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**HANSON CONSTRUCTION MATERIALS PTY LTD**

**BLAST EXISTING CONDITIONS ASSESSMENT**

**PROPOSED HANSON BUNYIP NORTH QUARRY - WA1438**

**Adrian Moore**  
**September 2019**

# HANSON CONSTRUCTION MATERIALS PTY LTD

## BLAST EXISTING CONDITIONS

### PROPOSED HANSON BUNYIP NORTH QUARRY - WA1438

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#### APPENDICES

Appendix 1: Receptors Map (AECOM)

This existing conditions report provides information on the current condition of the environment at this moment in time only, as per the report date.

An impact assessment will be undertaken as part of the EES process and made available for review at EES public exhibition.

Feedback is welcomed, please contact the Project Manager.

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## **HANSON CONSTRUCTION MATERIALS PTY LTD**

### **BLAST EXISTING CONDITIONS ASSESSMENT**

#### **PROPOSED HANSON BUNYIP NORTH QUARRY - WA1438**

## **1 INTRODUCTION**

Terrock Consulting Engineers was engaged by Hanson Construction Materials Pty Ltd to assess the existing conditions of blasting operations in the area surrounding the proposed Hanson Bunyip North Quarry, Sanders Road, Bunyip North. The existing conditions are presented in this report to meet the scoping requirements of the Environment Effects Statement (EES) for the proposed quarry, and to address questions raised through consultation with the Bunyip North community.

The primary considerations of this report are:

- Ground vibration levels from blasting
- Airblast (overpressure) levels from blasting

‘The terms “airblast” and “overpressure” refer to the low-frequency, sub-audible change of air pressure caused by blasting. The term “noise” refers to higher frequency emissions that are within the range of human hearing. The audible emissions from blasting are not currently subject to regulation. An assessment of audible noise impacts from proposed quarry operations is to be provided by qualified acoustic consultants.

Potential dust loads from whole quarry operations is to be assessed in a report from consultants qualified in this field to meet the requirements of the EES.

For the purposes of this report, the terms “sensitive site” and “receptor” are interchangeable.

## 2 BACKGROUND

The proposed Hanson Bunyip North Quarry (Work Authority No. 1438) is located at Sanders Rd, Bunyip North and is anticipated to be a supplier of high-quality granite products to meet the future needs of the local construction industry. Blasting is required to extract the rock for crushing and processing into useable grades of aggregate and other materials for sale. The location of the proposed quarry and details of the surrounding area shown in the Site Plan **Appendix 1**.

### 2.1 EES SCOPING REQUIREMENTS

This report intends to address (but is not limited to) the Scoping Requirements of the EES and present the existing conditions. The key issues, priorities and assessment requirements relevant to blasting impacts shown in Section 4 of the EES Scoping Requirements (September 2017) are;

#### Key issues

- *Disturbance and/or degradation of adjacent habitat that may support listed species or other protected flora or fauna.*
- *Potential for nearby residents to be exposed to excessive noise or vibration.*
- *Public safety hazards during quarry establishment, operation, rehabilitation and post closure, including in relation to use of explosives and the excavation of a deep void in the vicinity of existing dwellings, the geotechnical stability of the quarry and rehabilitated landform and bushfire response.*
- *Potential impacts on existing local industries, businesses, farmers and landholders.*
- *Short-term and potentially permanent effects on the landscape values and recreational values of the project vicinity, including but not limited to Mount Cannibal Flora and Fauna Reserve.*

#### Priorities for characterising the existing environment

- *Identify dwellings and any other potentially sensitive receptors that could be exposed to project-related air quality, noise or vibration impacts.*
- *Characterise air emissions and noise and vibration generation by proposed quarry activities, including processing, handling and transport within the site of extracted stone, crushed rock products and overburden.*
- *Describe local industry sectors including tourism and farming in the project area which could be affected directly or indirectly by the construction and operation of the project.*
- *Characterise the visual character and associated landscape, amenity and recreational values of the project vicinity.*

#### Design and mitigation measures

- *Identify potential and proposed design options and measures which could avoid or minimise significant effects on or in the vicinity of the project site on native vegetation and any EPBC Act listed ecological communities or threatened flora or fauna species or listed migratory species or any other listed threatened or protected flora and fauna species and their habitat.*
- *Describe and evaluate both potential and proposed design responses and/or other mitigation measures (including quarrying processing equipment and methods, and staging and scheduling of works), which could minimise noise and vibration and effects on sensitive receptors.*
- *Describe and evaluate potential and proposed design and mitigation measures that could ensure public safety during quarry development, operation, rehabilitation and post-closure and prevent the exposure of people to intrusive or hazardous levels of noise or vibration or other elevated risks.*

#### Assessment of likely effects

- *Assess the direct and indirect effects of the project and relevant alternatives on protected fauna, especially listed threatened species under the EPBC Act or FFG Act and listed migratory species under the EPBC Act.*
- *Predictions of likely vibration levels at dwellings in the vicinity of the project area, describing any sources of uncertainty associated with vibration modelling.*
- *Assess potential safety hazards and health risks to the public arising from the project.*
- *Assess potential social, local economic, farming and land use impacts arising from the project.*
- *Assess the effects of the project and relevant alternatives on; recreational values in the vicinity, especially but not only with respect to Mount Cannibal Flora and Fauna Reserve.*

### **Approach to manage performance**

- *Outline and evaluate proposed additional measures to monitor and manage noise and vibration levels to minimise residual effects and ensure compliance with relevant standards.*
- *Describe and evaluate any proposed measures to mitigate or manage public safety hazards and public health risks.*
- *Describe and evaluate any proposed measures to mitigate or manage potential social, local economic, farming and land use impacts.*
- *Describe and evaluate any proposed additional measures to mitigate or manage effects on landscape, visual amenity and recreational values, including in relation to the configuration and staging of works.*

## **2.2 KEY ISSUES EMERGING DURING CONSULTATION ACTIVITIES**

Stakeholder consultation on the Draft EES Scoping Requirements resulted in the emergence of specific queries, some of which pertain to blasting and the use of explosives at the proposed quarry. Some of these issues are addressed within this report and are listed as follows;

- The potential cumulative impacts of the proposed quarry with existing quarries in the area.
- The effect of blasting on livestock, with emphasis on the effect on horses.
- The effect of blasting on farm dams, groundwater and spring activity.
- The effect of blasting on slope stability of the surrounding area.
- The effect of blasting on the amenity of the Mt. Cannibal Flora and Fauna Reserve.
- The effect of blasting on granite outcrops located at or near the summit of Mt. Cannibal.

## **3 EXISTING CONDITIONS**

### **3.1 GEOLOGY**

A substantial resource of high-quality granite underlies WA1438. The rock is classed as Late Devonian Tynong Granite by GeoScience Victoria and typically exhibits moderate weathering through an upper layer overlying a more consistent, massive structure with widely spaced jointing planes. While exploratory drilling and sampling of rock at quarries is conducted to determine its quality and value as a commercial product, the precise properties of the rock is not an important consideration for assessing the impacts of blasting.

### **3.2 SURROUNDING LAND USE & RECEPTORS**

The area surrounding the proposed Bunyip North Quarry consists of rural residential properties containing occupied houses, sheds and dams. Some agricultural businesses operate in the surrounding area and some properties are used for small scale livestock grazing, horse riding and agistment.

The area contains scattered pockets of bushland and creek corridors and road reserves lined with native vegetation. The most significant area of bushland is the Mt. Cannibal Flora and Fauna Reserve that adjoins private properties adjacent to the western boundary of the Work Authority. Various species of native fauna found in this region of Victoria inhabit the area.

The surrounding land use and locations of sensitive sites/receptors identified within 1 km of the WA1438 boundary are shown in the **Appendix 1** site plan.

## **4 PROJECT DESCRIPTION**

### **4.1 PIT EXTENT**

The footprint of the proposed extraction area is located on an undulating foothill that extends east from Mount Cannibal. Topsoil and overburden is required to be excavated to expose the granite resource and this material will be stockpiled for progressive rehabilitation works.

Final pit design shows a 68.76 Ha extraction area with a minimum 100m buffer zone between the extraction limit and the boundary of the Work Authority. Blasting is proposed to be conducted on production benches with a standard face height of 14m. Staging plans show a maximum 10 benches/levels to the south and west, and 8 benches to the north and east. The extraction area has been significantly reduced from the original proposal and the separation distance between the Stage 4 extraction limit and the closest receptors has been increased.

### **4.2 STAGING**

Extraction is proposed to occur over four stages. Stage 1 (Years 1-8) is to open an extraction area adjacent to the processing plant with blasting operations progressing through a slot to the west. The following stages widen the pit to the south (Stage 2), northeast (Stage 3), then in a west and northerly direction through Stage 4 to the extraction limit.

The blasting area of Stage 1 is the most remote extraction from neighbouring residences. This will ensure ground vibration and airblast levels at sensitive sites from early blasting are relatively low and will allow quarry management to become familiar with the behaviour of the granite under blasting and local ground conditions including the characteristics of vibration transmission around the site. Observations and blast monitoring data recorded over the first few stages would also help guide any blast design modifications that may be needed to reduce ground vibration and airblast levels as operations approach neighbouring properties during later stages.

### 4.3 PRODUCTION RATES AND FREQUENCY OF BLASTING

The quantities of granite proposed to be extracted during each stage (based on full production estimates) is shown in **Table 1**.

*Table 1 – Staging Plan and estimated production*

Stage No.	Year completed	Approx. Volume extracted (m <sup>3</sup> )	Tonnes extracted
1	8	3,000,000	8,300,000
2	10	1,550,000	4,200,000
3	16	4,333,000	11,700,000
4	69	39,000,000	105,300,000

<b>Total</b>	<b>47,883,000</b>	<b>129,500,000</b>
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Production rates at quarries are limited by the capacity of their crushing and screening plants. Early production is proposed to be undertaken using a mobile processing plant with a capacity of 500,000 tonnes per annum (tpa) during Years 0-5. The construction of a fixed plant would permit full production from Year 6 at a maximum rate of 2,000,000 tonnes per annum. Production rates also fluctuate with market demand for stone products and therefore the number of blasts fired over each year typically varies. Other factors that may limit the frequency of blasting include the availability of blast hole drilling contractors and explosives supply.

The volume of rock extracted from a quarry blast is proportionate to the bench height, the number of blast holes and the spacing between holes. A blast with 100 holes is around the upper scale for hard rock quarrying. Based on standard blast design specifications (see **Table 3**) and the average density of granite (2.7 tonnes/m<sup>3</sup>), a blast of 100 x 89mm diameter holes will yield approximately 34,020 tonnes. For a blast with 100 x 102mm diameter holes, around 41,175 tonnes of granite is extracted.

Assuming an average 100 holes per blast, the approximate number of blasts per year required to meet the maximum production rates are shown in **Table 2**. At can be seen that fewer blasts would be required to meet production targets by using 102mm blast holes

*Table 2 – Estimated Blasting Frequency (at full production)*

	No. Blasts/year (89mm Ø holes)	No. Blasts/year (102mm Ø holes)
<b>500,000 tpa (Years 0-5)</b>	15	12
<b>2,000,000 tpa (Years 6-69)</b>	59	48

Around one blast per month would be required during the first 5 years. Based on recent demand for aggregate products and the experience of other quarries with 2,000,000 tpa processing plants, it is anticipated that blasting would be conducted at an maximum frequency of one blast per week during full production.



## 5 RELEVANT CRITERIA

### 5.1 GROUND VIBRATION AND AIRBLAST LIMITS

Blasting operations at quarries are currently regulated under state legislation by the Department of Jobs, Precincts and Regions (DJPR). The department's Earth Resources Regulation (ERR) branch provides guideline limits for ground vibration and airblast overpressure that are found in the ERR Guidelines and Codes of Practice; *Ground Vibration and Airblast Limits for Blasting in Mines and Quarries, Section 3.2: New Sites*. The limits apply at "sensitive sites", which are defined by ERR as "...any land within 10 metres of a residence, hospital, school, or other premises in which people could reasonably be expected to be free from undue annoyance and nuisance caused by blasting." The sensitive sites around the proposed quarry are occupied residences (houses).

The ERR Guideline Ground Vibration and Airblast Limits for new mines and quarries are:

**Ground Vibration:** < 5 mm/s (PPV) for 95% of all blasts  
≤ 10 mm/s (PPV) for all blasts

**Airblast:** < 115 dBL (Linear Peak) for 95% of blasts  
≤ 120 dBL (Linear Peak) for all blasts

The ERR limits are the primary control measure for preventing excessive ground vibration and airblast levels from blasting operations at quarries. Compliance with the limits is required for all blasting and exceedances may result in fines and penalties for quarry operators and shot firers. The upper limits (10 mm/s and 120 dBL) provide an allowance for the occasional unanticipated exceedance of the lower (95%) limits. However, compliance with the lower limits (5 mm/s and 115 dBL) is considered by quarry operators to be the target for all blasting.

It should be noted that the ERR limits are based on human comfort considerations and are lower than limits commonly used to prevent damage to buildings. From the ERR Guidelines,

*"The ground vibration and airblast limits recommended by the Guidelines have been set to minimise annoyance to people as a result of blasting on mine and quarry sites. They are therefore considerably lower than the levels that could give rise to damage to competent structures."*

A blasting window (the daily period in which blasting is permitted) is specified as part of a quarry's operating conditions. Blasting is generally only permitted at quarries from Monday to Friday between 10am and 4pm and it is assumed a similar time window would apply at the proposed quarry.

## 6 SENSITIVE SITES/RECEPTORS NEAR THE PROPOSED QUARRY

A Receptor Map (supplied by AECOM) showing the locations of sensitive sites/receptors in the wider area around the proposed Bunyip North Quarry is shown as **Appendix 1**. Because ground vibration and airblast levels are highest near the source and reduce with increasing distance, the blasting impacts at houses within 1km of potential blasting are the primary consideration for this assessment.

Twenty five sensitive sites (occupied houses) have been identified within 1km of the proposed Stage 4 extraction limit. The four closest sites are shown on the AECOM Receptor Map as dwellings;

- #015 – 217m east (Sanders Road)
- #099 – 221m northwest (Wallaby Court)
- #012 – 224m northeast (Sanders Road)
- #096 – 243m northwest (Wallaby Court)

The closet potential blasting to these dwellings is in the northwest and northeast corners of the Stage 4 extraction area and sequence plans suggest blasting is unlikely to approach these areas until mid to late Stage 4 extraction (Years 40-60). This would provide ample time for quarry management to determine any modifications of standard blast design that may be needed to ensure ongoing compliance with the ERR limits at these dwellings.



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**September 2019**

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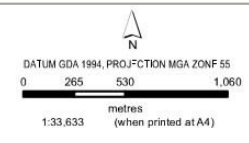
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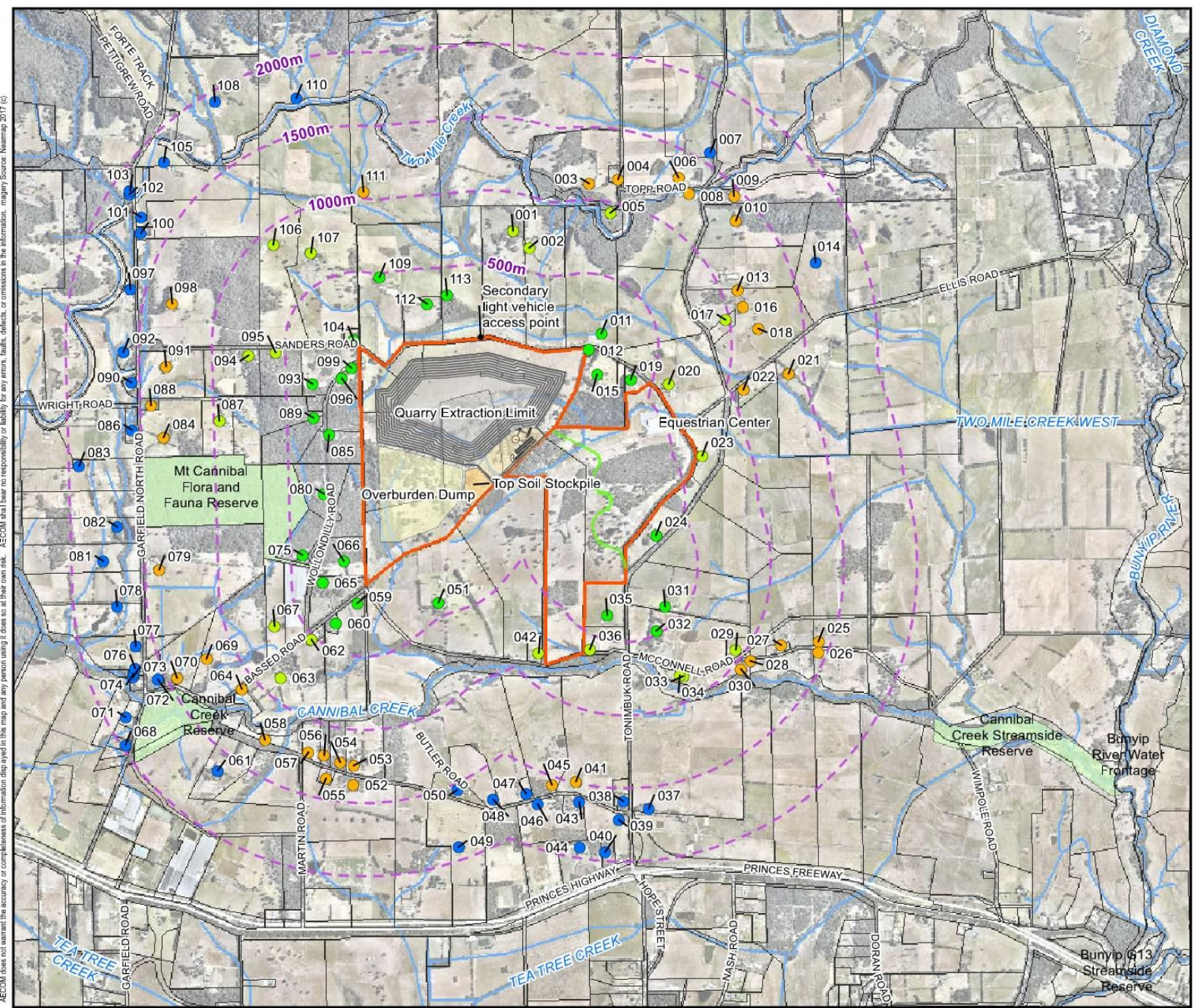


- Legend**
- Dwellings distance from Project boundary (metres)**
- 0 - 500
  - 501 - 1000
  - 1001 - 1500
  - 1501 - 2000
- ▭ Hanson Property
  - ▭ Access Road (sealed)
  - ▭ Overburden Dump
  - ▭ Top Soil Stockpile
  - ▭ Parks and Reserves
  - - - Distance from Project boundary
  - ▭ Plant Works Area
  - ▭ Quarry Extraction Limit

Data sources:  
 aerial imagery Nearmap 2018 (c)

**Receptor Map - Dwellings**

Hanson Bunyip North Quarry EES	Figure <b>F3-1</b>
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