17 April 2014
Our Ref: 4122

Carolyn Hunt
Gunnedah Council
63 Elgin Street
GUNNEDAH NSW 2380

Dear Carolyn,

2013NTH009 – MODIFICATION TO DA2012/185 MARY'S MOUNT BLUE METAL QUARRY

In response to issues raised at the Joint Regional Planning Meeting regarding the Mary's Mount Blue Metal Quarry held on 9 April 2014, we wish to lodge the following amendments to DA2012/185.

Burleith Residence

As to the subdivision of the quarry site from the Burleith property, the quarry has been re-designed to provide an acceptable buffer between the "Burleith" residence and the proposed pit boundary. Plan 2 Proposed Quarry Site Plan Issue G illustrates the modified pit design and the changes are summarised below:

Item	Proposed Quarry Site Plan Issue F dated 25 March 2013	Proposed Quarry Site Plan Issue G dated 11 April 2014
Proposed Project Boundary	17.63ha	12.52ha
Proposed Pit	14ha	9.4ha
Proposed edge of Pit from dwelling	55m	250m
Estimated Total Extraction	4,438,700bcm	2,631,500bcm
Total Life of the Quarry	38 years	23 years
Total Period of Extraction	37 years	22 years

The proposed reduction in quarry size will result in a reduced noise, dust and blast impact on the Burleith residence. Spectrum Acoustics have been engaged to model blast impacts from the quarry on the residence. This analysis has assessed the proposed blast regime against the Australian and New Zealand Environment and Conservation Council (ANZECC) human comfort criteria and concluded that, with the proposed maximum instantaneous charge (MIC) of 250kg, the ANZECC criteria can be met 215 metres from the quarry, which means that the edge of that impact zone will be 35 metres away from the "Burleith" residence. The pit boundary is more than 250 metres from the Burleith residence. The Environmental Impact Assessment Amendment 1 (EA) outlines that the proponent will reduce the MIC to 125kg if there blast impacts are a nuisance at nearby receivers. An MIC of 125kg requires a 170 metre offset from the quarry which means that the edge of that impact zone will be 80 metres away from the "Burleith" residence to meet the ANZECC criteria. Spectrum Acoustics have modelled potential impact on the "Burleith" residence from flyrock and concluded that if flyrock management is undertaken as outlined (which the proponent will do), there will be no impact from flyrock at the "Burleith" residence. The Spectrum Acoustics modelling is appended to this letter.

Noise and dust modelling present in the EA is based on worst case scenario where full extraction and processing operations are occurring simultaneously at the closest point to the residence, under southeast wind conditions. This situation is not likely to be a frequent occurrence. The reduced pit design will reduce impacts of noise and dust on the "Burleith" residence with the pit now 250 metres east of the dwelling. Existing dense vegetation between the project boundary and residence will now be retained providing a buffer to the residence.

The owners of the "Burleith" residence are aware of the impacts the proposed quarry expansion will have on the residence in which they currently reside. They have signed a private agreement with the quarry operator accepting these impacts.

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We ask the JRPP to review the following attached information in response to the issue raised by the JRPP as to whether the "Burleith" residence was within the blast zone (which it will not be) and, if it had been, the need to maintain the dwelling in common ownership with the owner of the quarry (which, it is respectfully submitted, does not arise):

- Spectrum Acoustics letter dated 17 April 2014
- Proposed Quarry Site Plan Issue G dated 11 April 2014

School Bus Route

The Traffic Impact Study (TIS) prepared by Ardill Payne in the Environmental Impact Assessment Amendment 1, dated 17 May 2013 recommends the following:

10. Cease haulage operations while school buses are using the haul route.

11. Inform truck drivers (via Tool Box meetings and/or site induction) of the existing school bus routes along Goolhi and Quia Roads, bus stop locations, school zones and timetables.

12. Confirm school bus timetables and routes with the bus companies at the beginning of each school year, and adjust the haulage schedule as required. Retain file notes to confirm the dialogue with the bus companies.

Gunnedah Quarry Products proposed to cease operations for the following times when the school bus is travelling along the haul route (school term only):

Mary's Mount Rd to Quia Rd
7:50am- 8:10am and 3:50pm- 4:10pm

Emerald Hill to Quia Rd
7:50am – 8:10am and 3:50pm – 4:10pm

Quia Rd to Gunnedah
8:00am – 8:30am and 3:30pm – 4:00pm

This haulage schedule has been illustrated in the attached figure – Haulage operations to cease at school bus times.

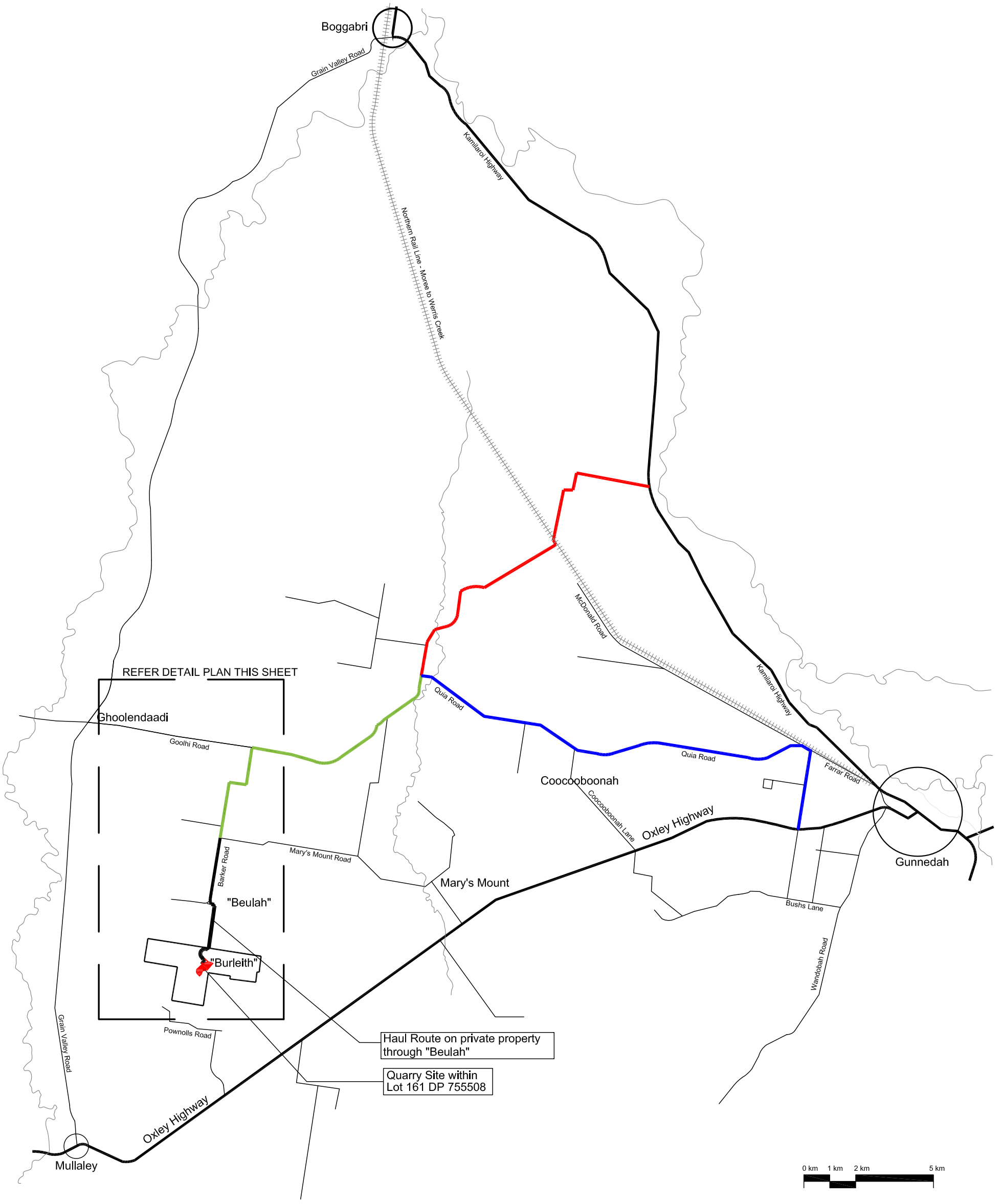
We ask Gunnedah Shire Council to amend the draft Conditions of Consent to include Quarry operator is to cease haulage operations while school buses are using the haul route as recommended in the TIS.

In addressing the issues raised, the proponent had made substantial changes to the proposed development including a 29% reduction in the proposed project boundary and a 40% reduction in total product extraction and quarry life. We hope that Council and the JRPP deem these changes acceptable in addressing the issues raised at the Joint Regional Planning Panel Meeting held on 9 April 2014.

Yours faithfully
STEWART SURVEYS PTY LTD

Kathryn Yigman

HAULAGE OPERATIONS TO CEASE AT SCHOOL BUS TIMES



QUARRY HAULING HOURS

MONDAY TO FRIDAY 7:00am-6:00pm (DAY LIGHT SAVINGS TIME)
MONDAY TO FRIDAY 7:00am-5:00pm (NON-DAYLIGHT SAVINGS TIME)
SATURDAY 8:00am-3:00pm

EXCEPT WHEN SCHOOL BUS IS OPERATING (SCHOOL TERM ONLY)

- MARY'S MOUNT RD TO QUIA RD - 7:50AM- 8:10AM AND 3:50PM- 4:10pm
- EMERALD HILL TO QUIA RD - 7:50AM - 8:10AM AND 3:50PM - 4:10PM
- QUIA RD TO GUNNEDAH - 8:00AM - 8:30AM AND 3:30PM - 4:00PM

PROPOSED EXTENT OF QUARRY
ZONE 55 - MGA CO-ORDINATES

COR	EASTING	NORTHING
A	783027.65	6563059.38
B	783113.01	6563100.76
C	783190.4	6563125.66
D	783095.06	6563203.39
E	783078.85	6563250.98
F	783233.17	6563124.2
G	783294.63	6563122.1
H	783395.27	6563080.39
I	783400.61	6563066.37
J	783193.69	6562795.45
K	783137.56	6562801.95
L	783017.72	6562754.65
M	782972.77	6562619.45
N	782903.36	6562553.32
O	782799.77	6562647.97
P	782770.61	6562701.26
Q	782776.56	6562816.06
R	782977.51	6563023.82
S	782942.96	6563071.74
T	782959.13	6563084.11
U	782977.02	6563089.27
V	782984.4	6563071.37
W	782976.77	6562764.67
X	782859.01	6562901.30

N
W E
S

PROPOSED NEW HAUL ROUTE

PROPOSED PROJECT BOUNDARY 12.52Ha

PROPOSED PIT 9.4Ha

SITE FACILITIES

PROPOSED PROJECT BOUNDARY 12.52Ha

PROPOSED PIT 9.4Ha

EXISTING QUARRY APPROVAL BOUNDARY

QUARRY PROCESSING

ORIGINAL QUARRY PROJECT AREA SHOWN DASHED

ORIGINAL QUARRY PIT AREA SHOWN IN GREY

PICNIC SHELTER

TELECOMMUNICATIONS TOWER

EXISTING DWELLING

HIGHWALL TO BE BENCHED REFER TO TYPICAL SECTION (BENCHING NOT SHOWN)

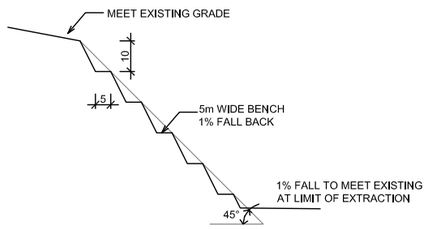
DP 755508 BOUNDARY

LOT 161

PROPOSED NEW BOUNDARY

LEGEND

- Proposed Project Site Boundary
- Existing Quarry Approved Limit
- Limit of Extraction
- Site Facilities
- Quarry Processing
- Existing Fences
- 404 Contours (2m Interval)
- Enviromental Management [E3]
  Zoning Under Gunnedah LEP 2012
- Lot 161 DP 755508 Boundary
- Existing Haul Road
- Proposed Spot Heights



HIGH WALL TYPICAL SECTION
NOTE: BENCHING NOT SHOWN IN CONTOURS

Issue	Date	Description
-	-	-

0 20 40 60 80 100 120 140 160 180 200
LENGTHS ARE IN METRES
1:2000@A1

0 40 80 120 160 200 240 280 320 360 400
LENGTHS ARE IN METRES
1:4000@A3

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Client
GUNNEDAH QUARRY PRODUCTS PTY LTD

Project
MARY'S MOUNT BLUE METAL QUARRY

Title
PROPOSED QUARRY SITE PLAN

Date
11 April 2014

Sheet No.
2 of 3

Drawing number
4122_quarry design

Issue
G

DRAWING SHEET SIZE = A1

17 April 2014

Ref: 13779/5151

Stewart Surveys Pty Ltd
109 Connadilly Street
Gunnedah NSW 2380

RE: ADDITIONAL INFORMATION – MARY'S MOUNT QUARRY

This letter provides the results of additional blast overpressure and vibration modelling conducted for the Gunnedah Quarry Products quarry at Mary's Mount with the aim of accurately quantifying potential impacts at the nearest residence, which is on "Burleith" which residence is approximately 250m from the proposed extraction footprint. The blast assessment included in the original noise assessment by Spectrum Acoustics presented a generic worst case with soft ground type and direct line of sight from the blast site to the residence.

This reassessment considers the geology of the site and the actual proposed blast location below the natural ground surface.

The blast parameters are as follows.

Drill and Blast Regime

Proposed blasting regimes have been based on the advice of Marty Bracher of Precision Drill and Blast Pty Ltd on 10th April 2013.

Blast design assumptions include;

- Bench heights of 10- 15m (cost effective and DPI acceptable)
- Blast Hole Diameters of 102mm
- Lower Powder Factors (kg/m3 of explosive) to suit the pre-fractured material

Charge Weight
MIC (Maximum instantaneous charge) per delay of 250 kg (2holes per delay)
This can be reduced to 125kg if vibration is an issue on your receiver points to monitor as per your EPA license when issued.

Two monitoring points will be determined and records maintained for all blasts.

Charge Deviation Rate
10 percent from design.

Production Rates Powder Factors (SG of 2.5gm/cc used for tonnage calcs)
0.5kg/m3 - 9tn explosives = 18,000 bcm (45,000 tn)

Based on production demand of 120,000bcm a year it is proposed that the blasting regime would not exceed 7 blasts per year.

Blasting Criteria

Human Comfort

Overpressure and vibration levels from blasting are assessable against human comfort criteria proposed by the Australian and New Zealand Environment and Conservation Council (ANZECC) in their publication *"Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration – September 1990"*.

The ANZECC criteria are routinely applied to coal mines and allow for blasting during daytime hours Monday to Saturday, or 260 blasts per year. Recommended overpressure levels for 95% of these blasts (247 blasts) are to be below 115 dB at residential receivers and the other 5% (13 blasts) are allowed to be up to 120 dB. No blasts should exceed 120dB.

Likewise, for 247 blasts per year the recommended maximum vibration velocity for blasting is 5mm/s Peak Vector Sum (PVS). The maximum recommended blast vibration level is 10 mm/s.

Given that the proposed blasting schedule is no more than seven blasts per year, providing respite from blasting on 98% of days in the year, and also because the landowner is willing to enter into an agreement with the proponent with regards to noise and vibration impacts, it is considered justifiable to adopt the recommended maximum blast criteria of 120 dB for overpressure and 10mm/s for ground vibration.

Building Damage

Building damage assessment criteria are nominated in AS 2187.2-1993 *"Explosives – Storage, Transport and Use Part 2: Use of Explosives"* as summarised in Table 1. These levels are considered the minimum at which minor cosmetic damage, such as cracked paint in cornices, could occur.

Table 1. Building damage blast criteria

Building Type	Vibration Level (mm/s)	Airblast Level (dB re 20 μPa)
Sensitive (and Heritage)	5	133
Residential	10	133
Commercial/Industrial	25	133

The adopted annoyance (ANZECC) criteria are below levels at which minor cosmetic building damage could occur.

Assessment methodology and Parameters

Unweighted airblast overpressure levels (OP) are predicted from **Equation 1** below.

$$OP = 165 - 24(\log_{10}(D) - 0.3 \log_{10}(Q)), \text{ dB} \qquad (1)$$

where D is distance from the blast to the assessment point (m) and
Q is the weight of explosive per delay (kg).

The basic equations for calculation of peak particle vibration (PPV) levels from blasting are as follows:

$$PPV = 1140\left(\frac{D}{Q^{0.5}}\right)^{-1.6} \text{, mm/s (for average ground type)} \quad (2)$$

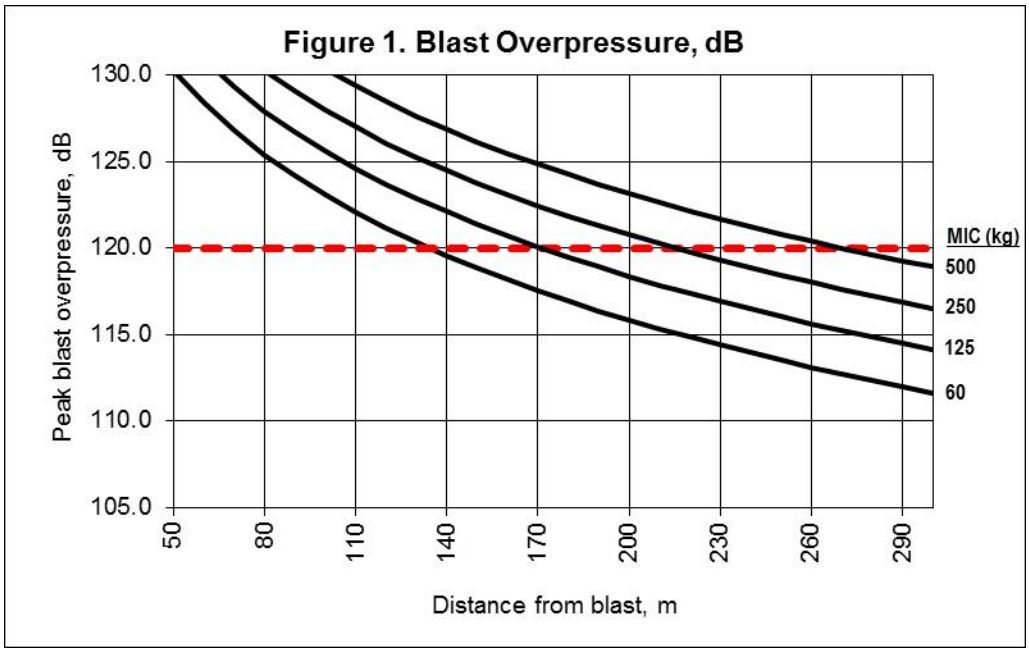
$$PPV = 500\left(\frac{D}{Q^{0.5}}\right)^{-1.6} \text{, mm/s (for hard rock)} \quad (3)$$

where *D* and *Q* are defined as in Equation 1. The geology of the site is described as being *Dolerite, basalt, trachyte, tuff breccia* derived from the Garrawilla Volcanics. This ground type is very hard and equation 2 was used for vibration calculations.

Blasting would not occur until the excavation has sunk to at least one bench below natural ground level. This will provide a natural earth obstruction at least 10m high between the blast surface and the residence. Based on the typical central overpressure frequency of 8Hz, a barrier insertion loss of 7dB has been estimated from standard barrier loss algorithms.

Blast overpressure and vibration calculations were performed for MIC values of 60kg, 125kg, 250kg and 500kg at distances from 50m to 300m from the blast. Results are shown in figures 1 and 2. Table 2 summarises the minimum set-back distances at which the adopted blast criteria are achieved for each MIC.

Figure 1. Blast Overpressure, dB



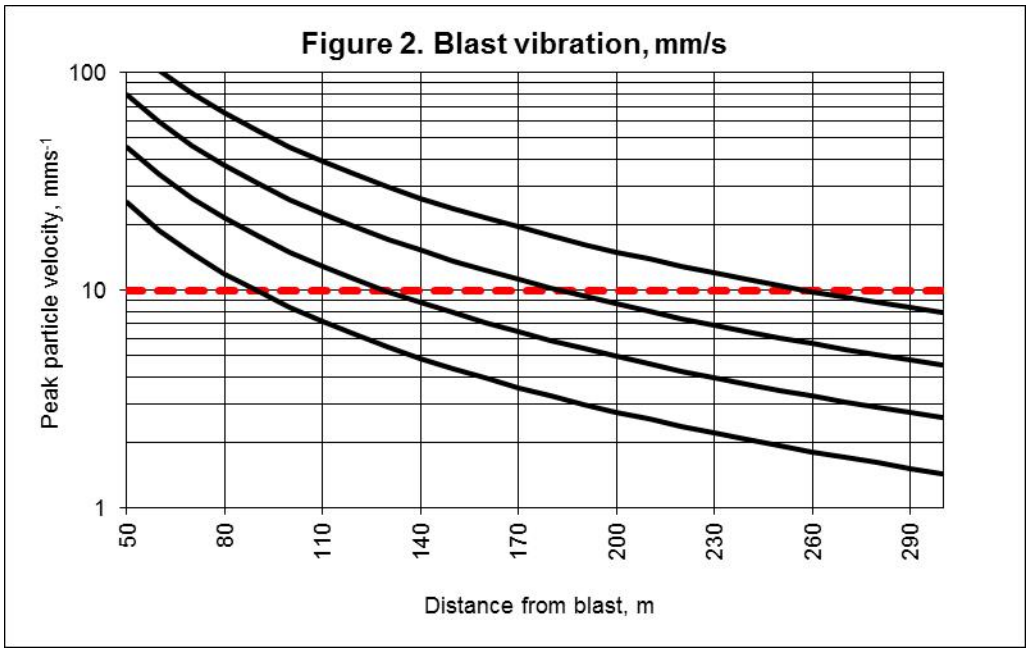


Table 2. Blast set-back distances

MIC, kg	Overpressure Setback (m)	Vibration Setback (m)	Overall Setback (m)
60	135	90	135
125	170	130	170
250	215	175	215
500	270	260	270

Table 2 shows that the required setback distance from the "Burleith" residence will be less than the proposed 250m setback for MIC values up to 250kg.

Flyrock

Since flyrock has the potential to cause damage or harm, it is considered the most important factor over which total control is required – flyrock can be eliminated through strict charging protocols. Flyrock can be considered as any rock fragment which is projected from the blast area beyond the clearance zone, or beyond the quarry boundaries.

As the most dangerous flyrock is projected in the direction of the open face the progression and staging of the quarry should be specifically designed so that open faces are not oriented towards the "Burleith" property, except when greater than 500m from the residence or more than one bench below the natural ground level along the edge of the extraction area nearest to the residence.

Flyrock modelling has been undertaken based on the methodology presented in the Blasters' Handbook, 18th edition, published by the International Society of Explosives Engineers in 2011 after international peer review. The model enables estimation of the maximum flyrock projection distances as a function of blasthole diameter, explosive strength, charge length and stemming length.

It is recommended that a minimum Factor of Safety of 2.0 be applied to the predictions of maximum projection distance resulting from the ISEE flyrock projection model, i.e. that maximum predicted flyrock projections must not be greater than one half of the distance to the nearest occupied structure. On this basis, modelling shows that with the charge configuration of 8 metres of emulsion explosive, a minimum of 2 metres of stemming, and a 102 mm diameter hole, rock fragments will not be projected more than approximately 85 metres from any blast which is approximately one third of the proposed minimum offset distance of 250m.

The protocols required in order to control flyrock include:

- Ensuring that every charged hole conforms to a minimum stemming length of 2 metres, so that flyrock projections cannot extend more than one third of the way to the "Burleith" residence based on the minimum separation distance of 250m;
- Ensuring that bench faces within 500m of "Burleith" are aligned so that rock fragments ejected from the free face cannot travel in the direction of the residence;
- Ensuring that any uncharged holes in the pattern (e.g. blocked holes) are back-filled so that fragment projections cannot occur;
- Ensuring that the charging of blastholes is only conducted by qualified personnel, experienced in the practice of blasting in close proximity to occupied residential structures: and
- Establishing positive contact with residents of "Burleith" to confirm their location prior to blasting.

In summary, the maximum recommended ANZECC blast criteria can be achieved at the nearest residence "Burleith" provided the overall setback distances in Table 2 are maintained. A stemming length of 2m will ensure flyrock would not reach the "Burleith" residence based on 250kg MIC and 250m setback distance. Flyrock management actions have been provided. Since there would be fewer than one blast per month, and distance from blast site to the residence would vary greatly throughout the project life, there would be ample time to ensure safe design parameters for each blast and notification of residents of "Burleith" to ensure their safety.

We trust this report fulfils your requirements at this time, however, should you require additional information or assistance please do not hesitate to contact the undersigned.

Yours faithfully

SPECTRUM ACOUSTICS PTY LIMITED

Neil Pennington
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Acoustical Consultant