

MATAKANUI

GOLD LIMITED



# Biodiversity Outcome Monitoring Plan

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## Glossary

| Specific terms      |                                                                                                                                                                    |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ACO                 | Artificial Cover Objects                                                                                                                                           |
| ARA                 | Ardgour Restoration Area                                                                                                                                           |
| ARP                 | Ardgour Restoration Plan                                                                                                                                           |
| BOGP                | Bendigo-Ophir Gold Project ('the Project')                                                                                                                         |
| BOMP                | Biodiversity Outcome Monitoring Plan                                                                                                                               |
| DDF                 | Direct disturbance footprint                                                                                                                                       |
| EMPF                | Ecological Management Plan Framework                                                                                                                               |
| ESA                 | Ecological Study Area                                                                                                                                              |
| LERMP               | Landscape and Ecological Rehabilitation Management Plan                                                                                                            |
| LMP                 | Lizard Management Plan                                                                                                                                             |
| MRZ                 | Mine Regeneration Zone                                                                                                                                             |
| SEQE                | Suitably Experienced and Qualified Ecologist(s)                                                                                                                    |
| TIMP                | Terrestrial Invertebrate Management Plan                                                                                                                           |
| General terms       |                                                                                                                                                                    |
| Biodiversity        | The variety of life on Earth at all its levels, from genes to ecosystems, and can encompass the evolutionary, ecological, and cultural processes that sustain life |
| Ecology             | The study of the relationships between living organisms, including humans, and their physical environment.                                                         |
| Habitat clearance   | Earthworks and/or vegetation clearance                                                                                                                             |
| Site description    |                                                                                                                                                                    |
| Ardgour Sanctuary   | An area of Ardgour Station, north-northwest of the DDF, in which 38 ha of pest exclusion fencing is proposed                                                       |
| Ardgour Rise        | A realignment of part of Thomson Gorge Road, via Ardgour Station (Ardgour Rise), planned to provide public access through to the Manuherikia Valley                |
| Bendigo Sanctuary   | An area of Bendigo Station, west of the DDF (and north of Bendigo Historic Reserve), in which 29 ha of pest exclusion fencing is proposed                          |
| Matakanui Sanctuary | Collectively the Ardgour and Bendigo Sanctuaries, comprising approximately 67 ha of pest-exclusion fenced areas.                                                   |

## 1. INTRODUCTION

### Plan objective, purpose and scope

The objective of this Biodiversity Outcome Monitoring Plan (**BOMP**) is to verify that stated ecological outcomes have been achieved within 35 years and to inform adaptive management or contingency measures where required. The purpose of this BOMP is to set out the methods for achieving this objective.

The Ecological Management Plan Framework (**EMPF**) outlines the responsibilities of the Environment Manager, Suitably Experienced and Qualified Ecologist(s) (SEQE), and other key personnel in implementing ecological management plans. This BOMP aligns with the EMPF and draws on the EMPF's principles of ecological effects management and contributes to the overall biodiversity outcomes through habitat enhancement and monitoring protocols.

Verification of these stated biodiversity outcomes will be determined via monitoring the response of biodiversity metrics to proposed rehabilitation and offsetting/ compensation measures that are intended to address adverse effects that cannot otherwise be avoided or minimised. The biodiversity outcome monitoring in this BOMP is thus distinct from compliance monitoring, which demonstrates that effects management has been undertaken in accordance with conditions and associated management plans.

The biodiversity outcome monitoring programme involves the monitoring of habitat types and associated species within ecological rehabilitation and offset/compensation sites, and their response to rehabilitation and offset/compensation actions.

Biodiversity outcomes relating to the success of salvage and relocation operations (effects minimisation) are not addressed in this plan. Specifically:

- The outcomes of plant salvage and relocation efforts into the ecological rehabilitation sites are set out in the Landscape and Ecological Rehabilitation Plan (**LERMP**).
- The outcomes of invertebrate and lizard salvaging and relocation operations are addressed in the Terrestrial Invertebrate (**TIMP**) and Lizard Management Plans (**LMP**) respectively. We note that the success of salvage and relocation operations for lizards requires the ability to distinguish relocated individuals from resident individuals, and approval would be required to permanently mark individuals.

Translocated species monitoring is factored into this plan but dependent on approval of specific translocation applications and may need to be adapted to

align with the monitoring requirements set out in the associated translocation conditions.

## 2. STATED BIODIVERSITY OUTCOMES

In many instances, net gain or net positive biodiversity outcomes are expected through rehabilitation and offset/compensation actions undertaken across 2,699 ha as detailed in the associated management plans.

All outcomes including net loss outcomes will be verified through fit for purpose metrics where this is possible. In some instances, net loss or uncertain outcomes are predicted due to a lack of evidence to the contrary, however, net positive or net gain outcomes may eventuate and thus predicted net loss outcomes also warrant verification. In particular, through the implementation of the Applied Research Plan for Conservation Management, Rehabilitation and Expansion of Cushionfield (**ARP**), effects management options may prove successful and identify management opportunities that generate tangible benefits.

In broad terms metrics used to verify stated outcomes include:

- Habitat type extent (remote sensing)
- Indigenous plant dominance per unit area
- Indigenous plant species richness per unit area
- Occupancy % occurrence across replicates
- Relative abundance based on counts (plants and fauna) or percent cover (herbaceous plants)

Table 1 below sets out the expected outcomes for habitats and the metrics used to verify stated outcomes.

**Table 1 expected outcomes for habitats and the metrics used to verify stated outcomes**

| Habitat type                                          | Expected outcome following offset/ compensation actions                                                                              | Metrics used to verify stated outcomes                                                                              |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Exotic pasture or herbfield                           | Net loss (replaced by native habitat)                                                                                                | <ul style="list-style-type: none"> <li>• Remote sensing (spatial extent)</li> <li>• Indigenous dominance</li> </ul> |
| Mixed depleted herbfield (cushionfield) and grassland | Net loss (but with potential for tangible benefits if the ARPCSA provides evidence that these outcomes can be demonstrably achieved) |                                                                                                                     |

| Habitat type                                 | Expected outcome following offset/ compensation actions | Metrics used to verify stated outcomes                                                                                                                      |
|----------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mixed tussock shrubland and exotic grassland | Net gain for native elements                            | <ul style="list-style-type: none"> <li>• Mean indigenous plant species richness</li> <li>• % occurrence and relative abundance of notable plants</li> </ul> |
| Mixed scrubland                              | Net gain for native elements                            |                                                                                                                                                             |
| Native-dominant tussockland                  | Net loss in extent and net gain in condition            |                                                                                                                                                             |
| Native taramea herbfield and shrubland       | Net gain in extent and condition                        |                                                                                                                                                             |
| Native-dominant scrubland                    | Net gain in extent and condition                        |                                                                                                                                                             |
| Alluvial podocarp forest                     | Net gain in extent and condition                        |                                                                                                                                                             |
| Swamp/Marsh wetlands                         | Net gain in extent and condition                        |                                                                                                                                                             |
| Fen wetlands                                 | Net loss in extent and condition                        |                                                                                                                                                             |
| Seepage wetlands                             | Net loss in extent and condition                        |                                                                                                                                                             |
| Alluvial podocarp forest                     | Net gain in extent and condition                        |                                                                                                                                                             |

Table 2 below sets out the expected outcomes for notable plant species and the metrics used to verify stated outcomes. Notable plant species include species classified as nationally or regionally threatened or at risk or otherwise assessed as having important ecological value.

**Table 2 Notable plant species and the metrics used to verify stated outcomes.**

| Notable species (nationally or regionally threatened or otherwise deemed to be of moderate or higher ecological value) | Expected outcome following offset/ compensation actions | Metrics used to verify stated outcomes                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tiny forget-me-not - <i>Myosotis brevis</i>                                                                            | Net loss                                                | <ul style="list-style-type: none"> <li>• Occupancy (% occurrence across monitoring programme replicates)</li> <li>• Relative abundance (number of plants or % cover per unit area)</li> </ul> |
| <i>Carex talboti</i>                                                                                                   | Net loss                                                |                                                                                                                                                                                               |
| <i>Colobanthus brevisepalus</i>                                                                                        | Net loss                                                |                                                                                                                                                                                               |
| <i>Raoulia beauverdii</i>                                                                                              | Net loss                                                |                                                                                                                                                                                               |
| <i>Hypericum involutum</i>                                                                                             | Net loss                                                |                                                                                                                                                                                               |
| Desert poa - <i>Poa maniototo</i>                                                                                      | Net loss                                                |                                                                                                                                                                                               |
| <i>Ceratocephala pungens</i>                                                                                           | Net loss                                                |                                                                                                                                                                                               |
| <i>Lagenophora barkeri</i>                                                                                             | Net loss                                                |                                                                                                                                                                                               |
| NZ Mousetail - <i>Myosurus minimus n-z</i>                                                                             | Net loss                                                |                                                                                                                                                                                               |
| Celadon mat daisy - <i>Raoulia parkii</i>                                                                              | Net loss                                                |                                                                                                                                                                                               |
| <i>Rytidosperma maculatum</i>                                                                                          | Net loss                                                |                                                                                                                                                                                               |

| Notable species (nationally or regionally threatened or otherwise deemed to be of moderate or higher ecological value) | Expected outcome following offset/compensation actions | Metrics used to verify stated outcomes                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Epilobium hectorii</i>                                                                                              | Uncertain                                              |                                                                                                                                                                                               |
| Common scabweed - <i>Raoulia australis</i>                                                                             | Net loss                                               |                                                                                                                                                                                               |
| <i>Rytidosperma buechananii</i>                                                                                        | Net loss                                               |                                                                                                                                                                                               |
| <i>Colobanthus strictus</i>                                                                                            | Net loss                                               |                                                                                                                                                                                               |
| Feldmark grass - <i>Rytidosperma pumilum</i>                                                                           | Net loss                                               |                                                                                                                                                                                               |
| Pincushion grass - <i>Agrostis muscosa</i>                                                                             | Net loss                                               |                                                                                                                                                                                               |
| <i>Poa lindsayi</i>                                                                                                    | Net loss                                               |                                                                                                                                                                                               |
| <i>Luzula leptophylla</i>                                                                                              | Net loss                                               |                                                                                                                                                                                               |
| <i>Myosotis antarctica</i> subsp. <i>antarctica</i>                                                                    | Net loss                                               |                                                                                                                                                                                               |
| Hot rock fern - <i>Pellaea calidrupium</i>                                                                             | Net loss                                               |                                                                                                                                                                                               |
| <i>Myriophyllum pedunculatum</i> ss <i>novae-zelandiae</i>                                                             | Net loss                                               |                                                                                                                                                                                               |
| Rock fern - <i>Cheilanthes sieberi sieberi</i>                                                                         | Uncertain                                              |                                                                                                                                                                                               |
| Coastal woodrush - <i>Luzula banksiana</i> var. <i>rhadina</i>                                                         | Net loss                                               |                                                                                                                                                                                               |
| <i>Rytidosperma corinum</i>                                                                                            | Net loss                                               |                                                                                                                                                                                               |
| <i>Vittadinia australis</i>                                                                                            | Uncertain                                              |                                                                                                                                                                                               |
| Kōwhai <i>Sophora microphylla</i>                                                                                      | Net positive                                           |                                                                                                                                                                                               |
| <i>Chaerophyllum ramosum</i>                                                                                           | Uncertain                                              |                                                                                                                                                                                               |
| <i>Juncus distegus</i>                                                                                                 | Net positive                                           |                                                                                                                                                                                               |
| Mikimiki - <i>Coprosma virescens</i>                                                                                   | Net positive                                           |                                                                                                                                                                                               |
| Blue Wheat Grass - <i>Anthosachne aprica</i>                                                                           | Net positive                                           |                                                                                                                                                                                               |
| <i>Olearia lineata</i>                                                                                                 | Net positive                                           |                                                                                                                                                                                               |
| Scented tree daisy <i>Olearia odorata</i>                                                                              | Net positive                                           | <ul style="list-style-type: none"> <li>• Occupancy (% occurrence across monitoring programme replicates)</li> <li>• Relative abundance (number of plants or % cover per unit area)</li> </ul> |
| <i>Styphelia nana</i>                                                                                                  | Net positive                                           |                                                                                                                                                                                               |
| <i>Pimelea aridula aridula</i>                                                                                         | Net positive                                           |                                                                                                                                                                                               |
| <i>Carex diandra</i>                                                                                                   | Net positive                                           |                                                                                                                                                                                               |
| Bladder Fern - <i>Cystopteris tasmanica</i>                                                                            | Net positive                                           |                                                                                                                                                                                               |
| <i>Festuca mathewsii</i> subsp. <i>mathewsii</i>                                                                       | Net positive                                           |                                                                                                                                                                                               |
| Buchanan's Sedge - <i>Carex buechananii</i>                                                                            | Net positive                                           |                                                                                                                                                                                               |
| <i>Geranium potentilloides</i>                                                                                         | Net positive                                           |                                                                                                                                                                                               |
| <i>Rumex flexuosus</i>                                                                                                 | Net positive                                           |                                                                                                                                                                                               |
| Bidibid / piripiri - <i>Acaena buechananii</i>                                                                         | Net positive                                           |                                                                                                                                                                                               |

| Notable species (nationally or regionally threatened or otherwise deemed to be of moderate or higher ecological value) | Expected outcome following offset/ compensation actions | Metrics used to verify stated outcomes |
|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------|
| Spineless Acaena - <i>Acaena inermis</i>                                                                               | Net positive                                            |                                        |
| <i>Carex kaloides</i>                                                                                                  | Net positive                                            |                                        |
| <i>Carmichaelia petrei</i>                                                                                             | Net positive                                            |                                        |
| <i>Geranium aff. microphyllum</i>                                                                                      | Net positive                                            |                                        |
| <i>Olearia bullata</i>                                                                                                 | Net positive                                            |                                        |
| <i>Pimelia notia</i>                                                                                                   | Net positive                                            |                                        |
| <i>Pimelea prostrata</i> subsp. <i>prostrata</i>                                                                       | Net positive                                            |                                        |
| Stout dwarf broom <i>Carmichaelia monroi</i>                                                                           | Net Gain                                                |                                        |
| <i>Coprosma brunnea</i>                                                                                                | Net Gain                                                |                                        |
| Coral broom <i>Carmichaelia crassicaulis crassicaulis</i>                                                              | Net Gain                                                |                                        |
| <i>Olearia cymbifolia</i>                                                                                              | Net Gain                                                |                                        |
| <i>Veronica rakaiensis</i>                                                                                             | Net Gain                                                |                                        |
| <i>Carmichaelia nana</i>                                                                                               | Net gain                                                |                                        |
| tussock bindweed ( <i>Convolvulus verecundus</i> subsp. <i>Verecundus</i> )                                            | Net gain                                                |                                        |

Table 3 below sets out the expected outcomes for notable fauna and the metrics used to verify stated outcomes. Notable fauna include species classified as nationally or regionally threatened or at risk or otherwise assessed as having important ecological value.

**Table 3 Notable fauna and the metrics used to verify stated outcomes.**

| Fauna species                            | Expected outcome following offset/ compensation actions | Metrics used to verify stated outcomes |
|------------------------------------------|---------------------------------------------------------|----------------------------------------|
| Avifauna                                 |                                                         |                                        |
| Indigenous Avifauna Species Richness     | Net positive                                            | Relative abundance / conspicuousness   |
| Indigenous Avifauna Assemblage abundance | Net positive                                            |                                        |
| New Zealand falcon – eastern form        | Net positive                                            |                                        |
| New Zealand pipit*                       | Net positive                                            |                                        |
| Silvereye*                               | Net positive                                            |                                        |
| Bellbird                                 | Net positive                                            |                                        |
| Black-fronted tern                       | Uncertain                                               |                                        |

| Fauna species                                      | Expected outcome following offset/ compensation actions | Metrics used to verify stated outcomes                                                                  |
|----------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Black-billed gull                                  | Uncertain                                               | Not applicable (it is not proposed to monitor outcomes for these species as they are likely unaffected. |
| South Island pied oystercatcher*                   | Uncertain                                               |                                                                                                         |
| Black shag                                         | Uncertain                                               |                                                                                                         |
| Little shag                                        | Uncertain                                               |                                                                                                         |
| Lizards                                            |                                                         |                                                                                                         |
| Tussock skink                                      | Net loss                                                | Counts (relative abundance)                                                                             |
| Kawarau gecko                                      | Net loss                                                |                                                                                                         |
| McCanns skink                                      | Net loss                                                |                                                                                                         |
| Otago skink (if translocation approval granted)    | Net gain                                                |                                                                                                         |
| Grand skink (if translocation approval granted)    | Net gain                                                |                                                                                                         |
| Jewelled gecko (if translocation approval granted) | Net gain                                                |                                                                                                         |
| Invertebrates                                      |                                                         |                                                                                                         |
| <i>Pseudocoremia cineracia</i> (moth)              | Uncertain                                               | Counts (relative abundance)                                                                             |
| <i>Harpalus</i> new sp. (ground beetle)            | Uncertain                                               |                                                                                                         |
| <i>Inophloeus</i> new sp. (weevil)                 | Uncertain                                               |                                                                                                         |
| <i>Phaulacridium otagoense</i> (grasshopper)       | Uncertain                                               |                                                                                                         |
| <i>Elachista helonoma</i> (moth)                   | Uncertain                                               |                                                                                                         |
| <i>Ichneutica toroneura</i> (moth)                 | Uncertain                                               |                                                                                                         |
| <i>Megadromus</i> new sp. 1 (ground beetle)        | Uncertain                                               |                                                                                                         |
| <i>Megadromus</i> new sp. 2 (ground beetle)        | Uncertain                                               |                                                                                                         |
| <i>Scythris</i> sp. 1 (moth)                       | Uncertain                                               |                                                                                                         |
| <i>Sporophyla oenospora</i> (moth)                 | Uncertain                                               |                                                                                                         |
| <i>Homodotis</i> sp. A (NZAC (CO)) (moth)          | Uncertain                                               |                                                                                                         |
| <i>Pasiphila</i> sp. 'Olearia' pug moth            | Uncertain                                               |                                                                                                         |
| <i>Agrotis admirationis</i> (moth)                 | Uncertain                                               | Counts (relative abundance)                                                                             |
| <i>Asaphodes recta</i> (moth)                      | Uncertain                                               |                                                                                                         |
| <i>Nyctemera annulata</i> (moth)                   | Uncertain                                               |                                                                                                         |
| <i>Ichneutica sistens</i> (moth)                   | Uncertain                                               |                                                                                                         |
| <i>Meterana exquisite</i> (moth)                   | Uncertain                                               |                                                                                                         |
| <i>Paranotoreas fulva</i> (moth)                   | Uncertain                                               |                                                                                                         |

### 3. BIODIVERSITY OUTCOME TARGETS

#### 3.1. Ecological rehabilitation sites

The following biodiversity outcomes are sought in rehabilitation areas, with the objective of reducing the severity of project effects. Targeted outcomes for achievement within 35 years of approvals being granted are:

- >70% of the 610 ha Direct Disturbance Footprint (**DDF**) is covered in a native vegetation/habitat mosaic that is dominated by indigenous woody shrubland and tussock with lesser amounts of cushionfield, taramea and marsh and swamp wetland habitats
- An increase in mean native plant species richness relative to the pre-mining state<sup>1</sup> for native tree, shrub and liana species across the habitats within the DDF relative to the pre-mining state;
- An increase in indigenous dominance of vegetation relative to the baseline
- An increase in mean Threatened or At Risk plant species richness and combined relative abundance relative to the pre-mining state across the habitats within the DDF; and
- An increase in mean abundance of seed dispersing native avifauna relative to the pre-mining state across the DDF

#### 3.2. Biodiversity offset/compensation sites

The following biodiversity outcomes are sought across 2,219 ha of biodiversity offset/compensation sites comprising the Mine Regeneration Zone (**MRZ**), Ardgour Restoration Area (ARA), Ardgour Sanctuary and Bendigo Sanctuary:

- A net increase in vegetation and fauna values that exceeds residual loss for each of the following metrics within 35 years of granting of approvals based on:
  - Areal extent of native-dominated vegetation/habitat cover across offset/compensation areas;
  - Mean species richness of trees, shrubs and lianes;
  - Mean indigenous dominance of plants
  - Mean species richness and combined abundance of the nationally/regionally threatened plant assemblage;

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<sup>1</sup> Relative to the baseline state as quantified in the various survey reports and summarised in the assessment of ecological effects report

- Establishment and persistence of re-introduced plants that are presently extirpated from the Ecological Study Area (**ESA**) and/or surrounding landscape as specified in the relevant plans.
- Mean abundance of seed dispersing native birds; and
- Mean indigenous avifauna species richness and assemblage abundance

Additionally, for the Ardgour and Bendigo Sanctuaries, the following biodiversity outcome is sought:

- An increase in native biodiversity in the landscape via the translocation of nationally or regionally Threatened or At Risk species that have been locally extirpated, including a minimum of:
  - Three lizard species (for example Otago skink, jewelled gecko and grand skink);
  - One invertebrate species (for example *Sigauss minutus* (minute grasshopper) or
  - *Sigauss childi* (Otago arid grasshopper)
  - One plant species (for example<sup>2</sup> *Ceratocephala pungens*, *Ranunculus brevis*, white sedge, *Carmichaelia nana*, or tussock bindweed (*Convolvulus verecundus* subsp. *Verecundus*)).

#### 4. MONITORING PROGRAMME STUDY AREA

The monitoring programme will be undertaken across the ecological rehabilitation and offset/compensation areas before and after the commencement of effects management measures. Baseline monitoring will include:

- Offset/compensation sites: Baseline monitoring prior to commencement of offset/compensation measures (yet to be completed). While existing information was captured as part of the assessment of ecological effects, replication was insufficient for biodiversity outcome monitoring.
- Direct disturbance footprint: Baseline information already collected from within 'DDF to inform the assessment of ecological effects report.

This baseline monitoring will enable 'before versus after' comparisons across 2,699 ha of available land that is proposed for ecological rehabilitation or offsetting/compensation. This includes monitoring within:

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<sup>2</sup> Establishment of spring annuals such as *C. pungens* will be in accordance with the outcomes of the ARPCSA

- The approximately 480 ha of ecological rehabilitation within the DDF (all available areas);
- The approximately 889 ha MRZ
- The approximately 1,263 ha ARA
- The approximately 38 ha Ardgour Sanctuary
- The approximately 29 ha Bendigo Sanctuary

The sections below set out the design of the terrestrial biodiversity outcome monitoring programme and the data collection and analysis methods used to verify that stated outcomes have been achieved.

## **5. TERRESTRIAL BIODIVERSITY MONITORING**

### **5.1. Study design**

Integrated terrestrial biodiversity monitoring stations (herein monitoring stations) will be selected using a stratified random approach to ensure representative spatial cover and adequate replication across the ecological rehabilitation and offset/compensation sites.

Monitoring stations will be selected from the same 800m x 800m grid network used for the baseline terrestrial ecology survey programme as described in the various survey reports (RMA Ecology, 2025 and Habitat NZ, 2025) and summarised in the Assessment of Ecological Effects Report (Alliance Ecology, 2025).

Monitoring stations will be selected at the grid centroids, which will be located within 800m x 800m, or 400m x 400m, 200m x 200m, or 100m x 100m nested grids depending on the areal extent of rehabilitation, offset/compensation and the replication needs within each site.

Regardless of the selected grid size, a single monitoring station will be assigned to the grid centroid. Where required, monitoring stations within the ecological rehabilitation sites or the respective offset/compensation sites will be randomly de-selected to match replication needs. Where the grid centroid is unsuitable for monitoring (e.g. excessively steep terrain) the monitoring station will be moved to the closest feasible position relative to the original site.

### **5.2. Data collection**

#### **5.2.1. Remote sensing**

Remote sensing (hyperspectral imagery) will be used to quantify temporary changes in native shrubland cover within ecological rehabilitation and offset/compensation sites.

This data will need to be calibrated against ground measurements at integrated monitoring stations as set out below. Remote sensing will be undertaken at a fine scale and include baseline imagery prior to the commencement of rehabilitation and offset/compensation measures.

### **5.2.2. Integrated terrestrial biodiversity monitoring stations**

A total of 500 integrated terrestrial biodiversity monitoring stations will be established across the 2,699 ha of ecological rehabilitation and offset/compensation sites, including:

- 100 monitoring stations within a 200m x 200m grid network across the ecological rehabilitation sites within the DDF
- 180 monitoring stations within a 200m x 200m grid network across the MRZ
- 180 monitoring stations within a 200m x 200m grid network across the ARA
- 20 monitoring stations within a 100m x 100m grid network across the Ardgour Sanctuary
- 20 monitoring stations within a 100m x 100m grid network across the Bendigo Sanctuary

Each monitoring station will be rotationally monitored once every five years between February and March with data collected for all metrics within the same monitoring event.

Biodiversity metrics monitored at the integrated monitoring stations centre on terrestrial vegetation, terrestrial avifauna, lizards and invertebrates as set out below. Each monitoring station centres on a 10 m x 10 m vegetation plot.

### **5.2.3. Terrestrial vegetation monitoring**

Terrestrial vegetation monitoring will be undertaken within each 10m x 10m plot to quantify vegetation characteristics and change within the ecological rehabilitation and offset/compensation sites before (baseline)<sup>3</sup> and after commencement of project activities.

Each 10 m x 10 m plot will be delineated with permanent stakes at the centre and four corners (NW, NE, SW and SE corners) and numbered. Permanent stakes will be H3 25 mm x 25 mm wooden stakes. The plot may be further subdivided into four 5 m x 5 m

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<sup>3</sup> Baseline monitoring within the DDF has been completed as noted in Section 3.

subplots using measuring tape to facilitate the recording of habitat and vegetation characteristic measurements. A GPS recording will be taken at the centre of each plot.

The data collection methods to verify stated effects management outcomes for terrestrial vegetation are set out in Table 4 below.

**Table 4: Data collection methods for native terrestrial vegetation monitoring**

| Bioindicator                           | Method                                                                                                                                                                                       |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vegetation and habitat data collection |                                                                                                                                                                                              |
| Vegetation                             | Vegetation photo points with photographs taken from the centre of the plot on a NW, NE, SW and SE bearing. The plot will be centred by corner stakes.                                        |
| Indigenous vegetation species richness | Composition of all large seedlings > 30cm; saplings; and trees > 2.5 cm Diameter at Breast Height (DBH) within 10 m x 10 m vegetation plots to obtain mean native species richness per plot. |
| Native tree basal area                 | Measurement of all native trees (> 2.5 cm DBH) within 10 m x 10 m vegetation plots to obtain a mean basal area per plot for each species                                                     |
| Seedling and sapling density           | Sapling and large seedling (> 30 cm) density for each native species within 5 m x 5 m subplots to obtain a mean basal area per plot for each species                                         |
| Herbaceous cover                       | % cover of herbaceous vegetation and ground habitat within four 2 m x 2 m subplots located in each corner of the 10m x 10m vegetation plot                                                   |

#### 5.2.4. Terrestrial bird monitoring

Five Minute Bird Counts (**5MBC**) will be undertaken in accordance with Hartley and Greene (2012), except only native species will be recorded. Distance sampling protocol will be used in accordance with Greene and Efford (2012<sup>9</sup>).

To this end, bird data collected for each observation during each 5MBC will include:

- Species composition and the number of individuals for each species recorded.
- Type of observation: aural, visual or both.
- Distance of observation from monitoring station (m)<sup>10 11</sup> with distances of observations from observers classified into four bands: 0 – 19 m, 20 – 39 m, 40 – 99 m and >100 m.

Bird counts will be undertaken by the **SEQE** (suitably experienced and qualified ecologist(s)) after a quiet period of 5 minutes. Environmental conditions recorded prior to commencement will include:

- Temperature: cold (>5°C), cool, (6°C to 10°C), mild (11°C to 15°C), warm (16°C to 22°C), hot (>22°C).
- Weather: fine/sunny, moderate rain, overcast, partly cloudy, light rain, heavy rain
- Wind (Beaufort scale)
- Noise: no noise, low noise level, moderate noise level, high noise level.

In accordance with Hartley and Greene (2012) counts will not be undertaken during adverse conditions including heavy rain, cold (<5°C), excessive noise, or wind 5 or higher on the Beaufort scale.

Data will be collected utilising ArcGIS tools including Field Maps and Survey123 (ESRI, 2023).

#### **5.2.5. Lizard monitoring**

Lizard monitoring at integrated monitoring stations will include four double layer Artificial Cover Objects (**ACOs**) placed adjacent to all four corners of the monitoring station a minimum of 12 months prior to first check<sup>4</sup>. Monitoring at each station will include a 1/2 person hour of timed manual searching via the lifting of rocks or coarse wood, checking crevices with a torch, or visual observations of basking lizards.

#### **5.2.6. Invertebrate monitoring**

Terrestrial invertebrate monitoring at integrated monitoring stations will include wooden disc monitoring and manual searching for ground beetles, spiders, wētā and other invertebrates, along with live light trap monitoring for moths.

A wooden disc will be placed adjacent to each lizard ACO in each corner of the integrated monitoring station. Wooden discs will be approximately 40-60cm in diameter and a minimum of 7.5cm thick and will be placed with the flattest surface onto bare ground (removal of leaf litter if necessary). These will be checked by carefully lifting the disc, recording the number and type of each taxa/species seen between the underside

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<sup>4</sup> It is important to allow ample time for ACOs to bed in so that baseline results aren't confounded by inadequate time between ACO deployment and checks. Where offset/compensation actions are scheduled for Winter 2026 (e.g. pest control in the Ardour Restoration Area in advance of lizard relocation), baseline lizard monitoring will be undertaken after offset/compensation actions. However, in such instances, lizard monitoring will be undertaken within six months of commencement of offset/compensation actions, before any notable changes can occur.

of the wood and ground, then carefully placing the disc back to avoid squashing any invertebrates.

A 0.5 person hour of timed manual searching will be undertaken at each monitoring station via the lifting of rocks or coarse wood, or visual observations.

Light trap monitoring will be conducted at approximately one in every five stations. To ensure moths are surveyed each year the required number of monitoring stations with light trap monitoring will be as follows:

- 20 out of the 100 monitoring stations across the ecological rehabilitation sites within the DDF
- 35 out of the 180 monitoring stations across the MRZ
- 35 out of the 180 monitoring stations across the ARA
- 5 out of the 20 monitoring stations across the Ardgour Sanctuary
- 5 out of the 20 monitoring stations across the Bendigo Sanctuary

Short-duration live light trapping will be employed instead of overnight traps that kill moths, minimising long-term population impacts and protecting significant species present in the area. Live light trap monitoring will utilise a collection chamber system, largely following the setup used in the Bendigo-Ophir Gold Project (**BOGP**) Terrestrial Invertebrate Survey. This uses a bucket-style collection chamber equipped with an appropriate 8-watt UV A lamp, perspex vanes, and battery power source, with egg cartons positioned within the trap to provide suitable resting surfaces for captured moths.

This approach ensures that moths can be safely observed, identified, and released unharmed while still providing effective monitoring data for the survey.

Light traps will be set up before dark and remain active for 3 hours after dark.

Photographs of each moth species will be taken and used for ID of species that cannot be readily identified on site. Specimens may be collected if required to ensure accurate identification under the discretion of a suitably experienced entomologist/ecologist, with all other individuals released at the collection location after identification.

Light trapping results will provide a species list which is intended to monitor species presence, and the composition of species, in the area over time. This method is not ideal for a quantitative comparison of abundance as it balances the need for quality information and reduces unnecessary specimen collection.

Environmental data will be collected alongside each sampling event including temperature, humidity, precipitation and a description of wind levels.

#### **5.2.7. Species translocation monitoring (Matakanui sanctuaries only)**

Biodiversity outcome monitoring for translocated species will be undertaken in accordance with monitoring requirements set out in specific translocation applications (yet to be applied for).

## **6. WETLAND BIODIVERSITY MONITORING PROGRAMME**

### **6.1. Programme design**

As with the terrestrial monitoring programme, wetland monitoring sites will be selected using a stratified random approach to ensure representative spatial cover and adequate replication across wetlands within the ecological rehabilitation and offset/compensation sites.

The wetland biodiversity monitoring programme will apply a 10m x 10m grid across all existing or created wetlands within the rehabilitation and offset/compensation sites.

A single 2m x 2m monitoring station will be assigned to each selected grid centroid, provided that the centroid is located within a wetland, as confirmed during ground-truthing. Plots will be randomly de-selected or selected to match the replication needs within each wetland.

### **6.2. Data collection**

#### **6.2.1. Remote sensing**

Remote sensing (hyperspectral imagery) will be used to quantify temporary changes in wetlands within ecological rehabilitation and offset/compensation sites. This data will need to be calibrated against ground measurements at integrated monitoring stations as set out below. As for terrestrial vegetation, remote sensing will be undertaken at a fine scale and include baseline imagery prior to the commencement of rehabilitation and offset/compensation measures.

#### **6.2.2. Integrated wetland biodiversity monitoring stations**

A total of 100 wetland biodiversity monitoring stations will be established across the approximately 13.6 ha of wetland ecological rehabilitation and offset/compensation sites, including:

- 60 monitoring stations within the 7.5 ha of vegetated wetlands that will be created in the ecological rehabilitation sites within the DDF (commencing immediately prior to rehabilitation within each area)

- 20 monitoring stations within the approx. 4.7 ha of wetland within the MRZs  
20 monitoring stations within the approx. 1.4 ha of wetland within the ARA

Wetland monitoring will not be conducted in the Ardgour or Bendigo sanctuaries as these areas contain no wetland habitats.

Each monitoring station will be rotationally monitored once every five years between February and March with data collected for all metrics within the same monitoring event.

Biodiversity metrics monitored at the integrated monitoring stations centre on wetland vegetation and, for the wetland rehabilitation in the DDF, wetland birds.

### **6.2.3. Wetland vegetation monitoring**

Wetland vegetation monitoring will be undertaken to quantify characteristics and change within the impact, habitat restoration and reference sites before and after the commencement of project activities.

Each 2m x 2m plot will be delineated with a permanent stake placed at the southwest corner and numbered. Permanent stakes will be H3 25 mm x 25 mm wooden stakes. A GPS recording will be taken at the centre of the plot.

The data collection methods to verify stated effects management outcomes for wetland vegetation are set out in Table 5 below.

**Table 5 Data collection methods for native wetland vegetation monitoring**

| Bioindicator                                                                | Method                                                                                                                                                                                     |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wetland vegetation and habitat data collection                              |                                                                                                                                                                                            |
| Wetland vegetation composition, indigenous dominance and relative abundance | Wetland vegetation photo points with photographs taken from the centre of the plot. The plot will be centred by corner stakes.                                                             |
|                                                                             | Composition of all large seedlings > 30cm; saplings; and trees > 2.5 cm Diameter at Breast Height (DBH) within 2 m x 2 m vegetation plots to obtain mean native species richness per plot. |
|                                                                             | Species composition and relative abundance (% cover) of herbaceous vegetation and ground habitat to obtain species richness and species relative abundance per 2m x 2m plot                |

Targeted wetland plant monitoring will also be undertaken as set out in the LERMP.

#### **6.2.4. Wetland bird monitoring**

Wetland birds will be monitored only within the swamp/marsh wetland complex to be created as part of the ecological rehabilitation of the DDF. No wetland habitat types within the offset/compensation sites are expected to support wetland birds.

Once wetlands have been re-created in the ecological rehabilitation area, wetland bird monitoring will include call-back monitoring for South Island māātā (fernbird) coupled with 5MBC. These counts will be undertaken in accordance with Hartley and Greene (2012) and as described above. Surveys will be undertaken in February/March of each year.

## **7. MONITORING AND REPORTING**

### **7.1. Baseline monitoring and reporting**

Within each of the offset/compensation sites (MRZ, ARA, Ardgour Sanctuary and Bendigo Sanctuary), baseline monitoring will begin in the spring/summer prior to the commencement of offset/compensation actions<sup>5</sup>. This will mean baseline monitoring within the MRZ, ARA and Bendigo Sanctuary will commence earlier than for the Ardgour Sanctuary which is not proposed for completion until 2028.

This baseline monitoring (Year 0) will involve data collection at all terrestrial and wetland monitoring sites for the purpose of providing robust quantitative information on biodiversity characteristics and values prior to the commencement of project activities at the offset/compensation sites.

A baseline monitoring report will be provided that includes:

- Verification that the baseline monitoring programme has been undertaken in accordance with relevant requirements and methods set out in the BOMP or the most recent amended version;
- Baseline monitoring results including descriptive statistics, updated maps and representative photos; and
- Recommendations for improving the monitoring programme if required.

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<sup>5</sup> The exception is that where offset/compensation actions are scheduled for Winter 2026 (e.g. pest control in the ARA in advance of lizard relocation), baseline lizard monitoring will be undertaken soon after offset/compensation actions

## **7.2. Biodiversity outcome monitoring and reporting**

Outcome monitoring at rehabilitation and offset/compensation sites will follow a five-year rotational cycle, beginning once rehabilitation or offset/compensation actions commence at each site. Each year, one-fifth of the monitoring stations established at a particular site will be monitored.

The timing of outcome monitoring commencement following the initiation of ecological rehabilitation or offset/compensation measures will vary across the different ecological rehabilitation and offset/compensation sites.

Monitoring will continue for the life of consent (35 years) and/or until stated biodiversity outcomes have been verified.

Annual biodiversity outcome monitoring reports will be provided as part of the integrated annual ecology report. These reports will include:

- Verification that the monitoring has been undertaken in accordance with relevant consent conditions and the methods set out in the BOMP or the most recent amended version;
- Monitoring results including descriptive and statistical analyses of changes relative to the baseline for each of the metrics set out above. Results shall include updated maps and representative photos;
- Recommendations for adaptive management if interim results suggest that the rehabilitation and offset/compensation programmes are not on-track to achieve stated outcomes at 35 years. This may include recommendation on the type, quantum and location of contingency measures to ensure that stated outcomes are achieved at 35 years; and
- Recommendations for improving the monitoring programme if required.

## **7.3. Biodiversity outcome report**

Upon completion of the monitoring programme and 35 years after commencement of project activities, a final biodiversity outcome report will be submitted to Council. This report shall include:

- Verification that the monitoring has been undertaken in accordance with relevant consent conditions and the methods set out in the BOMP or the most recent amended version.
- Monitoring results including descriptive and statistical analyses of changes relative to the baseline, with updated maps and representative photos.
- Verification that stated biodiversity outcomes have been achieved, and/or recommendations for contingency measures if required, including the type, quantum and location of contingency measures and associated monitoring requirements.

Should interim results from the biodiversity outcome monitoring reports indicate that stated biodiversity outcomes are unlikely to be achieved, adaptive management options will be considered. The location, scale, intensity, frequency, location and duration of the proposed adaptive management measure(s) to be considered will be commensurate with requirements for achieving stated biodiversity outcomes within the stated timeframe.

Should the final biodiversity outcome report provided in year 35 indicate that stated outcomes have not been achieved despite implementation of adaptive management measures, contingency management and associated monitoring measures will be required. The location, scale, intensity, frequency, location and duration of the proposed contingency measure(s) will be determined at that time, commensurate with the stated outcome(s) that have not been achieved.