MP4 Project Fast Track

Blasting Vibration and Airblast Effects Assessment

OGNZL Macraes New Zealand

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I am a mining engineer who has specialised knowledge and experience in explosives technology and commercial blasting applications for my 50+ year career. I work in most areas of civil and mining blasting including opencut and construction blasting. A major portion of my work in the past 50+ years has been in managing Risk Assessments, blasting project evaluation, auditing blasting performances and training engineers and shotfirers in safe & efficient blasting.

Limit of Liability

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Executive Summary

The following assessment, completed by TechNick, considers the potential vibration and airblast effects associated with proposed MP4 open pit and underground blasting activities at the Macraes Operation. The assessment has been based on established blasting methods currently used by OGNZL, historical monitoring data from comparable mining areas at the Macraes Operation, recognised industry-standard prediction methodologies, and the relevant consent and district plan standards.

Residential receivers and heritage structures potentially affected by blasting activities were assessed to determine likely vibration and airblast levels. Modelling of open pit blasting indicates that vibration and airblast effects at residential receivers can be managed within existing consented limits through the application of established blast design controls, including the use of reduced-charge and mini-blast designs as mining approaches sensitive boundaries. Predicted airblast levels are well below applicable limits, and vibration levels can be managed through ongoing monitoring and adjustment of blast designs where required. Accordingly, adverse effects on residential amenity are expected to be less than minor.

Potential effects on heritage buildings were also evaluated. While conservative modelling suggests that vibration levels generated by underground blasting could approach or exceed recommended guideline values at some structures within the Golden Point Historic Reserve, previous monitoring undertaken at Macraes demonstrates that actual blasting effects have generally been substantially lower than conservative predictions and have not resulted in blasting-related damage.

To manage potential effects on heritage structures, a comprehensive adaptive management approach is proposed. This includes baseline condition surveys undertaken by suitably qualified specialists, vibration monitoring at key locations, trigger levels based on recognised guidance for heritage buildings, follow-up inspections where trigger levels are exceeded, and remediation of any damage confirmed to be attributable to blasting activities. These measures provide a robust framework to identify, avoid and remedy potential adverse effects.

Based on the assessment undertaken, blasting activities associated with the proposed mining extensions can be undertaken in a manner that complies with relevant vibration and airblast standards and maintains acceptable amenity outcomes for nearby residents. Subject to implementation of the recommended monitoring, management and adaptive response measures, adverse effects from blasting are expected to be less than minor. While particular attention is required in relation to heritage structures within the Golden Point Historic Reserve, the proposed management framework provides an appropriate and effective means of managing those potential effects.

1. Introduction

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

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

To support the development of the substantive application for the Project, OGNZL has engaged Technick Consulting Pty Ltd to provide an assessment of the Project's effects on vibration and airblast effects of blasting activity for the proposed open pit and underground extensions and, to the extent required, identify any necessary management and operation measures to address any such effects.

This scope of this report is to:

- Characterise the vibration and airblast effects of blasting activity for the proposed open pit and underground mine extensions that form the basis of MP4.
- Consider the status of the residences and other potentially sensitive sites, including heritage sites, that are potentially affected by blasting activity.
- Perform modelling and calculations of predicted vibration and airblast levels based on historical records of blasting at the Macraes Operation, including blast vibration records from Frasers Open Pit and the Golden Point Underground Mine which had similar blast design characteristics to proposed blasting.
- Provide an assessment of the overall blasting vibration and airblast effects of the proposed mine extensions on nearby residences and other potentially sensitive sites in the surrounding environment including heritage sites.

2. Site Location and Description

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

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

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

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

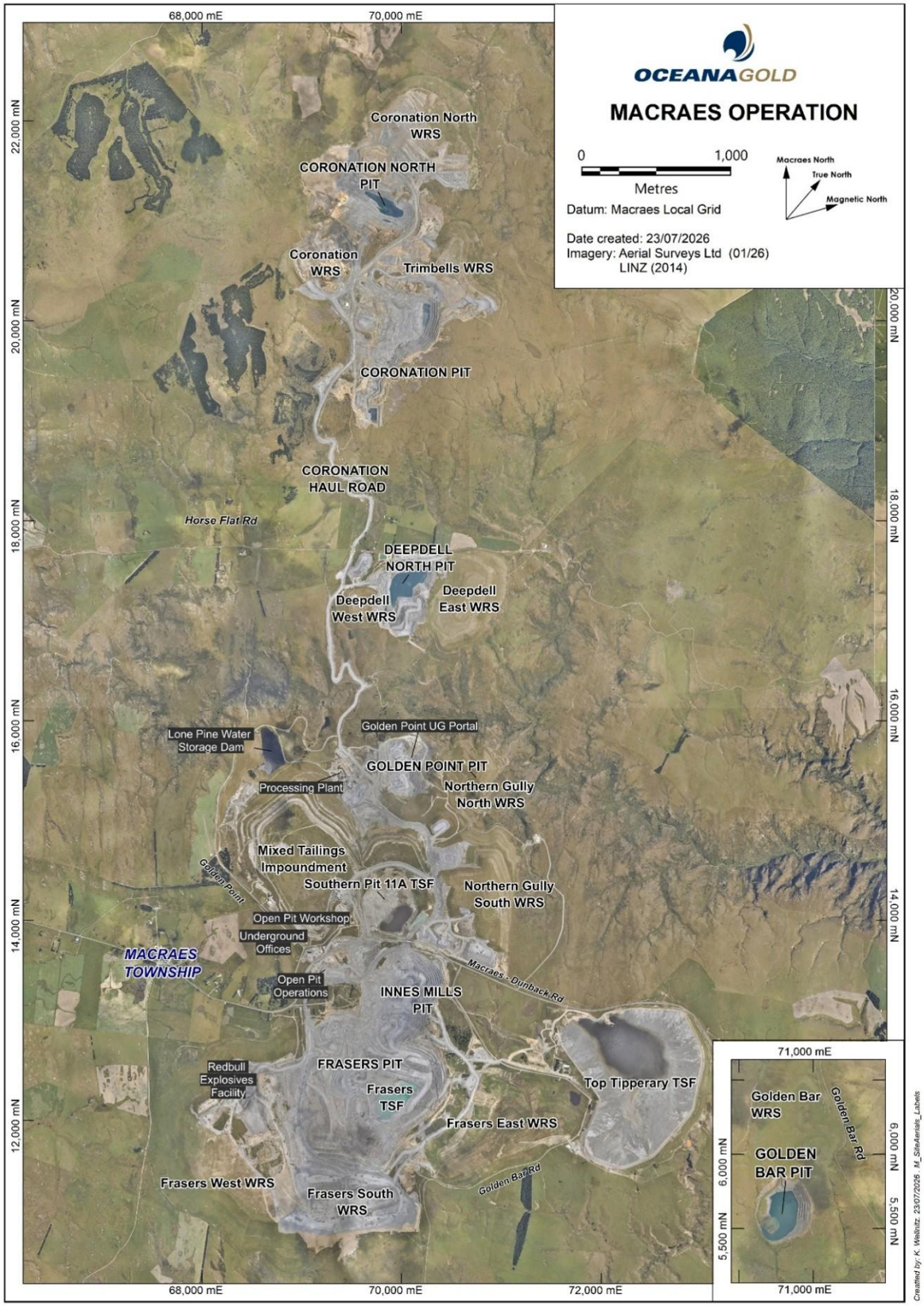


Figure 1 Existing site layout at Macraes Operation

3. 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;
    - 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.

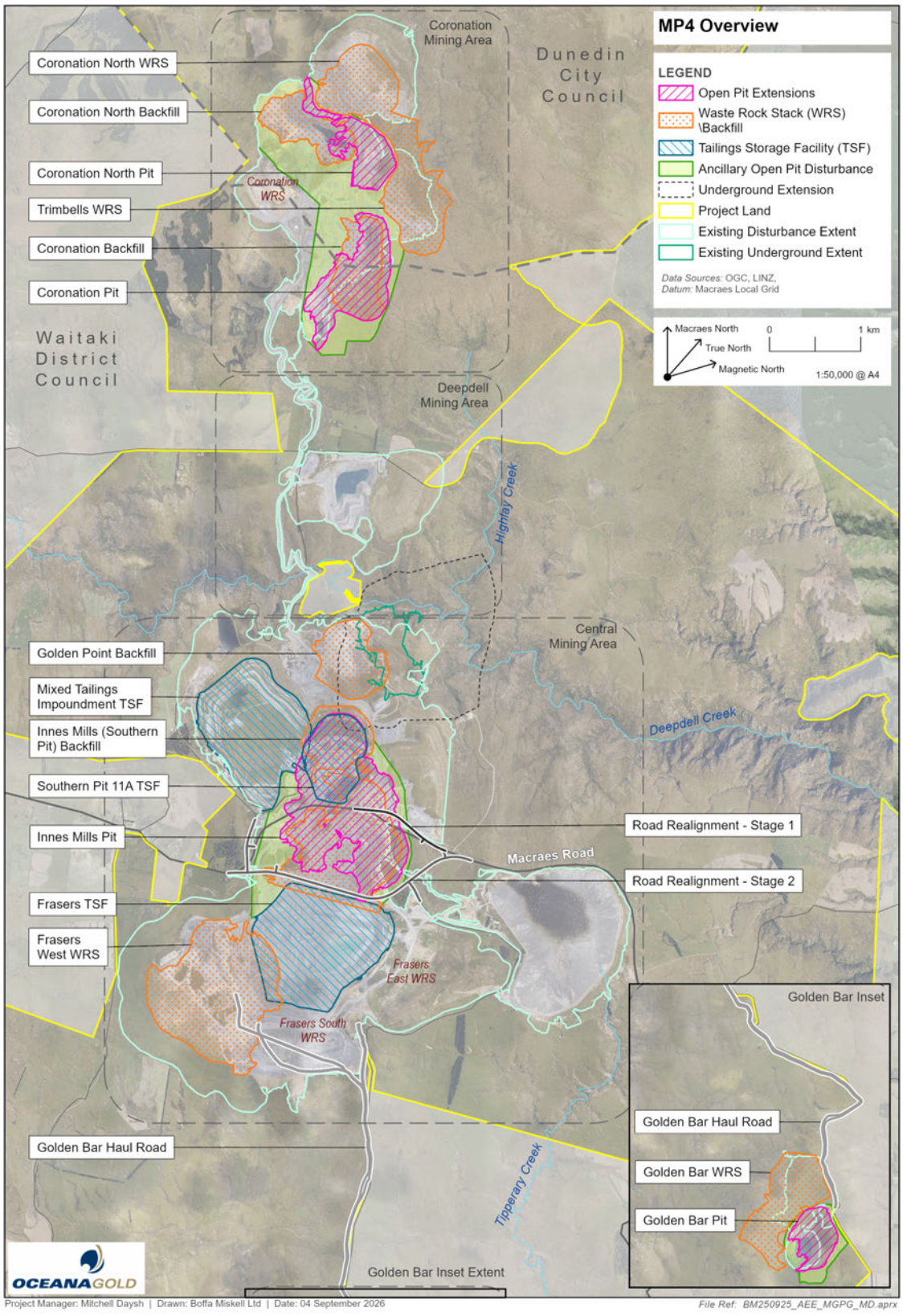


Figure 2: MP4 Project overview plan

4. Proposed blasting related activities

OGNZL operates both open pit and underground gold mines at Macraes Flat in North Otago. As per the Project Overview section, OGNZL is proposing to extend the existing Coronation, Coronation North, Innes Mills, & Golden Bar open pits and the Golden Point underground mine. The proposed extraction areas involve drilling and blasting using the same equipment and processes that are currently applied at the Macraes Operation.

4.1 Open Pit Blasting methods

The following key steps describe the general approach to blasting at the Macraes Operation:

- Drilling machines are used to drill blastholes on a predetermined pattern, to a design depth.
- Drillhole diameters for production blasting generally vary from 76mm to 200mm depending on the design parameters including rock type, required outcome and environmental implications.
- Blastholes are partly charged with calculated quantities of explosives and then inert fill material (stemming) is added to fill the hole to the surface.
- When all holes are charged, they are connected together with a delay initiation network so as to sequentially initiate each charge at slightly different instances to minimise blasting vibrations or airblast whilst producing fragmented rock for digging and processing.

For opencut mining Macraes employs a method termed ‘choke blasting’. Choke blasting is a controlled blasting technique where the broken rock (muck) from a previous blast is left in place — intentionally not mucked out — before the next blast is fired into it.

Rather than blasting into free air or a fully cleared face, explosives are detonated against a confined, resistive mass of already-broken material. The muck pile acts as a buffer or "choke" that restricts the forward movement of the newly blasted rock.

4.2 Underground blasting methods

There are three main types of blasting activities that are typical of underground mining at the Macraes Operation. These are classified as Development Blasting, Raise Blasting and Stope Blasting.

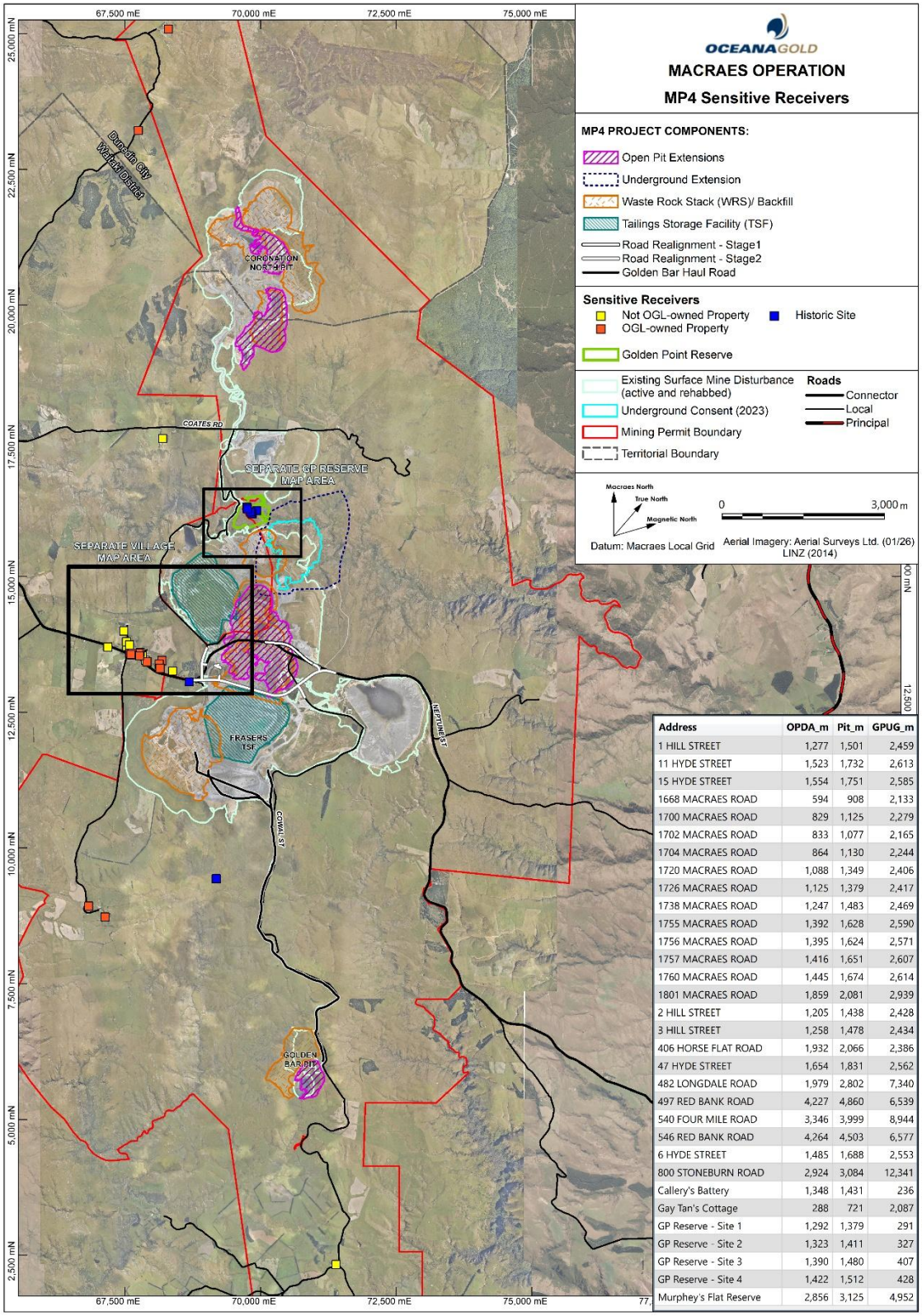
Development blasting is small scale, in terms of the blast hole diameter, blast hole length, explosive weight and overall yield of broken rock.

In Raise blasting, long blast holes are drilled between sublevels to create void spaces and drawpoints for ore removal.

The blasting that has the most potential impact vibration effects is open stope blasting. Open stope blasting utilises the greatest mass of explosive and maximum instantaneous charge which generates the highest vibrations. Long Hole Open Stoping designs have been utilised to date at the GPUG mine and will continue to be used to enable the proposed extension of the GPUG mine.

5. Sensitive sites in the surrounding environment

Proposed open pit and underground extensions have been considered in this blasting impacts study in terms of their setback distance to sensitive sites, including residential and historic sites. Included below as Figures 3, 4 and 5 are maps identifying sensitive sites, noting that not all the sites identified will be affected by blasting.



Address	OPDA_m	Pit_m	GPUG_m
1 HILL STREET	1,277	1,501	2,459
11 HYDE STREET	1,523	1,732	2,613
15 HYDE STREET	1,554	1,751	2,585
1668 MACRAES ROAD	594	908	2,133
1700 MACRAES ROAD	829	1,125	2,279
1702 MACRAES ROAD	833	1,077	2,165
1704 MACRAES ROAD	864	1,130	2,244
1720 MACRAES ROAD	1,088	1,349	2,406
1726 MACRAES ROAD	1,125	1,379	2,417
1738 MACRAES ROAD	1,247	1,483	2,469
1755 MACRAES ROAD	1,392	1,628	2,590
1756 MACRAES ROAD	1,395	1,624	2,571
1757 MACRAES ROAD	1,416	1,651	2,607
1760 MACRAES ROAD	1,445	1,674	2,614
1801 MACRAES ROAD	1,859	2,081	2,939
2 HILL STREET	1,205	1,438	2,428
3 HILL STREET	1,258	1,478	2,434
406 HORSE FLAT ROAD	1,932	2,066	2,386
47 HYDE STREET	1,654	1,831	2,562
482 LONGDALE ROAD	1,979	2,802	7,340
497 RED BANK ROAD	4,227	4,860	6,539
540 FOUR MILE ROAD	3,346	3,999	8,944
546 RED BANK ROAD	4,264	4,503	6,577
6 HYDE STREET	1,485	1,688	2,553
800 STONEBURN ROAD	2,924	3,084	12,341
Callery's Battery	1,348	1,431	236
Gay Tan's Cottage	288	721	2,087
GP Reserve - Site 1	1,292	1,379	291
GP Reserve - Site 2	1,323	1,411	327
GP Reserve - Site 3	1,390	1,480	407
GP Reserve - Site 4	1,422	1,512	428
Murphey's Flat Reserve	2,856	3,125	4,952

Figure 3: Macraes Operation - overview of sensitive sites

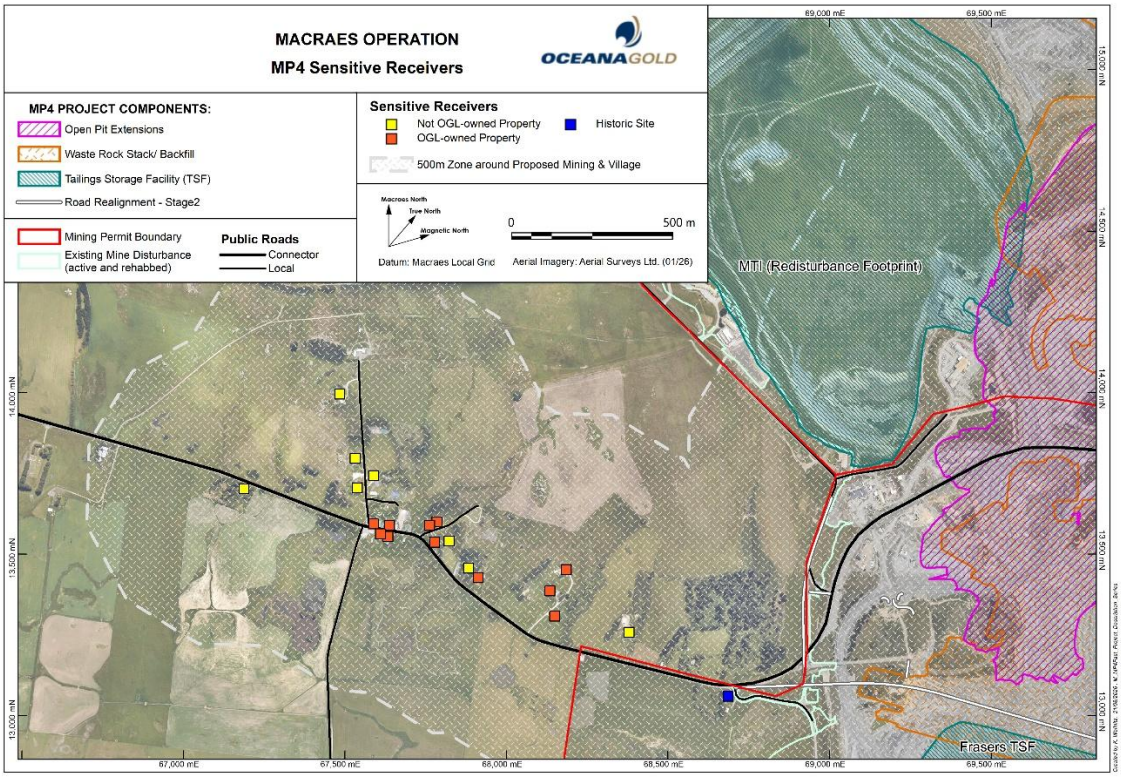


Figure 4: Macraes Township - sensitive sites

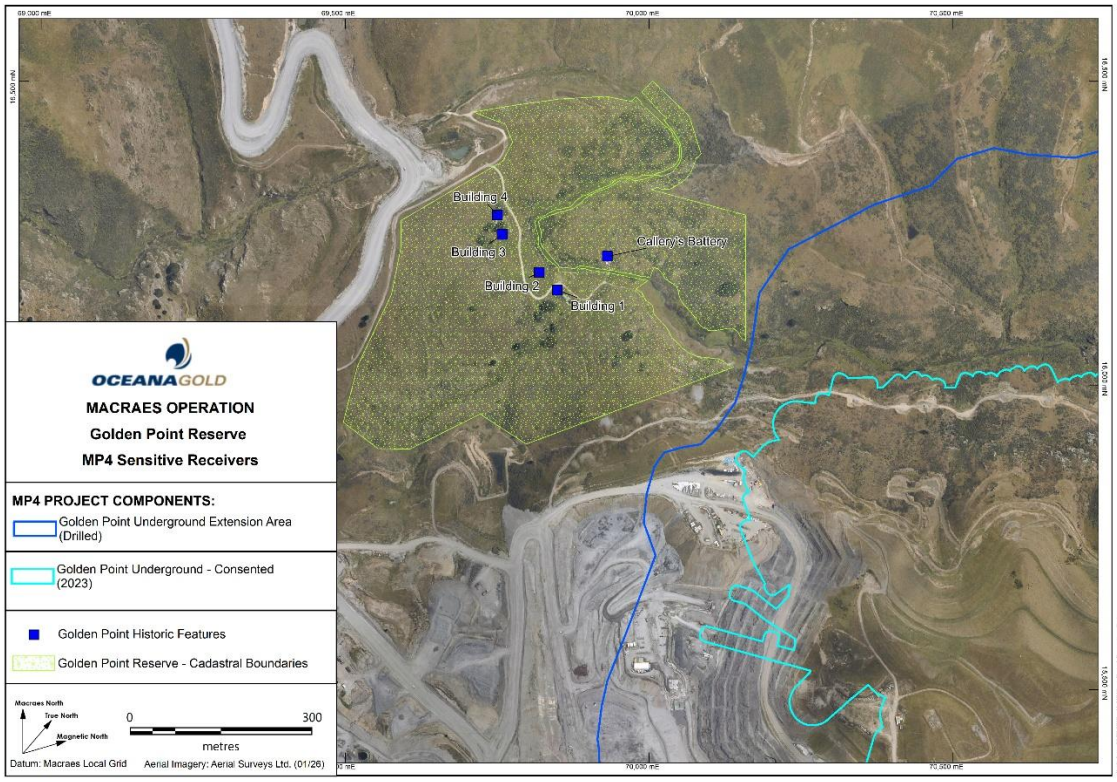


Figure 5: Golden Point Historic Reserve sensitive sites (historic)

5.1 Potentially Affected Residential Sites

Table 1 identifies the closest sensitive residential sites to each of the proposed open pit and underground mine extensions. Where the closest residence is owned by OGNZL, the next closest privately owned residence has been included. The closest existing residence (1668 Macraes Road) will be no closer than 908m from any blasting. The potential impacts of blasting at all potentially impacted residences can be managed using the same measures which are recommended for 1668 Macraes Road.

Table 1: Closest residential sites to open pit and underground blasting

Blasting location	Location of closest residences	Set back Distance (m)
Coronation Pit	406 Horse Flat Road	2066
Coronation North Pit	482 Longdale Road (OGNZL owned)	2802
	406 Horse Flat Road	3242
Golden Bar Pit	800 Stoneburn Road	3084
Innes Mills Pit	1668 Macraes Road	908
Golden Point Underground	406 Horse Flat road	2569

5.2 Potentially affected Historical / Heritage Sites

Table 2 identifies sensitive heritage sites where they exist within 1000 m of the proposed open pit and underground mine extensions. The closest historic site to open pit blasting is Gay Tans Cottage with a setback of 721 m from blasting. The closest historic site to underground blasting is Callery's Battery with a setback of 239 m from potential blasting, noting that Building 2 which is setback 326 m has been constructed with plaster and is therefore considered more vulnerable to the effects of blasting than Callery's Battery, despite the increased setback distance.

Table 2: Historic sites potentially impacted by open pit and underground blasting

Blasting location	Name	Description	Setback distance (m)
Innes Mills Pit	Gay Tans Cottage	Mortared mud brick with mud and lime render	721
Golden Point Underground	Callery's Battery	Timber-frame clad with corrugated iron sheets	239
	Building 1	Timber-frame clad with weatherboards	261
	Building 2	Sod with mud and lime render	326
	Building 3	Sod with mud (and lime?)	411
	Building 4	Sod with mud and lime render	432

Buildings 2-4 have been re-rendered at different times. A historic culvert wall is located approximately 170 m from the Golden Bar pit boundary. The structure is a schist dry-stone retaining wall and as such, is highly unlikely to be impacted by blasting. The historic culvert wall has not been considered further in this assessment.

6. Blasting criteria

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

6.1 AS 2187.2-2006 Explosives — Storage and use, Part 2: Use of explosives

Australian Standard (AS) 2187.2-2006 outlines limits for the reasonable protection of health and amenity (human comfort) from blasting impacts. Table J4.5 from the standard and included below as Table 3 forms the basis of the existing resource consent conditions for blasting operations at the Macraes Operation.

Table 3 Vibration Limits for Human Comfort as presented in Appendix J TABLE J4.5(A) Ground Vibration Limits For Human Comfort in Standard AS 2187.2-2006

Category	Type of blasting operations	Peak component particle velocity (mm/s)
Sensitive site*	Operations lasting longer than 12 months or more than 20 blasts.	5 mm/s for 95% blasts per year 10 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply
Sensitive site*	Operations lasting for less than 12 months or 20 blasts.	10 mm/s maximum unless agreement is reached with occupier that a higher limit may apply
Occupied non-sensitive sites, such as factories and commercial premises	All blasting	25 mm/s maximum unless agreement is reached with occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacturer's specifications or levels that can be shown to adversely affect the equipment operation

* Sensitive site includes occupied private houses & low rise residential buildings, theatres, schools, etc

6.2 Existing Resource Consent Conditions

OGNZL holds several resource consents for mining operations at the Macraes Operation which impose conditions upon blasting activities, relevant resource consents are identified in Table X.

Table 4: Macraes Operation resource consents that impose limits on blasting

Project	Date issued	Consent reference
Macraes Phase 3	12/14/2014	201.2011.35/2
Frasers West	11/11/2020	201.2020.1519
Deepdell North Stage 3 Project	9/22/2020	WDC 201.2019.1454
Coronation Project	11/22/2013	WDC 201.2013.360 and DCC LUC-2013-225
Golden Point Underground Mine and expansion	28/02/2024	WDC 201.2023.2107
Coronation North Project	4/24/2017	DCC LUC-2016-234 and LUC-2013-225A; and WDC 201.2016.779 and 201.2013.360.1).
Consent Continuity Stage 1	18 April 2024	201.2023.2302
Consent Continuity Stage 2	29/11/2025	201.2023.2302/3

Consent conditions that apply under the resource consents listed above require that vibration and airblast effects are managed to achieve target levels at the notional boundary of residences of 5 mm/s within a frequency range of 3 to 12Hz and 115 dBL. These levels are referenced in AS2187.2.2006[1] and are widely accepted as the limits at which residential amenity values are maintained at an acceptable level.

Table 5 lists conditions that have been imposed recently at the Macraes Operation to manage open pit and underground blasting effects, as well as conditions that were imposed to manage potential effects on heritage sites associated with mining the Frasers West Pit.

Note: Table 5 does not list all conditions that pertain to blasting at Macraes.

Table 5: Key conditions that have been imposed to manage blasting effects at Macraes

Consent reference	Blasting conditions
Consents Continuity Project Stage 2 201.2023.2302/3	7. Blasting and Vibration 7.1 The Consent Holder shall ensure that blasting practices minimise air and ground borne vibration. Flyrock shall be minimised and all blasting procedures shall be carried out so as to ensure the safety of employees and the public. No blasting shall occur when the weather is unsuitable. 7.2 The location and time of blasting shall be posted daily at all the main mine entrances and advised to employees by daily email. 7.3 Blasting shall be restricted to within the following hours: Monday to Friday 9:00 am – 5:30 pm Saturday and Sunday 10:00 am – 4:30 pm

[1] Explosives — Storage and use, Part 2: Use of explosives

	7.4 Details of blasting method, strength of the blast, and time of blast shall be entered into a record kept for that purpose and shall be available to the Consent Authority on request. This information shall also be included in the monitoring report required under Condition 9. 7.5 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the Consent Holder, or subject to an agreement with the Consent Holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010 shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time. 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. 7.6 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the Consent Holder, or subject to an agreement with the Consent Holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010 shall not exceed peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting. 7.7 The Consent Holder shall not conduct blasting within the vicinity of the Macraes Road or Golden Bar Road in a manner that constitutes a danger to life or property. If the Waitaki District Council considers it necessary to temporarily close the Macraes Road or Golden Bar Road to allow blasting to take place, it may permit the Consent Holder to temporarily close the road, provided that the Consent Holder: (a) Keeps the time of closure as short as possible; and (b) Does not allow the time of closure to exceed a maximum of 15 minutes in any continuous period of 60 minutes, except where an emergency situation arises in respect of the safety of the public or project personnel. In the event of such temporary closure the Consent Holder shall: (a) Ensure appropriate barriers are erected and ensure such number of persons as may be necessary are stationed at Macraes Road or Golden Bar Road to prevent access by the public to that part of the road that shall be closed; and (b) Hold current public liability insurance to indemnify any member of the public affected. (c) Postpone any blasting in order to reopen the Macraes Road or Golden Bar Road to allow the passage of vehicles for emergency purposes.
Golden Point Underground extension 2023 201.2023.2107	Vibration on Historic Buildings 39. The consent holder shall ensure that any blasting authorised by this consent avoids any damage to historic buildings or structures located in the Golden Point Historic Reserve. To achieve this condition the following shall be complied with:

	a) Prior to the commencement of blasting, a suitably qualified and experienced structural engineer shall examine these buildings and prepare a report that summarises the baseline condition of the buildings and in particular any cracks that already occur; b) The report completed under condition 39 (a) shall be provided in writing to the Consent Authority; c) The expert shall monitor the structures at a sufficient frequency to ensure, as far as practicable, that there is no damage to the buildings that could be attributable to the blasting; d) In the event that any new visible cracks appear on the features, or any other damage that has been attributed to the blasting by the monitoring in condition 39 (c), then the Consent Holder shall immediately cease all blasting and the Consent Authority and the Department of Conservation shall be immediately informed; e) The Consent Holder shall engage suitably qualified structural engineering and blasting experts that together prepare a report which sets out the reasons why the damage is likely to be attributable to the blasting and recommendations to change the blasting methodology as a means to avoid any further damage and any recommendations to change the frequency of monitoring as necessary. This report shall be provided in writing to the Consent Authority and Department of Conservation; f) Blasting may recommence in accordance with the recommendations contained in the report prepared under condition 39 (e) and the report has been provided in writing to the Consent Authority and Department of Conservation; and g) In the event that the new visible cracks or any other damage that has been attributed to the blasting under condition 39 (d) is significant then the consent holder shall work with the Consent Authority and Department of Conservation to repair the damage at its cost. Noise, Airblast and Vibration Monitoring Plan 40. Prior to any blasting authorised by this consent, the consent holder shall produce an updated Noise, Airblast and Vibration Monitoring Plan (including a Vibration Management Plan for Heritage Structures). The plan shall include but not be limited to: a) Details of the monitoring locations, the frequency of monitoring and the methods of measurement and assessment of noise and vibration required by the conditions of this consent; b) Procedures for recording blasting method, strength of the blast and time of blast; c) Procedures to adapt the blasting methodology as means to avoid any adverse effects on those buildings described in condition 39; d) Details of how the buildings described in condition 39 are to be inspected including the frequency of inspection.
Frasers West pit extraction 201.2020.1519	Vibration on Historic Buildings 39. The consent holder shall ensure that any blasting authorised by this consent avoids any damage to the Innes Farm Buildings, Griffin House or Gay Tans Cottage shown on Figure 2 attached with this consent. To achieve this condition the following shall be complied with:

	a. Prior to the commencement of blasting, a suitably qualified and experienced structural engineer shall examine these buildings and prepare a report that summarises the baseline condition of the buildings and in particular any cracks that already occur. b. The report completed under condition 39 (a) shall be provided in writing to the Consent Authority. c. The expert shall monitor the structures at a sufficient frequency to ensure, as far as practicable, that there is no damage to the buildings that could be attributable to the blasting. d. In the event that any new visible cracks appear on the features, or any other damage that has been attributed to the blasting by the monitoring in condition 39 (c), then the Consent Holder shall immediately cease all blasting and the Consent Authority and Heritage New Zealand/ Pouhere Taonga shall be immediately informed. e. The Consent Holder shall engage suitably qualified structural engineering and blasting experts that together prepare a report which sets out the reasons why the damage is likely to be attributable to the blasting and recommendations to change the blasting methodology as a means to avoid any further damage and any recommendations to change the frequency of monitoring as necessary. This report shall be provided in writing to the Consent Authority and Heritage New Zealand/ Pouhere Taonga. f. Blasting may recommence in accordance with the recommendations contained in the report prepared under condition 39 (e) and the report has been provided in writing to the Consent Authority and Heritage New Zealand/ Pouhere Taonga. g. In the event that new visible cracks or any other damage that has been attributed to the blasting under condition 39 (d) is significant then the consent holder shall work with the Consent Authority and Heritage New Zealand/ Pouhere Taonga to repair the damage at its cost. Noise, Airblast and Vibration Monitoring Plan 40. Prior to any blasting authorised by this consent, the consent holder shall produce an updated Noise, Airblast and Vibration Monitoring Plan (including a Vibration Management Plan for Heritage Structures). The plan shall include but not be limited to: a. Details of the monitoring locations, the frequency of monitoring and the methods of measurement and assessment of noise and vibration required by the conditions of this consent; b. Procedures for recording blasting method, strength of the blast and time of blast; c. Procedures to adapt the blasting methodology as means to avoid any adverse effects on those buildings described in condition 39; d. Details of how the buildings described in condition 39 are to be inspected including the frequency of inspection.

6.2 Waitaki District Plan blasting and vibration standards

Section 6 of the Waitaki District Plan contains critical Zone Standards for the Macraes Mining Project Mineral Zone. Section 6.5.2 Vibration states:

Activities shall be conducted such that the following ground vibration levels measured either at the Macraes Mining Zone boundary or the boundary of the Golden Point Historic Reserve shall not exceed 10mm per second peak particular velocity measured in the frequency range 3 hertz and 12 hertz.

Section 6.5.3 says for Blasting:

Activities shall be conducted such that the following air blast peak over sound pressure measured either at the Macraes Mining Zone Boundary or any building within the Golden Point Historic Reserve shall not exceed 128 dB linear unweighted. The hours of blasting shall be restricted to the following

Monday – Friday 9 am to 5.30 pm

Saturday and Sunday 10 am to 4.30 pm.

6.3 Vibration and Airblast levels to protect against damage to heritage sites

Based on expert opinion[2], monitoring of blasting at the Macraes Operation (specifically Frasers West Open Pit blasting) and international blasting documentation/standards, it is considered that the impact of blasting on heritage buildings is largely determined by the type materials the buildings are constructed of. For example, plaster is more likely to be impacted by blasting activities than wood or bricks that flex or withstand much high levels of vibration and air blast. Figure J4.4.2.2 from S 2187.2:2006 defines limits based on construction materials and has been reproduced below as Figure 6.

[2] Nick Elith of Technik (MP4 blasting engineer) and Jeremy Moyle of Orgin Heritage (MP4 project heritage expert).

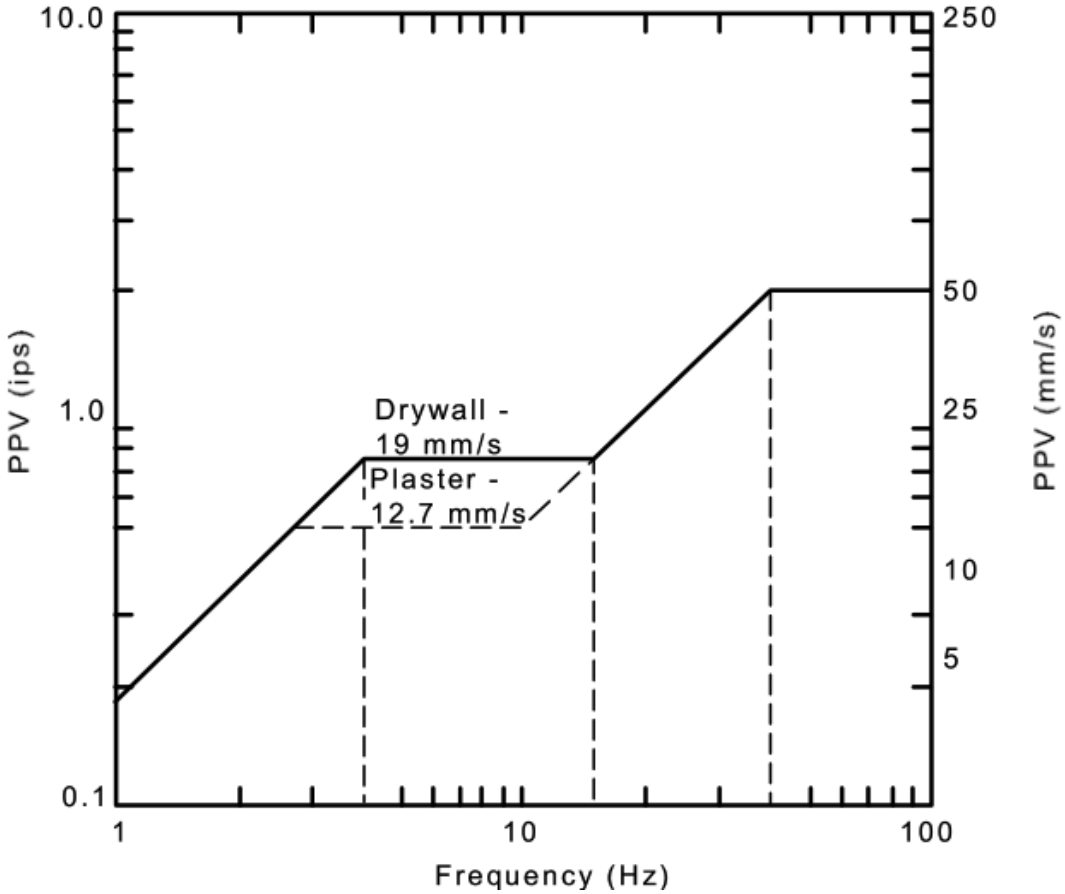


Figure 6: USBM 'Safe' Blasting vibration level criteria (Figure J4.4.2.2 from AUS 2187.2:2006

Based on Figure 6 it is considered that where possible blasting should be managed to achieve vibration levels not exceeding 12.7 mm/s at heritage sites where buildings are constructed using plaster and 19 mm/s for other buildings.

Vibration levels at heritage sites have been monitored in the past and building assessments undertaken to ensure the potential for heritage sites to be damaged was appropriately managed. During blasting at the Frasers West Open Pit maximum vibration and airblast levels of 1.3 mm/s and 122 dBL were recorded at Gaytans Cottage which was located approximately 465m from the closest blast site. Condition assessments following blasting confirmed that there was no damage to Gaytans Cottage as a result of blasting. The most recent condition assessments for Gaytans Cottage and heritage buildings within the Golden Point Historic Reserve are attached as Appendix A.

7 Open Pit Blasting

7.1 Open Pit Blast Design Characteristics

Blast designs for the open pit extensions, including drilling, charging, stemming, and firing procedures, will be essentially the same as those which are currently applied at the Macraes Operation. Of particular relevance are the procedures applied during the mining of the Frasers West Open Pit, where historic data shows that vibration and airblast overpressure levels at residential properties in the Macraes township complied with the limits in consent conditions.

This assessment has used the current and historical blast design values to calculate predicted environmental effects for each of the proposed mining extensions. Table 1 gives an indication of typical blast design parameters for the types of blasting employed at the existing open pits including explosives charge mass per hole, and MIC (Maximum Instantaneous Charge).

Included in Table 6 are the parameters for 'Normal' blasting which may be applied when at greater distances from any sensitive site. 'Normal' blasting is what is used in most instances for overburden stripping. More conservative blast designs are used in circumstances where more cautious blasting is appropriate to maintain control and minimize any environmental disturbances, such as blasting near pit limits. These more conservative blast designs are termed 'Reduced' blasting and 'Mini' blasting, they include additional measures of control as indicated in Table 6. These will be applied to ensure that blasting complies with conditioned limits for vibration and airblast.

Typical blasthole designs and configurations may have up to three holes per delay (MIC) for Ore blasts and two holes per delay (MIC) for Waste blasts.

Table 6: Typical blast parameters – OGNZL Open pits

Design parameters	Mini-blasting	Reduced	Normal
Diameter (mm)	102mm	102mm	200mm
Explosive MIC	30kg	60kg	400kg

7.2 Open Pit Blast Induced Vibrations

Vibration levels are calculated and stated as a peak particle velocity ('PPV') and measured in millimetres per second (mm/s).

Resource consents impose vibration limits consistent with the Standard AS 2187.2 in the context of preserving the comfort and amenity of persons at occupied premises and not specifically for the prevention of damage to buildings which the standard recognises as involving much higher levels of vibration.

Predicted vibration levels for properly designed, drilled and charged blasts can be calculated but these can only be verified and calibrated by taking site readings from actual blasts. At the Macraes Operation blasting has successfully been carried out in the various open pits over many years and considerable information is available to allow quality predictions for each pit extension. This means that measured vibration data will be available before any blasting is carried out in close proximity to houses or heritage sites. The volume of data from previous blasts will allow for the analysis and adjustment of blast designs to ensure levels remain below consent limits.

Survey data has been used to determine the distances from the various pit boundaries to nearby houses and heritage sites. It is rare to blast right up to the boundary of an open pit, it is more likely that due to the nature of the weathered rock, some of the upper overburden will be removed by excavation without blasting. This means that the final blasting areas are likely to be further away than those indicated in the calculations.

When approaching the final pit limits for the open pit extensions, the explosives charge (kg) per hole and MIC can be further reduced by limiting bench heights and hole diameters and this will result in substantially reduced vibrations and airblast. This is a simple technique that OGNZL regularly

employs if vibrations or airblast ever approach allowable levels and is shown in the vibration prediction tables as 'Reduced' and 'Mini' blast designs.

7.3 Prediction of Vibration levels for open pit mining

The AS2187.2 default formula used for predicting vibration levels is:

$$V = K \times \left(\frac{\sqrt{W}}{D} \right)^{1.6}$$

where:

V = peak particle velocity (PPV) or (RPPV)

W = explosives charge per delay (kg)

D = distance to damageable "target" (m)

K is a constant related to rock properties & blast design

RPPV refers to the 'Resultant' peak particle velocity which is the value taken from the accumulation of the vertical radial, and transverse individual planes. This is the most common reference applied to vibration limits and upon which the AS Standard 2187.2 is based.

AS2187.2 recognizes a range of potential 'K' values because of the wide range of geological formations world-wide. The 'K' value depends on geological conditions and the nature of the type of blast design.

For all proposed pit extensions, we have performed calculations using the AS2187.2 formula, with a 'K' value of 1200 which is at the higher end of "back-calculated" values from the historical OGNZL records.

7.4 Prediction of Airblast levels for open pit mining

Predictive calculations for airblast can vary because of the diversity of blasting configurations and the effects of pit orientation, weather and topography. For example, strong winds will increase the airblast levels in the down-wind direction. According to AS2187.2, an airblast level of 115 to 120 dBL is considered reasonable for human comfort at occupied premises, and well below any damage threshold.

Documents relating to seasonal wind directions in the area, including "Macraes Mine - Summary of Ambient Air Monitoring Results for 2016" of January 2018 and "DDN3 Wind Rose" for Macraes Flat, have been reviewed.

As outlined in the "Management Plan - Noise, Airblast and Vibration MAC-205-PLN-002-1" (Site Management Plan), it is incumbent on the mine operations management to make an assessment of the weather conditions on the day of a proposed open pit blast and to make changes to the time of a blast if conditions are unfavourable. The Site Management Plan should be reviewed and updated as necessary.

In practice, airblast levels are readily reduced simply by increasing the stemming length on blastholes, and this technique would typically be used, if necessary, in the higher bench levels where airblast is not much reduced by enclosure within the pit itself.

Airblast will reduce as the mine benches get deeper with time. As such, the airblast levels are expected to remain less than 115 dBL at the nearest residences and 120 dBL at any sensitive historical sites throughout the mining life of all the proposed open pit extensions.

AS 2187.2 2006: section J7.2 'Airblast overpressure', indicates that airblast levels are commonly estimated using the following scaling formula: Note that the kPa pressure needs to be converted to dBL and this is calculated in the airblast values for each site.

$$P = K_a X \left(\frac{R}{Q^{1/3}} \right)^{\alpha}$$

Where:

- P = pressure (kPa)
- Q = explosives charge mass (kg)
- R = distance from charge (m)
- Ka = site constant
- a = site exponent

$$P = 40 X \left(\frac{R}{Q^{1/3}} \right)^{-1.45}$$

7.5 Minimum Distance Vibration predictions by Blast Type

Table 7 shows the calculated vibrations for the identified closest residence and historic site for specified open pit blasting types.

Table 7: Vibration predictions for closest sensitive Receivers

	Mini		**Reduced**		**Production**		**Production**	
	1200	**30 kg**	**1200**	**60 kg**	**1200**	**400 kg**	**1200**	**400 kg**
Site	Distance (m)	PPV mm/s	Distance (m)	PPV mm/s	Distance (m)	PPV mm/s	Distance (m)	PPV mm/s
1668 Macraes Road - residence	910	2.6	910	3.9	910	12.3	2000	4.8
Gaytans Cottage – historic site	721	3.4	721	5.2	721	16.3	1000	11.0

The analysis in Table 7 indicates that the closest residence, 1668 Macraes Road, is predicted to experience acceptable vibration levels for both the 'Mini' and 'Reduced' blast designs where the PPV

will be less than 5 mm/s. Production blasting will have to be monitored to identify when reduced and mini blasts should be utilised to ensure compliance with specified limits. Predictions indicate that this may be necessary when the distance approaches ~ 2000m. OGNZL is obliged to ensure at all times that conditioned limits are complied with.

The analysis in Table 7 also indicates that the closest historic site, Gaytans Cottage, which contains plaster, is predicted to experience vibration levels below the 12.7 mm/s (the level at which plaster could be expected to crack) for both the 'Mini' and 'Reduced' blast designs. Production blasting will have to be monitored to identify when reduced and mini blasts should be utilised to ensure compliance with specified limits. Predictions indicate that this may be necessary when the distance approaches ~ 1000m. OGNZL is obliged to ensure at all times that conditioned limits are complied with.

Figure 7 illustrates the relationship between the different blasting designs and acceptable distances from a sensitive site.

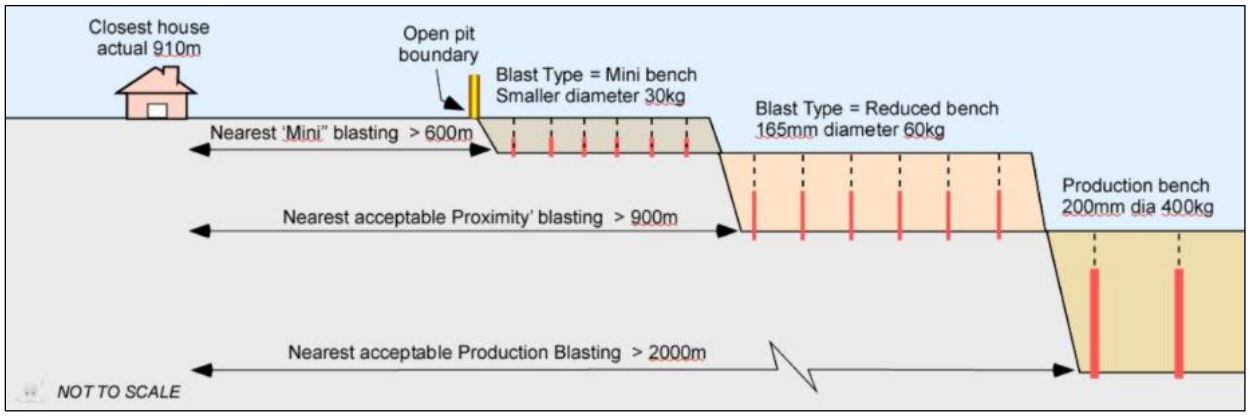


Figure 7: Relationship between blasting design and distances from a residence

7.6 Minimum Distance Airblast predictions by Blast Type

Table 8 shows the calculated Airblast for the identified closest residence.

Table 8: Minimum Distance Airblast predictions for Openpit blasting

Blast type	Mini kg'	30
Distance (m)	721	
Airblast	82	dBL

Reduced kg'	60
721	
91	dBL

Production kg	400
721	
114	dBL

This table indicates that even the closest house (1668 Macraes Road as well as Gaytan's Cottage) is predicted to experience acceptable airblast levels (less than 115 dBL) for all of the blast designs. Potential environmental effects associated with airblast are, therefore, considered to be negligible.

7.7 Measures to reduce vibration and airblast impacts from open pit blasting

The following generic recommendations should be adopted in relation to future open pit blasting activities at the Macraes Operation to manage the potential for adverse impacts.

- Standard initiation practices of firing multiple blastholes on separate millisecond delay intervals as per industry best practice. This has been part of all mine blasting at the Macraes Operation for decades.
- Within a single pit, initiation of blasting on different benches should be offset (not simultaneous) to ensure no cumulative effects.
- Between different pits, initiation of blasting should be offset (not simultaneous).
- As has been the case in the past at Macraes mining areas, and consistent with the Noise, Airblast and Vibration Monitoring Plan requirements, vibration monitoring shall be conducted at the nearest neighbour's residence and at any other sites considered sensitive or vulnerable. Such monitoring allows actual vibration levels and frequencies from all blasting activities to be recorded and reviewed, and on the basis of such readings, adjustments can be made to the predictive calculations and to ongoing blast designs to ensure compliance and human comfort.
- There may be a need to establish new monitoring positions for the proposed pit extensions based on the proximity of any sensitive sites.

These measures are proposed to be incorporated into existing management plans (refer Section 9) that control the way in which blasting is undertaken at the Macraes Operation.

7.8 Flyrock, Fumes, Dust impacts of Open Pit Blasting

The potential for impacts associated with flyrock, fumes and dust generation from open pit blasting can be adequately managed by continuing to apply the mitigation measures set out in existing resource consent conditions and management plans. This approach has been successfully applied at the Macraes Operation to manage such effects since blasting commenced.

8 Golden Point Underground blasting

Noting the reduced risk of undertaking blasting underground, the following assessment of potential impacts is brief compared to the above analysis of open pit blasting.

8.1 Underground Development blasting parameters

Four examples of development blast designs used by the exploration drive shotfirers were provided by OGNZL for analysis. The designs indicate kilograms per blast hole and allocation of LP 'NONEL' delay numbers. This information has been used to determine what the MIC might be used in any development tunnel.

For development only, the nominal MIC weight would be 50kg. However, there is considerable firing time 'scatter' for the longer LP delays which has been published by detonator manufacturers. This

means that statistically less than half the detonators have a likelihood of firing within an eight milli-second window. For this reason, we have conservatively used a MIC weight of 30kg in our calculations.

8.2 Prediction of Vibration levels for underground blasting

The method of predicting vibration levels from underground blasting uses the same formula which is applied to open pit blasting.

Table 9 shows the calculated vibrations for historic sites located within the Golden Point Historic Reserve and the closest residence at 406 Horse Flat Road. Calculations are based on the maximum MIC being utilised at closest possible distance to sensitive receivers.

Table 9: Golden Point Underground vibration predictions

Underground blasting	Sensitive site	Distance (m)	PPV (mm/s)
'K' = 1200 **MIC = 100 kg**	Residence - 406 Horse Flat road	2569	1.4
	Callery's Battery	239	25.0
	Building 1 - Manager's House (not plaster)	261	22.5
	Building 2 - Hughie Fraser's Hut (plaster)	326	17.2
	Building 3 - Sod Hut A (plaster)	411	13.0
	Building 4 - Sod Hut B (plaster)	432	12.3

The analysis in Table 9 indicates that the closest house (406 Horse Flat Road) is predicted to experience acceptable vibration levels from blasting.

Callery's Battery and Building 1 have nominal vibration predictions in excess of the prescribed 19 mm/s. It should be recognised that theoretical predictions may turn out to be inaccurate and the only true measure of vibration levels is to take recordings. If vibrations approach the prescribed limit, then changes to blast design and kg of explosives will need to be made.

Buildings 1, 2, 3 and the Callery's Battery have a theoretical calculated vibration prediction greater than the prescribed maximum of 12.7 mm/s for buildings constructed with plaster (Buildings 2 and 3) and 19 mm/s for buildings constructed without plaster (Callery's Battery and Building 1). While it is unlikely that these modelled vibration levels eventuate owing to the highly conservative approach to modelling, OGNZL acknowledges the increased risk of damage to heritage sites in the Golden Point Historic Reserve and has consequently proposed an adaptive management approach to monitor effects and remedy any damage. The proposed management approach is set out in Section 9.3.

Airblast, flyrock and other impacts are insignificant for underground operations, and consequently do not need to be considered further.

9 Management of blasting impacts

Various measures are available to assist in the management of impacts from blasting at the Macraes Operation.

9.1 Management Plans for blasting effects

The draft Noise, Airblast and Vibration Management Plan (refer Appendix B) incorporates the following information:

- Sources of noise, airblast and vibration at the Macraes Operation;
- Details of the monitoring locations, the frequency of monitoring and the method of measurement and assessment;
- Procedures for recording blasting method, strength of the blast and time of blast;
- Procedures for designs blasts to comply to ensure compliance with consented vibration and airblast limits
- Procedures for addressing non-compliant results and notification of the District Councils;
- Procedures for identifying heritage structures potentially affected by blasting, undertaking baseline condition surveys, monitoring those structures, and responding to any damage:
- Key personnel responsible for implementing the NAVMAP.

Additional mitigation measures to manage blasting effects are included in the following site specific management plans that apply at Macraes Operation:

- MAC-257-PHM-006 Macraes Explosives PHMP
- MAC-350-PRO-006.3 Management Plan Open Pit Explosives Management Plan
- MAC-352-PRO-000 Drill & Blast - Blasting
- MAC-352-PRO-005 Drill & Blast - Misfires
- MAC-352-PRO-011 Drill & Blast – Blast Guards
- MAC-351-PRO-034 Public Road Closures
- MAC-352-PRO-012 Drill & Blast – Blast Clearances
- MAC-352-PRO-011 Blast Guards
- MAC-352-PRO-000 Drill & Blast - Blasting

By continuing to apply mitigation measures as set out in the relevant management plans, there is assurance that OGNZL will continue to comply with vibration and airblast limits in consent conditions.

9.2 Vibration and airblast limits – Residences

It is considered appropriate to adopt existing consent conditions that set limits for vibration and airblast levels for residences. In summary:

- Peak particle velocity (PPV) shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time .
- Airblast overpressure measured within the notional boundary of any dwelling not owned by OGNZL shall not exceed a peak non-frequency weighted level of 115 decibels (provided it may be exceeded up to 5% of the total number of blasts over 12 months). This level shall not exceed 120 decibels at any time.

Proposed conditions which set vibration and airblast limits are included in Appendix C.

9.3 Effects on heritage sites

Heritage sites potentially impacted by blasting activities are identified in Section 5.2. As set out in Sections 7.3, 7.4 and 8.2, basic vibration and airblast calculations for each heritage site have been undertaken. Modelling confirms that it is possible that blasting may impact heritage sites i.e. vibrations levels may exceed recommended limits for the type of heritage buildings present in the surrounding environment.

Existing resource consent conditions do not stipulate vibration and airblast limits for heritage sites, however based on expert opinion, literature and OGNZL's experience blasting in proximity to heritage sites, it is proposed to adopt limits of 12.7 mm/s and 19 mm/s respectively to trigger a management response for buildings constructed with plaster (12.7 mm/s) and all other heritage sites (19 mm/s). Limits would apply adjacent to the heritage structures on the elevation closest to blasting. Vibrations below the proposed levels are considered unlikely to cause any deterioration beyond that which would be associated with normal seasonal variations caused by weather, climate, temperatures, or seismic forces.

Based on vibration modelling it is possible that historic buildings within the Golden Point Historic Reserve will be subject to vibration levels exceeding recommended limits. To the address the potential for blasting to impact heritage sites, it is proposed that baseline condition surveys are carried out by a Suitably Qualified and Experienced Professional (SQEP) prior to the commencement of blasting. If blasting results in levels of vibration exceeding the applicable limit at each structure, OGL would be required engage a SQEP to undertake a follow up inspection and remedy any damage in consultation with the Department of Conservation (DoC)[3].

The heritage buildings are not used for accommodation, so most of the time are unoccupied.

Proposed conditions which define the adaptive management approach for potential impacts on heritage sites are included in Appendix C.

10 Overall Summary and Conclusions

1. The hours of blasting shall be restricted to Monday-Friday 9am to 5.30pm and Saturday and Sunday 10am to 4.30pm.
2. There are conservative safety factors built into all calculations used for this assessment of vibration and airblast levels caused by blasting in the proposed open pit and underground mine extensions.
3. The potential for blasting vibrations to disturb the integrity and/or amenity of the specified neighbouring sensitive sites has been assessed and blast designs indicated to enable potential impacts to be managed.
4. To ensure compliance with conditioned vibration and airblast limits for residential receivers, blasting will be managed by on-going measurement and analysing actual vibrations at the closest residential sites and if required, blast designs will be modified to ensure compliance.

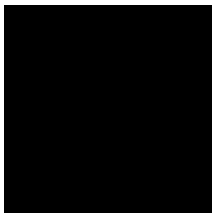
[3] The Department of Conservation administers the Golden Point Historic Reserve.

5. To ensure impacts on heritage sites from blasting are able to be identified and remedied, heritage sites will be inspected by a SEQP prior to blasting and in the event that conditioned vibration limts for heritage sites are exceeded. Any damage attributed to blasting would be remedied by OGL in consultation with DoC.
6. OGNZL regularly uses specific 'Reduced' blast designs that have a lower MIC when near boundaries of sensitive sites and residences to ensure vibration levels remain below consented limits. If OGNZL continues to conduct blasting in this way, then no residences will experience vibration levels above consented levels and District Plan standards which have proven to be acceptable to the residents.
7. Other consequences of blasting, such as fly rock and dust are unlikely to be of concern due to the extended distances to occupied sites. Potential hazards can be adequately addressed by continuing to apply the mitigation measures that have successfully been used at the Macraes Operation over many years.
8. It is recommended that the Noise, Airblast and Vibration Monitoring Plan shall be reviewed and updated prior to undertaking the proposed activities to ensure blasting activities continue to be effectively managed.
9. Compliance with District Plan standards and NZ / International Standards, means adverse impacts of blasting at sensitive residential receivers will be less than minor.

11 References - General

1. Australian Standard AS 2187.2-2006 EXPLOSIVES-STORAGE & USE - USE OF EXPLOSIVES ISBN: 0-7337-7225-0
2. Management Plan Open Pit Explosives - Approved date: Sep 2020 Revision Sep 2021. Document ID: MAC-350-PRO-006
3. Principal Hazard Management Plan - Explosives PHMP Approved date: Nov 2020. Document ID: MAC-257-PHM-006
4. "Management Plan Noise, Airblast and Vibration MAC-205-PLN-002-1"
5. Report: "Macraes Phase III Vibration and Air Blast Assessment Orica 2010"
6. Plans showing the location of the proposed development in relation to the current Macraes gold project and sensitive residences in the broader locality. "M_A1_Coro_ConsentingBasemap_20130327.pdf"
7. Map distances to nearest residences from the perimeter of proposed openpit.
8. Oriard, Lewis L. (2005) Explosives Engineering, Construction Vibrations and Geotechnology ISBN: 1-892396-13-0
9. III_06 Macraes Mining Rules section 6 - MACRAES MINING PROJECT MINERAL ZONE

Yours faithfully



[redacted] B.E. (Mining)
Explosives Engineer
Special Blasting Applications

Appendix A: Recent condition assessments for Gaytans Cottage and heritage buildings within the Golden Point Historic Reserve

ANNUAL MAINTENANCE WORKS: EXTERNAL HERITAGE FABRIC
YEAR: 2024-5

PREPARED FOR:
OceanaGold Macraes Operation
Golden Point Road
RD3, Macraes Flat 9483, East Otago

For attention of [redacted]r

Note: This maintenance report has been prepared for OceanaGold Macraes Operation to document 2024-5 maintenance recommendations for the building described below. It is not intended as a maintenance plan that identifies works, and their priority, to be carried out over a period of years. Instead, it is intended that the building will be re-inspected each year and this document will then be updated to record what has been done in the last year and what should be done in the next 12 months.
Building services (water, electricity, gas, sewerage, heating, etc) have not been inspected and are excluded from this document. No review of the building against the Building Code has been undertaken.
This document primarily covers the external envelope of the building. Where limited inspection of the interior has been carried out, this has been to look for externally-related maintenance issues and to allow Origin to provide advice on any specific internal heritage features that, in the view of the company, require particular consideration.

PROPERTY ADDRESS:	Gay Tan's Cottage Corner of Macraes Road and Gifford Road Macraes Flat
PHOTOGRAPH	

LIST OF WORKS RECOMMENDED TO BE CARRIED OUT IN THE NEXT 12 MONTHS:	• Reseal joints/corner mitres to the gutters. Facing the front door, the leak at right corner of the guttering is urgent. This has been dripping for more than 12 months and dampness has appeared inside. • Clean out gutters & downpipes. • Reposition loose leave guards; fix new leaf guards where there are none. • Refix loose ridge flashing on the roof; secure all loose fixings on the roof. • Wash down roof slopes where there are areas of grime/organic growths (particularly rear roof slopes); • Spray / pull out weeds growing around the perimeter of the cottage walls. • Start a programme to repair and paint timber windows, doors and fascias, beginning with the ones in the worst condition where the timber is now bare – north elevation. • Repair cracks to north elevation window sills. • Clean out the inside – floors and blinds. • Remove timber stored along west wall.
LIST OF WORKS CARRIED OUT IN THE LAST 12 MONTHS:	Weeds cleared; grass maintained The cottage has a long record of repair and maintenance work following its partial reconstruction after tree damage. Works included: • Repair and reinstallation of the cast iron range, chimney breast framing, fireplace/mantle and adjoining cupboard in the kitchen; • Reinstallation of the bed and small cupboard into the kitchen; • Reinstallation of the chimney breast framing in the northeast room; • Reinstallation of the bath into the rear lean-to, the construction of a timber frame to support it and the reinstallation of the original hinged timber bath cover; • Maintenance to the front door threshold; and • Propping up of a shed in the rear garden.
RECOMMENDATIONS FOR REVIEW AT THE NEXT ANNUAL INSPECTION:	• Ongoing programme of external joinery redecoration. It is anticipated that this will extend to the repainting of roof cladding. • Cracks and deterioration of the external render – monitor. • Moisture levels inside the building, particularly in walls and floors; • Moisture levels/staining to the west walls (main cottage and lean-to) externally; look at installing additional airbricks/vents. • The condition of the trees/shelterbelt on the west side of the cottage. • Repainting roof claddings to occur in the near future
NOTES/ADVISORY COMMENTS (IF ANY):	The interior of the cottage has been reinstated as far as possible by reintroducing fixtures and fittings salvaged from it. Traditional materials and techniques have been used and a policy of minimum intervention has been followed. Many of the internal finishes have been left 'as found'. An example is where old & deteriorated decorations have been retained as much as possible and minimal new decorations have been applied. This has retained the feel of age and authenticity to the rooms. It is recommended that this approach be followed in the future and that more widespread renewal and replacement is *avoided*. Being of earth construction, the management of water/moisture in and around the cottage is essential to the future wellbeing of the cottage. As windows are redecorated, they should be overhauled and eased to leave them secure and operational. Doors should also be left secure and with locks in good condition.

BRIEF DESCRIPTION OF THE BUILDING AND ITS CONSTRUCTION:	The cottage is of mud brick construction beneath a pitched and hipped timber roof frame clad with corrugated iron. The external walls are rendered/plastered and are built upon a stone plinth. The cottage appears to date from the period 1875-1882. For a detailed description of the cottage and its history, please refer to: • The March 2001 Conservation Report by Oakley Gray; and • The November 2015 Conservation Plan Review by Jackie Gillies + Associates.

ORIENTATION:	The front elevation of the cottage faces roughly north.

WAITAKI DISTRICT COUNCIL HERITAGE STATUS:	The cottage is included in the Waitaki District Council Register of Heritage Items as a Category B item (ref: 166).
HERITAGE NEW ZEALAND STATUS, INCLUDING COVENANT (IF ANY):	The cottage and its outbuildings are included in the Heritage New Zealand Pouhere Taonga List as a Category 2 Historic Place (ref: 7550). Given its apparent pre-1900 date, the stone cottage/site must be considered as an archaeological site for the purposes of the HNZPT Act 2014. The cottage and its outbuildings are also subject to a heritage covenant (dated 27 October 2006) under the HNZPT Act 2014. Under the terms of the covenant, Oceana Gold agrees not to damage or demolish any of the buildings on the site, or to do any activity which will be detrimental to the heritage values of the buildings. The covenant also requires the owner to: • Manage the site as an archaeological site under the HNZPT Act 2014; • Seek the written consent of Heritage New Zealand prior to undertaking specified activities within the site; • Seek the written consent of Heritage New Zealand for any proposed material changes (other than for repair and maintenance); and • Maintain the buildings, having regard to their architectural and historical significance and the Conservation Report for Louis Gay Tan's Cottage by Oakley Gray Architects (2001). The covenant also places restrictions on use of the land, including subdivision, the installation of utilities, and any prospecting/mining activity. The brief outline above has been provided as guidance regarding the application of the covenant; however, the specific wording of the covenant should be considered against any proposed development affecting the site.
DATE OF INSPECTION & WEATHER:	14 May – sunny with patchy cloud
LIMITATIONS ON INSPECTION: • No inspection of the roof frames or roof void was made; • No inspection of the subfloor void was possible.	

Andrew Barsby
Dunedin Manager/ Building Surveyor
For and on behalf of Origin Consultants Ltd
Architecture *Heritage* *Archaeology*

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PHOTOGRAPHS (ORIGIN CONSULTANTS LTD May 2025)

Photo 1 Loose ridge flashing & roofing.

Photo 2 Gutters filled with pine needles

Photo 3 Bare timber to one of the windows (east elevation).

Photo 4 Leaking joints to guttering; decaying fascia board

Photo 45Front elevation

Photo 6 East elevation

Photo 7 South elevation

Photo 8 West elevation

Photo 9 Interior – floors to be swept periodically

Photo 10 Monitor any damp patches inside

27 April 2022

[redacted] Our ref: 12546447

Oceana Gold (New Zealand) Limited
22 Maclaggan Street
Dunedin 9016
NEW ZEALAND

Dear [redacted],

Consent Condition Monitoring of Macraes DOC Golden Point Reserve Historic Buildings

1 Introduction

GHD was commissioned by OceanaGold (New Zealand) Ltd to undertake pre and post blast condition inspections of three historic buildings in accordance with the requirements of Waitaki District Council Consent No. 201.2020.1519. A report was issued for those three buildings dated 24 March 2021.

The scope has now been extended to include the historic buildings at the Department of Conservation's Golden Point reserve. There are 5 buildings with associated outbuildings as identified in Figure 2.

This report provides our condition inspection of the buildings. Their locations are as indicated on the aerial snip below.

The surveys were conducted in March 2021 and were limited to a visual inspection with photographs and manual crack width measurements as defined in our proposal dated 27 January 2021.

This report is subject to, and must be read in conjunction with, the limitations on page 14.

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.*Figure 1: Location of Golden Point Reserve at Macraes*

2 Inspection Methodology

This first inspection is a benchmark inspection undertaken before any blasting activities occur.

Each structure was viewed from the outside and photographic records taken to cover all external surfaces.

The internal inspection consisted of entering the main entrance moving left to right through every room and photographing every surface.

Due to confined spaces, lack of access provisions and safety of entering spaces with unknown strength, no entry was made into roof or underfloor spaces. Any movement of the structures, as a result of blasting activities, is likely to be detected from inspection of the external and internal surfaces without the need to access roof and underfloor spaces.

Figure 2: Location of Individual Buildings at Golden Point Reserve

Crack measurements were made where there were evident cracks. These will be remeasured following blasting activities.

Although the purpose of these inspections is not as a condition assessment, a general statement of the condition for this first report sets the context for the state of the buildings.

Some elements of buildings are good indicators of movement, such as brick chimneys, joints in stucco cladding, brittle concrete elements, plaster surfaces and existing cracks. Pre and post blast monitoring will focus on these areas.

Photos were taken at wall intersections, connections to the ceiling and above doors and windows as these are the areas that would exhibit cracking first should any movement occur.

We retain a large repository of photos that will be used to compare against photos taken in the same locations following blasting activities.

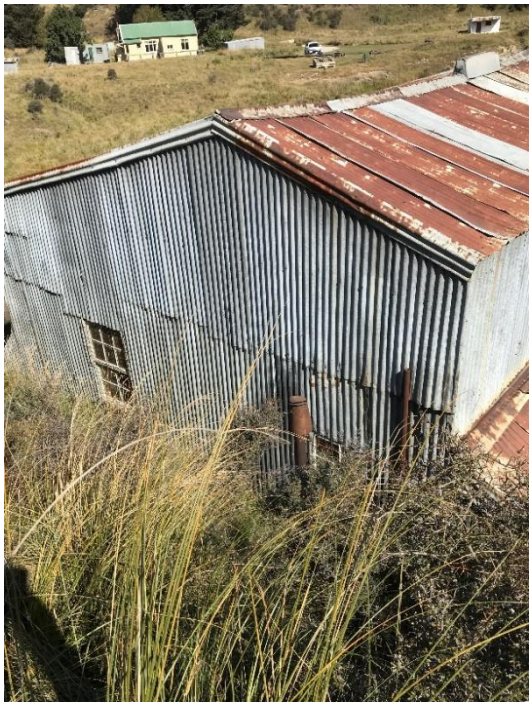
3 Callery Stamping Battery

3.1 General Condition External

The external envelope of the Callery Battery is galvanised corrugated iron roof and walls

It is a 100+ year old structure constructed from timber poles and beams. It is built into the side of a hill and consequently has 2 different mono pitch roof levels. There is a noticeable sag in the roof line of the higher roof portion.

The cladding sheeting is in reasonable condition with very little rust although there are gaps in the sheeting joints. The roofing iron however has advanced rust and has lifted at sheet joints. Roofing sheets have been turned down at the roof edges in lieu of edge flashings. Capping flashings are also in poor condition.



As there are no brittle surfaces such as stucco cladding or internal linings it is difficult to identify any points to benchmark against further movement.

The external doors have either excessive clearances or are already difficult to open so they may not be a good measure of post blast movement.

Installing ground accelerometers and undertaking an internal and external 3D laser scan of the building would be the only way to more accurately assess post blasting movement than the photographic record we have used.

However, even then it would need to be established if any movement has been detrimental to the structure. The timber structure is very tolerant of movement and would accommodate a lot of movement during any ground movement from either blasting operations or an earthquake without necessarily retaining any evidence of that movement.

3.2 General Condition Internal

The building houses a historic working stamping battery including oil fired engine but is also full of remnant paraphernalia from the days when it was still operating. Flooring is natural ground with a schist stacked retaining wall separating 2 floor levels. There are no internal linings to the walls or ceilings (except some hardboard lining in the engine room). Timbers are untreated but because the roofing and cladding still provide some weather protection they are generally in good condition. There is some sagging of the roof line as there is no central ridge beam. Roof construction consists of rafters with a shallow depth bottom chord without any truss bracing members. Similarly, as for the external surfaces, because of the lack of any brittle surfaces it is difficult to identify any points to benchmark against further movement. There is an internal door to the engine room which is snug fitting so any building movement may be reflected in the change to the operation of the door. Any ground movement could be reflected in the operation of the old mining machinery which is supported by a ground based structure made from large timber members bolted together.

4 Mine Managers House

4.1 General Condition External

Of all the structures in the Golden Point Reserve the mine managers house is in the best condition. It is a weatherboard house with a painted galvanized iron roof. It has been maintained to a reasonable standard with no evidence of rot in the rough cast weather boards and no rust apparent in the roof. The ridgeline is straight and all roofing sheeting is tight fitting with gutters fixed in place.

External painting appears to have been done recently. There is a large brick chimney on the northern side of the house. Weatherboards have been cut into the side of it. There are no apparent cracks in the chimney structure. Of any part of the building that would exhibit signs of ground movement it is likely to be the brittle chimney structure. Movement would be manifested as new cracks in the mortar between brick layers, within bricks or movement between the chimney and the tightly cut in weatherboards.

Windows are all intact but not all were tried to be opened. All doors that could be opened, opened freely. The building is bird proof.

Because of the good standard of paintwork any movement could be witnessed as cracking in paintwork.

The grounds are well kept and there are no trees or vegetation growing onto or within the building structure.

4.2 General Condition Internal

The mine managers house interior is in good condition. The building appears weatherproof. In the areas where cracks are typically seen, at door or window lintels, no cracks were evident. All linings were intact with no movement evident in corners, wall to floor and wall to ceiling joints. All doors swung and closed well. All plumbing was intact so no water damage from these potential sources was evident. The only defect found was a failed cabinet fixing that has resulted in the cabinet being partially displaced.

As the interior of this building is a ‘clean slate’, any movement would be clearly evident as movement in lining joints, sticking doors and cracks at lintels.

5 Mine Managers House Out Buildings

5.1 General Condition

There are 4 outbuildings associated with the mine managers house. The main ancillary building to the house, a garage, outhouse and shed. They are in variable condition, all intact and structurally competent but they are not weather, vermin or bird proof. They are timber structures and as such are very ductile. As a consequence, they will be able to withstand significant movement without necessarily showing much evidence of it. There would need to be significant ground movement to inflict any permanent deformation of these structures. They are most at risk from deterioration through rainwater and vermin than ground movement. The most practical method to identify any effect on the structures would be to make use of the photographic record associated with this report.

5.1.1 Ancillary Building

This is the workshop, laundry and additional storage building. The structure itself is competent with straight roof and wall lines. It is a timber framed structure with a mono pitched unpainted galvanised iron roof with the top side flashed to the wall. The lower side has a gutter that has partially fallen off. The sides of the roof are turned down onto the walls. The iron itself is not rusted except for a few sheets at the back of the building and 1 at the front. There are no flashings on windows or on the only entry door.

It has workbenches, a concrete washtub and an old copper with some window frames and general paraphernalia stored within. The workshop area walls and ceilings are lined with hardboard but there are numerous holes that birds have accessed and made nests in walls and within the ceiling space. There is extensive water staining and distortion of panels. There are timber floors throughout. The laundry area is unlined with no ceiling.

Although there are linings, they are not sufficiently competent to exhibit any evidence of ground movement.

5.1.2 Garage

The garage is a rough sawn timber structure clad in unpainted galvanised iron. The monopitch roofing iron is rolled down onto the walls on all sides. Iron has some minor rusting but is generally in reasonable condition. There are no gutters.

There are 2 large doors on one end that would be difficult to open. The timber members appear relatively intact and the structure has retained its shape. It has a dirt floor.

5.1.3 Shed

The shed is of similar construction as the garage. It has an opening on the high side. Some timbers have been exposed to rainwater through leaks in the roof and although still structurally sound are being to show signs of staining. The roofing iron is rustier than the other buildings and joints have opened up more.

There is an internal partition spanning half the width of the shed. It also has a dirt floor and is used for storing timber.

5.1.4 Outhouse

The building is assumed to be an outhouse toilet but was locked so couldn't be entered. It is of similar construction and condition to the other ancillary buildings

6 Miners Cottage 1

This cottage is constructed of plaster over sod brick with a galvanised iron roof edged with untreated timbers. It has associated timber framed outbuildings that are clad and roofed with galvanised corrugated iron.

6.1 General Condition External

The exterior is in generally poor condition. There are extensive areas where the plaster has fallen off the sod bricks and the bricks themselves have eroded. There are too many cracks and defects to list. We have taken an extensive photographic record that should be used to compare against any future inspection. Any new defects created by ground movement will be 'fresh' and should stand out against the existing weathered defects. The building is more at risk of deterioration from the elements than from any ground movement.

Below are some photographs showing examples of the external condition:






6.2 General Condition Internal

The interior of the building is a plaster finish over the sod bricks on the exterior walls. There is a cast iron stove recessed into the front wall.

There are cracks in various locations on the external walls mainly emanating from the top and bottom corners of windows. The largest crack is above the external door lintel which has cracked but also displaced horizontally by 10mm. There is also an area of plaster flaking from the wall. There is also a complete loss of plaster within the bedroom from the bottom 100mm (approximately) of the wall.

It appears the walls have been painted, or clay washed, not very long ago perhaps within the last 10 years. There is paint within the cracks suggesting they are not recent features at least not the wider parts of the cracks. They may have grown in extent more recently. Photographs with a measuring gauge have been taken at various crack locations.

There is an interior timber framed wall creating a bedroom lined with hardboard on one side. The ceiling is hardboard sheeting with painted timber battens. There is water staining in places and a small hole but generally the ceiling is of a reasonable standard. Floors are tongue and groove timbers. There are various shelves and doorless cupboards made from rough sawn timber.

There is evidence that birds are regular occupiers of the building.

There are 2 external adjoined outbuildings both of timber framed construction clad and roofed with unpainted galvanised iron. The iron is adequate although rusty in places and pulling apart at the joints. One shed has a window and door, the other has openings for door and window only. They are not completely waterproof. Inside they are partially lined with hardboard and tin with hessian sacking hanging from the purlins. They are in a very rough state but are solid enough, retaining their original shape.

7 Miners Cottage 2

This cottage is of very similar construction and condition as Cottage 1 except that it has white painted tin corner protectors screwed into the sod bricks. It has an external sod brick chimney with a small timber framed galvanised tin structure built around it to provide some weather protection to the entry door. It has a very small (approximately 5m2) remote timber framed shed clad and roofed with galvanised corrugated iron with no door.

7.1 General Condition External

The exterior is in generally poor condition. There are extensive areas where the plaster has fallen off the sod bricks and the bricks themselves have eroded. No.8 galvanised wire is evident within the brick structure. There are too many cracks and defects to list. The galvanised iron roof has extensive rusting but appears to still be waterproof. Similar to Cottage 1 we have taken an extensive photographic record that should be used to compare against any future inspection. As for Cottage 1, the building is more at risk of deterioration from the elements than from any ground movement.

Below are some photographs showing examples of the external condition:

7.2 General Condition Internal

The interior of the building has a gloss paint finish over the sod bricks on the entry door wall. There is a cast iron stove recessed into the entry door wall. There are extensive cracks, 25 to 30mm wide, in the wall near the top of the door. On the right hand side of the door looking out, the cracks have extended to the base of the cast iron stove surround. Photographs with a measuring gauge have been taken at various crack locations. The wider cracks existed before the wall was recently painted as paint is inside the cracks. However, the cracks have grown since painting. This is evidenced by the furtherest extent of the cracks. At these extents the cracks are fine, <1mm. If painted while the cracks were present, paint would bridge the fine gaps. However, the paint edges are sharp suggesting the paint has pulled apart with the substrate. This suggests there is continuing movement of the wall, either by ground movement or internal deterioration of the wall itself. Consequently, for any further cracking to be contributed to blasting operations measurement of cracks would need to be done immediately before and after the blasting operation.

The rest of the building including the ceiling is lined with hardboard therefore the condition of the remainder of the interior could not be assessed. There is however significant distortion of the lining in the ceiling suggesting movement has occurred. The building appears watertight with no evidence of staining on the linings and birdproof.

8 Miners Cottage 3

This cottage, although of the same sod brick construction as cottages 2 and 3, is in a lot better condition although obviously been well lived in. There is a cast iron stove with galvanised iron flue recessed into the eastern wall requiring protrusion of the wall around it. The walls have a thick smooth plaster finish painted white. It has a mono pitch unpainted galvanised iron roof that extends to a small veranda supported by railway iron posts. There is a concrete ground slab under the veranda. There are no associated out buildings.

8.1 General Condition External

Unlike the other 2 cottages the exterior fabric is in good condition except for several specific defects. The iron roof has some surface rust and the sheets joints are not all tightfitting but it remains waterproof.

The specific defects are:

Crack on the eastern wall; There is a distinct crack at the joint of the back wall with the eastern wall. The back wall does not have the same smooth painted finish as the other 3 sides. The paint is faded and it has a rough finish although the plaster is completely intact and has no cracks. The crack is 3mm wide at its widest point and extends the full height of the wall. Photographs have been taken with a measurement gauge for future comparison.

Lifted roof southwest corner;

The corner of the roof has lifted off the top of the wall. As there are no cracks or signs of settlement of the wall this appears to be a defect of the roof fixing to the wall having possibly failed during a wind event.

Cracks in veranda slab;

The veranda slab has one main crack and a few hairline cracks. Photographs have been taken with a measurement gauge for future comparison.

8.2 General Condition Internal

The entire interior is lined on the walls with hardboard and a ceiling lining. The door and window frames are made from robust timber members. The painted surface is old and scuffed and linoleum flooring well worn but despite the worn condition there is no cracking, distortion or water staining and the interior is bird proof. The only existing defect is the wall behind the stove. It is soot stained and has been effected by heat with some plaster have fallen off at the ends of the steel rail used for suspending items over the stove. There is minor cracking throughout the rest of the area behind the stove and a general rough appearance.

9 Future monitoring

Having visited the buildings, we consider that our current methodology is adequate for monitoring the condition of the buildings – i.e. essentially visual monitoring with photographic records and crack measurements in selected areas.

The photographic record can be used as a benchmark record to assess future condition.

Sincerely
GHD Limited

[redacted]

Graham McIlroy
Engineering Leader
[redacted]

Andrew McMenamin CMEngNZ CPEng
Project Director
[redacted]

Limitations

This report has been prepared by GHD for OceanaGold (New Zealand) Ltd and may only be used and relied on by OceanaGold (New Zealand) Ltd for the purpose of documenting the condition of buildings at the time of the visual inspections.

GHD otherwise disclaims responsibility to any person other than OceanaGold (New Zealand) Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

Appendix B: Draft Noise, Airblast Vibration Management Plan

Noise, Airblast and Vibration Management Plan

Approved Date:

Document ID:

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Department	Environment and Social Performance
Location/Site	Macraes

Approval Table

	Position Title	Name	Date
Authored By			
Reviewed By			
Approved By			

Document Issuance and Revision History

Document Name: Noise, Airblast and Vibration Management Plan (NAVMAP)

Document ID: MAC-200-PLN-000

Revision Number	Revision Date	Description	Effective Date
A	Jenny Autridge	Initial Draft	20 Oct 2011
B	Elyse Greer	Reviewed	25 Jul 2013
C	Scott Mossman	Reviewed and updated to include Coronation	7 Jul 2014
D	Lauren Arnold	Reviewed	1 Jun 2016
E	Lauren Arnold	Reviewed and updated to include Coronation North	3 Apr 2017
F	Lauren Arnold	Reviewed	10 Apr 2018
G	Gavin Lee	Reviewed and updated to additional processes	22 Oct 2019
H	Duncan Ross	Reviewed and updated to include Deepdell North Stage III	27 Nov 2020
I	Renee Tomsett	Reviewed	Feb 2023
J	Dr. Ravneel	The entire document was reviewed and GPUG Landuse Resource Consent details were added.	Nov 2024

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Tables

Figures

1 Purpose

1.1 Background

This Noise, Airblast and Vibration Management Plan (NAVMAP) has been prepared pursuant to, and to give effect to conditions of the OceanaGold (New Zealand) Limited (OceanaGold) land use consents listed in Table 1-1.

Table 1-1: Relevant OceanaGold Resource Consents

Project	Consent Reference
Macraes Phase III Expansion Project)	LRC 201.2011.35
Coronation Project	Joint LRC 201.2013.360 and LUC 2013-225
Coronation North Project	Joint LRC 201.2016.779, 201.2013.360.1, LUC-2016-234 and LUC-2013-225A
Coronation North Extension	Joint LRC 201.2019.1241/2, LUC-2019-42A
Deep Dell North Stage III	LUC 201.2019.1454
Golden Point Underground Mine Extension (2023)	LRC 201.2023.2107
Golden Point Underground Mine Extension (2020)	LUC 201.2020.1514
Consents Continuity Stage 1 (CCP1)	201.2023.2302
Consents Continuity Stage 2 (CCP2)	201.2023.2302/3
Macraes Phase 4	[*TBC*]

In particular, the NAVMAP gives effect to the MP4 consent conditions in the following sections: [To be completed]

The purpose of the NAVMAP is to facilitate the avoidance, remediation, and mitigation of any adverse effects of noise, airblast or vibration generated from mining activities and to promote proactive solutions to the control of noise, airblast and vibration from the site.

All of the consents listed in Table 1-1 stipulate compliance limits for noise, airblast and vibration generated by mining activities at the Macraes Operation. Until the consents expire or are formally surrendered, they technically authorise activities that generate noise and set out compliance limits that must be achieved. While the consents are generally consistent in how they set compliance limits, where there is an inconsistency, the more restrictive limit must be complied with.

The purpose of the NAVMAP is to facilitate the avoidance, remediation, and mitigation of any adverse effects of noise, airblast or vibration generated from mining activities and to promote proactive solutions to the control of noise, airblast and vibration from the site.

The NAVMAP includes information on the following:

- The sources of noise, airblast and vibration at the Macraes Operation;
- Noise, airblast or vibration monitoring methods;
- Noise, airblast and vibration mitigation and prevention measures;
- Mechanisms for remediation of adverse effects (should this be required);
- Methods for managing complaints regarding noise, airblast and vibration and keeping records related to compliance; and
- Key personnel responsible for implementing the NAVMAP.

The NAVMAP is intended to be a working document and as such information included is expected to be reviewed and revised as mining activities progress.

1.2 Objectives

The objectives of the NAVMAP are:

- To describe current and proposed noise, airblast and vibration management methods and procedures;
- To enable OceanaGold to operate in full compliance with resource consent requirements; and
- To describe the noise, airblast and vibration monitoring regime and reporting of results.

2 Background

2.1 Description of Activity

Key mining activities authorised by OceanaGold land use consents relevant to the NAVMAP include:

- The extraction of minerals and overburden by mechanical means including blasting within the open pits and the stockpiling and/or stacking of these materials;
- The construction of waste rock stacks;
- The transport, treatment, and processing of extracted minerals and waste rock;
- The stacking, deposit and storage of substances considered to contain any mineral from mine workings;
- The construction, maintenance, and use of all haul roads and access tracks around the mine site;
- The construction, de-commissioning, rehabilitation, de-construction or dismantling of the mine landforms and any structures and works resulting from mining activities;
- The construction, operation and maintenance of silt ponds and silt control facilities necessary for controlling runoff from mining operations;
- The construction of water storage dams;
- The processing of minerals at the onsite processing facility;
- The removal of tailings from existing storage facilities by way of hydraulic methods; and
- The transportation and discharge of tailings within storage facilities and the construction of these facilities.

- Maintenance of mobile and fixed plant.

Blasting is the dominant source of airblast and vibration, with hauling of ore/waste rock also a potential source of vibration.

Vehicle movements and heavy mining machinery, operation of stationary equipment, horns and sirens/alarms are the main sources of noise.

This management plan is informed by various technical reports prepared to support resource consent applications submitted to authorise the above activities. All the relevant technical reports are available upon request.

2.2 Description of Site and Local Environment

2.2.1 Site Description

The Macraes Operation is located on the Macraes Flat, approximately 30 km northwest of Palmerston in the Otago Region. 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 undertaken in accordance with existing resource consents. 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 (Frasers, now closed, and Golden Point, which is actively mined);
- Waste rock stacks at various stages of operation and rehabilitation;
- A network of haul roads and general mine service tracks;
- A Processing Plant;
- Five tailings storage facilities (three inactive, one active but nearing capacity, and one under construction and currently receiving tailings);
- An extensive network of water management infrastructure, including diversion drains, silt ponds, sumps, pit lakes, and freshwater storage reservoirs;
- Two consented but not yet constructed water storage reservoirs (Camp Creek Dam and Coal Creek Dam); and
- Associated infrastructure supporting ongoing operations, including district roads, powerlines, workshops, offices, and associated water and amenity facilities.

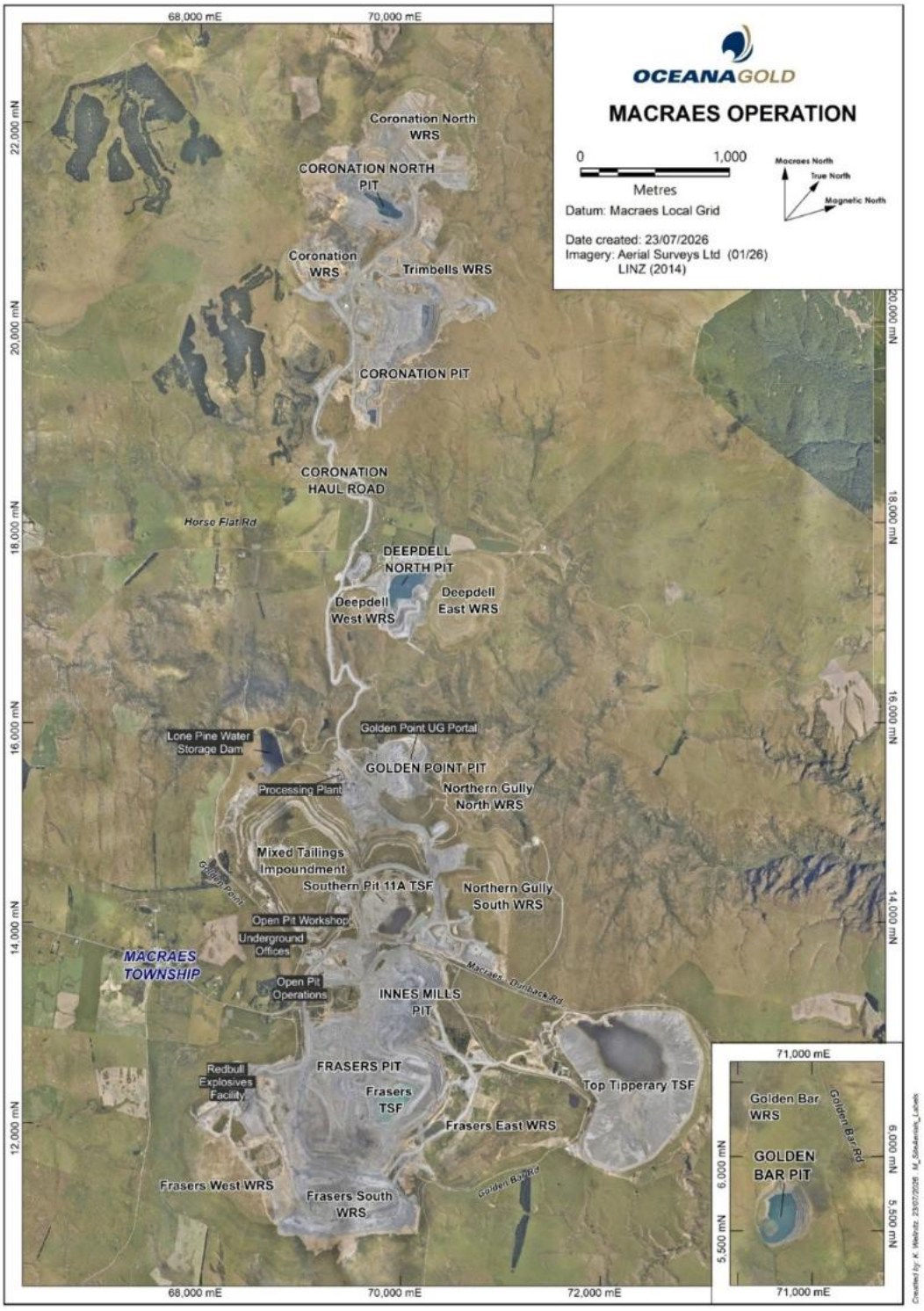


Figure 2-1: Macraes Operation Overview Maps

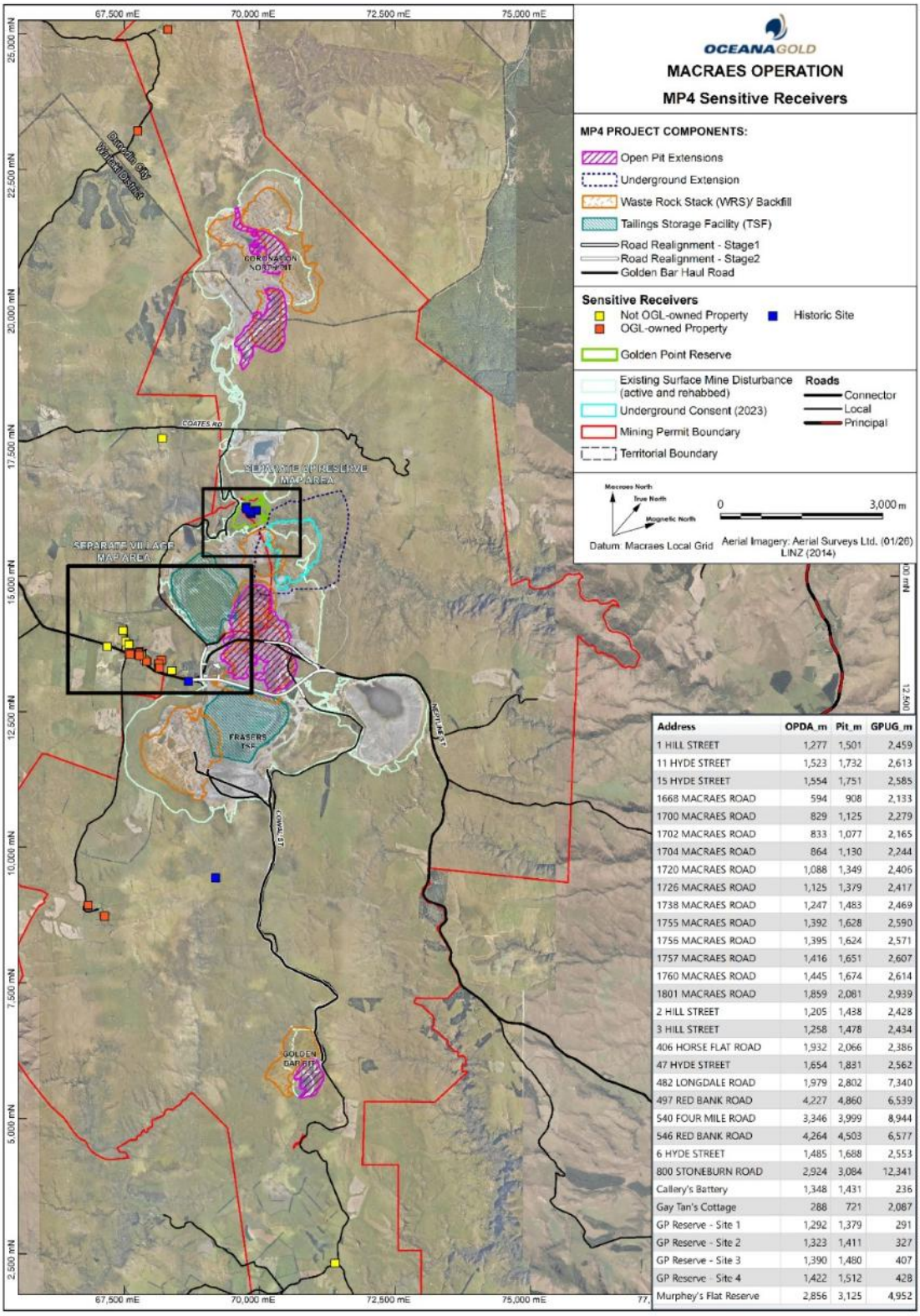
2.2.2 Local Environment

Macraes village is located approximately 1.2 km west of the Macraes Operation, there are land uses within the village that are sensitive to the effects of noise, vibration and blast effects, including dwellings, a school and community facilities. In addition to sensitive land uses within Macraes village, there are also sensitive land uses in the form of rural residential dwellings and historic sites in the wider area surrounding the Macraes Operation. Sensitive receivers in the environment surrounding the Macraes Operations are identified in Figure 2-2, Figure 2-3 and Figure 2-4. Included in Table 2-1 is a list of sensitive receiver sites.

Table 2-1: Sensitive Receivers

Address	Type	Owner
1 Hill Street	Dwelling	Oceana Gold (New Zealand) Limited
11 Hyde Street	Dwelling	Teachers Residence New Zealand Gazette 1962
15 Hyde Street	Dwelling	[redacted]
1700 Macraes Road	Dwelling	Oceana Gold (New Zealand) Limited
1702 Macraes Road	Dwelling	Oceana Gold (New Zealand) Limited
1704 Macraes Road	Dwelling	Oceana Gold (New Zealand) Limited
1720 Macraes Road	Dwelling	Oceana Gold (New Zealand) Limited
1726 Macraes Road	Non-residential	[redacted]
1738 Macraes Road	Dwelling	Oceana Gold (New Zealand) Limited
1755 Macraes Road	Dwelling	Oceana Gold (New Zealand) Limited
1756 Macraes Road	Community Hall	Oceana Gold (New Zealand) Limited
1757 Macraes Road	Dwelling	Oceana Gold (New Zealand) Limited
1760 Macraes Road	Stanleys Hotel	Oceana Gold (New Zealand) Limited
1801 Macraes Road	Dwelling	[redacted]
2 Hill Street	Non-residential	[redacted]
3 Hill Street	Dwelling	Oceana Gold (New Zealand) Limited
406 Horse Flat Road	Dwelling	[redacted]
47 Hyde Street	Dwelling	[redacted]
482 Longdale Road	Dwelling	Oceana Gold (New Zealand) Limited
497 Red Bank Road	Dwelling	Oceana Gold (New Zealand) Limited
540 Four Mile Road	Dwelling	Oceana Gold (New Zealand) Limited
546 Red Bank Road	Dwelling	Oceana Gold (New Zealand) Limited
6 Hyde Street	School	Set Apart for School New Zealand Gazette 1960
800 Stoneburn Road	Dwelling	[redacted]
Callery's Batttery	Dwelling	Administered by Department of Conservation

Gay Tan's Cottage	Historic Site	Oceana Gold (New Zealand) Limited
Golden Point Reserve Site 1	Historic Site	Administered by Department of Conservation
Golden Point Reserve Site 2	Historic Site	Administered by Department of Conservation
Golden Point Reserve Site 3	Historic Site	Administered by Department of Conservation
Golden Point Reserve Site 4	Historic Site	Administered by Department of Conservation
Murphys Flat	Historic Site	Administered by Department of Conservation



Address	OPDA_m	Pit_m	GPUG_m
1 HILL STREET	1,277	1,501	2,459
11 HYDE STREET	1,523	1,732	2,613
15 HYDE STREET	1,554	1,751	2,585
1668 MACRAES ROAD	594	908	2,133
1700 MACRAES ROAD	829	1,125	2,279
1702 MACRAES ROAD	833	1,077	2,165
1704 MACRAES ROAD	864	1,130	2,244
1720 MACRAES ROAD	1,088	1,349	2,406
1726 MACRAES ROAD	1,125	1,379	2,417
1738 MACRAES ROAD	1,247	1,483	2,469
1755 MACRAES ROAD	1,392	1,628	2,590
1756 MACRAES ROAD	1,395	1,624	2,571
1757 MACRAES ROAD	1,416	1,651	2,607
1760 MACRAES ROAD	1,445	1,674	2,614
1801 MACRAES ROAD	1,859	2,081	2,939
2 HILL STREET	1,205	1,438	2,428
3 HILL STREET	1,258	1,478	2,434
406 HORSE FLAT ROAD	1,932	2,066	2,386
47 HYDE STREET	1,654	1,831	2,562
482 LONGDALE ROAD	1,979	2,802	7,340
497 RED BANK ROAD	4,227	4,860	6,539
540 FOUR MILE ROAD	3,346	3,999	8,944
546 RED BANK ROAD	4,264	4,503	6,577
6 HYDE STREET	1,485	1,688	2,553
800 STONEBURN ROAD	2,924	3,084	12,341
Callery's Battery	1,348	1,431	236
Gay Tan's Cottage	288	721	2,087
GP Reserve - Site 1	1,292	1,379	291
GP Reserve - Site 2	1,323	1,411	327
GP Reserve - Site 3	1,390	1,480	407
GP Reserve - Site 4	1,422	1,512	428
Murphey's Flat Reserve	2,856	3,125	4,952

Figure 2-2: Overview of Sensitive Receivers

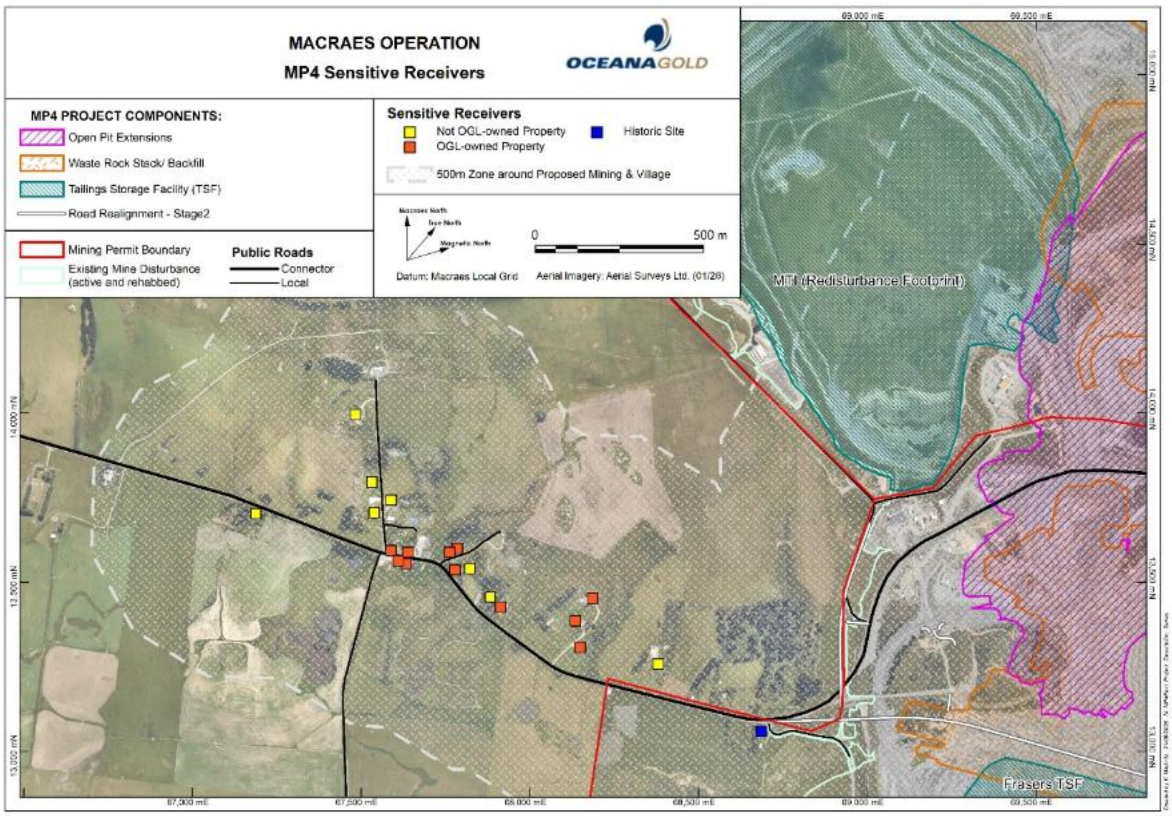


Figure 2-3: Macraes Village Sensitive Receivers

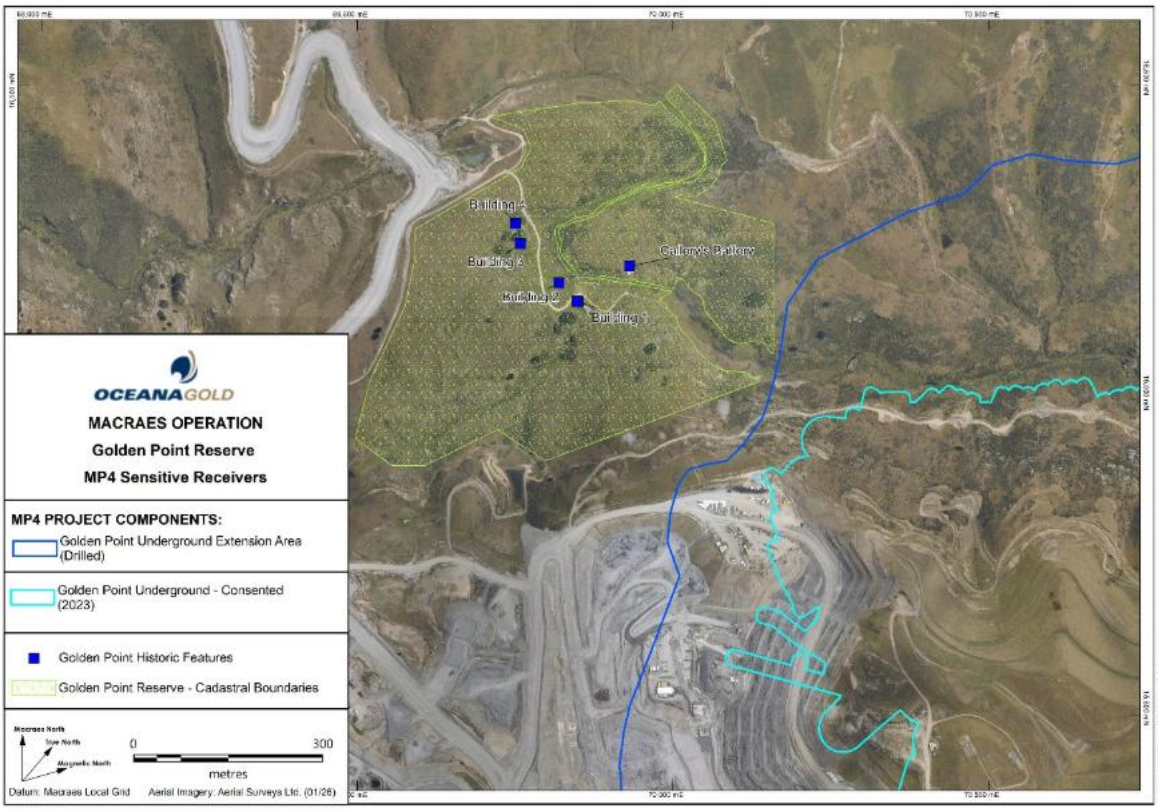


Figure 2-4: Golden Point Historic Reserve Sensitive Sites

3 Management of Adverse Effects

3.1 Noise Effects Management

3.1.1 Noise Compliance Limits at Dwellings

Land use consents listed in Table 1-1 impose the following noise limits at the notional boundary of any dwelling not owned by OceanaGold:

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

There are number of consents where bespoke limits or management approaches have been adopted, these are described below.

Deepdell North Stage III

Under consent 201.2019.1454 that authorises Deepdell North Stage III mining activities, a limit of 55 dBA Leq applies during on any day between 7 am to 9 pm.

Consents Continuity Stages 1 and 2

Under resource consents 201.2023.2302 and 201.2023.2302/3 that authorise CCP1 and CCP2 land use activities, compliance limits do not apply at following locations:

- Any property or site that is owned by the OceanaGold;
- The property located at 1668 Macraes Road;
- The property located at 406 Horse Flat Road;
- The property located at 1726 Macraes Road;
- The property located at 2 Hill Street; or
- Any property or site where a dwelling did not exist at the time this consent was granted.

Macraes Phase 4

[*To be completed*]

3.1.2 Mitigation Strategies

In line with sound environmental management practice and as set out in the relevant technical assessments, the development of mitigation strategies generally follows the hierarchy below:

- Control the impact at the source;
- Intercept at the pathway;
- Monitor at the receptor;
- Mitigate unacceptable adverse effects at the receptor; and
- Remedy unacceptable adverse effects at the receptor.

Thus, depending on the outcomes of modelling, mitigation strategies to avoid or minimise disturbance from noise, airblast and vibration include, but are not limited to:

- Staging of mining operations to avoid certain areas at night or in unfavourable weather conditions;
- Modification of blasting methods or blasting times;
- Modification to equipment or use of alternative equipment;
- Use of Trigger Action Response Plans (TARPs) for controlling problematic nighttime activities;
- Construction of noise bunds or barriers;
- Noise suppression systems on machinery;
- Maintenance of machinery;
- Double glazing of windows, insulation of walls or other forms of noise abatement at the receptor;
- Prior notification to affected parties where noise, airblast or vibration will be at levels of potential nuisance; and
- Monitoring and repair of any damage at historic sites vulnerable to the effects of vibration and airblast.

Mitigation strategies that are required by resource consent conditions or relied upon in effects modelling are set out below in Sections 3.2.2 - 3.2.5. Monitoring of adverse noise, vibration and airblast effects relies heavy on monitoring to inform blast designs, Section 4 describes noise, vibration and airblast monitoring at the Macraes Operation.

Noise Bunds

Noise bunds have been constructed south of the Frasers West Pit, west of Frasers Pit and east of the Coronation Haul Road to mitigate potential noise effects. Noise bunds must be retained through to closure of the mine.

To mitigate noise effects at 1688 Macraes Road associated with activities authorises by [insert MP4 consent ref] within three months of authorised activities commencing, a noise bund must be constructed on adjoining land to the east as shown in red on Figure 3-1 .

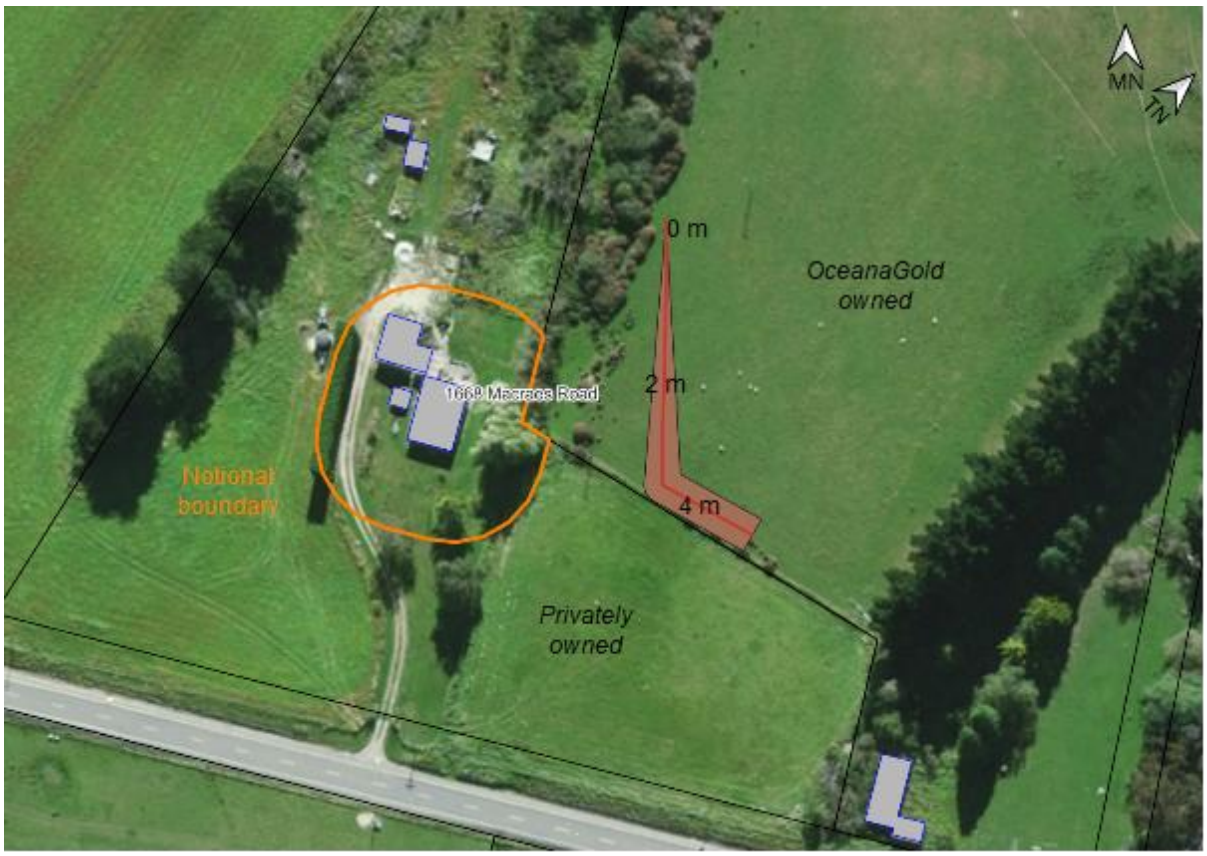


Figure 3-1: MP4 Noise Bund to Mitigate Effects on 1668 Macraes Road

Coronation Haul Road Restrictions

Condition 8.2 of resource consents that authorise mining at Coronation North states that no Heavy Vehicles other than a service truck shall use the haul road between the Coronation or Coronation North mine site and the gold processing plant as shown on Map 1 between the hours of 9.00 pm to 7.00 am each day. Condition 8.2 ceases to have effect if the OceanaGold obtains

an agreement with the owners of 406 Horse Flat Road that the condition is no longer necessary. The effect of Condition 8.2 not applying is that the noise limit at 406 Horse Flat Road during night-time hours shall be 51dBA LAeq.

Noise attenuation works were undertaken on the dwelling at 406 Horse Flat Road and approval from the owners of 406 Horse Flat Road was obtained and provided to ORC. Condition 8.2 of xx no longer applies.

Subject to future mine extensions being designed to not expose the dwelling at 406 Horse Flat Road to noise effects worse than those measured to inform the design of noise attenuation works undertaken on the dwelling, the agreement relating to the use of the Coronation Haul Road continues to apply i.e. OGL must continue to manage noise effects to comply with a limit of 51 dBA at Horse Flat Road. For clarity, a noise limit 51dB LAeq applies at the notional boundary of 406 Horse Flat Road for MP4 activities.

Night-time Activity Restrictions – Innes Mills Back Fill and Frasers West Waste Rock Stack

Mining activities authorised by MP4 are subject to additional controls to ensure noise levels remain below night-time noise compliance limits at the below locations:

- At the notional boundary of the dwelling at 1668 Macraes Road; and

Operations in the specific areas of Frasers West Waste Rock Stack and Innes Mills Back Fill Stage 1, identified in Figure 3-2, must occur during the day-time period only to ensure compliance with the night-time noise compliance limits.

The above restrictions are limited to spreading waste within these areas using a dozer and grader. Haulage to these locations is not restricted.

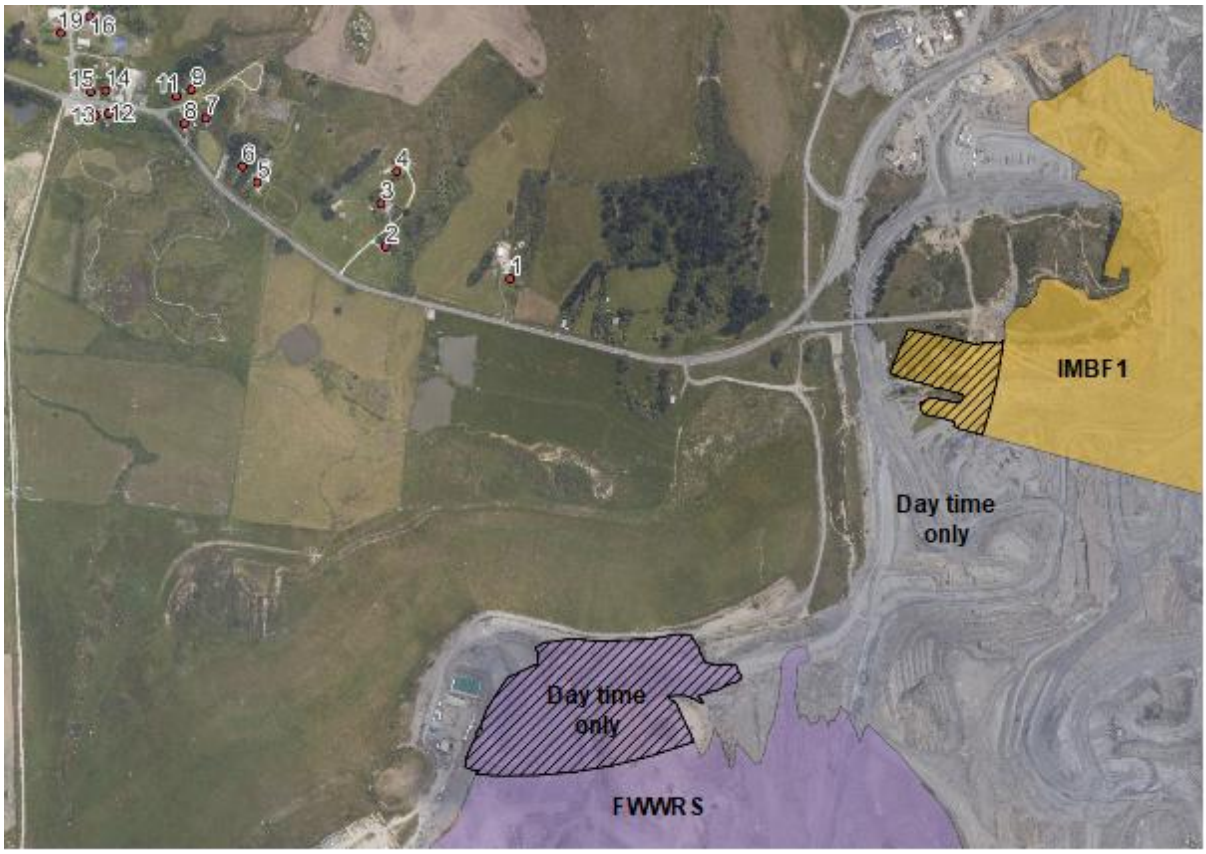


Figure 3-2: Restrictions on Night-Time Operations

Maintenance of Machinery

All machinery is regularly maintained to ensure it generates noise levels no higher than what was modelled to assess potential effects.

3.2 Blast Effects Management

3.2.1 Open Pit Vibration and Airblast Compliance Limits at Dewellings

Note: underground blasting is not subject to consent conditions that require compliance with limits at the notional boundary of dwellings.

The following blast and vibration limits apply when measured at the notional boundary of any dwelling not owned by OceanaGold:

- Vibration shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time; and
- Airblast overpressure shall not exceed a peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 120 dB (Linear peak) at any time.

3.2.2 Open Pit Blasting Times and Notifications

Note: underground blasting is not restricted to certain periods.

Blasting must be undertaken within the following periods:

- Monday-Friday 9.00 am to 5.30 pm; and
- Saturday, Sunday 10.00 am to 4.30 pm.

In addition to the above restrictions, blasting within the Deepdell Stage 3 pit is restricted to 10 am to 4:30 pm on public holidays.

The location and time of open pit blasting must be posted daily at all the main mine entrances and advised to employees by daily email.

3.2.3 Blast Design Parameters and Considerations

The size of any blast and hence the management of blasting effects starts with appropriate mine planning and design.

Management of blast vibration therefore needs to be a critical consideration in all areas of mine design and planning. The selection of the spacing, length and diameter of blast holes is interrelated and determines the optimum explosives charge weight that should be effectively applied when production blasting. All aspects of mine planning and design will be appropriately applied to achieve a balance between productivity, cost-effectiveness and vibration minimisation.

The blast design parameters are typically determined based upon the required powder factor that adequately fragments the rock to be excavated. The powder factor is the amount of explosives weight (or charge) used in kg per m3 of rock to be broken.

Ground vibration and airblast must also be considered to ensure compliance with the limits imposed by consent conditions. The magnitude of ground vibration and airblast are dependent upon the distance from the blast and the maximum instantaneous charge (MIC) of explosives being fired.

Other blast parameters that need to be determined for each blast are:

- The blasthole diameter;
- Burden and spacing of the blast pattern;
- The explosive density;
- The uncharged length of blasthole;
- The type of stemming material used and the stemming length. Insufficient stemming or inferior stemming material will reduce the confinement of the explosives charge when detonated, potentially resulting in some ‘rifling’ of the explosives charge and increased airblast;
- Sequencing of the blast hole initiation and the timing of the delays between each blast hole being initiated

- Whether decking of the explosives column in each blast hole is required to reduce the MIC. For example, detonation of some of the explosive's column can be delayed though the use of millisecond delay initiation units.

These parameters need to be selected to ensure blasting results in sufficient fragmentation of the blasted rock while achieving consent compliance and minimising detrimental vibration effects.

3.2.4 General Blast Design Procedure

In practice, the application of statistics and the design of a blast via a given vibration relationship (equation) does not need to and will not occur for every blast. The practice used throughout is to:

- Adopt an existing relevant vibration relationship as the starting point for the open pit and underground blast designs, adopting conservatism in selecting a Maximum Instantaneous Charge (MIC) until there are enough data to confirm or refine this relationship;
- Ensure the blast design has an MIC that is below the limiting MIC that has been calculated to achieve compliance with the consent conditions for ground vibration and airblast; and
- Review vibration and airblast monitoring data and adjust blast design parameters where necessary, monitoring data must be reviewed daily and adjusted accordingly when blasting is occurring within 2 km of a sensitive receiver.

All blasts are designed by open pit and underground mining engineers and are reviewed and approved by a Senior Technical Services staff member. This review must consider the maximum instantaneous charge, timing and sequencing and the results of previous firings in the same area.

Open Pit Blast Design

Characteristics

The most recent assessment of vibration and airblast effects from blasting at the Macraes operation by TechNick Consulting was undertaken in May 2026. The assessment concluded that ‘production’ blasting in the open pit will have to be moderated when the distance between blasting and a residence is less than 2km as the calculated peak particle velocity (PPV) at this distance would be 4.8 mm/s which is close to the resource consent limit of 5 mm/s.

Included in Table 3-1 are the open pit blast design parameters for ‘Normal’ blasting which may be applied when at greater distances than 2 km from the nearest residence. ‘Normal’ blasting is what is used in most instances for overburden stripping. More conservative blast designs are used in circumstances where more cautious blasting is appropriate to maintain control and minimise any environmental disturbances, such as blasting near pit limits. These more conservative blast designs are termed ‘Reduced’ blasting and ‘Mini’ blasting, they include additional measures of control as indicated in Table 3-1.

Typical blasthole designs and configurations may have up to three holes per delay MIC for Ore blasts and two holes per delay MIC for Waste blasts.

Table 3-1: Open Pit Blast Design Parameters

Design Parameters	Mini-blasting	Reduced	Normal
Diameter (mm)	102mm	102mm	200mm
Explosives MIC	30kg	60kg	400kg

Practices

In order to minimise ground vibration and airblast, within a single pit, initiation of blasting on different benches will be offset (not simultaneous) to ensure no cumulative effects.

Between different pits, initiation of blasting will also be offset (not simultaneous).

Mine operations management shall also make an assessment of the weather conditions on the day of a proposed open pit blast and to make changes to the time of a blast if conditions are deemed unfavourable (eg weather inversions).

Where a blast is within 2km of the nearest residence, appropriate adjustments will need to be made to the blast design parameters (particularly MIC based on the actual distance to a residence) to ensure the vibration limits are complied with.

Calculations

The AS2187.2 default formula used for predicting vibration levels is:

$$V = K \times \left(\frac{\sqrt{W}}{D} \right)^{1.6}$$

where:

V = peak particle velocity (PPV) or (RPPV)

W = explosives charge per delay (kg) or MIC

D = distance to damageable “target” (m)

K = is a constant related to rock properties & blast design

RPPV refers to the ‘Resultant’ peak particle velocity which is the value taken from the accumulation of the vertical radial, and transverse individual planes. This is the most common reference applied to vibration limits and upon which the Australian Standard 2187.2 is based.

AS2187.2 recognizes a range of potential ‘K’ values because of the wide range of geological formations world-wide. The ‘K’ value depends on geological conditions and the nature of the type of blast design.

Calculations using AS2187.2 formula can assume a ‘K’ value of 1200 which is at the higher end of “back-calculated” values from the historical OGNZL blasting records.

For blasts within 2km of a residence, an acceptable MIC will be back calculated using the above formula. Back calculation allows the determination of the site specific 'K' value for the geological formations between the blast area and the receptor.

For calculating airblast, the relevant formula has been derived from AS 2187.2 2006: section J7.2 'Airblast overpressure'.

$$P = K_a X \left(\frac{R}{Q^{1/3}} \right)^{\alpha}$$

Where:

P = pressure (kPa)

Q = explosives charge mass (kg)

R = distance from charge (m)

Ka = site constant

α = site exponent

The resultant kPa pressure is then converted to dBL. Using the historical blast data, the relationship below has been used to calculate airblast generated for the Macraes open pit blasts:

$$P = 40 X \left(\frac{R}{Q^{1/3}} \right)^{-1.45}$$

Production kg	400
Distance m	910
dBL	107

Calculations show that the closest house (1668 Macraes Road) is predicted to experience acceptable airblast levels (less than 115 dBL) for the closest, typical production blast designs. Potential environmental effects associated with airblast are generally considered to be negligible.

3.2.5 Underground Blast Design

Residential sensitive receivers are sufficiently setback from blasting within the Golden Point Underground mine to ensure vibration levels do not exceed compliance limits without any modification to the standard underground blast designs.

Within the Golden Point Historic Reserve there are number of historic buildings which could potentially be impacted by underground blasting. The approach to managing potential effects on historic buildings within the Golden Point Historic Reserve is set out in Section 3.3.7.

3.2.6 Blasting Records

For each blast, details of the blasting method and parameters, strength of the blast (drill and blast design details, explosives used) and time of the blast shall be entered into a record kept for that purpose and shall be available to the Council on request.

3.2.7 Managing Effects of Blasting on Historic Buildings

Based on vibration modelling it is possible that historic buildings within the Golden Point Historic Reserve will be subject to vibration levels exceeding recommended limits identified in AS 2187.2:2006 to protect against damage to buildings from blasting.

Table 3-2 shows the modelled vibrations for historic sites located within the Golden Point Historic Reserve and the closest residence at 406 Horse Flat Road. Calculations are based on the maximum MIC being utilised at closest possible distance to sensitive receivers.

Table 3-2: Golden Point Underground Vibration Predictions

Underground Blasting	Historic Building	Set back Distance (m)	Modelled Peak Particle Velocity or PPV (mm/s)	As 2187.2:2006 Recommended Limit (mm/s)
'K' = 1200 MIC =400kg	Gaytan's Cottage	721	16.3	12.7
'K' = 1200 MIC =100kg	Callery's Battery	239	25.0	19
	Building 1 (Manger's House)	261	22.5	19
	Building 2 (Hughie Fraser's Hut)	326	17.2	19
	Building 3 Sod Hut A	411	13.0	12.7
	Building 4 Sod Hut B	432	12.3	12.7

To address potential effects on historic buildings, prior to commencing blasting authorised by [insert MP4 consent ref], the following protocol must be adhered to:

If vibration monitoring undertaken in accordance with this NAVMAP indicates that vibration trigger limits have been exceeded at Building 2 or Gay Tan's Cottage, the Consent Holder must:

- Immediately revise blast design to avoid further trigger limit exceedences.
- Engage a SEQP - Heritage Structures, to:
  - undertake a follow-up condition survey of each heritage building where the relevant vibration limit has been exceeded. Where the relevant vibration limit is exceeded at Building 2, all buildings in the Golden Point Historic Reserve must be inspected; and
  - prepare a report which sets out:
    - the results of any follow-up condition surveys;
    - confirmation as to whether any new damage is likely to be attributable to the blasting;
    - recommendations to change the blasting methodology as a means to avoid any further damage; and
    - any recommendations to change the frequency of monitoring as necessary.
- The report must be provided to the Consent Authority, the Department of Conservation and Heritage New Zealand Pouhere Taonga.
- If the SQEP – Heritage Structures, confirms that new damage to a heritage building is attributable to blasting authorised by this consent, the Consent Holder must notify the

Department of Conservation and Heritage New Zealand Pouhere Taonga and offer to repair the damage at its own cost.

[Heritage NZ contact details]

[DoC contact details].

4 Monitoring

4.1 Monitoring Plan Requirement

The NAVMAP shall include but not be limited to:

- Details of the monitoring locations, the frequency of monitoring and the method of measurement and assessment in accordance with the relevant conditions of each consent that pertain to noise and vibration management;
- Procedures for recording blast method, strength of the blast and time of the blast; and
- Procedures for addressing non-compliant results and notification to the Council.

4.2 Blasting and Vibration Monitoring

4.2.1 Monitoring Locations and Frequency

Compliance limits apply at the notional boundary of any dwelling not owned by OceanaGold. Under consent LRC 201.2011.35 that authorises MP3 mining activities, compliance limits included in Section 3.3.1 also apply at a school or church that exists outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010.

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

To manage blasting effects and to confirm compliance with limits in Section 3.3.1, blasting shall be monitored on OGNZL land near the residence at 1668 Macraes Road and at the driveway to 406 Horse Flat Road. To manage blasting effects on historic buildings in accordance with the protocol identified in Section 3.3.7, blasting shall be monitored at Gaytans Cottage and Building 2 in the Golden Point Historic Reserve (refer Figure 2-4). The proposed location, timing and frequency of blast monitoring is set out in Table 4-1. Monitoring locations for blasting are identified in Figure 4-1.

Table 4-1: Blast Monitoring – Location, Timing and Frequency

Site Ref	Monitoring Locations	Timing	Frequency
Site 1	OGNZL land near the residence at 1668 Macraes Road	Blasting in Innes Mills Pit	Continually*
Site 2	At the driveway to 406 Horse Flat Road	Blasting in Coronation Pit	Monthly - two randomly selected blasts
Site 3	Gay Tan's Cottage	Blasting in Innes Mills Pit	Continually*
Site 4	Golden Point Historic Reserve –Building 2	Blasting in Golden Point Underground Mine	Continually*

The frequency of monitoring can reduce to 'two randomly selected blasts each month' where blasting occurring at distances exceeding 2 km from the closest sensitive receiver has not exceeded compliance limits specified in Section 3.3.1 for three months in a row.

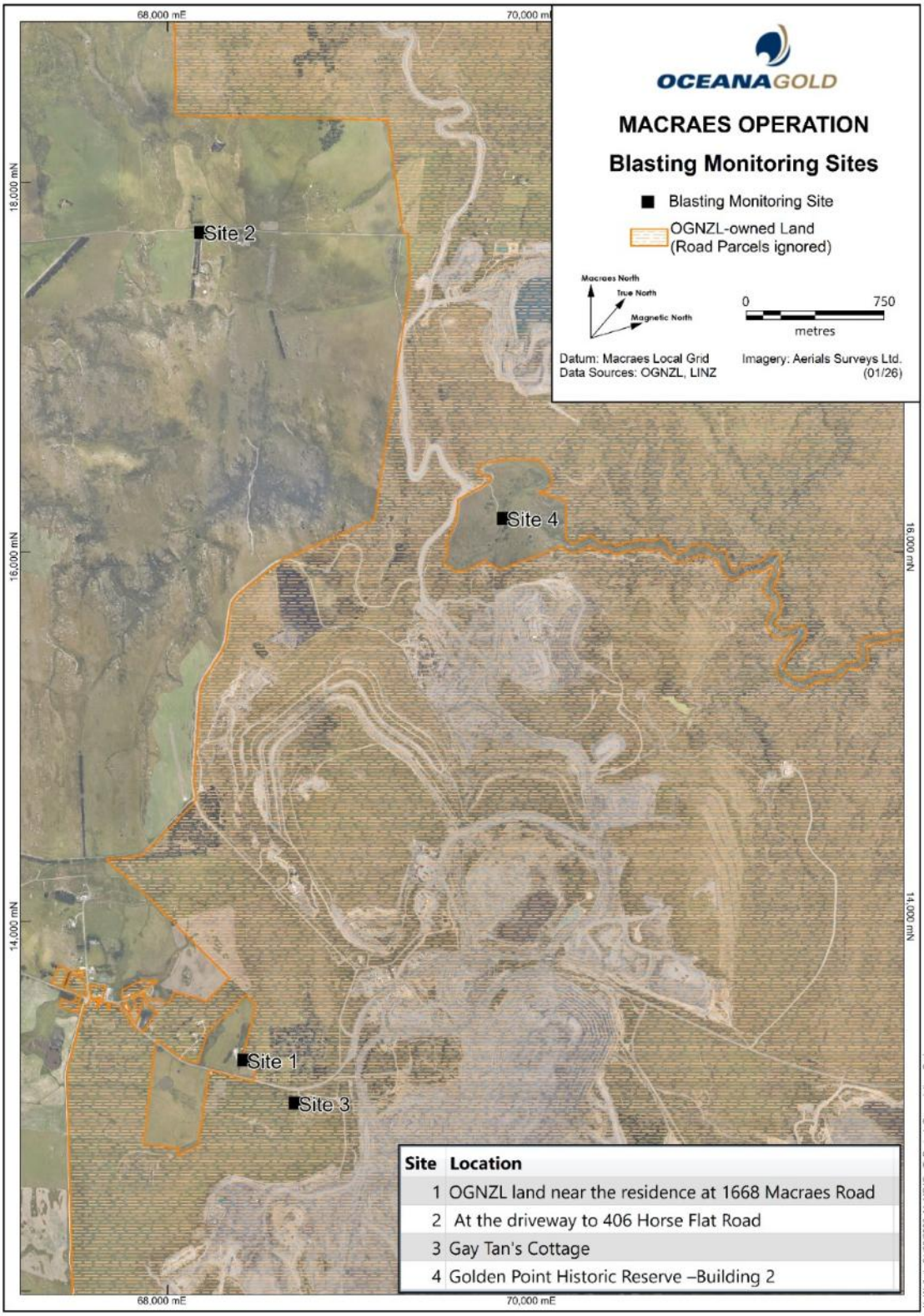


Figure 4-1: Blasting Monitoring Locations

4.2.2 Monitoring Equipment

Blast and sound overpressure monitoring will be undertaken using OceanaGold's Texcel GTM blast monitors or similar equivalent. The Blast monitors shall be calibrated externally before the expiry date of the previous external calibration.

4.2.3 Monitoring Results, Investigation and Reporting

Recorded airblast and vibration monitoring data must be stored in a central location and assessed against relevant compliance limits described in Section 3.3.1. Where monitoring results indicate an exceedance of airblast and vibration limits at a dwelling sensitive site, an investigation must be undertaken.

The investigation will include collection of relevant weather data, identifying operational activities at the time of the incident, collecting camera footage and interviewing operational staff. Investigations should endeavour to identify root cause and contributing factors.

Where the breach relates to a historic site, a condition survey must be undertaken in accordance with the protocol identified in Section 3.3.7.

In the event of a valid non-compliant airblast or vibration reading the event should be reported through to the relevant territorial authority (i.e. Waitaki District Council or Dunedin City Council depending on which Council boundary the incident occurred within), within 24 hours of the incident occurring.

A record of the event must be recorded in the InControl reporting system and any relevant actions assigned.

Monitoring results will be summarised and reported in the Project Overview and Annual Work and Rehabilitation Programme that is supplied to the WDC and DCC by 31 March each year

4.3 Noise Monitoring

A minimum of four readings must be taken each month at any of the dwellings identified as sensitive receiver(s) in Table 2 (not every dwelling is required to be monitored each month). Monitoring is to include both day-time (Monday to Friday 7 am – 9 pm) and night-time (Monday to Friday 9 pm to 7 am) measurements.

When the Coronation Haul Road is being used to transport ore to the processing plant, monthly monitoring must occur at 406 Horse Flat Road. When mining activities are occurring in the Central Mining Area1, monthly monitoring must occur at 1668 Macraes Road.

In addition, noise monitoring may occur on OceanaGold property from time to time as part of OceanaGold's internal review system.

4.3.1 Monitoring Equipment

Noise monitoring for compliance will be undertaken with a Casella CEL-621A or Casella CEL-632A sound Level Meter. The sound level meter shall be calibrated before each use and externally before the expiry date of the previous external calibration.

All noise measurements referred to 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 6803:2008 Acoustics: Environmental Noise.

4.3.2 Monitoring Results, Investigation and Reporting

Recorded noise monitoring data must be stored in a central location and assessed against relevant compliance limits described in Section 3.1. Where monitoring results indicate an exceedance of the noise limits at a sensitive site, an investigation must be undertaken.

The investigation will include collection of relevant weather data, identifying operational activities at the time of the incident, collecting camera footage and interviewing operational staff. Investigations should endeavour to identify root cause and contributing factors.

In the event of a valid non-compliant noise reading the event should be reported through to the relevant territorial authority (i.e. Waitaki District Council or Dunedin City Council depending on which Council boundary the incident occurred within), within 24 hours of the incident occurring.

A record of the event must be recorded in the InControl reporting system and any relevant actions assigned.

Monitoring results will be summarised and reported in the Project Overview and Annual Work and Rehabilitation Programme that is supplied to the WDC and DCC by 31 March each year.

4.3.3 Additional Monitoring

Additional monitoring may be required as a consent condition to confirm noise modelling results, in order to improve knowledge of specific conditions which may arise and lead to excessive noise levels, or as a result of management of operational noise through Trigger Action Response Plans (TARPs).

The use of unattended noise monitoring equipment is a useful tool for addressing knowledge gaps however it is important to consider using such equipment in conjunction with the collection of real-time weather data to ensure that measurements that are taken are within the meteorological window as defined by NZS 6801:2008 and NZS 6802:2008.

Spot noise measurements, as part of TARPs, will only be made by trained individuals (could include OGL personnel with the necessary skills to operate monitoring equipment effectively). Such spot measurements must record all necessary information (including time of reading, background noise, weather conditions). This information will be passed on to an OGL Environmental Advisor for filing and future reference.

5 Complaints

Complaints may be referred by one or more of the regulatory authorities, a member of the public or direct via an OceanaGold employee or contractor. It is the responsibility of the Manager Environment and Social Performance to respond to and follow up all complaints regarding noise, airblast or vibration. The Manager Environment and Social Performance may delegate that authority, and is responsible for ensuring suitably qualified personnel are available to respond to complaints.

Actions to be taken as soon as possible by the Manager Environment and Social Performance or delegated personnel:

- All complaints are logged in InForm Stakeholder data base.
- Note the time, date, identity and contact details of complainant. Note if complaint has been referred from a Consent Authority.
- Ask the complainant to describe the noise, airblast or vibration; how long it has been noticeable for, is it worse at any time of day, does it come from an identifiable source.
- As soon as possible after receipt of a complaint undertake a site inspection. Note all noise, airblast or vibration-producing activities taking place, which staff member or contractor is responsible for the site and the noise, airblast and vibration mitigation methods that are being used. Instigate any remedial action necessary.
- As soon as practical (preferably within two hours of remedial action being implemented) visit the area from where the complaint originated to ascertain if noise, airblast or vibration is still a problem.
- If it becomes apparent that there may be a source of noise, airblast or vibration other than activities at the Macraes Operation causing the nuisance it is important to verify this. Document the source.
- If complaint is received more than 12 hours after the event, conduct investigation including collecting relevant weather data, identifying operational activities at the time of the incident, collecting camera footage and interviewing operational staff. Investigations should endeavour to identify root cause and contributing factors.
- As soon as possible after the initial investigations have been completed contact the complainant to explain what has been found and remedial actions taken.
- If necessary, update any relevant procedures to prevent any recurrence of problems.

Follow up actions: Advise the Waitaki District Council (WDC) (all areas excluding Coronation North) and the Dunedin City Council (Coronation North and the DCC side of the Coronation Project) as soon as practical that a complaint has been received, what the findings of the investigation were and any remedial actions taken. A single consolidated reporting database that records whether complaints arise within the jurisdiction of WDC or DCC should be maintained.

The Macraes Operation has a concerns, complaints and grievance mechanism to use if the community has any issues. The relevant contact phone number or email address for the community to contact, and the process to follow, are laid out in the Macraes Operation Concerns, Complaints and Grievance Mechanism Standard Operating Procedure.

6 Responsibilities

OceanaGold as the holder of the consents for the Macraes Operation has the ultimate responsibility to ensure that all statutory requirements and conditions of consent are complied with and mining activities are carried out in accordance with the NAVMAP.

Table 6-1: Roles and Responsibilities

Role	Responsibilities
Macraes Asset President	Provide appropriate management and financial support for the effective implementation of the NAVMAP.
Open Pit Mining Manager	Implementation of the NAVMP and periodic reviews of the NAVMAP. Investigating breaches of noise, vibration or airblast consent compliance limits. Designing blasts to comply with vibration standards. Monitoring blasts to inform blast designs. Scheduling and managing mining activities to comply noise and vibration limits. Provision of information in a timely manner to inform investigations into breaches of compliance limits. Notifying staff of blast location and time1.
Underground Mining Manager	
Processing Manager	
Maintenance Superintendent *(limited to noise from the workshop)*	
Environment and Social Performance Manager	Review and approve the NAVMAP and ensure such reviews are undertaken at least annually.. Ensuring staff environmental awareness and training.
Environment Superintendent	Review the NAVMAP Monitoring and reporting of noise and vibration monitoring data to councils as required by consent conditions. Investigating breaches on noise and vibration standards. Commissioning historic building condition surveys where trigger limits are exceeded. Maintaining and operating the vibration monitoring network and calibration of blast monitors.
External Affairs and Social Performance Superintedent	Responding to and managing complaints.
Environment Advisor	Undertaking measurements and maintenance at the direction of the Environment Superintendent.
All personnel and contractors	Be aware of, and comply with, the procedures contained within or referred to in the NAVMAP

All contractors and staff working on site are to ensure that their activities comply with relevant consent conditions, inclusive of requirements set out in the NAVMAP.

7 Consultation

7.1 Neighbours

OceanaGold will consult with the Macraes Community Incorporated (MCI) regularly, as part of the bi-monthly meeting process, to inform them of any issues regarding noise, airblast or vibration at the Macraes Gold Mine site that may be of interest to the community and to obtain feedback from the community.

OceanaGold will advise the Macraes Community, through MCI, of the contact phone numbers to be used to advise OceanaGold of a noise, airblast or vibration complaint.

OceanaGold will also consult with parties who are potentially affected by noise, airblast and vibration, as determined by modelling or as identified through previously consented projects. Discussions will include an explanation of modelling results and mitigation strategies to be used to avoid or minimise noise effects.

Complaints should be directed to:

[Insert external affairs email address]

7.2 District and City Councils

OceanaGold will inform WDC and DCC of any issues regarding noise, airblast or vibration control at the Macraes Operation that may be of interest to them and to obtain feedback on compliance and performance where relevant. OceanaGold will provide WDC and DCC with contact numbers to be used to advise OceanaGold of a noise, airblast or vibration complaint.

8 Reporting

8.1 OceanaGold to Regulatory Authorities

OceanaGold will inform WDC and DCC of the following:

- Any complaints received regarding noise, airblast or vibration as soon as practical after receipt of the complaint; and
- Of any non-compliance with consent limits in Sections 3.2.1 and 3.3.1.

Only complaints related to activities north of Matherson Road (jurisdiction of DCC) will be forwarded on to DCC.

8.2 Waitaki District Council/Dunedin City Council to OceanaGold

OceanaGold requests that WDC and DCC advise of any complaints they receive regarding noise, airblast or vibration from the Macraes Operation immediately after a complaint has been lodged.

9 NAVMAP Review Procedure

The NAVMAP shall be reviewed as required taking into account:

- The outcome of any reviews completed as the result of any non-compliant results;
- The outcome of the blasting and noise monitoring data; and
- Whether management practices are resulting in compliance with the conditions of the relevant consents.

OGNZL may lodge an amended monitoring plan, management plan or other document for recertification at any time. Minor/administrative changes may be implemented without recertification where written notice is provided to ORC no less than 5 working days prior to publication of the amended document.

Minor/administrative changes are limited to corrections of errors, updates to contact details, updates to reflect changes in organisational structure, formatting improvements, or other changes that:

- Do not alter the objectives, performance standards, mitigation methods, monitoring methodology, or reporting requirements of the certified document; and
- Do not materially affect the scale, location, or nature of activities authorised by these consents.

APPENDIX A

Resource Consent Conditions for Noise, Airblast and Vibration

MP3	Coronation	Coronation North	Coronation North Extension	Deepdell North	CCP1	CCP2	GPUG	MP4
Blasting and Vibration								
8.1 The consent holder shall ensure that blasting practices minimise air and ground borne vibration. Fly-rock shall be minimised and all blasting procedures shall be carried out so as to ensure the safety of employees and the public. No blasting shall occur when the weather is unsuitable.	7.1 The consent holder shall ensure that blasting practices minimise air and ground borne vibration. Fly-rock shall be minimised and all blasting procedures shall be carried out so as to ensure the safety of employees and the public. No blasting shall occur when the weather is unsuitable.	7.1 The consent holder shall ensure that blasting practices minimise air and ground borne vibration. Fly-rock shall be minimised and all blasting procedures shall be carried out so as to ensure the safety of employees and the public. No blasting shall occur when the weather is unsuitable.	7.1 The consent holder shall ensure that blasting practices minimise air and ground borne vibration. Fly-rock shall be minimised and all blasting procedures shall be carried out so as to ensure the safety of employees and the public. No blasting shall occur when the weather is unsuitable.	7.1 The consent holder shall ensure that blasting practices minimise air and ground borne vibration. Flyrock shall be minimised, and all blasting procedures shall be carried out so as to ensure the safety of employees and the public.	8.1 The consent holder shall ensure that blasting practices minimise air and ground borne vibration. Fly-rock shall be minimised and all blasting procedures shall be carried out so as to ensure the safety of employees and the public. No blasting shall occur when the weather is unsuitable.	7.1 The Consent Holder shall ensure that blasting practices minimise air and ground borne vibration. Flyrock shall be minimised and all blasting procedures shall be carried out so as to ensure the safety of employees and the public. No blasting shall occur when the weather is unsuitable.	39. The consent holder shall ensure that any blasting authorised by this consent avoids any damage to historic buildings or structures located in the Golden Point Historic Reserve. To achieve this condition the following shall be complied with: a) Prior to the commencement of blasting, a suitably qualified and experienced structural engineer shall examine these buildings and prepare a report that summarises the baseline condition of the buildings and in particular any cracks that already occur; b) The report completed under condition 39 (a) shall be provided in writing to the Consent Authority; c) The expert shall monitor the structures at a sufficient frequency to ensure, as far as practicable, that there is no damage to the buildings that could be attributable to the blasting; d) In the event that any new visible cracks appear on the features, or any other damage that has been attributed to the blasting by the monitoring in condition 39 (c), then the Consent Holder shall immediately cease all blasting and the Consent Authority and the Department of Conservation shall be immediately informed; e) The Consent Holder shall engage suitably qualified structural engineering and blasting experts that together prepare a report which sets out the reasons why the damage is likely to be attributable to the blasting and recommendations to change the blasting methodology as a means to avoid any further damage and any recommendations to change the frequency of monitoring as necessary. This report shall be provided in writing to the Consent Authority and Department of Conservation; f) Blasting may recommence in accordance with the recommendations contained in the report prepared under	To be completed.

							condition 39 (e) and the report has been provided in writing to the Consent Authority and Department of Conservation; and	
8.2 The location and time of blasting shall be posted daily at all the main mine entrances and advised to employees by daily email.					8.2 The location and time of blasting shall be posted daily at all the main mine entrances and advised to employees by daily email.	7.2 The location and time of blasting shall be posted daily at all the main mine entrances and advised to employees by daily email.		
8.3 Blasting shall be restricted to within the following hours: Monday-Friday 9 am to 5.30pm, Saturday and Sunday 10am to 4.30 pm	7.2 Blasting shall be restricted to within the following hours: Monday-Friday 9 am to 5.30 pm, Saturday and Sunday 10 am to 4.30 pm.	7.2 Blasting shall be restricted to within the following hours: Monday-Friday 9 am to 5.30 pm, Saturday and Sunday 10 am to 4.30 pm.	7.2 Blasting shall be restricted to within the following hours: Monday-Friday 9 am to 5.30 pm, Saturday and Sunday 10 am to 4.30 pm.	7.2 Blasting authorised by this consent shall be restricted to within the following hours: a. Monday-Friday 9.00 am to 5.30 pm, b. Saturday, Sunday and public holidays 10.00 am to 4.30 pm.	8.3 Blasting shall be restricted to within the following hours Monday-Friday 9am to 5.30pm Saturday and Sunday 10am to 4.30pm	7.3 Blasting shall be restricted to within the following hours: Monday to Friday 9.00am to 5.30pm Saturday and Sunday 10.00am to 4.30pm		
8.4 Details of blasting method, strength of the blast and time of blast shall be entered into a record kept for that purpose and shall be available to the Council on request. This information shall also be included in the monitoring report, required under Condition 10.	7.3 Details of blasting method, strength of the blast and time of blast shall be entered into a record kept for that purpose and shall be available to the Councils on request. This information shall also be included in the monitoring report, required under Condition 9.	7.3 Details of blasting method, strength of the blast and time of blast shall be entered into a record kept for that purpose and shall be available to the Councils on request. This information shall also be included in the monitoring report, required under Condition 9.	7.3 Details of blasting method, strength of the blast and time of blast shall be entered into a record kept for that purpose and shall be available to the Councils on request. This information shall also be included in the monitoring report, required under Condition 9.	7.3 Details of blasting method, strength of the blast and time of blast shall be entered into a record kept for that purpose and shall be available to the Consent Authority on request. This information shall also be included in the monitoring report, required under Condition 9.	8.4 Details of blasting method, strength of the blast and time of blast shall be entered into a record kept for that purpose and shall be available to the Council on request. This information shall also be included in the monitoring report, required under Condition 10.	7.4 Details of blasting method, strength of the blast and time of blast shall be entered into a record kept for that purpose and shall be available to the Consent Authority on request. This information shall also be included in the monitoring report, required under Condition 9.		
8.5 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010 shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time.	7.4 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time.	7.4 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time.	7.4 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time.	7.4 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time.	8.5 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010 shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time.	7.5 Vibration due to blasting or any other activity associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the Consent Holder, or subject to an agreement with the Consent Holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010 shall not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 10 mm/sec at any time. **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.		
8.6 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010 shall not exceed a peak non-frequency-weighted (Linear	7.5 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder shall not exceed a peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level	7.5 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder shall not exceed a peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level	7.5 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder shall not exceed a peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level	7.5 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder shall not exceed a peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level	8.6 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the consent holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010 shall not exceed a peak non-frequency-weighted (Linear	7.6 Airblast overpressure from blasting associated with the mining operation, when measured at any point within the notional boundary of any dwelling not owned by the Consent Holder, or subject to an agreement with the Consent Holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan, deemed operative on 23 August 2010		

or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting.	shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting.	shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting.	shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting.	shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting. 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.	or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting. 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.	shall not exceed a peak non-frequency-weighted (Linear or flat) level of 115 decibels (dB), provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level shall not exceed 120 dB (Linear peak) at any time. For the purpose of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting.		
					8.7 The consent holder shall not conduct blasting within the vicinity of the Macraes-Dunback Road or Golden Bar Road in a manner that constitutes a danger to life or property. If the Council considers it necessary to temporarily close the Macraes-Dunback Road or Golden Bar Road to allow blasting to take place, it may permit the consent holder to temporarily close the road, provided that the consent holder: (a) Keeps the time of closure as short as possible; and (b) Does not allow the time of closure to exceed a maximum of 15 minutes in any continuous period of 60 minutes, except where an emergency situation arises in respect of the safety of the public or project personnel.	7.7 The Consent Holder shall not conduct blasting within the vicinity of the Macraes Road or Golden Bar Road in a manner that constitutes a danger to life or property. If the Waitaki District Council considers it necessary to temporarily close the Macraes Road or Golden Bar Road to allow blasting to take place, it may permit the Consent Holder to temporarily close the road, provided that the Consent Holder: (a) Keeps the time of closure as short as possible; and (b) Does not allow the time of closure to exceed a maximum of 15 minutes in any continuous period of 60 minutes, except where an emergency situation arises in respect of the safety of the public or project personnel. In the event of such temporary closure the Consent Holder shall: (a) Ensure appropriate barriers are erected and ensure such number of persons as may be necessary are stationed at Macraes Road or Golden Bar Road to prevent access by the public to that part of the road that shall be closed; and (b) Hold current public liability insurance to indemnify any member of the public affected. (c) Postpone any blasting in order to reopen the Macraes Road or Golden Bar Road to allow the passage of vehicles for emergency purposes.		
					8.8 In the event of such temporary closure the consent holder shall: (a) Ensure appropriate barriers are erected and ensure such number of persons as may be			

					necessary are stationed at Macraes-Dunback Road or Golden Bar Road to prevent access by the public to that part of the road that shall be closed; and (b) Hold current public liability insurance to indemnify any member of the public affected. (c) Postpone any blasting in order to reopen the Macraes-Dunback Road or Golden Bar Road to allow the passage of vehicles for emergency purposes.			
				Noise				
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 910.2: (a) On any day between 7 am to 9 pm (daytime): 50 dBA Leq; and (b) On any day between 9.00 pm to 7.00 am the following day (night-time): 40dBA Leq; and/or 70 dBA Lmax.	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 LAeq; and (b) On any day between 9.00 pm to 7.00 am the following day (night-time): 40dBA LAeq; and/or 70 dBA LAmax.	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 LAeq; and (b) On any day between 9.00 pm to 7.00 am the following day (night-time): 40dBA LAeq; and/or 70 dBA LAmax.	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 LAeq; and (b) On any day between 9.00 pm to 7.00 am the following day (night-time): 40dBA LAeq; and/or 70 dBA LAmax.	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: (a) On any day between 7 am to 9 pm (daytime): 55 dBA LAeq; and (b) On any day between 9.00 pm to 7.00 am the following day (night-time): 40dBA LAeq; and/or 70 dBA LAmax.	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: (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): 40dBA Leq; and/or 70 dBA Lmax.	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 LAeq; and (b) On any day between 9.00 pm to 7.00am the following day (night-time): 40dBA Leq; and/or 70 dBA Lmax.	31. 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: a) On any day between 7 am to 9 pm (daytime): 50 dBA LAeq; and b) On any day between 9.00 pm to 7.00am the following day (night-time): 40dBA LAeq; and/or 70 dBA LAmax.	31. 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: a) On any day between 7 am to 9 pm (daytime): 50 dBA LAeq; and b) On any day between 9.00 pm to 7.00am the following day (night-time): 40dBA LAeq; and/or 70 dBA LAmax.
					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.	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.	32. Noise measurements shall be taken at any point within Macraes Township; or at the notional boundary of any dwelling not owned by the consent holder in the Rural General or Rural Scenic Zone except that condition 31 shall not apply to any property or site that is owned by the consent holder. 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.	40. Prior to any blasting authorised by this consent, the consent holder shall produce an updated Noise, Airblast and Vibration Monitoring Plan (including a Vibration Management Plan for Heritage Structures). The plan shall include but not be limited to: a) Details of the monitoring locations, the frequency of monitoring and the methods of measurement and assessment of noise and vibration required by the conditions of this consent; b) Procedures for recording blasting method, strength of the blast and time of blast; c) Procedures to adapt the blasting methodology as means to avoid any adverse effects on those buildings described in condition 39; d) Details of how the buildings described in condition 39 are to be inspected including the frequency of inspection.
						8.3 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	33. All noise measurements referred to in Conditions 31 and 32 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.	of NZS 6802:2008 Acoustics: Environmental Noise.	

Appendix C: Proposed conditions of consent

Blasting and Vibration

1. Conditions 10 – 13 (inclusive) do not apply to blasting undertaken in the Golden Point Underground Mine.

2. The Consent Holder must ensure that blasting practices minimise air and ground borne vibration. Fly-rock must be minimised and all blasting procedures must be carried out to ensure the safety of employees and the public. Blasting must not occur when the weather is unsuitable.

3. The Consent Holder must ensure that the location and time of blasting is posted daily at all the main mine entrances and advised to employees by daily email.

4. The Consent Holder must ensure that blasting is restricted to within the following hours:

a) Monday to Friday 9.00am to 5.30pm; and
b) Saturday and Sunday 10.00am to 4.30pm.

5. The Consent Holder must ensure that details of blasting method, strength of the blast and time of blast are entered into a record kept for that purpose. This record must be provided to the District Councils following any written request.

6. Vibration due to blasting or any other activity associated with the mining operations, when measured at any point within the notional boundary of any dwelling not owned by the Consent Holder or subject to an agreement with the Consent Holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan deemed operative on 23 August 2010, must not exceed a peak particle velocity measured in the frequency range 3-12 Hz of 5 mm/sec provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level must not exceed 10 mm/sec at any time.

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.

7. Airblast overpressure from blasting associated with the mining operations, when measured at any point within the notional boundary of any dwelling not owned by the Consent Holder or subject to an agreement with the Consent Holder, school or church outside the Macraes Mining Project Mineral Zone as defined by the Waitaki District Plan deemed operative on 23 August 2010 must not exceed a peak non-frequency-weighted (Linear or flat) level of 115 dB, provided this level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level must not exceed 120 dB (Linear peak) at any time. For the purposes of this consent, C-frequency-weighting may be considered equivalent to the Linear or Flat-frequency-weighting.

8. The Consent Holder must not conduct blasting within the vicinity of the Macraes Road or Golden Bar Road in a manner that constitutes a danger to life or property. Where the Waitaki District Council permits the Consent Holder to temporarily close the Macraes Road or Golden Bar Road to

allow blasting to take place, and subject to the conditions of the road closure approvals, the Consent Holder must:

a) Keep the time of closure as short as possible;
b) Not allow the duration of a closure to exceed a maximum of 15 minutes in any continuous period of 60 minutes, except where an emergency situation arises in respect of the safety of the public or project personnel;
c) Ensure appropriate barriers are erected and ensure such number of persons as may be necessary are stationed at Macraes Road or Golden Bar Road to prevent access by the public to that part of the road that must be closed;
d) Hold current public liability insurance to indemnify any member of the public affected; and
e) Postpone any blasting in order to reopen the Macraes Road or Golden Bar Road to allow the passage of vehicles for emergency purposes.

Advice Note: Temporary road closures are subject to separate application processes under Schedule 10 of the Local Government Act 1974.

Monitoring of Noise, Airblast and Vibration

9. The Consent Holder must submit a Noise, Airblast and Vibration Management Plan (NAVMAP) for certification in accordance with Conditions 9 - 20 of Schedule 1 (Common Conditions).

10. The Objectives of the NAVMAP are to:

a) To describe current and proposed noise, airblast and vibration management methods and procedures.
b) To enable OceanaGold to operate in full compliance with resource consent requirements.
c) To describe the noise, airblast and vibration monitoring regime and reporting of results

11. The NAVMAP must include but not be limited to:

a) Sources of noise, airblast and vibration at the Macraes Operation;
b) Details of the monitoring locations, the frequency of monitoring and the method of measurement and assessment in accordance with Conditions 13 - 16;
c) Procedures for recording blasting method, strength of the blast and time of blast;
d) Procedures for addressing non-compliant results and notification of the District Councils;
e) Procedures for identifying heritage structures potentially affected by blasting, undertaking baseline condition surveys, monitoring those structures, and responding to any damage in accordance with Conditions 20 - 24; and
f) Key personnel responsible for implementing the NAVMAP.

12. Prior to the commencement of blasting authorised by this consent within the Central Mining Area, and in accordance with the certified NAVMAP, the Consent Holder must undertake baseline condition surveys of the following heritage buildings shown on Figure X in Schedule 4:

a) Gaytan's Cottage;

b) Callery's Battery;
c) Building 1 (Manager's House);
d) Building 2 (Hughie Fraser's Hut);
e) Building 3 Sod Hut A; and
f) Building 4 Sod Hut B.

13. The baseline condition surveys required by Condition 20 must be completed by a SQEP - Heritage Structures. The results of the inspection must be documented in a report, a copy of which must be provided to the Consent Authority, the Department of Conservation and Heritage New Zealand Pouhere Taonga within 40 working days of commencing blasting activities.

14. Prior to the commencement of blasting authorised by this consent within the Central Mining Area, and in accordance with the certified NAVMAP, the Consent Holder must install vibration monitors at Building 2 and Gay Tan's Cottage, or at such alternative monitoring locations specified in the certified NAVMAP. Vibration monitoring must be undertaken in accordance with the certified NAVMAP.

15. Where blasting is proposed within 2 kilometres of a heritage building identified in Condition 20, the Consent Holder must use it best endeavours to design blasts to achieve the following vibration limits:

Heritage Building	**Vibration trigger limit**
Gay Tan's Cottage Building 2 (Hughie Fraser's Hut) Building 3 Sod Hut Building 4 Sod Hut B	12.7 mm/s
Callery's Battery Building 1 (Manager's House)	19 m/s

16. If vibration monitoring undertaken in accordance with the certified NAVMAP indicates that vibration trigger limits have been exceeded at Building 2 or Gay Tan's Cottage, the Consent Holder must:

a) Immediately revise blast design to avoid further trigger limit exceedences,
b) Engage a SEQP - Heritage Structures to:
    i. Undertake a follow-up condition survey of each heritage building where the relevant vibration limit has been exceeded. Where the relevant vibration limit is exceeded at Building 2, all buildings in the Golden Point Historic Reserve must be inspected; and
    ii. Prepare a report which sets out:
        - the results of any follow-up condition surveys;
        - confirmation as to whether any new damage is likely to be attributable to the blasting;
        - recommendations to change the blasting methodology as a means to avoid any further damage; and
        - any recommendations to change the frequency of monitoring as necessary.

17. The report must be provided to the Consent Authority, the Department of Conservation and Heritage New Zealand Pouhere Taonga.

18. If the SQEP – Heritage Structures, person confirms that new damage to a heritage building is attributable to blasting authorised by this consent, the Consent Holder must notify the Department of Conservation and Heritage New Zealand Pouhere Taonga and offer to repair the damage at its own cost.

19. The NAVMAP for this consent may be combined with any other NAVMAP required by any other consent held by the Consent Holder for mining operations at Macraes Flat.

20. The Consent Holder must produce a report summarising exceedances of vibration limits P for the last 12 months. The report must be included in the annual Project Overview and Annual Work and Rehabilitation Plan (Conditions 23 of Schedule 1 (Common Conditions)).

21. All measurements from the NAVMAP must be recorded and must be provided to the District Councils following any written request.