Cleary Bros (Bombo) Pty Ltd

ABN: 28 000 157 808

CLEARY BROS

Albion Park Quarry Extraction Area Stage 7 Extension

Economic Assessment

Prepared by

Gillespie Economics

February 2022

Specialist Consultant Studies Compendium
Part 9

This page has intentionally been left blank

Cleary Bros (Bombo) Pty Ltd

ABN: 28 000 157 808

Albion Park Quarry Extraction Area Stage 7 Extension

Economic Assessment

Prepared for:	R.W. Corkery & Co. Pty Limited Level 1, 12 Dangar Road PO Box 239 BROOKLYN NSW 2083 Tel: (02) 9985 8511 Email: brooklyn@rwcorkery.com
On behalf of:	Cleary Bros (Bombo) Pty Ltd PO Box 210 PORT KEMBLA NSW 2505 Tel: (02) 4275 1000 Email: info@clearybros.com.au
Prepared by:	Gillespie Economics 13 Bigland Ave Denistone, NSW 2114 Tel: 0419 448 238 Email: gillecon@bigpond.net.au

February 2022

Addendum: The Economic Assessment identifies that Cleary Bros were continuing discussions with the owners of "Figtree Hill" regarding Project-related impacts, and an agreement had not been reached at the time the assessment was finalised. As identified in Section 2.5 of the EIS, a negotiated agreement has since been finalised between Cleary Bros and the owners of "Figtree Hill". As such, the "Figtree Hill" property is now considered Project-related for the purposes of this assessment. Under that agreement, the owners have agreed to accept Project-related impacts to the extent identified in the air quality, noise and visual assessments.

TABLE OF CONTENTS

EXECUTIVE SUMMARY **9-5**

1 INTRODUCTION **9-9**

1.1 BACKGROUND 9-9
1.2 ECONOMIC ASSESSMENT REQUIREMENTS 9-9

2 CLEARY BROS AND VERTICAL INTEGRATION **9-11**

3 SIGNIFICANCE OF THE RESOURCE **9-12**

4 COST BENEFIT ANALYSIS **9-13**

4.1 INTRODUCTION 9-13
4.2 IDENTIFICATION OF THE "WITHOUT" PROJECT SCENARIO 9-13
4.3 IDENTIFICATION OF THE "WITH" PROJECT SCENARIO 9-13
4.4 IDENTIFICATION OF BENEFITS AND COSTS 9-13
4.5 QUANTIFICATION/VALUATION OF BENEFITS AND COSTS 9-15
4.6 CONSOLIDATION OF VALUE ESTIMATES 9-22
4.7 DISTRIBUTION OF NSW COSTS AND BENEFITS 9-26
4.8 RISK AND SENSITIVITY ANALYSIS 9-27

5 THE REGIONAL ECONOMY **9-30**

5.1 INTRODUCTION 9-30
5.2 CHARACTERISATION OF THE REGION 9-30

6 LOCAL EFFECTS ANALYSIS **9-34**

6.1 INTRODUCTION 9-34
6.2 DIRECT EFFECTS RELATED TO EMPLOYMENT OF EXISTING RESIDENTS ONLY 9-34
6.3 DIRECT EFFECTS RELATED TO NON-LABOUR EXPENDITURE 9-34
6.4 SECOND ROUND AND FLOW-ON EFFECTS 9-35
6.5 REGIONAL ECONOMIC IMPACT ASSESSMENT 9-35
6.6 OTHER EFFECTS 9-37
6.7 ENVIRONMENTAL AND SOCIAL IMPACTS ON THE LOCAL COMMUNITY (EXTERNALITIES) 9-38
6.8 SUMMARY OF LOCAL EFFECTS 9-38

7 CONCLUSION **9-39**

8 REFERENCES **9-40**

ATTACHMENT 1 – COMPARISON OF INPUT-OUTPUT ANALYSIS AND THE LEA METHOD **9-41**

TABLES

Table ES1 Summary of Effects on the Local Community
Table 4.1 Potential Incremental Economic Benefits and Costs of the Project
Table 4.2 Alternative Frame of Potential Incremental Economic Benefits and Costs of the Project
Table 4.3 Net Production Benefits of the Project (Present Values at 7% Discount Rate)
Table 4.4 Externality Impacts of the Project (Present Values at 7% Discount Rate)
Table 4.5 Net Social Benefits of the Project (present value @ 7% discount rate)
Table 4.6 Incidence of NSW Costs and Benefits
Table 4.7 NSW CBA Sensitivity Testing (Present Value $M)
Table 5.1 Characteristics of Usual Residents

Table 5.2 Top 5 Industry Sectors of Employment for Usual Residents
Table 5.3 Population Growth
Table 5.4 Gross Value Added for the 5 Largest Industries in the Regional Economy (IO Sectors)
Table 5.5 Gross Value Added for the 5 Largest Industries in the Regional Economy (ANZSIC One-Digit Sectors)
Table 6.1 Analysis of Net Income Increase and FTE Job Increase Assuming Full Employment
Table 6.2 Gross Annual Direct and Indirect Regional Economic Impacts of the Quarry
Table 6.3 Gross Annual Direct and Indirect Regional Economic Impacts of Transport
Table 6.4 Gross Annual Direct and Indirect Regional Economic Impacts of Concrete Production
Table 6.5 Gross Annual Direct and Indirect Regional Economic Impacts of Quarry, Transport and Concrete Production
Table 6.6 Summary of Effects on the Local Community

FIGURES

Figure 4.1 Indicative Incremental Production from the Project Relative to the Base Case
Figure 5.1 Place of Work Employment Industry (1digit ANZSIC Sectors)

EXECUTIVE SUMMARY

Introduction

The Albion Park Quarry is located approximately 20km south-southwest of Wollongong. The proposed extension to the current extraction area contains approximately 33 million tonnes of latite and agglomerate resources which is a significant and important input to the production of aggregates to produce ready mixed concrete and a range of road pavement and armour rock products. Cleary Bros (Bombo) Pty Ltd (Cleary Bros) is proposing to extend the current extraction area of the Albion Park Quarry and continue operations for at least 30 years (the Project).

From an economic perspective, there are two important aspects of the Project that can be considered:

- its economic efficiency (i.e. consideration of the economic costs and benefits of the Project) which is evaluated using cost benefit analysis (CBA); and
- its effects on the local economy, which is evaluated using local effects analysis (LEA) and input-output (IO) analysis.

As Cleary Bros is a vertically integrated firm, undertaking successive stages in the production of concrete, including extraction and processing of hard rock, transportation to concrete batching plants and concrete batching, the Project has implications for other parts of the Cleary Bros business. The economic assessment incorporates consideration of these broader impacts.

Cost Benefit Analysis

A CBA of the Project indicated that it would have net production benefits to NSW of $35M (present value at 7% discount rate) comprising $26M in quarry benefits, $2M in ex quarry transport benefits and $8M in concrete production benefits.[1]

Provided the residual environmental, social and cultural impacts of the Project that accrue to NSW are considered to be valued at less than the level of net production benefits, the Project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

The above estimate of NSW net production benefits of the Project includes the costs of water access licences, biodiversity offsets and implementation of the NSW Government's VLAMP. The main residual environmental impacts of the Project, which have not already been incorporated into the estimate of net production benefits, relate to greenhouse gas (GHG) emissions (valued at $0.002M), impacts on one item of local heritage significance and minor visual impacts in 10 to 15 years time. The value of these residual economic costs is likely to be considerably less than the estimated net production benefits of the Project. Consequently, the Project is estimated to have net social benefits to NSW, and hence is desirable and justified from an economic efficiency perspective.

[1] Difference in total is due to rounding.

Local Effects Analysis

The local area used for the Local Effects Analysis comprises the Illawarra Statistical Area Level 4. This includes the Local Government Areas (LGAs) of Wollongong, Kiama and Shellharbour. The Project will provide direct economic activity, including jobs, to the local area economy, and indirect economic activity to the local area via both wage and non-wage expenditure. A summary of local economic effects of the Project is provided in **Table ES1**.

The Project will provide 95 direct jobs, comprising 27 quarry jobs, 32 transport jobs and 36 concrete production jobs. Assuming that those that already reside in the local area would have otherwise been already employed and that job vacancies created by these people filling the Project jobs remain unfilled (i.e. no job chain effects), the incremental disposable wages accruing to the region from Project is $1.7M per annum. This is equivalent to 23 direct full time equivalent (FTE) jobs. This is a minimum estimate as it assumes full employment in the region and hence the jobs from which people come to fill the Project jobs remain vacant.

Standard regional economic impact assessment using IO analysis, is not restricted to a focus on the existing labour force in the local area and does not assume an absence of job chain effects. In this framework, the Project is estimated to provide the following annual direct and indirect annual effects to the local economy:

- $90M in output;
- $36M in value-added;
- $18M in gross wages; and
- 219 jobs.

The main local environmental impacts are internalised into the production costs of Cleary Bros via mitigation, offset and compensation costs. Residual local environmental impacts after mitigation, offset and compensation are likely to be immaterial.

Table ES1 - Summary of Effects on the Local Community

Local Effects	**Direct Total**	**Direct Already Resident in the Local Area**	**Net**
Employment FTE	95	90	23
Net Income ($M)	6.5	6.2	1.7
Non-labour expenditure in the Local Area	21.5		
Regional Impacts	**Direct**	**Flow-on**	**Total**
Output ($M)	45	45	90
Value-added ($M)	13	23	36
Income ($M)	7	11	18
Employment	81	139	219

Other Local Economic Impacts	
Displaced activities	No material impact*
Wage rise impacts	No material impact*
Housing impacts	No material impact*
Demand on local infrastructure and services	No additional demand beyond current levels
Local Environmental Impacts	
Greenhouse gas emissions (Scope 1 and 3)	$0.0001M**
Operational noise	Impact on residences within "Figtree Hill" to be managed in accordance with the NSW Government's Voluntary Land Acquisition and Management Policy.
Biodiversity	Impacts on local biodiversity are offset
Historic heritage	One item of local heritage significance impacted – not likely to be material*
Visual	Cost of amenity barriers and tree screens included in costs Some minor visual impacts in 10 to 15 years time – not likely to be material

* Materiality refers to whether valuation of these impacts would have any bearing on the estimated net social benefits of the Project. NSW Government (2012) identified that if a Project has an NPV of say "$20 million, costs or benefits valued at less than $1 million are unlikely to be material."

**This figure is the estimated impact on NSW households apportioned to households in the Local Area.

This page has intentionally been left blank

1 INTRODUCTION

1.1 Background

Cleary Bros (Bombo) Pty Ltd (Cleary Bros) is proposing to extend the current extraction area of the Albion Park Hard Rock Quarry (the Project). The Project would not modify any extraction-related procedures for the extended extraction area, with the annual production limit maintained at 900 000tpa. Cleary Bros proposes to introduce continuous in-pit primary crushing and screening in addition to the current intermittent campaign crushing and screening. A proportion of the primary crushed and screened rock would then be transported to the fixed processing plant for further processing. The current practices for product loading and dispatch would continue.

R.W. Corkery and Co. Pty Ltd (Corkery) has been engaged to prepare an Environmental Impact Statement (EIS) for the Project. Gillespie Economics was engaged to prepare an Economic Assessment of the Project for incorporation into the EIS.

1.2 Economic Assessment Requirements

Economic Assessment requirements arise from the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Secretary's Environmental Assessment Requirements (SEARs). While there are no specific economic assessment guidelines for extractive industries, the *Guidelines for Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government, 2015) and the *Technical Notes Supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government, 2018), provide guidance on the economic assessment techniques that are appropriate for addressing the requirements under the EP&A Act. The requirements are briefly outlined below.

Environmental Planning and Assessment Act 1979

Section 4.15 of the EP&A Act requires the following two matters to be taken into consideration by the consent authority in determining a development application:

- the public interest (taken as the collective public interest of households in NSW); and
- the likely impacts of the development, including environmental impacts on both the natural and built environments, and social and ***economic impacts in the locality***.

Economic Assessment Guidelines

The NSW Government (2015) Guideline provides information to assist proponents with providing the necessary economic information to meet the abovementioned requirements of section 4.15 of the EP&A Act. The Guideline identifies that:

- Cost Benefit Analysis (CBA) is used to assess the public interest by estimating the net present value of the project to the NSW community;
- Local Effects Analysis (LEA) is used to assess the likely economic impacts of the development in the locality. The Guideline identifies a specific method for assessing the direct local effects of a mining project. However, it also states that "*a range of techniques are available for estimating second round or flow-on effects. These include CGE (computable general equilibrium) modelling, Input-Output (IO) or multiplier analysis.*"

The NSW Government (2018) Technical Notes provides guidance on including environmental, social and cultural impacts in the CBA.

Secretary's Environmental Assessment Requirements

The SEARs for the Project require:

"a detailed assessment of the likely economic impacts of the development, paying particular attention to:

- the significance of the resource;
- the costs and benefits of the project; identifying whether the development as a whole would result in a net benefit to NSW, including consideration of fluctuation in commodity markets and exchange rates; and
- the demand on local infrastructure and services."

Proposed Economic Assessment Methods

To meet the above requirements, two types of economic assessment of the Project are needed:

- a CBA; and
- a LEA.

2 CLEARY BROS AND VERTICAL INTEGRATION

Cleary Bros was incorporated under the Companies Act in 1955, however, the company has been in operation for over 100 years. Cleary Bros provides a range of services that illustrate the integrated nature of the Group:

1. Quarries;
2. Transport;
3. Concrete;
4. Construction; and
5. Plant hire.

Cleary Bros undertakes a number of successive stages in the supply of ready mixed concrete, including extraction and processing of hard rock, transportation to concrete batching plants, concrete batching and transportation of ready mixed concrete to customer sites. In economics, this is referred to as vertical integration.

From the perspective of Cleary Bros, this vertical integration has a number of advantages:

- it enables Cleary Bros to reduce its production and distribution costs by linking successive stages of production; and
- it ensures secure reliable supplies of inputs (of appropriate quality) in order to remain competitive.

This vertical integration of Cleary Bros' activities also has wider impacts on the operation of market processes, i.e. it promotes greater economic efficiency in resource use and maximises welfare gains for society. Various efficiency gains accrue through vertical integration of Cleary Bros. These include:

- technical efficiencies from combining together successive production process – cost minimisation;
- stockholding economies through the reduction in intermediate and contingency buffer stocks;
- elimination of some purchasing expenses in negotiating outside supply contracts by internalising these transactions within the company;
- managerial economies by having a single administrative system to handle several production activities; and
- financial economies through more advantageous bulk buying discounts and by lowering the cost of raising capital.

The net result of such economies of vertical integration is a reduction in the average costs of production of concrete and hence the ability to compete in the marketplace with other firms. The result for the consumer is lower market prices and increased output.

If competitors were the only source of raw material for Cleary Bros, then its competitors would be in a position to operate a price squeeze. That is, squeeze the profit margins of Cleary Bros. This would be done by the competitor raising Cleary Bros' costs through charging them a higher price for the raw material than the price charged for its own use, while setting a relatively low final product price.

Other vertically integrated competitors would therefore be in a position to injure a non-integrated competitor. This would force the closure of Cleary Bros concrete batching plants that are so affected and could have repercussions for the entire Company.

The vertical integration of Cleary Bros has implications for the CBA and LEA of the Project as extraction and processing operations affect both ex quarry transportation and concrete production.

3 SIGNIFICANCE OF THE RESOURCE

The Albion Park Quarry is located approximately 20km south-southwest of Wollongong. The property on which the Albion Park Quarry is located covers an area of 142.74ha of which approximately 54ha is currently disturbed by quarry-related activities

The total latite resource within the property is approximately 25Mt comprising both the Upper and Lower Latite units within the current extraction area and the proposed Stage 7. Most of this rock would be suitable for feed to the fixed or mobile crushing and screening plants less a small quantity that would result from extraction losses. The total quantity of agglomerate within the Project Area is approximately 8Mt. In total, approximately 33Mt of latite and agglomerate is recoverable from within the Project Area.

Hard rock materials derived from the latite and agglomerate resource are a significant and important input for the production of aggregates to produce ready mixed concrete and a range of road pavement and armour rock products. The demand for aggregates and road pavement materials is driven by population growth and the resulting need for additional housing, land subdivision, provision of trunk infrastructure, major landscaping projects, upgrading of road, rail and other transport networks, additional commercial and industrial development and the development of community, cultural and recreational infrastructure.

The largest individual market for aggregates in NSW is the Sydney region. Until recently the supply of aggregates to the Sydney Region was dominated by production at Penrith Lakes. The Penrith Lakes Scheme (as it was known) provided both construction sand and gravel but ceased production in 2016. Albion Park Quarry along with other quarries in the Illawarra, Central Coast and Lower Hunter have become important replacement sources of hard rock materials, in close proximity to Sydney.

While there is strong and growing demand for hard rock materials, their supply in proximity to Sydney is limited to specific areas where the required geological formations exist, and it is economic to extract. The Albion Park Quarry is one of these locations.

4 COST BENEFIT ANALYSIS

4.1 Introduction

CBA of the Project involves the following key steps:

- identification of the "with" and "without" Project scenarios;
- identification and valuation of the incremental benefits and costs;
- consolidation of value estimates using discounting to account for temporal differences;
- application of decision criteria;
- sensitivity testing;
- consideration of non-quantified benefits and costs; and
- consideration of the distribution of costs and benefits.

What follows is a CBA of the Project based on technical, financial and environmental information provided by Cleary Bros and Corkery.

4.2 Identification of the "Without" Project Scenario

A starting point for CBA is to establish the "without" Project scenario for the land impacted by the Project. This becomes the base case against which to assess the potential economic, social and environmental impacts of changes due to the Project. Without the Project, extraction under the existing approval at an average rate of approximately 750,000 tonnes per annum (tpa) (with a maximum of 900,000 tpa) continues until the resource is exhausted in 2026. At this time, it is assumed that the landform within the extraction area is rehabilitated, and the processing area is decommissioned and rehabilitated.

4.3 Identification of the "With" Project Scenario

"With" the Project, extraction at an average rate of 750,000 tpa (with maximum of 900,000 tpa) would continue for at least 30 years. At that time, it is assumed that the landform would be rehabilitated, and the processing area is decommissioned and rehabilitated.

Figure 4.1 illustrates the indicative incremental production of the Project relative to the base case.

4.4 Identification of Benefits and Costs

Relative to the base case, or "without" Project scenario, the Project may have the potential incremental economic benefit and cost categories shown in **Table 4.1**. The table includes costs and benefits associated with the integrated components of the Cleary Bros operations, not just the quarry operation.

It should be noted that the potential environmental, social and cultural costs listed in **Table 4.1** are only economic costs to the extent that they affect individual and community well-being through direct use of resources by individuals or non-use. If the potential impacts do not occur or are mitigated, compensated or offset to the extent where community wellbeing is insignificantly affected (i.e. costs are borne by the proponent), then no environmental, social or cultural economic costs should be included in the Project CBA apart from the mitigation, compensation or offsetting costs.

Figure 4.1 – Indicative Incremental Production from the Project Relative to the Base Case

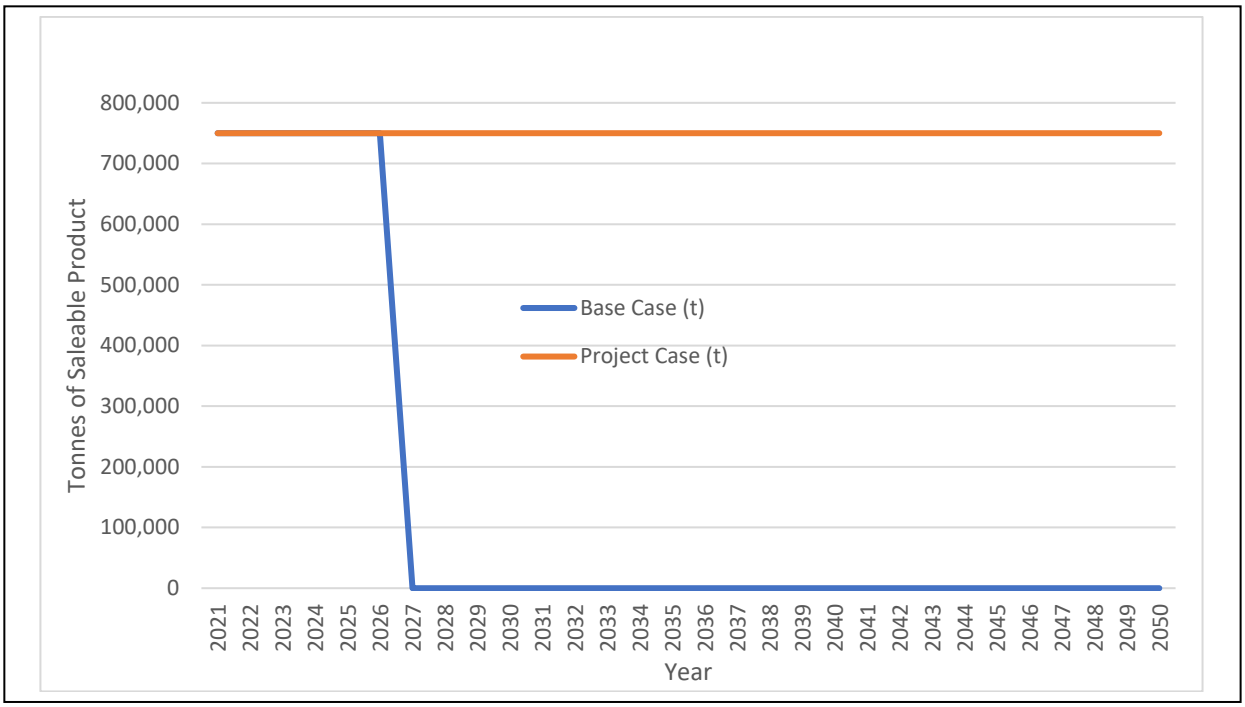


Table 4.1 - Potential Incremental Economic Benefits and Costs of the Project

Category	Costs	Benefits
Net production benefits from extraction and processing	• Opportunity cost of land in 2026 • Opportunity cost of capital in 2026 • Capital costs • Operating costs at quarry gate • Decommissioning and rehabilitation costs at cessation of the Project	• Avoided decommissioning and rehabilitation costs in 2026 • Sale value of quarry product at quarry gate • Residual value of capital and land at the end of the Project
Net production benefits from ex-quarry transport	• Capital and operating costs	• Revenues
Net production benefits of concrete production	• Capital and operating costs	• Revenues
Potential environmental, social and cultural impacts of extraction, processing and transportation, and concrete production after mitigation, offsetting and compensation	• Air quality impacts • Greenhouse gas generation • Noise and blasting impacts • Road transport impacts • Groundwater impacts • Surface water impacts • Biodiversity impacts • Aboriginal heritage impacts • Historic heritage impacts • Visual impacts • Net public infrastructure costs • Loss of surplus to other industries	• Wage benefits to employment • Economic benefits to existing landholders • Economic benefits to suppliers

Framed in another but equivalent way, the potential incremental costs and benefits of the Project are as per **Table 4.2**. No royalties accrue to Government from extraction and processing and hence these are omitted from the estimation of net production benefits.

Table 4.2 - Alternative Frame of Potential Economic Benefits and Costs of the Project

Costs	Benefits
Direct costs	***Direct benefits***
Nil	Net production benefits from extraction and processing • *Company tax* • *Net producer surplus*
	Net production benefits from ex quarry transport
	• *Company tax*
	• *Net producer surplus*
	Net production benefits from concrete production
	• *Company tax*
	• *Net produce surplus*
Indirect costs	***Indirect benefits***
Environmental, social and cultural impacts of extraction, processing and transportation, and concrete production after mitigation, offsetting and compensation	Wage benefits to employment
Net public infrastructure costs	Economic benefits to existing landholders
Loss of surplus to other industries	Economic benefits to suppliers

4.5 Quantification/Valuation of Benefits and Costs

Consistent with NSW Government (2015), the CBA was undertaken in 2021 real values, with discounting at 7 percent (%) and sensitivity testing at 4% and 10%.
The analysis period is 30 years, coinciding with the proposed duration of the development consent. Any impacts that occur after this period are included in the final year of the analysis as a terminal value.

Where competitive market prices are available, they have generally been used as an indicator of economic values. Environmental, cultural and social impacts have initially been left unquantified and interpreted using the threshold value method.[2]

Environmental, cultural and social impacts were then estimated using market data and benefit transfer[3] and incorporated into an estimate of the net social benefit of the Project. This estimated net social benefit of the Project provides another threshold value that any residual or non-quantified economic costs would need to exceed to make the Project questionable from an economic efficiency perspective.

4.5.1 Production Costs and Benefits of Extraction and Processing[4]

Opportunity Cost of Land and Capital in 2026

Under the base case scenario, the Albion Park Quarry would be decommissioned in approximately 2026 and residual land and capital value would be realised.

[2]The threshold value method uses the value of quantified net production benefits as the amount that unquantified environmental, social and cultural costs would need to exceed to make a project questionable from an economic efficiency perspective.
[3] Benefit transfer refers to transferring economic values that have been determined for other study sites.
[4] All values reported in this section are undiscounted unless specified.

With the Project, the quarry life would be extended to at least 2050 and hence there would be an opportunity cost of continuing to use the land and capital equipment at the Albion Park Quarry. This opportunity cost is estimated at $6.3M for land (based on NSW Valuer General's Land Values and Property Sales Map). Capital equipment is assumed to have $3.8M residual value at the end of base case (Cleary Bros, pers. comms.).

Capital Cost of the Project

Compared to the economic base case, the Project would require additional capital expenditure primarily associated with topsoil and overburden stripping. This cost is estimated at $260,000 per annum for 24 years (Cleary Bros, pers. comms.).

Annual Operating Costs of the Project

Compared to the base case, operating costs of the Project are associated with the additional 24 years of quarry life at an average production rate of 750 000 tpa.

The quarry operating costs of the Project include those associated with extraction, in-pit crushing and screening, general costs (including overheads and administration) and ongoing environmental, social and cultural mitigation costs. These costs include labour costs, which reflect the value of labour resources in their next best use. Unit operating costs are not reported for reasons of commercial confidentiality.

Decommissioning and Rehabilitation Costs

With the Project, the cost of decommissioning and rehabilitation activities at the end of the proposed Project life would be in the order of approximately $0.8M. Other annual rehabilitation costs are included in the annual operating costs of the Project.

Economic Benefits

Avoided Decommissioning and Rehabilitation Costs

Without the Project, in 2026 the resource would be depleted and the quarry would be decommissioned and rehabilitated, at an estimated cost of $0.5M. With the Project, these costs in 2026 are avoided in that year and are a benefit to the Project.

Revenues

The main economic benefit of the Project is the market value of the hard rock products produced. An average unit price at the quarry gate has been applied to the output of the quarry based on advice from Cleary Bros. It has not been reported for reasons of commercial confidentiality.

There is uncertainty around future hard rock prices and hence assumed values have been subjected to sensitivity testing (see Section 4.8).

Residual Value at End of the Evaluation Period

At the end of the Project, the land and capital equipment required for the Project would have some residual value that could be realised by sale. This is estimated at $6.3M for land and $3.8 for capital equipment.

4.5.2 Production costs and benefits of product transport

Product transportation is not a component of the Project as it is an approved activity under the approval for the fixed processing plant. However, from an economic perspective, there are incremental producer surplus or net production benefits associated with product transportation with the Project that would not occur under the base case. These net production benefits essentially relate to the net revenue that accrues to transport providers, including Cleary Bros Transport Division.

The annual net production benefit of product transport has been estimated based on assumed incremental quarry production, an average per tonne transport cost and an average per tonne revenue from transport (Cleary Bros pers. comms.).

4.5.3 Producer surplus in other integrated aspects of Cleary Bros (Bombo) Pty Ltd – concrete production

Hard rock production is a direct input into Cleary Bros concrete production. Without its own supply of hard rock, Cleary Bros would likely cease this aspect of its operations.

The annual net production benefit of concrete production has been estimated based on the incremental quarry production, an average unit cost of Cleary Bros concrete production and an average unit price of concrete (Cleary Bros pers. comms.).

4.5.4 External Costs and Benefits

The environmental, social and cultural impacts of the Project are assessed in the EIS. This Section considers these impacts from an economic perspective.

Air Quality

The impact of the Project emissions can potentially be valued using the:

- the property value method, where the change in property value as a result of the air quality impacts are estimated;
- the cost of illness method where changes in health episodes as a result of emissions are estimated; or
- the defensive expenditure method, where the costs of mitigation are estimated.

However, modelling of predicted air quality impacts by Northstar (2022) indicates that emissions of total suspended particulates, PM_{10}, $PM_{2.5}$ and deposited dust generated by the Project would remain below the relevant annual average and 24-hour average criteria at nearby residences. Additionally, predicted nitrogen dioxide concentrations associated with the Project would remain below the relevant annual and maximum 1-hour criteria. Consequently, impacts are considered to be immaterial from an aggregate economic efficiency perspective and no economic costs are included in the CBA apart from the costs of proposed general mitigation and monitoring measures.

Greenhouse Gas

The greenhouse gas assessment (Northstar, 2022) concluded that the Project would generate 7 712.2t CO_2-e per year of Scope 1 emissions and 396.2t CO_2-e per year of Scope 3 emissions.

To place an economic value on CO_2-e emissions, a shadow price of CO_2-e is required. Three shadow prices were used, the Forecast European Union Emission Allowance Units price, the Australian Treasury Clean Energy Future Policy Scenario and the US EPA Social Cost of Carbon. Under these shadow prices the present value of greenhouse gas emission cost is between $1.0M and $4.8M dollars, present value. This is a global damage cost of carbon (i.e. the cost of carbon emissions to the population of the whole world).

Consistent with the NSW Government (2015) Guidelines, NSW Government (2018) Technical Notes and the NSW Treasury (2017) Guidelines, the focus of CBA is on costs and benefits to the population of NSW. In the absence of any studies that have focused on the social damage cost of carbon emissions to NSW residents, some means of apportioning global damage costs borne by Australians is required. For the purpose of the Economic Assessment, this has been undertaken using Australia's share of the global population (around 0.3%) and NSWs share of the Australian population (32%). NSW DP&E has previously supported this approach (NSW DP&E, 2017).

On this basis, the present value of the cost of greenhouse gas emissions from the Project to Australia is estimated at between $3,200 and $14,900 dollars (present value), with an average value of $7,900. The cost of greenhouse gas emissions to NSW is estimated at between $1,000 and $4,800 dollars (present value), with an average value of $2,500.

Noise and Blasting

The impact of the Project noise as assessed by SLR (2022) at nearby properties can potentially be valued using the property value method, where the change in property value because of the noise impacts are estimated, or the defensive expenditure method and damage cost method where the costs of mitigation are estimated.

The Noise Impact Assessment identified that the noise generated by typical extraction and processing operations would satisfy the Project Noise Trigger Levels at all residences and the Shellharbour Anglican College. However, impacts of noise levels generated during a range of short-term activities would occur at the residences on "Figtree Hill". These exceedances would be managed either through a negotiated agreement with the owners of "Figtree Hill" or the adoption of an additional set of noise mitigation and management measures with the residual impacts managed through the NSW Government's Voluntary Land Acquisition and Mitigation Policy at a cost to the proponent. This internalises the externality costs into the production costs of the Project. An appropriate allowance has been included in the capital costs of the Project.

Compliance with standard blasting limits for air blast and ground vibration is predicted for all blasts within the Project Area.

Road Transport Impacts

Assessment of transport impacts has not been included in the EIS as approval already exists for road transport movements associated with the Albion Park Quarry. However, from an economic perspective continued road transport "with" the Project compared to "without" the Project could be associated with a number of externalities including capacity and safety issues, road wear and tear and vehicle emissions.

However, the Albion Park Quarry has direct access to arterial roads and hence no local road wear and tear would arise as a result of the Project. In addition, heavy vehicle registration charges include an allowance for road damage on arterial roads and emissions. Any externality costs of vehicle movements are therefore largely internalised into the operating costs of road transport. Consequently, there are no additional economic costs that warrant inclusion in the CBA.

Surface Water and Groundwater

Surface water and groundwater are potential inputs into numerous alternative production processes and so its use in the extractive industry has an opportunity cost, i.e. its value in the next best alternative use. In NSW, the government has established a market framework to facilitate the allocation of water. Water access and use is only permissible with possession of a Water Access Licence (WAL) (except in the case of harvestable rights, native title rights and some stock and domestic rights). Water Sharing Plans that are prepared under the *Water Management Act 2000* set the rules by which water is shared between all users, including the environment, in each water management area in NSW. These plans also set rules for water trading, that is, the buying and selling of water licences and also annual water allocations (Montoya 2010). Consequently, the market value for WALs can be considered to give a reasonable indication of its economic value in alternative uses i.e. its opportunity cost.

The Surface Water Impact Assessment undertaken by SEEC (2021) identifies that the Project would generate sediment-laden runoff which would be directed to internal sumps within the Project Area. The accumulated water would either be used for dust suppression or tested, and if necessary treated, to ensure that it meets quality criteria nominated in the Quarry's Environment Protection Licence, prior to controlled discharge after rainfall events. As a result, the Project would not have a significant impact on surface water quality or downstream flow. However, the intersection of groundwater that would have previously formed the baseflow for surface water flows would require an annual surface water entitlement of 2ML under the Minnamurra River Management zone of the Illawarra Rivers Water Source. The opportunity cost of this is assumed to be $500/ML i.e. $1,000.

Modelled groundwater inflow rates undertaken by Jacobs (2021) indicate increasing inflow as extraction within the Stage 7 area progresses. The current groundwater inflow into Stages 1 to 6 (38kL/day) is predicted to increase to a peak of approximately 187kL/day during Stage 7d. Groundwater drawdown of 2m would extend to an average of 150m from the boundary of Stage 7, with a maximum extension of the 2m drawdown level occurring approximately 250m to the west of Stage 7. Modelled baseflow reductions associated with groundwater level drawdown would peak at <5kL/day during Stage 7d.
Project-related groundwater impacts have been assessed as less than the *NSW Aquifer Interference Policy's* Minimal Impact Considerations. The 2m groundwater level drawdown would not encroach on any registered groundwater bores for water supply and no drawdown impacts would be experienced by high priority groundwater dependent ecosystems. Additionally, the Project is unlikely to lower the groundwater beneficial use category beyond 40m from the Project Area and potential contamination risks were assessed as low risk.

The Project would require a total annual groundwater entitlement of 66ML from the Sydney Basin South Groundwater Source**.** Cleary Bros currently hold an entitlement for 15 ML from the Sydney Basin South Groundwater Source. There is an opportunity cost of continuing to hold this 15 ML WAL and a direct financial cost of purchasing an additional 51 ML. This opportunity cost and financial cost is assumed to be $500/ML i.e. $33,000, and is included in the capital costs of the Project.

Biodiversity Impacts

A landscape assessment and targeted biodiversity surveys undertaken by Niche (2021) within the Stage 7 area concluded that the Project would result in the removal of 7.61ha of native vegetation, including areas of two threatened ecological communities: 4.69ha of 'Whalebone tree – Native Quince dry subtropical rainforest' (PCT 1300) and 2.92ha of '*Melaleuca armillaris* Tall Shrubland' (PCT 720). Additionally, the Project would result in the loss of 3.01ha of *Zieria granulata* habitat (including an estimated 2 170 mature individual plants) and 0.15ha of *Cynanchum elegans* habitat (including one known individual).

Both *Z. granulata* and *C. elegans* are species credit species for the Project. A referral for the Project has been lodged with the Commonwealth Department of Agriculture, Water and the Environment, who confirmed that the Project is a Controlled Action as it would likely result in significant impacts to listed threatened species and communities.

Cleary Bros intends to offset impacts from the Project retiring credits based on the like-for-like rules via either:

- establishment of a Stewardship Site; and/or
- facilitating the establishment of a Stewardship Site; and/or
- making a payment to the Biodiversity Conservation Fund calculated using the offset payments calculator.

The impacted vegetation, and associated fauna, is likely to have non-use values to the community that would be lost as a result of the Project. These values could potentially be estimated using non-market valuation methods. However, it is government policy that biodiversity offsets are provided that improve or at least maintain biodiversity values. The provision of offsets is also likely to have non-use values to the community that would be gained as a result of the Project. Provided the values held by the community for the offsets are equal or greater than values that would be lost then no additional economic costs warrant inclusion in the CBA apart from the costs of providing offsets. An allowance for biodiversity offset costs has been included in the capital costs of the Project.

Aboriginal Heritage

Impacts on Aboriginal cultural heritage can have use and non-use values to both Aboriginal and non-Aboriginal people that can be potentially estimated used nonmarket valuation methods such as choice modelling.

However, Biosis (2021a) recorded that no Aboriginal sites, potential archaeological deposits, artefacts or features were identified during surveys of the Project Area. The area was assessed as having low scientific and historical value, moderate aesthetic value and high cultural value. Due to the low potential for the presence of Aboriginal sites, in combination with the long history of disturbance from agricultural activities, it is not anticipated that the Project would impact any Aboriginal heritage values.

Hence, there are no material economic costs for inclusion in the CBA.

Historic Heritage

The Historic Heritage Assessment undertaken by Biosis (2021b) found that the Project would result in the demolition of items of historic heritage within the "Belmont Estate" including the Belmont House, which is of local heritage significance. A digital photographic archival recording of the "Belmont Estate" has been completed in accordance with the relevant guidelines. The Quarry's existing Heritage Management Plan will be updated to detail measures including the salvage and reconstruction of dry stone walls and the monitoring of demolition and ground disturbance works within the Project Area.

Impacts on historic heritage can have non-use values to the community, that can potentially be estimated using nonmarket valuation methods such as choice modelling. However, given the low level of heritage significance, these values are not likely to be material from an aggregated economic efficiency perspective. They have therefore been left unquantified in the CBA.

Visual Impacts

R.W. Corkery & Co. (2022) records the staged design of the extraction operations within Stage 7 together with proposed amenity barriers and tree screens would result in minor visibility of the extraction activities during the first 10 to 15 years of operations. Beyond that time, the upper extraction faces on the western side of Stage 7 would become increasingly visible from the "Figtree Hill" property to the north and from elevated areas within Shell Cove West, east of the Princes Highway. The impacts the dark grey exposed extraction faces would be minimised and softened by the vegetation established on each of the benches earlier in the Project life.

Visual impacts can potentially be estimated using the defensive expenditures method or property valuation method. The capital costs of the Project already include the costs of amenity barriers and tree screens. Any residual impacts, particularly 10 to 15 years in the future are unlikely to be significant from an aggregate economic efficiency perspective.

Net Public Infrastructure Impacts

No net infrastructure costs to government are envisaged as a result of the Project. Given that additional employment will likely be sourced from existing residents of NSW no additional demand for community infrastructure is envisaged.

Loss of Surplus to Other Industries

No loss of surplus to other industries is envisaged as a result of the Project.

Market Benefits to Workers

The Project will result in the continuation of employment of 27 people in extraction and processing operations, 32 people in transport and 36 people in concrete production.

As identified in the NSW Government (2015) Guideline, there may potentially be wage benefits associated with employment. Notwithstanding, there is considerably controversy about the measurement and inclusion of these benefits in NSW CBAs. Consequently, for the purpose of this analysis, wage benefits have conservatively been left unquantified.

Economic Benefits to Existing Landholders

All land required for the Project is owned by Cleary Bros. No benefits to other landholders via land prices in excess of the opportunity cost of the land will occur.

Economic Benefits to Suppliers

The focus of CBA is generally on primary costs and benefits i.e. first round impacts. Secondary net benefits that accrue to firms that sell to or buy from a project are not included. Conservatively, this convention is adopted and hence any secondary benefits remain unquantified.

4.6 Consolidation of Value Estimates

4.6.1 Net Production Benefits

The present value of production costs and benefits, using a 7% discount rate, is provided in **Table 4.3**.

The extraction component of the Project is estimated to have Australian net production benefits of $32M (present value at 7% discount rate), relative to the base case. Ex quarry transport associated with the Project is estimated to have Australian net production benefits of $3M (present value at 7% discount rate) relative to the base case, and the concrete production associated with the Project is estimated to have Australian net production benefits of $10M (present value at 7% discount rate) relative to the base case.
The net production benefits can be further apportioned to NSW based on Cleary Bros being 100% NSW owned, an assumption that transport providers are 100% NSW owned, and company tax benefits accruing to NSW based on its population share i.e. 32%. On this basis, the net production benefits of the Project that accrue to NSW are estimated at $26M in quarry net production benefits, $2M in transport net production benefits and $8M in concrete net production benefits (present value at 7% discount rate).

The estimated net production benefits that accrue to Australia and NSW can be used as a minimum threshold value or reference value against which the relative value of the residual environmental impacts of the Project, after mitigation, offset and compensation, may be assessed. This threshold value is the opportunity cost to society of not proceeding with the Project. It is a minimum threshold value as it does not include potential wage benefits and benefits to suppliers.

Provided the value of the residual environmental impacts of the Project, to Australian and NSW households, after mitigation, do not exceed the respective net production threshold values, then the Project will have net benefits to the Australian and NSW communities.

4.6.2 Externalities

Instead of leaving the analysis as a threshold value exercise, an attempt has been made to qualitatively consider and where possible quantify the main environmental, cultural and social impacts of the Project. **Table 4.4** summarises the results of the consideration of externalities in Section 4.5.2. Only GHG impacts differ between the Australian and NSW scope, albeit in a minor way.

From Section 4.5.2, it is evident that the main potential impacts of the Project are internalised into the production costs of the Project through mitigation measures, compensation payments, offsets and purchase of water allocations. Other quantified costs not already included in the production costs of the Project are associated with greenhouse gas costs, although from **Table 4.9** it is evident that these impacts to Australia and NSW are small or immaterial.

4.6.3 Net Social Benefits to Australia and NSW

The main decision criterion for assessing the economic desirability of a project to society is its net present value (NPV). NPV is the present value of benefits less the present value of costs. A positive NPV indicates that it would be desirable from an economic perspective for society to allocate resources to the project, because the community as a whole would obtain net benefits from the project.

The results from **Table 4.3** and **Table 4.4** are combined in **Table 4.5** to estimate the net social benefits of the Project to Australia and NSW, relative to both the base case.

Table 4.3 - Net Production Benefits of the Project ($M Present Values at 7% Discount Rate)

	Extraction and Processing	Ex Quarry Transport	Concrete Production
Costs			
Opportunity cost of land in 2026	$4		
Opportunity cost of capital equipment in 2026	$3		
Capital costs	$5		
Operating cost	$103	$57	$182
Decommissioning and rehab costs at cessation of Project	$0		
Sub-total	***$115***	***$57***	***$182***
Benefits			
Avoided decommissioning and rehab costs in 2026	$0		
Revenue	$145	$60	$191
Residual value of land in 2050	$1		
Residual value of capital equipment in 2050	$0		
Sub-total	***$147***	***$60***	***$191***
Australian Net Production Benefits	**$32**	**$3**	**$10**
Company Tax	$10	$1	$3
Residual Net Production Benefits	$22	$2	$7
Australian Net Production Benefits	**$32**	**$3**	**$10**
Company Tax	$3	$0	$1
Residual Net Production Benefits	$22	$2	$7
NSW Net Production Benefits	**$26**	**$2**	**$8**

*Differences in totals are due to rounding.

Table 4.4 – Externality Impacts of the Project ($M Present Values at 7% Discount Rate)

Benefits	**Australia**	**NSW**
Wage benefits to employment	Not quantified	
Economic benefits to existing landholders	$0	
Economic benefits to suppliers	Not quantified	
Sub-total		
Costs		
Greenhouse gas emissions (Scope 1 and 3)	$0.008	$0.003
Air quality	Meets relevant criteria - no material residual impact	
Noise and blasting	Blasting to comply with standards Impact on residences on "Figtree Hill" to be managed in accordance with the NSW Government's VLAMP. Cost included in capital costs	
Road transport	No local road impacts Externality costs of heavy vehicle transport included in registration and other operating requirements and hence are reflected in the operating costs - no material residual impact	
Surface water and Groundwater	Cost of WALs included in capital costs No drawdown impacts on registered groundwater bores or groundwater dependent ecosystems	
Biodiversity	Impacts on biodiversity are offset – cost of offsets included in capital costs	
Aboriginal heritage	No impact	
Historic heritage	One item of local heritage significance impacted – not likely to be material	
Visual	Cost of amenity barriers and tree screens included in costs Some minor visual impacts in 10 to 15 years time – not likely to be material	
Net public infrastructure costs	No impact	
Loss of surplus to other industries	No impact	

Table 4.5– Net Social Benefits of the Project ($M present value @ 7% discount rate)

Benefits	Australia	NSW
Net Production Benefits Extraction and Processing		
Company Tax	$10	$3
Residual Net Production Benefits	$22	$22
Sub-total	**$32**	**$26**
Net Production Benefits Transport		
Company Tax	$1	$0
Residual Net Production Benefits	$2	$2
Sub-total	**$3**	**$2**
Net Production Benefits Concrete		
Company Tax	$3	$1
Residual Net Production Benefits	$7	$7
Sub-total	**$10**	**$8**
Other Benefits		
Wage benefits to employment	Not quantified	Not quantified
Economic benefits to existing landholders	$0	$0
Economic benefits to suppliers	Not quantified	Not quantified
Sub-total	***$0***	***$0***
Total Benefits	**$45**	**$35***
Costs		
Greenhouse gas emissions (Scope 1 and 3)	$0**	$0***
Air quality	Meets relevant criteria - no material residual impact	
Noise and blasting	Blasting to comply with standards Impact on residences on "Figtree Hill" to be managed in accordance with the NSW Government's VLAMP. Cost included in capital costs	
Road transport	No local road impacts Externality costs of heavy vehicle transport included in registration and other operating requirements and hence are reflected in the operating costs - no material residual impact	
Surface water and Groundwater	Cost of WALs included in capital costs No drawdown impacts on registered groundwater bores or groundwater dependent ecosystems	
Biodiversity	Impacts on biodiversity are offset – cost of offsets included in capital costs	
Aboriginal heritage	No impact	
Historic heritage	One item local heritage significance impacted – not likely to be material	
Visual	Cost of amenity barriers and tree screens included in costs Some minor visual impacts in 10 to 15 years time – not likely to be material	
Net public infrastructure costs	No impact	
Loss of surplus to other industries	No impact	
Sub-total	***$0***	***$0***
Net Social Benefits -	**$45**	**$35**

*Does not sum to total due to rounding.

**Rounded to $M. The estimated value is $7,900.

***Rounded to $M. The estimated value is $2,500.

Overall, the Project is estimated to have net social benefits to both Australia and NSW, and hence is desirable and justified from an economic efficiency perspective.

While the major environmental, cultural and social impacts have been quantified and included in the Project CBA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than approximately $45M and $35M for the Project to be questionable from an Australian and NSW economic efficiency perspective, respectively.

4.7 Distribution of NSW Costs and Benefits

CBA is primarily concerned with the single objective of economic efficiency. CBA and welfare economics provide no guidance on what is a fair, equitable or preferable distribution of costs and benefits. Nevertheless, CBA can provide qualitative and quantitative information for the decision-maker on how economic efficiency costs and benefits are distributed.

The costs and benefits of the Project to NSW are potentially distributed among a range of stakeholders as identified in **Table 4.6**.

Table 4.6 - Incidence of NSW Costs and Benefits

BENEFITS AND COSTS	INCIDENCE OF COSTS AND BENEFITS	AUSTRALIA ($M)	NSW ($M)
Extraction and Processing Net Production Benefits			
Company tax	Australian and NSW Government and households	$10	$3
Net producer surplus	Cleary Bros	$22	$22
Transport Net Production Benefits			
Company tax	Australian and NSW Government and households	$1	$0
Net producer surplus	Cleary Bros and other transport providers	$2	$2
Concrete Net Production Benefits			
Company tax	Australian and NSW Government and households	$3	$1
Net producer surplus	Cleary Bros	$7	$7
Additional benefits			
Wage benefits to employment	People employed in extraction and processing operations, road transport and concrete production	Not quantified	Not quantified
Economic benefits to existing landholders	Local landholders who sell land required for the Project including buffer land	$0	$0
Economic benefits to suppliers	Suppliers of inputs to production	Not quantified	Not quantified

Table 4.6 (Cont'd) - Incidence of NSW Costs and Benefits

BENEFITS AND COSTS	INCIDENCE OF COSTS AND BENEFITS	AUSTRALIA ($M)	NSW ($M)
Environmental, social and cultural costs*			
Greenhouse gas emissions (Scope 1 and 2)	Australian and NSW households	$0.008	$0.003
Air quality	Adjoining landholders	Meets relevant criteria - no material residual impact	
Noise and blasting	Adjoining landholders	Blasting to comply with standards Impact on residences on "Figtree Hill" to be managed in accordance with the NSW Government's VLAMP. Cost included in capital cost	
Road transport	Australian and NSW Government and households	No local road impacts Externality costs of heavy vehicle transport included in registration and other operating requirements and hence are reflected in the operating costs - no material residual impact	
Surface water and Groundwater	Other water users and Australian and NSW households	Cost of WALs included in capital costs No drawdown impacts on registered groundwater bores or groundwater dependent ecosystems	
Biodiversity	Australian and NSW households	Impacts on biodiversity are offset – cost of offsets included in capital costs	
Aboriginal heritage	Aboriginal people and Australian and NSW households	No impact	
Historic heritage	Australian and NSW households	One item of local heritage significance impacted – not likely to be material	
Visual	Nearby landholders	Cost of amenity barriers and tree screens included in costs Some minor visual impacts in 10 to 15 years time – not likely to be material	
Net public infrastructure costs	Australian and NSW Government	No impact	
Loss of surplus to other industries	Other local businesses	No impact	

* NSW regulations require many impacts to be borne by the proponent via mitigation, offset and compensation. Where these measures perfectly mitigate, offset or compensate then no residual impacts occur and all impacts are borne by the proponent. This table identifies who bears residual impacts where mitigation, offset and compensation is imperfect.

4.8 Risk and Sensitivity Analysis

The main areas of environmental risk associated with Project relate to:

- the financial viability of a project from unexpected downturns in prices and any consequent environmental impacts from premature cessation of operations;
- ecological risk associated with whether the biodiversity offsets will adequately compensate for the direct ecological impacts; and
- other environmental, social and cultural impacts estimations and required mitigation measures.

The Independent Planning Commission (formerly the Planning Assessment Commission) has previously identified that the financial viability of projects is a risk assumed by the project proponents (NSW PAC, 2018). Nevertheless, it should be noted that the Project is the continuation of an existing financially viable operation. Cleary Bros is willing to invest in the Project and it is highly unlikely Cleary Bros investment would take place and then operations would cease, leaving residual environmental impacts within its property. Strong current and foreseeable demand for hard rock products is likely to underpin the financial viability of the Project.

The provision of biodiversity offsets can be associated with a number of risks, including in relation to the biodiversity benefits of additional management of offsets, success in reconstruction of ecological communities, time-lags between impacts and provision of offsets as well as between management actions and achievement of ecological outcomes. These risks are mitigated through offset ratios in the calculation of offsets requirements or fund payments, and commitment to the provision/payment for offset actions prior to the commencement of works under approval.

There is some risk associated with the estimation of environmental, social and cultural impacts of the Project and the level of mitigation measures proposed. However, it should be noted that impacts have generally been assessed based on the maximum annual levels of production and hence are likely to be overstated. Ongoing monitoring will ensure that appropriate mitigation measures are implemented as required.

The net present values (NPVs)[5] of the Project presented in **Table 4.5** is based on a range of assumptions around which there is some level of uncertainty. Uncertainty in a CBA can be dealt with through changing the values of critical variables in the analysis (James and Gillespie, 2002) to determine the effect on the NPV[6].
In this sensitivity analysis, the CBA results for NSW were tested for changes to the following variables at a 4%, 7% and 10% discount rate:

- Opportunity costs of land;
- Quarry capital cost, including biodiversity offsets, water access licences and the implementation of the NSW Government's VLAMP.
- Quarry operating costs;
- Quarry rehabilitation and decommissioning costs;
- Value of hard rock products;
- Quarry production levels;
- Residual value of quarry land;
- Net transport revenue; and
- Net concrete production revenue.

Results are reported in **Table 4.7**. What this analysis indicates, is that CBA results at the NSW level are most sensitive to reductions in the value of hard rock products and increases in operating costs.

The Project is the continuation of an existing extraction operation and hence operating costs in this location and geological environment are known. Estimates of operating costs of the Project are therefore likely to be reasonably accurate and a 20% increase that is maintained each and every year of the analysis as reported in the sensitivity analysis is highly unlikely.

[5] NPV is the present value of benefits less the present value of costs. Present values are calculated using a discount rate that reflects peoples time preferences.

[6] Quantitative risk analysis could also potentially be undertaken. However, this requires information on the probability distributions for input variables in the analysis. This information is not available and so the sensitivity testing is limited to uncertainty analysis.

The strong demand for aggregates, armour rock, and road pavement materials that underpins the Project suggests that sustained reductions in hard rock product value is highly unlikely.

The sensitivity analysis also indicated that the CBA results are not sensitive to changes in capital costs, which includes mitigation, compensation and offset costs, that have not already been internalised into production costs. Since mitigation, offset and compensation costs are small components of the capital and operating costs of the Project, it is unlikely that large changes in these cost levels would have any significant impact on the CBA results.

Under all scenarios examined, the Project has net social benefits to NSW.

Table 4.7 - NSW CBA Results Sensitivity Testing (Present Value $Millions)

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	$60	$35	$22
INCREASE 20%			
Opportunity cost of quarry land	$59	$35	$21
Opportunity cost of capital equipment	$59	$35	$22
Quarry development costs	$59	$35	$21
Quarry operating costs	$34	$19	$11
Quarry rehabilitation and decommissioning costs	$60	$35	$22
Avoided rehabilitation and decommissioning costs	$60	$36	$22
Value of hard rock products	$96	$59	$37
Volume of quarry production	$75	$46	$29
Residual value of land	$60	$36	$22
Residual value of capital	$60	$36	$22
Transport net revenue	$60	$36	$22
Concrete net revenue	$62	$37	$23
DECREASE 20%			
Opportunity cost of quarry land	$61	$36	$22
Opportunity cost of capital equipment	$60	$36	$22
Quarry development costs	$61	$36	$22
Quarry operating costs	$86	$52	$33
Quarry rehabilitation and decommissioning costs	$60	$35	$22
Avoided rehabilitation and decommissioning costs	$60	$35	$22
Value of hard rock products	$23	$12	$7
Volume of quarry production	$44	$25	$15
Residual value of land	$59	$35	$22
Residual value of capital	$60	$35	$22
Transport net revenue	$59	$35	$22
Concrete net revenue	$57	$34	$21

5 THE REGIONAL ECONOMY

5.1 Introduction

The Project Area is located in the Illawarra Statistical Area Level 4. This includes the Local Government Areas (LGAs) of Wollongong, Kiama and Shellharbour.

This is the locality/region that has the potential to provide inputs to the Project and derive economic benefits from the Project.

5.2 Characterisation of the Region

5.2.1 Residents of the Region

Table 5.1 provides some characteristics of the usual residents of locality based on the Australian Bureau of Statistics (ABS) 2016 Census of Population and Housing. In 2016, the region had a population of 293,494 and a labour force of 136,722. In 2016, there were 9,391 people unemployed representing 6.9% of the labour force.

The main occupations of usual residents were *Professionals* followed by *Technicians and Trade Workers* and *Clerical and Administrative Workers*. Twenty-five per cent of the employed usual residents work outside the region, with the main locations being the LGAs of Sydney, Sutherland Shire, Shoalhaven, Campbelltown and Wollondilly.

Table 5.1 - Characteristics of Usual Residents

	Illawarra SA4	
	No.	**%**
Demographics		
Population	293,494	
Median Age	39	
In Labour Force	136,722	46.6%
Unemployed	9,391	6.9%
Median household weekly income	$1,352	
Unoccupied private dwellings	9,667	
Median rent	$330	
Occupations		
Professionals	27,129	21.3
Technicians and Trades Workers	19,665	15.4
Clerical and Administrative Workers	17,128	13.5
Community and Personal Service Workers	15,952	12.5
Managers	13,274	10.4
Sales Workers	11,985	9.4
Labourers	11,586	9.1
Machinery Operators and Drivers	8,621	6.8

Source: ABS, 2016 Census of Population and Housing, Community Profiles

The main industry sectors in which usual residents were employed in 2016 is provided in **Table 5.2**. *Hospitals (except Psychiatric Hospitals)* was the most significant employment sector followed by *Aged Care Residential Services, Higher Education, Cafes and Restaurants* and *Supermarket and Grocery Stores.* Six per cent of the people working in the Illawarra SA4 live outside the locality, with the main residential locations being the LGAs of Shoalhaven, Sutherland and Wollondilly.

Table 5.2 - Top 5 Industry Sectors of Employment for Usual Residents

Sector	No.	%
Hospitals (except Psychiatric Hospitals)	5,366	4.2
Aged Care Residential Services	3,343	2.6
Higher Education	3,233	2.5
Cafes and Restaurants	3,111	2.4
Supermarket and Grocery Stores	3,093	2.4

Source: Australian Bureau of Statistics, 2016 Census of Population and Housing, Community Profiles

An indication of the health of an economy can be gained from population changes. This theory of regional economic growth suggests that places that are able to attract population immigration create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a 'vicious cycle' of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen, 1990).

Trends in regional economies as a result of globalisation and associated structural adjustment include:

- loss of significant industries such as abattoirs and timber mills from many rural areas;
- increased mechanisation of agriculture and aggregation of properties, resulting in loss of employment opportunities in this industry;
- growth of regional centres, at the expense of smaller towns;
- preference of Australians for coastal living, particularly for retirement; and
- preference of many of today's fastest growing industries for locating in large cities (Collits, 2000).

The result is that there has been declining population in many rural LGAs that are located in non-coastal areas. There has also been a decline in the population of smaller towns even in regions where the population has been growing.

Against this backdrop, it is evident that the population of the Illawarra SA4 has been growing, at a rate of 6.34% since 2011, lower than the population growth rate for NSW (which is driven by the population growth rate for Greater Sydney), but higher than the growth rate for areas outside Greater Sydney.

Table 5.3 - Population Growth

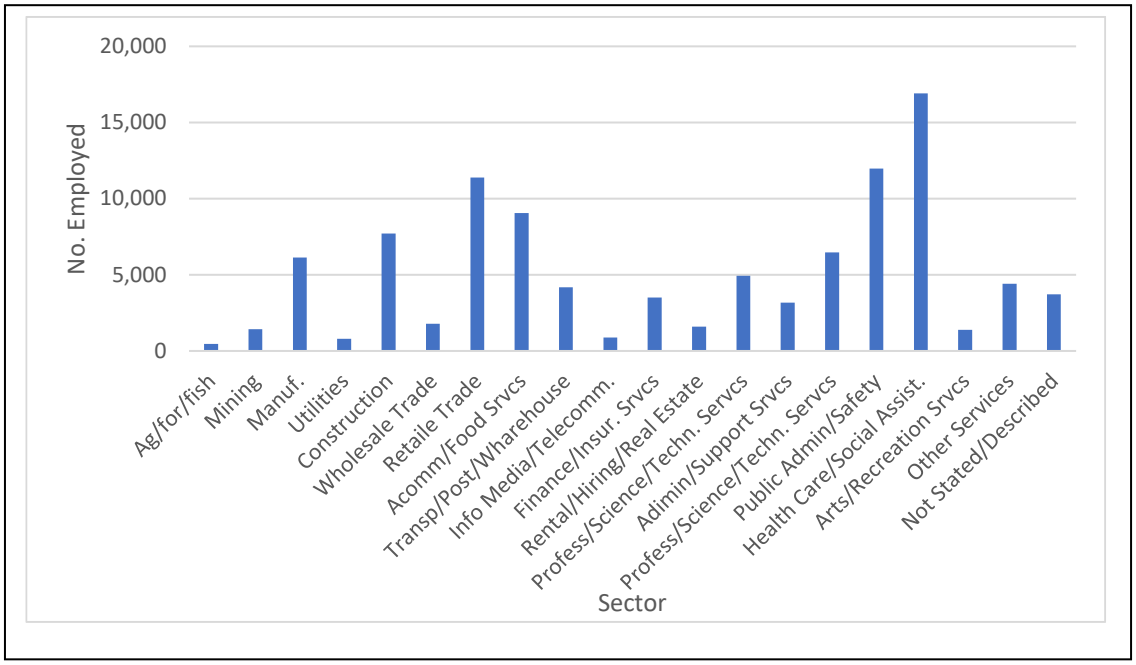
	2011	2016	Growth Rate 2011 - 2016
Illawarra SA4	275,983	293,494	6.34%
Regional NSW	2,525,984	2,656,237	5.16%
Greater Sydney, NSW Greater Capital City Statistical Area (GCCSA)	4,391,674	4,823,991	9.84%
NSW	6,917,658	7,480,228	8.13%

Source: Australian Bureau of Statistics, 2016 Census of Population and Housing, Community Profiles

5.2.2 Economic Activity in the Region

An indication of the nature of the regional economy can be gained by examining place of work employment by industry data - refer to **Figure 5.1**. This indicates the significance of the *Health Care and Social Assistance*, *Retail Trade* and *Public Administration and Safety* sectors.

Figure 5.1 - Place of Work Employment by Industry (1 digit ANZSIC Sectors)



Source: Australian Bureau of Statistics, 2016 Census of Population and Housing, Working Population Profiles

Gillespie Economics has produced an Input-Output (IO) table for the regional economy using the Generation of Regional Input Output Tables (GRIT) procedure developed by the University of Queensland and recognised internationally - Refer to Attachment 1. The Gross Regional Product (GRP) of the regional economy was estimated at $16,203 million for 2016.

The region is a net importer, with exports out of the region of $5,471 million and imports into the region of $9,637 million. Using the IO industry classifications, the largest exporting industries by value are:

- *Coal Mining* ($1,324 million);
- *Iron and Steel Manufacturing* ($844 million);
- *Basic Non-Ferrous Metal Manufacturing* ($412 million)
- *Technical, Vocational and Tertiary Education Services* ($313 million).

Exporting sectors are considered to be key drivers of regional economies and reflect a region's endowments and competitive advantages. The Albion Park Quarry is part of the *Non-Metallic Mineral Mining and Quarrying Sector*. While this sector is not as large as the abovementioned exporting sectors, it is also primarily an export sector and reflects one of the region's endowments and competitive advantages.

The following analysis uses the IO table data but reports the findings in terms of both the IO industry classifications and the ANZSIC One-digit industry classification.

Using the IO industry classifications, in terms of value-added, it is estimated that *Coal Mining; Health Care Services; Finance; Retail Trade; and Residential Care and Social Assistance* had the highest value added - in total, equal to approximately 26% of the regional economy and 31% of regional employment - **Table 5.4**.[7]

Table 5.4 - Gross Value Added for the 5 Largest Industries in the Regional Economy (IO Sectors)

Industry	Gross Value Added ($m)	Proportion of regional Economy (%)	Proportion of Regional Employment (%)
Coal mining	968	6%	1%
Health Care Services	830	5%	10%
Finance	829	5%	1%
Retail Trade	825	5%	12%
Residential Care and Social Assistance	751	5%	7%

Source: Gillespie Economics Input-Output Table

Based on the ANZSIC One-digit industry classification, in terms of value-added, it is estimated that *Rental, Hiring and Real Estate Services; Health Care and Social Assistance; Financial and Insurance Services; Education and Training; and Construction* had the highest value added - in total, equal to approximately 47% of the regional economy and 43% of regional employment - **Table 5.5**.

Table 5.5 - Gross Value Added for the 5 Largest Industries in the Regional Economy (ANZSIC One-Digit Sectors)

Industry	Gross Value Added ($m)	Proportion of regional Economy (%)	Proportion of Regional Employment (%)
Rental, Hiring and Real Estate Services	2,404	15%	2%
Health Care and Social Assistance	1,581	10%	17%
Financial and Insurance Services	1,319	8%	4%
Education and Training	1,199	7%	12%
Construction	1,181	7%	8%

Source: Gillespie Economics Input-Output Table

[7] Gross Value Added (GVA) measures the value of goods and services produced in a region.

6 LOCAL EFFECTS ANALYSIS

6.1 Introduction

The CBA in Section 4 is concerned with whether the incremental benefits of the Project exceed the incremental costs and therefore whether the community would, in aggregate, be better off 'with' the Project compared to 'without' it. This section examines local effects. It focuses on the operational phase of the Project.

The local area is defined as the Illawarra SA4, within which the Project Area is located and is the region considered likely to be main source of labour and non-labour inputs for the Project.

6.2 Direct Effects Related to Employment of Existing Residents Only

The Project will enable the continuation of employment for 27 quarry employees, 32 transport jobs and 36 concrete production jobs from 2025. Between 93% and 97% of those employed reside in the local area, with the remainder commuting from outside the local area.

Assuming that those that those who already reside in the local area would otherwise be employed elsewhere in the region at an average wage for the region, the incremental disposable wages accruing to the region as a result of the Project is $1.7M per annum. This is equivalent to 23 direct full time equivalent (FTE) extraction and processing operations, transport and concrete production jobs. This is a minimum estimate as it assumes full employment in the region and hence employees associated with the Project would always be employed in some capacity in the region, albeit at a lower wage.

Table 6.1 - Analysis of Net Income Increase and FTE Job Increase Assuming Full Employment

Attribute	Extraction and Processing	Transport	Concrete
a) Direct incremental employment	27	32	36
Number that already reside in the region	25	30	35
b) Average net income in sector	$81,583	$75,033	$53,833
c) Average net income in other industries*	$49,921	$49,921	$49,921
d) Average increase in net income per job (b-c)	$31,662	$25,112	$3,912
e) Increase in net income per year due to direct employment	$795,034	$755,370	$136,609
f) FTE (e/b)	10	10	3

*This information is not available from the ABS and hence average income across all sectors is used.

6.3 Direct Effects Related to Non-Labour Expenditure

The total annual non-labour expenditure (operating costs of the Project after subtraction of wages) is $10.5M, $4.3M and $20.7M, respectively for extraction and processing operations, transport and concrete production.

However, not all of this expenditure will accrue to the local area. From a 2016 input-output table of the local area economy developed by Gillespie Economics, the percentage of this non-labour expenditure accruing to the Illawarra local area is 53%, 61% and 64%, respectively.

6.4 Second Round and Flow-On Effects

The expenditure by employees, who reside in the region, and non-labour expenditure that is captured by the local area, provides flow-on economic activity to the local economy.

Recognised methods for assessing second round and flow-on effects such as input-output analysis (but also computable general equilibrium analysis), do not utilise direct effects of employment and income effects as calculated above in accordance with the Guidelines (NSW Government, 2015). Instead, they use the total employment working in the region, with total wages (rather than net additional wages to existing employed people) divided between those who live in the region and those who reside outside the region. They do utilise estimates of non-labour expenditure, however multiplier effects are not estimated in terms of non-labour expenditure but in terms of how this and labour expenditure contribute to the local area economy in terms of direct and indirect output, value-added, income and employment. This type of assessment is reported in the following section.

6.5 Regional Economic Impact Assessment

Standard regional economic impact assessment using input-output analysis, is not restricted to a focus on the existing labour force in the local area and does not assume an absence of job chain effects. The presence of job chain effects in a region, means that to the extent that jobs from which people come, to fill Project jobs, are themselves filled and their jobs are also filled until the lowest paid jobs are filled by people from unemployment, new labour force participants, then new wages in the region will approximate the total incremental wages associated with the project. Refer to Attachment 1.

In this framework, the annual direct and indirect economic activity impacts in the local area from the Quarry extension, associated transport and concrete production are summarised in **Tables 6.2**, **6.3** and **6.4**, respectively.

Table 6.2 – Gross Annual Direct and Indirect Regional Economic Impacts of the Quarry

Indicator	Direct Impacts	Production Induced Flow-ons	Consumption Induced Flow-ons	Total Flow-ons	Total Impacts
Output ($M)	19	8	5	13	32
Type IIA Multiplier	*1.00*	*0.44*	*0.27*	*0.71*	*1.71*
Value Added ($M)	8	4	3	7	15
Type IIA Multiplier	*1.00*	*0.46*	*0.36*	*0.82*	*1.82*
Income ($M)	3	2	1	3	6
Type IIA Multiplier	*1.00*	*0.73*	*0.43*	*1.16*	*2.16*
Employment (No.)	27	20	19	39	66
Type IIA Multiplier	*1.00*	*0.76*	*0.69*	*1.45*	*2.45*

Table 6.3 – Gross Annual Direct and Indirect Regional Economic Impacts of Transport

Indicator	Direct Impacts	Production Induced Flow-ons	Consumption Induced Flow-ons	Total Flow-ons	Total Impacts
Output ($M)	8	4	4	8	16
Type IIA Multiplier	*1.00*	*0.48*	*0.56*	*1.04*	*2.04*
Value Added ($M)	4	2	3	4	8
Type IIA Multiplier	*1.00*	*0.50*	*0.74*	*1.24*	*2.24*
Income ($M)	3	1	1	2	5
Type IIA Multiplier	*1.00*	*0.36*	*0.34*	*0.70*	*1.70*
Employment (No.)	32	13	16	29	61
Type IIA Multiplier	*1.00*	*0.42*	*0.50*	*0.92*	*1.92*

Table 6.4 – Gross Annual Direct and Indirect Regional Economic Impacts of Concrete Production

Indicator	Direct Impacts	Production Induced Flow-ons	Consumption Induced Flow-ons	Total Flow-ons	Total Impacts
Output ($M)	25	20	9	29	54
Type IIA Multiplier	*1.00*	*0.79*	*0.35*	*1.14*	*2.14*
Value Added ($M)	4	9	5	14	19
Type IIA Multiplier	*1.00*	*2.09*	*1.21*	*3.30*	*4.30*
Income ($M)	3	5	2	7	10
Type IIA Multiplier	*1.00*	*1.73*	*0.67*	*2.40*	*3.40*
Employment (No.)	36	55	32	87	123
Type IIA Multiplier	*1.00*	*1.53*	*0.88*	*2.41*	*3.41*

It is not possible to simply add the economic activity from extraction and processing operations, road transport and concrete production, to give the total economic activity from the three sectors impacted by the project. This is because IO analysis captures backward linkages and so the economic activity impacts from Cleary Bros concrete production already captures backward linkages to transport and extraction and processing operations.

To estimate the economic activity for the total impacted sectors, additional IO analysis was undertaken for the quarry sector and transport sector to omit the component (24%) associated with Cleary Bros concrete production i.e. 24% of quarry products are supplied to Cleary Bros own concrete operations with the remainder provided to the market. These adjusted impacts were then added to the IO of the Cleary Bros concrete sector to give a total potential economic activity provided by the Project.

Using this approach, the total and disaggregated annual impacts of the Project are shown in **Table 6.5**.

Table 6.5 – Gross Annual Direct and Indirect Regional Economic Impacts of Quarry, Transport and Concrete Production

Indicator	Direct Impacts	Production Induced Flow-ons	Consumption Induced Flow-ons	Total Flow-ons	Total Impacts
Output ($M)	45	29	16	45	90
Type IIA Multiplier	*1.00*	*0.64*	*0.35*	*0.99*	*1.99*
Value Added ($M)	13	13	10	23	36
Type IIA Multiplier	*1.00*	*0.99*	*0.71*	*1.70*	*2.70*
Income ($M)	7	7	4	11	18
Type IIA Multiplier	*1.00*	*1.02*	*0.50*	*1.52*	*2.52*
Employment (No.)	81	81	58	139	219
Type IIA Multiplier	*1.00*	*1.00*	*0.72*	*1.72*	*2.72*

6.6 Other Effects

6.6.1 Regional Economic Impacts of Displaced Agriculture

There will be some limited impact (temporary loss of grazing) on Cleary Bros pastoral operations as a result of the Project. However, these impacts are borne by Cleary Bros and are insignificant from a regional perspective.

6.6.2 Other Wage Impacts

In the short term, increased regional demand for labour as a result of the Project (relative to the "without Project" scenario) could potentially result in some increased pressure on wages in other sectors of the economy. The magnitude and duration of this upward wages pressure would depend on the level of demand for labour, the availability of labour resources in the region and the availability and mobility of labour from outside the region. However, given the scale of the Project and the availability of labour inside and outside the region, wage impacts are not likely to be significant. Where upward pressure on regional wages occurs, it represents an economic transfer between employers and owners of skills and would in turn attract skilled labour to the region leading to future downward pressure on wages.

6.6.3 Housing Impacts

The Project is not expected to result in any substantial in-migration of workers and their families and consequently the impact on housing prices is expected to be negligible.

6.6.4 Demand on Local Infrastructure and Services

Demand for local infrastructure and services arises from the production process as well as demands of the workforce and their families. The project is a continuation of existing levels of production and existing employment. It will therefore not provide any additional demand for local infrastructure beyond current levels.

6.7 Environmental and Social Impacts on the Local Community (Externalities)

The distribution of costs and benefits of the Project are summarised in **Table 4.6**. The main potential effects on the local community are noise criteria exceedances at the residences on the "Figtree Hill" property which will be managed in accordance with the NSW Government's VLAMP.

6.8 Summary of Local Effects

A summary of local effects of the Project is provided in **Table 6.6**.

Table 6.6 - Summary of Effects on the Local Community

Local Effects	**Direct Total**	**Direct Already Resident in the Local Area**	**Net**
Employment FTE	95	90	23
Net Income ($M)	6.5	6.2	1.7
Non-labour expenditure in the Local Area	21.5		
Regional Impacts	**Direct**	**Flow-on**	**Total**
Output ($M)	45	45	90
Value-added ($M)	13	23	36
Income ($M)	7	11	18
Employment	81	139	219

Other Local Economic Impacts	
Displaced activities	No impact
Wage rise impacts	No material impact*
Housing impacts	No material impact*
Demand on local infrastructure and services	No additional demand beyond current levels
Local Environmental Impacts	
Greenhouse gas emissions (Scope 1 and 3)	$0.0001M**
Operational noise	Impact on residences within "Figtree Hill" to be managed in accordance with the NSW Government's VLAMP.
Biodiversity	Impacts on local biodiversity are offset
Historic heritage	One item of local heritage significance impacted – not likely to be material*
Visual	Cost of amenity barriers and tree screens included in costs Some minor visual impacts in 10 to 15 years time – not likely to be material

* Materiality refers to whether valuation of these impacts would have any bearing on the estimated net social benefits of the Project. NSW Government (2012) identified that if a Project has an NPV of say "$20 million, costs or benefits valued at less than $1 million are unlikely to be material."

**This figure is the estimated impact on NSW households apportioned to households in the Local Area. The Illawarra population is 4% of the NSW population.

7 CONCLUSION

A CBA of the Project indicated that it would have net production benefits to NSW of $35M (present value at 7% discount rate) comprising $26M in extraction and processing benefits, $2M in ex quarry transport benefits and $8M in concrete production benefits.[8]

Provided the residual environmental, social and cultural impacts of the Project that accrue to NSW are considered to be valued at less than the level of net production benefits, the Project can be considered to provide an improvement in economic efficiency and hence is justified on economic grounds.

The above estimate of NSW net production benefits of the Project includes the costs of water access licences, biodiversity offsets and implementation of the NSW Government's VLAMP. The main residual environmental impacts of the Project, that have not already been incorporated into the estimate of net production benefits, relate to greenhouse gas (GHG) emissions (valued at $0.002M), impacts on one item of local heritage significance and minor visual impacts in 10 to 15 years time. The value of these residual economic costs is likely to be considerably less than the estimated net production benefits of the Project. Consequently, the Project is estimated to have net social benefits to NSW, and hence is desirable and justified from an economic efficiency perspective.

As well as providing net social benefits to NSW, the Project will provide direct economic activity, including jobs, to the local area economy, and indirect economic activity to the local area via both wage and non-wage expenditure.

The Project will provide 95 direct jobs, comprising 27 quarry jobs, 32 transport jobs and 36 concrete batching jobs. Assuming that those that already reside in the local area would have otherwise been already employed and that job vacancies created by these people filling the Project jobs remain unfilled (i.e. no job chain effects), the incremental disposable wages accruing to the region from Project is $1.7M per annum. This is equivalent to 23 direct full time equivalent (FTE) jobs. This is a minimum estimate as it assumes full employment in the region and hence the jobs from which people come to fill the Project jobs remain vacant.

Standard regional economic impact assessment using IO analysis, is not restricted to a focus on the existing labour force in the local area and does not assume an absence of job chain effects. In this framework, the Project is estimated to provide the following annual direct and indirect annual effects to the local economy:

- $90M in output;
- $36M in value-added;
- $18M in gross wages; and
- 219 jobs.

The main local environmental impacts are internalised into the production costs of Cleary Bros via mitigation, offset and compensation costs. Residual local environmental impacts after mitigation, offset and compensation are likely to be immaterial.

[8] Difference in total is due to rounding.

8 REFERENCES

Biosis Pty Ltd (2021a) *Albion Park Quarry Extension: Aboriginal and Cultural Heritage Assessment -prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 5*.

Biosis Pty Ltd (2021b) *Albion Park Quarry Extension: Aboriginal and Cultural Heritage Assessment - prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 6*.

Boardman, A., Greenberg, D., Vining, A.,Weimer, D. (2001) *Cost-Benefit Analysis: Concepts and Practice,* Prentice Hall, USA.

Jacobs Australia (2021) *Albion Park Quarry Extension: Groundwater Assessment - prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 8*.

James, D. and Gillespie, R. (2002) *Guideline for Economic Effects and Evaluation in EIA*. Prepared for NSW Department of Urban Affairs and Planning.

Lee, G. (2020) *Resource Assessment Cleary Bros Albion Park Quarry, Albion Park, New South Wales. Graham Lee & Associates Pty Ltd.*

Niche (2021) *Albion Park Quarry Extension: Biodiversity Development Assessment - prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 4*

Northstar (2022) *Albion Park Quarry Extension: Air Quality Assessment - prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 1*.

NSW Department of Planning and Environment (2017) *Residual Matters Report: State Significant Development Wallarah 2 Coal Project (SSD 4974),* NSW DP&E, Sydney.

NSW Government (2015) *Guidelines for the economic assessment mining and coal seam gas proposals.*

NSW Government (2018) *Technical Notes Supporting the Guidelines for the economic assessment mining and coal seam gas proposals.*

NSW Planning Assessment Commission (2018) *NSW Planning Assessment Commission Determination Report Wallarah 2 Coal Project – D482/17).*

NSW Treasury (2017) *NSW Government Guide to Cost-Benefit Analysis,* www.treasury.nsw.gov.au.

RW Corkery & Co (2022) *Albion Park Quarry Extension: Visual Impacts Assessment - prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 3*.

SLR Consulting Australia (2022) *Albion Park Quarry Extension: Noise and Vibration Assessment - prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 2*.

Strategic Environmental and Engineering Consulting (2021) *Albion Park Quarry Extension: Soil and Water Assessment- prepared for Cleary Bros. Specialist Consultant Studies Compendium, Part 7*.

ATTACHMENT 1 – COMPARISON OF INPUT-OUTPUT ANALYSIS AND THE LEA METHOD

IO analysis begins with identification of the direct gross regional economic activity footprint of a project for the region. If a project provides 100 jobs at the quarry site then all these jobs are counted in IO analysis as a direct effect i.e. direct employment in the region, because the jobs are located in the region. All income paid to employment is also included as it is generated in the economy and IO tables are based on place of work. However, in assessment of the impacts of a project on the regional economy only the income of employees living in the region are counted as direct income effects since it is only wages expenditure of those living in the region that flows through the regional economy. In IO analysis, if 40% of a project's jobs are filled by people who already reside in the region then the **total** wages of these people is counted as a direct regional income effect of the project. Similarly, if 40% of the new jobs are taken by people who migrate into the region this is also counted as direct income for the region, as it is income that will accrue to people living in the region even though they are new residents. In impact assessment using IO analysis, the income of those residing outside the region is excluded as most of their income will be taken home after shift and spent where they live or elsewhere.

These direct employment and income effects for the region are those **associated** with the project i.e. the gross footprint, rather than specifically an assessment of **incremental** effects. This is partly because assessment of incremental effects becomes highly contentious and difficult. However, as will be shown below, these gross direct effects associated with a project can also be a reasonable approximation of incremental effects when "job chain" effects are considered.

However, first is a comparison between how IO analysis treats direct employment and income effects (as explained above) and that in the NSW (2015) guideline.

The guideline splits labour into those ordinarily resident in the region and those not ordinarily resident in the locality. For those ordinarily resident in the region the guideline suggests calculation of incremental income as the difference between a mining (income and the average level of income in other industries in the region. Incremental direct employment is then calculated by dividing this incremental income by the average wage in mining.

The guideline ignores workers who migrate into the region to work. However, using the rationale of the guideline, workers who migrate into the region to take jobs in a project provide a greater level of incremental income and spending in the region than those that take jobs in a project and who already reside in the region. The entire wage of those migrating into the region is additive to regional income in comparison to wage increments for those already residing in the region.

Table 1 provides an example of incremental wages using the guideline method and when income from those migrating into the region is counted. If only the incremental wages of those who already reside in the region are counted the incremental impact is $1.4M in annual wages. However, if the incremental wages to the region from those who migrate into the region are included, this increases to $5.4M.

Table 1 - Incremental Income when Immigrating Workforce is Included

Categories of Workers	Direct Empl	Current Wages @$65k	New Wages @$100k	Incremental New Wages for Workers	Incremental New Wages to the Region
Already Live in Region	40	2,600,000	4,000,000	1,400,000	1,400,000
Migrate into Region to Live	40	2,600,000	4,000,000	1,400,000	4,000,000
Commute from outside	20	1,300,000	2,000,000	700,000	0
Total Direct Empl	**100**	**6,500,000**	**10,000,000**	**3,500,000**	**5,400,000**

Even for those already living in the region who are already employed, the incremental income estimated using the guideline will substantially understate additional regional income effects. This is because new jobs in a region create a chain of job opportunities (referred to in the literature as the "job chain" - see Persky et al, 2004 What are jobs worth?, Employment Research Vol. 11 , p. 3).

An already employed person in the region moving into a mining (including quarrying) job, creates a job vacancy, which can be filled by those in the region (already employed, unemployed or attracted into the labour force) or by in-migration. Where this job is filled by those already employed in the region this in turn creates another vacancy etc. Following the entire chain through, the cumulative increase in wages to a region would approach the wages of the total direct mining jobs. It would only be discounted if the chain ends with employment of those from local residents in the unemployment pool (who are receiving an allowance and hence already are spending income in the region), if jobs remain unfilled or if jobs are filled by a commuter workforce. The latter is less likely for lower paying jobs down the job chain. In periods of higher unemployment rates, jobs along the job chain remaining unfilled is unlikely. If the chain ends with in-migrating employment or employment of those in the region that are new to the workforce then the incremental wages is equal to the total wages of the new jobs.

Table 2 demonstrates the "job chain" effect in relation to 40 new mining jobs filled by already employed local workers. It shows that the total annual wages of the new mining jobs is $4M. Under the job chain approach where all jobs are backfilled including ultimately by 40 local residents from the unemployment pool the incremental wages to the region are $3.5M. If some of these jobs filled from the unemployment pool are ultimately filled by in-migration the difference between the incremental wages to the region and the total annual mining jobs wages will lessen.

The guideline does not take account of the "job chain" effect and essentially assumes that the previous jobs of "job movers" in the region remain vacant for the life of the Project.

Incorporation of consideration of the "job chain" effect means that the direct incremental income to a region approximates that assumed in IO analysis (i.e. the gross footprint of economic activity estimated using IO analysis is also an indicator of the net effect).

Table 2 - Demonstration of the Job Chain Effect for 40 Jobs Filled by Locals Who are Already Employed in the Region

	Total wages	Increment Wages Gain to Region
1. New mining wage for 40 workers @$100k	$4,000,000	$1,400,000 (1-2)
2. Current Wages for 40 workers @$65k	$2,600,000	$1,000,000 (2-3)
3. Wage of people filling above 40 positions @$40k	$1,600,000	$800,000 (3-4)
4. Wage of people filling above 40 positions @$20k	$800,000	$ 255,664 (4-5)
5. Wages of the unemployed filling above 40 positions (Newstart - single no children)	$544,336	
	Total	**$3,455,664**