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Macraes Phase 4 Fast-track

WETLAND RESIDUAL EFFECTS ANALYSIS REPORT

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LIST OF ABBREVIATIONS AND GLOSSARY

Abbreviation	Full term
AEE	Assessment of Environmental Effects
BOAM	Biodiversity Offset Accounting Model
BRWRS	Back Road Waste Rock Stack
ED	Ecological District
EcIA	Ecological Impact Assessment
EIANZ	Environment Institute of Australia and New Zealand
FTAA	Fast-track Approvals Act 2024
FTSF	Frasers Tailings Storage Facility
GPUG	Golden Point Underground
MEEA	Murphys Ecological Enhancement Area
MHP	Mt Highlay Plantation
MP4	Macraes Phase 4
MWMS	Mine Water Management System
NPBV	Net Present Biodiversity Value
NPS-FM	National Policy Statement for Freshwater Management
OGNZL	Oceana Gold
OGNZLNZ	Oceana Gold (New Zealand) Limited
pORPS	Proposed Otago Regional Policy Statement
REAR-WL	Residual Effects Analysis Report: Wetland
REMP	Residual Effects Management Plan
RMA	Resource Management Act 1991
TAR	Threatened and At Risk
TSF	Tailings Storage Facility
WL14	Herbfield [ephemeral]
WL15	Herbfield [lakeshore turf]
WL16	Red tussock, *Schoneus pauciflorus* tussockland
WL22	Carex, *Schoenus pauciflorus* sedgeland
WRS	Waste Rock Stack

Glossary	Full term
20 m precautionary allowance / buffer	A 20 m area surrounding parts of the direct impact footprint for which total loss of terrestrial ecological values is conservatively assumed for effects accounting. This allowance accounts for potential indirect effects and provides a precautionary basis for determining residual effects management requirements.
Additional conservation benefits	Ecological benefits provided by the residual effects management package that are not relied upon as equivalent replacement for, or to counterbalance, the quantified MP4 residual effects.
Additionality	For biodiversity compensation, gains in indigenous biodiversity that are additional to those that would have occurred without the compensation, including gains additional to minimisation, remediation or offsetting undertaken for the activity.

Benchmark	A reference condition or value against which baseline and predicted post-compensation biodiversity values are assessed in a BOAM.
Biodiversity compensation	Residual effects management that provides additional ecological benefits intended to counterbalance residual adverse effects where strict ecological equivalence, complete quantification, certainty of delivery, or all formal biodiversity offset requirements cannot be demonstrated.
Biodiversity offset	A measurable conservation outcome that meets the requirements of NPS-IB Appendix 3, addresses more than minor residual adverse effects after avoidance, minimisation and remediation have been sequentially applied, and is intended to achieve a net gain in the type, amount and condition of indigenous biodiversity.
Biodiversity Offset Accounting Model	A quantitative decision-support tool used to compare residual biodiversity losses at impact sites with predicted gains from proposed management. The models account for the scale and condition of biodiversity values, timing of gains, implementation risk and uncertainty, and assess biodiversity components and attributes separately.
Ecological equivalence (like-for-like)	The degree of similarity between biodiversity values affected and those provided through residual effects management, considering biodiversity type, amount, condition, equivalence over time and spatial context. The NPS-IB uses the term “like-for-like” for this concept.
Ecological value	The ecological importance or value of a species, community, habitat, site or area. For terrestrial sites, ecological value reflects the species, communities and habitats present and incorporates both quantity, such as rarity or extent, and quality, such as functionality or condition.
Effects management hierarchy	The sequential approach to managing adverse effects on indigenous biodiversity: avoid where practicable; minimise effects that cannot be avoided; remedy effects that cannot be minimised; provide biodiversity offsetting for more than minor residual effects where possible; provide biodiversity compensation where offsetting is not possible; and avoid the activity if compensation is not appropriate.
Finite endpoint	The defined future point at which the biodiversity outcome of a BOAM is assessed, and losses and predicted gains are compared.
Level of effect	The overall seriousness of an ecological effect, determined by combining the magnitude of the effect with the ecological value of the affected biodiversity or ecological feature.
Magnitude of effect	A measure of the extent or scale of an ecological impact and the degree of change it will cause.
Mitigation	Any measure employed to reduce the severity of effect (i.e. avoidance minimisation or remediation
Net Positive	Positive effects that outweighs adverse effects
Net Loss	An outcome where the available evidence indicates that the proposed compensation actions will not fully counterbalance the corresponding residual adverse effects. The remaining net loss is assigned a level of Very Low, Low, Moderate, High or Very High.

Net Positive (modelled)	An outcome where quantitative biodiversity modelling predicts that gains will exceed the corresponding residual losses after accounting for relevant factors such as time lags, implementation risk, confidence and discounting.
Net Positive (unmodelled)	An outcome where the type, scale, location and expected effectiveness of the proposed conservation actions indicate that biodiversity gains are likely to outweigh the corresponding residual losses, based on professional ecological judgement and available evidence rather than a quantitative biodiversity model.
Residual adverse effects	Adverse ecological effects remaining after measures to avoid, minimise and remedy effects have been applied.
Residual effects management package	The integrated package of conservation actions proposed to address residual terrestrial effects, including habitat protection, revegetation and enrichment planting, stock exclusion, pest plant management, mammalian pest and predator control, plantation removal, legal protection, monitoring and adaptive management.
Uncertain	An outcome where the proposed actions are expected to counterbalance losses, but the available information is insufficient to determine whether the resulting benefits will exceed, equal or fall short of the corresponding residual adverse effects.

EXECUTIVE SUMMARY

Proposal Overview and Purpose

The MP4 Project represents an expansion of the existing Macraes mining operation and is intended to extend the operational life of the mine through to 2039. The Project includes a range of mining, processing, infrastructure and ecological enhancement components, including open pit extensions at Innes Mills, Coronation, Coronation North and Golden Bar, further development of the Golden Point Underground mine, extensions to tailings storage facilities, waste rock disposal areas, infrastructure upgrades, water management infrastructure, ecological enhancement areas and associated rehabilitation works.

In addition to the MP4 Project, OceanaGold New Zealand Limited (OGNZL) proposes to construct and operate the Camp Creek and Coal Creek water storage reservoirs (the Reservoirs). These reservoirs were previously consented for water quality management purposes; however, OceanaGold does not hold consent under the National Environmental Standards for Freshwater (2020) (NES-F) for activities on natural inland wetlands for disturbance associated with constructing and operating the Reservoirs. Analysis of residual adverse effects to wetlands within Camp Creek and Coal Creek are presented within this plan as a separate effects package due to the existing consents, different nature and mechanisms of effects and associated with water storage infrastructure. Effects to wetlands at the reservoirs are associated with permanent inundation and changes to existing wetland hydrological conditions.

The Project is being progressed under the Fast-track Approvals Act 2024 (FTAA) as a listed project. The FTAA provides a streamlined approvals pathway that prioritises facilitating the delivery of projects with significant national or regional benefits while maintaining consideration of environmental effects, including effects on indigenous biodiversity and freshwater ecosystems. The assessment of wetland effects has therefore been undertaken in accordance with relevant legislative and policy requirements, including the Resource Management Act 1991, the National Policy Statement for Freshwater Management (NPS-FM) and the NES-F.

The Ecological Impact Assessment identified that, despite extensive avoidance, minimisation and remediation measures, residual adverse effects on natural inland wetlands remain. This Residual Effects Analysis Report Wetlands (REAR-WL) has been prepared to assess the residual effects management measures required to achieve a net positive biodiversity outcome for natural inland wetlands and their associated ecological values, as a result of this project. The purpose of this REAR-WL is to counter-balance residual adverse effects on wetland ecosystems through positive outcomes to wetland biodiversity within the landscapes that remain after avoidance, minimisation and mitigation measures have been implemented. Where residual effects remain, this report identifies appropriate conservation actions required to counterbalance ecological losses and provides an assessment of whether those actions are sufficient to achieve positive biodiversity outcomes.

An inherent biodiversity component of wetland ecosystems, and their values within the Project Area, arises from the abundance and diversity of Threatened and At Risk (TAR) wetland flora species. The residual effects management of wetland TAR flora has been combined with the terrestrial TAR flora and presented in the Residual Effects Analysis: Terrestrial Ecology package.

Project Summary Area

The Macraes Ecological District is a highly modified landscape where historical and ongoing land use pressures have substantially altered the extent, condition and function of indigenous wetland ecosystems. Historically, the district supported extensive wetland systems including ephemeral wetlands, copper tussock wetlands, sedgelands and freshwater herbaceous wetlands. However, these ecosystems have been progressively modified through historical burning, pastoral conversion, grazing, drainage, vegetation clearance and associated land management practices.

Within OGNZL Landholdings, there is a total of 55.36 ha of wetland extent (excluding those reclaimed by the project) has identified at a coarse mapping scale. The true area of wetland extent within OGL Landholdings is likely much higher than currently mapped. Of the identified 55.36 ha of coarse wetland identified extent, this is:

- 9.70 ha of ephemeral wetland;
- 13.24 ha of sedgeland;
- 30.58 ha of freshwater herbaceous;
- 0.082 ha of seepage wetland;
- 0.13 of shrubland wetland; and
- 0.95 ha of copper tussock wetland.

The remaining wetlands within OGNZL landholdings represent important remnants of these historically widespread ecosystems. Ground-truthing and mapping undertaken for the Project identified approximately 55.36 ha of existing wetland extent within OGNZL Landholdings, comprising ephemeral wetlands, sedgelands, freshwater herbaceous wetlands, seepage wetlands, shrubland wetlands and copper tussock wetlands. Many of these wetlands have been modified with a corresponding reduction in ecological value and functioning via exotic vegetation invasion, livestock grazing and pugging, and altered hydrological processes, creating opportunities for restoration and enhancement.

Summary of Values and Impacts

Within the overall Project footprint and surrounding 100 m buffer, a cumulative 15.45 ha of wetland extent is present, with 8.27 ha of wetlands located within and adjacent to MP4, 3.58 ha adjacent to waste rock stacks, and 3.60 ha of wetland located within, and adjacent to the Camp Creek and Coal Creek (the Reservoirs). The ecological values of affected wetlands vary considerably. Some wetlands are characterised by low indigenous vegetation cover and degraded ecological condition, while others contain higher indigenous richness, higher abundances of TAR plant communities and important habitat values. The highest ecological values are associated with ephemeral wetlands and some freshwater herbaceous wetlands. Ephemeral wetlands within the Project Area represent a highly specialised ecosystem type that is considered Naturally Uncommon and Critically Endangered nationally. These systems support distinctive wetland flora assemblages adapted to intermittent inundation and drying cycles. Although most directly impacted wetlands have been modified and contain substantial exotic vegetation cover, the wetlands still provide important ecological functions and some support indigenous vegetation communities and Threatened and At Risk (TAR) flora species.

The Project and the Reservoirs will result in the cumulative permanent loss of approximately 11.50 ha of natural inland wetland extent, through direct loss and indirect dewatering and diversion of seepage. This 11.50 ha of wetland extent includes those wetlands located within the 20 m buffer (cumulatively

0.50 ha), which have been incorporated into the total wetland loss as a surrogate to capture indirect effects to wetlands. Wetland loss constitutes 4.72 ha through MP4, 3.58 ha through the implementation of Waste Rock Stack seepage capture drains, and 3.20 ha through the Camp Creek and Coal Creek Reservoirs. The affected wetlands comprise a range of wetland ecosystem types:

- Ephemeral wetlands: 1.14 ha;
- Sedgeland wetlands: 1.43 ha (MP4), and 0.31 ha (the Reservoirs);
- Freshwater herbaceous wetlands: 2.10 ha (MP4), and 2.68 ha (the Reservoirs);
- Shrubland wetlands: 0.03 ha;
- Seepage wetlands: 0.02 ha;
- 3.58 ha of induced wetland (waste rock stacks); and
- Copper tussock wetland: 0.21 ha (the Reservoirs)

MP4 Project and the Reservoirs have the potential to affect wetlands within the Project footprint and buffer through direct and indirect pathways, including:

- Direct reclamation and permanent removal of wetland extent;
- Drainage and dewatering;
- Reduction in habitat for wetland flora and fauna;
- Altered groundwater and surface water regimes;
- Sediment deposition and changes in water quality;
- Dust deposition;
- Injury or harm to wetland fauna;
- Loss of wetland flora species;
- Accidental encroachment into retained wetland areas;
- Edge effects and changes in surrounding vegetation communities; and
- Increased vulnerability to weed invasion and dryland plant establishment.

Wetland Residual Effects

Avoidance, minimisation and mitigation measures have reduced potential indirect ecological effects to wetlands located within the 100 m buffer. These measures include the refinement of Project footprints, protection and demarcation of retained wetlands, construction controls, erosion and sediment controls, hydrological management, ecological supervision, threatened plant management, and vegetation salvage and propagation. Despite these measures, adverse residual effects remain where effects cannot be effectively managed, such as direct removal (Table 0-1). Residual effects after avoidance, minimisation and mitigation range from Moderate to Very High depending on wetland type and ecological value. The greatest residual effects are associated with:

- Very High value ephemeral wetlands where permanent loss of specialised habitat and associated flora values occurs;
- High value freshwater herbaceous wetlands where indigenous wetland values remain despite modification; and
- Moderate value sedgelands where wetland extent and ecological function are reduced.

Table 0-1. Summary of the extent and type of wetlands impacted by the Project and Reservoirs, and the resultant magnitude and level of effect

Wetland ecological type	Areal extent (ha)	Overall ecological value	Magnitude of effect	Overall residual level of effect
Ephemeral wetland	1.14	High to Very High	High	Very High.
Freshwater herbaceous vegetation	4.78 ha	High	Moderate	Low to High.
Sedgeland	1.74 ha	Moderate	Moderate	Moderate.
Shrubland	0.03	Low to Moderate	Moderate	Moderate.
Wetland seepage	0.02	High	Moderate	High.
Copper tussock	0.21	Moderate	High	Moderate.
Induced wetland	3.58	Negligible to Low	Moderate	Very Low to Low

Where residual adverse effects remain following implementation of avoidance, minimisation and remedy measures, OGNZL proposes a wetland residual effects management package focused on restoration, enhancement and long-term protection of existing degraded wetland ecosystems within their landholdings.

Residual Effects Management

All proposed residual effects management activities will be undertaken within OGNZL landholdings within the Macraes Ecological District. This ensures restoration actions occur within the same landscape and local as to where wetland values are being lost. The proposed compensation sites provide opportunities to connect existing habitat areas, enhance ecological corridors, buffer retained wetlands and improve the long-term resilience of wetland ecosystems within the local landscape.

The proposed approach has been developed to achieve net positive in wetland values through improving the condition, extent, function and resilience of existing wetland systems rather than through the creation of new wetlands. Wetland creation was considered as a potential residual effects management approach; however, the establishment of new wetlands would require substantial modification of existing waterways and hydrological systems, including damming, diversion of natural flows, or alteration of floodplain processes. These actions were considered likely to result in adverse effects on existing freshwater ecosystems and therefore were not considered an appropriate compensation approach for this Project.

Instead, residual effects management will be achieved through restoration and enhancement of degraded wetlands that currently have reduced ecological condition due to historical and current land use pressures. This approach provides an opportunity to restore indigenous wetland communities, improve wetland function and increase the long-term protection of wetland values within the Macraes Ecological District. Management actions will be tailored to individual wetland conditions, including existing vegetation communities, weed pressures, soil condition, grazing impacts and surrounding land use.

Residual Effects Analysis

The Biodiversity Offset Accounting Model (BOAM) has been applied to help verify whether the proposed restoration activities are sufficient to compensate for the predicted biodiversity losses associated with the Project. The BOAM provides a structured and transparent method for assessing whether proposed actions are likely sufficient to achieve no net loss, and preferably a net gain, in biodiversity values. It does so by quantifying losses and gains across defined biodiversity components and attributes, and by incorporating key factors such as time lags, uncertainty, and risk of failure through discounting and confidence assumptions. The current BOAMs are subject to limitations in the available baseline and predictive datasets, including differences in the type, timing and intensity of surveys undertaken; incomplete information on the present condition and distribution of some biodiversity values; uncertainty associated with extrapolating survey results across multiple habitats; and uncertainty regarding the rate, scale and ecological response to proposed restoration actions. Some model inputs therefore rely on conservative assumptions, professional judgement or predicted future ecological trajectories rather than directly comparable empirical measurements.

These limitations mean that the current BOAM results do not provide sufficient certainty to demonstrate that all relevant biodiversity offset principles and standards will be met. In particular, the present information may not consistently demonstrate measurable equivalence to the level of confidence required for the package to be characterised as a biodiversity offset. The residual effects management package is therefore described at this stage as biodiversity compensation, notwithstanding that the proposed actions have been designed to address affected values as directly as practicable and that several of the modelled outcomes indicate net positive outcomes for the data provided.

To provide confidence that the proposed type and quantum of wetland restoration and enhancement measures will achieve net positive outcomes, quantitative data were collected in wetlands within the proposed compensation locations. This included 98 wetland vegetation plots throughout 25 wetlands. Information collected included indigenous % cover; indigenous species richness; Threatened and At-Risk flora presence; and proportion of hydric vegetation. These metrics were then applied to the BOAM where the quantum of these values impacted by project activities was weighted against the predicted values of conservation gains at a finite time (seven to fifteen years, dependent upon the wetland type). The value of these gains is adjusted for time-lag and uncertainty to determine an overall score. A ‘net positive’ is achieved when the adjusted biodiversity gains from the compensation measures exceed the residual losses, consistent with national guidance such as the NPS-FM.

Residual Effects Implementation

The proposed Project wetland compensation package includes restoration, enhancement and protection actions across 13.49 ha of wetlands, and the protection and stock exclusion of 14.37 ha of wetland and riparian habitats at multiple locations within OGNZL landholdings. In total, 28 ha of wetland extent forms the quantum of compensation for 11.50 ha of wetland loss, which equates to a 1:2.5 loss-to-restoration/protection ratio, noting 3.58 ha of wetland loss constitutes highly degraded, induced wetland. This then ensures that restoration actions exchange a smaller extent of absolute

wetland loss, for large scale partial gains in wetland values occurring at a scale far greater than the wetland extent directly affected by the Project.

The principal restoration and enhancement actions will include:

- Indigenous revegetation and habitat enhancement across a total 13.49 ha
  - Native revegetation undertaken throughout compensation wetlands which are predominantly exotic dominated, where natural regeneration is unlikely to achieve restoration objectives within acceptable timeframes. Enrichment of native dominant wetlands will also occur. Planting will utilise locally appropriate indigenous wetland species and will prioritise species that reflect the intended restored ecosystem type. Revegetation will improve wetland structure, increase indigenous vegetation cover, enhance habitat availability and improve ecological resilience. Species selection will be matched to wetland hydrology and moisture gradients to ensure planted communities are appropriate for the receiving environment.
- Threatened and At Risk wetland flora management
  - Salvaged, propagated or sourced TAR plants, and their seeds will be incorporated into restoration sites where ecological conditions are suitable, providing an opportunity to retain local genetic material and enhance restoration outcomes. Analysis of residual effects on wetland TAR flora is detailed in the Residual Effects Analysis: Terrestrial report (Bioresearches, 2026l)
- Livestock exclusion and fencing of cumulative 28 ha of wetland
  - Stock exclusion fencing throughout all restoration and protection areas to remove pressures associated with livestock, such as grazing, trampling, pugging and soil compaction and nutrient enrichment. Removing stock pressure will allow recovery of soil structure, vegetation communities and wetland processes. As a by-product of stock exclusion, naturalisation of wetland hydrological regime is expected to occur. Ephemeral wetlands (2.78 ha) may benefit from managed sheep grazing, in which this will be undertaken within a controlled manner if deemed necessary.
- Weed control across 13.49 ha of wetland.
  - Targeted weed control will form a core component of restoration activities. Many wetlands within the compensation areas are currently dominated by exotic vegetation and invasive plant species, limiting indigenous regeneration and reducing ecological function. Weed management will focus on reducing competition from exotic vegetation and creating conditions suitable for indigenous wetland species establishment throughout 13.49 ha.

Proposed Compensation Activities

The compensation package includes restoration actions across six wetland types:

- **Ephemeral wetlands:** Restoration of 2.78 ha of ephemeral wetlands will focus on restoring indigenous turf communities, reducing exotic dominance and improving habitat condition. Management actions may include topsoil scraping, “hay transfer” of indigenous seed material, targeted weed control, planting, stock exclusion and buffering.
- **Sedgelands:** Sedgeland restoration across 5.17 ha will focus on transitioning degraded sedgelands with high exotic biomass wetlands towards natural, indigenous sedgelands. Actions include weed control, restoration planting, stock exclusion and establishment of appropriate hydrological conditions.

- **Freshwater herbaceous wetlands:** Rather than recreating indigenous herbaceous wetlands which may struggle to establish, given the presence of exotic vegetation freshwater herbaceous wetlands restoration actions will focus on establishing 5.4 ha of copper tussock wetland communities, coupled with stock exclusion, weed control and buffer planting.
- **Shrubland wetlands:** Shrubland wetland compensation will involve restoration of 0.14 ha gully systems supporting indigenous shrub communities, including buffering, stock exclusion and enhancement planting. In addition, buffer planting throughout the sedgelands and freshwater wetlands will include a mix of shrubland species, increasing the overall number of individuals throughout the local landscape.
- **Seepage wetlands:** Due to the difficulty of restoring isolated seep systems, compensation will focus on protecting the existing 0.22 ha seepage wetlands within Murphys Link through stock exclusion and long-term protection mechanisms.
- **Induced wetlands**: Induced wetlands have formed on the toe of existing Waste Rock Stacks (WRS's) from emerging seepage. These wetlands are of negligible to low value with limited ecological services, however, still constitute natural inland wetlands. These wetlands are to be compensated through protecting existing 4.14 ha of wetlands at Mount Highlay with stock exclusion and buffer planting.

The wetland compensation package will provide additional conservation benefits that are not relied upon as equivalent replacement for the quantified MP4 and the Reservoirs residual effects. This will be achieved through wetland protection for unmodelled wetland compensation for sedgeland, freshwater herbaceous and copper tussock wetland will occur through the protection in perpetuity and stock exclusion of 9.07 ha of wetland extent located within the upper gullies of Coal Creek. In addition, 0.96 ha of wetland, 0.17 ha of ephemeral wetland and 2.48 ha of riparian habitats will be subject to protection and stock exclusion throughout Murphys Link, over and above the proposed wetland restoration.

The proposed compensation areas are strategically located within OGNZL landholdings to provide long-term security and ecological connectivity. These areas include:

- Murphys Link;
- Cranky Jims Link; and
- Macraes Central.
- Coal Creek headwaters.
- Mount Highlay.

Wetland Restoration Feasibility and Limitations

Wetland restoration within the Macraes landscape presents both significant opportunities and ecological challenges. The compensation strategy has therefore been designed to recognise the limitations associated with restoring highly modified wetlands and to apply management approaches appropriate to individual wetland types.

Ephemeral wetlands represent the greatest restoration challenge due to their dependence on periodic wetting and drying cycles. These ecosystems support specialised turf-forming plant communities adapted to fluctuating hydrological conditions. Restoration success can be limited where exotic grasses dominate, soil nutrient levels have increased, or historical disturbance has altered natural processes.

To address these limitations, ephemeral wetland restoration will use a combination of targeted weed management, soil manipulation where appropriate, transfer of indigenous plant material, restoration planting, stock exclusion and adaptive management. The use of "hay transfer", involving the collection and redistribution of seed-rich indigenous plant material from donor wetlands, provides an opportunity to accelerate establishment of indigenous plant communities. Limited evidence on ephemeral wetland restoration is available in the New Zealand context, with some success being found within the lower North Island. Similar approaches have demonstrated success in wetland restoration within the Northern Hemisphere, including restoration of ephemeral wetland systems.

Vegetation direct transfer and soil salvage may also be used where suitable. These methods provide opportunities to transfer indigenous seedbanks, microbial communities and wetland-associated organisms; however, they require careful management because they may also transfer exotic plant material. Donor material selection and hygiene protocols will therefore be important to avoid introducing additional weed risks.

The restoration strategy also acknowledges that ecological recovery is a long-term process. Restoration outcomes may vary depending on seasonal conditions, hydrological performance, weed control success, establishment success and external pressures. Monitoring and adaptive management will therefore be a critical component of ensuring restoration trajectories remain aligned with ecological objectives.

Predicted Ecological Outcomes

The proposed residual effects management package has been developed to provide measurable ecological gains through the restoration, enhancement and long-term protection of wetland ecosystems within the Macraes Ecological District. The objective is not only to compensate for the direct loss of wetland extent associated with the MP4 Project and the Reservoirs, but also to address existing pressures affecting wetlands throughout OGNZL landholdings, including stock access, weed invasion, habitat fragmentation, loss of indigenous vegetation cover and declining ecological function. While a net loss in wetland extent will occur as a result of the Project and Camp and Coal Creek, a net positive outcome in wetland values is anticipated.

Predicted outcomes are described using four categories:

- **Net Positive (modelled)**: Quantitative biodiversity models predict that gains will exceed the corresponding residual losses after accounting for relevant factors such as time lags, implementation risk, confidence and discounting. This category has the strongest evidential basis because the predicted outcome is supported by quantitative analysis, although it remains biodiversity compensation where strict like-for-like equivalence or all formal offset requirements have not been demonstrated.
- **Net Positive (unmodelled)**: The type, scale, location and expected effectiveness of the proposed conservation actions indicate that the resulting biodiversity gains are likely to outweigh the corresponding residual losses.
- **Uncertain**: The proposed actions are expected to counter-balanced the losses, but the available information does not provide an adequate basis for determining whether those benefits will exceed, equal or fall short of the corresponding residual adverse effects.

- **Net Loss**: The available evidence indicates that the proposed compensation actions will not fully counterbalance the corresponding residual adverse effects. A residual net loss is therefore predicted after the expected benefits of the compensation actions have been considered. The remaining effect is assigned a level of Very Low, Low, Moderate, High or Very High, with the basis for that conclusion and any relevant uncertainty clearly identified.

The predicted ecological outcomes of the compensation package include:

- Increased extent and improved condition of indigenous wetland vegetation communities through transitioning exotic dominated wetlands to indigenous ecosystem types;
- Improved representation of indigenous wetland ecosystems within the Macraes Ecological District;
- Increased habitat availability for wetland-dependent flora;
- Protection of existing wetlands from ongoing degradation pressures;
- Increased abundance and distribution of Threatened and At-Risk wetland plant species;
- Improved ecological connectivity between retained and restored wetland habitats; and
- Increased resilience of wetland ecosystems to future disturbance and environmental change.

The proposed compensation actions are predicted to have an overall net positive ecological outcome, with the exception of ephemeral wetlands, in which outcomes were assessed as uncertain. This uncertain outcome prediction arises from the known difficulties in restoring ephemeral wetlands due to their unique ecosystems and the relatively low presence of evidence of successful ephemeral wetland restoration in the New Zealand context. The remaining wetland types were predicted to have an overall net positive ecological outcome due to the quantum of offset, known revegetation methods and assurance in their longevity through protection in perpetuity.

Table 0-2. Predicted ecological outcomes for wetland compensation.

Wetland type	Impact quantum and residual effect	Compensation Actions	Predicted Residual Outcome
Ephemeral wetland	Up to 1.14 ha loss. Residual effect: **Very High**	**1.8 ha** restoration planting, fencing and protection at Cranky Jims Link. **0.98 ha** restoration planting, fencing and protection at Macraes Central/Golden Bar Haul Road. **0.17 ha** at Murphys Connection.	**Uncertain** due to known difficulties in ephemeral wetland restoration.
Sedgeland	1.75 ha Residual effect: **Moderate**	**1.93 ha** restoration planting, fencing and protection Cranky Jims Link, **1.62 ha** restoration planting, fencing and protection Murphys Connection, **1.68 ha** restoration planting, fencing and protection at Macraes Central, and **3.6 ha** wetland protection in perpetuity at Coal Creek	**Net Positive (modelled and unmodelled)**
Freshwater herbaceous	4.8 ha Residual effect: **Low to High**	**2.08 ha** restoration planting, fencing and protection at Cranky Jims Link, **3.32 ha** restoration planting, fencing and protection at Macraes Central, and	**Net Positive (modelled and unmodelled)**

		4.5 ha wetland protection in perpetuity at Coal Creek, **0.96 ha** wetland and riparian protection in perpetuity and Murphys Connection	
Shrubland	0.03 ha Residual effect: **Moderate**	**0.14 ha** restoration planting, fencing and protection at Murphys Connection	**Net Positive (modelled)**
Seepage	0.02 ha Residual effect: **Very High**	**0.22 ha** wetland protection in perpetuity at Murphys Connection	**Net Positive (unmodelled)**
Copper tussock	0.21 ha Residual effect: **Moderate**	**0.92 ha** wetland protection in perpetuity at Coal Creek	**Net Positive (unmodelled)**
Induced wetland	3.58 ha Residual effect: **Low**	**4.14 ha** wetland protection in perpetuity at Mt Highly	**Net Positive (unmodelled)**

Monitoring and Adaptive Management

A comprehensive monitoring and adaptive management framework will be implemented to confirm that proposed restoration actions are achieving intended ecological outcomes and to identify where additional intervention is required. An adaptive framework recognises that wetland restoration outcomes cannot always be predicted with certainty and that management approaches must respond to ecological performance over time. Monitoring will be undertaken through implementation of the Wetland Monitoring Plan and will assess progress against defined restoration objectives, including:

- Wetland extent and persistence;
- Hydrological condition;
- Indigenous vegetation establishment;
- Reduction in exotic vegetation dominance;
- Survival and recruitment of planted species;
- Establishment of Threatened and At-Risk plant species;
- Wetland habitat condition;
- Effects of stock exclusion and fencing;
- Weed control effectiveness; and
- Overall ecosystem trajectory.

Monitoring will provide the information on whether restoration activities are progressing as expected and whether additional adaptive management responses are required.

Adaptive management measures may include:

- Additional weed control;
- Supplementary planting;
- Refinement or inclusion of grazing management within ephemeral wetlands;
- Additional fencing or buffering;
- Changes to restoration techniques where initial approaches are unsuccessful.

Long-Term Protection and Management

A key component of the residual effects management package is ensuring that restoration outcomes are maintained over the long term. Restoration without appropriate protection mechanisms may result in ecological gains being lost through renewed grazing pressure, weed invasion, hydrological alteration or other land-use pressures.

Long-term management will therefore include:

- Protection of restoration areas from livestock impacts;

- Maintenance of fencing and buffers;
- Ongoing weed surveillance and control;
- Protection of restored wetlands through appropriate legal mechanisms where applicable;
- Integration of restoration areas with surrounding ecological management activities; and
- Continued ecological monitoring.

These locations provide suitable receiving environments because they occur within the same ecological district as affected wetlands, contain comparable wetland types and provide sufficient spatial capacity to support restoration at the required scale.

Conclusion

The assessment concludes that the MP4 Project will result in unavoidable residual adverse effects on wetland ecosystems, including permanent loss of wetland extent and associated ecological values. The highest level of residual effects is associated with the loss of ephemeral wetlands, freshwater herbaceous wetlands and wetlands supporting Threatened and At-Risk flora species.

The effects management hierarchy has been applied throughout Project development, with avoidance, minimisation and remediation measures incorporated wherever practicable. These measures include footprint refinement, construction controls, wetland protection, hydrological management, sediment and erosion controls, vegetation salvage and ecological rehabilitation. Following implementation of these measures, residual effects remain that cannot be fully avoided, minimised or remedied. The proposed residual effects management package provides an appropriate ecological response by restoring and enhancing degraded wetlands, protecting existing wetland values and increasing indigenous biodiversity outcomes within the same ecological landscape.

Although the compensation package does not achieve biodiversity offsetting in the strict NPS-FM sense due to limitations associated with ecological equivalence, i.e. restoration uncertainty and inability to recreate certain wetland systems on a like-for-like basis, it provides substantial ecological gains and addresses key existing pressures affecting wetlands throughout OGNZL landholdings. The proposed compensation measures are considered feasible and proportionate to the scale and significance of the residual effects. Subject to implementation of the Wetland Restoration Management Plan, Wetland Monitoring Plan and associated adaptive management requirements, the residual effects management package is expected to result in improved wetland condition, enhanced ecological resilience and long-term protection of wetland biodiversity values within the Macraes Ecological District.

This proposed compensation package provides 28 ha of wetland compensation through a combination of restoration and enhancement, and protection and stock exclusion, in exchange for 11.50 ha of wetland extent, achieving an overall net positive predicted ecological outcomes for the majority of wetland types, with a conservative uncertain ecological outcome for ephemeral wetlands.

The MP4 Project's residual adverse effects on wetland ecology can be appropriately managed through the proposed combination of impact avoidance, minimisation, and compensation (restoration, enhancement and long-term ecological management actions).

The Camp Creek and Coal Creek assessments conclude that construction and operation of the proposed water storage dams will result in unavoidable residual effects on wetland ecosystems, primarily through permanent inundation and associated changes to wetland hydrology and ecological function. Avoidance of all wetland losses is not practicable due to the functional requirements of the infrastructure, the effects have been minimised where possible and will be addressed through targeted restoration, enhancement and protection of wetlands elsewhere within OGNZL landholdings.

The proposed management actions will provide ecological benefits through improving the condition of existing degraded wetlands, enhancing indigenous vegetation communities, protecting wetland habitat and maintaining wetland biodiversity values within the Macraes Ecological District. Following implementation of the proposed restoration, monitoring and adaptive management measures, the residual effects associated with Camp Creek and Coal Creek wetlands are considered appropriately managed through the proposed compensation framework.

In addition to the restoration of currently degraded natural inland wetlands to fulfil the compensation requirements, the experimental creation of new ephemeral wetland extent within the Project Area is proposed. This creation does not form part of the formal compensation package, as directed by the BOAM, but rather proposed as an additional benefit as it would create a research opportunity on how a critically endangered and naturally uncommon ecosystem type can be re-established within a modified landscape.

1 INTRODUCTION

OceanaGold (New Zealand) Limited ("**OGNZL**") currently undertakes open pit and underground gold mining operations at the Macraes Operation located at Golden Point Road, Macraes Flat, East Otago. As part of their ongoing operations, OGNZL continually review the remaining life of the Macraes Operation in light of updated knowledge of the gold resource and the economics of mining.

Reflecting recent exploration success and optimisation work, together with higher gold prices, the Macraes Phase Four Project ("**MP4**" or "**the Project**") seeks to extend the life of mining at the Macraes Operation until at least 2039. The Project, which will enable ongoing gold production at a rate of approximately 130,000 ounces per annum, is identified as a Listed Project in Schedule 2 of the Fast-track Approvals Act 2024 ("**FTAA**") as a project providing significant national or regional benefits.

To support the development of the substantive application for the Project, OGNZL has **Bioresearches** to provide an assessment of the Project's effects on **wetlands** and, to the extent required, identify any necessary management and operation measures to address any such effects.

This scope of this **Wetland Residual Effects Analysis Report** is to:

- Address residual effects associated with the MP4 mining activities resulting in wetland loss associated with the expansion of mining pit and waste rock stack footprints.
- Address residual wetland effects associated with the Camp Creek and Coal Creek Reservoirs as a separate compensation package
- Determine the type and quantum of conservation actions required to counterbalance residual losses
- Provide an overview of the residual adverse effects on wetland values to be addressed
- Detail the objectives of the wetland Residual Effects Management Package and assess the opportunities present within the current environment
- Describe the wetland habitat restoration or enhancement measures proposed to be implemented as compensation measures for the purpose of addressing residual effects on terrestrial and wetland ecological values
- Provide the ecological basis for achieving a net positive biodiversity outcome, whereby positive biodiversity outcomes from residual effects management counterbalance the residual adverse effects that remain following avoidance, minimisation and remediation
- Provide An assessment of the proposal against the biodiversity compensation principles in the National Policy Statement for Freshwater Management (NPS-FM).

1.1 Site Location and Description

OGNZL owns and operates the Macraes Operation at Macraes, approximately 30 km northwest of Palmerston in the Otago Region. The Macraes Operation is the largest gold mine in New Zealand and, since commissioning in 1990, has produced more than 6 million ounces of gold.
Macraes Flat is situated on an elevated plateau at approximately 500 m above sea level. The plateau is flanked by the Taieri Ridge to the northwest, Shag Valley and Horse Range to the east, and the coastal hills and extinct volcanic cones of Palmerston and Waikouaiti to the southeast. Macraes Road provides access to Macraes Flat and the Macraes Operation, connecting to State Highway 85 to the east and State Highway 87 (SH87, the Middlemarch–Hyde Road) to the west.

The environment within and surrounding the Macraes Operation has been shaped by historic and current mining activities. Figure 1-1 shows the arrangement of the major mine features at the Macraes Operation. In summary, the current components of the Macraes Operation include:

- Numerous open pits (both operational and non-operational);
- Two underground mines (Frasers, now closed, and Golden Point, which is actively mined);
- Waste rock stacks at various stages of operation and rehabilitation;
- A network of haul roads and general mine service tracks;
- A Processing Plant;
- Five tailings storage facilities (three inactive, one active but nearing capacity, and one under construction and currently receiving tailings);
- An extensive network of water management infrastructure, including diversion drains, silt ponds, sumps, pit lakes, and freshwater storage reservoirs;
- Two consented but not yet constructed water storage reservoirs (Camp Creek Dam and Coal Creek Dam); and
- Associated infrastructure supporting ongoing operations, including district roads, powerlines, workshops, offices, and associated water and amenity facilities.

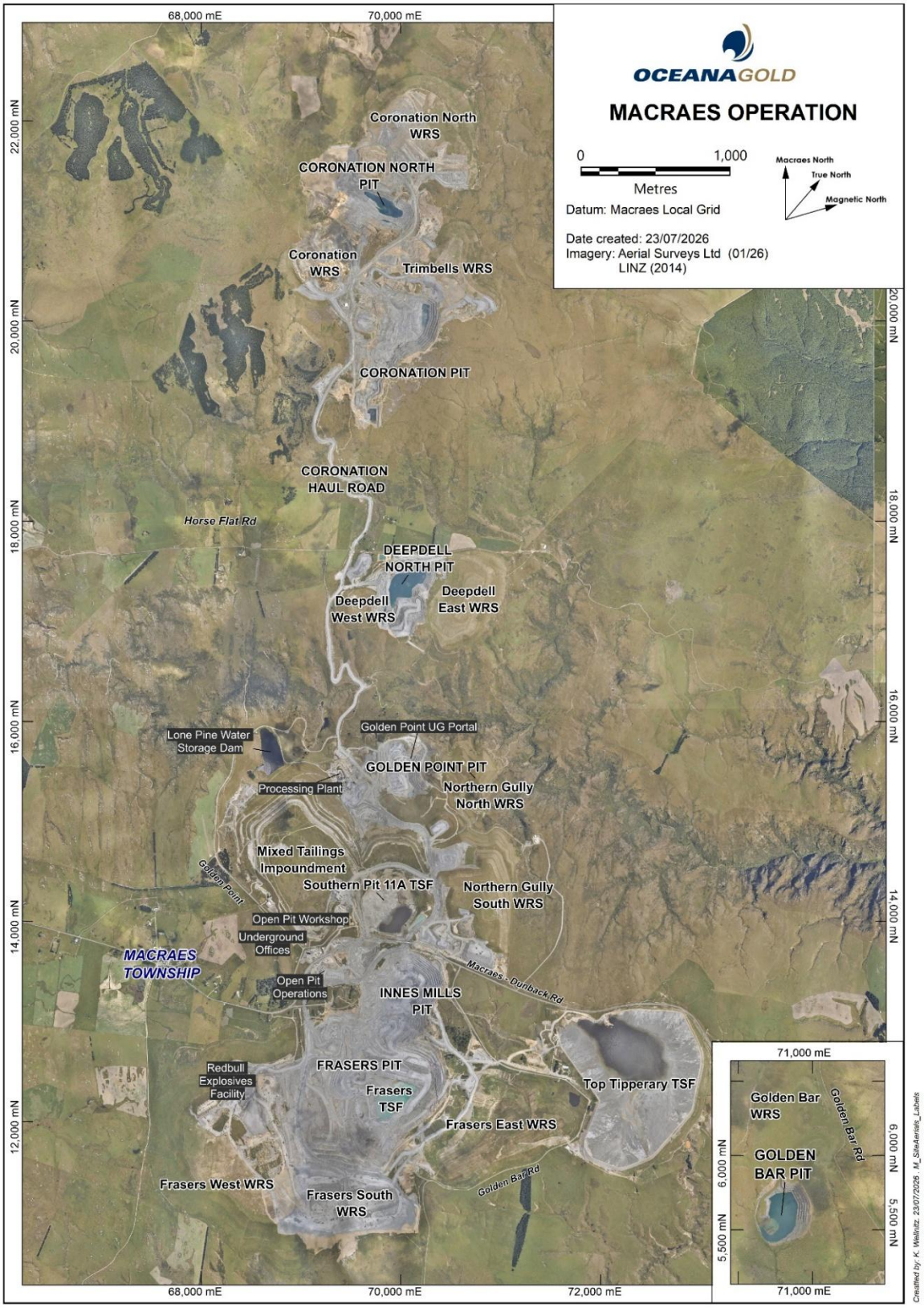


Figure 1-1. Existing site layout at the Macraes Operations (as of July 2026)

1.2 Project Overview

The Project is made up of the following proposed key activities:

- **Open pit extensions** at Coronation, Coronation North, Innes Mills, and Golden Bar.
- **Underground mine expansion** through further development of the Golden Point Underground mine ("**GPUG**").
- **Tailings management**, including:
    - Construction of the Frasers Tailings Storage Facility ("**FTSF**") Stage 3 to accommodate a total tailings storage of up to 153 Mt; and
    - Hydraulic mining and relocation of tailings from the Mixed Tailings Impoundment ("**MTI**"), Southern Pit Option 10 TSF ("**SP10**"), and Southern Pit Option 11A TSF ("**SP11**") to FTSF.
- **Waste rock disposal**, including increased storage capacity within open pits and at existing waste rock stacks at Coronation, Coronation North, Innes Mills, Golden Bar, Golden Point, and Frasers.
- **Water management infrastructure and operations**, including:
    - Construction of Camp Creek and Coal Creek water storage dams for flow and water quality management;
    - Construction, operation and maintenance of a Water Treatment Plant; and
    - Ongoing operation and maintenance of the Mine Water Management System ("**MWMS**").
- **Infrastructure and roading works**, including:
    - Realignment of Macraes Road in two stages; and
    - Relocation of the Open Pit Mining Workshop.
- **Ecological enhancements**, including establishment of:
    - Murphys Ecological Enhancement Area ("**MEEA**") near Murphys Creek, including predator fencing, access tracks, and site facilities;
    - Mt Highlay restoration area;
    - Cranky Jims Link shrubland enhancement area;
    - Murphys Link tussock protection area; and
    - Additional compensation measures for residual ecological impacts.
- **Mine closure and rehabilitation activities**, including rehabilitation of mining landforms, creation of pit lakes, dry capping of tailings storage facilities, and revegetation in accordance with closure objectives.

The Project will involve additional surface works, including wetland reclamation, wetland drainage and dewatering, and disturbance within and adjacent to existing disturbed mining areas. Certain components, including waste rock stack extensions and ecological enhancement areas, extend beyond previously disturbed footprints (Figure 1-2).

In addition to MP4, OGNZL intends to undertake the construction, operation and maintenance of water storage dams located in Camp Creek and Coal Creek (the Reservoirs; Figure 1-3 and Figure 1-4). These dams were consented as a contingency water quality management method as part of the MP3 and Coronation North consenting projects, respectively. The purpose of the dams is to discharge clean dilution water into Deepdell Creek (Camp Creek Dam) and Coal Creek and Mare Burn (Coal Creek Dam) during dry periods so that acceptable water quality standards are maintained.

The consents that authorise the construction, operation and maintenance of Camp Creek and Coal Creek Dams do not lapse and may be implemented at any time prior to their expiry on 1 October 2046 and 24 April 2052, respectively. OceanaGold does not hold consent under the National Environmental Standards for Freshwater (2020) (NES-F) for activities on natural inland wetlands, disturbance associated with the construction of the dam embankments, or where the water reservoir will flood existing natural inland wetlands, diminishing their extents and values. Analysis of residual adverse effects to wetlands within Camp Creek and Coal Creek are presented within this plan as a separate effects package.

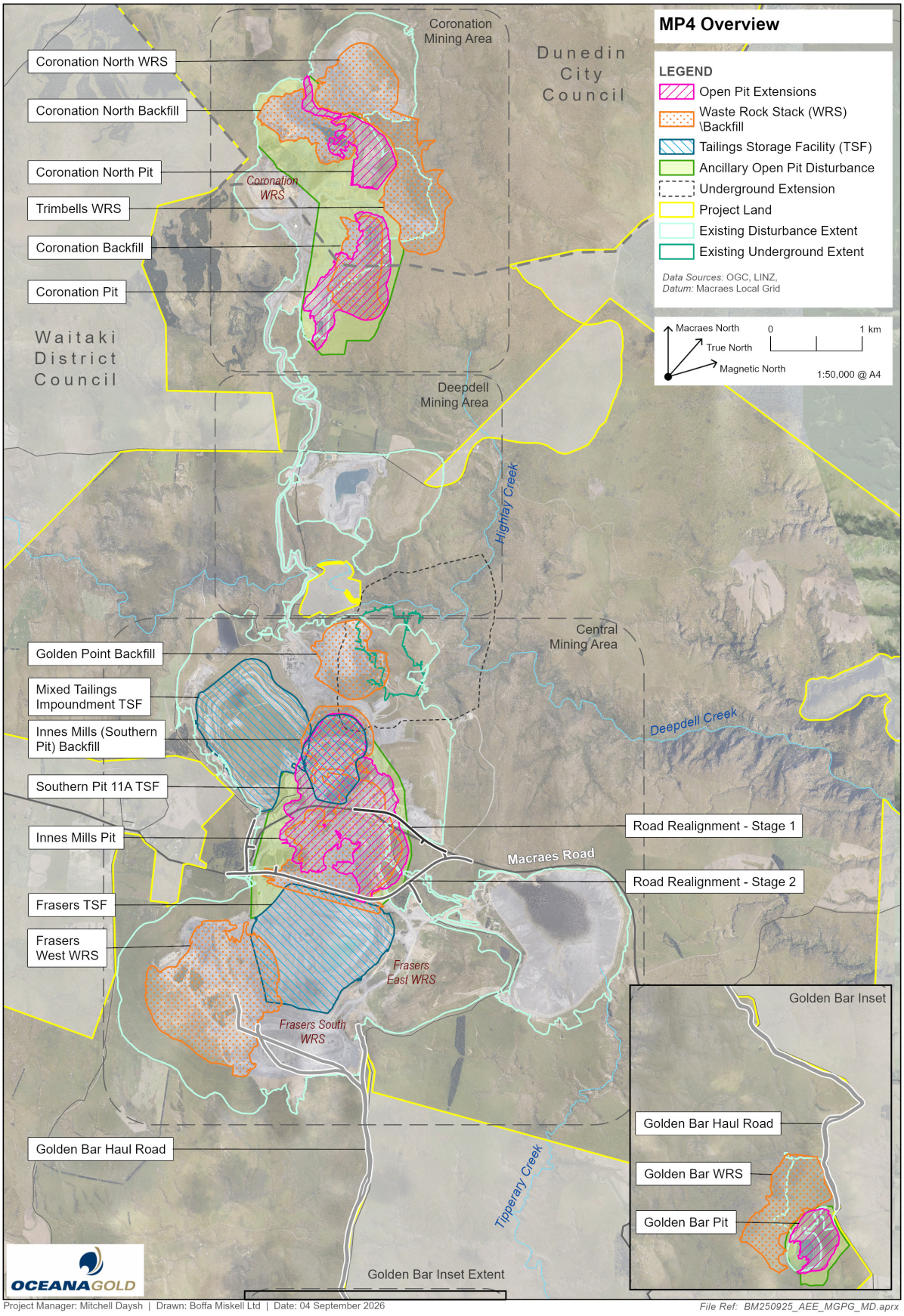


Figure 1-2: MP4 Overview Plan

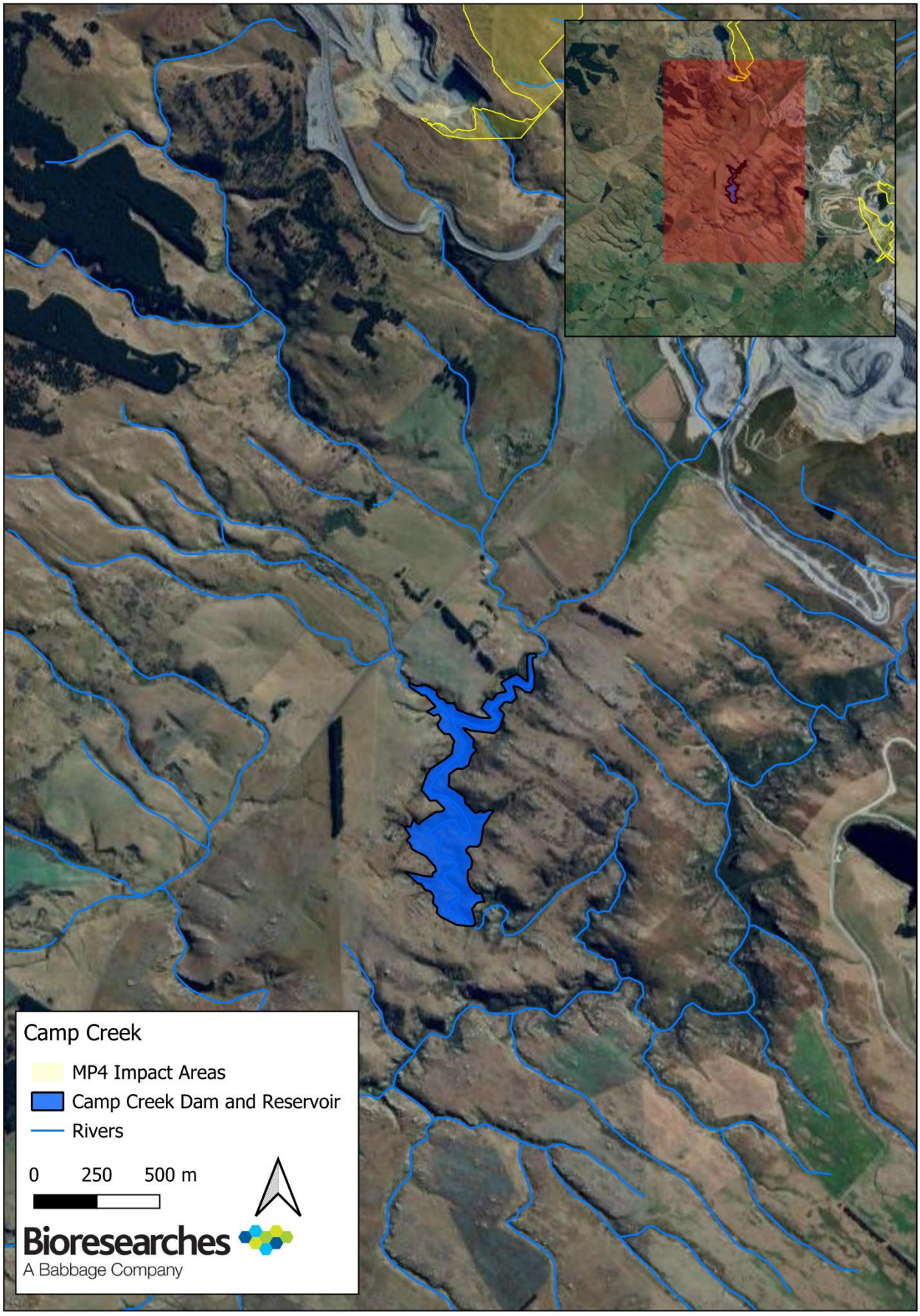


Figure 1-3. Camp Creek Dam embankment and reservoir. Source: OceanaGold Limited.

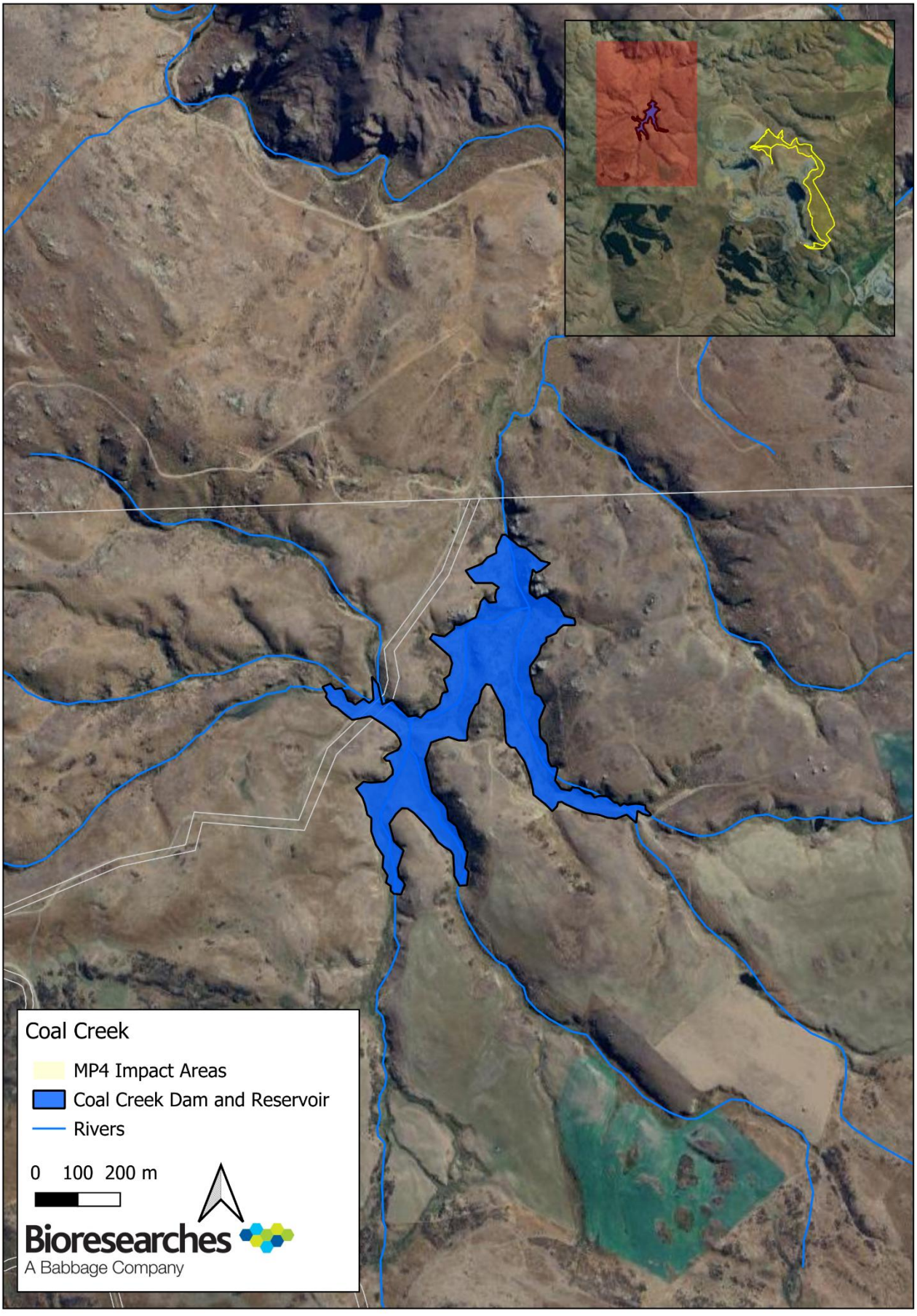


Figure 1-4. Coal Creek Dam embankment and reservoir.

1.3 Sequencing of Activities and Proposed Work Dates

The project is not being progressed in stages. Rather, all activities that comprise the MP4 project are included in this substantive application. Those activities are anticipated to occur across a period of 13 years, with OGNZL proposing to commence the MP4 project as soon as the necessary approvals are obtained.

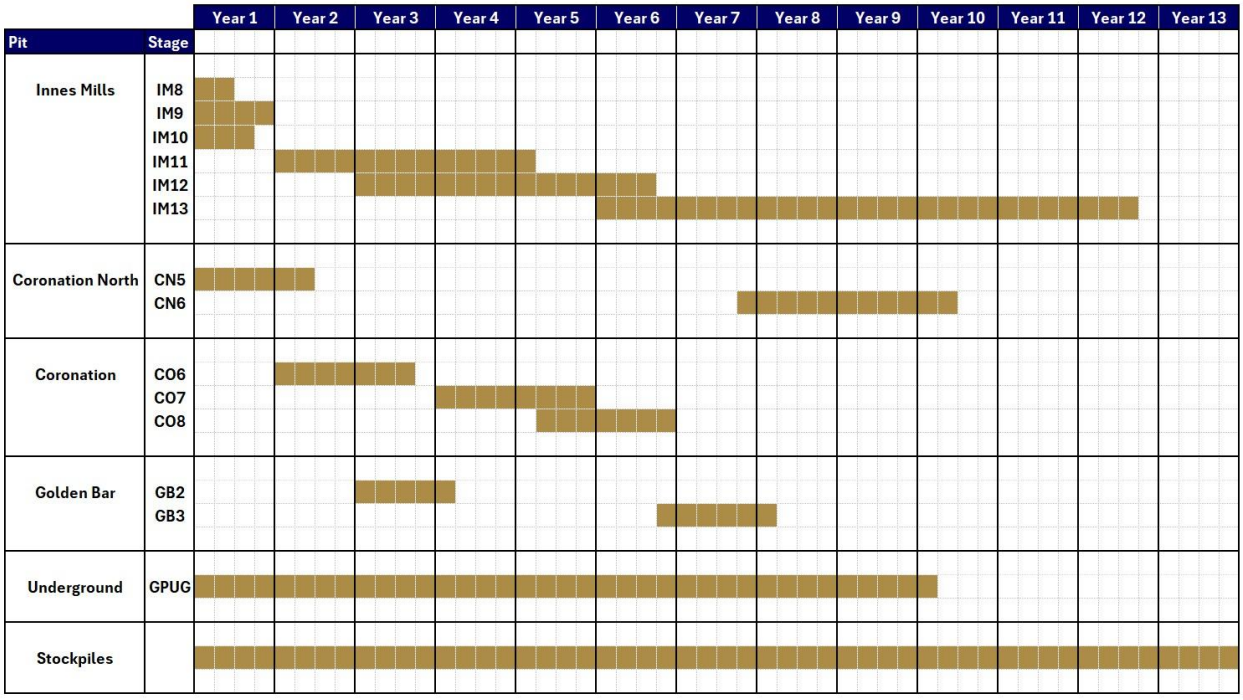
The activities described herein are expected to be generally sequenced as follows:

- The continuation of Innes Mills Pit mining from Year 1 to Year 12;
- The continuation of Coronation Pit mining from Year 2 to Year 6;
- Relocation of tailings from Southern Pit TSF and MTI from Year 2 to Year 12 to facilitate mining of Innes Mills Stage 13 (IM13);
- The continuation of Golden Bar Pit mining mostly in Year 3 and in Year 7;
- The continuation of GPUG mining from Year1 to Year 10;
- The continuation of Coronation North mining from Year 1 to Year 2 and then from Year 7 to Year 10;
- Associated replenishment of stockpiles throughout the MP4 mine life; and
- Full site rehabilitation to commence in Year 11 and be completed by approximately end of Year 13.

Mine planning is fluid at complex multi-pit operations such as the Macraes Operation. Precise timing of activities depends on a range of factors and operational requirements may facilitate changes to the sequencing of some activities.

Table 1-1 shows the anticipated sequencing of the proposed MP4 activities across the life of the project.

Table 1-1. Anticipated sequencing of MP4 activities



1.4 Purpose and Scope

The Ecological Impact Assessment (EcIA, Bioresearches 2026) identified residual adverse effects on wetland ecosystems throughout the Project Area from the loss of wetland extent due to the expansion of the mining pit and waste rock stack footprints. A Wetland Values Assessment was prepared to inform the EcIA and identify wetland extents and their values within the Project Area.

The purpose of this REAR-WL report is to determine the type and quantum of conservation actions (revegetation of new habitats and enhancement of existing habitats) required to counterbalance residual losses, assessed as moderate or higher, of wetland extent and values expected from the Project. Those conservation actions are quantified and measured against losses and modelled, using the BOAM, developed by Maseyk and others (Maseyk et al., 2015; 2018)), to ensure that the wetland extent and values lost are addressed by positive effects that outweigh the adverse effects.

This Residual Effects Assessment Report for Wetlands should be read in conjunction with the Wetland Values Assessment, the Ecological Impact Assessment (EcIA), the Wetland Monitoring Plan, the Threatened and At Risk Plant Management Plan and Wetland Residual Effects Management Plan, and Pest Control and Elimination Plan.

This REAR-WL document (E14) sits within a series of 18 ecology focused documents relating to the Project. The terrestrial and wetland values are identified and described in other documents, identified as E2-E6 in Table 1-2. This report should be read alongside the Substantive Application (Mitchell Daysh 2026), the Ecological Impact Assessment, and in conjunction with the terrestrial, wetland and freshwater management plans.

Table 1-2. Ecology Documents prepared for the proposed Macraes Phase 4 Project. Current document highlighted

Document #	Document name	Aspects covered	Author
E1	Terrestrial and Wetland Ecology Summary		Bioresearches (2026a)
Ecological Assessments			
E2	Assessment of Vegetation and Wetland Values	Terrestrial vegetation and wetlands	Whirika (2026)
E3	Assessment of Invertebrate Values		Bioresearches (2026b)
E4	Assessment of Lizard Values		Bioresearches (2026c)
E5	Assessment of Avifauna Values		Bioresearches (2026d)
E6	Assessment of Bat Values		Bioresearches (2026e)
E7	Ecological Impact Assessment	Terrestrial and wetland ecosystems and fauna	Bioresearches (2026f)
Ecological Management			
E8	Vegetation and TAR Flora Management Plan	Indigenous vegetation and threatened plants (wetland and terrestrial)	Bioresearches (2026g)

E9	Wetland Management Plan	Management and monitoring of Wetlands and TAR wetland plants	Bioresearches (2026h)
E10	Invertebrate Management & Monitoring Plan	Effects management and monitoring for invertebrates	Bioresearches (2026i)
E11	Lizard Management & Monitoring Plan	Effects management and monitoring for lizards	Bioresearches (2026j)
E12	Avifauna Management & Monitoring Plan	Effects management and monitoring for birds	Bioresearches (2026k)
Residual Effects Analysis and Management			
E13	Residual Effects Analysis: Terrestrial Ecology	Residual effects analyses for vegetation and fauna	Bioresearches (2026l)
E14	Residual Effects Analysis: Wetlands	Residual effects analyses for wetlands	Bioresearches (2026m)
E15	Residual Effects Terrestrial Restoration Plan	Compensation planting and vegetation restoration	Bioresearches (2026n)
E16	Residual Effects Wetland Management Plan	Planting and restoration for wetlands	Bioresearches (2026o)
E17	Ecological Impact Assessment: Pest-proof Fence Construction	Terrestrial and wetland ecosystems and fauna	Bioresearches (2026p)
E18	Pest Control and Elimination Plan	Animal pest management	Alliance Ecology (2026)

1.5 Statutory Context

This section summarises the legislation, policy, plans and strategies relevant to the protection, conservation and enhancement of nature conservation interests associated with the Macraes Project Area. The ecological effects described in this report are assessed as they relate to the ecological values described in the ecological values assessments (Whirika, 2026) as well as how they relate to planning, policy and statutory framework as addressed in the sections below.

1.5.1 Fast-track Approvals Act 2024 (FTAA)

The purpose of the FTAA is to facilitate the delivery of infrastructure and development projects with significant regional or national benefits. The system is intended to be a 'one-stop-shop' for resource consents under the Resource Management Act 1991 (RMA) and includes approvals required (for the purposes of this Project) under the Wildlife Act 1953. The purpose of the FTAA must be given greater weight than other considerations including the RMA.

1.5.2 Resource Management Act 1991 (RMA)

The purpose of the RMA is to achieve sustainable management of natural resources. Important elements of this are the maintenance of indigenous biodiversity and the protection of significant indigenous vegetation and habitats. The RMA requires that any adverse effects of development be avoided, remedied, or mitigated (note the *effects management hierarchy* is defined in the NPS-FM 2020 and identified below).

1.5.3 National Policy Statement for Freshwater Management (NPS-FM, 2020)

The NPS-FM provides direction under the RMA to local authorities for managing activities that affect the health of freshwater ecosystems. It establishes protections for freshwater bodies, including natural inland wetlands, and includes provisions for monitoring and reporting on freshwater quality and quantity. The NPS-FM also addresses the impacts of land use activities on freshwater resources, ensuring that these are sustainably managed.

The effects management hierarchy is an approach to managing the adverse effects of an activity on wetlands that requires that (NPS-FM, 3.21):

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.

1.5.4 National Environmental Standards for Freshwater (NES-F, 2020)

The National Environmental Standards for Freshwater 2020 (NES-F) set requirements and regulations for carrying out certain activities that pose risks to freshwater and freshwater ecosystems. Loss of wetland extent is a Discretionary Activity under Subpart 45D of the NES-F ('Extraction of minerals and ancillary activities'), provided that there is a functional need for the wetland loss in that location; and the effects management hierarchy is applied.

2 SUMMARY OF RESIDUAL ADVERSE EFFECTS ON WETLAND ECOLOGY VALUES

The Project will result in a relatively small but ecologically important loss of natural inland wetlands through direct reclamation, together with localised indirect effects associated with drainage, dewatering and hydrological change. Inference from available plot data suggests wetlands directly impacted through the project support a high degree of exotic vegetation, with 58% of wetlands with containing at least 70% vegetation cover of exotic species. The project components will result in the total direct loss of 11.50 ha of wetland extent. Of this extent, 4.72 ha of wetland (including the precautionary 20 m buffer) is directly affected by MP4 and subsequent dewatering, 3.58 ha of induced wetland is anticipated to be dewatered from seepage capture drains, and 3.20 ha is directly affected by the Reservoirs. Impacted wetland ecosystem types comprise of ephemeral wetlands, freshwater herbaceous wetlands, sedgelands, seepage wetlands and wetlands shrublands. The proportional loss of wetland extent in regards to identified wetlands within the local area between MP4 and the Reservoirs is presented in Table 2-1 and Table 2-2.

Table 2-1. Proportional direct impact on wetland ecosystems, based on extent mapped within OGNZL Landholdings and the Macraes ED.

Wetland type	MP4 Impacted Area (ha)	Proportion within OGNZL Landholdings		Proportion within Macraes ED*	
		(ha)	(%)	(ha)	(%)
Ephemeral wetland	1.14	9.70	11.75%	135	0.84%
Sedgeland**	1.43	13.24	10.8%	27	4.7%
Herbaceous freshwater**	2.14	30.59	6.9%	217	0.77
Seep	0.02*	0.082	24%	9.3	0.2%
Shrubland	0.03	0.13	23%	NA	NA
Induced wetland	3.58	-	-	-	-
Total direct loss	**8.30**	**55.36**	**14.9**	**361.3**	**2.29**

*based on Otago Regional Council Ecosystems and Habitat Maps Current Indigenous Ecosystems Layer and may not include small, discreet wetland extents. ** includes extent lost through dewatering

Table 2-2. Proportion of wetland type directly impacted at Camp and Coal Creek, based on representative extent mapped within OGNZL Landholdings and the Macraes ED.

Impact	Wetland type	Area impacted (ha)	Proportion within OGNZL Landholdings*		Proportion within Macraes ED (%)	
			(ha)	(%)	(ha)	(%)
Camp Creek	Sedgeland	0.05	13.24	0.37	135	0.7
	Freshwater herbaceous	0.19	30.58	0.62	217	0.002
Coal Creek	Sedgeland	0.26	13.24	1,96	135	0.9
	Freshwater herbaceous	2.49	30.58	8.14	9.3	0.019
	Copper tussock	0.21	0.95	22	217	0.002
Total		**3.20**	**45.66**	**7**	**361.3**	**0.88**

*minus wetland extent lost under MP4 to account for cumulative effects

Although many affected wetlands exhibit modified characteristics, several support Threatened and At Risk flora and include High and Very High ecological value wetland types, particularly ephemeral wetlands. At the local scale, this equates to approximately 11.75% of the currently mapped ephemeral

wetland extent within OceanaGold New Zealand landholdings (OGNZL Landholdings). In addition to those wetlands located within the direct impact areas and dewatering radius, 4.58 ha of wetland extent, including an additional 2.20 ha of ephemeral wetland, is located within 100 m of the proposed works.

In total, 4.72 ha of wetland extent is estimated to be lost through the MP4 expansion through direct reclamation and indirect dewatering, 3.58 ha of induced wetland dewatered through the diversion of WRS seepage, and a total 3.2 ha of wetland loss via inundation at Camp Creek and Coal Creek will occur, culminating in a total reduction of 11.50 ha of wetland extent, representing 22.69% of all wetlands identified within OGNZL Landholdings.

The EcIA demonstrates that the level of adverse effect has been reduced through application of the effects management hierarchy, including project design refinements, avoidance of sensitive areas where practicable, minimisation measures such as construction controls, erosion and sediment management, hydrological management, ecological supervision, salvage and transfer of wetland vegetation and soils, and remediation through rehabilitation. Further detail on the avoidance, minimisation and mitigation measures, and their influence on the assessed level of effect, is provided in the EcIA wetland effects assessment and the accompanying Wetland Management Plan and TAR Flora Management Plan.

Despite these measures to avoid, minimise and mitigate adverse impacts on wetlands, residual adverse effects arising from direct impacts remain on wetlands within the Project Area range from Low to Very High. In accordance with the EIANZ ecological impact Guidelines (Table 2-3), moderate or higher residual effects warrants residual effects management. The residual level of effect varies according to the biodiversity value of the affected wetland type, which range from Moderate to Very High, with the highest residual effects associated with Very High value ephemeral wetlands. High residual effects remain for High value seepage wetlands and High value freshwater herbaceous wetlands, and moderate residual effects remain for Moderate value sedgelands and shrublands.

Residual effects greater than 'Low': are considered to be significant and therefore require further actions to offset or compensate.

Following the proposed implementation of compensation measures, balancing the losses of wetland habitats with the gains in ecological restoration, the residual effect on impact wetlands is assessed to be Low for sedgelands, herbaceous wetlands and copper tussock.

Table 2-3. Summary of impact wetland values, area (ha) lost and level of effect before residual effects management for MP4 and the Reservoirs.

Wetland Type	Ecological Value	Direct adverse effect	Magnitude of effect (prior to management)	Level of effect (unmitigated)	Proposed avoidance, minimisation, and mitigation measure	Level of residual effect (prior to residual effects management)
Ephemeral wetland	High	Permanent reclamation of 0.75 ha of ephemeral wetland habitats, including extent and values. Loss includes ephemeral wetland flora (TAR & Taoka flora)	Moderate	High	Final works footprint demarcation, monitoring of TAR in edge zone, hydrological supplementation, dust suppression and erosion and sediment controls. Salvage and direct transfer of sedges, rushes. taoka flora and tussocks	High
	Very High	Permanent reclamation of 0.39 ha of ephemeral wetland habitats, including extent and values. Loss includes ephemeral wetland flora (TAR & Taoka flora)	High	Very High	Final works footprint demarcation, monitoring of TAR in edge zone, dust suppression and erosion and sediment controls. Salvage and direct transfer of sedges, rushes. taoka flora and tussocks	Very High
Sedgeland	Low	Permanent reclamation of 0.88 ha of sedgeland habitats, including extent and values. Loss includes ephemeral wetland flora (TAR & Taoka flora)	Moderate	Low	Final works footprint demarcation, monitoring of TAR in edge zone, dust suppression and erosion and sediment controls. Salvage and direct transfer of sedges, rushes. taoka flora and tussocks	Low
	Moderate	Permanent reclamation of 0.86 ha of sedgeland habitats, including extent and values. Loss includes ephemeral wetland flora (TAR & Taoka flora)	Moderate	Moderate	Final works footprint demarcation, monitoring of TAR in edge zone, hydrological supplementation, dust suppression and erosion and sediment controls. Salvage and direct transfer of sedges, rushes. taoka flora and tussocks	Moderate
Herbaceous	Low	Permanent reclamation of 0.44 ha of herbaceous wetland habitats, including extent and values. Loss includes ephemeral wetland flora (TAR & Taoka flora)	Low	Low	Final works footprint demarcation, monitoring of TAR in edge zone, hydrological supplementation, dust suppression and erosion and sediment controls. Salvage and direct transfer of sedges, rushes. taoka flora and tussocks	Low
	Moderate	Permanent loss of 0.19 ha of herbaceous wetland vegetation	Low	Low	Salvage and direct transfer of sedges, rushes. taoka flora and tussocks	Low
	High	Permanent reclamation of 4.15 ha of herbaceous wetland habitats, including extent and values. Loss includes ephemeral wetland flora (TAR & Taoka flora)	High	Very High	Final works footprint demarcation, monitoring of TAR in edge zone, hydrological supplementation, dust suppression and erosion and sediment controls. Salvage and direct transfer of sedges, rushes. taoka flora and tussocks	Very High

Wetland Type	Ecological Value	Direct adverse effect	Magnitude of effect (prior to management)	Level of effect (unmitigated)	Proposed avoidance, minimisation, and mitigation measure	Level of residual effect (prior to residual effects management)
Shrubland	Moderate	Permanent reclamation of 0.03 ha of shrubland wetland habitats, including extent and values. Loss includes ephemeral wetland flora (TAR & Taoka flora)	Moderate	Moderate	No avoidance, minimisation or mitigation measures able to be implemented.	Moderate
Seepage	High	Permanent reclamation of 0.02ha* of seepage wetland habitat, including extent and value	Moderate	High	No avoidance, minimisation or mitigation measures able to be implemented.	High
Induced wetland	Negligible to Low	Diversion of waste rock stack seepage, which has created wetland extent.	Moderate	Very Low to Low	No avoidance, minimisation or mitigation measures able to be implemented.	Low
Threatened At Risk Data Deficient and Locally Uncommon wetland plants	Moderate to High	Loss or disturbance of recorded plants and supporting habitat where individuals occur within the works footprint or 20 m buffer and cannot be avoided. Effects include removal of small or localised populations and loss of associated seedbank or habitat conditions.	High	Moderate to Very High	Pre-clearance surveys, demarcation of edge wetlands to avoid accidental destruction, vegetation direct transfer, seed collection, propagation, salvage and translocation.	Low

*edge zone conservatively = 20 m from direct footprint, buffer zone conservatively = 100 m from direct footprint

3 OBJECTIVES AND OUTCOMES OF RESIDUAL EFFECTS MANAGEMENT

3.1 Ecological Opportunities

3.1.1 Historic Condition

Within the Macraes Ecological District (ED) ephemeral wetlands/tarns would have been a common feature along ridge tops and planes of slopping hill, with copper tussock wetlands on side slopes and sedge wetlands within gullies and valley floors (Bibby, 1997). However, much of this original vegetation cover has been profoundly altered over the past c. 750 years, primarily through repeated anthropogenic burning associated with human land use practices (McGlone et al. 1995; Whitaker 1996). Following European settlement in the 1850s, extensive areas of sedge wetlands would have been present, however these areas would have been further modified through conversion to pasture (Bibby, 1997). Large areas, including ephemeral wetlands, were further modified through repeated burning, cultivation, oversowing, and fertiliser application, resulting in the widespread establishment of exotic pasture systems (Thompson 1949, Whitaker 1996).

3.1.2 Current Day

Today, the Macraes ED represents a highly modified landscape, with approximately 75% of the district dominated by exotic vegetation types, particularly improved pasture. (Bibby 1997; Thorsen pers. obs.). Wetland types historically present throughout the Macraes ED would have included copper tussock wetlands, sedgelands, (Bibby, 1997). Ephemeral wetlands are considered a Naturally Uncommon (Williams *et al*., 2007) and Critically Endangered ecosystem (Holdaway *et al*., 2012). Ephemeral wetlands can support a diverse assemblage of TAR flora and fauna. The ephemeral wetlands located within the impact area are degraded through weed/exotic plant infestation, stock access including pugging and grazing and soil compaction. As such, plant diversity within these wetlands is relatively low, with the majority exotic dominant.

Within OGNZL Landholdings, a total of 55.36 ha of wetland extent has been identified through aerial mapping and field verification[1]. These wetland extents (excluding those reclaimed by the project) have been identified as:

- 9.70 ha of ephemeral wetland;
- 13.24 ha of sedgeland;
- 30.58 ha of freshwater herbaceous;
- 0.082 ha of seepage wetland;
- 0.13 of shrubland wetland; and
- 0.95 ha of copper tussock wetland.

The majority of wetlands identified within OGNZL Landholdings show evidence of degradation and pressures including exotic plant invasion, livestock grazing and pugging and soil compaction, mammalian pest impacts, and dryland plant invasion. These threats can limit a wetland's ecological function within the local landscape through loss of indigenous biodiversity, altered hydrologic function, loss of soil

[1] Coarse aerial mapping may therefore exclude wetland extent which may be difficult to see. The actual extent of wetland coverage throughout OGNZL Landholdings is therefore expected to be greater

structure including porosity seedbank presence, and microbial activity, reductions in wetland extent and values.

3.1.3 Opportunities for Restoration and Enhancements

Within OGNZL Landholdings, a cumulative 55.36 ha of wetland extent (excluding wetlands directly impacted within the Project Area), has been identified via ground truthing and aerial mapping (Figure 3-1). This has provided a relatively coarse scale estimate of wetland habitats available for restoration, noting additional wetland extent not identified via aerial mapping is likely to be present throughout the local area (OGNZL Landholdings).

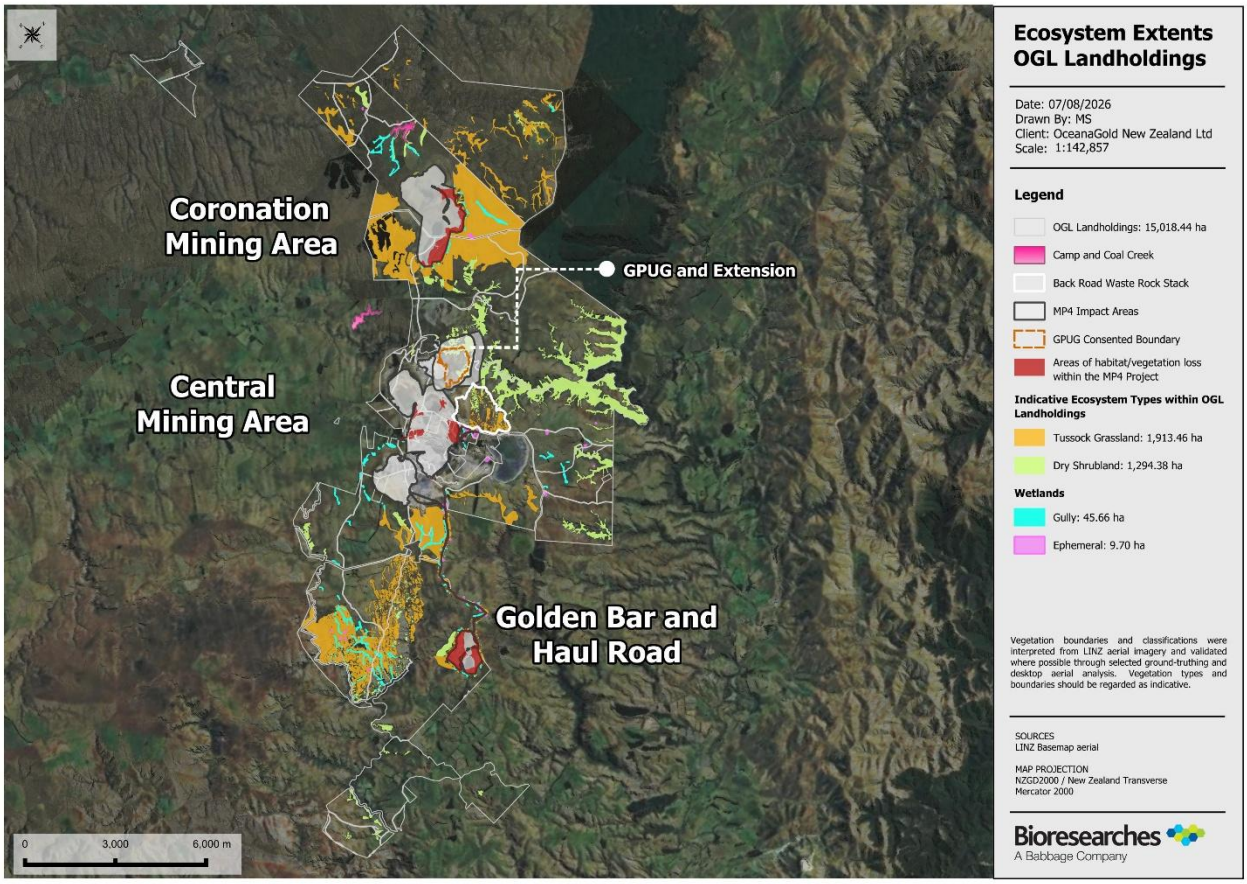


Figure 3-1. Areal extent of mapped vegetation types throughout OGNZL Landholdings.

Opportunities to restore and enhance degraded wetlands are therefore present throughout the local landscape. Methods to restore and enhance degraded wetlands will primarily be undertaken through fencing, weed control and re-vegetation to remove stock pressure and reduce competition to existing and planted indigenous flora. Restoration and enhancements of wetlands can include a variety of management options, each with their own benefits and constraints. Restoration enhancement opportunities and options relevant to wetlands present within OGNZL Landholdings are presented in Table 3-1.

Table 3-1. Restoration measures and their benefits and limitations considered in wetland compensation measures for MP4 and Camp and Coal Creek.

Restoration measure	Primary ecological benefit	Advantages	Limitations
Hydrological restoration (blocking drains, restoring groundwater connections, reinstating natural inundation)	Restores the fundamental ecological processes controlling wetland vegetation, soils and fauna	Effective restoration action and addresses the underlying cause of degradation. Limits the potential for dryland plant invasion and restores wetlands overarching ecosystem function.	Requires engineering works, landowner agreements and long-term monitoring (Peters & Clarkson, 2010 [Hydrology]). In the absence of artificial waterbodies, such as drains or ponds, works may lower water levels in adjacent wetlands through drawdown. Ephemeral wetland inundation periods may be altered and result in permanent saturation, limiting ephemeral wetland function.
Livestock exclusion (fencing)	Prevents trampling, grazing, sediment inputs and nutrient enrichment, allowing soil structure to recover	Rapid improvements in vegetation recovery, water quality and habitat condition are commonly reported. Ephemeral wetlands may benefit from light sheep grazing to reduce exotic pasture pressures.	Fencing alone does not restore degraded wetlands if hydrology remains altered or weeds dominate. Pest and smaller stock animals may pass through the fencing. Soil recovery may be slow in heavily impacted wetlands.
Weed control	Removes competitive exotic vegetation allowing native wetland species to recover	Essential first-stage restoration in many degraded wetlands. Particularly effective for reed sweet grass and pasture grasses if undertaken correctly.	Requires repeated maintenance for many years. Large-scale removal without follow-up planting may create opportunities for reinvasion, or bare ground from weed removal may accelerate pest infestation if not appropriately managed. Weed control in ephemeral wetlands likely required to be intensive and undertaken by hand. Peters & Clarkson, 2010 [Weeds])
Native revegetation	Accelerates recovery of vegetation structure, habitat diversity and ecological resilience	Effective where natural regeneration is limited. Local eco-sourced plants improve biodiversity outcomes and habitat connectivity.	Does not restore poor hydrology. Species selection must match moisture gradients and may require high maintenance during establishment. (Peters & Clarkson, 2010 [Revegetation])
Natural regeneration	Allows existing seedbanks and nearby vegetation to recolonise	May successful where hydrology is intact and exotic plant pressure is low.	Slow where seed sources have been lost or exotic species dominate (Morimoto *et al*., 2017).
Pest animal control	Significantly improves survival of native plants, birds, lizards and invertebrates	Important where browsing animal suppress regeneration of wetland vegetation.	Requires ongoing maintenance and integration with wider landscape programmes.
Sediment and nutrient source control	Improves water quality and prevents eutrophication	Reduces algal growth and maintains native wetland communities adapted to low nutrient conditions (Peters & Clarkson, 2010 [Nutrients]).	Often depends on catchment-wide management outside the restoration site.
Wetland soil salvage and transfer	Transfers seedbanks, microbes and organic soils to restoration sites	Can increase establishment of difficult-to-grow wetland communities when donor material is appropriately managed.	Limited by donor availability and timing; unsuitable handling can reduce viability. Transfer of soils with high pest plant biomass may introduce exotic vegetation to donor wetland (Bosman, 2018).

3.1.4 Wetland Creation Feasibility

The creation of new wetlands to compensate for the loss of extent of Sedgeland and herbaceous freshwater wetland has been considered, however, the creation of new wetland extent requires a source of water to ensure wetland vegetation would survive and mature and to create a functional wetland ecosystem. The creation of wetlands in Murphys and Cranky Jims to create a 1:1 loss to gains in wetland extent would therefore require alterations to natural stream through the slowing of stream flows, or more artificial creation through damming, diversion, lowering of the floodplain through earthworks (Peters & Clarkson, 2010). Given the extensive area this would require (4.80 ha of gully wetland), it has been determined this would ultimately lead to adverse effects on stream extent and values, including the overall loss of stream extent. It was therefore considered inappropriate to negatively modify existing stream values and extents for the purpose of compensating the loss of wetlands through wetland creation.

To compensate for the loss of wetland extent, which cannot be feasibly undertaken without diminishing values of another sensitive ecosystem, such as streams or existing wetlands, extensive restoration of degraded and impacted natural inland wetlands is proposed throughout Macraes Central, Murphys Outer and Cranky Jims Link and its periphery. The overall ratio of wetland loss to wetland restoration is proposed to be a minimum of 1:3.

3.2 Proposed Wetland Restoration and Habitat Enhancement

Wetland restoration and habitat enhancements will be undertaken on seven types of wetlands. These wetlands have been categorised by their wetland type e.g., ephemeral, sedgeland, and corresponding management actions to achieve the compensation objectives dependent upon their current conditions (Table 3-2).

The restoration of wetlands, particularly ephemeral and seepage wetlands, presents limitations and uncertainties. Proposed restoration of ephemeral wetlands is relatively experimental in practise due to the wetland's variable hydro-periods and their tendency to suffer from extensive weed infestation due to the turfing plant species which form ephemeral wetlands' natural plant community (Johnson & Rogers, 2003). Creating and indicting seepage wetlands involves intercepting groundwater on slopes, and inducing those groundwater flows to become surface water flows, potentially altering groundwater flows and tables.

Limitations and unintended outcomes through the restoration process may entail the following:

- The transfer of exotic species through Vegetation Direct Transfer (VDT) and soil salvage.
- Displacement and leakage wherein existing indigenous vegetation within the compensation wetlands may be outcompeted by planted specimens.
- Removal of stock may lead to the drying of wetland margins as the removal of pugging holes and soil compaction may have induced previous terrestrial margins to be wetter through reduced permeability and increased standing water presences

Wetland types are as follows:

- Type E-1: ephemeral wetlands which contained higher amount of water during summer/autumn site assessments, which consequently supported dense areas of exotic hydric vegetation such as glaucous sweet grass (*Glyceria delicanata*) (Photo 1)

- Type E-2: ephemeral wetlands which were in their dry hydro-period, in which no standing or pooling water was present, and these supported a dense cover of exotic grasses, including pasture grasses with some turfing vegetation present, with a dense perimeter of rushes (Photo 2).
- Type H-1: herbaceous wetland typically dominated by exotic grasses with a relatively high degree of pugging (Photo 3).
- Type H-2: herbaceous wetland dominated by rushes and sedges, with a herbaceous understory with variable indigenous presence (Photo 4). This type differentiates from Type H-1 as some structural variation is presence of sedges and rushes.
- Type S-1 – sedgelands in which exotic grasses tend to dominate with a reduced presence of sedges (Photo 5)
- Type S-2 sedgelands which have been modified to create stock ponds. Similarly to Type S-1, these sedgelands contain indigenous and exotic sedges with high proportion of weeds and intended to re-establish raupō and lacustrine turfing communities (Photo 6).
- Type Sh-1 – gullies which support hydric vegetation and sparse coverage of *Shawia bullata* (Photo 7).

Photo 1. Example of Type E-1 wetland

Photo 2. Example of Type E-2 wetland

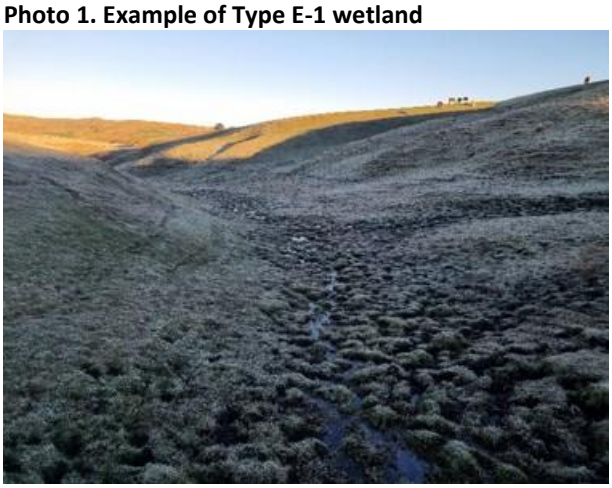


Photo 3. Example of Type H-1 wetland

Photo 4. Example of Type H-2 wetland

Photo 5. Example of Type S-1 wetland

Photo 6. Example of Type S-2 wetland

Photo 7. Example of Type Sh-1 wetland

Table 3-2 presents the wetland types and their location within the compensation areas, and the proposed management activities to be undertaken. This is considered to be a live management table and will be updated as refinements for restoration occur, particularly for ephemeral wetlands. Site preparation and actions to implement the proposed compensation measures is presented in the Wetland Restoration Plan (Bioresearches, 2026o)

Table 3-2. Indicative management actions within compensation wetlands to achieve biodiversity gains.

Wetland type ID	Management Actions
Type E-1	• Scrapes of topsoil and "hay treatment" • Targeted control • Restoration planting • Stock exclusion fencing • Adaptive management for **sheep** grazing during dry periods • Buffer planting
Type E-2	• Receival of indigenous plant salvage • Target weed control • Adaptive management for **sheep** grazing during dry periods • Buffer planting
Type H	• Targeted weed control • High density restoration planting to copper tussock wetland • Stock exclusion fencing

	• Buffer planting
Type S-1	• Targeted weed control • Restoration planting • Stock exclusion fencing • Buffer planting
Type S-2	• Targeted weed control • Restoration planting • Stock exclusion fencing • Buffer planting • Establishment of raupō within ponds
Type Sh-1	• Targeted weed control • Restoration planting • Stock exclusion fencing • Buffer planting

4 PROPOSED COMPENSATION ACTIVITIES

Key features of the compensation package include:

- Enrichment and enhancements of 2.78 ha of degraded, existing ephemeral wetlands currently subject to stock access and weed infestation (wetland type E-1 and E-2).
- 5.23 ha of sedgeland WL22 restoration, enhancement, planting, buffering and stock exclusion (wetland type S-1 and S-2)
- The trade up of 1.69 ha of exotic dominant freshwater herbaceous wetland for the establishment and enhancement of 5.40 ha of WL16 "Copper tussock"[2] wetland, including planting, buffering and stock exclusion (wetland type-H);
- Enrichment and establishment of Threatened and At Risk plants throughout the compensation wetlands, including those salvaged from the impact wetlands;
- The restoration and protection of 0.14 ha of shrubland wetland, including, buffering and stock exclusion (wetland type Sh-1);
- The protection and stock exclusion of 0.22 ha of seep wetland throughout Murphy Link;
- The protection and stock exclusion of 0.96 ha of wetland, and 2.48 ha of unclassified riparian vegetation throughout Murphy Link;
- The protection and stock exclusion of 9.08 ha of wetland, throughout Coal Creek headwaters; and
- The protection and stock exclusion of 4.14 ha of wetland throughout Mount Highlay.

4.1 Wetland Threatened and At Risk Flora

Residual effects management and compensation measures on all TAR flora, including wetland species, is detailed in the **Residual Effects Analysis: Terrestrial** (REAR-T, Bioresearches, 2026l). The wetland TAR flora has been included within the REAR-T to provide a complete and overall package on how residual adverse effects on TAR flora will be managed, rather than segmented between two documents.

All TAR plants affected by the Project will be subject to species-specific management, including salvage, propagation where practicable, establishment within suitable protected receiving sites, and subsequent monitoring. These measures are intended to minimise plant mortality and retain affected species within the wider Macraes landscape. However, the Project recognises that establishment success will vary among species and that uncertainty remains regarding the effectiveness of salvage and propagation for some taxa. Details on how this would be implemented is detailed in the Vegetation and TAR Flora Management Plan (Bioresearches, 2026g)

Several wetland TAR plant species subject to Moderate to Very High residual levels of effect are important components of the compensation revegetation and enrichment planting schedules for the compensation wetlands. Establishing wetland TAR flora species within protected compensation areas, and protected restoration areas will increase their abundance and distribution, contribute to the composition and ecological function of restored wetlands.

[2] Whilst the recognised WL16 ecosystem extent refers to Red Tussock, the location of the site is outside red tussock's distribution (North Island to Marlborough and North Canterbury), and within copper tussock's distribution, with WL16 mapped throughout the Otago Region (Wildlands, 2020).

These planting actions form a material part of the compensation package. Gains for individual TAR species have not been separately quantified or credited against their losses on a direct like-for-like basis within the REAR-T. The Project also recognises that propagation, translocation and establishment success will vary among taxa and that the long-term persistence of planted or salvaged individuals cannot be guaranteed.

Monitoring will assess establishment, survival and condition, identify the need for replacement planting or other management responses, and inform refinement of propagation and establishment methods. Outcomes, management responses and lessons arising from the programme will be documented and reported transparently.

4.2 Sedgelands, herbaceous wetlands and shrubland

All sedgeland, herbaceous and shrubland wetland restoration will include stock exclusion fencing and 15 m of riparian planting to provide a dense buffer to assist in wetland protection and restoration.

4.2.1 Freshwater herbaceous wetland compensation

Revegetation of native herbaceous wetlands to compensate for herbaceous wetlands throughout the Project Area and Camp and Coal Creek, such as those dominated by *Isolepis* sp., and/or *Eleocharis* sp., were considered, however, ultimately excluded as the scale of weed infestation and active management required to maintain these indigenous herbaceous ecosystems was determined to be unfeasible. Rather, establishment of native herbaceous vegetation has been purposefully focused on ephemeral wetlands (further explained in Section 4.2.4), where these closed systems can be carefully maintained, and the invasion of hydric pest species controlled to a greater degree. Instead, freshwater herbaceous wetlands, which are predominantly exotic dominant (average indigenous cover <15%), are proposed to be traded up to WL16 'Red Tussock, *Schonenus pauciflorus* tussockland' (Singers & Rodger, 2014). Whilst copper tussock (*Chionochlora rubra* subsp. *cuprea*) is inherently a 'facultative'[3] species, they are recognised to inhabit boggy areas and have been identified within wetlands throughout OGNZL Landholdings This ecosystem is known to persist in the area and was historically present throughout (Bibby, 1997). Once a WL16 wetland is established and dense, they are expected to be relatively resilient to weed incursion, as observed in the Copper Tussock Reference Wetland assessed at Mount Highlay Restoration Area, noting this wetland lacked a riparian buffer which would provide further buffering and weed encroachment protection.

4.2.2 Sedgeland wetland compensation

Revegetation of sedgelands will be undertaken to enhance existing degraded sedgelands, and transition exotic dominate wetlands to the recognised ecosystem extent WL22 '*Carex, Schoenus pauciflorus* sedgeland' (Singers & Rodger, 2014).

In regard to the loss of herbaceous freshwater and Sedgeland wetlands within the Coronation Mining Area, compensation for their loss will occur within a single, large (1.68 ha) degraded wetland located within Macraes Central. This is proposed to be achieved by creating a gradient in ecosystem types, in which the upper portion shall be traded up, replacing the lost herbaceous freshwater wetlands with WL16 wetlands, which transition to WL22 sedgeland to compensate for the loss of degraded sedgeland in the

[3] commonly occurs in both wetlands and uplands

Coronation Mining Area. WL22 Sedgeland wetlands restoration has been selected for the loss of degraded Sedgeland wetlands in the Project Area. This includes systems which contain stock ponds, presenting the opportunity to establish raupō within the current open water systems.

4.2.3 Shrubland wetland compensation

Shrubland wetlands, dominated by *Shawia bullata*, are located within gullys and riparian margins within the impact area. These wetlands consist of sparse tree cover with an exotic understory, limiting their overall function as a wetland. To compensate for their loss, restoration actions will include establishing 0.12 ha of shrubland wetland throughout a gully within Murphys Outer.

4.2.4 Ephemeral wetland enhancements

The restoration of degraded ephemeral wetlands located throughout OGNZL landholdings is proposed to compensate for the loss of ephemeral wetlands within the Project Area. This restoration will require bespoke restoration activities, dependent upon:

- Hydrological phases (short inundation versus long inundation);
- Existing plant communities;
- Grazed, or un-grazed site conditions,
- Weed infestation,
- Soil condition and
- Surrounding land use, (e.g. agricultural, mining, covenant area).

Restoration of ephemeral wetlands will aim to remove exotic plant growth and encourage the growth of indigenous vegetation. The re-establishment of turfing communities will be implemented as far as practicable; however, it is acknowledged this is somewhat difficult.

Potential preparation to facilitate restoration and enhancement involves a scraping process. This process includes the removal of topsoil, followed by aggressive weed control and “hay transfer” in which freshly collected, seed rich indigenous plant material from donor sites is spread throughout the receiving wetland (Rasan *et al*., 2007). Hay transfer has shown some success in fen grasslands in Europe (Rasran *et al*., 2007) and adapted to ephemeral wetland restoration in the Wairio Wetland Complex (Johnson, 2012) in New Zealand. Whilst weed invasion was encountered within Wairio, it is recognised no post-treatment aside from the planting of natives was undertaken. We acknowledge fen wetland systems are typically of lower nutrient levels than ephemeral wetlands. This scraping process results in a reduction of nutrients and removal of highly competitive pasture species and their seed banks, which has allowed for the germination and growth of indigneous vegetation with reduced exotic vegetation competition. Where ephemeral wetlands are dominated by exotic grasses, such as ephemeral wetlands within Cranky Jims Link, this management strategy may minimise exotic plant dominance without the intensive use of herbicides thus reducing potential adverse effects on remaining indigenous species.

Additional ephemeral wetland restoration techniques may include the importation of soils and plants salvaged from ephemeral wetlands within the impact area. This soil salvage will provide a transfer of soil seed bank, soil microbial communities and invertebrates, to the compensation wetlands, however this would likely result in the transfer of exotic plant specimens. This soil salvage should occur within ephemeral wetland where indigenous plant cover is highest to minimise the spread of exotic plant species. For example wetlands which are dominated by exotic species, such as kneed foxtail (*Alopecurus*

geniculatus) at Golden Bar will not have soil salvage, however wetlands with higher indigenous vegetation such as waoriki (*Ranunculus amphitrichus*) and *Agrostis pallescens* may be subject to soil salvage.

Proposed buffer planting, of tussock and shrubland around the ephemeral wetlands, will assist in reducing the invasion of dryland plants and weeds to the ephemeral wetlands during seasonally dry periods. Using short stature buffering vegetation will limit the overall shading to the ephemeral wetland vegetation.

4.2.5 Seepage wetlands

Seepage headwater wetlands, similar to the seep being lost at Coronation, are present throughout the Murphy' Link, and are located at the top of steep gullies. Restoration of existing seeps at steep gully heads was investigated, however feasibility of planting and protecting isolated seeps throughout OGNZL landholdings is low. Rather, the protection and removal of stock from these areas at Murphy Link is considered to have more desirable ecological outcomes as this would provide the protection of headwater seep wetland types within one area, rather than fragmented pockets of similar wetland type.

4.3 Locations for compensation actions

Biodiversity compensation actions for the MP4 Project will be undertaken within the OGNZL Landholdings, ensuring landholder security for the wetland restoration and enhancements and long-term protections. As detailed in the following sections, the enhancements will be located within the areas of Murphys Link; Cranky Jims Link (which is proposed to bridge the gap between the existing Cranky Jims covenants and existing Island Block covenant), and Macraes Central, Coal Creek Headwaters and Mount Highlay (Figure 4-1).

These compensation sites are located within the Macraes ED in proximity to the impact areas (Appendix B; Figure 0-4). They have been specifically identified to provide a suitable receiving habitat for compensation actions due to their proximity to the Project footprint, ecological similarity to affected habitats, and their capacity to support proposed restoration and enhancement activities.

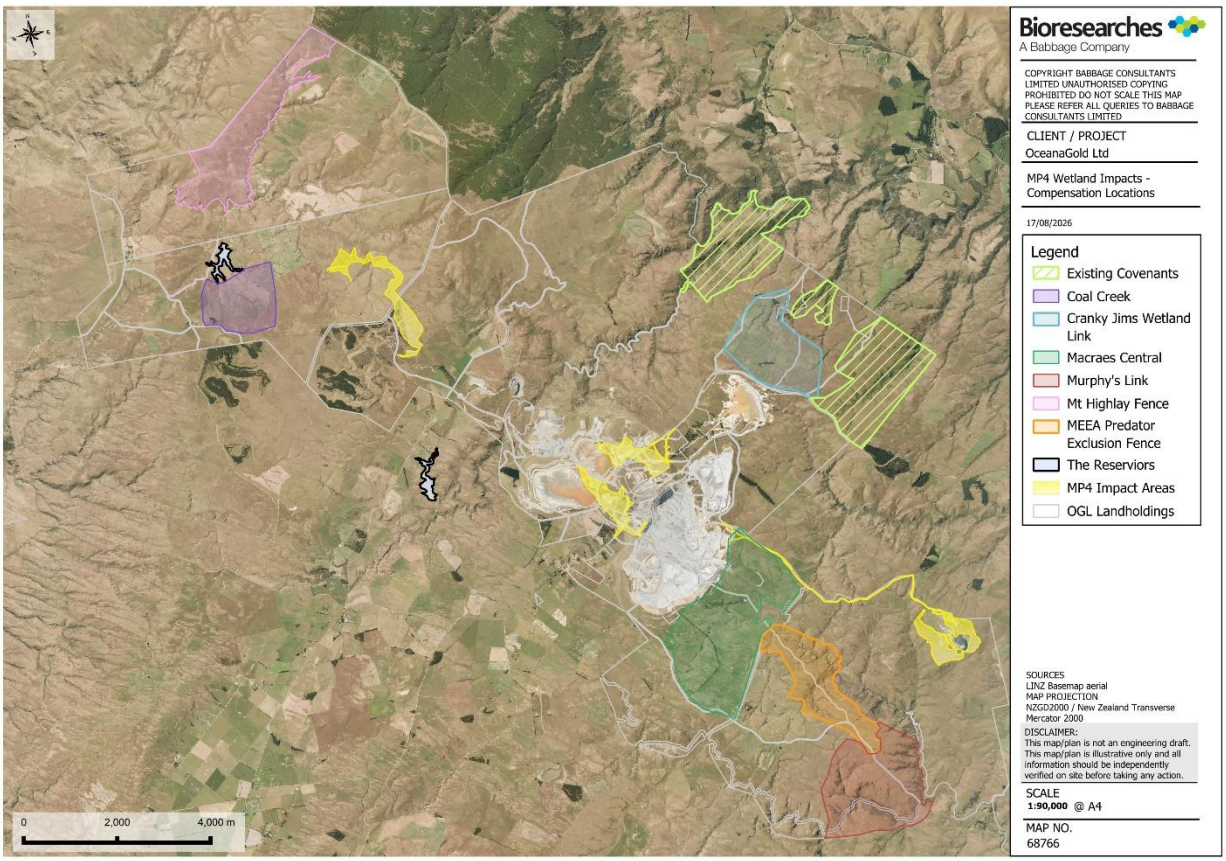


Figure 4-1. Locations of the five compensation areas for wetland restoration.

4.3.1 Cranky Jims Link

A series of three separate existing ecological covenants (Cranky Jims Wetland Covenant (97.4 ha), Cranky Jims Shrubland Covenant (47.2 ha) and Island Block Covenant (291.55 ha)), are proposed to be connected by the Cranky Jims Link covenant, forming one continuous protected area (Figure 4-2). This link will enable the establishment of dry shrubland / grey scrub to support the Terrestrial Residual Effects Analysis. Multiple degraded wetlands, including ephemeral wetlands, occur within and adjacent to Cranky Jims Link but outside the proposed dry scrub/grey scrub area. These wetland features are located within a modified landscape and are accessible for grazing with stock access currently present throughout the wetlands. Cranky Jims Link presents the opportunity for trading up in regard to lost Freshwater Herbaceous wetland types consistent with NPS-FM principles of ecological equivalence and landscape context.

4.3.2 Macraes Central

Wetland compensation at Macraes Central ties into the stream compensation actions, with highly degraded wetlands located at the headwaters of the proposed stream compensation area and ephemeral wetlands adjacent to Golden Bar Haul Road (Figure 4-3). Where available, it is proposed to compensate for wetland loss from each project component area within the local area, however this is not always possible, particularly for Coronation where compensation wetlands may not be able to be protected in perpetuity, minimising the long-term ecological gains.

4.3.3 Murphys Link

Murphys Link occurs within a landscape characterised by modified pastoral grasslands over a flat surface with multiple gullies with tributaries hosting degraded wetland habitats. These areas are highly grazed with stock access throughout and lack riparian buffers. Ecosystem types within the gullies and tributaries correspond with those impacted by the MP4 Project, enabling a like-for-like compensation approach, and present the opportunity for trading up in regard to lost Freshwater Herbaceous wetland types consistent with NPS-FM principles of ecological equivalence and landscape context.

The Murphys Link area provides sufficient spatial extent to accommodate wetland revegetation and enhancement actions at the scale required[4] (Figure 4-4). In addition, its location within the same ecological district ensures that compensation outcomes are delivered within the natural range of the affected aquatic biodiversity, supporting ecological integrity and improving the likelihood of successful establishment and persistence of restored habitats. Murphys Link supports multiple headwater gullies with similar characteristics to the putative seepage wetland which is to be lost at Coronation. By protecting these seepages and removing stock and their associated effects, downstream benefits should occur as the filtration capacity of wetlands would then increase, coupled with the removal of a nutrient source (i.e. stock), improving the quality of water to the downstream receiving environment.

4.3.4 Coal Creek Headwaters

The Coal Creek Headwaters, located immediately upstream of the proposed and consented Coal Creek Reservoir contain extensive wetland extent, approximately 9.07 ha of wetland, which appear to be unfenced from stock, limited protective vegetation buffers with unrestricted stock access (Figure 4-5). Coal Creek headwaters provide spatial extent, within proximity, immediately upstream of the impact area, to ensure compensation actions are delivered within its natural range and provides a viable site for the receiving of Vegetation Direct Transfer (VDT) and TAR plant salvage undertaken within the impacted Coal Creek wetlands. In addition, pond edge planting of the completed reservoirs provides the opportunity to establish turfing, lacustrine wetland communities within the landscape.

4.3.5 Mount Highlay

The Mt Highlay Station plantation comprises approximately 265 ha of recently established three-year-old plantation forest. At this early stage, the planted pines remain small enough for removal to be practicable, while much of the underlying wetland is still present and capable of recovery, as made evident by the presence of a high value copper tussock wetland. Mt Highlay will subject to 175.65 ha of indigenous planting as part of the terrestrial residual effects package (Bioresearches, 2026l), providing opportunity to protect existing wetlands and establish buffer planting around their perimeter, allowing for natural regeneration and restoration to occur (Figure 4-6).

[4] Required to ensure the wetland values and extents lost are addressed by positive effects that outweigh the adverse effects (in accordance with NPS-FM appendix 7 – Scale of aquatic compensation)

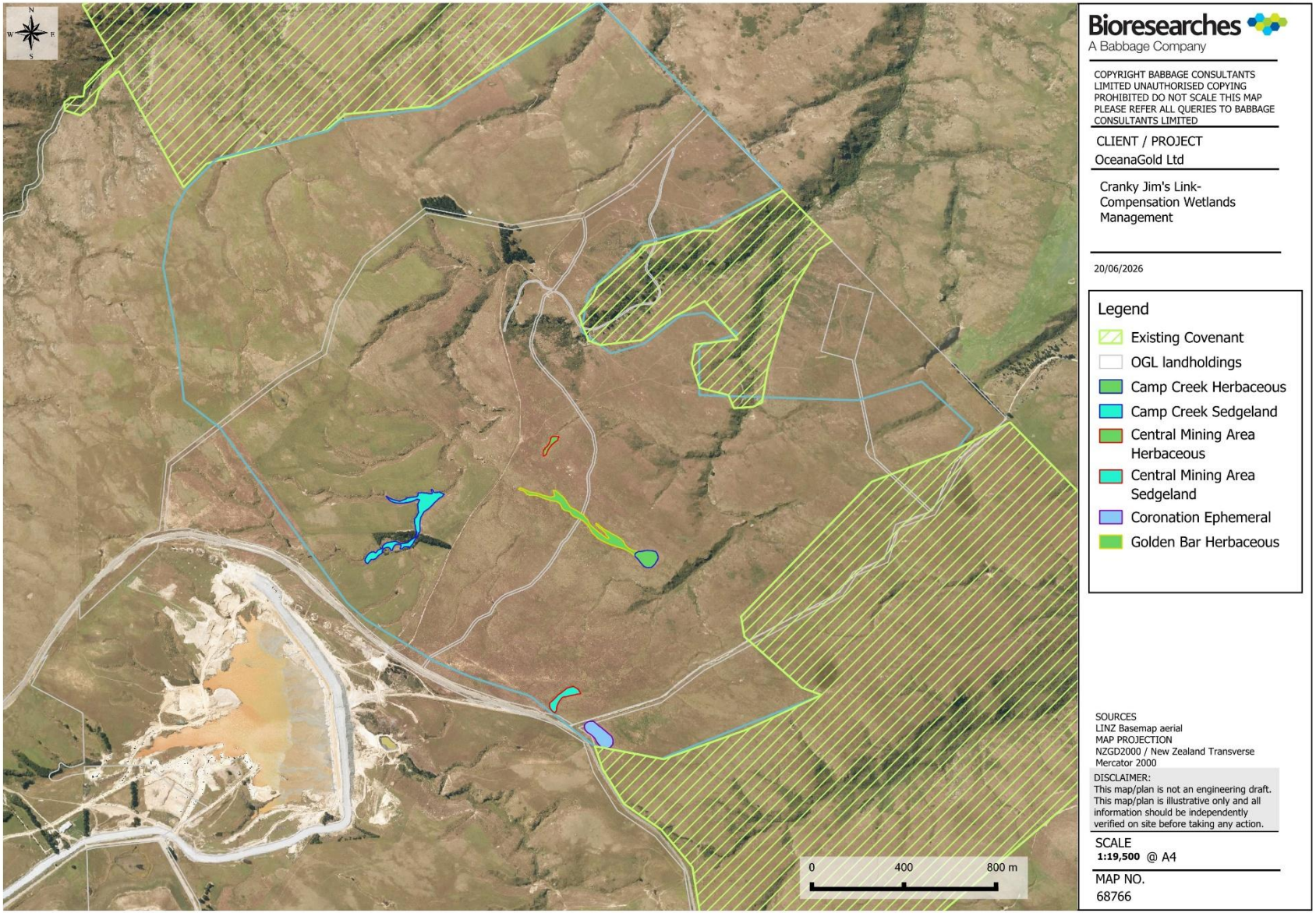


Figure 4-2. Indicative wetland compensation locations, within Cranky Jims Link

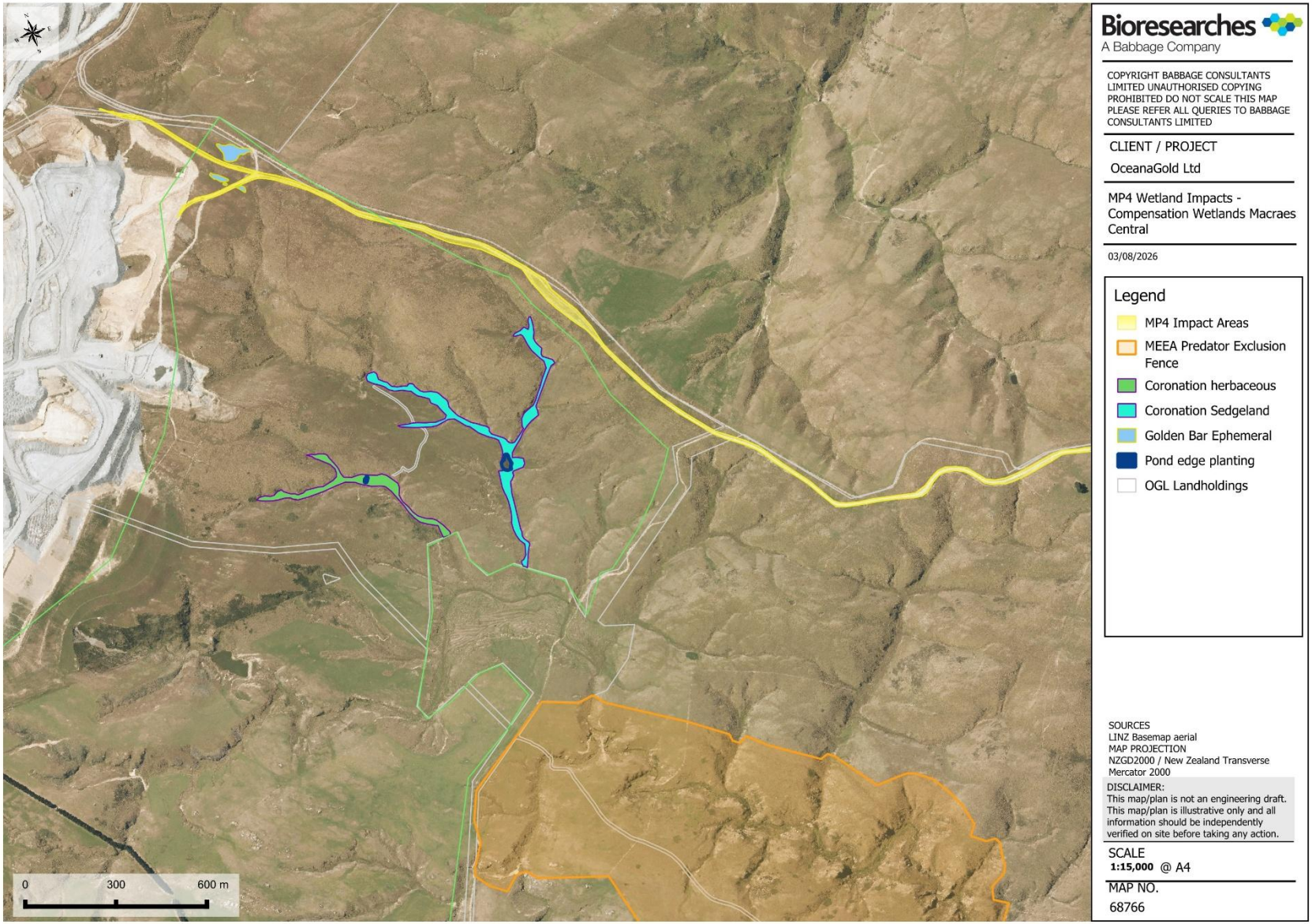


Figure 4-3. Indicative wetland compensation locations within Macraes Central

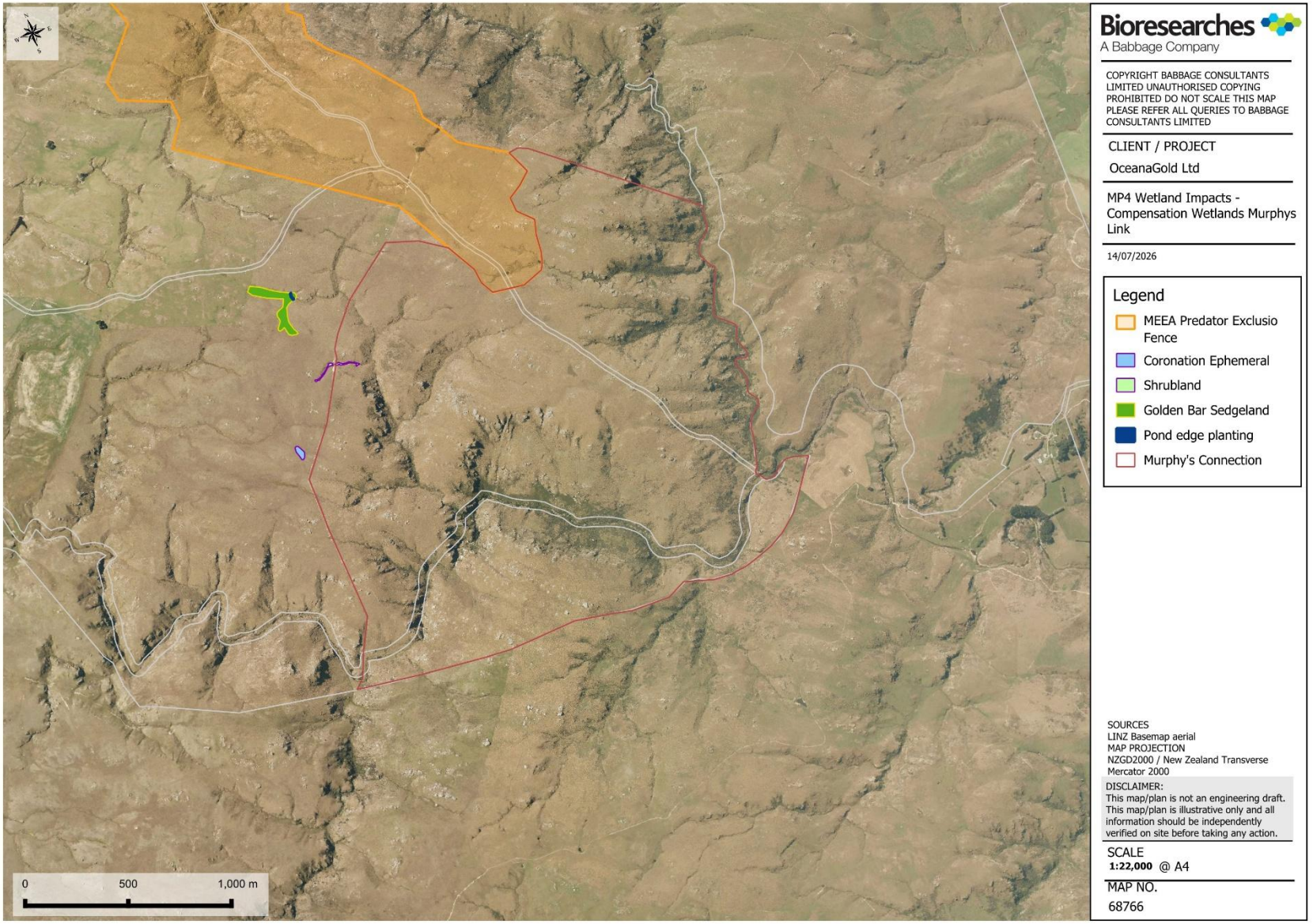


Figure 4-4. Indicative wetland compensation locations adjacent to Murphys Connection

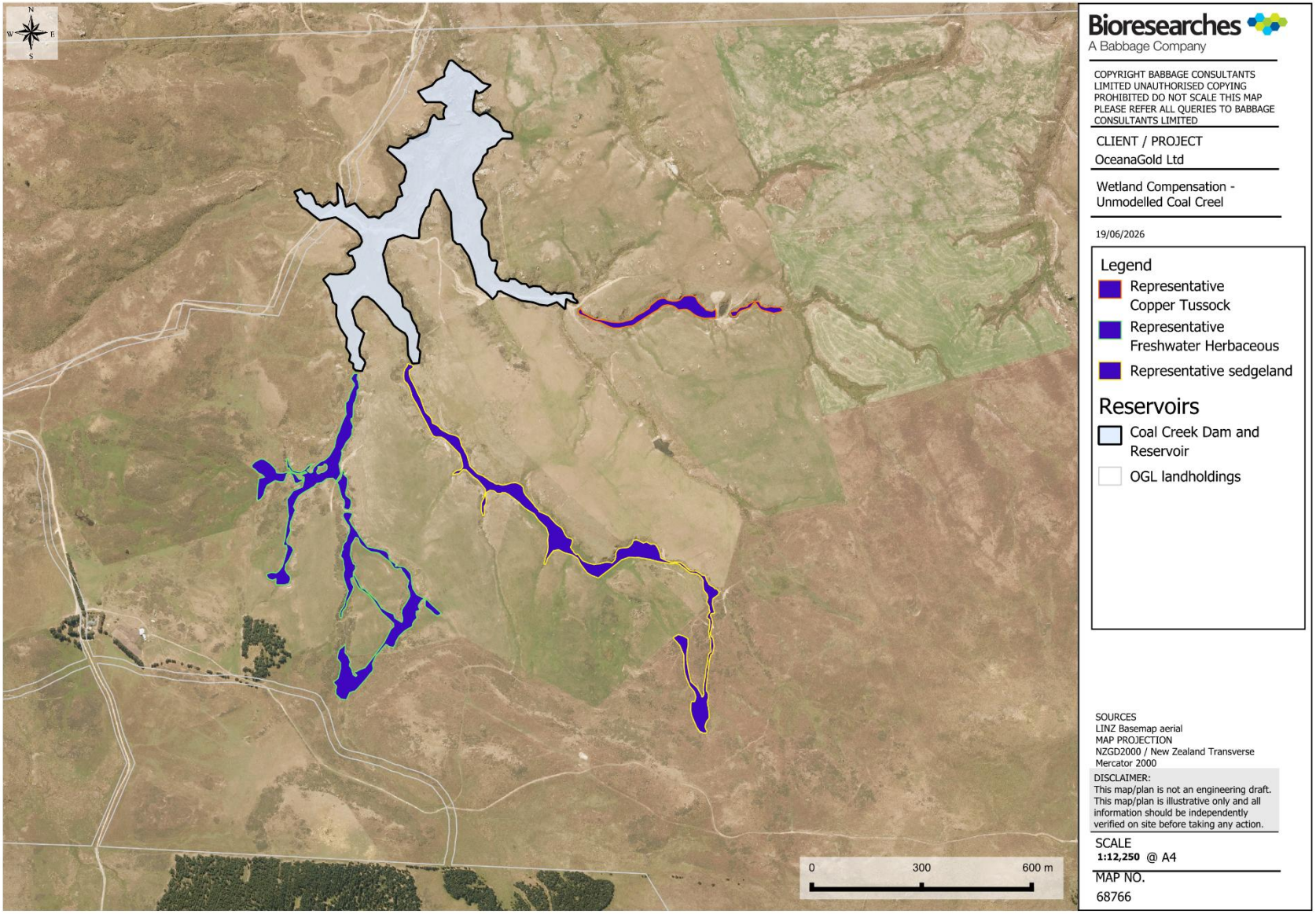


Figure 4-5. Indicative wetland compensation locations at Coal Creek Headwaters

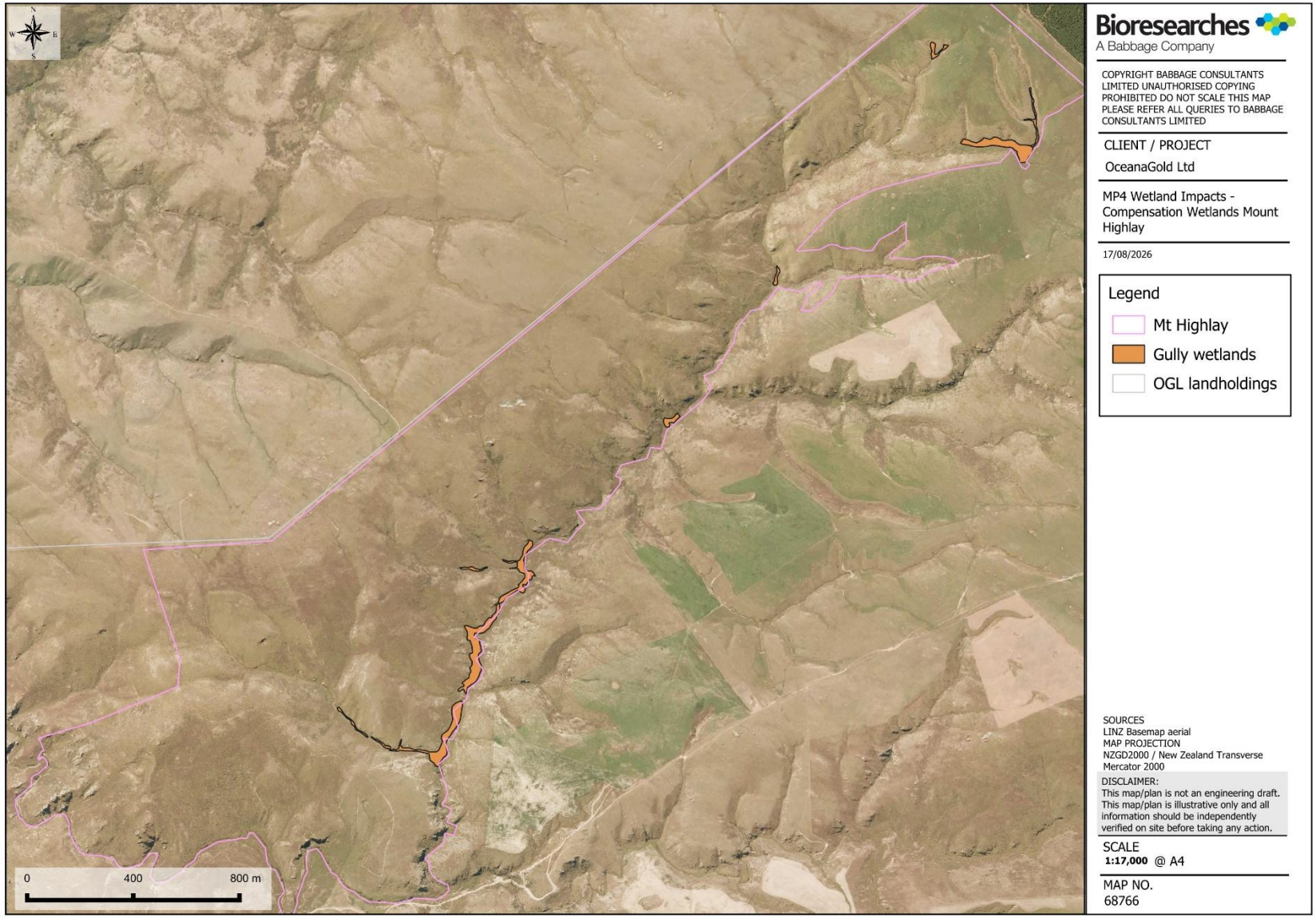


Figure 4-6. Indicative wetland compensation locations at Mount Highlay

5 RESIDUAL EFFECTS MANAGEMENT STRATEGY

Offsetting and Compensation are recognised tools for counterbalancing residual adverse effects on ecological values in New Zealand and internationally. Within New Zealand, offset and compensation are defined under the National Policy Statement for Freshwater Management 2020 (NPS-FM) and are applied to more than minor residual adverse effects on a wetland or river after steps to avoid, minimise and remedy adverse effects are demonstrated to have been sequentially exhausted (Appendix 6 and Appendix 7, NPS-FM, 2020)).

Offsetting or compensation is required to ensure that residual adverse effects on wetlands are adequately addressed. Both offsets and compensation typically involve project-specific ecological restoration and enhancement activities. A key difference between offsets and compensation is that offsets must be demonstrated via a like-for-like quantitative loss/gain calculation (Baber et al. 2025). In contrast, compensation does not require this calculation, but indigenous biodiversity values lost must be addressed by positive effects that "outweigh" the adverse effects.

As required as for the application of residual effects management, the ecological value of the impacted wetlands and the wetland areas proposed for restoration were assessed utilising the Ecological Impact Assessment (EcIA) Guidelines for use in New Zealand, published by the Environmental Institute of Australia and New Zealand (EIANZ) (Roper-Lindsay et al., 2018). Information gathered during site visits between January and May 2026 was also utilized to inform the ecological value assessments.

This Residual Effects Analysis Report addresses the residual effects of the proposed project's impacts on wetland extent and values situated throughout a modified ecological landscape. As such, the proposed residual effects strategy intends to enhance degraded wetland ecosystems and trade up those which are currently "freshwater herbaceous" with a recognised ecosystem extent which is known to be able to establish within the area, namely WL16 "Red tussock, *Schoenus pauciflorus* tussockland".

5.1 Limitations and Constraints

The current application has relied on a package of flora survey data, primarily supplied within the Values Report (Whirika, 2026), for the impact wetlands, and has applied this dataset to the BOAM. However, revisions have, in part, resulted in some data points being discounted, and therefore lowering the confidence in the representativeness of existing datasets within the impact area. For example, supplied data used to describe wetland ecosystems (such as percent cover, indigenous species richness, TAR presence) within the impact area at Coronation North, relied on only 15 plots to represent 17 wetlands, including wetland mosaics with shifts in ecosystem type. Within the buffer zone only 12 plots within 10 wetlands have been provided. Whilst the preference is for plot data to be collected from each identified wetland, it is acknowledged different wetlands may contain similar vegetation structure to that represented in wetland plots undertaken within an adjacent impacted wetland area.

The seepage wetland mapped at Coronation is approximately 0.02 ha in size, however, review of site photographs and communication with field staff indicates this seep to be significantly smaller than mapped, approximately 5 m^2 (Photo 8). This more extensive area (0.02 ha) has been accounted for within the total wetland loss calculations within the impact assessment; however a degree of practicality has been applied to the compensation package in determining ecological gains as it pertains to seepage wetlands.

Photo 8. Identified seepage wetland at Coronation. **Images supplied by Whirika**

Throughout the Project Area approximately 9% of the supplied wetland plots located within mapped wetland extents, failed with certainty, both the Dominance Test and Prevalence Index (i.e. they failed to meet the criteria for natural inland wetlands). These plot calculations were therefore excluded from the wetland BOAM calculations. However, whilst these plots have been excluded from the calculations, these mapped area of 'wetland' have been incorporated into the area of loss on a conservative basis. This is to ensure any discreet areas of wetland not detected during the supplied survey data are accounted for, and any seasonal shifts (noting field surveys were undertaken in summer) in vegetation communities are captured, producing a conservative estimate on wetland lost and subsequent compensation measures. In order to address these data limitations, further field surveys of impact and compensation wetlands are intended to be undertaken in Spring 2026 to identify vegetation within the growing season.

In addition to identified data limitations, the overall residual effects management will be unable to achieve no-net-loss in wetland *extent* due to landscape and site constraints, reducing the ability to purposefully create wetland habitats without creating an adverse effect to other aquatic ecosystems, resulting in 'leakage', which would not satisfy the principals for offset as per Principal 5 of Appendix 6 within the NPS-FM.

A net loss in wetland extent will occur, and in regards to wetland values, the residual effects package has defaulted to compensation as there are a number of limitations and constraints, reducing the robustness and rigour of the wetland data set to meet the offsetting standards. The overall residual effects package is therefore determined to better align with biodiversity compensation.

In undertaking the biodiversity compensation, the BOAM is still used to sense check that the overall residual effects management approach otherwise aligns with the principles for biodiversity offsetting, and that *values* are as close as possible to like-for-like.

Precautions have been applied to the residual effects modelling, including reduced confidence settings in the BOAM, and modelling loss of additional wetland extent located within the 20 m buffer zone, to reduce uncertainty where possible. These conservative inputs are described below:

- Reduced Confidence: reducing confidence to low accounts for uncertainty in the compensation due to limited information on successful restoration of wetland types within the local landscape, decreasing the overall BOAM outputs generating, and creating more conservative estimates of positive outcomes.
- Increased time to endpoint: wetland restoration and planting on gully wetlands, such as sedgelands and herbaceous wetlands which can typically establish within 18 months to two years. This increase in time to endpoint reflects the site conditions and the untested compensation measures as it pertains to TAR flora propagation and enrichment and ephemeral wetland restoration.
- Additional wetland extent: by accounting for mapped wetland extent which may not meet the definition of a natural inland wetland, and including wetlands present within the 20 m buffer, this conservative action therefore accounts for any potential discrepancy in wetland identification.

The loss of natural inland wetlands across the ecosystem extents; Sedgeland, herbaceous freshwater, shrubland wetland, seepages and ephemeral, throughout the MP4 project area will be compensated through the creation and enhancement of wetlands in Murphys Link, Cranky Jims Link and Macraes Central. These compensation sites, particularly those ephemeral wetlands located at Macraes Central, may be substituted for ephemeral wetland extent located in more appropriate areas are identified.

It is further noted that, where additional biodiversity gains are anticipated from the overall residual effects package (creation of ephemeral wetland extents) these are not quantified in residual effects modelling, or considered to form part of the compensation package. This is due to the experimental approach in constructing ephemeral wetlands for biodiversity gains, which does not have the scientific rigour, in the New Zealand context. Therefore, the creation of ephemeral wetlands cannot form part of the modelled compensation actions to address residual adverse effects.

To address the existing information limitations, further baseline and condition data will be collected at the impact and residual effects management sites before relevant works and management actions are implemented. The BOAMs will then be updated and reapplied using the improved datasets, refined management assumptions and confirmed implementation areas. Where the updated modelling and supporting evidence demonstrate that the applicable biodiversity offset principles and standards can be achieved, those components of the package may subsequently be verified and managed as biodiversity offsets. Components for which equivalence, certainty or offsetting standards cannot be demonstrated will continue to be treated as biodiversity compensation

5.2 Biodiversity Offset Accounting Model

The BOAM is a quantitative decision-support tool used to assess whether proposed biodiversity offsets are sufficient to counterbalance residual adverse effects and achieve no net loss, or preferably a net gain, in biodiversity values. BOAM operates by disaggregating biodiversity into key components (such as vegetation structure, hydrological integrity, and indigenous biodiversity) and assigning scores to attributes within each component based on condition, extent, and ecological function. These values are then used to calculate a Net Present Biodiversity Value (NPBV), which incorporates time lags, risk of failure, and uncertainty through discounting and confidence multipliers, enabling comparison of biodiversity losses and gains over time (Department of Conservation, 2014).

A key feature of the BOAM framework is its requirement for like-for-like accounting across biodiversity components, ensuring that gains in one component do not mask losses in another. This aligns with best-practice offsetting principles, including equivalence, additionality, and transparency, and supports robust, defensible offset design under the effect's management hierarchy. By explicitly accounting for temporal delays and uncertainty, BOAM provides a precautionary and structured approach to demonstrating offset adequacy and informing consent conditions and long-term management commitments (Department of Conservation, 2014; Pilgrim et al., 2013).

In this assessment, BOAM is used as the primary method to quantify biodiversity losses and gains and to determine the scale and type of restoration and enhancement actions required. The model outputs are used to demonstrate that the proposed compensation package can achieve at a net positive, in aquatic biodiversity values over an appropriate ecological timeframe. Details regarding the application of the BOAM on wetlands is presented in APP

5.3 BOAM Outputs

5.3.1 Summary

The wetland BOAM models quantify the balance between biodiversity losses and gains for wetland types across the three project areas (Coronation North, Macraes Central, and Golden Bar), expressed as NPBV. The outputs provide a transparent assessment of whether the proposed compensation package achieves positive effects on wetland vegetation values that outweigh the adverse effects. The percentile changes between the impact site and the compensation has been calculated to demonstrate whether the proposed compensation measures have achieved net positive outcome, or whether loss in biodiversity values has occurred (Table 5-1).

Table 5-1. BOAM Output Summary Table and model outcomes

Project Area	Biodiversity Component	Biodiversity Attribute	Biodiversity Value at Compensation Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Biodiversity value difference between compensation and impact	Expected Outcome
Coronation	Ephemeral wetland	Indigenous species richness	0.19	-0.20	0.00	-0.01	Net Loss
		TAR plant presence	0.31	-0.20	0.12	0.59	Net Positive
		Native plant cover	0.18	-0.25	-0.07	-0.28	Net Loss
	Herbaceous	Indigenous species	1.18	-0.58	0.60	1.04	Net Positive
		TAR plant presence	1.39	-1.04	0.35	0.34	Net Positive
		Hydrological integrity	0.44	-0.89	-0.45	-0.50	Net Loss
		Indigenous species richness	1.03	-0.96	0.07	0.07	Net Positive
	Sedgeland	Indigenous species relative cover	0.33	-0.32	0.01	0.02	Net Positive
		TAR plant presence	0.85	-0.37	0.48	1.31	Net Positive
		Hydrological integrity	0.12	-0.43	-0.31	-0.72	Net Loss
		Indigenous species richness	0.26	-0.30	-0.04	-0.12	Net Loss
Central Mining Area	Ephemeral wetland	Indigenous species richness	0.17	-0.23	-0.06	-0.25	Net Loss
		TAR plant presence	0.47	-0.31	0.16	0.50	Net Positive
		Native plant cover	0.30	-0.20	0.09	0.47	Net Positive
	Sedgeland	Indigenous species	0.16	-0.10	0.06	0.57	Net Positive
		TAR plant presence	0.15	0.00	0.15	153.60	Net Positive
		Hydrological integrity	0.03	-0.10	-0.07	-0.72	Net Loss
		Indigenous species richness	0.08	-0.03	0.05	1.58	Net Positive
	Herbaceous	Indigenous species	0.08	-0.01	0.08	12.77	Net Positive
		TAR plant presence	0.06	0.00	0.06	56.13	Net Positive
		Hydrological integrity	0.00	-0.14	-0.14	-1.01	Net Loss

		Indigenous species richness	0.09	-0.02	0.07	3.28	Net Positive
Golden Bar	Ephemeral wetland	Indigenous species richness	0.29	-0.05	0.10	5.00	Net Positive
		TAR plant presence	0.39	0.00	0.19	194.00	Net Positive
		Native plant cover	0.25	-0.11	0.01	0.14	Net Positive
	Sedgeland	Indigenous species	0.43	-0.14	0.29	2.00	Net Positive
		TAR plant presence	0.27	0.00	0.27	272.90	Net Positive
		Hydrological integrity	0.11	-0.18	-0.08	-0.41	Net Loss
		Indigenous species richness	0.14	-0.07	0.07	1.00	Net Positive
	Herbaceous	Indigenous species	0.49	0.00	0.49	486.08	Net Positive
		TAR plant presence	0.46	0.00	0.46	459.43	Net Positive
		Hydrological integrity	0.05	-0.21	-0.16	-0.76	Net Loss
		Indigenous species richness	0.52	-0.03	0.48	14.16	Net Positive
Golden Bar	Shrubland	Indigenous species	0.02	-0.03	-0.01	-0.32	Net Loss
		TAR plant presence	0.05	-0.02	0.03	1.50	Net Positive
		Hydrological integrity	0.00	-0.02	-0.01	-0.78	Net Loss
		Indigenous species richness	0.01	-0.01	0.01	0.66	Net Positive
Camp Creek	Sedgeland	Indigenous species	0.52	-0.04	0.47	10.83	Net Positive
		TAR plant presence	0.74	0.00	0.74	739.00	Net Positive
		Hydrological integrity	0.06	-0.04	0.02	0.42	Net Positive
		Indigenous species richness	-0.06	-0.01	-0.07	-5.80	Net Loss
	Herbaceous	Indigenous species	0.20	0.00	0.20	94.79	Net Positive
		TAR plant presence	0.27	-0.19	0.08	0.42	Net Positive
		Hydrological integrity	0.01	-0.12	-0.12	-0.92	Net Loss
		Indigenous species richness	0.14	-0.11	0.03	0.26	Net Positive

5.3.2 Coronation North

Table 5-2. BOAM justifications of sedgeland (direct and dewatering) within Coronation

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Sedgeland	Percent of indigenous species cover	**91** Median % cover of indigenous species throughout vegetation plots undertaken within Benchmark WL16 wetland	**53** Median indigenous vegetation throughout Sedgeland wetland plots surveyed at Coronation north	**Restoration and enhancement** of 1.68 ha of Sedgeland wetland Confidence >50-<75%	**90%** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Reduction in exotic vegetation through weed control to promote indigenous growth	0.01
	Threatened At Risk Plant Presence	2 Count of TAR species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland	**2** Greatest count of Threatened and/or At Risk plants present within Sedgeland	**Restoration and enhancement** of 1.68 ha of Sedgeland wetland Confidence >50-<75%	**5** Seven years	Introduction of TAR plant specimens to the restoration planting	0.48
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.76** Average cover of hydric vegetation within Sedgeland plot points throughout Coronation North	**Stock exclusion and buffer planting** of 1.68 ha of Sedgeland wetland Confidence >50-<75%	**0.95** Seven years	Removal of stock impacts, including grazing and pugging to restoring hydrological function of the wetland and resultant minimisation dryland plant presence	-0.31
	Indigenous species richness	**13** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland	**7** Count of indigenous vegetation species located within all Sedgeland wetland to be reclaimed at Coronation north	**Restoration and enhancement** of 1.68 ha of Sedgeland wetland Confidence >50-<75%	**13** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Includes the introduction of turfing species within existing stock ponds situated within the compensation wetland. Planting of 15 m protective buffer around the wetland body.	-0.04
							0.04

Table 5-3. BOAM justifications of freshwater herbaceous (direct) within Coronation

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Freshwater Herbaceous	Percent of indigenous species cover	**91** Median indigenous species cover from reference Copper Tussock wetland	**42** Median indigenous vegetation cover throughout freshwater herbaceous wetland plots surveyed at Coronation north	**Restoration and enhancement** of 3.32 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**90%** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Reduction in exotic vegetation through weed control to promote indigenous growth	0.60
	Threatened At Risk Plant Presence	**2** Count of TAR species present within reference Copper Tussock wetland	**0** Count of total Threatened and/or At Risk plants present within all freshwater herbaceous wetlands	**Restoration and enhancement** of 3.32 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**5** Seven years	Transplanting of At Risk vegetation from existing wetland, and introduction of TAR to re-instated copper tussock restoration planting	0.35
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.70** Median cover of hydric vegetation within freshwater herbaceous plot points throughout Coronation North	**Stock exclusion and buffer planting** of 3.32 ha of copper tussock wetland Confidence >50-<75%	**0.95** Seven years	Removal of stock and stock impacts (grazing and pugging) restoring hydrological function of the wetland to minimising dryland plant prevalence.	-0.45
	Indigenous species richness	**13** Count of indigenous species identified within copper tussock wetland	**10** Count of indigenous vegetation species located within all herbaceous freshwater wetlands to be reclaimed at Coronation north	**Restoration and enhancement** of 3.32 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**10** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Planting of 15 m protective buffer around the wetland body.	0.07
							0.14

Table 5-4. BOAM justifications of ephemeral wetlands within Coronation

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Ephemeral	Indigenous species richness	**8** Count of indigenous species identified/observed within benchmark reference	**4** Average indigenous vegetation cover within seepage wetland plots surveyed at Coronation north	**Restoration and enhancement** of 0.78 ha of existing ephemeral wetland Low confidence >50% <75% %	**8** Fifteen years	Extensive weed control, including topsoil striping and planting of appropriate turfing species.	0.00
	Threatened At Risk Plant Presence	**2** Count (+1) of TAR plant species within benchmark reference	2 Greatest count of Threatened and/or At Risk plants present within seepage wetland within Coronation North	**Restoration and enhancement** of 0.78 ha of existing ephemeral wetland Low confidence >50% <75% %	**3** Fifteen years	Receival of TAR plants salvaged at impact wetlands and planting of TAR plants. Controlled and selective grazing from sheep during dry hydroperiod.	0.12
	Native plant cover	**77** Greatest indigenous species cover within vegetation plot in benchmark reference	**52** Average cover of indigenous vegetation within ephemeral wetlands throughout Coronation	**Restoration and enhancement** of 0.78 ha of existing ephemeral wetland Low confidence >50% <75%	**50** Fifteen years	Extensive weed control, planting of appropriate turfing species and controlled grazing. Creation of 20 m buffer from planted and VDT tussock to limit exotic plant invasion	-0.07
							0.01

5.3.3 Golden Bar

Table 5-5. BOAM justifications of sedgelands within Golden Bar

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Sedgeland	Percent of indigenous species cover	**91** Median indigenous species cover from reference Copper Tussock wetland	**18** Median indigenous vegetation throughout Sedgeland wetland to be reclaimed at Golden Bar	**Restoration and enhancement** of 1.63 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**95** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness.	0.29
	Threatened At Risk Plant Presence	**2** Count of TAR species present within reference Copper Tussock wetland	**0** Greatest count of Threatened and/or At Risk plants present within Sedgeland wetland to be reclaimed at Golden Bar	**Restoration and enhancement** of 1.63 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**2** Seven years	Transplanting of At Risk vegetation from existing wetland, and introduction of TAR to herbaceous restoration planting	0.27
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.24** Average cover of hydric vegetation within Sedgeland wetland to be reclaimed at Golden Bar	**Stock exclusion and buffer planting** of 1.63 ha of copper tussock wetland Confidence >50-<75%	**0.95** Seven years	High plant densities and removal of stock impacts reduces invasion of dryland plant species, restoring hydrological function of the wetland to minimise dryland plant presence.	-0.08
	Indigenous species richness	**12** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland Count of indigenous species identified within copper tussock wetland	**2** Count of indigenous vegetation species located within all Sedgeland wetland to be reclaimed at Golden Bar	**Restoration and enhancement** of 1.63 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	9 Seven years	Established approach to revegetation within a compensation wetland with a higher indigenous species richness (n=11). Planting of 15 m protective buffer around the wetland body.	0.07
							0.14

Table 5-6. BOAM justifications of herbaceous wetlands within Golden Bar

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Freshwater Herbaceous	Percent of indigenous species cover	**91** Median indigenous species cover from reference Copper Tussock wetland	**0** Median indigenous vegetation cover throughout freshwater herbaceous wetlands removed at Golden Bar	**Restoration and enhancement** of 2.3 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**85** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness.	0.49
	Threatened At Risk Plant Presence	**2** Count of TAR species present within reference Copper Tussock wetland	**0** Greatest count of Threatened and/or At Risk plants present within freshwater herbaceous wetlands removed at Golden Bar	**Restoration and enhancement** of 2.3 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**2** Seven years	Transplanting of At Risk vegetation from existing wetland, and introduction of TAR to herbaceous restoration planting	0.46
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.50** Average cover of hydric vegetation within freshwater herbaceous wetlands removed at Golden Bar	**Stock exclusion and buffer planting** of 2.3 ha of copper tussock wetland Confidence >50-<75%	**0.95** Seven years	High plant densities and removal of stock impacts reduces invasion of dryland plant species, restoring hydrological function of the wetland to minimise dryland plant presence.	-0.16
	Indigenous species richness	**12** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland Count of indigenous species identified within copper tussock wetland	**1** Count of indigenous vegetation species located within all freshwater herbaceous wetlands removed at Golden Bar	**Restoration and enhancement** of 2.3 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**12** Seven years	Established approach to revegetation within a compensation wetland with a higher indigenous species richness (n=10). Planting of 15 m protective buffer around the wetland body.	0.48
							0.32

Table 5-7. BOAM justifications of ephemeral wetlands within Golden Bar

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Ephemeral	Indigenous species richness	**9** Count of indigenous species identified/observed within benchmark reference	**2** Number of indigenous flora species within ephemeral wetlands at Golden bar	**Restoration and enhancement** of 0.98 ha of existing ephemeral wetland Low confidence >50% <75% %	**6** Ten years	Extensive weed control, including topsoil striping and planting of appropriate turfing species.	0.24
	Threatened At Risk Plant Presence	**2** Count (+1) of TAR plant species within benchmark reference	**0** Greatest count of Threatened and/or At Risk plants present within ephemeral wetlands at Golden Bar	**Restoration and enhancement** of 0. 98 ha of existing ephemeral wetland Low confidence >50% <75% %	**3** Ten years	Receival of TAR plants salvaged at impact wetlands and planting of TAR plants. Controlled and selective grazing from sheep during dry hydroperiod.	0.39
	Native plant cover	**77** Greatest indigenous species cover within vegetation plot in benchmark reference	**24** Average cover of indigenous vegetation within ephemeral wetlands throughout Golden Bar	**Restoration and enhancement** of 0. 98 ha of existing ephemeral wetland Low confidence >50% <75% %	**50** Ten years	Extensive weed control, planting of appropriate turfing species and controlled grazing. Creation of 20 m buffer from planted and VDT tussock to limit exotic plant invasion	0.14
							0.26

5.3.4 Shrubland

Table 5-8. BOAM justifications of cumulative shrubland wetlands within the Golden Bar and Macraes Central.

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Shrublands	Percent of indigenous species cover	**91** Median indigenous species cover from terrestrial shrubland	**67** Percent indigenous vegetation cover within shrubland vegetation plot	**Restoration and enhancement** of 0.14 ha of corresponding wetland. Low confidence >50% <75%	**90** 5 years	Indigenous vegetation planting through	-0.01
	Threatened At Risk Plant Presence	**2** Count of TAR species present within reference Copper Tussock wetland	**1** Count of Threatened and/or At Risk plants present within within shrubland vegetation plot	**Restoration and enhancement** of 0.14 ha of corresponding wetland. Low confidence >50% <75%	**3** 5 years	Planting of additional TAR species, such as piripiri which is present within the impact shrubland	0.03
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.91** Proportional cover of hydric vegetation within within shrubland vegetation plot	**Restoration and enhancement** of 0.14 ha of corresponding wetland. Low confidence >50% <.	**0.95** 5 years	Removal of stock, fencing and buffer planting to remove	-0.01
	Indigenous species richness	**12** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland Count of indigenous species identified within copper tussock wetland	**3** Count of indigenous species recorded within shrubland vegetation plot	**Restoration and enhancement** of 0.14 ha of corresponding wetland. Low confidence >50% <	**9** 5 years	Increase in species richness through weed control and the planting of at least 2 two additional indigenous species (current species richness of seven). Planting of 15 m protective buffer around the wetland body.	0.01
							0.00

5.3.5 Macraes Central

Table 5-9. BOAM justifications of ephemeral wetlands within Macraes Central

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Ephemeral	Indigenous species richness	**8** Count of indigenous species identified/observed within benchmark reference	**4** Average indigenous vegetation cover within ephemeral wetlands at Macraes Central	**Restoration and enhancement** of 1.17 ha of existing ephemeral wetland Low confidence >50% <75% %	**8** Fifteen years	Extensive weed control, including topsoil striping and planting of appropriate turfing species.	-0.06
	Threatened At Risk Plant Presence	**2** Count of TAR plant species within benchmark reference	**1** Greatest count of Threatened and/or At Risk plants present within ephemeral wetlands at Macraes Central	**Restoration and enhancement** of 1.17 ha of existing ephemeral wetland Low confidence >50% <75% % %	**2** Fifteen years	Receival of TAR plants salvaged at impact wetlands and planting of TAR plants. Controlled and selective grazing from sheep during dry hydroperiod.	0.16
	Native plant cover	**77** Greatest indigenous species cover within vegetation plot in benchmark reference	**52** Average cover of hydric vegetation within freshwater herbaceous plot points throughout Macraes Central	**Restoration and enhancement** of 1.17 ha of existing ephemeral wetland Low confidence >50% <75% %	**50** Fifteen years	Extensive weed control, planting of appropriate turfing species and controlled grazing. Creation of 20 m buffer from planted and VDT tussock to limit exotic plant invasion	0.09
							0.06

Table 5-10. BOAM justifications of sedgelands within Macraes Central

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Sedgeland	Percent of indigenous species cover	**91** Median indigenous species cover from reference Copper Tussock wetland	**33** Average indigenous vegetation throughout Sedgeland wetland plots surveyed at Coronation north	**Restoration and enhancement** of 0.46 ha of Sedgeland wetland Confidence >50-<75%	**90%** Seven years	Well established approach to vegetating. The required range of species will be specifically planted to achieve a high species richness. Reduction in exotic vegetation through weed control to promote indigenous growth	0.06
	Threatened At Risk Plant Presence	**2** Count of TAR species present within reference Copper Tussock wetland	**1** Greatest count of Threatened and/or At Risk plants present within Sedgeland	**Restoration and enhancement** of 0.46 ha of Sedgeland wetland Confidence >50-<75%	**2** Seven years	Introduction of TAR plant specimens to the restoration planting	0.15
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.76** Average cover of hydric vegetation within Sedgeland plot points throughout Coronation North	**Stock exclusion and buffer planting** of 0.46 ha of Sedgeland wetland Confidence >50-<75%	**0.95** Ten years	Removal of stock impacts, including grazing and pugging to restoring hydrological function of the wetland and resultant minimisation dryland plant presence	-0.07
	Indigenous species richness	**12** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland Count of indigenous species identified within copper tussock wetland	**7** Count of indigenous vegetation species located within all Sedgeland wetland plots surveyed at Coronation north	**Restoration and enhancement** of 0.46 ha of Sedgeland wetland Confidence >50-<75%	**8** Seven years	Well established approach to vegetating. The required range of species will be specifically planted to achieve a high species richness. Planting of 15 m protective buffer around the wetland body.	0.05
							0.05

Table 5-11. BOAM justifications of freshwater herbaceous wetlands within Macraes Central.

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Sedgeland	Percent of indigenous species cover	**91** Median indigenous species cover from reference Copper Tussock wetland	**33** Average indigenous vegetation throughout Sedgeland wetland plots surveyed at Coronation north	**Restoration and enhancement** of 0.17 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**90%** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Reduction in exotic vegetation through weed control to promote indigenous growth	0.08
	Threatened At Risk Plant Presence	**2** Count of TAR species present within reference Copper Tussock wetland	**1** Greatest count of Threatened and/or At Risk plants present within Sedgeland	**Restoration and enhancement** of 0.17 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**2** Seven years	Introduction of TAR plant specimens to the restoration planting	0.06
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.76** Average cover of hydric vegetation within Sedgeland plot points throughout Coronation North	**Stock exclusion and buffer planting** of 0.17 ha of copper tussock wetland Confidence >50-<75%	**0.95** Ten years	Removal of stock impacts, including grazing and pugging to restoring hydrological function of the wetland and resultant minimisation dryland plant presence	-0.14
	Indigenous species richness	**12** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland Count of indigenous species identified within copper tussock wetland	**7** Count of indigenous vegetation species located within all Sedgeland wetland plots surveyed at Coronation north	**Restoration and enhancement** of 0.17 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**10** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Planting of 15 m protective buffer around the wetland body.	0.07
							0.01

5.3.6 Camp Creek

Table 5-12. BOAM justifications of Sedgeland within Camp Creek

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Sedgeland	Percent of indigenous species cover	**91** Median % cover of indigenous species throughout vegetation plots undertaken within Benchmark WL16 wetland	**53** Median indigenous vegetation throughout Sedgeland wetland plots surveyed at Coronation north	**Restoration and enhancement** of 1.46 ha of Sedgeland wetland Confidence >50-<75%	**95%** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Reduction in exotic vegetation through weed control to promote indigenous growth	0.47
	Threatened At Risk Plant Presence	**2** Count of TAR species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland	**2** Greatest count of Threatened and/or At Risk plants present within Sedgeland	**Restoration and enhancement** of 1.46 ha of Sedgeland wetland Confidence >50-<75%	**4** Seven years	Introduction of TAR plant specimens to the restoration planting	0.74
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.76** Average cover of hydric vegetation within Sedgeland plot points throughout Coronation North	**Stock exclusion and buffer planting** of 1.46 ha of Sedgeland wetland Confidence >50-<75%	**0.95** Seven years	Removal of stock impacts, including grazing and pugging to restoring hydrological function of the wetland and resultant minimisation dryland plant presence	0.02
	Indigenous species richness	**12** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland	**7** Count of indigenous vegetation species located within all Sedgeland wetland to be reclaimed at Coronation north	**Restoration and enhancement** of 1.46 ha of Sedgeland wetland Confidence >50-<75%	**11** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Includes the introduction of turfing within existing stockponds situated within the compensation wetland and Planting of 15 m protective buffer around the wetland body.	-0.07
							0.29

Table 5-13. BOAM justifications of freshwater herbaceous within Camp Creek

Wetland Class	Biodiversity attribute	Benchmark and justification	Impact value	Action and confidence	Biodiversity value and corresponding endpoint	Justification for endpoint and confidence (References / data)	Attribute Net Biodiversity Value
Freshwater Herbaceous	Percent of indigenous species cover	**91** Median indigenous species cover from reference Copper Tussock wetland	**42** Median indigenous vegetation cover throughout freshwater herbaceous wetland plots surveyed at Coronation north	**Restoration and enhancement** of 0.54 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**95** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Reduction in exotic vegetation through weed control to promote indigenous growth	0.20
	Threatened At Risk Plant Presence	**2** Count of TAR species present within reference Copper Tussock wetland	**0** Count of total Threatened and/or At Risk plants present within all freshwater herbaceous wetlands	**Restoration and enhancement** of 0.54 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**2** Seven years	Transplanting of At Risk vegetation from existing wetland, and introduction of TAR to re-instated copper tussock restoration planting	0.08
	Hydrological integrity	**0.98** Proportion of hydric vegetation cover, representing hydrological integrity within copper tussock wetland	**0.70** Median cover of hydric vegetation within freshwater herbaceous plot points throughout Coronation North	**Stock exclusion and buffer planting** of 0.54 ha of copper tussock wetland Confidence >50-<75%	**0.90** Seven years	Removal of stock and stock impacts (grazing and pugging) restoring hydrological function of the wetland to minimising dryland plant prevalence.	-0.12
	Indigenous species richness	**12** Count of indigenous species recorded within wetland vegetation plots, and observed throughout Benchmark WL16 wetland	**10** Count of indigenous vegetation species located within all herbaceous freshwater wetlands to be reclaimed at Coronation north	**Restoration and enhancement** of 0.54 ha of WL16 wetland as a trade-up form exotic herbaceous wetland Confidence >50-<75%	**8** Seven years	Well established approach to vegetating The required range of species will be specifically planted to achieve a high species richness. Planting of 15 m protective buffer around the wetland body.	0.03
							0.05

5.4 Ecological Outcomes

5.4.1 Predicted compensation outcomes

The predicted outcome categories in Table 5-14 provide a framework for classifying predicted biodiversity outcomes after compensation is considered. It distinguishes between modelled and unmodelled net positive outcomes according to the strength of their evidential basis, identifies cases where the balance between gains and losses remains uncertain, and records any predicted net loss by its remaining level of effect. Overall, it makes clear both the expected direction of the outcome and the degree of confidence supporting that conclusion.

Table 5-14. Predicted outcome categories following compensation actions.

Predicted outcome category	Interpretation
Net Positive (modelled)	Quantitative biodiversity models predict that gains will exceed the corresponding residual losses after accounting for relevant factors such as time lags, implementation risk, confidence and discounting. The modelling is also sense-checked against the scale, location and expected ecological effectiveness of the proposed actions. This category has the strongest evidential basis because the predicted outcome is supported by quantitative analysis, although it remains biodiversity compensation where strict like-for-like equivalence or all formal offset requirements have not been demonstrated.
Net Positive (unmodelled)	The type, scale, location and expected effectiveness of the proposed conservation actions indicate that the resulting biodiversity gains are likely to outweigh the corresponding residual losses. The conclusion is not supported by a quantitative biodiversity model and therefore has a lower level of evidential certainty than a modelled net positive outcome. It is instead based on professional ecological judgement, the available ecological evidence, and the scale and durability of the proposed conservation actions.
Uncertain	The proposed actions are expected to counter-balanced the losses, but the available information does not provide an adequate basis for determining whether those benefits will exceed, equal or fall short of the corresponding residual adverse effects.
Net Loss	The available evidence indicates that the proposed compensation actions will not fully counterbalance the corresponding residual adverse effects. A residual net loss is therefore predicted after the expected benefits of the compensation actions have been considered. The remaining effect is assigned a level of Very Low, Low, Moderate, High or Very High, with the basis for that conclusion and any relevant uncertainty clearly identified.

Across all three project areas, the impact models calculate the total biodiversity loss associated with the clearance of approximately 4.72 ha of natural inland wetland for MP4 and 0.24 ha at Camp Creek, with losses conservatively assumed to occur immediately and not at Year 0. These losses are then compared against modelled gains from revegetation and enhancement actions within the offset models.

Indigenous species richness was modelled at a relatively low benchmark (approximately 11). This then provided relatively low uplift to restoration activities and does not recognise values greater than the benchmark. It is likely indigenous species richness could be established above the modelled benchmarks, however this has been conservatively modelled.

The model outputs indicate that for MP4:

- Revegetation contributes the majority of long-term biodiversity gains, reflecting the large areas of new wetland habitat established and the eventual recovery of vegetation condition toward benchmark states. However, these gains are subject to discounting due to time lags associated with vegetation establishment and maturation.
- Enhancement actions provide earlier biodiversity gains, as improvements to existing vegetation condition occur more rapidly. These gains are particularly important in compensating temporal losses and reducing overall model risk.
- Hydrological integrity does not represent a gain in biodiversity values and returns a negative NPBV. However, this attribute has been purposefully retained to reflect/demonstrate the intended intactness of wetland ecosystems, in which hydrologically functioning wetlands should have very low percentage (<10%) of FACU or UPL plants.

Shrubland is considered to be marginal, with negative attribute values, and an NPBV of 0.00 associated with indigenous species percentage and hydrological integrity. This small area of shrubland does not meet the definition of WL20 '*Coprosma,* twiggy tree daisy scrub', and is rather ephemeral gullies which support the growth of *Shawia bullata*. To further compensate for these low gains, *Shawia bullata* is to be established throughout the riparian buffers of the compensation wetlands and appropriate tributaries and gullies to increase the overall quantity of a regionally At-Risk flora species. Through the revegetation of *Shawia bullata*, additional dispersal throughout the lower portions of the gully is expected to naturally occur. While outcomes vary between the three project areas due to differences in impact extent and model inputs, the overall pattern is consistent, with compensation gains exceeding losses for each ecosystem type when assessed independently.

The model outputs are sensitive to key assumptions, particularly time to endpoint and confidence factors. As such, the achievement of predicted gains is contingent on effective implementation of restoration actions, including revegetation success, pest and weed control, and long-term site protection.

The BOAM outputs provide a quantitative basis for concluding that the proposed compensation package for wetland vegetation is adequate to address residual effects as a result of direct and indirect impacts occurring from MP4 and Camp Creek and to an extent, Coal Creek, subject to the assumptions outlined above and the implementation of robust monitoring and adaptive management to ensure that predicted biodiversity gains are realised over time. The actions required to implement the restoration of these wetlands is detailed in the Wetland Management Plan (Bioresearches, 2026p), the requirements to monitor compensation wetlands is summarised in Section 6 below and detailed in the Wetland Monitoring Plan.

5.5 Non-quantifiable compensation

In addition to the modelled compensation outcomes, additional un-modelled compensation is proposed to be undertaken for the loss of the headwater seep wetland at Coronation, wetland extent located within the Coal Creek reservoir and induced wetlands lost through the installation and operation of seepage capture drains. This non-quantifiable compensation consists of a cumulative 16.86 ha.

5.5.1 Coal Creek Headwaters

Immediately upstream of Coal Creek, an estimated 9.07 ha of wetland extent is present, and supports wetland features based of desktop analysis (Figure 5-1). The areal extent and site features of these

wetland habitats shall be assessed in the spring survey period. In order to compensate for the loss of 2.96 ha of wetland extent present within Coal Creek, representing 2.49 ha or freshwater herbaceous, 0.26 ha of sedgeland, and 0.21 ha of copper tussock wetland at Coal Creek, it is proposed this 9.07 ha of wetland extent is stock-proof fenced and protected. In addition to the protection, these wetlands will also be a receiver site for wetland TAR flora and the VDT of indigenous sedges, rushes and tussocks that shall be salvaged within Coal Creek, keeping these flora species within the immediate area. On completion of the Coal Creek reservoir, the planting of turfing species shall be undertaken around the periphery of the dam lake, creating new turfing, lacustrine wetland extent within the local area. The protection of 9.07 ha of wetland provides a ratio of 1:3 of wetland loss to wetland protection and enrichment. These methodologies and potential species viable for transplantation and VDT is presented in the Threatened At Risk Management Plan (Bioresearches, 2026h).

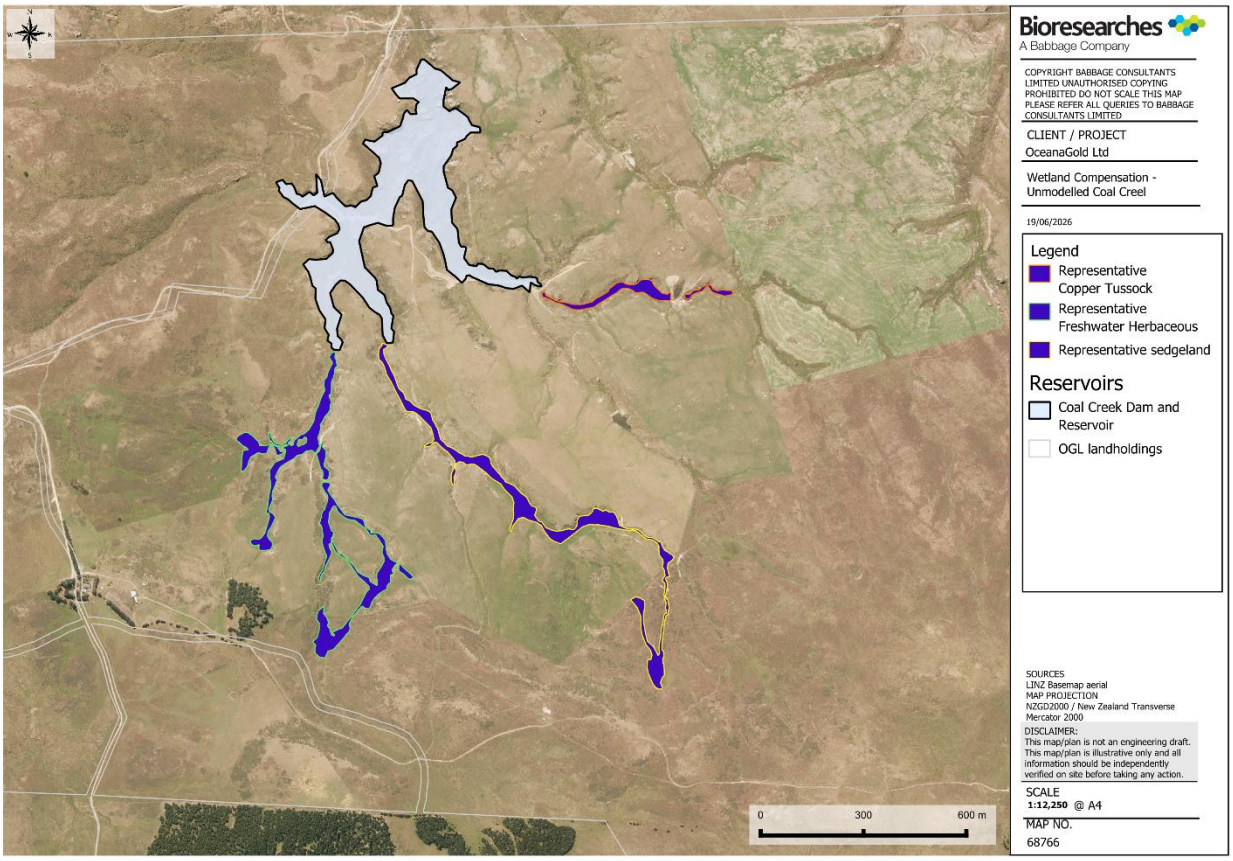


Figure 5-1. Freshwater herbaceous wetland protection throughout Coal Creek.

5.5.2 Murphys Link

The quantum of seepage and headwater wetland areas within the Murphys Link is 0.22 ha[5], whilst the area indicative to be lost at Coronation is realistically 5 m^2 in size, as outlined in Section 5.1. This compensation measure creates a 44-fold increase in seepage wetland protections, which would be achieved outside of this compensation package. This protection and the exclusion of stock from upper headwater wetlands, and their associated stream length. The restoration of headwater wetlands will benefit downstream reaches through reducing the levels of contaminants and sediments transported downstream through the natural wetland filtration process (Uuemaa et al., 2018).

[5] A greater quantum of seepage wetland has been mapped than that presented in Table 2-3. The quantum of seepage wetland in Table 2-2 is calculated of the relative percent representation of seepage wetland extent (i.e. 0.13% of impact wetland extent) within the direct impact area, compared to mapped wetland extent throughout OGNZL Landholdings.

At Murphys Link, 0.96 ha of wetland, 0.17 ha of ephemeral wetland and 2.48 ha of riparian habitats are proposed to be protected and stock removed to compensate for the loss of 0.44 ha of herbaceous wetland, potentially impacted through dewatering, and to provide further ecological protections and outcomes compared with the overall no let loss, as derived from the BOAM modelling. In total, 3.61 ha of wetland and riparian habitats will be protected as additional compensation for 0.44 ha of wetland, and additional biodiversity gains for 4.28 ha of wetland, above the compensation measures modelled. This compensation measure will protect multiple upper catchment tributaries and headwaters which ultimately drain into the Murphys Creek and Waikouaiti North Branch (Figure 5-2).

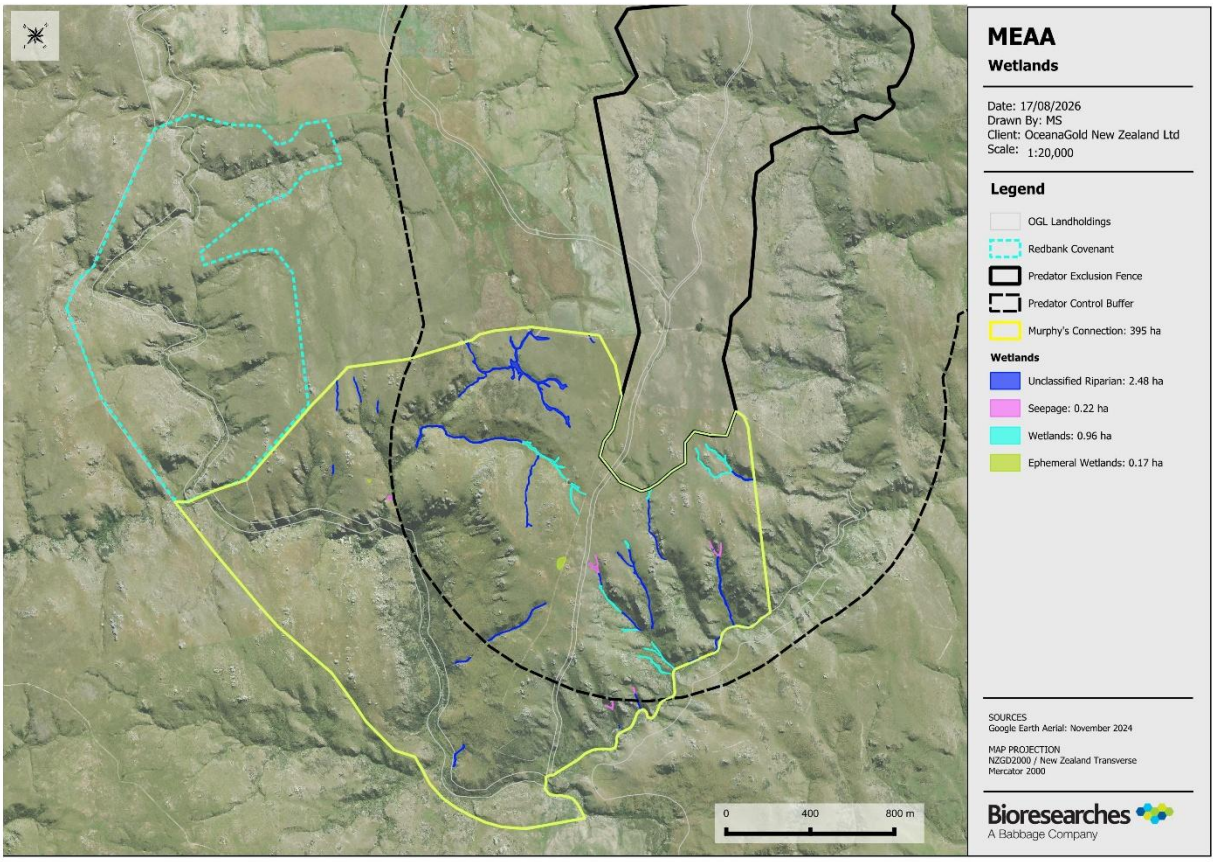


Figure 5-2. Seepage/headwater wetland protection throughout the Murphys Link.

As a form of the terrestrial residual effects management for TAR flora, nine terrestrial TAR plants require open habitat with either bare ground or low vegetation and limited competition from weeds. To maintain this habitat and provide an opportunity to research the responses of these species to difference levels of grazing for restoration purposes, a grazing study area of 10 ha shall be established for these species to be planted into and created within the Murphys Ecological Enhancement Area covenant, adjacent to farmland to provide stock access. The covenant for this land must specify that grazing by stock is allowed for research and indigenous plant preservation purposes. Wetlands and waterways in these areas must be fenced to exclude stock in accordance with the wetland compensation measures (with the exception of ephemeral wetlands which may be left open to grazing on the advice of the Project botanist).

5.5.3 Mount Highlay

The quantum of wetland situated throughout Mount Highlay consists of 4.14 ha of gully wetland. The areal extent and site features of these wetland habitats shall be assessed in the spring survey period; however, it is confirmed that a high-quality copper tussock wetland is present within the restoration area. To compensate for the loss of 3.58 ha of negligible to low-quality induced wetland extent.

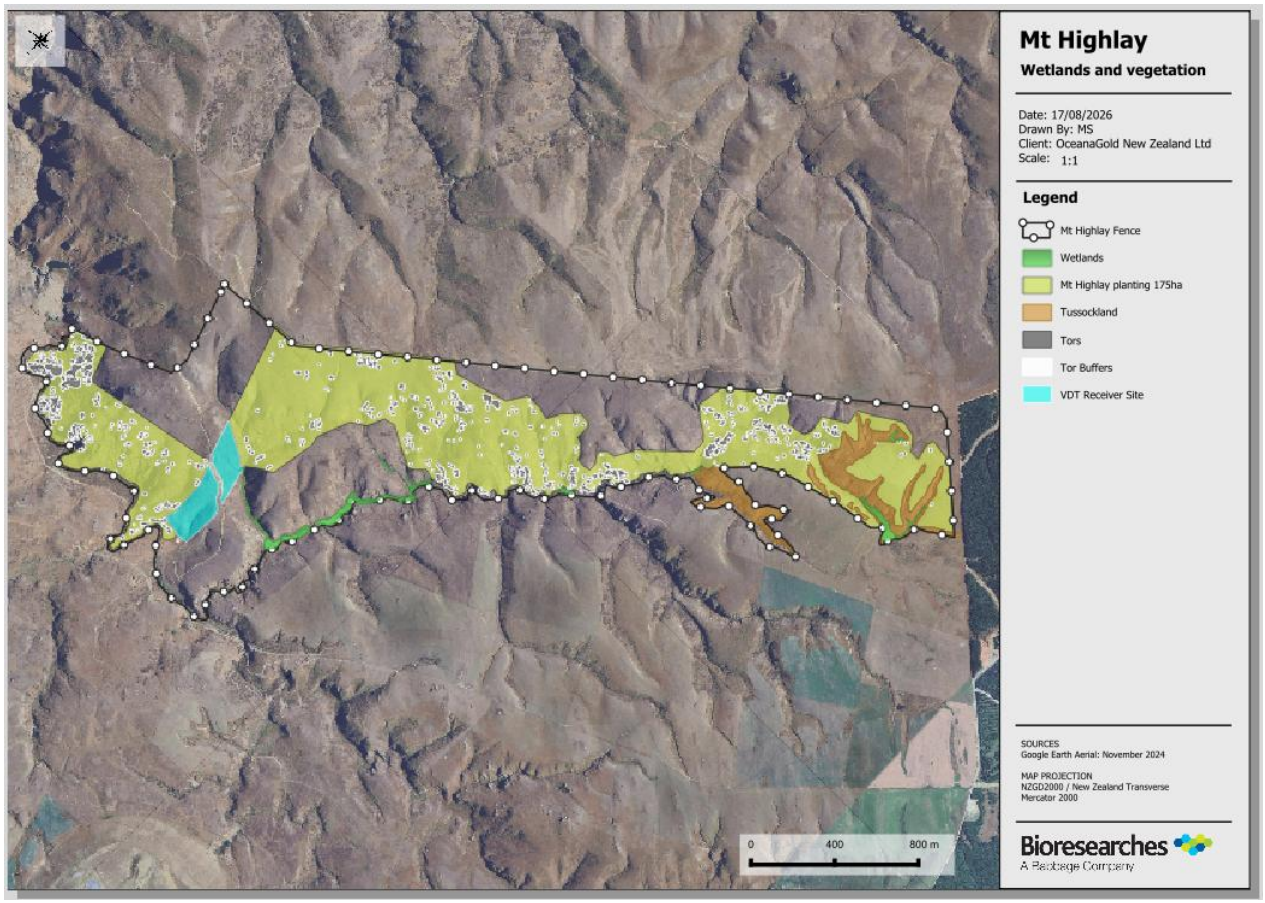


Figure 5-3. Wetland protections throughout Mount Highlay, with buffer planting provided by terrestrial planting.

Removal of stock will increase the recovery and re-naturalisation of wetlands within Mount Highlay, as made evident by the condition of the copper tussock wetland. Cattle grazing has degraded the upper extents of the wetland (outside of OGNZL Landholdings), however the lower extent which is fenced from stock contains a high cover of indigneous species, high diversity of indigenous species, a more natural hydrological regime, presence of TAR and Taoka flora species. In addition to the exclusion of stock, existing wetlands will benefit through the establishment of buffering vegetation as a component of the terrestrial residual effects actions. Whilst the ratio of loss to protection of wetlands is calculated to be 1:1, the protection and buffer planting of wetlands which have the potential to re-naturalise to high quality wetlands which will provide a much greater range of ecosystem services, such as flora and fauna habitat, water quality control, TAR habitats and form distinct ecotones with the proposed tussock planting, in excess of those wetlands proposed to be lost.

5.6 Anticipated Ecological Outcomes

Ephemeral wetlands have been conservatively considered to be uncertain due to uncertainties in restoration techniques and evidence is considered to be insufficient to determine whether the gains will fully counterbalance the losses. All wetland types, excluding ephemeral wetlands are predicted to achieve a net positive ecological outcome (Table 5-15). This is supported through the quantitative modelling and broader unmodelled benefits from protection, stock exclusion and receiving of TAR wetland flora.

Table 5-15. Predicted ecological outcomes following compensation measures.

Wetland type	Impact quantum and residual effect	Compensation Actions	Predicted Residual Outcome
Ephemeral wetland	Up to 1.14 ha loss. Residual effect: **Very High**	**1.8 ha** restoration planting, fencing and protection at Cranky Jims Link. **0.98 ha** restoration planting, fencing and protection at Macraes Central/Golden Bar Haul Road. **0.17 ha** at Murphys Connection.	**Uncertain** due to known difficulties in ephemeral wetland restoration.
Sedgeland	1.75 ha Residual effect: **Moderate**	**1.93 ha** restoration planting, fencing and protection Cranky Jims Link, **1.62 ha** restoration planting, fencing and protection Murphys Connection, **1.68 ha** restoration planting, fencing and protection at Macraes Central, and **3.6 ha** wetland protection in perpetuity at Coal Creek	**Net Positive (modelled and unmodelled)**
Freshwater herbaceous	4.8 ha Residual effect: **Low to High**	**2.08 ha** restoration planting, fencing and protection at Cranky Jims Link, **3.32 ha** restoration planting, fencing and protection at Macraes Central, and **4.5 ha** wetland protection in perpetuity at Coal Creek, **0.96 ha** wetland and riparian protection in perpetuity and Murphys Connection	**Net Positive (modelled and unmodelled)**
Shrubland	0.03 ha Residual effect: **Moderate**	**0.14 ha** restoration planting, fencing and protection at Murphys Connection	**Net Positive (modelled)**
Seepage	0.02 ha Residual effect: **Very High**	**0.22 ha** wetland protection in perpetuity at Murphys Connection	**Net Positive (unmodelled)**
Copper tussock	0.21 ha Residual effect: **Moderate**	**0.92 ha** wetland protection in perpetuity at Coal Creek	**Net Positive (unmodelled)**
Induced wetland	3.58 ha Residual effect: **Low**	**4.14 ha** wetland protection in perpetuity at Mt Highly	**Net Positive (unmodelled)**

6 WETLAND MONITORING PLAN

The Wetland Management and Monitoring Plan (Bioresearches, 2026h) provides the framework for assessing the effectiveness of wetland management, restoration, and compensation measures throughout the life of the Project. The plan has been developed to monitor and record the restoration efforts within the compensation wetlands in a standardised and transparent approach. This monitoring plan is intended to ensure the biodiversity outcomes determined via the BOAM and unmodelled ecological outcomes are being appropriately met, through plant establishment and wetland protections, to ensure no net loss of wetland values is achieved within the prescribed timeframe.

The plan establishes baseline conditions, monitoring methodologies, performance measures, reporting requirements, and adaptive management triggers for both retained wetlands that may be affected by Project activities and wetlands restored or enhanced as compensation for residual effects. Monitoring results will be used to evaluate whether wetland extent, hydrology, vegetation condition, and biodiversity values are being maintained or progressing toward intended ecological outcomes, and to identify and implement corrective actions through adaptive management where required.

In summary, the Wetland Monitoring Plan demonstrates how wetland outcomes will be monitored, assessed, reported, and adaptively managed. The Plan requires:

- Undertaking baseline monitoring for a minimum of one year before Project works commence to establish reference conditions for wetland extent, hydrology, vegetation composition, and condition.
- Undertaking whole-wetland condition assessments using standardised wetland condition indicators, including hydrological integrity, ecosystem intactness, vegetation quality, and evidence of disturbance.
- Establishing permanent vegetation monitoring plots and transects to measure vegetation composition, indigenous species richness, vegetation cover, wetland affinity, and restoration success over time.
- Establishing fixed photopoints and collect drone imagery to provide a repeatable visual record of wetland condition, vegetation development, wetland extent, and restoration progress.
- Monitoring compensation wetlands against biodiversity compensation performance measures, including indigenous vegetation cover, indigenous species richness, hydric vegetation cover, and establishment of Threatened and At Risk (TAR) species.
- Applying predefined adaptive management triggers for declines in species richness, reductions in hydric vegetation, TAR species establishment failures, and animal damage.
- Investigating failures and implementing corrective actions where required, including hydrological interventions, supplementary planting, enrichment planting, weed control, pest control, stock exclusion improvements, and restoration adjustments.
- Producing annual monitoring reports and detailed reviews at Year 5 (and Year 10 for ephemeral wetlands) to assess progress toward compensation and BOAM performance targets and determine whether additional management actions are required

7 ASSESSMENT AGAINST COMPENSATION PRINCIPLES

In accordance with the effects management hierarchy, adverse effects are required to be avoided, minimised, or mitigated. Where more than minor residual effects occur after avoidance, minimisation or mitigation, aquatic offsetting is provided where possible; then if aquatic offsetting is not possible, aquatic compensation is provided.

As aquatic offsetting is not possible for this site (refer Section 3.1.4), aquatic compensation will be provided for wetland loss, as a result of direct impacts and indirect impacts resulting in a reduction of wetland extent and/or values. The principles for aquatic compensation are listed and described in Appendix 7 of the NPS-FM. These principles are tabulated as Table 7-1, with a description of how each principle will be achieved by the proposed compensation package described in detail in Section 4.

Table 7-1. Principles of aquatic biodiversity compensations outlined in the NPS-FM, and how these will be achieved for the proposed works.

Compensation principle	How this will be achieved as part of the MP4 Project
Adherence to effects management hierarchy	An EcIA has been completed (Bioresearches, 2026), and through this process the effects management hierarchy has been applied. Avoidance and minimisation of ecological effects through design has been proposed where-ever this has been practicable/possible. Mitigation of potential adverse effects on wetlands has been accomplished through avoidance of wetland extent and minimised through the rescue of threatened and at-risk flora, and the management of indirect effects such as sedimentation. The loss of wetland extent and values cannot be reasonably offset, as described in Section 3.1.4 and Section 5.1 of this report, therefore, the loss of wetlands must be compensated for.
When aquatic compensation is not appropriate	Compensation can achieve the conservation outcomes specified in the NPS FM, in which positive effects of wetland restoration will outweigh adverse effects from wetland loss, in which 4.73 ha of wetland will be compensated through the restoration and enhancement of 10.56 ha of wetland. There is no net loss of irreplaceable habitat; there is adequate certainty about the success of the proposed compensation measures; and it is the most technically feasible option to address the residual effects after application of the initial steps of the effects management hierarchy.
Scale of aquatic compensation	The Project will result in a loss of 4.73 ha (MP4) and 3.2 ha (the Reservoirs) of natural wetland extent. The compensation package will result in 12.6 ha of modelled wetland compensation for MP4 and 2.01 ha of compensation for Camp Creek, through restoration from exotic, unbuffered wetlands to indigenous wetlands with native buffer planting, recreation of indigenous ecosystems within an exotic ecosystem type and the salvage of TAR plants and soil seedbanks from the impact sites. The extent of compensation exceeds the wetland loss at the impact site. It is expected that the uplift in ecological value and consequently the ecosystem services provided by the restoration of wetlands will appropriately compensate for the loss in wetland extent and values; and will lead to no net loss of biodiversity values. In addition, unmodelled compensation through the protection and stock exclusion of a cumulative 12.9 ha of wetland for seep wetland, wetland extent within Coal Creek, and to achieve additional gains above what has been modelled. Overall, 25 ha of wetland extent will be subject to compensation measures
Additionality	There are no current or future plans to undertake any of the proposed revegetation and restoration actions on the selected compensation actions. Without these compensation actions, no restoration or enhancements are planned to occur.
Leakage	The aquatic compensation design and implementation will avoid displacing harm to the restoration wetland location; and will ensure that potential harm to existing biodiversity at the proposed compensation locations will be mitigated and temporary.
Long term outcomes	All restoration actions will be legally protected in perpetuity and monitored for a minimum 15 years to ensure compensation targets are achieved.

Landscape context	The proposed compensation wetland is located within OGNZL landholdings and within the same general landscape. They are within the same ecological region and ecological district; and are all considered to be very similar wetland types.
Time lags	The BOAM models account for time lags between loss of aquatic values at the impact site and gains at the compensation Project areas Within the restoration wetlands, herbaceous wetland planting tiers will establish within a season, and will be replacing dominantly exotic species. This is time lag is assessed as temporary and medium term. Monitoring of the plantings will be undertaken in general accordance with the Clarkson et al., 2003 'Handbook for Monitoring Wetland Condition'.
Trading up	When trading up forms part of aquatic compensation, the proposal demonstrates that the aquatic extent gained are demonstrably of greater or higher value than those lost. The loss of degraded wetland extents will be exchanged for the restoration of indigenous recognised ecosystem types, such as degraded Sedgeland to WL22 (*Carex, schoenus pauciflorus* sedgeland), and freshwater herbaceous to WL16 (Red tussock, *Schoenus pauciflorus* tussockland). The proposal also shows the values lost are not comprised of Threatened or At Risk/Declining flora or fauna species. The compensation wetlands replacing the impact wetlands will be of equal or higher ecological value than those wetlands being lost
Financial contribution	This is not a consideration at this site.
Science and mātauranga Māori	The design of the aquatic compensation will be based on established and proven methods for fauna and flora management and restoration. The compensation will provide careful consideration to opportunities for maximising ecological outcomes as well as providing for interests of the landowner and including takata whenua.
Takata whenua or stakeholder participation	Takata whenua continue to be engaged and provided opportunities for participation in ecological management . Stakeholder feedback has been reviewed following a previous application and considered during updates to the current application. Engagement with stakeholders, including DOC, Council and Takata Whenua was undertaken prior to lodgemen.t
Transparency	OGNZL will deliver the aquatic compensation actions and then document its key targets and outcomes through provision of regular monitoring reports and compliance meetings in liaison with Otago Regional Council and where appropriate, the Department of Conservation. Contingency reports are part of this plan to ensure that if biodiversity compensation objectives are not met, in keeping with the BOAM parameters, further ecological enhancement/compensation activities are set out for OGNZL to meet their BOAM targets.

8 RESEARCH OPPORTUNITIES

8.1 Ephemeral wetland creation

In acknowledgement of ephemeral wetlands' critically endangered and uncommon threat status, it is proposed to re-create ephemeral wetland extent which is to be lost as a result of the disturbance. As these wetlands are hydrologically supported through temporal interactions with the ground water and rainwater, adverse impacts to streams/river and existing wetlands was considered to be avoided. The ephemeral wetland creation is considered to be an experimental action which produces research opportunities, and is not relied upon within the BOAM models, or considered to be an unmodelled compensation approach, rather a research and development opportunity as an additional benefit of the overall residual effects management package.

To ensure research opportunities are clearly recognised, implemented and reported upon, OGNZL has proposed to invest $20,000 towards supporting a post-graduate university thesis project relating to the re-creation of ephemeral wetlands and TAR flora management. This research would then provide a scientifically robust methodology on how these wetlands can be re-created, failures and achievements in their establishment and provide details on restoration actions following environmental triggers (i.e. response following drought or flood events, fire, stock access and grazing).

Induced ephemeral wetlands have been identified on the benching of waste rock stacks, where these shallow pans from unlevel ground experience temporary inundation and dryness, with wetland vegetation, namely *Glyceria declinata*, an exotic albeit hydric plant species, observed to grow (Photo 9 and Photo 10). It is therefore considered possible to create ephemeral wetlands given this threatened ecosystem type can be unintentionally induced. While this is a simplified description of ephemeral wetlands, it provides some insight into the feasibility of constructing ephemeral wetlands.

Photo 9 & Photo 10. Induced ephemeral wetland

Ephemeral wetland creation will occur over a cumulative 1.14 ha. The construction will include shallow scrapes within the landforms to provide the contour of the wetland. Landforms on which these scrapes will be undertaken may include waste rock stacks, around Macraes Central, or the proposed compensation sites to allow for easy access for construction, monitoring and maintenance. Following contouring of the constructed wetlands, appropriate soils will be placed within the wetland to expediate the formation of wetlands in comparison to the induced ephemeral wetlands. These induced wetlands were observed to form over a number of years (OGNZL, pers. Comms) due to the lack of appropriate soils

and lack of seedbanks. Where possible, soils from existing wetlands which are to be reclaimed may be rescued and translocated to the new wetlands to introduce the important soil microbes, bacteria and soil seed banks. By transplanting soils, this would then result in the transplanting of exotic species to the new wetlands. Therefore, an adaptive weed control scheme is needed to be carried out.

It is proposed that a variety of ephemeral wetland shapes, depths, contours and placement within the local landscape is undertaken to provide a series of ephemeral wetlands, and to allow researchers to determine which profile produces the greatest results. Ephemeral wetlands created will overall have a circular or oval shape to reduce the perimeter to area ratio and therefore weed invasion potential (Tang *et al*., 2023). Whilst ephemeral wetlands are indicated to have a moderate degree of drainage (Johnson and Gerbeaux, 2004), the use of a compact clay liner to reduce water loss through percolation has shown success in the creation of Vernal Pools in British Colombia (Bosman, 2018)

The creation of ephemeral wetlands is considered experimental, with no certainty or predictability on how these intended ecosystems will respond. The management and establishment of ephemeral wetlands would require an adaptive management approach, in which success and failures are documented, alongside their management techniques to provide insights on how they can be successfully managed and established.

The hydrological function of an ephemeral wetland is determined by its soil profile and the presence of a low-permeability subsurface perching layer, where this layer reduces pooling waters draining into the water table. (Perchemlides & Patterson, 2023). Compaction of the ephemeral wetland liner can therefore reduce permeability to increase the ponding and inundation of water during the wet season, which would then be covered with an appropriate soil matrix, and compacted. To encourage root penetration and plant establishment, this topsoil layer should be de-compacted using light hand tools or rakes. To prevent soil erosion and suppress invasive plant species that thrive on disturbed soils, all bare ground must be stabilised after construction to reduce erosion and sedimentation into the created wetland (Pennsylvania Natural Heritage Program, 2010).

A common challenge noted in literature about restoring ephemeral wetlands is the long-term decline of native species richness after the initial implementation phase (Tang *et al*., 2023). While active management and weeding during the first season can establish diverse native plant communities, aquatic pools often see a reduction in native species richness once maintenance ceases, and has been identified to be driven by the spatial zonation of the pools and weed invasion from the surrounding landscape (Tang *et al*., 2023). The central bottom zone of a vernal pool experiences the longest period of continuous inundation, minimising the potential for dryland weeds to invade, however in the context of Macraes, *Glyceria delicanata* would be able to colonise these longer inundation areas during the wet hydro-phase. Longer-term inundation may inhibit upland plant invasion within the central zonation of the wetland, which in term can promote greater indigenous plant growth (Gerdhardt & Collinge, 2007). The inundation may be prolonged through the excavation of larger, deeper basins. During the drier hydro-phase of ephemeral wetlands, exotic plant growth would have to be carefully managed to reduce its proliferation under more favourable conditions, such as sheep grazing whilst dry. To successfully support and restore ephemeral wetlands, management must extend beyond the pool basin into the surrounding terrestrial habitat through dense buffer planting of tussock and stock exclusion fencing. This buffer planting will minimise dryland plant invasion, as the buffer planting establishes, thereby reducing weed invasion pressures during on portion of the ephemeral wetland hydro-cycle.

9 CONCLUSION

The Macraes Phase 4 Project will result in the permanent loss of approximately 11.50 ha of wetland extent, in which 4.72 ha of natural inland wetland will be lost through MP4, 3.58 ha of wetland lost via seepage capture drains, and 3.2 ha lost through the Reservoirs. Wetland loss comprises of a range of wetland types including ephemeral wetlands, freshwater herbaceous wetlands, sedgelands, seepage wetland, wetland shrublands and copper tussock wetland. Although the affected wetlands are generally modified and support a relatively high proportion of exotic vegetation, they continue to provide important indigenous biodiversity values, including habitat for Threatened, At Risk and Naturally Uncommon flora, and several wetland types of High and Very High ecological value.

The proposed Residual Effects Management Report has been developed to address these remaining effects through restoration and enhancement of degraded wetlands within OceanaGold landholdings. The restoration programme adopts a process-based approach that prioritises reinstatement of ecological function through stock exclusion, weed control, hydrological enhancement where appropriate, protection of existing indigenous vegetation, targeted revegetation using eco-sourced indigenous species, pest animal management, and long-term monitoring and adaptive management. These measures are consistent with current restoration science, which recognises restoration of hydrological processes and the removal of ongoing degradation pressures as the primary determinants of successful wetland recovery.

Importantly, restoration has been directed towards existing degraded wetlands that retain ecological function and restoration potential, rather than attempting to recreate new wetland ecosystems. This approach provides the greatest opportunity to improve indigenous biodiversity values by increasing native vegetation cover, improving habitat condition, reducing ongoing degradation from livestock, weeds and pest animals, enhancing ecological resilience, and increasing the long-term viability of wetland ecosystems across the Macraes landscape. For ephemeral wetlands, restoration is intended to maintain their naturally seasonal hydrological regime and open vegetation structure, recognising that these ecosystems require different management from permanently inundated palustrine wetlands. Due to the rarity of some wetland ecosystems, namely ephemeral wetlands and seepage wetlands and their associated values, proposed management cannot adequately address residual effects, however the proposed wetland compensation package counterbalances these effects with clear and considerable net positive outcomes, including those of high or very high value.

The proposed restoration package also provides benefits beyond replacement of wetland extent alone. Restoration actions will improve ecological integrity, habitat quality, connectivity and resilience across a substantially larger area of wetland than is directly affected by the Project. These improvements are expected to deliver sustained gains in ecosystem function, indigenous biodiversity values and habitat for Threatened and At Risk flora, while addressing existing degradation that would otherwise continue in the absence of active management. The proposed wetland compensation package is aligned with the principals of compensation per the NPS-FM.

Collectively, the proposed restoration and enhancement measures provide a robust, measurable and ecologically defensible response to the residual adverse effects of the Project. When implemented alongside the Wetland Management Plan, Wetland Monitoring Plan, Threatened and At Risk Flora Management Plan and Pest Management Plan, the Residual Effects Analysis Report is expected to achieve long-term improvements in wetland condition and biodiversity values that appropriately counterbalance

the residual effects identified by the Ecological Impact Assessment and are consistent with the biodiversity compensation principles of the National Policy Statement for Freshwater Management 2020 and the effects management hierarchy applied to the Project.

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APPLICABILITY AND LIMITATIONS

Restrictions of Intended Purpose

This report has been prepared solely for the benefit of Oceana Gold (New Zealand) Limited as our client with respect to the brief. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such party's sole risk.

Babbage/Bioresearches acknowledges that this report will be relied on by a Panel appointed under the Fast Track Approvals Act 2024 and these disclaimers do not prevent that reliance

Legal Interpretation

Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions. Where opinions or judgements are to be relied on, they should be independently verified with appropriate legal advice.

Maps and Images

All maps, plans, and figures included in this report are indicative only and are not to be used or interpreted as engineering drafts. Do not scale any of the maps, plans or figures in this report. Any information shown here on maps, plans and figures should be independently verified on site before taking any action. Sources for map and plan compositions include LINZ Data and Map Services and local council GIS services. For further details regarding any maps, plans or figures in this report, please contact Babbage Consultants Limited.

Reliability of Investigation

Babbage/ Bioresearches has performed the services for this project in accordance with the standard agreement for consulting services and current professional standards for environmental site assessment. No guarantees are either expressed or implied.

Recommendations and opinions in this report are based on discrete sampling data. The nature and continuity of matrix sampled away from the sampling points are inferred and it must be appreciated that actual conditions could vary from the assumed model.

There is no investigation that is thorough enough to preclude the presence of materials at the site that presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable may in the future become subject to different regulatory standards, which cause them to become unacceptable and require further remediation for this site to be suitable for the existing or proposed land use activities.

Appendix A
Wetland Management Units

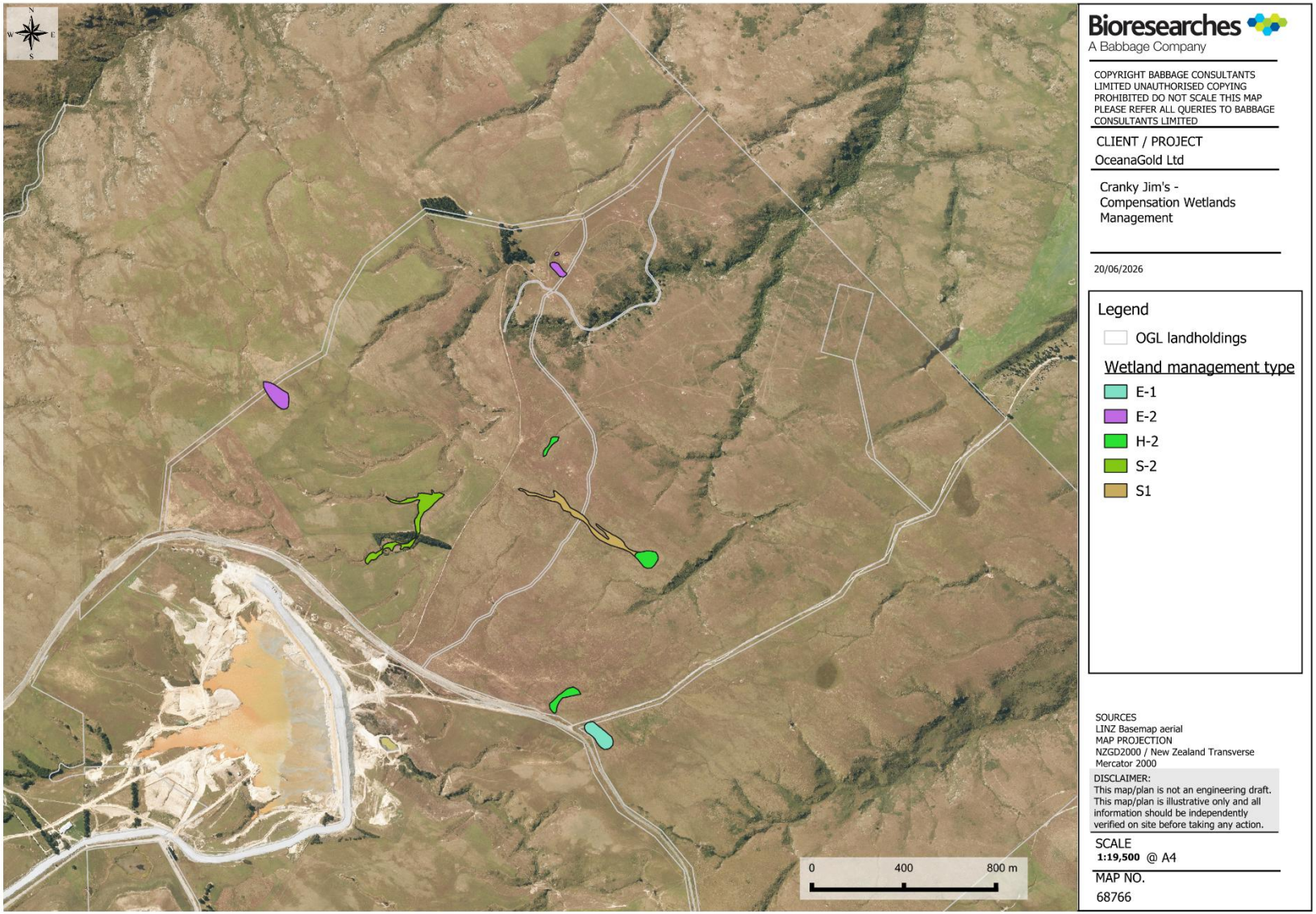


Figure 0-1. Wetland management types within Cranky Jims Link

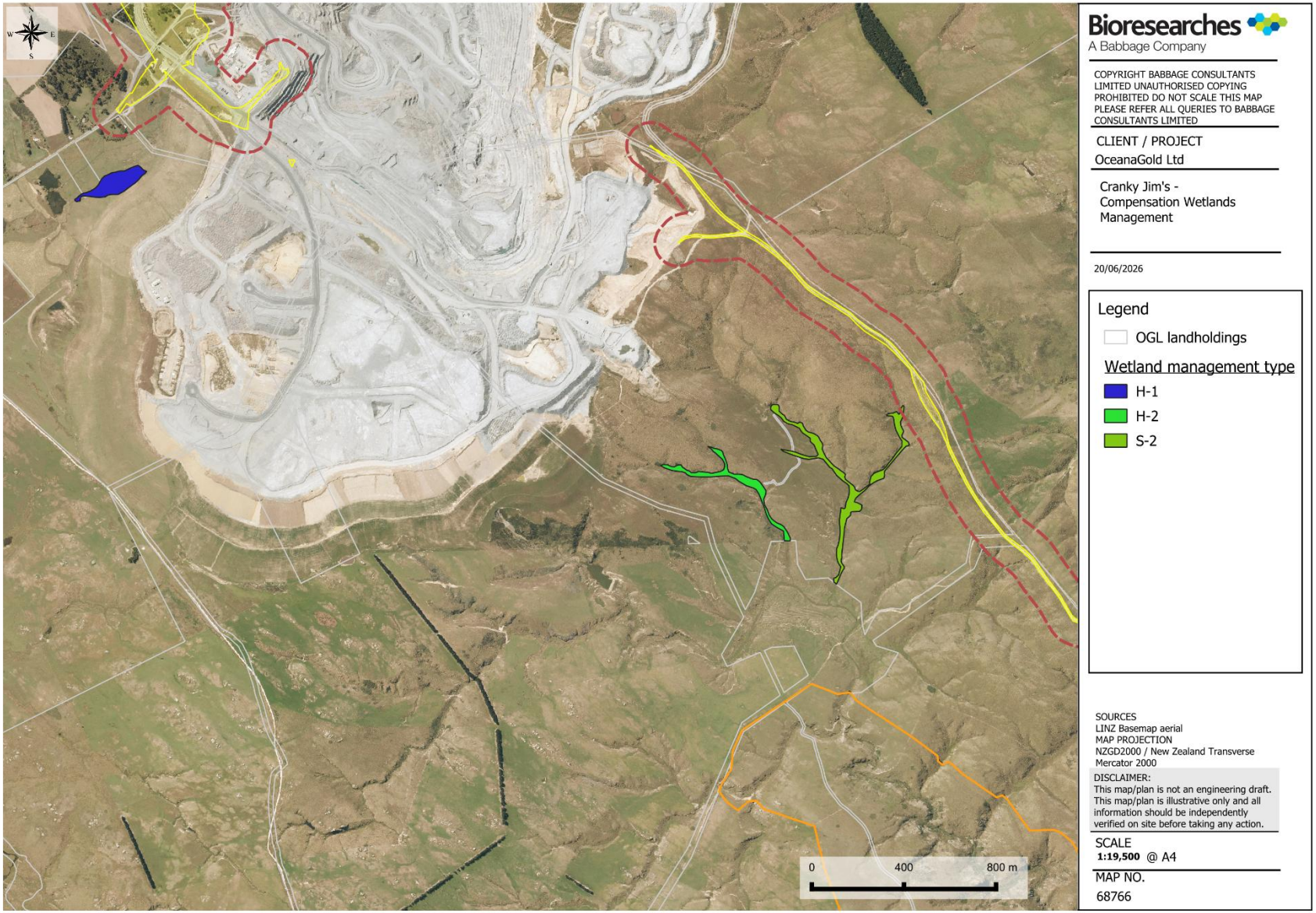


Figure 0-2. Wetland management types within Macraes Central

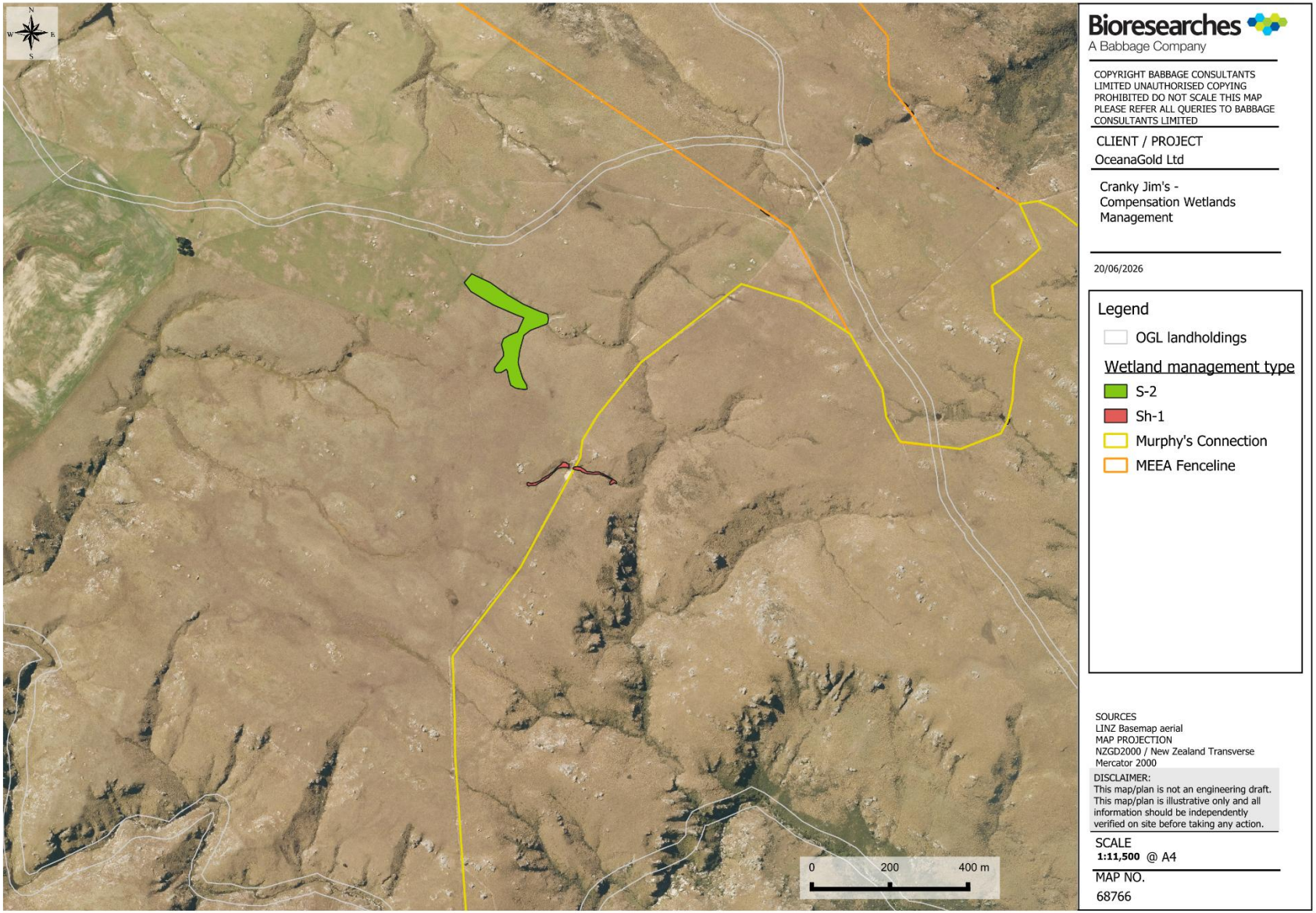


Figure 0-3. Wetland management types within Murphys Connection

Appendix B

Compensation Locations and Proximity to Project Components

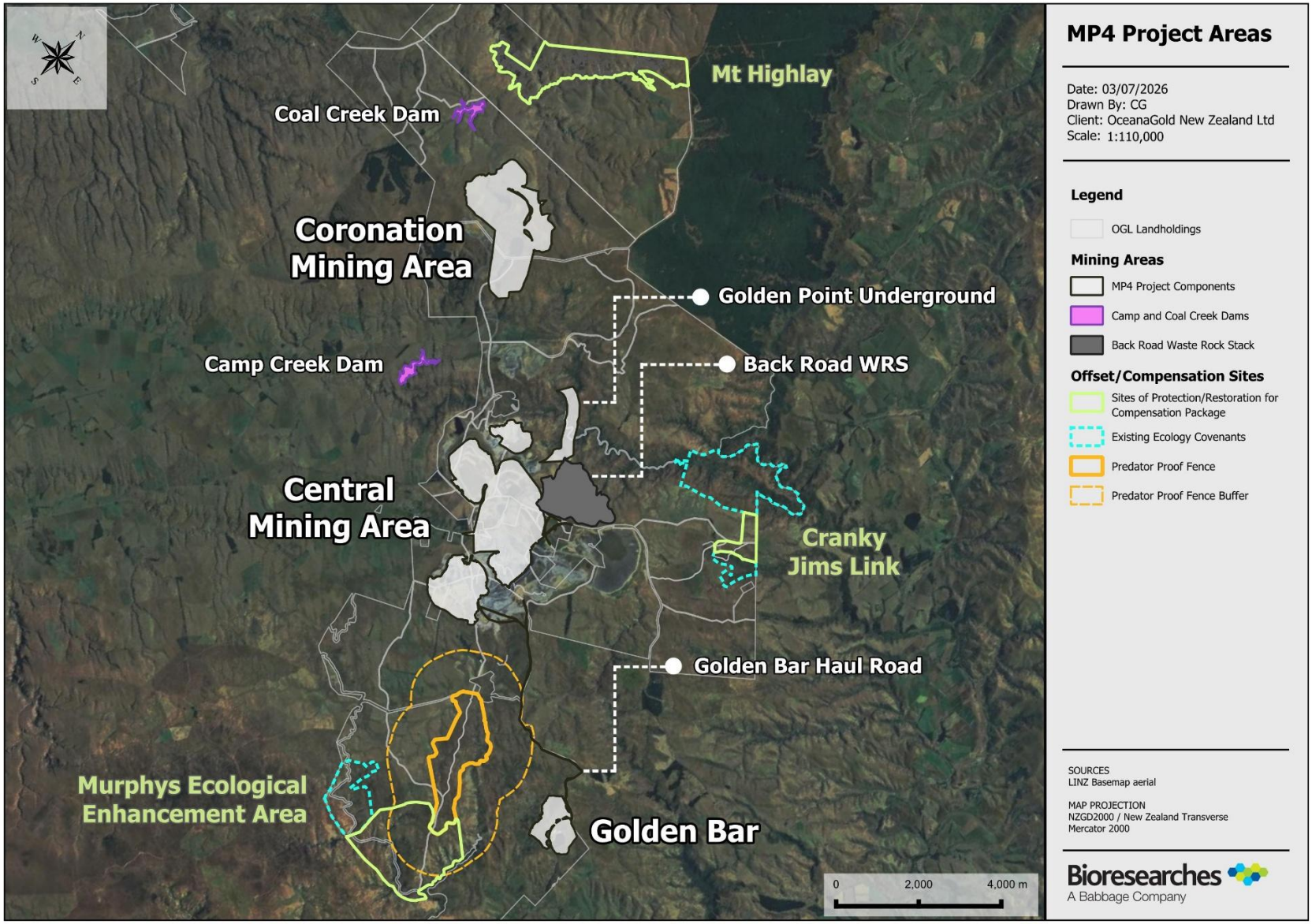


Figure 0-4. Project components of MP4

Appendix C
Compensation Package

Model Application

Wetland biodiversity components

Within the BOAM modelling framework, biodiversity components represent the ecosystem types of wetlands which are to be lost through the Project and development of consented reservoirs. The BOAM modelling framework is applied separately to the key biodiversity components affected by the Project:

- Sedgeland;
- Herbaceous Freshwater wetlands;
- Ephemeral wetlands; and
- Shrubland.

Within Camp Creek, the BOAM framework is applied separately to key biodiversity components affected, namely:

- Herbaceous freshwater
- Sedgeland

Each of these components have different ecological characteristics, data availability, and response pathways to management. Accordingly, separate BOAM models are developed for each component, with tailored biodiversity attributes, benchmarks, and assumptions. This disaggregated approach ensures that losses and gains are assessed independently for each component, avoiding aggregation effects and ensuring that gains in one component do not offset losses in another.

Overall, the use of BOAM in this manner provides a robust, transparent, and component-specific assessment of the aquatic compensation adequacy and forms the quantitative basis for demonstrating that the proposed compensation package can achieve no net loss or net gain outcomes. The data utilised in the BOAM models do not meet the rigour or robustness of offset standards and coupled with the overall loss of wetland extent, as new wetland extent will not be created, means the residual effects management for wetlands has defaulted to compensation, in which the intended package should aim to achieve no net loss and/or a net positive outcome, as informed by the BOAM.

Biodiversity Attributes

The impact models quantify the loss of wetland vegetation biodiversity values associated with the MP4 Project, based on the extent and condition of affected ecosystems prior to disturbance. Separate impact models have been developed for sedgeland, herbaceous wetlands, and ephemeral wetlands within each of the three project areas (Coronation North, Macraes Central, Golden Bar) as well as Camp Creek and Coal Creek, ensuring that losses are assessed on their specific biodiversity attributes. In regard to shrubland wetlands, no vegetation plot data are available for Coronation. The cumulative area of shrubland (0.03 ha) and vegetation condition scores, as informed by vegetation plot data at Golden Bar, has been used within the BOAM to inform compensation adequacy.

The primary inputs to the impact models include:

- **Biodiversity type and extent:** The total area of natural inland wetland loss, based on the final impact footprint.
- **Biodiversity Component**: associated wetland type. For this assessment, direct and indirect losses within MP4 comprise of approximately:
  - 1.43 ha Sedgeland;
  - 2.10 ha freshwater herbaceous wetland;
  - 1.14 ha of ephemeral wetland; and

  - 0.03 ha shrubland
- Within Camp Creek and Coal Creek, these losses comprise of approximately
  - 0.05 ha of Sedgeland in Camp Creek;
  - 0.19 ha of freshwater herbaceous wetland in Camp Creek.
- **Baseline condition (pre-impact scores):** Quantifiable vegetation condition scores are assigned to each biodiversity attribute within the BOAM framework (e.g. indigenous species richness, presence of threatened and at-risk flora, hydric vegetation integrity, cover of native species), based on field survey data and ecological assessments presented in the EcIA and supporting technical reports. These scores represent the current ecological state of the vegetation relative to benchmark (reference) conditions.
  - Proportional cover of indigenous vegetation: reflects the proportional cover of native plant species within the individual wetlands.
  - Indigenous species richness: reflects the overall number of indigenous plant species within a wetland, where a natural wetland extent is expected to contain a diverse number of flora species, compared to overall low indigenous richness or monoculture of indigenous flora (i.e. *Carex secta*).
  - TAR Plant Presence: count of individual TAR plants, on a regional or national scale, within the project component, represented throughout all wetlands within the Project Area.
  - Hydric vegetation integrity: the proportion (0-1) of hydric vegetation (FAC, FACW, OBL) as an indicator of hydrological integrity and function of the wetlands. Where impacts such as stock and/or modification to the catchment is present, a high proportion of dryland plant species (Facultative Upland and Upland[6]) is expected to occur.
- **Benchmark condition:** Benchmark values represent the expected condition of each ecosystem type under minimal human disturbance within the Macraes Ecological District. These benchmarks provide the reference point against which both losses and gains are assessed.
- **Area-weighted biodiversity values:** The model combines wetland extent and condition scores to calculate a biodiversity value per hectare, which is then scaled to the total impacted area to estimate the overall biodiversity loss.

The impact models assume that wetland loss results in an immediate and complete loss of biodiversity value within the affected footprint. This is a conservative assumption consistent with BOAM guidance, as it reflects the removal of both structural and functional components of the ecosystem.

Model Inputs

The BOAM quantifies the biodiversity gains as they pertain to wetland value based on the attributes used, and the expected gains from proposed enhancement and restoration actions within the Murphys Connection, Cranky Jims Link and Macraes Central areas. These gains are directly compared against the calculated losses to determine compensation adequacy. The accounting model focuses on re-vegetation outcomes as these can be quantified in regard to area established, vegetation composition and restoration trajectory. Separate models have been developed for each wetland ecosystem type within each of the three project areas (Coronation , Macraes Central, and Golden Bar), consistent with the like-for-like requirements of the BOAM framework.

The primary inputs to the models include:

[6] Upland plants – rarely in wetlands, almost always in drylands; Facultative Upland – occasionally in wetlands but usually thrive in uplands.

- **Actions and areas:** The extent of restoration and re-creation activity required to generate sufficient biodiversity gains. Across the Project, this includes approximately 5.23 ha of restoration of sedgelands and 0.14 ha of shrublands, and 5.40 ha of wetland uplift through the transition from exotic herbaceous to WL17 copper tussock wetland. Within Murphys Outer, approximately 5.23 ha of degraded wetland is present; 5.81 ha of degraded wetland is present in Cranky Jims Link; 1.8 ha of wetland is present in Murphys Connection, all of which are available for enhancement.
- **Initial condition (pre-compensation state):** For enhancement areas, the starting condition reflects the current state of existing vegetation, which is typically modified but retains some indigenous structure and function. Initial condition of the enhancement wetlands has been determined from wetland delineation plots undertaken throughout representative vegetation communities within the degraded areas. As such, wetlands that contain multiple vegetation types (i.e. dominance of *Glyceria declinata* which shifts to *Agrostis stolonifera*, to *Carex leporina* dominant), more than one vegetation plot has been undertaken. At wetlands with one homogenous vegetation community, one vegetation plot was undertaken within a representative area. The initial condition is indicated to be low (e.g. exotic hydric vegetation or limited indigenous dominance), reflecting limited existing biodiversity value prior to restoration.
- **Target (post-compensation) condition:** Target condition scores are assigned based on the expected outcomes of restoration and enhancement actions. For revegetation, this reflects the establishment of associated wetland communities approaching benchmark condition over time.
- **Time to establishment:** The period required for revegetation of restoration and recreation wetlands to achieve their target condition.
- **Confidence (success) factors:** Multipliers are applied to account for uncertainty and risk of failure in achieving predicted aquatic biodiversity gains. These factors reflect the level of confidence in restoration methods, site suitability, and long-term management, and are informed by the proponent's experience and the use of established ecological restoration techniques.
- **Management inputs:** The models incorporate the effects of ongoing management, including predator control, stock exclusion, and weed management, which are expected to improve habitat condition and support both vegetation and fauna outcomes.

All biodiversity compensation gains are modelled over time and discounted to present value using the standard BOAM discount rate, ensuring that time lags between impact and ecological recovery are appropriately accounted for. This results in a conservative estimate of biodiversity gains relative to immediate losses.

Overall, the BOAM inputs reflect a combination of wetland re-creation and enhancement and are designed to deliver both long-term replacement of lost vegetation and more immediate gains in aquatic ecological condition. These inputs form the basis for calculating the Net Present Biodiversity Value (NPBV) of gains and assessing whether the proposed compensation package ensures positive effects outweigh adverse effects to wetlands.

Model Outputs and Assumptions

The wetland BOAM models are based on the impact model and offset model worksheets only, which define the inputs, trajectories, and calculations used to quantify biodiversity losses and gains for wetlands across the three project areas. The models apply a consistent framework while allowing for variation in ecosystem type, condition, and restoration pathway.

A discount rate of 0.03 is applied to all compensation gains, consistent with BOAM guidance, to account for the time preference of biodiversity outcomes. Losses are assumed to occur at time zero and are therefore not discounted, while gains accrue over time and are discounted to reflect delays in ecological recovery. This discount rate is considered to be conservative as wetland loss will occur in project stages, instead of all wetland loss occurring within the first year. This results in the establishment of wetland compensation prior to wetland loss e.g. reclamation of 0.49 ha of wetland for the Coronation Stage 8 Pit, scheduled to begin Year 5 of the Project, will be compensated for prior to their loss.

Vegetation condition is represented through BOAM attributes that describe ecosystem structure, composition, and function. These attributes are scored relative to defined benchmark conditions representative of minimally disturbed wetland ecosystems within the Macraes ED. Benchmark values are held constant and provide the reference against which both losses and gains are assessed. Benchmark wetlands were located within OGNZL landholdings. These benchmark wetlands, whilst not under active management (i.e. active weed control, fencing and buffer planting, indigenous plant maintenance), show no signs of stock access, including pugging and grazing, with a relatively intact plant community.

Benchmark assessments were physically undertaken within ephemeral and copper tussock wetlands (Figure 0-5). The benchmark reference ephemeral wetland is located at Coronation. This ephemeral wetland was located within farmland which did not show signs of recent grazing at the time of assessment. The wetland contains a dense tussock buffer around the outer edges, resulting in a higher diversity of indigenous plants within the wetland, than those with exposed buffers. Whilst this reference ephemeral wetland does contain exotic plant invasion, we note no active management, such as weed control, is taking place. The benchmark for copper tussock wetland is located at Mount Highlay Restoration Area, where stock exclusion has allowed for indigenous vegetation, namely copper tussock and sedges to re-establish with no stock grazing pressure. There is also a herbaceous understory and the presence of a taoka species; toetoe (*Austroderia richardii*).

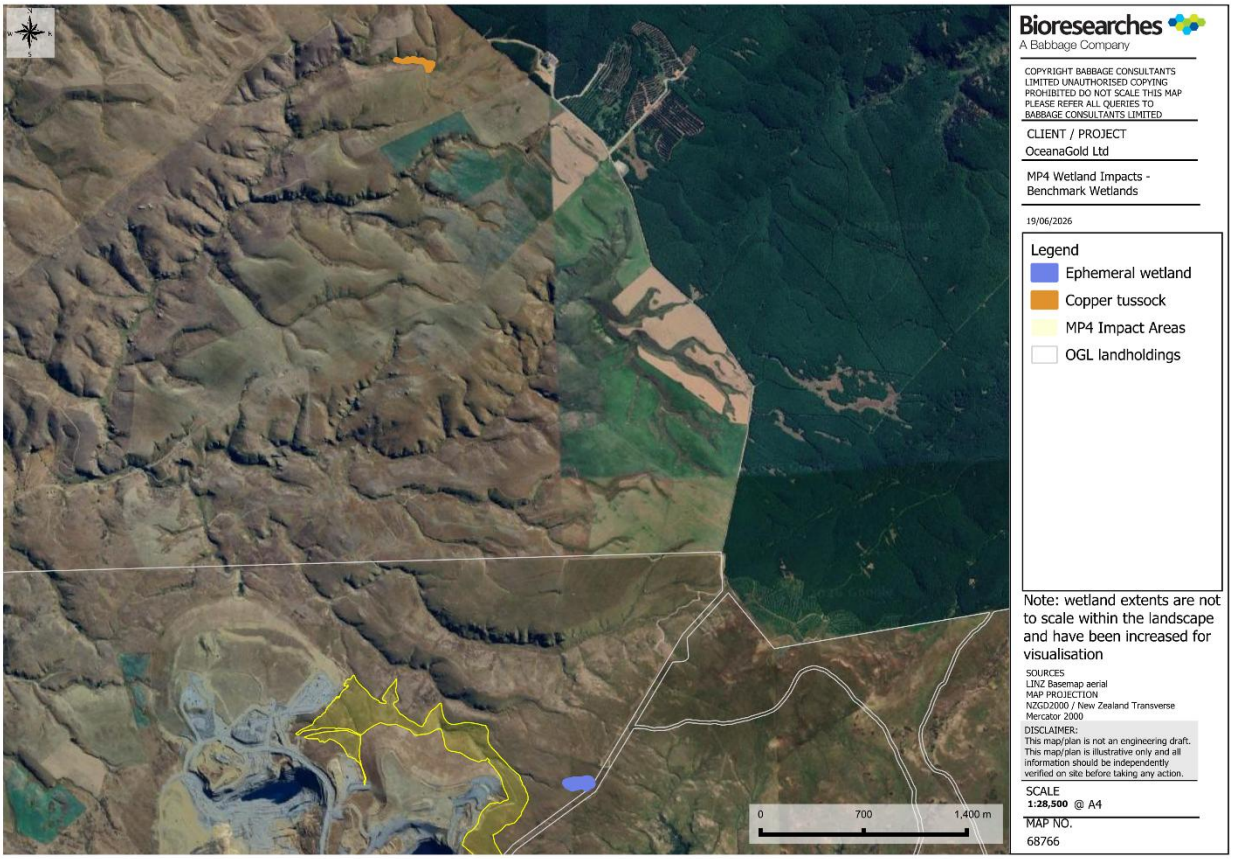


Figure 0-5. Location of identified benchmark sites.

No benchmark "WL22, Carex, *Schoenus pauciflorus* Sedgeland" were assessed as no appropriate site could be found, however it is expected the general attributes identified within the copper tussock wetlands would be comparable to those within benchmark condition WL22 Sedgelands (i.e. high indigenous species richness and percent cover, presences of TAR species, intact hydrological regime). These two wetland types contain similar attributes in terms of vegetation stature, vegetative tiers (generally lack woody vegetation and low shrub), and similar hydrology.

The impact models assume that wetland vegetation clearance results in the complete and immediate loss of wetlands within the affected footprint, even though wetland loss will occur progressively as the Project expands. This reflects the removal of all ecological attributes associated with the wetlands and is consistent with a conservative approach to quantifying losses.

Restoration is assumed to commence from degraded wetland extents where indigenous species richness is low; no or low numbers of TAR flora species are present; and stock impacts and general weed invasion has negatively affected the hydrological integrity of the wetland, resulting in the invasion of dryland species; and the overall species richness of indigenous vegetation is low. Larger wetland systems (>1 ha) identified for compensation contained greater numbers of indigenous species i.e. richness, however this is considered to be beneficial as it presents a more intact wetland ecosystem where restoration actions will be realised on a faster timeline than those with a lower species richness. These larger wetlands also contained a greater number of small, indigenous, herbaceous species, which may be difficult to replant within the compensation wetlands. The compensation actions through weed removal, promotion of indigenous growth and reduction of dryland plants will likely result in these populations growing as the ecosystem type becomes more naturalised.

Confidence (success) factors are applied within the model worksheets to account for uncertainty and risk of failure. To be conservative, a low confidence has been applied to the compensation activities for all wetland types.

The models assume that all compensation areas will be subject to long-term protection and active management, including pest control, stock exclusion, and weed management. In particular, the surrounding landscape-level pest control and stock exclusion is assumed to improve wetland vegetation condition by reducing browsing pressure and enabling regeneration processes, including the planting and introduction of indigenous plant specimens. All modelling is undertaken on a like-for-like basis, with losses and gains calculated separately for each wetland type. Compensation actions will occur within the same ecological district and within the natural range of the affected ecosystems, ensuring ecological equivalence and alignment with best-practice compensation principles. In regards to shrubland wetlands, located within Coronation and Golden Bar, no wetland plot data are available for the shrubland located within Coronation to determine measures prior to impact. As such, the two impact areas have been consolidated into one BOAM.

Uncertainty remains inherent in ecological restoration, particularly in relation to long-term vegetation trajectories and external influences such as climate variability. The BOAM framework addresses this through the application of discounting, confidence factors, and conservative endpoint assumptions. However, it is acknowledged that model outputs represent decision-support estimates rather than guaranteed outcomes, and are dependent on effective implementation, monitoring, and adaptive management. The process to be applied at the Macraes Operation has been explained in Section 6 of this report, and the Wetland Monitoring Plan (Bioresearches, 2026).

The primary outputs and assumptions to the models include:

- **Discount Rate**: 3% discount in accordance with standard practice and as recommended in the BOAM User Guide (Maseyk *et al.* 2015).
- **Proposed actions:** Four compensation actions are proposed for wetlands. These are:
  - Restoration and planting of appropriate wetland ecosystem
  - Fencing and stock exclusion
  - Fencing and protection of headwater seepage wetlands
  - Planting and translocation of TAR plant species

  Note that BOAMs were not prepared for the experimental creation of ephemeral wetlands.
- **Compensation Area:** Compensation actions will be undertaken over a cumulative 14.67 ha of wetland;
  - Ephemeral wetland:
    - 1.8 ha restoration at Cranky Jims Link;
    - 0.98 ha at Macraes Central/Golden Bar Haul Road and
  - Sedgeland:
    - 1.93 ha restoration at Cranky Jims Link;
    - 1.63 ha at Murphys Connection; and
    - 1.68 ha restoration at Macraes Central.
  - Herbaceous
    - 2.08 ha restoration at Cranky Jims Link; and
    - 3.32 ha restoration at Macraes Central
  - Shrubland wetland
    0.14 ha restoration at Murphys Connection

- **Confidence in proposed actions:** All confidence actions were set at 'Low' as a precautionary approach. This was based on:
  - Limited number of vegetation plots
  - Limited evidence / examples of ephemeral wetland restoration
  - Uncertainties from wetland extent due to summer survey period
- **Measure Prior to Actions:** All wetlands; median values from multiple plots within representative wetland ecosystem types per their assigned area (Murphys Outer, Cranky Jims Link, Macraes Central), were used for measures prior to impact.
- **Measure After Actions:** Predicted values after proposed actions were based on benchmark plots, in which stock exclusion is present and no inherently visible impacts, such as mining, vegetation clearance is present. These measures, particularly for species richness and TAR plant presence, took into account existing indigenous plants individuals within the wetlands which are likely to benefit from restoration planting and propagate.
- **Time till Endpoint:** The finite endpoints (i.e., the endpoint at which the stated outcome is measured) were set as:
  - 15 years for ephemeral wetlands.
  - 7 years for sedgelands, herbaceous wetlands (transformed to copper tussock), and shrubland wetland

Appendix D
BOAM Outputs

BOAM Model for wetland loss at Coronation North

Appendix 1. BOAM outputs for the loss of 0.41 ha of Sedgeland at Coronation North

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.1	Sedgeland	1.1a	Indigenous species relative cover	%percent	91	Restoration planting and stock fencing of degraded wetland	1.68	Low confidence >50% <75%	Finite end point	Continue to Column M	55	90	7	0.33	-0.32	0.01	0.04
		1.1b	TAR plant presence	#count	3	Restoration planting and creation of new wetland	1.68	Low confidence >50% <75%	Finite end point	Continue to Column M	0	5	7	0.85	-0.37	0.48	
		1.1c	Hydrological integrity	proportion of hydric vegetation (0-	0.98	Restoration planting and exclusion of stock	1.68	Low confidence >50% <75%	Finite end point	Continue to Column M	0.81	0.95	7	0.12	-0.43	-0.31	
		1.1d	Indingous species richness	#count	13	Transplanting and planting of indigenous species above what is currently present	1.68	Low confidence >50% <75%	Finite end point	Continue to Column M	9	13	7	0.26	-0.30	-0.04	
		1.1e						Confident 75-90%	Choose option							Not calculated	

Appendix 2. BOAM outputs for the loss of 1.25 ha of freshwater herbaceous wetland at Coronation North

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.2	Herbaceous	1.2a	Indigenous species	%percent	91	Restoration planting and creation of new wetland ecosystem extent W16	3.32	Low confidence >50% <75%	Finite end point	Continue to Column M	26	90	7	1.18	-0.58	0.60	0.14
		1.2b	TAR plant presence	#count	6	Planting of TAR species, including those rescued from impact area	3.32	Low confidence >50% <75%	Finite end point	Continue to Column M	0	5	7	1.39	-1.04	0.35	
		1.2c	Hydrological integrity	proportion of hydric vegetation (0-	0.98	Exclusion of stock and buffer planting	3.32	Low confidence >50% <75%	Finite end point	Continue to Column M	0.69	0.95	7	0.44	-0.89	-0.45	
		1.2d	Indingous species richness	#count	13	Restoration planting and creation of new wetland ecosystem extent WL16	3.32	Low confidence >50% <75%	Finite end point	Continue to Column M	2	10	7	1.03	-0.96	0.07	

Appendix 3. BOAM output for the loss of 0.39 ha of ephemeral wetland at Coronation

This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model						These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
2.2	coro ephem	2.2a	Indigenous species richness	#count	8	Restoration and enhancement of existing wetlands, including stock exlusion	0.78	Low confidence >50% <75%	Finite end point	Continue to Column M	3	8	15	0.19	-0.20	0.00	0.01
		2.2b	TAR plant presence	#count	2	Restoration and enhancement of existing wetlands	0.78	Low confidence >50% <75%	Finite end point	Continue to Column M	0	3	15	0.31	-0.20	0.12	
		2.2c	Native plant cover	%percent cover	77	Restoration and enhancement of existing wetlands	0.78	Low confidence >50% <75%	Finite end point	Continue to Column M	5	50	15	0.18	-0.25	-0.07	

BOAM Model for wetland loss at Macraes Central

Appendix 4. BOAM outputs for the loss of 0.12 ha of Sedgeland at Macraes Central

This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model						These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.1	Sedgeland	1.1a	Indigenous species	%percent	95	Restoration planting and creation of new wetland	0.46	Low confidence >50% <75%	Finite end point	Continue to Column M	25	90	7	0.16	-0.10	0.06	0.05
		1.1b	TAR plant presence	#count	3	Restoration planting and creation of new wetland	0.46	Low confidence >50% <75%	Finite end point	Continue to Column M	0	2	7	0.15	0.00	0.15	
		1.1c	Hydrological integrity	proportion of hydric vegetation (0-	1	Restoration planting and creation of new wetland	0.46	Low confidence >50% <75%	Finite end point	Continue to Column M	0.83	0.95	7	0.03	-0.10	-0.07	
		1.1d	Indigenous species richness	#count	12	Restoration planting and creation of new wetland	0.46	Low confidence >50% <75%	Finite end point	Continue to Column M	4	8	7	0.08	-0.03	0.05	
		1.1e						Confident 75-90%	Choose option							Not calculated	

Appendix 5. BOAM outputs for the loss of 0.03 ha of Freshwater Herbaceous wetland at Macraes Central

This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model						These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.2	Herbaceous	1.2a	Indigenous species	%percent	95	Restoration planting and creation of new wetland	0.17	Low confidence >50% <75%	Finite end point	Continue to Column M	0	90	7	0.08	-0.01	0.08	0.01
		1.2b	TAR plant presence	#count	3	Restoration planting and creation of new wetland	0.17	Low confidence >50% <75%	Finite end point	Continue to Column M	0	2	7	0.06	0.00	0.06	
		1.2c	Hydrological integrity	proportion of hydric vegetation (0-	1	Restoration planting and creation of new wetland	0.17	Low confidence >50% <75%	Finite end point	Continue to Column M	0.97	0.95	7	0.00	-0.14	-0.14	
		1.2d	Indigenous species richnesss	#count	7		0.17	Low confidence >50% <75%	Finite end point	Continue to Column M	0	10	7	0.09	-0.02	0.07	

Appendix 6. BOAM outputs for the loss of 0.62 ha of ephemeral wetland at Macraes Central

This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model						These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
2.3	mc ephem	2.3a	Indigenous species richness	#count	8	Planting of species attractive to terrestrial native invertebrates	1.17	Low confidence >50% <75%	Finite end point	Continue to Column M	5	8	15	0.17	-0.23	-0.06	0.06
		2.3b	TAR plant presence	#count	2	Salvage of sediments in existing wetland to translocate tadpole shrimp (if	1.17	Low confidence >50% <75%	Finite end point	Continue to Column M	0	2	15	0.47	-0.31	0.16	
		2.3c	Native plant cover	%percent cover	77	Translocation of tadpole shrimp and attraction plants for TAR terrestrial	1.17	Low confidence >50% <75%	Finite end point	Continue to Column M	1	50	15	0.30	-0.20	0.09	

BOAM Model for wetland loss at Golden Bar

Appendix 7. BOAM output for the loss of 0.76 ha of sedgeland wetland at Golden Bar

This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model						These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.1	Sedgeland	1.1a	Indigenous species	%percent	95	Restoration planting and establishment of naturalised WL22 wetland	1.63	Low confidence >50% <75%	Finite end point	Continue to Column M	35	85	7	0.43	-0.14	0.29	0.14
		1.1b	TAR plant presence	#count	3	Restoration planting and establishment of naturalised WL22 wetland	1.63	Low confidence >50% <75%	Finite end point	Continue to Column M	1	2	7	0.27	0.00	0.27	
		1.1c	Hydrological integrity	proportion of hydric vegetation (0-	1	Stock exclusion and fencing	1.63	Low confidence >50% <75%	Finite end point	Continue to Column M	0.82	0.95	7	0.11	-0.18	-0.08	
		1.1d	Indigenous species richnesss	#count	12	Restoration planting and establishment of naturalised WL22 wetland	1.63	Low confidence >50% <75%	Finite end point	Continue to Column M	10	12	7	0.14	-0.07	0.07	
		1.1e						Confident 75-90%	Choose option							Not calculated	

Appendix 8. BOAM output for the loss of 0.41 ha of herbaceous freshwater wetland

This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model						These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.2	Herbaceous	1.2a	Indigenous species	%percent	95	Restoration planting and transition to WL16 wetland including weed control	1.37	Low confidence >50% <75%	Finite end point	Continue to Column M	23	90	7	0.49	0.00	0.49	0.32
		1.2b	TAR plant presence	#count	3	Restoration planting and transition to WL16 wetland including weed control	1.37	Low confidence >50% <75%	Finite end point	Continue to Column M	0	2	7	0.46	0.00	0.46	
		1.2c	Hydrological integrity	proportion of hydric vegetation (0-	1	Stock exclusion, fencing and buffer planting	1.37	Low confidence >50% <75%	Finite end point	Continue to Column M	0.88	0.95	7	0.05	-0.21	-0.16	
		1.2d	Indigenous species richnesss	#count	12	Restoration planting and transition to WL16 wetland including weed control	1.37	Low confidence >50% <75%	Finite end point	Continue to Column M	3	12	7	0.52	-0.03	0.48	

Appendix 9. BOAM output for the loss of 0.13 ha of ephemeral wetland

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
2.1	gb ephemeral wetland	2.1a	Indigenous species richness	#count	8	Restoration and enhancement of existing ephemeral wetlands	0.98	Low confidence >50% <75%	Finite end point	Continue to Column M	0	6	15	0.29	-0.05	0.24	0.26
		2.1b	TAR plant presence	#count	2	Restoration and enhancement of existing ephemeral wetlands	0.98	Low confidence >50% <75%	Finite end point	Continue to Column M	0	3	15	0.39	0.00	0.39	
		2.1c	Native plant cover	%percent cover	77	Restoration and enhancement of existing ephemeral wetlands	0.98	Low confidence >50% <75%	Finite end point	Continue to Column M	0	50	15	0.25	-0.11	0.14	
		2.1d						Low confidence >50% <75%	Choose option							Not calculated	
		2.1e						Low confidence >50% <75%	Choose option							Not calculated	

BOAM Model for shrubland wetland loss

Appendix 10. BOAM output for the loss of 0.03 ha of cumulative shrubland wetland at Coronation North and Golden bar

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.1	Shrubland	1.1a	Indigenous species	%percent	90	Restoration planting and creation of new wetland	0.14	Low confidence >50% <75%	Finite end point	Continue to Column M	67	95	5	0.02	-0.03	-0.01	0.00
		1.1b	TAR plant presence	#count	3	Restoration planting and creation of new wetland	0.14	Low confidence >50% <75%	Finite end point	Continue to Column M	1	3	5	0.05	-0.02	0.03	
		1.1c	Hydrological integrity	proportion of hydric vegetation (0-	0.95	Restoration planting and creation of new wetland	0.14	Low confidence >50% <75%	Finite end point	Continue to Column M	0.9	0.95	5	0.00	-0.02	-0.01	
		1.1d	Indigenous species richness	#count	10	Restoration planting and creation of new wetland	0.14	Low confidence >50% <75%	Finite end point	Continue to Column M	7	9	5	0.01	-0.01	0.01	
		1.1e						Confident 75-90%	Choose option							Not calculated	

BOAM outputs for wetland loss at Camp Creek

Appendix 11. BOAM outputs for the loss of 0.05 ha of sedgeland

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.1	Sedgeland	1.1a	Indigenous species	%percent	91	Restoration planting and creation of new wetland	1.46	Low confidence >50% <75%	Finite end point	Continue to Column M	27	95	7	0.52	-0.04	0.47	0.29
		1.1b	TAR plant presence	#count	2	Planting of TAR plants salaved, propogated or procured into the wetland	1.46	Low confidence >50% <75%	Finite end point	Continue to Column M	0	4	7	0.74	0.00	0.74	
		1.1c	Hydrological integrity	proportion of hydric vegetation (0-	0.98	Restoration planting and creation of new wetland	1.46	Low confidence >50% <75%	Finite end point	Continue to Column M	0.87	0.95	7	0.06	-0.04	0.02	
		1.1d	Indigenous species richness	#count	12	Restoration planting and creation of new wetland	1.46	Low confidence >50% <75%	Finite end point	Continue to Column M	13	11	7	-0.06	-0.01	-0.07	
		1.1e						Confident 75-90%	Choose option							Not calculated	

Appendix 12. BOAM outputs for the loss of 0.19 ha of freshwater herbaceous wetland

	This section captures which elements of biodiversity are to be accounted for, and the benchmark value for the Attribute. The information matches that in the Impact Model					These cells provide information about the proposed Offset Actions			Calculations can be made for a finite end point, or at five yearly time-steps over 35 years. Indicate preference in Column K and Follow the instructions in Column L		This section is where the marginal change in the measure of Biodiversity Attribute due to the Offset Action is quantified. Inputs are derived from direct measure, existing data or models where available, or expert estimated predictions. Attribute Biodiversity Value at the Offset Site is compared to the Attribute Biodiversity Value at the Impact Site to calculate the Net Present Biodiversity Value for each Attribute						This is the average Net Present Biodiversity Value for the Biodiversity Component
	Biodiversity Component	Biodiversity Attribute		Measurement Unit	Benchmark	Proposed Offset Actions	Offset area (ha)	Confidence in Offset Actions			Measure prior to Offset	Measure after Offset	Time till endpoint (years)	Biodiversity Value at Offset Site	Biodiversity Value at Impact Site	Attribute Net Present Biodiversity Value	Component Net Present Biodiversity Value
1.2	Herbaceous	1.2a	Indigenous species	%percent	91	Restoration planting and creation of new wetland	0.54	Low confidence >50% <75%	Finite end point	Continue to Column M	25	95	7	0.20	0.00	0.20	0.05
		1.2b	TAR plant presence	#count	2	Planting of TAR plants salaved, propogated or procured into the wetland	0.54	Low confidence >50% <75%	Finite end point	Continue to Column M	0	2	7	0.27	-0.19	0.08	
		1.2c	Hydrological integrity	proportion of hydric vegetation (0-	0.98	Restoration planting and creation of new wetland	0.54	Low confidence >50% <75%	Finite end point	Continue to Column M	0.88	0.9	7	0.01	-0.12	-0.12	
		1.2d	Indigenous species richness	#count	12	Restoration planting and creation of new wetland	0.54	Low confidence >50% <75%	Finite end point	Continue to Column M	2	8	7	0.14	-0.11	0.03	
													3				

Appendix E
BOAM Wetland Community Data

Appendix 13. Impact Wetland BOAM inputs for Coronation. Plot data provided by Whirika

Plot #	% indigenous	TAR plant	proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	class	Indigneous Species Codes						
661	55	0	0.68	3	50	2.49	N/A	sedgeland	CARsec	AUSRIC	JUNdis				
1176	**88**	0	1	1	100	1.24	N/A	sedgeland	CARsec						
1178	11	0	0.59	2	50	2.54	50	sedgeland	CARsin	RANfol					
1179	35	0	1	3	100	1.90	N/A	sedgeland	**OLEbul**	CARfor	CARsec				
1180	7	**1**	0.72	1	50	2.49	N/A	sedgeland	**EPIins**						
14	47	0	0.72	2	100	2.36	N/A	sedgeland	CARgau	ELEacu					
15	53	0	0.7	3	50	2.77	50	sedgeland	CARgau	HYDmic	LOBang				
18	68	1	0.87	4	100	2.96	0	sedgeland	AUSric	BLEpen	**CARtec**	CHIrig			
49	67	0	**0.82**	7	100	1.93	N/A	sedgeland	**OLEbul**	BLEpen	CARsin	ELEacu	JUNedg	RANfol	SENglo
37	17	0	0.76	4	67	2.16	N/A	sedgeland	CARsin	POAcit	RANamp	RANfol			
	50	**0.20**	**0.74**	**3.00**					Total indigneous species richness						19

Plot #	% indigenous	TAR plant	proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	class	Indigneous Species Codes		
46	7	0	0.69	1	100	2.62	100	ephem	ELEacu		
wlpw	25	0	0.25	1	0	3.25	0	ephem	RANamp		
w1p2	18	0	0.21	1	0	3.44	0	ephem	RANamp		
w1p5	17	1	0.24	1	0	3.53	N/A	ephem	**AGRpac**		
w2p1	60	1	1	2	100	1.45	N/A	ephem	**AGRpac**	RANamp	
w2p2	55	1	1	2	100	1.49	N/A	ephem	**AGRpac**	RANamp	
w2p3	0	0	0.81	0	100	2.38	N/A	ephem	JUNeff	AGRcap	
w2p4	80	1	1	2	100	1.44	N/A	ephem	**AGRpac**	RANamp	
w2p5	24	1	0.17	2	0	3.45	0	ephem	CARsin	**AGRpal**	
w2p6	27	1	0.38	1	50	3.34	50	ephem	**AGRpac**		
w2p7	78	1	1	2	100	1.59	N/A	ephem	**AGRpac**	RANamp	
w2p8	**100**	1	1	3	100	1.40	N/A	ephem	**AGRpac**	CARsin	
w2p9	53	1	0.58	2	67	2.53	67	ephem	**AGRpac**	RANamp	
w2p10	42	**1**	0.42	1	0	3.17	0	ephem	**AGRpac**		
w3p1	63	1	0.72	1	100	2.56	100	ephem	**AGRpac**		
w3p2	92	1	1	1	100	2.00	N/A	ephem	**AGRpac**		
w3p3	97	1	1	3	100	1.24	N/A	ephem	**AGRpac**	RANamp	ELEacu
w3p4	44	0	1	1	100	1.56	N/A	ephem	RANamp		
w3p5	72	1	0.84	1	100	2.31	N/A	ephem	**AGRpac**		
w3p6	46	1	1	2	100	1.17	N/A	ephem	**AGRpac**	RANamp	
w3p9	73	1	1	2	100	1.13	N/A	ephem	**AGRpac**	RANamp	
w3p10	100	1	1	2	0	1.92	N/A	ephem	**AGRpac**	RANamp	
	54	**0.77**	**0.92**	**1.50**					Total indigneous species richness		7

Plot #	% indigenous	TAR plant	proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	class	Indigneous Species Codes			
3	59	0	0.57	4	50	2.90	50	herb	CHIrig	RANmul	RYTnig	SCHpau
13	4	0	0.77	3	75	2.50	N/A	herb	ELEacu	RANamp	RANfol	
42	1	0	**0.77**	1	100	2.97	50	herb	RANamp			
53	**63**	0	0.46	4	50	2.99	50	herb	CARsin	CHIrig	JUNedg	SCHpau
72	42	0	0.7	4	75	2.52	50	herb	BLEpen	CARsin	ELEacu	SCHpau
	42	**1.00**	**0.70**	**4.00**					Total indigneous species richness			10

Appendix 14. Impact Wetland BOAM inputs for Central Mining Area. Plot data provided by Whirika

Plot #	% indigenous	TAR plant	Proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	class	Indigneous Species Codes						
234	44	0	0.84	3	100.00	3.11	0	ephemeral	CHIrsc	GERbre	RANamp				
243	25	1	0.92	3	100.00	2.06	N/A	ephemeral	CARsin	ELEacu	EPIins				
244	**71**	0	0.80	6	100.00	2.06	N/A	ephemeral	ELEacu	GALpro	HYDhet	LILnov	LOBper	MYRpro	
245	0	0	**0.99**	0	100.00	2.02	N/A	ephemeral							
247	15	0	0.91	1	100.00	2.13	N/A	ephemeral	ELEacu						
	25	**0.20**	**0.91**	**3.00**											11
1	0	0	**1.00**	0	100	2.15	N/A	herb							
2	0	0	0.52	0	50.00	2.88	50	herb							
3	0	0	1.00	0	100.00	1.68	N/A	herb							
4	0	0	0.95	0	100.00	2.23	N/A	herb							
5	0	0	0.98	0	100	1.89	N/A	herb							
6	0	0	1.00	0	100	1.94	N/A	herb							
7	**5**	0	0.71	1	50	2.65	50	herb	ELEacu						
	0	**0.00**	**0.98**	**0.00**											1
8	53	0	0.66	1	100	2.13	N/A	sedgeland	CARsec						
9	74	0	0.79	1	100	1.63	N/A	sedgeland	CARsec						
10	80	0	**1.00**	2	100	1.40	N/A	sedgeland	CARsin	CARsec					
11	**83**	0	0.83	2	100	1.83	N/A	sedgeland	AUSful	CARsec					
12	81	0	1.00	1	100.00	1.19	N/A	sedgeland	CARsin						
14	65	0	0.65	2	50.00	2.06	N/A	sedgeland	CARsin	CARsec					
15	47	0	0.68	2	50.00	2.47	N/A	sedgeland	AUSful	CARsin					
	80	**0.00**	**0.83**	**2.00**											3
98	0	0	0.47	0	66.67	3.07	66.66666667	herb							
100b	**4**	0	**0.65**	1	50.00	3.00	50	herb	JUNedg						
108b	0	0	0.94	0	100.00	2.28	N/A	herb							
	0	**0.00**	**0.65**	**0.00**											1
	5	**0.0**	**0.91**	**1.0**					**Total indigneous species richness**						**14**

Appendix 15. Impact Wetland BOAM inputs for Golden Bar. Strick-through represents data not utilised in BOAM calculations, however included for transparency. Plot data provided by Whirika

Plot #	% indigenous	TAR plant	proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	class	Indigneous Species Codes		
~~1147~~	~~0~~	~~0~~	~~0.23~~	~~0~~	~~0~~	~~3.55~~	~~N/A~~	~~Non-wetland~~			
~~1149~~	~~0~~	~~0~~	~~0.23~~	~~0~~	~~0~~	~~3.97~~	~~N/A~~	~~Non-wetland~~			
~~1150~~	~~0~~	~~0~~	~~0.35~~	~~0~~	~~33~~	~~3.65~~	~~N/A~~	~~Non-wetland~~			
1152	**15**	0	**0.65**	1	100	2.80	100	herb	POLves		
~~1153~~	~~20~~	~~0~~	~~0.24~~	~~1~~	~~33~~	~~3.72~~	~~N/A~~	~~Non-wetland~~	~~CARsec~~		
~~1165~~	~~0~~	~~0~~	~~0.00~~	~~0~~	~~0~~	~~4.68~~	~~N/A~~	~~Non-wetland~~			
~~1166~~	~~0~~	~~0~~	~~0.00~~	~~0~~	~~0~~	~~4.84~~	~~N/A~~	~~Non-wetland~~			
~~1167~~	~~0~~	~~0~~	~~0.00~~	~~0~~	~~0~~	~~4.33~~	~~N/A~~	~~Non-wetland~~			
~~1168~~	~~0~~	~~0~~	~~0.07~~	~~0~~	~~0~~	~~4.38~~	~~N/A~~	~~Non-wetland~~			
~~1170~~	~~18~~	~~0~~	~~0.18~~	~~1~~	~~0~~	~~3.97~~	~~N/A~~	~~Non-wetland~~	~~CARsec~~		
~~1171~~	~~92~~	~~0~~	~~0.26~~	~~2~~	~~0~~	~~3.22~~	~~0~~	~~Non-wetland~~	~~POLves~~	~~CARsec~~	
~~1172~~	~~14~~	~~0~~	~~0.20~~	~~1~~	~~0~~	~~3.91~~	~~N/A~~	~~Non-wetland~~	~~CARsec~~		
~~1173~~	~~11~~	~~0~~	~~0.51~~	~~1~~	~~33~~	~~3.18~~	~~33~~	~~Non-wetland~~	~~CARsec~~		
	0	**0.00**	**0.23**	**0.00**					Total indigneous species		2

Plot #	% indigenous	TAR plant	proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	class	Indigneous Species Codes		
51	14	0	**0.99**	1	100	2.02	N/A	ephem	JUNdis		
60	0	0	0.79	0	67	2.51	67	ephem			
71	**71**	0	0.21	2	0	3.79	N/A	ephem	POLves	ACAtes	
792	0	0	0.90	0	100	2.20	N/A	ephem			
799	0	0	0.86	0	100	2.29	N/A	ephem			
864	**33**	0	**0.79**	1	100	2.21	N/A	ephem	JUNdis		
686	30	0	0.75	1	75	2.45	N/A	ephem	CARsin		
871	32	0	0.74	2	100	2.72	50	ephem	CHIrsc	CARsin	
	22	**0.00**	**0.79**	**1.00**					Total indigneous species		5
~~791~~	~~2~~	~~0~~	~~0.02~~	~~1~~	~~0~~	~~3.95~~	~~N/A~~		~~JUNdis~~		
~~858~~	~~15~~	~~0~~	~~0.30~~	~~1~~	~~0~~	~~3.55~~	~~N/A~~	~~ephem~~	~~JUNdis~~		
~~860~~	~~39~~	~~0~~	~~0.49~~	~~2~~	~~50~~	~~3.08~~	~~50~~	~~ephem~~	~~JUNdis~~	~~RANamp~~	
	15	**0.00**	**0.75**	**1.50**					Total indigneous species		2

Appendix 16. Benchmark Copper Tussock Wetland Inputs

Plot #	% indigenous	TAR plant	proportion hydric	Indigneous species richness	Dom	PI	Indigneous Species Codes									
998	91	1	0.99	10	100	1.96	**OLEbul**	AUSric	CHIrsc	CARsec	SCHpau	BLEpen	EPInum	RANamp	BULang	CARsin
989	91	1	0.97	8	100	1.84	CARsec	CHIrsc	SCHpau	**OLEbul**	BLEpen	RANamp	BULang	HYDmos	**CARtec**	
	91	**2.0**	**0.98**	**9.0**												12

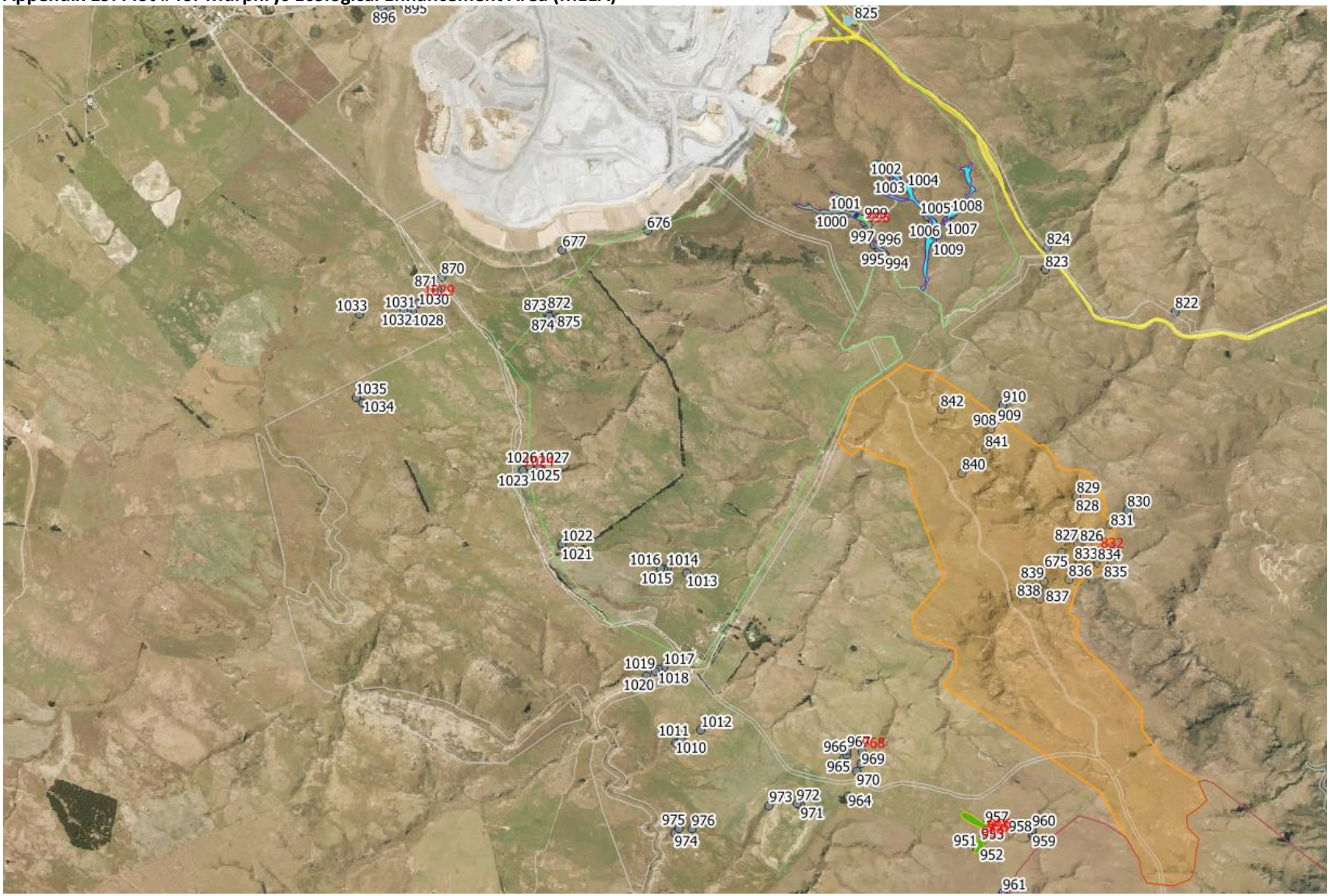
Appendix 17. Benchmark Ephemeral Wetland Inputs

Plot #	% indigenous	TAR plant	proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	class	Indigneous Species Codes/Total indigneous species richness				
877	65	1	0.85	2	100	1.92	N/A	Pasture/Ephemeral?	**CHIcsd**	CARgau			
878	34	0	0.73	1	100	2.29	N/A		CARgau				
879	77	0	0.87	3	100	1.46	N/A		CARgau	ELEacu	RANamp		
880	27	0	0.68	2	50	2.48	N/A		JUNedg	CARgau			
881	38	0	1.00	5	100	1.38	N/A		JUNpla	CARsec	ELEacu	JUNedg	CARgau
	38	**0.2**	**0.85**	**2.0**									7

Appendix 18. Compensation wetland inputs at MEEA. Note, plots include wetland not utilised for compensation.

Plot #	% Indigenous	TAR plant count	Proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	Class	Unique Indigneous Species						
951	35	0	**0.98**	2	100	1.85	N/A	Sedgeland	ELEacu	JUNpau					
952	**48**	0	0.73	3	67	2.55	67		SCHpau	CHIcsd	SPHagn				
953	57	**1**	0.96	6	100	1.97	N/A		**CARtec**	JUNpau	RANamp	BLEpen	EPIner	SPHagn	
954	6	0	0.34	2		3.43	0		CARgau	EPIner					
957	5	0	0.82	1	100	2.53	100		ELEacu						
	35	**0**	**0.82**	**2**											10
958	13	**1**	**0.85**	3	75	2.41	N/A	Copper tussock	**CHIcsd**	**EPIner**	**RANamp**				
960	**25**	0	0.63	5	50	2.70	50		EPIner	SCHpau	EPIner	ELEacu	CARsin		
	30	**0.25**	**0.82**	**4**											6
961	65	1	**1.00**	4	100	1.74	N/A	Shrubland	OLEbul	SCHpau	SPHagn	CARsin			
962	68	0	0.81	5	50	2.03	N/A		SPHagn	JUNedg	ELEacu	SCHpau	EPIner		
	67	**0.50**	**0.90**	**5**											7
971	**21**	0	0.96	2	100	1.52	N/A	Herbacous	SPHagn	EPIner					
972	2	0	**0.97**	1	100	2.24	N/A		RANamp						
	12	**0.00**	**0.96**	**2**											3
974	2	0	0.94	1	100	1.97	N/A	Herbacous	CALpet						
975	31	0	**0.94**	3	100	2.16	N/A		CHIrsc	EPIner	SPHagn				
976	31	0	0.92	2	100	1.96	N/A		SCHpau	CALpet					
	12	**0.00**	**0.94**	**2**											5
994	**56**	0	**0.92**	3	100	1.74	N/A	Sedgeland	CARsin	ELEacu	LEMdis				
995	56	0	0.81	5	100	2.59	50		SCHpau	CHIcsd	RANamp	BULang	CARsin		
996	51	0	0.75	4	100	2.26	N/A		CARsec	CHIcsd	CARsin	SCHpau			
998	55	0	0.85	5	100	2.19	N/A		SCHpau	CARsin	RANamp	EPInum	ELEacu		
999	28	0	0.74	3	100	2.44	N/A		CARsin	CARsec	RANamp				
	55	**0.00**	**0.81**	**4**											9
1003	**37**	0	**0.79**	3	100	2.37	N/A	Sedgeland	SCHpau	ELEacu	RANfol				
1004	16	0	0.59	2	67	2.99	33		CARfgl	RANamp					
1006	10	0	0.69	2	75	2.6			CARfgl	CHIrsc					
	16	**0.00**	**0.69**	**3**											6
1018	4	0	0.74	2	67	2.73	33	Herbacous	RANamp	ELEacu					
1019	19	0	**0.78**	2	67	2.72	33		CARsec	BLEpen					
1020	5	0	0.71	1	50	2.95	0		CARsin						
	5	**0.00**	**0.74**	**2**											5
1023	24	0	0.81	2	100	2.53	33	Herbaceous	ELEacu	JUNedg					
1026	27	0	**0.84**	2	100	2.59	50		CARsec	BLEpen					
	25	**0.00**	**0.83**	**2**											4
1034	17	0	**0.96**	2	100	1.39	N/A	Herbaceous	ELEacu	RANamp					
1035	11	0	0.68	2	50	2.88	50		SCHpau	CHIcsd					
	14	**0.00**	**0.82**	**2**											4

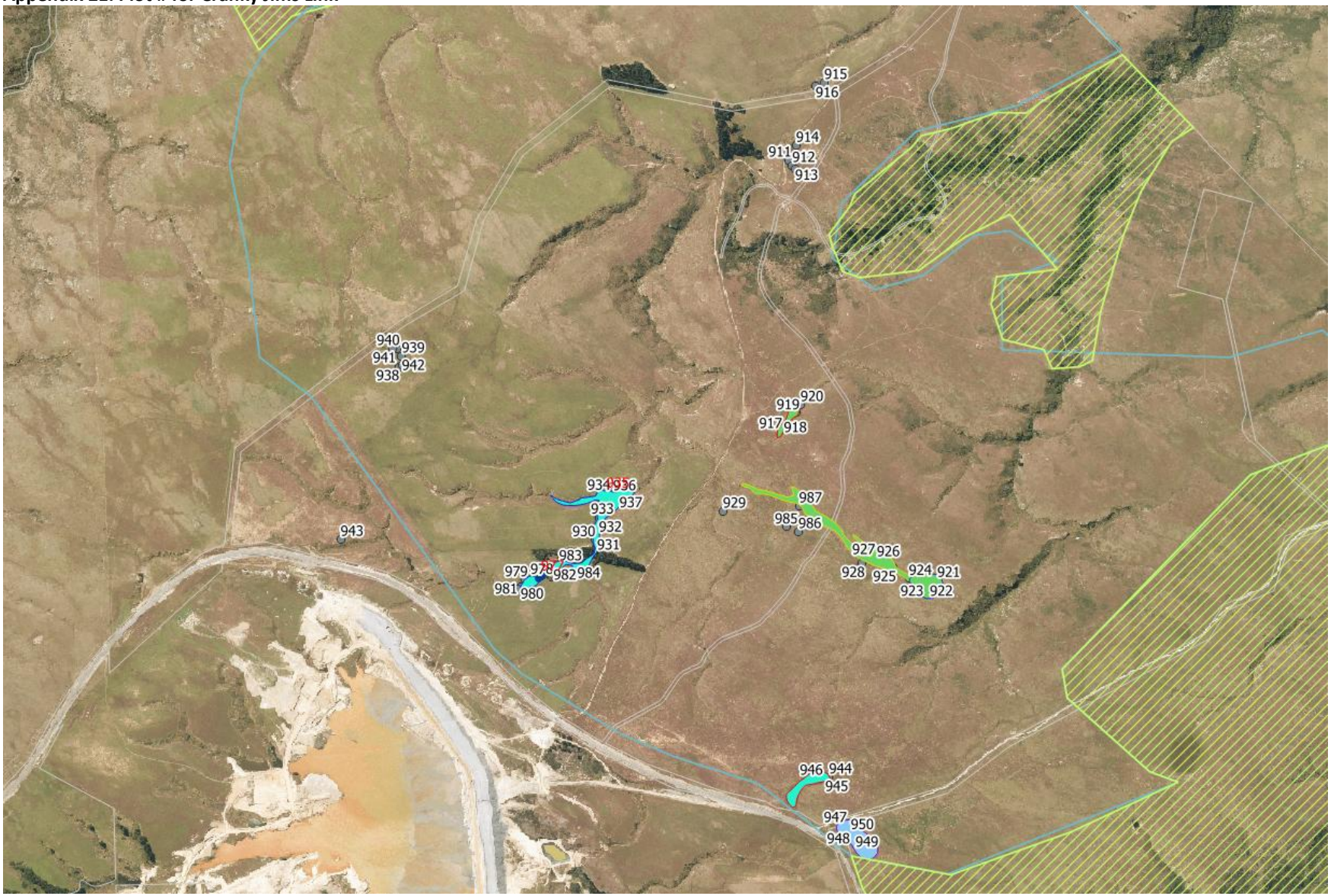
Appendix 19. Plot # for Murphrys Ecological Enhancement Area (MEEA)



Appendix 20. Compensation wetland inputs at Cranky Jims Link

Plot #	% indigenous	TAR plant	Proportion hydric	Indigneous species richness	Dom	PI	FAC-neutral	Class	Indigneous Species Codes/Total indigneous species richness			
911	0	0	0.51	0	50	3.17	50	Ephemeral				
912	1	0	0.98	1	100	2.07	N/A		RANamp			
913	5	0	1.06	1	100	2.11	N/A		COPpro			
	1	**0.0**	**0.98**	**1.0**								2
914	12	0	0.85	2	100	2.22	N/A	Ephemeral	HYDsul	RANamp		
	12	**0.0**	**0.85**	**2.0**								2
917	19	0	0.96	1	100	2.56	0	Copper tussock	CARsin			
918	20	0	1.00	2	100	2.25	N/A		JUNdis	CHIcsd		
919	4	0	0.94	2	100	2.38	N/A		JUNpla	CARsec		
	19	**0.0**	**0.96**	**2.0**								5
921	4	0	0.88	1	100	2.59	50	Herbacous	RANamp			
922	0	0	0.96	0	100	2.26	N/A					
923	25	0	0.64	1	50	2.64	33		CARgau			
	4	**0.0**	**0.88**	**1.0**								2
924	23	0	0.86	1	100	2.86	33	Copper tussock	CHIrsc			
925	24	0	0.85	3	100	2.64	50		CHIrsc	RANamp	EPIner	
926	45	0	0.88	1	100	3.11	0		CHIrsc			
	24	**0.0**	**0.86**	**1.0**								3
930	32	0	0.89	2	100	1.46	N/A	Sedgeland	CARsec	HYDsul		
931	4	0	0.96	2	100	1.81	N/A		COPpro	CARsec		
932	35	0	0.79	1	100	1.91	N/A		CARsec			
933	13	0	1.00	2	100	2.00	N/A		CHIcsd	CARsin		
934	60	0	0.80	3	67	2.65	33		CHIrsc	SCHpau	CARsin	
977	11	0	1.00	2	100	1.86	N/A		LEMdis	HYDmic		
978	5	0	1.00	2	100	1.95	N/A		LEMdis	CARsec		
979	27	0	0.67	3	67	2.29	N/A		CARsec	CARgau	ELEacu	
980	28	0	0.83	3	100	2.10	N/A		SCHpau	CARsec	BLEpen	
982	70	0	0.87	2	100	1.69	N/A		CARsin	RANamp		
983	71	0	0.86	2	100	1.67	N/A		CARsin	CARsec		
	28	**0.0**	**0.87**	**2.0**								13
938	25	0	0.92	1	100	2.42	N/A	Ephemeral	EPIner			
939	0	0	1.00	0	100	1.00	N/A					
940	38	0	1.00	1	100	1.33	N/A		ELEacu			
941	0	0	1.00	0	100	2.00	N/A					
942	0	0	1.00	0	100	1.95	N/A					
	0	**0.0**	**1.00**	**0.0**								2
944	14	0	0.57	1	50	2.90	50	Sedgeland	JUNdis			
945	30	0	0.52	1	50	3.11	50		JUNedg			
946	23	0	1.00	1	100	1.73	N/A		CARsin			
	23	**0.0**	**0.57**	**1.0**								3
947	45	0	0.72	2	100	2.59	67	Ephemeral	CHIcsd	schPAU		
948	14	0	0.90	1	100	2.29	N/A		JUNdis			
949	0	0	1.00	0	100	1.02	N/A					
950	0	0	1.00	0	100	1.83	N/A					
	7	**0.0**	**0.95**	**0.5**								3

Appendix 21. Plot # for Cranky Jims Link



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