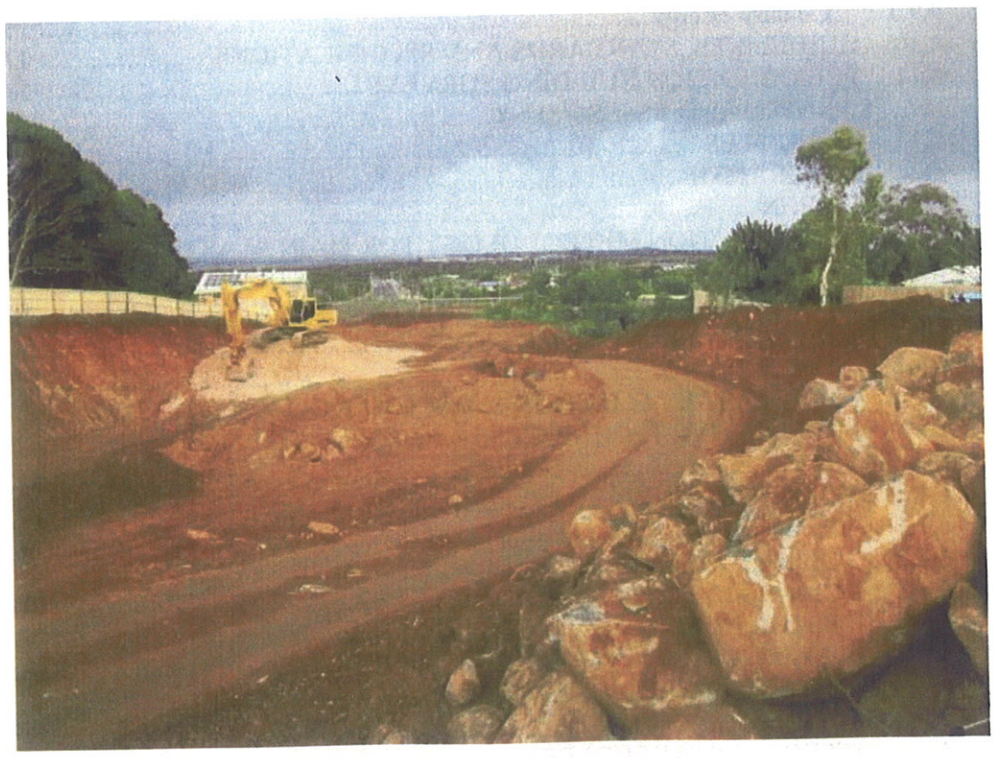
BANORA POINT
UPGRADE ALLIANCE
Upgrading the Pacific Highway

BANORA POINT UPGRADE ALLIANCE

BLAST MANAGEMENT PLAN (BMP)



Revision - 3

13/12/10

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Alliance Manager	Environmental Manager	Project Manager

Details of Revision Amendment

Plan Control
The latest version of this plan will be available on the Alliance Intranet System (Banora Point Sharepoint) for all project personnel. Distribution of the plan will be to those detailed on the distribution listing above. This distribution will be by "hard copy" or electronically via 'Sharepoint' for those using 'Sharepoint'.

The Environmental Manager will maintain, review and update this plan.

Amendment
Each new revision to the plan will be distributed to all registered copyholders with an instruction that the superseded copy be destroyed or marked as superseded.

The revision number is included at the end of the document number, which is noted on each page. When amendments occur, the document or relevant section will be reissued with the revision number updated accordingly.

The Alliance Manager, Systems Manager or Environmental Manager will approve amendments by initial in the Approval column below.

The following provides a record of amendments made to this document.

Revision	Date	Description	Page	Section	Approved By
Draft	8 Oct 10	Draft for agencies	All		
Rev 1	29 Oct 10	Rev1 for RTA	All		JB
Rev 2	26 Nov 10	Rev2 for RTA	All		SA
Rev 3	13 Dec 10	To DoP for approval	All		JB

1.0 INTRODUCTION

Project Approval 07_0059 for Banora Point upgrade was issued to the Roads and Traffic Authority (RTA) on 26 February 2009 after consideration and review of the Environmental Assessment (EA) under Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act) by the Minister for Planning.

The construction of the Banora Point Upgrade project (the Project) requires the excavation of Sexton Hill. Due to the hard rock in Sexton Hill the excavation process will require blasting.

This Blast Management Plan (BMP) has been prepared to detail the measures Banora Point Upgrade Alliance (BPUA) will use to ensure compliance with relevant licences and approvals, reduce adverse impacts to the local community and environment, and manage noise, vibration and air blast associated with the blasting activities on the Project. This BMP also details measures to ensure the works are conducted safely and traffic impacts are minimised.

This document supplements the Project's approved Construction Noise and Vibration Management Plan (NVMP) in relation to blasting requirements.

1.1 PURPOSE

The purpose of the BMP is to:

- Supplements the NVMP by specifically detailing the proposed method of blasting and the relevant blasting controls to minimise impacts caused by noise and vibration.
- Summarise the various specification requirements relating to blasting;
- Present the principles and guidelines for minimising impacts on local residents and other sensitive receivers;
- Describe the practical measures and best management practices to be included in the design and implementation of blasting operations;
- Outline the design, pre and post blast evaluations, monitoring and documentation framework;
- Provide an efficient, simplified and diligent approach to addressing the issues that may arise from the blasting operations.

1.2 OBJECTIVES

The objectives of the BMP are to:

- Present the quality, safety, environmental and community procedures relating to blasting activities;
- Minimise the impacts from the blasting operations;
- Ensure vibration, airblast overpressure and dust is controlled within prescribed limits;
- Protect the amenity of the residents and other building occupiers;
- Protect the amenity of passive recreation areas;
- Ensure the community is consulted and complaints are minimised;
- Prevent damage to adjacent public utilities, structures and buildings.

2.0 SCOPE OF WORKS

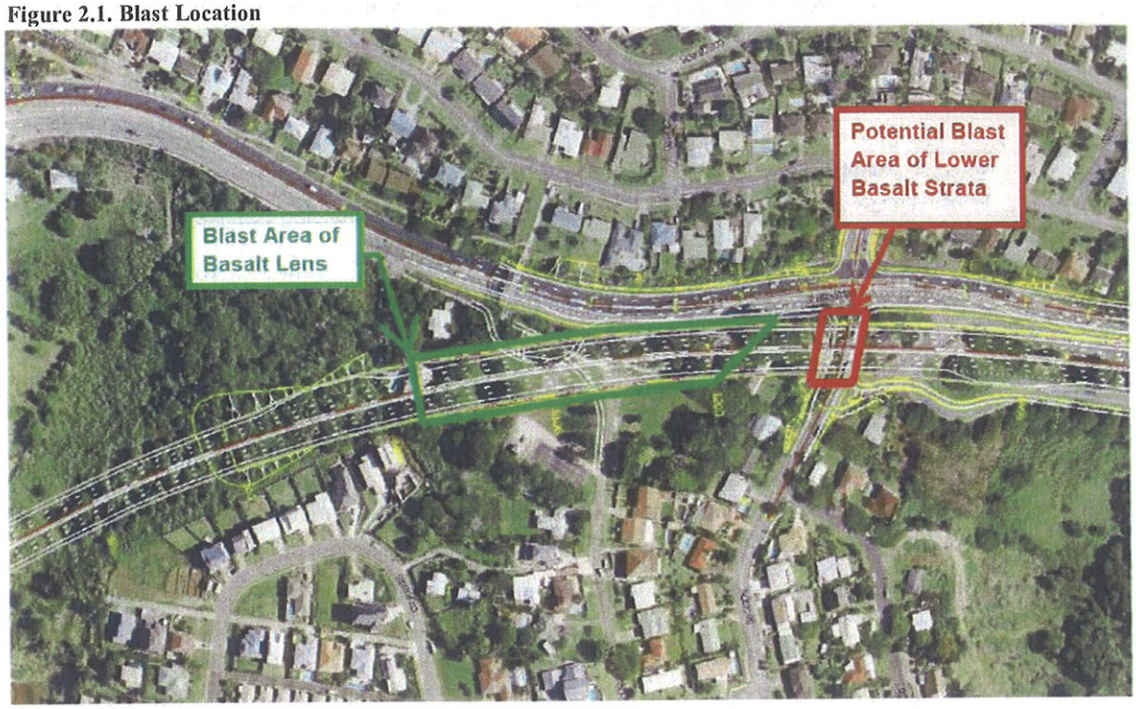
Rock excavation requiring blasting will be restricted to the main cutting through Sexton Hill. Alternate methods to blasting are planned for the southern interchange excavation although minor blasting may be required if they are not successful.

BPUA will appoint a specialist Drill and Blast contractor to undertake these works and an independent blasting consultant to review and monitor the blasting operations and its effect on the local community.

2.1 Main Cutting – Sexton Hill

The main cutting is located between CH84500 – CH84750 (refer Figure 2-1 and Appendix A), and it is expected that 35,000m3 of material will be blasted from this location. This material will mainly comprise of basalt and agglomerate. The maximum depth of the cutting is 23.0m. The hard rock that requires blasting ranges from 3m to 13m below existing ground level. The lens itself varies from 2m to 5m thick. It is anticipated that this will take 25 to 35 Blasts (depending on vibration results) with an anticipated duration of approximately 6 months.

Figure 2.1. Blast Location



3.0 DEFINITIONS

Blast, Blasting	The firing of explosive materials for such purposes as breaking rock or other material, or moving material.
Flyrock	Rocks propelled from the blast area by the force of an explosion.
Ground Vibration	Movement of the ground by elastic waves emanating from a blast, measured by particle velocity.
Particle Velocity	A measure of the intensity of ground vibration, specifically the velocity of motion of the ground particles as they are excited by the wave energy.
Airblast/Overpressure	An airborne shock wave resulting from detonation of explosives. An airblast may be caused by overburden movement or the release of expanding gas into the air.
Sensitive Receiver	People, property, environment and infrastructure susceptible to the effects from blasting.
Stemming	Inert material placed into the drill hole on top of or between separate charges of explosive material. Used to confine the explosives.
Burden	The distance from the drill hole to the nearest free face

Overburden	Material of any nature lying on top of a deposit that is to be blasted.
Spacing	Distance between drill holes.
Subdrill	The practice of drilling holes below floor level or working elevations to ensure breakage of rock to work elevation.
Bench	A horizontal ledge from which holes can be drilled vertically down into the material to be blasted.
Drill Hole	A hole drilled into the material to be blasted for the purpose to contain the explosive charge.
Initiation	Detonation in an explosive material.
Muckpile	The pile of broken material resulting from a blast.
Misfire	A blast, drill hole or explosive material that failed to detonate as planned.
Particle Velocity	A measure of ground vibration and is the velocity of motion of the ground particles as they experience wave energy resulting from a blast.
Primer	Initiates other explosives by either containing a detonator or detonating cord attached to the detonator.
Shotfirer	The qualified person responsible for the loading and firing of a blast.
Blast Controller	Coordinates and takes overall control of the blasting and associated activities on the day of the blast. It is anticipated that the BPUA General Forman/Foreman/Project Engineer will be the blast controller
Blast Guard	Controls access at designated areas to ensure the blast area is clear of members of the public and the workforce leading up to and at the time of the blast.

4.0 REQUIREMENTS, APPROVALS AND GUIDELINES

The following sections summarise the requirements and guidelines relevant to blasting works as contained in the Ministers Conditions of Approval, the RTA's Statement of Commitments, the Environmental Protection Licence, the Environment Assessment and the Scope of Works and Technical Criteria (SWTC).

4.1 APPROVALS & NOTIFICATIONS

In order to commence blasting operations the impacts of the operations and who will be affected need to be considered. The following stakeholders have been considered for notification.

- Department of Planning (DoP) – No formal application or permit is required although the Project's NVMP requires a Blast Management Plan to be submitted to DoP for review and approval. This document will satisfy this requirement.
- Department of Environment, Climate Change & Water (DECCW) – No formal application or permit is required. A copy of this Blast Management Plan will be submitted to DECCW for comment. BPUA's Environmental Work Method Statement for the blasting operations has been reviewed by DECCW.
- RTA – No formal application or permit required other than review of this Document.
- Tweed Shire Council (TSC) – No formal application or permit is required although the Blast Management Plan has been requested for information by the BPUA designated representative.
- Work Cover – no formal notification process other than involvement of local Work Cover Representative.
- Police and Emergency Services – no permit required except notification of the works.
- Bus Operators – One bus stop will be affected during the traffic closures and as such our blasting times will be set to avoid peak bus use times. The bus companies will be informed of the blasting times.
- Utility companies – service providers such as Telstra have been consulted with in regards to vibration restrictions and these restrictions have been designed into the trial and main blasts. Refer to section 4.8 below for further details.
- Sensitive Receivers - Consultation to all sensitive receivers located within 1km of the blast location will be conducted via letter box drops informing them of the blasting works including day of the week, time of the day, number of blasts etc. A warning siren will be utilised immediately prior to the blasts as a reminder for the local residents. Consultation will also be made with affected educational institutions to ensure that blasts are not timetabled during examination periods, unless prior arrangements acceptable to the affected institutions are made. Community consultation is further discussed in Section 7 of this BMP.
- General public - Traffic alerts and the VMS will be utilised to advise the broader community including motorists either side of the border. The traffic

alerts will also be sent to the stakeholders who have requested to be included on the weekly traffic alert and construction activity database. Refer to Section 7 of this BMP for further details.

4.2 LEGISLATION

The key environmental legislation relating to blasting, and the noise and vibration management include:

- Environment Planning and Assessment Act (1979);
- Protection of the Environment Operations Act 1997, and Amendment Act 2005; and
- Local Government Act (1993).

The relevance of these Acts to the Banora Point Upgrade is detailed in the BPUA's Construction Environmental Management Plan (CEMP).

4.3 MINISTERS CONDITIONS OF APPROVAL & STATEMENT OF COMMITMENTS

The Project Conditions of Approval (CoA) issued by the Minister of Planning in February 2009 that relate to blasting include:

CoA #	Minister's Condition of Approval	Reference in BMP
2.10	Blasting associated with the construction is only permitted during the following hours: i. 9:00 am to 5:00 pm, Mondays to Fridays, inclusive; ii. 9:00 am to 1:00 pm on Saturdays; and iii. at no time on Sundays or public holidays. This condition does not apply in the event of a direction from police or other relevant authority for safety or emergency reasons to avoid loss of life, property loss and/or to prevent environmental harm.	Section 5.7
2.11	The Proponent shall consult with affected educational institutions and ensure that noise-generating construction works in the vicinity of the institutions are not timetabled during examination periods, unless other arrangements acceptable to the affected institutions are made at no cost to the affected institutions.	Section 4.1 & 7.7
2.13	The Proponent shall ensure that airblast overpressure generated by blasting associated with the project does not exceed the criteria specified in Table 1 when measured at the most affected residence or other sensitive receiver. Table 1: Airblast Overpressure Criteria: Airblast Overpressure | Allowable Exceedance	Section 5.3

[dB(Lin Peak)]	
115	5% of total number of blasts over a 12 month period
120	Never

2.14	The Proponent shall ensure that ground vibration generated by blasting associated with the project does not exceed the criteria specified in Table 2 when measured at the most affected residence or other sensitive receiver. Table 2: Peak Particle Velocity Criteria:	Section 5.3

Peak Particle Velocity (mms^{-1})	Allowable Exceedance
5	5% of total number of blasts over a 12 month period
10	Never

6.4 d)	A **Construction Noise and Vibration Management Plan** to detail how construction noise and vibration impacts would be minimised and managed. The Plan shall be developed in consultation with the DECC and include, but not necessarily be limited to: i. details of and an indicative schedule for construction activities; ii. identification of noise and/or vibration generating construction activities that would affect sensitive receivers, particularly residential areas; iii. procedures to ensure overpressure and vibration criteria are met during blasting, including a suitable blast program supported by test blast results; iv. a detailed description of the reasonable and feasible actions and measures to be implemented to ensure compliance with the relevant noise and vibration criteria/objectives; v. procedures for notifying sensitive receivers of construction activities likely to affect their noise and vibration amenity, as well as procedures for managing noise complaints; and vi. a description of how the effectiveness of these actions and measures would be monitored during the proposed works, clearly indicating how often this monitoring would be conducted, the locations where monitoring would take place, how the results of this monitoring would be recorded; and, procedures to be followed should non-compliance against any of the documents identified in Condition 1.1 or this management plan be detected.	Section 5.7

The blasting requirements in RTA's Statement of Commitments include:

Objective	Ref	Commitment	Reference in BMP
Noise			

Objective	Ref	Commitment	Reference in BMP
Limit impacts on sensitive receivers associated with blasting activities during construction and, where necessary, comply with relevant standard to reduce airblast overpressure and vibration levels to an acceptable level.	CN11	Reasonable and feasible mitigation that seeks to achieve airblast overpressure and vibration criteria will be developed and implemented.	Section 5.3
	CN12	Site-specific noise and vibration management will be undertaken once blast requirements are confirmed (if required), including identifying appropriate buffer zones.	Section 5.7.1
	CN13	Air blast overpressure and vibration will be measured from test blasts to establish appropriate propagation characteristics for the site and increase the accuracy of blasting predictions.	Section 5.3
	CN14	Surveys will be undertaken at critical properties before and after any blasting activities to identify any potential damage.	Section 4.11
	CN15	Blasting vibrations and air blast overpressure will be monitored during construction.	Section 5.6
	CN16	All reasonable attempts will be made to contact sensitive receivers located within 500 metres of a blast location. The contact will be made at least 48 hours before a blast and advice given to the receiver will include a schedule of blast time(s) and a telephone number and contact name.	Section 4.1& 7
	CN17	Alternative techniques to blasting will be considered in areas where criteria cannot be achieved, and applied as appropriate.	Section 5.9
Address and resolve any complaints regarding noise and/or vibration impacts	CN19	A complaints resolution procedure will be implemented to ensure that complaints are thoroughly investigated and appropriate controls implemented as appropriate (see Commitment C4).	Section 7
Minimise construction noise, vibration and blasting impacts on sensitive receivers	CN20	Construction hours will normally be limited to between 7am and 6pm Monday to Friday and between 7am and 1pm Saturday. No work will take place outside these hours or on public holidays without prior discussion with and/or notification of local residents and the Department	Section 5.7

Objective	Ref	Commitment	Reference in BMP
		of Environment and Climate Change. **Note – these hours are for general construction work and do not include blasting which has its own specific working hours outlined in CoA 2.10.**	
Land Use and Property			
	L4	Property inspections will be conducted, subject to landowner agreement, on all structures within 200 metres of proposed blasting locations, within 50 metres of construction activities that generate vibration impacts and at any other locations identified in the risk assessment.	Section 4.11

4.4 ENVIRONMENTAL PROTECTION LICENCE

The DECCW have issued an Environment Protection Licence (EPL) for the Project, No. 13226. The EPL conditions relating to blasting are detailed below.

EPL #	EPL Condition	Reference in BMP
L7	**Blasting Limits**	
L7.1	The overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Section 5.3
L7.2	The overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Section 5.3
L7.3	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at any time. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Section 5.3
L7.4	Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec for more than five per cent of the total number of blasts over each reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.	Section 5.3

Blasting Hours		
O3.5	Blasting operations at the premises may only take place between 9:00am and 5:00pm Monday to Friday and 9:00am and 1:00pm Saturday. (Where compelling safety reasons exist, the EPA may permit a blast to occur outside the above hours. A prior written request for approval of any such blast must be made to the EPA)	Section 5.7
M10	**Blasting Monitoring**	
M10.1	To determine compliance with condition(s) L7.1, L7.2, L7.3 and L7.4: a) Airblast overpressure and ground vibration levels must be measured and electronically recorded at the most affected residence or noise sensitive location that is not owned by the licensee or subject a private agreement between the owner of the residence or noise sensitive location and the licensee for all blasts carried out in or on the premises; and b) b) Instrumentation used to measure the airblast overpressure and ground vibration levels must meet the requirements of Australian Standard AS 2187.2-2006.	Section 5.6 and 5.7

4.5 ENVIROMENTAL ASSESSMENT

The Environmental Assessment for the Pacific Highway Banora Point Upgrade prepared by Parsons Brinckerhoff for the RTA (EA February 2008) details the following:

- The assessment approach applied in the noise and vibration assessment took into account the guidelines listed in the Environmental Assessment requirements (where relevant) as follows:
  - The Australian and New Zealand Conservation Council's (ANZECC 1990) Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration – for guidance on airblast overpressure and vibration criteria. (Section 11.1, Page 127).
- Some blasting is likely to be required for the purpose of hard rock cutting at Sexton Hill. Potential airblast overpressure and ground vibration impacts of this activity were assessed using the method detailed in Section 4.3.4 of Technical Paper 6 (Section 11.4.5, Page 138).
- Table 11-7 summarises the estimated maximum charge mass per delay and separation distances required to achieve the applicable criteria. It should be noted that this procedure is only an estimation procedure. In order to obtain an accurate prediction, site specific testing is essential.

Table 11-7 **Minimum separation distances required to achieve blasting criteria for various charge sizes**

Effective charge mass per delay (kilograms)	Distance required to achieve <5 millimetres per second PPV[1] (metres)	Distance required to achieve 105dB(lin) (metres)
0.1	9	110
0.5	21	200
2	42	300
10	94	520
20	133	650

Notes *1: PPV = peak particle velocity*

The above predictions indicate that airblast overpressure is the more stringent criterion. Given the close proximity of residential properties, site-specific testing and blasting management strategies would be essential to ensure that the criteria are achieved. Given the proximity of residential properties, alternative construction techniques would be preferred wherever possible. Proposed blasting management measures are described in section 11.5.2. (Section 11.4.5, Page 139).

- The following blasting management measures would be implemented to minimise construction impacts at adjacent sensitive receivers: (Section 11.5.2, Page 144):
  - Site-specific noise and vibration predictions would be undertaken when the blast designs and geotechnical information are confirmed. Appropriate buffer zones would be identified to ensure that airblast overpressure is limited to acceptable levels. Blasting designs would be selected to ensure that the criteria are achieved at residential properties surrounding the project. (Section 11.5.2, Page 144).
  - Blasting vibrations and airblast overpressure would be monitored throughout the project. (Section 11.5.2, Page 144).
  - Airblast overpressure and vibration would be measured from a series of test blasts in order to establish appropriate propagation characteristics for the site and to increase the accuracy of blasting predictions. (Section 11.5.2, Page 144).
  - Surveys would be undertaken of all critical properties, before and after blasting activities, to ensure that no damage is occurring to structures located on the property. (Section 11.5.2, Page 144).
  - Time restrictions would be considered to ensure minimum impacts on residents. (Section 11.5.2, Page 144).
  - Consultation with residents would be considered with regard to the timing of blasting activities. (Section 11.5.2, Page 144).

- A complaints resolution procedure would be implemented so that complaints are thoroughly investigated and blasting activities ceased or modified where appropriate. (Section 11.5.2, Page 144).
- Alternative construction techniques would be used in areas where the criteria cannot be achieved using the above management strategies. (Section 11.5.2, Page 144).

It must be noted that the results from the blast evaluation show that considerably less explosive can be used to remain below the 5mm/s restriction. By comparison, approximately 2.5 times the distance will be required to achieve <5mm/s than what is stated in the EA.

4.6 BPUA MODIFICATION REQUEST FOR BLASTING LIMITS

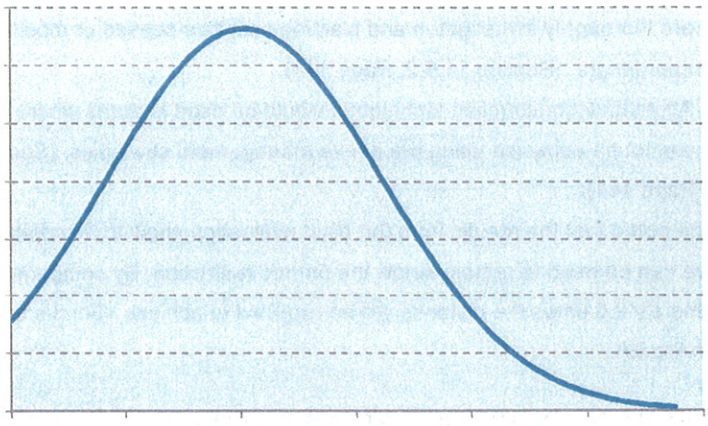
A submission requesting a modification of the blasting limits from that above has been submitted with this Blast Management Plan and a copy is included in Appendix B of this document.

Blast Evaluation trials were carried out on site to determine the actual site attenuation characteristics. These enable us to accurately predict vibration levels specific for our site rather than using industry standard values. This greatly improves our ability to accurately predict vibration levels at the closest residence and significantly reduces the risk of exceedances. Our vibration modelling now includes these characteristics and has been subject to a 95% confidence interval.

To maintain 95% of blasts below 5mm/s and 5% up to 10mm/s would result in significant secondary breakage due to the rock not fragmenting sufficiently to allow free excavation. The evaluation blasts confirmed this by predicting the maximum charge weights possible while maintaining 5mm/s. There are some areas of the rock lens that can not be blasted due to the proximity to adjacent houses and will need to be rock hammered out.

By increasing the number of blasts that can exceed 5mm/s while planning and modelling to not exceed 10mm/s at 95% confidence we can significantly increase fragmentation which will dramatically reduce the amount of overall vibration experienced by the resident i.e. significantly less rock breaking which will be a greater impact to the community.

All blasts will be designed to remain below the 10mm/s vibration restriction on 95% of occasions. The range of peak vibration will vary depending on the variable geotechnical conditions and is shown in the figure below.



0.0 mm/s 2.5 mm/s 5.0 mm/s 7.5 mm/s 10.0 mm/s 12.5 mm/s 15.0 mm/s

The targeted average level of vibration will be 5mm/s. It is expected that 95% of the blast patterns will generate less than 10mm/s at the nearest property. 99% of the blast patterns will generate less than 12mm/s and all blasts are predicted to generate less than 15mm/s.

If an exceedance is recorded while blasting using the modelled 95% confidence interval, we will notify the DECCW, DOP, RTA and the BPUA Environmental Representative. An NCR will also be generated and issued to record the planned changes to our subsequent blast designs.

4.7 SCOPE OF WORKS AND TECHNICAL CRITERIA

Criteria from the Scope of Works and Technical Criteria include:

- Prior to the commencement of the Alliance Works, pre-condition (dilapidation) surveys will be completed on properties likely to be affected from any of the Alliance Works and Temporary Works. These surveys will be used to determine the condition of existing infrastructure and to then determine the extent of any damage that may have been caused by the Alliance Works. The limits of these re-condition surveys are as follows:
  - All Properties within 200m radius from Wilson Park Land Bridge for potential blasting in the Alliance Works (SWTC)

Compliance with the above requirement is detailed in Section 7.7.

4.8 BPUA CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN (NVMP)

The approved NVMP specifically excludes the detailed management of blasting and the control of associated noise and vibration. The NVMP contains the same requirements for blasting operations as stated in the CoA and the EPL and as such have not been duplicated in this section. Some additional mitigation measures for blasting activities detailed in the NVMP include:

- Videotaping of blasting activities in close proximity to residents will be undertaken.
- Obtain appropriate weather data by taking measurements as soon as practicable prior to blasting, and from the data predict whether air blast overpressure levels are likely to be increased above the levels expected under adverse weather conditions.

This BMP supplements the NVMP by specifically detailing the proposed method of blasting and the relevant blasting controls to minimise impacts caused by noise and vibration.

4.9 UTILITY AUTHORITIES

4.9.1 Telstra

Telstra have two services running along the alignment, namely the Copper Cable and Optical Fibre. BPUA have been advised by Telstra, (see Appendix C) that the maximum allowable ground vibration is 50mm/sec (PPV peak particle velocity).

Figure 4.8.1 Underground Telstra Services

4.9.2 Water and Sewer

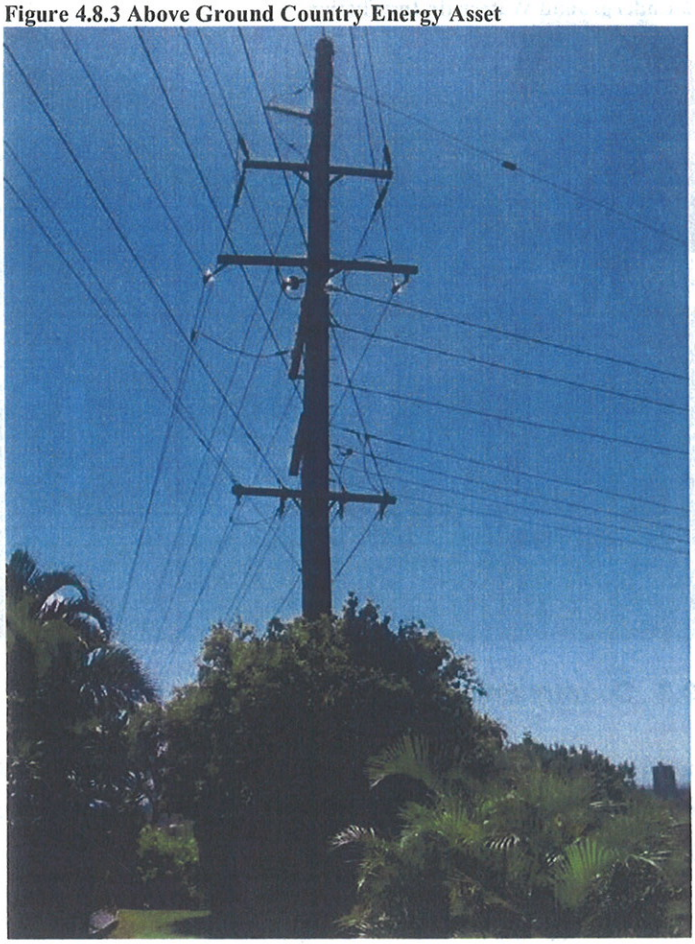
Water and sewer services (see Appendix C) are located along sections of the proposed alignment. BPUA have been advised by Tweed Shire Council that for the assets within a 50m zone of the blast there is no such maximum value as long as the integrity of the asset is maintained. TSC require notification of the blast schedule so they can review these assets. For assets outside of this zone the maximum allowable ground vibration is 20mm/sec (PPV peak particle velocity).

Figure 4.8.2 Underground Waternain Installation

4.9.3 Country Energy

Country Energy services are located along sections of the proposed alignment. Clarification is currently being sought from Country Energy in relation to the maximum allowable ground vibration. Adoption of 50mm/s limit in line with telecommunication and power assets of other authorities is the expected criteria. BPUA have previously been advised that an appropriate limit is 50mm/s.

Figure 4.8.3 Above Ground Country Energy Asset



4.10 GUIDELINES, STANDARDS AND SPECIFICATIONS

The key Guidelines and Standards relevant to blasting management include:

- Standard RTA Specifications:
    - BPUA R44 Earthworks
    - BPUA G36 Environmental Protection (Management Systems)
    - BPUA G5 Environmental Protection Requirements.
- Environmental Noise Management Manual – RTA 2001.
- Environmental Noise Control Manual Chapter 171 Construction Site Noise – EPA 1994.
- Environmental Noise Control Manual Chapter 174 Vibration in Buildings – EPA 1994.
- Department of Environment, Climate Change & Water, Interim Construction Noise Guidelines, 2009.

- Technical Basis for Guidelines to Minimise Annoyance due to Blasting Over Pressure and Ground Vibration September 1990 – Australian and New Zealand Environment Council (ANZECC).
- Australian Standard AS2187.0 2006 – Explosives – Storage, Transport and Use Part 0 – Terminology.
- Australian Standard AS2187.0 2006 – Explosives – Storage, Transport and Use Part 1 – Terminology.
- Australian Standard AS2187.1 2006 – Explosives – Storage and Use Part 2: Use of explosives.
- Australian Standard AS2187.2 2006 – Explosives – Storage, Transport and Use – Part 3: Pyrotechnics – Shopgoods fireworks –Design, performance and testing.
- Australian Standard AS2187.4 2006 – Explosives – Storage, Transport and Use – Part 4 Pyrotechnics – Outdoor Displays.
- EPA ENCM Chapter 154 – Blasting Vibration Limits.
- NSW Dept of Mineral Resources – Blasting Limits.
- Environmental Noise Management – Assessing Vibration: a technical guideline, February 2006 - DECCW (previously DEC)..
- Explosives Regulation 2005.

4.11 PRE-CONDITION BUILDING SURVEYS

Pre-blast building condition inspections have been conducted on all structures that are located within 200m of the proposed blasting works at the Sexton Hill cutting, in accordance with SoC No. L4. These reports have been undertaken to establish the condition of all existing infrastructure which could be affected by blasting works. Copies of these reports have been issued to the RTA Representative, the Project Verifier and the owner and/or occupier. Following completion of the project, additional surveys will be conducted as required on buildings to identify any potential damage.

5.0 PLANNING AND ASSESSMENT

Detailed planning is the key to ensuring a safe and efficient blast. Monitoring and assessment is required to drive continual improvement in the blasting process and to show compliance with various standards and conditions. The following sections outline BPUA's approach to planning and assessment.

5.1 PRINCIPLES

The principles and guidelines for minimising the impact on local residents and other sensitive receivers from noise and vibration are detailed in the following sections. All blasts on this project will be restricted blasts. Restricted blasts control every parameter of a blast design to optimise the fragmentation achievable when blasting in close proximity to sensitive receivers while minimising noise, vibration and fly rock.

BPUA will be undertaking 3 distinct types of blasting on the project. They are:

1. A Blast Evaluation – this includes drilling 11 holes in 3 locations, 3-4 holes per location, throughout the cutting and firing a small charge in each hole. These will be from the existing surface level and some 15m deep. Monitors are set up in multiple areas in and around the cutting. The blasts are typically spaced 15 minutes apart to allow for vibration data gathering and design modification of the next blast hole. This evaluation is carried out to accurately model ground vibrations in accordance with Section 11.5.2 of the Environmental Assessment and was completed on 3/8/2010. Refer to section 5.4 below for further details.
2. Trial Blast: This is our first blast on site that creates fragmentation of the rock that allows for excavation. The trial blast is designed using the data from the blast evaluation and aims to comfortably achieve below vibration restrictions. It is a scaled down version of a typical main blast. This will be approximately 20-25 holes and have a slightly reduced charge weight to further improve our confidence of the blast design and geological conditions.
3. Main Blasting: these are typically blasts of approx 2,000m3 bcm conducted after the blast evaluation and trial blast have been completed. These are the blast utilised to assist excavation of the rock in the cutting. The hard rock that requires blasting ranges from 3m to 13m below existing ground level. The lens itself varies from 2m to 5m thick.

Each blast will be specifically designed and the maximum charge weight (MIC) selected such that no one detonation will cause vibration levels to exceed the target goals. This MIC is the critical factor in controlling the impacts to local residents and sensitive receivers and changes depending on distance, geology and velocity of detonation.

Once the maximum charge weight has been determined for each blast the other parameters are carefully selected to control distribution of this explosive in the hole to maximise fragmentation, to control the direction of initiation to further reduce vibration effects, to control hole size and stemming material to reduce ejection risks, to control the positioning of the explosives in decked holes and to control the potential for fly rock generation. No explosives will be temporarily stored onsite overnight.

Once the above parameters have been determined the blast will be designed to not exceed any vibration limits, to be as safe as possible, and to fragment the rock as much as possible

5.2 PROGRAMME

It is currently anticipated that blasting will need to commence in the Sexton Hill cutting early November 2010 with rock levels confirmed higher than expected following additional geotechnical bore holes.

The current program is to undertake one to two blasts per week yielding approximately 2,000 bcm per week. Analysis of the seasonal traffic peak volume data suggests the best time to close the Pacific Highway to enable safe blasting is between 12:00pm and 12:30pm and between 1:00pm and 1:30pm on Monday's, Tuesday's and Wednesday's. Therefore the BPUA intends to undertake all blasting activities on Monday's, Tuesday's and Wednesday's between 12:00pm and 12:30pm and between 1:00pm and 1:30pm. There will only be one blast per day and the day and time will be notified to the community as per our communication procedure.

All preliminary checks and setup of the blast site will be completed prior to these times so blasting is as close as possible to the advertised half hour blast window.

The number of production blasts is anticipated to be 20-30 (depending on vibration readings) excluding the initial evaluation test blasts. The duration of main blasting activities will be approximately 6 months from commencement.

5.3 DESIGN

The design for each of the blasts will be undertaken by BPUA's specialist drill and blast subcontractor. BPUA has engaged an independent blasting and blast vibration expert John Heilig and Partners to review the blast design, blast methodology and to undertake monitoring and analysis of the vibration results to continuously improve the noise and vibration control and ensure compliance with restrictions. John Heilig and Partners have extensive experience in blasting in urban areas including Ballina Bypass Alliance, Airport Link and Northern Busway, North-South Bypass Tunnel (NSBT) as well as multiple international projects.

Vibration and airblast results from the evaluation blasts and each production blast will be used to accurately model the expected vibration levels for subsequent blasts. This continual improvement will ensure we decrease the probability of exceeding any limits by continuously improving our model and data set. Predicted airblast overpressure levels are to be calculated prior to blast based on the current weather conditions. If predicted levels are likely to be exceeded at neighbouring dwellings cease or restrict the blast.

The blast design will specify the:

- MIC (Maximum Instantaneous Charge);
- Burden;
- Spacing;
- Depth;
- Inclination of holes;
- Hole diameter;
- Subgrade drilling;
- Stemming;
- Powder Factor;
- Type of explosives;
- Initiation Sequence;
- Sensitive structures;
- Volume of blasted material;
- Distance to sensitive receivers; and
- Expected levels of vibration and airblast at sensitive receivers.

Once the vibration modelling and blasting parameters for each blast have been determined these are run through a blasting program that determines the best

initiation sequence to provide further opportunity to modify vibration and also control relief which can impact in vibration as well.

In accordance with RTA Specification BPUA R44, a Hold Point will be submitted prior to each of the blasts. This hold point will include the blast design details provided by the drill and blast subcontractor.

5.4 CONSTRUCTION METHODOLOGY FOR MAIN BLASTS

The trial and main blasting (subject to approval of a Blast Management Plan) will be carried out following the sequence of activities below:

1. Design of each blast to achieve the intended result including compliance with all environmental and safety requirements. The blast design shall be developed to produce the required cross section at each location and may include line drilling. The depth of each blast will be determined and may include localised deepening for drainage etc. Explosive type should give consideration to factors that may affect the blast such as predicted wet weather.
2. Coordination of blast designs and program to ensure issues associated with materials handling, excavation of OTR, site access, haul roads, stockpiles are taken into consideration.
3. Marking out of blast pattern.
4. Drilling of blastholes. This will likely require a minimum of 2 drill rigs. Accurate drill logs will be recorded for each hole. The holes will be drilled to a depth that is agreed as below the basalt lens and then stemmed back up to the explosive and charge to control vibration.
5. Dipping, priming and loading of blastholes with suitable primers, detonators and explosives to suit the requirements of the blast design. Again the explosive type will give consideration to factors that may affect the blast such as predicted wet weather. It is anticipated that the basalt lens will require deck loading to ensure only one pass of blasting is required, minimising the number of blasts.
6. Stemming of blastholes. Stockpile of appropriate stemming material will be provided at each site in close proximity. A method of ensuring each blasthole is sufficiently filled with stemming shall form a hold point for each blast, i.e. an actual quantity vs design quantity check. Filling of blastholes with stemming material is to be carried out by competent workers.
7. Connection of all detonators, delays etc. as required by the blast design. It is noted that electronic detonators may be required for blasting on the project due to the environmental and safety constraints.
8. Supply and installation of blast protection measures to eliminate 'fly rock' or ejection of material from the shot area for each blast. The control measures will

be reviewed and inspected of prior to each blast. Existing over burden (approx 3m) and potentially blast mats will be used to control flyrock for the project.

9. Supply of documentation from subcontractor a minimum of 48 hours prior to each blast for review, including all details from section 5.3 above . The documentation shall also include safety considerations and environmental measures such as methods of monitoring vibration and locations of monitoring equipment.
10. Coordination in relation to the shot being fired to manage the clearing of each area, stopping of traffic etc.
11. Firing of the shot. It is anticipated that the BPUA General Forman/Foreman/ Project Engineer will be the blast controller and will take overall control of each blast.
12. Any rectification measures required as a result of a miss-fire, including overnight security if required. Misfire rectification procedures vary between subcontractors however they will be documented in detail in the Drill and Blast subcontractors safety management plan.
13. Supply of documentation following each blast including drill sheets, checklists, monitoring results, video of blast etc. as detailed in Specification R44.

5.5 MONITORING OF MAIN PRODUCTION BLASTS

Vibration and air blast monitoring will be conducted by Dr John Heilig of Heilig and Partners. John has vast experience in blasting monitoring and control in dense urban environments such as Banora Point as detailed earlier.

Blast monitoring instrumentation will be installed and maintained in accordance with relevant Australian Standards (eg. AS2187.2 - 1993). Monitoring units will be calibrated annually to standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics).

Blast monitoring equipment will consist of a computer and display unit connected by cable to a geophone transducer which senses vibration, and to a microphone with low-frequency measurement characteristics which senses air blast overpressure. Vibration and overpressure levels are monitored concurrently upon detection of a trigger, and the data is processed and stored in the computer memory.

The blast monitoring system proposed for this project utilises the instrumentation available from INSTANTEL.

The proposed system will include a relocatable near-field unit placed within close proximity to the blast area and additional blast monitoring units located at the most affected residence or noise sensitive location, in accordance with the MCoA and EPL

requirements. The locations of the vibration monitors will be in accordance with the blast evaluation monitoring (Appendix D). Additional monitoring will be provided at the affected structures in proximity to the blast sites during construction (if required). These affected structures are likely to be pile walls RW07 and RW08, the Landbridge and Laura Street Bridge. Concrete pours at these locations will be coordinated with the blasting to ensure no adverse quality impacts.

In addition to the above, each blast will be recorded using digital video equipment to record any surface movement and minor ejections.

5.6 NOISE, VIBRATON & DUST MITIGATION

5.6.1 Noise & Vibration Controls

Drilling Activities:

Drilling works are only to occur 7:00am to 6:00pm Monday to Friday; or 8:00am to 1:00pm Saturday.

Noise from the drilling operations need to be minimised as much as possible. As such the following controls need to be implemented as a minimum:

- Drilling rigs are to be fitted with appropriate silencers (noise control kits) and are to be maintained in an efficient condition.
- Drilling rigs are to be switched off when not in use.
- Noise levels of the drill rigs will be monitored before commencing work to determine noise mitigations required.
- Temporary noise barriers are to be installed directly near the drilling rigs. The existing noise hoarding will also provide some additional benefits. No gaps must be present in the temporary noise barriers including between the ground and the bottom of the barrier.
- Ensure drill rig remains within the cut batter whenever possible to contain noise within the cutting.
- Broad-band reverse alarms to be used.
- Respite periods are to be considered depending on effectiveness of above controls.
- The drilling location will be at least 3m below the crest of the cutting so will be buffered by the cutting wall

Blasting Activities:

Blasting works will be limited to approved work hours Monday to Friday 9am-5pm and Saturday 9am to 1pm. As stated in Section 5.2, BPUA intends to undertake the blasts

on the same three days per week and at the same time of day to ensure consistency in blast days and times to reduce community confusion and disruption. .

The vibration results from the evaluation blast have been used to calculate the K value for the trial and main blasts for the south, central and northern end of the cutting. The results also allow more accurate modelling and pricing of the drill and blast works. The report from the blast evaluation is attached in Appendix E.

As stated above in Section 5.3, the blasts will be designed to ensure the limits for vibration and airblast overpressure are not exceeded. The blast design will vary the explosive quantity depending on the proximity of the blast to the sensitive receiver, effectively creating a buffer zone. Vibration and airblast results from the trial blast and each additional blast will be modelled and the results used to design the next blast to ensure a minimum number of blasts without exceeding the limits.

Predicted airblast overpressure levels will be calculated prior to the blasts based on the current weather conditions. If predicted levels are likely to be exceeded at neighbouring dwellings cease or restrict the blast. The 3m of overburden is also a key method of controlling airblast overpressure

As detailed in Section 5.6, airblast overpressure and ground vibration levels will be measured and electronically recorded at the most affected residence or noise/vibration sensitive location that is not owned by the RTA or subject to a private agreement for all blasts carried out.

All noise and vibration complaints will be recorded and actioned as detailed in Section 7 of this BMP.

5.6.2 Dust

Trucks entering and leaving the premises that are carrying dust generating loads (eg. Stemming material) must be covered at all times except during loading and unloading.

Water carts will be used as required during the drilling operations. In addition, drill rigs that utilise water and dust collectors will be used on site.

Blast protection measures to eliminate 'fly rock' or ejection of material from the shot area will be installed for each blast. The control measures will be reviewed and inspected prior to each blast. Existing over burden (approx 3m) and potentially blast

mats will be used to control flyrock for the project. The blast lens is also within the water table which should minimise any potential dust issues.

Dust monitoring will occur during blasting activities in accordance with the Project's Air Quality Management Plan.

5.7 POST BLAST EVALUATION & DOCUMENTATION

The performance of each blast will be reviewed to consider the safety and environmental outcomes, the impact on traffic and effectiveness of the traffic management, assessment of blast muckpile to verify that there has been no misfire, and inspections of the blast area and surrounding work area for evidence of flyrock.

The intent of the review is to check that the blast performed as per the design and to seek areas for improvements in future blasts.

Blast report pro-formers will be completed detailing explosives usage, timing plans and environmental monitoring results. Fragmentation and heave performance are also to be evaluated and any comments on the blast will be documented. In accordance with RTA Specification BPUA R44 all the following details will be recorded:

- Date, Identification number and time of blast;
- Location, number and diameter of blast holes loaded;
- Depth of each drill hole loaded;
- Inclination of drill holes;
- Burden(s) and spacings;
- Types and amounts of explosives used;
- Maximum instantaneous charge (MIC);
- Initiation Plan;
- Length and type of stemming in each blast hole;
- Ground vibration and noise levels at measuring locations.
- Video footage to record any surface movement and minor ejections.

These records will be signed off by the shotfirer. A copy of the records will be filed in BPUA's Quality Management System (QESE).

Should either air-blast overpressure or peak particle velocity be exceeded, the Environmental Manager will investigate the exceedance and consult with the shot-firer and Project Engineer to implement strategies to minimise re-occurrences prior to the next blast. In the event of an exceedance the following will be documented:

- the date, time and nature of exceedance;
- review blast procedures and preparation to determine the cause (likely cause) of the exceedance;
- identify actions taken to date to avoid exceedances;
- identify proposed measures to address the exceedance;
- amend blast procedures as a result of any proposed mitigation measures;
- document and file this investigation report onsite.

DECCW and DoP will be notified of any exceedances in the EPL monthly compliance report and the 6 monthly compliance reports. All monitoring results will also be discussed at the monthly Environmental Review Group meetings. In cases where the exceedeances have the potential to cause harm to the environment or community, reporting will be as per the MCoA 1.4.

5.8 ALTERNATIVE TECHNIQUES

There are 7 alternative techniques have been investigated. They are:

1. Boulder Buster – Water / CO2 compression
2. Bright Star – Expanding Gels
3. Cardox – CO2 shell
4. Piston Cartridge
5. Super Wedge
6. Rock Breaker
7. Slender/tapered Moil

These alternatives are cost prohibitive to use across the main cutting although will be applicable in localised areas sensitive to vibration.

Following extensive reviews, meetings and discussions with suppliers of the above, only the super wedge and slender moil option will be progressed further for boulders, trimming back to piles and potentially in the southern interchange cutting.

Figure 5.9.1 Superwedge

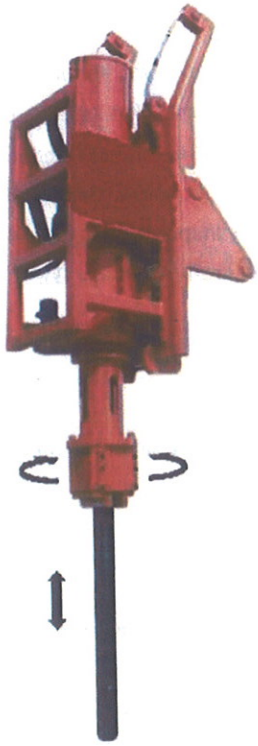
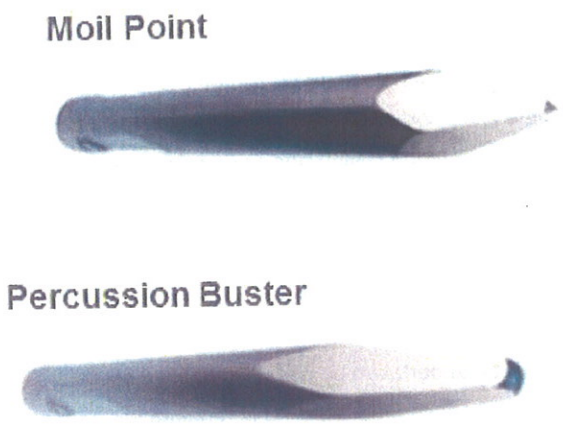


Figure 5.9.2 Slender/tapered Moil



6.0 SAFETY

Blasting is a high risk activity and as such, safety is of extreme importance. This includes the safety of people, property, environment and infrastructure. The safety procedures to be implemented in this Project will be described in the Drill and Blast Subcontractors Management Plan (Appendix F) and will be generally as below. Safe Work Method Statements (SWMS), pre-start toolboxes and Safety Inspection checklists and Observations will be completed prior and during the works as required (Appendix G).

6.1 WORK SITE

A summary of the safety measures that will be implemented during the various stages of the blasting operation are given below.

6.1.1 Pre-Planning

Pre-planning includes the details outlined in Sections 5.3 Design and 5.4 Pre-blast Evaluation of this Management Plan. Pre-planning will ensure that all the safety aspects of the blasting are considered in the design and that everyone involved is aware of the risks associated with the blasting works.

BPUA surveyors will set-out the perimeter of the blast from which the subcontractor will mark drill holes. This perimeter is key as it sets the exclusion zone limits. The exclusion area will be a minimum of 50m around the blast location. Further details on the exclusion area procedures are provided below in section 6.2.
Existing boreholes, test holes and piezometric holes will be identified and marked on the exclusion zone drawing. These holes will be assessed by the Blasting Consultant (John Heilig) and appropriate measures put in place to control any water ejection from these.

6.1.2 Drilling

The drilling will be undertaken by suitably qualified operators. The area where drilling and subsequent blasting is required will be marked off, allowing access only to the blasting team. The drilling should be completed prior to any charging commencing, and where drilling must be performed during charging, there must be six (6) metres between these two activities. The drill operator will be briefed on the blast design and pattern requirements by the

shotfirer prior to the commencement of drilling. This briefing will be conducted and recorded as a toolbox meeting. The driller will keep a drillers log and give this to the shotfirer prior to any loading of charges commencing. This includes position, angles and depths of each hole. The driller will notify the shotfirer of any unexpected subsurface voids or changes in rock strata on the blasting works proformas (Appendix H).

Figure 6.1.2 Drill Rig in Operation

6.1.3 Charging

Charging and initiation setup will cease upon the approach of electrical storms. The shotfirer and the Alliance supervisor will monitor the weather conditions regularly throughout, on a daily basis, to discern the likelihood of storm events. All personnel will be removed from the area and charging will not recommence until electrical storm has passed. The blast area will have a boundary erected around it, allowing entry by authorised personnel only. The blasting area will be kept free of all obstructions and hazards and there will be strictly no smoking permitted.

The set up prior to the blasting initiation involves the loading of the primer, loading the charges, connecting the shot, and clearing the areas.

Loading of the primer will be undertaken by the shotfirer or a person under the supervision of the shotfirer. The primers and detonators will be kept separate at all times until loading of the drill holes. The drill holes will be

checked to ensure there are no blockages and drilled to the correct depth. The depth of the drill hole will be recorded on the loading sheet. The primer is first to be lowered into the drill hole, in a manner to prevent damage to it or the attached detonator.

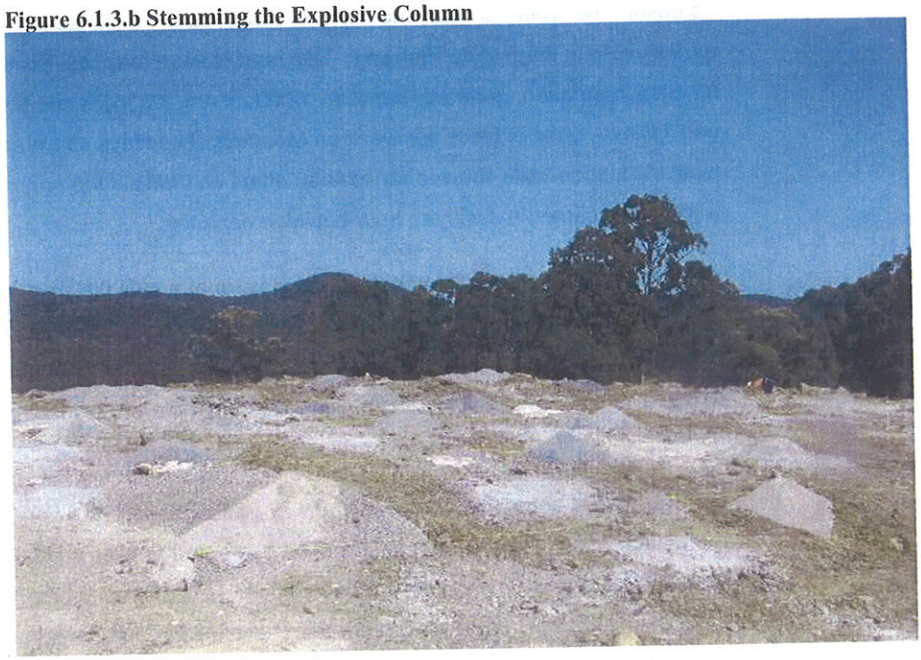
Figure 6.1.3.a Loading the Explosive Column

Once the primer is in place, the remaining explosive column is loaded. Care is taken to protect the leg wires of the detonators. The loading of bulk explosive materials into the drill hole will be checked to ensure that there is no blockage, or if it has passed though a crevice or cave in the drill hole diverting the explosive. The quantity of explosive loaded into each hole will be recorded on the charging sheet (Appendix H). This will prevent excessive loading of the drill hole due to comparisons with the blast design figures. If a cartridge of explosive becomes lodged in the borehole, care must be taken to remove or fix the situation. A retrieval tool can carefully be used; however excessive force, as well as the drill steel or the drill should never be used to force an explosive charge past an obstruction.

When the entire column is loaded, the charge must be confined in the drill hole with an adequate amount and type of stemming. The amount of stemming required will be specified in the blast design. The stemming size will also be determined by the hole diameter used. Like the loading of the explosive, stemming will be conducted by the shotfirer or a person under the supervision of the shotfirer. It will be placed into the drill hole in a controlled manner to prevent bridging, and the quantity monitored to ensure the entire

hole is filled. The stemming height will be recorded for each hole (Appendix H).

Figure 6.1.3.b Stemming the Explosive Column



6.1.4 Blasting Initiation

When the shot has been loaded the detonator leads will be connected in the sequence detailed on the approved blast design. It is anticipated that electronic detonators will be required to effectively control the vibration from the blasts. This sequence will be checked by a BPUA Engineer following the shotfirers check and any issues recorded on the loading initiation sheet (Appendix H). The blast should be detonated as soon as possible. Reducing the time a loaded and connected shot is left in reduces the time of hazardous exposure for employees on site, and also reduces the chances of any one entering the site and becoming in danger from the blast. The main concern at time of detonation is that the area is completely clear and access controlled. Plans to show this exclusion zone can be seen in Appendix I. A Process Control Plan will be followed to ensure all items requiring an action have been completed prior to blasting (Appendix J). The blast controller will coordinate blasting of the shot and take overall control on the day of the blast.

6.2 TRAFFIC & PEDESTRIAN MANAGEMENT

To ensure the safety of local and highway traffic, all of the blasts will require a full road closure of the Pacific Highway. This road closure may result in delays up to 15 minutes in duration, generally between 12:00pm and 12:30pm and between 1:00pm and 1:30pm, once or twice per week on Mondays, Tuesdays and Wednesdays. The blast evaluation trials showed no adverse effect on traffic at the proposed times even with 3 trials carried out with an hour between each trial.

Traffic controllers will implement this road closure at a safe distance (both from the blast site and to ensure safe stopping sight distance) and at a suitable road grade to allow traffic flow to resume quickly. The clear distance for where the traffic is to be stopped is such that the travelling public will not be able to view the blasting operations.

Once the traffic control has stopped highway traffic, BPUA scout vehicles will drive from either ends tailing the last vehicles to ensure and provide confirmation that the area is clear. Queue managers will be positioned at each end of the project to monitor and control this queue if required. There will be multiple advance warning signs and queue managers at each end to facilitate the build up of traffic if required. VMS boards, both mobile and permanent (e.g. Tugun Bypass), will be utilised for advance warning also.

The southbound (SB) off ramp onto Minjungbal Drive and the SB lane of Minjungbal leading to Darlington Drive will remain open. The SB on ramp from Minjungbal will be closed to traffic. The local roads (Laura Street, Short Street, Terranora Road) are located in the middle of the closures. These roads will be closed as required depending on blast location and a BPUA Traffic Scout/s and Pedestrian Scout/s placed at the intersection of the Pacific Highway and the local roads. Right turns out of Terranora Road onto SB Pacific Highway will be permitted while the traffic is stopped via traffic controller hand directions. Right turns out of Laura Street onto northbound (NB) Darlington Drive Link will be permitted while the traffic is stopped via traffic controller hand directions. These roads all have fairly low volumes of traffic and will have clear advance warning signs to advise users of the planned stoppages. Traffic Control Plans for these closures are detailed in Appendix K.

A traffic control setup using a rolling stop has been trialled and will be implemented (Appendix K). It entails adjacent slow moving scout vehicles travelling at 40 km/h concurrently on both lanes of the Pacific Highway Southbound and Northbound; starting a calculated distance away from the traffic control road closure. The objective

is to clear the stopped traffic in front of the scout vehicles allowing the blast to occur with minimal traffic delays on the Pacific Highway.

The Shared User Path and other minor footpaths also run through the blasting exclusion zones and will require blast guards to be positioned to stop and control access into the exclusion zone during the firing sequence.

There will be a number of back yards, balconies, veranda's and pools that will need to be monitored and ensured are cleared of people during the blasting operations. Some residents will need to stay indoors during the blasts. Details of how BPUA will manage this process are contained in Section 7 of this Management Plan. Hold points for this will be included on the process control plan (Appendix J).

Locations for ALL traffic controllers, Blast Guards, The Blast Controller, exclusion zones, properties needing to be cleared, pools, balconies etc will be clearly identified on a specific plan for each blast and provided to each member of the blast control team (Appendix I and K).

Traffic control plans for each location have been developed and will be submitted for RTA review and approval. Once approved, a Road Occupancy Licence would be requested and obtained for the closure of the Highway during the blasting operations.

7.0 COMMUNITY INVOLVEMENT PLAN

This Community Involvement Plan (CIP) for blasting outlines the proposed tasks and activities that will be undertaken by the BPUA Community Relations Team to minimise the impact of blasting on the local community and other road users.

7.1 OBJECTIVES OF THE CIP

The objectives of the CIP are to:

- Provide all residents and stakeholders with advanced information of the effects, management (including implementing mitigation measures), constraints, and duration of blasting;
- Provide a community wide awareness of the blast periods and times; and
- Ensure effected residents and stakeholders are notified and remain indoors during blasting operations or are outside of the designated safety exclusion zone during blasts.

7.2 AFFECTED STAKEHOLDERS

The following groups have been identified as stakeholders who may be affected by the blasting works:

- Property owners who live adjacent to, or in the vicinity of, the blast areas;
- Banora Point residents;
- Directly affected businesses;
- Wider community, including residents and businesses, such as Tweed Heads South;
- Road users including;
    - local traffic
    - through traffic
    - truck traffic
    - bus companies – local and long distant
    - cyclists
    - pedestrians
- Emergency services (in the unlikely event of an accident);
- Tweed Shire Council;
- Department of Lands;
- Educational Facilities;

- Trucking Association;
- Gold Coast (Tugun) Airport; and
- Utility workers on nearby easements.

7.3 TIMEFRAME FOR DISRUPTION

Blasting will occur once per day generally between 12:00 – 12:30pm and 1:00 – 1.30pm and be once or twice per week on Monday's, Tuesday's or Wednesday's.

7.4 COMMUNITY MANAGEMENT MEASURES

The following measures are required to mitigate safety risks to the public from blasting:

- Ensure designated Banora Point residents are given the option of being temporarily relocated or asked to remain indoors during blast periods i.e. clearing backyards, pools, balconies;
- Stop traffic on Pacific Highway during blast periods and carry out rolling traffic stop. This may result into delays up to 15 minutes;
- Stop local roads traffic where required during blast periods. This may result into delays up to 15 minutes;
- Stop pedestrian and cyclist traffic for up to 15 minutes during blast periods.

7.5 STAKEHOLDER ENGAGEMENT AND EXCLUSION ZONE

Banora Point residents are considered a significant stakeholder group that may be impacted by the blasting at Sexton Hill (Appendix L).

The Alliance recognises that the community may be impacted by blasting activities and continues to commit to a policy of 'no surprises - if we know it is going to impact them they will be forewarned'.

It is therefore imperative that residents are notified of the exclusion zone that will be determined from the evaluation blasts. This has been initially nominated at 50 metres from the blast centre.

Following the monitoring of the blasts, the safety perimeter may be reduced in size. This initial 50 metre radius extends to properties in Banora Point. The alliance

recognises that some residents may be required to stay indoors during the time of the blast.

The houses that are predicted to be affected by each blast are outlined below. The houses are within the 50m exclusion zone however to minimise disruption to the residents and by using overburdens and low charge weights it is deemed appropriate for the residents to remain indoors as opposed to be evacuated. The 3m of overburden and stemming will remove the risk of flyrock. We have consulted Orica (a specialised urban blast subcontractor) and John Heilig and Partners who have both advised this is appropriate and consistent with other similar projects.

Blast Location	Address
Cutting South	41 Bione Ave, 43 Bione Ave
Cutting Centre	None
Cutting North	1 Laura St, 12 Laura St

7.6 RELOCATION AND MOVEMENTS OF RESIDENTS DURING BLASTING

7.6.1 Stakeholder notification procedure prior to the blast

The key element to controlling the movements of the affected residents is to ensure that all the affected residents are either indoors or away from their houses at the time of firing of the blast.

The procedure for ensuring this occurs will be developed in consultation with the community, but will generally be as follows:

STEP 1: Notify all affected residents within the 1km radius

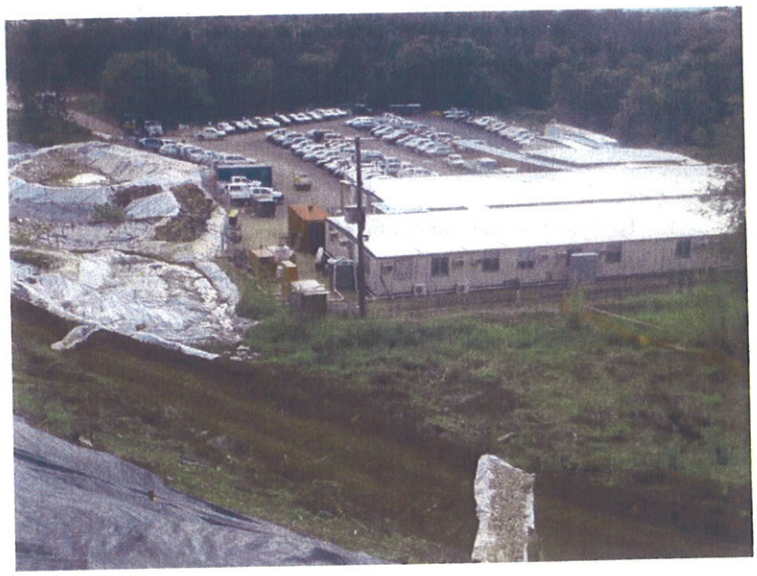
All residents within a 1km radius of the blasts will be notified of the blasting activities via a letterbox drop. The letter will inform them of the blasting works including days of the week, time of the day, number of blasts etc. This notification will be disseminated at least one week prior to the blasting commencing and advice given to the receiver will also include details of the 1800 telephone number and BPUA contact details should they have any concerns.

STEP 2: Identify and advise residents of temporary relocation, letter and doorknock prior to blast

The BPUA will ensure designated Banora Point residents are given the option of being temporarily relocated or asked to remain indoors during blast periods i.e. clearing backyards, pools, balconies.

The details will be provided in a letter (hand delivered during a doorknock) to the resident advising that they need to stay indoors or contact the Alliance if they require temporary relocation during the blasting. The letter will also include relevant contact information of the Community Relations Team should stakeholders have any issues/concerns.

Those who have opted for temporary relocation during the blasting will be notified of transport details. A mini bus or other suitable vehicle would be used to relocate the residents to BPUA's site compound (approx 500m north of blast area). Residents would be escorted to the Community Information Centre where tea and/or lunch facilities would be provided.



Site compound

Community information centre,

STEP 3: VMS signs

In addition, VMS signs within the corridor will be continuously updated advising the next day and time of the blast.

7.6.2 Consultation procedure during the blast

To ensure a consistent and streamlined consultation process during the blast the Alliance will ensure that following activities are undertaken:

- Blasting will be kept to set days per week (Monday, Tuesday and Wednesday) to develop some consistency and allow residents to plan in advance;
- Affected residents will be given the opportunity to make their own way to the relocation site at a specific time prior to the blast taking place;
- A roll call will be taken to determine if any required residents are absent;
- With this information, BPUA staff and blast guards will begin checking each street / house to ensure those who previously indicated that they would like to leave their premises have been picked up in transport provided by the Alliance. They will then be relocated to the site compound.

- BPUA staff and blast guards will begin checking each street / house to ensure all residents who were advised to stay indoors are doing so.
- A final inspection will then be carried out to confirm the required residents are accounted for, and this will be advised to the blast controller;
- The blast siren will sound and the blast will be initiated. Approximately 15 minutes after this, the all clear will be given and residents will be able to come outside.
- It will be suggested that pets are contained indoors during the blasts.
- The Community Relations Team will monitor the 1800 number and manage complaints and follow up on any other enquires in relation to the works. All complaints will be reported in BPUA's monthly report to DECCW and DoP

7.7 COMMUNICATION TOOLS

A range of communication tools will be used throughout the blasting process to adequately inform stakeholders and to ensure all enquiries, complaints and concerns are captured and addressed.

The table below outlines the communication tools to be implemented.

Stakeholder	Communication Tool	Task
Direct contact with closest affected residents	• Face-to-face meetings at homes • Phone calls	• Door knocking of residents in nearest vicinity of the blasts to explain the constraints and requirements for safety during blasts, etc. • Ongoing communication through phone calls and visits.
All stakeholders	• 1800 freecall	• The 1800 freecall number is operational 24 hours a day 7 days a week to answer all project related enquiries.
All stakeholders	• Fact sheet	• A fact sheet will be developed outlining what controlled blasting is, noise and vibration impacts, blast times for the project, and traffic impacts. This will be available at the Community Information Centre and during community information sessions. It will also be placed on the project website.
All stakeholders	• Community Information Centre	• The Community Information Centre is open from 7:30 am – 5:00 pm Monday

		to Friday to assist all stakeholders. • Stakeholders will be encouraged to visit the centre and speak to a community engagement consultant about the blasting works if they have any queries.
Closest residents	• Database development and updating	• A list of affected residents has been developed to allow all resident information to be captured and documented. • The database will capture if a resident has particular needs, is going to be holidays etc. • This list will be used to check off each person to ensure they remain indoors, during the blasting.
Banora Point Residents	• Letterbox drop	A letter will be developed to notify community of works. Distribution within a 1km radius includes: • residents (after direct contact) • property owners • businesses and the wider community where appropriate An additional letter will be disseminated to closest affected residents asking that they stay indoors. The letter will advise of commencement of blasting period, proposed schedule and contact details for further information.
Residents/motorists /businesses	• Traffic Alert	• Advise of traffic stoppages on highway Distribution: • Placed in local newspapers as required during the blast periods and on local radio station broadcasts
Additional stakeholders	• Email	• Summary of blast schedule and traffic alert. Distribution: • Email list which will include bus companies, trucking organisations, local residents, other stakeholders.
All stakeholders Roadside Notice board and VMS	• Roadside Notice board, community information centre noticeboard and VMS	• Constant notification of the next blast activities will be on displayed message boards. These will be installed at the community information centre and at Laura street notifying residents of the next blast date and time. • The message boards will remain in use throughout the period of blasting and be continually updated with the "next blast" information. • Variable message boards will also be used on the northbound and

		southbound Pacific Highway. The 1800 number will also be displayed on VMS and message boards.
Emergency Services and the TSC	• Email	• Advise Emergency Services and TSC of blast activity. • There will be allowance for emergency vehicles right up to the time of blast and straight after the blast has been fired – as coordinated with the Blast Controller and Traffic Controllers. • All other vehicles will remain until the Highway is 'officially' re-opened.
Gold Coast Airport	• Phone call	• Advise of blast activity. • Give the airlines notification of the planned blasting works.
RTA Pacific Highway Traffic Management Centre	• Email/ phone call	• Road Occupancy would be requested and obtained • Informing RTA PHTMC of blasting works. • Liaison with RTA PHTMC will be via the RTA and BPUA Project team. • Phone calls and emails, along with ROLs. Weekly forecasts will be supplied.
Utility Providers	• Phone call	• Advise of blast activity • Regularly inform the utility providers of the planned blasting operations to ensure that there are no workers in the vicinity of the cutting on blast days.
BPUA Project Site Compound staff	• Email/face to face	• Advise of blast activity • All employees to be notified of the planned blasting works. Toolbox talks will be held to discuss the procedures and requirements of personnel during the blasting operations.
Educational Facilities	• Email/ phone call	• Initial consultation regarding blast activity during examination periods • Ongoing communication through phone calls

7.8 POINTS OF CONTACT

The Project Information number, 1800 012 611, is displayed on the Project Information signs at the Northern and Southern ends of the job. The number will also be displayed on the weekly traffic alert, VMS signs during blasting periods, on the website, on emails and any other correspondence that is sent to the public regarding the blasting works.

The BPUA contact for the blast management will be the Project Engineer who will be available to answer any questions in relation to blasting works. The Community Engagement Manager or a member of the community relations team will contact the Project Engineer directly should they require additional information or to advise of community complaints or concerns.