Macraes Phase 4 Project
Impact Management Plan V3

Oceana Gold (NZ) Ltd

Macraes Gold Project

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1 Document Summary

The MP4 Project now involves the following mine workings:

- Extending Coronation Pit down dip (stage 6 – CO6) and infilling the Coronation Pit with the mined waste rock and including the pit lake spillway.
- Extending Innes Mills Pit down dip and to a lesser extent up dip (stages 9 & 10 – IM9-10) and partially backfilling Frasers, Golden Point and Innes Mills pits and some waste going to the consented waste rock stacks (WRS) at Frasers.
- Rehandling some waste material from Northern Gully Waste Rock Stack (NGWRS) to back fill Golden Point Open Pit to provide buttressing for the MTI tailings storage facility.
- Extending Golden Bar Pit down dip (stage 2 – GB2) and disposing of mined waste rock at an expanded the Golden Bar WRS
- In addition, the mined-out Frasers Pit will be partially filled with tailings (FTSF) resulting from the processing of ore from consented pits, GPUG, the above open pit extensions and processing stockpiled lower grade ore.

Collectively, the above is referred to as the MP4 Open pit Extensions Project ('MP4 or the project'). The ecological impacts result from the proposed pit extensions. No ecological effects accrue from backfilling pits or placing waste within the limits of established and consented WRSs, or tailings disposal in the Frasers Pit.

The Assessment of Ecological Effects of MP4[1,2,3,4] [5] assesses that this project will (outside of existing consented areas):

  - Remove 37 ha of indigenous or semi-natural vegetation comprised of narrow-leaved tussock grassland, shrubland, riparian / wetland vegetation mosaic including 95 m of natural river bed and 33 m of induced river bed (430 m in total) portions totalling 0.008 ha classified as natural

[1] Ahikā Consulting Ltd. 2024. MP4 Project: Assessment of Effects on Vegetation & Avifauna. Unpub. Report 0015-220726 to Oceana Gold NZ Ltd.

[2] Bioresearches (2024). Herpetofauna Survey & Assessment: Macraes MP4. Consultation Draft. Technical Report Prepared for Oceana Gold (New Zealand) Ltd.

[3] Bioresearches (2024). Invertebrate Survey & Assessment: Macraes MP4. Consultation Draft. Technical Report Prepared for Oceana Gold (New Zealand) Ltd.

[4] Whirika Consulting Ltd. 2024. Ecological values of planned Coronation spillway and mitigation of project effects. Technical Note, 21 August 2024.

[5] Whirika Consulting Ltd. 2024. Wetland evaluation of Golden Bar Pit & Waste Rock Stack watercourses. 4 October 2024.

inland wetland, and ephemeral wetlands inhabited by 128 indigenous plant species (including fourteen rare species), and which also provides habitat for 11 indigenous bird species, (including one Threatened and two At Risk species).

- Directly impact 45 ha of improved pasture, pine forest (felled), exotic rough pasture and rehabilitated rough exotic grassland on the Northern Gully WRS.
- Potentially affect the surrounding vegetation resulting from project activities extending up to 100 m beyond the project area, containing 51 ha of indigenous vegetation.
- Impact a large but unknown number (likely high 1,000s) of three species of native reptile and their habitats, two of which are listed as At Risk.
- Impact on invertebrate communities inhabiting natural vegetation communities, including one Threatened species.

Overall, without taking into account impact management measures, the MP4 project is assessed as having a low or moderate effect on most of the terrestrial ecological features. The exception to this is a very high impact on three ephemeral wetlands at the Coronation 6 that are critically endangered naturally uncommon ecosystems, a high impact on tussockland, desert broom, NZ falcon, the moth *Orocrambus sophistes* and pipit at Golden Bar, and a high level of effect on native lizards at Golden Bar Pit and Golden Bar Waste Rock Stack.

To address these impacts, Oceana Gold (New Zealand) Limited (OceanaGold) proposes to implement the measures identified within this Impact Management Plan (IMP). These measures include:

Avoid effects by:

1) Redesigning the project plan so that project components avoid areas of higher ecological values, where practicable. This has resulted in removing Round Hill Stage 5 extension from the project and adjusting the location of the proposed Golden Bar Waste Rock Stack (WRS) to avoid lizard habitat, rare plants, and an ephemeral wetland.
2) Siting infrastructure such as the Golden Bar Road realignment away from areas with high ecological value wherever practicable.
3) Isolating areas of higher ecological value in the buffer area by signage or physical isolation where rockfall risk is high.
4) Implementing the 'ground nesting birds' protocol to avoid impacting on the nests of ground-nesting birds (banded dotterel, pipit and South Island pied oystercatcher).

Remedy effects by:

5) Structure and rehabilitate areas of WRS to provide habitat for lizards.
6) Rehabilitation of Golden Bar WRS to narrow-leaved tussock grassland.
7) Recreating the pit lake environment in the new Golden Bar pit.
8) Allow exotic vegetation habitats of lizards and birds (e.g., rank exotic grassland) to re-establish on mine workings.
9) Replanting the Coronation Spillway with narrow-leaved tussock grasses and *Celmisia hookeri* plants

Mitigate impacts by:

10) Minimising project effects of dust, noise, weeds, fire, sediment, contaminants on the surrounding area.
11) Salvage of lizards from the MP4 open pit extension areas to an area in the Murphys Ecological Enhancement Area (EEA) protected by a predator fence (this action is also being undertaken to satisfy the requirements of the Wildlife Act (1953)).
12) Rescuing Declining shrub *Carmichaelia petriei,* Naturally Uncommon rush *Juncus distegus* and Data Deficient shrub *Melicytus aff. alpinus* (c) (CHR 541568; Otago) that have been identified as plant species that are of moderate or higher ecological importance or that are of restricted distribution within the Macraes E.D. to safe site(s) in Ecological Enhancement Areas (EEA) (including OceanaGold covenants).
13) Salvage of tussock grass host plant habitat of *Orocrambus sophistes,* a Threatened invertebrate species if proved to be present, to re-create or enhance suitable habitat in a protected site.
14) Rescuing the Naturally Uncommon mountain daisy *Celmisia hookeri* in the Coronation Spillway footprint and replanting these in a fenced area adjacent to the newly-constructed spillway.

Offset residual effects by:

15) Creating a tussock grassland and shrubland offset at the proposed Murphys EEA (a site with better ecological values) and fund the ecological management of this area that also creates habitat that benefits lizards and birds (this action is also being undertaken to satisfy the requirements of the Wildlife Act (1953)).
16) Creating an offset for impact on ephemeral wetlands at Coronation by creating new wetlands.
17) Creating an offset for impact on wetlands at Innes Mills Stage 10 by creating a new wetland.

Compensate for remaining residual adverse effects by:

18) Constructing a predator fence around at least 45 ha of suitable habitat and removing all mammalian predators to benefit lizards and birds (including taoka[6] species).
19) Creation of replacement rock tor habitat for lizards.
20) Research into invertebrate community response to changes in tussockland habitat and researching habitat of *Orocrambus sophistes* (if proved to be present).
21) Protection and enhancement of riparian / wetland vegetation mosaic including approximately 860 m of stream bed and 0.008 ha of areas classified as natural inland wetland.
22) Fencing off a 100 m length of the gully bottom below Coronation Spillway.
23) Contingency measures associated with lizard salvage (see Lizard Management Plan).

Once implemented, this IMP will adequately address the magnitude of the effect on impacted ecological features by avoiding, minimising, remediating, offsetting and compensating all adverse ecological effects (as required under the planning documents) arising from the MP4.

This IMP also addresses the effects on lizards as Protected Wildlife under the Wildlife Act 1953. Further details on the salvage and relocation of lizards are discussed in the Lizard Management Plan (LMP)[7]).

This document is structured so that the general condition and threats to biodiversity in the Macraes Ecological District are described (Sections 2 and 3), the predicted impacts (Section 4) are summarised from the project Ecological Impact Assessments, the approach to impact management is described in the context of the regulatory framework within which this IMP must fit (Section 5), a general evaluation of impact management options in Section 6 and how to quantify these (Section 7), the preferred mitigation options selected to address the more than minor effects of this project in Section 9 and the IMP (Section 10) that will give effect to the preferred mitigation options.

Additional detail for more complex aspects that support this IMP are:

A. A Lizard Management Plan (LMP) that details the activities to address effects of the project on lizard species including requirements under the Wildlife Act (1953) such as salvage and monitoring the outcomes of these activities. This document is appended to this IMP in Appendix 3.

The planned approach (as employed in previous projects) has been to use the IMP as the basis for discussion with Department of Conservation (DOC), Councils, Iwi and other stakeholders to formulate consent

[6] Taoka is the preferred dialect spelling of taonga in this region of the Kai Tahu rohe.
[7] Bioresearches, 2024. Macraes MP4 Project: Lizard Management Plan. Unpub. Report dated to Oceana Gold NZ Ltd.

conditions (and wildlife authority requirements) which give effect to the outcomes of these discussions. The plan for achievement of consent conditions will be detailed with achievement targets in an Ecological Management Plan (EMP) developed in consultation with DOC and Iwi and certified by the consent authority. This EMP may contain subordinate plans such as for pest management, management of Ecological Enhancement Areas, lizard management, predator control, weed management, etc, as required to provide the level of detail necessary to undertake the actions within the EMP.

2 General Ecological Setting

The general ecological setting of MP4 is described in the Ecological Impact Assessment Reports and is summarised here as it provides important context for the IMP.

2.1 Vegetation Cover

Past vegetation cover of the Macraes Ecological District (ED) is thought to have comprised montane short tussockland grading into subalpine tall tussockland, with areas of mixed hardwood and podocarp forest, kanuka forest and *Coprosma*-flax scrub (Bibby 1997). In Otago, much of the original vegetation cover has been dramatically altered as a result of anthropogenic factors (McGlone et al. 1995), and this massive vegetation change has also occurred at Macraes (Whitaker 1996). Since European settlement in the 1850's (Thompson 1949), areas have been burnt (sometimes repeatedly) and exotic grasslands induced by ploughing, oversowing, and applying fertiliser (Whitaker 1996). The present vegetation of the Macraes ED is of a highly modified nature, with approximately 75% of the district dominated by exotic vegetation types (mainly improved pastureland) and the remainder of the vegetation types being indigenous and comprised of varying density, narrow-leaved tussockland, copper tussock-based wetlands and grey shrubland interspersed with remnants of original forest cover and scattered ephemeral wetlands (Bibby 1997, Thorsen pers. obs.). The remaining native vegetation communities currently present within the Macraes area are botanically diverse (Thorsen 2008) and is comprised of 601 indigenous (including 18 Data Deficient, 65 At Risk and 31 Threatened species) and 237 exotic species. The remaining vegetation communities are likely to be derived from the original vegetation communities that existed before human colonisation of the region, but many are likely to be considerably reduced in extent and species diversity. Invasion by exotic shrub and tree species, particularly gorse and broom, is an increasing problem in the area, as is conversion of tussock grassland to pasture and feed crop on lower slope land.

2.2 Fauna

Of the fauna, fifty-six species of birds have been recorded from the Macraes E.D., of which thirty-six are indigenous and twenty are introduced. The area's indigenous avifauna are likely being predated by exotic mammals, though the impact of this predation pressure on population dynamics is not known. They are also being impacted by changes to their habitats, however the nature of these changes and their impacts on the species is again not known.

The area is noted for its high diversity of seven lizard species (Whitaker et al. 2002) and the invertebrate communities are diverse (for a region at moderate altitude) and include some species that are rare or of biogeographic interest (Patrick 1997). The lizard species are being similarly impacted as birds by exotic

mammals and habitat change, though the severity of predation is somewhat moderated by the abundance of rocky habitats offering safer retreat sites. This is thought to be at least part of the reason why Central Otago retains a high density and diversity of lizard species relative to other parts of the country. Some catchments provide habitat for populations of non-migratory galaxiids, freshwater crayfish and longfin eel, which are being affected through predation by trout and changes to their habitats, particularly in the lower reaches of watercourses.

3 Threats and conservation of biodiversity

3.1 Threats to biodiversity

Many of the species of conservation concern in the Macraes E.D. retain good population sizes probably at least in part because of past farming practices, but current conversion of narrow-leaved tussockland and dryland herbfield by discing or spraying are reducing the extent of some plant communities. Oversowing and topdressing of areas of indigenous vegetation also alters plant species composition, usually at the expense of indigenous species (matagouri being a notable exception to this). Burning of indigenous grasslands is less commonly practiced in the area, but escaped fires are very detrimental to grasslands and shrublands. Predation by introduced mammals and invasion by exotic herb, grass, shrub and tree species, (particularly gorse and broom and weed invasion of wetlands) is insidious but difficult to quantify and likely impacts species differently and some "pest" species may be beneficial to some species in some situations.

3.2 Current conservation programmes

Efforts to protect the biodiversity in the Macraes E.D. include a DOC skink protection programme in the Redbank-Nenthorn area and conservation activities associated with past OceanaGold projects including the creation of six covenants between 16 and 290 ha in size. DOC has undergone a process of identifying Ecological Management Units (EMU)[8]: the sites where conservation management would provide the most conservation gain. The Macraes DOC reserves and Mt Watkins are two EMU that are close to the Project Impact Area (PIA).

[8] See http://www.doc.govt.nz/about-us/our-role/managing-conservation/natural-heritage-management/identifying-conservation-priorities/

The current protected area network protects a full range of the habitat types present in the Macraes E.D., but much of the biodiversity inhabiting these habitat types is of restricted occurrence so a focus needs to be on protecting the under-represented habitat types reflective of this biogeographic pattern.

There are large outstanding conservation needs in the Macraes E.D., particularly for the conservation of plants, fish and invertebrates.

3.3 Effects of a changing climate

Climate change is expected[9] to make the Macraes area drier in general, but with increasing frequency of storm events, some severe and with dramatically increased risk of deep-seated fires. While the likely effects of these changes on New Zealand's biota are largely unknown[10,11], they are likely to change the vegetation communities, particularly of communities that are more open and degraded to a drier form with a changed species composition such as an understory with less thin-leaved herbaceous species and maybe with the loss of some canopy forming species leading to less canopy heterogeneity. A possibility is that the area will eventually become too arid to support the currently widespread narrow-leaved tussock grassland and that this could be replaced by an exotic-dominated short tussock grassland and scabweed herbfield. Some rare species with a restricted distribution may become rarer or be lost from the E.D. if their habitat changes beyond their tolerable limits and they may be less likely to be able to colonise other habitats due to the fragmented nature of the remaining natural habitats (and fragmentation is likely to increase).

[9] Ministry for the Environment 2018. Climate Change Projections for New Zealand: Atmosphere Projections Based on Simulations from the IPCC Fifth Assessment, 2nd Edition. Wellington: Ministry for the Environment. See also https://niwa.co.nz/adaptationtoolbox/regionalprojections/zone5

[10] https://www.researchgate.net/publication/349205548_Climate-change_impacts_exacerbate_conservation_threats_in_island_systems_New_Zealand_as_a_case_study

[11] https://www.researchgate.net/publication/358243992_Current_knowledge_and_potential_impacts_of_climate_change_on_New_Zealand%27s_biological_heritage

4 Project Impacts on Ecological Features

The ecological assessments of the MP4 project (Ahika Consulting 2024, Babbage 2024b) identified ecological features within the PIA will be impacted by project activities. In addition is the loss of 73 ha of lizard habitat (including 12 rock tors) occupied by three species of lizards including the At Risk - Declining tussock skink and korero gecko (Babbage 2024a).

Table 1. Quantity and importance of ecological features, and impact of the MP4 Project[12].

Project Component	Ecological Feature Class	Ecological Feature Type	Ecological Feature	Classification of Feature	Footprint [13]	Buffer	Amount Affected[14]	Unit of Measurement	Accuracy of measurement	Ecological Importance of Feature	Magnitude of Project Impact on Feature		Overall Project Effect
											Local Scale	National Scale	
Coronation 6 (including spillway)	**Bird**	Community	Indigenous Species Diversity				5	species	Estimated				
Coronation 6 (including spillway)	**Bird**	Rare Species	Pipit	Declining			Unknown	pairs	Estimated	High	Moderate		High
Coronation 6 (including spillway)	**Bird**	Rare Species	Banded dotterel	Declining			1-2	pairs	Estimated	High	Low		Low

[12] Lizard and invertebrate values yet to be added to table.

[13] Outside of the already authorised mining areas.

[14] Area within footprint + 5% of area in buffer unless all area in buffer affected (ephemeral wetlands and riparian vegetation communities)

Coronation 6 (including spillway)	**Environment**	LENZ	Threatened LENZ with indigenous vegetation		2.77			Hectares	Measured				
Coronation 6 (including spillway)	**Flora**	Community	Ephemeral Wetland	Critically Endangered Historically Uncommon ecosystem type National Priority for Protection	0.06	0.16	0.22	Hectares	Measured	High	High	Moderate	Very High
Coronation 6 (including spillway)	**Flora**	Community	Riparian / wetland vegetation mosaic		0.03	0.2	0.0	Hectares	Measured	Moderate	Low		Low
Coronation 6 (including spillway)	**Flora**	Community	Tussockland		3.0	7.0	3.35	Hectares	Measured	High	Low		Low
Coronation 6 (including spillway)	**Flora**	Community	Natural Inland Wetlands	National Priority for Protection	0.02	0.1	0.12	Hectares	Measured				
Coronation 6 (including spillway)	**Flora**	Community	Extent of semi-natural & natural communities		3.0	7.3	3.4	Hectares	Measured				
Coronation 6 (including spillway)	**Flora**	Rare Species	Deschampsia cespitosa	Declining	3		3	individuals	counted	High	Low		Low
Coronation 6 (including spillway)	**Flora**	Rare Species	Agrostis pallescens	Naturally Uncommon			506	m^2	Estimated	Moderate	High		Moderate
Coronation 6 (including spillway)	**Flora**	Rare Species	Celmisia hookeri	Naturally Uncommon	300				Estimated	Moderate	Moderate		Moderate
Coronation 6 (including spillway)	**Kai Tahu Taoka**	Bird	Karearea/Falcon	Taonga species			1?	pairs	Estimated				
Coronation 6 (including spillway)	**Kai Tahu Taoka**	Bird	Kahu/Harrier	Taonga species			Present		Estimated				
Coronation 6 (including spillway)	**Kai Tahu Taoka**	Bird	Pihoihoi/pipit	Taonga species			Unknown		Estimated				

Coronation 6 (including spillway)	**Kai Tahu Taoka**	Bird	Rirorirо/Grey Warbler	Taonga species			Present		Estimated				
Coronation 6 (including spillway)	**Kai Tahu Taoka**	Plant	Patotara/*Leucopogon fraseri*	Taonga species			Occasional	plant	Estimated				
Coronation 6 (including spillway)	**Kai Tahu Taoka**	Plant	Taramea/*Aciphylla aurea*	Taonga species			Occasional	plant	Estimated				
Coronation 6 (including spillway)	**Kai Tahu Taoka**	Plant	Wiwi/*Juncus edgarae* and *juncus distegus*	Taonga species			local	patch	Estimated				
FrIM	**Bird**	Community	Indigenous Species Diversity				3	species	Estimated				
FrIM	**Bird**	Species	Pipit	Declining			Unknown	pairs	Estimated	High	Low		Low
FrIM	**Flora**	Community	Pasture communities		7.3	12.6	7.3	Hectares	Measured	Moderate	Low		Low
FrIM	**Flora**	Community	Tussockland		0.2	0.7	0.2	Hectares	Measured	Moderate	Low		Low
FrIM	**Flora**	Community	Wetland			0.07	0.07	Hectares	Measured				
FrIM	**Flora**	Community	Riparian / wetland vegetation mosaic		0.3	0.3	0.6	Hectares	Measured	Moderate	Low		Low
FrIM	**Kai Tahu Taoka**	Bird	Pihoihoi/pipit	Taonga species			Unknown		Estimated				
FrIM	**Kai Tahu Taoka**	Bird	Putakitaki/Paradise shelduck	Taonga species			Present		Estimated				
Golden Bar	**Bird**	Community	Indigenous Species Diversity				5	species	Estimated				
Golden Bar	**Bird**	Rare Species	Falcon	Vulnerable	1		1	pairs	Estimated	Very High	Moderate		High
Golden Bar	**Bird**	Rare Species	Pipit	Declining	Unknown		Unknown	pairs	Estimated	High	Moderate		High
Golden Bar	**Invertebrate**	Rare Species	*Orocrambus sophistes*	Vulnerable	1			Individual	Measured	High			High
Golden Bar	**Environment**	LENZ	Threatened LENZ with indigenous vegetation		28.2		28.2	Hectares	Measured				
Golden Bar	**Flora**	Community	Riparian / wetland vegetation mosaic		0.8	0.1	0.9	Hectares	Measured	High	Lo		Low

Golden Bar	**Flora**	Community	Shrubland		0.06	0	0.06	Hectares	Measured	Low	Low		Low
Golden Bar	**Flora**	Community	Tussockland		27.3	35.9	29.1	Hectares	Measured	High	Moderate	Low	High
Golden Bar	**Flora**	Community	Extent of semi-natural & natural communities		28.2	37.8	30.1	Hectares	Measured				
Golden Bar	**Flora**	Rare Species	Carmichaelia petriei	Declining	100		100	individuals	Estimated	High	Moderate		High
Golden Bar	**Flora**	Rare Species	Discaria toumatou	Declining	Common		Unknown	individuals	Estimated	High	Negligible		Very Low
Golden Bar	**Flora**	Rare Species	Epilobium insulare	Declining	6		6	individuals	counted	High	Low		Low
Golden Bar	**Flora**	Rare Species	Mentha cunninghamii	Declining	0.25		0.25	m^2	Estimated	High	Negligible		Very Low
Golden Bar	**Flora**	Rare Species	Cardamine grandiscapa	Naturally Uncommon		3	3	individuals	Counted	Moderate	High		Moderate
Golden Bar	**Flora**	Rare Species	Celmisia hookeri	Naturally Uncommon		150	150	individuals	Estimated	Moderate	Low		Low
Golden Bar	**Flora**	Rare Species	Gingidia grisea	Naturally Uncommon, Otago endemic		6	6	individuals	Counted	Moderate	Low		Low
Golden Bar	**Flora**	Rare Species	Juncus distegus	Naturally Uncommon	6		6	individuals	Estimated	Moderate	Low		Low
Golden Bar	**Flora**	Rare Species	Melicytus 'Otago'	Data Deficient	20		20	individuals	Estimated	Moderate	High		Moderate
Golden Bar	**Flora**	Rare Species	Ranunculus 'Peel'	Data Deficient		1	1	m^2	Estimated	Moderate	Moderate		Moderate
Golden Bar	**Flora**	Rare Species	Fuchsia perscandens	Uncommon E.D.	1		1	individuals	Counted	Moderate	Low		Low
Golden Bar	**Flora**	Rare Species	Sophora microphylla	Uncommon E.D.		1	1	individuals	Counted	Moderate	Low		Low
Golden Bar	**Kai Tahu Taoka**	Bird	Karearea/Falcon	Taonga species			1	pairs	Estimated				
Golden Bar	**Kai Tahu Taoka**	Bird	Kahu/Harrier	Taonga species			1?	pairs	Estimated				
Golden Bar	**Kai Tahu Taoka**	Bird	Karoro/Black-backed hull	Taonga species			Colony in lake		Estimated				
Golden Bar	**Kai Tahu Taoka**	Bird	Pihoihoi/pipit	Taonga species			Unknown		Estimated				
Golden Bar	**Kai Tahu Taoka**	Bird	Putakitaki/Paradise shelduck	Taonga species			Present		Estimated				
Golden Bar	**Kai Tahu Taoka**	Plant	Aruhe/Bracken	Taonga species			Scattered	patches	Estimated				
Golden Bar	**Kai Tahu Taoka**	Plant	Taramea/*Aciphylla aurea*	Taonga species			Occasional	plant	Estimated				

Golden Bar	**Kai Tahu Taoka**	Plant	Wi/*Poa cita*	Taonga species			rare	plant	Estimated				
Golden Bar	**Kai Tahu Taoka**	Plant	Wiwi/*Juncus edgarae* and *juncus distegus*	Taonga species			rare	plant	Estimated				
Golden Bar Road Realignment	**Flora**	Community	Tussockland		0.1	0.3	0.1	Hectares	Measured	Low	Very Low		Low
Golden Bar Road Realignment	**Flora**	Community	Ephemeral Wetland	Critically Endangered Historically Uncommon ecosystem type National Priority for Protection		0.7	0	Hectares	Measured	High	Low		Low
Golden Point buttresses & Northern Gully WRS	No ecological features of import known to be present excepting the possible presence of lizards (See Babbage 2024a) and possible occurrence of ground-nesting birds												

Other matters also requiring consideration are:

- A proportion of the PIA has been classified as a Threatened Land Environment of NZ (LENZ) environment.
- The ephemeral wetlands at Coronation are a Critically Endangered Naturally Uncommon ecosystem.
- The tussockland, shrubland, wetland, riparian and ephemeral wetland vegetation communities present in the PIA are considered significant under the partially operative and proposed Otago Regional Policy Statement and the Waitaki District Plan and would qualify as Significant Natural Areas under the criteria in the National Policy Statement for Indigenous Biodiversity.

5 Impact Management Requirements

The following impact management approach has been developed for managing the effects of MP4 on biological diversity. This approach is consistent with Policies 5.4.6 *Offsetting for indigenous biological diversity* and 5.4.8 *Adverse effects from mineral and petroleum exploration, extraction and processing* of the Otago Regional Policy Statement (ORPS), (for natural inland wetlands) the National Policy Statement for Freshwater Management (NPS-FM) 2020 (amended 23 February 2023) and the National Policy Statement for Indigenous Biodiversity (NPS-IB) (2023).

The NPS-FM, as amended, requires regional councils to insert a policy in its regional plan which allows for mineral extraction and ancillary activities which affect natural inland wetlands where the mineral extraction and ancillary activities will provide significant national or regional benefits, and there is a functional need for the activity to occur in that location and the effects of the activity will be managed through applying the effects management hierarchy. The NPS-IB also places an obligation on councils to consider the effects of a project on the area's biodiversity with an overall objective of maintaining indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity.

The ORC has prepared a new Proposed Otago Regional Policy Statement 2021. This is currently going through the hearing process and due to the uncertainty around the wording of its offsetting and compensation policies and Appendices, the exact wording of these policies have not been assessed in this Impact Management Plan. Consultation has also begun on a new Otago Region Land and Water Plan.

The options set out in this Impact Management Plan follow an effects management hierarchy of first seeking to avoid the impact, then remediate unavoidable ecological effects[15] where practicable before considering mitigating ecological effects. Following this, biological diversity offsetting (offsetting) is then employed to address as much of the residual ecological effects where practicable, and finally employ biological diversity compensation (compensation) for the remainder of the ecological effects. Moving to the next step in the hierarchy is only possible once the possibility of employing the higher-order option has been fully explored and documented and the residual ecological effects calculated. Following a mitigation hierarchy is an obligation within the POORPS, NPS-FM and the NPS-IB. Where there are discrepancies between the mitigation hierarchies (and their offsetting or compensation requirements) then the stricter condition has been applied as this is consistent with Policy 3 of the NPS-IB which requires a precautionary approach.

[15] Residual adverse ecological effects are the remainder of a project's predicted non-minor impact on all of the ecological features within the PIA that would not be addressed once the actions under consideration for that mitigation option have been employed as designed.

5.1 Otago Regional Plan: Water

Policies 5.4.2 & 5.4.2A guide the managing effects of the MP4 project on the beds and margins of rivers (streams).

5.4.2 In the management of any activity involving surface water, groundwater or the bed or margin of any lake or river, to give priority to avoiding, in preference to remedying or mitigating:

(1) Adverse effects on:

(a) Natural values identified in Schedule 1A;

(b) Water supply values identified in Schedule 1B;

(c) Registered historic places identified in Schedule 1C, or archaeological sites in, on, under or over the bed or margin of a lake or river;

(d) Spiritual and cultural beliefs, values and uses of significance to Kai Tahu identified in Schedule 1D;

(e) The natural character of any lake or river, or its margins;

(f) Amenity values supported by any water body.

5.4.2A The loss of river extent and values is avoided, unless the council is satisfied:

(a) That there is a functional need for the activity in that location; and

(b) The effects of the activity are managed by applying the effects management hierarchy.

5.2 Otago Region Partially Operative Regional Policy Statement

The policies in POORPS that inform this IMP are:

Policy 3.1.9 Ecosystems and indigenous biological diversity

Manage ecosystems and indigenous biological diversity in terrestrial, freshwater and marine environments to:

a) Maintain or enhance:

i. Ecosystem health and indigenous biological diversity including habitats of indigenous fauna;

ii. Biological diversity where the presence of exotic flora and fauna supports indigenous biological diversity;

b) Maintain or enhance as far as practicable:

i. Areas of predominantly indigenous vegetation;

ii. Habitats of trout and salmon unless detrimental to indigenous biological diversity;

iii. Areas buffering or linking ecosystems;

c) Recognise and provide for:

i. Hydrological services, including the services provided by tall tussock grassland;

ii. Natural resources and processes that support indigenous biological diversity;

d) Control the adverse effects of pest species, prevent their introduction and reduce their spread.

Policy 3.2.2 Managing significant indigenous vegetation and habitats

Protect and enhance areas of significant indigenous vegetation and significant habitats of indigenous fauna, by all of the following:

a) In the coastal environment, avoiding adverse effects on:

i. The values that contribute to the area or habitat being significant;

ii. Indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists;

iii. Taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;

iv. Indigenous ecosystems and vegetation types that are threatened in the coastal

environment, or are naturally rare;

v. Habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;

vi. Areas containing nationally significant examples of indigenous community types; and

vii. Areas set aside for full or partial protection of indigenous biological diversity under other legislation;

b) Beyond the coastal environment, and in the coastal environment in significant areas not captured by a) above, maintaining those values that contribute to the area or habitat being significant;

c) Avoiding significant adverse effects on other values of the area or habitat;

d) Remedying when other adverse effects cannot be avoided;

e) Mitigating when other adverse effects cannot be avoided or remedied;

f) Encouraging enhancement of those areas and values that contribute to the area or habitat being significant;

g) Controlling the adverse effects of pest species, preventing their introduction and reducing their spread

Policy 5.4.6 Offsetting for indigenous biological diversity

Consider indigenous biological diversity offsetting, when:

a) Residual adverse effects of activities cannot be avoided, remedied or mitigated;

b) The offset achieves no net loss and preferably a net gain in indigenous biological diversity;

c) The offset ensures there is no loss of individuals of Threatened taxa other than kanuka (*Kunzea robusta* and *Kunzea serotina*[16]), and no reasonably measurable loss within the ecological district to an At Risk-Declining taxon, other than mānuka (*Leptospermum scoparium*), under the New Zealand Threat Classification System ("NZTCS");

d) The offset is undertaken where it will result in the best ecological outcome, preferably;

[16] Noting that these names are both now synonymised with *Kunzea ericoides* , see Peter B. Heenan, Matt S. McGlone, Caroline M. Mitchell, James K. McCarthy & Gary J. Houliston (2023): Genotypic variation, phylogeography, unified species concept, and the 'grey zone' of taxonomic uncertainty in kānuka: recognition of *Kunzea ericoides* (A.Rich.) Joy Thomps. sens. lat. (Myrtaceae), New Zealand Journal of Botany, DOI: 10.1080/0028825X.2022.2162427

I. Close to the location of development; or

II. Within the same ecological district or coastal marine biogeographic region;

e) The offset is applied so that the ecological values being achieved are the same or similar to those being lost;

f) The positive ecological outcomes of the offset last at least as long as the impact of the activity, preferably in perpetuity;

g) The offset will achieve biological diversity outcomes beyond results that would have occurred if the offset was not proposed;

h) The delay between the loss of biological diversity through the proposal and the gain or maturation of the offset's biological diversity outcomes is minimised.

Policy 5.4.6A Biological Diversity Compensation

Consider the use of biological diversity compensation:

a) When:

i. Adverse effects of activities cannot be avoided, remedied, mitigated or offset; and

ii. The residual adverse effects will not result in

1. The loss of an indigenous taxon (excluding freshwater fauna and flora) or of any ecosystem type from an ecological district or coastal marine biogeographic region;

2. Removal or loss of viability of habitat of a threatened or at risk indigenous species of fauna or flora under the New Zealand Threat Classification System ("NZTCS");

3. Removal or loss of viability of an originally rare or uncommon ecosystem type that is associated with indigenous vegetation or habitat of indigenous fauna;

4. Worsening of the NZTCS conservation status of any threatened or at risk indigenous freshwater fauna.

b) By applying the following criteria:

i. The compensation is proportionate to the adverse effect;

ii. The compensation is undertaken where it will result in the best practicable ecological outcome, preferably;

1. Close to the location of development;

2. Within the same ecological district or coastal marine biogeographic region;

iii. The compensation will achieve positive biological diversity outcomes that would not have occurred without that compensation;

iv. The positive ecological outcomes of the compensation last for at least as long as the adverse effects of the activity; and

v. The delay between the loss of biological diversity through the proposal and the gain or maturation of the compensation's biological diversity outcomes is minimised.

Policy 5.4.8 Adverse effects from mineral and petroleum exploration, extraction and processing

Manage adverse effects from the exploration, extraction and processing of minerals and petroleum,

by:

a) Giving preference to avoiding their location in all of the following:

i. Areas of significant indigenous vegetation and significant habitats of indigenous fauna in the coastal environment;

ii. Outstanding natural character in the coastal environment;

iii. Outstanding natural features and natural landscapes, including seascapes, in the coastal environment;

iv. Areas of significant indigenous vegetation and significant habitats of indigenous fauna beyond the coastal environment;

v. Outstanding natural character in areas beyond the coastal environment;

vi. Outstanding natural features and landscapes beyond the coastal environment;

vii. Outstanding water bodies or wetlands;

viii. Places or areas containing historic heritage of regional or national significance;

ix. Areas subject to significant natural hazard risk;

b) Where it is not practicable to avoid locating in the areas listed in a) above because of the

functional needs of that activity:

i. Avoid adverse effects on the values that contribute to the significant or outstanding

nature of a) i-iii;

ii. Avoid, remedy or mitigate, as necessary, adverse effects on values in order to maintain the outstanding or significant nature of a) iv-viii;

iii. Consider first biological diversity offsetting, and then biological diversity compensation, if adverse effects described in b) ii. on indigenous biological diversity cannot be practicably remedied or mitigated;

iv. Minimise any increase in natural hazard risk through mitigation measures;

v. Consider environmental compensation if adverse effects described in b) ii, other than on indigenous biological diversity, cannot practically be avoided, remedied or mitigated;

ba) Avoid significant adverse effects on natural character in all other areas of the coastal environment;

c) Avoiding adverse effects on the health and safety of the community;

d) Avoiding, remedying, or mitigating adverse effects on other values including highly valued natural features, landscapes and seascapes in order to maintain their high values;

e) Considering biological diversity offsetting or compensating for residual adverse effects on other values;

f) Reducing unavoidable adverse effects by:

i. Staging development for longer term activities; and

ii. Progressively rehabilitating the site, where possible;

g) Applying a precautionary approach (including adaptive management where appropriate) to assessing the effects of the activity, where there is scientific uncertainty, and potentially significant or irreversible adverse effects.

Where there is a conflict, Policy 5.4.8 prevails over policies under Objective 3.2 (except for policy 3.2.12), Policy 4.3.1 and Policy 5.2.3.

5.3 National Policy Statement for Indigenous Biodiversity

The effects of the MP4 project are managed under Clause 3.16[17] of the NPS-IB which requires the effects on indigenous biodiversity to be managed by applying the effects management hierarchy.

The effects mitigation hierarchy in the NPS-IB is worded:

> effects management hierarchy means an approach to managing the adverse effects of an activity on indigenous biodiversity that requires that:
>
> (a) adverse effects are avoided where practicable; then
>
> (b) where adverse effects cannot be avoided, they are minimised where practicable; then
>
> (c) where adverse effects cannot be minimised, they are remedied where practicable; then
>
> (d) where more than minor residual adverse effects cannot be avoided, minimised, or remedied, biodiversity offsetting is provided where possible; then
>
> (e) where biodiversity offsetting of more than minor residual adverse effects is not possible, biodiversity compensation is provided; then
>
> (f) if biodiversity compensation is not appropriate, the activity itself is avoided.

The employment of a biodiversity offset is guided by Appendix 3:

> These principles apply to the use of biodiversity offsets for adverse effects on indigenous biodiversity.
>
> (1) Adherence to effects management hierarchy: A biodiversity offset is a commitment to redress more than minor residual adverse effects and should be contemplated only after steps to avoid, minimise, and remedy adverse effects are demonstrated to have been sequentially exhausted.
>
> (2) When biodiversity offsetting is not appropriate: Biodiversity offsets are not appropriate in situations where indigenous biodiversity values cannot be offset to achieve a net gain.
>
> Examples of an offset not being appropriate include where:

[17] While several of the areas in the MP4 PIA would qualify as Significant Natural Areas using the Criteria in Appendix 1 of the NPS-IB, they are not formally a Significant Natural Area until listed in the relevant District Plan as required under Clause 3.9. Therefore, Clause 3.16 (not Clauses 3.10 to 3.15) is the relevant cause to guide management of the project's effects on biodiversity.

(a) residual adverse effects cannot be offset because of the irreplaceability or vulnerability of the indigenous biodiversity affected:

(b) effects on indigenous biodiversity are uncertain, unknown, or little understood, but potential effects are significantly adverse or irreversible:

(c) there are no technically feasible options by which to secure gains within an acceptable timeframe.

(3) Net gain: This principle reflects a standard of acceptability for demonstrating, and then achieving, a net gain in indigenous biodiversity values. Net gain is demonstrated by a like-for-like quantitative loss/gain calculation of the following, and is achieved when the indigenous biodiversity values at the offset site are equivalent to or exceed those being lost at the impact site:

(a) types of indigenous biodiversity, including when indigenous species depend on introduced species for their persistence; and

(b) amount; and

(c) condition (structure and quality).

(4) Additionality: A biodiversity offset achieves gains in indigenous biodiversity above and beyond gains that would have occurred in the absence of the offset, such as gains that are additional to any minimisation and remediation undertaken in relation to the adverse effects of the activity.

(5) Leakage: Biodiversity offset design and implementation avoids displacing harm to other indigenous biodiversity in the same or any other location.

(6) Long-term outcomes: A biodiversity offset is managed to secure outcomes of the activity that last at least as long as the impacts, and preferably in perpetuity. Consideration must be given to long-term issues around funding, location, management and monitoring.

(7) Landscape context: Biodiversity offsetting is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district. The action considers the landscape context of both the impact site and the offset site, taking into account interactions between species, habitats and ecosystems, spatial connections, and ecosystem function.

(8) Time lags: The delay between loss of, or effects on, indigenous biodiversity values at the impact site and the gain or maturity of indigenous biodiversity at the offset site is minimised so that the calculated gains are achieved within the consent period or, as appropriate, a longer period (but not more than 35 years).

(9) Science and mātauranga Māori: The design and implementation of a biodiversity offset is a documented process informed by science and mātauranga Māori.

(10) Tangata whenua and stakeholder participation: Opportunity for the effective and early participation of tangata whenua and stakeholders is demonstrated when planning biodiversity offsets, including their evaluation, selection, design, implementation, and monitoring.

(11) Transparency: The design and implementation of a biodiversity offset, and communication of its results to the public, is undertaken in a transparent and timely manner.

The employment of biodiversity compensation is guided by Appendix 4:

These principles apply to the use of biodiversity compensation for adverse effects on indigenous

biodiversity:

(1) Adherence to effects management hierarchy: Biodiversity compensation is a commitment to redress more than minor residual adverse effects, and should be contemplated only after steps to avoid, minimise, remedy, and offset adverse effects are demonstrated to have been sequentially exhausted.

(2) When biodiversity compensation is not appropriate: Biodiversity compensation is not appropriate where indigenous biodiversity values are not able to be compensated for.

Examples of biodiversity compensation not being appropriate include where:

(a) the indigenous biodiversity affected is irreplaceable or vulnerable;

(b) effects on indigenous biodiversity are uncertain, unknown, or little understood, but potential effects are significantly adverse or irreversible;

(c) there are no technically feasible options by which to secure a proposed net gain within acceptable timeframes.

(3) Scale of biodiversity compensation: The indigenous biodiversity values lost through the activity to which the biodiversity compensation applies are addressed by positive effects to indigenous biodiversity (including when indigenous species depend on introduced species for their persistence), that outweigh the adverse effects.

(4) Additionality: Biodiversity compensation achieves gains in indigenous biodiversity above and beyond gains that would have occurred in the absence of the compensation, such as gains that are

additional to any minimisation and remediation or offsetting undertaken in relation to the adverse effects of the activity.

(5) Leakage: Biodiversity compensation design and implementation avoids displacing harm to other indigenous biodiversity in the same or any other location.

(6) Long-term outcomes: Biodiversity compensation is managed to secure outcomes of the activity that last as least as long as the impacts, and preferably in perpetuity.

Consideration must be given to long-term issues around funding, location, management, and monitoring.

These principles apply to the use of biodiversity compensation for adverse effects on indigenous

biodiversity:

(7) Landscape context: Biodiversity compensation is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district. The action considers the landscape context of both the impact site and the compensation site, taking into account interactions between species, habitats and ecosystems, spatial connections, and ecosystem function.

(8) Time lags: The delay between loss of, or effects on, indigenous biodiversity values at the impact site and the gain or maturity of indigenous biodiversity at the compensation site is minimised so that the calculated gains are achieved within the consent period or, as appropriate, a longer period (but not more than 35 years).

(9) Trading up: When trading up forms part of biodiversity compensation, the proposal demonstrates that the indigenous biodiversity gains are demonstrably greater or higher than those lost. The proposal also shows the values lost are not to Threatened or At Risk (declining) species or to species considered vulnerable or irreplaceable.

(10) Financial contributions: A financial contribution is only considered if:

(a) there is no effective option available for delivering biodiversity gains on the ground; and

(b) it directly funds an intended biodiversity gain or benefit that complies with the rest of these principles.

(11) Science and mātauranga Māori: The design and implementation of biodiversity compensation is a documented process informed by science, and mātauranga Māori.

(12) Tangata whenua and stakeholder participation: Opportunity for the effective and early participation of tangata whenua and stakeholders is demonstrated when planning for biodiversity compensation, including its evaluation, selection, design, implementation, and monitoring.

(13) Transparency: The design and implementation of biodiversity compensation, and communication of its results to the public, is undertaken in a transparent and timely manner.

It is assumed that if biodiversity offsetting or biodiversity compensation is applied under the effects management hierarchy required in Clause 3.16 that the proposed offset complied with principles 1 to 6 in Appendix 3 and 4 and has had regard to the remaining principles in Appendix 3 and 4, as appropriate and as required under Clause 3.10.

5.4 National Policy Statement & National Environment Standards for Freshwater Management.

The effects arising from the MP4 project on natural inland wetlands (at Coronation 6) must be consistent with Clause 45D of the NES-FM which requires that the activity is locationally-constrained, provides regional or national benefit, and the effects are managed by application of the effects management hierarchy:

effects management hierarchy, in relation to natural inland wetlands and rivers, means an approach to managing the adverse effects of an activity on the extent or values of a wetland or river (including cumulative effects and loss of potential value) that requires that:

(a) adverse effects are avoided where practicable; then

(b) where adverse effects cannot be avoided, they are minimised where practicable; then

(c) where adverse effects cannot be minimised, they are remedied where practicable; then

(d) where more than minor residual adverse effects cannot be avoided, minimised, or remedied, aquatic offsetting is provided where possible; then

(e) if aquatic offsetting of more than minor residual adverse effects is not possible, aquatic compensation is provided; then

(f) if aquatic compensation is not appropriate, the activity itself is avoided.

The employment of an aquatic offset is guided by Appendix 6 of the NPS-FM:

> These principles apply to the use of aquatic offsets for the loss of extent or values of natural inland wetlands and rivers ("extent or values" below).
>
> 1. Adherence to effects management hierarchy: An aquatic offset is a commitment to redress more than minor residual adverse effects, and should be contemplated only after steps to avoid, minimise, and remedy adverse effects are demonstrated to have been sequentially exhausted.
>
> 2. When aquatic offsetting is not appropriate: Aquatic offsets are not appropriate in situations where, in terms of conservation outcomes, the extent or values cannot be offset to achieve no net loss, and preferably a net gain, in the extent and values. Examples of an offset not being appropriate would include where:
>
> > (a) residual adverse effects cannot be offset because of the irreplaceability or vulnerability of the extent or values affected:
> >
> > (b) effects on the extent or values are uncertain, unknown, or little understood, but potential effects are significantly adverse:
> >
> > (c) there are no technically feasible options by which to secure proposed no net loss and preferably a net gain outcome within an acceptable timeframe.
>
> 3. No net loss and preferably a net gain: This is demonstrated by a like-for-like quantitative loss/gain calculation, and is achieved when the extent or values gained at the offset site (measured by type, amount and condition) are equivalent to or exceed those being lost at the impact site.
>
> 4. Additionality: An aquatic offset achieves gains in extent or values above and beyond gains that would have occurred in the absence of the offset, such as gains that are additional to any minimisation and remediation undertaken in relation to the adverse effects of the activity.
>
> 5. Leakage: Aquatic offset design and implementation avoids displacing harm to other locations (including harm to existing biodiversity at the offset site).
>
> 6. Long-term outcomes: An aquatic offset is managed to secure outcomes of the activity that last at least as long as the impacts, and preferably in perpetuity. Consideration must be given to long-term issues around funding, location, management and monitoring.
>
> 7. Landscape context: An aquatic offset action is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district. The action considers the landscape context of both the impact site and the offset site, taking into account

interactions between species, habitats and ecosystems, spatial and hydrological connections, and ecosystem function.

8. Time lags: The delay between loss of extent or values at the impact site and the gain or maturity of extent or values at the offset site is minimised so that the calculated gains are achieved within the consent period or, as appropriate, a longer period (but not more than 35 years).

9. Science and mātauranga Māori: The design and implementation of an aquatic offset is a documented process informed by science where available, and mātauranga Māori at place.

10. Tangata whenua or stakeholder participation: Opportunity for the effective and early participation of tangata whenua or stakeholders is demonstrated when planning aquatic offsets, including their evaluation, selection, design, implementation, and monitoring.

11. Transparency: The design and implementation of an aquatic offset, and communication of its results to the public, is undertaken in a transparent and timely manner.

The employment of aquatic compensation is guided by Appendix 7 of the NPS-FM:

These principles apply to the use of aquatic compensation for the loss of extent or values of natural inland wetlands and rivers ("extent or values" below).

1. Adherence to effects management hierarchy: Aquatic compensation is a commitment to redress more than minor residual adverse effects, and should be contemplated only after steps to avoid, minimise, remedy, and offset adverse effects are demonstrated to have been sequentially exhausted.

2. When aquatic compensation is not appropriate: Aquatic compensation is not appropriate where, in terms of conservation outcomes, the extent or values are not able to be compensated for. Examples of aquatic compensation not being appropriate would include where:

(a) the affected part of the natural inland wetland or river bed, or its values, including species, are irreplaceable or vulnerable:

(b) effects on the extent or values are uncertain, unknown, or little understood, but potential effects are significantly adverse:

(c) there are no technically feasible options by which to secure gains within an acceptable timeframe.

3. Scale of aquatic compensation: The extent or values to be lost through the activity to which the aquatic compensation applies are addressed by positive effects that outweigh the adverse effects.

4. Additionality: Aquatic compensation achieves gains in extent or values above and beyond gains that would have occurred in the absence of the compensation, such as gains that are additional to any minimisation and remediation or offsetting undertaken in relation to the adverse effects of the activity.

5. Leakage: Aquatic compensation design and implementation avoids displacing harm to other locations (including harm to existing biodiversity at the compensation site).

6. Long-term outcomes: Aquatic compensation is managed to secure outcomes of the activity that last as least as long as the impacts, and preferably in perpetuity. Consideration must be given to long-term issues around funding, location, management, and monitoring.

7. Landscape context: An aquatic compensation action is undertaken where this will result in the best ecological outcome, preferably close to the impact site or within the same ecological district. The action considers the landscape context of both the impact site and the compensation site, taking into account interactions between species, habitats and ecosystems, spatial and hydrological connections, and ecosystem function.

8. Time lags: The delay between loss of extent or values at the impact site and the gain or maturity of extent or values at the compensation site is minimised so that the calculated gains are achieved within the consent period or, as appropriate, a longer period (but not more than 35 years).

9. Trading up: When trading up forms part of aquatic compensation, the proposal demonstrates that the aquatic extent or values gained are demonstrably of greater or higher value than those lost. The proposal also shows the values lost are not to Threatened or At Risk/Declining species or to species considered vulnerable or irreplaceable.

10. Financial contribution: A financial contribution is only considered if it directly funds an intended aquatic gain or benefit that complies with the rest of these principles.

11. Science and mātauranga Māori: The design and implementation of aquatic compensation is a documented process informed by science where available, and mātauranga Māori at place.

12. Tangata whenua or stakeholder participation: Opportunity for the effective and early participation of tangata whenua or stakeholders is demonstrated when planning aquatic compensation, including its evaluation, selection, design, implementation, and monitoring.

13. Transparency: The design and implementation of aquatic compensation, and communication of its results to the public, is undertaken in a transparent and timely manner.

5.5 Waitaki District Council

The Waitaki District Plan manages the effects on the environment of mining activity using Policies 16.7.2 requiring avoiding, remedy or mitigate the effects of mine activity and 16.9.3 as a discretionary activity with consideration of effects on any nature conservation value or on grand or Otago Skinks.

The Draft Waitaki District Plan in general has a requirement to use the mitigation hierarchy at sites where a scheduled Significant Natural Area is present, avoid effects on any area identified as significant using the Criteria in APP3, and to use offsetting or compensation to address project effects in other areas where offsetting is defined as a measurable conservation outcome resulting from actions which are designed to compensate for significant residual adverse effects on biodiversity arising from human activities after all appropriate prevention and mitigation measures have been taken.

The Waitaki District Council has obligations to enact the NPS-IB, NES-FM, NPS-FM and POORPS.

5.6 Dunedin City Council

Part of Coronation 6 Pit and the Coronation North Backfill are within Dunedin City Council's administration boundary. The effects of a mining project on biodiversity are managed through Policy 10.2.1.Y, Policy 2.2.3.6 (biodiversity offsetting), or Policy 2.2.3.7 (environmental compensation).

Policy 10.2.1.Y:

Only allow new roads or additions or alterations to existing roads (roads of national or regional importance only), buildings and structures that form part of rail infrastructure, airport activities, port activities, network utility activities, mining, mineral prospecting and mineral exploration, and any activities ancillary to these, including earthworks and vegetation clearance, to locate in areas of indigenous vegetation and/or habitats of indigenous fauna that meet the significance criteria in Policy 2.2.3.2, including but not limited to scheduled Areas of Significant Biodiversity Value (ASBVs), where all of the following are met:

a. the activity has a functional need or operational need to locate in the area; and

b. in the coastal environment, as described in Policy 1 of the New Zealand Coastal Policy Statement 2010, adverse effects on the values that contribute to the significance of the area (according to the criteria in Policy 2.2.3.2) are avoided; and

c. outside the coastal environment, adverse effects on the values that contribute to the

significance of the area are:

i. avoided or, if avoidance is not practicable, remedied or mitigated as necessary to maintain the significance of the area; and

ii. where adverse effects on these values cannot practicably be avoided, remedied or mitigated, biodiversity offsetting is proposed in accordance with Policy 2.2.3.6; and

iii. for residual adverse effects that cannot practicably be avoided, remedied, mitigated or offset, environmental compensation is proposed in accordance with Policy 2.2.3.7; and

d. adverse effects on other biodiversity values of significant areas of indigenous vegetation and/or habitats of indigenous fauna are avoided or minimised as far as practicable, including through biodiversity offsetting that is proposed in accordance with Policy 2.2.3.6, or environmental compensation that is proposed in accordance with Policy 2.2.3.7.

Policy 2.2.3.6

Only consider a biodiversity offset, as a positive effect to be balanced against the adverse effects of an activity, where the offset:

a. is proposed to address residual adverse effects after taking steps to first:

i. avoid adverse effects; then

ii. minimise adverse effects as far as practicable; by

1. mitigating effects and then remedying effects that cannot be mitigated; and

2. ensuring that any on-site rehabilitation or restoration measures will occur as soon as practicable;

b. is close to the donor site, unless a more distant site will result in a significantly better ecological outcome;

c. will result in no net loss and preferably a net gain in biodiversity value; where:

i. the biodiversity values gained will be the same or similar to those being lost;

ii. any gains in biodiversity values are demonstrably additional to those that may have occurred if the proposed activity had not gone ahead; and

iii. the positive effects of the offset last at least as long as the adverse effects of the proposed activity, and preferably in perpetuity;

d. will not be used to offset irreplaceable and vulnerable biodiversity and is not contrary to Policy 11 of the New Zealand Coastal Policy Statement; and does not include forfeiting rights to permitted or consented land use or development activities.

Policy 2.2.3.7

Only consider environmental compensation, as a positive effect to be balanced against the adverse effects of an activity, where:

a. the compensation is proposed to address residual adverse effects after taking steps to first:

i. avoid adverse effects; then

ii. minimise adverse effects as far as practicable; by

1. mitigating effects and then remedying effects that cannot be mitigated; and

2. ensuring that any on-site rehabilitation or restoration measures will occur as soon as practicable; then

iii. offset adverse effects in accordance with Policy 2.2.3.6;

b. the environmental compensation is as close as possible to meeting the criteria for a biodiversity offset as set out in Policy 2.2.3.6

5.7 Department of Conservation

OceanaGold has engaged with the Department of Conservation as the Department has statutory obligations under Clause 6 (b), (c), (d) of the Conservation Act (1987), the Wildlife Act (1953), and the Central Otago Drylands/Manuherikia Place of the Otago Conservation Management Strategy (2016, incorporating the 2022 partial review) (CMS)

5.8 Affected leaseholders and landowners

OceanaGold owns all of the land which is within the project footprint and buffer, and the land within the MEEA. Some OceanaGold land is leased to local farmer and OceanaGold will engage with affected leaseholders, and any affected owners before implementing the proposed MEEA.

5.9 Other considerations

In considering the above requirements, the following assumptions have been made:

- **Avoidance** refers to changing a project's activity so that it no longer impacts on an ecological feature. Mining, by its very nature, makes it difficult to avoid an ecological feature where it overlies the targeted resource. There are opportunities to avoid impacts arising from some mine activities, such as placement of mine road and building infrastructure, but this needs to be balanced against other values (including economics, heritage, cultural and other stakeholder concerns). Avoidance can also include staging of project activities – for example by depositing WRS material into lower-value areas first – where there is some uncertainty in the extent of the Project Design.
- **Remedying** refers to undertaking activities, following cessation of the impact, that rehabilitate or restore the site back to an acceptable ecological state. The opportunities for restoring a mining project's impact are limited by the technical challenges associated with rehabilitating mine workings in a particular location to a functioning natural ecological state, and the need to balance post mining land use with land rehabilitation quality and various stakeholder inputs.
- **Mitigating (or minimising)** refers to adopting a practice that reduces a project's impact on an ecological feature. Mitigation includes actions such as salvaging of species from the Project footprint and either translocating directly to a new site, or cultivating for later planting at an appropriate site. It also includes Standard Operating Procedures adopted to reduce the effects of dust, noise, weeds, fire, etc.
- **Biological Diversity Offsetting** refers to measurable conservation outcomes resulting from actions designed to address residual adverse biodiversity impacts arising from project development after appropriate avoidance, minimisation and remediation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground. The ability to utilise an offset is included in the POORPS as part of an effects management hierarchy and Policy 5.4.6 the POORPS provides direction on when an offset can be considered as does 3.22 of the NPS-FM with detail in Appendix 6 and Appendix 7, and the NPS-IB with details in Appendix 3 and Appendix 4. There are a number of guiding documents available to guide the design of an offset in NZ including the approaches adopted internationally by Business & Biodiversity Offsets Programme (BBOP), and nationally by DOC and the Biodiversity Working Group's (BWG) guidance to Councils. For

this project the BWG guidance to Councils[18] together with recent advice on limits to offsets[19] is used as the guiding document for the design and evaluation of the offset with the offset calculations following a disaggregated biodiversity offset accounting model[20,21] as this is considered the current best practice for the use of offsets in NZ under the Resource Management Act and also meets the requirements of the NPS-FM and POORPS.

- **Compensation** involves undertaking activities that will result in a benefit to an ecological value outside the project footprint or off-site. Compensation differs from Offsetting in that the biodiversity outcomes are not "like for like". A number of compensatory activities can be undertaken, either separately or in combination, to address a project's impacts, ranging from legal covenanting of high-value areas, enhancing habitat of plants or wildlife, through weed or pest control, research to better understand how to manage ecological features, habitat creation, education and interpretation, supporting community-led biodiversity projects, and undertaking activities that protect rare species.

The following evaluation considerations are also used to help select the most appropriate activities:

- Where possible align compensatory activities with the greatest conservation need.
- The ecological gain that could be achieved, including gains in knowledge that increase the ability to effectively manage conservation issues here or elsewhere.
- That the ecological gain is sufficiently worthwhile.
- That the activities are technically feasible with an acceptable chance of achieving their desired outcome.
- That the activity is affordable and delivers benefits appropriate to the cost.
- That ecological resilience (including to changes resulting from increased climate volatility) is considered when selecting a site for an activity, to ensure that gains are not eroded over time due to ecological processes that are difficult to manage (e.g., lost ecosystem function).
- That land tenure allows certainty of access to undertake the activity over time.
- The ability to maintain the gain achieved by the activity over at least the term of the project impact.

[18] Maseyk, F; Ussher, G; Kessels, G; Christensen, M; Brown, M. 2018. Biodiversity Offsetting under the Resource Management Act: A guidance document. BioManagers Group for the Biodiversity Working Group.

[19] J Markham, M Baber, J Quinn, M Christensen, T Ryan, M Lowe, S Knowles, D Miller, G Ussher. 2022. Assessing limits to biodiversity offsetting in Aotearoa: a proposed framework. Resource Management Journal.

[20] Maseyk, F.J.F; Barea, L.P; Stephens, R.T.T; Possingham, H.P; Dutson, G; Maron, M. 2016. A disaggregated biodiversity offset accounting model to improve estimation of ecological equivalency and no net loss. Biological Conservation 204: 322-332.

[21] Maseyk, F; Maron, M; Seaton, R; Dutso, G. 2015. A Biodiversity Offsets Accounting Model for New Zealand: User Manual. Department of Conservation, Hamilton.

- That the ecological gain can be monitored to ensure that the activity is achieving its planned outcome.
- There is an ability to add additional mitigation measures in response to additional OceanaGold projects.
- That the process of evaluation and implementation is transparent and of high quality.
- That the outcomes of activities do not unnecessarily constrain future commercial endeavours of either OceanaGold and/or the local community, particularly farming.

6 Options for Impact Management in a Macraes Context

The options available to address the project's impacts are described here in the order of the effects management hierarchy outlined above.

6.1 Avoidance options

The opportunity to avoid ecological features includes the decision on siting of all, or part, of the project infrastructure, staging construction, and excluding activities from buffer areas (for example, by using temporary fencing), depending on the operational and financial constraints of the sites.

6.2 Remediation options

Remediating an area back to its pre-impact ecological condition is possible in some situations, but is limited by the technical challenges associated with rehabilitating mine workings of this type seen at Macraes Gold Project and in this location to a functioning natural ecological state, the timescale to replicate some ecological features (such as old-growth shrubland), the paucity of examples of successful site rehabilitation, and the previously-expressed wish of the local community that the mine is rehabilitated to farming pasture.

6.3 Mitigation options

The opportunities to mitigate the impacts of this project includes operational measures to reduce dust, noise, disturbance, and sediment, contaminant suppression, weed surveillance, fire response and rescue (removal to a safe site) of ecological features. These are discussed further here.

6.3.1 Dust suppression

Dust-fall can be a problem for plants as it inhibits their photosynthetic capacity. Suppressing dust that is created during construction activities is a standard mine operating procedure and will minimise this effect.

6.3.2 Noise and minimising disturbance

Operating heavy machinery and construction activities creates considerable noise and disturbance which is likely to create a negative reaction in animal species, though this reaction will vary depending on species. Managing noise levels through scheduling and exploitation of natural and artificial noise barriers is a standard mine operating procedure and will help minimise this effect, though there is likely to be displacement of some animal species from the immediate vicinity of the mine disturbance areas.

6.3.3 Weed surveillance

Importation of new weed species into the area during construction and operations could, depending on the species, have a huge impact on the area's biodiversity. Regular inspection of the area for new weed species can alleviate this risk. Areas of OceanaGold land are regularly inspected for new weed incursions and new weeds found are subject to OceanaGold's annual environmental weed control operation.

6.3.4 Fire response

The Macraes area is often very dry and any fires that do start have the potential to cover large areas and harm large areas of natural vegetation, as well as mine and farm assets. A site fire avoidance protocol and rapid response to any suspected fires is a standard operating procedure and will minimise this effect.

6.3.5 Sediment Control

Ground works associated with building foundations and roadway construction disturbs land, removes vegetation and soil cover and so increases the risk of fine sediment discharges to watercourses. Sediment control measures are routinely employed by OceanaGold at Macraes Mine and will continue to be applied to minimise this effect.

6.3.6 Manage accidental contaminant spills

The presence of mining machinery in and around waterways presents a risk of contaminants entering watercourses with potential to harm aquatic life. OceanaGold will continue to address this effect by operating an appropriate on-site contaminant management plan.

6.3.7 Protect against nuisance weed/algae introduction into waterways

Machinery and personnel involved in mining can potentially transfer nuisance weeds/algae to local watercourses. OceanaGold complies with notices and guidelines issued by Biosecurity New Zealand regarding nuisance weeds/algae and will continue this practice.

6.3.8 Rescue of ecological features

Some of the higher-importance ecological features such as some plant species can be rescued by removing them (or propagating parts of them such as seeds or cuttings) following OceanaGold's Plant Propagation, Translocation and Management Procedure, then establishing them at suitable areas within existing habitat (for instance nearby DOC and OceanaGold protected areas) (Figure 1).

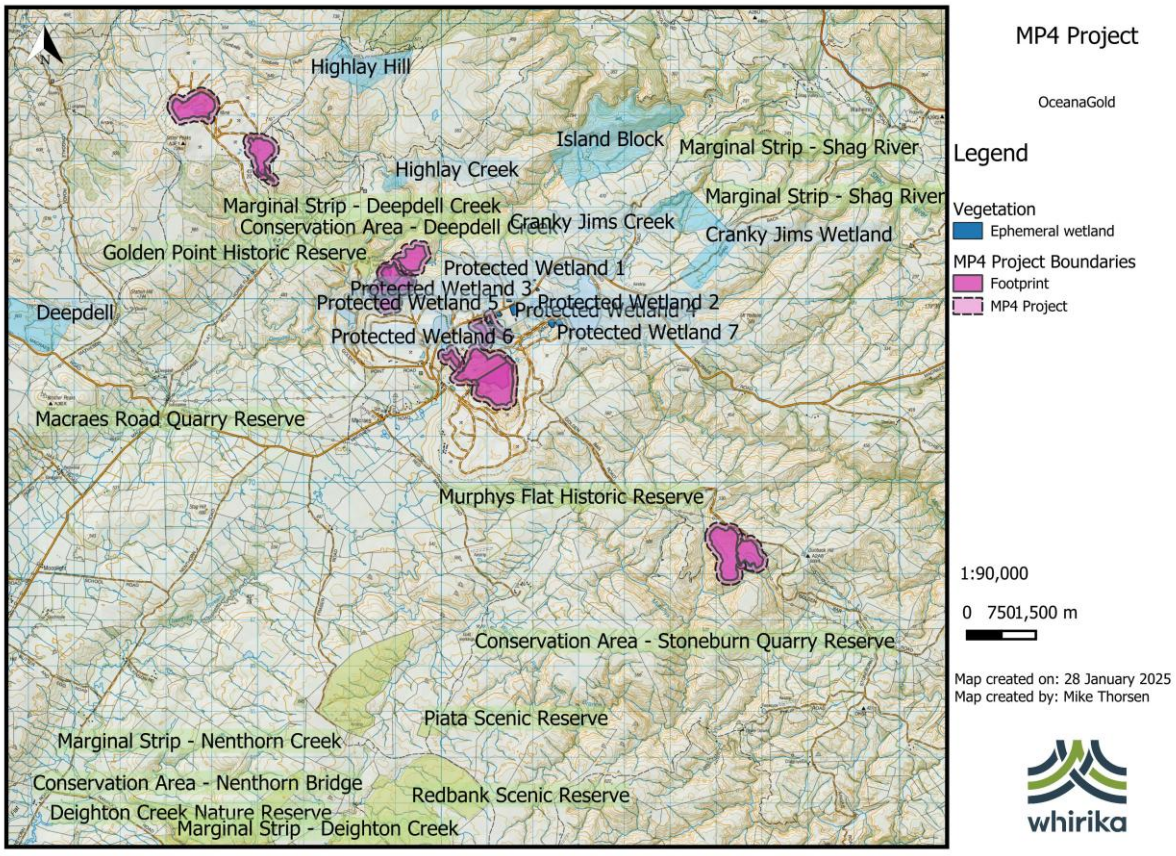

Figure 1. Location of OceanaGold (blue) and DOC (green) protected areas relative to the MP project components (purple).

6.4 Offsetting and Compensation options

Offsetting and compensation can employ the same mechanisms. The main difference between offsetting and compensation is that that offsetting is "like for like" and is calculated to achieve No Net Loss or a Net Gain. Both offsetting and compensation, either in full or partially, of residual adverse effects may be useful tools to address impacts of a project. The NPS-IB, NES-FM, DCC and POORPS give preference, following avoidance, remediation, and mitigation actions, to adopting an offset with an objective of resulting in a Net Gain over utilising a compensation approach to address the project's residual ecological effects.

The opportunity to employ an offset is determined by the availability of comparable sites in which to undertake the offset, the technical challenges of employing the offset, the ability to set a reference baseline and to measure progress towards a No Net Loss or Net Gain situation, and the cost of these activities. There are some local constraints on establishing protected areas as an 'averted loss' offset (see 6.4.1), which is a commonly applied offsetting approach. Compensation has limitations in that there is reduced certainty in the ecological gain under this approach. Some possible offset or compensation activities are described below.

6.4.1 Land protection

Protecting areas of high conservation value, which may have different ecological values to those being impacted, via a legal covenant has been used in previous OceanaGold projects. While land protection is a valuable tool to remediate a project's impacts, and their benefits are long-lasting, care needs to be taken when pursuing a covenant as they can unintentionally constrain land use if they are sited on an area of land that has commercial value (for instance for mining or farming). There is also a need for on-going management to maintain the covenant's biodiversity features, which requires landowner support and both funds and labour over the life of the covenant and that extends beyond mine closure. Land protection can be especially effective when used in conjunction with habitat enhancement (see below).

OceanaGold currently manages 13 ecological covenants and Protected Wetlands in and around Macraes covering a total of 655 ha[22]. Other protected lands in the vicinity include the 590 ha Deighton Creek Nature Reserve, the 1,452 ha Redbank Scenic Reserve and the 332 ha Manuka Stream Conservation Area (Figure 1), giving a total of 3,029 ha of legally protected land in the Macraes Ecological District. This equates to 2.4% of the Ecological District's land area and is similar to the proportion protected in the ecologically similar nearby Manorburn Ecological District (Whirika Consulting Ltd unpub. data).

[22] Two further covenants totalling c. 55 ha are in the process of formalisation.

6.4.2 Habitat enhancement

Enhancing the habitat of indigenous plants or wildlife (usually through enrichment planting, pest control and / or weed control) can provide benefit to both a habitat and its inhabitants by removing predators that are limiting populations, removing weed species that are displacing plants or animals from their preferred habitat, or by creating barriers to movement of trout into high-value aquatic environments in order to protect galaxiid fish.

Protecting or enhancing rare habitats can provide high ecological benefit. A number of New Zealand's habitats are considered rare, either because they were always of very limited extent (see Williams et al. 2007) or because human activity has reduced their extent and/or intactness. Also, some habitats are now considered Threatened (Holdaway et al. 2012). Several examples of these rare and threatened habitats are present in Otago, and in the Macraes E.D. there are Critically Endangered saline sites and ephemeral wetlands as well as Endangered seepages and flushes. Other important communities are the schist bluff communities, dryland shrubland (grey scrub) and riparian margin vegetation as these are of limited extent and host a number of rare species. Without conservation attention many of these habitats and communities are being degraded or will be lost.

6.4.3 Invasive weed and animal pest control

Removing or controlling invasive environmental weeds or animal pests can be an important conservation measure. The NZ Biodiversity Strategy regards invasive introduced animal pests and weeds as a more serious threat to biodiversity than ongoing habitat loss and modification. Some weeds that have the potential to transform local wetlands are known from just one locality within the Macraes E.D. and are of very limited occurrence in Otago. There are other species that have recently arrived in the Macraes E.D. and which could become a nuisance to agriculture and biodiversity. Eradicating these species will save a large amount of biodiversity protection work into the future. Instigating a weed surveillance programme together with the capacity to remove newly arrived weed species would have benefit to protecting both biodiversity areas and agricultural areas.

Animal pest control in the Macraes E.D. has been shown to benefit local lizard populations and there are opportunities to employ predator control to benefit other lizard populations as well as populations of birds and large invertebrates. Animal pest control (e.g., rabbits) can also provide benefits to vegetation communities that also provide habitat to indigenous fauna. The high cost of predator control, uncertainty in both the level of effectiveness and population responses of the protected fauna, and the rapid loss of benefit when predator control ceases all need to be considered. The nearby (30 km to the south) Predator Free Dunedin Halo project is investigating effective landscape scale control of possums and stoats. The Central Otago tussock grasslands such as at Macraes area is of interest as a potential next phase of the project. Pest control activities at Macraes could also help inform appropriate approaches in tussock-based ecosystems.

6.4.4 Protecting species of conservation concern

In New Zealand, a number of plant and animal species are considered at risk of extinction; there are 402 species of plants which are considered Threatened (i.e., of high risk of extinction) and a further 885 are considered At Risk (de Lange et al. 2018). Many more are rare in a local context.

The Macraes E.D. is known to contain the highest diversity of rare plants of any site in New Zealand (Bibby 1997, Thorsen 2008, Figure 2). However, the known distributions of the rare species in this area reflects the location of past survey effort, including those conducted by OceanaGold around mine projects. In the Macraes E.D., there are populations of seven Nationally Critical plant species, 10 Nationally Endangered plant species, 15 Nationally Vulnerable plant species, 37 Declining plant species, 28 Naturally Uncommon plant species, and 18 Data Deficient plant species (Ahikā Consulting unpub. data). Populations of some of these plant species are the largest known nationally. Many of the plant species and the rarer plant communities are facing considerable threat from weed competition and exotic animals. The Macraes E.D. also contains some of the last wild populations of Nationally Endangered grand and Otago skinks, and important populations of three At Risk lizard species. The invertebrate fauna of the Macraes E.D. has been poorly surveyed, but is known to include at least 412 indigenous species, including six Threatened, six At Risk, and seven Data Deficient Species (Ahikā Consulting unpub. data). It is also home to a number of indigenous freshwater fauna that are of conservation concern: the Declining freshwater crayfish *Paranephrops zealandicus* and long-finned eel *Anguilla dieffenbachii*, and the Nationally Vulnerable non-migratory roundhead galaxias *Galaxias anomalus* and Taieri flathead galaxias *Galaxias depressiceps*.

There is a large conservation programme nearby focussed on protecting the grand and Otago skink populations between Redbank and Nenthorn, and this project is also providing benefit to other lizard and bird species. However, there is currently little focus on management of the area's aquatic fauna, invertebrates, rare plants or vegetation communities beyond control of some woody weed species and pests at a few sites. The Macraes E.D. has extensive potential for plant and freshwater species-focussed conservation programmes using specific tools such as translocation, cultivation and replanting in order to enhance populations, and to protect populations through building trout barriers, controlling weeds, browsing mammals, and pest insects.

6.4.5 Research

Research on topics that inform our ability to manage ecosystems or species successfully is valuable for the continuing development of biodiversity conservation. Currently, there is little available research to help guide management of most of New Zealand's rare species or habitats. In the Macraes area there is an opportunity to build on past research projects (e.g., ephemeral wetlands by Johnson and Rogers (2003)), as well as build research into the adaptive management component of other compensatory activities.

Currently there are investigations supported and funded by OceanaGold on the utility of created rock stacks, pest control and habitat improvement for bolstering lizard populations and tools to manage ephemeral wetlands. These research projects are in years 1-3 and results are not yet available.

6.4.6 Environmental education and awareness

Education on, and awareness of, conservation issues, particularly on the importance of biodiversity and its management, is in line with the New Zealand Biodiversity Strategy and Action Plan and can be a valuable compensation activity when well-designed.

6.4.7 Community conservation

Local communities undertake, or are involved in, many important biodiversity projects throughout New Zealand. Many of them struggle to be financially sustainable, primarily due to the temporary nature of most funding arrangements, and this factor alone frequently leads to project failure. There are no active biodiversity conservation groups in the Macraes area, but the Landscape Connections Trust[23] is planning pest control activities in the east Otago area. The Central Otago Ecological Trust[24] runs a lizard conservation project centred on the Mokomoko Dryland Sanctuary near Alexandra. Funding of a reputable trust to provide sustainable support for the on-going efforts of community groups and other conservation organisations in the Macraes region is an option.

[23] See http://www.beyondorokonui.org.nz/ part of the Predator Free Dunedin project.
[24] See http://www.coet.org.nz/

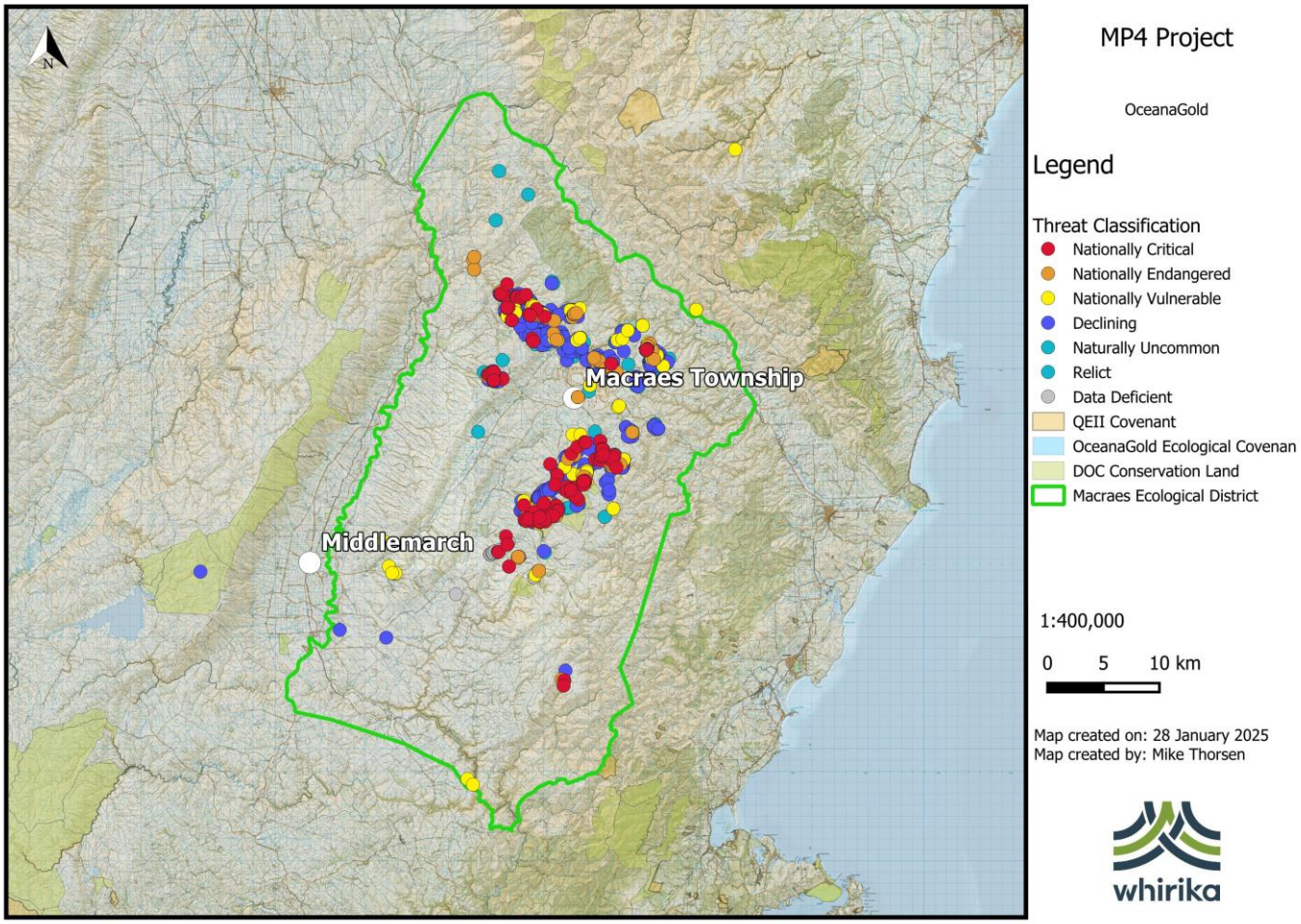

Figure 2. Locations of Threatened, At Risk and rare plant species in the vicinity of the Macraes E.D. Note, clustering of dots reflects survey effort more than actual distribution of rare plant species (data Ahikā Consulting Ltd).

7 Quantifying the loss

Calculating the quantity and 'value' of the biodiversity likely to be lost and therefore replaced under an effects management approach, such as the one used in this IMP, is difficult. Measures that are most frequently used are often simplistic: 'like for like' (i.e. 10 *Carex tenuiculmis* plants predicted to be lost from the project site and 10 *Carex tenuiculmis* planned to be planted at a nearby proposed mitigation site), or with additional consideration given to the condition of the feature (i.e. 25 hectares of narrow-leaved tussock grassland of 1m stature and 60% ground cover at both the project site and at a nearby proposed mitigation site).

The emergence of disaggregated offset calculations and replacement multipliers is increasing the validity of these evaluations. Calculating the value of biodiversity loss when considering a number of features, or features that are 'like for unlike', remains problematic. This approach is best termed 'value for value'. The

most frequently used measure (or metric) in these situations that require a range of mitigation actions consists of combining expert opinions with cross-party negotiation in order to reach a consensus that the projected gain at the mitigation site is appropriate to the value of the ecological loss of the different features in the project site. In these types of calculations, it is important to incorporate consideration of uncertainties, concealed trade-offs, and the baseline condition and trend of the feature: for example, halting or slowing a declining trend is a conservation gain.

Another method is to adopt a value of land approach, in which the area of the impact is calculated and then either an equivalent area is protected, or payment made at the purchase price of an equivalent area of land in that district. Similar methods have been used in previous OceanaGold projects at Macraes and Reefton.

Whatever approach is adopted to valuing the loss, it should be based on measurable metrics that can be repeated over time (such as mapped extent of a vegetation type, canopy cover estimated in representative plots, counts of individuals or population density estimates based on mark-recapture or distance sampling methodology).

An IMP should adequately address the loss of ecological value caused by a project's impacts and that is the aim of this plan.

8 Offset design and targets

Offsets are large, often complicated projects that require good quality information applied in an ecologically-meaningful manner. Gathering this information takes time and so often an offset is designed based on estimated values to produce an initial estimate of the extent and nature of the offset required to produce NNL. As information becomes available the offset is refined until the formal offset target is produced. This formal offset target also includes consideration of the degree of certainty and may include adjustments to ensure that Net Gain is achieved. While the formal offset target is what is worked to, the state of NNL is considered to have been achieved once the measured improvements produced by the offset match those required under a High Confidence version of the model and that the improvements have been demonstrated to be achievable for a meaningful period of time (3-5 years in most instances).

Offsets are designed based on conservation best practices and building on previous experiences. Each component of the offset design and the parameters used in the offset model needs to be recorded together with notes on how they are calculated and the reason for their use. Offsets are delivered within an Ecological Enhancement Area (so termed as other, non-offset, effects management activities also occur at the site). The offset design is delivered via the Ecological Enhancement Area Management Plan (EEAMP) which needs to be reviewed and adapted to ensure that the offset targets are met. The implications of adopting the offset on others needs consultation, implications of activities at the site and adjoining land considered, and where necessary, formal access and management agreements and protective mechanisms put in place. Offsets

need to be implemented to the required standard by suitably experienced staff withing an appropriate management and support structure and with the necessary resources available. The results of the offset should be communicated to stakeholders in a clear and understandable manner on an annual basis, with a summary document produced 5-yearly that investigates how the project is tracking towards achieving its targets and any recommendation to changes in the EEAMP to assist with achieving the NNL and NG goals.

Monitoring of progress towards and past the formal offset target needs to be based on a methodology that is scientifically justifiable, robust, repeatable. and with appropriate precision and undertaken at appropriate frequency by suitably skilled people.

The offsets as designed in this project are based on a disaggregated accounting model[25] and includes consideration of:

- Adherence to the effects management hierarchy
- Appropriateness
- Net Gain
- Additionality
- Leakage
- Long term outcomes
- Location
- Time lags
- Knowledge
- Equity
- Transparency

Further information on biodiversity offsets internationally is available at https://www.forest-trends.org/bbop/bbop-key-concepts/biodiversity-offsets/.

[25] Maseyk, F.J.F; Barea, L.T; Stephens, R.T.T; Possingham, H.P; Dutson, G; Maron, M. 2016. A disaggregated biodiversity accounting model to improve estimation of ecological equivalency and no net loss. Biological Conservation 204: 322-332.

9 Summary of Proposed Effects Management Approach

A range of impact management measures for the MP4 project's impacts on ecological features (Section 4) were evaluated against the considerations in Sections 5, 1, 7 and preferred approach to addressing the impact of the MP4 project on ecological features is outlined here and explained further in Section 10 and their general location is provided in Figure 3.

Avoid effects by:

1) Redesigning the project plan so that project components avoid areas of higher ecological values, where practicable. This has resulted in removing Round Hill Stage 5 extension from the project and adjusting the location of the proposed Golden Bar Waste Rock Stack (WRS) to avoid lizard habitat, rare plants, and an ephemeral wetland.
2) Siting infrastructure such as the Golden Bar Road realignment away from areas with high ecological value wherever practicable.
3) Isolating areas of higher ecological value in the buffer area by signage or physical isolation where rockfall risk is high.
4) Implementing the 'ground nesting birds' protocol to avoid impacting on the nests of ground-nesting birds (banded dotterel, pipit and South Island pied oystercatcher).

Remedy effects by:

5) Structure and rehabilitate areas of WRS to provide habitat for lizards.
6) Rehabilitation of Golden Bar WRS to narrow-leaved tussock grassland.
7) Recreating the pit lake environment in the new Golden Bar pit.
8) Allow exotic vegetation habitats of lizards and birds (e.g., rank exotic grassland) to re-establish on mine workings.
9) Replanting the Coronation Spillway with narrow-leaved tussock grasses and *Celmisia hookeri* plants

Mitigate impacts by:

10) Minimising project effects of dust, noise, weeds, fire, sediment, contaminants on the surrounding area.

11) Salvage of lizards from the MP4 open pit extension areas to an area in the Murphys Ecological Enhancement Area (EEA) protected by a predator fence (this action is also being undertaken to satisfy the requirements of the Wildlife Act (1953)).
12) Rescuing Declining shrub *Carmichaelia petriei,* Naturally Uncommon rush *Juncus distegus* and Data Deficient shrub *Melicytus aff. alpinus* (c) (CHR 541568; Otago) that have been identified as plant species that are of moderate or higher ecological importance or that are of restricted distribution within the Macraes E.D. to safe site(s) in Ecological Enhancement Areas (EEA) (including OceanaGold covenants).
13) Salvage of tussock grass host plant habitat of *Orocrambus sophistes,* a Threatened invertebrate species if proved to be present, to re-create or enhance suitable habitat in a protected site.
14) Rescuing the Naturally Uncommon mountain daisy *Celmisia hookeri* in the Coronation Spillway footprint and replanting these in a fenced area adjacent to the newly-constructed spillway.

Offset residual effects by:

15) Creating a tussock grassland and shrubland offset at the proposed Murphys EEA (a site with better ecological values) and fund the ecological management of this area that also creates habitat that benefits lizards and birds (this action is also being undertaken to satisfy the requirements of the Wildlife Act (1953)).
16) Creating an offset for impact on ephemeral wetlands at Coronation by creating new wetlands.
17) Creating an offset for impact on wetlands at Innes Mills Stage 10 by creating a new wetland.

Compensate for remaining residual adverse effects by:

18) Constructing a predator fence around at least 45 ha of suitable habitat and removing all mammalian predators to benefit lizards and birds (including taoka[26] species).
19) Creation of replacement rock tor habitat for lizards.
20) Research into invertebrate community response to changes in tussockland habitat and researching habitat of *Orocrambus sophistes* (if proved to be present).
21) Protection and enhancement of riparian / wetland vegetation mosaic including 860 m of stream bed and 0.008 ha of areas classified as natural inland wetland.
22) Fencing off a 100 m length of the gully bottom below Coronation Spillway.

[26] Taoka is the preferred dialect spelling of taonga in this region of the Kai Tahu rohe.

23) Contingency measures associated with lizard salvage (see Lizard Management Plan).

OceanaGold has overall responsibility for undertaking this work as described in the effects management plan described in Section 10. It is considered that the project effects on ecological features can be managed through implementation of this IMP. These works will be staged so that they occur as and when the project affects that area (staging is detailed in Section 10.8). This means that if a component of MP4 did not proceed, the potential adverse effects would be less and the mitigatory package offered in the IMP would need to be reconsidered.

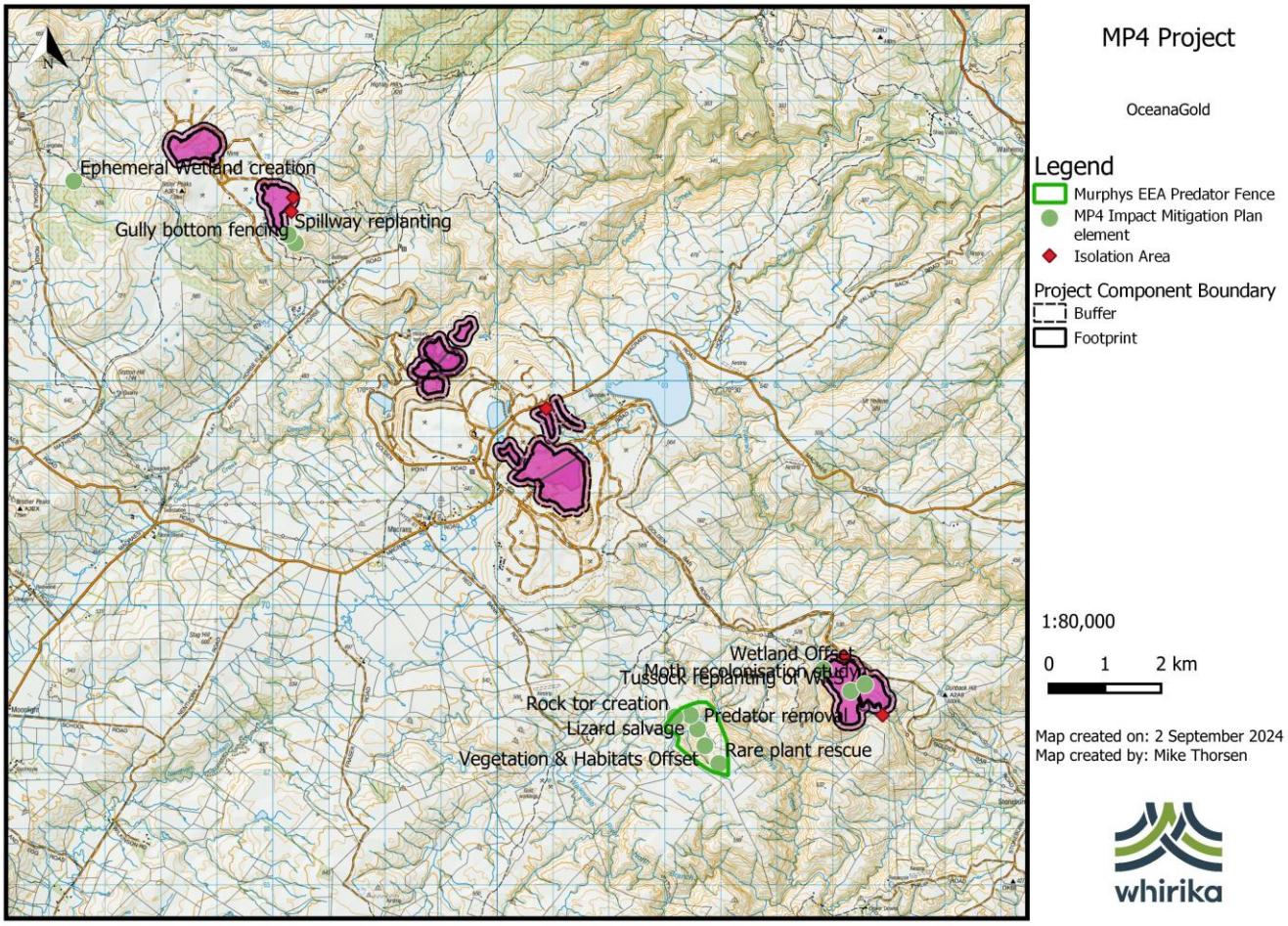

Figure 3. Location of the impact management elements in the MP4 Impact Management Plan.

10 Ecology Impact Management Plan

The following are details of the activities that Oceana Gold (New Zealand) Limited propose to undertake to manage the predicted impact on the area's ecological features resulting from implementation of the MP4 Project. OceanaGold has overall responsibility for undertaking this work as described in this IMP.

10.1 Avoidance

Activities that have been or will be undertaken to avoid the impact of the project are:

10.1.1 Location and shape of pits and WRS

Areas of higher ecological value were identified and mapped during site assessments. The ability to redesign the project plan to avoid these areas was discussed with mine management and geotechnical experts to ensure feasibility. As part of these discussions the Round Hill Stage 5 extension and, consequently, the Southern Pit-Innes Mills pit extension, waste disposal at BRWRS and the Macraes- Dunback Road realignment were removed from the project and the location of the proposed Golden Bar WRS was adjusted to avoid a rocky area providing habitat for lizards and rare plants and a nearby ephemeral wetland. In addition, the Coronation waste disposal plan was changed from placing waste atop the Trimbells WRS to infilling Coronation North Pit.

10.1.2 Siting of infrastructure

The location of new project infrastructure (such as roads) is mostly sited on areas disturbed during previous mine projects.

10.1.3 Realigning Golden Bar Road

The planned new route of the Golden Bar Road intersection with the Macraes – Dunback Road traverses mostly lower-value ecological areas. The exception is 0.1 ha of narrow-leaved tussock grassland within the footprint and three small ephemeral wetlands within the buffer area. The effects on the tussock grassland will be incorporated into the tussock offset and the potential effects of road construction on the ephemeral wetlands in the 100 m buffer will be managed by including a requirement to avoid sediment during development of the road engineering design.

10.1.4 Isolating high ecological value areas in the Buffer

Areas in the buffer area with higher ecological values (Figure 3) will be isolated from unintended effects (such as vehicle movements, errant rockfall) by clearly delineating these areas on maps provided to mine operations staff and on the ground by using well-maintained flagging tape, temporary fencing, and signage. Any sites with high ecological values within 10 m of the boundary of a WRS will be protected by rock-intercept fencing or bund at the base of the WRS if a stability assessment suggests there is an unacceptable risk of rock fall in the adjacent ecology.

10.1.5 Avoiding disturbance of ground nesting birds

Use the 'ground nesting birds' protocol (Appendix 2) to avoid impacting on the nests of protected[27] ground-nesting pipit and (if become present) South Island pied oystercatcher or banded dotterel[28].

10.2 Remediation

The opportunities to remedy MP4 project impacts are limited by the technical challenges associated with rehabilitating mine workings of this type and in this location to a functioning natural ecological state. The following remediation actions are proposed:

10.2.1 WRS lizard habitat rehabilitation

There is some opportunity to rehabilitate the WRS margins to provide habitat for lizards by depositing larger aggregate and boulders (such as in Figure 4) in identified areas under guidance of the LMP. These rocky areas will be naturally colonised by lizards from the surrounding area, and the population density at these sites should increase as habitat quality increases with plant growth, particularly if vegetation regrowth includes fruit-bearing plants. It is not planned to monitor lizard colonisation of these sites as previous work has shown that similar created rock habitats such as other waste rock stacks and the lizard rock piles are colonised by lizard species, but that these are difficult to monitor (EcoGecko 2013, OceanaGold unpub. data).

[27] Protected wildlife in the Wildlife Act (1953).

[28] No other indigenous species are known or likely to nest within the ZOI.

Undertaking this action will provide benefit in 1) creating habitat that will be occupied by populations of the skinks *Oligosoma maccanni* (clade 4 genotype), *Oligosoma polychroma* (clade 5 genotype), and the Declining gecko *Woodworthia* "Otago/Southland large", 2) create a safer refuge for these lizard populations by decreasing the hunting efficiency of cats and other mammalian predators in these areas.

Figure 4. Photo of large aggregate deposited as 'screes' on the margin of the Coronation haul road.

10.2.2 Golden Bar WRS tussock rehabilitation

23 ha of the 48 ha extension of the Golden Bar WRS will be rehabilitated to 80% cover[29] of narrow-leaved tussock grassland by spreading tussock seed and planting subdivided or nursery grown 1 m tall narrow-leaved tussock plants at 2 m spacing (up to c. 57,500 plants needed to replant side slopes and top) within a stock fenced area. Seed of pioneering grassland species such as hard tussock, blue tussock and silver tussock harvested from cultivated donor stock will be spread over the site following cessation of rock deposition. Inter-tussock species will be planted in between planted tussocks to speed return to a native plant community. It is estimated that to return this site to a narrow-leaved tussock grassland reflective of natural communities will take 50 to 100 years to reach maturity.

Undertaking this action will provide additional benefit by 1) creating habitat that will be occupied by populations of the skinks *Oligosoma maccanni* (clade 4 genotype), *Oligosoma polychroma* (clade 5 genotype), and the Declining gecko *Woodworthia* "Otago/Southland large", 2) create habitat for tussock-inhabiting invertebrates and possibly including the Threatened moth *Orocrambus sophistes*.

10.2.3 Pit lakes

The new pit lakes in the Golden Bar, Innes Mills and Coronation pits will produce replacement habitat similar to what currently occurs at Golden Bar Pit and Coronation North Pit (and which would form in Innes Mills Pit once mining ceases).

10.2.4 Rehabilitation of exotic vegetation communities inhabited by lizards and birds

To recreate the exotic plant communities inhabited by lizards and birds (e.g., exotic rank grassland on rehabilitated mine workings) will be actively (in sites were rehabilitation is required) or passively rehabilitated (small peripheral disturbance sites) to allow an equivalent area of suitable vegetation communities to develop that can support lizard populations.

[29] The target of 85% cover of the 23 ha allows for some bare areas which are a natural feature of tussock grasslands and is a more-achievable target than 100% of the 23 ha.

10.2.5 Replanting the Coronation Spillway with narrow-leaved tussock grasses and Celmisia hookeri plants

Plant the margin of the Coronation Spillway with narrow-leaved tussock grasses and *Celmisia hookeri* plants sourced from the local area within a fenced area either side of the spillway so that they produce a natural-looking vegetation community.

10.3 Mitigation

The opportunities to mitigate the impact of this project include controls on dust, noise, disturbance, sediment, contaminant suppression, weed surveillance, fire response and rescue (salvage) of rare plants and lizards.

10.3.1 Dust suppression

Dust-fall can be a problem for plants as it inhibits their photosynthetic capacity. Though none of the species present in the PIA is thought to be particularly susceptible to dust, supressing dust that is created during mine activities is a standard operating procedure and will minimise this effect.

10.3.2 Noise and minimising disturbance

Blasting and operating heavy machinery creates considerable noise and disturbance which is likely to create a negative reaction in animal species. Though this reaction will vary, most of the bird species recorded at this site appear to acclimate to regular disturbance. Minimising noise is a standard operating procedure and will minimise this effect, though is likely that paradise shelducks will not nest within sight of the project.

10.3.3 Weed surveillance

Importation of new weed species into the area during mine operations could, depending on the species, have a huge impact on the area's biodiversity. To minimise this risk an inspection every 6 months for the first 2 years and then annually of the area around mine operations for new weed species by a qualified ecologist will alleviate this risk. New environmental weeds that are discovered in the area will be subject to OceanaGold's annual environmental weed control operation.

10.3.4 Fire response

The Macraes area is usually very dry and any fires that do start have the potential to cover large areas and harm large areas of natural vegetation. A site fire avoidance protocol and rapid response to any suspected fires is a standard operating procedure and will minimise this effect.

10.3.5 Sediment Control

Mining disturbs land, removes vegetation and soil cover, and so increases the risk of fine sediment discharges to watercourses. Sediment control measures are routinely employed by OceanaGold at Macraes Mine and will continue to be applied to minimise this effect. Specific efforts on sediment control in the Macraes Phase 4 development are contained in the Erosion and Sediment Control Plan (in prep.).

10.3.6 Manage accidental contaminant spills

The presence of construction machinery in and around waterways presents a small risk of contaminants entering watercourses with potential to harm aquatic life. OceanaGold will continue to address this effect by operating an appropriate on-site contaminant management plan.

10.3.7 Protect against nuisance weed/algae introduction into waterways

Machinery and personnel involved in construction can potentially transfer nuisance weeds/algae to local watercourses. OceanaGold complies with notices and guidelines issued by Biosecurity New Zealand regarding nuisance weeds/algae and will continue this practice.

10.3.8 Rescue of rare plants

The higher-importance plants identified in Section 4 will be rescued by a suitably experienced operator removing them (or propagating parts of them such as seeds or cuttings) following OceanaGold's Plant Propagation, Translocation and Management Procedure (updated to include the species listed below) and establishing them at EEA sites with suitable habitat (for instance DOC and OceanaGold protected areas). The plants will receive post-introduction care where practicable including watering and suppression of competing vegetation for two years. The success of moving these species will be monitored by measuring and counting the number of plants at the recipient site on an annual basis for three years once the target number of plants have been established. Rescue is proposed for the following species:

1) The Declining shrub *Carmichaelia petriei* from the c. 100 shrubs in the Golden Bar pit and WRS to 500 individuals in the Murphys EEA to create a new population there adjacent to an existing population.
2) The Naturally Uncommon rush *Juncus distegus* from c. 6 individuals in the Golden Bar WRS to 50 individuals in the Murphys EEA to create a new population there.
3) The Data Deficient shrub *Melicytus* aff. *alpinus* (c) (CHR 541568; Otago) to form a component of shrubland in the Murphys EEA at a number at least twice the number of plants being lost as a result of the project.
4) Rescuing the Naturally Uncommon mountain daisy *Celmisia hookeri* in the Coronation Spillway footprint and replanting the same number (including individuals planted as remediation) of these in a fenced area adjacent to the newly-constructed spillway.

These four species have been selected on the basis of their importance in the local situation, and their probable amenity to being rescued, whilst taking into account the extent of the project impact upon them identified in Section 4. The recipient sites have been chosen on the basis of their proximity to the project area and the availability of suitable habitat.

Undertaking this action will provide benefit in 1) preventing a reduction in population density of these species in this area, and 2) removing these species to a safer environment within nearby protected areas to create new populations.

10.3.9 Rescue of Threatened invertebrates

The project's impact on *Orocrambus sophistes* a species of Threatened moth that has been recorded from the Golden Bar WRS will be addressed (if the species is proved to be present in pre-works surveys in Autumn) through removal of host plant (tussock) during summer (when the adult stage is not present and the less motile larvae are likely to be present within the tussock foliage) and the tussock stockpiled and cared for at a nearby area of existing tussock grassland and then replanted back onto the Golden Bar WRS during the tussock rehabilitation plantings.

10.3.10 Salvage of lizards

The estimate of lizard numbers that will be displaced by the project is wide (refer the LMP). It is planned to salvage a capped proportion of the impacted population to the proposed Murphys Ecological Enhancement Area which will have been subject to a recently-established predator control programme and then predator fencing an area within this. This is to ensure there is a protective benefit for wildlife as required by the Wildlife

Act 1953. OceanaGold has applied for a wildlife permit for the MP4 Project area. The details of this proposed salvage and relocation programme are discussed in more detail in the LMP.

10.4 Residual adverse effects following avoidance, remediation, and mitigation

After avoidance, remediation and mitigation, there will still be some residual adverse effects on tussockland, lizards and lizard habitat, birds and bird habitats, and invertebrate habitat.

10.5 Offsetting

As there are forecast to be residual adverse effects of the project on the sites biodiversity after implementation of the Avoid, Remedy and Mitigate (Table 2, see Section 10.4), an offset as described under the NES-FM, NPS-IB, POORPS, DCC 2GP will be provided to address remaining adverse effects. This offset will be a multiuse offset in an Ecological Enhancement Area (EEA) at a site locally known as Murphys (Murphys EEA) to address the residual impact on narrow-leaved tussock grasslands, riparian / wetland vegetation mosaic, and shrubland. These offsets will also provide habitat for birds (including taoka species), invertebrates, and reptiles, but this is not their primary purpose. Murphys EEA will also be the relocation site for the lizards which will be salvaged, under a wildlife permit, from the MP4 Project area footprint. There are local constraints on how an offset can be realised in the Macraes situation (see comments in Sections 6.4 and 6.4.1) and these have been considered in the design of the offset package. The implementation and management of the EEA site will be documented in an EEA Management Plan (sometimes also termed an Offset Plan).

Table 2. Residual area of affected vegetation communities used in offset and compensation calculations.

Vegetation Community	Area in Footprint (Ha)	Area in Buffer (Ha)	Area Corrections	Residual Area Affected (Ha)	Calculation notes
Tussockland	30.5	42.8	+2.1 (5% of buffer) – 11.5 (50% of 23 ha GBWRS)	21.2	-50% of GBWRS as site being rehabilitated to tussock and + 5% of buffer areas to account for non-direct effects
Shrubland	0.06	0.31	+0.02	0.08	+ 5% of buffer areas to account for non-direct effects
Ephemeral Wetlands	0.02	0.9	-0.7	0.22	0.22 ha is area of ephemeral wetland at Coronation 6 footprint and buffer. The ephemeral wetlands in this buffer area are included due to potential dewatering. No effect expected on a 0.77 ha Ephemeral Wetland in road realignment buffer and Ephemeral Wetlands near Innes Mills lost since assessment.
Riparian / wetland vegetation mosaic	1.1	0.7	0	1.85	
Wetlands	0	0.07		0.07	

10.5.1 Offset design

The offsets are designed to meet the conditions listed in Policy 5.4.6 in the POORPS, Appendix 3 of the NPS-IB, Appendix 6 of the NPS-FM and Policy 2.2.3.6 of the DCC 2GP (see Section 5 for wordings). The alignment of the proposed offsets with these policy requirements is discussed in Section 11 (below).

10.5.2 Site selection

The planned tussockland, riparian / wetland vegetation mosaic and shrubland offsets and a large part of the lizard compensation will occur within the Murphys EEA. Here a covenant with an area of at least 45 ha (and containing 39 ha of tussock grassland at 15% average cover, space to establish 0.5 ha of new shrubland and including areas of riparian / wetland vegetation mosaic will be established under the Conservation Act, or other appropriate legal mechanism, in Murphys Creek (Figure 5). This area contains biodiversity that is of similar character to that being lost, and visually appears to be of better quality and a higher diversity of species together with other inherent ecological values (such as a developing kanuka shrubland). The covenanted area will be fenced to exclude stock.

Important components of the offsets and offset site are:

- Legal protection in perpetuity.
- Be of sufficient size to compensate for uncertainties in ecological outcomes.
- Satisfy the offset criteria detailed in the POORPS.
- Will have funding to support the management over the term of the offset.
- Will involve the Macraes community and Iwi together with DOC and Councils in the offset design and placement.
- Will incorporate the Science and Traditional Knowledge offset principle by including mataraka Māori and Macraes community knowledge of biodiversity management in the Macraes Area.
- Will incorporate the Equity offset principle by sharing the risks and benefits between the farming community, DOC and Councils.
- Be managed with ecological oversight.

This offset will also address the impact on the Declining matagouri and some components of the invertebrate and bird communities through protecting areas inhabited by these species.

Murphys EEA has been selected on the basis of its proximity to the Golden Bar and Innes Mills pits, the similarity of vegetation to that being affected, and also best fulfils site selection criteria for lizard salvage or translocation activities[30]. It is an area of farmland that retains areas of semi-natural vegetation that is degraded by ongoing grazing, weed invasion (particularly by gorse), and a recent fire that has severely damaged the shrublands and tussock grassland. The tussocks have recovered to about 50% of their probable pre-burn stature and there has been some loss in extent. The site is comparable in elevation (except to the higher elevation Coronation 6 area) and general ecological character to the sites within the project area, though there is a greater predominance and greater size of rock outcrops and tors (viewed as a positive attribute). The site is nearby to a site that was known to recently harbour Otago skinks at two sites and these may still be present[31]. A number of other ecological features are present in the site (depending on its final boundary) including populations of other rare plants. The boundary of the EEA is located to give at least 200 m clearance of a nearby area of potential mining interest.

[30] NZ Lizard Taxon Advisory Group, 2019

[31] Knox, C. 2015. Survey for green skink (*Oligosoma chloronoton* Clade 3b) on the Oceana Gold (NZ) Limited estate at Macraes Flat, Otago. Unpub. Report. EcoGecko Consultants.

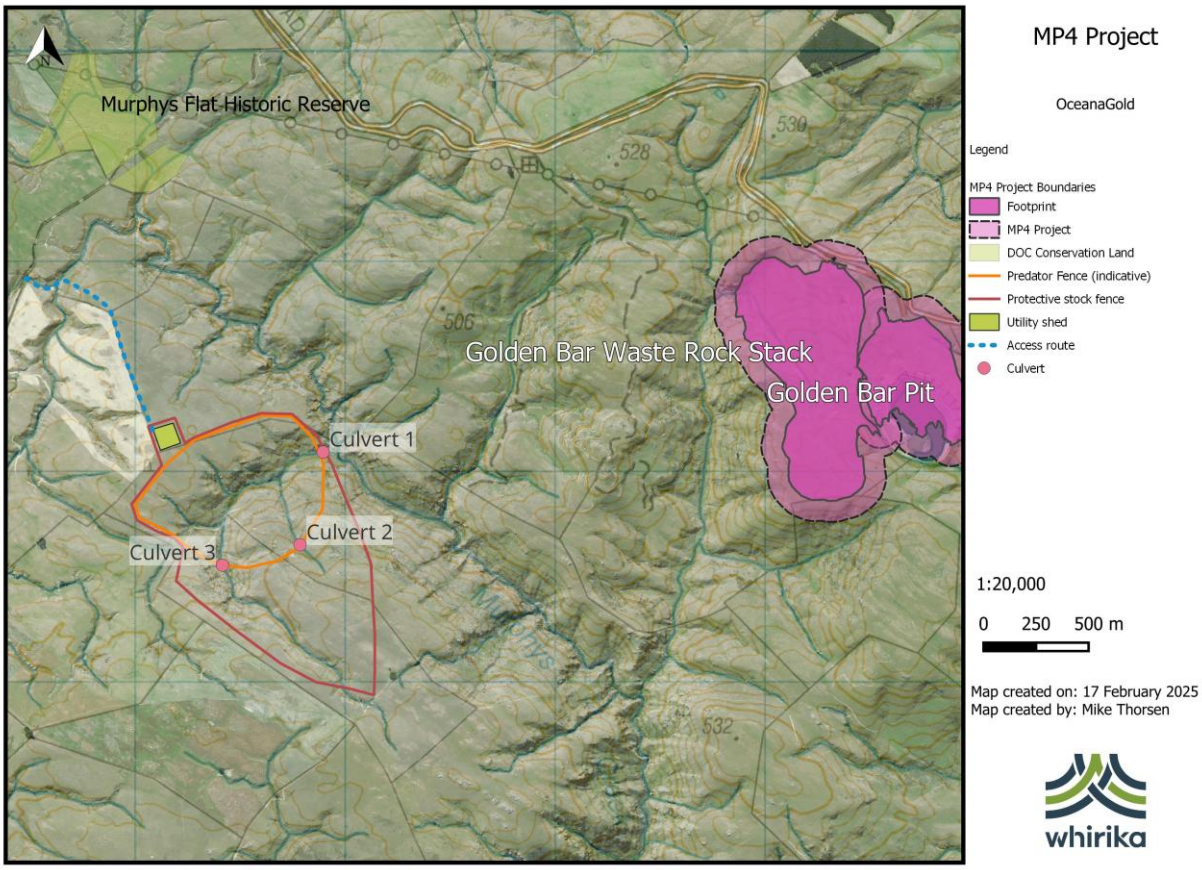

Figure 5. Indicative location of Murphys EEA (red outline). Murphys Historic Reserve shaded green. Golden Bar Road at top of figure and Golden Bar project components shaded pink. Note: the orange line indicates the practicable fenceline of a predator-proof Xcluder fence.

10.5.3 Shrubland Offset

To offset the effects on 0.06 ha of shrubland in the Golden Bar WRS footprint and the indirect effects on 0.31 ha of shrublands bordering the Golden Bar Pit & WRS and the Golden Point Backfill Buttresses , a 0.5 ha area of shrubland will be created by planting with additional diversity of shrub species at one site in Murphys EEA to produce both a gain in both species diversity (to five additional species selected from the shrubland species list in Appendix 1 and including the shrubs *Fuchsia perscandens* and *Melicytus* aff. *alpinus* (c) (CHR 541568; Otago) and Melicytus aff. alpinus (d) (CHR 541567; "dark")) and resulting in a canopy cover of 75% within 10 years as an offset for the project's impacts on this vegetation community. The offset site will be protected from invasion of woody weeds for the 35-year term of the offset by undertaking woody weed control to a zero-density target within a 200 m radius of the shrubland offset site. Net gain will have been achieved once these targets have been exceeded.

This is a terrestrial offset undertaken in accordance with the NPS-IB and POORPS.

10.5.4 Tussockland Offset

The 21.2 ha residual effect (the balance of the affected 32.6 ha of tussockland reduced by the positive effects of planting tussock on the Golden Bar WRS) of the project will be addressed by creating a Tussockland Offset of at least 39.3 ha over an area of existing tussock grassland that is currently at 15% tussock cover and increasing average tussock cover to 50%as measured from drone photographs of ten permanently marked 10 m x 10 m vegetation plots by increasing stature of existing tussock plants (that have previously been burnt) by managing the degree of grazing and, if necessary, creating new areas of tussock grassland by facilitating natural regeneration and/or planting of nursery-grown ecosourced and appropriately hardened stock within 30 years. The indigeneity of inter-tussock forbs will be increased from the current level (Indigeneity Index of 0.16) to an Indigeneity Index of 0.2 within 30 years. The Indigeneity Index is calculated from the summed frequency within 25 5 cm x 5 cm grid squares within a 0.5 m x 0.5 m grid placed in each of the 4 corners of the 10 m x 10 m permanent plot of all indigenous species divided by the total summed frequencies of all plant species). The residual effect of the Golden Bar WRS tussock planting has been calculated on the basis that the 23 ha of tussock being planted to 80% canopy cover is expected to take 50-100 years to reach ecological maturity, and that much of the ecological gain is in the early periods of this timeframe. Therefore, a 50% residual effect is applied to the 23 ha of tussock grassland within the Golden Bar project components footprints in calculating the required offset.

The offset will be achieved by:

a) managing or excluding stock to allow natural tussock regrowth and regeneration and recovery of inter-tussock diversity as a shade-providing tussock canopy develops;

b) removing gorse and keeping the area free of woody weeds and other environmental weeds; and

c) regular control of pests like pigs, goats (if present), rabbits and hares using either shooting or poisoning campaigns.

If necessary, enhancement planting will be undertaken in areas where tussock cover is not reaching offset targets.

Longer term it is expected that, through natural processes, that the tussock grassland will transition into a shrubland and/or woodland of native species (this process is already underway at sites nearby). The new shrubland and/or forest areas are considered of at least equal ecological value to the tussock grassland and are the expected natural vegetation for this area.

Net gain will have been achieved once these targets have been exceeded.

This is a terrestrial offset undertaken in accordance with the NPS-IB and POORPS.

10.5.5 Ephemeral wetlands offset

Within the Coronation 6 pit ZOI are:

1) one previously-impacted ephemeral wetland covering 0.04 ha within the Coronation 6 Pit project which has now degraded and occupied by exotic pasture species to the extent that it is no longer classified as a natural inland wetland,
2) a previously-impacted 0.02 ha site in the buffer area, and
3) a more natural 0.16 ha example also occurs in the buffer area more distant from the existing pit edge.

This is a total of 0.22 ha. This impact includes 0.18 ha of ephemeral wetlands in the buffer area which are expected to become dewatered. The Coronation 6 project will directly impact, or impact further[32], on this 0.22 ha which together have approximately 52% cover by indigenous species. These are ecologically important sites as they are mostly natural inland wetlands that are Naturally Uncommon Critically Endangered ecosystems. As the effects cannot be avoided, remedied or mitigated, then the effect must be offset as required under the NES-FM using the guidance provided in the NPS-FM. It is proposed to produce an offset for the entire 0.22 ha to produce a net gain in biodiversity.

To manage this effect it is planned to create up to 5 ephemeral wetlands covering 0.3 ha on the flat sloping exotic grassland dominated spur on the Taieri Ridge, 3.5 km west of the Coronation 6 Pit (Figure 6) by excavating shallow (c. 1m below relative ground height) gently sloping concave scrapes into the bedrock, filling these to 10 cm depth with commercial peat material, and seeding these with ephemeral wetland and wetland plant species onto the peat base to form within 10 years at least a 50% cover by indigenous ephemeral wetland species (ideally a near-continuous cover of native plant community before weed species become established). Two of these ephemeral wetlands will be excavated to a deeper depth and with a deeper peat base to recreate the more-intact impacted wetland example.

Actual location of sites will be chosen to remove the risk that the wetland will be affected by potential future mine extensions (i.e. west of the Coronation mine area) and avoid damage to other ecological values. The sites will be fenced using a cattle-exclusion fence similar in design to that employed

[32] In that it will add to affects produced by previous projects in this area.

around the OceanaGold Protected Wetlands to maintain sheep access to retain their role in preventing the short-stature native plant communities being overtopped by weeds. Ongoing weed control using the technique(s) found most effective at the Middlemarch Ephemeral Wetland EEA will also be implemented. It is thought this approach will have a high chance of establishing an ephemeral wetland plant community as elements of this community establish readily on drainage ditches and other man-made features in the area. The ability to maintain this community into the future is unknown as they are susceptible to weed invasion.

Net gain will have been achieved once these targets have been exceeded.

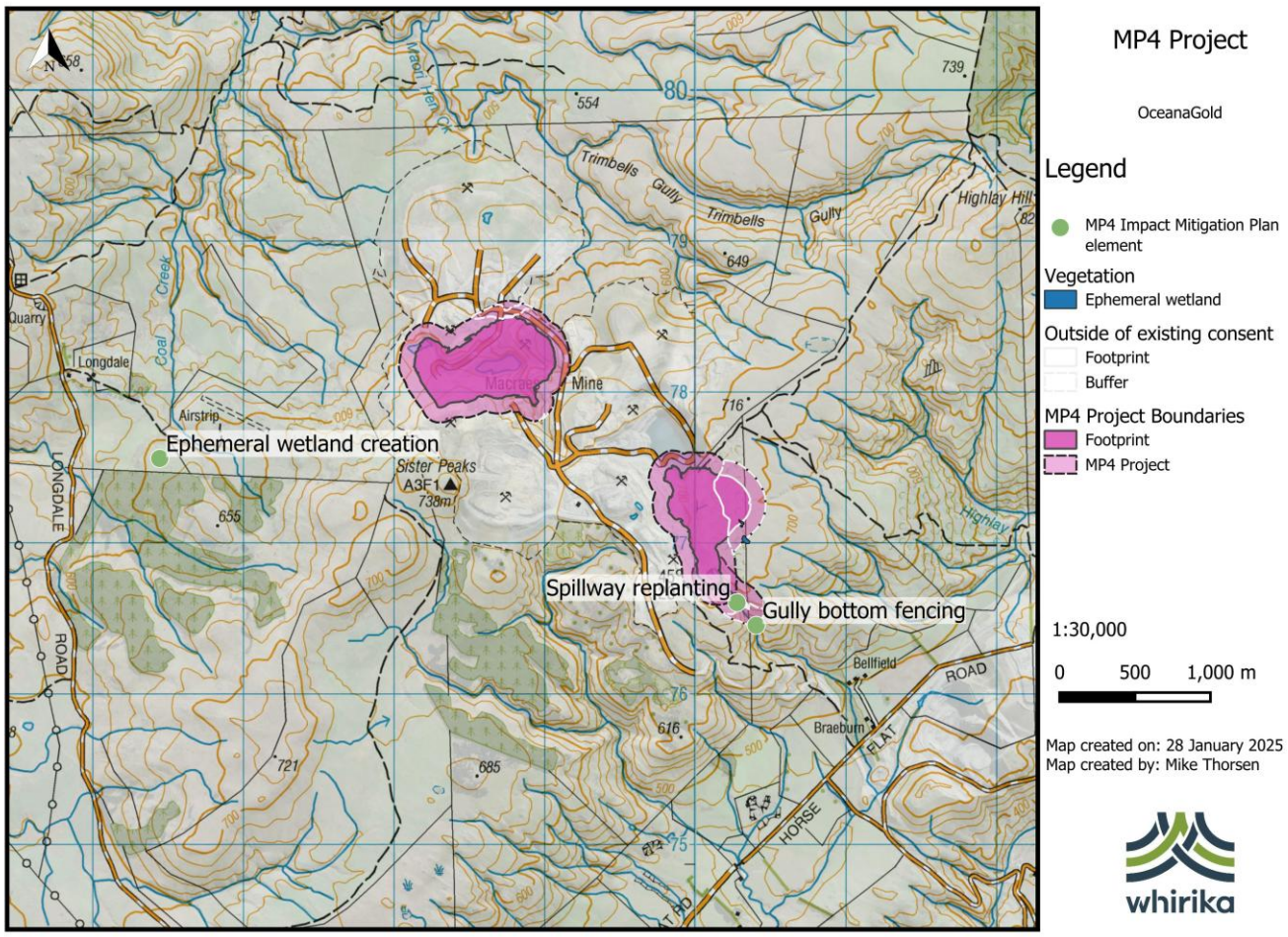

Figure 6. General vicinity where ephemeral wetland creation will occur. Coronation 6 pit in purple to right of image. Affected ephemeral wetlands in blue (to east of south-eastern project component.

10.5.6 Wetland Offset

The two wetlands totalling 0.07 ha in the Innes Mills Stage 10 buffer are expected to be dewatered as a result of the project. This loss will be offset by creating a new wetland of 0.1 ha and with 50% cover by indigenous wetland species at the upper crossing point of the predator fence around Murphys EEA and within the encircling stock fence (Figure 7).

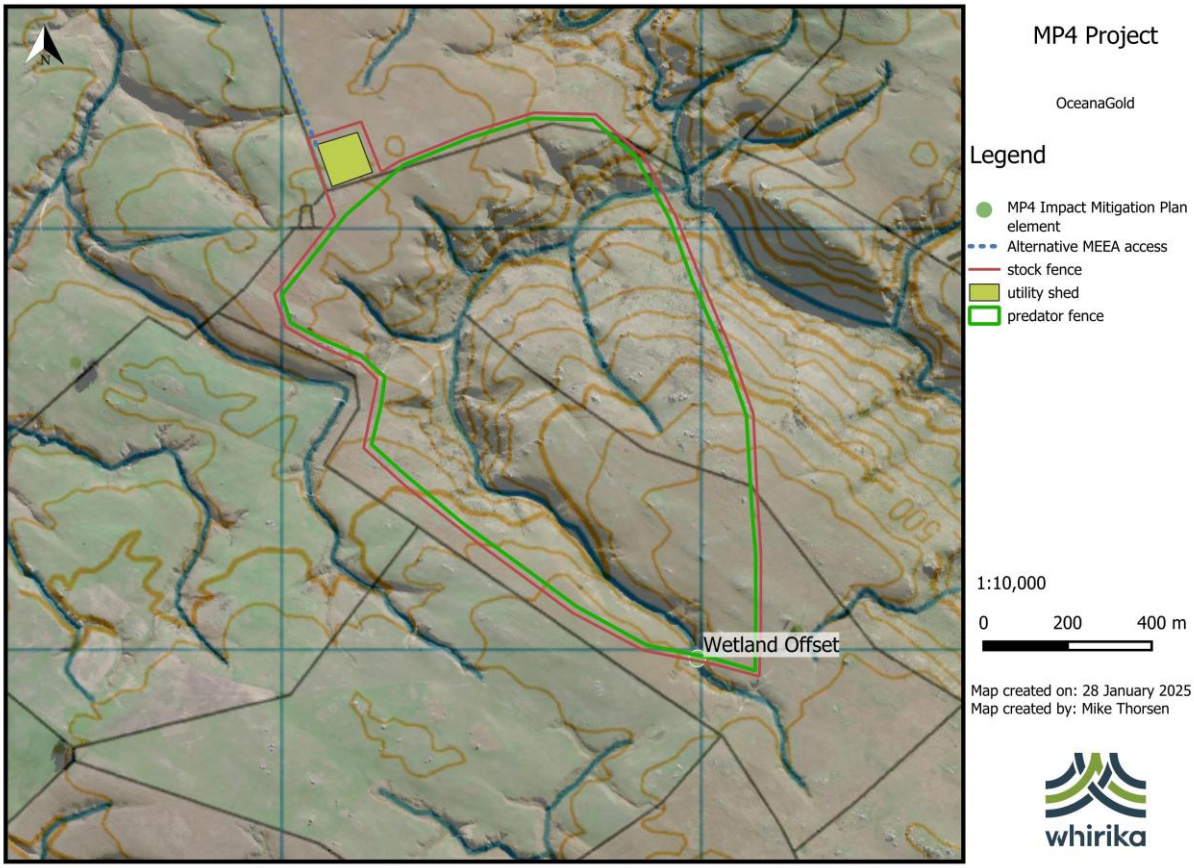

Figure 7. Indicative location of wetland offset within the Murphys EEA.

10.5.7 EEA Management Plans

The implementation and management of the EEA will be documented in an ecological enhancement area management plan (EEAMP). The EEAMP will form a part of a broader project Ecological Management Plan (which will include on-site works to avoid, remedy, and mitigate adverse effects, compensation measures, etc).

The EEAMP will include:

- a description of the offset, the calculation basis, locations and management activities at which enhancements will be generated;
- securing the ability to undertake enhancement works within management sites by way of landowner agreements or covenant;
- the technical detail of the management activities;
- the financial costs of site management for inclusion into bond calculations or other similar instruments as required by Council that secure financial delivery of biodiversity enhancements;
- a monitoring programme to assess the degree to which enhancement targets are being achieved and the ability to adjust biodiversity management to ensure that gains are achieved and maintained for the long term;
- the roles and responsibilities of those carrying out the work, and the governance and management structures relating to the operation of the enhancement site(s); and
- reporting the results of monitoring and a process for undertaking actions if enhancement targets are not being achieved as anticipated.

10.6 Effects that cannot be offset

As discussed in Section 5, an offset requires No Net Loss or preferably a Net Gain. Where No Net Loss cannot be reliably calculated, an offset may not be achievable and instead ecological compensation is proposed. For example, an offset is not planned for the effects on reptile populations and habitat due to the technical complexity of measuring skink and gecko populations at the impact sites or for addressing the effects on bird populations and habitats as accurately measuring populations of the affected bird species is difficult and it is considered that management planned for lizards applies equally to birds. No offset is planned to address the effect on invertebrates due to the extremely challenging difficulties in quantifying population sizes. The effects on the riparian / wetland vegetation mosaic community are difficult to address via an offset approach as these communities are not easily amenable to management as they are mostly affected by grazing and low herbaceous weeds which restricts the ability to improve their condition and it is not possible to increase their extent as they already occur in all suitable sites. The project's effects on these ecological features will be addressed by providing ecological compensation which is based, where possible, on an offsetting approach.

10.7 Ecological compensation

10.7.1 Predator removal

The focus of the proposed predator control will be using predator removal within an Xcluder[33] predator proof fence in the Murphys EEA. The predator removal area will extend over 45 ha[34] in Murphy's EEA (Figure 5) within which the populations of all target pests will be eradicated and maintained at zero (this may require episodic control of mice within the area). Potential breach points of the predator fence (particularly where the fence crosses streams) will be reinforced using 1 ha blocks of permanently set Ka Mate traps paired with permanent bait stations restocked 6-monthly on a 10 m spacing to keep mice at very low densities in these vulnerable areas. Once constructed, the length of the fence will not be re-scaled if lizard population targets are not being met, however, any significant surplus lizard holding capacity may be reserved for mitigating future Macraes Gold Project ecological effects.

All predator control activities, including their eradication within the fence, will be directed by a Predator Control Plan (to be developed).

OceanaGold has applied for a wildlife permit to salvage and relocate lizards from MP4 Project areas. Pest control or predator removal will also be one of the main tools employed at the relocation site to address the effect on lizard and bird populations under the Wildlife Act as in the LMP (and will also benefit the vegetation offsets).

10.7.2 Lizard Enhancement Project

The effect of the MP4 project on lizards will be addressed under an offset framework of removal of predators from within a predator-proof fence to address the effect on lizard populations. This work is undertaken on the assumption that managing the effect on skink populations will also benefit gecko populations to a similar level, but as gecko populations are notoriously difficult to accurately monitor this population response is taken as given. A similar approach to that used in an offset will be employed in designing the Lizard Enhancement Project which will consist of the predator removal described above to achieve a target lizard population size of net gain.

[33] https://www.xcluder.co.nz/xcluder-fences/fence-designs/

[34] See **Error! Reference source not found.**. Actual areas subject to confirmation

Measuring impact on affected populations

The size of the skink (and gecko) populations within the PIA have been estimated using pitfall trapping and N-mixture modelling and CMR analysis[35]. These area-specific population density estimates have then be used to extrapolate to give the total affected population size for each species based on the habitat present at the site.

Measuring baseline population size of resident lizards and measuring population change

To obtain an accurate measure of the baseline population size of resident lizards, pitfall trapping and N-mixture modelling and CMR analysis[36] has been used. This will be repeated in 2025 to increase the robustness of the baseline estimate. Population estimates (with confidence intervals) generated from the model will provide the baseline reference points for each affected area prior to impact and for the mitigation site (Murphys EEA) prior to pest management and lizard release.

The monitoring design will employ stratified random sampling to establish a defined number of independent sites[37] across the MP4 Project areas. Sampling will be achieved by overlaying 100 x 100 m grid squares on the monitoring areas and randomly selecting a representative number of grid squares ('sites') that will be subject to monitoring (Figure 8). The number of randomly selected sites will vary between, and be related to, the size of monitoring areas.

At least two repeats of baseline measuring will be required to produce an accurate baseline measurement.

In addition to the modelled abundance estimates, population demographic information will be collected for all species encountered. Captured lizards will be measured (snout-vent and vent-tail length), weighed, and sexed prior to release.

Fuller details of the proposed lizard monitoring are in the LMP.

[35] MacKenzie, D. I., and Bratt, A.E. (2024). Analysis of Macraes Flat Lizard Monitoring Data. Report for [Bioresearches], Proteus Client Report: 192. Proteus, Outram, New Zealand.

[36] MacKenzie, D. I., and Bratt, A.E. (2024). Analysis of Macraes Flat Lizard Monitoring Data. Report for [Bioresearches], Proteus Client Report: 192. Proteus, Outram, New Zealand.

[37] Independent sites are considered sites that are sufficiently spatially distributed to eliminate the possibility of the same individual(s) being detected more than once during a sampling period.

Averted loss

For both tussock skink and korero gecko, both of which have an At Risk – Declining threat classification due to a national decline in numbers and/or range. It is likely that this decline is also happening in the Macraes area as the same contributing factors (predators and habitat loss) are present though there may be some amelioration offered due to the rocky habitat protecting lizards from predation. This averted loss could be included in the target calculation, but the offset outcome target has not been adjusted (downwards) at this time. This is to give an additional 'insurance' of reaching actual NNL as a result of project activities.

Estimating population response

The lizard population response that can be expected from actual levels of predator control in New Zealand is poorly known. Lizard populations on islands respond strongly to removal of exotic lizard predators (e.g., rodents[38,39]). On mainland NZ, population responses are obscured by uncertainties of actual level of predator control achieved due to the difficulties of measuring depletion of predator populations and shifts in predator-prey interactions. However, predator control can be instrumental in facilitating lizard population recovery on the mainland[40].

Where predator control appears to have been effective, population response from vulnerable lizard species can reach four-fold increases[41,]. Population increases from commoner species may be less strong as they are probably not being affected by mammalian predators to the same extent as vulnerable lizard species, either due to behavioural or habitat differences, or because the reproductive rate is higher (or a combination of any of these) [42]. While it is possible that within predator fenced areas that lizard responses could reach the population increases encountered on predator-free islands, this is unlikely and a conservative figure of 100% population increase has been used in offset calculations.

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[38] Bellingham, P. et al. 2010. New Zealand island restoration: Seabirds, predators, and the importance of history. NZ J. Ecol. 34.

[39] However, a doubling in population size within 5 years of common skink species is anecdotally reported for the Mokomoko Dryland Sanctuary.

[40] Reardon, J.T. 2020. Predator control allows critically endangered lizards to recover on mainland New Zealand. NZ J. Ecol. 36.

[41] Difference in population response between unmanaged and trapping from periphery to fence in Fig 2 of Reardon, J.T. 2020. Predator control allows critically endangered lizards to recover on mainland New Zealand. NZ J. Ecol. 36.

[42] A doubling in population size within 5 years of common skink species is anecdotally reported for the Mokomoko Dryland Sanctuary.

This offset assumes that predators, particularly mice, are having the same level of effects on the resident lizard populations as have been observed at the nearby Grand and Otago Skink Management Area (which extends c. 1 to 10 km to the south) and the Mokomoko Dryland Sanctuary (near Alexandra).

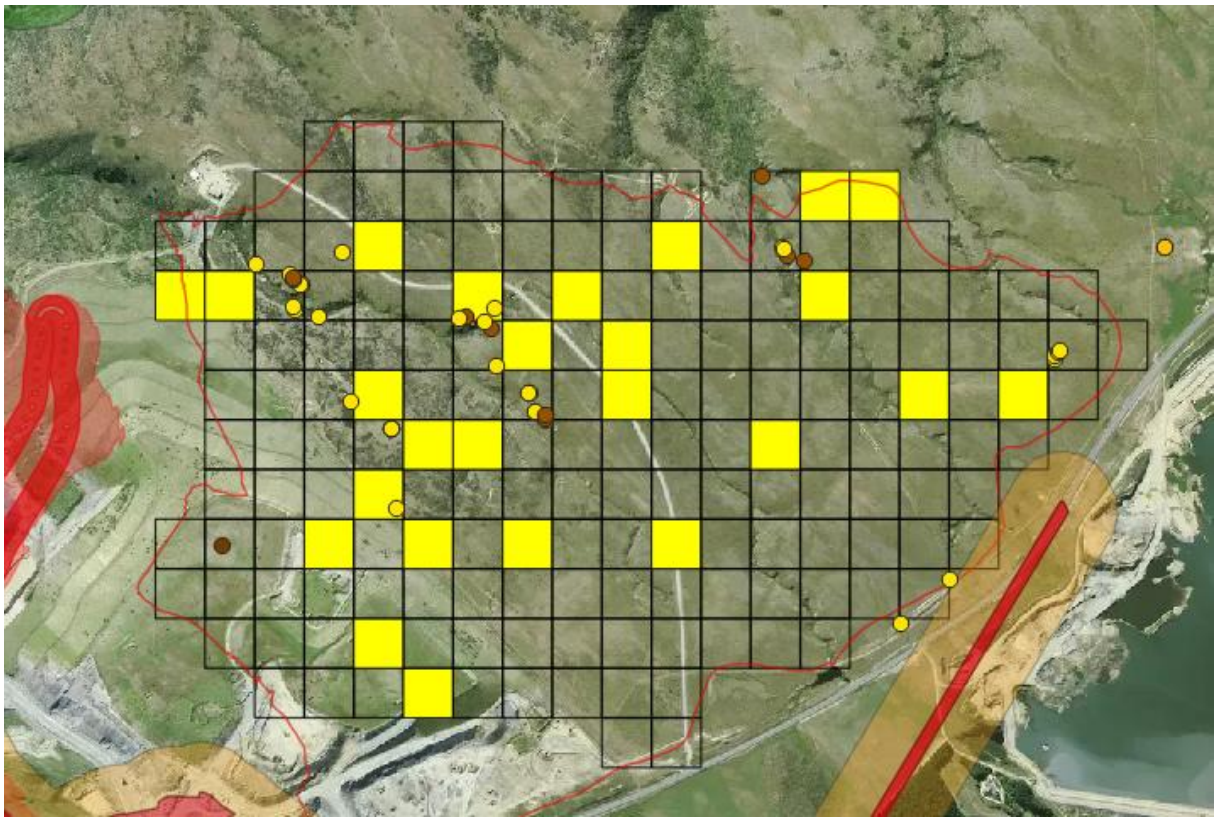

Figure 8. Example random stratified sampling design for lizard populations (image Bioresearches).

Population response targets

A disaggregated offset model has been used to calculate the 45 ha predator-fenced area necessary to achieve a NNL of skink numbers if a 100% (or two-fold) increase in skink populations is achieved in 10 years within the Murphys EEA. This target includes a 5% adjustment to ensure that NG is achieved. NNL will have been achieved once a population increase of 80% has been demonstrated within the 45 ha predator fenced area.

10.7.3 Rock tor replacement

While the effectiveness of rock tor creation is unknown, it is currently the only technique available to address the loss of rock tor habitat of lizards (and also invertebrates and birds to a degree). At least two rock tor designs are currently being trialled at Macraes (Camp Creek and Deepdell North). The initial results of these trials will be used to inform the best design for replacement rock tors. It is proposed to use locally sourced plate schist to create ~35 replacement rock tors to the agreed design at Murphys EEA along the existing access road (to minimize impact of rock transport).

10.7.4 Bird Enhancement Project

The bird enhancement project will focus on enhancement of local population of pihoihoi NZ pipit as a surrogate for other bird species that occur in the area. While site rehabilitation and many of the activities in this Impact Management Plan are likely to also benefit pihoihoi, the predator removal within the predator fence will be used to achieve a net gain in number of pipit/pihoihoi. It is difficult to quantify the impact of the project on the resident pihoihoi population or the effectiveness of the enhancement project as pihoihoi are at times very mobile. For this reason, it is proposed to use the number of pihoihoi recorded in pre-works walk through counts during the breeding season to produce an estimate of the territorial pair population resident in the MP4 project area. This will form the pre-impact population size of pihoihoi in offset calculations to produce the Net Gain target. Pihoihoi response to the landscape scale predator control will be measured by counts of territorial birds (including pre- predator control baseline counts) within the Murphys EEA.

10.7.5 Research into invertebrate community response to habitat protection

The response of the invertebrate communities of the Murphys EEA to changes in their tussockland habitat will be monitored using a similar approach employed in the Redbank EEA. This involves using frequency counts of indigenous species within the Lepidoptera and large ground dwelling invertebrate groups established using a 3-year average of individuals captured on 3 permanently marked lines of 5 sample stations containing one Heath-type light trap and four pitfall traps monitored annually over 3 days in the covenant and in a reference site. This monitoring will start at commencement of the project to establish a baseline and then occur for 3 years every 10 years. Monitoring of habitat usage and population dynamics of the Threatened moth *Orocrambus sophistes* will be instigated if this species is confirmed to be present in the impact area.

10.7.6 Riparian / wetland vegetation mosaic protection and enhancement

The effects on 1.63 ha of riparian / wetland vegetation mosaic and on 430 m of stream bed will be addressed via 1) including at least 2.15 ha of riparian / wetland vegetation mosaic with 38% cover by indigenous species in the Murphys EEA, and 2) the protection of at least 860 m of equivalent or better watercourse habitat within the MEEA. The 2.15 ha site will be managed by removing all fringing woody weeds and keeping the riparian site clear of wetland environmental weeds. This is expected to produce an improvement in current condition of this vegetation community of at least 10% in terms of cover by indigenous species. As 10% is less than the NNL offset target of 40% improvement from the current state it is planned to plant 500 riparian shrub species along the margins of the riparian / wetland mosaic in the lower reaches of Murphys EEA to produces stream reaches with shaded margins. This should provide an additional, higher quality, environment that is now almost absent in the general area. The 860 m of stream length will be at a site protected by a stock fence and protected from invasion by woody riparian tree weed species (i.e., willow)

10.7.7 Fencing of 100 m of gully bottom below Coronation Spillway.

To fence off 100 m of gully bottom extending from the spillway downstream to the current stock fence using standard stock fencing situated at least 5 m from gully bottom.

10.7.8 Lizard salvage contingency measures

Lizard salvage can be difficult to plan and there are chances that unusual conditions will be encountered. For this reason, the Lizard Management Plan contains details of contingency measures that will be employed as, and if, required.

10.8 Staging of activities

The activities described in this Impact Management Plan will be staged to commence once works have commenced on that component of the MP4 project.

Works that will be staged are:

1. Isolating sites of higher ecological value will occur immediately prior to works commencing at that site.

2. Replanting tussock onto the Golden Bar WRS will commence once deposition of rock onto the WRS has finished.
3. Rescue of rare plant and the Threatened invertebrates projects will commence once works are scheduled at Golden Bar.

10.9 Monitoring of gains

A monitoring programme will be implemented as part of the project Ecological Management Plan and EEAMP(s). This monitoring will focus on:

1. Documenting long-term changes in lizard populations within the Murphy's EEA[43], particularly in areas where salvage lizards have been released.
2. Documenting long-term changes in bird populations, particularly of uncommon or taoka species, in the Murphys EEA.
3. Long-term monitoring of invertebrate communities in the Murphys EEA and Golden Bar WRS tussock rehabilitation in comparison with un-managed site(s) utilising pitfall trapping and light trapping.
4. Monitoring the quality and type of vegetation (community composition, ground cover, structure, weediness, pest damage) in the Murphys EEA, wetland and ephemeral wetland offset sites in comparison with un-managed site(s) (where possible) using permanent plots.
5. Monitoring of establishment and survival of rescued plants.
6. Monitoring of re-establishment of tussock grassland at Golden Bar WRS measuring community composition, ground cover, structure, weediness, pest damage.
7. Environmental weed survey and monitoring.
8. Annual inspections of Murphys EEA to increase knowledge of the biodiversity at the site.
9. Pest animal removal effectiveness.

[43] See Section 5, Lizard Management Plan

11 Alignment with policy

Below is an overview of how the activities proposed in the Impact Management Plan align with the requirements of regulatory documents. Conditions are grouped into those with similar intent to avoid repetition.

11.1 POORPS Policy 3.1.9 Ecosystems and indigenous biological diversity

The activities in this IMP are consistent with the objective to maintain and enhance ecosystems and biological diversity as the overall intention is to produce a Net Gain in the biodiversity values in the vicinity of the project. This is further reinforced by employing Net Gain offsets. The natural resources and processes, or that support biodiversity are mostly unchanged, or changes are redressed. Policy 3.1.9 says to maintenance or enhance as far as practicable "areas buffering or linking ecosystems". None of the affected sites buffers an adjoining ecosystem, or the loss of any buffering is redressed. This proposal includes significant measures to address weeds and mammal pests within and around the Murphys EEA.

11.2 POORPS Policy 3.2.2 Managing significant indigenous vegetation and habitats; Policy 4.3.4 Adverse effects of nationally and regionally significant infrastructure; Policy 5.4.8 Adverse effects from mineral and petroleum exploration, extraction and processing; NPS-IB Clause 3.16; WDC Policy 16.7.2; 16.9.3; DCC Policy 10.2.1.Y

The approach taken in this IMP is consistent with the intent of these policies as they have followed the effects management hierarchy of first avoiding effects, then remedying, mitigating or offsetting or compensating for project effects within an overall objective of a Net Gain in biodiversity. These are described in Section 10. The project is locationally constrained which prevents adherence to a preference to avoid locating an activity in areas of significant indigenous vegetation and significant habitats of indigenous fauna beyond the coastal environment (POORPS Policy 4.3.4.a) ii. And Policy 5.4.8. a) iv) The effects management hierarchy has been employed in accordance with the further requirements of this policy and in accordance with Policy 5.4.8 where an activity cannot avoid

significant indigenous vegetation or significant habitat of indigenous fauna then using staging, remedying and mitigating adverse effects on values in order to maintain the significant nature of the indigenous vegetation and habitat of fauna.

11.3 POORPS Policy 5.4.6 Offsetting for indigenous biological diversity, NPS-IB Appendix 3; DCC Policy 2.2.3.6

Under the POORPS, NPS-IB and other policies, the following conditions must be met.

Adherence to mitigation hierarchy

The offsets have been designed to account for the residual effects that remain following all practicable effort to avoid, remedy and mitigate the project's effects (see Sections 10.1,10.2,10.3 for description of these efforts).

Adherence to this criteria is a requirement of the NPS-IB, NES-FM, POORPS, DCC.

Appropriateness

The use of an offset is considered appropriate[44] as the offsets are intended to address the project's effects on vegetation communities that are widespread within the Macraes E.D. (and elsewhere) and inhabited by flora and fauna that are of lesser conservation concern. Most of the vegetation communities occur on a diverse variety of landforms and geologies. The exception is the ephemeral wetland vegetation community that is a naturally uncommon ecosystem that occurs (in Otago) in depressions on flat surfaces. This ecosystem is frequent in the Macraes area and mapping as part of the previous Deepdell North III Project identified at least 1,360 ephemeral wetlands covering 162.39 ha (and at least a further 218 possible examples). There are innumerable smaller examples that are not discernible on aerial photographs.

[44] See also J Markham, M Baber, J Quinn, M Christensen, T Ryan, M Lowe, S Knowles, D Miller, G Ussher. 2023. Assessing limits to biodiversity offsetting in Aotearoa: a proposed framework. Resource Management Journal for a framework to assess appropriateness of an offset. This is the approach employed here.

The effects of the project are well known. The MP4 project is the latest in a number of similar mine operations in the Macrae's area dating back to the 1950's (and to the 1800's for other mining methods). The expected effects are total removal within the footprint and with some effect extending beyond this due to changed environments and a degree of dewatering of watercourses and ephemeral wetlands. These effects are described and discussed in the EcIA.

There are no technical barriers to achieving Net Gain as the offsets are based on similar management actions employed in previous mine projects, or that have been employed elsewhere. All of the offset components have high or very high certainty of achieving their outcomes.

Overall, the appropriateness of using offsets as planned is assessed as **high** (Table 3) with little need to consider limitation though some caution should be employed in the ephemeral wetland offset (Table 4).

The offset ensures there is no loss of any Threatened taxa and no reasonably measurable loss with the ecological district to an At Risk - Declining taxa (as defined under the New Zealand Threat Classification System).

Table 3. Offset appropriateness assessment[45]

	Offsetability		
Offsetability sub-criteria	**Low**	**Moderate**	**High**
Opportunity: Confirmed availability of sufficient offset sites (e.g., habitats that can be restored or enhanced) in close proximity*to the area of impact, or in the wider landscape.	Suitable sites are not available	Suitable sites are not available in proximity to the area of impact but are available in the wider landscape	Suitable sites are available in proximity to the area of impact(s) **Yes for all offset components**
Technical feasibility: The degree to which proposed offset measures are proven to have a high likelihood of success	Proposed ecological restoration and enhancement measures are unproven and/or known to fail	Offset measures are expected to work but strong supporting evidence is lacking **Yes for ephemeral wetland offset**	Proposed habitat restoration and enhancement measures are proven to work with a high degree of confidence **Yes for most offset components**
Outcome certainty: Expected biodiversity gains associated with offset measures will be verified through biodiversity outcome monitoring and application of adaptive management/contingency measures as required	Ecological outcome monitoring is feasible but not proposed†. Nor are adaptive management and contingency measures proposed	Expected gains are proposed to be verified through ecological outcome monitoring (where feasible). Adaptive management/contingency measures are proposed BUT The degree of confidence that intended ecological outcomes will be realised is relatively low	It is proposed to verify expected gains through ecological outcome monitoring and to undertake adaptive management/enact contingency measures as required AND The degree of confidence that intended ecological outcomes will be realised is relatively high **Yes for all offset components**
Overall offsetability	Low (One or more Low sub-criteria score)	Moderate (No Low sub-criteria scores)	**High (at least two High and one Moderate sub-criteria score)**

[45] From J Markham, M Baber, J Quinn, M Christensen, T Ryan, M Lowe, S Knowles, D Miller, G Ussher. 2023. Assessing limits to biodiversity offsetting in Aotearoa: a proposed framework. Resource Management Journal

Table 4. Limits to offsetting assessment outcome matrix: Likelihood that the project effects on a given biodiversity value align with the limits to offsetting principle[46]

	Offsetability		
Level of effect	**Low**	**Moderate**	**High**
Very high	Very Low	Low	**Moderate for ephemeral wetland**
High	Low	Moderate	**High for tussockland and wetland**
Moderate	Low	High	**Very High for shrubland**

[46] From J Markham, M Baber, J Quinn, M Christensen, T Ryan, M Lowe, S Knowles, D Miller, G Ussher. 2023. Assessing limits to biodiversity offsetting in Aotearoa: a proposed framework. Resource Management Journal

Net Gain

A disaggregated accounting model[47] was used to calculate the extent of works required within the EEA to achieve at least a state of Net Gain in biodiversity using the March 2015 user manual and spreadsheets. The offsets all involve working in very similar vegetation communities and will be based on measurement of their composition, amount and structure. Sampling of the affected areas and baseline measurements of Murphys EEA are scheduled for the summer of 2023-2024 to provide better data quality from a more appropriate time of the year. In the interim estimates were made of the offset variables to calculate what size and degree of improvement could be needed to result in a Net Gain in biodiversity.

Additionality

The offsets are additional to those that have been produced as a result of other projects or that are proposed as remediation and mitigation in this project. They replace no current conservation activities at the site. They occur in a context of an area where biodiversity is being lost (a negative trend), and though there is some protection of biodiversity afforded by policies in the POORPS, NPS, WDC and DCC District Plans, these offsets will provide additional, well-resourced and long-term conservation support to the Murphys EEA area.

Leakage

No displacement of harm or negative effects is expected to result from the offsets as the planned activities focused on removal of pest animals and weeds.

Long term outcomes

The offsets are developed with long-term outcomes that provide enduring benefit to biodiversity. The duration of the impact of the activity where offsets are proposed are permanent loss of the affected ecological features. A 35-year timeframe of active management is proposed to reflect the duration

[47] Maseyk, F.J.F; Barea, L.T; Stephens, R.T.T; Possingham, H.P; Dutson, G; Maron, M. 2016. A disaggregated biodiversity accounting model to improve estimation of ecological equivalency and no net loss. Biological Conservation 204: 322-332.

of impact. The benefits will be secured by the creation of a legal covenant, or similar legal protection, over the offset site[48].

The implementation and ongoing management and monitoring of the proposed offset will be funded by OceanaGold over the life of the mine, with sufficient funds (including depreciation and inflation) also being placed in a bond to cover the planned activities over the agreed timeframe. The size of the bond will be adjusted annually to ensure that it covers the agreed period of planned work. Once OceanaGold ceases operations (mine closure) the bond will be paid to a delegated authority who will then be responsible for managing the offsets to maintain the specified targets for the balance of the 35 years from date of fence completion.

The location of the offset site spans a variety of habitats which should help buffer against climate variability. It is located in a gully system which are refugia for natural values and the site will contribute to the protection of the natural values. It is not located on known mineral resources and is not in a location that would impede current farm operations. Surrounding land use, such as pasture conversion and exotic afforestation, may occur, but these are not expected to affect the offset site as it is of a size that any edge effect from neighbouring land uses are minor in extent. It is not expected that ecological change within the site will make future management more difficult as ecological resilience increases with intactness of the natural vegetation and therefore pest pressures should decrease as the offset achieves its outcomes.

Monitoring of the biodiversity gain at the site will be yearly until the biodiversity targets have been exceeded. Monitoring will then occur on a five-yearly basis to confirm that the biodiversity targets are still being met.

The following criteria need to be considered in the design of an offset, but do not ned to be met to fulfil the requirements of the NP-IB. They will need to be met to conform with the POORPS.

Location

Murphy's EEA is located in the same Ecological District as where the impact will occur and involve the same habitat types. It is 2.5 km from the project component with the largest effect on local biodiversity and 13 km from the most distant project component. Its altitudinal range of 380 m to 520 m a.s.l. is of a similar elevation to that of the Golden Bar and central project components (460 m to

[48] The benefits from the predator removal accrued to lizards over the 35-year timeframe of the offset may begin to be eroded as maintenance of the predator fence by OceanaGold will cease at this time, but the benefit of permanent legal protection of their habitat will remain.

560 m a.s.l), but is lower than the Coronation project components (c. 700 m a.s.l.). This will create a small difference between the species in the Coronation area and the species that occur at the Murphys EEA site which will not have some higher-elevation species (but will have additional lower-elevation species). The ephemeral wetland offset site is at the same elevation as the impacted sites and is 4 km away.

The offset sites are located in mosaics of similar habitat and are likely to function as a network of habitats that are connected but the extent of the connection will be dependent on the biologies of the species concerned (i.e., flighted birds will move between habitats easily, reptile less easily, native plants less easily again and there is likely to be very little connection of ground dwelling invertebrates with reduced flight characteristics). Habitat disconnection is likely a natural feature of ephemeral wetlands that occur at scattered sites in the landscape. All habitats are influenced by the surrounding landscape, but the habitats in these offsets have limited dependency on surrounding habitats, with the exception of Riparian / wetland vegetation mosaic which is strongly influenced by upstream water-contributing habitats, instream conditions and surrounding land use (especially shading habitats such as shrublands or trees. Ephemeral wetlands are not strongly ecologically linked with surrounding habitats, but those that occur in farmland tend to be managed as pasture sites. Wetlands are also constrained in their location by local topography, in the Macraes E.D. occurring mainly in in shallowly-sloping gully bottoms where waterflow is impounded and creating a poorly drained flat surface. These conditions are replicated in the offset site.

It is considered that the selected Murphys EEA offset site offers the best ecological outcomes as the alternative sites (which for the lizard alternatives were considered and which are discussed in the LMP) are either further away and hence harder to access for long term management, consist of dissimilar habitats or are on more rugged land which makes management more difficult.

Time lags

The time lags expected depends on the component of the offset:

For the tussock grassland offset, gains are expected to accrue once destocking has occurred and the necessary increase in tussock cover will mostly through regrowth of existing tussock plants and will be reached in 5-10 years. Further increases in cover will be through a combination of natural regeneration and direct planting as it will be 10-20 years before the tussock would be ‘mature’. Recovery of the inter-tussock herb communities will occur naturally from expansion of existing plants once tussock is providing adequate shade.

For the shrubland offset, the gains will begin to accrue once the shrubs are planted and it is expected that maturity of the shrubs will take 10-20 years and by that time they will be providing a shaded habitat for understory herbs.

The ephemeral wetland offset is expected to accrue biodiversity gains once the sites have been excavated and native plants reintroduced. The species that occupy this habitat are capable of rapid increase in numbers and covers (at some sites all plants die over summer and the site is completely reclothed by growth from seed during spring). Therefore, the maturity of the offset may be as short as 3 years. However, weed invasion may delay this and require an extra 3-5 years before the local weed sources is depleted and the natural vegetation community becomes resilient to weed invasion.

The wetland offset is expected to accrue biodiversity gains once waterflow is impeded and once planting of indigenous wetland species begins and maturing within 5 years.

Knowledge

The offset design has been informed by a body of both published and unpublished science. Determining the scale of the offset uses the disaggregated accounting method[49], which is the most-recent scientifically peer reviewed method and is the method recommended in the most-recent guidance[50].

The actions that comprise the offset are based on the outcomes of conservation efforts in the Macraes area.

Mātauranga Māori has not been included in this design, although consultation and engagement on ecological and other project matters continues.

Equity

Currently the offset has no participation from Mana Whenua and limited participation from other stakeholders. Therefore, the onus of the offset is solely held by OceanaGold. The Department of Conservation has been involved in the design of the offset and has an interest in the outcomes of the offset.

Transparency

This offset is considered of high transparency as it has been peer reviewed (by Boffa Miskell) but the offsetting has not been independently quantified. This will be subject to expert examination by the

[49] Maseyk, F.J.F; Barea, L.T; Stephens, R.T.T; Possingham, H.P; Dutson, G; Maron, M. 2016. A disaggregated biodiversity accounting model to improve estimation of ecological equivalency and no net loss. Biological Conservation 204: 322-332.
[50] Fleur Maseyk, Graham Ussher, Gerry Kessels, Mark Christensen, Marie Brown. 2018. Biodiversity Offsetting under the Resource Management Act: a guidance document.

consenting authorities and Department of Conservation, is likely to be further examined in a hearing and the documents (including the worksheets) will be a matter of public record attached to the consent application. The offset will also be discussed with the local farming community and with iwi.

Results will be communicated annually to the consenting authorities as a component of OceanaGold's Annual Ecology Report.

The offsets do not involve forfeiture of rights.

11.4 POORPS Policy 5.4.6A Biological Diversity Compensation; NPS-IB Appendix 4; DCC Policy 2.2.3.7

Biological diversity compensation is only being considered after the higher-level requirements of the effects mitigation hierarchy have been employed. The following effects cannot be avoided, remedied, mitigated or offset:

The effects of the project on resident lizard and bird populations.

The effects on rock tor habitats.

The effects on invertebrate communities.

The effects on riparian / wetland vegetation mosaic and streams.

These effects cannot be avoided due to the locational constraints of the mining activity. The effects cannot be remedied as the effects is mostly total loss of the features and there are technical barriers to recreating the lost features. No options were identified that could mitigate the effect. The effects cannot be offset mainly due to the technical difficulties in quantifying lizard and invertebrate communities and, for invertebrates, the technical difficulties in managing invertebrate communities due to a lack of knowledge on effective management techniques. The effects on riparian / wetland vegetation mosaic and streams cannot be offset due to the lack of effective management tools for this vegetation community in a Macraes context. The effects on birds is being considered as a compensatory activity because it is utilising the same predator management being used to effect a Net Gain in lizard populations.

For these reasons the following activities are offered as biological diversity compensation. For all these activities, excepting research of invertebrates and lizard salvage contingencies, they all have been designed using offset calculations to indicate the quantum of effort required to meet a Net Gain in biodiversity. Because of this calculation it is considered that the compensation is proportionate to the adverse effect. These compensation activities however have less confidence in being able to quantitatively prove that Net Gain has been achieved.

1) A predator control programme consisting of a predator-proof fence to benefit lizards and birds (including taoka species).
2) Creation of replacement rock tor habitat for lizards.
3) Research into invertebrate community response to changes in tussockland habitat.
4) Protection of riparian / wetland vegetation mosaic and streams.
5) Contingency measures if lizard salvage does not proceed as planned (see Lizard Management Plan).

None of the compensatory activities involve irreplaceable or vulnerable species or habitats. And while there are uncertainties associated with the effects requiring the employment of biological compensation, none of the species is considered significantly adversely affected and it is thought that the uncertainties can be managed such that the effects on the species will have reasonable expectation of providing a net gain in biodiversity, or at the most a minor effect on a species. The compensatory activities are based on current species and habitat management approaches.

These compensatory activities will not result in the loss of an indigenous taxon or of any ecosystem type from the Macraes E.D. Nor will it result in the removal or loss of viability of habitat of a Threatened or At Risk indigenous species of fauna or flora as the project's effects on habitat of At Risk species are planned to be addressed via mitigation and offsetting. There are no residual adverse effects which are more than minor affecting the habitat of At Risk or Threatened indigenous species. The project does not affect any Threatened or At Risk indigenous freshwater fauna.

The project's effects on the one uncommon ecosystem type present (ephemeral wetlands) will be addressed through offsetting.

The location of the compensation activities is is in the same Ecological District as the project and is about 3 km west of the site (Golden Bar) with the greatest effect on ecological features and 11 km from the most-distant project component (Coronation 6). It has ecological communities very similar to those at Golden Bar (tussock grassland, shrubland and rock outcrops) and occurs at a similar elevation (400 m versus 500 m for Golden Bar & SPIM, and 700 m for Coronation 6). The slightly lower elevation is considered a better outcome as biodiversity is being lost disproportionately from lower

elevations and therefore protection and enhancements of lower altitude areas is ecologically more worthwhile.

None of the planned compensation activities would occur if the project did not take place. The positive ecological outcomes of the compensation activities are in perpetuity as they either will remain in-situ within a protected (covenanted) area, or are supportive measures until habitat quality permanently increases within the protected area. The outcomes of all proposed compensation activities are expected to begin achieving their desired results within 1 year (predator control), 3-5 years (rock tor replacement), or 5 years (invertebrate research). These timeframes are constrained by ecological processes (annual breeding of lizards and birds) and technical constraints (time required to affect removal of predators, time required to undertake research). None of the compensatory activities will result in displacement of pests into the surrounding area.

Currently the offset has had no input from Mana Whenua and limited participation from other stakeholders. Therefore, the onus of the offset is solely held by OceanaGold. The Department of Conservation has an interest in the outcomes of the offset.

This compensation package is considered of high transparency as it has been independently evaluated, and will be subject to expert examination by the consenting authorities and Department of Conservation, is likely to be further examined in a hearing and the documents (including the worksheets) will be a matter of public record attached to the consent application. These activities will also be discussed with Mana Whenua and the local farming community.

Results will be communicated annually to the consenting authorities as a component of OceanaGold's Annual Ecology Report.

12 Effects of implementing impact management elements

This IMP requires some activities to be implemented which have elements (such as clearing fence lines) that will themselves have effects on the local ecology and may be subject to resource consents from WDC and ORC. These elements are:

1) Clearance of areas of tussock grassland and shrubland and earthworks for creation of predator fence and protective encircling stock fence, and establishment of a utility shed.
2) Clearance of riparian vegetation and earthworks, earthworks and discharge of sediment to waterway associated with installing culverts at two points (downstream waterway discharge

point, upstream inlet point) to provide for movement of water without allowing predator entry.

3) Clearance of areas of tussock grassland and shrubland and earthworks for creation of utility shed next at Murphys EEA.
4) Clearance of areas of tussock grassland and shrubland, earthworks and discharge of sediment to waterways for upgrading of the existing access track to Murphys EEA and installation of a culvert at an existing stream ford to provide for all weather access.
5) Earthworks to excavate new ephemeral wetlands[51].

The site where the ephemeral wetlands are to be excavated (see Figure 6) is entirely within farm pasture and so no adverse effect on local biodiversity is expected.

An indicative map of the planned Murphys EEA elements is shown in Figure 9 and the indicative footprint to within 3 m of these elements totals 6 ha and the vegetation within the footprint is primarily depleted grassland with areas of tussock grassland, riparian / wetland vegetation matrix, shrubland and rock (Table 5). It is expected that the local biodiversity impacted by the Murphys EEA project elements could include areas of vegetation or habitat of species that meet one or more of the significance criteria within the Waitaki District Plan or Regional Plans.

Table 5. Areas of the vegetation communities within 3 m of the footprint of the MEEA elements.

Vegetation Community	**Area (ha)**
Tussock grassland	2.6
Shrubland	0.08
Depleted grassland	3.23
Rock	0.08
Riparian / wetland vegetation matrix	0.01

Managing the impact of these elements on local biodiversity will be through employing the effects management hierarchy of:

Avoid

Remediate

Mitigate

Offset

[51] This site is entirely within farm pasture and so no adverse effect on local biodiversity is expected.

Compensate

As the final location of these elements has not been decided, the evaluation of the degree of impact will be undertaken following confirmation of their location (following an evaluation of sites to avoid – step 1 in the hierarchy).

This will include:

1) Avoiding placing culverts in any areas identified as a wetland.
2) Any effect on rare plants (that cannot be avoided) will be mitigated by incorporating that species in the plant rescue package (Section 10.3.8).
3) Any effect on shrubland (that cannot be avoided) will be offset by adjusting the offset target (Section 10.5.3).
4) Any effect on tussock grassland (that cannot be avoided) will be offset by adjusting the offset target (Section 10.5.4).
5) Any effect on the riparian / wetland vegetation mosaic from installation of culverts at the waterway entrance and exit point(s) along the predator fence is expected to be less than minor due to the small size of the culverts. There are no indigenous fish populations known upstream and so fish passage is not an issue. There is a population of Taieri flathead galaxias both upstream and at the site of the planned culvert in the existing vehicle ford on the access way. Installation of this culvert will follow the fish passage guidelines (2018)[52]. Culvert location will avoid any area that is assessed as being a wetland (rather than a riparian / wetland mosaic).
6) Any effects on lizards, birds or invertebrates will be assumed addressed through the adjustments to offset targets. Using the indicative area impacted (Table 5), this would require increasing the percent cover target of the tussock grassland offset from the current target of 50 percent to 55 percent, the extent of shrubland in the shrubland offset from 0.5 ha to 0.6 ha. The effect on the riparian / wetland vegetation matrix will be via increasing the riparian planting by 50 additional plants.

[52] https://environment.govt.nz/acts-and-regulations/freshwater-implementation-guidance/fish-passage/#the-guidelines

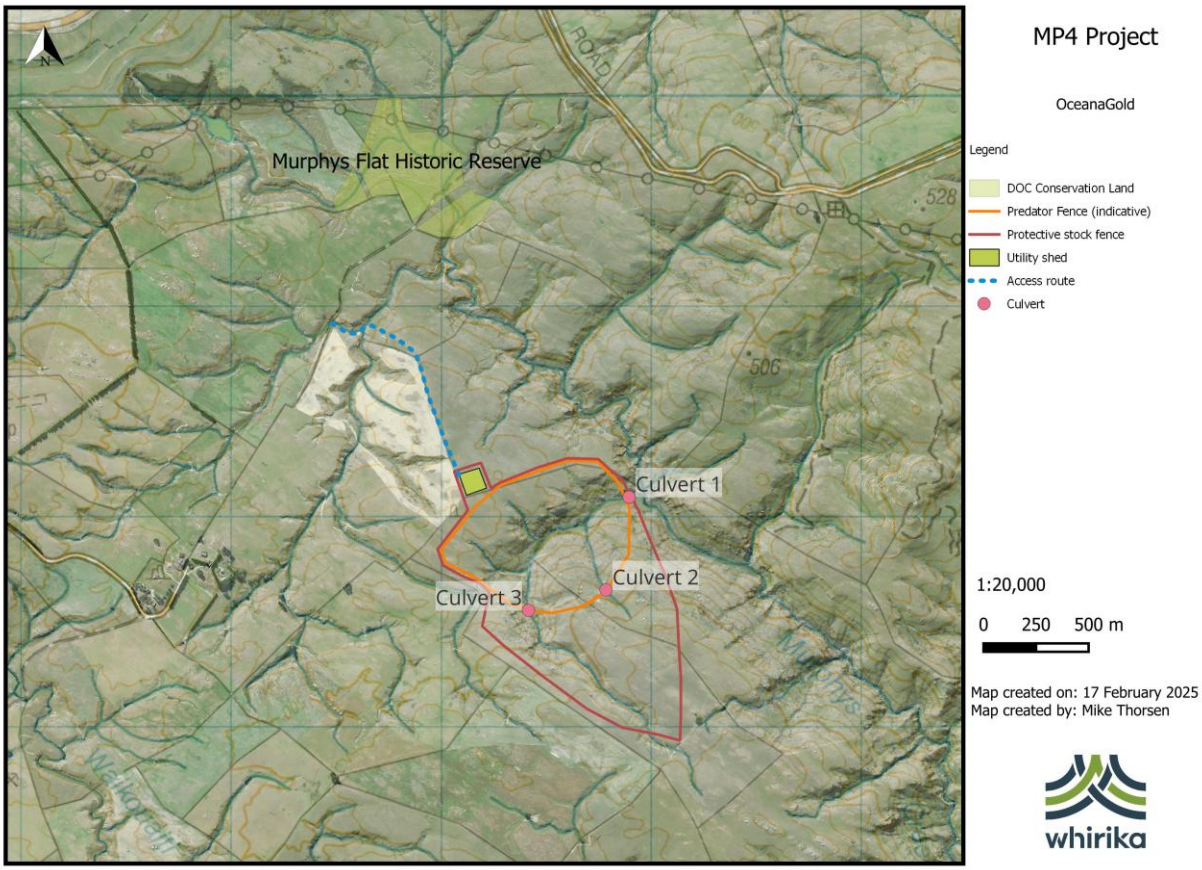

Figure 9. Indicative layout of Murphys EEA project elements.

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14 Appendices

1. List of shrubland species recorded from Macraes (105 species)

Acrothamnus colensoi (Hook.f.) Quinn

Androstoma empetrifolium Hook.f.

Aristotelia fruticosa Hook.f.

Aristotelia serrata (J.R.Forst. & G.Forst.) W.R.B.Oliv.

Calystegia tuguriorum (G.Forst.) R.Br. ex Hook.f.

Carmichaelia corrugata Colenso

Carmichaelia crassicaulis Hook.f. subsp. crassicaulis

Carmichaelia kirkii Hook.f.

Carmichaelia petriei Kirk

Carpodetus serratus J.R.Forst. & G.Forst.

Clematis marata J.B.Armstr.

Clematis quadribracteolata Colenso

Coprosma areolata Cheeseman

Coprosma brunnea (Kirk) Cockayne ex Cheeseman

Coprosma cheesemanii W.R.B.Oliv.

Coprosma ciliata Hook.f.

Coprosma colensoi Hook.f.

Coprosma crassifolia Colenso

Coprosma cuneata Hook.f.

Coprosma dumosa (Cheeseman) G.T.Jane

Coprosma elatirioides de Lange & A.S.Markey

Coprosma intertexta G.Simpson

Coprosma linariifolia Hook.f.

Coprosma perpusilla Colenso subsp. perpusilla

Coprosma petriei Cheeseman

Coprosma propinqua var. propinqua A.Cunn.

Coprosma pseudociliata G.T.Jane

Coprosma pseudocuneata W.R.B.Oliv. ex Garn.-Jones & Elder

Coprosma rigida Cheeseman

Coprosma rotundifolia A.Cunn.

Coprosma rubra Petrie

Coprosma rugosa Cheeseman

Coprosma virescens Petrie

Coprosma wallii Petrie in Cheeseman

Coprosma xcunninghamii

Cordyline australis (G.Forst.) Endl.

Coriaria angustissima Hook.f.

Coriaria plumosa W.R.B.Oliv.

Coriaria sarmentosa G.Forst.

Corokia buddleioides A.Cunn. var. buddleioides

Corokia cotoneaster Raoul

Discaria toumatou Raoul

Dracophyllum longifolium (J.R.Forst. & G.Forst.) R.Br. var. longifolium

Dracophyllum rosmarinifolium (G.Forst.) R.Br.

Dracophyllum uniflorum var. frondosum G.Simpson

Fuchsia excorticata (J.R.Forst. & G.Forst.) L.f.

Fuchsia perscandens Cockayne & Allan

Fuchsia xcolensoi

Gaultheria antipoda G.Forst.

Gaultheria crassa Allan

Gaultheria depressa Hook.f. var. depressa

Gaultheria depressa var. novae-zelandiae D.A.Franklin

Gaultheria macrostigma (Colenso) D.J.Middleton

Griselinia littoralis Raoul

Halocarpus bidwillii (Kirk) Quinn

Helichrysum intermedium G.Simpson

Helichrysum lanceolatum (Buchanan) Kirk

Helichrysum simpsonii Kottaim.

Kunzea ericoides (A.Rich.) Joy Thomps.

Kunzea robusta de Lange & Toelken

Kunzea serotina de Lange & Toelken

Leptecophylla aff. juniperina (a) (AK 322501; "east")

Leptecophylla juniperina (J.R.Forst. & G.Forst.) C.M.Weiller subsp. juniperina

Leptospermum scoparium J.R.Forst. & G.Forst. var. scoparium

Leucopogon fraseri A.Cunn.

Leucopogon fraseri complex (mountain ecotype)

Melicope simplex A.Cunn.

Melicytus aff. alpinus (c) (CHR 541568; Otago)

Melicytus aff. alpinus (d) (CHR 541567; "dark")

Melicytus alpinus (Kirk) Garn.-Jones

Muehlenbeckia australis (G.Forst.) Meisn.

Muehlenbeckia australis x Muehlenbeckia complexa

Muehlenbeckia axillaris (Hook.f.) Endl.

Muehlenbeckia complexa (A.Cunn.) Meisn. var. complexa

Myrsine australis (A.Rich.) Allan

Myrsine divaricata A.Cunn.

Myrsine nummularia (Hook.f.) Hook.f.

Olearia bullata H.D.Wilson & Garn.-Jones

Olearia fimbriata Heads

Olearia ilicifolia Hook.f.

Olearia lineata (Kirk) Cockayne

Olearia lineata (Kirk) Cockayne x Olearia bullata H.D.Wilson & Garn.-Jones

Olearia odorata Petrie

Ozothamnus leptophyllus (G.Forst.) Breitw. & J.M.Ward

Ozothamnus vauvilliersii Hombr. & Jacquinot ex Decne.

Parsonsia capsularis var. tenuis G.Simpson & J.S.Thomson

Parsonsia heterophylla A.Cunn.

Pentachondra pumila (J.R.Forst. & G.Forst.) R.Br.

Pimelea oreophila C.J.Burrows subsp. oreophila

Pimelea oreophila subsp. lepta C.J.Burrows

Pimelea pseudolyallii Allan

Podocarpus nivalis Hook.

Raukaua simplex (G.Forst.) A.D.Mitch., Frodin & Heads

Rubus cissoides A.Cunn.

Rubus schmidelioides A.Cunn. var. schmidelioides

Rubus schmidelioides var. subpauperatus (Cockayne) Allan

Rubus squarrosus Fritsch

Solanum laciniatum Aiton

Sophora prostrata Buchanan

Styphelia nesophila (DC.) Sleumer

Styphelia nesophila (DC.) Sleumer (mountain ecotype)

Teucrium parvifolium (Hook.f.) Kattari et Salmaki

Veronica odora Hook.f.

Veronica rakaiensis J.B.Armstr.

Veronica salicifolia G.Forst.

2. Ground nesting birds protocol (Draft)

Oceana Gold (NZ) Ltd

Macraes Gold Project

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Ground-nesting Bird Protocol (Draft)

November 2020

Report prepared for Oceana Gold (New Zealand) Ltd by Dr M. J. Thorsen,

22 November 2020

Report number: 01015-25-5

2 Dowling Street

Dunedin 9016

New Zealand

Document Summary

The Wildlife Act (1953) requires avoiding the disturbance of protected wildlife. On occasions mine activities could conflict with the requirements of the Act and an example of this is disturbing nesting birds (especially ground-nesting indigenous birds (banded dotterel, South Island pied oystercatcher, pied stilt). Under the Wildlife Act (1953) it is an offence to harm (including disturb) many of New Zealand's indigenous bird species. Two of the three species are classified as Threatened or At Risk in the New Zealand Threat Classification System. This document sets out the protocols and controls that OceanaGold will employ to ensure that its activities do not contravene the Wildlife Act or the company's environmental policy. This document sets out:

- The regulatory frameworks and interested parties that the protocol must be consistent with.
- Roles and responsibilities of parties involved in project works and implementing controls relating to ground-nesting birds;
- A risk assessment of typical construction activities in the context of the sensitivity of the receiving environment (species and habitats);
- Management measures (controls) to limit the impacts of the project on ground-nesting birds, and advice on how to implement them through the project specific Environmental Management Plan (EMP).
- Information on the species' breeding biology.

This protocol is restricted to ground-nesting indigenous bird species as other bird species are addressed elsewhere. Currently it applies to banded dotterel, South Island pied oystercatcher and pied stilt. Other ground-nesting species may be added if they show signs of breeding in the PIA.

15 Regulatory setting and key considerations

15.1 Regulatory setting

15.1.1 The Wildlife Act (1953) and Wildlife Order (2019)

Many species of birds present in New Zealand are protected under Schedule 1 (wildlife declared to be game), Schedule 2 (partially protected wildlife), Schedule 3 (wildlife that may be hunted or killed subject to Minister's notification), Schedule 4 (wildlife not protected, except in areas and during periods specified in Minister's

notification, Schedule 5 (wildlife not protected), Schedule 6 (wildlife declared to be wild animals subject to the Wild Animal Control Act 1977) and subsequent Wildlife Order (2019). Any species not on one of these schedules is considered 'absolutely protected'. It is an offense under S. 63 of the Wildlife Act to (a) "hunt or kill any absolutely protected or partially protected wildlife or any game:" or (c) "rob, disturb, or destroy, or have in his or her possession the nest of any absolutely protected or partially protected wildlife or of any game." Hunt or kill is defined as (emphasis added) "in relation to any wildlife, includes the hunting, killing, taking, trapping, or capturing of any wildlife by any means; and also includes pursuing, disturbing, or molesting any wildlife, taking or using a firearm, dog, or like method to hunt or kill wildlife, whether this results in killing or capturing or not; and also includes every attempt to hunt or kill wildlife and every act of assistance of any other person to hunt or kill wildlife." For further interpretation of this definition and the overall purpose of the Wildlife Act reference should be made to the 'shark cage diving decision' (*Shark Experience Ltd v PauaMAC5 Inc* [2019] NZSC 111) which considers the over-riding purpose of the Wildlife Act (1953) is to protect wildlife and that 'hunt or kill' also includes activities that incidentally disturb protected wildlife.

15.1.2 Conservation Act (1987).

The conservation of native birds is also included within the broader purpose of the Conservation Act (1987), but this Act relates more to site management plans and the role of the Department of Conservation to advocate for conservation of birds when not on public conservation lands.

15.1.3 Resource Management Act (1991)

This Act seeks to set management of New Zealand's natural resources (including birds) on a sustainable foundation. However, it's relevance in this case is limited once consent for a project has been granted.

15.2 Oceana Gold Environmental Policy

OceanaGold's environmental management programme is based on the complete mine life cycle, from exploration through development and operation, to eventual decommissioning, closure and site rehabilitation. The company seeks to not only meet, but consistently exceed regulatory requirements in place, to protect the environment for future generations and safeguard the sustainability of nearby communities.

OceanaGold is committed to continued improvement in the identification, assessment, mitigation, and monitoring of the environmental effects of its operations. The company works hard to plan and implement

environmental projects that protect and support the natural environments associated with its operations, and that demonstrate its focus on international best practice environmental stewardship. Clearly, the company's activities can impact the environment and in some cases, create lasting effects. Wherever possible, OceanaGold seeks to ensure a net environmental gain from its activities, and is diligent in its adherence to all applicable laws and standards in New Zealand and offshore.

The Company aims to be an industry leader in the identification, assessment, mitigation and monitoring of its environmental impacts. Specifically, OceanaGold commits to:

• Identify and mitigate all environmental and human health impacts associated with its activities. In undertaking mitigation measures, the company will aim for a net environmental gain.
• Comply with all applicable laws and standards, and apply company-wide standards, based on international best practice, that minimise adverse environmental impacts arising from its operations.
• Rehabilitate all mine sites to a stable landscape and land use which does not pose any unacceptable risk to the environment.
• Develop an end-of-mine-life land use, in consultation with stakeholders, which will leave a positive legacy.

The aim of this policy is to provide direction to OceanaGold's employees, and contractors undertaking activities on the Company's behalf. The policy aims to place OceanaGold at the forefront of environmental impact identification and mitigation within the mining industry.

The purpose of ecological work at OceanaGold's Macraes mine site is to:

1. Ensure monitoring, management and reporting of flora, fauna and habitat meets relevant legislation, permits or licenses and community consultation outcomes.
2. Pursue a practice of minimum disturbance for the flora, fauna and habitat in the areas the site operates.
3. Ensure that the status of flora and fauna species of conservation interest is not elevated as a direct or indirect result of mining activities.

These works will be undertaken to <u>at least</u> the Minimum Standard where:

- Sites will develop an Environmental Impact Assessment or Management Plan which will address management of land, flora, fauna and habitat, taking into account relevant legislation, permits or licenses, and community consultation.
- The Environmental Impact Assessment is to be updated where there are changes to any part of the operation (either man-made or natural) that significantly impact on it.

- The minimum area of vegetation required for exploration, construction and operation will be cleared.
- Where practicable, topsoil to a depth of 20 cm will be stockpiled prior, for use in rehabilitation.
- Sites will develop a programme to monitor and evaluate the health of flora and fauna affected by the location, and take steps to mitigate any adverse effects revealed.
- The monitoring programme will include weed and pest species, and appropriate management practices will be used to mitigate adverse effects.
- All employees are prohibited from capturing, purchasing or acquiring native wildlife for any purpose.

15.3 Interested parties

15.3.1 Department of Conservation

The Department of Conservation has overall responsibility for managing the Wildlife Act (1953) and to advocate for the conservation of New Zealand's biodiversity where it occurs outside of public conservation lands. They are also a leader with extensive experience in bird management.

They are likely to have an interest in ground-nesting birds both from a compliance with the Wildlife Act and in advocating for good conservation outcomes.

15.3.2 Waitaki District Council

The Waitaki District Council has an interest in this issue as the consenting authority. While consent has been granted for this project, unexpected events such as the discovery of ground-nesting birds will be of interest under their regulatory and advocacy purpose under the operative District Plan and the Indigenous Biodiversity Strategy. They have a staff member who's duties include advice to landowners.

15.3.3 Otago Regional Council

The Otago Regional Council has an interest in this issue as the consenting authority. While consent has been granted for this project, unexpected events such as the discovery of ground-nesting birds will be of interest

under their regulatory and advocacy purpose under the operative Regional Policy Statement and the Biodiversity Strategy.

16 Roles and Responsibility

The following are the roles and responsibilities in relation to managing ground-nesting birds at Deepdell North.

Role	**OGL Environment & Community Manager**	**Environment Advisor - Operations**	**OGL Mine Engineer / Mine Supervisor**	**Project Ornithologist**
Responsibilities	Overall responsibility for implementation of protocol. Reviewing and reporting on activities. Facilitates and oversees required monitoring. Reviews and updates this protocol as necessary.	Advising operations team on controls and changes to controls. Monitoring of status of ground-nesting birds (with support from Project Ornithologist). Visual inspections of compliance.	Ensure that site activities do not contravene the protocol. Ensure that sub-contractors are aware of, and comply with, protocol.	Advice on site controls and monitoring required to Environment & Community Manager. Respond to, and provide advice on, any bird management issues/effects. Locate nesting sites.

17 Risk assessment

The management of ground-nesting birds will be based on using control measures tied to the risk profile of both activities and bird nesting stage. This risk assessment is based on observations that these ground-nesting bird species rapidly become acclimated to vehicle movements and construction noise. In this assessment it is assumed that project activities cannot be de-risked (for example by changing operating approach), but that location and timing of activities can be modified, if risk of not changing is unacceptable.

17.1 Risk factors

17.1.1 Bird nesting stage

The risk of a project to birds in the area is very much dependent on the stage of nesting that the birds are at.

Risk: High – Eggs or young chicks (< 1 week old) present

Risk: Moderate – older chicks (to fledging age), birds of uncertain breeding status.

Risk: Low – juvenile birds, non-nesting birds, birds at pre-nesting stage (including construction of nest scrape).

17.1.2 Project activities

The risk from project activities is centred on the scale and effect of the activity.

Risk: High – earth moving, blasting (and sound from blasting), construction.

Risk: Moderate – vehicle movements off track, excavation noise, drilling.

Risk : Low – vehicle movements on track, people movements, vehicle noise.

17.1.3 Location of activity

The magnitude of a project activities is mitigated by distance, and birds rapidly become acclimated to activities at very close locations. This acclimation is stronger for activities that are constant, or are frequent but that traverse the area quickly.

Risk: High – activities on or directly affecting known nesting areas.

Risk: Moderate – activities within 100 m of birds, or birds of uncertain locality.

Risk: Low – activities > 100 m of birds.

17.2 Risk likelihood

Likelihood of a risk depends on the interaction of frequency or certainty of an activity, the bird nesting stage, and the location of activity.

The risk likelihood is calculated for both an unmanaged and the residual risk of a managed (using controls) situation.

17.3 Risk matrix

The overall and residual risk is calculated from the table below. The overall risk is the intersection between the activity risk and the bird risk at two scales.

	<100 m from birds, or bird location unknown			>100 m from birds		
Activity risk (right) and bird risk (below)	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
High	Very High	High	Medium	High	Medium	Low
Medium	High	Medium	Low	Medium	Low	Low
Low	Medium	Low	Very Low	Low	Low	Very Low

17.4 Uncertainty

Where there is uncertainty around the risk profile, the effects on the birds will be monitored and the information used to refine the risk assessment.

If a new activity is required to take place in the breeding grounds then appropriate controls will be discussed between the Environment Manager and Project Ornithologist.

18 Control measures

Control measures follow a Avoid, Isolate, Minimise, Mitigate and Deter hierarchy based on the overall risk in the Risk Matrix. The residual risk is calculated from the remaining risk once controls are in place.

18.1 Avoid

For Very High overall risk – project activities should cease for the duration when High Risk bird activity is occurring.

18.2 Isolate

For High overall risk – project activities should not occur within 100 m of known locations of chicks for the duration until chicks are capable of flight from the site, unless an appropriate minimise control measure can be implemented. The 100 m perimeter will need to shift as chick(s) move location. It may be necessary to temporarily fence (using shade-netting or similar) nearby areas that are scheduled for high risk activities. As a precautionary principle, the area where nesting behaviour is suspected of occurring should be isolated until nesting stage and location is identified.

18.3 Minimise

For High or Moderate overall risk – vehicle movements to be kept to identified paths. Duration of visits to mapped bird areas to be less than 30 minutes in duration to minimise the risk of nest abandonment.

Sight-screening of some activities (such as drilling) could be attempted, as long as the behaviour of the nesting birds is monitored at 1) the start of gear placement and 2) at the commencement of activity. The activity can continue if the behaviour of nesting birds is not altered materially.

18.4 Mitigate

For Low overall risk – alternative nesting areas outside of the PIA can be created, but the effectiveness of this is unknown. Predator control can help boost productivity, but is not being considered at this stage.

18.5 Deter

For Low or Very Low overall risk – birds can be deterred from nesting at a site by employing bird deterrent activities such as bird kites, occupation of sites, and covering/altering potential nesting areas. These are likely to only be effective for short periods of time and should be employed wisely. Both the Environment Manager and Project Ornithologist should be involved in deciding when and how to employ this control.

18.6 Residual risk

If the residual risk once controls are employed is considered to be High or Very High, then approval to proceed is required from the General Manager.

18.7 Contingency Measures

Outlined here are contingency measures for additional situations which may arise during the construction phase:

• If **breeding birds** are found at any stage of the year by a member of the project team, the Environmental Advisor - Operations should be informed immediately. Under no circumstances should breeding birds or nest contents (eggs or chicks) be moved or handled. The Environmental Advisor - Operations will contact the Project Ecologist/Ornithologist to devise a plan for managing the birds and informing the relevant agencies.

• If a **lethargic looking bird with no visible signs of injury** is found *within an area of construction works* at any stage of the year by a member of the project team, the Environmental Advisor - Operations should be informed immediately. The Environmental Advisor - Operations will contact the Project

Ecologist/Ornithologist to inform the relevant agencies. In the interim, the bird should be carefully placed in a dry cardboard box (with air-holes) and placed[3] in a quiet location away from works until a plan is devised by the Environmental Advisor - Operations in conjunction with the Project Ecologist/ Ornithologist.

• If a **lethargic looking bird with no visible signs of injury** is found *outside of the construction work areas* by a member of the project team, the bird should be left alone and not handled. Photos should be taken and sent to the Environmental Advisor - Operations. The Environmental Advisor - Operations will in turn inform the Project Ecologist/Ornithologist and provide any photos taken.

• If a bird showing **visible signs of injury** is found by a member of the project team either within or immediately adjacent to a works area, an Environment team member should be informed immediately. The Environmental Advisor - Operations will contact the Project Ecologist/Ornithologist to inform the relevant agencies. In the interim, the bird should be carefully placed in a dry cardboard box (with air-holes) and placed in a quiet location away from works until a plan is devised by the Environmental Advisor - Operations in conjunction with the Project Ecologist/Ornithologist.

• If a recently **dead bird** is found by a member of the project team within a works area, photos should be taken and sent to the Environmental Advisor - Operations. The Environmental Advisor - Operations will collect the bird and store in a freezer and will contact the Project Ornithologist and inform the relevant agencies. An autopsy will be performed if necessary.

18.8 Decision flow chart

A ground nesting bird present of uncertain breeding status AND showing indications of breeding activity (alarm calling or broken wing display.

↓

Contact Project Ornithologist to determine breeding status of birds and find nest (if present).

→ **No breeding**: Environment Advisor - Operations to continue to monitor area during breeding season (to end February).

↓

Breeding (eggs): Mark vicinity of nest and mark out 100 m perimeter.

Environment Advisor – Operations to inform OGL Mine Engineer & Mine Supervisor.

Environment Advisor – Operations to monitor nest daily until chicks hatch or nest fails and keep updating Project Ornithologist.

Environment Advisor – Operations to coordinate appropriate controls for mine activities (with input from project Ornithologist if required).

↓

Breeding (chicks):

Environment Advisor – Operations to daily locate chicks or epicentre of parent distraction displays and mark out 100 m perimeter until chicks capable of flight.

Environment Advisor – Operations to inform OGL Mine Engineer & Mine Supervisor of changes to perimeter.

Environment Advisor – Operations to coordinate appropriate controls for mine activities (with input from project Ornithologist if required).

Non-breeding (chicks fledged or nest abandoned):

Environment Manager, Environment Advisor – Operations and Project Ornithologist to decide on implementation of deter controls.

Environment Advisor – Operations to monitor site at least every 3rd day for signs of birds occupying site (if a deter control implemented) or for indications of breeding.

Appendix 1. Species habitat preferences and timing of breeding events.

Banded dotterel *Charadrius b. bicinctus*

Conservation Status: Threatened – Nationally Vulnerable

Nesting habitat: Usually widely-spaced nests on lightly vegetated open rocky ground such as riverbeds, beaches, mountain ranges,

outwash fans, and lightly grassed farmland.

Breeding season: August to January (possibly renesting into February).

Breeding success: low – many nests and young chicks taken by cats, hedgehogs and possums.

Nest type: scrape lined with grass.

Clutch size: to 5 eggs.

Incubation period: 25-28 days (from last egg). Chicks leave nest immediately after hatching. Young chicks 'freeze' when disturbed.

Age to fledging (able to fly): 35-42 days.

Age to independence: 42-56 days (from hatching).

Renest interval (after failure): unknown, prob. 5-15 days. New nests can be close to previous nest or far-distant.

Foods: Insects and berries. Chicks forage for themselves from near-hatching (first few days they subsist on yolk sac).

Further information: http://nzbirdsonline.org.nz/species/banded-dotterel

South Island pied oystercatcher *Haematopus finschi*

Conservation Status: At Risk - Declining

Nesting habitat: Solitary nesting on open areas on rough farmland, river beds and rear beach areas. Nest are often on a slightly raised area.

Breeding season: August to January (possibly renesting into February).

Breeding success: variable – nests and chicks at risk from cats, possums and hedgehogs.

Nest type: usually unlined scrape.

Clutch size: to 3 eggs.

Incubation period: 24-28 days (from last egg). Chicks leave nest immediately after hatching. Young chicks 'freeze' when disturbed.

Age to fledging (able to fly): 28-42 days.

Age to independence: 42-60 days (from hatching).

Renest interval (after failure): unknown, prob. 5-15 days. New nests can be close to previous nest or far-distant. Can try multiple renests.

Foods: Insects and berries. Chicks forage for themselves from near-hatching (first few days they subsist on yolk sac).

Further information: http://nzbirdsonline.org.nz/species/south-island-pied-oystercatcher

Pied stilt *Himatopus h. leucocephalus*

Conservation Status: Not Threatened

Nesting habitat: Colonial nesters on flat open areas near water.

Breeding season: August to January (possibly renesting into February).

Breeding success: unknown.

Nest type: untidy low pile of vegetation.

Clutch size: to 6 eggs.

Incubation period: c. 25 days (from last egg). Chicks leave nest immediately after hatching. Young chicks 'freeze' when disturbed.

Age to fledging (able to fly): 28-32 days.

Age to independence: Unknown.

Renest interval (after failure): unknown, prob. 5-15 days.

Foods: Insects and berries. Chicks forage for themselves from near-hatching (first few days they subsist on yolk sac).

Further information: http://nzbirdsonline.org.nz/species/pied-stilt

Appendix 2. Identified nesting areas

Known or potential areas where nesting could occur include the flat tops of the existing WRS, the flat cultivated pasture areas on both sides of Horse Flat Road, open raised areas with good visibility, and flat damp areas adjacent to the farm pond (pied stilt only). These areas cover most of the PIA excepting the existing Deepdell North pit and adjacent shrublands on slope, and so are not mapped.

3. Lizard Management Plan

Document provided as a separate attachment.