Environmental Material Risk Plan

Vibration Environmental Material Risk Management Plan

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Department	**Sustainability**
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Approval table

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Revision number	Revision date	Section	Page	Description	Effective Date
1	Dec 2013			Initial Plan	01/01/2013
2	Nov 2016			Incorporation of Slevin (SUPA) into Plan	01/11/2016
3	Jul 2017			Incorporation of MDDP into Plan	01/07/2017
4	Mar 2019			Incorporation of Project Martha into Plan	01/05/2019
5	May 2022			Three yearly update, relocation of Pensioner Flats monitor, change to blast windows and alignment to OGNZL EMR standards	01/05/2022
6	July 2022			Removal of three Correnso monitors from the network	01/08/2022
7	July 2023	All	All	Annual EMR update	01/08/2023
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8.0	Nov 2024			Resubmitted for review	05/11/2024

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1. PLAN OBJECTIVE

The objectives of this Vibration Environmental Material Risk Management Plan (VMP) are to detail the methods to be used by OceanaGold New Zealand Ltd - Waihi (OGNZL) to:

- comply with the relevant conditions of the following Hauraki District Council (HDC) Land Use Consents (LUC): 202.2012 (Correnso Underground Mine project), LUC LUSE-202.2016.544.001 (Slevin Underground Project Area), LUSE-202.2017.664.001 (Martha Drill Drives Project (MDDP)), and LUC 202.2018.857.001 (Project Martha);
- meet OGNZL's Environmental Material Risk Management Plan minimum requirements
- comply with OGNZL's Corporate Environmental Standards related to vibration
- avoid or mitigate unreasonable blasting vibration effects as required by s17 of the Resource Management Act; and
- liaise with HDC and the Waihi community and respond to complaints and concerns as they arise.

Note**:** *OGNZL has prepared and operates under an existing VMP for its current Martha pit and Favona/Trio underground mines (approved under Mining Licence 32-2388, the HDC Land Use Consents 97/98 - 105 (for the Martha Mine), 85.050.326E (Favona Underground Mine), and RC-15774 (Trio Underground Mine)). To avoid confusion that may arise by discussing the management of these other mines, the Correnso/Martha VMP is submitted to meet the requirements of the Correnso, Slevin, MDDP and Project Martha LUCs only. If appropriate or necessary, future revisions may be amalgamated into a single VMP covering all of the Waihi operations.*

REFERENCE AND COMPLIANCE

Level	Source
Legislation or Guidelines	• HDC Land Use Consent 202.2012 (Correnso) • HDC Land Use Consent 202.2016.544.001 (Slevin) • HDC Land Use Consent 664.001.2017 (MDDP) • Variation to mining licence 32-2388 • HDC Land Use Consent 97/98-105 (EMMA) • HDC Land Use Consent 202.2018.857.001 (Project Martha)
Corporate	• OGC-450-STD-020 OGNZL Environmental Performance Standards
	• OGC-450-GUI-005 Risk Management Guidelines
Site	• WAI-800-PRO-007 Concerns, Complaints and Grievances Procedure
	• WAI-200-PRO-008 Field Monitoring of Blast Vibration

2. BACKGROUND

OGNZL operates an open pit and underground mines in Waihi, New Zealand. Vibration impacts from underground and open pit blasting activities, if managed improperly, have the potential to cause damage to property and heritage items, and impact residents' amenity. Given the proximity of mining operations to the

township of Waihi, vibration impacts have been identified as an Environmental Material Risk that could create a level 3 or greater consequence through OGNZL's risk assessment process (Appendix H). An Environmental Material Risk Management Plan is therefore required to ensure effective control measures and monitoring programs are implemented to manage vibration impacts and comply with relevant regulatory requirements.

The following section sets out the various Project areas covered under this plan.

2.1 Correnso

The Correnso Underground Mine (Correnso) is located within the Correnso Extensions Project Area (CEPA) under residential land in the eastern part of the Waihi township. The required Waikato Regional Council (WRC) consents to undertake the project were granted in December 2012, and the HDC LUC was granted on 18 October 2013.

The first year of operation in Correnso involved development blasting to construct access and orebody drives; stope production blasting began in June 2015. Additional development and extraction has been undertaken into the identified extensions (Empire, Daybreak, and Christina). Mining in the Correnso project area is now complete, with some backfilling remaining to be completed. Underground access to Project Martha will continue to be required through specific Correnso access drives.

The Correnso LUC includes specific conditions that set limits on the permissible vibration level, times and durations of blasts, and the numbers of blast events per day to protect the amenity of the residents.

Although mining in Correnso is currently in abeyance, OGNZL has plans to commence narrow vein mining in the Correnso for a short period of time. Correnso monitoring and compliance obligations remain in this plan, to cover the area when blasting is being recommenced.

2.2 Slevin

The Slevin Underground Mine is a development between Correnso and the Martha Pit. The required consents for Slevin from WRC were in place from the Correnso Extensions Project Area (CEPA) application and the HDC LUC was granted in late October 2016. Access to Slevin was an extension of Correnso's Daybreak ore body and stope production is well advanced.

The Slevin LUC conditions in relation to blast vibration are sufficiently similar to Correnso in terms of permissible vibration level, times and durations of blasts, and number of blast events per day to protect the amenity of the residents and enable the two operations to operate under the same monitoring mechanisms and management plan.

2.3 MDDP

The Martha Drill Drive Project (MDDP) involved installing two exploration drives from the western end of the Slevin development, extending under the southern wall of the Martha pit, to enable exploration under and to the south of the pit. Both the 920mRL and 800mRL drives are completed.

Like the Slevin project, the MDDP LUC conditions in relation to blast vibration are sufficiently like those of the other two LUCs to enable the three operations to operate under broadly the same monitoring mechanisms and management plan. The MDDP area is contained wholly within the subsequent Project Martha Project area and therefore blast vibration monitoring for MDDP is now incorporated into the Project Martha network.

2.4 Project Martha

Project Martha (Martha) is a recently consented project extending operations in, around and under the existing Martha open pit. The required consents to undertake the project were granted by WRC and the HDC in February 2019. Activities include:

- Martha Underground: Development and extraction of ore from under the Martha Pit and areas southwest towards Kenny St (Rex ore body), accessed from the existing drives of other OGNZL projects (Correnso, SUPA, and MDDP).

- Martha Pit: The laying back of the northern batter of the pit, restoring access to the bottom of the pit and extracting ore accessible as a result of those activities.

Martha's LUC conditions are very similar to the Correnso/Slevin/MDDP LUC conditions for Underground operations, and the previous Extended Martha Mine Area (EMMA) LUC conditions for Pit blasting. This has enabled the Underground component of Martha to be incorporated into the same management regime as Correnso/Slevin/MDDP, while the open pit will be a progression of the previous Pit management.

Note: Although the new consent for the Martha Pit has been granted, there is no scheduled start date. Any likely blasting in the open pit is not currently scheduled. Rather than attempt to predict the management of open pit blasting so far into the future, OGNZL commits to submitting a revised management plan at least 30 working days prior to the first pit blast. This revision will also document the management/mitigation of flyrock and sound overpressure, as these two effects are predominantly a risk of surface mining (when considering impacts on the community).

3. LEGAL REQUIREMENTS

The full conditions relating to blasting in the Land Use Consents are included as Appendix A to F. In summary, these conditions require OGNZL to comply with the following (note: MDDP differs in having no production blasts):

- No more than three underground blast events per day, Monday to Saturday, between 0700 and 2000 (Correnso 14(a), Slevin 8(a), MDDP 13(a), Martha 31[1]);
- Open pit blasting restricted to between 1000-1500 Monday-Friday and 1000-1200 Saturday, and not to occur concurrently with Underground blasts (except for safety reasons) (Martha 32);
- No blasting at night (2000 to 0700 the following day), on Sundays or public holidays (Correnso 14(b), Slevin 8(b), MDDP 13(b), Martha 31 & 33(a)[1]);
- Conditions relating to permitted vibration levels, with 95% and average specifications calculated independently for development and production blast types (Correnso 14(c-f) & 17, Slevin 8(c-f) MDDP 13(c-f), Martha 33(b-f)[1]);
- Duration limits on production and development blasts (Correnso 14(g-i), Slevin 8(g-i), MDDP 13(g-i), Martha 33(f-i)[1]);
- Compliance standards do not apply to property owned by OGNZL or subject to written agreement that vibration effects are not to be considered (Correnso 14, Slevin 8, MDDP13, Martha 30);
- Maximum overpressure limit of 128 dBL (Martha 32);
- 'Best endeavour measures' to minimise blasting impacts on the community (Correnso 15(a), Slevin 9(a), MDDP 14(a), Martha 34);
- Implementation of an Amenity Effect Programme (AEP) (Correnso 15(b-i), Slevin 9(b-i), MDDP 14(b-i), Martha 35-42);
- Simultaneous blasts within the Trio, Favona or Martha Mine must meet the Correnso/Slevin/MDDP vibration limits (LUC Correnso 16, Slevin 10, MDDP 15, Martha 43);
- No blasting for the ventilation shaft construction (Correnso 18);
- A Vibration Management Plan to be submitted to HDC prior to commencement of mining (LUC Correnso 19, Slevin 11, MDDP 19, Martha 46);
- Impulsive vibration from all blast events to be monitored (LUC Correnso 20(a), Slevin 12(a), MDDP 16(a), Martha 45(a));

[1] Blasts for maintenance/safety purposes in the Martha consent may occur at any time and are excluded from the three blasts per day and night-time, Sundays and public holidays restriction, but must comply with lower vibration limits.

- Monitoring system to be automated to allow for prompt analysis (LUC Correnso 20(b), Slevin 12(b), MDDP 16(b), Martha 45(b));
- Monitoring to be conducted by suitably trained personnel, using equipment compliant with current AS/NZ standards (Correnso 20(c), Slevin 12(c), MDDP 16(c), Martha 45(c));
- The establishment of and criteria for fixed monitoring locations (Correnso 20(d-e), Slevin 12(d-e), MDDP 16(d-e), Martha 45(d-e));
- A roving monitor to record vibrations at complainant locations and determine the need for additional fixed monitor installations (Correnso 20(f-g), Slevin 12(f-g), MDDP 16(f-g), Martha 45(f-g));
- Complete records to be kept of each blast event (Correnso 20(h), Slevin 12(h), MDDP 16(h), Martha 45(h));
- Structural condition surveys to be completed on selected properties prior to blasting commencing (Correnso 21(a), Martha 55));
- Protocols for responding to complaints of property damage (Correnso 21(b), Slevin 13, MDDP 17, Martha 56);
- Maintaining a website which will present a monthly mining plan and a log of results from the latest ten blast events (Correnso 22(a & e), Slevin 14(a & e), MDDP 18(a & e), Martha 52);
- No blasting without the written approval of the Mine Manager (Correnso 22(b), Slevin 14(b), MDDP 18(b), Martha 49);
- Reporting and mitigating actions required in the event of vibration standards being exceeded (Correnso 22(c-d), Slevin 14(c-d), MDDP 18(c-d), Martha 50-51);
- Provision of a three-monthly summary report to HDC (Correnso 22(f), Slevin 14(f), MDDP 18(f), Martha 53);
- Systematic storage of records reports and complaints (Correnso 22(g), Slevin 14(g), MDDP 18(g), Martha 54);
- Monitoring of Union Hill Heritage Items if modelling indicates vibration levels of 5 mm/s within 20 m (Correnso 66);
- Structural survey of the Cornish Pumphouse if blasting occurs within 250 m (Martha 33l).

4. ROLES AND RESPONSIBILITIES

ROLE	RESPONSIBILITY
General Manager	• Review of the VMP • Provide appropriate management and financial support for the implementation of this plan • Reporting high-level blast results to HDC
Superintendent - Environment	• Monitoring and reporting of blast vibration results • Review of the VMP • Informing the General Manager and Manager – Mining (UG) of any high-level vibration results • Staff environmental awareness and training
Manager - Mining (Underground)	• Designing blasts to meet required vibration standards • Investigating high-level vibration results and implementing mitigation strategies • Provision of blast information data in a timely manner
Senior Environmental Advisor - Operations	• Maintaining the vibration monitoring network • Ensuring blast information data is entered into Envirohub correctly and in a timely manner

All applicable personnel	• Be aware of, and comply with, the procedures contained within or referred to in the VMP

5. BLASTING TIMES AND VIBRATION LIMITS

The compliance limits are largely contained in Correnso LUC c14, Slevin LUC c8, MDDP c13 and Martha c33 (see summary table below).

Table 1 – Compliance limits

Available blasting periods	Underground: Monday to Saturday, between 0700 and 2000 No blasting at night (2000 to 0700 the following day), on Sundays or on public holidays. No limits to periods for safety/maintenance blasts. Pit: Blasting permitted from 1000 - 1500 Mon-Fri and 1000 – 1200 Sat. Not to occur concurrent with Underground blasts.
Maximum number of blast events per day	3 underground blasts Note: There are no limits to the number of pit blasts per day, but practical considerations limit these.
Peak Particle Velocity (vector sum) limit	For development blasts: • 5mm/s for 95% of monitored events • 2mm/s on average at each approved monitor (six month rolling period) For production blasts: • 5mm/s for 95% of monitored events • 3mm/s on average at each approved monitor (six month rolling period) For pit blasts: • 5mm/s for 95% of monitored events For maintenance/safety blasts (Martha c33(b(iv))): • 1mm/s for all events
Noise (pit blasts)	128 dBL maximum overpressure

Definitions:

- *A Blast Event is defined as an individual blast or number of linked individual blasts.*
- *A Development Blast is an event containing only development blasts. A development blast is defined as any blast*
    - *having a maximum instantaneous charge weight per hole of no more than 7 kilograms of explosive (Correnso 14k, Slevin 8k), or*
    - *used for creation or enlargement of a tunnel for the purposes of mine construction or access (Martha 33j).*
- *A Production Blast is defined as any blast:*

  - *in which a single hole contains a maximum instantaneous charge weight of more than 7 kilograms of explosive. Slot blasts are deemed to be production blasts (Correnso 14l, Slevin 8l) or*
  - *any blast that is not a development blast (excluding any blast for maintenance / safety purposes) (Martha 33k).*
- *Blasts for maintenance / safety purposes (Martha c33(b(iv))) includes breaking over-sized rocks, trimming / slashing of backs, walls and floors, firing of mis-fired explosives and removal of bridged stopes.*

Predictability of blasting times is recognised as a means of reducing and mitigating blast vibration amenity effects and therefore it is of benefit to the community for OGNZL to restrict its three underground blasting events to regular blast windows where practicable.

Although underground blasting is permitted to occur up to three times at any time between 7am and 8pm, Monday to Saturday, OGNZL will use best endeavours to fire:

- Blasts during the shift changes and meal breaks; and
- Production blasts with a PPV greater than 2 mm/s during the midday meal break, when residents are more likely to be at work or busy at home.

Earlier LUC conditions (Correnso (c15(a(ii)) and Slevin (c9(a(ii))) refer to a 1 pm (1300) meal break, while Martha (c34(b)) specifies the current 1330 meal break (1330 – 1430). Now that operations in Correnso is limited to narrow vein mining, blasting is now scheduled in accordance with the Martha condition specified meal break (1330 – 1430).

In recognition of its obligation to minimise blast effects, OGNZL will endeavour to keep each firing close to a set time each day and within each window to the extent practicable.

It must be recognised that underground mining is a complex undertaking, and that many factors can influence OGNZL's ability to have prepared each blast ready to fire at set times each available day.

While OGNZL will use its best endeavours to achieve consistent firing times whenever it can (including firing close to a set time within each window), for maintenance and safety reasons there may be infrequent times when blasting must occur outside the three targeted one-hour windows outlined above. These may not occur at night (2000 hrs to 0700 hrs) for Correnso, Slevin and MDDP, but may occur at any time for Martha providing relevant vibration limits are complied with.

Compliance with the 95-percentile limit shall be determined:

- separately for development blasts and for production blasts,
- based on the highest recorded vibration for each blast event measured at any monitor,
- where the blast type is assigned on a monitor-by-monitor basis according to the blast with the minimum scaled distance from each monitor, and
- based on a six-month rolling average (for the initial 100 blasts of each type, compliance will be no more than one exceedance of 5mm/s in every 20 consecutive blast events).

Compliance with the average limit shall be determined:

- separately for development blast events and for production blast events,
- determined separately for each blast monitor based on the total number of blast events in a six-month rolling period,
- where the blast type is assigned on a monitor-by-monitor basis according to the blast with the minimum scaled distance from each monitor, and
- only once the initial 100 blasts of each type have been fired.

6. BLAST EVENT DURATION

Blast duration is recognised as a factor that influences human response to vibration; the longer the duration, the greater the effect.

Consent Conditions (Correnso 14(g), Slevin 8(g), Martha 33(f-g)) place limitations on the duration of blasts, with different durations depending on the type of blasts[2] (or combination thereof) such that 95% of:

- production blasts (not blast event) shall have a total duration of no more than 9 seconds;
- development blasts shall have a total duration of no more than 12 seconds;
- a combination of production and development blasts shall have a duration of not more than 12 seconds; and
- Consent Conditions (Correnso 14(h), Slevin 8(h), Martha 33(g), MDDP 13(g)) also place limitations on the duration of blasts events (18, 18, 18, and 12 seconds respectively).

Note: The 9 seconds duration for production blasts referred to in the conditions is a nominal time and corresponds with the maximum delay used in production blasting (8,050 milliseconds).

In addition to meeting consented duration limits, OGNZL will use best endeavours to maintain the impacts of blasting vibration duration to the practicable minimum. In particular, OGNZL will endeavour to:

- Initiate all blasts within each blast event at the same time. The simultaneous initiation of blasts within a single event required to meet the targets and minimise blast event duration is desirable from operational, safety and blast duration perspectives.
- Minimise the duration of all production blasts (not blast events) to less than the nominal maximum delay of 8,050 milliseconds.
- Restrict the duration of all blast events to the minimum, consistent with safe and efficient mining operations.

By achieving the above targets, the maximum blast event duration should often be no more than about 10 seconds.

7. BLAST NOTIFICATION

Prior and timely notification of an impending blast event can reduce the vibration effect for some people. In addition to advertising daily planned blasts on its website, OGNZL has to date implemented a daily manual process of advising residents of impending blasts, via email, txt, or phone. OGNZL has also implemented an automated Blast Notification System, comprising receiver units that will be offered to any concerned property owner/occupier within the Correnso/Slevin and Project Martha areas. The shot firer shall use the system to signal the impending production blast event prior to initiating the blast; initially 30 seconds. The delay between the notification signal and the firing of the shot may be adjusted from time to time, based on community feedback, to give the optimal practical warning time. The Blast Notification System will only be employed for blasts with a predicted PPV of greater than 2 mm/s undertaken in the meal break (1330 – 1430) window.

While the automated Blast Notification System is the preferred method, there may be special circumstances where it is appropriate to retain one or other of the original notification methods.

7.1 Website

OGNZL will continue to provide blasting advice on its website (www.waihigold.co.nz/blast-times/) for its current operations. This will include all underground operations, and provide the following:

[2] Maintenance/safety blasts for Martha have been recognised as a special requirement. Although these blasts may occur at any time, there is more strict limitations on vibration (1mm/s) and duration (2 seconds).

7.1.1 Monthly

At the start of each month, a plan showing the areas to be mined (and hence blasted) during that month shall be prepared and loaded onto the site (https://www.waihigold.co.nz/newsletters/mining-matters/).The downloadable pdf version of the plan shall also be available and hard copies made available to the Waihi Information Centre & HDC Waihi Service Centre.

While OGNZL will use its best endeavours to restrict its blasting to the work areas defined on the plan, it is recognised that operational constraints must dictate and may lead to deviations from the plan during the month.

7.1.2 Daily

Each morning, the intended times and locations for production blast events for that day will be published.

As soon as practicable following each blast event, the vibration magnitude recorded at each of the vibration compliance monitors will be presented on the website. The site will keep a running display of the last ten blast events. Getting the data onto the website promptly requires automation, and it is not practicable to manually interrogate the results for erroneous data; as such, the results remain provisional until verified.

8. MANAGEMENT OF EFFECTS

8.1 Mine Planning and Mining Methods

The size of 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. For example, the selection of the sub-level spacing determines the length of blast holes and hence the charge weight that can 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.

Mine planning typically utilises modified Avoca technique for most stoping but may require the use of Overhand Cut and Fill mining methods in the upper levels of the orebody. Cut and fill mining may be necessary in the upper levels of the mine to minimise vibration at the surface. Once there is sufficient separation between the surface and the areas being mined, mining can revert to more productive methods, e.g., modified Avoca or transverse stoping.

8.2 Blast Design

8.2.1 Introduction

Construction to the approved mine plan determines the maximum length of blasthole for the production blasts, which are the blasts more likely to generate elevated vibration levels. The parameters then available for adjusting blast design are;

- The blasthole diameter;
- The explosive density; and
- The uncharged length of blasthole (stemmed length).

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. Blasting at Favona since early 2005 and at Trio since late 2010, supplemented by blasting within Correnso, Slevin and MDDP has provided an excellent base of experience for future blast design and vibration management for Martha.

The vibration data from these projects have been analysed using techniques consistent with the recommendations provided in the Australian Standard AS2187 and/or other accepted methods of analyses. The equation typically used to predict the level of vibration at Waihi for a given explosive quantity and distance has the following form (Equation 1):

$$PPV = K \times \left(\frac{d}{\sqrt{w}}\right)^{\beta}$$

where:

PPV = peak particle velocity (vector sum), expressed in mm/s;

K = an attenuation constant;

d = the distance between the blast and the monitor, expressed in m;

w = the MIC, in kilograms;

β = a constant, which for Waihi has been determined as -1.49; and

$d/\sqrt{w}$ = the scaled distance term

As with OGNZL's other underground projects, the version of the above equation needs to achieve a "95% design" objective. For the default blast design the 95% design relationship is:

$$PPV_{Underground\ Design} = 2230\left(\frac{d}{\sqrt{w}}\right)^{-1.49}$$

8.2.2 Blast Design Procedures

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

1. Adopt the above equation as the starting point for the initial access drive development blasts, but to err on the side of conservatism in charging the blast-holes until there are enough data to confirm or refine this relationship.
2. Apply the previous blast design once it is demonstrated to achieve compliance with the consent conditions and the objectives of this Plan, with adjustments where the previous recorded vibrations dictate.
3. Undertake statistical analyses using the access drive development blast data to update the above relationship for designing the first long-hole production blast(s).
4. Adopt a conservative charge weight, i.e. less than indicated as applicable by the adjusted 95% design relationship, for the initial long-hole production blasts until there are enough data to confirm or refine this relationship.
5. Apply the maximum calculated charge weight to the blast designs once it is demonstrated to achieve compliance with the consent conditions and the objectives of this Plan, with adjustments where the previous recorded vibrations dictate.
6. Repeat steps 3 to 5 when blasting moves to a new area within the mine, or in areas where difficulties have already been experienced.
7. In instances where compliance has proven difficult to achieve, the design shall be interrogated further to include detailed analyses based on the available data from previous blasting specific to, or near, that location.

All blasts are designed by Production Engineers and are reviewed and approved by a Senior Technical Services staff member. This review includes checks on the maximum instantaneous charge, timing and sequencing, and considers the results of previous firings in the same area.

OGNZL has also modified Envirohub (Section 9.2) to enable blast vibration history to be reviewed by level and location to inform subsequent blast designs. This process will continue throughout the life of projects.

The updated statistical analyses and revisions to the design relationship referred to in the steps above shall be undertaken by Heilig & Partners Pty Ltd.

8.2.3 Blasting Protocols

Underground Development and Cut & Fill Blasts

- Generally, for development there are no more than 8 holes on any one delay.
- Typically, a charge weight per hole of no more than about 5 kg will be used unless previous blasts have indicated a higher-than acceptable vibration. Where elevated vibration is experienced, the blast design will be reassessed as outlined above in section 8.2.2.

Underground Slot Blasts

- Slots will be blasted in lifts, with each lift being generally no more than around 5 metres, unless ground conditions or safety dictate otherwise.
- An MIC of around 18kg will be used in each lift.

Underground Production Blasts

- As far as practicable, production blasts with a predicted PPV of greater than 2 mm/s are to be fired between 1.30 – 2.30pm. Production blasts with a predicted PPV of less than 2 mm/s may be fired during the morning (7.00am – 8.00am) and evening (7.00pm – 8.00pm) blast windows.
- The MIC is selected based on the procedures outlined above in section 8.2.2 to achieve an acceptably low level of vibration while maximising the efficiency of the blast. For about one third of the production blasts in the mid to upper levels of the orebody, a charge weight of less than 20kg per delay will be required, with a further one third of production blasts able to be fired with 20-30kg per delay. These reduced charge weights may be achieved by decking. At the bottom of the mine, the remaining productions blasts can be mined with a single column of explosives and an MIC of around 30kg per delay.
- OGNZL uses IKON electronic detonators, recognising the need to control vibration magnitude and duration. These can be programmed for between 1 millisecond out to 15,000 milliseconds (note that the conditions of consent limit the maximum delay to 8050 milliseconds).
- The above routine protocols have come about after extensive modelling and trial blasting; there is a check process for each stope blast design. If there is a need to increase the size of patterns above and beyond standard practice, blast plans are sent to Heilig and Partners Pty Ltd for review.

Underground Maintenance/Safety Blasts

- Because the limit for these blasts is 1 mm/s, these are necessarily small charge blasts, likely to be no more than a few holes, and in most cases decoupled from the host rock. These blasts include breaking over-sized rocks, trimming / slashing of backs, walls and floors, firing of mis-fired explosives and removal of bridged stopes

Irrespective of blast type, OGNZL has procedures that utilise the blast design for management of the blasting process; from marking up a heading face, for drilling through to production charging, firing, and managing misfires.

9. MONITORING

9.1 Structural Condition Surveys

For structural surveys, OGNZL utilises BRANZ as an independent, suitably qualified and experienced engineering firm. They have been undertaking surveys at Waihi for many years and understand the requirements relating to visual inspections and video records.

Correnso LUC Condition 21(a) required 15 representative properties to have structural condition surveys undertaken prior to Correnso-related blasting. In addition, surveys were also carried out at Waihi East School and kindergarten, the former Mine Manager's house at 57 Barry Rd, and 'control' properties (approved by HDC) sufficiently distant from blasting influences. There is no such requirement for Slevin or MDDP.

Martha c55 requires BRANZ structural condition surveys of residential properties over the Rex ore body prior to any blasting in relation to Rex. At least five representative properties were to be surveyed, along with at least two 'control' properties away from the potential vibration effects from mining. OGNZL offered the survey to ALL properties above the Rex ore body. 10 properties above the orebody were surveyed as a result, with an additional 7 properties surveyed as control properties. A further survey of a property was undertaken at the request of the owner due to its proximity to the Martha Pit.

Martha c33(l) requires an engineering survey into the structural integrity of the Cornish Pumphouse prior to blasting within a 250m radius (horizontal or vertical) of the pumphouse. The initial survey of the pumphouse was undertaken in March 2019 and May 2020. Follow up surveying will take place within five years.

9.2 Monitor Installation and Maintenance

Fixed Vibration monitors (Figure 1) are installed inside a concrete bunker. Within the bunker, a geophone is fixed to a concrete square which is installed during the set-up process of a permanent monitor. The geophone is connected to the monitoring device which sends the vibration data to the Envirohub computer (shown in Figure 2). Further details on how to install a monitor are included in Appendix I.

9.3 Envirohub

The Envirohub vibration monitoring system (VMS), previously called Blasthub, has been utilised as the blast vibration monitoring system since 1 January 2005 (HDC approval reference 64.601.001 dated 8/3/05). The system provides real-time, web-based monitoring that is accessible to both HDC and OGNZL and includes automatic email notification of blast events that trigger two or more monitors.

Results from blast monitoring are automatically loaded onto Envirohub from the vibration monitoring network (Figure 2), along with manual loading of details of the blast design and plan. Heilig and Partners Pty Ltd compares the corresponding plans/results and provides an external review, developing recommendations when necessary for on-going blasting plans and procedures to ensure compliance (with a safety margin).

Figure 1 –Vibration Monitoring Locations

Results are accessible for review on an internet website (https://oceanagold.envirohub.com/). Access to the website is controlled by the OGNZL Senior Advisor – environment with permission for review provided to HDC staff and OGNZL users. A schematic of the VMS is shown in Figure 2.

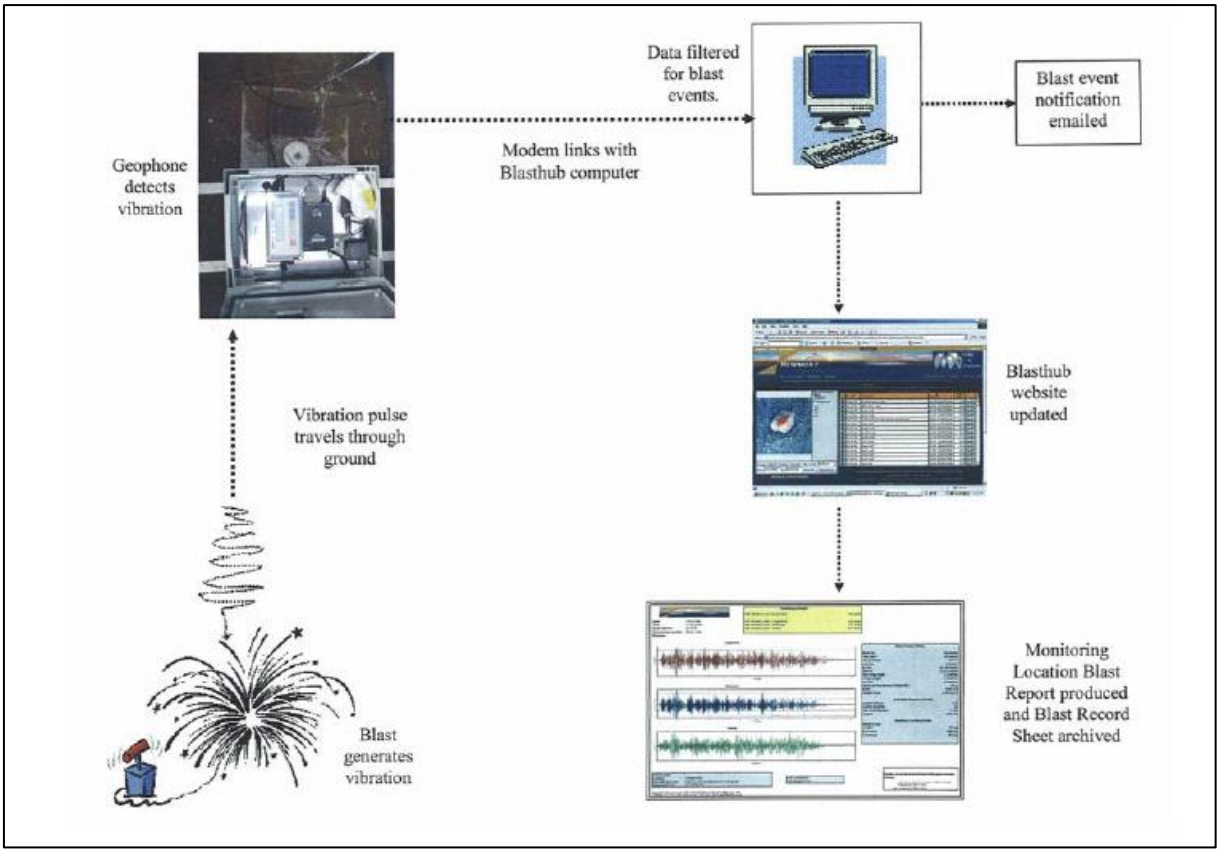


Figure 2 – Schematic of Envirohub Vibration Monitoring System

Each vibration monitor has four recording channels. An external geophone (transducer) monitors vibration in three directions (Transverse, Vertical & Longitudinal particle velocities). Ground vibrations generated by a blast are detected by the geophone generating a variable voltage trace. From this data a Peak Particle Velocity (PPV) is generated.

The fixed monitors have pre-set recording period and vibration trigger levels (see Table 1). After recording an event a monitor will automatically dial the Envirohub computer to download the data. In addition, each monitor has a “dial home” schedule for administrative checks. Downloaded data is filtered by Heilig & Partners Pty. Ltd. to classify blast events from erroneous events (activities such as vehicular, livestock, seismic, etc.). Blast Location Monitoring Reports (summarising results & displaying vibration traces) are generated and incorporated into the Envirohub database.

Table 2 – VMS Monitor Configurations

Name	*Location*	*Monitor Co-ordinates (Old Mt. Eden)*			*Recording Period*	*Threshold*[1]	*Operating Schedule*[1]	*Applicable Consents*[2]
		X	*Y*	*RL*				
Main North	47 Gladstone	396544.2	643492.1	1121.4	18 seconds	0.75mm/s	Continuous	Cor, SUPA
Main Central	29 Gladstone	396497.0	643283.4	1119.4	18 seconds	0.75mm/s	Continuous	Cor, SUPA
Main South	16 Gladstone	396545.8	643094.1	1117.9	18 seconds	0.75mm/s	Continuous	Cor, SUPA
Secondary SE	68 Barry Rd	396739.8	643022.5	1117.4	18 seconds	0.75mm/s	06:30 – 20:30	Cor, SUPA
Secondary SW	28 Roycroft St	396251.0	643049.2	1113.5	18 seconds	0.75mm/s	Continuous	Cor, SUPA, PM
Secondary West	22 Slevin St	396246.0	643262.5	1115.5	18 seconds	0.75mm/s	Continuous	Cor, SUPA, PM
Secondary NW*								
Secondary Nth*								
Secondary NE*								
Secondary East	23 Smith St	396781.2	643388.8	1120.4	18 seconds	0.75mm/s	06:30 – 20:30	Cor, SUPA
Central School	Central School	395075.1	642730.8	1116.9	18 seconds	0.75mm/s	Continuous	PM
Pensioner Flats	140 Seddon St	395674.2	642704.1	1115.1	18 seconds	0.75mm/s	Continuous	PM
Waihi CBD	4 Haszard	395309.7	642592.0	1116.1	18 seconds	0.75mm/s	Continuous	PM
Pitt Street	Pitt St	395185.4	643301.1	1125.6	18 seconds	0.75mm/s	Continuous	PM
Grey Street	Grey St	396091.6	643365.7	1117.3	18 seconds	0.75mm/s	Continuous	PM
Islington Tce	Islington Tce	395006.3	643023.3	1125.6	18 seconds	0.75mm/s	Continuous	PM
Bulltown Road	79 Bulltown Rd	395440.3	643576.9	1148.2	18 seconds	0.75mm/s	Continuous	PM
Rex North	1B Gilmour St	395711.3	642684.4	1111.3	18 seconds	0.75mm/s	Continuous	PM
Rex East	126 Kenny St	395724.9	642692.8	1109.7	18 seconds	0.75mm/s	Continuous	PM
Rex South	104 Kenny St	395769.5	642585.8	1107.8	18 seconds	0.75mm/s	Continuous	PM
Rex West	75 Kenny St	395586.3	642539.8	1111.4	18 seconds	0.75mm/s	Continuous	PM

Vibration monitors are calibrated and inspected on a yearly schedule. Calibration is completed by Heilig & Partners Ply Ltd.

[1] *The threshold and operating schedule may need to be varied (with HDC written approval) if extraneous vibration readings cause the monitors to fill and go into 'idle'.*

[2] *Applicable consents: Correnso (Cor), Slevin (SUPA), MDDP (MDDP), Project Martha (PM)*

**No monitor currently in place at these monitoring locations as blasting in Correnso is limited to narrow vein mining.*

9.4 Compliance Determination

9.4.1 Overview

LUC conditions (Correnso c14(c-d), c17, Slevin c8(c-d), MDDP c13(c-d) and Martha c33(d-e)) require that blast vibration compliance be assessed separately for development and production blasts against permissible maximum and average levels of vibration. For Correnso/Slevin/MDDP, a blast will be classed as either development or production based on whether the maximum instantaneous explosive weight (MIC) is less than or greater than 7 kilograms respectively. For Martha, the definition is based on activity; a development blast being a blast used to create or enlarge a tunnel for mine construction/access, a production blast is 'not a development blast' (except blasts for maintenance/safety purposes).

Calculating the average level of vibration for development and production blasting will occur within the Envirohub program and the results displayed on a compliance page within Envirohub where data specifically relating to the compliance statistics will be shown. The statistics page will show for each of the approved monitoring locations[1] the average level of vibration for both development and production based upon the six-month rolling period (or for the first 100 blast events, whichever occurs later). The data will be displayed for each of the individual monitoring sites. The page will also display trend graphs for each monitoring site showing the variation in the average level of vibration with time.

Envirohub will assign a vibration value for all production and development blasts, including blasts that are initiated simultaneously within a single blast event. The assigning of a specific blast to a recorded vibration will be based on the blast with the minimum scaled distance from each monitor.

Vibration levels for each blast will be assigned (where that blast has the minimum scaled distance) or back calculated using the K value for that blast/monitoring configuration. Only the single highest value for each blast type within a blast event will be used for calculating the average and 95% compliance statistics.

9.4.2 Scaled Distance

As described in Section 8.2.1 (blast design), the convention for estimating the magnitude of vibration is expressed by the following equation (Equation 1):

$$PPV = K \times \left(\frac{d}{\sqrt{w}}\right)^{\beta}$$

where:

PPV = peak particle velocity (vector sum), expressed in mm/s;

K = an attenuation constant;

d = the distance between the blast and the monitor, expressed in m;

w = the MIC, in kilograms;

β = a constant, which for Waihi has been determined as -1.49; and

$d/\sqrt{w}$ = the scaled distance term

[1] Plus any additional sites that may be identified through the roving monitoring and agreed in writing by HDC.

The scaled distance is therefore a term that encompasses the distance between the blast and the monitoring location divided by the square root of the MIC.

9.4.3 Assigning Blasts to Monitored Vibration Results

When multiple blasts are fired within a single blast event, the maximum vibration recorded at each monitor will be assumed to have been generated by the individual blast with the minimum scaled distance value, irrespective of the type of blast (development or production).

Once assigned to a recorded vibration level, the K value for the blast generating the maximum vibration is the only unknown but can be readily calculated by manipulating the above equation thus (Equation 2):

$$K = \frac{PPV}{\left(\frac{d}{\sqrt{w}}\right)^{\beta}}$$

The same approach is applied to blast events that contain only a single blast.

9.4.4 95% Compliance

Compliance with the 95th percentile limit (Correnso c14(c-e), Slevin c8(c-e), MDDP c13(c-e) and Martha c33(d-e)) shall be based on the highest recorded vibration for each blast event measured at any monitor, i.e. after each blast event, a single vibration reading will be added to the historical readings, with that reading being the highest level obtained from the entire monitoring array. Separate records will be maintained for development blast events and production blast events, where the blast type is assigned on a monitor-by-monitor basis according to the blast with the minimum scaled distance from each monitor. Envirohub will also classify the blast events into Correnso and Martha, based on the assigned monitors within each projects' network, enabling corresponding reporting of compliance.

The reported percentile level for each type of blast event will be derived over a rolling period of 6 months. Correnso LUC c17 and Martha LUC c44 required that no more than one in 20 consecutive blast events may exceed 5mm/s for the initial 100 events; thereafter, compliance will be reported as a percentage. 100 events of each type of blast event have already occurred and compliance for all projects will be reported as an ongoing percentage. The primary OGNZL response required for higher level blasts is the requirement for investigating and reporting individual blast events that exceed the 5mm/s level (Correnso c22(c-d), Slevin c14(c-d), MDDP c18(c-d) and Martha c50-51).

9.4.5 Averaging Procedure

The algorithm (agreed between HDC and OGNZL) for calculating the average vibration value will be coded into Envirohub and unable to be altered without the agreement of HDC and OGNZL. The algorithm will calculate the average level of vibration according to the following definitions:

a) A blast event may comprise only development blasts or production blasts, or a combination of both types, initiated simultaneously;

b) Each blast within a blast event will be classed as either development or production depending on its relevant criteria (refer blast type definitions (Section 4);

c) For calculation of average PPV levels, independent average levels will be calculated for development and production blasts;

d) For calculation of average PPV levels, independent average levels will be calculated at each permanent vibration monitor;

e) After each blast event, and at each permanent monitor location, a single PPV level will be added to either the development or production database to update the average PPV value, and the only exception to this will be when a blast event contains both development and production blast types, in which case a single PPV will be added to each of the development and production blast databases. The second level will be calculated using the same K value derived from the dominant blast type which was estimated to have produced the measured PPV, based on the blast type with the minimum scaled distance to the monitor. The level assigned to each blast-type database will represent the highest

vibration level recorded from all of the blasts of that type fired in that event. The following examples are provided for clarity:

i. Where a blast event contains multiple development blasts, and no production blast, Envirohub will identify the blast with the minimum scaled distance, and the PPV for the entire event will be assigned to that particular development blast. The development blast vibration database, and the average PPV for development blasting will be automatically updated by the addition of one new value, being the PPV as measured at that monitor location.

ii. Where a blast event contains multiple production blasts, and no development blast, Envirohub will identify the blast with the minimum scaled distance, and the PPV for the entire event will be assigned to that particular production blast. The production blast vibration database and the average PPV for production blasting will be automatically updated by the addition of one new value, being the PPV as measured at that monitor location.

iii. Where a blast contains a mix of both production and development blasts, Envirohub will identify the blast with the minimum scaled distance and determine whether it is a production or development blast by reference to supporting documentation. The procedure described in a) or b) above will then be followed for that blast type. In addition, Envirohub will calculate the appropriate K value for that blast and apply that K value to estimate the highest PPV for the other blast type with the minimum scaled distance (considering only the blasts of the second blast type). The single estimated PPV for the second blast type will also be added to the vibration database for that blast type.

f) Where a permanent monitor fails to trigger, that monitor will be assigned a PPV equal to two thirds of the threshold trigger level, which will nominally be set to 0.75 mm/s. The assumed PPV will be assigned to the blast type with the minimum scaled distance, and, if necessary, a PPV will be back-calculated for the other blast type using the method described above. The trigger threshold level at each monitor will be set as low as possible to avoid bias in assumed PPV levels but will also be set so as to avoid excessive spurious triggering and possible loss of critical blast event data.

g) For completeness, for those blast events consisting of only a single type, the K value will also be calculated using Equation 2;

h) For each blast event type, the average level of vibration will be calculated by summing the measured, calculated or inferred level of vibration for each event type initiated over the previous six-month period and dividing by the number of blast events of that type that occurred within the same period;

i) The average values will be recalculated each day for each monitoring location and for each blast type and the values appended to the trend graphs. Envirohub will also be able to classify the averages based on which project (Correnso/Slevin/MDDP or Martha) the blasts and monitors are assigned to.

For each blast within every event, the blast, K value, distance and MIC will be recorded within Envirohub. The tabulated data will be available for export to permit any further analyses as and when required.

9.5 Roving Monitor

Under the conditions of consents OGNZL must hold at least one spare vibration monitoring unit for use as a roving monitor. The objectives for the roving monitor(s) are;

1. To assess and confirm compliance with the consent vibration and duration limits.
2. The check for anomalous vibration behaviour.
3. To address residents' concerns about vibration effects and to assist in understanding what they are experiencing.
4. To provide additional detail on blast design and behaviour (often when deployed near blasts).
5. To identify a new or additional fixed monitoring location (see MDDP c16(f) and Martha c47(a(vii))).

To achieve objectives 1 to 3, the roving monitor(s) will be deployed in response to a series of complaints from a single residence or area, and/or when requested by a resident. A roving monitor need not be deployed in response to a single complaint, nor when complaints are received following a single blast event that generates a relatively high level of vibration. A roving monitor will only be deployed where its installation is approved by the resident.

Internal monitoring to improve knowledge on blast behaviour and design (objective 4) occurs on an "as required" basis, typically at the request of mining engineering personnel.

9.5.1 Roving Monitor Procedure

Achieving the objectives (1-3) of roving monitoring requires a unit to be set at a site of interest for a period to time sufficient to enable vibration results at that site to be compared with results from the permanent vibration monitors and the expected levels of vibration (based on the relevant scale-distance equation and the separation between the site and the locations of the blasts). Recognising the limited number of roving monitors and the time required to obtain sufficient data, responding to complaints and monitoring requests may have to be scheduled.

Typically, a roving monitor programme at a property would follow the following sequence until resolved:

1. OGNZL will undertake monitoring upon receipt of a series of complaints from a resident, when the resident requests monitoring, and when a roving monitor is available. Initially, monitoring will be undertaken with the geophone on spikes, in natural ground where practical, and at a specific location on the property agreed to between the resident and monitoring personnel. After monitoring for typically 2 weeks or 20 blast events (whichever completes first), the data will be analysed (including a comparison with compliance monitors) and reported to HDC with a recommendation.

Normal configuration settings for residential monitoring are to set the units in 'histogram mode' rather than one of the 'waveform' modes which have higher monitor memory demand. This means that not only can smaller vibrations be determined; the units can be left for longer durations before they reach capacity (this means less disruption to the residents).

2. If warranted (in discussion with HDC), OGNZL will subsequently continue monitoring (this time, with the geophone on a concrete block) for a further 4 weeks or 50 events (whichever completes first). The data will be analysed (utilising a protocol agreed between Blastechnology and Heilig & Partners, June 2018) and reported to HDC, along with a recommendation.
3. If the subsequent data indicates sufficiently anomalous data to question the existing compliance network, a range of mitigation and redress measures will be considered in consultation with HDC:
    - Relocation of a nearby compliance monitor to a location more representative of the vicinity.
    - An additional compliance monitor.
    - Either of the above may require additional roving monitoring to determine an even more representative or acceptable location; the site of the initial monitoring may be improved upon, a permanent monitor may be unacceptable to the resident, or practical considerations (e.g. traffic interference) may require a more pragmatic location.
    - OGNZL may negotiate with the resident to reach a written agreement whereby vibration effects are not to be taken into account for monitoring and compliance purposes (Correnso c14, Slevin c8, MDDP c13, Martha c30(b))
    - OGNZL may negotiate to purchase the property, which would render the compliance standards not applicable as a company-owned property (Correnso c14, Slevin c8, MDDP c13, Martha c30(a))
    - In addition to this, the AEP program (Section 11) has the capability to adjust AEP assessments (from an agreed start date) for the affected property to more accurately reflect the anomalous vibrations determined for the property.
4. All roving blast-monitoring data in response to residents' complaints will be reported to HDC for their consideration as part of the monitoring programme above, along with being held on OGNZL's computer network. Roving data will continue to be included in the three-monthly summary reports submitted to HDC, with private data redacted (copies are available on their website: http://www.hauraki-dc.govt.nz/).
5. Further information on roving vibration monitoring is available in the Field Monitoring of Blast Vibration SOP (WAI-200-PRO-008).

9.5.2 Monitoring within Structures

Monitoring within structures for compliance is generally discouraged. There are large variations within a structure depending on its construction and foundations (some structures dull vibrations while others amplify

the transmission) and consent compliance is based upon the level of ground vibration, not structure vibration. This is verified in the conditions of the consents which specify that fixed (compliance) monitoring locations must not be on or inside a building or structure (and that roving monitoring in such locations is not deemed to be compliance monitoring).

9.6 Geophones

Figure 1 shows the location of the existing vibration monitors (geophones) associated with the projects. These locations were established by agreement with the HDC and are documented in the consents. Should the monitor locations become redundant or non-representative of their surrounding area, relocation will be consulted with HDC and any new locations confirmed in writing.

Geophones are bolted to a concrete block set in the ground at each site. The site is secured by a protective housing to discourage vandalism. Within the protective housing is an “Instantel MiniMate Plus” seismograph and a cellular modem. Each monitoring station calls the Envirohub computer after being triggered, and at predetermined schedules to conduct administrative checks.

9.7 Geophone & Microphone (Sound) Calibration

The seismographs, geophones and microphones undergo annual calibration by an independently certified company. The preferred supplier is Saros Group Pty. Ltd., contact:

3/11 Parkview St, Milton, Queensland, 4064, Australia. Tel: 00 61 7 3367 3400, Web: www.saros.com.au.

Calibration certificates are kept electronically on the Envirohub database (accessible via the internet), with additional copies in the OGNZL Environmental Department database.

Calibration certificates required for geophones and microphones (currently included with geophone certificate) contain the following information:

- Report number
- Make & Model of instrument
- Monitor serial number
- Geophone serial number
- Microphone serial number (if present)
- Calibration date
- Method reference in accordance with ISO/IEC 17025 (1999) & management ISO 9002:1994 accredited
- Test equipment references
- Compliance with relevant standard (Australian national standards of measurements)
- Endorsement certification or logo by accrediting organisation
- Signature of person performing calibration and date of service.

10. MITIGATION

As outlined above in section 8.2.2, whenever production blasting is initiated in a new area, the first blasts are designed very conservatively and take into consideration the geographical location, geological factors of the ground and the vibration results from nearby production areas. Based on the results of the initial blasts, charging parameters may be altered for subsequent blasts to increase efficiencies whilst still maintaining vibration compliance.

Most the factors that affect vibration management are completed well ahead of OGNZL obtaining the detailed vibration relationship data required to finalise a blast design. Those aspects of mine design that influence blast

design (e.g. sub-level spacing) are typically fixed years before blasting occurs in each area of the mine. Also, key aspects of a blast design (blasthole diameter, burden and spacing) are completed weeks if not months ahead of blasting occurring within a given stope, and the pattern drilled to that design typically weeks ahead of a blast occurring.

Therefore, if an elevated and unexpected vibration result occurs, the only remaining aspect of the design that can usually be modified to reduce vibration is the charge weight. Selection of the appropriate charge weight therefore becomes the fundamental mitigation action.

The following pro-active management regime has therefore been developed. Adhering to the mitigation procedure will minimise the chances of individual or average vibration results above consent limits and minimise vibration effects on residents.

10.1 Mitigation Actions

The objective of mitigation is to minimise significant impacts on residents and ensure processes are in place to avoid a breach of consent.

The primary mitigation for significant impact on residents is compliance with the 95% and average limits specified in consent conditions. While there is no single blast maximum limit (both limits are based on a 'trend' of blasts), vibrations larger than 5mm/s are recognised as having a significant detrimental effect on both the 95% and average limits.

Post-blast mitigation measures are based on the same 'monitor and response' process as used at OGNZL's other underground operations as outlined above in s8.2.2. However, in recognition that blasting activities will occur below the residential area of Waihi and therefore close to Waihi residents, and the introduction of an average limit, the following safeguards and responses to blast results have been developed:

Individual Blasts

For any blasts resulting in vibration levels greater than 5mm/s at any compliance monitor, OGNZL will review the blast design and implementation. This review, and any subsequent mitigation measures, will be reported to HDC within five days of the blast. This correspondence will also serve to give effect to the requirements of consent conditions.

Average Vibration

Separate from investigating individual high PPV blasts, OGNZL will also establish an arbitrary level for the average vibration, which when reached triggers an investigation to ensure that the relevant consent limit is not reached. These arbitrary levels are 1.6mm/s for development blasts (with a compliance limit of 2mm/s) and 2.6 mm/s for production blasts (compliance limit 3mm/s). When this level is reached, the underground engineers will be notified they are nearing the compliance limit.

Because the average vibration is determined separately for each monitor, in addition to the mitigation options (Correnso c22(c), Slevin c14(c), MDDP c18(c), Martha c50), OGNZL may also be able to relocate primary blasting activities to another area to give relief to the affected compliance monitor (and therefore to the residents in that area).

11. REPORTING

Records of all vibration monitoring (including roving monitoring) are maintained and can be provided to HDC on request. In the event of an exceedance of compliance standard or a consent breach, OGNZL prepares a specific report to HDC. This report will contain the details of the event, along with the outcome of an investigation and mitigation measures to avoid a recurrence.

OGNZL provides a summary report to the Council at the end of each calendar quarter for all blasting and vibration for the Waihi operations (for practical purposes, HDC has approved calendar quarter reporting, rather than the consent dates specified). This report provides information on blasting undertaken, explosive use, vibration and overpressure levels recorded, compliance and exceedance data, complaints received, and roving monitoring undertaken.

The Company Liaison Officer provides Council with six-monthly reports documenting any complaints (including those relating to vibration) and mitigation action taken.

12. COMMUNITY LIAISON

In accordance with conditions of its mining licence, resource consents and land use consents, OGNZL maintains the position of Company Liaison Officer (CLO) to liaise between the consent holder, the community, and the Council. *(While not required by a condition of consent, OGNZL also employs a Community Engagement Officer to increase its community engagement support.)* The CLO has sufficient delegated power to be able to deal immediately with complaints received and is required to investigate those complaints as soon as possible after receipt.

The contact free-phone number for the CLO is notified in local newspapers as a footnote in every community update (normally fortnightly). The current CLO and contact details are:

Donna Fisher 0800 WAIHIGOLD (0800 924 444)

In addition to liaison staff, a range of communication and engagement strategies are used for different stakeholder groups as appropriate. These include:

- ‘Open door’ policy for members of the public to meet with External Affairs team members at our Project Information Office – 86 Seddon Streer, Waihi between 10am – 2 pm weekdays.
- A monthly “Update” column in the HC Post, providing information on current mining activities and items of interest.
- Monthly publication of the “Mining Matters” newsletter distributed to 1000 households in Waih.
- Press releases in local newspapers in response to media requests or project milestones such as the commencement of blasting.
- The actively managed website, http://www.waihigold.co.nz/, providing information on mining activities (e.g. blasting notification and results as itemised in s6.1) and including the “Update”.
- Public notice boards erected at Martha viewing areas to provide project information.
- Letter drops within the community when information about specific issues needs to be circulated.
- House visits to residents seeking further information.
- The use of various forums and groups to gain feedback and provide information (e.g. Waihi Community Forum and Iwi Advisory Group)
- In addition, six- monthly community meetings are held to present information and receive feedback on past and proposed mining activities, and monitoring results.

12.1 Amenity Effect Programme

The consent limits that have been set for mining operations are designed to, and do, avoid nuisance effects for most of the Waihi community for most of the time. OGNZL complies with these limits most of the time but some people living close to the mine consider they experience some reduction in amenity due to increased levels of noise, vibration and possibly dust. Thus, while the Waihi community broadly shares the economic and social benefits of OGNZL’s mining operations, a relatively small proportion of the town’s population considers it bears some disadvantages from the operations.

In addition to on-going community liaison and complaints management, OGNZL has developed the Amenity Effect Programme (AEP) and has been implementing this as part of its on-going liaison and consultation

programme with the local community. The programme was instigated in 2008 (with payments backdated to 2007), and aims to

- Acknowledge that some people consider their amenity is affected by blast vibration, dust or noise effects;
- Provide an incentive for owners/occupiers to maintain the property ownership/occupation status quo to the maximum extent practicable;
- Provide an incentive for OGNZL to strive to minimise operational effects on the local community; and
- Ensure cost-effectiveness for OGNZL and enable or enhance existing and future land access.

To determine the assessed vibration at residence for a blast, the AEP program utilises known 'data-points' (the locations of the blast, the residence, and adjacent compliance monitors) in three dimensions (easting, northing and relative elevation), along with the vibration results for the adjacent compliance monitors. A regression algorithm utilises the vibration data for the compliance monitors and the monitors' distance from the blast, and calculates an assessed vibration for each residence based on the residence's distance from the blast and their relative proximity to the adjacent compliance monitors. This calculation is undertaken for each property for each blast; when there are several blasts within one event, the largest assessed vibration is utilised in the AEP determination for that event.

The Correnso, Slevin, MDDP, and Martha consents make this hitherto voluntary programme a condition requirement (Correnso c15(b), Slevin c9(b), MDDP c14(b), Martha c35). The property owners or occupiers within the areas affected by operations will be offered payments based on the assessed vibration received at the property; this is determined by utilising the known or assessed vibrations from the compliance monitoring network and making scaled-distance calculations for each individual property.

Payment rates and calculations were established for the voluntary AEP through detailed investigations and negotiation. Subsequent consents have formalised the payment regime and methodology (Correnso c15(c-i), Slevin c9(c-i), MDDP c14(c-i), Martha c36-42) for properties subject to vibration from mining operations. Payments are calculated on a six-monthly basis (Jan-Jun, Jul-Dec) and made within two months or as soon as practicable thereafter.

Calculating the specific payments to each property is done via a web-based program that utilises the Envirohub database. Those owners/occupiers within the program requesting the information can be provided with a username and password to access the data for their property. The programme does not apply to unoccupied houses or undeveloped property.

13. COMPLAINT RESPONSE

The OGNZL Standard Operating Procedure WAI-800-PRO-007 Concerns, Complaints and Grievances Procedure (refer to SharePoint) will be used for any complaints received from the community.

14. TRAINING

All management, staff and contractors who work on site take part in induction training before commencing work on the project. In addition to the site health and safety training, the induction aims at raising general awareness of individual responsibilities for managing and reporting environmental and community effects. Reporting procedures and accountabilities to departmental managers and environmental staff are outlined, and all inductees are provided with a site contact list.

Responsibility for staff environmental awareness and training rests with the Superintendent - Environment or delegated representative. Environmental personnel undertake vibration monitoring and maintain monitoring infrastructure, with training, support and guidance provided by John Heilig of Heilig & Partners Pty Ltd.

15. RECORDS AND DOCUMENTATION

Records and documents related to Vibration are saved in the G: Environmental folder. Vibration monitoring data is saved on the Envirohub database.

16. AUDIT AND REVIEW

As this is a plan to manage an identified Environmental Material Risk, OGNZL internal standards require it to be reviewed every year as a minimum, and/or in any of the following circumstances:

- Following any event or investigation that impacts on this VMP
- Any amendments to the site risk register
- Any amendments to legislation

Any material modification will be submitted to HDC for review and not implemented until approved. If additional mitigation actions are required to reduce vibration effects, the agreed actions will be implemented by OGNZL as soon as practicable.

APPENDIX A – VIBRATION CONDITIONS HDC LAND USE CONSENT NO. 202.2012 (CORRENSO)

Blasting and Vibration

13. Ground Vibration

All blast events shall comply with the vibration levels, numbers of events and durations specified in Condition 14.

14. Impulsive Vibration from Blasting

The activity shall comply with the following standard as measured at the boundary of any residentially zoned site or the notional boundary of any occupied rural dwelling not owned by the consent holder (or related company) or not subject to an agreement with the consent holder (or related company).

In the event that a property is sold and is not subject to an agreement between the consent holder (or related company) and the purchaser or related company, or in the event that there is no longer an agreement between the consent holder and the landowner, the measurement of vibration shall revert to being on or close to the boundary of that residentially or low-density residentially zoned site or the notional boundary of the occupied rural dwelling.

a. There shall be no more than three blast events per day, from Monday to Saturday and between 0700 and 2000.
b. No blasting shall be undertaken at night (2000 to 0700 the following day), on Sundays or on public holidays.
c. The peak particle velocity (vector sum) shall be no more than:
    i. For development blasts;
        - 5mm/s for 95% of the monitored events.
        - 2mm/s on average.
    ii. For production blasts;
        - 5mm/s for 95% of the monitored events.
        - 3mm/s on average.
d. Compliance with the 95% and average limits shall be measured over a six-month rolling period.
e. Compliance with the 95-percentile limit shall be determined separately for development blast events and for production blast events, and based on the highest recorded vibration for each blast event measured at any monitor, where the blast type is assigned on a monitor-by-monitor basis according to the blast with the minimum scaled distance from each monitor.
f. Compliance with the average limit shall be determined separately for each blast monitor based on the total number of blast events in the six-month rolling period.
g. For all blast events, including those involving a combination of production and development blasts (95% compliance);
    i. Production blasts shall have a total duration of not more than 9 seconds;
    ii. Development blasts shall have a total duration of not more than 12 seconds;
    iii. A combination of production and development blasts shall have a duration of not more than 12 seconds.
h. No blast event shall have a duration of more than 18 seconds.
i. Duration is to be calculated as the time from the nominal firing time of the first charge to the nominal firing time of the last charge.
j. A ‘Blast Event’ is defined as:

    ‘An individual or number of linked individual blasts of not more than the total duration periods specified above.’

k. A ‘Development Blast’ is defined as:

'Any blast with a maximum instantaneous charge weight per hole of no more than 7 kilograms of explosive.'

l. A 'Production Blast' is defined as:

'Any blast in which a single hole contains a maximum instantaneous charge weight of more than 7 kilograms of explosive.' Slot blasts are deemed to be Production Blasts for the purpose of this definition.

15. Minimisation and Mitigation of Blasting Impacts

a. In addition to complying with the requirements of Condition 14, the consent holder shall minimise, to the extent practicable, the impacts of blasting vibrations for the Community. The measures to be applied in this regard shall be set out in the Vibration Management Plan (Condition 19) and will include details of how the following requirements will be achieved to the greatest extent practicable:

i. Restrict the duration of blast events to the minimum consistent with safe and efficient mining operations;

ii. Fire the production blasts within the 1pm meal break;

iii. Fire the three defined daily blast windows at shift changes and meal breaks;

iv. Implement timely blast notification procedures;

v. Report blast vibration results in a timely manner.

b. While blasting is occurring as provided for by this consent, the consent holder shall also continue to implement the Amenity Effect Programme (AEP) in respect of vibration as set out below provided that owners and/or tenants who have entered into a separate arrangement with the consent holder and/or have otherwise agreed not to receive the AEP will not be eligible to receive AEP payments under this condition.

c. The consent holder shall use the recorded data from the vibration compliance monitoring network to estimate the vibration received at occupied residences from blasting within the Correnso Underground Mine, and shall make payments to the occupiers of those residences in accordance with the table and criteria below:

Table: AEP Payment Schedule

Vibration Magnitude (mm/s)	Payment per Blast Event ($)
≥1.5	17.70
≥3.5	53.00
≥5	177.00
≥6	352.00

d. The stated payment rates are those existing at 1 January 2013. The rates will be adjusted for the start of each calendar year by the Consumer Price Index (CPI) published by Statistics New Zealand and made publicly available on the consent holder's website.

e. An occupied residence shall be eligible to receive AEP payments if it receives 2 or more blast events generating vibration of 1.5mm/s or greater in any month.

f. The AEP does not apply to any unoccupied houses or undeveloped residential property.

g. Occupiers of eligible residences shall receive a minimum payment of $250.

h. Payments to occupiers of eligible residences shall be calculated six-monthly, and payment made within two months or as soon as practicable thereafter.

i. Should AEP payments become taxable, the consent holder shall not be liable for any taxes associated with the payments. Nor shall the consent holder be liable for any future changes to national superannuation or other benefits as a result of an eligible occupier receiving the AEP payments required under this consent.

16. Where blast events provided under this consent occur simultaneously with blast events at Trio or Favona Underground Mines or the Martha Mine, the consent holder shall ensure that such blast events comply with the maximum ground vibration level limits specified in Condition 14 of this consent.

17. For the initial 100 blast events of each type, no more than one exceedance of 5mm/s in every 20 consecutive blast events shall be deemed to be compliant with the 95-percentile limit stated in Condition 14.

    The assessment of compliance with the average limits stated in Condition 14 shall not apply until 100 blast events of each type have been fired.

    Once 100 blast events of each type have been fired, compliance with both the 95 percentile and average limits shall be separately assessed for each blast type as per conditions 14 e) and f) respectively.

18. Ventilation Shaft Construction

    No blasting shall be employed in the construction of the ventilation shaft which is approved in terms of this consent.

19. Vibration Management Plan

    The consent holder shall prepare a Vibration Management Plan for written approval by the Council. The objective of the Plan is to provide detail on how compliance with vibration consent Conditions 14 to 22 and 80 will be achieved for the duration of this consent. This Plan shall be submitted to the Council at least 1 month prior to the exercise of this consent and the consent shall not be exercised until the Vibration Management Plan has been approved by the Council. The Vibration Management Plan may be reviewed and amended from time to time, subject to the approval of the Council but not in a manner inconsistent with these conditions.

    The Plan shall specifically include the following:

    a. Measures to be adopted to meet the conditions of this consent to ensure that blast vibrations for both development and production blasts are minimised to the greatest extent practicable, including;
        i. Description of the blast design criteria and blast design review procedures. All blasts shall be designed to a 95% level of confidence to achieve the vibration levels specified in Condition 14 and the requirements of Condition 15a).
        ii. The numbers, times (generally around shift changeovers), duration of blast events, and in general terms the coordination of development and production blasts into one blast event and steps to minimise the duration of blast events.
        iii. Procedures to be adopted where vibration levels approach the maximum permitted levels and mitigation actions to be implemented in the event of an exceedance of the limits stated in Condition 14.
        iv. The methods and procedures to be adopted to enable the separate recording and reporting of development and slot / production blasting.
        v. The methods and procedures to be adopted in deploying the roving monitor(s), data usage from the roving monitors, and identifying circumstances where vibration monitoring within structures shall be considered. Any monitoring undertaken in these circumstances is deemed not to be compliance monitoring.
    b. Further detail on the Amenity Effect Programme as required under Condition 15b).
    c. The location of fixed monitoring locations to be established in accordance with Condition 20d).
    d. The properties to be surveyed in accordance with condition 21 a).
    e. Records to be kept, including blast design data.

    Advice note:

    The Vibration Management Plan may be prepared in conjunction with the Vibration Management Plans prepared in accordance with the consent requirements applying to other mines in the Waihi area.

20. Blasting and Vibration Monitoring

a. The consent holder shall monitor impulsive vibration from all blast events associated with the mining provided for under this consent.

b. The monitoring system shall be automated to allow for the prompt analysis of each blast event.

c. Suitably trained personnel shall conduct any monitoring required under this consent, including the installation of roving monitors. Equipment used for monitoring, equipment calibration and vibration measurement procedures shall comply with the current Australian Standard AS2187.2 (or equivalent international standards) and equipment manufacturers' recommendations.

d. Unless otherwise required or confirmed in writing by the Council, the fixed monitoring locations for the Correnso Underground Mine shall be those shown in Figure 3. These monitoring locations pertain to the Correnso ore body and will need to be reviewed if the operations move to new areas.

e. The fixed monitoring locations shall not be on or inside a building or structure.

f. Pursuant to condition 20(d), data received from a roving monitor may identify a new or additional permanent monitoring location.

g. A roving monitor shall be deployed to record vibrations in locations where complaints regarding vibration have been made in accordance with a procedure specified in the approved Vibration Management Plan required under Condition 19.

h. A complete record of each blast event shall be maintained. The record shall include:

   i. Types of measurement instrument used.
   ii. Time and duration of blast event.
   iii. Location of blasts.
   iv. Locations of monitoring positions.
   v. Distances from the blasts to the monitoring position and nearest residence.
   vi. Measured vibration levels.
   vii. Total amount of explosive used.
   viii. Delay sequence of the blast event.
   ix. Maximum instantaneous charge.
   x. Volume of rock blasted.
   xi. Complaints (including the nature of effects, for example rattling window, was the complainant awoken) and whether the vibration mitigation action process has been undertaken (Condition 22 c))
   xii. Design criteria not covered in items (i) to (xi) above.

Advice note:

While this condition relates only to the monitoring of blast vibration associated with the mining activities provided for under this consent, similar conditions of the consent apply to all of the consent holder's other mining operations such that the consent holder is required to monitor blast vibrations from all of its mining activities.

21. Property Damage

a. Before blasting associated with the Correnso Underground Mine starts, and provided the property owner consents, the consent holder shall complete a structural condition survey for at least 15 representative properties (excluding properties owned by the consent holder at that time) as agreed in writing by the Council. The representative properties are to be located in the vicinity of the vibration monitors required under Condition 20 d). In addition to these properties, structural condition surveys shall be carried out as follows (subject to owner's agreement):

   i. At 'control' properties removed from the influence of any potential vibration effects from mining, as approved by the Council.
   ii. At Waihi East School and kindergarten.
   iii. At the former Mine Manager's house (57 Barry Road).

The survey properties shall be identified in the Vibration Management Plan (Condition 19).

The surveys shall be carried out by an independent structural engineer suitably qualified and experienced in domestic building design and construction. The survey reports shall include a visual inspection and video record of all existing built surfaces and defects including concrete accessways.

b) Upon receipt of a complaint of property damage an appropriately qualified staff member of the consent holder shall investigate and respond to the complaint within five business days or as soon thereafter as practicable unless the matter is considered urgent.

If the resident does not agree with advice from the consent holder's representative the consent holder may, or if the cause of the damage is unclear the consent holder shall, engage an appropriately qualified independent third party to investigate and report to both the homeowner and consent holder. The consent holder shall request that report to be available in 30 days unless considered urgent by the independent third party in which case the report shall be made available as soon as practicable. If the resident does not agree with the advice and the consent holder does not engage a third party then the resident may contact the Council, and if the Council determines, after investigation, that a third party investigation is warranted then the consent holder shall commission and meet the reasonable costs of that investigation.

If the advice of the independent third party or the consent holder's representative determines that the cause of the damage is attributable to activities authorised by this consent then the consent holder will remedy the damage at its cost as soon as practicable in accordance with any recommendation by the third party and to the reasonable satisfaction of the resident.

If any dispute arises in accordance with this clause, then the consent holder will offer to the resident the opportunity to enter binding arbitration through the Independent Review Panel (IRP). If the resident chooses not to participate in that binding arbitration then the consent holder's obligations under this condition are at an end.

If the IRP cannot conduct this arbitration function, the Council shall mediate the dispute under the same terms as the IRP.

For the purposes of this consent the IRP shall be as established and amended from time to time by the Waihi Community Forum (WCF).

22. Management and Reporting

a. Throughout the period of mining provided for under this consent, at the start of each calendar month the consent holder shall prepare a two-dimensional plan showing the existing mining and the proposed areas of mining activities during that month. The plan shall be loaded onto a page of the consent holder's website. A downloadable pdf version of the plan shall be available from the web page and hard copies shall be available for collection from the Waihi Information Centre and the Hauraki District Council Waihi Service Centre, and on request.

The consent holder shall use its best endeavours to restrict its blasting to the work areas defined on the plan recognising that operational constraints prevail and may lead to deviations from the plan during the month.

b. No blasting operations shall be carried out without the written approval of the Mine Manager. Before blasting commences, the Mine Manager shall ensure that the operations will not cause danger, damage, or undue discomfort to any person nor danger and damage to property.

c. If blast monitoring shows that the vibration standards have been exceeded, the consent holder shall implement mitigation actions to ensure compliance. Possible mitigation actions include but are not limited to:

i. Limiting the rate of excavation advance.

ii. Reducing the blast hole diameter.

iii. Reducing the weight of explosive in the blast hole.

iv. Using alternative explosive types.

v. Using electronic delays to adjust sequencing.

vi. Decking.

vii. Changing the blast pattern.

viii. Drilling and blasting in two passes.

ix. Changing the method of mining.

d. The consent holder shall provide a report to Council for each blast event where the measured vibration exceeds the specified maximum limits. The reports shall be submitted within five (5) days after the blast event and include the records listed in Condition 20 h) above and mitigation actions taken to limit subsequent blast vibrations to the maximum limits or less as generally outlined in Condition 22 c).

e. The consent holder shall, prior to the first development blast event pursuant to this consent, establish a page on its website that will show the recorded vibration magnitude for the last ten blast events for each of the compliance monitors required under Condition 20 d). The results of the most recent blast event will:

i. be posted on the web page as soon as practicable after the occurrence of that blast event; and

ii. remain provisional until they are verified

f. The consent holder shall provide a summary report to Council at three (3) monthly intervals after commencement of the Correnso Underground Mine. The report shall include the following:

i. Confirmation of actions taken during the previous reporting period.

ii. All vibration related complaints received during the current reporting period and mitigation actions taken by the consent holder.

iii. Results of vibration monitoring separately for development and production blasts.

iv. All roving monitor data results recorded during the quarter.

g. Monitoring records, reports and complaint schedules shall be stored securely and maintained in a systematic manner for 12 months after completion of all blasting at the underground mine. Records shall be available for perusal by Council and its representatives on request.

Figure 3

Position of fixed monitors

APPENDIX B – VIBRATION CONDITIONS HDC LAND USE CONSENT LUSE-202.2016.544.001 (Slevin)

Blasting and Vibration

7. Ground Vibration

All blast events shall comply with the vibration levels, numbers of events and durations specified in Condition 8.

8. Impulsive Vibration from Blasting

The activity shall comply with the following standard as measured at the boundary of any Residentially or lowdensity residentially zoned site or the notional boundary of any occupied rural dwelling not owned by the consent holder (or related company) or not subject to an agreement with the consent holder (or related company).

In the event that a property is sold and is not subject to an agreement between the consent holder (or related company) and the purchaser or related company, or in the event that there is no longer an agreement between the consent holder and the landowner, the measurement of vibration shall revert to being on or close to the boundary of that residentially or low-density residentially zoned site or the notional boundary of the occupied rural dwelling.

a. There shall be no more than three blast events per day, from Monday to Saturday and between 0700 and 2000 (excluding any blasts for maintenance/safety purposes).
b. No blasting shall be undertaken at night (2000 to 0700 the following day), on Sundays or on public holidays (excluding any blasts for maintenance/safety purposes).
c. The peak particle velocity (vector sum) shall be no more than:
    i) For development blasts;
    - 5mm/s for 95% of the monitored events.
    - 2mm/s on average.

    ii) For production blasts;
    - 5mm/s for 95% of the monitored events.
    - 3mm/s on average.

    iii) For maintenance/safety blasts:
    - 1.0mm/s for all blast events

d. Compliance with the 95% and average limits shall be measured over a six-month rolling period.
e. Compliance with the 95-percentile limit shall be determined separately for development blast events and for production blast events, and based on the highest recorded vibration for each blast event measured at any monitor, where the blast type is assigned on a monitor-by-monitor basis according to the blast with the minimum scaled distance from each monitor.
f. Compliance with the average limit shall be determined separately for each blast monitor based on the total number of blast events in the six-month rolling period.
g. For all blast events, including those involving a combination of production and development blasts (95% compliance);
    i) Production blasts shall have a total duration of not more than 9 seconds;
    ii) Development blasts shall have a total duration of not more than 12 seconds;
    iii) A combination of production and development blasts shall have a duration of not more than 12 seconds.

    iv) Maintenance/safety blasts shall have a total duration of not more than 2 seconds, other than for maintenance to retain tunnels, shafts and accessways in SUPA.
h. No blast event shall have a duration of more than 18 seconds.
i. Duration is to be calculated as the time from the nominal firing time of the first charge to the nominal firing time of the last charge.
j. A 'Blast Event' is defined as:

An individual or number of linked individual blasts of no more than the total duration periods specified above

k. A 'Development Blast' is defined as:

Any blast with a maximum instantaneous charge weight per hole of no more than 7 kilograms of explosive.

l. A 'Production Blast' is defined as:

Any blast in which a single hole contains a maximum instantaneous charge weight of more than 7 kilograms of explosive.' Slot blasts are deemed to be Production Blasts for the purpose of this definition.

m. A ‘Maintenance/Safety Blast’ is defined as:

Blasts for maintenance/safety purposes include breaking over-sized rocks, trimming/slashing of backs, walls and floors, firing of mis-fired explosives and removal of bridged stopes.

Advice Note:

There shall be no more than three development/production blast events per day from within all of the underground mines operated by the consent holder combined in the area covered by Mining Permit 41808. within CEPPA, SUPA and the Martha Drill Drive Project “MDDP” combined. For condition 8c the averages and 95 percentiles will be calculated for vibration from blasting within SUPA, CEPPA and MDDP combined.

9. Minimisation and Mitigation of Blasting Impacts

a. In addition to complying with the requirements of Condition 8, the consent holder shall minimise, to the extent practicable, the impacts of blasting vibrations for the Community. The measures to be applied in this regard shall be set out in the Vibration Management Plan (Condition 11) and will include details of how the following requirements will be achieved to the greatest extent practicable:
    i. Restrict the duration of blast events to the minimum consistent with safe and efficient mining operations;
    ii. Fire the production blasts within the 1 pm meal break;
    iii. Fire the three defined daily blast windows at shift changes and meal breaks;
    iv. Implement timely blast notification procedures;
    v. Report blast vibration results in a timely manner.

b. While blasting is occurring as provided for by this consent, the consent holder shall also continue to implement the Amenity Effect Programme (AEP) in respect of vibration as set out below provided that owners and/or tenants who have entered into a separate arrangement with the consent holder and/or have otherwise agreed not to receive the AEP will not be eligible to receive AEP payments under this condition.

c. The consent holder shall use the recorded data from the vibration compliance monitoring network to estimate the vibration received at occupied residences from blasting within the Slevin Underground Mine, and shall make payments to the occupiers of those residences in accordance with the table and criteria below:

Table. AEP Payment Schedule

Vibration Magnitude (mm/s)	Payment per Blast Event ($)
≥1.5	18.68
≥3.5	55.92
≥5	186.75
≥6	371.69

d. The stated payment rates are those existing at 1 January 2018. The rates will be adjusted for the start of each calendar year by the Consumer Price Index (CPI) published by Statistics New Zealand and made publicly available on the consent holder's website.

e. An occupied residence shall be eligible to receive AEP payments if it receives 2 or more blast events generating vibration of 1.5mm/s or greater in any month.

f. The AEP does not apply to any unoccupied houses or undeveloped residential property.

g. Occupiers of eligible residences shall receive a minimum payment of $250 per six monthly period.

h. Payments to occupiers of eligible residences shall be calculated six-monthly, and payment made within two months or as soon as practicable thereafter.

i. Should AEP payments become taxable, the consent holder shall not be liable for any taxes associated with the payments. Nor shall the consent holder be liable for any future changes to national superannuation or other benefits as a result of an eligible occupier receiving the AEP payments required under this consent.

Advice Note: For the purposes of determining AEP payments the AEP payments will be based on the recorded vibration data from both CEPPA, SUPA and the Martha Underground Mine combined.

10. Where blast events provided under this consent occur simultaneously with blast events at other Underground Mines Mines operated by the consent holder and set out in Condition 2 above, or the Martha Mine, the consent holder shall ensure that such blast events comply with the maximum ground vibration level limits specified in Condition 8 of this consent.

11. Vibration Management Plan

The consent holder shall prepare a Vibration Management Plan for written approval by the Council. The objective of the Plan is to provide detail on how compliance with vibration consent Conditions 7 to 14 and 42 will be achieved for the duration of this consent. This Plan shall be submitted to the Council at least 2 weeks prior to the exercise of this consent and the consent shall not be exercised until the Vibration Management Plan has been approved by the Council. The Vibration Management Plan may be reviewed and amended from time to time, subject to the certification of the Council but not in a manner inconsistent with these conditions. If certification is not provided within 30 working days of Council's receipt of the Vibration Management Plan blasting authorised by this consent may commence.

The Plan shall specifically include the following:

a. Measures to be adopted to meet the conditions of this consent to ensure that blast vibrations for both development and production blasts are minimised to the greatest extent practicable, including;

i. Description of the blast design criteria and blast design review procedures. All blasts shall be designed to a 95% level of confidence to achieve the vibration levels specified in Condition 8 and the requirements of Condition 9a).

ii. The numbers, times (generally around shift changeovers), duration of blast events, and in general terms the coordination of development and production blasts into one blast event and steps to minimise the duration of blast events.

iii. Procedures to be adopted where vibration levels approach the maximum permitted levels and mitigation actions to be implemented in the event of an exceedance of the limits stated in Condition 8.

iv. The methods and procedures to be adopted to enable the separate recording and reporting of development and slot / production blasting.

v. The methods and procedures to be adopted in deploying the roving monitor(s), data usage from theroving monitors, procedures for converting a roving monitor location to a fixed monitoring location, and identifying circumstances where vibration monitoring within structures shall be considered. Any monitoring undertaken in these circumstances by roving monitors or within structures is deemed notto be compliance monitoring.

vi. The methods and procedures for identifying and addressing anomalous vibration results recorded at any monitored site, including sites monitored with roving monitors.

b. Further detail on the Amenity Effect Programme as required under Condition 9b).

c. The location of fixed monitoring locations to be established in accordance with Condition 12d).

d. Records to be kept, including blast design data.

Advice note:

The Vibration Management Plan may be prepared in conjunction with the Vibration Management Plans prepared in accordance with the consent requirements applying to other mines in the Waihi area.

12. Blasting and Vibration Monitoring

a. The consent holder shall monitor impulsive vibration from all blast events associated with the mining provided for under this consent.

b. The monitoring system shall be automated to allow for the prompt analysis of each blast event.

c. Suitably trained personnel shall conduct any monitoring required under this consent, including the installation of roving monitors. Equipment used for monitoring, equipment calibration and vibration measurement procedures shall comply with the current Australian Standard AS2187.2 (or equivalent international standards) and equipment manufacturers' recommendations.

d. Unless otherwise required or confirmed in writing by the Council, the fixed monitoring locations for the Slevin Underground Mine shall be those shown in Figure 2. These monitoring locations pertain to the Slevin ore body and will need to be reviewed if the operations move to new areas.

e. The fixed monitoring locations shall not be on or inside a building or structure.

f. Pursuant to condition 12(d), data received from a roving monitor may identify a new or additional permanent monitoring location.

g. A roving monitor shall be deployed to record vibrations in locations where complaints regarding vibration have been made in accordance with a procedure specified in the approved Vibration Management Plan required under Condition 11.

h. A complete record of each blast event shall be maintained. The record shall include:

i. Types of measurement instrument used.

ii. Time and duration of blast event.

iii. Locations of blasts.

iv. Locations of monitoring positions.

v. Distances from the blasts to the monitoring position and nearest residence.

vi. Measured vibration levels.

vii. Total amount of explosive used.

viii. Delay sequence of the blast event.

ix. Maximum instantaneous charge.

x. Volume of rock blasted.

xi. Complaints (including the nature of effects, for example rattling window, was the complainant awoken) and whether the vibration mitigation action process has been undertaken (Condition 14 c))

xii. Design criteria not covered in items (i) to (xi) above.

Advice note:

While this condition relates only to the monitoring of blast vibration associated with the mining activities provided for under this consent, similar conditions apply to all of the consent holder's other mining operations and require the consent holder to monitor blast vibrations from all of its mining activities.

13. Property Damage

a) Upon receipt of a complaint of property damage suspected by the property owner to be caused from activities authorised by this consent, an appropriately qualified staff member of the consent holder shall investigate and respond to the complaint within five business days or as soon thereafter as practicable unless the matter is considered urgent.

If the property owner does not agree with advice from the consent holder's representative the consent holder may, or if the cause of the damage is unclear the consent holder shall, engage an appropriately qualified independent third party to investigate and report to both the property owner and consent holder. The consent holder shall request that report to be available in 30 days unless considered urgent by the independent third party in which case the report shall be made available as soon as practicable. If the property owner does not agree with the advice and the consent holder does not engage a third party then the resident may contact the Council, and if the Council determines, after investigation, that a third party investigation is warranted then the consent holder shall commission and meet the reasonable costs of that investigation.

If the advice of the independent third party or the consent holder's representative determines that the cause of the damage is attributable to activities authorised by this consent then the consent holder will remedy the damage at its cost as soon as practicable in accordance with any recommendation made by the third party and to the reasonable satisfaction of the property owner.

If any dispute arises in accordance with this clause condition, then the consent holder will offer to the resident the opportunity to enter binding matter shall be referred to arbitration in accordance with the provisions of the Arbitration Act 1996. An arbitrator shall be appointed by the President of the Institute of Professional Engineers in New Zealand. The arbitrator shall give their determination within 30 working days of their appointment, unless the consent holder and the property owner agree that time shall be extended. In all other respects, the provisions of the Arbitration Act 1996 shall apply. If the property owner chooses not to participate in the binding arbitration, then the consent holder's obligations under this condition are at an end.

14. Management and Reporting

a. Throughout the period of mining provided for under this consent, at the start of each calendar month the consent holder shall prepare a two-dimensional plan showing the existing mining and the proposed areas of mining activities during that month. The plan shall be loaded onto a page of the consent holder's website. A downloadable pdf version of the plan shall be available from the web page and hard copies shall be available for collection from the Waihi Information Centre and the Hauraki District Council Waihi Service Centre, and on request.

The consent holder shall use its best endeavours to restrict its blasting to the work areas defined on the plan recognising that operational constraints prevail and may lead to deviations from the plan during the course of the month.

b. No blasting operations shall be carried out without the written approval of the Mine Manager. Before blasting commences, the Mine Manager shall ensure that the operations will not cause danger, damage or undue discomfort to any person nor danger and damage to property.

c. In the event that blast monitoring shows that the vibration standards have been exceeded, the consent holder shall implement mitigation actions to ensure compliance. Possible mitigation actions include but are not limited to:

i. Limiting the rate of excavation advance.
ii. Reducing the blast hole diameter.
iii. Reducing the weight of explosive in the blast hole.
iv. Using alternative explosive types.
v. Using electronic delays to adjust sequencing.
vi. Decking.
vii. Changing the blast pattern.
viii. Drilling and blasting in two passes.
ix. Changing the method of mining.

d. The consent holder shall provide a report to Council for each blast event where the measured vibration exceeds applicable peak particle velocity specified in Condition 8. The report shall be submitted within five (5) days after the blast event and include the records listed in Condition 12 h) above and mitigation actions taken to limit subsequent blast vibrations to the maximum limits or less as generally outlined in Condition 14 c).

e. The consent holder shall establish a page on its website that will show the recorded vibration magnitude for the last ten blast events for each of the compliance monitoring required under Condition 12.The results of the most recent blast event will:

f. be posted on the consent holder's web page as soon as practicable after the occurrence of that blast event; and

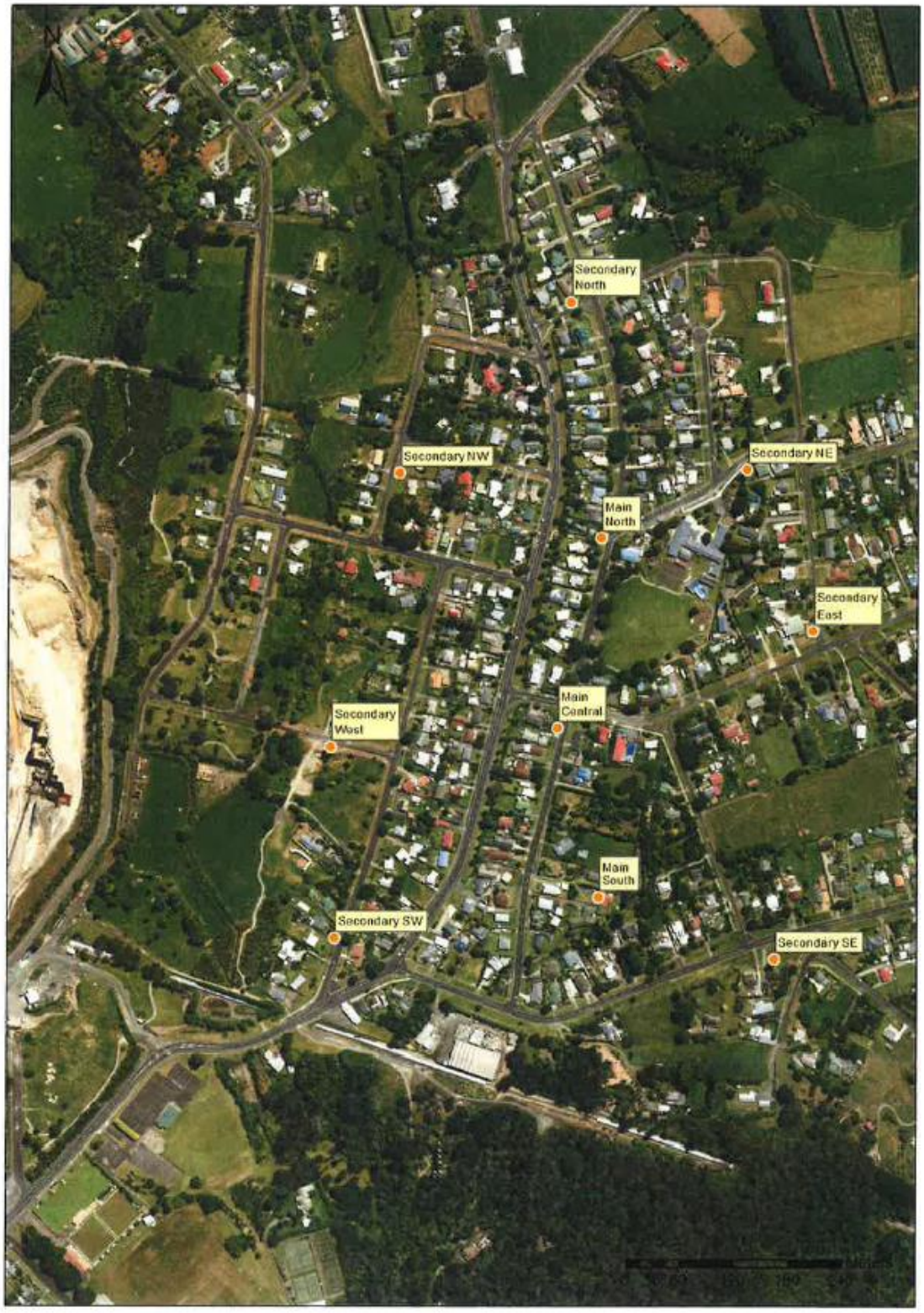
g. remain provisional until they are verified

h. The consent holder shall provide a summary report to Council at three (3) monthly intervals after the first exercise of this consent as provided for by condition 4. The report shall include the following:

i. Confirmation of actions taken during the previous reporting period.
ii. All vibration related complaints received during the current reporting period and mitigation actions taken by the consent holder.
iii. Results of vibration monitoring separately for underground development and production blasts.
iv. All roving monitor data results recorded during the quarter.

i. Monitoring records, reports and complaint schedules shall be stored securely and maintained in a systematic manner for 12 months after completion of all blasting at the underground mine. Records shall be available for perusal by Council and its representatives on request.

Figure 2: Location of Vibration Monitoring Sites



APPENDIX C – VIBRATION CONDITIONS HDC LAND USE CONSENT LUC RC-664.001.2017 (MDDP)

13 Impulsive Vibration from Blasting

The activity shall comply with the following standard as measured at the boundary of any site not zoned Rural or in the case of land zoned Rural, the notional boundary of any occupied rural dwelling where the site or occupied rural dwelling is not owned by the consent holder (or related company) or not subject to an agreement with the consent holder (or related company).

In the event that a property is sold and is not subject to an agreement between the consent holder (or related company) and the purchaser or related company, or in the event that there is no longer an agreement between the consent holder and the landowner, the measurement of vibration shall revert to being on or close to the boundary of that site not zoned Rural or in the case of land zoned Rural, the notional boundary of the occupied rural dwelling.

a) There shall be no more than three blast events per day, from Monday to Saturday and between 0700 and 2000.

b) No blasting shall be undertaken at night (2000 to 0700 the following day), on Sundays or on public holidays.

c) The peak particle velocity (vector sum) shall be no more than:
   i) 5mm/s for 95% of the monitored events.
   ii) 2mm/s on average.

d) Compliance with the 95% and average limits shall be measured over a six-month rolling period.

e) Compliance with the 95-percentile limit shall be determined based on the highest recorded vibration for each blast event measured at any monitor.

f) Compliance with the average limit shall be determined separately for each blast monitor based on the total number of blast events in the six-month rolling period. The blast monitors for compliance measuring purposes shall be those fixed monitors as described in condition 16 d).

g) Blast events shall have a total duration of not more than 12 seconds;

h) Duration is to be calculated as the time from the nominal firing time of the first charge to the nominal firing time of the last charge.

i) A 'Blast Event' is defined as 'An individual or number of linked individual blasts of not more than the total duration periods specified above.'

Advice Note:

There shall be no more than three blast events per day from within CEPPA, SUPA and the MDDP combined. For condition 13c)), the averages and 95 percentiles will be calculated for vibration from blasting within both SUPA, CEPPA and MDDP combined.

14 Minimisation and Mitigation of Blasting Impacts

a) In addition to complying with the requirements of condition 13, the consent holder shall minimise, to the extent practicable, the impacts of blasting vibrations for the community. The measures to be applied in this regard shall be set out in the Vibration Management Plan (condition 19) and will include details of how the following requirements will be achieved to the greatest extent practicable:

   i) Restrict the duration of blast events to the minimum consistent with safe and efficient mining operations;

   ii) Fire the three defined daily blast windows at shift changes and meal breaks;

iii) Implement timely blast notification procedures;

iv) Report blast vibration results in a timely manner.

b) While blasting is occurring as provided for by this consent, the consent holder shall also continue to implement the Amenity Effect Programme (AEP) in respect of vibration as set out below provided that owners and/or tenants who have entered into a separate arrangement with the consent holder and/or have otherwise agreed not to receive the AEP will not be eligible to receive AEP payments under this condition.

c) The consent holder shall use the recorded data from the vibration compliance monitoring network to estimate the vibration received at occupied residences from blasting within the MDDP, and shall make payments to the occupiers of those residences in accordance with the table and criteria below:

Table: AEP Payment Schedule

Vibration Magnitude (mm/s)	Payment per Blast Event ($)
≥1.5	17.70
≥3.5	53.00
≥5	177.00
≥6	352.00

d) The stated payment rates are those existing at 1 January 2013. The rates will be adjusted for the start of each calendar year by the Consumer Price Index (CPI) published by Statistics New Zealand and made publicly available on the consent holder's website.

e) An occupied residence shall be eligible to receive AEP payments if it receives two or more blast events generating vibration of 1.5mm/s or greater in any month.

f) The AEP does not apply to any unoccupied houses or undeveloped residential property.

g) Occupiers of eligible residences shall receive a minimum payment of $250.

h) Payments to occupiers of eligible residences shall be calculated six-monthly, and payment made within two months or as soon as practicable thereafter.

i) Should AEP payments become taxable, the consent holder shall not be liable for any taxes associated with the payments. Nor shall the consent holder be liable for any future changes to national superannuation or other benefits as a result of an eligible occupier receiving the AEP payments required under this consent.

Advice Note:

For the purposes of determining AEP payments the AEP payments will be based on the recorded vibration data from CEPPA, SUPA and MDDP combined.

15 Where blast events provided under this consent occur simultaneously with blast events at the Trio, Favona or Martha mines, or within CEPPA or SUPA, the consent holder shall ensure that such blast events comply with the maximum ground vibration level limits specified in condition 13 of this consent.

16 Blasting and Vibration Monitoring

a) The consent holder shall monitor impulsive vibration from all blast events associated with the mining provided for under this consent.

b) The monitoring system shall be automated to allow for the prompt analysis of each blast event.

c) Suitably trained personnel shall conduct any monitoring required under this consent, including the

installation of roving monitors. Equipment used for monitoring, equipment calibration and vibration measurement procedures shall comply with the current Australian Standard AS2187.2 (or equivalent international standards) and equipment manufacturers' recommendations.

d) Unless otherwise required or confirmed in writing by the Council, the fixed monitoring locations for the MDDP shall be those shown as the MDDP monitors in in Figure 3 together with an additional monitor to be located between the Pensioner Flats and the Central School. The location of the additional monitor is to be confirmed with the Council prior to installation and be in place within 4 months of the commencement of this consent. The procedure to be employed in determining the location of the additional monitor shall be described in the Vibration Management Plan required by condition 19.

e) The fixed monitoring locations shall not be on or inside a building or structure.

f) Pursuant to condition 16d, data received from a roving monitor may identify a new or additional fixed monitoring location.

g) A roving monitor shall be deployed to record vibrations in locations where complaints regarding vibration have been made in accordance with a procedure specified in the approved Vibration Management Plan required under condition 19.

h) A complete record of each blast event shall be maintained. The record shall include:

i) Types of measurement instrument used.

ii) Time and duration of blast event.

iii) Locations of blasts.

iv) Locations of monitoring positions.

v) Distances from the blasts to the monitoring position and nearest residence.

vi) Measured vibration levels.

vii) Total amount of explosive used.

viii) Delay sequence of the blast event.

ix) Maximum instantaneous charge.

x) Volume of rock blasted.

xi) Complaints (including the nature of effects, for example rattling window, was the complainant awoken) and whether the vibration mitigation action process has been undertaken (condition 18c)

xii) Design criteria not covered in items i) to xi) above.

Advice note:

While this condition relates only to the monitoring of blast vibration associated with the mining activities provided for under this consent, similar conditions apply to all of the consent holder's other mining operations and require the consent holder to monitor blast vibrations from all of its mining activities.

17 Property Damage

a) Upon receipt of a complaint of property damage an appropriately qualified staff member of the consent holder shall investigate and respond to the complaint within five business days or as soon thereafter as practicable unless the matter is considered urgent.

If the property owner does not agree with advice from the consent holder's representative the consent holder may, or if the cause of the damage is unclear the consent holder shall, engage an appropriately qualified independent third party to investigate and report to both the property owner and consent holder. The consent holder shall request that report to be available in 30 days unless considered urgent by the independent third party in which case the report shall be made available as soon as practicable. If the property owner does not agree with the advice and the consent holder does not engage a third party then the resident may contact the Council, and if the Council determines, after investigation, that a third-party investigation is warranted then the consent holder shall commission and meet the reasonable costs of that investigation.

If the advice of the independent third party or the consent holder's representative determines that the cause of the damage is attributable to activities authorised by this consent then the consent holder will remedy the damage at its cost as soon as practicable in accordance with any recommendation made by the third party and to the reasonable satisfaction of the resident.

If any dispute arises in accordance with this clause, then the consent holder will offer to the property owner the opportunity to enter binding arbitration through the Independent Review Panel (IRP). If the property owner chooses not to participate in that binding arbitration then the consent holder's obligations under this condition are at an end.

In the event that the IRP cannot conduct this arbitration function, the Council shall mediate the dispute under the same terms as the IRP.

For the purposes of this consent the IRP will be as established and amended from time to time by the Waihi Community Forum (WCF).

18 Management and Reporting

a) Throughout the period of mining provided for under this consent, at the start of each calendar month the consent holder shall prepare a two- dimensional plan showing the existing mining and the proposed areas of mining activities during that month. The plan shall be loaded onto a page of the consent holder's website. A downloadable pdf version of the plan shall be available from the web page and hard copies shall be available for collection from the Waihi Information Centre and the Hauraki District Council Waihi Service Centre, and on request.

   The consent holder shall use its best endeavours to restrict its blasting to the work areas defined on the plan recognising that operational constraints prevail and may lead to deviations from the plan during the course of the month.

b) No blasting operations shall be carried out without the written approval of the Mine Manager. Before blasting commences, the Mine Manager shall ensure that the operations will not cause danger, damage or undue discomfort to any person nor danger and damage to property.

c) In the event that blast monitoring shows that the vibration standards have been exceeded, the consent holder shall implement mitigation actions to ensure compliance. Possible mitigation actions include but are not limited to:

   i) Limiting the rate of excavation advance.

   ii) Reducing the blast hole diameter.

   iii) Reducing the weight of explosive in the blast hole.

   iv) Using alternative explosive types.

   v) Using electronic delays to adjust sequencing.

   vi) Changing the blast pattern.

vii) Changing the method of development.

d) The consent holder shall provide a report to Council for each blast event where the measured vibration exceeds the specified maximum limits. The reports shall be submitted within five days after the blast event and include the records listed in condition 0h) above and mitigation actions taken to limit subsequent blast vibrations to the maximum limits or less as generally outlined in condition 18c.

e) The consent holder shall record the vibration magnitude for blast events resulting from the MDDP on its website. The results of the most recent blast event will:

i) be posted on the web page as soon as practicable after the occurrence of that blast event; and

ii) remain provisional until they are verified.

f) The consent holder shall provide a summary report to Council at three-monthly intervals after the first exercise of this consent as provided for by condition 4. The report shall include the following:

i) Confirmation of actions taken during the previous reporting period.

ii) All vibration related complaints received during the current reporting period and mitigation actions taken by the consent holder.

iii) Results of vibration monitoring for development blasts.

iv) All roving monitor data results recorded during the quarter.

g) Monitoring records, reports and complaint schedules shall be stored securely and maintained in a systematic manner for 12 months after completion of all blasting at MDDP. Records shall be available for perusal by Council and its representatives on request.

19 Vibration Management Plan

The consent holder shall prepare a Vibration Management Plan for written approval by the Council. The objective of the Plan is to provide detail on how compliance with vibration consent conditions 13 to 18 and 34 will be achieved for the duration of this consent. This Plan shall be submitted to the Council at least two weeks prior to the exercise of this consent and the consent shall not be exercised until the Vibration Management Plan has been approved by the Council. The Vibration Management Plan may be reviewed and amended from time to time, subject to the approval of the Council but not in a manner inconsistent with these conditions.

The Plan shall specifically include the following:

a) Measures to be adopted to meet the conditions of this consent to ensure that blast vibrations are minimised to the greatest extent practicable, including;

i) Description of the blast design criteria and blast design review procedures. All blasts shall be designed to a 95% level of confidence to achieve the vibration levels specified in condition 13 and the requirements of condition 14a).

ii) The numbers, times (generally around shift changeovers), duration of blast events, and in general terms the coordination of blasts into one blast event and steps to minimise the duration of blast events.

iii) Procedures to be adopted where vibration levels approach the maximum permitted levels and mitigation actions to be implemented in the event of an exceedance of the limits stated in condition 13.

iv) The methods and procedures to be adopted in deploying the roving monitor(s), data usage from the roving monitors, and identifying circumstances where vibration monitoring within structures shall be considered. Any monitoring undertaken in these circumstances is deemed not to be compliance monitoring.

b) Further detail on the Amenity Effect Programme as required under condition 14b).

c) The location of fixed monitors to be established in accordance with condition 16d).

d) Records to be kept, including blast design data.

Advice note:

The Vibration Management Plan may be prepared in conjunction with the Vibration Management Plans prepared in accordance with the consent requirements applying to other mines in the Waihi area.

OCEANAGOLD WAIHI OPERATION

Fixed Vibration Monitor Locations

Figure 3

Date: 07 July 2017

APPENDIX D – VIBRATION CONDITIONS - VARIATION TO MINING LICENCE 32-2388

General and particular work programmes

1. The work to be undertaken pursuant to this licence shall be limited to the following:

b. Mining

Open pit and minor underground mining and exploratory work, using explosives and mechanical excavating, truck handling of material within the pit area and that portion of the rest of the licence area that lies to the west of Junction Road, conveyor belt handling to a chemical processing plant, beneficiation and ore treatment including waste and tailings disposal within the licence area.

d. Monitoring

The regular monitoring of pit slopes, tailings retaining structures, ground movement, noise, blasting, vibration, air quality and rehabilitation programmes together with the necessary rectification work as required.

7B Company Liaison Officer

(a) The licensee shall appoint a person ("the Company Liaison Officer"), subject to the approval of the Minister to liaise between the licensee, the community, and the Minister as set below. The Company Liaison Officer shall have sufficient delegated power to be able to deal immediately with complaints received and shall be required to investigate those complaints as soon as possible after receipt.

(b) The name of the Company Liaison Officer together with the contact phone numbers for that person shall be publicly notified in local newspapers by the licensee prior to the commencement of the extended project (at least one month prior, but not more than two months prior to the commencement of construction activities) and at least once a year thereafter.

(c) The Company Liaison Officer shall be appointed prior to the commencement of the extended project and this position shall be filled at all times during the construction activities as defined in Condition 3.

Council Liaison Officer

(d) The licensee shall provide all the reasonable costs associated with the appointment and support of a Council Liaison Officer, to be employed by and be responsible to the Minister during the construction activities as defined in Condition 3.

(Note: The following is for information purposes only and does not form part of the condition.

The Council Liaison Officer may either be a new appointment or may be an existing employee.

Whether or not the appointee is an existing employee, the Council Liaison Officer's role shall be independent and objective and designed to promote effective gathering of information of effects upon the community from the mining activity; and, in the light of such

information, to promote effective liaison with the Company Liaison Officer so that the effects identified may be remedied or mitigated.)

The functions and responsibilities of the Council Liaison Officer shall be as follows:

(i) Liaise between the Company Liaison Officer, members of the community, the Waihi Liaison Forum (or its equivalent), and the Minister;

(ii) Report to the Minister on an "as events happen" basis, and weekly on complaints received, actions undertaken by the licensee and the complainant in respect to complaints, and on any other relevant actions and activities occurring during the week;

(iii) Ensure that the Company Liaison Officer is providing information to residents in the area around the mine and tailings facilities of the activities that are programmed to be undertaken in the coming week (especially land clearance, construction and blasting), activities that were carried out in the previous week and any other material that will inform the residents of what is programmed to happen in the coming weeks;

(iv) Facilitate the appointment of a mediator, venue, time etc agreeable to both parties, to undertake the mediation of disputes or concerns between the licensee and members of the community. Except in those situations where both parties are in agreement, the Council Liaison Officer's function is not to act as a mediator. The role of mediation is a specialist one that needs to be undertaken by persons experienced and trained in this area.

(e) The Company Liaison Officer shall, during construction activities, report weekly to the Council Liaison Officer on all complaints received in the prior week and the action taken to investigate those complaints. In addition, the Company Liaison Officer shall investigate and report on any other matters as directed by the Council Liaison Officer concerning or arising out of construction activities. (See periods of construction activities as defined in condition 3.)

(f) The Company Liaison Officer shall give residents who are likely to be affected and the Council Liaison Officer reasonable (minimum one week's) prior notice of construction activities, indicating likely timing and duration.

(g) Following completion of initial construction activities, and prior to the commencement of other construction activities (ie during operations stage), the Company Liaison Officer shall report six monthly to the Minister on the following:

(i) All complaints received during the previous six-month period, action taken by the licensee and the resolutions, if any;

(ii) Other matters of concern raised by the community;

(iii) Any mediation entered into by the licensee and others with respect to operational matters and the outcome (unless the parties have agreed to keep such confidential).

7C Complaints procedure and mediation

Note: the following is for information purposes only and does not form part of the condition.

- Complainants will be expected to contact the Company Liaison Officer in the first instance (refer condition 7B(a)).

- During construction activities, if a complainant is dissatisfied with the response by the Company Liaison Officer, they shall contact the Council Liaison Officer with the details of the complaint

and the Company Liaison Officer's response. Outside the construction activities, complainants shall contact any officer of the Minister**.**

The licensee shall comply with the following complaints procedure and mediation process:

(a) The Company Liaison Officer shall meet with the complainant and the Council Liaison Officer to discuss the complaint and ways in which the issue can be resolved.

(b) If the parties cannot agree on a resolution, the matter shall be put to mediation.

(Note: The following is for information purposes only and does not form part of the condition:

(i) Refer condition 7B(d)(iv) above.

(ii) Unless the parties agree the outcome of mediation shall not be binding.)

Blasting and vibration

20.

(a) All blasting procedures shall be carried out so as to ensure the safety of persons in the mine and/or the immediate vicinity of the mine site. The licensee shall notify WorkSafe New Zealand of the blasting procedures to be employed and of any changes thereto and the blasting procedures shall be approved by WorkSafe New Zealand. The blasting procedures shall address the following specific items; regular blasting times, warning and all clear signals, control of fly rock, vibration and air blast monitoring and such other matters as Worksafe New Zealand may direct.

(b) No blasting operations shall be carried out without the written approval of the Mine Manager, who shall first satisfy himself that the blasting operations will not cause either danger, damage or undue discomfort to any person or danger to property.

(c) A blasting programme shall be publicly notified in newspapers circulating in the area prior to any blasting taking place and at regular intervals not exceeding six (6) months thereafter. Changes to the blasting programme will be notified in newspapers circulating in the area at least three (3) days prior to implementation.

The Company Liaison Officer shall ensure that the blasting programme and changes to the blasting programme are provided to all residents in the immediate area surrounding the mine who in the opinion of the Company Liaison Officer (after consultation with the Council Liaison Officer) are likely to experience the effects of blasting and vibration. The same respective notification time periods shall apply.

d) Vibration levels measured in the ground closest to any affected residence excluding those properties owned by the licence holder or related Company or subject to an agreement with the licence holder or related Company shall be 95% compliant with a maximum level for ground vibration of 5 mm/s and shall not exceed a Vmax of 10 mm/s (both expressed as vector sum of velocity components). The 95% compliance limit is defined as the level not to be exceeded for 95% of blasts over the preceding twelve month period. Blasting is permitted within the following hours;

Open Pit Operations

Monday-Friday 1000-1500

Saturday 1000-1200

(e) Details of all blasts shall be recorded as set out in condition 29.

(f) The peak overall sound pressure level due to air blasts shall not exceed 128dB linear (unweighted), measured at any affected residence excluding those properties owned by the licence holder or related Company, or subject to an agreement with the licence holder or related Company.

(h) Except where specifically provided in condition 20(f) all blasting operations and measurements in relation to operations shall be carried out in accordance with AS2187.2:2006 The Use of Explosives.

(i) Vibration Management Plan

The licence holder shall prepare a Vibration Management Plan. The objective of this plan is to detail the methods to be used to comply with conditions 20 and 29.

Blasting

29.

(a) The licensee shall monitor every blast event in terms of blast location, charge weight per delay, number of holes, initiation timing and measured vibration. Where equipment malfunctions or is not available for recording (e.g. during maintenance), this shall be noted and included in the monitoring report presented to the Minister. Where blasting is to be undertaken in the vicinity of the overpressure sensor, the licensee shall also monitor the overpressure level. The location of the fixed vibration and overpressure sensors shall be undertaken in consultation with the Minister, and changes to the location of these sensors and monitor shall be agreed with the Minister prior to their relocation. The licensee shall deploy a roving monitor to record blast vibrations in the location where complaints regarding vibration have been made. The results of the monitoring shall be provided to the Minister.

(b) The licensee shall, unless otherwise directed to do so by the Minister following consultation with the licensee, provide a quarterly summary report to the Minister on the blasting undertaken, and the vibration and overpressure levels recorded, as well as any complaints received.

(c) Monitoring in the ground at the base of the Cornish Pumphouse shall be undertaken when blasting is carried out within a 250 metre radius of the structure. The peak component vibration levels shall not exceed 25 mm/s

3.4 LIAISON OFFICERS

Company Liaison Officer

a) The consent holder shall appoint a person ("the Company Liaison Officer"), subject to the approval of the Hauraki District Council and the Waikato Regional Council to liaise between the consent holder, the community, the Hauraki District Council and the Waikato Regional Council as set out in this consent. The Company Liaison Officer shall have sufficient delegated power to be able to deal immediately with complaints received and shall be required to investigate those complaints as soon as possible after receipt.

b) The name of the Company Liaison Officer together with the contact phone numbers for that person shall be publicly notified in local newspapers by the consent holder prior to the exercising of this consent (at least one month prior, but not more than two months prior to the commencement of construction activities) and at least once a year thereafter.

c) The Company Liaison Officer shall be appointed prior to the exercising of this consent and this position shall be filled at all times during the construction activities as defined in Condition 3.3.

Council Liaison Officer

d) The consent holder shall provide all the reasonable costs associated with the appointment and support of a Council Liaison Officer, to be employed by and be responsible jointly to the Hauraki District Council and Waikato Regional Council during the construction activities as defined in Condition 3.3.

(Note: The following is for information purposes only and does not form part of the condition.

The Council Liaison Officer may either be a new appointment or may be an existing employee. Whether or not the appointee is an existing employee, the Council Liaison Officer's role shall be independent and objective and designed to promote effective gathering of information of effects upon the community from the mining activity; and, in the light of such information, to promote effective liaison with the Company Liaison Officer so that the effects identified may be remedied or mitigated.

The functions and responsibilities of the Council Liaison Officer shall be as follows:

i) liaise between the Company Liaison Officer, members of the community, the Waihi Liaison Forum (or its equivalent), Hauraki District Council and Waikato Regional Council;

ii) report to the Hauraki District Council and Waikato Regional Council on an "as events happen" basis, and weekly on complaints received, actions undertaken by the consent holder and the complainant in respect to complaints, and on any other relevant actions and activities occurring during the week;

iii) ensure that the Company Liaison Officer is providing information to residents in the area around the mine and tailings facilities of the activities that are programmed to be undertaken in the coming week (especially land clearance, construction and blasting), activities that were carried out in the previous week and any other material that will inform the residents of what is programmed to happen in the coming weeks;

iv) facilitate the appointment of a mediator, venue, time etc agreeable to both parties, to undertake the mediation of disputes or concerns between the consent holder and members of the community. Except in those situations where both parties are in agreement, the Council Liaison Officer's function is not to act as a mediator. The role

of mediation is a specialist one that needs to be undertaken by persons experienced and trained in this area).

e) The Company Liaison Officer shall, during construction activities, report weekly to the Council Liaison Officer on all complaints received in the prior week and the action taken to investigate those complaints. In addition, the Company Liaison Officer shall investigate and report on any other matters as directed by the Council Liaison Officer concerning or arising out of construction activities. (See periods of construction activities as defined in condition 3.3)

f) The Company Liaison Officer shall give residents who are likely to be affected and the Council Liaison Officer reasonable (minimum one week's) prior notice of construction activities, indicating likely timing and duration.

g) Following completion of initial construction activities, and prior to the commencement of other construction activities (ie during operations stage), the Company Liaison Officer shall report six monthly to the Hauraki District Council and the Waikato Regional Council on the following:

(i) All complaints received during the previous six month period, action taken by the consent holder and the resolutions, if any;

(ii) Other matters of concern raised by the community;

(iii) Any mediation entered into by the consent holder and others with respect to operational matters and the outcome (unless the parties have agreed to keep such confidential).

3.5 COMPLAINTS PROCEDURE AND MEDIATION

(Note: The following is for information purposes only and does not form part of the condition:

i) Complainants will be expected to contact the Company Liaison Officer in the first instance (refer to Condition 3.4 a)).

ii) During the construction activities, if the complainant is dissatisfied with the response by the Company Liaison Officer, they shall contact the Council Liaison Officer with details of the complaint and the Company Liaison Officer's response. Outside the construction activities, complainants shall contact the Manager Planning and Environmental Services or any other Officer of Council.)

The consent holder shall comply with the following complaints procedure and mediation process:

a) The Company Liaison Officer shall meet with the complainant and the Council Liaison Officer, to discuss the complaint and ways in which the issue can be resolved.

b) If the parties cannot agree on a resolution, the matter shall be put to mediation.

(Note: The following is for information purposes only and does not form part of the condition:

i. Refer to Condition 3.4 d), Note iv)

ii. Unless the parties agree, the outcome of the mediation shall not be binding.)

3.10 BLASTING AND VIBRATION

(a) All blasting procedures shall be carried out so as to ensure the safety of persons in the mine and/or in the immediate vicinity of the mine site. The consent holder shall notify the Health and Safety Inspector (Mining Act) of the blasting procedures to be employed and of any changes thereto and the blasting procedures shall be approved by the Health and Safety Inspector (Mining Act). The blasting procedures shall address the following specific items: regular blasting times, warning and all clear signals, control of fly rock, vibration and air blast monitoring and such other matters as the Inspector may direct.

(b) No blasting operations shall be carried out without the written approval of the Mine Manager, who shall first satisfy himself that the blasting operations will not cause either danger, damage or undue discomfort to any person or danger to property.

(c) A blasting programme shall be publicly notified in newspapers circulating in the area prior to any blasting taking place and at regular intervals not exceeding six (6) months thereafter.

Changes to the blasting programme shall be notified in newspapers circulating in the area at least three (3) days prior to implementation.

The Company Liaison Officer shall also ensure that the blasting programme and changes to the blasting programme are provided to all residents in the immediate area surrounding the mine who in the opinion of the Company Liaison Officer (after consultation with the Council Liaison Officer) are likely to experience the effects of blasting and vibration. The same respective notification time periods shall apply.

(d) Blasting shall be restricted to within the following hours:

Monday - Friday	1000-1500
Saturday	1000-1200

(e) Details of all blasts shall be recorded.

(f) The peak overall sound pressure level due to the air blasts:

i) at any residence within the boundary of the Extended Martha Mine Area as shown on Planning Maps K1 - K5 of the Operative Hauraki District Plan not owned by the Waihi Gold Company; or

ii) at any residence outside the boundary of the Extended Martha Mine Area as shown on Planning Maps K1 - K5 of the Operative Hauraki District Plan except for those residences owned by the Waihi Gold Company in the area shown on the map attached in Appendix F;

shall not exceed 128 dB linear (unweighted).

(g) During initial construction (as defined in Condition 3.3), but excluding:

- upgrade of conveyor system (not including the creation of the conveyor slot), but including use of laydown areas
- construction of pipeline from the Water Treatment Plant to the Ohinemuri River;
- road construction and upgrading associated with the Extended Project;
- construction of a new Scout Hall and a new Radio Club facility,

and for a period of 12 months after initial construction activities cease, vibration levels measured in the ground closest to:

i) any residence within the boundary of the Extended Martha Mine Area as shown on Planning Maps K1 - K5 of the Operative Hauraki District Plan not owned by the Waihi Gold Company; or

ii) any residence outside the boundary of the Extended Martha Mine Area as shown on Planning Maps K1 - K5 of the Operative Hauraki District Plan, except for those residences owned by the Waihi Gold Company in the area shown on the map attached in Appendix F:

shall not exceed 10 mm/s peak particle velocity measured in the frequency range between 3 Hz and 12 Hz, thereafter NZS 4403:1976 Codes of Practice for the Storage, Handling and Use of Explosives shall apply.

(h) After the 12 month period specified in Condition 3.10 (g) has expired, and at all times for those initial construction activities excluded under Condition 3.10 (g) above, vibration levels measured in the ground closest to:

i) any residence within the boundary of the Extended Martha Mine Area as shown on Planning Maps K1 - K5 of the Operative Hauraki District Plan not owned by the Waihi Gold Company; or

ii) any residence outside the boundary of the Extended Martha Mine Area as shown on Planning Maps K1 - K5 of the Operative Hauraki District Plan except for those residences owned by the Waihi Gold Company in the area shown on the map attached in Appendix F:

shall comply with the provisions of Rule 9.4.3 of the Operative Hauraki District Plan.

(i) Except where specifically provided in Condition 3.8(g) all blasting operations and measurements in relation to such operations shall be carried out in accordance with NZS 4403:1976 Code of Practice for the Storage, Handling and Use of Explosives .

3.11 MONITORING AND REPORTING ON BLASTING AND VIBRATION

(a) The consent holder shall monitor every blast event over 1 mm/sec in terms of blast location, charge weight per delay, number of holes, initiation timing and measured vibration. Where equipment malfunctions or is not available for recording (eg during maintenance), this shall be noted and included in the monitoring report presented to Council. Where blasting is to be undertaken in the vicinity of the overpressure sensor, the consent holder shall also monitor the overpressure level. The location of the fixed vibration and overpressure sensors shall be undertaken in consultation with Council, and changes to the location of these sensors and monitor shall be agreed with Council prior to their relocation. The consent holder shall deploy a roving monitor to record blast vibrations in the location where complaints regarding vibration have been made. The results of the monitoring shall be provided to Council.

(b) The consent holder shall, unless otherwise directed to do so by the Council following consultation with the consent holder, provide a summary report to the Council at the end of each February, May, August and November on the blasting undertaken, and the vibration and overpressure levels recorded, as well as any complaints received.

(c) Monitoring in the ground at the base of the Cornish Pumphouse shall be undertaken when blasting is carried out within a 250 metre radius of the structure. The peak component vibration levels shall not exceed 25 mm/s at frequencies in the range 20 to 30 Hz within the 250 metre radius. A report addressing changes to the building's structural integrity (with particular emphasis on changes that are likely to be caused by blast-induced vibrations within 250 metres) shall be supplied to Council on the anniversary of the date of commencement of this consent. The report shall be prepared by a registered engineer experienced in such work.

APPENDIX F – VIBRATION CONDITIONS HDC LAND USE CONSENT LUC 202.2018.857.001 (Project Martha)

BLASTING AND VIBRATION

Impulsive Vibration from Blasting

28 Ground Vibration

All blast events shall comply with the vibration levels, number of events and durations specified in Conditions 29 to 33.

29 Impulsive Vibration from Blasting

All blast events shall comply with the limits and standards set out below as measured at the boundary of any residential, low density residential or town centre zoned site that is lawfully used for residential purposes, or the notional boundary of any occupied rural dwelling.

30 The standards in Condition 33 shall not apply to any property or site that is:

a. Owned by the consent holder or a related company; or

b. Owned by a third party which is subject to either a registered covenant or a written agreement (a copy of which is provided to the Council) whereby vibration effects on the property caused by activities authorised under this consent are not to be taken into account for monitoring and compliance purposes.

31 Underground Blasting

There shall be no more than three blast events per day, from Monday to Saturday and between 0700 and 2000 (excluding any blasts for maintenance / safety purposes).

No blasting shall be undertaken between 2000 and 0700 the following day (excluding any blasts for maintenance / safety purposes).

Blasts for maintenance / safety purposes can occur at any time and shall not exceed a maximum peak particle velocity of 1.00mm/s.

32 Pit Blasting

Blasting is permitted between the hours of 1000 – 1500 Monday to Friday and 1000 – 1200 Saturday.

No blasting in the Pit shall occur concurrently with underground blasts other than for safety reasons.

The maximum overpressure is 128 dBL for any blast.

33 All Blasting

a. No blasting shall be undertaken on Sundays or on public holidays (excluding any underground blasts for maintenance / safety purposes).

b. The peak particle velocity (vector sum) shall be no more than:

(i) For development blasts;

- 5mm/s for 95% of the monitored events
- 2mm/s on average.

(ii) For production blasts;

- 5mm/s for 95% of the monitored events
- 3mm/s on average.

(iii) For Martha Pit blasts;

- 5mm/s for 95% of the monitored events

(iv) For maintenance/safety blasts;

- 1.0mm/s for all blast events

c. Compliance with the 95% and average limits shall be measured over a six-month rolling period.

d. Compliance with the 95% limit shall be determined separately for development blast events and for production blast events, and based on the highest recorded vibration for each blast event measured at any monitor, where the blast type is assigned on a monitor-by-monitor basis according to the blast with the minimum scaled distance from each monitor.

e. Compliance with the average limit shall be determined separately for each blast monitor based on the total number of blast events in the six-month rolling period.

f. For all underground blast events, including those involving a combination of production and development blasts (95% compliance);

(i) Production blasts shall have a total duration of not more than 9 seconds;

(ii) Development blasts shall have a total duration of not more than 12 seconds;

(iii) A combination of production and development blasts shall have a duration of not more than 12 seconds;

(iv) Maintenance/safety blasts shall have a total duration of not more than 2 seconds, other than for maintenance to retain tunnels, shafts and accessways in Correnso and SUPA.

g. No underground blast event shall have a duration of more than 18 seconds.

h. Duration is to be calculated as the time from the nominal firing time of the first charge to the nominal firing time of the last charge.

i. A 'Blast Event' is defined as:

'An individual or number of linked individual blasts of not more than the total duration periods specified above.'

j. A 'Development Blast' is defined as:

'Any blast that is used in the creation or enlargement of a tunnel for the purposes of mine construction or access.'

k. A 'Production Blast' is defined as:

'Any blast that is not a development blast (excluding any blast for maintenance / safety purposes)'.

k_1. A 'Maintenance / Safety Blast' is defined as:

'Blasts for maintenance / safety purposes includes breaking over-sized rocks, trimming / slashing of backs, walls and floors, firing of mis-fired explosives and removal of bridged stopes.'

l. Prior to the first blast within a radius of 250 m (horizontal or vertical) of the Pumphouse, and every 5 years thereafter unless otherwise agreed by Council, the consent holder shall engage a structural engineer to undertake a survey of and produce a report on the structural integrity of the Cornish Pumphouse with particular emphasis upon changes that are likely to have been caused by blast induced vibrations. Each such report shall be supplied to the Council within 30 working days of its completion. The consent holder shall make good any damage identified in the structural engineer's report referred to above.

Advice Note:

There should be no more than three development / production blast events per day from within all of the underground mines operated by the consent holder combined in the area covered by Mining Permit 41808.

Minimisation and Mitigation of Blasting Impacts

34 In addition to complying with the requirements of Condition 28, the consent holder shall minimise, to the extent practicable, the impacts of blasting vibrations on the community. The measures to be applied in this regard shall be set out in the Vibration Management Plan (Condition 46) and will include details of how the following requirements will be achieved where practicable:

a. Restrict the duration of blast events to the minimum consistent with safe and efficient mining operations;

b. Fire the underground production blasts within the 1330 meal break;

c. Fire the three defined daily underground blast windows at shift changes and meal breaks;

d. Implement timely blast notification procedures; and

e. Report blast event vibration results in a timely manner.

34A Prior to the commencement of blasting within the Martha Pit, the consent holder shall conduct a risk assessment, the objective of which is to minimise the risks associated with flyrock having considered all relevant and material factors including but not limited to:

a. Proximity of blasting to the pit crest, property and areas with public access;

b. Blast design parameters such as stemming length, loading horizon, explosive quantity, explosive density, blast hole inclination, blast orientation and degree of ground fracturing;

c. Identification and treatment of any uncharged holes or voids;

d. Degree of ground saturation; and

e. Potential risk control measures.

The assessment shall be facilitated by a person suitably qualified or experienced in risk assessment. The risk control measures, and the methods and procedures for implementing them, shall be set out in the Vibration Management Plan required under Conditions 46 and 47.

35 While blasting is occurring as provided for by this consent, the consent holder shall also continue to implement the Amenity Effects Programme ("AEP") in respect of vibration as set out below, provided that owners and / or tenants who have entered into a separate arrangement with the consent holder and / or have otherwise agreed not to receive the AEP will not be eligible to receive AEP payments under this condition.

36 The consent holder shall use the recorded data from the vibration compliance monitoring network to estimate the vibration received at occupied residences from blasting associated with the Martha Pit and the Martha Underground Mine, and shall make payments to the occupiers of those residences in accordance with the table and criteria below:

Vibration Magnitude (mm/s)	Payment Per Blast Event ($)
≥ 1.5	18.68
≥ 3.5	55.92
≥ 5	186.75
≥ 6	371.69

37 The stated payment rates are those existing at 1 January 2018. The rates will be adjusted for the start of each calendar year by the Consumer Price Index (CPI) published by Statistics New Zealand and made publicly available on the consent holder's website.

38 An occupied residence (including properties lawfully used for residential purposes in the Town Centre Zone) shall be eligible to receive AEP payments if it receives two or more blast events generating vibration of 1.5 mm/s or greater in any month.

39 The AEP does not apply to any unoccupied houses or undeveloped residential property.

40 Occupiers of eligible residences shall receive a minimum payment of $250 per six-monthly period.

41 Payments to occupiers of eligible residences shall be calculated six-monthly, and payment made within two months or as soon as practicable thereafter.

42 Should AEP payments become taxable, the consent holder shall not be liable for any taxes associated with the payments. Nor shall the consent holder be liable for any future changes to national superannuation or other benefits as a result of an eligible occupier receiving the AEP payments in accordance with this consent.

43 Where blast events provided for under this consent occur simultaneously with blast events at other underground mines operated by the consent holder and set out in Condition 1A above, the consent holder shall ensure that such blast events comply with the maximum ground vibration level limits specified in Condition 33 of this consent.

44 For the initial 100 underground blast events of each type, no more than one exceedance of 5mm/s in every 20 consecutive blast events shall be deemed to be compliant with the 95 percent limit stated in Condition 33.

The assessment of compliance with the average limits stated in Condition 33 shall not apply until 100 underground blast events of each type have been fired.

Once 100 underground blast events of each type have been fired, compliance with both the 95 percent and average limits shall be separately assessed for each blast type as per Conditions 33(d) and (e) respectively.

Blasting and Vibration Monitoring

45 Blasting and vibration monitoring shall be managed as follows:

a. The consent holder shall monitor impulsive vibration from all blast events associated with the mining activities provided for under this consent;

b. The monitoring system shall be automated to allow for the prompt analysis of each blast event;

c. Suitably trained personnel shall conduct any monitoring required under this consent, including the installation of roving monitors. Equipment used for monitoring, equipment calibration and vibration measurement procedures shall comply with the current Australian Standard *AS2187.2* (or equivalent international standards) and equipment manufacturers' recommendations;

d. Unless otherwise required or confirmed in writing by the Council, the fixed monitoring locations for the Martha Pit, Martha Underground Mine and Rex Orebody shall be those shown in Appendix 3;

e. The fixed monitoring locations shall not be on, or inside, a building or structure;

f. Pursuant to Condition 45(d), data received from a roving monitor may identify a new or additional permanent monitoring location;

g. A roving monitor shall be deployed to record vibrations in locations where complaints regarding vibration have been made in accordance with a procedure specified in the Vibration Management Plan required under Conditions 46 and 47; and

h. A complete record of each blast event shall be maintained. The record shall include:

(i) Types of measurement instrument used;

(ii) Time and duration of blast event;

(iii) Locations of blasts;

(iv) Locations of monitoring positions;

(v) Distances from the blasts to the monitoring position and nearest residence;

(vi) Measured vibration levels;

(vii) Total amount of explosive used;

(viii) Delay sequence of the blast event;

(ix) Maximum instantaneous charge;

(x) Volume of rock blasted;

(xi) Complaints (including the nature of effects, for example rattling window, was the complainant awoken) and whether the vibration mitigation action process has been undertaken (Condition 50); and

(xii) Design criteria not covered in items (i) to (xi) above.

Advice Note:

While this condition relates only to the monitoring of blast vibration associated with the mining activities provided for under this consent, similar conditions apply to all of the consent holder's other mining operations and require the consent holder to monitor blast vibrations from all of its mining activities.

Vibration Management Plan

46 The consent holder shall prepare a Vibration Management Plan for certification by the Council. The objective of the Vibration Management Plan is to provide detail on how compliance with Conditions 28 to 54 will be achieved for the duration of this consent. The Vibration Management Plan shall be

submitted to the Council at least 30 working days prior to the first blast event authorised by this consent. If certification is not provided within 30 working days of Council's receipt of the Vibration Management Plan blasting authorised by this consent may commence.

The Vibration Management Plan may be reviewed and amended from time to time, subject to the certification of the Council but not in a manner inconsistent with these conditions.

47 The Vibration Management Plan shall specifically include the following:

a. Measures to be adopted to meet the conditions of this consent to ensure that blast vibrations are minimised to the greatest extent practicable, including:
   (i) Description of the blast design criteria and blast design review procedures. All blasts shall be designed to a 95-percentile level of confidence to achieve the ground vibration level limits specified in Condition 33;
   (ii) The numbers, times (generally around shift changeovers), duration of blast events, and in general terms the coordination of blasts into one blast event and steps to minimise the duration of blast events;
   (iii) Procedures to be adopted where vibration levels approach the maximum limits and mitigation actions to be implemented in the event of an exceedance of the ground vibration level limits stated in Condition 33;
   (iv) The methods and procedures to be adopted to enable the separate recording and reporting of development and slot / production blasting;
   (v) The methods and procedures to be adopted for managing and monitoring of overpressure;
   (vi) The methods and procedures identified by the risk assessment required by Condition 34A to be adopted for managing flyrock;
   (vii) The methods and procedures to be adopted in deploying the roving monitor(s), data usage from the roving monitors, procedures for converting a roving monitor location to a fixed monitoring location, and identifying circumstances where vibration monitoring within structures shall be considered. Any monitoring undertaken by roving monitors or within structures is deemed not to be compliance monitoring; and
   (viii) The methods and procedures for identifying and addressing anomalous vibration results recorded at any monitored site, including sites monitored with roving monitors.
b. The location of fixed monitoring locations to be established in accordance with Condition 45(d); and
c. Further detail on the Amenity Effects Programme as required under Condition 35;
d. The properties to be surveyed in accordance with Condition 55; and
e. Records to be kept, including blast design data.

Advice Note:

The Vibration Management Plan may be prepared in conjunction with the Vibration Management Plans prepared in accordance with the consent requirements applying to the consent holder's other mines in the Waihi area.

Management and Reporting

48 Throughout the period of mining the Rex Orebody as authorised under this consent, the consent holder shall prepare a two-dimensional plan at the start of each calendar month showing the existing mining and the proposed areas of mining activities during that month. The plan shall be loaded onto a page of the consent holder's website. A downloadable pdf version of the plan shall be available from the website and hard copies shall also be available for collection from the Waihi Information Centre and the Council's Waihi Service Centre, and on request.

The consent holder shall use its best endeavours to restrict its blasting to the work areas defined on the plan recognising that operational constraints prevail and may lead to deviations from the plan during the course of the month.

49 No blasting operations shall be carried out without the written approval of the Mine Manager. Before blasting commences, the Mine Manager shall ensure that the operations will not cause danger, damage or undue discomfort to any person nor danger and damage to property.

50 In the event that blast monitoring shows that the vibration standards have been exceeded, the consent holder shall implement mitigation actions to ensure compliance. Possible mitigation actions include, but are not limited to:

a. Limiting the rate of excavation advance;

b. Reducing the blast hole diameter;

c. Reducing the weight of explosive in the blast hole;

d. Using alternative explosive types;

e. Using electronic delays to adjust sequencing;

f. Decking;

g. Changing the blast pattern;

h. Drilling and blasting in two passes; and

i. Changing the method of mining.

51 The consent holder shall provide a report to Council for each blast event where the measured vibration exceeds the applicable peak particle velocity specified in Condition 33. The report shall be submitted within five working days after the blast event and include the records listed in Condition 45(h) above and mitigation actions taken to limit subsequent blast vibrations to the maximum limits or less as generally outlined in Condition 50.

52 The consent holder shall, prior to the first development blast event pursuant to this consent, establish a page on its website that will show the recorded vibration magnitude for the last ten blast events for each of the compliance monitors required under Condition 45(d). The results of the most recent blast event will:

a. Be posted on the consent holder's webpage as soon as practicable after the occurrence of that blast event; and

b. Remain provisional until they are verified.

53 The consent holder shall provide a summary report to Council at three-monthly intervals after the first exercise of this consent. The report shall include the following:

a. Confirmation of actions (including all blasts for maintenance / safety purposes) taken during the previous reporting period;

b. All vibration related complaints received during the current reporting period and mitigation actions taken by the consent holder;

c. Results of vibration monitoring separately for underground maintenance/safety, development and production blasts, and for Martha Pit blasts; and

d. All roving monitor data results recorded during the quarter.

54 Monitoring records, reports and complaint schedules shall be stored securely and maintained in a systematic manner for 12 months after completion of all blasting at the underground mine. Records shall be available for perusal by Council and its representatives on request.

Property Damage

55. Before blasting associated with the Rex Orebody of the Martha Underground Mine commences, and provided the property owner consents, the consent holder shall:

a. Undertake a BRANZ survey for each building (excluding out buildings and garages) in accordance with the Project Martha Property Policy as on the consent holder's website as at 19 October 2018;

b. Complete a structural condition survey for at least five representative properties (excluding properties owned by the consent holder at that time). The representative properties are to be located in the vicinity of the vibration monitors required under Condition 45(d); and

c. In addition to these properties, structural condition surveys shall be carried out at 'control' properties removed from the influence of any potential vibration effects from mining.

The survey properties shall be identified in the Vibration Management Plan (Conditions 46 and 47).

The surveys shall be carried out by an independent structural engineer suitably qualified and experienced in domestic building design and construction. The survey reports shall include a visual inspection and video of all existing built surfaces and defects including concrete accessways.

APPENDIX G – OCEANAGOLD ENVIRONMENTAL MATERIAL RRISK REQUIREMENTS AND CORPORATE STANDARDS

Vibration has been assessed as an Environmental Material Risk for OceanaGold Waihi as it could create a level 3 or greater consequent event(s) either as a one-off or because of cumulative impacts.

Table 1 sets out the minimum requirements for OGNZL's Environmental Material Risk Management Plans and where in this document the requirements are met. Table 2 includes OceanaGold's Corporate standards related to vibration and how they are complied with.

Table 1 - Environmental Material Risk Management Plan minimum requirements

Environmental Material Risk Management Plan minimum requirements	**Location in document**
Use of the Corporate document control system and templates	Throughout. Document controlled as per OGC-450-PRO-004
Statement as to the nature of the Material Risk Area, as addressed by the EMRMP	Section 2
The results of any risk assessment completed in respect to the Material Risk Area	Appendix H
A description of the control measures using the hierarchy of controls required to be implemented to manage the Material Risk Area;	Appendix H, Section 8
A description of how permit conditions and OGC standards and framework requirements apply to the Material Risk Area, and how they shall be complied with;	Section 3, Table 4 and throughout
Identification of where emergency preparedness for the Environmental Risk Area is documented	Not applicable
A description of the roles and their corresponding responsibilities under the EMRMP, including the competencies required to carry out such roles and responsibilities	Section 4
Any other matter required by host country legislation or OGC standards particularly relating to a Material Risk Area.	Section 3

Table 2 - OGC Environmental Standards Requirements

	Requirements	Compliance
OGC Standards	Where noise, vibration and visual impacts are not assessed as Material Risks, the Business Unit shall document systems and processes that demonstrate how impacts from these aspects are managed at the Business Unit. (Site)	Vibration assessed as Material Risk Compliance to EMR requirements set out in Table 3
	Baseline noise and visual impact conditions shall be characterised prior to the construction of new facilities and extensions to existing facilities. (Site)	Completed at the outset of new projects through the AEE process
	Business units shall identify all affected external receivers that will be impacted by noise, vibration and intrusive visual impacts. Where applicable, noise, vibration and visual impact monitoring shall be undertaken to identify any adverse effects from the Business Unit. (Site)	Completed at the outset of new projects through the AEE process Monitoring processes outlined in section 9 of this document
	Equipment design and purchasing requirements shall consider the minimisation of noise and vibration levels. (Site)	Blast design considers minimisation of vibration level.
	Blasting activities shall comply with regulatory requirements and consider the potential impacts to the community. (Site)	Section 3 sets out host country requirements
	In the absence of host country requirements and guidelines, peak overall sound pressure level due to air blasts shall not exceed 128 dB (unweighted) at any residential property not owned by Business Units. (Site)	Section 3 sets out host country requirements
	Blasting shall be designed to prevent damage to structures unless they are owned by Business Units. (Site)	Vibration consent compliance limits designed to prevent damage to structures
	Monitoring systems and programs shall be established to ensure Business Units activities operate in compliance, including a mechanism for assessing noise and vibration monitoring results against the relevant criteria. (Site)	Section 9
	In the absence of host country requirements or guidelines Australian Standard AS 2187.2-2006, Explosives – Storage and Use of Explosives (or equivalent) shall be applied. (Site)	Addressed within Hazardous Substances Use and Management Plan

APPENDIX H – VIBRATION RISK ASSESSMENT

Risk Description (What can happen)	Potential Cause(s) (How / why might it happen?)	Principal Hazard Impacts	Inherent Risk (Absent or failed controls/defences)				Critical Controls	Current Controls	Impacted Areas (Maximum reasonable consequence)							Residual/Current Risk (controls present and applied)			
			Consequence (Credible worst case)	Likelihood	Risk Level				Health and Safety	Environmental	Social	Financial	Reputation	Compliance	OceanaGold Standard	Consequence (Maximum reasonable case)	Likelihood	Risk Level	
Blast vibration non-compliance	Repeated high level blasts Poorly designed blasts Poor ground conditions Lack of mitigation following high level blasts	Delays to operation Prosecution Difficulties for future consenting	4	D	14	**High**	Blasts designed to predicted PPV <5 mm/s Investigations into vibration results >5mm/s	Blasts designed to predicted PPV <5 mm/s Investigations into vibration results >5mm/s			4	4	4	4	9.Environmental Noise and Vibration	2	D	**5**	**Low**
Blast vibration causes damage to structures or heritage items	Poorly designed blast Anomalous geology	Cost to repair/replace Damage to reputation Prosecution	3	D	**9**	**Medium**	Compliance limits designed by vibration technical specialist to prevent damage to structures Blast design to predicted PPV <5mm/s	Compliance limits designed by vibration technical specialist to prevent damage to structures Blast design to predicted PPV <5mm/s			4	4	4	4	9.Environmental Noise and Vibration	2	E	**3**	**Low**
High level blasts cause very high Amenity Effect Payment	Repeated high level blasts Poor ground conditions Lack of mitigation following high level blasts	Increased costs Damage to reputation	3	D	**9**	**Medium**	Compliance limits designed by vibration technical specialist to prevent damage to structures Blast design to predicted PPV <5mm/s	Compliance limits designed by vibration technical specialist to prevent damage to structures Blast design to predicted PPV <5mm/s Roving monitoring to investigate anomalous geology			3	3	3	3	9.Environmental Noise and Vibration	1	C	**4**	**Low**

APPENDIX I – VIBRATION MONITOR INSTALLATION

To programme a new monitor:

1. Open Blastware and plug device into computer.
2. Ensure Series III tick-box is ticked; Click Series III Unit.
3. Select ‘Remote Access’, ‘Auto Call Home’, ‘Setup Unit’
   3.1. Activate ‘Enable Auto Call Home’
   3.2. Check ‘RADIO RING’ chosen
   3.3. Verify ‘When to Call Home’ select ‘After Event Recorded’, and ‘At Specified Times’ (chose times).
4. Unit’, ‘Setup’, ‘Compliance Setup’
   4.1. Ensure ‘Recording setup’ is correct. Load setup from G:drive if necessary (using ‘Setup files’).
   4.2. ‘Notes’ Edit ‘Location’ with destination & edit geophone serial# to be used.
   4.3. ‘Send to Unit
5. Put unit into field
6. Assign monitor to correct location on Envirohub using the monitor serial number
7. Correct the file names in WAI-BMX-02 with the appropriate serial name of the monitor.