



OceanaGold New Zealand Ltd  
Third Quarter Summary Report 2019  
Vibration Levels in Waihi



## Contents

Summary .....	1
1. Introduction.....	1
2. Equipment Performance .....	1
3. Calibration .....	3
4. Compliance Assessment .....	4
4.1 Underground (Favona & Trio) Operations.....	4
4.2 Correnso, SUPA and MDDP .....	4
4.3 Project Martha .....	4
5. Blasting.....	5
6. Complaints.....	6
7. Vibration and Complaint Management.....	8

## Summary

- Results from the Blasthub vibration monitoring system for the third quarter 2019 are reported for Favona, Trio, Correnso and SUPA Underground Mines, the Martha Drill Drives Project (MDDP) and newly commenced Project Martha. Stope blasting was only carried out in relation to Correnso/SUPA/MDDP, with significant development blasting undertaken deep in the Trio mine and in the Martha Underground component of Project Martha.
- Compliance for Correnso/SUPA/MDDP development and production blasting was achieved for both the 95-percentile and average limits defined by the consents. Two blast results were above the 95-percentile standard of 5mm/s; these were reported, investigated and applicable mitigation actions implemented.
- Compliance for Trio blasting was achieved during the quarter; none of the 92 blast events during the period triggered the compliance monitors.
- Compliance for Project Martha blasting was achieved during the quarter; none of the 103 blast events during the period triggered the compliance monitors.
- 73 vibration-related complaints were received during the reporting period, up from the 46 received in the previous quarter. The number of complainants also increased; 18 during the quarter cf. 14 in the previous period. These increases are considered due to several large deep Correnso blasts that generated multiple complaints per blast.
- The total number of blasts (521) was down on the previous quarter (657) while the number of blast events (209) was comparable (202). The reduced number of blasts was due to reduced equipment availability for significant periods, while the blast events were still kept up due to the availability of multiple headings in Trio and the Martha Underground.

## 1. Introduction

This report documents vibration measurements and assessments to meet the requirements of:

- a) Hauraki District Council (HDC) LUC No. 97/98-105 (Condition 3.11) for the extended Martha Mine Project.
- b) HDC Land Use Consent 85.050.326E (Condition 24) for the Favona Underground Mine.
- c) HDC Land Use Consent RC-15774 (Condition 9) for the Trio Underground Mine Project.
- d) HDC Land Use Consent RC – 202.2012 (Condition 22 (f)) for the Correnso Underground Mine.
- e) HDC Land Use Consent RC – 202.2016 (Condition 14 (f)) for the Slevin Underground Mine (SUPA).
- f) HDC Land Use Consent RC – 202.2017 (Condition 18 (f)) for the Martha Drill Drive Project (MDDP).
- g) HDC Land Use Consent LUC 202.2018.857.1 (Condition 53) for Project Martha.

As agreed between OceanaGold and HDC these reports summarise vibration results and general performance of the monitoring system over calendar quarters rather than the dates set out in the consents.

## 2. Equipment Performance

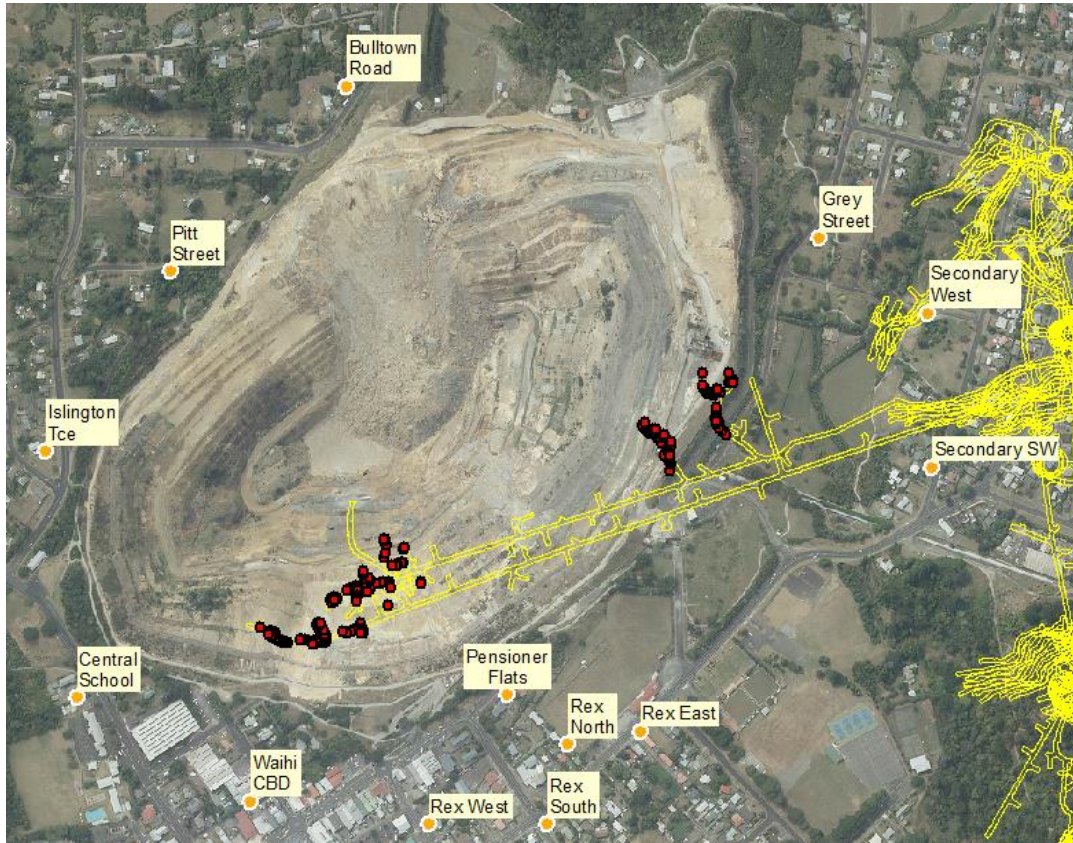
“Blasthub”, the vibration monitoring system, has been used for reporting purposes, providing real-time monitoring, recording and review of results on a web-site. Access to the web-site is controlled, with permissions for review provided to HDC staff and OceanaGold users. The system is set with trigger levels between 0.40 and 0.75 mm/s for Martha and Underground operations.

In terms of vibration monitoring, the Project Martha network comprises 13 monitors (some shared with the Correnso network). These all have a trigger limit currently set at 0.75 mm/s. Any blasts fired during the period (highlighted in red) and the monitor locations are shown in Figure 1. (*nb: the ‘Rex’ monitors have not yet been installed, but will be prior to mining in that vicinity*)

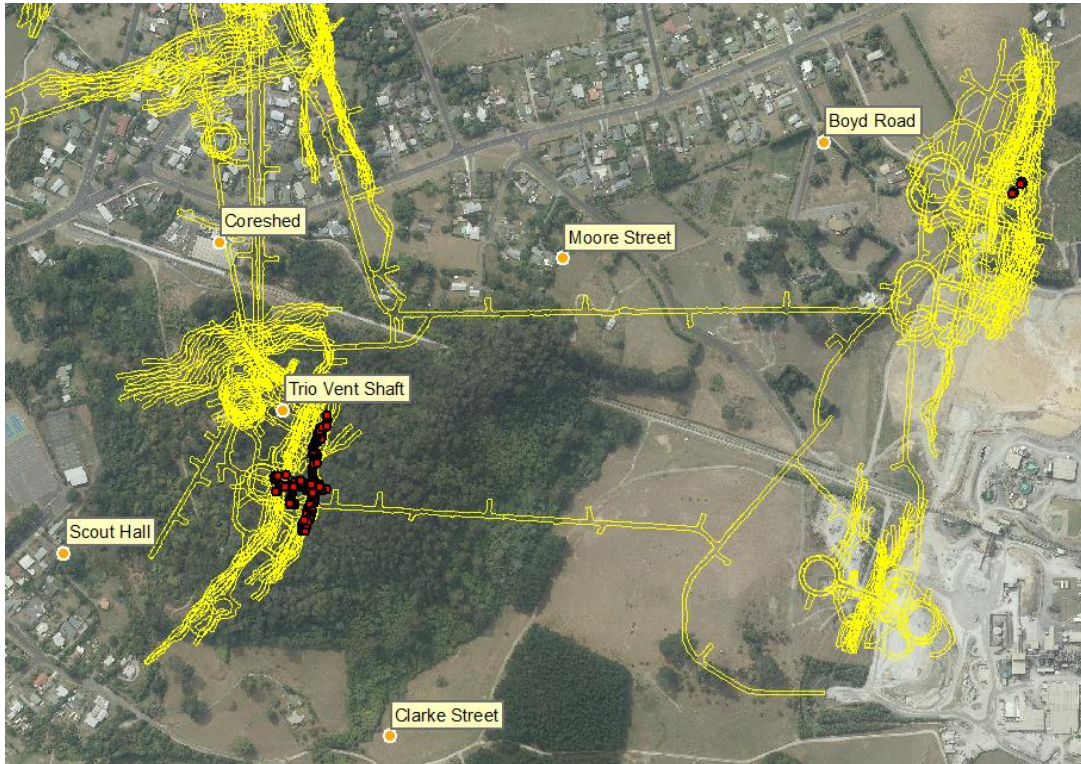
The Trio Underground Operations have five compliance monitors situated at Boyd Rd, Moore St, Clarke St, the Coreshed (Barry Rd) and the Scout Hall (Baker St). In addition to these, one other monitor is located near the Trio vent shaft (Trio VS). This monitor acts as an ‘indicator’ for Blasthub, which allows correlation with the other monitors to report the compliance monitoring results directly onto Blasthub. The blasts fired during the period (highlighted in red) and monitor locations are shown in Figure 2.

The Correnso Underground monitoring network comprises 10 permanent vibration monitors. These all have a trigger limit currently set at 0.75 mm/s. The blasts fired during the period (highlighted in red) and monitor locations are shown in Figure 3. SUPA utilises the same compliance monitors as Correnso, with the data incorporated into a shared database.

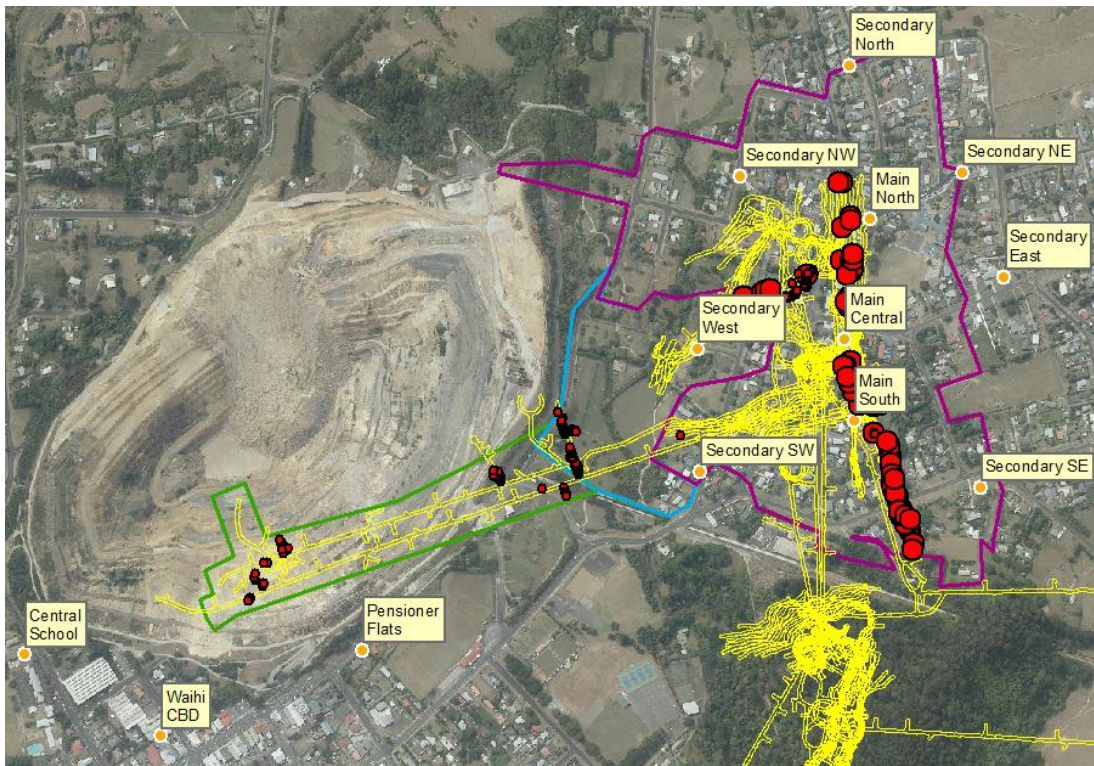
MDDP officially commenced on 17 August 2017 and shares two monitors from the Correnso network (Secondary W and Secondary SW) along with three monitors (Pensioner Flats, Waihi CBD, Central School) along the drives' paths. MDDP data has initially been incorporated into the shared Correnso database, but with the Project Martha consent boundary overlaying the MDDP consent area, the MDDP data subsequent to commencing Project Martha has now been allocated to the Project Martha database for reporting purposes.



**Figure 1 VMS Monitor & Blast Locations – Project Martha**



**Figure 2 VMS Monitor & Blast Locations – Underground Operations (Favona & Trio)**



**Figure 3: VMS Monitor & Blast Locations – Correnso, SUPA & MDDP Operations**

*Note: Larger icons indicate Production Blasts (>7kg MIC)*

### 3. Calibration

Calibration of monitoring equipment, including the roving monitors, was completed in November 2018 and June 2019. Calibration certificates can be viewed on Blasthub; refer to the monitoring results during those periods. The calibrations were undertaken by the Saros Group Pty Ltd in Queensland and conducted in accordance with AS/NZS ISO9000-2000 and AS ISO/IEC17025-2005 quality standards.

## 4. Compliance Assessment

### 4.1 Project Martha

Blasting commenced under the Project Martha resource consent in late July, when blasting commenced outside the MDDP consent boundary. The blasts relating to this work are usually fired simultaneously with the Correnso/SUPA blast events during the routine blast windows. Three small maintenance blasts outside routine blast times were recorded during the period.

231 blasts were fired in Project Martha during the reporting period; all were either Development or Safety/Maintenance blasts. Compliance was achieved during the quarter; no compliance monitors were triggered by Project Martha blasts.

Project Martha Development:

- The highest six-month average<sup>1</sup> for development blasting at a compliance monitor was assessed as 0.44mm/s at Main Central, below the consent limit average of 2mm/s.
- The development six month rolling 95 percentile<sup>1</sup> for all locations was assessed as 0.75mm/s, below the 5mm/s limit.

### 4.2 Underground (Favona & Trio) Operations

Ongoing development-scale blasting was undertaken in the Trio Operations area during this reporting period (131 Trio blasts, down from the 238 blasts total in the previous quarter). Trio development consisted of extending drives underneath the earlier Trio works to facilitate stoping in the final quarter of 2019. No blasting was undertaken within Favona.

Although no production mining or stoping occurred, 4 production-scale blasts (i.e. greater than 7kg MIC) occurred within Trio during the quarter. These were still small for production-scale blasts ( $\leq 20$ kg MIC) and were all in relation to escapeway construction, where a small number of extended holes were required to link one drive with the one above.

Compliance was achieved during the quarter; none of the blasts during the period triggered the compliance monitors. Any blasts that were undertaken when a compliance monitor was triggered were assessed as having been triggered by significantly larger, neighbouring, Correnso production blasts. This includes the production-scale blasts, which all coincided with Correnso production blasts in the southern end of the Gladstone ore-body.

### 4.3 Correnso, SUPA and MDDP

During the third quarter of 2019, 287 blast events (cf. 168 in the previous quarter) occurred in the Correnso, SUPA, and MDDP projects. The blast locations are presented in Figure 3 above, with the relative locations indicated for development and production blasting. The peak vibration levels for the period are shown in Figure 4 below.

The Martha Drill Drives have now been completed to their full extent into the MDDP consent area, with the 920 Drive breaking through into the pit on 29 January. Subsequent to Project Martha commencing, blasting data within MDDP is now allocated to the Martha Underground database for recording and compliance purposes (see 4.3 below).

Development:

- The highest six-month average<sup>1</sup> for development blasting at a compliance monitor was 0.62mm/s at Main Central, below the consent limit average of 2mm/s.
- The development six month rolling 95 percentile<sup>1</sup> for all locations was 0.75mm/s, below the 5mm/s limit.

Production:

- The highest six-month average<sup>1</sup> for production blasting at a compliance monitor was 1.63mm/s at Main North, below the consent limit average of 3mm/s.
- The production six month rolling 95 percentile<sup>1</sup> for all locations was 4.08mm/s, below the 5mm/s limit.

<sup>1</sup> Data is presented as at the end of the quarter

Two blasts exceeded the 5mm/s level at a compliance monitor during the quarter:

- On 08 July at 13:43hrs, while firing the 765-785 Dobson North stope, Main North monitor registered 5.8mm/s.  
An investigation indicated the second-to-last ring failed to fire effectively, leaving a bridge and no free face for the final ring to release into. There were numerous potential factors that may have contributed to the failure of penultimate ring, but there was nothing untoward with the design and charging and no casual factor could be isolated. The previous blast resulted in a PPV Of 2.9mm/s at Main North, so it was concluded that the bridge was an anomaly.
- On 21 September at 14:48, from firing the 765-785 Gladstone North stope, vibrations above 5mm/s were registered at Secondary East (7.9mm/s), Main Central (5.9mm/s), Secondary West (5.0mm/s) and Grey St (5.8mm/s). *Note: Grey St is not a compliance monitor for Correnso, but the result was acknowledged.*

Immediate mitigation for this result was to reduce charge weights in the next blast in the stope; this resulted in a maximum vibration of 2.0mm/s at Secondary West. Subsequent investigation discovered that the delay sequence of the blast holes was sub-optimal and resulted in some blast holes having an increased 'work burden' and increased resultant vibration. Extra training and peer review were instigated to ensure that future blasts had increased attention to design detail and scrutiny to ensure charge designs are optimised.

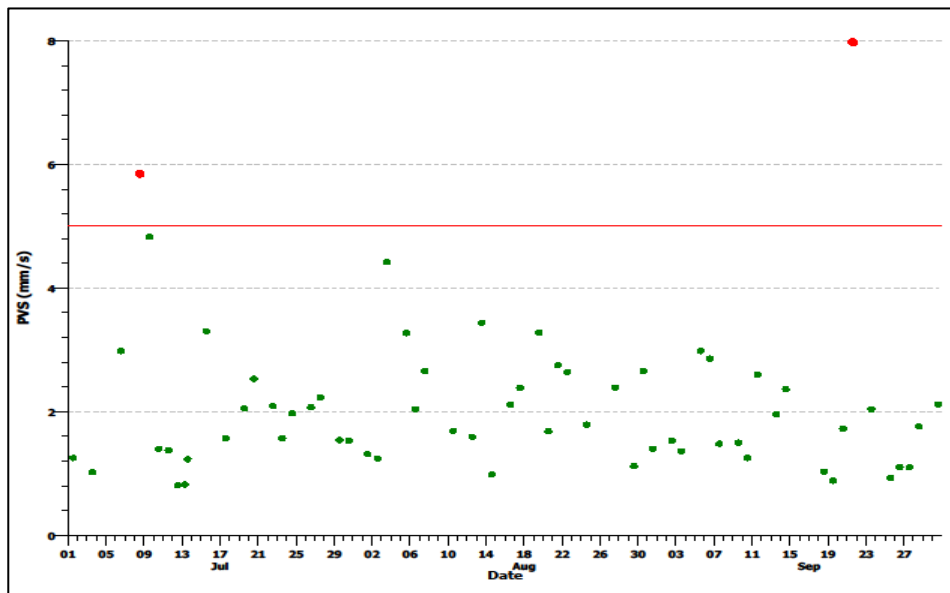


Figure 4: Peak Vibration Levels – Correnso/SUPA/MDDP Operations

## 5. Blasting

The 292 blast events during the period was significantly higher than the 209 events in the previous quarter (Table 1), with the increase due to the ability to independently fire in Trio and the availability of multiple headings in Martha Underground.

Table 1: Quarterly blast events

Operation	1 <sup>st</sup> Quarter 2019	2 <sup>nd</sup> Quarter 2019	3 <sup>rd</sup> Quarter 2019
Martha Underground	-	-	103 (81 independent)
Underground (Trio)	36*	149 (31 Independent)	92 (43 independent)
Correnso/SUPA/MDDP	202	178	168
<b>Total</b>	<b>202</b>	<b>209</b>	<b>292</b>

\* Early Trio blasts occurred simultaneously with blasting in Correnso/SUPA/MDDP and did not contribute to the total number of blast events. Later Trio blasts were regularly fired independently to Correnso and those count additionally.

Multiple blasts may be fired during the one blast event. There were 521 blasts in the third quarter of 2019, down significantly compared with 657 in the previous quarter (Figure 5). The fewer blasts were due primarily to a reduced equipment availability, with several machines out of action for significant periods. There is also an



increased focus on development of the Martha Underground, and the number of blasts in Correnso and Trio correspondingly dropped off during the quarter as development has been focused more on Project Martha.

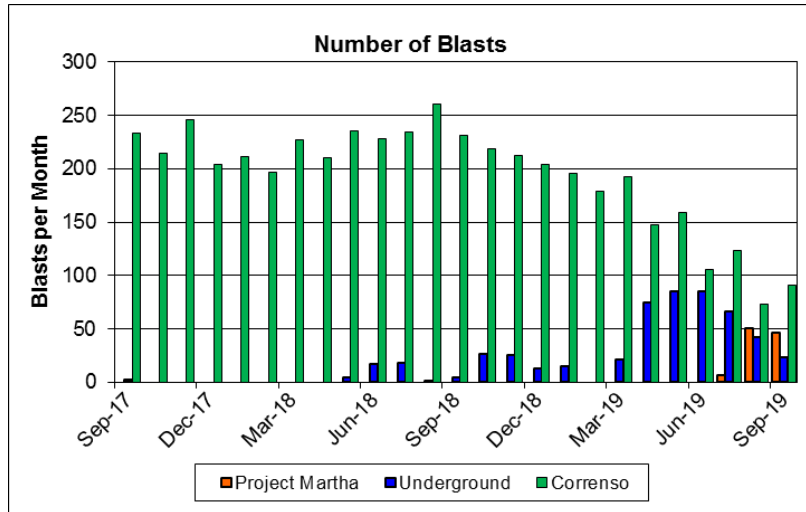


Figure 5: Number of Blasts (all operations)

## 6. Complaints

73 vibration-related complaints were received during the reporting period, up from the 46 received in the previous quarter (Figures 6 & 7). The number of complainants also increased; 18 during the quarter cf. 14 in the previous period. These increases are considered due to several large deep blasts that generated multiple complaints (and therefore, complainants) per blast. 34 (47%) of the complaints were received from 2 residents. Table 2 provides a summary of the complaints received during the quarter.

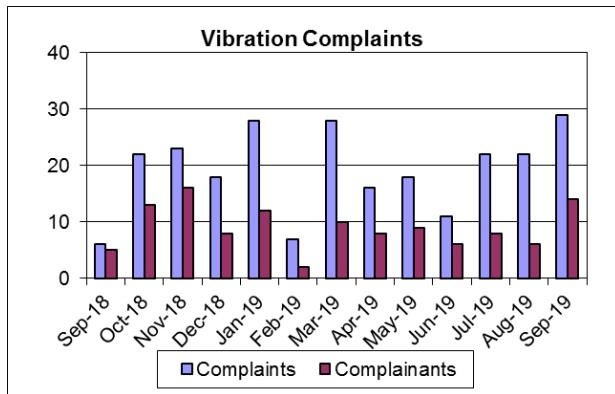


Figure 6: Number of Complaints & Complainants

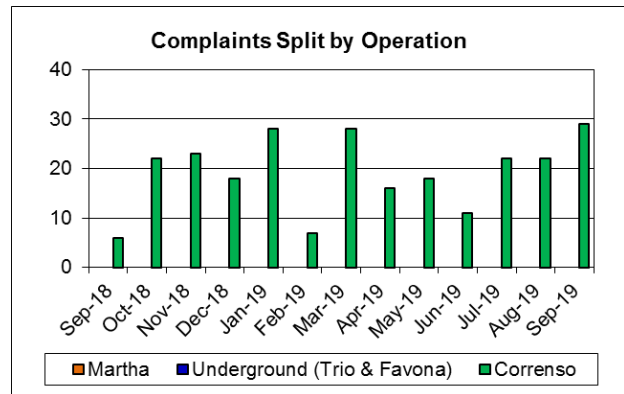


Figure 7: Complaints by Operation

**Table 2: Summary of vibration complaints registered by OceanaGold**

Date	Address	Nearest Monitor		Highest Blasthub Reading (mm/s)	Site
		Location	Reading (mm/s)		
1-Jul-19	Barry Rd		n/a	n/a	Correnso
3-Jul-19	Cuba St	Secondary East	1.0	1.0	Correnso
4-Jul-19	Gladstone Rd		n/a	n/a	Correnso
4-Jul-19	Gladstone Rd		n/a	n/a	Correnso
8-Jul-19	Gladstone Rd	Secondary North	2.2	5.8	Correnso
8-Jul-19	Smith St	Secondary NE	2.4	5.8	Correnso
8-Jul-19	Gladstone Rd	Main North	2.9	2.9	Correnso
8-Jul-19	Gladstone Rd	Main North	5.8	5.8	Correnso
8-Jul-19	Gladstone Rd	Main North	2.9	2.9	Correnso
8-Jul-19	Gladstone Rd	Main North	5.8	5.8	Correnso
9-Jul-19	Gladstone Rd	Main South	2.4	4.8	Correnso
9-Jul-19	Cuba St	Secondary East	2.0	4.8	Correnso
12-Jul-19	Barry Rd		n/a	n/a	Correnso
13-Jul-19	Cuba St	Secondary East	1.1	1.7	Correnso
15-Jul-19	Gladstone Rd	Main North	3.3	3.3	Correnso
22-Jul-19	Gladstone Rd	Main North	2.5	2.5	Correnso
23-Jul-19	Kenny St		n/a	n/a	Correnso
23-Jul-19	Gladstone Rd	Main North	1.4	1.5	Correnso
24-Jul-19	Gladstone Rd	Secondary North	1.5	1.9	Correnso
29-Jul-19	Cuba St	Secondary East	1.5	1.5	Correnso
30-Jul-19	Cuba St	Secondary East	1.5	1.5	Correnso
30-Jul-19	Barry Rd	Secondary SE	1.0	1.5	Correnso
3-Aug-19	Gladstone Rd	Secondary North	2.4	4.4	Correnso
3-Aug-19	Cuba St	Secondary East	1.7	4.4	Correnso
5-Aug-19	Cuba St	Secondary East	2.3	3.2	Correnso
5-Aug-19	Gladstone Rd	Secondary North	1.5	3.2	Correnso
5-Aug-19	Gladstone Rd	Main North	4.4	4.4	Correnso
5-Aug-19	Gladstone Rd	Main North	3.2	3.2	Correnso
6-Aug-19	Cuba St	Secondary East	2.0	2.2	Correnso
6-Aug-19	Stafford St	Secondary East	2.0	2.2	Correnso
1-Aug-19	George St	Core Shed	2.0	2.0	Correnso
1-Aug-19	George St	Core Shed	1.8	2.0	Correnso
1-Aug-19	George St	Secondary SE	1.0	1.5	Correnso
1-Aug-19	George St	Core Shed	1.4	1.7	Correnso
13-Aug-19	Stafford St	Secondary SE	1.7	3.4	Correnso
13-Aug-19	Gladstone Rd	Main North	2.0	3.4	Correnso
19-Aug-19	Stafford St	Secondary SE	1.1	3.2	Correnso
19-Aug-19	Gladstone Rd	Main North	2.3	2.3	Correnso
19-Aug-19	Gladstone Rd	Main North	1.3	3.2	Correnso
21-Aug-19	Stafford St	Secondary E	1.5	2.7	Correnso
27-Aug-19	Gladstone Rd	Secondary North	2.3	2.3	Correnso
29-Aug-19	Cuba St	Secondary East	1.0	1.1	Correnso
30-Aug-19	Gladstone Rd	Secondary North	2.0	2.6	Correnso
30-Aug-19	Gladstone Rd	Main North	2.6	2.6	Correnso
3-Sep-19	Cuba St	Secondary East	1.2	2.1	Correnso
5-Sep-19	Gladstone Rd	Main North	2.9	2.9	Correnso
6-Sep-19	Clarke St	Scout Hall	1.2	4.0	Correnso
6-Sep-19	Waihi-Whangamata Rd	Secondary North	1.7	4.0	Correnso
6-Sep-19	Kenny St	Secondary SW	2.4	4.0	Correnso
6-Sep-19	Gladstone Rd	Secondary North	1.7	4.0	Correnso
6-Sep-19	Cuba St	Secondary East	2.4	2.9	Correnso
9-Sep-19	Stafford St	Secondary East	1.3	1.6	Correnso
9-Sep-19	Cuba St	Secondary East	1.4	2.1	Correnso
9-Sep-19	Cuba St	Secondary East	1.3	1.6	Correnso
11-Sep-19	Stafford St	Secondary East	1.3	2.6	Correnso

Date	Address	Nearest Monitor		Highest Blasthub Reading (mm/s)	Site
		Location	Reading (mm/s)		
12-Sep-19	Barry Rd		n/a	n/a	Correnso
13-Sep-19	Cuba St	Secondary East	1.9	1.9	Correnso
14-Sep-19	Cuba St	Secondary East	1.5	2.3	Correnso
21-Sep-19	Violet St	Secondary NW	4.9	7.9	Correnso
21-Sep-19	Cuba St	Secondary East	7.9	7.9	Correnso
21-Sep-19	Gladstone Rd	Secondary North	3.0	7.9	Correnso
21-Sep-19	Gladstone Rd	Secondary North	3.0	7.9	Correnso
21-Sep-19	Gladstone Rd	Secondary North	3.0	7.9	Correnso
21-Sep-19	Gladstone Rd	Main South	3.0	7.9	Correnso
21-Sep-19	Stafford St	Secondary East	7.9	7.9	Correnso
23-Sep-19	Gladstone Rd	Main North	4.8	7.9	Correnso
23-Sep-19	Stafford St	Secondary East	1.9	2.0	Correnso
23-Sep-19	Gladstone Rd	Main South	3.0	7.9	Correnso
27-Sep-19	Cuba St	Secondary East	0.9	1.3	Correnso
30-Sep-19	Cuba St	Secondary East	1.6	2.4	Correnso
30-Sep-19	Gladstone Rd	Main South	2.0	2.4	Correnso
30-Sep-19	Gladstone Rd	Main North	1.4	2.4	Correnso
30-Sep-19	Gladstone Rd	Main South	2.0	2.4	Correnso

## 7. Vibration and Complaint Management

A roving monitor was deployed at a Barry Rd property late in September in response to a query whether a nearby compliance monitor was representative of vibrations at the property. Monitoring was not completed until the next quarter and will be reported in that quarter's report.