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OceanaGold Macraes Phase 4 Project

Assessment of Environmental Noise Effects

Prepared for:
OceanaGold Corporation
Macraes Flat
EAST OTAGO 9483

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Document Acceptance

Author	Signature
Oliver Hutchison BA (Hons), MArchSci Acoustic Engineer	
Reviewer	Signature
Clare Dykes MBS, MASNZ Senior Acoustic Engineer	
Approver	Signature
Dr Jeremy Trevathan Ph.D. B.E.(Hons.) Assoc. NZPI® MASNZ Managing Director	

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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 Acoustic Engineering Services to provide an assessment of the Project’s effects on environmental noise and, to the extent required, identify any necessary management and operation measures to address any such effects.

This scope of this report is to:

- Identify key sources of noise associated with the proposal.
- Discuss appropriate acoustic criteria for the project, with reference to the District Plan, New Zealand Standards, and other relevant guidance.
- Summarise the process and results from noise modelling undertaken for the project.
- Compare the results of noise modelling against the acoustic criteria, and comment on effects associated with the predicted noise levels.

2.0 SITE LOCATION AND DESCRIPTION

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

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

The environment within and surrounding the Macraes Operation has been shaped by historic and current mining activities. Figure 2.1 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.

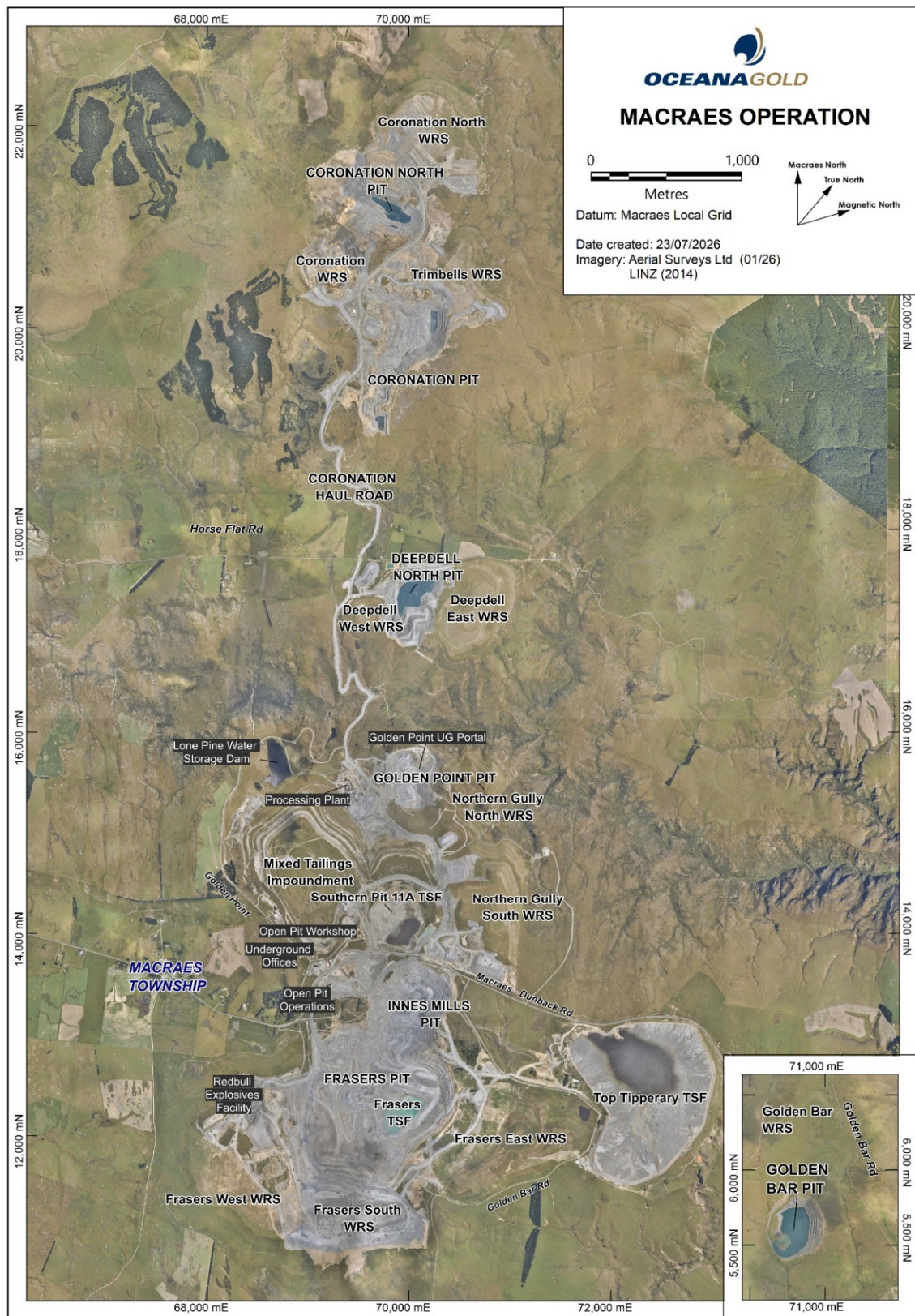


Figure 2.1 – Existing site layout at the Macraes Operation (as of July 2026)

3.0 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 3.1 below.

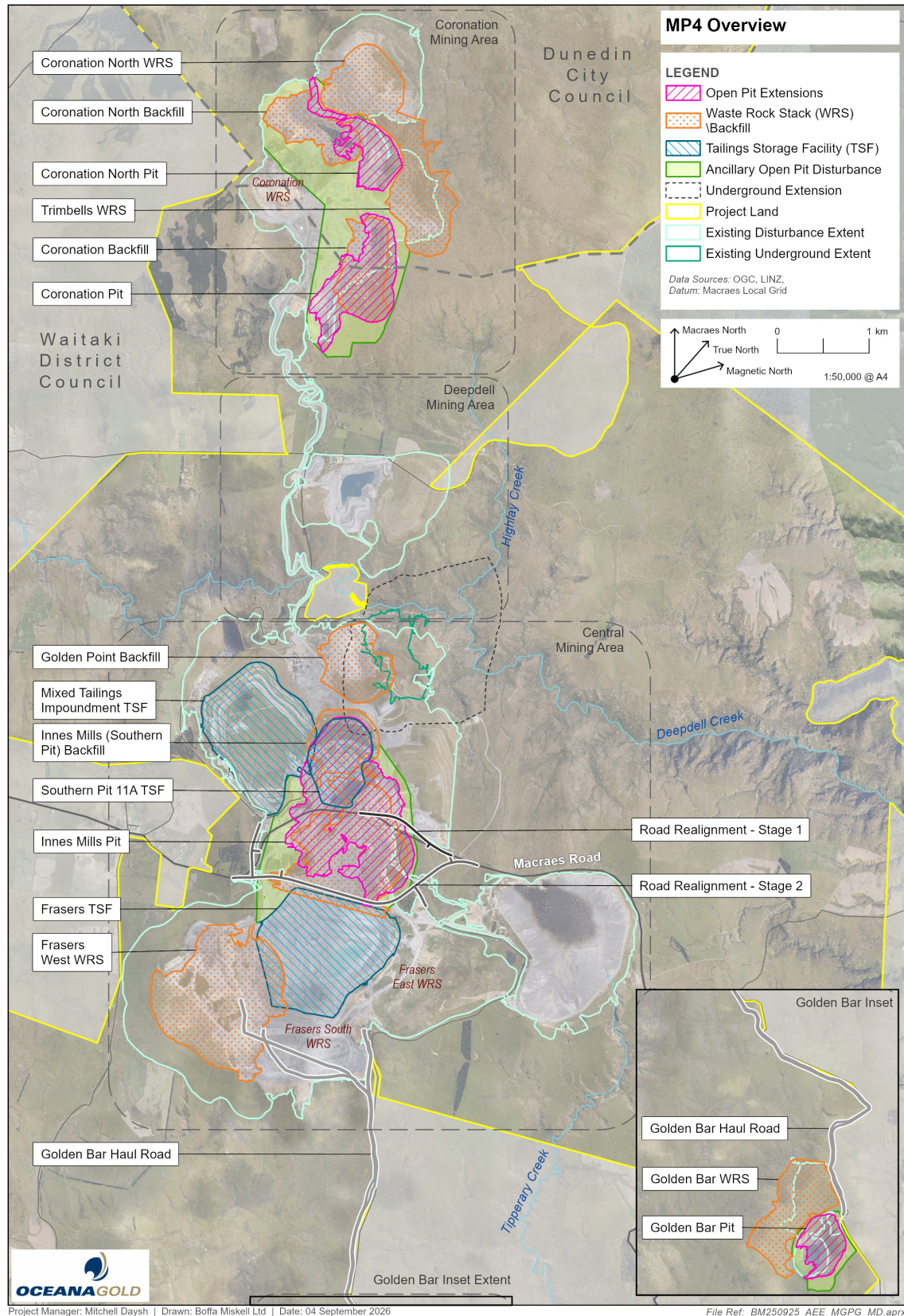


Figure 3.1 – MP4 overview plan

This report relies on information provided by OGNZL by email and file share, including terrain contours, identification of noise sensitive properties, description of the activity, and technical data for the proposed activity.

This report focusses on long term environmental noise sources associated with the overall mining operation. We note that due to its impulsive nature, noise from blasting does not fit in well with the noise criteria discussed below, and is typically assessed by different parameters. It is therefore considered separately from the other noise sources, and has been excluded from this report. A separate blasting noise and vibration assessment has been carried out for this project by TechNick Consulting.

3.1 Sequencing of activities and proposed work dates

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

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

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

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

Figure 3.2 shows the anticipated sequencing of the proposed MP4 activities across the life of the project.

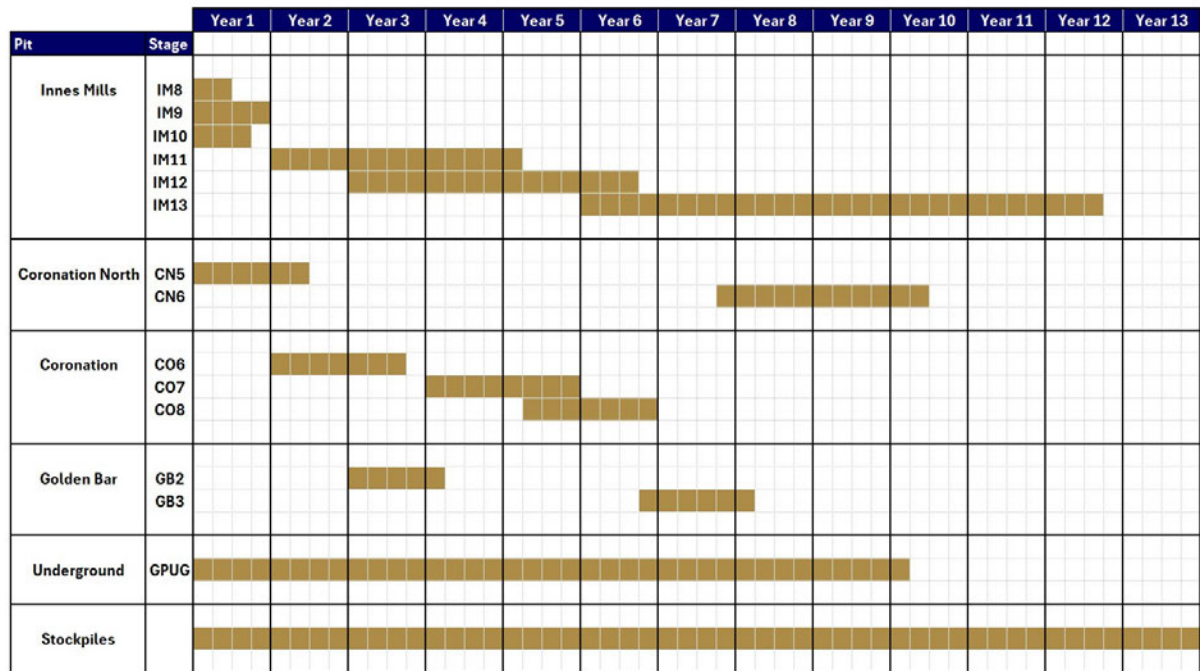


Figure 3.2 – Anticipated sequencing of the proposed MP4 activities

3.2 Site and surrounding area

The Macraes Operation currently contains a number of operating and previously mined open pits and associated waste rock stacks, underground mines and a Processing Plant. The proposed activity is located mostly within the Macraes Mining Project Mineral Zone (MMPMZ) as defined in the Operative Waitaki District Plan (OWDP). The MMPMZ adjoins the Rural General Zone to the west of the site. To the north, east, and south, the MMPMZ adjoins the Rural Scenic Zone. To the west of the MMPMZ boundary, the town of Macraes is located within a Township Zone.

The Coronation Mining Area is partially located within the jurisdiction of the Dunedin City Council in an area zoned High Country Rural zone.

The relevant zoning of the MP4 activity areas is shown in figure 3.3 below.

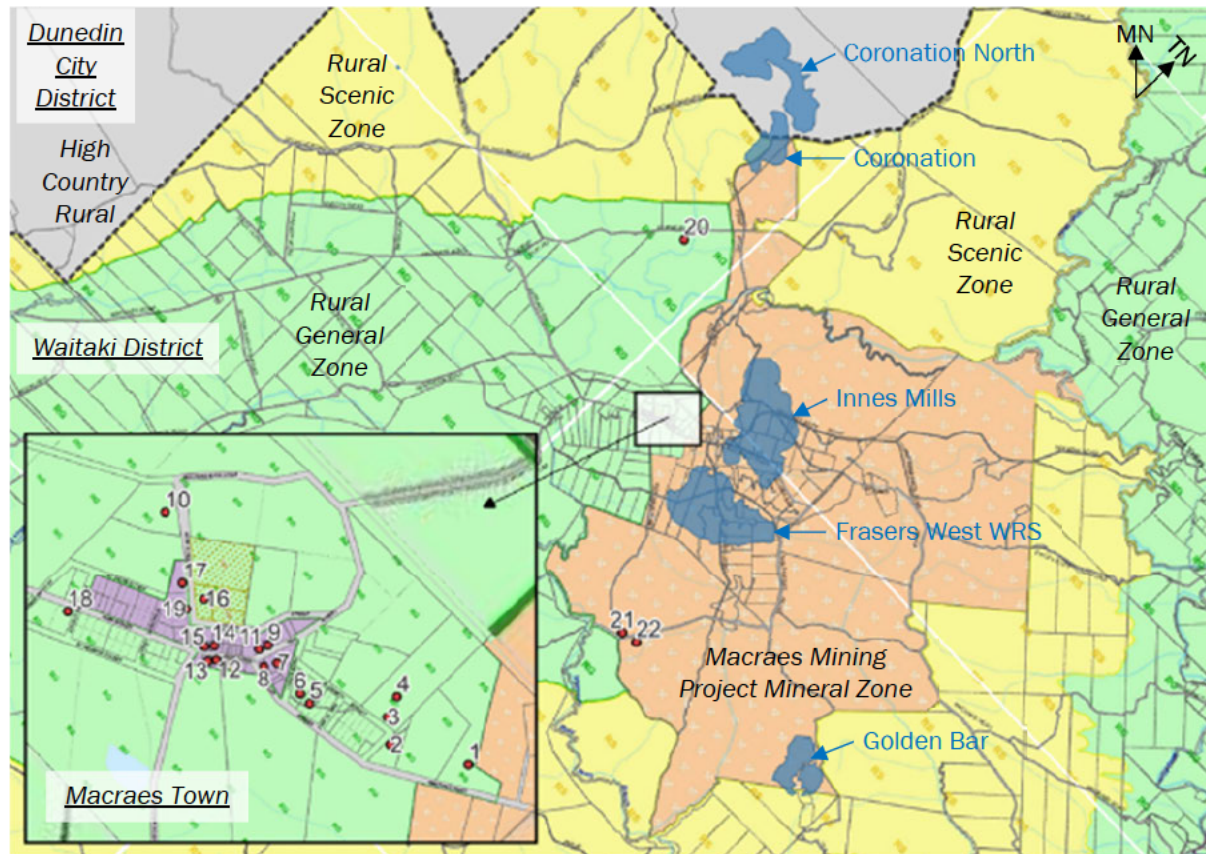


Figure 3.3 – District Plan zones with relative location of proposed MP4 activity areas

There are a number of residential properties and other potentially noise-sensitive sites within and around the MMPMZ which are in relatively close proximity to existing and proposed mining areas (particularly concentrated around the Macraes town area). Figure 3.3 above indicates with red dots the positions of these receiving sites, relative to key locations on the project site, and table 3.1 below shows details of these sites, including distances from locations of proposed MP4 activity.

Table 3.1 – Nearby residential properties and potentially noise-sensitive sites, with distances to the proposed activity

No.	Address	Property type	Owner-ship	Title reference	Approximate distance (metres)	
					Closest point on the MMPMZ boundary	Closest point on a proposed haulage route
1	1668 Macraes Road	Residential	Private	OT7D/910	15	660
2	1700 Macraes Road	Residential	OGNZL	OT291/8	135	900
3	1704 Macraes Road	Residential	OGNZL	OT13B/88	210	910
4	1702 Macraes Road	Residential	OGNZL	OT13B/88	255	900
5	1720 Macraes Road	Residential	OGNZL	OT129/31	390	1,160
6	1726 Macraes Road	Non-residential	Private	OT57/145	440	1,190
7	2 Hill Street	Non-residential	Private	3043500	520	1,250
8	1738 Macraes Road	Residential	OGNZL	OT4B/968	565	1,310
9	3 Hill Street	Residential	OGNZL	OT2D/902	597	1,300
10	47 Hyde Street	Residential	Private	OT3B/1339	600	1,730
11	1 Hill Street	Residential	OGNZL	OT8B/487	610	1,300
12	1755 Macraes Road	Residential	OGNZL	OT383/118	695	1,450
13	1757 Macraes Road	Residential	OGNZL	1041575	715	1,470
14	1758 Macraes Road	Residential	OGNZL	OT6/400	730	1,460
15	1760 Macraes Road	Hotel	OGNZL	OT211/221	745	1,490
16	6 Hyde Street	Non-residential (school)	Ministry of Education	3129260	830	1,530
17	15 Hyde Street	Residential	Private	OT10D/206	850	1,600
18	1801 Macraes Road	Residential	Private	OT129/35	900	1,900
19	11 Hyde Street	Residential	Ministry of Education	3043785	900	1,600

Table 3.1 continued over page

Table 3.1 (continued) – Nearby residential properties and potentially noise-sensitive sites, with distances to the proposed activity

No.	Address	Property type	Owner-ship	Title reference	Approximate distance (metres)	
					Closest point on the MMPMZ boundary	Closest point on a proposed haulage route
20	406 Horse Flat Road	Residential	Private	OT14C/1088	1,100	1,100
21	497 Red Bank Road	Department of Conservation	OGNZL	7941	(Inside MMPMZ)	3,150
22	546 Red Bank Road	Residential	OGNZL	159928	(Inside MMPMZ)	2,820

As noted in table 3.1 above, the majority of the residential receivers are owned by OGNZL. There are six key residential properties which are not owned by OGNZL (sites 1, 10, 17, 18, 19, and 22), and which may be affected by the proposed activity. These considered to be the key receivers for this assessment, and they have been bolded in the table.

3.3 Proposed activity

The proposed activities which form part of the Project that are of relevance to the noise assessment have been outlined below.

3.3.1 Open pit extensions and waste rock disposal

There are planned expansions of the existing open pit mining activities at the Golden Bar, Coronation, Coronation North and Innes Mills pits.

Typically, drill and blast methods will be used to fracture and loosen the overburden before excavation. Blasting operations are restricted to between 9:00 am and 5:30 pm Monday to Friday and between 10.00 am and 4.30 pm on Saturdays, Sundays and public holidays. Loading out of the waste rock to haulage trucks will be undertaken using excavators. The CAT 789 haul trucks have a nominal rated payload of 194 tonnes. Haulage of ore from the Golden Bar Pit (GB2) to the Processing Plant is proposed to be undertaken using CAT 773 trucks, or similar. These trucks have a nominal rated payload of 55 tonnes. Waste disposal will primarily be by end tipping into the various waste rock disposal locations listed below, supplemented with spreading of the unloaded waste with a dozer and/or a grader. The mining, loading, hauling, and unloading activity is expected to operate 24 hours a day, 7 days a week.

Waste rock mined from the various stages of MP4 is planned to be disposed in eleven waste rock disposal locations: Coronation North Backfill (CNBF), Coronation North Waste Rock Stack (CNWRS), Coronation Backfill (COBF), Coronation Waste Rock Stack (COWRS), Frasers Backfill (FRBF), Frasers South Backfill (FSBF), Frasers West Waste Rock Stack (FWWRS), Golden Bar Waste Rock Stack (GBWRS), Golden Point Backfill (GPBF), Innes Mills Backfill (IMBF), and Trimbells Waste Rock Stack (TRWRS).

3.3.2 Underground mining

There is a planned extension of the existing underground mining activities at Golden Point Underground Mine. Noise emissions associated with underground mining are typically restricted to above-ground activity, such as support infrastructure (ventilation fans, etc.) and surface haulage (trucks). No new surface

infrastructure will be required in association with the expansion of GPUG, and surface haulage movements are expected to remain the same as the existing, consented GPUG activity.

3.3.3 *Hydraulic mining*

Tailings from MTI, SP10, and SP11 are proposed to be removed via hydraulic mining and transported via pipework to permanent storage in the Frasers TSF. Hydraulic mining uses high pressure water jets to loosen the tailings into a slurry, which can subsequently be pumped around the site. Noise sources associated with hydraulic mining are expected to include high pressure pumps supplying the jets, the jets themselves, lower pressure pumps for water reticulation and the pumping of relocated tailings. Diesel generators may be used at the substation (near the Processing Plant) to supply the additional power requirements of the hydraulic mining operation. During construction of the hydraulic-mining infrastructure (pump stations, generator platform, etc.), noise generation associated with temporary construction activities will also occur.

3.3.4 *Open Pit Workshop relocation*

The Open Pit Workshop is planned to be moved from its current location on Macraes Back Road to a new facility to the west of Frasers Pit. The facility will include a new workshop building and a paved outdoor area for storage and maintenance of machines. Noise emissions from the new Open Pit Workshop will include engine noise from equipment (during movement around the site, and engine testing), and other moveable plant (excavators, etc.), tooling, and breakout noise from use of pneumatic tooling at the workshop building. During construction of the new Open Pit Workshop, noise generation associated with temporary construction activities will also occur.

3.3.5 *Macraes Road realignment*

Macraes Road is planned to be realigned in two stages, to accommodate proposed extensions to the Innes Mills Pit. During construction of the two stages of Macraes Road realignment, noise generation associated with temporary construction activities (earth movement, road surfacing, etc.) will occur.

4.0 ACOUSTIC CRITERIA

The FTAA requires consideration of the significance of any adverse impacts associated with the proposal. Guidance as to the significance of any adverse noise effects may be obtained from several sources.

4.1 Operative Waitaki District Plan noise standards

As stated above, the site is mostly located within the MMPMZ, with the nearest neighbouring properties located within the Rural General Zone or Township Zone under the Operative Waitaki District Plan (OWDP).

The noise standards which apply to the MMPMZ are outlined in section 6.5 of the OWDP, and are as follows:

Noise

Activities shall be constructed such that the following noise levels are not exceeded at the Macraes Mining Mineral Zone Boundary:

<i>During daytime</i>	<i>55 dB L_{Aeq} (15 min)</i>
<i>During night time</i>	<i>40 dB L_{Aeq} (15 min)</i>
<i>At all times</i>	<i>75 dB L_{AFmax}</i>

Daytime is defined as 0700 to 2200 hours Monday to Friday & 0800 to 1700 hours Saturday. Night time is all other times and any public holiday.

The noise standards which apply within the Rural General Zone and Rural Scenic Zone are outlined in section 4.5 of the OWDP, and are as follows:

Noise

Activities shall be conducted such that the following noise limits are not exceeded at any point within the notional boundary of a habitable building on another site, other than the site from which noise is generated:

<i>Monday to Friday 7am – 10pm</i>	<i>55 dB L_{Aeq} (15 min)</i>
<i>Saturday 8am – 7pm</i>	<i>55 dB L_{Aeq} (15 min)</i>
<i>At all other times and any public holiday</i>	<i>40 dB L_{Aeq} (15 min)</i>
<i>Daily 10pm to 7am the following day</i>	<i>75 dB L_{AFmax}</i>

The OWDP defines the notional boundary as a line 20 metres from any side of a dwelling building, or the legal boundary where this is closer to the dwelling building.

The noise standards which apply within the Township Zone are outlined in section 5.5 of the OWDP, and are as follows:

Noise

On any site, activities, other than residential activities and outdoor recreation, shall be conducted such that the following noise limits are not exceeded at any point within the boundary of another site within the Township Zone, other than the site from which the noise is generated, during the following time frames:

<i>Monday to Friday 7am – 10pm</i>	<i>55 dB L_{Aeq} (15 min)</i>
<i>Saturday 8am – 7pm</i>	<i>55 dB L_{Aeq} (15 min)</i>
<i>At all other times and any public holiday</i>	<i>40 dB L_{Aeq} (15 min)</i>
<i>Daily 10pm to 7am the following day</i>	<i>75 dB L_{AFmax}</i>

Sound levels shall be measured in accordance with the provisions of NZS 6801:2008 *Acoustics – Measurement of Environmental Sound* and assessed in accordance with the provision of NZS 6802:2008 *Acoustics – Environmental Noise*.

The OWDP contains no specific rule or limits for noise from temporary construction activities.

4.2 Dunedin City 2nd Generation District Plan (2GP) noise standards

Under the Dunedin City 2GP District Plan (DC2GP), the project site is included in the High Country Rural zone.

The noise standards which apply to noise generated within the High Country Rural zone are outlined in Section C – City-wide provisions, 9 Public Health and Safety, 9.3 Performance Standards 9.3.6 Noise.

The following noise standards apply at the notional boundary of residences:

Day time (0700 to 1900 hours)	55 dB L_{Aeq} (15 min)
Evening (1900 to 2200 hours)	50 dB L_{Aeq} (15 min)
Night time (2200 to 0700 hours)	40 dB L_{Aeq} (15 min) and 70 dB L_{AFmax}

The DC2GP defines the notional boundary as a line 20 metres from any side of a residential building, or the site boundary where this is closer to the residential building.

Sound levels shall be measured in accordance with the provisions of NZS 6801:2008 *Acoustics – Measurement of Environmental Sound* and assessed in accordance with the provision of NZS 6802:2008 *Acoustics – Environmental Noise*.

With respect to noise from temporary construction activities, the DC2GP requires this to comply with the limits outlined in 4.5.4.1 *Construction and site investigation noise*. The limits in this rule are reproduced from NZS 6803:1999 *Acoustics – Construction Noise*, which are typically higher than limits for operational noise.

4.3 New Zealand Standard 6802

NZS 6802:2008 *Acoustics – Environmental Noise* outlines a guideline day time limit of 55 dB L_{Aeq} (15 min) and a night time noise limit of 45 dB L_{Aeq} (15 min) for “the reasonable protection of health and amenity associated with the use of land for residential purposes”.

If there are no timeframes otherwise specified, then NZS 6802:2008 suggests that the day time period is 0700 to 2200 hours, and the night time period 2200 to 0700 hours.

NZS 6802 defines the notional boundary as a line 20 metres from any side of a dwelling, or the legal boundary where this is closer to the dwelling.

The Standard also describes how a -3 dB adjustment may be applied to sound received for less than 50 % of the day time period, and a -5 dB adjustment may be applied to sound received for less than 30 % of the day time period.

4.4 World Health Organisation

*Guidelines for Community Noise*¹, a document produced by the World Health Organisation (WHO) based on extensive international research recommends a guideline limit of 55 dB L_{Aeq} (16 hr) to ensure few people are ‘seriously annoyed’ in residential situations. A guideline limit of 50 dB L_{Aeq} (16 hr) is recommended to prevent

¹ Edited by Berglund, B *et al.* *Guidelines for community noise*. World Health Organization 1999.

moderate annoyance. A guideline night time limit of 45 dB $L_{Aeq}(8\text{ hr})$ is recommended to allow occupants to sleep with windows open.

The day time guidelines relate to ongoing noise at the stated level over a 16-hour period with no distinction between days of the week. While the night time guidelines relate to ongoing noise at the stated level over an 8-hour period with no distinction between days of the week.

4.5 Approved Resource Consents for existing mining activity at the site

As stated above, there are other areas of ongoing mining activity on the site, which have had their noise effects considered during their respective consenting processes.

We have reviewed the approved conditions of the Macraes Phase 3 (MP3) land use consent (Consent number 201.2011.35/2) and the CCP2 land use consent (201.2023.2302/3), which authorise open pit mining, including at Frasers and Innes Mills pits. The noise related conditions of consent are outlined in Condition 9 for MP3 and Condition 8 for CCP2, and are as follows:

CCP2:

8. NOISE

Noise Limits

8.1 The Consent Holder shall ensure that all construction and operation activities associated with the mining operations are designed and conducted so that the following noise limits are not exceeded at the locations specified in Condition 8.2:

- a) On any day between 7 am to 9 pm (daytime): 50 dBA Leq; and
- b) On any day between 9.00 pm to 7.00am the following day (night time): 40 dBA Leq; and/or 70 dBA Lmax.

Measurement Locations

8.2 Noise measurements shall be taken at any point within Macraes Village; or at, the notional boundary of any dwelling except that Condition 8.1 shall not apply to:

- a) Any property or site that is owned by the Consent Holder; or
- b) The property located at 1668 Macraes Road; or
- c) The property located at 406 Horse Flat Road; or
- d) Any property or site where a dwelling did not exist at the time this consent was granted.

Advice Note: The notional boundary is defined as a line 20 metres from the exterior wall of any rural dwelling or the legal boundary where this is closer to the dwelling.

Measurement and Assessment

All noise measurements referred to in Conditions 8.1 and 8.2 above shall be measured in accordance with the provisions of NZS 6801:2008 Acoustics: Measurement of Environmental Sound, and shall be assessed in accordance with the provisions of NZS 6802:2008 Acoustics: Environmental Noise.

MP3:

9. NOISE

Noise limits

- 9.1. The consent holder shall ensure that all construction and operation activities associated with the mining operations are designed and conducted so that the following noise limits are not exceeded at the locations specified in Condition 9.2:

- a) On any day between 7 am to 9 pm (daytime): 50 dBA Leq; and
- b) On any day between 9.00 pm on to 7.00 am the following day (night time): 40 dBA Leq; and/or 70 dBA Lmax

Measurement Locations

- 9.2. Noise measurements shall be taken at any point within Macraes Village; or at, the notional boundary of any dwelling not owned by the consent holder in the Rural Scenic Zone.

Note: The notional boundary is defined as a line 20 metres from the exterior wall of any rural dwelling or the legal boundary where this is closer to the dwelling.

Measurement and Assessment

- 9.3. All noise measurements referred to in Conditions 9.1 and 9.2 above shall be measured in accordance with the provisions of NZS 6802:2008 Acoustics: Measurement of Environmental Sound, and shall be assessed in accordance with the provisions of NZS 6802:2008 Acoustics: Environmental Noise

4.6 Measurements of the current noise environment

Measurements of the current mining activity occurring at the site were conducted between approximately 2200 hours and 2400 hours on Wednesday the 4th of March 2026. Details of the measurements completed in general accordance with NZS 6801:2008 Acoustics – Measurement of Sound and conducted on the 4th of March 2026 are as follows:

Personnel:	Oliver Hutchison, Acoustic Engineering Services
Weather:	Clear skies, light winds, mild temperature (12 °C)
Instrumentation:	Brüel & Kjær Type 2250 Class 1 Sound Analyser (Serial Number 3025183, last calibrated 2 February 2026) Brüel & Kjær 4231 Acoustic calibrator (Serial Number 3011404, last calibrated 17 February 2026)
Field calibration:	The analyser was calibrated before measurements, and the calibration checked after measurements. No significant change was noted (< 0.1 dB).
Settings:	A weighting (dBA), fast response.

During the measurement period the Processing Plant and the existing Open Pit Workshop were operating as normal. Noise from the Open Pit Workshop was audible at the northwest end of Hyde Street, in Macraes town. Some truck haulage was also occurring periodically during measurements along the haul road to the east of Macraes township, and was audible at times along Macraes Road, east of Macraes Town. However, activity at the mine during the visit was at a lower level than that which may occur during peak periods of the proposed activity, resulting in correspondingly lower measured noise levels.

During this time, measured noise levels were as follows:

- On Macraes Road, near 1668 Macraes Road – 35 dB LAeq (15 min)
- On Hyde Street, near 47 Hyde Street – 40 dB LAeq (15 min)

- In Macraes Town, top end of Union Street – 36 dB L_{Aeq} (15 min)
- On Horse Flat Road, near 406 Horse Flat Road – 39 dB L_{Aeq} (15 min)

Based on our observations on site, noise from the existing mining operation (albeit at a low activity level) is an audible component of the night time noise environment in the areas around the existing residential receivers.

4.7 Discussion regarding appropriate noise levels

As outlined above, in order to fully comply with the OWDP noise standards, noise would need to be assessed at the MMPMZ boundary. With regard to noise effects, all other relevant guidance (including NZS 6802, and the previous Resource Consent conditions discussed in section 4.5 above) consider it appropriate to assess noise levels at the notional boundary of noise sensitive dwellings, or within the site boundary where the site is located within the Macraes Township Zone. As there are many locations on the MMPMZ boundary which are not noise-sensitive, but instead are remote rural locations with no dwellings nearby, we consider the notional boundary of noise sensitive sites (or the site boundary for properties in Macraes Town) to be the appropriate assessment location for this proposal.

As the proposed MP4 activities may operate continuously throughout the day and night time periods, it is the noise emitted during the night time period (i.e. when people are sleeping) that has the potential to have the greatest effect on the neighbouring properties.

Ideally noise levels from the MP4 activities would be managed so that they were less than 40 dB L_{Aeq} (15 min) during the night time period at the notional or site boundary of privately owned neighbouring dwellings, in line with existing consent conditions². However, we note that the recognised guidance discussed above recommends a maximum external noise level of 45 dB L_{Aeq} (15 min) at a bedroom window to ensure occupants can sleep with windows open. Noise levels between 40 and 45 dB L_{Aeq} (15 min) are therefore considered to be acceptable, with effects which are no more than minor.

With respect to noise from temporary construction activities, as noted in section 4.5 above, approved Resource Consents for existing mining activity at the site have included temporary construction noise within the overall noise limits. We consider this to be an appropriate approach for MP4 temporary construction activities. We note that the temporary construction noise limits in the DC2GP, and those in other relevant guidance (NZS 6803), are typically higher than the overall noise limits in approved Resource Consents for existing mining activity at the site.

² Alternative limits to those set out in the OWDP apply at 1668 Macraes Road and 406 Horse Flat Road – refer conditions 8.1 and 8.2 of WDC land use consent 201.2023.2302/3.

5.0 NOISE GENERATED BY THE ACTIVITY

SoundPLAN computational noise modelling based on ISO 9613 *Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation* has been used to calculate the propagation of noise from the site, taking into account the topography of the area, and sound power levels for each of the noise sources.

This modelling considers enhanced propagation representative of either moderate downwind conditions (up to 5 m/s) in every direction (which would not occur in reality), or moderate ground-based temperature inversions to represent what can occur on a clear, calm night. Noise levels predicted under these conditions are taken as being at the upper limit of the ‘meteorological window’ described in NZS 6801:2008 and NZS 6802:2008 where valid compliance assessments are possible.

5.1 Sound power of equipment

Clare Dykes of AES conducted a series of noise measurements on mining plant, equipment, and heavy machinery operating at the existing Coronation North Pit, between 1300 and 1600 hours on the 8th of February 2018. Measurements were made under neutral weather conditions in general accordance with NZS 6801:2008 *Acoustics – Measurement of Environmental Sound*.

The purpose of these measurements was to acquire data which could be used for predicting the expected noise levels at the notional boundaries of the neighbouring residential dwellings, for a given worst-case scenario in each of the proposed activity areas.

5.1.1 Main mining equipment

Based on previous measurements and analysis undertaken by AES, the assumed worst-case sound power levels of the noise generating equipment which is associated with the operation are shown in table 5.1 below. The measured noise levels are in line with the reference levels provided in the relevant standards. This data has been used to calculate the noise expected at the nearest neighbouring dwellings due to the machinery operating.

Table 5.1 – Equipment sound power levels

Equipment or machinery	Sound level dB L _{WA}	Notes
Drill	119	1.
Excavator	115	2.
Dozer / Loader	116	2.
Grader	115	2.

1. Based on measurements undertaken of a Boart Longyear KWL 1600 drilling rig on site.
2. Measured typical levels on site and referenced against the British Standard BS 5228-1:2009 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*.

5.1.2 Haulage trucks

The noise level emitted by haulage trucks is more difficult to determine as the noise output of a truck varies with load, terrain, and operation.

Given the changing gradient of the haulage route, the trucks emit varying levels of noise as they travel up / down the road. To determine the relative noise source level of the trucks as they travel on the haulage route, we have calibrated our model using the results from attended noise monitoring undertaken by OGNZL at the

dwelling at 1668 Macraes Road on Tuesday the 21st of May 2019. Results from this measurement showed that noise from two loaded haulage truck passes on the haulage road under neutral weather conditions measured 37 dB $L_{Aeq} (15 \text{ min})$ at the 1668 Macraes Road dwelling. Both trucks measured were the CAT 789D type which has a nominal rated payload of 194 tonnes, and which are owned and operated by OGNZL.

We note that this value may be increased if the truck movements happened to occur at a time during enhanced propagation which still fell within the meteorological window outlined in NZS 6802:2008, such as during a temperature inversion condition.

We have therefore considered trucks as a line source along the haulage road, scaled to the measurements above, with an adjustment for enhanced propagation.

Additional measurements of haulage truck noise have been conducted in March 2026 in a range of locations around the Macraes site.

The model of truck used for the Golden Bar ore haulage activity, CAT 773D (nominal rated payload of 55 tonnes), is a significantly smaller truck than the CAT 789D (nominal rated payload of 194 tonnes). We have not had the opportunity to undertake measurements of the CAT 773D trucks, though from information made available by the manufacturer, external noise emissions from 773D trucks are in the order of 5 dB less than that emitted by the CAT 789D model (which we have measured as described above).

5.2 Predicted noise levels – Ongoing activity

In this section we have analysed noise-generating activity that is expected to be ongoing throughout the lifespan of the MP4 project. Most noise sources associated with ongoing mining activity will be located within the pit shells for the vast majority of the time. Trucks used for haulage of extracted rock out of the pit are the notable exception, as these travel between pits, waste rock stacks, and, in the case of ore, the Processing Plant. Therefore, noise generated by these trucks can occur above ground level for parts of the haulage routes.

In section 7.0 below, we have outlined key noise mitigation strategies for MP4, including a bund wall near receiver 1 (the residential dwelling at 1668 Macraes Road), and day time only operation of earthmoving equipment in two key waste rock stack areas. These mitigation strategies are to ensure that noise from MP4 does not exceed 45 dB $L_{Aeq} (15 \text{ min})$ at any residential receiver.

The modelling in the following sections has been undertaken with this mitigation included.

5.2.1 Removal of extracted rock

For the majority of the time, the main activity in the MP4 mining areas will be the excavation and haulage of waste and ore-containing rock. This activity will comprise of periodic drill and blast, excavators loading the material into haul trucks, and the trucks transporting waste rock to permanent disposal. Additional trucks will transport ore to the Processing Plant.

The intensity of activity within each mining area on any given day can depend on a variety of factors including scheduled truck numbers, the nature of the haulage routes, weather conditions, etc. The scenario analysed in this section is intended to reflect a reasonable peak level scenario for concurrently operating noise sources during a worst-case 15-minute period in each year of the MP4 project lifespan. Generally speaking, for the majority of the time, noise levels from MP4 mining activity are expected to be less than the levels predicted in this section. However, the predicted levels could occur from time to time.

We have modelled monthly projected mining activity data as supplied by OGNZL for the duration of the MP4 project. For brevity we have reported annual results only – being the maximum level expected at the notional boundary of the receiver in any month of a given year.

We have considered the peak operation could consist of the following during a worst-case 15-minute period:

- Coronation North:
 - Up to 10 trucks in a 15-minute period on the haul road travelling between the Coronation North pit and permanent waste rock storage in CNBF or CNWRS.
 - Up to 6 trucks in a 15-minute period on the haul road travelling between the Coronation North pit the Processing Plant.
- Coronation:
 - Up to 15 trucks in a 15-minute period on the haul road travelling between the Coronation pit and permanent waste rock storage in CNWRS, COWRS, TRWRS, or COBF.
 - Up to 10 trucks in a 15-minute period on the haul road travelling between the Coronation pit the Processing Plant.
- Innes Mills:
 - Up to 18 trucks in a 15-minute period on the haul road travelling between the Innes Mills pit and permanent waste rock storage in FRBF, FSBF, FWRS, IMBF, or GPBF.
 - Up to 6 trucks in a 15-minute period on the haul road travelling between the Innes Mills pit the Processing Plant.
- Golden Bar:
 - Up to 8 trucks in a 15-minute period on the haul road travelling between the Golden Bar pit and permanent waste rock storage in GBWRS.
 - Up to 4 trucks in a 15-minute period on the haul road travelling between the Golden Bar pit the Processing Plant.

In addition to the above, our model also included the following for each mining stage:

- A single drill operating in the pit.
- A single excavator operating in the pit.
- A single dozer operating in the pit.
- A single grader operating within the waste disposal area.
- A single dozer operating within the waste disposal area.

The expected noise levels from the above scenarios at the nearby dwellings are outlined in Appendix 1 at the end of this report. However, the key findings of our analysis have been summarised below:

- Noise associated with the ongoing operations as part of the proposed MP4 activity is expected to result in noise levels of less than 40 dB $L_{Aeq} (15 \text{ min})$ at most nearby residential dwellings, with the following exceptions:
 - At the notional boundary of the private dwelling at 1668 Macraes Road (receiver 1) there is potential for levels of 41 to 43 dB $L_{Aeq} (15 \text{ min})$ to be received during most years of the project operation. This is primarily due to waste haulage from Innes Mills Stage 11 and Innes Mills Stage 12.

- At the notional boundary of the private dwelling at 406 Horse Flat Road (receiver 20), there is potential for levels of 44 to 46 dB L_{Aeq} (15 min) to be received during several years of the project. This is primarily due to ore haulage trucks on the haul road between the Coronation and/or Coronation North pits and the Processing Plant.
- At receivers 2 – 5 and 8 (which are dwellings owned by OGNZL), noise levels of between 41 to 44 dB L_{Aeq} (15 min) could be received.
- At receivers 6 – 7 (privately owned non-residential sites) there is potential for levels of 41 to 42 dB L_{Aeq} (15 min) to be received during most years of the project operation.

We have discussed effects from MP4 noise in section 8.0 below.

5.2.2 Hydraulic mining

All tailings from SP10 and SP11 and some tailings from the MTI are proposed to be removed via hydraulic mining and transported as a slurry via pipework to permanent storage in the Frasers TSF. Hydraulic mining uses high pressure water jets to loosen the tailings and form a slurry, which will subsequently be pumped to Frasers TSF.

Noise sources associated with hydraulic mining are expected to include high pressure pumps supplying the jets, the jets themselves, high-pressure water impacting the tailings pile, and lower pressure pumps located at several pumping stations for supply of water to the high-pressure pumps.

We have undertaken modelling of noise from each of the above sources, to determine expected noise levels at nearby residential dwellings. Our modelling included the following:

- Low pressure stations (Decant return Pump Station 1, 3, and 4, Turkeys Nest, Slurry Pump Station, and Sump Pontoon):
 - 2 active pumps (Warman 12/10 STAH) per station – each pump has been modelled with a continuous sound pressure level of 90 dB L_{Aeq} at 1 metre
- High pressure pump station:
 - 6 active pumps (Warman 8/6 AHPP) – each pump has been modelled with a continuous sound pressure level of 90 dB L_{Aeq} at 1 metre
- High pressure cannons:
 - 2 active cannons mounted on Bobcats/skid steers – each cannon/Bobcat has been modelled with a continuous sound pressure level of 120 dB L_{Aeq} at 1 metre

The model has considered the cannons located at the existing terrain height, as this is expected to be the worst-case – with SP11 at its highest elevation. As SP11 is mined out, the cannons will be lower relative to the surrounding terrain, and noise shielding is expected to be improved.

Based on the above scenario, noise from the hydro mining operation is expected to be less than 30 dB L_{Aeq} (15 min) at all residential receiving locations. This is a very low level and is not expected to meaningfully add to the noise levels received from other sources (such as removal of extracted rock). Due to the low levels expected, noise from hydraulic mining is not considered further.

5.2.3 Relocated Open Pit Workshop

The Open Pit Workshop is planned to be moved from its current location on Macraes Back Road to a new facility south of Macraes Road (existing alignment). The facility will include a new workshop building and a paved outdoor area for storage and maintenance of machines. The proposed location of the Open Pit Workshop is as shown in figure 5.1 below.



Figure 5.1 – Proposed location of the Open Pit Workshop

Noise sources associated with the Open Pit Workshop will include engine noise from moveable plant (trucks, excavators, etc.) moving around the site (and/or undergoing stationary engine testing), and breakout noise from tool use in the workshop building.

We have undertaken modelling of noise from the new Open Pit Workshop location to determine expected noise levels at nearby residential dwellings. Our modelling included the following:

- One mining truck (CAT 789D) driving continuously around the workshop building (as may occur during testing) – continuous sound pressure level of 85 dB L_{Aeq} at 10 metres.
- Breakout noise through the open roller doors of the Workshop building – continuous sound pressure level of 75 dB L_{Aeq} at 10 metres.

Based on the above scenario, noise from the new Open Pit Workshop is expected to be less than 30 dB L_{Aeq} (15 min) at all residential receiving locations. This is a very low level and is not expected to meaningfully add to the noise levels received from other sources (such as removal of extracted rock).

We note that in the current situation, the existing Open Pit Workshop position is at a higher elevation (than the planned site), and some residential properties at the north end of Macraes Township have line of sight to this location – which results in occasional audible noise from the current Open Pit Workshop at these properties. The new Open Pit Workshop location is at a lower elevation, and there is no line of sight to any residential properties. Therefore, we expect that moving the Open Pit Workshop will result in an improvement of the overall situation of noise from the Open Pit Workshop operation.

Due to the low levels expected, noise from the relocated Open Pit Workshop is not considered further in this report.

5.3 Predicted noise levels – Temporary surface level operations

With open pit mining, the majority of noise generating activity (except truck haulage) will occur within the pits, typically below the surrounding ground level. During the initial stages of open pit mining there will be some noise generating activity, such as drilling and excavation, which occurs at the existing surface ground level. As the pit excavation progresses and the pit deepens, screening is provided by the enclosing pit walls. Inversely, within waste rock storage areas, the final phases of waste rock deposition are likely to be the worst-case from a noise perspective, as earthmoving equipment will be located close to the surface level of the surrounding terrain, and/or elevated above the surrounding terrain in some cases. Surface level operations are therefore considered to be a worst-case scenario for drilling and earthmoving equipment, and this would only occur for a limited period of time.

We have analysed scenarios below for temporary surface level drilling and earthmoving activities.

5.3.1 Surface level drilling holes for blasting

We understand that for typical drill and blast operations, it takes approximately 6 minutes to drill the holes, and the drill will only stop for a short amount of time between holes to relocate to the next hole, and to allow a sample of cuttings to be taken. Drilling operations comprise grade control drilling to collect samples for determining gold content, and for blast holes. Both activities are undertaken on a 24/7 basis.

We have modelled a variety of scenarios with a drill operating at the existing surface level at many different locations around the whole perimeter of each pit extension area, including Innes Mills, Golden Bar, Coronation North, and Coronation. The drill in our model was configured as a single drill operating continuously for a 15-minute period, though we note this is a conservative approach (there will be periods of lower noise emissions during a typical 15-minute period, as the drill is repositioned etc.). Furthermore, we understand that in practice, material in the upper bench is likely to be softened by weathering processes and hence easier to excavate (free dig, or lower powder factor) and therefore drilling cycles may be shorter at the top layers of the pits.

Based on this analysis, our modelling indicates that noise associated with drilling at existing ground level on the proposed MP4 open pit extension areas is expected to result in noise levels of 36 dB $L_{Aeq}(15\text{ min})$ or less at all nearby residential properties and other receiving locations. This complies with the night time noise standard of 40 – 45 dB $L_{Aeq}(15\text{ min})$ at all receivers.

The expected noise levels from MP4 drilling activity alone have been provided in Appendix 2 at the end of this report.

5.3.2 Surface level earthworks

As noted above, excavation equipment is likely to operate at surface level during the initial stages of open pit mining operations on expanded pit areas. Additionally, earthmoving equipment associated with waste rock stack construction may occur at or above surface level. Excavation and waste rock movement operations are typically a 24-hour operation and therefore the activity must be assessed against the night time acoustic criteria.

As with drilling above, we have modelled a variety of scenarios with excavation equipment operating at the existing surface level at many different locations around the full perimeter of each pit expansion area, including Innes Mills, Golden Bar, Coronation, and Coronation North, and the full perimeter of waste rock disposal and/or pit backfill areas.

For each open pit expansion area, we have modelled a scenario with a single excavator and a dozer operating simultaneously and continuously in the worst-case location for a 15-minute period. For waste rock disposal / backfill areas, we have modelled a single dozer and a grader operating simultaneously and continuously in the worst-case location for a 15-minute period. For this modelling, terrain was configured to be the worst-case (highest terrain) for each area. For new mining areas, this is the existing terrain height (derived from the supplied LiDAR data). For waste rock disposal / backfill areas, the worst-case terrain scenario is the proposed final stack height.

Based on this analysis, our modelling indicates that noise associated with surface level earthworks is expected to result in noise levels of 37 dB $L_{Aeq} (15 \text{ min})$ or less at all nearby residential properties and other receiving locations. This complies with the night time noise standard of 40 – 45 dB $L_{Aeq} (15 \text{ min})$ at all receivers.

The expected noise levels from MP4 surface level earthworks activity alone have been provided in Appendix 3 at the end of this report.

5.3.3 *Temporary construction noise*

As noted previously, various aspects of the MP4 operation will involve temporary construction activities, including establishment of the Open Pit Workshop and hydraulic mining operations, and road building associated with the Macraes Road realignment. Noise from all temporary construction activities associated with MP4 is expected to be less than 30 dB $L_{Aeq} (15 \text{ min})$ at all residential receiving locations. This is a very low level and is not expected to meaningfully add to the noise levels received from other sources (such as removal of extracted rock).

5.4 Cumulative noise

In this section, we analyse cumulative noise from proposed MP4 activities, together with noise from known existing and consented OGNZL activity on the Macraes site.

Coronation North Stage 5 mining activity

An extension to the Coronation North mine is currently planned to occur until the middle of year 2 of the MP4 project. This project was consented in 2019, and variations for Coronation North mining were issued in late 2024.

We have previously completed an Assessment of Environmental Noise Effects report for the Coronation North Stage 5 activity (AES file reference AC19058 – 01 – R2 and dated the 21st of March 2019). We have also received updated ore haulage truck movement data for Coronation North Stage 5, and we have included this in our assessment of cumulative noise alongside the proposed MP4 activities.

Innes Mills Stage 9 Continuity Consent Project (CCP2) – extension mining activity

A proposed extension to the Innes Mills mine is currently planned to occur between 2026 and the end of year 1 of the MP4 project. This activity was consented under the Continuity Consent Stage 2 project application in 2025. We have also received updated ore haulage truck movement data for Innes Mills Stage 9, and we have included this in our assessment of cumulative noise alongside the proposed MP4 activities.

Golden Point Underground (GPUG) extension and expansion mining activity

A proposed extension and expansion to the GPUG mine (beneath Deepdell Creek) is currently scheduled to occur up to year 3 of MP4. This activity was consented under the GPUG expansion project application in 2025.

We have previously completed an Assessment of Environmental Noise Effects report for the consented GPUG activity (AES file reference AC19259 – 04 – R3 and dated the 24th of February 2025). We have therefore based our assessment of cumulative noise from the GPUG extension and expansion and MP4 activities on the levels outlined in this previous report.

5.4.1 Expected cumulative noise levels

Based on the above, we have assessed cumulative noise levels from ongoing noise generating activity during concurrent operation of the proposed MP4 activity, alongside Coronation North Stage 5, CCP2 (Innes Mills Stage 9), and GPUG during the overlapping years of each mining project. The expected worst-case cumulative noise levels from concurrent activities during the night time period are summarised below:

- At the notional boundary of receiver 20 (406 Horse Flat Road), in year 1 of MP4: an increase of 13 dB (above the MP4-only predicted level for ongoing activity in appendix 1) – to an overall level of 44 dB L_{Aeq} (15 min).

We have discussed effects from cumulative MP4 noise and existing, consented activity in section 8.0 below.

6.0 OVERALL NOISE LEVELS

For the majority of the project duration the ongoing activity noise levels outlined in section 5.2 above are expected to be representative of the worst-case night time noise emissions from the project (the loudest 15-minute period in any month of the relevant year, not present for the whole year).

However, from time to time, temporary surface activities (including surface excavation and drilling) may occur concurrently with ongoing rock extraction activity during the night time period. This may happen during the initial stages of open pit mining operations on new / expanded pit areas, and/or at the later stages of construction of waste rock storage areas, as the elevation of the waste rock stack approaches its final height.

In this section we have outlined expected overall noise levels if both temporary activities (as discussed in section 5.3 above) and worst-case ongoing activities (as discussed in section 5.2 above) occur concurrently. We note that this is a conservative assessment that assumes that peak activity takes place continuously in the loudest location at the same time, alongside peak haulage activity, and favourable noise propagation conditions. In reality, this is unlikely to occur.

Our modelling in this section is based on day time-only operation of temporary surface activity in the specific areas of Frasers West Waste Rock Stack (FWWRS) and Innes Mills Back Fill Stage 1 (IMBF1) outlined in section 7.2 below.

We have also included in this section noise from existing, consented activity activities (as discussed in section 5.4 above). Note that these existing activities are expected to overlap with MP4 during project years 1 and 2 only.

The overall worst-case noise levels from concurrent ongoing and temporary surface level activities, and cumulative noise from existing consented activities, are shown in table 6.1 below.

Table 6.1 – Expected overall noise levels from concurrent activities

Location		Highest expected noise level (dB L _{Aeq} (15 min))										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
1	1668 Macraes Road	44	44	45	44	45	44	43	44	44	43	39
2	1700 Macraes Road	43	44	45	45	45	44	43	45	44	44	39
3	1704 Macraes Road	43	43	44	44	44	43	42	44	43	43	39
4	1702 Macraes Road	44	44	45	45	45	44	43	45	44	44	39
5	1720 Macraes Road	42	42	43	43	43	43	41	43	43	42	37
6	1726 Macraes Road*	42	42	43	43	43	43	41	43	42	42	37
7	2 Hill Street*	41	42	43	43	43	42	41	42	42	41	37
8	1738 Macraes Road	41	41	42	42	42	41	40	41	41	41	35
9	3 Hill Street	38	39	40	40	39	37	35	36	36	36	35
10	47 Hyde Street	39	39	40	40	40	39	38	39	39	39	36
11	1 Hill Street	39	39	40	40	40	38	37	39	38	38	36
12	1755 Macraes Road	38	39	40	40	40	38	37	38	38	38	35
13	1757 Macraes Road	38	39	40	40	40	39	38	39	39	39	35
14	1758 Macraes Road	39	39	40	40	40	38	37	38	38	38	36
15	1760 Macraes Road	39	39	40	40	40	38	37	38	38	38	36
16	6 Hyde Street*	39	39	40	40	40	38	37	39	38	38	36
17	15 Hyde Street	39	39	40	40	40	38	37	39	38	38	36
18	1801 Macraes Road	38	38	39	39	39	37	36	37	37	37	33
19	11 Hyde Street	39	39	40	40	41	38	37	39	38	38	36
20	406 Horse Flat Road	44	44	44	39	45	46	34	35	37	41	34
21	497 Red Bank Road*	-	31	32	32	32	-	-	-	-	-	-
22	546 Red Bank Road	-	32	33	33	33	31	-	-	-	-	-

* Non-residential

Levels exceeding the Rural General Zone and Township Zone night time noise standard in the OWDP (40 dB L_{Aeq} (15 min)) have been highlighted. Where the predicted levels are below 30 dB, these have not been stated, as it is unlikely that noise at these levels will be audible. Residential properties not owned by OGNZL have been bolded.

We have discussed effects from MP4 noise in section 8.0 below.

7.0 MITIGATION

7.1 Mitigation at 406 Horse Flat Road

For the property at 406 Horse Flat Road, we understand that OGNZL has previously funded upgrades to this dwelling and has agreed previously with the owner/occupier of the property that provided noise levels are limited to 51 dB L_{Aeq} (15 min) or less, that effects would be considered acceptable and Affected Party Approval will be provided. We understand that OGNZL is seeking to replicate this agreement to cover MP4. As noted in section 5.4 above, noise levels associated with MP4 activities are expected to be less than 51 dB L_{Aeq} (15 min) for the full duration of the project.

7.2 Mitigation at 1668 Macraes Road

For the property at 1668 Macraes Road, we understand that OGNZL has previously funded upgrades to this dwelling and has agreed previously with the owner/occupier of the property that provided noise levels are limited to 45 dB L_{Aeq} (15 min) or less, that effects would be considered acceptable and Affected Party Approval will be provided. We understand that OGNZL is seeking to replicate this agreement to cover MP4. However, mitigation will be required to achieve the same limits.

We recommend that construction of a noise protection bund wall be considered in the neighbouring land parcel to the east of 1668 Macraes Road (the neighbouring parcel is owned by OGNZL). The bund would need to have a height of 4 metres above ground level at its southernmost extent, tapering to ground level at the north end as the terrain rises. The indicative size and location of the bund is shown in figure 7.1 below.



Figure 7.1 – Potential location for noise protection bund wall

Provided the above bund is adopted (or a similarly effective design), and provided the further mitigation in section 7.3 below is adopted, we expect that noise levels from all MP4 activities will be 45 dB L_{Aeq} (15 min) or less during all years of MP4 operation, when received within the notional boundary of the property at 1668 Macraes Road. As outlined above, noise at this level is consistent with existing agreed noise limits at this property, the WHO and NZS6802:2008 recommendations to allow occupants to sleep with windows open for ventilation.

7.3 Day time only operation of temporary surface activities

We note that two key areas of MP4 waste rock disposal locations have effective line of sight to Macraes Town, and the surrounding residential receivers. Noise from these two MP4 waste rock disposal locations (when combined with peak haulage activity) may result in exceedances of the respective night time noise limits at these dwellings.

If operations in these two specific areas occur during the day time period only, noise levels from temporary surface activities are expected to reduce to 36 dB L_{Aeq} (15 min) or less at all receiving locations during the night time period. This would mean that noise from concurrent ongoing and temporary surface level activities during the night time would comply with a night time noise standard of 40 – 45 dB L_{Aeq} (15 min) at all receivers.

We have outlined in figure 7.2 below the specific areas of Frasers West Waste Rock Stack (FWWRS) and Innes Mills Back Fill Stage 1 (IMBF1) where day time operations only are recommended.



Figure 7.2 – FWWRS and IMBF1 surface level operations

To clarify, the day / night time periods for the Rural General Zone and Township Zone under the OWDP are defined as follows:

Day time

Monday to Friday 0700 to 2200 hours
Saturday 0800 to 1900 hours

Night time

At all other times and any public holiday

We understand from discussion with OGNZL that it is operationally feasible for earthworks operations in the above areas to occur during the day time period only.

8.0 NOISE EFFECTS

As shown in table 6.1 above, noise levels from worst-case MP4 activity (and existing consented activity) are expected to exceed the limits of the OWDP Rural General and Township Zones at several nearby receivers, summarised as follows:

- At the notional boundary of the private dwelling at 1668 Macraes Road there is potential for levels of up to 43 to 45 dB $L_{Aeq} (15 \text{ min})$ to be received during most years of the project operation.
- At the notional boundary of the private dwelling at 406 Horse Flat Road, there is potential for levels of 41 to 46 dB $L_{Aeq} (15 \text{ min})$ to be received during several years of the project.
- At receivers 2 – 5 and 8 (which are dwellings owned by OGNZL), noise levels of between 41 to 45 dB $L_{Aeq} (15 \text{ min})$ could be received during most years of the project operation.
- At receivers 6 – 7 (privately owned non-residential sites) there is potential for levels of 41 to 43 dB $L_{Aeq} (15 \text{ min})$ to be received during most years of the project operation.
- At the notional boundary of all other privately-owned dwellings (receivers 10, 17, 18, and 19), noise levels of 40 dB $L_{Aeq} (15 \text{ min})$ or less are expected during all years of MP4.

As discussed in section 4.7, where predicted noise levels are 45 dB $L_{Aeq} (15 \text{ min})$ or less, this is still consistent with the WHO and NZS6802:2008 recommendations to allow occupants to sleep with windows open for ventilation. The noise levels predicted for MP4 are based on reasonable worst-case operational scenarios and are not expected to be present all the time. Based on this, at properties where noise levels are no higher than 45 dB $L_{Aeq} (15 \text{ min})$, it is expected that noise effects would be no more than minor.

For the property at 1668 Macraes Road, as noted previously, we understand that OGNZL has funded upgrades to this dwelling and has an agreement for previous consents with the owner/occupier of this property that, provided noise levels are limited to 45 dB $L_{Aeq} (15 \text{ min})$ or less, effects would be considered acceptable and Affected Party Approval will be provided. Provided the mitigation discussed in section 7.0 above is adopted, this agreed limit is expected to be met.

For the property at 406 Horse Flat Road, we understand that OGNZL has funded upgrades to this dwelling and has an agreement for previous consents with the owner/occupier of this property that, provided noise levels are limited to 51 dB $L_{Aeq} (15 \text{ min})$ or less, Affected Party Approval will be provided. We understand that it is being sought to extend this agreement to cover MP4. As the predicted noise levels are lower than 51 dB $L_{Aeq} (15 \text{ min})$, noise effects are not considered further.

9.0 COMPLIANCE AT THE MMPMZ BOUNDARY

As noted in section 4.7 above, we consider that assessment of noise levels at the notional boundaries of residential dwellings is most appropriate for determining noise effects from mining activity on the OGNZL Macraes site. However, the OWDP also includes noise standards at the MMPMZ boundary. As this boundary is largely located in remote rural locations where there are no dwellings in the vicinity, we do not consider the noise levels along this boundary to be representative of the effects experienced by the owner/occupier of the property impacted.

We note that some MP4 and existing consented mining activity occurs in very close proximity to the MMPMZ boundary, and in some locations (Coronation pit, Coronation North pit, Golden Bar pit) occurs outside the MMPMZ boundary. Therefore, the noise standards outlined for the MMPMZ will not be met regardless of the proposed level of the activity, as equipment will be driving back and forth over (or directly alongside) the MMPMZ boundary (as is already the case with existing consented activity in a number of locations).

We have modelled noise levels at all locations around the MMPMZ boundary during all years of the proposed MP4 operation. Modelling has been based on the cumulative levels for all OGNZL activity.

Figure 9.1 below shows, with red lines, locations along the MMPMZ boundary where the OWDP boundary night time noise standard (40 dB $L_{Aeq}(15\text{ min})$) is expected to be exceeded at some point during the MP4 project life span and a non-compliance would occur. Properties (land) adjacent to areas of exceedance at the boundary have been indicated (excluding OGNZL owned titles), and these are discussed further in table 9.1 below.

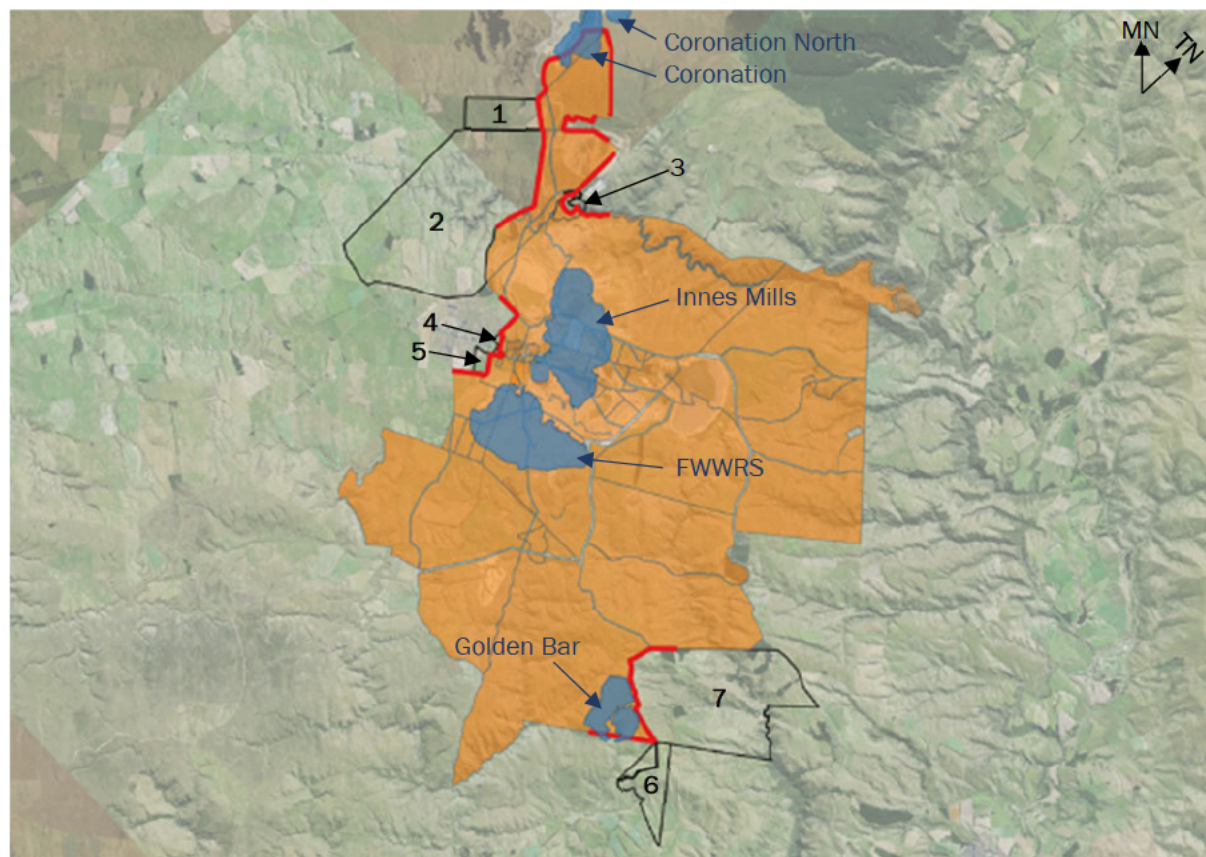


Figure 9.1 - Compliance at the MMPMZ boundary

We note the non-compliances referred to above are based on exceedance of the OWDP MMPMZ night time noise standard (40 dB L_{Aeq} (15 min)). During the daytime, given the higher noise standard at the MMPMZ boundary (50 dB L_{Aeq} (15 min)), the overall areas of exceedance will be smaller. Nevertheless, some exceedance in the same general locations is still expected, and is inevitable based on the location of activity.

Table 9.1 below outlines the non-OGNZL owned properties identified in figure 9.1 above where non-compliances would be expected along parts of the MMPMZ boundary during some periods of MP4 operation.

Table 9.1 – Non-OGNZL owned sites adjacent to the MMPMZ boundary where a non-compliance is expected

Reference (from figure 9.1)	Site	Description
1 & 2	<u>Owner: Private</u> <u>Titles: OT14C/1088 and OT14C/1089</u>	These exceedances are primarily due to ore haulage trucks travelling between the Coronation & Coronation North pits and the Processing Plant, which travel along part of the MMPMZ boundary.
3	<u>Owner: Crown</u> <u>(Golden Point Reserve)</u> <u>Titles: OT17D/1098 and OT420/92</u>	These exceedances are primarily due to ore haulage trucks travelling between the Coronation & Coronation North pits and the Processing Plant.
4 – 5	<u>Owner: Private</u> <u>Title: OT16B/853</u>	These exceedances are primarily due to activity in the Innes Mills area.
6	<u>Owner: Private</u> <u>Title: OT10D/121</u>	These exceedances are due to activity in the Golden Bar area.
7	<u>Owner: Private</u> <u>Title: OT14C/205</u>	These exceedances are due to ore haulage trucks travelling between the Golden Bar pit and the Processing Plant, which travel along part of the MMPMZ boundary.

It should be noted that the non-compliances generally all occur in remote rural locations (with the exception of References 4 & 5) which are far from any residential receivers. Therefore, we do not expect any adverse noise effects from these exceedances.

References 4 & 5 are closer to the Macraes Township, and reference 4 is the site containing the 1668 Macraes Road residential dwelling (discussed previously in this report). In this case, while a noise level of up to 49 dB L_{Aeq} (15 min) may be expected along parts of the MMPMZ boundary in this area, the more relevant observation is that at the notional boundary of the dwelling on the site, noise levels are not expected to exceed 45 dB L_{Aeq} (15 min), and effects from noise at this level have been discussed in section 8.0 above.

10.0 CONCLUSION

Noise from a range of sources expected to be associated with the proposed MP4 project and concurrent existing mining activities has been considered.

As the mining activity may operate continuously throughout the day and night time period it is the noise emitted during the night time period that will have the most effect on the nearby residential properties. Based on a review of the Waitaki and Dunedin City District Plans, previous consents, and other relevant guidance, ideally noise levels from MP4 would be managed so that they were less than 40 dB $L_{Aeq} (15 \text{ min})$ during the night time period when received at the notional boundary of dwellings. However, we note that recognised guidance suggests noise levels of up to 45 dB $L_{Aeq} (15 \text{ min})$ would still allow occupants to sleep with windows open. Noise levels between 40 and 45 dB $L_{Aeq} (15 \text{ min})$ are therefore considered to be acceptable, with effects which are no more than minor.

Our calculations predict that noise levels associated with the MP4 project will comply with the relevant OWDP night time criteria at the notional boundaries of most nearby residential dwellings, with the following exceptions:

- At the notional boundary of the private dwelling at 1668 Macraes Road there is potential for levels of up to 43 to 45 dB $L_{Aeq} (15 \text{ min})$ to be received during most years of the project operation.
- At the notional boundary of the private dwelling at 406 Horse Flat Road, there is potential for levels of 41 to 46 dB $L_{Aeq} (15 \text{ min})$ to be received during several years of the project.
- At receivers 2 – 5 and 8 (which are dwellings owned by OGNZL), noise levels of between 41 to 45 dB $L_{Aeq} (15 \text{ min})$ could be received during most years of the project operation.
- At receivers 6 – 7 (privately owned non-residential sites) there is potential for levels of 41 to 43 dB $L_{Aeq} (15 \text{ min})$ to be received during most years of the project operation.
- At the notional boundary of all other privately-owned dwellings (receivers 10, 17, 18, and 19), noise levels of 40 dB $L_{Aeq} (15 \text{ min})$ or less are expected during all years of MP4.

For the property at 406 Horse Flat Road, we understand that OGNZL has funded upgrades to this dwelling and has an agreement with the owner/occupier of this property for other consents that, provided noise levels are limited to 51 dB $L_{Aeq} (15 \text{ min})$ or less, Affected Party Approval will be provided. We understand that an extension to this agreement is being sought to cover MP4 activity. If this is obtained, as the predicted noise levels are lower than 51 dB $L_{Aeq} (15 \text{ min})$, noise effects need not be considered further.

For the property at 1668 Macraes Road, we understand that OGNZL has an agreement with the owner/occupier of this property for other consents that, provided noise levels are limited to 45 dB $L_{Aeq} (15 \text{ min})$ or less, Affected Party Approval will be provided. We understand that an extension to this agreement is being sought to cover MP4 activity. Options for mitigation have been outlined, including a proposed bund wall.

In addition to this mitigation, we recommend that surface level earthmoving activities in the northern part of the FWWRS area, and the western part of IMBF1 (as depicted in figure 7.2 above) occur during the day time period only – to ensure that overall cumulative night time noise levels do not exceed 45 dB $L_{Aeq} (15 \text{ min})$ within the notional boundary of the dwelling at 1668 Macraes Road, and 40 dB $L_{Aeq} (15 \text{ min})$ within the notional boundary of other nearby residential dwellings not owned by OGNZL.

Provided the above can be achieved, we expect that noise from the MP4 project will generally be appropriate and suitably controlled.

APPENDIX 1 – EXPECTED NOISE LEVELS FROM MP4 HAULAGE ACTIVITY ONLY

Location		Highest expected noise level (dB L _{Aeq} (15 min))										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
1	1668 Macraes Road	42	42	43	43	43	42	41	43	42	42	-
2	1700 Macraes Road	42	42	44	43	43	44	42	44	44	43	33
3	1704 Macraes Road	41	42	43	43	43	42	41	43	42	42	33
4	1702 Macraes Road	42	42	43	44	44	43	42	44	43	43	34
5	1720 Macraes Road	40	41	42	42	42	42	40	42	42	42	33
6	1726 Macraes Road*	41	41	42	42	42	42	40	42	42	42	33
7	2 Hill Street*	40	41	42	42	42	41	39	41	41	41	33
8	1738 Macraes Road	40	40	41	41	41	40	38	40	40	40	-
9	3 Hill Street	37	37	38	38	36	33	31	33	33	33	-
10	47 Hyde Street	37	37	39	38	39	38	36	38	37	37	33
11	1 Hill Street	37	38	39	39	39	37	35	37	36	36	33
12	1755 Macraes Road	37	38	39	39	39	36	35	37	36	36	33
13	1757 Macraes Road	37	38	39	39	39	38	36	38	38	38	32
14	1758 Macraes Road	37	38	39	39	39	37	35	37	37	36	33
15	1760 Macraes Road	37	38	39	39	39	36	35	37	36	36	33
16	6 Hyde Street*	38	38	39	39	39	37	36	38	37	37	33
17	15 Hyde Street	38	38	39	40	40	37	36	38	37	37	33
18	1801 Macraes Road	37	37	39	38	38	36	35	37	36	36	31
19	11 Hyde Street	37	38	39	39	40	37	36	38	37	37	33
20	406 Horse Flat Road	32	44	44	38	45	46	32	34	36	41	32
21	497 Red Bank Road*	-	-	30	-	-	-	-	-	-	-	-
22	546 Red Bank Road	-	-	30	30	-	-	-	-	-	-	-

* Non-residential

Levels exceeding the Rural General Zone and Township Zone night time noise standard in the OWDP (40 dB L_{Aeq} (15 min)) have been highlighted. Where the predicted levels are below 30 dB, these have not been stated, as it is unlikely that noise at these levels will be audible. Residential properties not owned by OGNZL have been bolded.

APPENDIX 2 – EXPECTED NOISE LEVELS FROM MP4 DRILLING ACTIVITY ONLY

Location		Highest expected noise level (dB L _{Aeq} (15 min))										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
1	1668 Macraes Road	36	36	36	36	36	36	36	36	36	36	36
2	1700 Macraes Road	35	35	35	35	35	35	35	35	35	35	35
3	1704 Macraes Road	35	35	35	35	35	35	35	35	35	35	35
4	1702 Macraes Road	35	35	35	35	35	35	35	35	35	35	35
5	1720 Macraes Road	33	33	33	33	33	33	33	33	33	33	33
6	1726 Macraes Road*	33	33	33	33	33	33	33	33	33	33	33
7	2 Hill Street*	32	32	32	32	32	32	32	32	32	32	32
8	1738 Macraes Road	32	32	32	32	32	32	32	32	32	32	32
9	3 Hill Street	31	31	31	31	31	31	31	31	31	31	31
10	47 Hyde Street	31	31	31	31	31	31	31	31	31	31	31
11	1 Hill Street	31	31	31	31	31	31	31	31	31	31	31
12	1755 Macraes Road	-	-	-	-	-	-	-	-	-	-	-
13	1757 Macraes Road	-	-	-	-	-	-	-	-	-	-	-
14	1758 Macraes Road	30	30	30	30	30	30	30	30	30	30	30
15	1760 Macraes Road	30	30	30	30	30	30	30	30	30	30	30
16	6 Hyde Street*	-	-	-	-	-	-	-	-	-	-	-
17	15 Hyde Street	-	-	-	-	-	-	-	-	-	-	-
18	1801 Macraes Road	-	-	-	-	-	-	-	-	-	-	-
19	11 Hyde Street	-	-	-	-	-	-	-	-	-	-	-
20	406 Horse Flat Road	-	-	-	-	-	-	-	-	-	-	-
21	497 Red Bank Road*	-	-	-	-	-	-	-	-	-	-	-
22	546 Red Bank Road	-	-	-	-	-	-	-	-	-	-	-

* Non-residential

Levels exceeding the Rural General Zone and Township Zone night time noise standard in the OWDP (40 dB L_{Aeq} (15 min)) have been highlighted. Where the predicted levels are below 30 dB, these have not been stated, as it is unlikely that noise at these levels will be audible. Residential properties not owned by OGNZL have been bolded.

APPENDIX 3 – EXPECTED NOISE LEVELS FROM MP4 SURFACE LEVEL EARTHWORKS ONLY

Location		Highest expected noise level (dB L _{Aeq} (15 min))										
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
1	1668 Macraes Road	37	37	37	37	37	37	34	34	34	35	35
2	1700 Macraes Road	36	37	37	37	37	37	33	33	33	34	34
3	1704 Macraes Road	36	37	37	37	37	37	33	33	33	34	34
4	1702 Macraes Road	36	37	37	37	37	37	34	34	34	35	35
5	1720 Macraes Road	34	35	35	35	35	35	31	31	31	32	32
6	1726 Macraes Road*	33	35	35	35	35	35	31	31	31	32	32
7	2 Hill Street*	33	34	34	34	34	34	31	31	31	32	32
8	1738 Macraes Road	32	34	34	34	34	34	-	-	-	31	31
9	3 Hill Street	30	32	32	32	32	32	-	-	-	30	30
10	47 Hyde Street	31	32	32	32	32	32	31	31	31	31	31
11	1 Hill Street	31	34	34	34	34	34	-	-	-	31	31
12	1755 Macraes Road	31	33	33	33	33	33	-	-	-	-	-
13	1757 Macraes Road	31	33	33	33	33	33	-	-	-	-	-
14	1758 Macraes Road	31	33	33	33	33	33	-	-	-	30	30
15	1760 Macraes Road	31	33	33	33	33	33	-	-	-	-	-
16	6 Hyde Street*	30	32	32	32	32	32	-	-	-	-	-
17	15 Hyde Street	-	32	32	32	32	32	-	-	-	-	-
18	1801 Macraes Road	-	31	31	31	31	31	-	-	-	-	-
19	11 Hyde Street	30	32	32	32	32	32	-	-	-	-	-
20	406 Horse Flat Road	-	-	-	-	-	-	-	-	-	-	-
21	497 Red Bank Road*	-	-	-	-	-	-	-	-	-	-	-
22	546 Red Bank Road	-	-	-	-	-	-	-	-	-	-	-

* Non-residential

Levels exceeding the Rural General Zone and Township Zone night time noise standard in the OWDP (40 dB L_{Aeq} (15 min)) have been highlighted. Where the predicted levels are below 30 dB, these have not been stated, as it is unlikely that noise at these levels will be audible. Residential properties not owned by OGNZL have been bolded.