Ballina Shire Council

Valuation of Tuckombil and Stokers Quarries

October 2015

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Alan Robertson RPEQ 05642	Director (Ausrocks)	QA & RPEQ Certification		29/10/2015

This document has been prepared for the exclusive use of the client on the basis of instructions, information and data supplied by the Client (Ballina Shire Council) as at October 2015. This document has been prepared by Ausrocks Pty Ltd, Ausrocks has no financial association with the Client other than carrying out this report as requested by the Client.

EXECUTIVE SUMMARY

Ausrocks Pty Ltd (Ausrocks) has been commissioned by the Ballina Shire Council (BSC) to complete an Internal Valuation for their Tuckombil and Stokers Quarries. The sites are located in on the eastern side of Alstonville with Tuckombil Quarry located on the north-eastern edge of town next to the hockey fields and Stokers Quarry is located between the Bruxner Highway and Gap Road. Tuckombil Quarry operates on a campaign basis predominantly supplying the adjacent asphalt plant with quarrying activities currently abandoned at Stokers Quarry.

The Tuckombil site is on Lots 2 and 4/1130300 (total 36.4ha) and the Stokers site is on Lot 10/DP712025 and Lot 12/DP814359 (total 27.01ha).

The Development Approval for Stokers Quarry was obtained in 1995 (DA1995/274) and approval for an amendment was made on 19 December 2013 and the approval is reviewed each 5 years in terms of rehabilitation performance and environmental management to permit another 5 years operation.

The Development Approval for Tuckombil Quarry was also obtained in 1995 (DA1995/276) and approval for an amendment was made on 3 August 2013 and the approval is reviewed each 5 years in terms of rehabilitation performance and environmental management to permit another 5 years operation.

Development Approval for Stokers Quarry is for a 14,000m^3/a maximum extraction rate from 2014 for a total of 330,000m^3 over 30 years. Development Approval for Tuckombil Quarry is for a 100,000t/a maximum extraction rate from 2014 for a total of 450,000m^3 (1.3Mt).over 30 years.

Previously Ausrocks completed Resource Estimations and Quarry Development Plans (QDP) for Ballina Shire Council which form the basis of this valuation. Survey data was generated from an aerial LiDAR survey completed by Atlass (Aust) Pty Ltd and generated data from the Queensland Government (QLD globe data) via Google Earth. In addition information was also sourced from discussions with Quarry Manager Jon Rigley regarding a realistic extraction rate and plans. The survey coordinate system is in GDA94 (Zone 56) on UTM Projection/ Australian horizontal datum.

This valuation document addresses the following:

- Provide a valuation for Tuckombil and Stokers Quarry, which includes an asset-based valuation and a Net Present Value (NPV) based valuation.
- Investigate potential blending opportunities between Stokers and Tuckombil material. Complete laboratory tests for (California Bearing Ratio (CBR), Bulk Density and particle size density (PSD) and check against the specifications for DGS and DGB roadbase.
- Assess the cost of removing and selling overburden from Tuckombil and potential sales of material based on local demand.
- Assess Stokers Quarry Rehabilitation Costs
- Review the Cost-Benefit analysis of the combined Tuckombil-Stokers operation (transporting material from Stokers to Tuckombil).

Surpac software version 6.4.1 was used to develop a 3D model of the quarry including a pit design, governed by the local geological and geotechnical factors, bench design parameters, proposed extraction area and cadastral boundaries with the assumption that the material quality is consistent.

Executive Summary

AUSROCKS

A total of three financial analysis scenarios were completed for valuation of the project based on a number of various assumptions. These were as follows:

- **Scenario 1**: Operations proceed as normal. Tuckombil operates at 61,200 t/a and Stokers produces 18,800 t/a.
- **Scenario 2**: Operations proceed as normal. Tuckombil operates at 80,000 t/a with Stokers placed into Care and Maintenance and is progressively rehabilitated.
- **Scenario 3**: BSC Continues royalty agreement as is currently in place for the next 10 years at current production rates of 40,000t/a.

Conclusions

1. Potential Market

The largest potential market in the short term (2016-2021) is the Pacific Complete Pacific Highway upgrade from Woolgoolga to Ballina, managed by Lang O'Rourke and Parsons Brinkerhof. There are large demands for general fill which could be readily made available from Stokers or Tuckombil, provided the areas proposed to be disturbed are included in the DA area. It is unlikely that other quarries in the area could supply the volumes required and it is likely that Tuckombil or Stokers could be competitive where haul distances to the Pacific Highway upgrade are short.

2. Asset Valuation

- Resource Value (DA Approved)
  - Tuckombil**: $0.99M**
  - Stokers: **$0.38M**
- Resource Value (Future potential DA Approval))
  - Tuckombil: **$1.67M**
  - Stokers: **$0.98M**
- Land Unimproved Value (1 July 2014)
  - Stokers (26.98ha): **$755,000**
  - Tuckombil (46.4ha): **$1,405,000**
- Site Infrastructure Improvements
  - Tuckombil (excludes Boral Facility): **$0.075M**: Roads, weighbridge, office.
  - Stokers: Nil
- Short-Term Contracts Value and Stock on Hand:
  - Excluded from this valuation

Total Asset Value: $6.255M; Stokers: $2.115; Tuckombil: $4.14M

3. NPV Analysis

Scenario 1: The Net Present Value for Scenario 1, as assessed by Ausrocks using a number of assumed parameters based on operating Tuckombil and Stokers quarries together to produce basalt, argillite and blended products is in the range **$0.1.3M to $5.6M** with the base case being **$2.89M.**

Scenario 2: The Net Present Value for Scenario 2, as assessed by Ausrocks using a number of assumed parameters based on operating Tuckombil and placing Stokers quarry under care and maintenance whilst progressively rehabilitating the site. The Net Present Value is in the range of **$1.5M to $3.21M** with the base case being **$2.32M.**

Scenario 3: The Net Present Value for Scenario 3, is similar to the current Scenario in which BSC continues on with a leasee operating the quarry and a royalty being paid back to the council. As assessed by Ausrocks using a number of assumed parameters is in the range of **$0.60M** to **$2.03M** with the base case being **$ 0.91M.**

Ausrocks recommends a valuation in line with the base case for **Scenario 1** being representative of the project value at present and would recommend that a sale price for the project (ie Tuckombil and Stokers) in the range **$4M-$6M**. Ausrocks has indicated that the split of values for the project as follows:

- Stokers: **$1.5M-$2M**
- Tuckombil: **$3.5M- $4M**

As indicated, depending on the market, buyers available and the short term development of the project, the realisable value at sale should be not less than **$4.0M** in any circumstances.

From the current constraints in place at Stokers Quarry it is clear that for the quarry to operate it must be done so in conjunction with the operation of Tuckombil Quarry. At Stokers Quarry, sensitive receivers prevent crushing and screening of aggregates and blasting is confined by the Bruxner Highway to the South of the quarry and site works are to be completed prior to the recommencement of extractive operations. The following is recommended in regard to this study. M3

4. Blending of Stokers and Tuckombil Material

Ausrocks commissioned material testing of a blend supplied by Lismore City Council for meeting DGB20, DGS20 and MB20 roadbase. Excellent results were obtained, utilising the strength properties of the basalt and the plasticity properties of the argillite. This option provides the best NPV ($for BSC with the highest NPV obtained if the quarries operate at maximum approved rates of extraction

5. Rehabilitation Costs - Stokers

Stokers Quarry can be rehabilitated in three stages, depending on the amount of material extracted. The volume that can be extracted, the volume of material required for rehabilitation and the cost of rehabilitation is summarised in the table below. Note that Stage 1 is a minimum rehabilitation requirement if the site is to be rehabilitated without any further extraction,

Stage	Reserve (bcm)	Rehab Material (m^3)#	Cost ($)
Stage 1	138,385	59,318	$258,232
Stage 2	253,057	59,372	$255,835
Stage 3	1,225,579	103,463	$453,147

#Rehab material may be utilised from the Reserve or imported.

Alan Robertson

Director, RPEQ 5642, Ausrocks Pty Ltd

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GLOSSARY OF TERMS

Bank Cubic Metres (BCM or bcm): The net quantity of a material prior to excavation. Often referred to as in-situ, or undisturbed.

Batter Angle: The slope angle to the horizontal of the pit walls of a quarry or mine.

Bedding: The smallest division of a geological formation or stratigraphic rock series marked by well-defined divisional planes, separating it from the layers above and below.

Barricade: A barrier installed in a quarry which is located to prevent access into that part of the quarry. A sign is normally installed on the barricade which confirms its used and who is authorised to remove it or pass through it.

Bench: The horizontal or near horizontal profile/s of a quarry surface that is excavated primarily to catch rocks falling from above and provide a drainage path for rainwater and seepage water. The main bench parameters are the width, the height between benches and the batter angle

Berm/Bund: An earth wall often created by equipment for the purposes of safety. As a rule of thumb a safety bund should be constructed to half the height of wheel of the largest piece of equipment. A fall berm on the quarry floor or a bench is a berm that will safely catch any rock falling from a bench above. No persons should enter the area between a fall berm and the toe of a bench.

California Bearing Ratio (CBR): A penetration test for evaluation of the mechanical strength of road subgrades and base courses.

Campaign Mining: Intense mining strategy which involves utilising equipment for a short duration of time to achieve a large output that is stockpiled and sold slowly. Often used in conjunction with crushing and screening contracts.

Competent Person: A competent must be a member of fellow of The Australasian Institute of Mining and Metallurgy, or of the Australian Institute of Geoscientists, or of a 'Recognised Professional Organisation'. The person must have a minimum of five years' experience working with the style of mineralisation or type of deposit under consideration and relevant to the activity which that person is undertaking.

Design Parameters: Values assigned and assumptions made to key pit specifications which allow to pit designs to be generated.

Dip: The orientation or attitude of a geologic feature. The dip gives the steepest angle of the descent of a tilted bed or feature relative to a horizontal plane and is given by the number (0-90 degrees) as well as a letter (N, S, E, W)

Geotechnical: In engineering terms this is a branch of civil engineering concerned with the engineering behaviour of earth materials.

In-situ: A Latin phrase that translates to "in original position". Often referred to with BCM.

Job Safety Analysis (JSA): A risk management tool that is used prior to working on a task on a site that is not a normal routine task or requires special safety considerations and procedures. The JSA should be signed off by all personnel involved in the task as well as the Site Supervisor.

JORC Code: Joint Ore Reserves Committee (JORC) Code set the minimum standards for Public Reporting of minerals Exploration Results, Mineral Resources and Ore Reserves.

Loose Cubic Metres (LCM): The gross quantity of a material after excavation from an in-situ setting (BCM). Often due to a "swell" in the material as a result of the excavation often lowering the density of a material.

LiDAR: A remote sensing technology that measures distance by illuminating a target with a laser and analysing the reflected light. The term LiDAR was created from combining the words "light" and "radar".

Overburden: Non-marketable soil and rock that overlies a mineral deposit

Petrographic: A division of petrology that focuses on detailed description of rocks. The mineral content and the textural relationships are described in detail.

Pit Floor: The lowest point of the pit or quarry. The pit floor is often determined as the point at which the operation is non-longer economically feasible or has an external constraint that allows operations not to drop any lower.

Processing Area: The area in a quarry or mine in which raw material is processed by either physical or chemical means to produce a final product. In terms of quarrying this usually entails a crushing and screening system, stockpile stacker and

Reserve: A mineral deposit that is of value legally, that is technically economic and feasible to extract. Defined by the JORC Code, a Reserve can be either Probable or Proved with the latter an increased level of mining, processing, metallurgical, infrastructure, economic, marketing, legal, environment and social factors.

Resource: A mineral deposit that is potentially valuable, and for which reasonable prospects exist for eventual economic extraction. Defined by the JORC Code, a Resource can be either Inferred, Indicated or Measured which are assessed based on increasing levels of geological knowledge and confidence.

Rip-Rap/ Armour Rock: Material that is used to armour shorelines, streambeds, bridge abutments, pilings and other shorelines structures against scour and water or ice erosion.

Rippable. This refers to quarry material which can be moved from the in-situ state by a ripper attached to a bulldozer or an excavator. Material that is not rippable will generally need to be removed by drilling and blasting or other mechanical means.

Scaling Walls: The process of removing loose rock from the quarry walls. This is normally achieved by a rockbreaker attached to an excavator.

Swell Factor: The volume expansion and associated reduction in density of rock from the in-situ status to the broken status e.g. as loaded to a truck. Usually expressed a percentage e.g. 10% for sand, 40% for hard rock. Alternatively, the ratio of the weight or volume of loose excavation material to the weight or volume of the same material in-situ.

SWOT analysis: A Strengths, Weaknesses, Opportunities and Threats analysis of a project and its operators carried out, usually by a third party, to assess recommendations as to how a project should be progressed.

Weathered/Weathering: The process by which rocks are broken down into small grains and soil. It can occur through rainfall, ice formation, or the action of living things, such as algae and plant roots which forms part of the geological cycle.

1 BACKGROUND

1.1 SCOPE OF WORKS

Ausrocks Pty Ltd (Ausrocks) Consulting Mining Engineers to the Australian Quarrying Industry have been requested by Ballina Shire Council (BSC) to complete an Internal Valuation of their Stokers Quarry and Tuckombil Quarry at Alstonville. The agreed scope of works to be completed as part of the valuation is as follows:

- Desktop Review of Data and Previous Reports
- Marketing Assessment
- Material Testing and Classifications
- Financial Analysis
- SWOT Analysis
- Cost Benefit Analysis of running Tuckombil-Stokers as a joint operation

1.2 COMPETENCY OF AUTHOR

The qualifications of Alan Robertson (RPEQ 5642) and recent studies carried out by Ausrocks that are relevant to this valuation are summarised in ATTACHMENT 1.

1.3 PREVIOUS WORK

Data from previous reports was supplied by Ballina Shire Council. The previous reports were reviewed, re-interpreted and where appropriate, incorporated into this report. The following information was made available:

- Groundworks Plus - Tuckombil and Stokers Quarry Evaluation and Strategic Options Report
- Ballina Shire Council Request for Tender RFT784
- Ausrocks – Stokers Quarry Development Plan 2015
- Ausrocks – Tuckombil Quarry Development Plan 2015

1.4 SITE DESCRIPTION

Tuckombil and Stokers Quarries are both currently owned by BSC and leased by Lismore Shire Council (LSC), and are located approximately 1.5km to the North and 4.5 South East of Alstonville CBD respectively. Currently due to a number of environmental, safety and economic constraints raw material (when available) is transported from Stokers Quarry also known as Lot 10 on plan DP712025 and Lot12DP814359, to be processed and blended at the nearby Tuckombil Quarry located at Lots 1, 2 and 4 DP1130300 both within BSC.

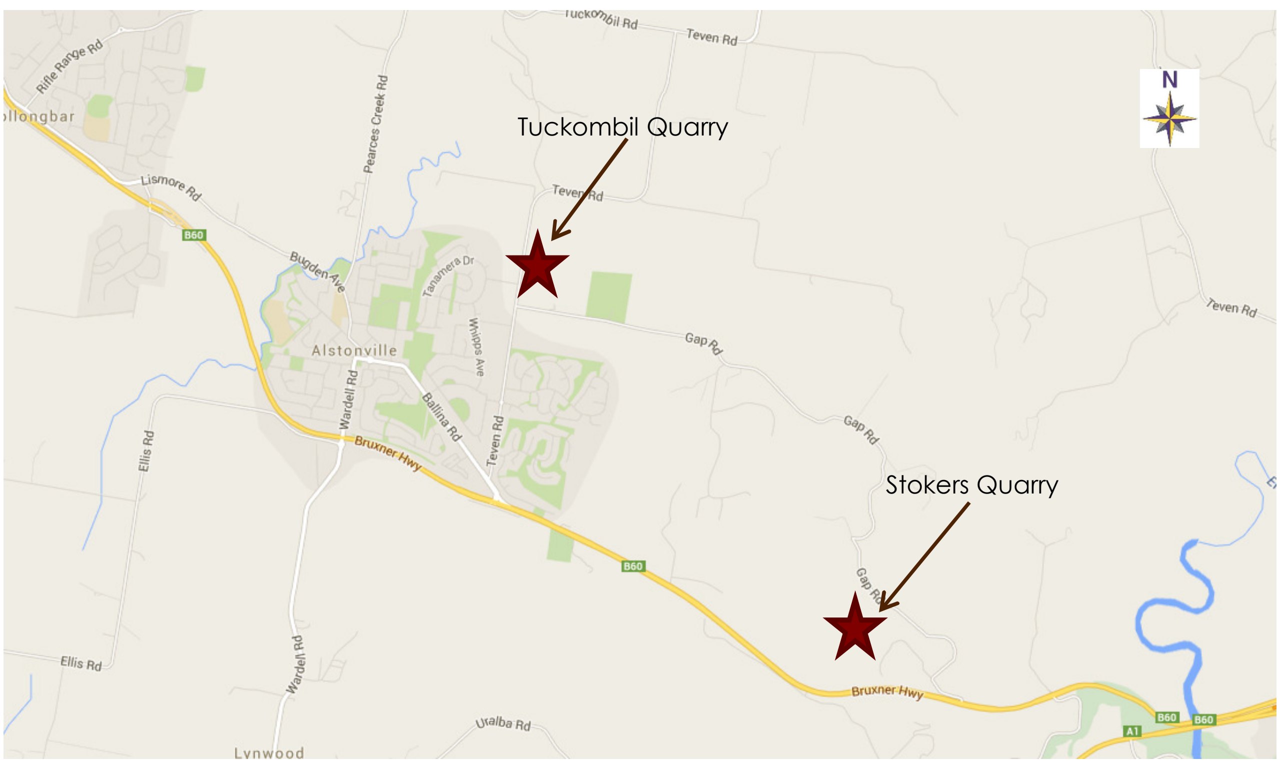
Tuckombil Quarry is accessed from Gap Road via the Boral Asphalt Plant area. The extraction area covered mainly the Lot 2 and north of Lot 4, (refer Figure 4.3and 4.7 pit Design). The Lot is encompassed by two Hockey/Cricket fields, a Croquet fields and a Council owned and operated nursery to the south and Eastern corner which is also owned by the council, Teven Road to the West, Gap Road and the Boral Asphalt Plant to the South including residences and nurseries farms to the North. The extraction pit is designed to progress from northeast of current pit and branching out from quarry back road and without impeding on the current activities of one Hockey/Cricket field and Croquet field. The extraction is carried out by utilising traditional quarry methods the extraction pit is quarried from top to bottom implementing the drilling and blasting method. Processing and quarrying is completed in a campaign basis with the material progressively moved From out of the pit to the Stockpile area located South West of the extraction area, When there is an excess of material From campaign mining, this material remains in pit until there is adequate space to accommodate additional stocks. Stormwater flows from the processing and stockpiling areas into two large in-pit sumps on the western edge of the excavation area (low wall side), which are used for dust suppression and, feeding the Asphalt Plant. When excess flows of water fill the inpit sumps past desired levels, this water is pumped into the nearby creek. The quarry currently has a weighbridge, office and an amenity located to the South of the extraction zone and owns a Komatsu Loader which is used to load product into Quarry Trucks. Figure 1.1 shows the site locality map; Figure 1.2 shows the site Cadastral plan and operational boundaries. Refer Appendix 1 for details site layout plans for the quarry.

Stokers Quarry can be accessed from Gap Road through Bruxner Highway and with an alternate access via Teven Gap Road. The property is owned by the BSC and the area is bordered by private residents to the north and south of the pit. When operational, the quarry utilised traditional quarrying methods, extracting from top to bottom following a narrow vein of argillite using drilling and blasting method.

Currently, there is no designated stormwater catchment area for the disturbed area runoff. However, the pit floor was extracted to drain southward therefore allowing for an accumulation of stormwater in the southern end of the pit. According to the site Operations Manager the operation intends to progressively increase the disturbed area and likewise improve the erosion and sediment control measures to minimise potential environmental impacts to surrounding vegetation communities.

- The western fence adjacent to Stage 2 pit boundary is the most important, particularly to be installed before bike track is operating.
- There should be a continuous fence around the quarry area. This can be a combination of existing fences, gates, with the fence line shown on the plan STP_001F to fill in the gaps, if required.

FIGURE 1.1 - SITE LOCATION MAP



2 RESOURCE ESTIMATION, CLASSIFICATION AND MATERIAL QUALITY

2.1 DISCLAIMER

Two complete reports "Tuckombil Quarry – Quarry Development Plan July 2015" and "Stokers Quarry – Quarry Development Plan" were completed mid 2015 covering a Resource Assessment and Quarry Development Plan for each site. The main points of these documents are summarised in this Valuation. Due to the size of the report, a copy of these reports can be provided by Ausrocks Pty Ltd or Ballina Shire Council on request.

2.2 TUCKOMBIL QUARRY

2.2.1 RESOURCE ESTIMATION AND CLASSIFICATION

The rocks within the potential resource area were assessed for use as pavement materials (i.e. road base products), concrete and sealing aggregates, rip-rap and armour rock and railway ballast. Rocks that are considered not suitable for any of the above end uses could be considered for use as select fill. This assessment was based on field observations, petrographic assessment and previous experience. Rocks used as raw feed to produce quarry products that will comply with relevant specifications need to be strong, durable that can be crushed to produce non-flaky cobble, gravel and/or sand size particles that are free from excessive dust and internal inherent weaknesses. The fines (i.e. <75 μm) produced or added to the products should be of low plasticity and free of organic matter and deleterious materials. The products made from the rocks are required to maintain their characteristics during the design service life of the structures for which they are to be used.

The identified potential quarry resources were classified based on their potential end use as described below:

- **Type A Resource Slight Weathered and Fresh Basalt:** Slightly weathered and fresh grey basalt indicates that the rock is hard, strong and durable. The fine grained and interlocking constituents of the rock are strongly bonded together and are expected to withstand conditions anticipated in typical service applications. The proportion of weak minerals or minerals that may weather rapidly is low and their distribution is such that they are anticipated to be protected from rapid weathering by the more durable minerals that surround them. The slightly weathered or fresh basalt is considered as the main quarry resource. Based on previous production from the Tuckombil Quarry and the petrographic assessment, these rocks have characteristics that are considered suitable to use as raw feed to produce concrete and sealing aggregates, as well as pavement materials suitable for use for highway construction or aggressive environment. SW Fr basalts could also be considered for use as marine revetment walls provided suitable size blocks can be won. The use of additives, such as highly to moderately weathered rock may be required for the production of lower quality road bases to provide plastic fines required for the bonding of pavement materials. Most of the SW-FR rock indicated in the eastern and north-eastern extension area, adjacent to the existing pit is anticipated to be available for extraction to the level of groundwater. Material winning below the groundwater level is not considered economic, unless a gravity based de-watering system can be implemented. Establishment of long term and seasonal groundwater levels are suggested to estimate maximum extractable resources.
- **Type B Resource – Moderately Weathered Basalt: Moderately weathered basalt** with interbedded highly or slightly weathered bands occurred below the overburden and overlying the main quarry resources (Resource Type A). Vesicular and amygdaloidal rocks of estimated low to medium strength, indicated in the boreholes to occur near the base of the basalt is included in this resource category. The moderately weathered, low to medium strength, Fractured basalt is anticipated to be suitable for use as raw feed in selected pavement materials with low or no durability test limits, provided the rocks are blended with better quality rock at appropriate ratios. These weathered

rocks generally produce low to medium plasticity fines that, while providing binding capacity to the road-bases, are not anticipated to negatively impact on the bearing capacity characteristics of the pavement materials. The roadbase materials are typically used as sub-base pavement materials, for traffic layer on unsealed roads and similar temporary pavements, as well as for bridging layers over soft soils and selected backfill around structures. These rocks are not considered suitable for use as raw feed to produce concrete or sealing aggregates. The use of moderately weathered rocks will need to be limited in production of concrete and sealing aggregates and they are not considered suitable for use as raw feed to produce nether railway ballast nor armour rock. The weathered rocks generally do not present production problems, provided material extraction is planned to control the proportion of the weathered rocks in the raw feed. Should highly weathered rocks with medium to high plasticity clays be encountered during material winning that are interbedded with better quality basalt then scalping out of natural fines will be required. The removed natural fines could be considered for use as select fill (refer type C resource below).

- **Type C Resource Overburden:** Residual soil and extremely weathered to highly weathered basalt is considered from quarry resources perspective as **overburden**. However, the extremely weathered to highly weathered basaltic material could be considered for use as select fill, provided localised material characteristics would meet project specific specifications. Based on visual inspection and previous experience with similar materials, the weathered basalt portion of the overburden is likely to have California Bearing Ratios (CBR) values of >10%. The residual clayey soils could be considered for use as low permeability layers for lining dams or other water retaining structures, as well as for low permeability capping layers for landfill and similar applications. In addition to the overburden overlying the Type B and Type A resources, safety bunds/noise and visual screen bunds located between the existing playing fields and the eastern pit wall are assumed to comprise weathered rocks and residual soils stripped from the quarry pit area. These materials will require relocation before quarry development can progress to the east, or could be considered for use as select fill material. To reduce the cost of relocation, the materials in the existing bunds could be characterised and offered for sale at the cost of loading to allow expansion of the quarry pit. Based on observed exposures in cuttings, topsoil depth is estimated to be typically about 0.3 m over the site. Topsoil and any other material with organic matter will need to be stripped and stockpiled for use in the rehabilitation stage of the project.

2.2.2 IN-SITU PIT RESERVE ESTIMATION

Using the available resource knowledge a floor level for the quarry was assumed at -RL112m. The current pit design has used the appropriate parameters and assumptions to develop a pit shell for use during the volume analysis. The current volume estimated down to RL112m is described in Table 2.1 and 2.2.

TABLE 2.1 – IN-SITU PIT RESERVE MATERIAL ESTIMATE

Stage	mRL		bcm (m^3)	Comments
	From	To		
Stage 1	146	140	252,332	
Stage 2	150	140	243,862	
Stage 3	146	140	602,264	
Stage 4	146	112	1,189,117	
Stage 5	135	112	276,533	
Grand Total			2,564,108	

Note; mRL is based on average levels.

TABLE 2.2: ESTIMATED IN SITU PIT VOLUMES BASED ON MATERIALS CLASSIFICATION

Materials Classification	Estimate in BCM		Density (t/m3)	In-situ Tonnage (t)	Pit Reserve (t)
	Volume in Resources Area	Volume in Pit Reserve			
Fill/Topsoil	915,214	472,096	2.4	2,196,514	1,133,030
EW_HW	1,445,715	405,550	2.6	3,758,859	1,054,430
MW_SW	340,349	118,738	2.7	918,942	320,593
SW_FR	3,726,969	1,567,724	2.8	10,435,513	4,389,627
Grand Total	6,428,247	2,564,108		17,309,828	6,897,680

Note; * the assumed density of 2.8t/m^3 was based on average density of the basalt. Note: 1m^3 is the same as 1 Bank Cubic Metre (bcm)

It should be noted that the resource data is based on software (Surpac version 6.4.1) evaluation of the data. It is recommend that regular analysis of the extraction areas be carried out using information gathered from production blast hole drilling as production progresses to determine the consistency and quality of the resource. In addition, the resource drilling should be regularly updated as production progresses in order to ascertain the extent of the resource and to assist in planning the quarry beyond the current projection. Therefore it is recommended that a resource drilling regime be incorporated into production drilling as the operation progresses.

2.2.3 MATERIAL QUALITY

Petrographic testing was conducted on three samples from the drilling conducted at Tuckombil Quarry, these were from:

- **Drillhole TB02 depths 29-30m**
- **Drillhole TB05 depths 12-13m**
- **Drillhole TB05 depths 35-36m**

Each of these samples had similar test results and thus the description will be summarised together. The sample was identified as Olivine Basalt, finely crystalline, mildly flow-aligned, essentially unweathered, lightly altered, hard, strong and durable. The samples were testing for their suitability as Concrete Aggregate, Road Base, Rail Ballast, Sealing Aggregate and Asphaltic Asphalt. Additionally the samples would be acceptable for use as Marine Armour Rock and Rip Rap granted sufficiently sized joint free blocks can be quarried. A summary showing suitability as various construction materials is in Table 2.3, with magnified images of TB02, TB05 12-13m and TB05 35-36m exhibited in Figure 2.1.

FIGURE 2.1: MAGINIFIED IMAGES UNDER POLARISED LIGHT OF TUCKOMBIL SAMPLES

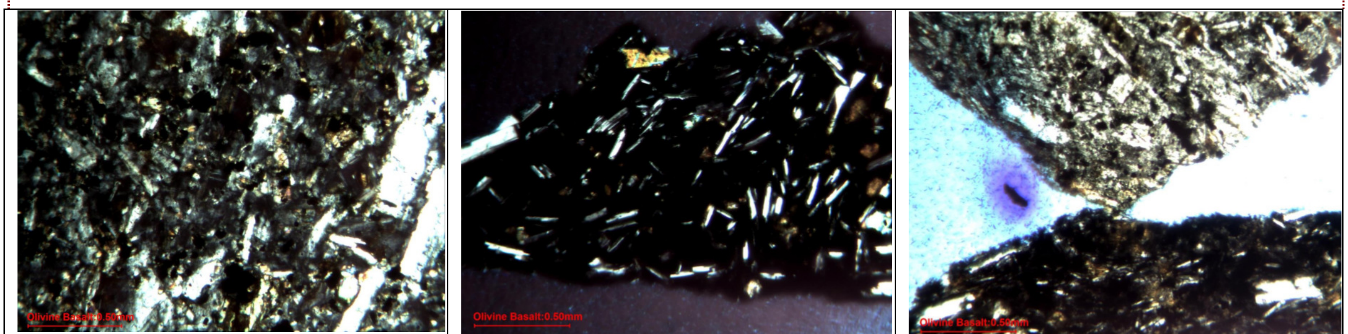


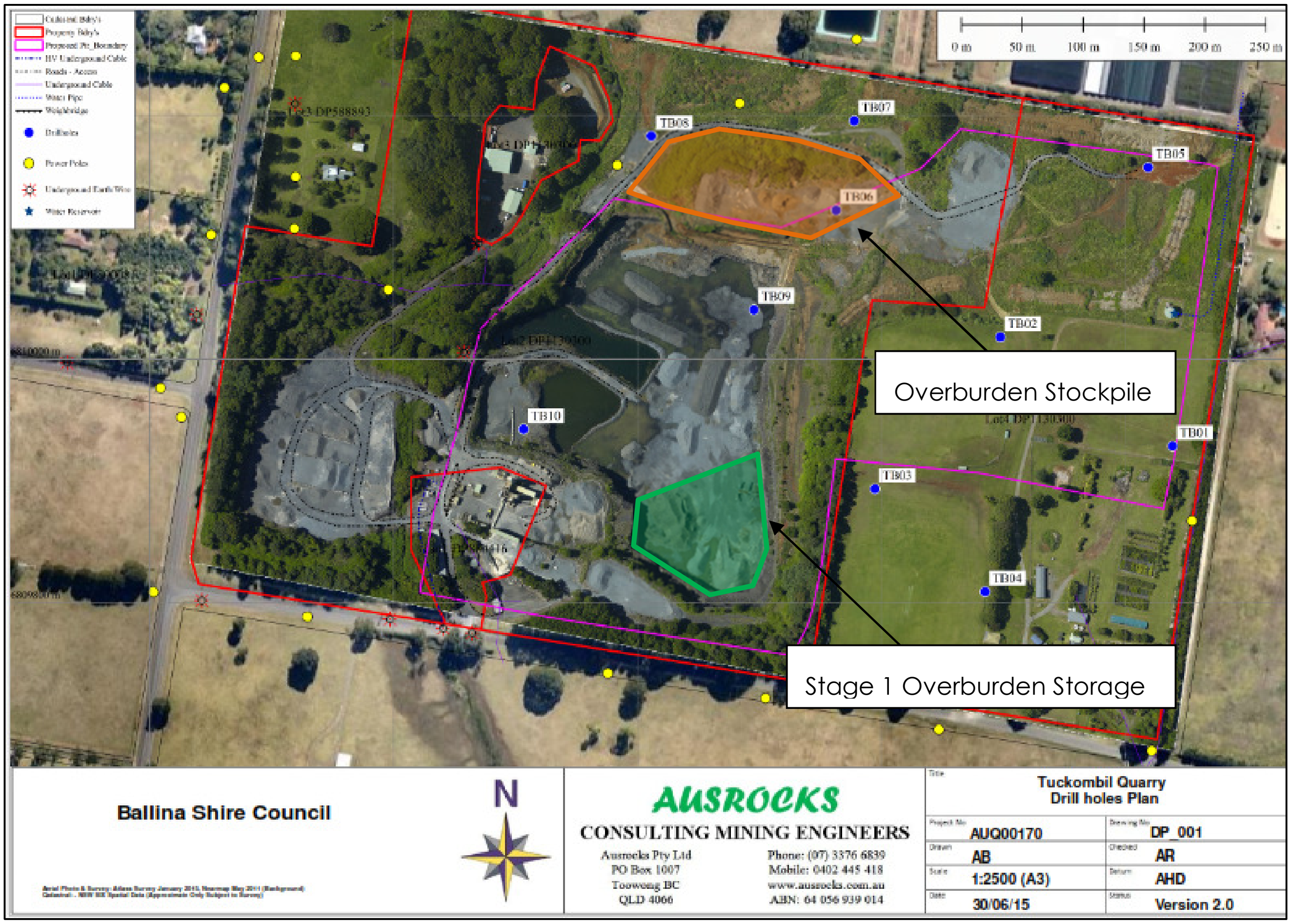
TABLE 2.3: PRODUCT SUITABILITY OF TUCKOMBIL QUARRY BY PETROGRAPHIC ANALYSIS

	Asphalt and Sealing Aggregate	**Concrete**	**Roadbase**	**Rail Ballast**	**Rip Rap and Marine Armour Rock**
TB02 29-30m	Suitable	Suitable	Suitable	Suitable	Suitable
TB05 12-13m	Suitable	Suitable	Suitable	Suitable	Suitable
TB05 35-36m	Suitable	Suitable	Suitable	Suitable	Suitable

2.2.4 OVERBURDEN REMOVAL AND PLACEMENT

In the past at Tuckombil Quarry overburden has been stripped and short-hauled to the closest feasible location stockpiled to keep costs to a minimum. Currently a large overburden stockpile has been established to directly to the north of the current advancing face. A site photo with the overburden stockpile and overlays of the future quarry plans moving forward is shown in Figure 2.2.

FIGURE 2.2: AERIAL PHOTO OF TUCKOMBIL QUARRY WITH OVERBURDEN STOCKPILE LABELLED



The design conducted by Ausrocks was completed to minimise the amount of overburden and the associated costs that required removal. Previously expansion of the quarry has been from North from the South, however due to the large stockpile of overburden, the future plan for the development of the quarry is towards the East. Overburden removal will be conducted using the same equipment as regular production of the quarry, with the material either sold, stockpiled at the existing overburden stockpile or stockpiled against the south eastern wall of the quarry. The following assumptions were made regarding the removal of overburden at Tuckombil Quarry:

- Overburden/Fill material is either stockpiled in the existing Overburden Stockpile currently located to the North of the existing pit, dumped in pit to backfill the existing excavation or sold as some form of fill.
- Overburden/Fill material will be stockpiled in:
    - Stage 1: South-eastern corner of the existing Tuckombil Pit. This is an ideal location as it both backfills the existing quarry void, but does not compromise the future expansion of the

quarry. Furthermore additional material. Material can also be placed in the existing overburden stockpile area.

- Stage 2-4: Overburden can be stored progressively against the eastern wall of the existing pit as there is ample capacity store this material without compromising the future development of the quarry.

- All Overburden removal is completed using onsite production equipment, which for the purposes of this valuation was:
  - Komatsu WA480 Loader:
  - 25 tonne Articulated Haul Truck m^3
- Costing of the removal of the overburden is dependent on the haul distance between the area where the overburden is stripped and when it is dumped

Based on the above assumptions a cost was calculated per Bank Cubic Metre (BCM) for the allocated haul distance. The estimated costs for each of the haul distances per BCM is summarised in Table 2.4, with the accompanying calculations in ATTACHMENT 8.

TABLE 2.4: HAUL DISTANCE AND APPROXIMATE COST PER TONNE

Haul Distance	**600m**	**700m**	**800m**	**900m**	**1000m**
Cost per BCM ($/m³)	3.21	3.50	3.78	4.05	4.35
Productivity per Hour (h)	116.4	106.8	98.8	91.8	85.8

From the designs completed by Ausrocks, an average haul distance for each stage was estimated to determine the costs associated with moving the required volume. A summary of the estimated overburden removal costs is shown in Table 2.5.

TABLE 2.5: ESTIMATED OVERBURDEN REMOVAL COST FOR EACH STAGE

Stage	**Average Haul Distance**	**Overburden to Remove**	**Average Cost for Haul Distance**	**Overburden Removal Cost**
	m	m³	$/BCM	$
Stage 1	700	74,480	3.50	260,680
Stage 2	800	44,080	3.78	166,622
Stage 3	700	157,301	3.50	550,554
Stage 4	600	182,935	3.21	587,221

2.3 STOKERS QUARRY

2.3.1 RESOURCE ESTIMATION AND CLASSIFICATION

The rocks within the potential western resource area at the Stokers Quarry were assessed for use as pavement materials (i.e. road base products), concrete aggregates, rip-rap and armour rock. Rocks that are considered not suitable for any of the above end uses could be considered for use as select fill. This assessment was based on field observations, petrographic assessment and previous experience with similar rocks. No laboratory tests were carried out for this assessment.

Rocks used as raw feed to produce quarry products that will comply with relevant specifications need to be strong and durable material that can be crushed to produce non-flaky gravel and/or sand size particles that are free from excessive dust and internal inherent weaknesses. The fines (i.e. <75 µm) produced or added to the products should be of low plasticity and free of organic matter and deleterious materials. The products made from the rocks are required to maintain their characteristics during the design service life of the structures for which they are to be used.

The identified potential quarry resources in the western extension area were classified based on their suitability for all product types or if they could only be considered for production of limited end products. The suitability classifications are described below:

- **Type A Resource – Slightly Weathered and Fresh Rock:** Microscopic examination of the slightly weathered and fresh grey argillite indicates that the rock is essentially hard and essentially durable. The fine grained and recrystallised constituents of the rock comprise mainly durable minerals and are expected to withstand conditions anticipated in typical service applications. The proportion of weak minerals or minerals that may weather rapidly is moderate but their distribution is such that they are anticipated to be mainly protected from rapid weathering by the more durable minerals that surround them. Fracturing of rocks along foliation is anticipated to occur. The slightly weathered or fresh argillite (+ SW-Fr meta-greywacke and metasiltstone) is considered as the main quarry resource. Based on the petrographic assessment, these rocks have characteristics that are considered suitable to use as raw feed to produce pavement materials suitable for use for highway construction. The rocks are considered suitable to produce concrete aggregates for low to medium strength concrete. SW-Fr rocks could also be considered as marginal for use as revetment walls in a relatively low energy environment, such as riverine training walls and abutment protection, provided suitable size blocks can be won. The proportion of winnable boulder size rocks is anticipated to be low due to the inherent foliation, laminations and well developed discontinuities. Larger rock fragments would be more suitable for use as temporary rock fill or bridging layer over soft ground than revetment wall rocks. Type A resource rocks appear to be present throughout the investigated area, however, the depth of overburden appears to be highly variable. Based on pit wall exposures and drillhole data the SW-Fr rock at depths < 13 m occurs in the topographically low area with surface elevation below about 40 m RL, west of the existing pit. The SW-Fr rock resources are open to depth and the resource thickness is anticipated to be >100 m. For resource calculation purposes the floor of the resource should be considered at -5 m AHD, due to potential extraction difficulties in groundwater affected depths. Most of the SW-Fr rock indicated in the drillholes, both within the existing pit floor and in the western extension area is anticipated to be available for extraction, provided overburden and lesser quality resources (see description below for type B resources) can be removed economically. Groundwater levels appear to be inconsistent across the site and appear to be localised. De-watering of type A rocks is anticipated to occur naturally as progression of the pit allows gravity drainage from the adjacent rocks.

- **Type B Resource – Moderately to Slightly Weather Rock: Moderately to slightly weathered rocks** of estimated low to high strength occur below the overburden and overlying the main quarry resources (resource type A). The MW-SW rocks are anticipated to be suitable for use as raw feed in selected pavement materials with low or no durability test limits, provided the rocks are blended with better quality rock at appropriate ratios. These weathered rocks generally produce low to medium plasticity fines that, while providing binding capacity to the road-bases, are not anticipated to negatively impact on the bearing capacity characteristics of the pavement materials. The lower durability roadbase materials are typically used as sub-base pavement materials, for traffic layer on unsealed roads and similar temporary pavements, as well as for bridging layers over soft soils and selected backfill around structures. These rocks are not considered suitable for use as raw feed to produce concrete or sealing aggregates, however, drainage aggregates can also be produced using type B resources. The MW-SW rocks will need to be limited in production of concrete aggregates and they are not considered suitable for use as raw feed to produce nether railway ballast nor armour rock. The MW-SW rocks generally do not present production problems, provided material extraction is planned to control the proportion of the weathered rocks in the raw feed. This is best achieved by advancement of several quarry benches to allow selective material winning. Should highly weathered rocks with medium to high plasticity clays be encountered during material winning that are interbedded with better quality rocks then scalping out of natural fines will be required. The removed natural fines could be considered for use as select fill (refer type C resource below).

- **Type C Resource – Overburden:** Residual soil and extremely to moderately weathered metamorphic rocks are considered from quarry resources perspective as **overburden**. However, the highly and highly to moderately weathered rocks could be considered for use as select fill, provided localised material characteristics would meet project specific specifications. Based on visual inspection and previous experience with similar materials, the weathered rocks portion of the overburden is likely to have California Bearing Ratio (CBR) values of >15%. The weathered rocks appeared fragmented and are anticipated to be rippable with a D7 or similar dozer. For estimating purposes overburden thicknesses shown in Table 1.1 were used. The residual clayey soils could be considered for use as low permeability layers for lining dams or other water retaining structures, as well as for low permeability capping layers for landfill and similar applications. These soils are not anticipated to be suitable for use as selected fill due to their relatively high plasticity. Based on observed exposures in cuttings, topsoil depth is estimated to be typically about 0.3 m over the site. Topsoil and any other material with organic matter will need to be stripped and stockpiled for use in the rehabilitation stage of the project.

2.3.2 IN-SITU PIT RESERVE ESTIMATION

Using the available resource knowledge a floor level for the quarry was assumed at -5mRL. The current pit design has used the appropriate parameters and assumptions to develop a pit shell for use during the volume analysis. The current volume estimated down to -5mRL is described in Table 2.6 and 2.7.

TABLE 2.6: IN-SITU PIT MATERIAL ESTIMATE

Stage	From	To	bcm (m^3)	Density (t/m^3)	Tonnage (t)
Stage 1	65	35	138,385	2.4	332,124
Stage 2	35	5	253,037	2.7	683,200
Stage 3	66	5	1,225,579	2.5	3,063,948

Note; * the assumed density of 2.7t/m^3 was based on average density of the greywacke. Note: 1m^3 is the same as 1 Bank Cubic Metre (bcm) The Reserves stated are not to JORC compliance.

TABLE 2.7: ESTIMATED IN SITU PIT VOLUMES BASED ON MATERIALS CLASSIFICATION

Stokers Pit Reserve Estimate (bcm)		
	Pit 1 (Stage 1&2)	**Pit 2 (Stage 3A,3B &3C)**
Fill/Topsoil	77,672	136,109
EW_HW	79,508	300,688
MW_SW	165,320	334,766
SW_Fr	68,922	454,016
Grand Total	**391,422**	**1,225,579**

It should be noted that the resource data is based on software (Surpac version 6.4.1) evaluation of the data. It is recommend that regular analysis of the extraction areas be carried out using information gathered from production blast hole drilling as production progresses to determine the consistency and quality of the resource. In addition, the resource drilling should be regularly updated as production progresses in order to ascertain the extent of the resource and to assist in planning the quarry beyond the current projection and below the pit floor. Therefore it is recommended that a resource drilling regime be incorporated into production drilling as the operation progresses.

2.3.3 MATERIAL QUALITY

Petrographic testing was conducted on three samples from the drilling conducted at Stokers Quarry, these were from:

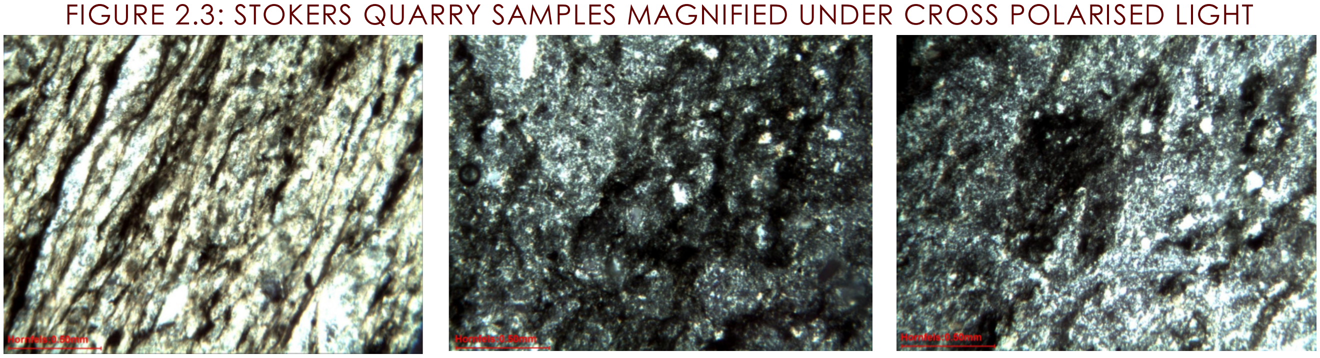
- **Drillhole ST02 depths 16-17m and Drillhole ST07 depths 13-14m:** Both of these samples exhibited similar characteristics and thus will be summarised together. The samples were identified as Meta-pelite, very finely crystalline, non-porous, unweathered to slightly weathered, apparently hard and apparently strong. Weak silicate minerals and graphite are present in a mostly unconnected decussate texture enclosed in hard minerals which improves the overall quality. The material was deemed to have suitable hardness strength and durability for use in asphalt and sealing aggregate, but there may be difficulty establishing adequate bonding of the material with bitumen. Although there is potential for mild or slow deleterious alkali-silica reactivity the material was deemed adequate for use in concrete. Roadbase products can be adequately sourced from the sample however the material was not deemed marginally suitable as a rail ballast and unsuitable for rip rap and marine armour rock due to the fissility of piltic rock that could be susceptible to mechanical disaggregation due to salt crystallization along micaceous partings.
- **Drillhole ST03 depths 15-16m**: The sample was identified as Meta-pelite, very finely crystalline, non-porous, and unweathered to slightly weathered, moderately durable to durable. It was not recommended for use in asphalt and sealing aggregates, due to the difficulty establishing bonding with bitumen due to the very fine grainsize. Although there is potential for mild or slow deleterious alkali-silica reactivity the material was deemed adequate for use in concrete. Roadbase products can be adequately sourced from the sample however rail ballast, rip rap and marine armour rock are not suitable applications for the material.

An image of each of the samples that underwent petrographic testing are shown below in FIGURE 2.3, which shows ST02, ST03, ST07 from left to right respectively.

TABLE 2.8: PETROGRAPHIC SAMPLES AND SUITABILITY FOR VARIOUS PRODUCTS

	Asphalt and Sealing Aggregate	**Concrete**	**Roadbase**	**Rail Ballast**	**Rip Rap and Marine Armour Rock**
ST02 16-17m	Adequate	Suitable	Suitable	Marginally Suitable-	Not Recommended
ST03 15-16m	Not Recommended	Adequate	Adequate	Not Recommended-	Not Recommended-
ST07 13-14m	Adequate	Adequate	Suitable	Borderline Suitable	Borderline Suitable

FIGURE 2.3: STOKERS QUARRY SAMPLES MAGNIFIED UNDER CROSS POLARISED LIGHT



2.4 TUCKOMBIL-STOKERS COMBINED ROADBASE

At present there is still a surplus of unprocessed Argillite material located on site at Tuckombil Quarry. In the past Argillite has been in the main material used to create Roadbase. Now with the temporary closure of Stokers Quarry, a number of materials have been imported into the Tuckombil Quarry to produce a roadbase which includes the basalt produced at Tuckombil Quarry. Material was sampled from Tuckombil on the 22nd of August 2015 to test for the potential of use of a Tuckombil-Stokers blend that adheres to the specifications of DGB20, DGS20 and MB20 roadbase. The roadbase sample obtained had been processed and mixed by LSC and underwent the following materials testing:

- Particle Size Distribution Testing
- Atterberg Limit Testing
- Wet/Dry Variation
- Particle Shape By Proportion Calliper

2.4.1 PARTICLE SIZE DISTRIBUTION

Particle Size Distribution (PSD) testing was carried out on the aforementioned sample that was collected on the 22nd of August 2015. PSD is a measurement designed to determine and report information about the size and range of a set of particles representatives of a material (Particle Technology Labs, 2015). A summary of the BSC PSD is shown in Table 2.9.

TABLE 2.9: PSD TESTING ON TUCKOMBIL-STOKERS COMBINED ROADBASE

Sieve Sizes (mm)	Civiltech Percent Passing Aug 2015	DGB20 Specs	DGS20 Specs	MB20 Specs
		Unbound	Unbound	Bound
		Base	Subbase	Base/Subbase
19.0	100	95-100	95-100	95-100
13.2	83	78-92	70-90	70-90
9.5	63	63-83	58-80	60-80
4.75	38	44-64	43-65	
2.36	24	33-49	30-55	30-50
0.425	10	14-23	10-30	10-25
0.075	5.4	7-14	4-17	4-12

Source: New South Wales, Roads and Maritime Services

2.4.2 ATTERBERG LIMIT TESTING

Atterberg Limits and linear shrinkage tests were carried out on the sample roadbase to determine weathered rock/soil plasticity characteristics and the results are shown in Table 2.10. The results were used to estimate suitability for use producing roadbase or for use as select fill.

TABLE 2.10: RESULTS OF ATTERBERG LIMITS AND LINEAR SHRINKAGE TESTS

Variable	Tuckombil-Stokers Roadbase	DGB20	DGS20	MB20
Liquid Limit (%)	18	Max 23	Max 23	-
Plasticity Limit (%)	17	Max 20	Max 20	-
Plasticity Index (%)	1	Min 2 – Max 6 for Types B & C Max 8 – Type D	Max 6-12	Max 2-10

Source: New South Wales, Roads and Maritime Services

2.4.3 WET/DRY VARIATION TESTING

The summary of the Wet/Dry Variation work on the sample tested along with RMS specifications for Roadbases are shown in 2.11 and summarised below. From the testing completed the Wet/Dry Variation indicates that the sample taken would fits the testing specifications for DGB20, DGS20 and MB20.

TABLE: 2.11: SUMMARY OF WET-DRY VARIATION TESTING

Test	Tuckombil-Stokers Roadbase	DGB20	DGS20	MB20
10% fines, wet strength (kN)	236	Min 70	-	Min 70
10% fines, dry strength (kN)	265	-	-	-
Wet/Dry strength variation (%)	11	Max 35	Max 35	Max 35
Particle Shape (using 3:1 Ratio)%	Max 35	Max 35	Max 35	Max 35

Source: New South Wales, Roads and Maritime Servic

3 FINANCIAL ANALYSIS

3.1 ASSET VALUATION

Ausrocks has completed an asset valuation on the quarry reserves (based on quarry designs) for the resources estimated by drilling for both quarries. Ausrocks has a database

TABLE 3.1: TUCKOMBIL RESERVE VALUE

Material	Reserve (t)	(%)	Value ($/t)	Total ($)
Fill/Topsoil	1133030	16.43%	0.00	0
EH-HW	1054430	15.29%	0.60	632658
MW-SW	320593	4.65%	0.8	256474.4
SW-Fr	4389627	63.64%	1	4389627
Total	6897680	100.00%	0.77	5278759
Total $M)				**5.28**

TABLE 3.2: STOKERS RESERVE VALUE

AREA 1					**AREA 2**			**TOTAL**		
Material	Reserve (bcm)	(%)	Density (t/cum)	Tonnes (t)	Reserve	Density	Tonnes (t)	Total	Value	Total ($)
Fill/Topsoil	77672	19.84%	2.4	186413	136109	2.4	326662	513074	0	0
EH-HW	79508	20.31%	2.5	198770	300688	2.5	751720	950490	0.4	380196
MW-SW	165320	42.24%	2.6	429832	334766	2.6	870392	1300224	0.5	650112
SW-Fr	68922	17.61%	2.7	186089	454016	2.7	1225843	1411933	0.6	847160
Total	391422	100.00%			1225579		3174616	4175721	0.45	1877467
Total ($M)										**1.88**

3.2 NPV SCENARIOS

A total of three scenarios were completed based on a number of various assumptions these were as follows:

- **Scenario 1**: Operations proceed as normal, Tuckombil operates at 30,000 t/a and Stokers producing 10,000 t.
- **Scenario 2**: Operations proceed as normal Tuckombil operates at 40,000 t/a and Stokers placed into Care and Maintenance and progressively rehabilitated.
- **Scenario 3**: BSC Continues royalty agreement as is currently in place for the next 10 years.

3.2.1 SCENARIO 1

The first NPV Scenario that was completed was continued operation of both Tuckombil and Stokers quarries at a combined production rate of 80,000 t/a. To complete Scenario 1 there were a number of assumptions made as follows:

- All material that is extracted from Stokers Quarry is processed at Tuckombil Quarry as crushing and screening is no longer viable at Stokers Quarry due to urban encroachment.
- A fee of $0.20 per tonne per km has been used to calculate the haulage costs from Stokers Quarry to Tuckombil Quarry which from a 6km journey is $1.20 per tonne.
- Royalties are not included as it is assumed that the Quarry will be owner operator
- Renewal of Tuckombil Quarry Development Application is costed in 2015 in preparation for the 2016 Renewal.
- 50% of the material within both Stokers and Tuckombil Quarry will require drilling and blasting, this is costed at $1.57 per tonne.
- Production rates (Year 3 on):
  - Tuckombil Quarry: 61,200 t/a – Basalt Products
  - Stokers Quarry: 18,800 t/a – Argillite Products
- Product Pricing and Splits:
  - Basalt Aggregates: $35/t, 48% of total production
  - Argillite Aggregates: $36/t, 15% of total production
  - Roadbases: $21/t, 17% of total production
  - Crusher Dusts: $25/t, 20% of total production
- CAPEX required,
  - 25 Tonne Wheel Loader (Komatsu WA480)
  - 30 Tonne Excavator
  - 30 Tonne Articulated Dump Truck
  - Water Truck
  - Toyota Landcruiser
  - Earthworks to make Stokers Quarry safe to operate
- Discount rate of 14%.
  - Interest based on 10 Year Bonds. Currently 2.68%. **Use 3%.**
  - Political Risk.(takes into account Government Policy, Native title, competing land use issues, project location):
    - Low political risk: 2-3%.
    - Medium to high political risk: 4-5%
    - Extremely high political risk: 6-10%
  - A political risk of **5%** is recommended.
  - Project Risk (takes into account complexity of extraction of material, operator competency, material quality, market competition):
    - Low project risk: 2-3%.
    - Medium to high project risk:4-5%
    - Extremely high project risk:6-10%

  A project risk of **6%** is selected.

In this scenario the discount rate is estimated at 14%. Project life is 10 years.

Table 3.1 shows a Sensitivity Analysis based on varying the NPV parameters (Parameter Numbers 1-13). The project is quite robust in terms of increases in discount rate, operating costs and decreases in revenue. The right hand column indicates the likelihood of each scenario occurring, ranging from very high likelihood to very low likelihood. Table 3.1 indicates the robustness of the project with no scenarios where the NPV goes below zero.

Scenario 1 represents the BSC quarries currently operating as a joint operation of both Tuckombil and Stokers Quarries. The key to this Scenario is undertaking the recommended works to ensure the safe operation of the quarry at Stokers. The production of the Argillite material from Stokers Quarry is important for the joint operations of the quarries as it is the key in creating various roadbases to RMS specifications. Based on the Sensitivity Analysis, the range of after-tax **NPV's is $1.3 to $5.60M** with the base case being **$2.89M**. The highest value NPV is based on production at maximum rate under current Da Approvals (100,000t/a Tuckombil, 36,000t Stokers)

TABLE 3.1: SENSITIVITY ANALYSIS – SCENARIO 1

	Parameter Number/Variables	NPV (After tax) ($M)	Change (%)	Likelihood
1	Base Case (Discount Rate 14%)	2.89	0%	Very likely
2	Use 15% Discount Rate	2.75	-5%	Likely
3	Use 13% Discount Rate	3.58	24%	Likely
4	Increase Annual Opcost by 10%	1.30	-55%	Unlikely
5	Increase CAPEX by 20%	2.75	-5%	Unlkely
6	Increase Production by 10%	3.35	16%	Likely
7	Increase Production by 60%	5.60	94%	Likely
8	Decrease Production by 10%	2.44	-16%	Unlikely
9	Decrease Production by 35%	1.31	-55%	Likely
10	Decrease Product Price by 10%	2.06	-29%	Likely
11	Decrease Costs by 5%	3.11	8%	Unlikely
12	Increase Costs by 5%	3.09	7%	Likely
13	Increase Product Prices by 5%, costs by 10%	2.88	0%	Likely

Note: Likelihood represents the chance of the scenario occurring. Likelihood varies from Very High to Very Low.

3.2.2 SCENARIO 2

The second NPV Scenario that was completed was the continued operation of Tuckombil Quarry by BSC (rather than lease to LSC) and the closing of Stokers Quarry which is then put under care and maintenance so that it is progressively rehabilitated. Alternatively Stokers Quarry could be sold. To complete Scenario 2, there were a number of assumptions made as follows:

- Royalties are not included as it is assumed that the Quarry will be owner operator
- Renewal of Tuckombil Quarry Development Application is costed in 2015 in preparation for the 2016 Renewal.
- 50% of the material within Tuckombil Quarry will require drilling and blasting, this is costed at $1.57 per tonne.
- **Production rates**
  - Tuckombil Quarry: 80,00 t/a – Basalt Products after build up Year 1,2
- **Product Pricing and Splits:**
  - Basalt Aggregates: $35/t, 48% of total production
  - Roadbases: $21/t, 17% of total production
  - Crusher Dusts: $25/t, 20% of total production
- **CAPEX required ($0.8M)**
  - 25 Tonne Wheel Loader (Komatsu WA480)
  - 30 Tonne Excavator
  - 30 Tonne Articulated Dump Truck
  - Water Truck
  - Toyota Landcruiser
  - Earthworks to make Stokers Quarry safe to operate
- **Discount rate of 14%.**
  - Interest based on 10 Year Bonds. Currently 2.68%. **Use 3%.**
  - Political Risk.(takes into account Government Policy, Native title, competing land use issues, project location):
    - Low political risk: 2-3%.
    - Medium to high political risk: 4-5%
    - Extremely high political risk: 6-10%
    - **A Political risk of 6% is recommended.**
  - Project Risk (takes into account complexity of extraction of material, operator competency, material quality, market competition):
    - Low project risk: 2-3%.
    - Medium to high project risk:4-5%
    - Extremely high project risk:6-10%
    - **A Project Risk of 5% is recommended**

In this scenario the discount rate is estimated at 14%. Project life is 10 years.

Table 3.2 shows a Sensitivity Analysis based on varying the NPV parameters (Parameter Numbers 1-8. The right hand column indicates the likelihood of each scenario occurring, ranging from very high likelihood to very low likelihood. Table 3.1 indicates the robustness of the project with no scenarios where the NPV goes below zero.

Scenario 2 represents the current value of Tuckombil and Stokers Quarries if only Tuckombil is producing material and Stokers and progressively rehabilitated. Based on the Sensitivity Analysis, the range of **NPV's after tax is $1.5M to $3.21M**. The base case value is **$2.32M.**

TABLE 3.2: SENSITIVITY ANALYSIS – SCENARIO 2

Parameter Number/Variables		NPV (After tax) ($M)	Change (%)	Likelihood
1	Base Case (Discount Rate 14%)	2.32	0%	Very likely
2	Use 15% Discount Rate	2.20	-10%	Likely
3	Use 13% Discount Rate	2.90	0%	Likely
4	Increase Annual Opcost by 10%	1.85	-34%	Unlikely
5	Increase CAPEX by 20%	2.17	-22%	Unlkely
6	Increase Production by 10%	1.98	34%	Likely
7	Decrease Production by 10%	1.67	-44%	Likely
8	Decrease Production by 50% (40,000t/a	0.40	-56%	Unlikely
9	Increase production by 26% (DA approved max)	3.21	16%	Likely
10	Decrease Product Price by 10%	1.50	-26%	Likely
11	Decrease costs by 5%	3.02	-11%	Unlikely
12	Increase Costs by 5%	2.09	-28%	Likely
13	Increase Product Prices by 5%, costs by 10%	2.27	-22%	Likely

Note: Likelihood represents the chance of the scenario occurring. Likelihood varies from Very High to Very Low.

3.2.3 SCENARIO 3

The third NPV Scenario that was completed was continued operation of Tuckombil Quarry and potentially Stokers quarry similar to the current situation between BSC and LCC. To complete Scenario 3 there were a number of assumptions made as follows:

- There is a one off fee for the renewal of the Development Application at Tuckombil Quarry in the first year of the lease of $150,000.
- The assumed royalty rate is the same as is currently paid by LCC to BSC which is $4 per tonne.
- The base case production rate was assumed to be similar to current extraction rates which is approximately 35,000 tonnes per annum.
- Product Splits and Pricing are negligible as this is a royalty per tonne figure
- Renewal of Tuckombil Quarry Development Application is costed in 2015 in preparation for the 2016 Renewal.
- Discount rate of 15%.
    - Interest based on 10 Year Bonds. Currently 2.68%. **Use 3%.**
    - Political Risk.(takes into account Government Policy, Native title, competing land use issues, project location):
        - Low political risk: 2-3%.
        - Medium to high political risk: 4-6%
        - Extremely high political risk: 7-10%
    - **A political risk of 6% is recommended.**
    - Project Risk (takes into account complexity of extraction of material, operator competency, material quality, market competition):
        - Low project risk: 2-3%.
        - Medium to high project risk:4-6%
        - Extremely high project risk:7-10%

In this scenario the discount rate is estimated at 15%. Project life is 10 years.

Table 3.3 shows a Sensitivity Analysis based on varying the NPV parameters (Parameter Numbers 1-8). The project yields only positive returns as this is a royalty based arrangement that requires very little to no input from BSC. The right hand column indicates the likelihood of each scenario occurring, ranging from very high likelihood to very low likelihood. Table 3.3 indicates the robustness of the project with no scenarios where the NPV goes below zero.

Scenario 3 represents the return that can be expected on both Tuckombil and Stokers Quarries from collecting a royalty on a per tonne basis, as currently occurs. Based on the Sensitivity Analysis, the range of NPV's is **$0.73M** to **$2.77M**, the base case being **$0.91M.**

TABLE 3.3: SENSITIVITY ANALYSIS – SCENARIO 3

	Parameter Number/Variables	NPV (Before tax) ($M)	Change (%)	Likelihood
1	**Base Case (Discount Rate 15%)**	0.91	0%	Very likely
2	**Use 16% Discount Rate**	0.88	-3%	Likely
3	**Use 14% Discount Rate**	0.95	4%	Unlikely
4	**Increase Production by 20%**	1.09	20%	Unlikely
5	**Decrease Production by 20%**	0.73	-20%	Unlkely
6	**Increase production to full Approved production rate (from Year 2)**	2.77	204%	Unlikely
7	**Increase Royalty Rate 10%**	1.00	10%	Likely
8	**Decrease Royalty Rate 10%**	0.82	-10%	Likely

Note: Likelihood represents the chance of the scenario occurring. Likelihood varies from Very High to Very Low.

4 MARKETING ASSESSMENT

4.1 NORTHERN NSW CONSTRUCTION MATERIALS MARKET

The BSC Quarries are both located within 5km from Alstonville which is located in the centre of BSC. BSC currently has a population of approximately 42,000 residents, with a growth rate steady at 0.8% in 2014. This means that the demand for supply of quarry materials is increasing at a rate of 3,000t/a. The demand for sand is generally 30%-40% of the total quarry materials demand (i.e. 900 - 1,200 t/a). Table 7 shows the population growth in the surrounding Northern NSW Coast regions.

Facilitation of the increased population growth will require an increase in demand (in excess of 10t/a pp) for quarry material for the residential housing and associated infrastructure required.

Over the next 5 years there is an extension of the Pacific Motorway from Woolgoolga to Ballina extension, which is Australia's largest regional infrastructure project. There are 11 sections to the project with the final three stages within a reasonable haul distance from BSC Quarries:

- Section 9: Broadwater National Park to Richmond River.
- Section 10: Richmond River to Coolgardie Road.
- Section 11: Coolgardie Road to Ballina Bypass

The total cost of the Woolgoolga to Ballina extension is expected to cost just under $600 million to construct.

Additional to the Pacific Highway upgrade over the next 10 years, the following major infrastructure projects have been identified in the Ballina Region:

- Ballina Byron Gateway Airport (2015-2017). Terminal alterations, new landside entrance road and new car park.
- Byron Central Hospital (Federal Government, $80M).
- Recycling Centres in Ballina and Byron.

4.2 SHORT-TERM CONTRACTS

Currently Lismore City Council (LCC) is leasing the both Tuckombil and Stokers Quarry from BSC. As LCC is not the client short-term contracts were not accessible when completing this valuation. It is known that Tuckombil Quarry provides basalt feed for the Boral Asphalt Plant at Alstonville.

4.3 QUARRY COMPETITORS AND MARKET WITHIN THE REGION

To determine the marketability of Ballina Sands products the current supply of material in the surrounding region was assessed. Utilising Google Earth Pro, a 30 km radius circle was centered on Tuckombil location at Gap Road, Alstonville, with a screen capture exhibited in Figure 4.1.

Figure 4.1 illustrates in the area surrounding Ballina Sands, there are 10 hard rock quarries and 3 sand quarries. Of the three sand quarries Ballina Sands has a haul advantage to Lennox Heads, and is only 9km to the North of Ballina and 14km to the South of Byron Bay.

FIGURE 4.1: BALLINA SHIRE COUNCIL QUARRIES MARKETING MAP

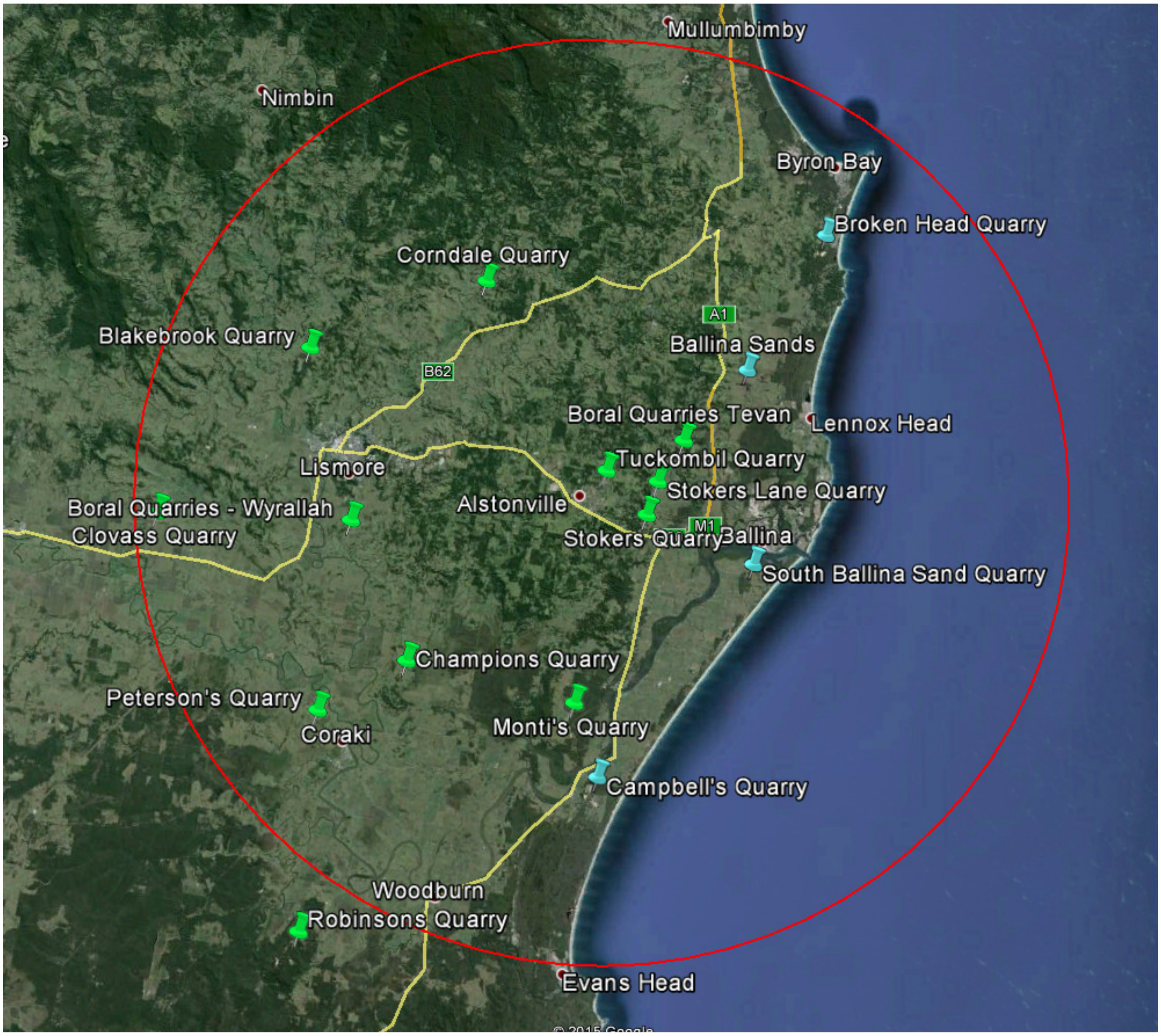


TABLE 4.1: SWOT ANALYSIS OF TUCKOMBIL AND STOKERS QUARRY

Strengths	Weaknesses
– Diverse product range of aggregates, roadbase, fills and dusts. – Established quarry access road & infrastructure. – Low initial CAPEX to commence operations if leasee cannot be found for Quarry. – Very High Royalty payment makes leasing attractive, risk-free option for BSC. – Established and continued supply of the on-site Boral Asphalt Plant at Tuckombil Quarry. – High average sale price of quarry products.	– Tuckombil DA requires renewing in 2016, Stokers in 2015. – Crushing and screening material at Stokers no longer achievable as too many complaints from sensitive receivers. – Crushing and Screening must be undertaken in pit due to noise and dust complaints, which incurs additional haul costs. – Increasing amount of overburden removal required at both Stokers and Tuckombil Quarry. – Variable Resource Quality – Initial works required at Stokers Quarry to establish safe operation – The material has not undertaken all of the required testing for RMS suitable material.
Opportunities	**Threats**
– Potential increase in production to Pacific Motorway upgrade Ballina to Woolgoolga – Blending materials from each site to create a DG20 Roadbase with weathered material from Stokers. – An increase in production at Tuckombil Quarry will require minimum CAPEX input – Haul Advantage in comparison with Quarries located to the North in regards	– Increasing number of residents surrounding Tuckombil Quarry which are objecting the – If Stokers Quarry expands blasting closer than 250m will not be permitted without closing the Bruxner Highway. – Nearby Stoker's Lane Quarry at Teven has placed a Development Application increasing production to 500,000 t/a above the current production rate of 265,000 t/a – Low growth rates in the region which is reflective of material demand within the region.

TABLE 4.2: POPULATION GROWTH IN MARKETING AREA – BALLINA SANDS

Local Government Area	Distance CBD to Quarry (km)	2001	2006	2011	2030	% Growth from 2006
Lismore City Council	18.5	41,572	42,210	42,766	53,680	27.17%
Ballina Shire Council	13.7	37,017	38,461	39,273	50,000	30.00%
Byron Shire Council	37.0	28,916	28,766	29,209	33,064	14.94%
Richmond Valley Council	49.5	20,326	21,313	22,037	28,000	31.38%
TOTAL		**127831**	**130750**	**133,286**	**164,744**	**26.00%**

Source: Australian Bureau of Statistics, 2013, Ballina Shire Council website, Lismore City Council website.

Note: Kyogle Shire Tweed Shire and Clarence Valley Council Areas are excluded as they are outside the area of consideration because of the haulage distances

5 STATUS OF STOKERS QUARRY

5.1 CURRENT OPTIONS

Currently Stokers Quarry presents a number of difficulties that prevent the operation of a safe, environmental, efficient and economic quarry, they are as follows:

- The Eastern Face and Southern Faces of the Quarry have been mined as a single bench and not split into the recommended 10-15m bench heights. As a bare minimum these faces will need to be blasted to form benches before safe extraction can occur.
- Due to the proximity of the Quarry of the Bruxner Highway to the South (pit edge is 140m away), the highway will need to be shut when blasting. Shutting roads for blasts occurs on smaller roads, but the degree of difficulty will increase significantly as the road in question is a highway. Note the minimum exclusion zone when blasting is usually 250-300m.
- Crushing and Screening is unable to be completed in Stokers Quarry, due to potential dust and noise complaints. All of the material must be transported and pushed into the pit at Tuckombil Quarry.

Considering the operational issues with Stoker Quarry the following options are proposed:

- **Rehabilitation Option 1:** Complete Stage 1 of the Design Extraction Plan (Attached - 332,134 t removed) with fill material used to rehabilitate exposed slopes gradually as quality material is sold from the quarry. At the completion of Stage 1 the rehabilitation has been minimised due to strategic placement of highly weathered and fill material.
- **Rehabilitation Option 2:** Complete Stage 1 of the Design Extraction Plan with fill material stockpiled onsite or sold to as fill to the local market as not to compromise the Development of Stage 2 (683,200t). Fill material is strategically placed throughout the quarry to minimise the amount of rehabilitation required at the end of Stage 2.
- **Rehabilitation Option 3:** Complete Stage 1 and Stage 2 of the Design Extraction Plan with fill material and topsoil stockpiled onsite or sold to as fill to the local market as not to compromise the Development of Stage 3 (3,063,948t). Fill material is strategically placed throughout the quarry to minimise the amount of rehabilitation at the end of Stage 3.

Each rehabilitation option accounts for completing Stage 1 of the Stoker Quarry QDP as this is necessary requirement. The rehabilitation concept would be to push down the existing material on site using a D8 sized Dozer, establishing drainage contours and covering the final slopes (less than 40 degrees) with available topsoil and plant with recommended vegetation.

Stage 1 extraction of weathered material, as a means of extracting Stage 2 (better quality material) will result in the Pit 1 profile). Rehabilitation is generally undertaken as soon as feasible but due to the expected long extracting activities on site and the rate of material demands for local road maintenance. It anticipated that the area may remain open for some time, during this time appropriate erosion and sediment controls will be introduced to reduce the risk of sediment production.

Full extraction of Stage 3 results in the Pit 2 profile. If all of Pit 2 is extracted, the quarry life will be extended to in excess of 100 years at 30,000 t/a. The base of the pit will be used for water storage. Planting of trees will take place on the accessible benches using small equipment and available stored topsoil. Rehabilitation of the quarry faces will be undertaken by placing up to 1m of overburden and up to 100mm of topsoil on the terminal bench, with a combination of natural regeneration and supplementary planting of native vegetation. The requirement for topsoil placement will be assessed through on-site trials by monitoring the effectiveness of planting directly within overburden vs planting within topsoil and overburden.

The processing and stockpiling areas are generally flatter and contain compacted roads and laydown areas. These areas will be contoured to suit the final rehabilitation profile (with appropriate drainage) and compacted areas will be deep ripped followed by topsoil placement.

5.2 REHABILITATION PLAN & COSTING

5.2.1 SLOPE STABILITY

Ausrocks recommended a Slope Stability Profile that should be implemented at Stokers Quarry for the safe and efficient operation should the quarry re-commence production. A bench width and height of 10m were selected with a batter angle of 70° ruled appropriate in fresh rock and 50° in weathered material utilising geotechnical analysis.

The Slope Stability Profile completed is appropriate for an operation quarry, however 70° batter angles are too steep for an acceptable rehabilitation profile. Ausrocks proposes that the rehabilitation profile change the batter angles from 70° to a maximum angle of 40°. An illustration of the comparison between the Operational and Rehabilitation slope profile is shown in Figure 5.1 with the changes in slope profile summarised in Table 5.1.

FIGURE 5.1: OPERATION AND REHABILITATION SLOPE PROFILES

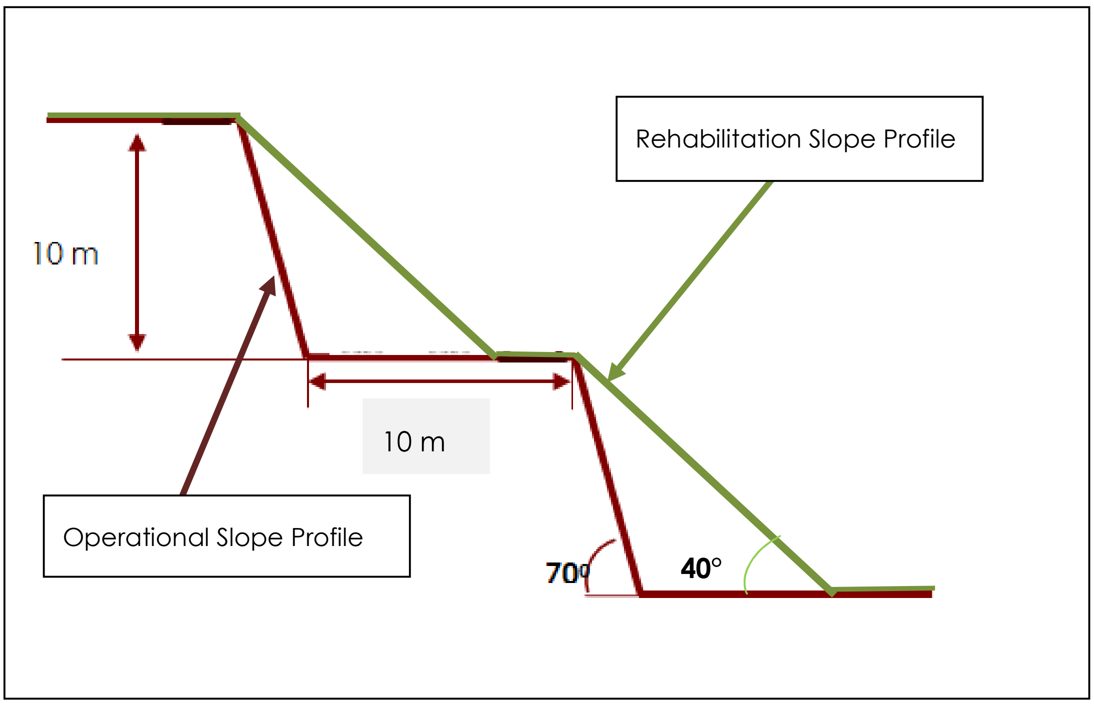


TABLE 5.1: OPERATION AND REHABILITATION SLOPE PARAMETERS

Parameter	Operational	Rehabilitation	Comment
Safety Bund Height	1m	N/A	Bund design has 1V:1.5H side slope
Bench Height	10m		
Width	10m	N/A	Geological Influence
Batter Angle in Fill/EW	50°		Geological Influence
Batter Angle fi	70°		Geological Influence

5.2.2 REHABILITATION VOLUMES

To calculate accurate costing on the rehabilitation of Stokers Quarry a number of key assumptions were made as follows:

- All bench faces to be rehabilitated so that the slope angle does not exceed 40°. Currently bench faces at Stokers Quarry are between 60°to 70°.
- Rehabilitation of faces are either stabilised by utilising a Dozer to cut material from one section and push it into a fill area or material is dumped against the bench face to allow for the shallowing of batter angles to 40°.
- Any quarry excavation exceeds the current pit floor 18-15m RL AHD does not require rehabilitation as this depth will be suitable for the storage of water and thus the quarry faces would be under water. This is approximately 10m below the existing quarry floor (18m RL)
- Drill and Blast will not be conducted within 250m of the Bruxner Highway, alternative methods of rock breaking will have to be utilised.
- Where possible Dozer Push was preferred due to the lower operating costs compared to Excavator loading and placement of material with trucks.
- All disturbed areas will need to be covered with 1m of weather fill or overburden material 100mm of topsoil to rehabilitate

Volume calculations were completed using the Stage Pit Designs as completed by Ausrocks as the base mark applying the aforementioned assumptions end with results summarised in Table 5.2.

TABLE 5.2: REHABILITATION COSTS FOR VARIOUS STAGES

Rehabilitation Stage	Dozer Push	Excavator-Truck	Overburden Spread	Top Soil Spread	Total Material	Estimated Cost
	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	($)
Stage 1	3,411	18,607	33,119	4,180	59,319	258,232
Stage 2	4,962	19,848	30,382	4,180	59,373	255,835
Stage 3	3,928	48,379	44,828	6,327	103,463	453,147

6 CONCLUSIONS

7 REFERENCES

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APPENDIX 1 | QUARRY VALUATION CAPABILITY STATEMENT

APPENDIX 2 | MATERIAL TESTING

APPENDIX 3 | PETROGRAPHIC ANALYSIS

APPENDIX 4 | STAGED 3-D PLANS

APPENDIX 5 | FINANCIAL ANALYSIS – SCENARIO 1

APPENDIX 6 | FINANCIAL ANALYSIS – SCENARIO 2

APPENDIX 7 | FINANCIAL ANALYSIS – SCENARIO 3

APPENDIX 8 | REHABILITATION CALCULATIONS