Duration and Intensity of excavation operations

The duration of the quarry is predicted to have a lifespan of between 35 and 40 years. It is difficult to predict the exact volume of material within the proposed quarry as there is insufficient geotechnical investigations over the entire area. It is also difficult to predict the actual annual extraction at any one time as this will be based on demand.

Estimated total resource from natural surface (figure 2.1) to proposed quarry design (figure 2.2) is approximately 4,435,000bcm.

The staging diagrams figure 2.4 to 2.18 show the approximate year bracket for the quarrying of each area based on an annual extraction rate of 120,000 bcm. These figures are an estimation of the total volume and have not been based on any geotechnical reports or testing.

Method of Operation

The proponent is planning to campaign mine the site, meaning the product will be excavated and stockpiled. When a sufficient volume of material is stockpiled excavation will cease and processing begin. This type of operation makes efficient use of machinery and minimises noise and dust impacts during different processes. It is anticipated that the material in stage 1 can all be extracted mechanically using a their current methodology involving an excavator. The density of material at lower depths is not known and while mechanical excavation is the preferred methodology as it is the most cost effective a drill and blast regime may be required for stage 2 and 3.

Drill and Blast Regime

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

Blast design assumptions include;

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

Max Blast Rate
If an average depth of 10 meters is used there would be approximately 110-120 holes loaded per blast to maximise the loading efficiencies.

Blast area for environmental calculations would be between 1700 and 1800m2 on a 10m bench. For example stage 1.5 has a surface area of 15,500m2, potential extraction of 215,500bcm, if all material was extracted using blasting 12 blasts would be required (215,500/18,000), and the blast area would be 1,300m2 (15,500/12).

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

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

Charge Deviation Rate
10 percent from design.

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

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

List of potential machinery to be used on site

Machinery	Use
50 Tonne Jaw Crusher (McCloskey C50)	Processing
Triple deck screen	Processing
Cone crusher	Processing
Excavator	Road Construction & Processing
Grader	Road maintenance and initial construction
Water cart	Dust suppression, Road maintenance and vegetation maintenance
42 tonne Articulated dump truck	Road Construction & Processing
D10 Bulldozer	Road Construction, Stripping overburden and rehabilitation/landform shaping
Front end loader	Truck loading, processing and moving stockpiles.
Roller	Road Construction
32 Tonne Truck and Dog Trailer	Hauling (by contractor)

(Details provided by Gunnedah Quarry Products)

Details of the proposed Haul Route

The current operation's approved haul route is along Barker Road ('Beulah' entrance to Goolhi Road). It is proposed to be maintained with an anticipated 50:50 spilt with haulage back via Goolhi Road to the Kamilaroi Highway at Emerald Hill and via Quia Road to the Oxely Highway at Gunnedah. This proposed route is shown in the attached figure 2.19. The operations are predicted to generate an average of 88 movements a day (44 loaded movements).

Ardill Payne have been engaged to prepared a traffic impact study for these routes and a voluntary planning agreement between the proponent and Gunnedah Shire Council to cover the maintenance costs associated with the proposed development on local roads. The traffic study (refer section 4.5) of this report concludes that the traffic generated by the development represents approximately 6.4% of the total traffic generated on these road. The traffic impact assessment outlines a number of recommendations to mitigate impacts of the operations on local roads and improve the haul route condition.

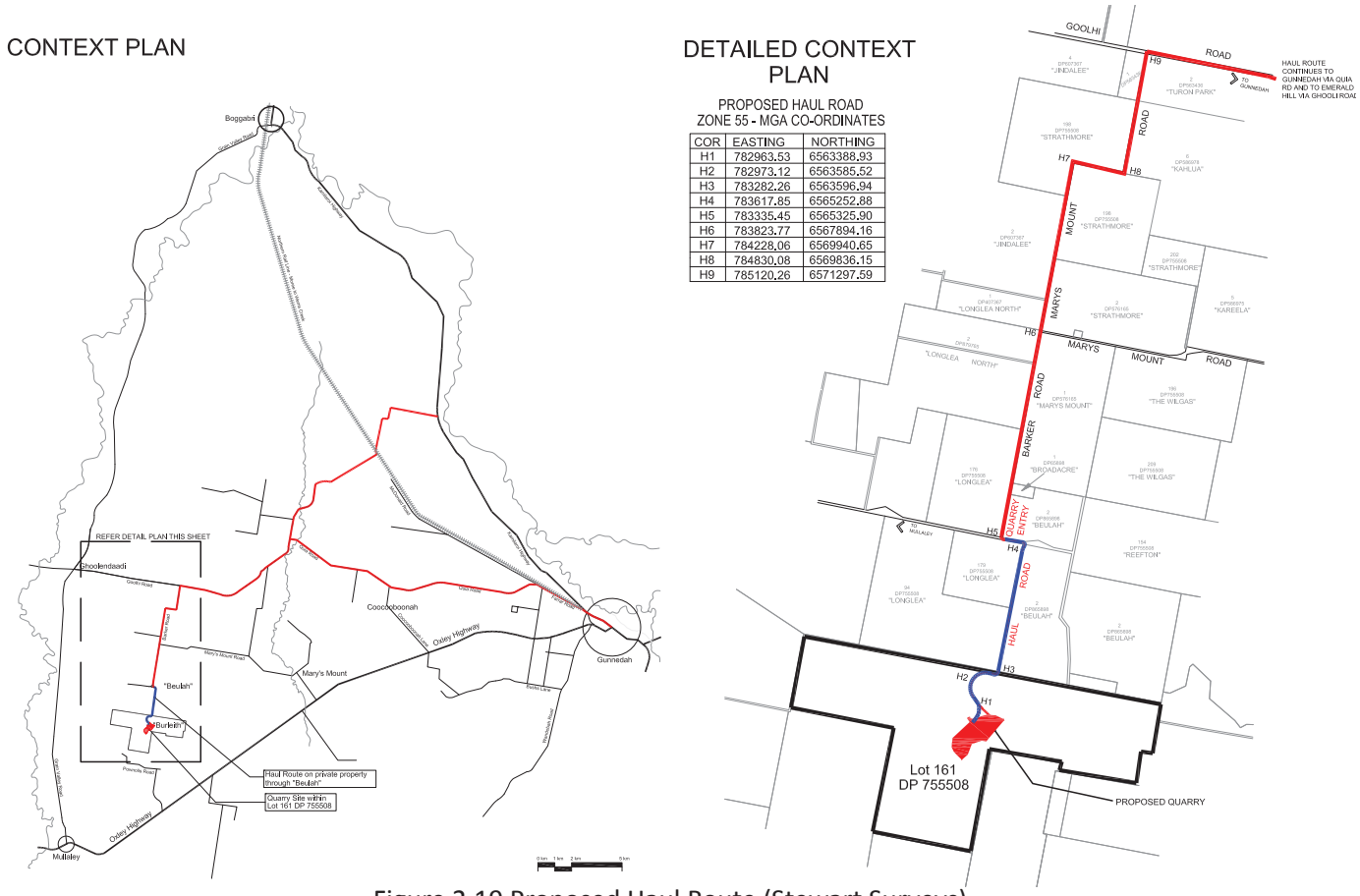

Figure 2.19 Proposed Haul Route (Stewart Surveys)

The gravel products are hauled by sub-contractors using truck and dog tailer vehicles. Each vehicle has the capacity to carry up to 32 tonnes when loaded. Under the current approval this equates to approximately 2,813 loaded haulage movements per year. If the maximum approved quantity is extracted this would equate to 11,613 loaded truck movements per year. In full operation using a loading capacity of 10 minutes per truck and dog on a day light savings day 60 truck and dogs movement would be the peak loaded movements occur per day. This is based on the current loading machinery, as there are no current plans to increase loading capacity in the quarry.

Full details of the haul route and traffic impact statement is outlined in section 4.5 of this report.

Final landform and final use

The quarry staging will result in the higher ground being quarried and shaped progressively deepening to the final pit levels. The existing grade of the hill where the quarry is proposed, has an existing slope ranging from 11 degrees to 18 degrees as shown in the existing survey figure 2.1. The final landform has been based on the precedent developed by Hannan, 1995 outlined in the following document;

Managing Urban Stormwater – Soils and Construction: Volume 2E Mines and Quarries published by the NSW Department of Environment and Climate Change in 2008.

This precedent is shown in figure 2.20 from the above document.

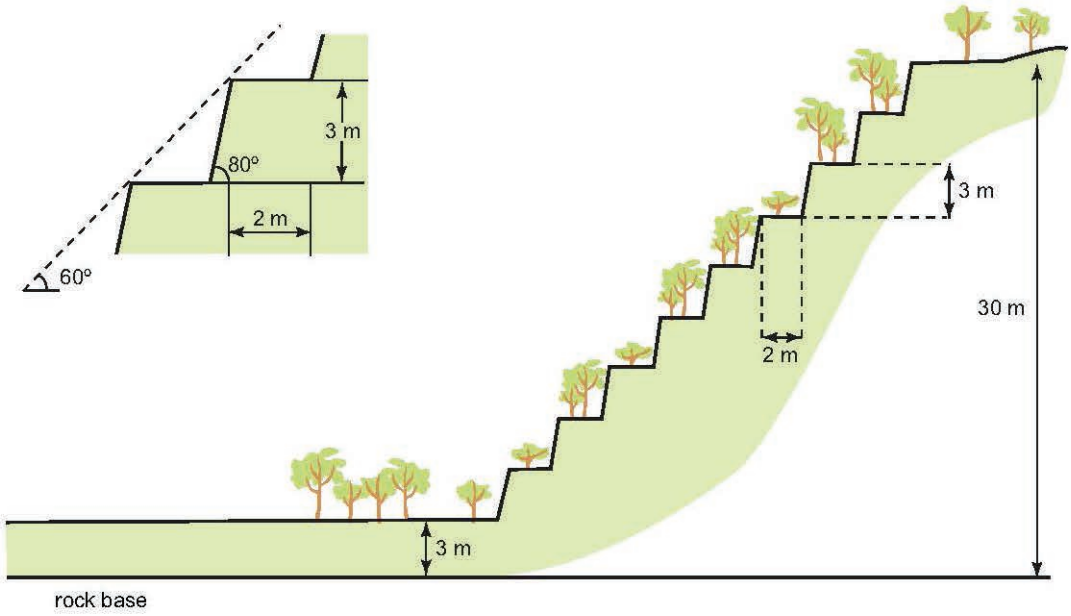

Figure 4.3 Example of revegetation of benches – cross section (source: Hannan 1995)

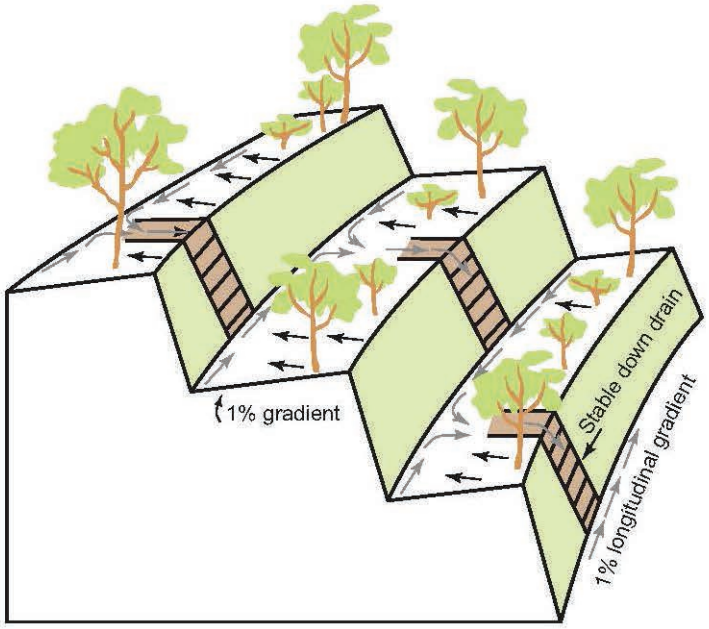

Figure 4.4 Example of design parameters for quarry benching
(source: Hannan 1995)

Figure 2.20 Precedent proposed quarry benching (Hannan, 1995)

The proposed benching at the quarry will be 5 metres wide at 10 metre vertical intervals. These benches will be constructed with in-fall drainage and a longitudinal grade of 1%. As water run off has not been an issue on the site, with water being absorbed into the fractured rock quickly, stable down drains to manage stormwater will be installed at approximately 150 metre intervals. The Hannan example shown in figure 2.20 outlines the slope to have an overall averaged slope of 60/120 degrees. On the subject site a less steep angle of 45 or 135 degrees is proposed as shown in the typical cross section figure 2.21 below.

The 5 metre wide terraces provide an opportunity to re-vegetate the terraces with native trees and shrubs, reducing the visual impact of the final void from the surrounding area. It would also be wide enough to allow vehicle access on some terraces.

The overall height of the high wall varies and in the worst case is 85 metres from the pit floor to the existing hill scape grade. Benching will occur around three sides of the proposed quarry, with levels meeting natural grades at the north eastern extent of the quarry. The benching height along the northern and western boundary of the quarry is up to 32 metres. The overall quarry design contours does not show this proposed benching. The redesign of the quarry outlined in this amendment results in a reduced visual impact of the operations from surrounding areas.

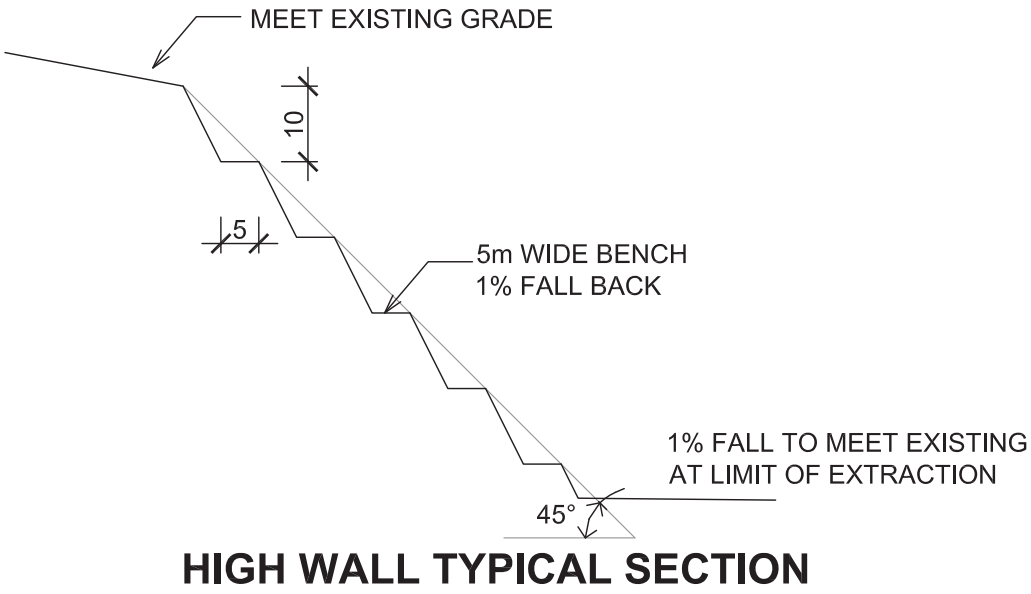

Figure 2.21: Proposed high wall benching typical section

The benefits of this approach to the high wall allows the benches to be planted providing improved visual amenity following the quarry operations. It also creates a safer high wall where in the case of an accidental fall the furthest someone would fall is 10 metres. If the high wall was not benched and sloped at 45 degrees from top to bottom the risks of injury from an accidental fall would increase substantially.

Following completion of the quarry a fence will be constructed along the top of the high wall to provide a barrier for wildlife and people in this higher area.

The final use for the quarry site will be revegetated and lower slopes will return be to light grazing.

Likely interactions between the proposed operations and existing/approved development and land use in the area

The surrounding landuse at the subject site is agricultural. Generally properties are large holdings and operate as full time farming operations in crop and grazing ventures. There are no known extractive industries in the immediate vicinity of the site.

The village of Mullaley with a population of 207 people recorded in the 2006 Australian Census is located approximately 10 kilometres by road from the subject site. Aside from residential uses the village contains a local primary school which enrols 26 students (2011, annual report) and 7 staff, local businesses, including agricultural suppliers and mechanics, general stores and post office.

Other residences in close proximity to the site are sparsely distributed with 13 residences within a 4 kilometre radius of the proposed quarry.

The impacts of the quarry operations on these existing land uses and developments in the area including potential impacts on traffic particularly along the haul route, potential impacts on health from dust and noise generation, and amenity impacts such as visual impact.

Barker Road is a local scale gravel road which is a no through road. This road is most heavily used during crop harvest time, with local access to properties and school bus drop off occurring on a daily basis. Goolhi Road provides a connection between rural properties in the areas and Quia Road through to Gunnedah or Goolhi Road to Emerald Hill. These roads are used by both heavy vehicles and domestic cars. As outlined above the proposed increase in traffic as

a result of this development will be 6.4% (Ardill Payne). It is not expected that the proposed operations will impact detrimentally on the farming operations on nearby properties.

The cumulative impacts of dust particularly during crop harvest may impact the wider area around the quarry. The quarry operation has put in place a number of mitigation measures to deal with the dust generated from the development as outlined in section 4.7 of this report.

It is concluded that the proposed development will have minimal impact on surrounding existing operations within the area. Both the proposed development and existing surrounding land uses can co-exist without impact the other detrimentally.