

MACRAES PHASE FOUR PROJECT

ASSESSMENT OF ENVIRONMENTAL EFFECTS – LIGHTING

Prepared for

OceanaGold (New Zealand) Limited

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EXECUTIVE SUMMARY

The Macraes Phase 4 project ("MP4" or "the Project") seeks to extend the life of mining operations at the Macraes Operation through to at least 2039. The Project will comprise;

- Open pit mining extensions
- Underground mine expansion
- Tailings management
- Waste rock management
- Water management infrastructure and operations
- Infrastructure and roading works
- Ecological mitigation and enhancement
- Mine closure and rehabilitation

The Macraes Operation is located at Macraes Flat, situated on an elevated plateau at approximately 500 m above sea level. The plateau is flanked by the Taieri Ridge to the northwest, Shag Valley and Horse Range to the east, and the coastal hills and extinct volcanic cones of Palmerston and Waikouaiti to the southeast.

The purpose of this report is to advise the expected lighting effects generated by the Project and recommend suitable mitigation measures where necessary.

Lighting will include:

- Fixed lighting – Associated with the relocation of the Open Pit Workshop facilities, and
- Mobile lighting – Associated with all above ground activities

New fixed lighting proposed under the Project for the relocated Open Pit Workshop facilities, will be installed to applicable lighting standards to control potential lighting effects. Higher intensity lights such as floodlights will be aimed down with zero upward tilt and lower intensity lights such as bulkhead type will be mounted near ground level and generally concealed from view by topography and vegetation.

Mobile lighting towers ("MLT") will be aimed away from nearby residential locations.

Low intensity lighting may be visible from a small number of nearby residences and motorists using public roads, but the majority of the lighting will be concealed by topography and vegetation.

The lighting will comply with the relevant lighting standards set out in the Operative Waitaki District Plan ("WDP") and the Operative Dunedin City Second Generation District Plan ("2GP").

The lighting conditions recommended will ensure that lighting effects are suitably managed.

Lighting effects will be no more than low (i.e. less than minor), provided the recommended conditions are adopted.

1.0 INTRODUCTION

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

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

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

This scope of this report is to:

- Describe existing lighting features
- Describe the proposed modifications to the lighting
- Analyse the potential effects of the lighting
- Review the lighting effects in relation to existing consents, District Plan provisions and proposed conditions of consent

1.1 Site Location and Description

OGNZL owns and operates the Macraes Operation at Macraes, approximately 30 km northwest of Palmerston in the Otago Region. The Macraes Operation is the largest gold mine in New Zealand and, since commissioning in 1990, has produced more than 6 million ounces of gold.

Macraes Flat is situated on an elevated plateau at approximately 500 m above sea level. The plateau is flanked by the Taieri Ridge to the northwest, Shag Valley and Horse Range to the east, and the coastal hills and extinct volcanic cones of Palmerston and Waikouaiti to the southeast. Macraes Road provides access to Macraes Flat and the Macraes Operation, connecting to State Highway 85 to the east and State Highway 87 (SH87, the Middlesmarch–Hyde Road) to the west.

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

- Numerous open pits (both operational and non-operational);
- Two underground mines (Fraser's, now closed, and Golden Point, which is actively mined);
- Waste rock stacks at various stages of operation and rehabilitation;
- A network of haul roads and general mine service tracks;
- A Processing Plant;
- Five tailings storage facilities (three inactive, one active but nearing capacity, and one under construction and currently receiving tailings);
- An extensive network of water management infrastructure, including diversion drains, silt ponds, sumps, pit lakes, and freshwater storage reservoirs;

- Two consented but not yet constructed water storage reservoirs (Camp Creek Dam and Coal Creek Dam); and
- Associated infrastructure supporting ongoing operations, including district roads, powerlines, workshops, offices, and associated water and amenity facilities.

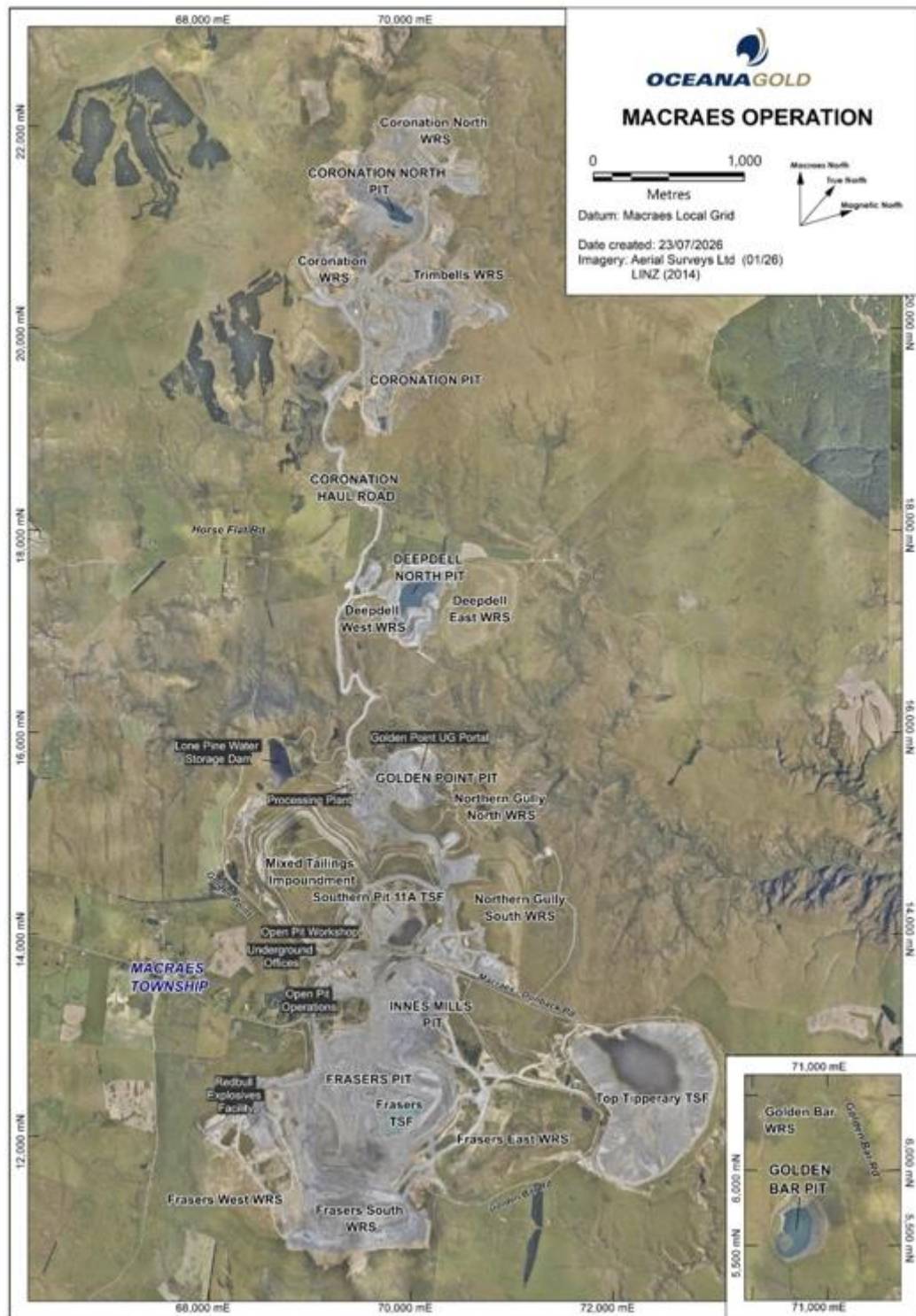


Figure 1: Existing site layout at the Macraes Operation [as of July 2026]

1.2 Project Overview

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

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

An overview of the proposed activities which make up the Project is shown in Figure 2 below.

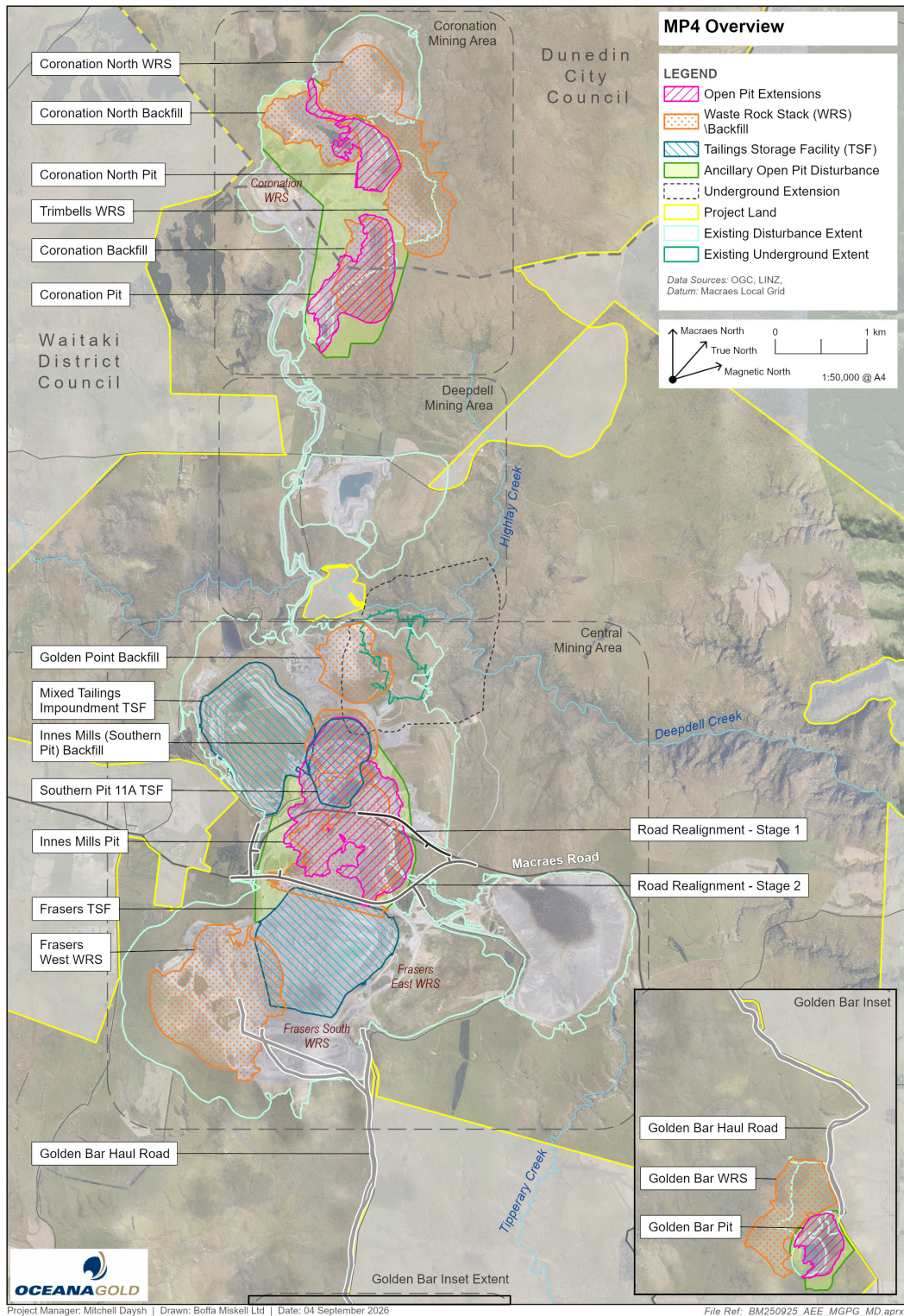


Figure 2: MP4 Overview plan

Currently, the Macraes Operation has lighting at night, which will continue with modifications to provide for the proposed activities.

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).

The only significant change to fixed lighting will accompany the relocation of the open pit workshop facilities from the northside to the southside of Macraes Road. As further discussed in section 5, the lighting will be designed such that effects will be net positive.

The proposed operation times will be the same as existing – i.e. 24 hours/day, 7 days/week.

This report relates to proposed modifications to the Macraes Operation as detailed in the project description section of the Substantive Application Report for MP4¹, insofar as they affect exterior lighting.

¹ Macraes Phase Four Project - Substantive Application for Approvals, Mitchell Daysh

2.0 EXISTING LIGHTING ENVIRONMENT

The existing environment comprising and surrounding the Macraes Operation (shown in Figure 1) is described in detail in the Substantive Application Report.

There is sparse inhabitation in surrounding land that might have views of the Macraes Operation and lighting therein. The nearest populated settlement is Macraes Township to the west of the operation. There are a small number of residences on Horse Flat Road, north of Macraes and on Red Bank Road, south of Macraes.

Sensitive Receivers are located and described in the Boffa Miskell Landscape and Visual Assessment ("LVA").

The majority of the sensitive receivers are screened by topography and/or dense foliage such that they have little or no visibility of the existing or proposed lighting at the Macraes Operation. The most affected residence appears to be 47 Hyde Street (Erindale Farm Ltd), which currently has distant views of fixed lighting at the underground and open pit workshops.

Formed public roads that pass through, and/or are near the Macraes Operation, include:

- Horse Flat Road
- Golden Point Road
- Macraes Road
- Hill Street (within Macraes)
- Hyde Street (within Macraes)
- Golden Bar Road
- Red Bank Road

Further west, Longdale Road may also have some visibility of parts of the Macraes Operation.

All of the roads are understood to experience little, if any, traffic at night. The most active road is Macraes Road. Golden Point Road is sealed, with no residential properties. Golden Bar Road is mostly a single lane unsealed road, with no residential properties.

Locations along Highway 85 to the east and Highway 87 to the west, are screened by topography from views of lighting at the Macraes Operation.

There is no public road lighting within or near the Macraes Operation, with the exception of 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).

2.1 Site Visit

The author undertook a site visit on Tuesday 10 February 2026 of the Macraes Operation and surrounding areas, both day and night, to appreciate existing and potential lighting effects.

The weather was overcast but fine.

Related observations are included in section 2.2 of this report.

2.2 Analysis

Further to the site visit, some observations regarding the environment are provided below.

The Macraes Operation is located on land zoned as described in detail in the Substantive Application Report but generally as follows:

- Coronation North Pit, Coronation North WRS & Trimbells WRS:
 - Operative Dunedin City Second Generation District Plan ("2GP"):
 - High country rural zone, and
 - Taieri Ridge and Mare Burn mapped area
- Other parts of the Macraes Operation:
 - Operative Waitaki District Plan ("WDP"):
 - Mainly: Macraes Mining Project Mineral Zone, and
 - Partially: Rural Scenic Zone

The boundary between Dunedin City and Waitaki District is shown in Figure 2.

Observations relating to the relative location of nearby land with a residential use, are described in Table 1. Locations are shown in figures 3 and 4.

ITEM	CLOSEST RESIDENTIAL USE	OBSERVATIONS
1.1	<i>Residential Location 1</i> (1668 Macraes Road)	The residence will have views of the Frasers West WRS as it increases in height over time, and limited views of other works covered by the application to the east. Since the proposed conditions will ensure that any MLT is aimed away from the residence, the only additional lighting visible may be views of vehicle lights negotiating the uppermost portion of Frasers West WRS.
1.2	<i>Residential Location 2</i> (406 Horse Flat Road)	The closest private residence on Horse Flat Road, outside the Macraes Operation, is located at 406 Horse Flat Road. This appears to be well screened by vegetation but may have some visibility of lighting at the Processing Plant (2.3km or more distant) and potentially lighting on vehicles using the Coronation Haul Road, noting the haul road is largely

		screened by an existing bund (1km or more distant)
1.3	Residential Location 3 (47 Hyde Street, Macraes)	While there are several private residential properties in Macraes Township, the only residence that appears to have any significant views of lighting within Macraes Operation is located at 47 Hyde Street, from which views of the workshops are available (1.5km or more distant). Other residences are screened by the topography and/or dense vegetation.
1.4	Residential Location 4 (497 & 546 Red Bank Road)	There are several buildings at the southern end of Red Bank Road, of which two are understood to be residential in nature. They are some 2.5km south of Frasers South Backfill. They may have some distant views of vehicles using the Haul Road (2.8km or more distant) linking to Golden Bar, but they should have no visibility of operational lighting at Golden Bar due to the topography. They may have distant views of the lighting associated with waste rock stacks (2.5 km or more distant), workshops and adjacent buildings (5.5km or more distant).

Table 1. Closest Residential Use

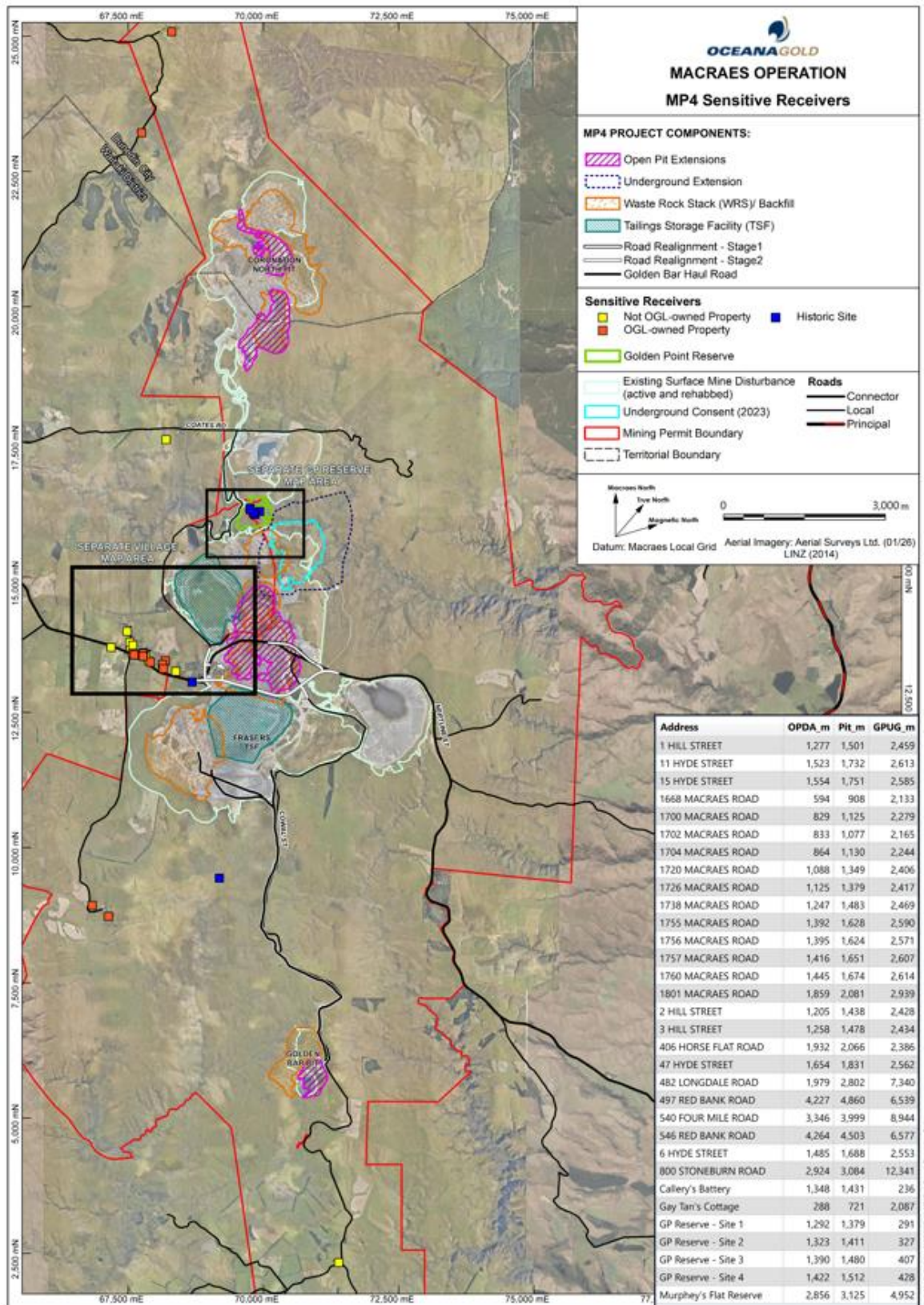


Figure 3. Sensitive Receivers - Overview

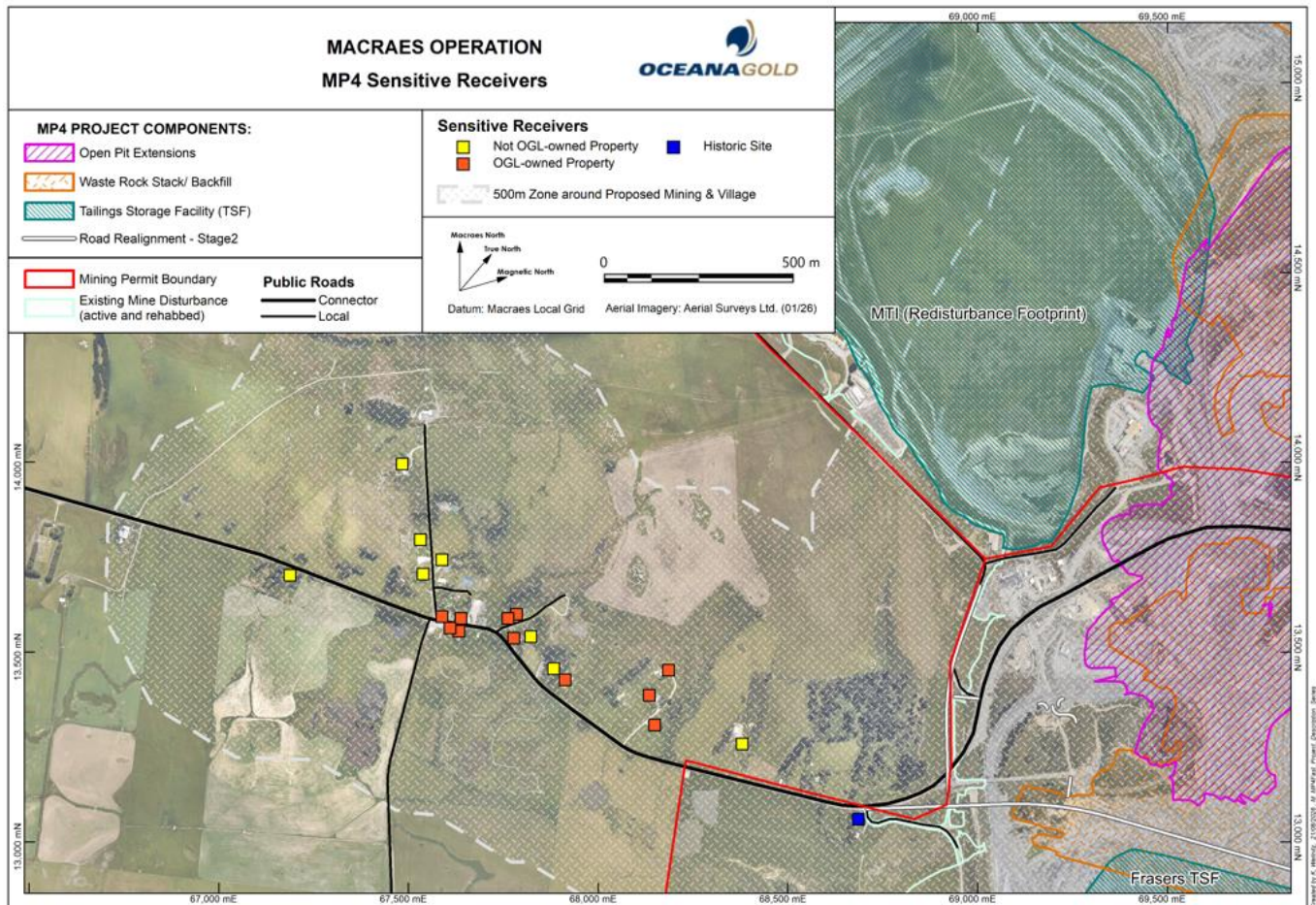


Figure 4. Sensitive Receivers – Macraes Township

There are two buildings owned by OGNZL located within the Macraes Operation, immediately south of the Top Tipperary Tailings Storage Facility. These are not used as permanent residences and as such, are not considered to be sensitive receivers.

While there are additional residential properties within 6km of the Macraes Operation, other than those cited in Table 1, it appears unlikely that the additional properties will have visibility of lighting within the Macraes Operation due to topography and/or vegetation.

The existing ambient light conditions within the Macraes Operation and surrounds are summarised in Table 3, based on the type of environmental zone. The definition of the environmental zones is described in Table 3.1 of AS/NZS 4282:2023, repeated below in Table 2 for reference.

Environmental Zones	Ambient Light Conditions	Descriptions/Examples
A0	Intrinsically Dark	UNESCO Starlight Reserve IDA: Dark Sky Parks, Reserves or Sanctuaries Major optical observatories Other accreditations of dark sky places for example astro-tourism, heritage value, astronomical importance, wildlife/ecosystem protection Lighting for safe access may be required
A1	Dark	Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas)
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas Generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections
A3	Medium district brightness	Suburban areas in towns and cities Generally roadways with streetlighting through suburban, rural or semi-rural areas
A4	High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas Industrial and port areas Transport Interchanges
TV	High district brightness	Vicinity of major sport and event stadiums during TV broadcasts
NOTE: Zones A0 and A1 would normally have a minimum area of 50 ha (0.5 km ²). There may be smaller environmentally sensitive areas.		

Table 2. Environmental zones (per AS/NZS 4282 Table 3.1)

Using the guidelines provided in AS/NZS 4282:2023 (Control of the obtrusive effects of outdoor lighting), the ambient light conditions for MP4, when operational, and at the surrounding receptors, could best be described as shown in Table 3.

ITEM	LOCATION	ENVIRONMENTAL ZONE (per AS/NZS 4282:2023)	AMBIENT LIGHT CONDITIONS
2.1	Macraes Operation Areas		
2.1.1	Buildings (Workshops ,etc)	A4	High district brightness (Industrial lighting)
2.1.2	Active work areas (Pits, Rock Stacks, Haul Roads)	A4	High district brightness (Industrial lighting)
2.2	Surrounds - Adjacent		
2.2.1	Residential Location 1 (1668 Macraes Road)	A2	Low district brightness (Sparsely inhabited, semi-rural, no road lighting)
2.3	Surrounds - Distant Views (≥ 1 km)		
2.3.1	Residential Location 2 (406 Horse Flat Road)	A2	Low district brightness (Sparsely inhabited, rural, no road lighting)
2.3.2	Residential Location 3 (47 Hyde Street, Macraes)	A3	Medium district brightness (Village, roadways with streetlighting)
2.3.3	Residential Area 4 (Red Bank Road)	A2	Low district brightness (Sparsely inhabited, rural, no road lighting)

Table 3. Ambient light conditions

3.0 PROPOSED LIGHTING

3.1 General

There is presently lighting, used in active parts of the Macraes Operation, which will generally remain under the Project. Lighting of a similar nature is proposed in new areas associated with the Project. The existing and proposed consents are discussed in section 4.

Mining operations will occur 24/7 as is currently the case. New operational fixed lighting on buildings and static lighting columns will be on all night to ensure safe use, orientation, early recognition of obstructions, hazards and people and for safe movement of staff.

Sensor lighting is not viewed as a suitable approach for these reasons, particularly since it may not provide sufficiently early recognition of approaching people or vehicles from all directions and could potentially affect safety. The fixed lighting duration will change throughout the year as the length of night varies – approximately 15 hours in mid-winter to 9 hours in mid-summer.

Vehicles and mobile plant with associated navigation, work and safety lighting will operate throughout the night, moving through the Macraes Operation as required to suit the nature of their activities. Mobile lighting towers will operate throughout the night – typically at excavation locations and at significant bends/intersections of roads within the Macraes Operation.

Images of existing features, lighting and effects have been included in Appendix B and referenced in this section, since the lighting proposed for MP4 will be of a similar nature.

Figure B1 in Appendix B – shows representative views of the Macraes Operation from the surrounds, and views of the surrounds from the Macraes Operation.

Relevant examples of typical lighting present at the Macraes Operation are shown in Figures B2-B4 in Appendix B as indicative of the expected lighting that will be used for the Project as described later in this section.

Fixed Lighting

Permanent stationary lighting is referred to as “**Fixed Lighting**”.

Examples of fixed lighting are shown in Figure B2 in Appendix B.

This lighting is mounted on columns, buildings and structures and may be present for the operational life of the mine.

Fixed lighting associated with the Project will include the relocated Open Pit Workshop facilities and water treatment plant.

The lighting for the new Open Pit Workshop will be similar to the existing Open Pit Workshop i.e. refer Figures B5.2-5.5 in Appendix B), albeit with reduced effects due to the location (i.e. concealed from view from Macraes Township), zero upward tilt and 2700K colour temperature. Hence, effects will be net positive.

The proposed location of the new Open Pit Workshop is shown on the lighting concept plans in Appendix C. These plans also demonstrate expected lighting performance and effects.

The water treatment plant will be located immediately north of the existing Processing Plant as indicated by the white lines in Figure 5.



Figure 5. Water Treatment Plant location

The lighting for the water treatment plant will be minimal and similar to that seen on the structures shown in Figure 6.



*Figure 6. Water Treatment Plant – Similar Installation
(Courtesy of Process Flow)*

The structure is compact, lighting is directed toward the plant and the location will not be visible from residential locations.

Mobile Lighting Towers

Mobile lighting towers ("MLT") will be used as required at night at work faces, principal mine road bends and intersections for safety. They will also be used for parking associated with cribs.

Examples of the mobile lighting equipment are shown in Figure B3 in Appendix B.

When erected, each lighting tower can typically be up to 11.5m high.

Mobile Plant and Vehicles

Mobile plant and vehicles will be equipped with headlights, safety lights and work lights.

Examples of the machines are shown in Figure B4 in Appendix B.

Mobile lighting towers and lighting attached to mobile plant and vehicles, are collectively referred to as "**Mobile Lighting**".

Night-time Lighting

Examples of the nighttime presentation of the lighting detailed above are shown in Figure B5 in Appendix B.

The Macraes Operation covers a significant area, the nature of work in different parts of the mine varies in terms of lighting and sensitive receivers affected by one part of the Macraes Operation, may have no visibility of activities in other parts of the Macraes Operation. Hence, effects have been separately considered from three areas referred to as "Coronation Mining Area", "Central Mining Area" and "Golden Bar Mining Area". These are defined and addressed in the following sections.

3.2 Coronation Mining Area

MP4 activities within the Coronation Mining Area with potential lighting effects include:

- Extensions to Coronation and Coronation North Pits, including areas of pit backfill
- Increased storage capacity at Coronation North, Trimbells and Coronation Waste Rock Stacks ("WRS")
- Continued use of the existing Coronation Haul Road.

In addition, the following elements are within the Coronation Mining Area, but are existing and therefore excluded from this assessment:

- Igloo workshop

No new fixed lighting is proposed.

Mobile lighting may include:

- Pit, backfill & WRS: Mining operations & Crib (plant, vehicles and mobile lighting towers);
 - Similar to figures: Daytime – B2.4-2.7 & B3 in Appendix B. Night-time – B5.8-5.9 in Appendix B.

The only additional lighting with respect to MP4, potentially visible to sensitive receivers, may be mobile lighting used for increased storage capacity for WRS.

3.3 Central Mining Area

MP4 activities within the Central Mining Area with potential lighting effects include:

- Innes Mills Open Pit – extension and backfilling
- Waste Rock Stacks – Increased storage capacity – Innes Mills and Frasers
- Frasers TSF
- Hydraulic mining of tailings from SP10 and SP11 TSFs and the Mixed Tailings Impoundment (MTI)
- Relocated Open Pit Workshop facilities
- Continued use of the existing haul road network.

In addition, the following elements are within the Central Mining Area, but are existing and therefore excluded from this assessment:

- Processing Plant
- Existing pump Stations
- Concrete Batching Plant
- Maintenance Facilities
- Offices – Management, Open Pit & Underground

New fixed lighting may include:

- Relocated Open Pit Workshop facilities (Refer section 3.3.1 and figures B5.2-5.5 in Appendix B)

Mobile lighting may include:

- Pit, backfill & WRS: Mining operations & Crib (plant, vehicles and mobile lighting towers);
 - Similar to figures: Daytime – B4.5-4.8 in Appendix B & B3.5 in Appendix B. Night-time – B5.8-5.9 in Appendix B.
- MP4 includes the hydraulic mining and pumping of tailings from SP10, SP11 and MTI. The hydraulic mining will operate at night and need lights at nighttime and foggy conditions. There will be fixed lighting at the pump stations that supply high pressure water for this mining; the pump stations for pumping the tailings to Frasers TSF; and on the control room needed for controlling the high-pressure water cannons. For the pump stations, this lighting is to illuminate the immediate area to facilitate inspections or any maintenance during darkness. For the control room, the lighting is to provide a well-lit passage for safe access.

- Mobile lighting towers will be needed in each of the three TSFs. These are needed for lighting the water cannon areas and for the relocation of the water supply pipelines as mining progresses across each TSF. However, these lights will be effectively shielded/obscured below each TSF embankment wall.

The only additional lighting with respect to MP4, potentially visible to sensitive receivers, may be mobile lighting used for dumping waste rock at the waste rock stacks.

The lighting for the relocated Open Pit Workshop will be visible to motorists travelling on Macraes Road.

3.3.1 Relocated Open Pit Workshop

The current workshop (including the yard, washdown and tyre maintenance facility) will be removed (currently north of Macraes Road) and will be reconstructed nearby, still within the Central Area, but south of the existing Macraes Road alignment.

Macraes Road will be realigned to be immediately south of the new Open Pit Workshop location.

A concept lighting design is shown in Appendix C on Layouts L01 & L02 as described below. The lighting will be similar to existing (refer Figures B5.2-5.5 in Appendix B). However, the lighting will be less obtrusive than that installed at the existing Open Pit Workshop, by virtue of improvements including:

- The new location will avoid direct visibility from Macraes Township
- No upward tilt for floodlights
- 2700K colour temperature

Layout L01 in Appendix C shows a potential lighting solution that will satisfy the operational and safety needs of the facility and incorporates the above features.

Layout L02 in Appendix C provides an analysis of the initial (i.e. worst case) obtrusive lighting effects for the design shown in Layout L01.

In summary:

- There will be no measurable light spill or luminous intensity (i.e. glare) at any residential location
- Glare effects to motorists, calculated as Threshold Increment (TI) will be nil at any public road

The design of the workshop facilities and associated lighting is subject to future design development, but the concept lighting design, undertaken in accordance with the proposed conditions of consent, establishes that any lighting effects can be adequately mitigated.

3.3.2 New public road intersections

The realignment of Macraes Road will include new intersections. Subject to agreement with the Waitaki District Council, any new intersection may include a flag light, consistent with Waitaki District Council requirements. Any such lighting will be installed with minimal tilt and in accordance with accepted road safety practice. The location of the intersections is such that the lighting is not expected to be visible to any nearby residential location.

3.4 Golden Bar Mining Area

The Golden Bar Mining Area includes:

- Golden Bar – Pit
- Golden Bar – WRS
- Reinstatement and further use of the Golden Bar Haul Road – Linking to the other areas of the Macraes Operation

No fixed lighting is envisaged.

Mobile lighting may include:

- Pit & WRS: Mining operations & Crib (plant, vehicles and mobile lighting towers);
 - Similar to figures: Daytime – B4.5-4.8 & B3.5 in Appendix B. Night-time – B5.8-5.9 in Appendix B.

The only lighting potentially visible to sensitive receivers, and only those on Red Bank Road, would be from vehicles on part of the Golden Bar Haul Road.

3.5 Construction lighting

While the construction of buildings and permanent structures (i.e. the relocated Open Pit Workshop) is envisaged to be a daytime activity, there could potentially be night-time work.

Where that is required, construction lighting may include:

- Crane boom lighting
- Construction vehicle navigation, safety and working lighting
- Mobile lighting towers to highlight the work area
- Temporary festoon or similar lighting within buildings and/or structures to support localised construction and fit-out work

The visibility of any such construction lighting would be temporary and consistent with that described for the fixed lighting, as discussed separately in the report.

3.6 De-construction lighting

At the end of the operational life of the Macraes Operation, infrastructure will be dismantled and removed. As with construction, this is expected to be a daytime activity, but there could potentially be night-time work during the de-construction period.

Lighting for water treatment facilities may remain long term. Lighting will be minimal and not visible from residential locations – Figures 5 and 6 refer. Effects will be negligible.

The type of lighting, locations and expected visibility will be similar to that described for construction.

4.0 STATUTORY REQUIREMENTS

The Macraes Operation presently operates under a number of consents as detailed in section 4.1.

Compliance of the effects of lighting proposed under MP4 has been assessed against the District Plan relevant to each location:

- Section 4.2: Coronation North Pit, Coronation North WRS & Trimbells WRS: Operative Dunedin City Second Generation District Plan ("2GP")
- Section 4.3: All other parts of the Macraes Operation: Operative Waitaki District Plan ("WDP")

4.1 Existing Resource Consents

I have been advised by OGNZL that the current Resource Consent Conditions applicable to lighting at the Macraes Operation are those listed in the OGNZL memo at Appendix A.

All the conditions, except one discussed below, have the same wording as the following condition:

"All flood lighting luminaires that could potentially cause a glare nuisance or a traffic hazard shall be fitted with shields and, as far as is practicable, orientated so that the principal output is directed away from residences and traffic"

The existing lighting appears to satisfy the conditions.

Condition 12.2 of WDC ref. 201.2019.1454² related to Deepdell North Stage 3 has not been considered as effects on Ecology are beyond the scope of this report.

4.2 2GP

The 2GP is relevant to the portion of the Macraes Operation within the Dunedin City boundary, being the Coronation Mining Area north of Matheson Road. Refer Figure 2.

The portion of land is zoned High Country Rural. Lighting effects are addressed in relation to 2GP Chapter 16 Rural Zone – 16.5.5 Light Spill, as set out in Table 4.

² Condition 12.2 of WDC ref. 201.2019.1454 (re Deepdell North Stage 3): All lighting luminaries located within 50m of any significant indigenous shrubland communities, including but not limited to shrubland that is greater than 10 square metres in area or shrubland located within a gully, shall be fitted with UV and blue light filters. The condition does not apply to shrubland that will be removed during mining-related activities.

PROVISION	COMPLIANCE
D. Management Zones 16. Rural Zones Rules 16.5 Land Use Performance Standards 16.5.5 Light spill	
4.2.5 <u>Light Spill</u> <i>Light spill measured 1.5m above ground level at the boundary of a site must not exceed 1 Lux between 10:00pm and 7:00am.</i> <i>Lights must be:</i> <i>cut-off or fully shielded; and</i> <i>directed away from roads and any adjacent property.</i> <i>Light spill measured at the boundary of the residential zone or any site used for residential purposes between 7:00am and 10:00pm must not exceed 3 Lux, except this standard does not apply to light spill from the headlights of motor vehicles.</i> <i>Activities that contravene rules 16.5.5.1 and 16.5.5.2 are discretionary activities.</i> <i>Activities that contravene any light spill limit in Rule 16.5.5.3 by 25% or less are discretionary activities.</i> <i>Activities that contravene any light spill limit in Rule 16.5.5.3 by greater than 25% are non-complying activities.</i>	- No new fixed lighting is proposed in the Coronation Mining Area. MLTs will be aimed down onto a local work space and be aimed away from boundaries adjacent residential use and public roads. Measurable light spill at the site boundaries will be less than 1 lux and typically Nil. - When a MLT is used, it is to be practically oriented and tilted to light the work area. When the MLT is higher than the work area it will be tilted downwards to suit the work. When it is at or lower than the work face, then the work face will shield the light from view. This is addressed in the proposed conditions. Hence, the intent of this provision is satisfied - As for item 1 - Not applicable - Not applicable - Not applicable <u>Summary: Complies</u>

Table 4. 2GP Compliance

4.3 WDP

The WDP is relevant to the portion of the Macraes Operation within Waitaki District, effectively being all areas south of Matheson Road.

Lighting effects are addressed in the provisions as set out in Table 5.

PROVISION	COMPLIANCE
2 Rural Zone – Rural (S) Scenic	
<i>No lighting provisions stated</i>	Not applicable
6 Macraes Mining Project Mineral Zone ("MMPMZ") 6.5.4 Lighting	
<i>Activities shall be conducted such that 5 lux spill (horizontal and vertical) is not exceeded at the Macraes Mining Zone Boundary.</i> <i>All exterior lighting shall be, where visible, directed away from public roads and the Macraes Mining Zone Boundary.</i>	- As noted elsewhere in the report, proposed lighting for MP4 will generate less than 1 lux at the MMPNZ boundary - Any proposed lighting potentially visible beyond the Macraes Operation, as proposed for MP4, will be directed down towards the areas to be lit as required by the proposed conditions. Hence, exterior lighting will not be tilted up to be obtrusive to motorists or residents. Therefore, it will be effectively directed away from public roads and the MMPNZ boundary. Summary: Complies

Table 5. WDP Compliance

4.4 Compliance

In summary, subject to adopting the conditions proposed in this report, the lighting will be compliant with the relevant lighting standards in both the 2GP and the WDP.

4.5 AS/NZS 4282:2023

Neither the 2GP nor the WDP require compliance with the recommended obtrusive light limits in AS/NZS 4282:2023 (Control of the obtrusive effects of outdoor lighting) ("AS/NZS 4282").

However, for completeness, compliance has also been assessed in relation to AS/NZS 4282:

1. Table 3.1 - Environment Zone: As noted earlier in Table 2, the lighting categories applicable to the areas within the Macraes Operation where lighting is proposed range from A2 to A4. A2 ("low district brightness") is the most stringent of these and for simplicity has conservatively been used for this assessment.
2. Table 3.2 – Light technical parameters:
 - a. Light spill: Not relevant as addressed above under 2GP and WDP
 - b. Threshold Increment (TI) (i.e. glare to motorists): Recommended $\leq 20\%$. This can only be calculated as it is not measurable. It is also not possible to predict every possible scenario in terms of MLT placement in order to calculate. However, from past experience and calculations undertaken for similar lighting elsewhere, TI will be significantly less than 20%. As evidenced by the Outdoor Workshop Concept Lighting calculations presented in Appendix C, TI from the fixed lighting will be less than 20%.
 - c. Upward Light Ratio: Recommended $\leq 1\%$. This limit applies in aggregate to all fixed lighting in an installation. In accordance, new fixed lighting will be tilted down with no upward light. Hence, the lighting will comply with this requirement.
3. Table 3.3 – Maximum luminous intensity: Recommended $\leq 1,000$ candelas (cd) during curfew hours (i.e. the most stringent). This can only be calculated as it is not practical to site measure. The most prevalent form of lighting will be MLT which will be moved regularly as required throughout the Macraes Operation and then aimed as required. It is therefore not possible to calculate every potential configuration that may occur. However, the potential dispositions have been considered and it is expected that the lighting will comply with the 1,000cd limit, provided the conditions proposed in this report are adopted.
4. Table 3.4 – Maximum luminance of surfaces: Not applicable. This table relates to lighting of signs and highlighting building facades, none of which is relevant in this instance.

Hence, while compliance with the recommended obtrusive light limits in AS/NZS 4282 is not required by either the 2GP or the WDP, the recommended limits will be satisfied.

5.0 ENVIRONMENTAL EFFECTS

The potential effects of the lighting required as part of the Project with respect to potential sensitive receivers ("Observers") have been considered.

Observers could include:

- Occupants of residential dwellings with direct visibility of the Macraes Operation ("Residents")
- Motorists on public roads ("Motorists")

Observers could also potentially include nocturnal biota. However, any such effects, if relevant, will be separately addressed in the Ecological Impact Assessment - Terrestrial, Wetlands, and Fauna (Bioresarches 2026).

This section addresses the potential effects of lighting on Observers, including:

- relevant site observations;
- categories of potential effects; and
- an assessment of the effects.

The Quality Planning website proposes a scale³ as below for the determination of adverse effects. An abbreviated expression in square brackets has been included to simplify the reference to each category for brevity;

- **Nil Effects [Nil]**
No effects at all.
- **Less than Minor Adverse Effects [Less than minor]**
Adverse effects that are discernible day-to-day effects, but too small to adversely affect other persons.
- **Minor Adverse Effects [Minor]**
Adverse effects that are noticeable but will not cause any significant adverse impacts.
- **More than Minor Adverse Effects [More than minor]**
Adverse effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied.
- **Significant Adverse Effects that could be remedied or mitigated [Significant]**
An effect that is noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied.
- **Unacceptable Adverse Effects [Unacceptable]**
Extensive adverse effects that cannot be avoided, remedied or mitigated.

Working within the context of the above definitions, these planning terms have been correlated with views of technical effects, to provide a technical effect rating as shown in Table 9.

³ Quality Planning – Determining the extent of adverse effects
(<https://www.qualityplanning.org.nz/node/837>)

EFFECT RATING	PLANNING DETERMINATION
Very high	Significant
High	Significant
Moderate-high	More than minor
Moderate	More than minor
Low-moderate	Minor
Low	Less than minor
Negligible-very low	Less than minor

Table 9. Technical vs planning effects terminology

5.1 Lighting Effects

Clarifying the effects mentioned in this report, indicative arrangements and nominal associated lighting effects are summarised below.

- General principles:**

The nominal illuminance (spill light) at the window of a dwelling from a point source can be calculated by the formula:

$$E = I/d^2 \text{ (E=Illuminance, I=Luminous Intensity, d=distance)}$$

While modern LED lights often contain multiple LED chips, with the viewing distances from residences and public roads noted in Table 1, each light source will effectively appear as a single point source.

Luminous Intensity is expressed as candelas ("cd").

For context:

- An LED roadway light can typically be in the order of 2,000cd for a 25 watt residential road light or 9,000cd for a 100 watt highway light.
- The luminous intensity of a vehicle headlight on low beam is approximately 30,000cd.
- Starlight on a clear evening produces approximately 0.0001 lux (lux is the unit of measurement for the amount of light on a surface per unit area).

Typical moonlight with a full moon on a clear night is approximately 0.3-0.5 lux, but can range up to 1 lux.

- **Observations**

It is understood that existing fixed lighting presently installed at the Macraes Operation, and mobile lighting within consented areas, is covered by existing consents or operates as a permitted activity.

New fixed lighting associated with MP4 could include the relocated Open Pit Workshop and any pump stations installed to enable MP4. The proposed lighting for these elements will comply with the relevant lighting standards in the District Plans.

The lighting effects from the relocated Open Pit Workshop will be no worse than existing and in fact will be net positive since:

- Lighting at those facilities will no longer be visible to sensitive receivers within the Macraes Township, nor elsewhere
- The proposed conditions of consent will ensure that lighting effects to motorists are suitably managed

The proposed fixed and mobile lighting has been considered and the following observations relate to lighting that is potentially not covered by existing consents:

- Based on Illuminance readings taken at the existing Open Pit Workshop light spill should be no greater than 1 lux at 50m from any of the installed lights.
- The lighting at the relocated Open Pit Workshop will be similar to the existing facility. Hence, spill light at any sensitive receiver will be less than 1 lux as there are no residences within 50m of the proposed workshop.
- There are no sensitive receivers that will have a view of the relocated Open Pit Workshop. Hence, glare effects to residents will be 0cd.
- Glare effects to motorists can be calculated for fixed lighting, but are not practical to measure in the field. The existing lighting was viewed from a motorist's perspective and no disabling effects were observed. The existing glare effects to motorists (referred to as Threshold Increment ["TI"]) are considered to be equal to, or at least very near 0%, for lighting other than public road lighting.
- As evidenced by the calculations for the relocated Open Pit Workshop in Appendix C, glare effects (TI) to motorists on public roads will also be at or near 0%.
- Glare effects experienced at 47 Hyde Street, currently being the most affected sensitive receiver, will reduce with the removal of the Open Pit Workshop from their view.
- Mobile lighting within the Pits is not presently visible to sensitive receivers and is not envisaged to be visible for the proposed Pit expansions.
- While it is not practical to assess with 100% certainty, based on site observations and an understanding of the works proposed by MP4, glare effects from vehicle lighting should be negligible (i.e. less than minor).
- Vehicle lighting, particularly those associated with dump trucks and water trucks, may become visible to sensitive receivers at Macraes and/or Red Bank Road, as

vehicles traverse to higher levels with the proposed increases to WRS heights. However, with the separation distances mentioned in Table 1, lighting effects to sensitive receivers will be negligible (i.e. less than minor).

- MLTs are presently used in the Pits and at selected Haul Road intersections, none of which are currently visible from sensitive receivers. MLTs may potentially be used at higher elevations than they are at present with the proposed increases to WRS heights. However, with the separation distances mentioned in Table 1, together with the recommended lighting conditions, lighting effects at sensitive receivers will be negligible (i.e. less than minor).
- The lighting effects from the relocated Open Pit Workshop will be no worse than existing and in fact will be net positive since:
 - Lighting at those facilities will no longer be visible to sensitive receivers within the Macraes township, nor elsewhere
 - The proposed conditions of consent will ensure that lighting effects to motorists are suitably managed

- **Night sky views**

With respect to ability to clearly see the sky at night, the proposed changes under MP4 will make negligible difference.

Hence, any change in such effects would be negligible-very low (i.e. less than minor).

- **Analysis of lighting effects:**

Lighting effects will satisfy the limits in the District Plans and the recommendations in AS/NZS 4282 (see Section 4).

The majority of lighting associated within mining activities proposed under MP4 will be concealed from view from sensitive receivers. There is a potential for some additional visibility of vehicle and MLT lighting in areas subject to MP4 activities, but separation distances in conjunction with proposed conditions will ensure that any effects are no more than low (i.e. less than minor).

5.2 Residents

While not all types of obtrusive light effects will necessarily affect Residents, the following potential effects have been considered;

1. **Sky glow:** Light scattered in the atmosphere reducing visibility of the night sky;
2. **Light spill:** Direct light trespass, as measured in lux, typically at the window of a dwelling;
3. **Glare:** Brightness of a light source when viewed in contrast to the immediate surrounds;
4. **Amenity:** Views of the night sky; and
5. **Health:** Sleep disturbance & seizures.

Light spill is managed by the requirements of existing Resource Consent conditions, as well as the 2GP and WDP. Glare and sky glow are not specifically addressed under existing Resource Consent conditions, nor the 2GP nor WDP, but limits are recommended by a standard (AS/NZS 4282:2023). Amenity and health effects are good practice elements assessed by expert opinion.

Sky Glow

Sky glow is typically noticed as the glow visible above an artificial lighting installation at night when viewed from a distance, as a result of direct and reflected upward light from artificial lighting, striking particles in the atmosphere and scattering the light.

The quantity and nature of lighting existing and proposed at the Macraes Operation will be such that sky glow from the lighting will be negligible. Hence, sky glow effects on Residents will be negligible-very low (i.e. less than minor).

Light Spill

The nominal illuminance (spill light) at the window of a dwelling from a point source can be calculated by the formula;

$$E = I/d^2 \text{ (E=Illuminance, I=Luminous Intensity, d=distance)}$$

In other words, spill light reduces geometrically with distance from the light source.

Based on the separation distances noted in Table 1, potential spill light at residences that have a view of the lighting, will be less than 1 lux.

Hence, light spill effects to Residents will be negligible-very low (i.e. less than minor).

Glare

Glare (luminous intensity) will vary with viewing angle but not distance.

As viewed during the site visit, effects from current mining activities were negligible to low (i.e. less than minor). Effects from MP4 would be similar for residents.

While it is true that the numerical value of luminous intensity does not vary with distance, the actual effect of the apparent brightness does lessen as distance increases, since the light source occupies a progressively smaller part of the view.

A comparison could be made with our Sun. It is a star, with a similar size and order of brightness as many others we see in the night sky. However, our Sun is much closer than the other stars and thereby too bright to look at directly. Whereas other more distant stars are comfortable to view.

Mobile lighting towers will typically be aimed toward the working area, rather than towards distant residences, so effects will be lessened. Lights attached to mobile plant and vehicles tend to be transient in nature as they move with the plant/vehicle.

Glare effects to Residents will be low (i.e. less than minor).

Amenity

When considering enjoyment of views of the night sky, the existing lighting environment is typically the limiting factor.

Any change in amenity effects to Residents will be negligible-very low (i.e. less than minor).

Health

Excess light at night can negatively affect sleep. However, there will be minimal lighting visible from residential locations as described above, no permanent persistent flashing lights and the lighting complies with the 2GP and WDC light spill provisions.

Potential effects on health to Residents will be negligible to very low (i.e. less than minor).

Summary of effects of Residents

Lighting effects to residential locations will be no more than low (i.e. less than minor).

5.3 Motorists

While not all types of obtrusive light effects will necessarily affect Motorists, the following potential effects have been considered:

1. **Glare:** The relative brightness of a light source in the driver's field of view and the potential for this to affect vision; and
2. **Distraction:** The potential for a flashing light to distract the driver's attention.

Glare

An analysis of glare effects to Motorists is like that for Residents. The effect will lessen with distance due to the reduction in the size of the light source in the Motorist's view.

Provided the conditions proposed are adopted, lighting effects on public road users will be satisfactorily mitigated.

Glare to Motorists is evaluated by the term Threshold Increment ("TI"). AS/NZS 4282:2023 recommends a maximum TI of 20%. TI is primarily related to the visibility of the main beam of each luminaire. For fixed lighting other than minor security/access lighting, the luminaires will be aimed down and not directly visible from the road. Hence, the TI will be near or at 0%.

Mobile lighting will typically be aimed at the workplace rather than roads. Nonetheless, the separation distance and mitigation afforded by the conditions proposed, are such that TI will be well below the recommended 20% limit.

Glare effects to Motorists will be no more than low (i.e. less than minor).

Distraction

Flashing lights can be distracting to a Motorist. This would be particularly so in an otherwise dark environment.

Mobile plant and equipment that will be used at the Macraes Operation will use flashing safety warning lights, but they will be mostly concealed from view from public roads by topography and vegetation. Should any become visible, the separation distances, will ensure that any effects are negligible.

Hence, distraction effects to Motorists will be negligible-very low (i.e. less than minor).

Summary of effects on Motorists

Effects to Motorists will be no more than low.

5.4 Overall Summary of effects

The expected effects ratings for the various parameters mentioned above are summarised in Table 10.

RECEIVER	PARAMETER	TECHNICAL EFFECTS	PLANNING ASSESSMENT
Residents	Skyglow	Negligible-very low	Less than minor
	Light spill	Negligible-very low	Less than minor
	Glare	Low	Less than minor
	Amenity	Negligible-very low	Less than minor
	Health	Negligible-very low	Less than minor
Motorists	Glare	Low	Less than minor
	Distraction	Negligible-very low	Less than minor

Table 10. Lighting Effects Ratings

Hence, effects from the lighting associated with MP4 activities will be no more than low (i.e. less than minor).

6.0 MITIGATION MEASURES

6.1 Recommended conditions

To satisfactorily manage lighting effects from the Macraes Operation, the following conditions are recommended to be included if consent is granted;

LIGHTING

1. Mobile lighting towers (MLT): A MLT shall:
 - a. Be no taller than 12m,
 - b. Unless the MLT lighting will not be visible due to topography, not be aimed directly towards any residence or public road nearby the Macraes Operation as follows:
 - Residences at Macraes Township, Horse Flat Road and Red Bank Road
 - Macraes Road, between Red Bank Road & Shag Valley Back Road
2. Fixed Lighting: Where new fixed lighting (i.e. lighting mounted on buildings, static structures, lighting columns or the like) is visible from any residential property or public road, it shall:
 - a. Be the minimum output required for safe access and operation;
 - b. Have a nominal colour temperature no greater than 2700K; and
 - c. Be directed down, with no upward tilt and selected to ensure no more than 1% direct upward light is emitted, or
 - d. Be selected to ensure that the maximum luminous intensity from any luminaire, in any direction, does not exceed 1,000 candelas.
3. Vehicle lighting:
 - a. When using headlights, vehicles operating within the Macraes Operation must use dipped headlights whenever it is safe to do so.

7.0 CONCLUSION

The Macraes Operation, including MP4 areas in particular, are generally remote from inhabited areas. In addition, the surrounding topography minimises potential views of lighting. Much of the operational lighting also occurs within open pit areas that are below the viewshafts from the few surrounding residential locations.

Similarly, there are few Motorists using the public roads, especially at night, and any lighting that could potentially affect a Motorists will be suitably managed.

Overall, provided the conditions proposed are implemented, lighting effects will be low (i.e. less than minor).

APPENDIX A: EXISTING LIGHTING CONSENT REQUIREMENTS

MEMORANDUM

To: John McKenney – External lighting effects consultant (LDP), Ethan Glover, External planner (Mitchell Daysh)

From: Matt Curran, Oceana Gold Consenting Advisor

Item: Summary of consent requirements for the management of lighting effects

Date: 10 April 2026

Included below in Table 1 are conditions attached to land use consents that apply at the OceanaGold Macraes Operation that manage of lighting effects.

Table 1: Resource consent conditions at Macraes that manage lighting effects

Consent	Lighting conditions
CCP2 WDC Reference: 201.2023.2302/3	10.1 All flood lighting luminaires that could potentially cause a glare nuisance or a traffic hazard shall be fitted with shields and, as far as is practicable, orientated so that the principal output is directed away from residences and traffic.
Coronation North WDC Reference: 201.2019.1241/2 DCC Reference: LUC- 2019-42A	10.1 All flood lighting luminaires that could potentially cause a glare nuisance or a traffic hazard shall be fitted with shields and, as far as is practicable, orientated so that the principal output is directed away from residences and traffic.
MP3 201.2011.35	11.1 All flood lighting luminaires that could potentially cause a glare nuisance or a traffic hazard shall be fitted with shields and, as far as is practicable, orientated so that the principal output is directed away from residences and traffic.
Coronation WDC Reference: 201.2013.380 DCC Reference: LUC- 2013-225	10.1 All flood lighting luminaires that could potentially cause a glare nuisance or a traffic hazard shall be fitted with shields and, as far as is practicable, orientated so that the principal output is directed away from residences and traffic.
Deepdell North Stage 3 WDC Reference: 201.2019.1454	12.1 All flood lighting luminaires utilised at site between sunset and sunrise that could potentially cause a glare nuisance, or a traffic hazard shall be, as far as is practicable, orientated so that the principal output is directed away from residences and traffic. 12.2 All lighting luminaries located within 50m of any significant indigenous shrubland communities, including but not limited to shrubland that is greater than 10 square metres in area or shrubland located within a gully, shall be fitted with UV and blue light filters. The condition does not apply to shrubland that will be removed during mining-related activities.

Excluded from the above table are consent requirements that manage potential effects on ecological values e.g. invertebrates. It is noted that Consents Continuity Project Stage 2 (CCP2) consents require that light traps are set during vegetation clearance and captured invertebrates are relocated to a protected covenant.

Matthew Curran

Consenting advisor

APPENDIX B: REFERENCE IMAGES

Figure B1 shows representative views of and from the Macraes Operation.



B1.1: View to east from road at 406 Horse Flat Road
(Golden Point Backfill on left. Workshops on right)



B1.2: View to west from Golden Bar Road
(Golden Bar Pit will be in foreground)



B1.3: View to south from Coronation Haul Road

(Column & structure mounted lights)



B1.4: Typical crib (Coronation North)

(MLT used for exterior lighting [not in image])



B1.5: Views looking north across Coronation North

(Backfill on left. WRS on right)



B1.6: View looking east across Innes Mills Pit to Frasers East WRS



B1.7: Innes Mills Pit- Typical Haul Road traffic

Figure B1. Representative views

Figure B2 shows examples of existing fixed lighting at the Macraes Operation.



B2.1: Pump Station
(Column & structure mounted lights)



B2.2: Main Office
(Building mounted security lights)



B2.3: Open Pit Office and Parking
(Building mounted security lights. Column mounted parking lights)



B2.4: Processing Plant
(Mainly structure mounted lights)



B2.5: Underground Maintenance Workshop
(Mainly building mounted lights)



B2.6: Existing Open Pit Maintenance Workshop
(Mainly building mounted lights)



B2.7: Existing Tyre Maintenance Yard
(Column mounted lights)



B2.8: Coronation Maintenance Igloo Workshop
(Mainly building mounted lights)



B2.9: Concrete Batching Plant
(Structure mounted lights)

Figure B2. Fixed Lighting Examples

Figure B3 shows examples of existing Mobile Light Towers (MLT) at the Macraes Operation.

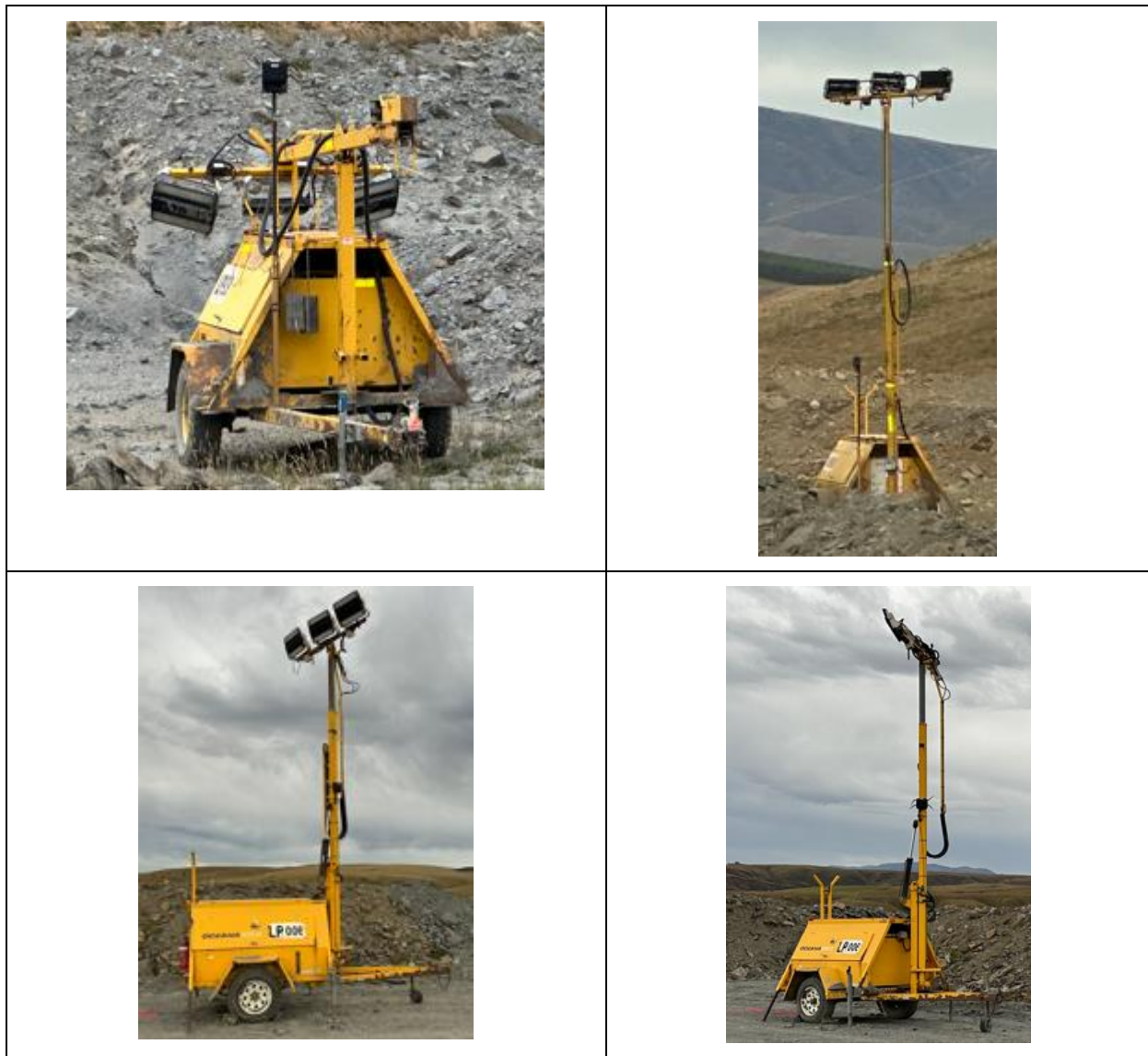


Figure B3: Mobile Lighting Tower Examples

Figure B4 shows examples of existing mobile plant and vehicles and associated lighting.



B4.1: Light Vehicles



B4.2: Excavator



B4.3: Cable laying tractor



B4.5: Tip truck & Excavator



B4.6: Drilling Rig



B4.7: Water truck



B4.8: Grader



B4.9: Service Vehicle

Figure B4. Mobile Plant and Vehicle Examples

Figure B5 shows examples of existing lighting.

	
B5.1: Open pit office and facilities	
	
B5.2: Existing Open Pit – Workshop	
	
B5.3: Open Pit – Yard	B5.4: Open Pit – Washdown



B5.5: Open Pit – Tyre Maintenance



B5.6: Pump Station



B5.7: Processing Plant



B5.8: Innes Mills Pit - Typical open pit operations

(Drilling left & centre. MLT in centre. Excavator on right)



B5.9: Innes Mills Pit – Open pit activities

(Previous image area in left foreground. Other lights typically on vehicles [e.g. tip trucks])



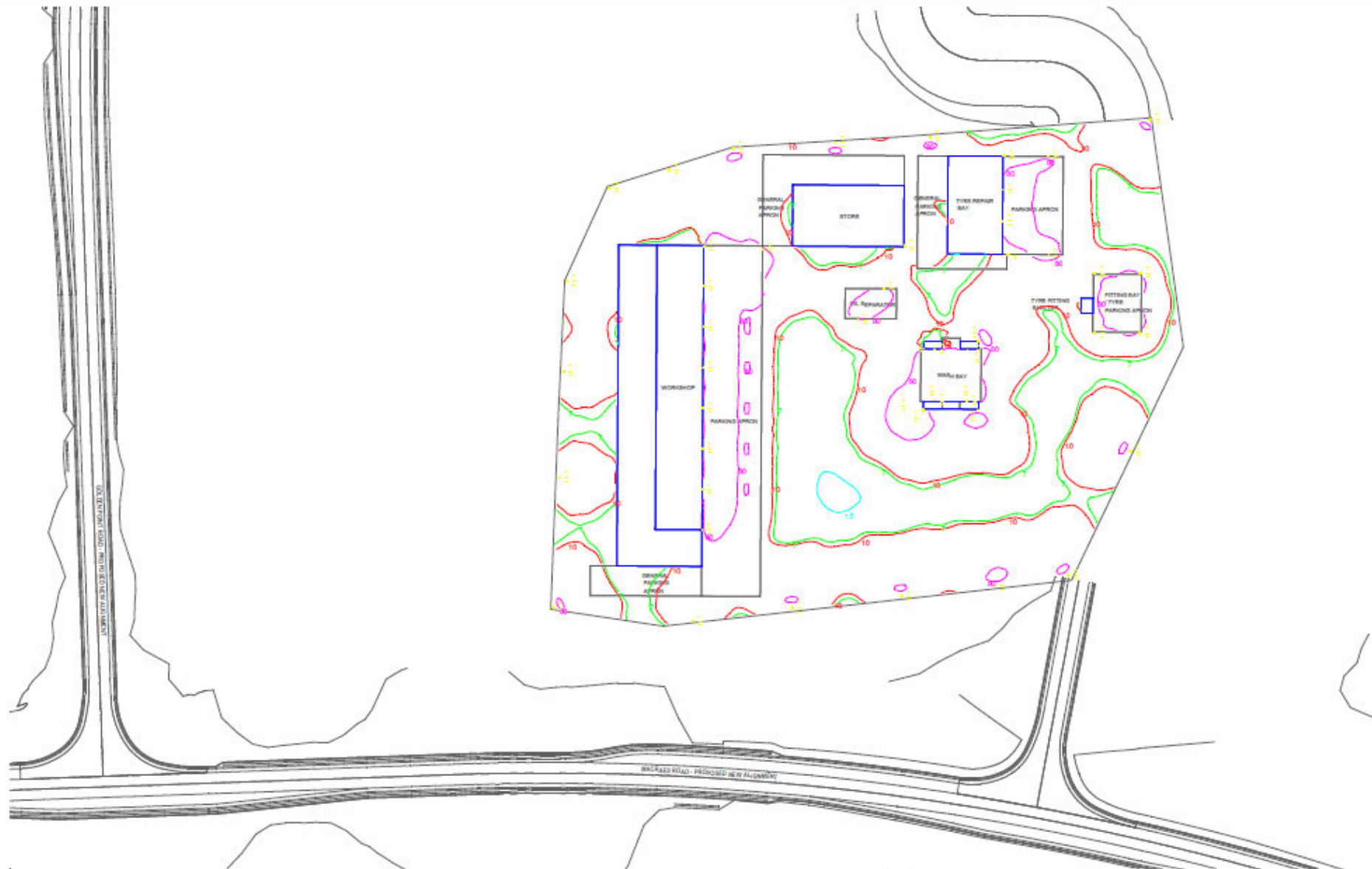
B5.10: Magnified view of existing Open Pit Workshop from road at 47 Hyde Street

(Tyre maintenance on the left. Open pit workshop on the right)

Figure B5. Night-time lighting examples

APPENDIX C: RELOCATED OPEN PIT WORKSHOP LIGHTING

- 25-0049-001A-L01: PROPOSED OP WORKSHOP LIGHTING CONCEPT
 - MAINTAINED ILLUMINANCE
- 25-0049-001A-L02: PROPOSED OP WORKSHOP LIGHTING CONCEPT
 - INITIAL ILLUMINANCE

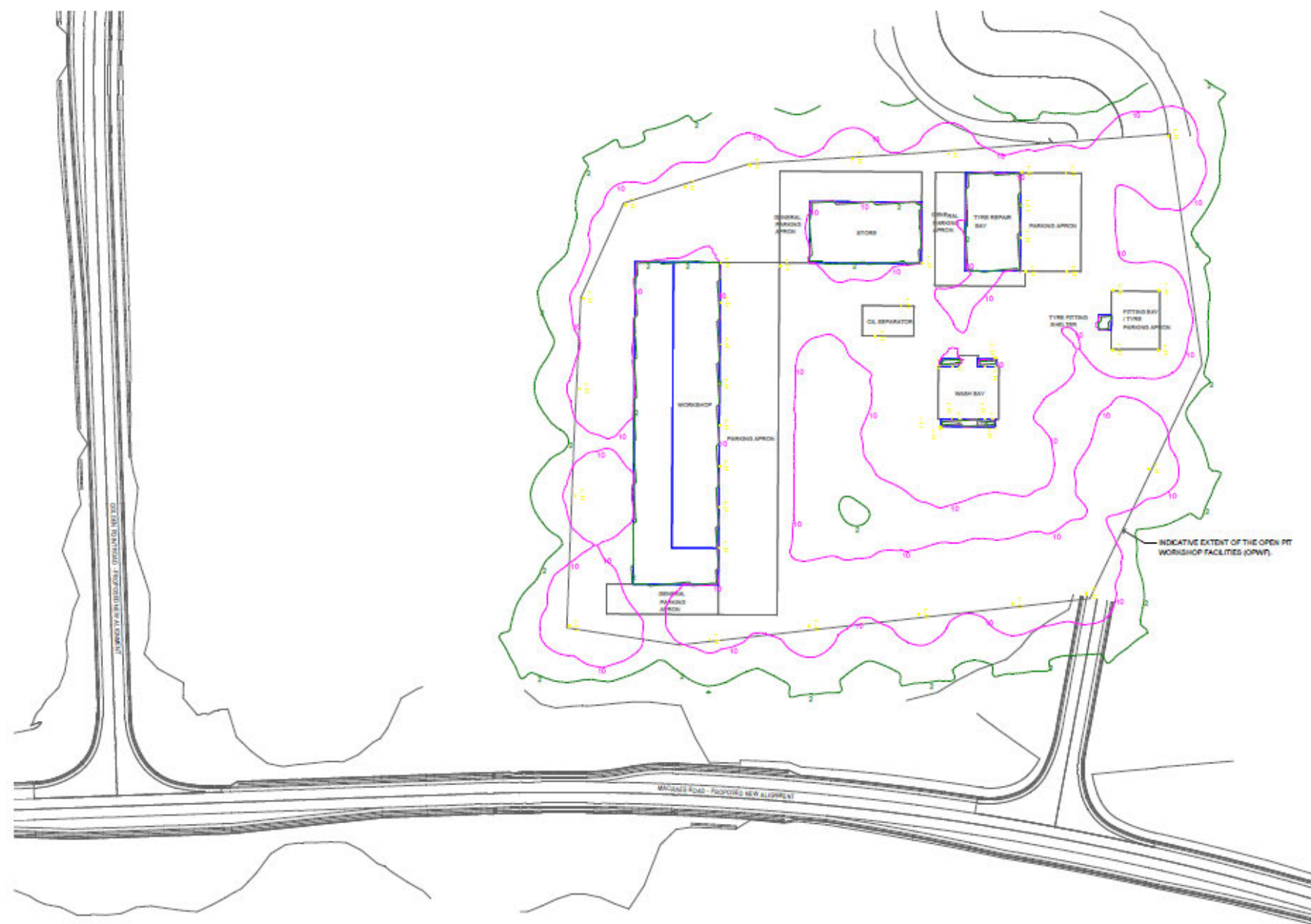


Qty	Label	Arrangement	Description	Mounting Height	Lum. Watts	Lum. Lumens	LLF
20	A	Single	PHILIPS CLEARFLOOD 133W 2700K OR SIMILAR	5, 6.5, 10, 12	133.3	17380	0.690
8	B	Single	PHILIPS CLEARFLOOD 191W 2700K OR SIMILAR	10, 12	191.1	26726	0.690
23	C	Single	PHILIPS CLEARFLOOD 324W 2700K OR SIMILAR	12	324.2	42994	0.690

Label	Description	CalcType	Units	Avg	Max	Min	Max/Avg
General Yard	Gen Storage - Ped Access	Illuminance	Lux	25.51	173.78	1.26	6.81
Oil Separator	Maintenance	Illuminance	Lux	83.96	106.60	44.33	1.27
Store General Parking Apron	PC2	Illuminance	Lux	29.96	76.43	5.92	2.55
Type Fitting Bay Parking Apron	Maintenance	Illuminance	Lux	94.54	154.04	67.25	1.63
Type Repair Parking Apron	Maintenance	Illuminance	Lux	86.52	153.42	36.84	1.77
Tyre Repair General Parking Apron	PC2	Illuminance	Lux	26.03	67.33	1.32	2.59
Wash Bay	Maintenance	Illuminance	Lux	169.07	272.42	7.10	1.61
Workshop General Parking Apron	PC2	Illuminance	Lux	13.91	52.88	1.74	3.80
Workshop Parking Apron	Maintenance	Illuminance	Lux	82.93	143.15	15.56	1.73

- NOTES
1. CONCEPT DESIGN ONLY AS PROOF OF ABILITY TO ADEQUATELY MITIGATE EFFECTS.
 2. LIGHTING DESIGNED TO THE RECOMMENDATIONS IN AS/NZS1690.2.5.
 3. LUMINAIRES WILL BE INSTALLED WITH NO UPWARD TILT AND HAVE 2700K COLOUR TEMPERATURE.

	PROJECT: MACRAES MP4 - PROPOSED OP WORKSHOP LIGHTING CONCEPT		
	DRAWING: MAINTAINED ILLUMINANCE		
	SCALE: 1:1500 @ A3	DESIGNED BY: MJG	CHECKED BY: JAM
	PROJECT NUMBER: 25-0049-001A-L01		DATE: 23/04/2024



Luminaire Schedule						
Qty	Label	Arrangement	Description	Mounting Height	Lum. Watts	Lum. Lumens
20	A	Single	PHILIPS CLEARFLOOD 133W 2700K OR SIMILAR	5, 6.5, 10, 12	133.3	17360
8	B	Single	PHILIPS CLEARFLOOD 191W 2700K OR SIMILAR	10, 12	191.1	26726
23	C	Single	PHILIPS CLEARFLOOD 324W 2700K OR SIMILAR	12	324.2	42994

Calculation Summary				
Label	CalcType	Units	Max	MIn
GOLDEN POINT - NORTHBOUND - TI	Obtrusive - TI	%	0	0
GOLDEN POINT - SOUTHBOUND - TI	Obtrusive - TI	%	0	0
MACRAES ROAD - EASTBOUND - TI	Obtrusive - TI	%	0	0
MACRAES ROAD - WESTBOUND - TI	Obtrusive - TI	%	0	0

- NOTES
1. CONCEPT DESIGN ONLY AS PROOF OF ABILITY TO ADEQUATELY MITIGATE EFFECTS.
 2. OBTRUSIVE LIGHTING EFFECTS DETERMINED AS WORST CASE (I.E. MF = 1).
 3. LUMINAIRES WILL BE INSTALLED WITH NO UPWARD TILT AND HAVE 2700K COLOUR TEMPERATURE.
 4. NO RESIDENCE IS EXPECTED TO HAVE A VIEW OF ANY LIGHT SOURCE. HENCE, GLARE TO RESIDENTS, AS ASSESSED, WILL BE NIL.
 5. GLARE TO MOTORISTS (TERMED THRESHOLD INCREMENT (TI)), AS CALCULATED, WILL BE 0%.
 6. SPILL LIGHT REDUCES TO 0.00 LUX AT APPROXIMATELY 0.1 km FROM THE OPWF EXTENTS. THE CLOSEST INHABITABLE RESIDENCE, 1668 MACRAES ROAD IS AT LEAST 0.6 km FROM THE OPWF THEREFORE LIGHT SPILL AT ANY RESIDENCE WILL BE NIL.

		PROJECT: MACRAES MPN - PROPOSED OP WORKSHOP LIGHTING CONCEPT	
		INITIAL ILLUMINANCE	
SCALE: 1:1500 @ A3	DRAWN BY: MG	CHECKED BY: JM	DATE: 23/04/2025
PROJECT & DRAWING NO:		25-0049-001A-L02	
SHEET NO:		1	