

## **5. EXISTING ENVIRONMENT**

### **5.1 OVERVIEW**

This section outlines the key characteristics of the Macraes Operation and the surrounding environment and landscape within which MP4 will occur. It provides details of:

- > Site location and general characteristics;
- > Existing and authorised mining activities;
- > Site water management;
- > Ecological compensation areas;
- > Current land ownership and utilisation;
- > Statutory planning framework;
- > Cultural values;
- > Existing Economic Environment;
- > Geology and mineral resources;
- > Geotechnical and geochemistry conditions;
- > Hydrology and hydrogeology characteristics;
- > Aquatic ecology and freshwater quality;
- > Wetland values;
- > Terrestrial ecology values;
- > Natural character and landscape values;
- > Archaeological and heritage features;
- > Contaminated land;
- > Existing noise and lighting;
- > Air quality, meteorology and climate;
- > Roading and transport;
- > The socio-economic context; and
- > Recreation values.



Together, these factors form the existing environment against which the impacts of MP4 should be assessed.

As previously noted, OGNZL has engaged numerous independent experts to prepare technical reports for MP4 to provide an understanding of the existing environment of the Macraes Operation. The following sections provide a summary of the existing physical and environmental values described in these technical reports. For a more detailed description of the existing environment, refer to the corresponding technical report(s) provided as **Part B** of this substantive application.

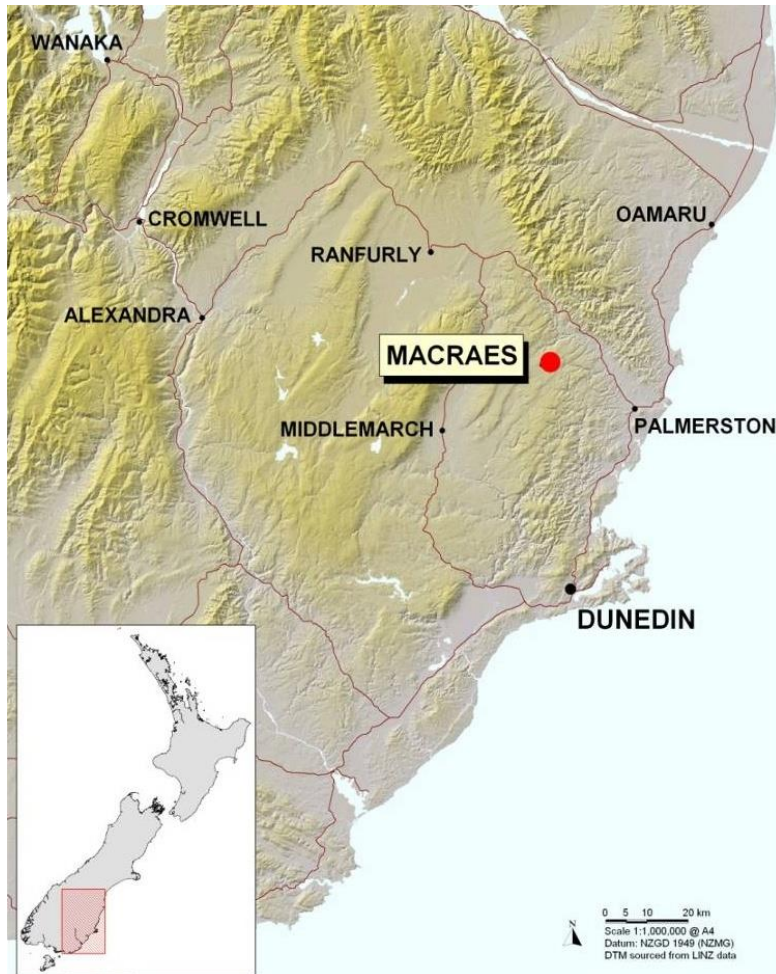
## **5.2 SITE LOCATION AND GENERAL CHARACTERISTICS**

The Macraes Operation is located approximately 30 km inland from Palmerston, at Macraes Flat, East Otago (below). Macraes Flat 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 Flat is situated on an elevated plateau, at approximately 500 m above sea level, and is isolated from the main state highways and towns of East Otago. The local road, Macraes Road, connects Macraes Flat and the associated Macraes Operation with State Highway 85 to the east and State Highway 87 to the west.

The Macraes Operation is located in a rural area surrounded by low intensity pastoral farming. Macraes township/village, which includes approximately 15 houses, a school and a historic hotel, is located immediately to the west of the Macraes Operation (See Figure 5 1: General Location of the Macraes Operation).





**Figure 5-1: General Location of the Macraes Operation**

As described in **Part A.04** of this report, the Macraes Operation comprises four main mining areas, the Coronation Mining Area, the Deepdell Mining Area, the Central Mining Area and the Golden Bar Mining Area. Also important to MP4, is the Coal Creek Dam, Camp Creek Dam and the various ecological compensation areas located within the Project Area as shown in Figure 5-2. It is noted that the Coal Creek and Camp Creek Dams have both obtained resource consent under previous authorisations and are yet to be constructed. More details are provided in Section 5.4.2 and 5.4.3 below.



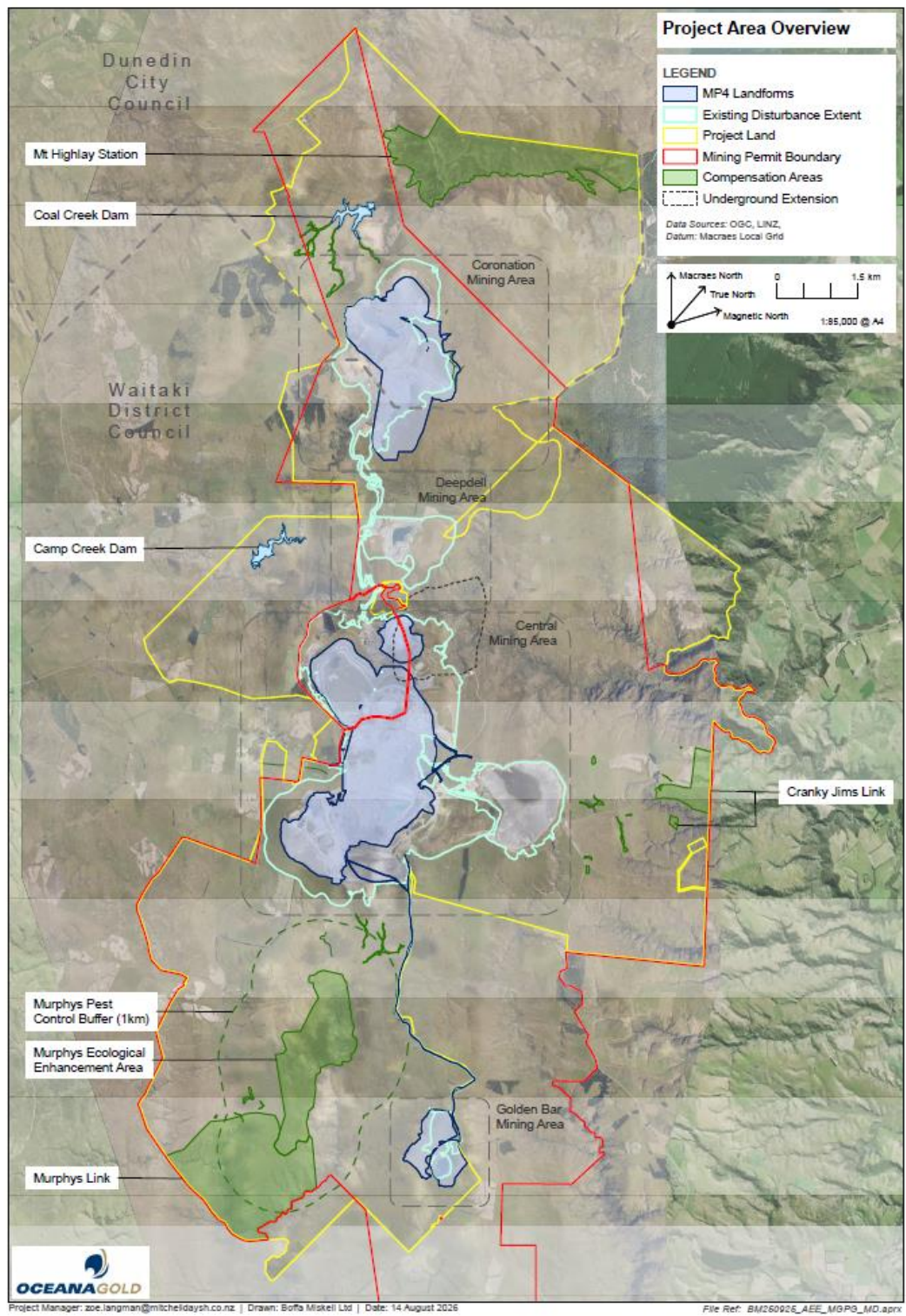


Figure 5-2: MP4 Project Area



### 5.3 EXISTING AND AUTHORISED MINING ACTIVITIES

A dominant feature of the existing environment is the various mines (open pits and underground) and associated activities at the Macraes Operation. These activities include:

- > Various open pits (operating and non-operational);
- > Two underground mines (Frasers – now closed and Golden Point - being actively mined);
- > Various waste rock stacks (active, partially rehabilitated and fully rehabilitated);
- > A network of haul roads and general mine service tracks;
- > A Processing Plant;
- > Four tailings storage facilities (MTI and SP11 – both inactive, Top Tipperary TSF – active, and Frasers TSF which is being constructed and is currently receiving tailings);
- > An extensive network of water management infrastructure including diversion drains, silt ponds, sumps, pit lakes and freshwater storage reservoirs;
- > Two consented water storage reservoirs that have not yet been constructed being Camp Creek Dam and Coal Creek Dam; and
- > Associated infrastructure to support ongoing operations in the form of district roads, powerlines, workshop facilities and offices and associated water and amenity facilities.

Figure 5-3 illustrates the arrangement of existing major mine features at the Macraes Operation and a brief description of these features and the relevant mining areas is provided in the sections that follow. A separate report detailing the existing approvals providing for the established and authorised mining activities is provided in **Part F** of this substantive application. These existing authorisations provide for the large-scale extraction of minerals and overburden from open pit and underground mines using mechanical methods, as well as the transport, treatment, and processing of ore at the on-site Processing Plant. Existing approvals also provide for the stacking, storage, and disposal of waste rock from open pit and underground mining activities, including deposition within consented WRSs and as backfill within mined-out pits.



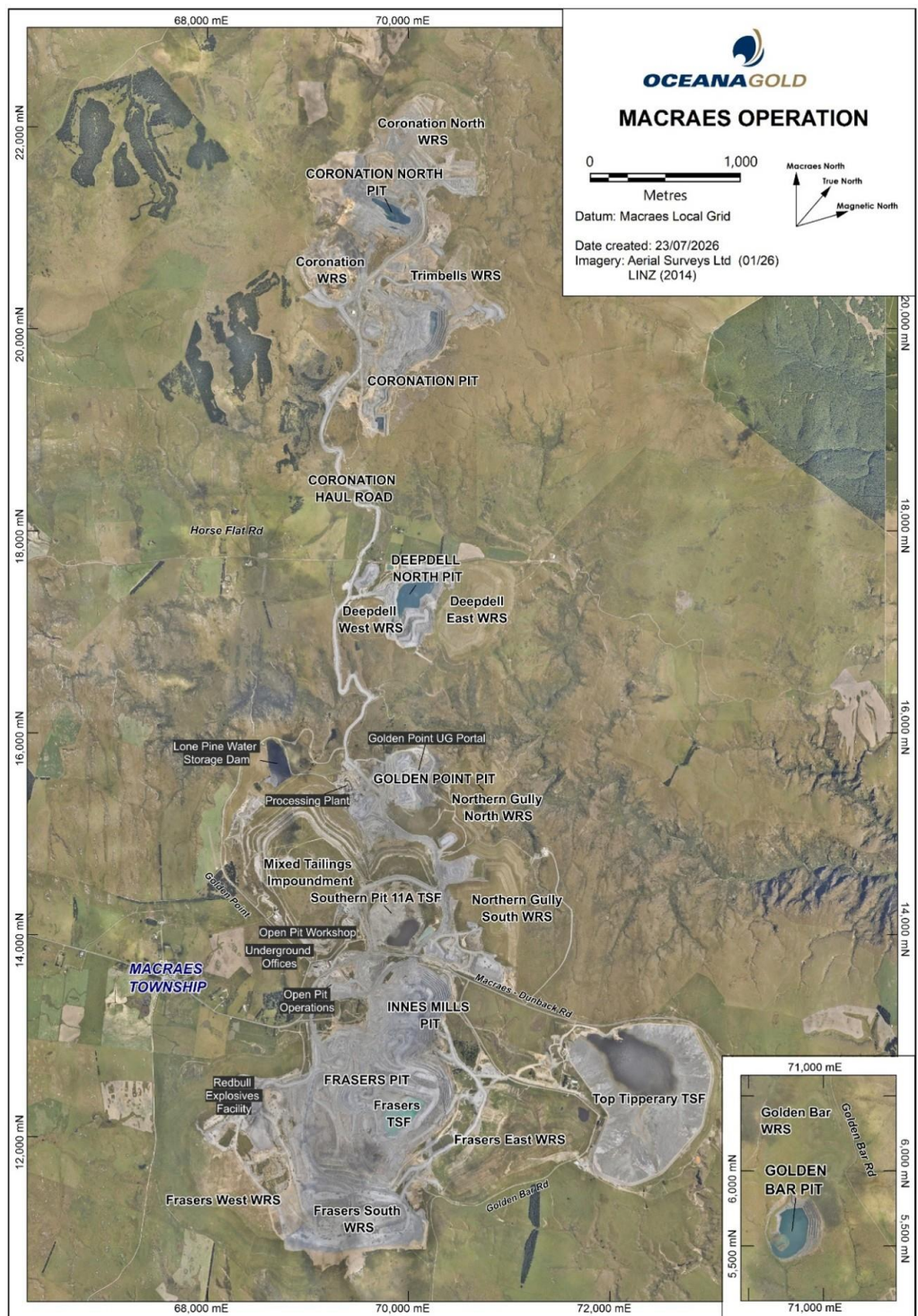


Figure 5-3: Existing site layout at the Macraes Operation.

### 5.3.1 Existing Approvals

#### 5.3.1.1 Approvals under the Crown Minerals Act

OGNZL holds several permits under the Crown Minerals Act, and as relevant to this application they comprise:

- > Mineral Mining Permit 41064 which was obtained in 1993 and covers the majority of the Macraes Operation including the Coronation Mining Area, Golden Bar Mining Area and part of the Central Mining Area. This permit expires on 31 January 2030; and
- > Mineral Mining Permit 52738 which was obtained in 2010 and includes part of the remaining sections of the Central Mining Area. This permit expires on 30 October 2045.

The mining permit boundaries are shown in Figure 4-1 and both mining permits are currently active.

#### 5.3.1.2 Approvals under the RMA

In summary, following the granting of initial permits in 1988 under the Mining Act 1971, then the further resource consents in 1992, 1997, 2000, 2001, 2002, 2004, 2006, 2020 and 2024 under the RMA in relation to various expansions in both the production level and physical elements of the overall mine (including pits, WRS, and storage facilities for tailings and process water), the following applications and decisions have occurred:

- > In 2010, OGNZL sought and was later granted consent for an extension to the life of the Macraes Operation. The extension, called the Macraes Phase III Project (“**MP3**”), was expected to take the consented mine life through to 2020, instead of the mine closing as previously proposed in 2012. Under MP3, production at the Frasers Underground Mine (“**FRUG**”) continued in parallel with the open pits and has now ceased. The Macraes opencast mining operations were to be scaled back towards the scheduled end of the mine’s life (i.e. in 2019 – 2020).
- > In 2012, OGNZL sought and was later granted another extension to the life of the Macraes Operation, with mining of the Coronation Pit at the northern end of the MGP, commencing in 2014. The Coronation Project was expected to add approximately one year to the overall mine life. In other words, rather than the Macraes opencast mining operations being scaled back in 2019 – 2020 as was previously proposed, this was to be delayed until 2020 – 2021. 2019 would see a continuation of the same level of mining activity at the site as was proposed previously for the period 2015 to 2018 under MP3.
- > In 2016, OGNZL sought and was granted a further extension called the Coronation North Project which include authorisation of Coal Creek Dam. This extension was to add three



full years to the operational life of the mine – i.e. in terms of the economic effects of the Project, the operating life of the mine was to continue at current levels into the years 2020, 2021 and 2022, with the scaling back of activities and rehabilitation pushed back to 2023 and 2024. A further extension to the Coronation North Pit was authorised in 2019 and OGNZL intends to commence mining within this extension area in 2025.

- > In 2020, a further extension of the Macraes Operation was granted called the Deepdell North Stage III Project. The estimated duration of the operation and rehabilitation activities of this Project were approximately three years, with the Project effectively adding an additional full year to the operational life of the MGP. This meant that the operating life of the mine would continue into the year 2024, with the scaling back of activities and rehabilitation pushed back to 2025 and 2026. In 2020 OGNZL obtained consents for GPUG approximately 40 hectares (“ha”) of underground mining accessed from Golden Point Pit. This was estimated to allow for underground mining from 2020 – 2024.
- > In 2024, resource consents were obtained for the expansion and extension of the GPUG. These consents enable an additional 70 ha of mine extent and provide for further underground mining until around 2030. Resource consents were also obtained for the initial stage of tailings storage in Frasers Pit (Frasers TSF Stage 1). In 2025, resource consents were obtained for the expansion of Innes Mills Pit and for a further stage of tailings storage in Frasers Pit (Frasers TSF Stage 2). These consents provided the Macraes Operation with additional tailings storage capacity to enable gold production from otherwise consented mining areas to continue at current rates until about the end of 2027.

OGNZL currently operates under numerous resource consents issued via the approval processes summarised. A full list of current resource consents at the Macraes Operation is provided in **Part F** of this substantive application.

#### 5.3.1.3 Approvals under the Wildlife Act

OGNZL has held several wildlife permits under the Wildlife Act relating to the management of lizards across the Macraes Operation, where required to support consented activities summarised above. These permits have provided authorisation for activities such as lizard surveys, salvage, relocation, and habitat management associated with various projects and consents on site.

There are currently two active Wildlife Permits at the Macraes Operation. These permits relate to mining and ancillary activities at Coronation North Pit and Innes Mills Pit and provide for the salvage, translocation and incidental killing of protected lizards from within



authorised development areas and for further monitoring of relocated lizards. All other lizard permits previously held across the operation are no longer active.

#### 5.3.1.4 Approvals under the Heritage New Zealand Pouhere Taonga Act

OGNZL has obtained archaeological authorities under the Heritage Act as required to support various projects and consented activities across the Macraes Operation. These authorities have provided the necessary approvals for works in areas where there was potential for archaeological sites to be present, ensuring activities were undertaken in accordance with the requirements of the FTAA and relevant heritage management obligations.

### 5.3.2 Open Pits and Waste Rock Stacks

The Macraes Operation is a mature multi pit mining operation and comprises numerous open pits (both active and inactive). Open pits have developed in stages over the life of the mine as the orebody has been followed down dip. Waste rock generated from open pits is managed through a network of WRSs which have been authorised in connection with various mining projects over the site's 36-year history.

Open pit mining activities are currently occurring in the Coronation Mining Area at Coronation North Pit (Stage 5) and in the Central Mining Area at Innes Mills Pit (Stages 8, 9 & 10). Waste rock from Coronation North Pit is currently directed to the Coronation North WRS and waste rock from Innes Mills Pit is currently directed to Frasers Backfill Embankment (part of Frasers TSF) and Frasers South Backfill.

Further information relating to inactive or rehabilitated open pits and waste rock stacks will be supplied to the Councils annually in the Project Overview and Annual Work and Rehabilitation Plan. Table 5-1 below provides an overview of the status / use of each pit and WRS at the Macraes Operation.

**Table 5-1: Current status of open pits and waste rock stacks at the Macraes Operation**

| Mining Area            | Open Pits and Waste Rock Stacks | Current Status                                                                          |
|------------------------|---------------------------------|-----------------------------------------------------------------------------------------|
| Coronation Mining Area | Coronation North Pit            | Actively being mined (Stage 5)                                                          |
|                        | Coronation Pit                  | Inactive – operated as a water storage sump as part of the Mine Water Management System |



| <b>Mining Area</b>   | <b>Open Pits and Waste Rock Stacks</b> | <b>Current Status</b>                                                                        |
|----------------------|----------------------------------------|----------------------------------------------------------------------------------------------|
|                      | Coronation North WRS                   | Actively receiving waste rock with residual capacity remaining<br>Lower slopes rehabilitated |
|                      | Trimbells WRS                          | Inactive with residual capacity remaining<br>Lower slopes rehabilitated                      |
|                      | Coronation WRS                         | Inactive with residual capacity remaining<br>Lower slopes rehabilitated                      |
| Deepdell Mining Area | Deepdell North Pit                     | Inactive – operated as a water storage sump as part of the Mine Water Management System      |
|                      | Deepdell South Pit                     | Fully backfilled and rehabilitated                                                           |
|                      | Deepdell East WRS                      | Rehabilitated                                                                                |
|                      | Deepdell West WRS                      | Rehabilitated                                                                                |
| Central Mining Area  | Frasers Pit                            | Being developed as an in-pit TSF (Frasers TSF)                                               |
|                      | Innes Mills Pit                        | Actively being mined (Stages 8, 9 & 10)                                                      |
|                      | Southern Pit                           | Occupied by Southern Pit TSF                                                                 |
|                      | Round Hill / Golden Point Pit          | Inactive (partially backfilled) – used for access to Golden Point Underground Mine           |
|                      | Frasers West WRS                       | Inactive with residual capacity remaining<br>Lower slopes rehabilitated                      |
|                      | Frasers South WRS and Backfill         | Inactive with residual capacity remaining                                                    |
|                      | Frasers East WRS                       | Rehabilitated                                                                                |



| Mining Area            | Open Pits and Waste Rock Stacks | Current Status           |
|------------------------|---------------------------------|--------------------------|
|                        | Frasers North WRS               | Not constructed          |
|                        | Back Road WRS                   | Not constructed          |
|                        | Northern Gully WRS              | Rehabilitated            |
| Golden Bar Mining Area | Golden Bar Pit                  | Rehabilitated – Pit lake |
|                        | Golden Bar WRS                  | Rehabilitated            |

### 5.3.3 Frasers Underground Mine (FRUG)

FRUG is a now closed underground mine that commenced operation in 2006. The FRUG portals were sealed in 2025. Consents authorised the full range of underground mining activities, including portals, declines, ventilation systems, underground development, and supporting surface infrastructure. FRUG now comprises hydraulically connected workings extending to approximately 910 m below ground level and has an estimated residual void volume of 5.67 Mm<sup>3</sup>. The workings predominantly underlie Frasers East WRS and part of Top Tipperary TSF as shown in Figure 5-4. Some of the shallowest of the mine stopes also underlie the eastern high wall of Frasers Pit.



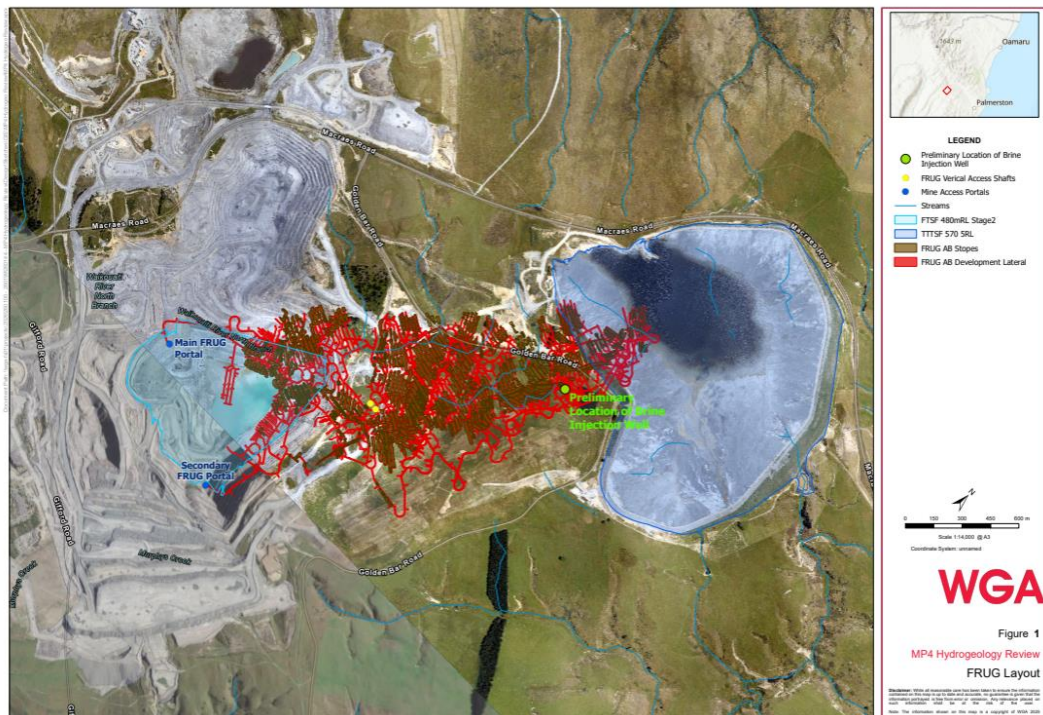


Figure 5-4: FRUG Layout (Source: WGA 2026)

#### 5.3.4 Golden Point Underground Mine (GPUG)

GPUG is an underground mine operation, commissioned in 2020, and is currently operating. Ongoing review of ore reserves and redesign of the ore development and extraction layout to optimise the mine plan is standard practice for underground mines. Potential layouts for GPUG have been revised several times since the resource consents were granted by the WDC and ORC in 2020 to both maximise possible ore extraction and ensure that potential adverse effects are avoided where possible. Existing approvals enable production until around 2030. The authorised and as-built layout is shown in Figure 5-5.



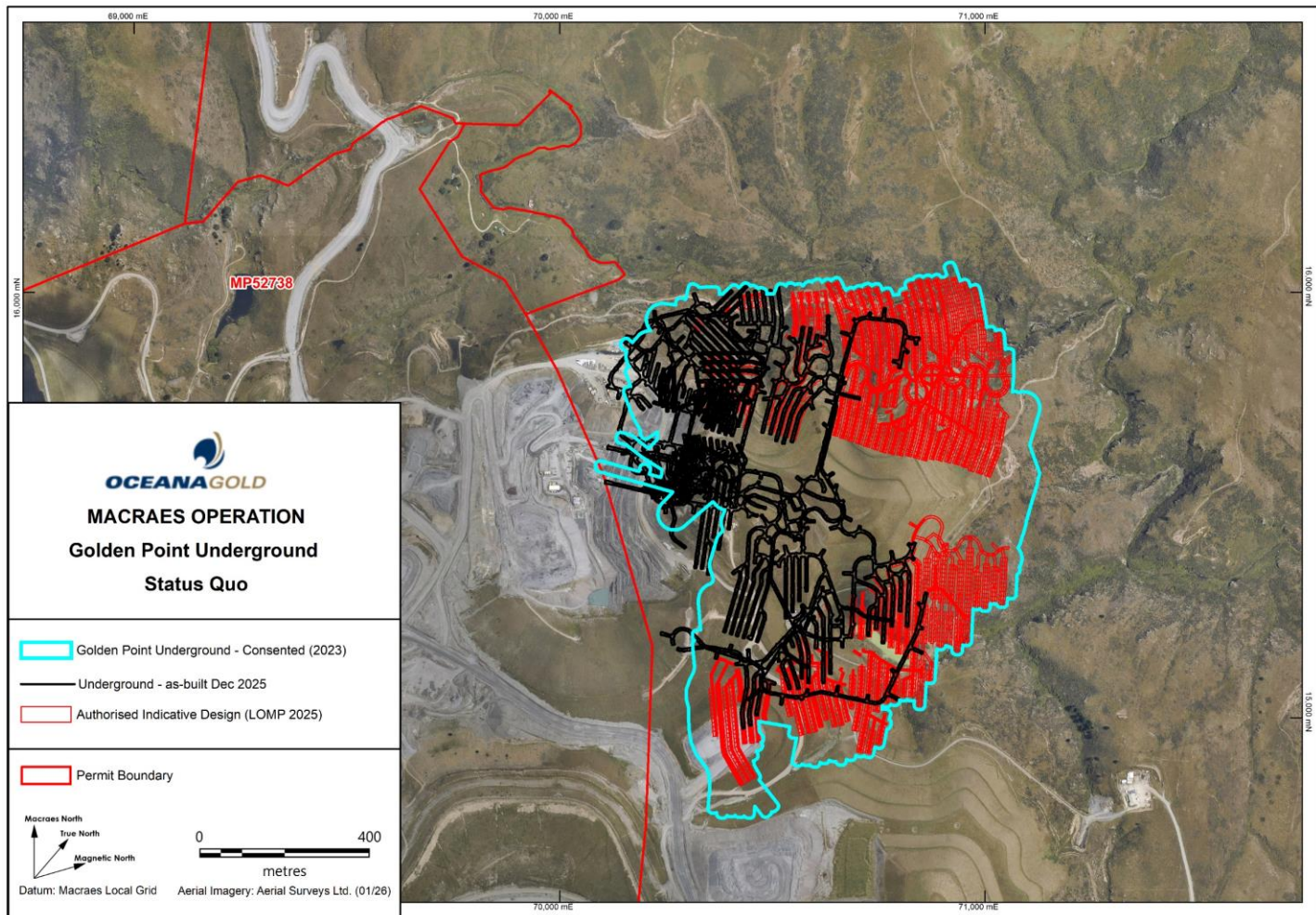


Figure 5-5: Consented and as-built map of GPUG.



There are two entrances to the GPUG (shown in Figure 5-6), and these include associated laydown areas and concrete transfer facilities. Relevant features include:

- > A laydown area that includes storage of numerous used polymer Intermediate Bulk Containers (“**IBCs**”) used for CF Foam and Strata Bond;
- > Storage of general and miscellaneous equipment such as machinery parts and consumables;
- > A compressor that provides compressed air to the underground mine; and
- > Concrete transfers from above-ground to underground trucks at the portal and washings are discharged to ground with runoff collecting into a sediment trap.



Figure 5-6: Golden Point Underground Mine Portal at the Central Mining Area.

### 5.3.5 Haul Roads

There are active haul roads running in a north to south direction through the wider site area. The Coronation Haul Road runs from Coronation North to the Processing Plant and provides a connection between the Coronation, Deepdell and Central Mining Areas. Other haul roads run through the Central Mining Areas between the open pits and the Processing Plant and between open pits and WRSs. Where haul roads have no further use at the Macraes



Operation, they are rehabilitated. A disused 6.8 km haul road on land owned by OGNZL connects the current active haul road system at Frasers Pit to Golden Bar Pit.

#### 5.3.6 Processing Plant

The Processing Plant is located to the north of the Central Mining Area and operates 24/7 to process ore from open pit and underground mining. The Processing Plant uses large quantities of water, grinding mined ore into fine particles before subjecting it to a series of physical, thermal, and chemical processing steps to extract and refine gold. OGNZL holds all necessary resource consents to authorise the operation and maintenance of the Processing Plant through to 31 August 2032, and these consents are currently being fully implemented. A full list of these approvals is provided in **Part F** of this substantive application.

Ore awaiting processing is stored on a platform adjacent to the eastern side of the Processing Plant (the Run of Mine Pad (“**ROM pad**”) shown in Figure 5-7). Settled sediment removed from the Environmental Pond is also temporarily stored in this area. Low-grade ore is stored at several locations across the wider Macraes Operation site, with stockpile locations varying over time and collectively comprising several thousand tonnes of material.

Following gold extraction, the resulting waste material (tailings) is pumped as a slurry to a TSF, where it is contained and managed to enable safe and stable long-term storage. Excess process water associated with the tailings slurry is typically decanted to form a surface pond and is recycled back to the Processing Plant. Additional water supply is sourced from the Taieri River via the Lone Pine Reservoir or from within the Macraes Water Management System (“**MWMS**”) (refer Section 5.4.1 in **Part A.05** of this report). At times, excess water within the TSF is managed through forced evaporation using water sprayers.



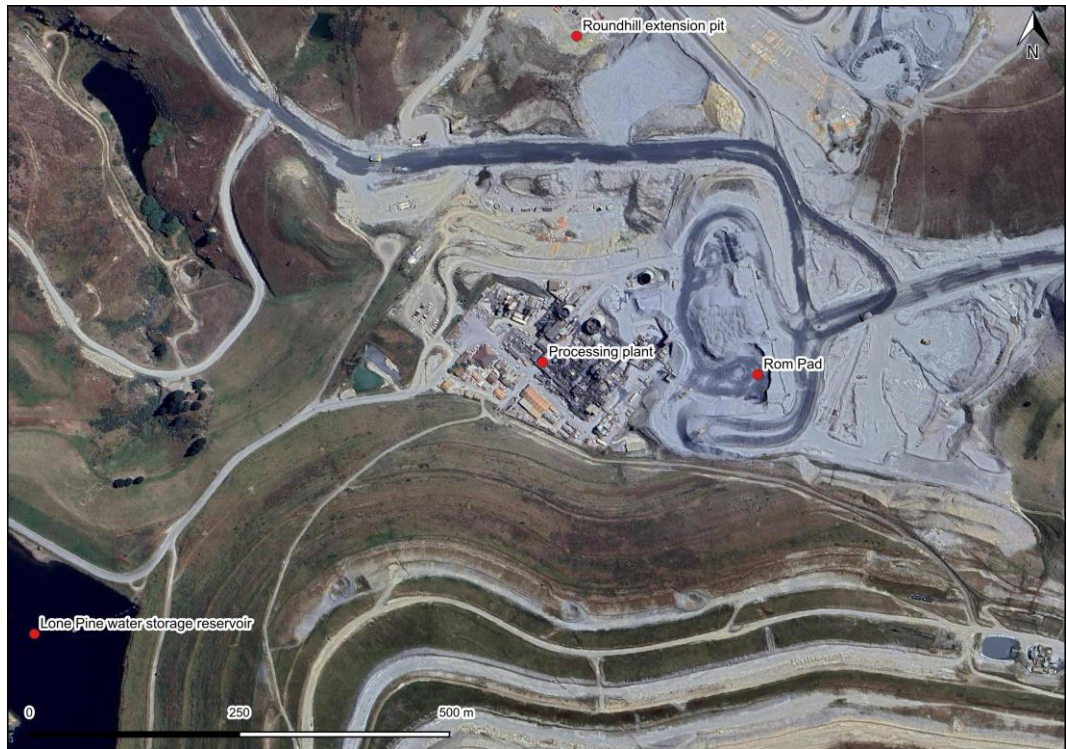


Figure 5-7: Ore Storage (Rom Pad) adjacent to the Processing Plant.

### 5.3.7 Tailings Storage Facilities

There are four operational and non-operating TSFs at the Macraes Operation (shown in Figure 5-8 below):

- > The Frasers TSF;
- > The Top Tipperary TSF;
- > The Southern Pit TSF (comprising Southern Pit Option 10 TSF (“**SP10**”) and Southern Pit Option 11A TSF (“**SP11**”); and
- > The Mixed Tailings Impoundment (“**MTI**”).





**Figure 5-8: TSF Locations at the Macraes Operation.**

#### **5.3.7.1 Frasers TSF**

Frasers TSF is an in-pit TSF being constructed within the mined-out Frasers Pit and is currently receiving tailings from the Processing Plant. It comprises a waste rock embankment called Frasers Backfill which separates stored tailings for the nearby Innes Mills Pit. Frasers TSF has been authorised in two stages and has an authorised tailings storage volume of about 35 Mt.

#### **5.3.7.2 Top Tipperary TSF**

The Top Tipperary TSF is the largest TSF on site and has been active since construction commenced in October 2013. The facility comprises a zoned earth and rockfill embankment constructed from mine waste rock and has been raised in a series of lifts to a current embankment height of 570 mRL. Construction of the embankment to this final height was completed in January 2025 and very little tailings storage capacity remains.

#### **5.3.7.3 Southern Pit TSF**

The Southern Pit TSF is located within the mined out Southern Pit immediately east of the MTI. It comprises both the SP10 and SP11A TSFs and contains approximately 27 Mt of tailings. Tailing deposition into this TSF began in 2006 and ceased in 2012. The facility



comprises a zoned earth and rockfill embankment constructed from mine waste rock and has been raised in a series of lifts to a current embankment height of 544m RL.<sup>3</sup>

The Southern Pit TSF is inactive and classified as a resting impoundment with no remaining capacity for tailings storage and no practicable option for further embankment raises.

#### **5.3.7.4 Mixed Tailings Impoundment**

The MTI was the initial starter TSF for the Macraes Operation and now contains approximately 70 Mt of tailings. Tailings deposition began in 1991 and ceased in 2013 when Top Tipperary TSF commenced operation. The facility comprises a zoned earth and rockfill embankment constructed from mine waste rock and has been raised in a series of lifts to a current embankment height of 548m RL.<sup>4</sup>

The MTI is inactive and classified as a resting impoundment with no remaining capacity for tailings storage and no practicable option for further embankment raises.

#### **5.3.8 Ancillary Infrastructure**

Mining at the Macraes Operation is supported by a range of ancillary infrastructure, much of which exists within the Central Mining Area. Ancillary infrastructure includes but is not limited to:

- > Offices;
- > Workshops;
- > Fuel storage;
- > A Concrete Batching Plant;
- > Explosives storage and manufacturing facilities; and
- > Electricity distribution infrastructure.

All of the existing ancillary infrastructure will continue to be used for MP4 although the existing Open Pit Workshop will be relocated; a further description of that is provided below.

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<sup>3</sup> Resource consent to RL551 and building consent to RL544 (current crest level).

<sup>4</sup> Resource consent to RL551 and building consent to RL544 (current crest level).



#### 5.3.8.1 Open Pit Mining Workshop

The Open Pit Mining Workshop (**“the Workshop”**) is located between the MTI and SP11 dam, just north of the Innes Mills and Frasers Pits. The main features of the Open Pit Mining Workshop are shown in Figure 5-9.



Figure 5-9: Features of the Open Pit Mining Workshop.

The main workshop area comprises two adjoining steel-framed buildings with concrete floors. Vehicle access is provided by cantilever doors on the eastern side. Office space is accommodated on a mezzanine level and within portable units to the west.

Workshop activities and infrastructure include banded hydrocarbon and waste oil storage, vehicle repair, servicing and refuelling areas, a service truck refill point, a small diesel bowser, and a gas storage area. A concrete apron on the eastern side drains to a stormwater sump.

Surrounding the buildings are areas for scrap metal and parts storage, laydown, parking, and general site traffic. Ancillary infrastructure includes storage containers, generators, and firefighting water tanks. The northern part of the workshop area includes wash bays for light and heavy vehicles. Associated infrastructure includes sumps, piping, and ponds for wash water and sediment management. This area also accommodates tyre testing, equipment storage, and heavy vehicle parking.



Stormwater from the wider workshop area is collected via a western gully and directed toward the MTI. The site also includes a fuel farm with a 30,000 L diesel tank, used for light vehicle refuelling, and a portable diesel tank and a decommissioned fuel tank.

### **5.3.9 Closure of Macraes Operation**

Closure of the Macraes Operation has been considered in each of the previous consenting phases and has generally been consented to the extent practicable, while acknowledging that some additional resource consents might be required at the time of final closure.

The currently authorised closure strategy provides for the establishment of pit lakes within Coronation North Pit, Coronation Pit, Deepdell North Pit, Golden Point / Round Hill Pit, Innes Mills Pit, Frasers Pit and Golden Bar Pit. WRS and other disturbed landforms are intended to be progressively rehabilitated to stable, vegetated landforms that support post-mining land uses. Within the Central Mining Area and Golden Bar Mining Area, rehabilitation is generally directed toward pasture-based land cover, while the Coronation Mining Area is intended to support a mix of pasture and tussock grassland.

TSFs are intended to be drained, capped and rehabilitated with vegetation appropriate to the final landform and agreed post-mining land use, including pasture, shrubland and tree cover. An exception is the Frasers TSF, which is planned to be inundated by the future Frasers Pit Lake.

Following closure, site infrastructure is generally intended to be removed in accordance with a site decommissioning plan. Public exclusion areas, primarily associated with pit lake margins and other safety-sensitive features, are proposed to be established where required, with fencing or barriers maintained to manage public safety.

The final post-mining landscape also provides for ongoing public access through selected areas, including the vesting of the Coronation haul road as a public road and the establishment of an east-west access route through the former mine workings.

The existing resource consents require the provision of financial bonds to secure implementation of closure and rehabilitation outcomes which are bonded to the relevant territorial authorities. Under the current consent framework, responsibility for closure, rehabilitation and ongoing consent obligations remains with OGNZL as consent holder unless those obligations are formally transferred to another party as part of a future land disposal process.



### 5.3.10 Approvals and Applications Currently Being Processed

The following resource consent applications for activities at Macraes have been lodged by OGNZL and continue to be processed:

- > Back Road Waste Rock Stack
  - > A resource consent application was made in 2022 to ORC to replace an expired resource consent (RM10.351.01) providing for the reclamation of streams associated with the construction of the proposed Back Road WRS. At this time the need for a further consent regarding natural inland wetlands was also identified. On 25 July 2022, ORC issued a second request for further information and that application remains on hold whilst OGNZL considers its response.
- > Coronation Mining Area Consent Replacements
  - > A resource consent application was made in 2025 to ORC to replace several expiring discharge permits to enable ongoing construction and rehabilitation of the Coronation WRS, Coronation North WRS and Trimbells WRS, as well as backfilling of Coronation Pit and Coronation North Pit. On 4 November 2025, ORC issued a request for further information and that application remains on hold whilst OGNZL considers its response.
- > Concrete Batching Plant Relocation
  - > A resource consent application was made in late August 2026 to WDC for a land use consent to enable the use and storage of hazardous substances associated with the relocation of the on-site Concrete Batching Plant and associated relocation of a fuel farm. No regional council consents were sought as part of this application.

No other applications for approvals relevant to the FTAA are currently being processed.

## 5.4 SITE WATER MANAGEMENT

### 5.4.1 Mine Water Management System and Infrastructure

The management of water within the MWMS is a key part of the mining operation. The MWMS involves the management of water within the mine to achieve the following objectives:

- > To enable the use of water at the Macraes Operation to support mining and activities ancillary to mining;
- > To ensure that a constant supply of water is available to the Processing Plant to enable continuous processing of ore;



- > To allow for the storage of water at locations across the mine prior to its use in the mining and processing of ore; and
- > To control discharges of mine impacted water to the wider environment such that compliance with instream water quality criteria is maintained.

### **Elements of the MWMS**

The MWMS comprises the following key elements:

- > Open Pits, which collect and store surface water runoff and groundwater inflow. Open pits are also used for temporary storage of water pumped from other elements of the MWMS;
- > Underground Mines, which collect groundwater inflow (including seepage from other mine features), and any operational water used in the course of developing or maintaining underground mines;
- > TSFs, which collect tailings slurry discharged from the Processing Plant, rainfall and seepage and are a primary source of process water through pumping back to the Processing Plant;
- > Sumps and silt ponds, which collect water from WRSs and other disturbed areas;
- > Dams, which provide for the temporary storage of water; and
- > Above ground water storage infrastructure e.g. tanks, pipes and pumps.

The primary sources of water to the MWMS are:

- > Rainfall and stormwater collecting in the elements listed above;
- > Groundwater that is naturally intercepted by open pits and underground mines;
- > Augmentation of OGNZL's consented water take from the Taieri River which enters the MWMS at the Lone Pine Reservoir; and
- > Seepages from mine related elements such as TSFs and WRSs.

### **Management of the MWMS**

OGNZL uses water conveyance infrastructure (primarily pumps and pipes) to move water between the various MWMS elements as required to meet its objectives. Water from the MWMS may be used in the Processing Plant, used in the underground mining system, for dust suppression, and to support ancillary mining activities e.g. vehicle wash down, fire suppression and use in workshops and yards to discharge from the site in accordance with



the discharge permits. Any discharges from the MWMS are managed in accordance with the conditions of OGNZL's existing discharge permits.

#### **5.4.2 Camp Creek Dam**

Camp Creek Dam site is located to the south-east of the Coronation Mining Area and north-east of the Central Mining Area as shown in Figure 5-10. OGNZL holds a suite of resource consents that authorise the construction, operation and maintenance of Camp Creek Dam that were issued for the Macraes Phase 3 Project. The dam has not yet been constructed but since being authorised has remained an available option to provide a constant, or seasonally varied, water supply downstream to supplement naturally occurring low flows in Deepdell Creek for the purposes of maintaining water quality. The consented dam consists of an embankment with an approximate height of 29 m, behind which approximately 1.4 million m<sup>3</sup> of water can be stored when at full capacity, with a reservoir footprint of approximately 13.7 ha.

The consents that authorise the construction, operation and maintenance of Camp Creek Dam do not lapse and may be implemented at any time prior to their expiry on 1 October 2046.



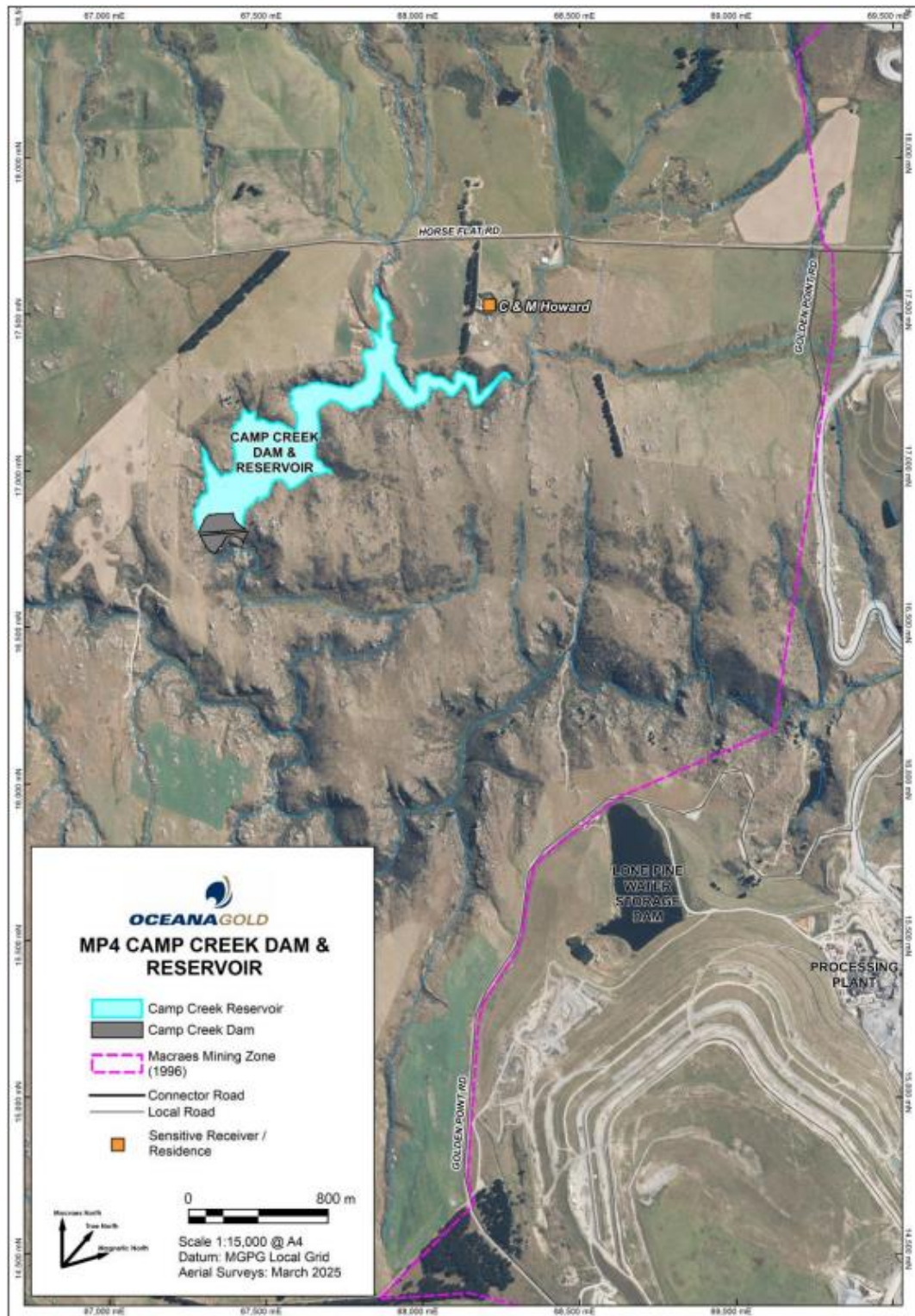


Figure 5-10: Locality of Camp Creek Dam and Reservoir.



### 5.4.3 Coal Creek Dam

Coal Creek Dam site is located to the north-east of the Coronation Mining Area as shown in Figure 5-11. OGNZL holds a suite of resource consents that authorise the construction, operation and maintenance of Coal Creek Dam which were issued for the Coronation North Project. The dam has not yet been constructed but since being authorised has remained an available option to provide a constant water supply downstream to supplement naturally occurring low flows in Coal Creek and Mare Burn for the purposes of maintaining water quality. The consented dam consists of an embankment with an approximate height of 27 m, behind which approximately 0.67 million m<sup>3</sup> of water can be stored when at full capacity, with a reservoir footprint of approximately 9.3 ha.

The consents that authorise the construction, operation and maintenance of Coal Creek Dam do not lapse and may be implemented at any time prior to the consent expiry on 24 April 2052.



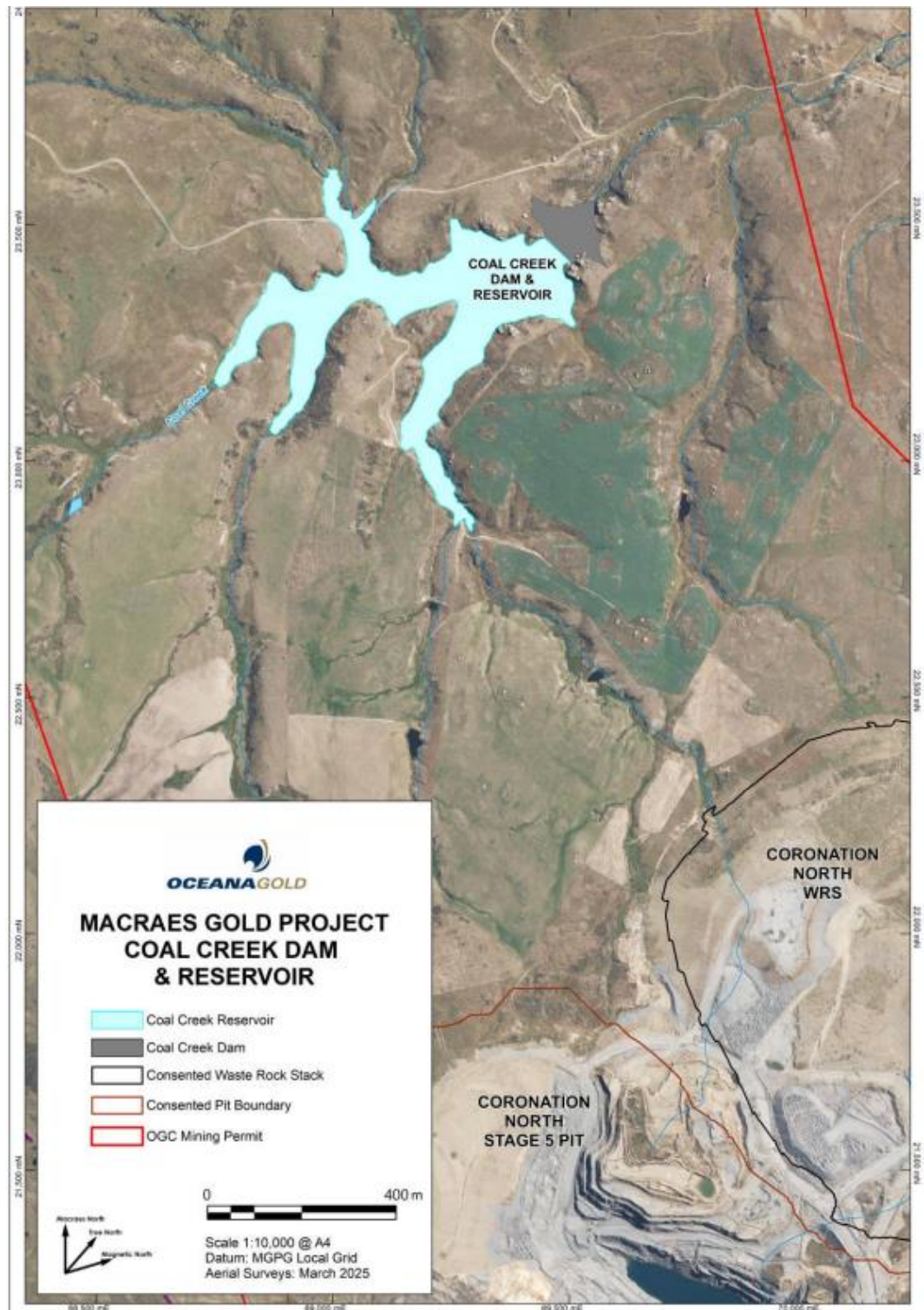


Figure 5-11: Location of Coal Creek Dam and Reservoir.



#### 5.4.4 Water Quality Compliance Criteria

OGNZL's existing discharge permits provide for a range of discharges associated with mining activities across the Mare Burn, North Branch Waikouaiti River, and Deepdell Creek catchments. Collectively, they establish a comprehensive monitoring and compliance framework. Water quality is assessed at specified downstream receiving environments and, where available, upstream control sites.

Monitoring requirements include defined locations, parameters, frequencies, supported by supplementary monitoring to inform interpretation of wider catchment conditions. The established water quality compliance limits reflect the regulatory and technical guidance applicable at the time of consenting, drawing on national and international water quality standards. These limits vary between locations depending on their purpose.

Existing water quality compliance criteria at the key monitoring points are detailed by Viridis (2026a) for each of these catchments and are identified in Table 5-2. OGNZL utilises its existing Water Quality Management Plan ("WQMP") to manage its existing activities to achieve these criteria.

Table 5-2: Existing Water Quality Compliance Criteria.

| Parameter                    | Limit     | Applicable Sites                                                    |
|------------------------------|-----------|---------------------------------------------------------------------|
| pH                           | 7 - 8.5   | Shag at Loop, Shag at McCormicks Creek                              |
|                              | 6.5 - 9.5 | MB02                                                                |
|                              | 6.0 - 9.5 | CJ01, DC08, MB01, MC01, MC02, GB02, HC02, NB03, NBWRRF, SPMP1, TC01 |
| Visibility (TSS / turbidity) | 30-50% Δ  | MB02                                                                |
| Sulphate                     | 1,000     | CJ01, DC08, HC02, MB01, MC01, NBWRRF, TC01                          |
|                              | 250       | NB03, Shag at Loop Road, Shag at McCormicks Creek                   |
| Ammoniacal nitrogen          | 0.24      | MB02                                                                |
| Nitrate nitrogen             | 2.4       | DC08, HC02, MB02, Shag at Loop Road                                 |



| Parameter | Limit  | Applicable Sites                                                                                           |
|-----------|--------|------------------------------------------------------------------------------------------------------------|
|           | 3.5    | DC08, HC02, Shag at Loop Road                                                                              |
| Arsenic   | 0.15   | CJ01, DC08, GB02, MB01, MB02, MC01, MC02, NBWRRF, SPMP1, TC01                                              |
|           | 0.013  | HC02                                                                                                       |
|           | 0.01   | NB03, Shag at Loop Road, Shag at McCormicks Creek                                                          |
| Copper    | 0.018  | CJ01, DC08, GB02, MB01, MB02, MC01, MC02, NB03, NBWRRF, Shag at Loop Road, Shag at McCormicks, SPMP1, TC01 |
|           | 0.0076 | HC02                                                                                                       |
| Iron      | 1      | CJ01, DC08, GB02, MB01, MB02, MC01, MC02, NB03, NBWRRF, SPMP1, TC01                                        |
|           | 0.3    | HC02                                                                                                       |
|           | 0.2    | NB03, Shag at Loop Road, Shag at McCormicks                                                                |
| Lead      | 0.0059 | CJ01, DC08, GB02, MB01, MB02, MC01, MC02, NB03, NBWRRF, Shag at Loop Road, Shag at McCormicks, SPMP1, TC01 |
|           | 0.043  | HC02                                                                                                       |
| Zinc      | 0.23   | CJ01, DC08, GB02, MB01, MB02, MC01, MC02, NB03, NBWRRF, Shag at Loop Road, Shag at McCormicks, TC01        |
|           | 0.044  | HC02                                                                                                       |



| Parameter                    | Limit | Applicable Sites                                                                               |
|------------------------------|-------|------------------------------------------------------------------------------------------------|
| Cyanide                      | 0.1   | CJ01, DC08, MB01, MB02, MC01, NB03, NBWRRF, Shag at Loop Road, Shag at McCormicks, SPMP1, TC01 |
| Long filamentous algae cover | 30%   | DC03, DC08, HC02                                                                               |

Notes: Units are in g/m3 unless stated otherwise; All metals are tested in the dissolved fraction unless stated; HMTV = hardness modified trigger value; DGV = default guideline value; NBL = national bottom line; A applied as fixed limit; B Calculated at pH of 8; \* Adjusted here for a standard Macraes Operation hardness of 220 g/m3 CaCO3, though typically presented in consent schedules at a hardness of 30 or 100 g/m3 CaCO3.

Previous projects at the Macraes Operation have been consented on the basis that water quality in the existing environment could approach the limits prescribed in the above table throughout the life of the mine and into closure. Significant investment has been made into the operation on the basis that these compliance limits will endure for at least the duration of the existing resource consents. The existing resource consents provide for these compliance limits until at least 2046.

OGNZL utilises the MWMS to achieve the compliance criteria during operations. Various mitigation measures are prescribed in the WQMP to enable the above criteria to be met over the long term. These include (but are not limited to):

- > Rehabilitation of WRS surfaces;
- > Implementation of passive treatment systems for WRS and TSF seepages; and
- > Augmentation of stream flows using one or more freshwater sources.

## 5.5 ECOLOGICAL COMPENSATION AREAS

Over the life of the Macraes Operation, numerous ecological enhancement and offsetting activities have occurred. These include, but are not limited to:

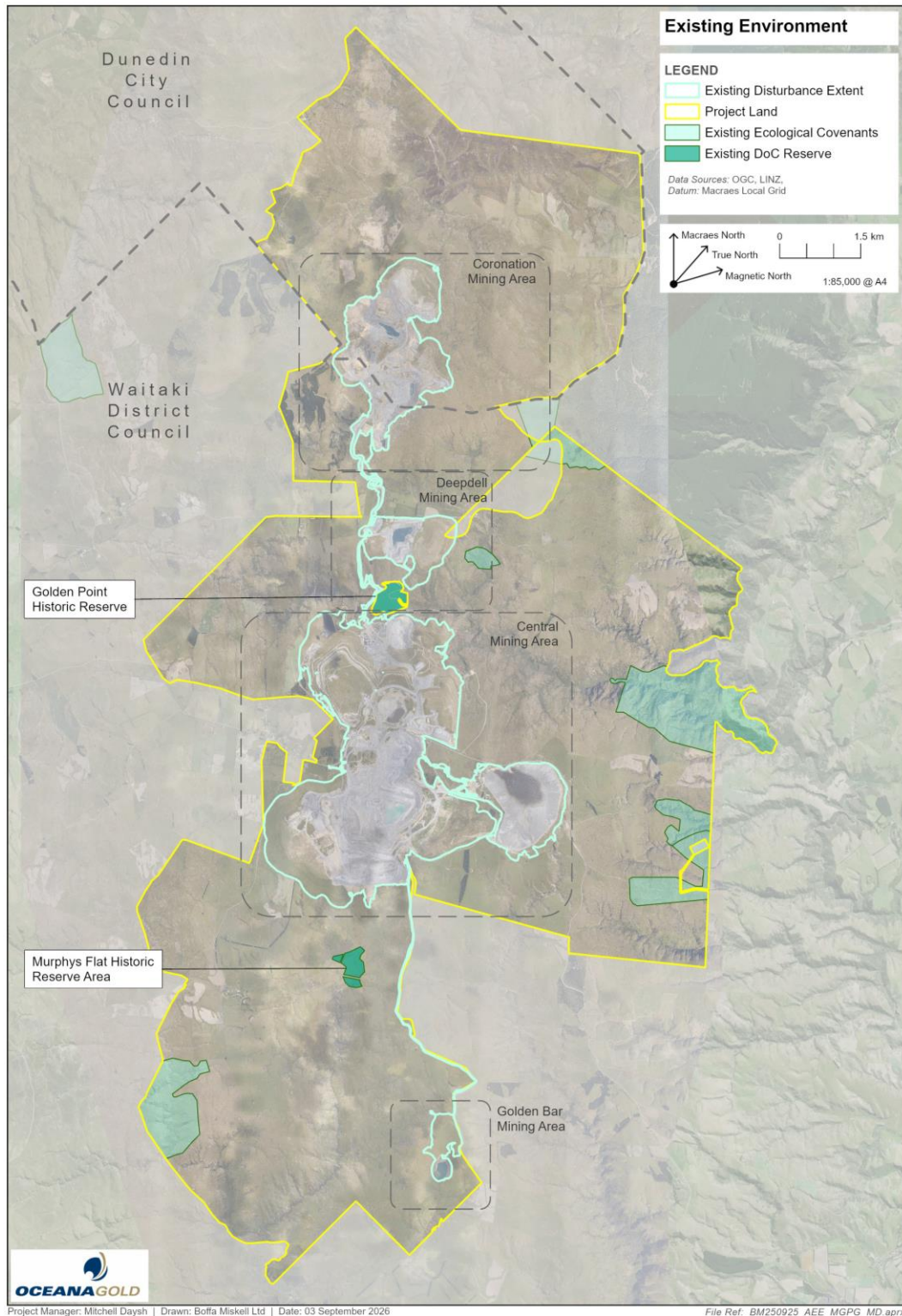
- > The establishment and ongoing management of the Island Block Covenant Area;
- > The establishment and ongoing management of the Highlay Hill Covenant Area;
- > The establishment and ongoing management of the Highlay Creek Covenant Area;
- > The establishment and ongoing management of the Cranky Jims shrubland and wetland Covenant Areas;
- > The establishment of the Deepdell Tussock Covenant;



- > The fencing and enhancement of seven wetlands along the Macraes-Dunback Road;
- > The establishment and ongoing management of the Redback Ecological Enhancement Area and the Wetland Ecological Enhancement Area; and
- > The creation of a \$250,000 Habitat Enhancement Fund as part of the Coronation North Project.

The location of these areas are shown in Figure 5-12: Location of Existing Ecological Areas. below.





**Figure 5-12: Location of Existing Ecological Areas.**

In accordance with the resource consents described in **Part F** of this substantive application, additional ecological management measures have also been undertaken,



including species translocations, the protection and management of At Risk and Threatened species, rehabilitation activities, and other ecological enhancement initiatives.

## **5.6 LAND OWNERSHIP**

### **5.6.1 Project Land**

The current Macraes Operation is located on land owned by OGNZL. MP4 proposes to expand aspects of the Macraes Operation and includes several ancillary activities that occur on land adjacent to the existing operation. For the purposes of this application, Project Land has been defined using an envelope (aligned with cadastral boundaries) that encapsulates all activities comprising the Project as described in **Part A.06** of this report. Figure 5-13 below illustrates the ownership of the Project Land.

OGNZL is the registered owner and occupier of the vast majority of the Project Land. Parts of the Project Land not owned by OGNZL are illustrate on Figure 5-13 and are limited to:

- > Camp Creek Dam land (held in private ownership);
- > Road reserve (owned and managed by WDC); and
- > Historic Reserve and riparian margins (owned and managed by the Crown).

In respect of the Camp Creek Dam land, following the grant of resource consents for Camp Creek Dam as part of the MP3 Project, OGNZL entered into an Access and Easement Option Agreement with the landowners on 20 December 2011. The Agreement provided OGNZL with a 10-year option to obtain an easement to access the land and construct, operate and maintain the Camp Creek Dam. By letter dated 8 December 2021, OGNZL gave notice that it wished to exercise the option, and a Deed of Covenant giving effect to the easement was executed on 13 June 2022. As a result, OGNZL holds easement rights over the Camp Creek Dam land and has the necessary legal interest to enable the construction, operation and maintenance of Camp Creek Dam as provided in **Part G.04** of this substantive application.

In respect of road reserve land, both formed and unformed (paper roads) traverse the Macraes Operation. OGNZL has existing consenting obligations for road reserves and certain public works agreements under the Public Work Act 1981 in relation to road reserves at Macraes. Where OGNZL wishes to undertake activities which would impact public roads, it needs to apply to the relevant roading authority (either the WDC or DCC) for an appropriate agreement, such as a licence to occupy, lease, other access arrangement, or permanent road stopping. Road stopping procedures sit outside the FTAA process. As part of its consultation and engagement with both Councils, OGNZL has identified the need for additional road stopping applications and has requested further public works agreements



under the Public Works Act 1981 in relation to road reserves. No objections to these requests have been received from either Council.

Where an existing road or unformed road reserve functions as a thoroughfare, OGNZL may, as part of any road stopping process, provide a replacement road alignment or alternative road reserve. For Stage 2 of the Macraes Road realignment, the proposed alignment will traverse the Frasers Backfill Embankment. Given that the embankment is classified as a large dam, the land containing the road cannot be vested in the WDC. OGNZL has therefore engaged with WDC and Environment Canterbury regarding the establishment of an easement to provide for an ongoing public right of way along Macraes Road.<sup>5</sup>

In respect of Crown owned land, the proposed MP4 activities have minimal interaction with this land. The proposed GPUG extension extends underground beneath a riparian margin of Deepdell Creek that is reserved to the Crown. OceanaGold's Mining Permits provide access to this land for underground mining and no access arrangement is required under the Crown Minerals Act. Further, OGNZL's proposed compensation activities may extend over the Murphys Flat Historic Reserve, which is managed by DOC. Potential activities within the Historic Reserve will be limited to pest animal control and associated monitoring. If necessary, OGNZL will apply for a concession for these activities via the conventional pathway.

**Part J.01** of this substantive application identifies the legal descriptions, records of title, as well as owner and occupier information for the Project Land. **Part J.02** of this substantive application provides a list of legal descriptions grouped by Project Element and identifies relevant legal interests (as discussed in the next section). Copies of all records of title for the Project Land are contained in **Part J.04** of this substantive application.

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<sup>5</sup> Environment Canterbury is the building consent authority for large dams in the Otago Region.



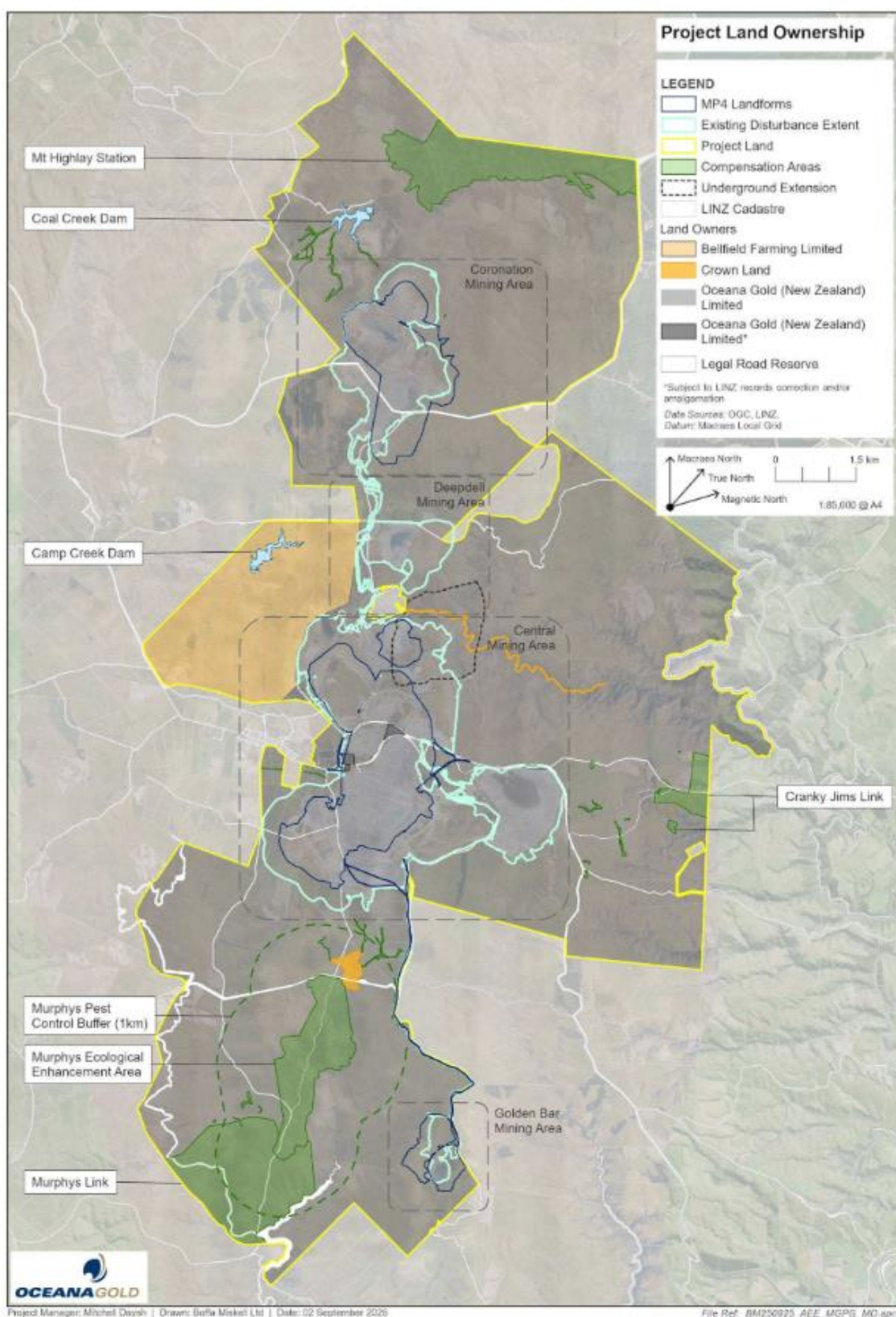


Figure 5-13: Landownership of areas relevant to MP4.



### 5.6.2 Titles and Registered Interests

In addition to land ownership, legal interests in the Project Land including easements, covenants and other encumbrances (if applicable), have been reviewed and considered where relevant. **Part J.02** of this substantive application identifies those with potential implications for MP4 activities. These include interests related to:

> The Climate Change Response Act 2002

Several parcels of land are subject to a notice pursuant to Section 195(2) Climate Change Response Act 2002. These notices relate to existing forestry located on the Project Land. This includes the Mt Highlay Station forestry block proposed to be removed. As part of establishing the compensation area at Mt Highlay Station, OGNZL will take steps to remove the relevant notice relating to its forestry. This can occur via a standard process under the Climate Change Response Act 2002.

> Heritage Covenants

Several parcels of Project Land are subject to Heritage Covenants. For the most part, the MP4 activities will not interact with these covenants. Where activities are proposed on land included within a heritage covenant, these activities have been considered by Origin (2026a). This is limited to works in the vicinity of Gay Tan's Cottage associated with Frasers West WRS and Macraes Road Realignment Stage 2. In respect of these works, Origin (2026a) states that although the works will occur within covenant-protected land, no modification to archaeological sites is proposed. As heritage covenant approvals are not provided for under the FTAA, approval from HNZPT will be sought separately, if required.

> Part IVA Conservation Act 1987

A number of land parcels are subject to Part IVA Conservation Act memorials. These memorials only have practical effect where the relevant land adjoins a river or stream with a bed that has an average width of 3 metres or more. In such cases a Crown-owned marginal strip may exist along the water's edge. A desktop assessment has indicated that where the Project Elements interact with streams, the streams are not of sufficient width to result in riparian margins.<sup>6</sup>

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<sup>6</sup> OGNZL acknowledges that stream widths have not been surveyed and if riparian margins are present, either a concession would be required where project activities coincide with that riparian margin, or adjustments would need to be made to the precise location of activities within compensation areas to ensure they do not occur within 20m of the stream.



### 5.6.3 Adjacent Landowners and Occupiers

Adjacent landowners and occupiers have been identified based on the boundary of the Project Land. Where the land immediately adjacent to the Project Land boundary is owned by OGNZL, the next adjoining privately owned parcel has been included as adjacent land for the purpose of satisfying in the assessment. In addition, the entirety of Macraes Village has been considered as adjacent land due to its proximity to the Macraes Operation. Figure 5-14 illustrates all land captured as adjacent land applying this approach. The details of all owners and occupiers (if relevant) of the identified adjacent land are provided in **Part J.03** of this substantive application.



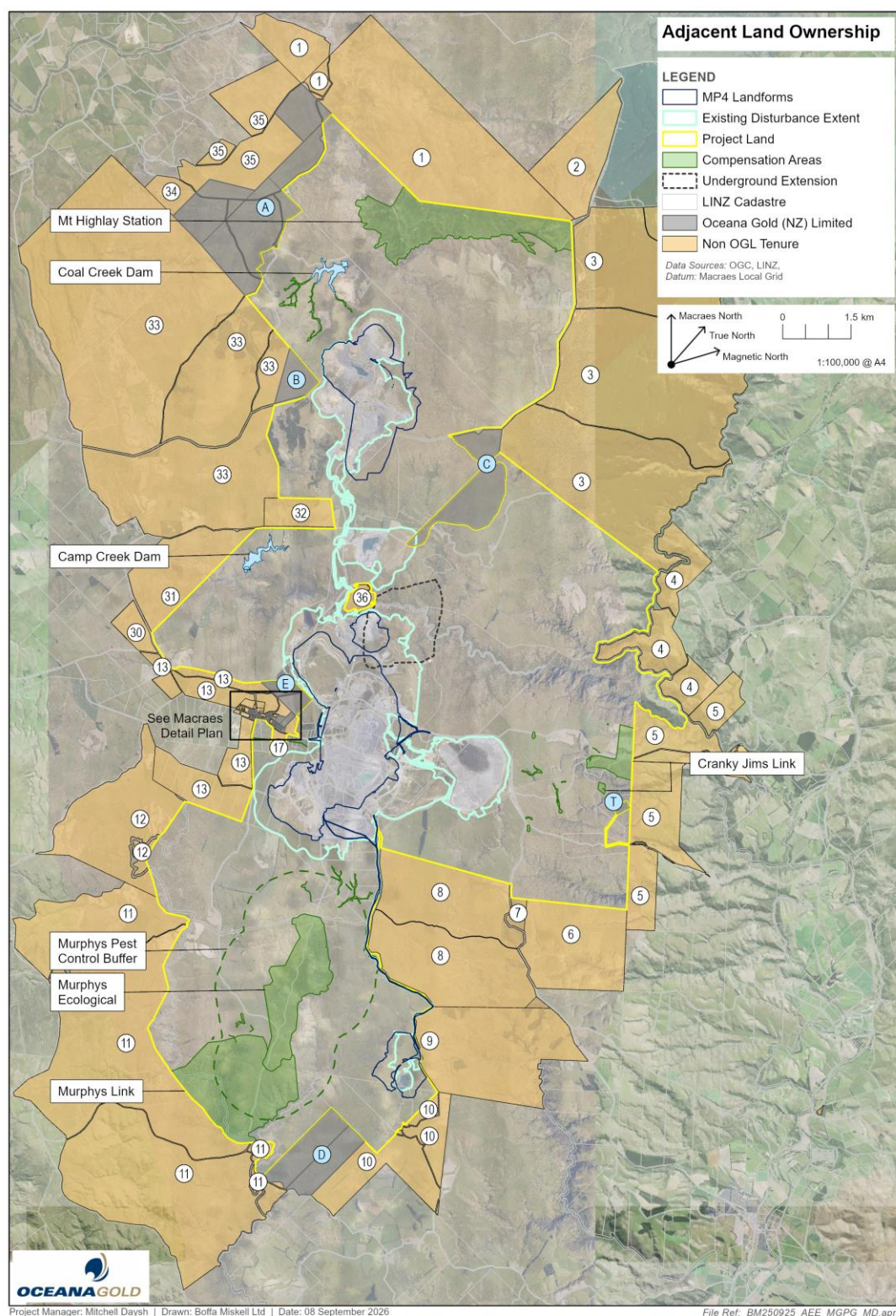


Figure 5-14: Map of Adjacent Land.



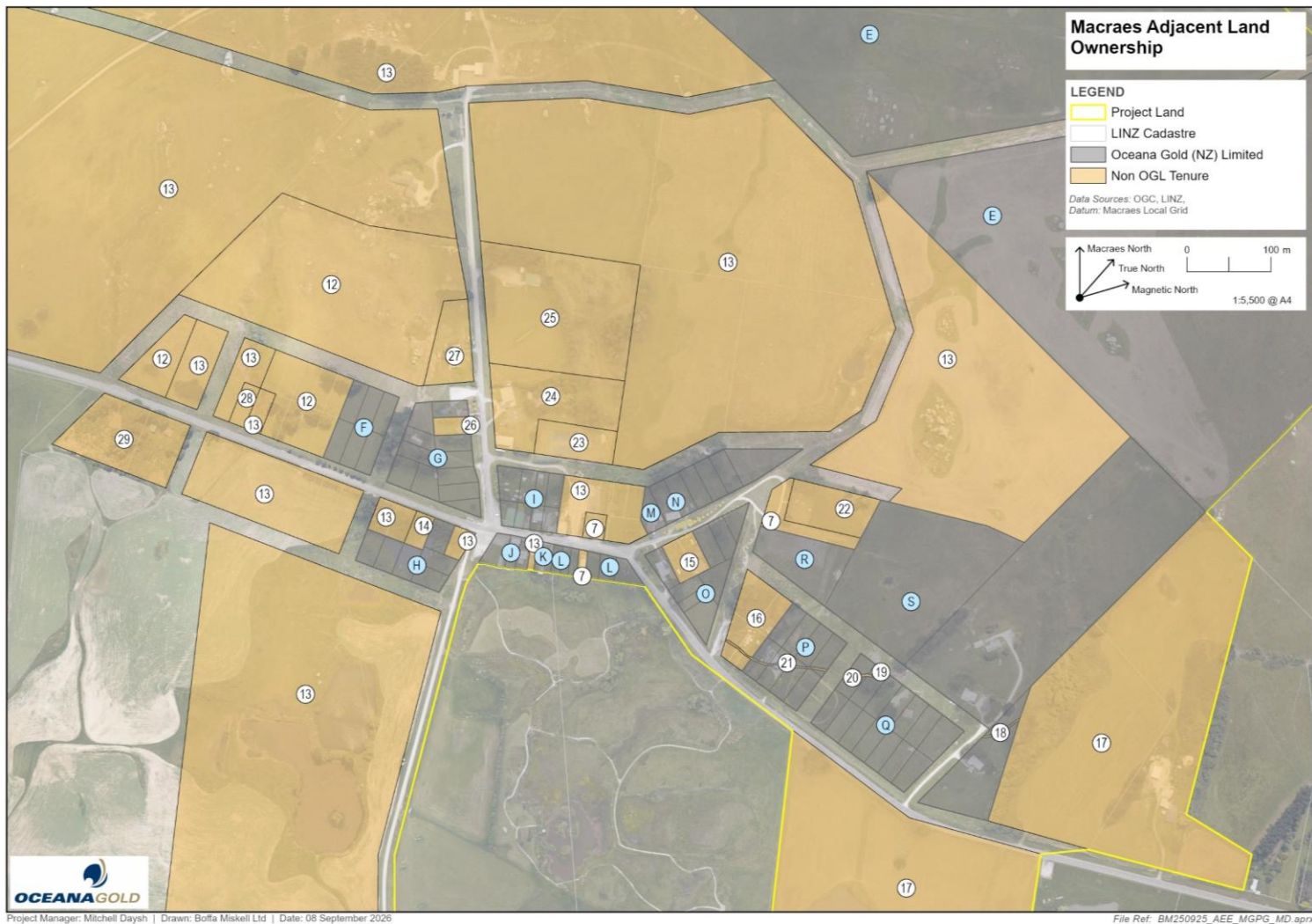


Figure 5-15: Map of Adjacent Land Inset



## 5.7 STATUTORY PLANNING FRAMEWORK

The Macraes Operation is located within the jurisdictional boundaries of the Otago Regional Council (“**ORC**”) and the Waitaki District Council (“**WDC**”). However, part of the Coronation Mining Area is located within the Dunedin City Council (“**DCC**”) jurisdiction. A summary of the relevant zonings, overlays and notations under the various regional and district plans administered by the ORC, WDC and DCC are provided in the sub-sections below. A full assessment of MP4 against the provisions of the statutory planning documents is provided in **Part A.07** of this report and **Part I** of this substantive application.

### 5.7.1 Otago Regional Policy Statement

The Otago Regional Policy Statement (“**RPS**”) notes that mining activities in the region contribute to approximately 4.5% of the total GDP for the Otago Region (\$13.2 billion).

The RPS describes the landscape in the Otago Region as modified by both farmland and remnants of the region’s early gold mining activity creating a rich sense of heritage and regional identity.

The Macraes Operation is not subject to any statutory acknowledgements listed within the RPS,<sup>7</sup> but the closest statutory acknowledgements to the Macraes Operation are the Mata-Au (Clutha River) and Te Wairere (Lake Dunstan).

### 5.7.2 Otago Regional Plans

There are no relevant notations or overlays that apply to the Macraes Operation under the relevant regional plans administered by the ORC. In summary, the following points are relevant to note for MP4:

- > The north-east section of the Macraes Operation is located within the Shag Catchment area and is subject to minimum flow requirements in the Regional Plan: Water for Otago (“**Regional Water Plan**”) (shown in Figure 5-16: River Catchments for the Macraes Operation);
- > The Regional Water Plan identifies the Deepdell Creek as having ecosystem values, including freedom from biological nuisances, the presence of rare indigenous fish species, and significant habitat for the flathead galaxiid;
- > The Regional Water Plan recognises Mare Burn as having natural ecosystem values for the presence of riparian vegetation of significance to aquatic habitats, spawning areas

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<sup>7</sup> Listed in the RPS but the statutory acknowledgments are protected through the Ngāi Tahu Settlement Act 1998.



for significant fish (trout and salmon), and significant areas for the development of juvenile trout and salmon;

- > The Macraes Operation is within the Dunedin & Coast Freshwater Management Unit (“**FMU**”) and the North Otago FMU;
- > MP4 is not located within any airsheds identified in Air Zone 1 and 2 and is therefore located in Air Zone 3 under the Regional Air Plan. This covers the remainder of the Otago Region and is subject to less stringent air quality standards; and
- > The Regional Waste Plan states a matter of concern relates to contaminated sites (which are often associated with mining activities) and disposal of hazardous waste such as mine waste and tailings.



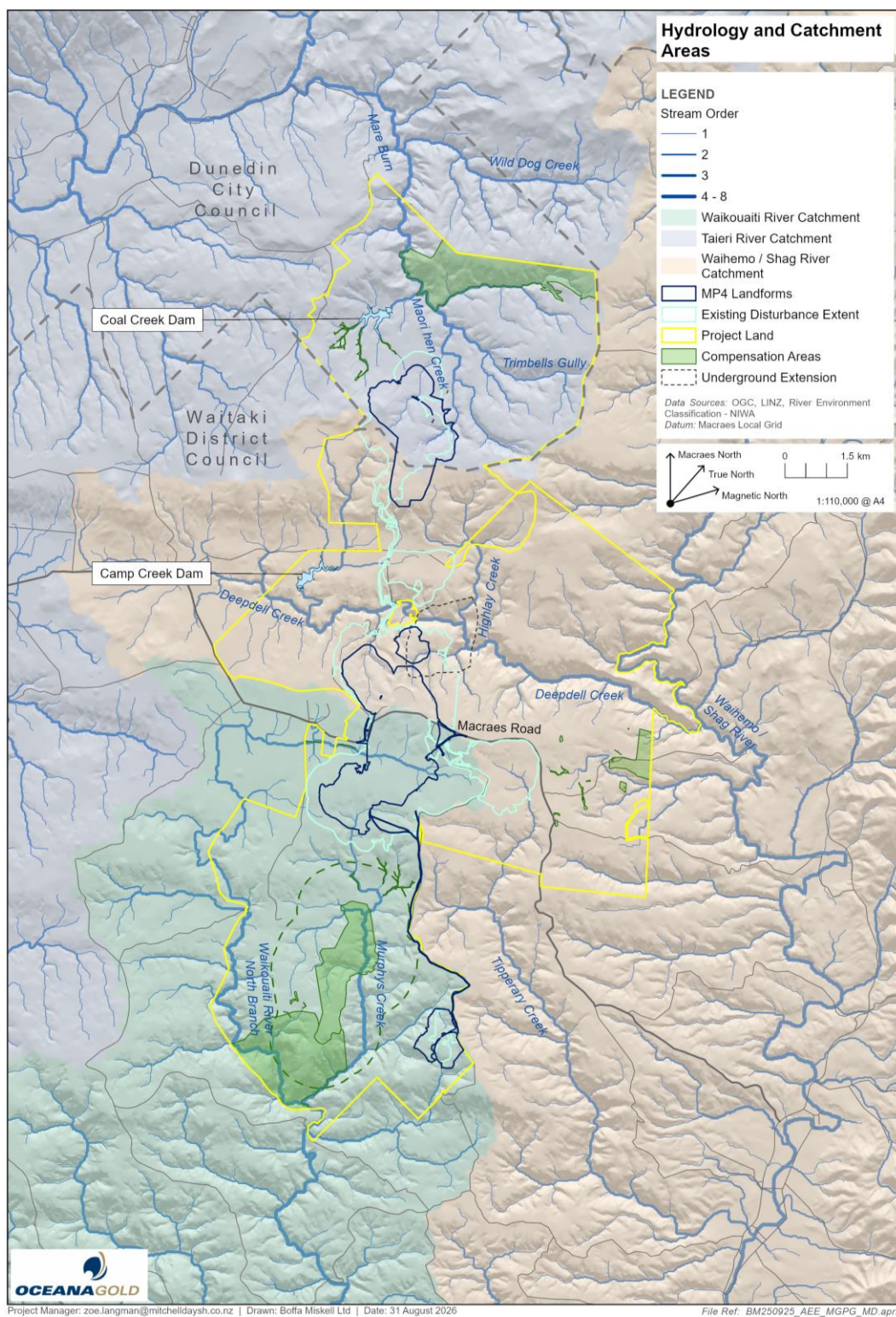


Figure 5-16: River Catchments for the Macraes Operation.



A full assessment of the resource consents sought under these regional plans for MP4 is provided in **Part A.07** of this report and a full rule assessment is provided in **Part I** of this substantive application.

### 5.7.3 Operative Waitaki District Plan

The Operative Waitaki District Plan (“**Operative WDP**”) was made operative in 2013. The relevant zoning and overlays detailed in the WDP as applicable to MP4 are summarised below.<sup>8</sup>

The operation is located predominantly within the Waitaki District, with Matheson Road marking the boundary with the Dunedin City district to the north. All land parcels south of Matheson Road (including part of the Coronation Backfill area) are subject to the WDP overlays described below.

The activities associated with MP4 are located predominantly within the Macraes Mining Project Mineral Zone (“**MMPMZ**”) and partially within the Rural Scenic Zone and General Rural Zone (as shown in Figure 5-18: Operative WDP Context).

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<sup>8</sup> Note that WDC is currently undertaking a partial review of its District Plan. Submissions on the Proposed District Plan have yet to be heard and no decisions have been issued. Accordingly, these provisions (insofar as they relate to the Macraes operation do not have legal effect and therefore have not been assessed in this application / report). Hearings on the PWDP began the week of 19 August 2026 and will occur in six parts.



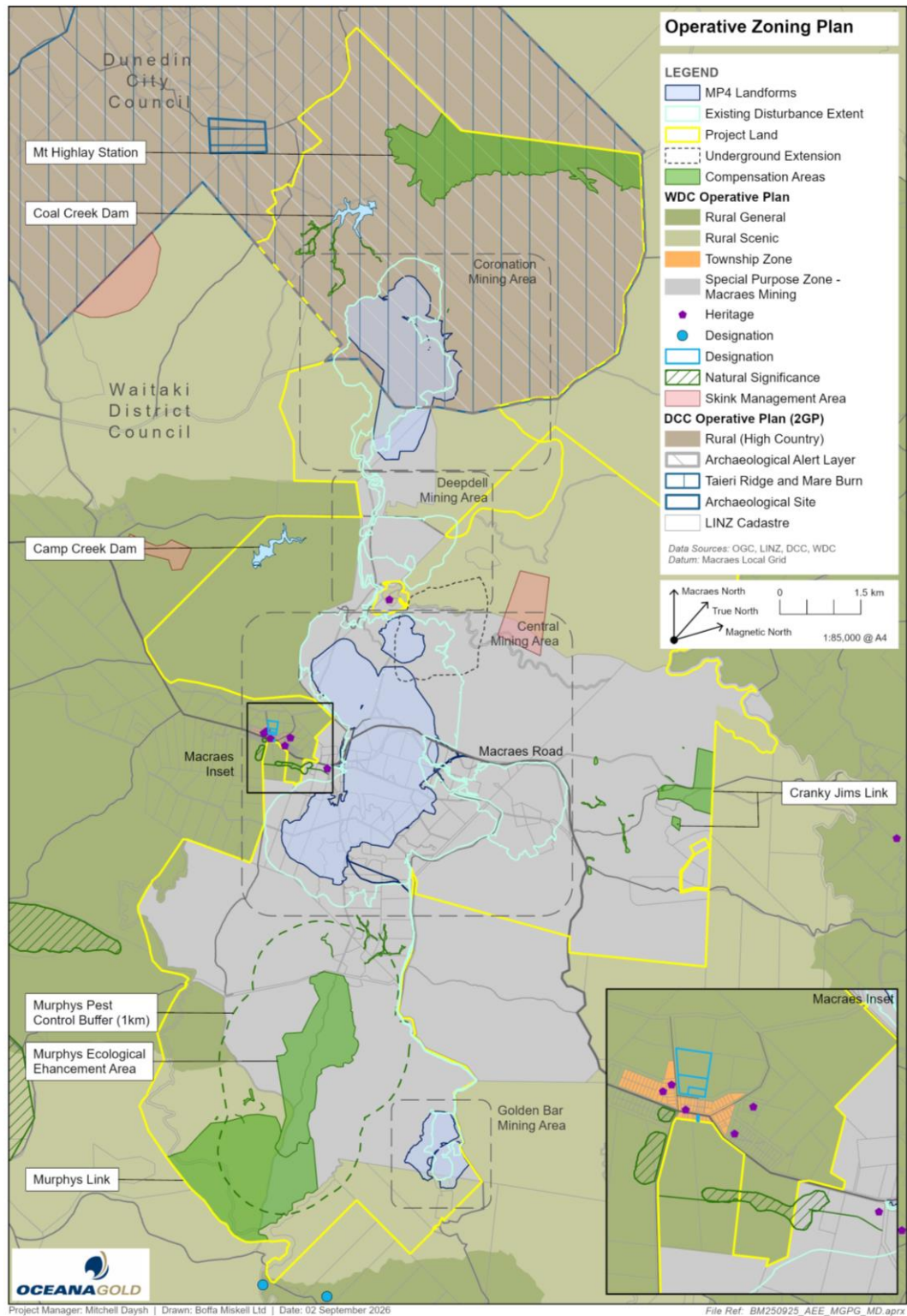


Figure 5-17: Operative WDP Context.



Heritage site 166 is located on the corner of Macraes Road and Gifford Road. The heritage site is identified as Gay Tan's Cottage<sup>9</sup> and has been listed with the following categories:

- > District Plan Category B;
- > NZHPT Register number 3217; and
- > NZHPT Category 2.

Immediately to the west of the Macraes Operation is Macraes township/village which includes five District Plan Category B heritage sites: 78 (Stanley's Hotel), 79 (Former St Patricks Catholic Church), 122 (Stone House), 123 (Presbyterian Church) and 128 (Old Cemetery)).

To the north of the Macraes Operation, a site adjacent to Golden Point Road contains heritage site 129 (WDC Map 31). This site is identified as Golden Point Sod Hut and Battery<sup>10</sup> and has the following categories:

- > District Plan Category B;
- > NZHPT Register number 7211 (part of the Golden Point historic area); and
- > Does not have a listed NZHPT category reference.

The location of the identified features are shown in Figure 5-17 above. There are no other heritage features, archaeological sites or other notable features identified within the boundaries of MP4 or in the immediate vicinity of Macraes Operation.

With respect to natural environment values, there are two Areas of Significant Indigenous Vegetation and Habitat of Indigenous Fauna (referred to as Natural Significance Sites on the Planning Maps) located within or in proximity to the MP4 boundary:

- > 103(b) Emerald Stream which is identified as a priority habitat area for Grand skink and Otago skink. Most diverse lizard population in the South Island. Other species include green skink, common skink, spotted common skink, speckled common skink and common gecko. Shallow valleys and gentle rolling ridges with extensive outcrops and bluffs along streams and standing tors. Vegetation includes snow tussock vegetation, manuka shrubland and outcrop vegetation. Falcon are also present.

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<sup>9</sup> Gay Tan's Cottage is the last intact Chinese residence in the Macraes Area and is one of the only surviving Chinese buildings throughout Otago.

<sup>10</sup> The Golden Point Sod Hut and Battery Site is part of the Golden Point Historic Reserve.



- > 106 Macraes Ponds which is identified as an important area for waterfowl and a rare moth (*Gingidiobora nebulosa*) on a local form of plant (*Gingidia montana*).

Macraes Ponds comprise a series of wetlands within the headwaters of the North Branch Waikouaiti River and are located on the low-lying flats between Macraes township and the Frasers West WRS. Part of this wetland network is located within the project land boundaries.

The northernmost extent of the Emerald Stream site is located approximately 700 m southeast of the Macraes Mining Project Mineral Zone/North Branch Waikouaiti River boundary and approximately 3.5 km from the Frasers West WRS.

These two Areas of Significant Indigenous Vegetation and Habitat of Indigenous Fauna are identified in Figure 5-17 above.

There are two roading alignments shown on the District Plan maps. There are no rules that apply to the realignment, but it is shown as a feature at the Macraes Operation.

The directly adjoining properties are zoned a mixture of Rural Scenic and Rural General and do not have any specific overlays shown on the WDC Planning Maps.

#### 5.7.4 Proposed Waitaki District Plan

WDC has notified the Exemptions Version of the Waitaki Proposed District Plan (“**Proposed WDP**”), however decisions are yet to be issued on this Plan. As such, the Operative WDP prevails. For completeness, a summary of the relevant overlays has been provided below.

Most of the Macraes Operation is within the Special Purpose Zone – Macraes Mining. The land adjacent to the Macraes Operation is zoned General Rural Zone. A National Grid transmission line traverses the project area generally from north to south. Associated 33 kV electricity distribution lines are also present.

Several facilities within the Macraes Operation exist within the Surface Fault Rupture Hazard Activities and Buildings Overlay. The rupture hazard overlay traverses the site in an east-west direction through the central portion of the project area, including areas around Deepdell and Macraes Road.

Several heritage sites are located adjacent to the western project boundary in the Central Mining Area, particularly around the Macraes settlement and infrastructure corridors.

The relevant overlays and features are shown in Figure 5-18 below.



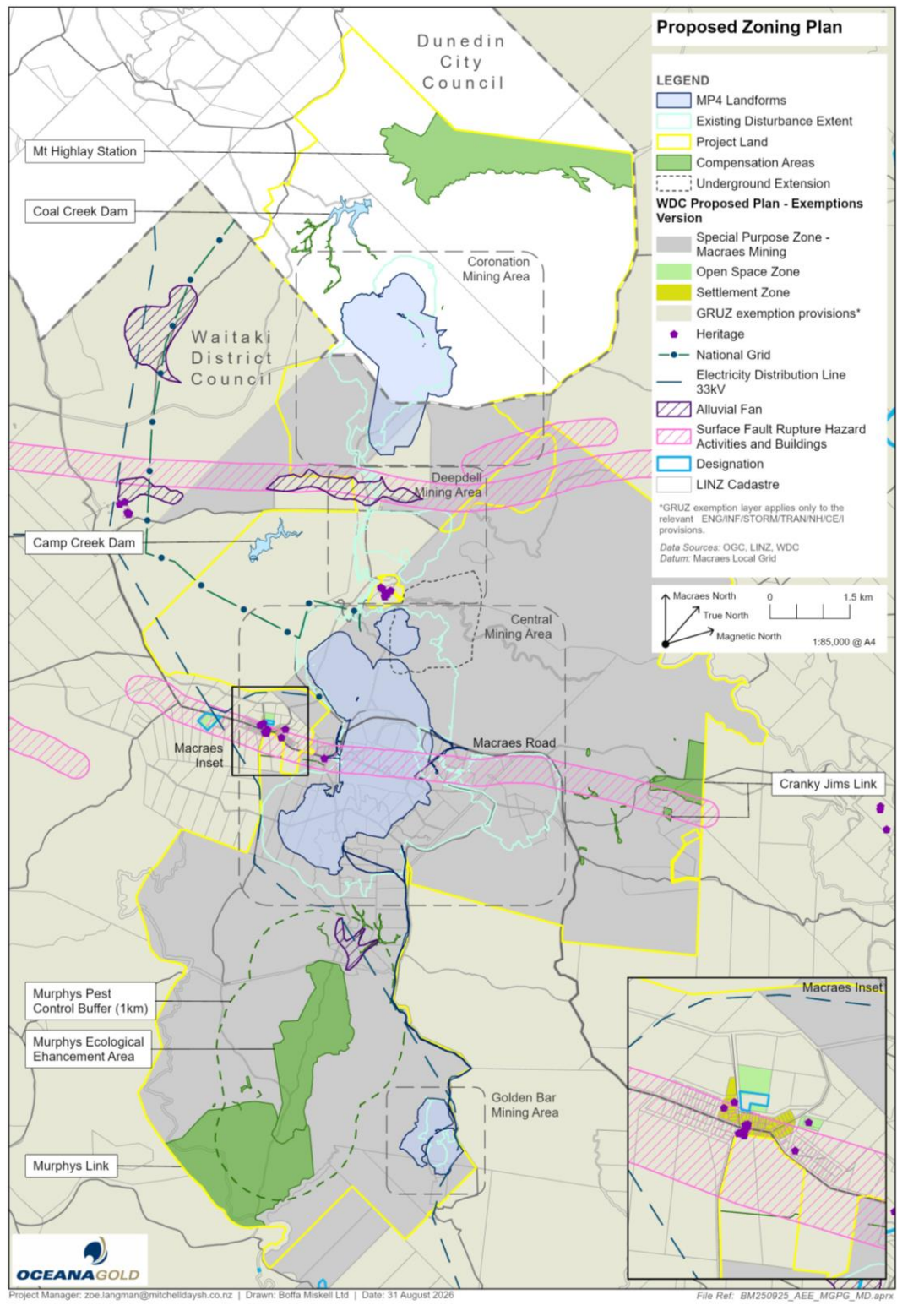


Figure 5-18: Proposed WDP Context.



### 5.7.5 Dunedin City Council

The Dunedin City District Plan (“**2GP**”) is the second district plan developed for the Dunedin City district under the RMA. As of 17 June 2026, the 2GP is operative and must be considered in full. A summary of the relevant zones and features have been provided below.

The northern section of the Macraes Operation, specifically the Coronation North Pit, Trimbells WRS, Coronation WRS and the Coronation North Backfill are all located within the jurisdiction of the DCC as shown in Figure 5-18: Proposed WDP Context. This area is subject to the following planning overlays in the 2GP.

- > Archaeological Alert Layer;
- > High Country Rural Zone; and
- > Taieri Ridge and Mare Burn mapped area.

The 2GP includes an archaeological alert layer over the Coronation and Coronation North Mining Areas. Note 3.3.2A of the 2GP states that scheduled archaeological sites are identified on the Planning Maps and that unidentified archaeological sites are more likely to occur within areas covered by the archaeological alert layer. There are no scheduled archaeological sites identified in the 2GP within the Macraes Operation.

The High-Country Rural Zone is described as extending along the north-western boundary of Dunedin City, encompassing the high-country ridgelines of the Rock and Pillar and Lammermoor Ranges above the Strath Taieri Plain. The zone is characterised by its defined landforms and limited human modification. The Macraes Operation has modified part of the area through mining activities. These activities are predominantly undertaken in the Waitaki District but have expanded into the Dunedin City District with the Coronation and Coronation North Projects.

The Coronation Mining Area also includes an overlay of the Taieri Ridge and Mare Burn mapped area, which has mana whenua values associated with a historic Māori trail across the ridge. Other values identified in the High-Country Rural Zone relevant to the MP4 include:

- > Large scale, open, expansive character. Highly coherent natural landform under an apparently largely unmodified grassland vegetative cover. The zone covers a high-country area distinctive for Dunedin;
- > Unique landforms, reminiscent of Central Otago. These include elevated sections of the Taieri Ridge. Rock outcrops and tors are distinctive features;



- > Predominantly pastoral land use including intact scrub and snow tussock vegetation sequences progressing to sub-alpine herb fields, as well as some modified grasslands; and
- > Human made elements which emphasise local character and contribute to visual quality, e.g. stone buildings, rock fence posts.

#### 5.7.6 National Policy Statement for Highly Productive Land

The National Policy Statement for Highly Productive Land 2022 (“**NPS-HPL**”) came into effect on 17 October 2022. It provides direction to protect highly productive land from inappropriate use and development.

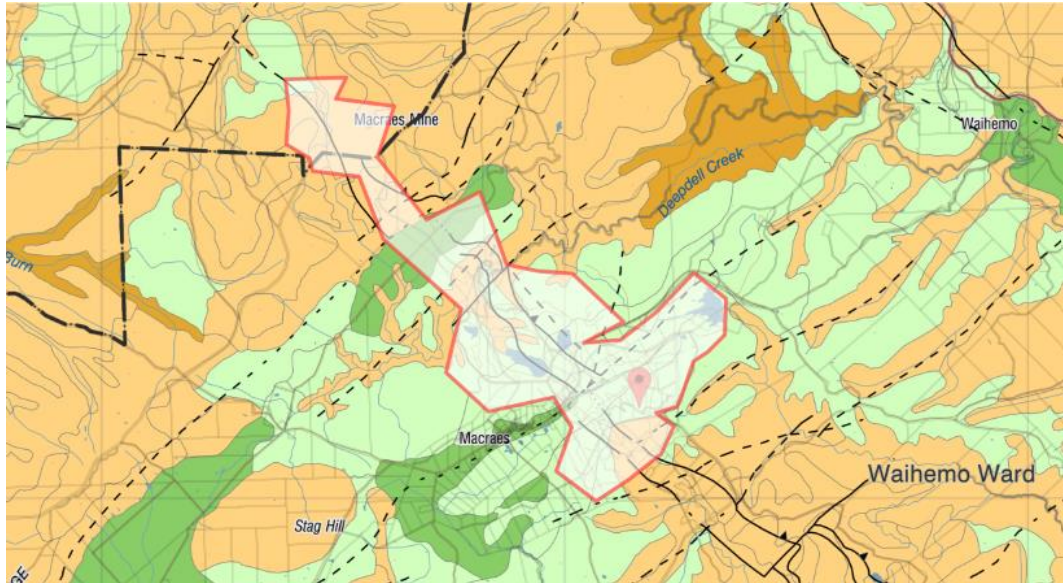
The RPS does not yet contain maps of highly productive land in the region. Until that mapping occurs, the NPS-HPL treats highly productive land as land zoned general rural or rural production and classified as LUC 1, 2, and 3.<sup>11</sup> Our Environment Maps, administered by Manaaki Whenua Landcare Research and shown in Figure 5-19, identify the land use capability (“**LUC**”) of the Macraes Operation. Figure 5-19 shows that a small section of land between the Coronation Mining Area and the Central Mining Area is classified as LUC 3. However, this part of the Macraes Operation is not zoned general rural or rural production and therefore is not highly productive land.<sup>12</sup> The Macraes Operation is generally unsuitable for productive use due to historic and current mining operations on the site.

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<sup>11</sup> Clause 3.5(7) of the NPS-HPL. Noting there are exceptions for land identified for future urban development or rural land that is in the process of being rezoned.

<sup>12</sup> Clause 3.5(a)(i) of the NPS-HPL.





**Figure 5-19: LUC Class of the Project Site, indicative boundaries shown in red (Source: Manaaki Whenua Landcare Research)**

#### **5.7.7 Statutory Acknowledgments and Customary Marine Titles**

There are various statutory acknowledgements in the Ngāi Tahu Claims Settlement Act 1998, however, none are intersected by or located within the vicinity of the Macraes Operation or the MP4 Project Area. For completeness, it is also noted that there are no customary marine titles of relevance to the Macraes Operation.

Taonga species are listed in Schedule 97 of the Ngāi Tahu Claims Settlement Act 1998. Those present in the environment surrounding the Macraes Operation include:

- > Kārearea / eastern falcon;
- > Pihoihoi / New Zealand pipit;
- > Kōau / black shag;
- > Karoro / southern black-backed gull;
- > Kāhu / swamp harrier;
- > Pūtakitaki / paradise shelduck;
- > Riroriro / grey warbler;
- > Pīwakawaka / South Island fantail;
- > Poaka / pied stilt;
- > Kuruwhengu / Kuruwhengi / Australasian shoveler;



- > Kūkupa / Kererū / New Zealand pigeon;
- > Pākura / Pūkeko;
- > Kōtare / sacred kingfisher;
- > Tete / grey teal;
- > Tūī; and
- > Ruru koukou / morepork.

#### **5.7.8 Public Conservation Land**

For completeness, there is no public conservation land within the Macraes Operation. There are conservation reserves that are accessible via roads within, or adjacent to the Macraes Operation including:

- > Golden Point Historic Reserve;
- > Deepdell Creek Marginal Strip; and
- > Murphys Flat Historic Reserve Area.

### **5.8 CULTURAL VALUES**

The Macraes Operation is located within a culturally significant landscape for Kāi Tahu, encompassing the headwaters of the Taieri, Waikouaiti and Waihemo catchments. The following iwi entities identified they have an interest in the lands within and around the Macraes Operation:

- > Te Rūnanga o Moeraki;
- > Kāti Huirapa Rūnaka ki Puketeraki; and
- > Te Rūnanga o Ōtākou.

OGNZL has consulted each of these entities in good faith to ascertain the nature of their interest. This consultation is summarised in Section 8, and identified cultural effects are assessed in Section 9.3 of **Part A.09** of this report.

A Cultural Impact Assessment in respect of a previous iteration of the Project (**‘2025 CIA’**) was completed by Aukaha on behalf of Kāti Huirapa Rūnaka ki Puketeraki, who are recognised as mana whenua in the Project area, and two further Rūnaka, Te Rūnanga o Moeraki and Te Rūnanga o Ōtākou (together Kā Rūnaka), which hold recognised cultural associations across the wider Waihemo and Taiari catchments and have an interest in the Project area due to the potential effects on the whenua and wai of those areas. The 2025 CIA



was prepared in relation to an application made in 2024 for resource consents for the MP4 (RMA) Project as described in **Part A.04** of this report. The 2025 CIA identifies the cultural values associated with the Macraes area, based on the four core values of mana, mauri, tapu and whakapapa. While the current MP4 application (under the FTAA) differs from the earlier project (under the RMA), the cultural values and impacts identified in the 2025 CIA remain relevant.

The East Otago area was and is of cultural importance to the Waitaha, Kāti Mamoe, and Kāi Tahu people as a source of mahika kai, a place of settlement, a burial place, and as a cultural landscape that embodies the ancestral, spiritual, and religious traditions of mana whenua. East Otago is, therefore, an important taoka tuku iho for Kā Rūnaka.

The following sections summarise cultural values identified in the 2025 CIA, as informed by subsequent engagement with Kā Rūnaka. However, the summaries below do not speak for the views of Kā Rūnaka specifically related to cultural values that may be impacted by MP4.

#### Mana

Mana is the word used to describe the authority and prestige that is passed down through lines of whakapapa and that originated with the creation of the world by atua, who are the original ancestors of the many aspects of te taiao, including people. For Kāi Tahu, the state of the environment and the bounty of resources are significant measures of the mana of the people. Under the tenets of kaitiakitaka, mana whenua consider it their duty to protect and sustain te taiao for future generations. This includes caring for taoka species and their habitats and striving for the restoration of waterways like the Taiari, Waikouaiti and Waihemo and the whenua. These actions are an expression of their mana and enable the fulfilment of rakatirataka and kaitiakitaka roles handed down from the tipuna.

#### Mauri

The word mauri refers to the life essence found in all things, relating to its nature, appearance, and vitality. For mana whenua, the mauri of the environment is a direct reflection of the health and wellbeing of whānau and communities. The presence and health of indigenous flora and fauna is an expression of the mauri of the natural environment in an area. Mana whenua apply the principle of utu, giving back more than is taken, as a means of protecting mauri. The right to take kai and extract resources from te taiao is balanced with the kaitiaki duty to care for, and nurture, the environment in return.

Kāi Tahu have an intergenerational responsibility to protect the native species and habitats within their takiwā. The Macraes Operation includes natural habitats of mahika kai and taoka species, including kōrero geckos, southern grass skinks, McCann's skinks, and the *Orocrambus sophistes* moth, and plant species.



## Tapu

The principle of tapu provides a guide for mana whenua to gauge the appropriateness of actions and behaviours in the context of the existing environment. The obligation to respect and protect the environment is derived from the significant tapu of te taiao. Natural elements like water, earth, and air are very early ancestors that came into being at the time of the atua and the creation of the world. As a result, their tapu is heightened, as is the obligation to protect them as taoka handed down from tipuna and held in trust for mokopuna to come.

## Whakapapa

Kāi Tahu are bound to the land, water and all life supported by them by whakapapa. The word whakapapa references the build up of layers, a metaphor for the layering of generations from the past to the present, and into the future. The resource management approach “Ki Uta Ki Tai”, emphasises the holistic management of the interrelated elements within the natural environment. Water released by Raki makes its way into rivers, which in turn connect the entire landscape from the mountains to the sea. From the sea, water evaporates, condenses, and falls again on Papatūānuku, an eternal holistic cycle. Therefore, wāi māori in the headwaters should be in its purest form where it falls from Raki and flows from the mountains to the sea. The Macraes Operation is situated in the headwater streams of Taiari, and Waikouaiti, Waihemo catchments.

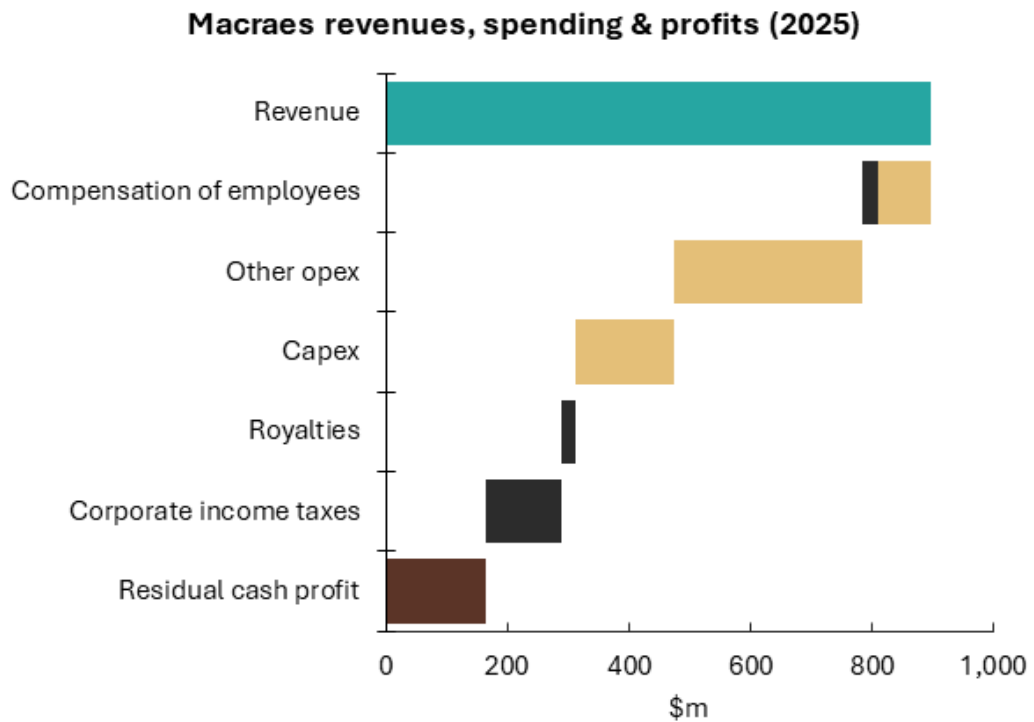
## **5.9 EXISTING ECONOMIC ENVIRONMENT**

The Macraes Operation has been part of the Otago economy since the early 1990s and continues to contribute through gold export earnings, employment, supplier expenditure, and the payment of taxes and royalties. Eaquib & Eaquib (2026a) describes that in 2025 alone, the operation contributed to the local, regional and national economy through:

- > Generating an export revenue of approximately \$896 million;
- > Spending of approximately \$113 million on employee compensation;
- > Spending approximately \$583 million on operating and capital expenditure;
- > Contributing approximately \$147 million in royalties and taxes; and
- > Contributing approximately \$29 million in PAYE.

This is shown in Figure 5-20 below.





**Figure 5-20: Macraes revenues, spendings and profits (Eaqub & Eaqub, 2026a).**

The operation directly employed approximately 760 people (726 FTEs) in 2025, with around 85% of employees residing in Otago. Beyond the workforce employed on site, expenditure with New Zealand suppliers was associated with an estimated 2,950 indirect jobs nationally, while household spending by workers linked to the operation contributed to a further 1,400 induced jobs across the economy. In total, the Macraes Operation was associated with approximately 5,100 jobs nationally, including around 2,400 jobs within Otago. The workforce is predominantly locally based and relatively stable, with an average employment tenure of 6.5 years, compared with an Otago regional average of 3 years. The average years of employment of Macraes staff is shown in Figure 5-21 below.



### Employment duration of Macraes staff & Otago region

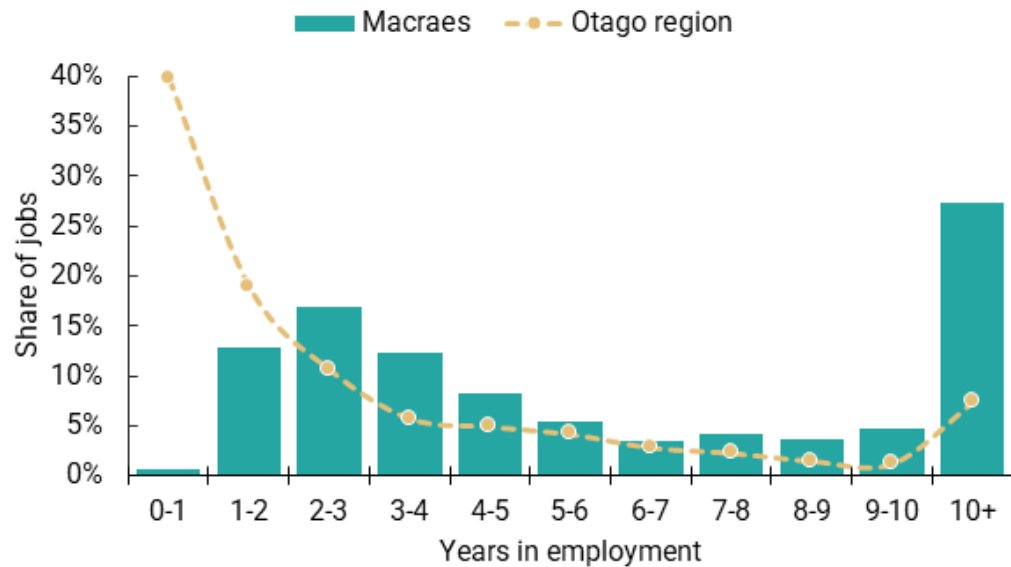


Figure 5-21: Employment duration of Macraes staff and Otago Region (Eaqub & Eaqub, 2026).

Without MP4, mining activities at the Macraes Operation are anticipated to begin closure stages from 2027, resulting in changes to the existing economic activity, employment, and expenditure currently associated with the operation.

#### 5.10 GEOLOGY AND MINERAL RESOURCES

A detailed description of the geological characteristics of the proposed work sites for MP4 are provided in PSM (2026a – 2026d), EGL (2026a – 2026d) and WWLA (2026a) and these reports are included in **Part B** of this substantive application. The geology and mineral resources associated with MP4 have been summarised below.

The Macraes Operation is underlain by Rakaia Terrane Otago Schist, comprising metamorphosed and mineralised former seabed deposits formed approximately 130 - 140 million years ago. Gold mineralisation occurs within discrete shoots in the Hyde - Macraes Shear Zone which has a lateral length of over 40 km. Small areas of Quaternary sediments and Miocene volcanics are also present.

The area is structurally characterised by two dominant orthogonal fault sets striking north and east. The Hyde - Macraes Shear Zone generally dips gently eastward between Stoneburn and Coronation, with a broad bend at Nunns where it transitions to a northeast dip.



A thin loess cover overlies much of the area, typically comprising very stiff silt, sandy silt or silty fine sand, with soil depths generally in the order of 0.2 - 0.4 m.

The structural geology model at the Macraes Operation includes several key discontinuity sets. Foliation<sup>13</sup> typically ranges from flat to moderately east-dipping (approximately 15 – 45° towards 100°) and is sub-parallel to a footwall foot (“**FF**”) and Hanging Wall Shear (“**HWS**”).

Mine and regional scale faults generally dip moderately to steeply east and can be infilled with clay or breccia up to 100 mm thick. This set includes the Northern Gully and Boomgate faults. In contrast, batter and mine scale faults and shears show a broad range from flat to moderately west dipping. This includes the shallow Ramp Shears, which, together with foliation, influence block-type failures on the west wall.

A less dominant set of faults dips moderately to steeply north and south, including the Contractors and Workshop Fault. Joint sets include west-dipping and conjugate east-dipping structures, as well as northeast-dipping joints with southwest-dipping conjugates.

## 5.11 GEOTECHNICAL CONDITIONS

Numerous technical assessments have been undertaken to determine the geotechnical conditions for MP4. These reports include PSM (2026a – 2026d). The reports are provided in **Part B** of this substantive application, and the existing geotechnical conditions are summarised in the relevant locations sub-headings below.

### 5.11.1 Coronation Mining Area

The Coronation mining area contains typical rock mass characteristics including:

- > Footwall psammite (Class A): lithified rock with frequent defects and rare shearing, characterised by medium to high strength and a good rock quality designation (“**RQD**”);
- > Hanging wall psammitic schist (Class B): generally fractured rock with frequent defects and some shearing, displaying low to high strength and a fair RQD;
- > Fractured pelite/psammite schist (Class C): fractured to fragmented material with frequent shearing, low to medium strength, and poor to fair RQD, with localised zones of very poor quality;

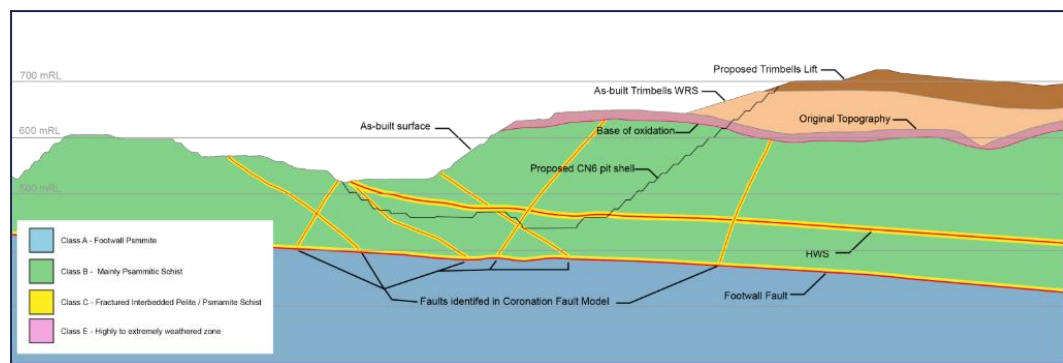
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<sup>13</sup> Foliation is a general geology term describing repetitive, leaf-like layering or planar banding in material. It typically refers to the alignment of mineral grains in metamorphic rocks caused by directed pressure, heat, and deformation, producing a layered or banded structure perpendicular to the main stress direction.



- > Fault zones: very weak material with extremely low to very low strength and very poor RQD; and
- > Weathered schist: highly to extremely weathered material with extremely low to soil-like strength and very poor RQD.

The cross section through rock mass at Coronation North is provided in Figure 5-22 below.



**Figure 5-22: Schematic cross section through rock mass at Coronation North facing north.**

### 5.11.2 Central Mining Area

The Central Mining Area contains the same typical rock mass characteristics as the Coronation Mining Area. EGL (2026a) considers geotechnical matters associated with Innes Mills Pit Stages 11–13, including the relocation of tailings from SP11A and part of MTI to the FTSF. EGL (2026b) outlines matters relating to FTSF Stage 3. A summary of the key geotechnical conditions relevant to MP4 is provided below.

The MTI, SP10 and SP11A TSFs are founded on unweathered to slightly weathered schist comprising predominantly psammitic to semi-psammitic units, with underlying semi-pelite and pelite at depth. SP10 and SP11A are pit fill TSFs, whereas MTI is an above-ground facility. The site is structurally complex, with schist foliation, joints, shears and several mapped faults (including the FF, Northern Gully, Battery Creek and Macraes faults) influencing ground conditions across the area.

The Central Mining Area, comprising the Innes Mills and Frasers mining areas, is developed within the Hyde-Macraes Shear Zone, which is approximately 100 m thick and dips about 15 to 20° to the east. The area contains interbedded psammitic, semi-psammitic and pelitic schists typical of the Macraes Operation, with mineralisation hosted within the lower greenschist facies (chlorite zone) above the FF. Based on the intensity of major faults and shears within the Innes Mills shear zone, an additional rock mass unit has been identified between the HWS and FF, referred to as the "Ramp Shear Zone". To capture the uncertainty

associated with the substantially higher shear intensity in this zone, the rock mass component of the function adopts a Mohr-Coulomb shear strength based on Class C generalised Hoek-Brown parameters, equivalent to a normal stress of approximately 500 kPa. This anisotropic material replaces Classes B and C between the two major structures. Geotechnical conditions throughout the area are strongly influenced by schist foliation, shears and major fault structures, including the FF and Macraes Fault Zone, which locally affect rock mass quality and slope performance.

Mining within the Central Mining Area has exposed several large-scale structural features and provided extensive information on rock mass behaviour. In particular, slope performance within the Innes Mills and Frasers pits is influenced by the FF and associated fault and shear networks, which have resulted in localised deformation and translational sliding within portions of the western pit walls. These mechanisms are well understood through ongoing geotechnical investigation, monitoring and operational experience and have informed the design and assessment of the proposed mining and tailings storage developments.

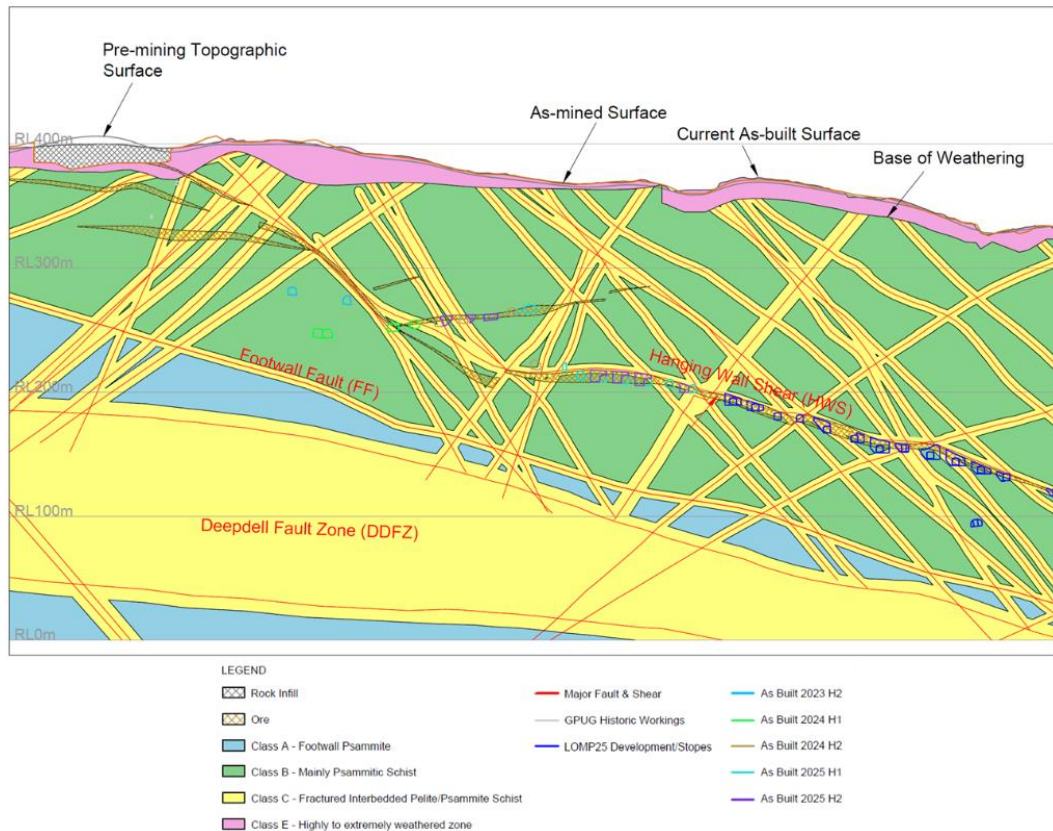
Groundwater is present throughout the MTI, SP10 and SP11A TSF sites within schist and overlying sediments. Flow is primarily controlled by secondary permeability associated with fractures and faults, as the intact schist has low primary permeability. Groundwater levels generally reflect topography, flowing from elevated areas to gullies and drainage systems. Conditions are locally influenced by structural features and historic mining activities, with drawdown occurring around pits and eventual recovery to stable levels expected post-closure.

Groundwater levels in the Innes Mills Pit and Frasers Pit are currently significantly influenced by mining activities, resulting in localised drawdown within the pit walls.

Innes Mills Pit and Frasers Pit are developed within interbedded psammitic and pelitic schist associated with the Hyde–Macraes Shear Zone, with the east-dipping FF extending beneath the FTSF and offset across the Macraes Fault Zone. Pit slopes, particularly the western walls, have experienced significant displacement, resulting in locally highly deformed rock masses. Near-surface conditions comprise variably weathered schist overlain by alluvial deposits and, in places, mine waste rock fill.

The geological structure and rock mass conditions at GPUG are consistent with those described for the Central Mining Area open pits. The typical rock mass distribution is shown below in Figure 5-23.





**Figure 5-23: Cross-section showing typical rock mass distribution at GPUG.**

The Macraes Operation is located within a region of generally low historical seismicity. However, several nearby and regional faults, including the Taieri Ridge, Billys Ridge, Hyde and Waihemo faults, are considered active and capable of generating infrequent moderate to large magnitude earthquakes. The Alpine Fault is located approximately 200 km to the northwest of the Macraes Operation and can produce larger events. The Macraes Fault, which traverses the Macraes Operation, has not ruptured to the ground surface within the last 11,500 years and shows no evidence of late Quaternary deformation. This indicates a very low annual probability of rupture, although it is still recognised as a potentially active structure.

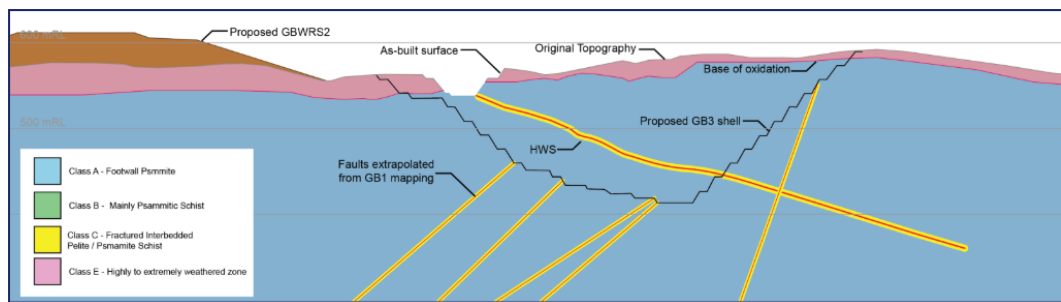
### 5.11.3 Golden Bar Area

PSM (2026a) details that the Golden Bar Pit targets the Eastern Lode ore zone, located approximately 400 m stratigraphically above the FF, within predominantly psammite rock. Observations from earlier mining phases at Golden Bar indicate favourable slope performance and generally good rock mass quality. Accordingly, the geotechnical model classifies the rock mass as equivalent to footwall psammite (Class A): lithified rock with frequent defects and rare shearing, characterised by medium to high strength and a good RQD.

Rock mass conditions observed following Stage 1 mining, and expected to extend eastward based on nearby psammite outcrops, are summarised as follows:

- > The rock mass is typically more massive, with higher intact strength than that encountered in other pits, representing the upper range of Geological Strength Index (“GSI”) values relative to Class B materials at Macraes;
- > Prominent large quartz veins are present within the pit walls;
- > Foliation dips shallowly toward the southeast, averaging approximately 20° / 125°;
- > Jointing is well defined, with steeply dipping sets trending to the northeast and southwest; and
- > Weathering extends to at least 70 m below ground surface, indicated by oxide staining along joint surfaces.

The schematic cross section through typical rock mass at Golden Bar is shown in Figure 5-24 below.



**Figure 5-24: Schematic cross section through typical rock mass at Golden Bar facing north.**

#### 5.11.4 Waste Rock Stacks

WRS are not confined to a singular area within the Macraes Operation and therefore the geotechnical conditions have been considered separately. PSM (2026c) details the typical foundation conditions for WRS and these have been summarised below.

A thin layer of surficial soil, interpreted as loess-derived material, is present across the Macraes Operation. This material comprises very stiff, light yellow-grey silt, sandy silt, or silty fine sand. Investigations at Back Road WRS, Deepdell East WRS, and the Top Tipperary TSF indicate a typical thickness of 0.2–0.5 m, with a localised maximum of up to 4.0 m.

In areas where new WRS will extend over existing facilities, waste may be placed on previously constructed material. It cannot be confirmed whether surficial soils were fully



removed during earlier construction. As such, a conservative scenario including a 0.5 m thick low-strength soil layer is incorporated into sensitivity analyses.

Beneath the surficial layer, the foundation material typically comprises weathered schist (Class E). This is an oxidised, highly foliated rock mass dominated by semi-psammite, with minor psammite and semi-pelite. The adopted shear strength parameters are:

- > Unit weight: 25 kN/m<sup>3</sup>
- > Cohesion: 100 kPa
- > Friction angle: 38°

The thickness of weathered schist varies across the site but is generally in the order of 20 – 30 m below the pre-mining ground surface.

## **5.12 GEOCHEMISTRY CONDITIONS**

MWM (2026b) describes geoenvironmental hazards at the Macraes Operation and suggests that geohazard risk is more strongly controlled by weathering processes and waste rock proximity to mineralisation than by the pit domain where waste rock is sourced. Waste rock environmental geohazards identified through this investigation include:

- > Arsenic was identified as the main potential constituent of concern for all pit domains and waste rock zones; enrichment is identified in all intra burden / weakly mineralised waste rock samples. Arsenic is elevated in both static leachate and column leach test leachate data.
- > Antimony is identified from elemental enrichment and static leach testing.
- > Aluminium is elevated in static leach testing and column leach test leachate.
- > Boron, copper, and zinc are elevated in column leach test leachate.

Additional potential constituents of concern identified include:

- > Arsenic and sulphate identified through tailings water quality.
- > Antimony is identified as a potential constituent of concern for tailings, though low concentrations are observed in tailings water.
- > Nitrogenous compounds (e.g., nitrate, nitrite, and ammoniacal nitrogen) due to ammonium nitrate-based blasting residues.

Total sulphur data and acid neutralising capacity of waste rock tested as part of this investigation are within the range identified from existing waste rock, suggesting



geoenvironmental hazards of sampled material are represented by existing geochemical data available for the Macraes Operation.

### 5.13 HYDROLOGY

The hydrology attributed to the proposed work areas of MP4 is described in GHD (2026a), WWLA (2025a and 2025b), EGL (2025a and 2025c) and Viridis (2026a), which are provided in **Part B** of this substantive application.

Monitoring and assessment undertaken across the Macraes Operation indicate that, despite long-term mining activity and associated landform modification, the principal receiving waterways remain intact. The Taieri, Shag / Waihemo and Waikouaiti North catchments continue to support functioning stream networks, aquatic habitats, and indigenous aquatic communities, and water quality within the main receiving catchments is generally good. The topography of the wider Macraes site reflects the geological evolution of the region. Prolonged weathering and erosion have formed a low relief peneplain, bounded by the North Branch of the Waikouaiti River to the west, Deepdell Creek to the north, and Murphys Creek to the south. Deepdell Creek is deeply incised into this surface, creating steep valley slopes with limited alluvial deposition, whereas the North Branch of the Waikouaiti River is characterised by gentler relief, broader valleys, and more extensive alluvial deposits.

Over approximately 35 years of mining, the original topography has been modified by excavation and waste rock placement. Mining activities have generally followed the orientation of the Hyde- Macraes Shear Zone, the principal structural control on orebody development. While mining has altered parts of the original catchments within the Macraes Operation, the principal surrounding waterways remain intact, comprising a mix of intermittent and permanent streams. The rivers, streams networks and catchments are shown in Figure 5-25 and an overview of the waterway classification is in Figure 5-26.



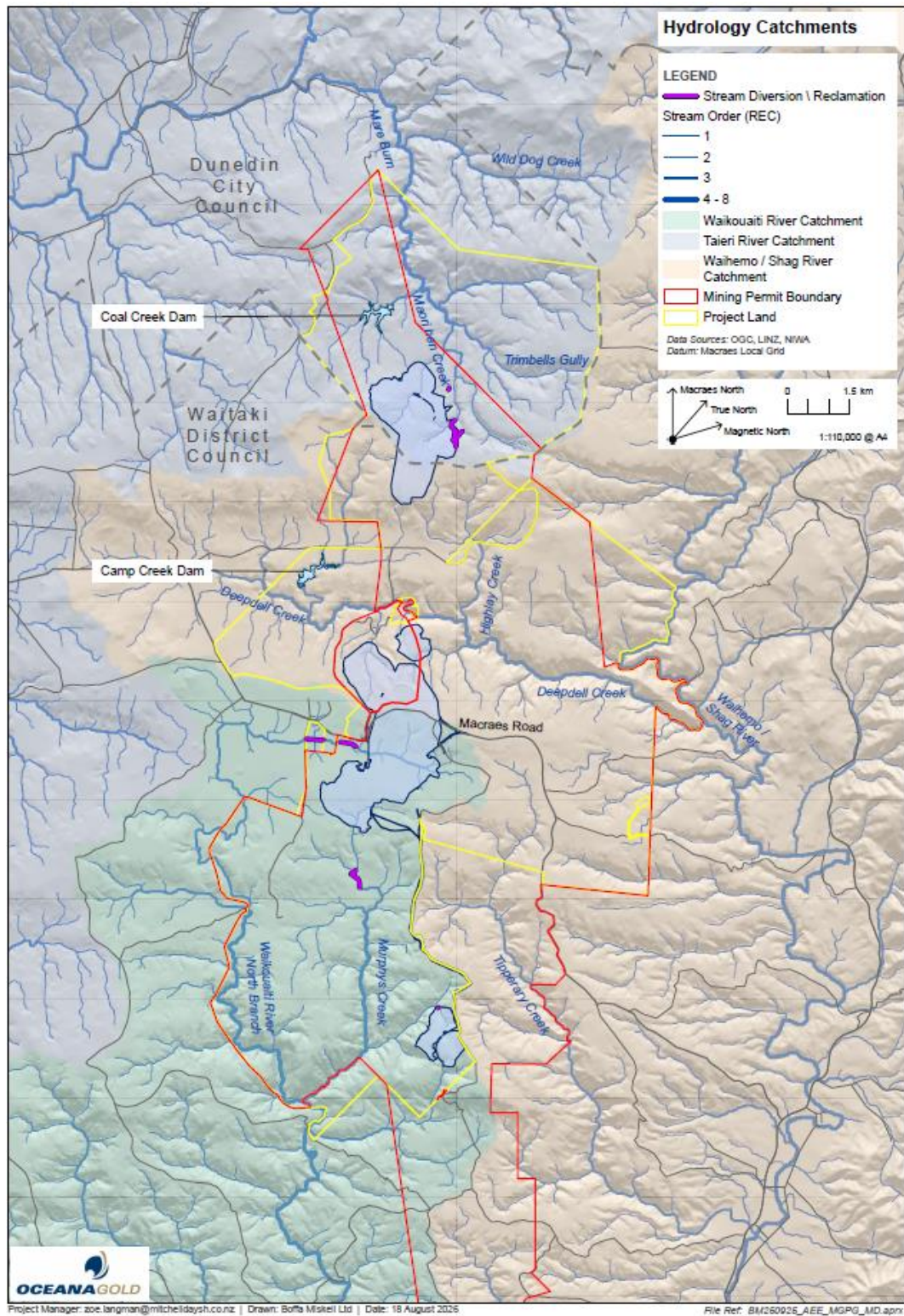


Figure 5-25: Location of Rivers and Streams in relation to MP4 Landforms.



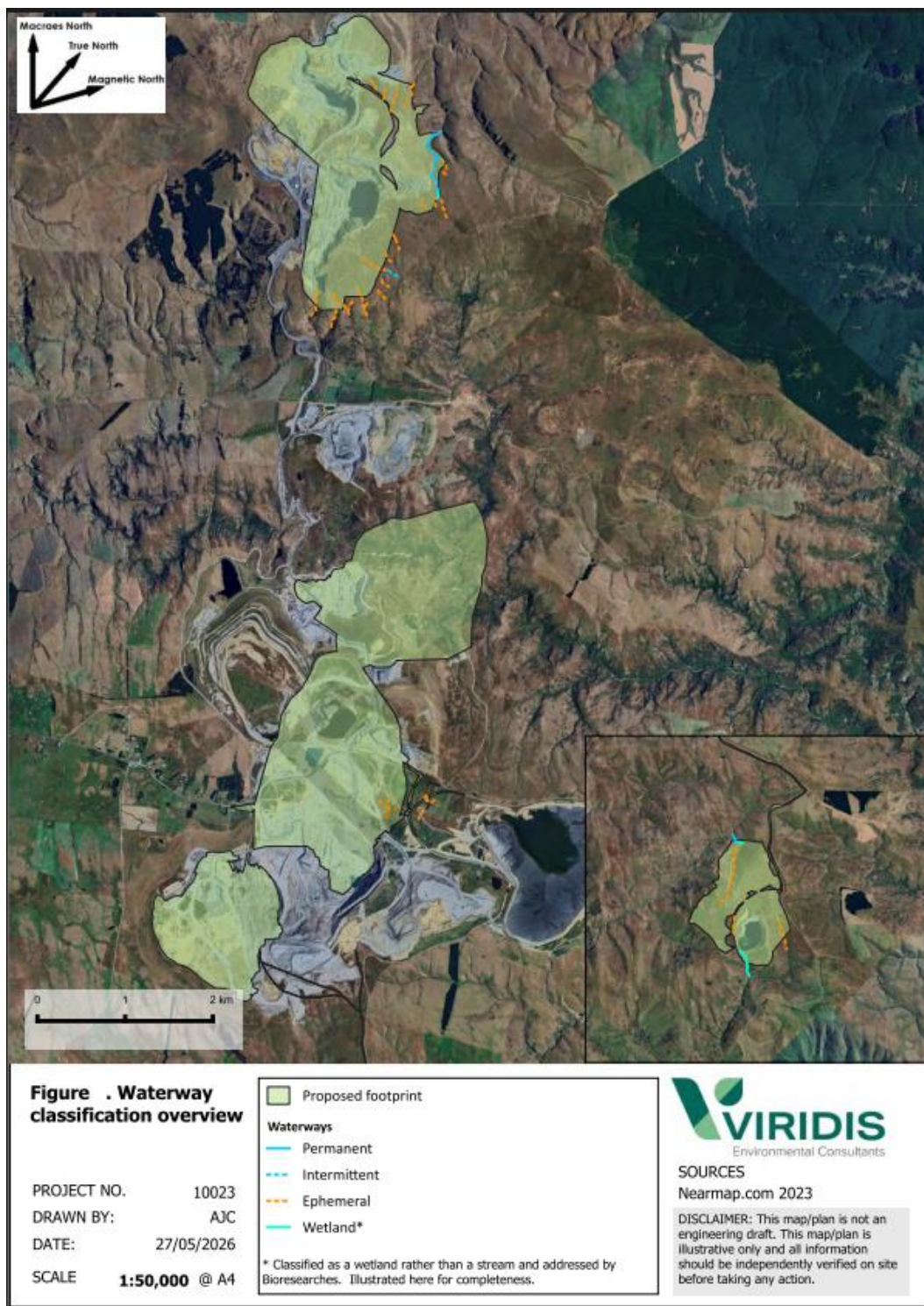


Figure 5-26: Waterway Classification Overview (Viridis, 2026a).

The Macraes Operation lies within the Shag / Waihemo, Taieri, and North Branch of the Waikouaiti River catchments. The Shag / Waihemo River flows southeast to the coast near Matakaea, the North Branch of the Waikouaiti River flows south to the ocean near Karitane,



and the Taieri River flows south to the coast south of Dunedin. Land use within these catchments is predominantly agricultural and forestry.

The depth to groundwater across the Macraes Operation is variable, reflecting topography and mining influences such as open pits. Groundwater inflows to pits are generally low, and dewatering wells are not typically used, except for occasional depressurisation bores to manage slope stability. Groundwater is managed through pumping from pit sumps to the mine water management system, while shallow subsurface flow generally follows topography, discharging to surface water bodies.

#### **5.13.1 Taieri River**

Taieri River is New Zealand's fourth longest river, flowing from the Lammermoor Range around the Rock and Pillar Range to the coast south of Dunedin. Within the Macraes Operation, Mare Burn and Trimbells Gully are key tributaries of the Taieri River, with catchments encompassing the mine footprint, surrounding farmland, and plantation forestry.

The Taieri River is a distinctive freshwater environment characterised by its natural brown tea-coloured appearance, resulting from tannins leached from wetlands and tussock-covered soils in the upper catchment. The river's mid-reaches generally have relatively low nutrient concentrations compared with many rural rivers; however, water quality remains subject to pressures associated with fine sediment inputs, reduced water clarity, faecal contamination, and elevated water temperatures.

#### **5.13.2 Shag / Waihemo River**

The Shag / Waihemo River catchment originates on the southern side of the Kakanui Mountains and is predominantly characterised by agricultural land use, with areas of plantation forestry. Several tributaries contribute to the catchment, including Deepdell Creek, Camp Creek, Highlay Creek, Cranky Jims Creek, and Tipperary Creek. Deepdell Creek flows through the mine site and, like Highlay Creek, is intermittent and can cease flowing during the summer months. Portions of Highlay Creek and Cranky Jims Creek are protected by covenants, with Cranky Jims Creek supporting some of the best examples of regenerating native vegetation in the area. Overall, the Shag / Waihemo River is considered to have generally good water quality; however, historical and ongoing agricultural activities have resulted in water quality pressures in parts of the catchment, particularly downstream, including elevated nutrient and sediment levels, *Escherichia coli* contamination, reduced summer flows, and riparian modification.



### 5.13.3 Waikouaiti North Branch River

The Waikouaiti River catchment comprises two main branches, with the North Branch originating in the vicinity of the Macraes mine site and flowing southward before joining the South Branch and ultimately discharging to the coast at Karitane. The catchment is characterised by a mix of mining activities, agricultural land use, and areas of native vegetation in the lower reaches. Key tributaries within and around the mine site include Murphys Creek, Clydesdale Creek, and the Golden Bar tributary, all of which contribute to the North Branch. Overall, the North Branch of the Waikouaiti River is considered to have generally very good water quality. However, the catchment experiences relatively dry conditions and low summer flows, making water quality and aquatic habitat sensitive to flow reductions, sediment inputs, nutrient enrichment, and wider catchment disturbance.

Figure 5-27 shows the location of the tributaries described above across the Macraes Operation.

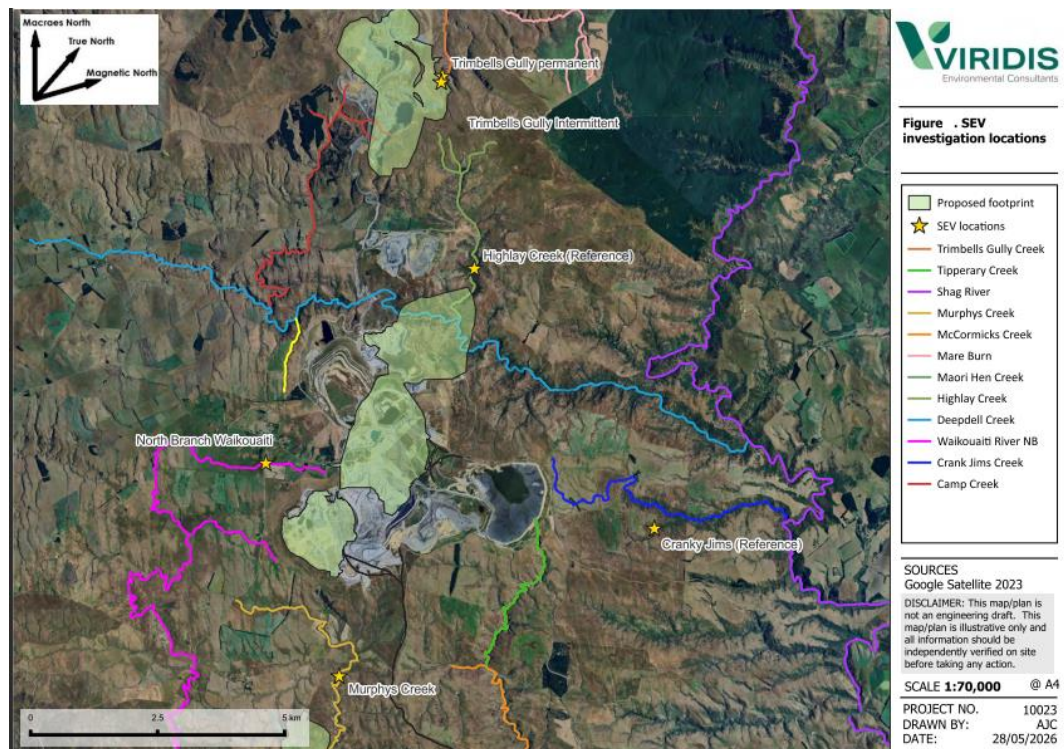


Figure 5-27: Location of Tributaries in relation to the Macraes Operation.

### 5.14 AQUATIC ECOLOGY VALUES

The aquatic ecology values attributed to the various waterbodies located within, and near the proposed work areas of MP4 are detailed in Viridis (2026a), a copy of which is provided in **Part B** of this substantive application.



The Macraes Operation footprint (inclusive of activities both existing and proposed) sits across the Taieri, Shag and Waikouaiti North Branch River catchments. It is noted that other channels within and around the Macraes Operation are ephemeral<sup>14</sup> and do not meet the Auckland Council Practice and Guidance note for River / Stream Classification. While these channels fall outside the applied classification criteria, they may still possess ecological value. Ephemeral channels have generally not been included in the assessment where no ecological value has been identified, unless otherwise specified.

#### **5.14.1 Taieri River**

The ecological value of the Taieri River, as a whole, is considered to be high to very high due to its size, and provision of extensive, variable and high-quality instream habitat. The river, and wider catchment, provides habitat for various Threatened and At Risk fish species including Taieri flathead galaxias, bluegill bully, dusky galaxias, Eldon's galaxias, giant kōkopu, inanga, koaro, roundhead galaxias, longfin, and upland bully and torrentfish.

##### **5.14.1.1 Trimbell's Gully tributary**

Trimbell's Gully originates on the north-western slopes of Highlay Hill and flows around the base of the existing Trimbell's Gully WRS before joining Māori Hen Creek and ultimately discharging to the Mare Burn within the Taieri River catchment. Within the disturbance area, the tributary comprises a combination of permanent and intermittent reaches, with permanent flow occurring downstream of the existing sediment pond due to continuous pond discharge, while upstream reaches are intermittent and include sections that cease flowing during drier periods. The uppermost reaches transition into wetland habitat and ephemeral channels.

The permanent reach is characterised by a stable, moderately incised channel with predominantly fine sediment substrates, moderate macrophyte and periphyton growth, and low to moderate flows that respond rapidly to rainfall events. The intermittent reaches are generally narrower and shallower, with a mix of gravel, cobble and fine sediment substrates and scattered wetland-associated vegetation. Environmental DNA ("eDNA") sampling identified aquatic invertebrate communities dominated by common taxa tolerant of elevated sediment levels and moderate habitat disturbance. No fish species were detected within either the permanent or intermittent reaches. While Taieri flathead galaxias are known to occur further downstream, the sediment pond and its perched outlet structure form a complete barrier to fish passage, effectively isolating upstream habitats. Overall, the tributary supports limited aquatic habitat values and low biodiversity, reflecting its

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<sup>14</sup> Ephemeral streams are waterways that only flow during or immediately after rainfall.



intermittent nature, modified hydrology, and restricted connectivity to the wider freshwater network.

Viridis (2026a) considers that Trimbells Gully has low ecological value.

#### **5.14.2 Shag / Waihemo River**

Shag / Waihemo River is considered to have high to very high ecological value due to the extensive range of high-quality and diverse instream habitats it provides. The river and its wider catchment support a variety of indigenous fish species, including several Threatened and At Risk species such as Taieri flathead galaxias, bluegill bully, inanga, koaro, torrentfish, longfin eel, and upland bully. Accordingly, the river is recognised as an important freshwater ecosystem with significant ecological and biodiversity values at both the catchment and regional scale.

##### **5.14.2.1 Deepdell Creek**

Deepdell Creek is a significant tributary of the Shag River and flows eastwards through the Macraes Operation. It is an intermittent watercourse, with substantial reaches ceasing to flow during summer months. These seasonal drying periods result in reduced flow and elevated water temperatures, which influence aquatic habitat conditions and favour less flow-sensitive aquatic invertebrate communities.

While the fish community in all catchments is dominated by Taieri flathead galaxias, infrequent records of eels and brown trout occur at some sites within the Deepdell Creek.

##### **5.14.2.2 Camp Creek and Highlay Creek**

Camp Creek and Highlay Creek are minor tributaries of Deepdell Creek. The Camp Creek sub-catchment is predominantly characterised by agricultural land cover, including areas used for hay production. The Highlay Creek catchment contains a covenanted area where stock access has been excluded. Highlay Creek exhibits intermittent flow characteristics and is known to cease flowing during drier summer periods.

#### **5.14.3 Waikouaiti North Branch River**

Similarly, North Branch of the Waikouaiti River is also considered to have high ecological value due to the extensive range of diverse and high-quality instream habitats it provides. The river and its wider catchment support a variety of indigenous fish species, including several Threatened and At Risk species such as Taieri flathead galaxias, bluegill bully, inanga, koaro, torrentfish, longfin eel, upland bully, banded kōkopu, and lamprey. While the river system as a whole has significant ecological and biodiversity values, the upper reaches within the mine site are more modified and currently support lower ecological values as a



result of the absence of permanent flow, reduced water quality, limited instream habitat, and historical catchment modification. Nonetheless, the North Branch remains an important freshwater ecosystem within the wider catchment.

The upper reaches of the Waikouaiti North Branch River are located within the Macraes Operation and the ecological value for this section of the river is low. The waterway flows through a highly modified and straightened channel before passing beneath Red Bank Road and continuing downstream. Within the site, the river is intermittent in nature, typically only containing water during wetter winter periods. When water is present, flow is generally absent, resulting in stagnant and often anoxic conditions. The channel is characterised by extensive macrophyte growth, soft fine-sediment substrates, and a lack of native riparian vegetation, with grazed pasture extending to the channel margins and allowing stock access where present.

Ecological monitoring undertaken since 2018 indicates that this reach supports limited aquatic habitat values. Fish surveys have not recorded any fish species within this section of the river, while macroinvertebrate communities are characterised by low diversity and are dominated by common taxa tolerant of degraded habitat conditions. The modified nature of the channel, combined with intermittent flow, poor water quality, limited habitat complexity, and ongoing agricultural influences, contributes to the overall low ecological value of this reach.

#### **5.14.3.1 Clydesdale Creek**

Clydesdale Creek is a tributary of Murphys Creek, and part of the Waikouaiti North Branch River Catchment. The impacted creek comprises a short, approximately 22 m long channel located on the north-western side of the Golden Bar WRS, fed by seepage from the waste rock stack and an adjacent wetland area before discharging to the Clydesdale Creek sediment pond. Although influenced by the surrounding artificial landform, the channel is naturally sourced from infiltrated rainfall and is therefore considered a modified natural watercourse. The stream is heavily influenced by stock grazing, with extensive pugging observed during site inspections, soft sediment substrates, limited riparian vegetation, and minimal shading. Habitat quality is consequently low and is expected to support only common and disturbance-tolerant macroinvertebrate species. The receiving sediment pond and its perched culvert outlet create a complete barrier to fish passage, preventing access to the stream; however, given the very limited extent of habitat upstream, this is not considered to result in a significant ecological constraint. Based on its physical characteristics and habitat conditions, the ecological values of the tributary are considered comparable to those of the intermittent reaches of Trimbells Gully Tributary. Overall, the Clydesdale Creek tributary is considered to have low ecological value.



#### **5.14.3.2 Murphys Creek**

As described above, Murphys Creek is a tributary of the Waikouaiti North Branch River. The tributary originates south of the active mining area and flows through a steep gully system before discharging to the North Branch Waikouaiti River. The upper reaches are relatively flat and have been modified by stock access, resulting in channel widening, localised pugging, and extensive growth of aquatic vegetation. Further downstream, particularly within and below a heritage covenant area, the stream becomes more defined and supports a diverse range of habitat features, including pools, riffles, exposed bedrock, and silt-dominated substrates. Riparian vegetation is typical of the surrounding agricultural landscape, comprising grazed pasture, tussocks, sedges, and areas of native and exotic scrub that provide low to moderate shading. Environmental DNA (eDNA) sampling confirmed the presence of Taieri flathead galaxias, shortfin eel, and longfin eel, while macroinvertebrate communities included a mix of pollution-tolerant and more sensitive taxa. This reflects the influence of agricultural land use and the varied habitat conditions present within the catchment.

Murphys Creek contains At Risk species, including Taieri flathead galaxias and longfin eel, which elevates the ecological significance of the waterway, the assessed reach is affected by ongoing habitat pressures that limit its overall ecological condition. These pressures include stock access, limited riparian management, and reduced habitat quality, resulting in a moderate ecological value rating that reflects the current condition and functional habitat value of the stream rather than the conservation status of the species present.

Overall, Murphys Creek is considered to have moderate ecological value.

#### **5.14.4 Ephemeral Channels**

The remaining channels within and surrounding the MP4 footprint have been classified as ephemeral channels. These features are characterised by dry gullies and shallow depressions that lack defined bed and bank features, evidence of erosion or sediment sorting, and are fully vegetated with terrestrial species. Field assessments confirmed that these channels do not exhibit the characteristics required to be classified as permanent or intermittent streams. As such, they provide limited aquatic habitat and are considered to have low freshwater ecological value.

#### **5.14.5 Aquatic Flora**

Aquatic plant growth within the catchments is generally characterised by abundant filamentous and mat-forming algae, with the highest cover recorded in Deepdell Creek and Highlay Creek, although guideline thresholds of 30% filamentous algae cover are generally not exceeded. Macrophytes are most prevalent within the North Branch Waikouaiti River



catchment, largely reflecting reduced riparian shading associated with surrounding land use, which promotes aquatic plant growth. The extent of both algal and macrophyte cover is strongly seasonal, with peak growth typically occurring during summer and autumn when water temperatures are warmer and daylight hours are longer. However, some waterways, including Murphys Creek, support consistently high macrophyte cover throughout the year.

Overall, testament to Macraes historical performance is that aquatic ecosystems downstream of the operation remain healthy.

#### **5.14.6 Macroinvertebrates**

Long-term seasonal monitoring indicates that macroinvertebrate communities within waterways across the Macraes area are generally consistent with Attribute C of the National Policy Statement for Freshwater Management (“**NPS-FM**”), reflecting moderate levels of organic pollution or nutrient enrichment, although some monitoring results fall within Attribute D, below the national bottom line. Similar results recorded at both impact and control sites suggest that macroinvertebrate communities are influenced by broader catchment factors rather than mining activities alone, including current and historical agricultural land use and, in some areas, historic mining.

Macroinvertebrate assemblages vary across the river catchments in response to differences in habitat conditions, with higher proportions of sensitive EPT taxa typically recorded in the Taieri catchment where instream habitat quality is greater. In contrast, the more modified waterways of the North Branch Waikouaiti River catchment generally support lower abundances of sensitive taxa, while communities within the Shag / Waihemo River catchment are influenced by the intermittent nature of Deepdell Creek and associated seasonal changes in flow and water temperature. Macroinvertebrate communities within and around the Macraes Operation are representative of moderately impacted, rural freshwater environments.

#### **5.14.7 Fish Communities**

Fish communities across the catchments are dominated by Taieri flathead galaxias (Threatened- Nationally Vulnerable), with this species forming the most abundant and widespread component of the aquatic fauna. Other fish species are present in lower numbers, with occasional records of longfin eels and brown trout, particularly within larger tributaries such as Deepdell Creek. Bullies have been recorded only infrequently, with observations limited to a single site within the North Branch Waikouaiti River catchment. Freshwater crayfish are also relatively abundant where suitable habitat is available. Although population densities of aquatic species have fluctuated over time, monitoring



indicates that populations are generally stable and continue to be supported by the freshwater habitats present within the catchments.

## **5.15 FRESHWATER QUALITY**

Viridis (2026a) prepared an Assessment of Aquatic Effects, which is included in **Part B** of this substantive application. A summary of the existing freshwater environment is provided below. Details of existing water takes, discharges to water, and compliance with relevant water quality criteria are contained in Section 5.4.

### **5.15.1 Receiving Water Quality**

Long-term water quality monitoring undertaken across the Shag / Waihemo, Waikouaiti and Taieri River catchments indicates that the receiving environment is generally characterised by stable physicochemical conditions and relatively good water quality, with some localised water quality pressures. Monitoring shows that pH levels remain consistently within ranges suitable for aquatic life and turbidity is generally low, indicating limited suspended sediment. Sulphate concentrations are elevated at some locations, particularly within Murphys Creek, where reduced abundances of sensitive macroinvertebrate taxa have also been observed.

Nutrient concentrations are generally low across the catchments, with ammoniacal nitrogen and dissolved reactive phosphorus commonly below detection limits. Localised nitrate enrichment has been identified within parts of the Mare Burn and Murphys Creek catchments, where elevated concentrations correspond with lower macroinvertebrate condition scores. However, evidence of nutrient-driven eutrophication is limited and confined to a small number of sites where elevated nitrogen levels coincide with conditions favourable for filamentous algae growth. Overall, nutrient-related effects appear localised rather than widespread.

Monitoring of inorganic contaminants indicates that most metals and other toxicants occur at concentrations unlikely to pose significant ecological risks across the wider receiving environment. Localised elevations of arsenic have been recorded within lower Deepdell Creek, Battery Creek and Golden Bar Creek, reflecting both natural mineralisation and historical mining influences. Elevated concentrations of nickel and zinc have also been identified within parts of the Mare Burn catchment, while elevated iron concentrations have been recorded in the upper North Branch Waikouaiti River. Dissolved copper, lead and boron concentrations are generally low and remain below ecological guideline thresholds. Weak Acid Dissociable cyanide has occasionally exceeded conservative trigger values at several monitoring locations; however, detections also occur at control sites, suggesting that natural background sources likely contribute to observed concentrations.



Overall, water quality monitoring indicates that the receiving environment remains in generally good condition, with water quality effects largely restricted to specific locations influenced by natural geological conditions, historical mining activities, and broader catchment land-use pressures.

## **5.16 WETLAND VALUES**

Whirika (2026a) has prepared a vegetation and wetland values assessment and Bioresarches (2026a) considers ecological impacts on wetlands. A copy of these reports is provided in **Part B** of this substantive application. The key wetland values relevant to MP4 have been summarised below.

### **5.16.1 Coronation Mining Area**

There are several wetland habitats identified within the Coronation Mining Area. Notably, this area contains the only Naturally Uncommon seepage and long-inundation ephemeral wetland types within the Macraes Operation. The seepage wetland is prescribed a high overall ecological value, and the ephemeral wetland has very high ecological value. Both wetland types are identified as endangered ecosystems.

Other wetland types identified in the Coronation Mining Area include:

- > Freshwater herbaceous wetland, described as having a high overall ecological value;
- > *Carex secta* sedgeland wetland, described as having a moderate overall ecological value; and
- > *Shawia bullata* shrubland wetland, described as having a low ecological value.

### **5.16.2 Central Mining Area**

The Central Mining Area has been extensively modified by historic and ongoing mining activities, resulting in a predominance of mine-modified land and vegetation communities dominated by exotic species. Within this highly altered environment, indigenous wetland values are limited and occur primarily as small, isolated features.

Approximately 0.55 ha of ephemeral wetlands are present adjacent to Innes Mills Pit. A further 1.35 ha of other wetland types are present in other locations of the Central Mining Area. Similarly to the Coronation Area, the ephemeral wetlands are identified as having a high overall ecological value. Other wetland types contained within the Central Mining Area include:

- > Wetland sedgeland which has a low ecological value;
- > Freshwater herbaceous which has a low overall ecological value;



- > *Carex secta* sedgeland which has a moderate ecological value; and
- > *Shawia bullata* shrubland which has a moderate ecological value.

Furthermore, the Central Mining Area includes rare, locally significant, plant values. Species classified as Regionally Threatened, Data Deficient, or At Risk recorded within the area include *Lobelia ionantha*, *Juncus pusillus*, *Lobelia perpusilla*, *Juncus australis*, *Anthosachne falcis*, *Juncus distegus*, *Microlaena stipoides*, and *Celmisia hookeri*.

### 5.16.3 Golden Bar Mining Area and Haul Road Area

Wetland features within the Golden Bar Mining Area are limited in extent and occur as small, discrete components within a predominantly modified landscape. The area is largely characterised by heavily grazed narrow-leaved tussock grassland, with wetlands present as minor ephemeral features associated with localised drainage and low-lying areas. Wetland habitats located within the Golden Bar Mining Area and Golden Bar WRS include:

- > Ephemeral wetlands that have a moderate overall ecological value;
- > Freshwater herbaceous wetland that has low overall ecological value; and
- > *Carex secta* sedgeland wetland that has a moderate overall ecological value.

Ephemeral wetland vegetation is present within the Golden Bar Haul Road area, which is of high ecological value, despite its limited extent. These wetlands represent a short-inundation subtype of a Naturally Uncommon, Critically Endangered ecosystem. Additional ephemeral wetlands are present close to the proposed impact area.

## 5.17 TERRESTRIAL ECOLOGY

The terrestrial ecology values for the proposed work areas of MP4 are detailed in Bioresearches (2026a – 2026f) and Whirika (2026a), of which a copy is provided in **Part B** of this substantive application. The following sections are presented by Mining Area, with each area including descriptions of terrestrial ecological habitats and species located within, and adjacent to the Macraes Operation. This includes:

- > Vegetation;
- > Invertebrates;
- > Avifauna;
- > Lizards;
- > Mammalian Pests; and
- > Amphibians.



A Bat Values Assessment was prepared by Biosearches (2026f) to assess the potential presence of pekapeka (both long and short tailed bats) within the Macraes Operation. The assessment included both a desktop review and field investigations. It concluded that pekapeka are unlikely to be present within or near the Macraes Operation due to limited suitable roosting habitat and unfavourable climate. Due to the lack of bats within and surrounding the Macraes Operation, bats have been excluded from the location sub-headings below.

### **5.17.1 Coronation Mining Area**

#### **5.17.1.1 Vegetation**

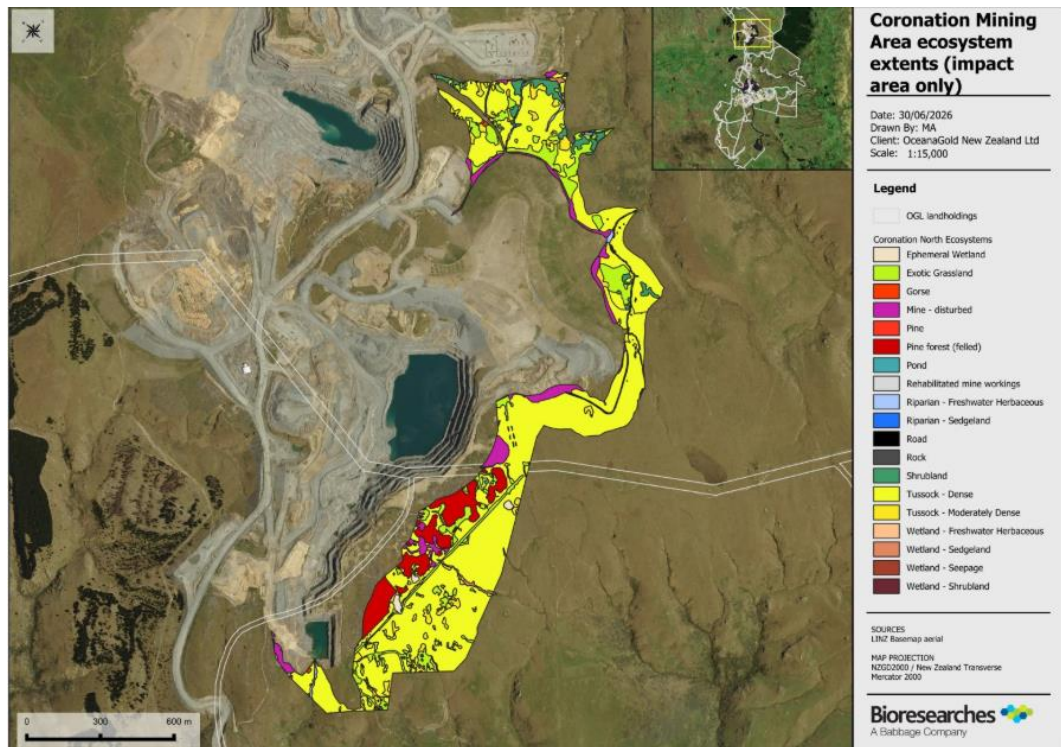
Coronation North comprises a modified open-country landscape shaped by historic mining and pastoral use, yet it retains a diverse mosaic of indigenous habitats of notable ecological significance. These habitats include indigenous grassland, shrubland, rock outcrops, riparian margins, and wetland systems. Each of these habitats contribute to the overall ecological values of the Macraes Operation.

The Coronation Mining Area is dominated by narrow-leaved tussock grassland, which covers approximately 63 ha and represents the primary indigenous vegetation type. This grassland is assessed as having High ecological value due to its relatively intact structure, good ecological integrity, and comparatively high plant diversity despite historical grazing and burning pressures. Importantly, it supports populations of Regionally Threatened and At Risk plant species, making it a key ecological feature of the area.

Smaller but significant components of indigenous vegetation include shrubland, riparian vegetation, wetlands, and rock habitats. These collectively increase habitat heterogeneity and support a broader range of species and ecological functions.

Figure 5-28 shows the ecosystem extents in the Coronation Mining Area, noting this figure only displays those ecosystems in the proposed impact area.





**Figure 5-28: Ecosystem types identified within Coronation Mining Area impact area (Bioresearches, 2026b).**

Bioresearches (2026b) identifies several Threatened and At Risk vegetation species located within the Coronation Mining Area, and the immediately surrounding area, including:

- > Dwarf broom and indigenous St John's wort, which are classified as Threatened – Regionally Critical and Threatened at the national level;
- > Five species that are Threatened – Regionally Endangered and At Risk – Declining: *Carex kaloides*, slender wine sedge, wetland daisy, creeping button daisy, and *Rytidosperma thomsonii*;
- > Five species classed as Threatened – Regionally Vulnerable and At Risk – Declining: *Acaena buechananii*, narrow-leaved speargrass, tufted hair grass, *Epilobium insulare*, and *Euchiton polylepis*;
- > Seven species identified as At Risk – Regionally Declining, including five that are also At Risk – Declining nationally (delicate bluegrass, desert broom, New Zealand mint, *Rytidosperma buechananii*, and *Olearia lineata*) and two that are not threatened nationally (*Colobanthus strictus* and *Juncus distegus*); and
- > Five species classed as At Risk – Regionally Naturally Uncommon: wetland grass, Hooker's Mountain daisy, *Lagenophora pinnatifida*, *Poa pusilla*, and *Olearia bullata*.



#### 5.17.1.2 Invertebrates

The Coronation Mining Area comprises predominantly modified (grazed) tussock grassland, with additional habitat features including ephemeral wetlands, riparian margins, and small, isolated rock outcrops. The invertebrate assemblage present is characteristic of these modified tussock environments and is broadly representative of the surrounding landscape. Larger-bodied invertebrates, such as ground beetles (including *Mecodema* and *Megadromus* species) and the Otago ground wētā, are present and are well represented. The assemblage also includes a range of moth and other invertebrate species typical of tussock ecosystems, with diversity patterns reflecting those commonly found across similar modified habitats within the wider Macraes Ecological District.

Survey records indicate the presence of several species with elevated conservation status, including five 'At Risk – Declining' species (*Agrotis admirationis*, *Asaphodes recta*, *Dasyuris partheniata*, *Nyctemera annulata*, and *Patagoniodes farinaria*) and one 'Data Deficient' species (*Wiseana fuliginea*).

The invertebrate community occupies a range of ecological roles, including predation, pollination, and decomposition, and includes both diurnal and nocturnal species. The area remains ecologically connected to adjacent tussock habitats to the north, east, and south, supporting continuity of invertebrate populations and enabling gene flow across the wider landscape. Although the habitat has been modified by land use activities such as grazing, the invertebrate assemblage persists and reflects the ecological characteristics of the broader modified tussock environment.

The invertebrate community in the Coronation North Mining Area has been assigned a moderate overall ecological value.

#### 5.17.1.3 Avifauna

Bioresearches (2026a, 2026b and 2026e) consider avifauna values within the Coronation Mining Area. The area supports a characteristic inland Otago open-country bird assemblage, including South Island pied oystercatcher, banded dotterel, and New Zealand pipit, all of which are classified as nationally At Risk. The available habitats offer suitable foraging areas and potential nesting opportunities for ground-nesting species. This includes the threatened New Zealand falcon, though no active nesting sites have been confirmed. Avifauna values at the Coronation Mining Area are considered moderate overall.



#### **5.17.1.4 Lizards**

The Coronation Mining Area supports a range of habitat types suitable for lizards, including tussock grassland, rock outcrops and rock piles, ephemeral wetlands, and modified environments such as pasture and felled pine forest.

Three lizard species were identified as present within the Coronation Mining Area: the McCann's skink, southern grass skink, and kōrero gecko. McCann's skinks and southern grass skinks are the most abundant species and are common across the area. McCann's skinks are primarily associated with rocky habitats, although they are also observed utilising grassland and tussock areas. In contrast, southern grass skinks show a preference for grassland, tussock, wetland margins, and felled pine areas.

Kōrero geckos were recorded less frequently and are largely restricted to small, isolated rock outcrops across the footprint. They were not detected in established vegetation in the Coronation Mining Area indicating a strong association with rocky microhabitats.

At both Camp Creek and Coal Creek sites, all three species were recorded and were generally common. Kōrero geckos were consistently associated with rock outcrops and found beneath loose rocks. No Otago green skinks were captured during systematic surveys at Camp Creek; however, a single individual was observed opportunistically. Follow-up searches did not relocate the species. No threatened lizard species were recorded at Coal Creek, although their presence in the area cannot be ruled out.

Bioresearches (2026d) assessed lizard values in the Coronation Mining Area as moderate overall.

#### **5.17.1.5 Amphibians**

Bioresearches (2026b) identified that Whistling tree frogs are present at the Macraes Operation, specifically in ponds, riparian margins, wetlands, seeps and rockpiles. Whistling tree frogs have been identified in the Coronation Mining Area.

Whistling tree frogs are listed in Schedule 5 of the Wildlife Act as amphibians not protected under the Act. These frogs do not provide any wider ecological functions and do not have an assigned ecological value.

### **5.17.2 Central Mining Area**

#### **5.17.2.1 Vegetation**

Vegetation within the Central Mining Area is largely influenced by extensive historic and ongoing mining activities. As a result, most of the area supports vegetation communities



dominated by exotic species established on mine-modified substrates. These communities typically consist of pasture grasses, herbs, and other opportunistic species adapted to disturbed ground conditions, reflecting a highly altered ecological baseline.

Indigenous vegetation is limited in extent and occurs primarily as small, fragmented remnants. These include scattered patches of shrubland and riparian vegetation, which represent the remaining native plant cover within the area. While these remnants retain some ecological value, they are generally isolated and reduced in diversity compared to original vegetation patterns. Vegetation species located in the Central Mining Area include:

- > Narrow-leaved tussock grassland that has a low overall ecological value;
- > *Carex secta* sedgeland that has a low overall ecological value;
- > *Shawia bullata* shrubland that has a moderate overall ecological value;
- > Indigenous dominated shrubland that has a low overall ecological value;
- > Rock outcrops that have a low overall ecological value; and
- > Exotic dominated vegetation on mine disturbed ground that has a negligible ecological value.

Further, Bioresarches (2026b) details At Risk and Threatened plant species located within the Central Mining Area. The extents of these species are shown in Figure 5-29 below. It is noted that these extents only show those in the impact areas proposed as part of MP4.



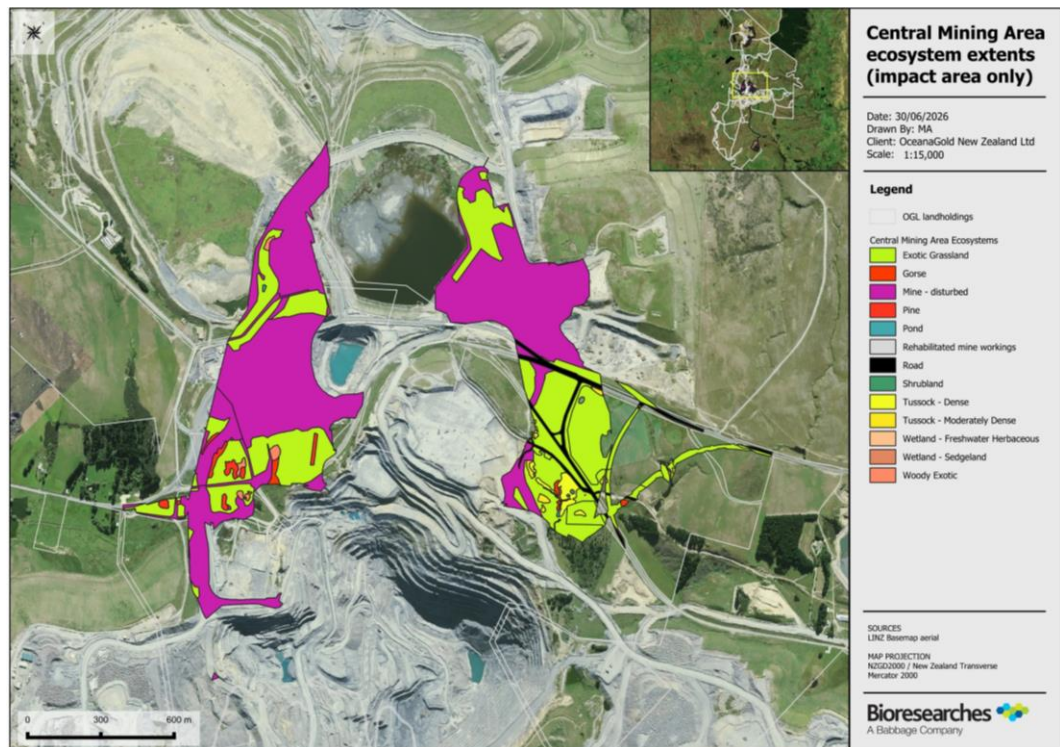


Figure 5-29: Ecosystem extents for the Central Mining Area (Bioresearches, 2026b).

#### 5.17.2.2 Invertebrates

Due to the scale and variability of the Central Mining Area and surrounding project components, invertebrate values have been assessed across a number of distinct sub-areas. A summary of the findings from Bioresearches (2026b and 2026c) is provided below.

The Central Mining Area is characterised by highly modified habitats including grazed grassland, exotic treelands, and weed-dominated vegetation. Invertebrate diversity and abundance in the Central Mining Area reflect the dominance of exotic vegetation and are consistent with other disturbed sites within OGNZL landholdings and the broader Macraes Ecological District. Species recorded occupy a range of ecological roles, including predation, pollination, and decomposition. Notably, two 'At Risk – Declining' species, *Nyctemera annulata* and *Patagoniodes farinaria* are present and are likely to be supported by the abundance of exotic host plants such as *Senecio* species. Although ecological connectivity is reduced by the surrounding active mining footprint, many species retain dispersal capability. This allows the area to function as a stepping-stone within the wider landscape. The extent of exotic vegetation also enables some species to complete their full life cycles within the area. Overall, the invertebrate ecological value of the Central Mining Area is moderate.

In contrast, the GPUG area supports a more diverse and intact mosaic of habitats. These habitats include modified tussock grassland, tussock–grey shrubland, rock outcrops, and densely vegetated gullies associated with the Deepdell Creek catchment. These habitats are more representative of the natural character of the Macraes Ecological District and support a correspondingly richer invertebrate assemblage. The invertebrate community is typical of relatively intact tussock and shrubland ecosystems and includes species occupying both terrestrial and riparian environments. Species of conservation interest recorded in this area include the ‘At Risk – Declining’ moth *Nyctemera annulata* and the New Zealand mantis. The presence of less modified habitat suggests these species are likely to be supported within the area despite low recorded numbers. The invertebrate community performs a full range of ecological functions and benefits from strong connectivity with surrounding habitats to the north, east, and south, supporting movement and gene flow. Overall, the ecological value of invertebrates within the GPUG area is very high.

The area between the Macraes Road and Frasers West WRS represents the most modified end of the habitat spectrum, comprising predominantly short, grazed grassland with very limited structural or floristic diversity. As a result, invertebrate habitat is poor and diversity is expected to be low, dominated by widespread, disturbance-tolerant species, including a high proportion of exotic taxa. While common indigenous species may also be present, no species of conservation concern have been recorded. Ecological function is limited to basic roles such as predation, decomposition, and pollination by species adapted to simple pasture systems. Connectivity is also relatively constrained, although nearby wetland and pond habitats to the north provide more suitable environments for freshwater invertebrates, and some mobile species may utilise the area as part of broader movement across the landscape. The overall ecological value of invertebrates in the area between the Macraes Road and Frasers West WRS is low.

#### 5.17.2.3 Avifauna

The Central Mining Area supports a diverse assemblage of indigenous bird species associated with open-country habitats such as pasture, tussock grassland, exposed substrates, haul roads, and rehabilitated landforms. These environments provide suitable foraging and potential breeding opportunities, particularly for species adapted to disturbed or sparsely vegetated conditions.

The ecological value of the area is elevated by the regular presence of nationally At Risk species, including New Zealand pipit, banded dotterel, and South Island pied oystercatcher. A range of other indigenous birds, including the grey warbler, morepork, New Zealand fantail, paradise shelduck, pied stilt, swamp harrier, and welcome swallow were also observed within the Central Mining Area.



Despite the modified nature of the Central Mining Area, avifauna values are moderate overall.

#### 5.17.2.4 Lizards

The Central Mining Area generally offers comparatively lower-quality lizard habitat than the other mining areas. However, McCann's and southern grass skinks have been observed within the area in high numbers. Kōrero geckos have not been recorded in the Central Mining Area footprint, likely reflecting a lack of rocky outcrops. Lizard values for the wider Central Mining Area are moderate overall.

#### 5.17.2.5 Amphibians

Whistling tree frogs are present within the Macraes Operation, specifically in ponds, riparian margins, wetlands, seeps and rockpiles. Whistling tree frogs have not been specifically identified as being present in the Central Mining Area. These frogs do not provide any wider ecological functions and do not have an assigned ecological value.

### 5.17.3 Golden Bar and Golden Bar Haul Road Area

#### 5.17.3.1 Vegetation

Vegetation within the Golden Bar Mining Area is dominated by an extensive narrow-leaved tussock grassland that is heavily grazed and locally affected by weed invasion. This is reflective of the long history of land use and modification across the site. Within this predominantly altered landscape, smaller areas of indigenous vegetation persist, including shrubland and riparian margins. These areas of vegetation contribute to the remaining native biodiversity values.

Despite modification, the area supports several plant species of ecological significance. The Golden Bar WRS contains the only known occurrences within the Macraes Operation of indigenous dominated shrubland (dominated by *Melicytus* 'otago' and fuchsia) which has a high overall ecological value for containing rare species. In addition, schist rock outcrops within the WRS have a high overall ecological value.

Other vegetation identified within the Golden Bar Mining Area, Golden Bar WRS and Haul Road areas include:

- > Narrow-leaved tussock grassland which has a low overall ecological value;
- > Matagouri dominated shrubland that has a low overall ecological value;
- > Riparian *carex secta* sedgeland that has a moderate overall ecological value; and
- > Exotic dominated vegetation that has a negligible overall ecological value.



Further to the species listed above, Bioresearches (2026a) have identified Threatened and At Risk plant species within the Golden Bar Mining and Haul Road Areas. These are:

- > *Rytidosperma thomsonii* is a dryland grassland species, classified as Threatened – Regionally Endangered and At Risk – Declining nationally, located in the Golden Bar 20 m buffer area;
- > Desert broom, mountain carrot and *Juncus distegus* are classified as At Risk – Regionally Declining species. Their national conservation status ranges from At Risk – Declining to Not Threatened;
- > Hooker’s mountain daisy and *Olearia bullata*, both classified as At Risk – Regionally Naturally Uncommon and At Risk – Naturally Uncommon nationally. However, *Olearia bullata* is classified as Not Threatened at the national level; and
- > Cress and *Ranunculus aff. reflexus*, which are classified as Regionally Data Deficient, and At Risk – Naturally Uncommon or At Risk – Declining at the national level.

The ecosystem extents are shown in Figure 5-30 and Figure 5-31. Again, it is noted that the areas shown are specific to those that would be impacted as part of MP4.

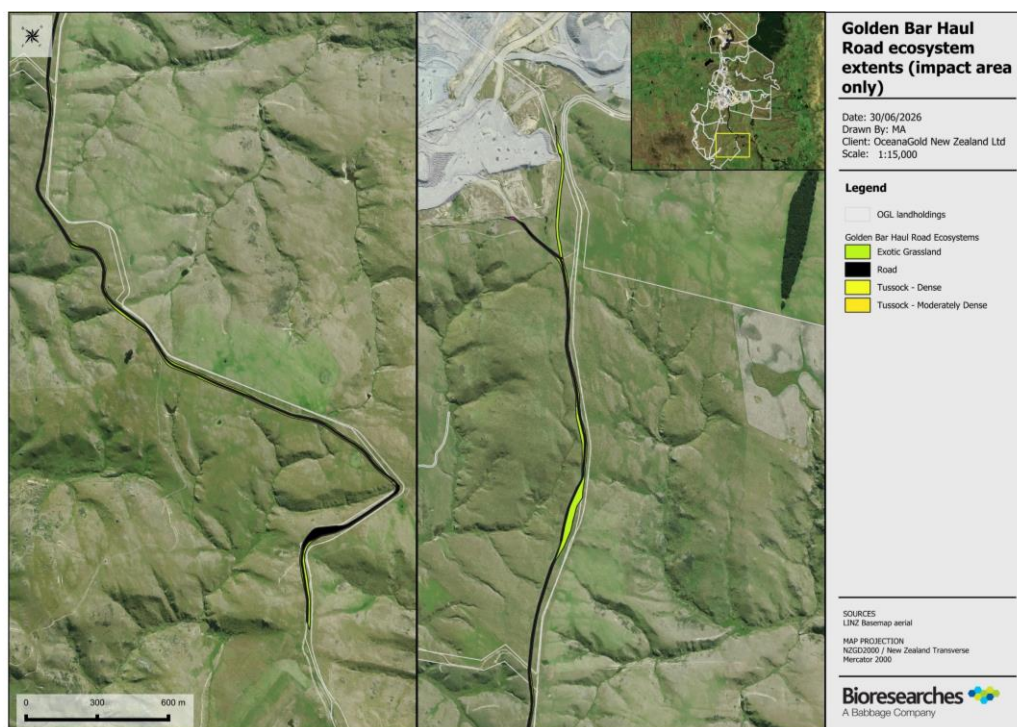
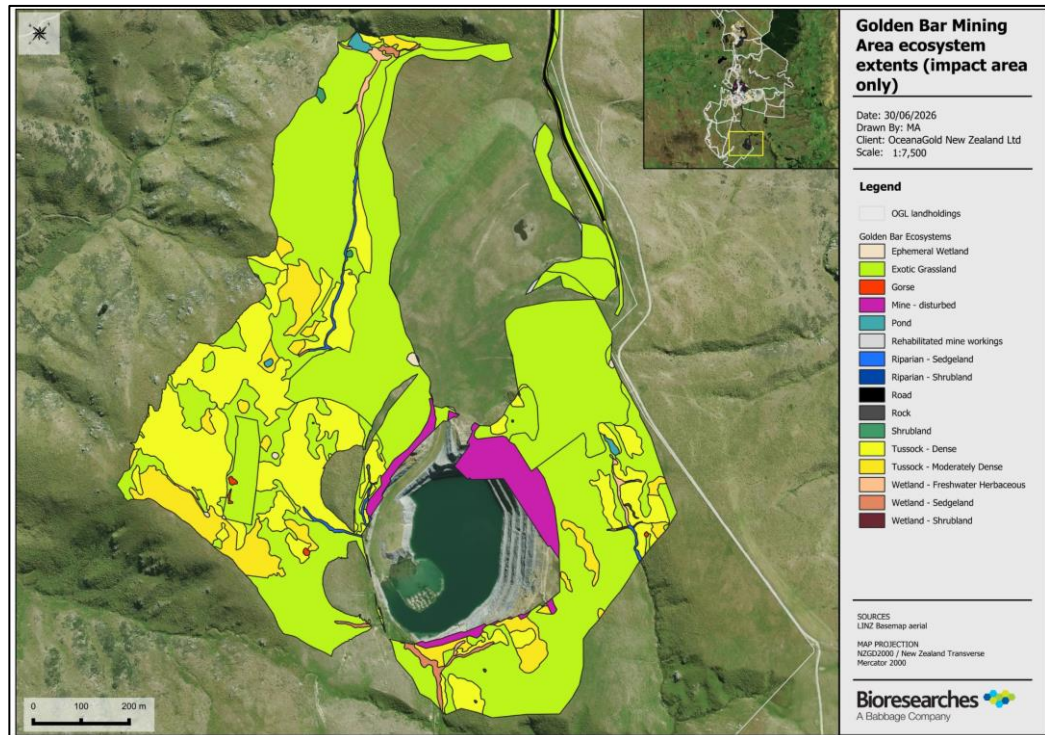


Figure 5-30: Ecosystem extents within the Golden Bar Haul Road impact area (Bioresearches, 2026b).





**Figure 5-31: Ecosystem extents of the Golden Bar Mining Area impact area (Bioresearches, 2026b).**

Ecological values for vegetation in the Golden Bar Haul Road area, are low overall. This is reflective of the effects of historic disturbance, road use, grazing, and the predominance of exotic species and infrastructure. Narrow-leaved tussock grassland located in the area is also assessed as having low ecological value, although it continues to provide habitat for a Regionally Declining and At Risk plant species.

#### 5.17.3.2 Invertebrates

The Golden Bar Mining Area comprises predominantly modified tussock grassland interspersed with grazed pasture, ephemeral wetlands, riparian margins, and isolated rock outcrops. As such, the area supports an invertebrate assemblage typical of these environments within the wider Macraes landscape. Larger-bodied taxa, such as *Mecodema* and *Megadromus* ground beetles, are well represented in more vegetated areas, and the presence of species such as *Orocrambus sophistes* and *Pasiphila* sp. indicates the assemblage is broadly representative of tussock-dominated habitats. Species of conservation interest recorded include one 'Threatened – Nationally Vulnerable' species (*Orocrambus sophistes*), two 'At Risk – Declining' species (*Nyctemera annulata* and *Pasiphila* sp), and one 'At Risk – Uncommon' species (*Bityla seicea*). The invertebrate community occupies a range of ecological roles, including predation, pollination, and decomposition, and remains connected to similar habitats in all directions. This supports



ecological continuity and gene flow, despite ongoing habitat modification. The overall ecological value for invertebrates in the Golden Bar Mining Area is high.

The Golden Bar Haul Road footprint is largely devoid of invertebrate habitat due to its disturbed nature, reflecting its use as a historical haul road and ongoing grazing. Limited habitat is present along the margins and within a 20 m buffer. Degraded tussock, rock tors, and sparse vegetation support a low diversity invertebrate assemblage representative of modified environments in the wider landscape. The invertebrate community is expected to be dominated by common, disturbance tolerant species, including both exotic and widespread indigenous taxa, with no species of conservation concern recorded. While ecological function within the footprint itself is limited, adjacent habitats provide more suitable conditions. The area remains connected to surrounding tussock ecosystems, allowing some mobile species to move through and contribute to wider population processes.

The overall ecological value for invertebrates in the Golden Bar Haul Road Area is low.

#### **5.17.3.3 Avifauna**

Avifauna values for the Golden Bar Mining Area are assessed as low overall. The corridor supports a modified open-country bird assemblage typical of pastoral and mining environments. While At Risk species such as South Island pied oystercatcher, banded dotterel, and New Zealand pipit have been recorded within the Golden Bar Haul Road, the habitat quality is generally low. Further to this point, these environments are widely available across the surrounding landscape.

#### **5.17.3.4 Lizards**

The McCann's skink, southern grass skink and kōrero gecko were observed within the Golden Bar Mining Area. Both the McCann's Skink and southern grass skink were common throughout the footprint due the rocks and pasture located in the area. Kōrero geckos were only observed in rocky habitats that included smaller isolated rock outcrops. No large, threatened lizard species were detected in the Golden Bar Mining Area. The lizard values in the Golden Bar Mining Area are low overall.

McCann's skink is common throughout the Golden Bar Haul Road corridor, while southern grass skink occurs locally in denser vegetation. Kōrero gecko has not been recorded within the footprint and is unlikely to occur due to the lack of suitable rocky habitat. Lizard values within the Golden Bar Haul Road are also assessed as high overall.

Further to the points above, the wider Murphys Creek area supports robust populations of common lizard species, including McCann's skink, southern grass skink, and kōrero gecko.



#### 5.17.3.5 Amphibians

Whistling tree frogs are present in ponds, riparian margins, wetlands, seeps and rockpiles across the Macraes Operation and are present in the Golden Bar area. These frogs do not provide any wider ecological functions and do not have an assigned ecological value.

### 5.18 NATURAL CHARACTER AND LANDSCAPE VALUES

The landscape and natural character values attributed to the proposed work areas of MP4 are detailed in Boffa Miskell (2026). This report is provided in **Part B** of this substantive application.

Boffa Miskell (2026) also considers the cultural associations of the local landscape which are summarised in Section 5.8 above and are relevant to the natural character and landscape values associated with MP4. Macraes is located within a rural upland hill country landscape, and the landscape is defined by an extensive network of fluvially incised rolling hills, featuring broad ridge tops where rock outcrops and tors are frequently present, including along the skyline. These ranges and ridgelines are generally oriented northeast to southwest and enclose several narrow valley floors, such as Billys Flat, Moonlight Flat, and the Strath Taieri Plain.

As described in Section 5.7 above, the Macraes Operation is predominantly located within the Macraes Mining Project Mineral Zone and partially within the Rural Scenic Zone and General Rural Zone in the WDP. This area forms part of an elevated inland hill-country landscape between the Rock and Pillar / Taieri Ridge system to the west and more dissected terrain extending east toward Palmerston and the Kakanui–Horse Ranges. The Coronation, Central and Golden Bar mining areas are distributed across upland ridges, shallow basins and incised catchments around Macraes township, rather than forming a single compact area.

The Coronation Mining Area lies near the boundary with the Taieri Ridge Landscape Character Area within Dunedin City, representing a transition from the broader Macraes upland landscape to ridge and basin landforms to the west. The relevant landscape context therefore includes the wider Macraes upland area, within which the mining areas are physically, visually and historically associated, rather than being limited to individual mining footprints.

The broader landscape comprises a complex sequence of hills transitioning to the block-faulted ridgeline of the Taieri Ridge to the southwest. The landforms are strongly dissected by drainage gullies and characterised by schist outcrops and tors typical of the Otago Peneplain. Rounded volcanic knobs are also present, including Highlay Hill (820 masl) to the north-east.



Vegetation cover is predominantly exotic grassland associated with pastoral land use, particularly within the Moonlight Valley. Tussock grassland and low shrubland occur in steeper gullies. Remnants of snow tussock, short tussock grassland, cushion bogs, and wetland vegetation are present along the Taieri Ridge crest.

The Macraes Operation is a prominent human-modified landform within the landscape, alongside pastoral farming. Apart from Macraes township and scattered rural-residential properties, the area is largely uninhabited farmland.

Rivers and streams are a key component of the natural character, including headwaters of the Taieri, Waikouaiti North Branch and Shag / Waihemo Rivers. These waterways The Taieri, Waikouaiti North Branch and Shag / Waihemo Rivers form part of the cultural landscape for mana whenua, including as ara tawhito and resource areas, with the Waikouaiti River North Branch recognised as the wellspring of the Puketeraki whānau and a focus for kaitiakitaka.

None of the potentially affected sections of the listed waterbodies are identified as outstanding waterbodies in the Regional Water Plan.

## **5.19 ARCHAEOLOGICAL AND HERITAGE VALUES**

### **Overview**

A Heritage Assessment has been prepared by Origin (2026a) as well as an Archaeological Assessment (2026b). These reports can be found in **Part B** of this substantive application and the archaeological and heritage values relevant to MP4 have been summarised below.

Gold was discovered in Deepdell Creek by James Crombie and his associates in May 1862. After the discovery, gold was found in the surrounding creeks and, due to the influx of miners, Macraes township was formed three kilometres south of Deepdell Creek. Hard rock mining was established in the area in 1866, and there was a period of stagnation through the 1880s and 1890s. At the end of the 19<sup>th</sup> and beginning of the 20<sup>th</sup> century, a number of hard rock mines were established in the area, including the Golden Bell, Maritana, Deepdell, Golden Point, Mt Highlay, and Round Hill. These mines operated at a significantly larger scale than the earlier alluvial workings and required more machinery and coordinated manpower.

### **5.19.1 Coronation Mining Area**

Early European activity in the Coronation Mining Area was driven by alluvial gold mining at the Highlay Diggings and mining began in the Coronation Mining Area around the late 1880's. Initial workings were located specifically in Trimbells Gully and Mareburn Gully.



Four archaeological sites are recorded within the Coronation Mining Area but, given the extent of subsequent mining activities, these sites have historically been destroyed and are no longer located within the area. These previously comprised:

- > Pit, trench, adit and mine, Archsite reference I42/93;
- > Adit, dam and mining workshops, Archsite reference I42/162;
- > Adit, dam, prospecting pit/trench, reservoir, sluicings, sluicing face and trench, Archsite reference I42/163; and
- > Dam and reservoir, Archsite reference I42/167.

The only remaining archaeological feature within the Coronation Mining Area is the north-south fence line along the eastern edge of Part Section 2 Block VII Highlay Survey District, as shown in Figure 5-33 (Archsite reference I42/253). The fence comprises six number eight wires supported by iron standards, with notched tops indicating former barbed wire, and follows a historic land parcel boundary. Origin (2026a) suggests the fence was likely established around the 1888 subdivision of Deepdell Run.

Origin (2026b) considered that the heritage values for the fence line site and all values (inclusive of archaeological, historic and cultural) are negligible.

There is no evidence of historic Māori activity within the Coronation Mining Area.



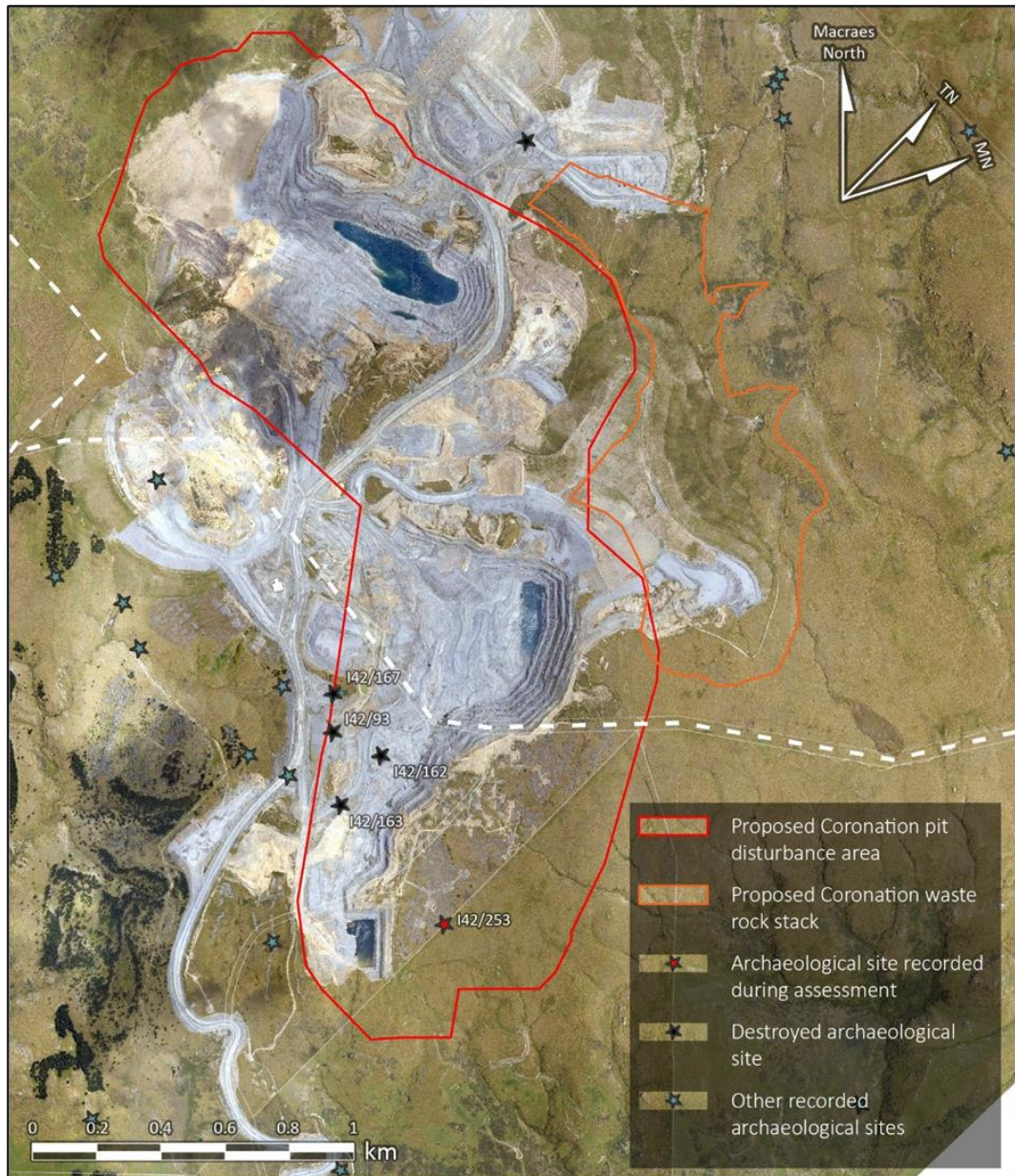


Figure 5-32: Locations of recorded archaeological sites in and around the Coronation Mining Area.

#### 5.19.2 Camp Creek Dam and Reservoir

A resource consent has already been obtained for the Camp Creek Dam, as mentioned in Section 5.3 of this report. There are ten identified archaeological sites recorded within and around the Camp Creek Dam and Reservoir site. These comprise a series of water races, prospecting pits, alluvial workings, hut remains, a stone culvert, and a stone hut. These sites include:



- > Camp Creek Alluvial Mining: Water race and prospecting pits, ArchSite reference I42/148;
- > Camp Creek Alluvial Mining: Water race, ArchSite reference I42/149;
- > Camp Creek Alluvial Mining: Prospecting pit, ArchSite reference I42/150;
- > Camp Creek Alluvial Mining: Water race, ArchSite reference I42/151;
- > Camp Creek Alluvial Mining: Prospecting pit and associated workings, ArchSite reference I42/152;
- > Harry's Hut, ArchSite reference I42/153;
- > Stone culvert beneath Horse Flat Road, ArchSite reference I42/154;
- > Camp Creek Alluvial Mining: Water race and workings, ArchSite reference I42/155;
- > Camp Creek Alluvial Mining: Water race, workings and hut remains, ArchSite reference I42/156; and
- > Camp Creek Alluvial Mining: Extensive mining workings, ArchSite reference I42/157.

The locations of these archaeological sites are shown in Figure 5-33 below. The condition of the archaeological sites vary between poor and fair, with the exception of I42/157 which is in good condition.





Figure 5-33: Locations of recorded archaeological sites in and around the Camp Creek Dam Site.

### 5.19.3 Coal Creek Dam and Reservoir

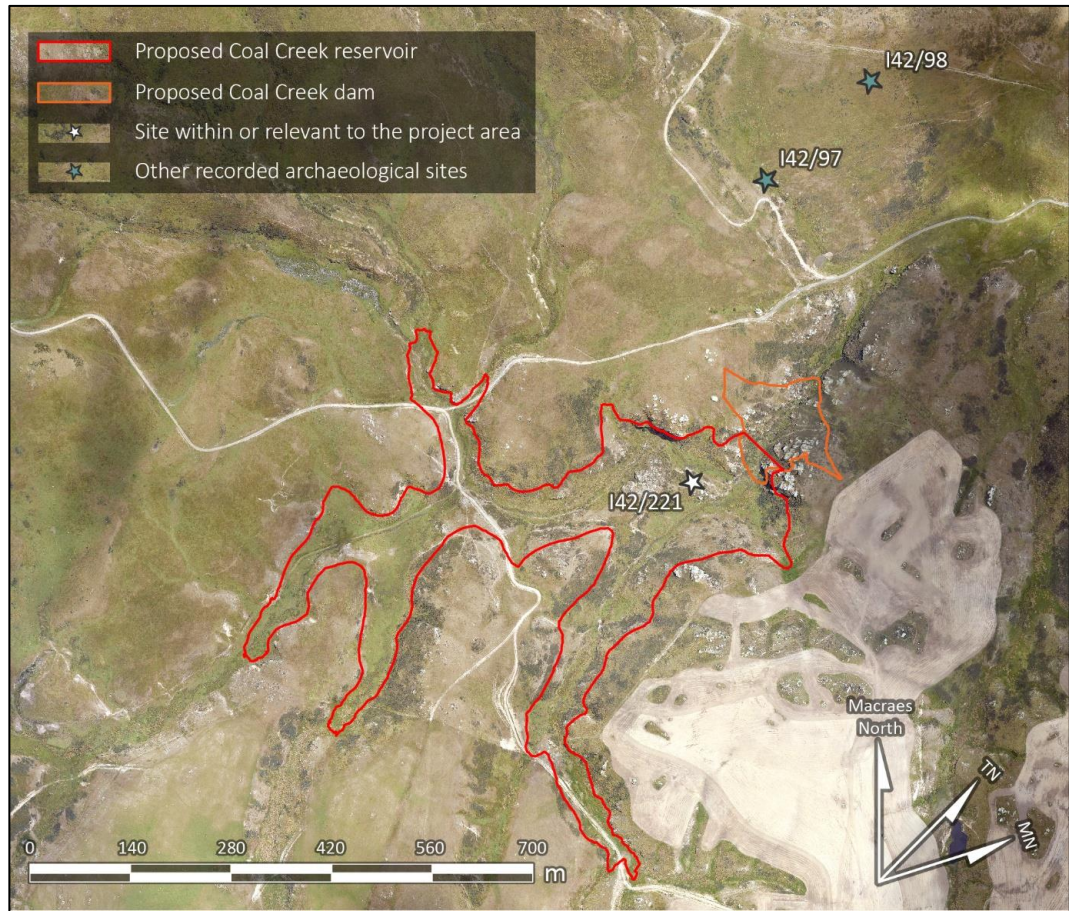
As mentioned earlier in this report, resource consents for the Coal Creek Dam have been obtained as part of the Coronation North Project. An archaeological authority was obtained in 2016 (reference 2017/430) which has since expired. This substantive application therefore seeks a new authority approval.

There is only one identified archaeological site located within the Coal Creek Dam and Reservoir site which is the Coal Creek Alluvial Workings: Mound, Tailings and Water Race (I42/221). The Mound, Tailings and Water Race has a previous authority reference 2017/430.

The following archaeological sites are located to the north of the Coal Creek Dam and Reservoir:

- > NZ Gold and Tungsten Site: Quartz mining, Archsite reference I42/97; and
- > NZ Gold and Tungsten Site: Battery, Archsite reference I42/98.

The Quartz mining site and the Battery have a previous authority reference of 2004/58 and the locations of these archaeological sites are shown in Figure 5-34.



**Figure 5-34: Locations of recorded archaeological sites in and around the Coal Creek Dam Site.**

There are five identified items located within the dam footprint. These include:

- > Race or track supported by revetment (Archsite reference CC04);
- > Race or track supported by revetment (Archsite reference CC05);
- > Revetment at top of high schist outcropping (Archsite reference CC06);
- > Additional revetment in outcrop next to CC06 (Archsite reference CC07); and
- > Race or track supported by revetment (Archsite reference CC08).

These features are shown in Figure 5-36 below (shown in orange).

The footprint of the proposed Coal Creek Dam contains numerous items which are shown as blue dots in Figure 5-35, and alluvial workings which are shown as black dots. The details of each of these items / alluvial workings is provided below:



- > Large semi-circle revetment west of the former battery location (Archsite reference CC01);
- > Former stamper battery location (Archsite reference CC02);
- > Water race running parallel to and west of / uphill from Coal Creek (Archsite reference CC03);
- > Race or track supported by revetment (Archsite reference CC04 and CC05);
- > Revetment at top of high schist outcropping and additional revetment (Archsite reference CC06 and CC07);
- > Race or track supported by revetment (Archsite reference CC08);
- > Breached revetment with Coal Creek running through it (Archsite reference CC09);
- > Stone revetment with concave top (Archsite reference CC10);
- > Water race on slope above creek (Archsite reference CC28);
- > Section of revetment supporting race CC28 (Archsite references CC29, CC30, CC31 and CC32);
- > Water race (Archsite reference CC11);
- > A series of pits and mounds (Archsite reference CC23);
- > Concave topped revetment on the western side of Coal Creek and revetment likely associated with tramline on east side of Coal Creek (Archsite reference CC24 and CC25);
- > Pits and mounds (Archsite reference CC26);
- > Revetment likely associated with tramline on east side of Coal Creek (Archsite reference CC27);
- > A small section of revetment along tramline (Archsite reference CC20);
- > Remains of a revetment repurposed for a modern road crossing over Coal Creek (Archsite reference CC21);
- > Long section of revetment on slope, likely supporting mildly eroded race (Archsite reference CC22);
- > Area marked by Teele as containing workings, possibly the remains of pit working (Archsite reference CC12);
- > Pit and spoil heap (Archsite reference CC13);



- > Earthen mound causeway of tramline and visible cross section of causeway (Archsite reference CC14 and CC15);
- > Area marked as containing workings by Teele, no features visible during survey (Archsite reference CC16);
- > Revetment supporting tramline and cut for tramline in slope (Archsite reference CC17 and CC18); and
- > Series of subtle mounds possibly representing the remains of paddocking type workings (Archsite reference CC19).

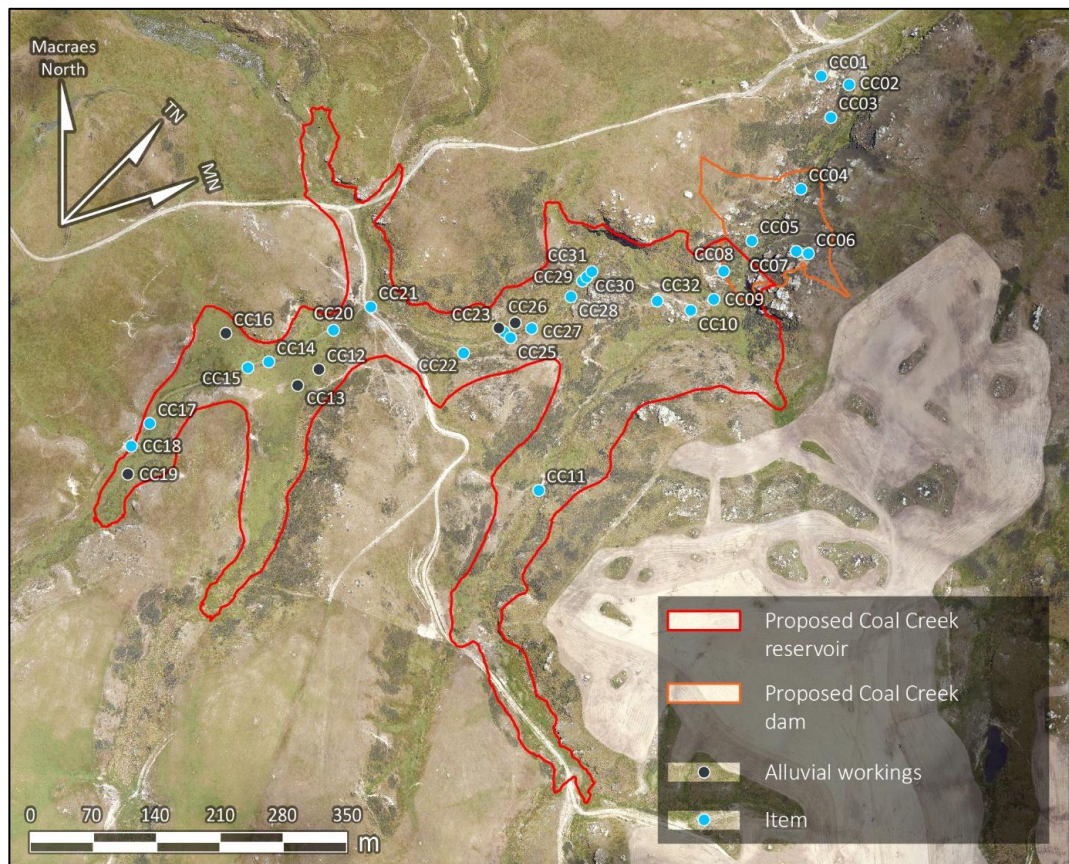


Figure 5-35: Overall Coal Creek Dam and Reservoir area with specific feature markers shown.

#### 5.19.4 Central Mining Area

The Central Mining Area is a highly modified landscape that has undergone extensive historical and more recent mining-related disturbance. Prior to mining, the area formed part of an early access route into Macraes from Dunback and supported a dispersed rural settlement, comprising small landholdings with associated domestic buildings. Historic



records and aerial imagery indicate the presence of multiple dwellings, farm structures, and infrastructure. A concentration of mining-related features including water races, dams, alluvial workings, and an auriferous reserve was also indicated. This area was historically referred to as part of the “upper township” of Macraes. This also included the Macraes Chinese Camp, an important settlement from the 1870s associated with Chinese gold miners. Evidence of this occupation included sod huts, cultivation areas, and artefacts, although the precise extent and configuration of the camp has varied over time and remains uncertain.

Gay Tan’s Cottage (Archsite reference I42/49), a restored historic structure associated with early Chinese occupation is located immediately adjacent to the Macraes Operation and has been subject to archaeological monitoring during restoration works. The area where Gay Tan’s Cottage is located is shown in Figure 5-36 below which also shows the existing structures on the site.



**Figure 5-36: Area covered by Gay Tan’s Cottage.**

Archaeological investigations undertaken since the 1990s indicate that much of the historic fabric within the Central Mining Area has been modified or removed as part of successive mining developments undertaken under archaeological authorities issued pursuant to heritage legislation. Numerous recorded archaeological sites within and adjacent to the Central Mining Area, including domestic structures, alluvial workings (ArchSite reference I42/64), and associated features, have been affected by mining activities authorised through these processes. In many cases, archaeological survey, investigation, recording, and, where



appropriate, excavation were undertaken before sites were modified or removed, resulting in the recovery of information that has contributed to understanding the area's mining history.

Notable features, including sections of alluvial workings and associated structures, have been modified through the development of mining infrastructure, including WRSs. More recent authorised mining activities have also included the demolition or removal of remaining historic buildings, such as the Griffin/Development House (ArchSite reference I42/214), following archaeological assessment and recording.

Despite this extensive modification, some archaeological values persist in the wider area, including sites that have been subject to investigation or remain partially intact beyond the immediate mining footprint. Overall, the existing environment reflects a landscape that has transitioned from early mining and rural settlement to an intensively developed modern mining area. Notably, much of the original historic and archaeological context has been either removed or significantly modified.

#### **5.19.5 Golden Bar Mining Area**

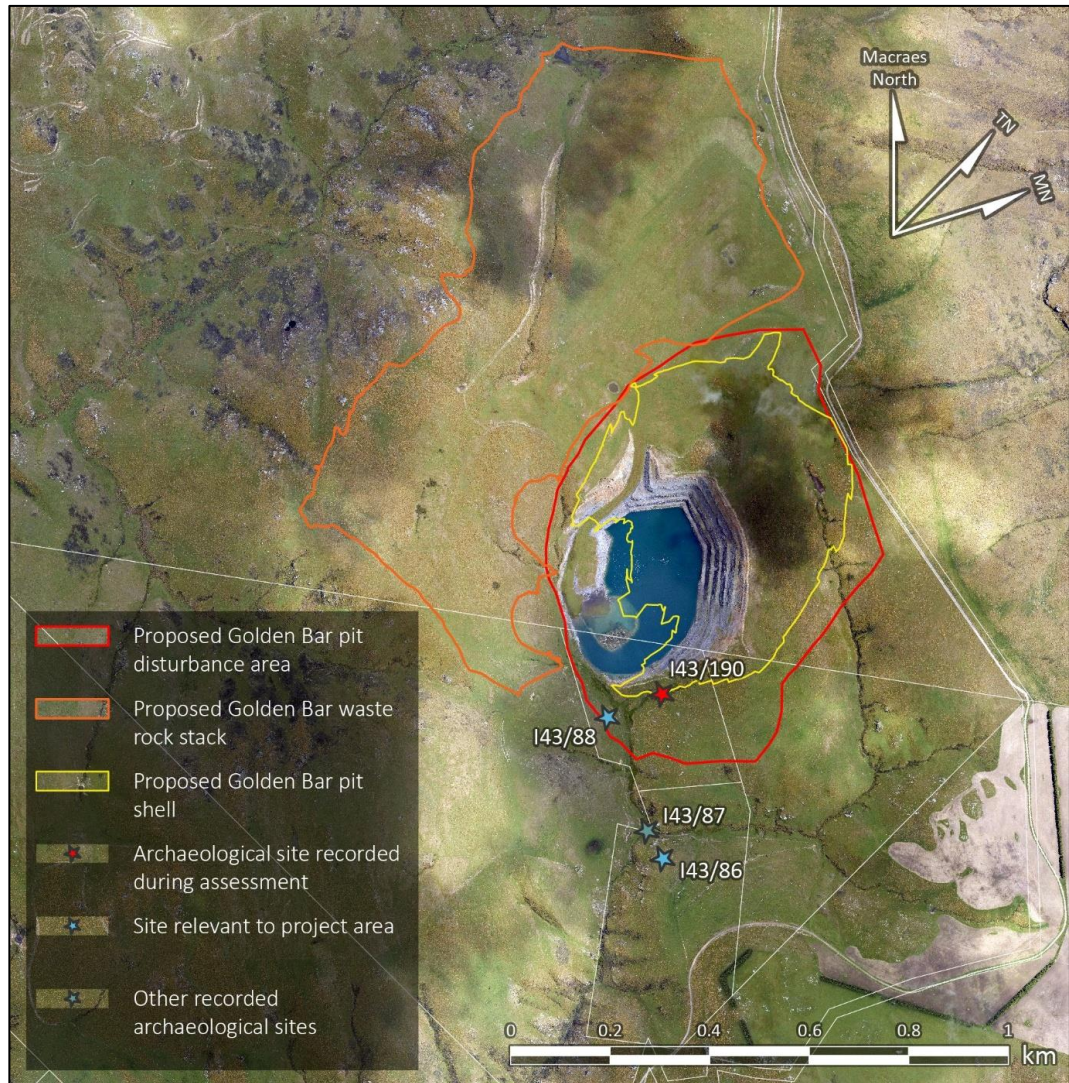
The Golden Bar Mine was subject to mining from 1869 until approximately 1934 or 1942. Various mining licenses were submitted to the Macraes and Naseby Warden's Courts and are recorded in survey plans.

There are three archaeological sites identified within vicinity of the Golden Bar Mine area, these include:

- > Gold mine, Archsite reference I43/86;
- > Gold battery, Archsite reference I43/87; and
- > Gold battery, Archsite reference I43/88.

All three archaeological sites share the same archaeological authority reference numbers, 2003/89 and 2002/162, and are shown in Figure 5-37 below.





**Figure 5-37: Location of recorded archaeological sites in and around Golden Bar Pit and Golden Bar WRS.**

Golden Bar Mine (Archsite reference I43/86) encompasses several features associated with the 19<sup>th</sup> and 20<sup>th</sup> century mining system and includes two battery sites (Archsites I43/87 and I43/88). Gold battery (Archsite reference I43/87) is outside the pit disturbance area, to the south of the surveyed dam and was therefore, not included in the assessment. Origin (2026a) identify that several of the recorded main mine workings have been destroyed by modern mining at Golden Bar Pit. However, most of the remaining features were in good condition and are clearly defined.

Archsite I43/190 comprises an area of overgrown sluicings located north of the 1927 gold battery (Archsite reference I43/88), as recorded during this assessment. The sluicings are situated to the east of Golden Bar Pit and remain unaffected by modern mining activities. Two sluiced gullies converge toward the creek to the south. While the precise age of the site



is uncertain, it is considered likely to date to 19th-century alluvial mining, prior to the development of hard-rock mining in the area.

Further to the sites identified above, Figure 5-38 below displays other archaeological sites within the Golden Bar Mining Area. The recorded Golden Bar mine and battery items represent a diverse range of mining, processing, transport, and domestic features that together illustrate the development and operation of the area. There were approximately 12 adits<sup>15</sup> documented within the area, although many have been partially or completely destroyed through mining associated with the Golden Bar Pit. Surviving examples vary in condition from clearly visible openings to those obscured by vegetation or affected by erosion from earlier workings.

Evidence of habitation and site use is reflected in numerous building or hut terraces, most of which have no standing structural remains but are identifiable as cut platforms. Some of these were partially excavated and interpreted as either domestic dwellings or mining-related buildings. Industrial infrastructure is also well represented, including the remains of the 1927 gold battery with associated features such as a tailings area, and a stone dam likely linked to early twentieth-century processing activity. Supporting infrastructure includes a stone-revetted track, tramway causeway, water race, and culvert-like stone revetment. This is demonstrative of how materials, water, and ore were managed across the site. Earlier exploration and extraction activities are evidenced by prospecting trenches and pits, a now-destroyed shaft, and a recorded scarp feature associated with former workings.

The proposed Golden Bar WRS is predominantly located over modified open paddocks. One area of interest was identified within the footprint, comprising disturbed ground initially considered to potentially reflect historic mining activity. This area was surveyed on 2 March 2026 and was determined to be the result of natural slumping rather than anthropogenic disturbance.

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<sup>15</sup> An adit is a tunnel driven into the side of a mountain or ridge to access an underground mine.





Figure 5-38: Golden Bar Mine and Recorded Items.

Origin (2026b) has assigned heritage values to each of the identified historic heritage sites, with all sites not listed below assessed as having negligible value. The following heritage values are relevant to MP4:

- > Golden Bar Mine and Battery (ArchSite references I43/86 and I43/88) is assessed as having moderate archaeological, historic, technological, historical and social value; and
- > Sluicings (Archsite reference I43/190) are assessed as having low archaeological value.

No archaeological or heritage features (including those of Māori origin) have been identified within the footprint of the Golden Bar Pit mine area. No other heritage is recognised under the HNZPT or District Plan schedules.

#### **5.19.6 Golden Bar Haul Road**

The establishment of Golden Bar Road dates back to at least 1867 and is described to roughly follow the current alignment along the ridgetops. Origin (2026a) recognise that historic aerials show little change over time beyond the appearance of modern mining to the north.

There are two identified archaeological sites within the vicinity of the Golden Bar Haul Road area. These are:

- > Prospecting pit, Archsite reference I42/33; and
- > Trig station, Archsite reference I42/41.

The location of these two archaeological sites is shown in Figure 5-39 below. There is no recorded archaeological authority reference associated with either site.

The prospecting pit was described as a natural pond partially modified through excavation, likely either tested for gold-bearing material or deepened for stock water. The prospecting pit is assessed as being in fair condition and the extent of the archaeological site extent is shown in Figure 5-40.

The nearby trig station comprises a circular schist boulder plinth approximately 200 mm in height, topped with an iron bayonet-style marker. The feature, now overgrown, has been interpreted as dating to the 19th century, likely established prior to 1867. It is recognised that the trig station is in good condition.

No additional archaeological sites, including those of Māori origin, were identified within the proposed Golden Bar Haul Road footprint beyond those recorded above. Consistent with this, no further heritage values have been assigned due to the absence of additional identified heritage sites.





**Figure 5-39: Locations of recorded archaeological sites in and around the proposed Golden Bar Haul Road.**



**Figure 5-40: Extent of the Prospecting Pit.**



### 5.19.7 Murphys Creek Ecological Enhancement Area

There are two identified archaeological sites located within the boundaries of the proposed MEEA and four located in the surrounding areas. Those within the MEEA boundaries are:

- > Murphys Creek Alluvial Mining, Archsite reference I43/191;
- > Ounce Battery water race, Archsite reference I43/192;
- > Prospecting pit, Archsite reference I43/193;
- > Prospecting pit, Archsite reference I43/195;
- > Stone culvert, Archsite reference I42/256;
- > Fence line, Archsite reference I42/257; and
- > Gold workings area I42/258.

Features recorded under Archsite I43/191 adjacent to Murphys Creek, and outside of the MP4 footprint, include a range of mining-related remains. These comprise earthen embankments interpreted as possible dam structures or overgrown tailings mounds, and exposed tailings within a sluiced area. An overgrown prospecting pit is located nearby. Additional features include the remains of a panelled timber door and the approximate location of former hut sites, although this area was heavily overgrown and not accessible at the time of survey. Also present in the wider area is the Ounce Battery water race (I43/192). This is characterised by a channel supported in places by vertical stone revetment and forms part of a larger system supplying water to the downstream battery site

A possible prospecting site is located in the north-western part of the MEEA and comprises an area of disturbed ground featuring three aligned depressions with scattered quartz cobbles and boulders. The site is visible in 1947 aerial imagery and has been recorded in ArchSite as I43/195. In addition, a prospecting pit (I43/193) is present adjacent to MEEA Creek, approximately 160 m upstream of its junction with Murphys Creek, comprising a heavily overgrown pit within the MEEA.

A culvert of dry-laid schist slabs passing approximately 2-3 metres under the surface of a road embankment is recorded under Archsite I43/256. Archsite I42/257 comprises a fence line which runs along the southern side of the farm road that passes over Culvert I42/256. Southeast of Culvert I42/256, is a small goldmining area partially revetted benched track, a prospecting pit, and potential tailings under Archsite I42/258.



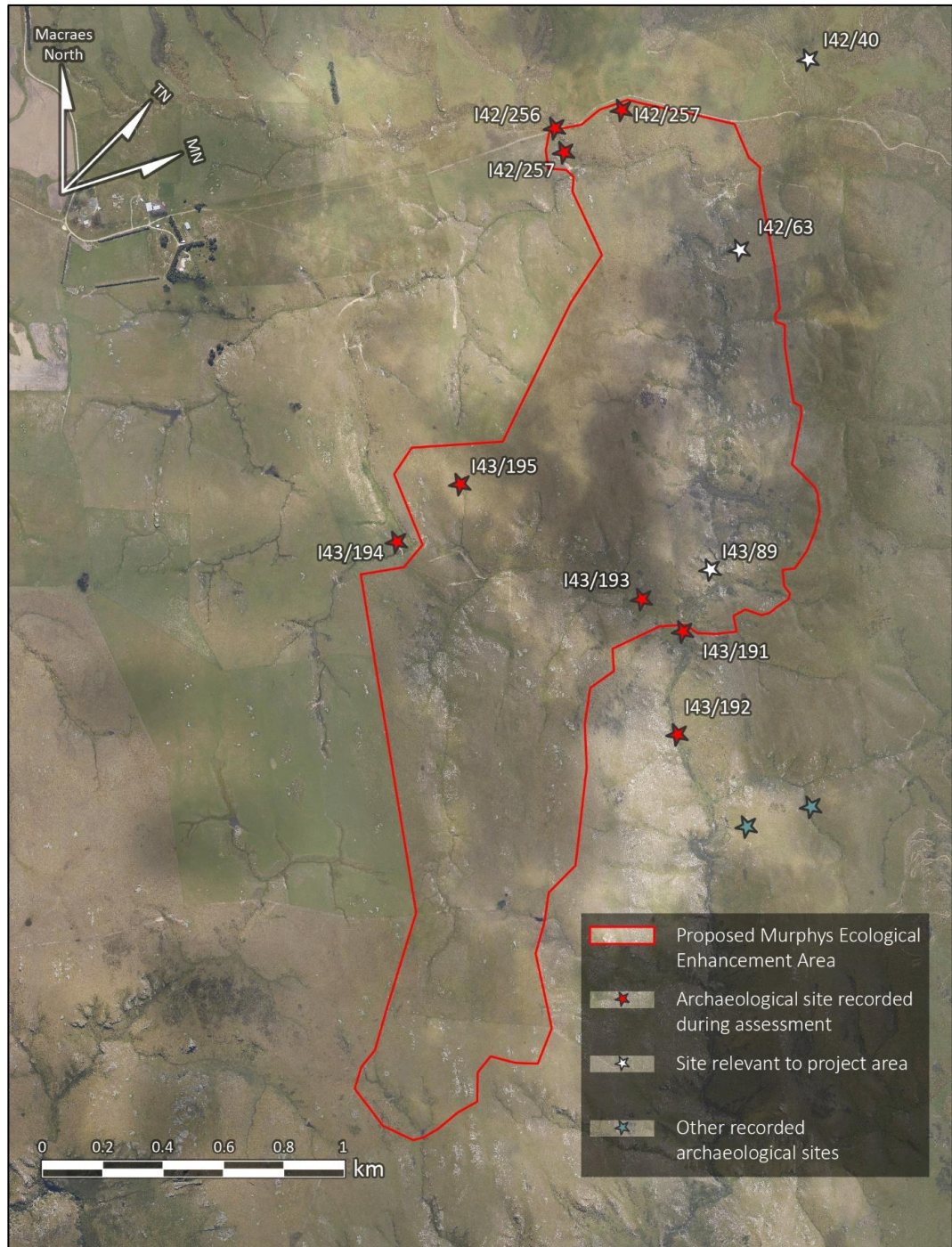


Figure 5-41: Locations of recorded archaeological sites in and around the Murphys Ecological Enhancement Area.

## 5.20 CONTAMINATED LAND

The Macraes Operation is identified on the ORC Selected Land Use Register (“**SLUR**”) due to historic and current activities on the site being listed on the Hazardous Activities and Industries List (“**HAIL**”).



Three technical reports have been commissioned by OGNZL to investigate ground contamination for MP4, including:

- > A Preliminary Site Investigation (“**PSI**”) prepared by WWLA (2026a) considers potential risks of ground contamination;
- > A Detailed Site Investigation (“**DSI**”) prepared by WWLA (2026b) assesses actual ground contamination of the Open Pit Mining Workshop; and
- > A Preliminary Assessment of per and polyfluoroalkyl substances (“**PFAS**”) contamination has been prepared by WWLA (2026c).

These technical assessments are provided in **Part B** of this substantive application.

WWLA (2026a) identified that there are three key types of potential contamination within the footprint of the Macraes Operation, including:

- > Localised areas of contamination (such as workshops, fuel farms and the Processing Plant), however it is noted that not all areas that may contain contamination will be disturbed as part of MP4;
- > There are potentially larger areas of low-level contamination (such as outdoor storage areas and waste disposal areas); and
- > Discharges from contamination-related remediation activities.

The DSI prepared by WWLA (2026b) assesses actual ground contamination specifically within the Open Pit Mining Workshop area. As mentioned earlier in this report, the Open Pit Mining Workshop is proposed to be relocated as part of MP4.

The DSI report identified that several activities listed on the HAIL have been undertaken at the workshop, including:

- > Storage tanks or drums for fuel, chemicals or liquid waste (A17 on the HAIL);
- > Motor vehicle workshops (F4 on the HAIL);
- > Retail or commercial refuelling activities (F7 on the HAIL);
- > Intentional or accidental release of a contaminant in sufficient quantity to present a risk to human health or the environment – *potentially occurring* (I on the HAIL); and
- > Migration of a contaminant in sufficient quantity to present a risk to human health or the environment – *potentially occurring* (H on the HAIL).



Further to the list above, soil sampling confirmed metals (particularly arsenic) levels were naturally elevated in waste rock. Soil sampling also found sediment and solids residue in the workshop contained elevated levels of arsenic.

#### 5.20.1 PFAS Contamination

Historical investigations have identified the use of aqueous film-forming foam (“AFFF”) as the primary potential source of PFAS within the Macraes Operation. PFAS-containing foams were previously stored and used across the site, including within heavy vehicle fire suppression systems, firefighting equipment, emergency response supplies, and workshop facilities where fire suppression systems were serviced and refilled. Historical releases of AFFF are understood to have occurred through routine servicing activities, system activations, and occasional training exercises. Since the phase out of PFAS-containing foams in response to regulatory changes, these products have been replaced with fluorine-free alternatives. While a complete inventory of historic PFAS-containing foam usage is not available, available records and current firefighting infrastructure indicate that PFAS-containing AFFF was used across a range of operational areas over an estimated 15 to 20 year period. As a result, PFAS may be present in environmental media in areas associated with the historical storage, handling, use, and discharge of AFFF.

#### 5.21 NOISE

The existing noise environments within the vicinity of MP4 are described in AES (2026), a copy of which is provided in **Part B** of this substantive application.

Noise from existing and consented mining activities is part of the existing environment for MP4. The approved consent conditions of existing resource consents apply to existing operations occurring in locations similar to those proposed and require that all mining activities comply with specified noise limits. Except where noted below, these limits must not be exceeded at any point within Macraes Village or at the notional boundary of any dwelling not owned by OGNZL:

- > On any day between 7am and 9pm (daytime): 50 dB  $L_{Aeq}$ ; and
- > On any day between 9pm and 7am the following day (night-time): 40 dB  $L_{Aeq}$ ; and/or 70 dB  $L_{Amax}$ .

Exceptions to the above noise limits apply at:

- > 1668 Macraes Road, where OGNZL’s recent resource consents do not prescribe noise limits because noise is managed by a private agreement between OGNZL and the property owner / occupier; and



- > 406 Horse Flat Road, where the conditions of consent<sup>16</sup> enable OGNZL to observe a night-time noise limit of 51 dB L<sub>Aeq</sub> at this property.

## 5.22 LIGHTING

A Lighting Assessment has been prepared by LDP (2026) that considers effects on the surrounding environment from artificial lighting associated with MP4. This report is provided in **Part B** of this substantive application.

As described previously in this application, the Macraes Operation is an active mining environment and therefore, has existing lighting that is used at night. The Macraes Operation also uses mobile lighting that are consented or used as a permitted activity under the relevant district plan. The existing lighting includes:

- > Fixed lighting on buildings and columns for working and security;
- > Mobile lighting towers for working and selected Haul Road intersections and vehicle and mobile plant lighting (headlights, navigation lighting, hazard warning lights and working lights); and
- > Mobile plant lighting (inclusive of headlights, navigation lighting, hazard warning lights and working lights).

Dwellings directly surrounding the Macraes Operation are low in density, and the nearest populated settlement is Macraes Township that is located to the west of the operation. There is no public road lighting within or near the Macraes Operation, except for one roadway light at the intersection of Macraes Road and Golden Point Road. Nearby, there are a small number of roadway lights in Macraes Township (along Macraes Road and Hyde Street).

## 5.23 AIR QUALITY, METEOROLOGY AND CLIMATE

Meteorological data recorded within the vicinity of MP4 activities has identified that:

- > At the meteorological stations, patterns show that stronger winds occur during daytime hours and winds tend more from the east;
- > Wind erosion of exposed surfaces typically becomes significant at hourly average speeds above approximately 7 m/s, with increased dust entrainment occurring at speeds greater than 10 m/s; and

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<sup>16</sup> Condition 8.2 of the Coronation North Extension Project land use consent WDC Reference: 201.2019.1241 & DCC Reference: LUC-2019-42.



- > Rainfall measured at the Macraes Site has varied in recent years, with variations between 575 mm/year and 1,047 mm/year. The average rainfall over this period is 700 mm/year.

As mentioned earlier in this application, the Macraes Operation is located within the ‘remainder of the Otago region’ airshed, which is not identified as a polluted airshed.

## 5.24 ROADING AND TRAFFIC

The existing transportation environment and road network within and surrounding the Macraes Operation is described in Stantec (2026) and provided in **Part B** of this substantive application. A summary of the key characteristics of the existing transport environment is provided below.

Access to the Macraes Operation is primarily via Macraes Road which extends from SH85 and serves as the principal route to the site. Macraes Road is classified as an arterial road and carries fewer than 1,000 vehicles per day (“vpd”). It has a sealed width of approximately 7.4 m, with marked centrelines and edgelines, and operates under an open road speed environment. Macraes Road intersects with Hyde–Macraes Road at a skewed, give-way controlled junction, where it retains priority and continues south as Moonlight Road.

Hyde–Macraes Road provides access from SH87 and connects to Macraes Road. It has a sealed width ranging from approximately 6.0 m to 6.8 m, with marked centrelines and edge lines.

SH85 carries approximately 1,500 vehicles per day south of the Macraes Road intersection. SH87 carries relatively low traffic volumes both north and south of Hyde–Macraes Road. Traffic volumes on both SH85 and SH87 have experienced low growth, increasing by approximately 1% per annum since 2010.

Traffic generated by the Macraes Operation beyond the site is primarily associated with staff movements. The operation typically employs around 210 staff on the day shift (7:00 am to 7:00 pm) and 120 staff on the night shift (7:00 pm to 7:00 am), with peak traffic occurring prior to the start of the day shift. The operation generates approximately 300 light vehicle movements per day, with peak hourly movements of around 100 vehicles.

Heavy vehicle movements on the public road network associated with the existing operation are relatively low, typically comprising fewer than 10 deliveries per day (approximately 20 heavy vehicle movements), including operational and contractor traffic.

Crash records indicate that there have been 10 reported crashes on Macraes Road between Macraes village and SH85, including one fatal, two serious-injury, and six minor-injury



crashes since 2015. Five crashes have been recorded on Hyde–Macraes Road, while one minor-injury crash has occurred at the SH85/Macraes Road intersection. No crashes have been reported at the SH87/Hyde–Macraes Road intersection.

The Macraes Operation includes a network of internal haul roads connecting mining areas to the processing plant and waste rock storage facilities. This includes an active haul road from the Coronation Mining Area and the former Golden Bar Haul Road, which has since been rehabilitated. All internal haul and mine access roads are restricted and not accessible to the public.

## **5.25 SOCIO-ECONOMIC CONTEXT**

A social impact assessment has been prepared by WSP (2026), and this report is provided in **Part B** of this substantive application. A summary of the social-economic context is provided below.

Social infrastructure within Macraes is limited but important to community functioning. Key facilities include Macraes Moonlight School (with a small roll of approximately 12–20 students), which serves as a central community hub, and Stanley’s Hotel, a historic hospitality venue providing accommodation and acting as a primary social gathering place. Additional facilities include the Macraes Pavilion and small community spaces. These facilities form the core of social interaction in an otherwise dispersed settlement.

The settlement’s social characteristics are closely associated with mining and farming activities. Most permanent residents are connected to these industries. The area also accommodates a small temporary workforce associated with the mine, including workers staying locally during shift rotations. The mine contributes to the presence of mining-related households within the community and supports local facilities and services.

Macraes is also valued for its quiet, isolated environment and rural character. In addition to its residential and productive functions, it attracts some visitors due to its historic mining landscape and rural setting. Overall, the social environment is defined by a small, stable population, limited but locally significant infrastructure, and a strong association with mining and farming activities.

## **5.26 PUBLIC ACCESS AND RECREATION**

Public access and recreational use within the Macraes Operation area are very limited. The land parcels that form the Macraes Operation are owned by OGNZL and a large percentage of the surrounding land are also under OGNZL’s ownership. The land is owned and actively managed for mining activities, with no areas of designated public land.



Between the Central and Golden Bar Mining Areas is Murphys Flat Historic Reserve which is a site managed and administrated by DOC. The Historic Reserve seeks to protect important remnants of Otago's gold mining history and is accessed via Golden Bar Road.

There are two other public conservation areas to the north of the Macraes Operation, the Golden Point Historic Reserve and Deepdell Creek Marginal Strip. Existing protocols established under previous authorisations ensure that public access to these areas is maintained and not restricted.

Access to the Macraes Operation is otherwise restricted to authorised personnel, with no established public walking tracks or recreational infrastructure present. As a result, the Macraes Operation has no recreational value and provides limited opportunity for public use.

