APPENDIX N: ECONOMIC IMPACT ASSESSMENT

DEEP CREEK QUARRY EIS – ECONOMIC ASSESSMENT

IRONSTONE DEVELOPMENTS PTY LTD
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EXECUTIVE SUMMARY

BACKGROUND

Ironstone Development Pty Ltd (IDPL) is an Australian-owned company located in the Hunter region of New South Wales, with considerable experience in quarrying operations. IDPL have proposed to develop a hard rock quarry, Deep Creek Quarry (DCQ), located approximately ten kilometres northeast of Clarence Town and eleven kilometres northwest of Karuah, within the Local Government Area (LGA) of Mid-Coast in New South Wales. IDPL is now seeking approval for construction and operation of the DCQ (the Project).

According to Schedule 1, Clause 7 of the State Environmental Planning Policy (State and Regional Development) 2011, development that extracts from a total resource of more than five million tonnes is classified as State Significant Development (SSD), and therefore must be assessed pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979*. This act requires the preparation of an Environmental Impact Statement (EIS) in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. As part of the EIS, analysis of the anticipated economic impacts of the Project is required.

The most relevant economy against which to examine the regional impacts associated with the Project is the regional economy comprised of the SA3s of Great Lakes (in which the Project is located and lies within the Mid Coast Local Government Area (LGA)), Taree-Gloucester, Lower Hunter, Port Stephens, Maitland, Newcastle, Lake Macquarie – East, Lake Macquarie – West. This area is hereafter referred to as the Catchment.

EXISTING ECONOMIC ENVIRONMENT

Historically, the Catchment population has recorded moderate growth, averaging 1.0% per annum between 2001 and 2019, to reach a population of approximately 715,900 people by 2019. Average annual population growth between 2001 and 2019 was 0.2 percentage points lower than that of the State, with annual growth for the Catchment consistently trending below the State average over the seven years to 2019. Population projections suggest the Catchment's resident population is expected to continue to increase, though at a slower rate than historically, with the average annual rate of growth projected to reach 0.7% from 2019 to 2041. By 2041, the Catchment's population is projected to increase to approximately 833,200 people and is expected to represent 7.9% of the New South Wales population.

In 2018-19, the Catchment's economy recorded GRP of approximately $51.03 billion in chain volume terms. Between 2006-07 and 2018-19, the economy recorded moderate growth of approximately 1.9% per annum on average, slightly lower than the 2.3% recorded for the State. In 2018-19, the largest employing industry in the Catchment was healthcare and social assistance, representing 17.1% of jobs, followed by retail trade (10.4%) and construction (10.1%).

The Catchment's labour force was relatively flat between 2010 and 2014 (with growth of 0.8% per annum on average), however, it has experienced a more rapid expansion (compared to historically) between 2015 and 2019 of 2.4% growth per annum on average (prior to the COVID-19 pandemic). The unemployment rate fluctuated between 4.5% to just above 5.5% between 2010 and 2014, consistent with the State average, however spiked to above 8.0% in 2015 (this is consistent with the large decline in manufacturing employment in this year). Following this period, the unemployment rate dropped back to around 5.0% to just above 5.5% in 2017 and fluctuated slightly above the State average for the remainder of the period.

Rental prices rose between 2017 and 2020 in the Catchment while demand remained steady, whilst more subdued demand is evident in the housing market. The number of house sales declined by 3.1% per month (on average) from June 2017 to June 2020. Whilst prices also declined over the two years to September 2019, there was a recovery over the three months to June 2020 to reach an average price of approximately $533,300. The number of rental bonds lodged follows a cyclical trend, with March a key month for residents entering the rental market or moving between rental properties. Rental prices grew by 0.7% on average per annum over the 24 months to September 2020, significantly higher than that for the State where rental prices have remained relatively stable. This growth in prices has occurred despite demand in the rental market remaining relatively flat on a year-to-year basis.

The COVID-19 pandemic reached Australia in early January 2020, which led to reduced business activity, redundancies, and rising unemployment rates by mid-2020. As a result, the unemployment rate in the Catchment increased from 4.8% in March 2020 to 5.6% in June 2020 (a 0.8 percentage point increase). This rise is double that recorded for the State. Over this period, employment in the Catchment declined as workers transitioned to unemployment or became discouraged and left the labour force (evidenced by the rise in unemployment levels and decline in labour force). This had a significant impact on industry activity, with indicative estimates suggesting (as of 2 January 2021) that the Catchment recorded a decline of approximately $1.9 billion in industry value added in the Catchment, or 4.6%. The construction sector was the most heavily impacted sector, followed by manufacturing.

LOCAL EFFECTS ANALYSIS

Potential Beneficial Impacts

Key beneficial impacts arising from the Project are outlined in Table ES.1. Beneficial impacts are examined in consideration of what would otherwise occur if the Project does not proceed.

Table ES.1. Assessment of Beneficial Impacts of the Project

Impact	Description
Economic Growth	The Project will contribute to economic growth through increased Gross Regional / State Product (GRP / GSP) during construction, operations, and decommissioning / rehabilitation phases, compared to what would occur without the Project, flowing from both direct and flow-on impacts. The contribution to GSP will increase from approximately $3.7 million in 2021-22 (first year of construction) to approximately $8.5 million per annum between 2027-28 and 2040-41. The contribution to GSP is then estimated to rise to peak at $10.2 million per annum between 2043-44 and 2048-49 before the operations winds down and ceases by 2051-52. A contribution of approximately $7.6 million is estimated in 2051-52 as a result of final operations decommissioning and rehabilitation activities. In total, the Catchment is estimated to capture approximately 91.9% of the total contribution to GSP across the assessment period (from 2021-22 to 2051-52), with the rest of NSW accounting for approximately 8.1%.
Employment and Incomes	The Project will support jobs and incomes during construction, operations, and decommissioning / rehabilitation phases, compared to what would occur without the Project, flowing from both direct and flow-on impacts. Including direct and flow-on activity: • Approximately 20 FTE jobs are estimated to be supported in NSW in the first year of construction (2021-22), which decreases in line with construction activity to 2022-23 before operational activity commences in 2023-24 with 17 FTEs. • FTE jobs supported in NSW are estimated to rise from 17 in 2023-24 to 31 FTE jobs by 2043-44 and through to 2050-51. • Employment is then estimated to fall to 26 FTE jobs in 2051-52 as production winds up and ceases and decommissioning and rehabilitation activities occur. Approximately 87.8% of jobs supported in NSW will be within the Catchment, with the remainder in the rest of NSW.
Support for Upstream Supply Chain Businesses	The Project will increase quarrying and processing activities in the Catchment and thereby support and create opportunities for suppliers in the Catchment and NSW, providing additional security and longevity of business incomes (and employment). The Project will also create opportunities to secure new contracts and increase sales to supply and service the needs of the Project through flow-on impacts in the supply chain, during all phases of the Project. The construction phase is estimated to support business revenues for local businesses within the Catchment of approximately $5.8 million through direct construction activity. Flow-on supply chain impacts during construction are estimated to support an additional $3.3 million in business revenue in the Catchment. An additional $0.9 million in business revenues are estimated to be supported in the rest of NSW through direct and flow-on activity. During operations, the Project is estimated to support approximately $15.7 million in business revenues per annum on average in the Catchment through direct and flow-on activity, with a further $1.3 million in revenues supported for businesses in the rest of NSW.
Support for Downstream Customers	DCQ is anticipated to become an important supplier of road base, crusher dust, aggregates, and rock domestically. The general resource market areas for the products of the quarry include Port Stephens, Newcastle, Maitland, Lake Macquarie, and Mid-Coast. Decorative and

Impact	Description
	high Polishing Aggregate Friction Value (PAFV) products will travel further and have a wider market, including Sydney, Lithgow, Canberra, Port Macquarie, and Coffs Harbour. The Project will provide a new and alternative supply source to the market which will service the strengthening demand for construction material together with several other planned new supplies coming online in the Catchment. The Project will thereby improve security of supply within the Catchment to meet the significant number of planned infrastructure and other projects. Without the Project, future demand for quarried materials may require supply from outside the Catchment and further afield, which may place increased cost pressures on input costs for these customers due to longer transport distances. To this end the Project can be seen as important for the longer-term security of supply of domestic production, while also supporting transport and logistics business for the transport of products to customers.
Government Revenue	The Project will provide a lift in Australian, State and Local government taxation revenues through a variety of taxes and duties. Overall, the Project is estimated to deliver a total of: • $23.8 million in additional revenue to the Australian Government, through personal income tax, fringe benefits tax, company tax and GST, compared to what would occur without the Project. • $1.5 million in additional revenue to the NSW Government compared to what would occur without the Project. • $11.1 million in road levy revenue to Local Government compared to what would occur without the Project. These additional revenues can be used by government to provide additional infrastructure and services to support business and households throughout Australia.

Source: AEC.

Potential Adverse Impacts

As outlined above, the Project will allow for additional economic activity in the region, stimulating increases in economic growth, employment and incomes, support for supply chain business and additional government revenues. Economic impacts of the Project are anticipated to be overwhelmingly positive, with minimal adverse economic impacts identified.

CUMULATIVE IMPACT ASSESSMENT

The majority of proposed projects for the region are extensions that will replace or augment activities from existing operations that are nearing completion, whilst two quarries are anticipated to cease over the next few years. Several new quarries are proposed in the region which are either in assessment or EIS phase. As such, the quarrying activity within the region can be expected to increase compared to existing levels moving forward.

If DCQ and the other proposed quarries were to commence construction at a similar point in time, this will result in an increase in jobs and economic activity, including added activity in the property market as well as demand for infrastructure and services. These impacts are anticipated to be normalised across the catchment, and not cause significant strain.

The development of the DCQ project in combination with the new quarries and continued and/ or augmented operations of existing quarries (incl. any additional construction activity in the short term) is ultimately likely to benefit the region due to increase accessibility to competitively prices and accessible quarried materials.

MITIGATION STRATEGIES

Assessment of the economic impacts of the Project identified the Project is not anticipated to generate any adverse economic issues, risks or impacts of significance. Economic impacts of the Project are anticipated to be overwhelmingly positive, with minimal adverse economic impacts.

While the potential adverse economic impacts from the Project are minimal, there are some potential areas that should be monitored, and strategies employed to ensure benefits of the Project to the Catchment and NSW are maximised and any potential adverse impacts minimised:

- To maximise local benefits derived from the Project, the proponent and contractors engaged by the proponent will be encouraged to source labour locally where possible and practical and provide training opportunities where practical.
- To maximise local benefits derived from the Project, the proponent and contractors engaged by the proponent will provide sufficient opportunities and access to information for local businesses to understand the Project's supply contract arrangements and requirements, and improve their ability to secure supply contracts.

It should be recognised that these strategies form part of IDPL's Project planning, and modelling of impacts in this report has been based on these strategies being implemented.

COST BENEFIT ANALYSIS

The Net Present Value (NPV) of the Project has been estimated as the difference between the present value (PV) of future benefits and PV of future costs. A cost benefit analysis (CBA) for the Project shows that, assuming a discount rate of 7%, the NPV of the Project to the NSW economy is estimated at $22.7 million (Table ES.2). At a discount rate of 10%, the Project is estimated to result in a net benefit to NSW of $14.0 million. The benefit cost ratio (BCR) is estimated at 1.26 at a discount rate of 7%, highlighting that the Project is estimated to return $1.26 for every dollar cost.

Table ES.2. Summary CBA Results of Project Impacts to NSW

Real Discount Rate	PV Costs ($M)	PV Benefits ($M)	NPV ($M)	BCR
4%	$128.8	$166.6	$37.8	1.29
7%	**$87.6**	**$110.3**	**$22.7**	**1.26**
10%	$63.4	$77.3	$14.0	1.22

Source: AEC.

The CBA identifies that the Project is economically desirable for NSW with the benefits outweighing the costs across all discount rates examined (4%, 7% and 10%) (Table ES.2).

Sensitivity analysis shows that, at a discount rate of 7%, there is a 90% probability the Project will provide an NPV between $0.4 million and $44.3 million. Sensitivity testing returned a positive NPV across 98.3% of the 5,000 iterations run in Monte Carlo analysis, with the analysis most sensitive to the net operating result. The NPV is highly sensitive to the net operating result (i.e., difference between revenue from operations and operational spend in the table below); the larger the net operating result the larger the NPV.

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1. INTRODUCTION

1.1 BACKGROUND

Ironstone Developments Pty Ltd (IDPL) is an Australian-owned company located in the Hunter region of New South Wales, with considerable experience in quarrying operations. IDPL have proposed to develop a hard rock quarry, Deep Creek Quarry (DCQ), located approximately ten kilometres northeast of Clarence Town and eleven kilometres northwest of Karuah, within the Local Government Area (LGA) of Mid-Coast in New South Wales. IDPL is now seeking approval for construction and operation of the DCQ (the Project).

According to Schedule 1, Clause 7 of the *State Environmental Planning Policy (State and Regional Development) 2011,* developments that extract a total resource of more than five million tonnes is classified as State Significant Development (SSD), and therefore must be assessed pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979*. This act requires the preparation of an Environmental Impact Statement (EIS) in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* As part of the EIS, analysis of the anticipated economic impacts of the Project is required.

1.2 PURPOSE OF THIS REPORT

This report has been developed as a technical document for use in preparing the EIS. The report quantifies the expected beneficial and adverse economic impacts of the Project on the regional and state economies. The report also recommends mitigation strategies to ensure regional economic values are enhanced or, as a minimum, maintained if the Project proceeds.

2. ASSESSMENT APPROACH

2.1 ASSESSMENT REQUIREMENTS

The Secretary's Environmental Assessment Requirements (SEARs) outline that an analysis is required to provide a detailed assessment of the likely economic impacts of the development. The below table highlights the requirements relevant to the economic impact assessment.

Table 2.1. SEARs Requirements Relevant to Economic Analysis

SEARS Item	Location in Report
General Requirements	
An assessment of the likely impacts of the development on the environment, focusing on the key issues identified below, including:	
• A description of the existing environment likely to be affected by the development, using sufficient baseline/ background data.	• Section 4
• An assessment of the likely impacts of all stages of the development, including any cumulative impacts, taking into consideration any relevant laws, environmental planning instruments, guidelines, policies, plans, and industry codes of practice.	• Sections 5 & 6
• A description of the measures that would be implemented to avoid, minimise, mitigate and/or offset the likely impacts of the development, and an assessment of: ○ Whether these measures are consistent with industry best practise, and represent the full range of reasonable and feasible mitigation measures that could be implemented. ○ The likely effectiveness of these measures. ○ Whether contingency measures would be necessary to manage any residual risk.	• Section 7
• A description of the measures that would be implemented to monitor and report on the environmental performance of the development.	• Section 7
Key Issues	
Economic – including a detailed assessment of the likely economic impacts of the development, paying particular attention to:	
• The significance of the resource	• Section 3.2
• 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.	• Section 8
• The demand on local infrastructure and services.	• Section 5.6
Cumulative Impacts – including an assessment of likely cumulative impacts of the proposed quarry operating in combination with other established quarries in the locality, paying particular attention to likely impacts on road safety, water resources, land capability, and shared infrastructure.	• Section 6
Agency Correspondence (Regional NSW – Mining, Exploration and Geoscience (MEG))	
5. Project Economics and Target Market The proponent is to supply an assessment of project economics including:	
• Price forecasts by product type used by the Proponent.	• Section 3.3.2.2
• Product tonnages split into market segment, including justification for market segment based on quality parameters.	• Section 3.3.2.1
• CAPEX & OPEX necessary for the Project broken down into the various sub-categories and equipment type. Include any changes that the project will have on existing mine infrastructure and broader ex-mine infrastructure – rail, CHPP, etc.	• Section 3.3.1
• Estimates of employment generation broken down into direct, indirect, ongoing, construction and contract workers.	• Section 5.2
• Total royalty generated over the life of the Project.	• Section 5.4
• Relationship and interaction with other mines. Detailed the Project impacts on the existing mine and surrounding mines.	• Section 6
6. Royalty Generated Total royalty generated to the state over the life of the Project.	• Section 5.4

Source: NSW Department of Planning and Environment (2021).

2.2 METHOD OF ASSESSMENT

2.2.1 Existing Economic Environment

The existing economic environment Section provides an overview of the existing economic profile of the Project study area (see Section 2.3 for a definition of the Catchment used for the Project study area) and provides a current baseline for assessment of the significance of potential impacts of the proposed development. Regional economic data collected during this stage is used to develop economic models and informs the 'base case' (or baseline scenario) against which the Project's impacts are assessed.

A summary of the existing economic environment is presented in Section 4, with supporting data and analysis in Appendix A.

The existing economic environment includes an assessment and overview of the prevailing conditions of the economy based on available data sets at the time of writing. However, the timing of release of many data sets can lag by three to six months (and in the case of Census data this is only available every five years), which can mean recent developments and macro-economic conditions (including ramifications of COVID-19) may not be fully reflected in the statistics and data presented. Additional context and analysis regarding recent impacts on the existing environment in consideration of the ramifications of COVID-19 for the Catchment and NSW economies has been provided where possible.

2.2.2 Local Effects Analysis (LEA)

The LEA Section uses economic impact modelling results as well as information from the existing environment and desktop research to analyse, assess and discuss the economic impacts of the Project.

The LEA includes input and information from:

- Economic modelling using Input-Output (IO) modelling techniques (a description of IO modelling is provided in Appendix B).
- Interpretation of modelling output in the context of the regional and state economies, and analysis of other non-quantified changes to the economic environment.
- Evaluation of the significance of impacts in relation to economic resources.

The assessment identifies the economic impacts specific to the Project compared to what would be anticipated if the Project does not proceed. The LEA is presented in Section 5.

2.2.3 Development of Mitigation and Enhancement Strategies

The mitigation strategies Section identifies strategies to avoid, reduce or mitigate the negative economic impacts and enhance and facilitate the capture of the positive impacts identified in the economic impact assessment. Mitigation and enhancement strategies are presented in Section 7.

2.2.4 Cost Benefit Analysis (CBA)

The CBA has been conducted in line with NSW and Australian Government guidelines, examining the stream of relevant economic, social, and environmental costs and benefits anticipated from the Project to assess the net present value of the Project to the NSW community. Additional details regarding the CBA assessment method used is provided in Appendix C. The results of the CBA are presented in Section 8.4 of this report.

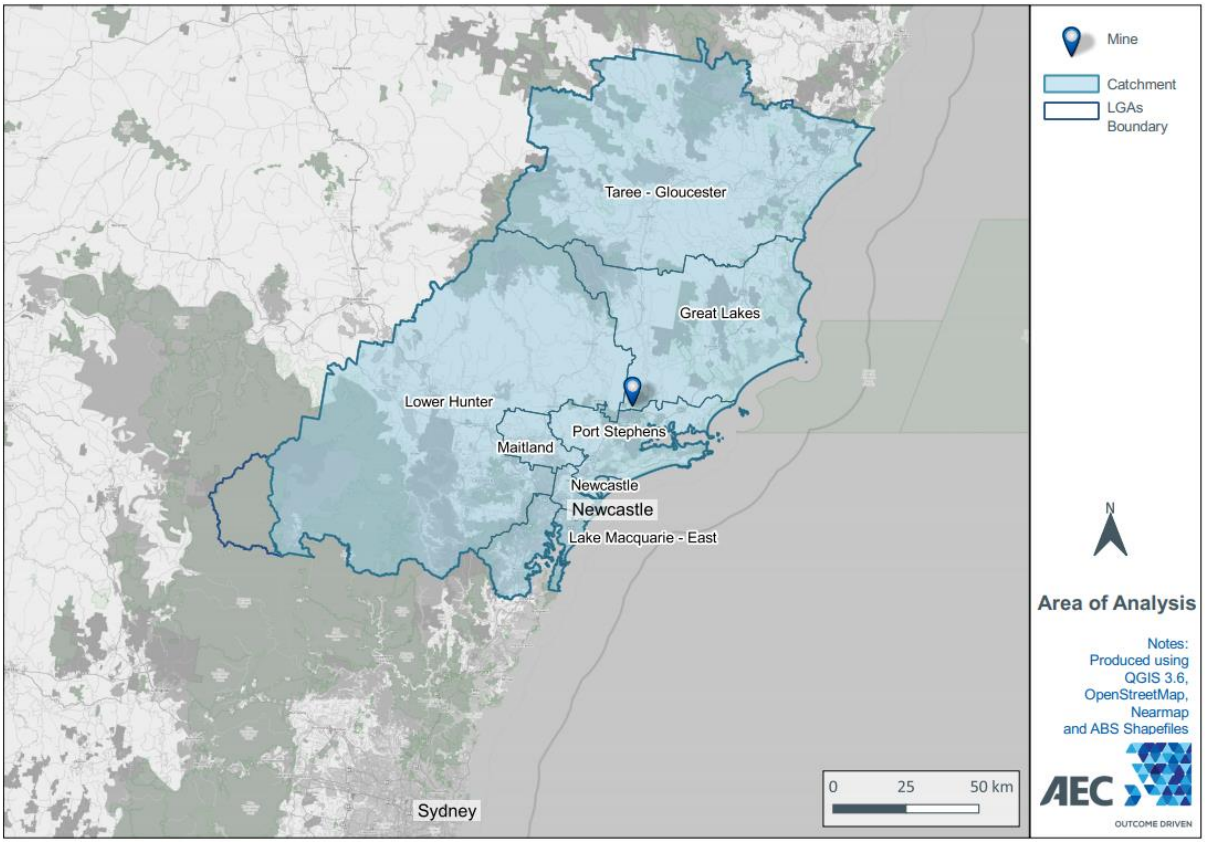
2.3 STUDY AREA

The study area used in the LEA is defined as the aggregation of the following SA3s:

- Great Lakes (in which the Project is located and lies within the Mid Coast Local Government Area (LGA)).
- Taree-Gloucester.
- Lower Hunter.
- Port Stephens.
- Maitland.
- Newcastle.
- Lake Macquarie – East.
- Lake Macquarie – West.

The above study area is hereafter referred to as the "Catchment". A map of the Catchment is presented in Figure 2.1. This catchment was chosen as it encompasses the Project location as well as the key source markets for goods/ labour, represented by a 100-kilometre radius.

Figure 2.1. Map of Catchment



Source: AEC

3. PROJECT OVERVIEW AND ASSUMPTIONS

3.1 PROJECT DESCRIPTION

The Project seeks approval for the construction and operation of the DCQ, in the Great Lakes region of New South Wales. The Project is to be located off The Bucketts Way north of Limeburners Creek, with the Project area representing approximately 30 hectares; 18 hectares for quarry extraction and 12 hectares for supporting infrastructure and roads.

Specifically, the Project will enable the following activities:

- Weathered rock stripped by bulldozer or excavator.
- Blasting of hard rock.
- Excavator and articulated trucks utilised to feed mobile crusher and screen on the pit floor.
- Conveyors, articulated trucks, and excavator or front-end loader and articulated trucks utilised to distribute materials between processing and stockpile areas.
- Front-end loader utilised to load road registered haulage trucks with saleable products.

The Project will require the following support facilities and utilities, to be developed during construction:

- Site office, weighbridge, workshop, stores, car parking.
- New Intersection on The Bucketts Way with private sealed access road.
- Power supply from diesel generators, solar or connection to the mains network via a new underground electrical line adjacent to the access road.
- Telecommunications line run adjacent to the access road.
- Water supply sourced from rainwater, onsite dams, surface water runoff, groundwater seepage and imported potable water as needed.

At the end of the Project life (i.e., completion of extraction), the quarry benches will be revegetated, and a free draining quarry floor will be provided.

The Project is anticipated to extract approximately 11.83 million tonnes (Mt) of ore over a 30-year period, with peak annual extraction of up to 500,000 tonnes per annum (tpa) (Ironstone, unpublished). Products of this extraction process will include road base, crusher dust, aggregates, and rock for various purposes (including for road construction and landscaping). Resources are typically transported to markets in and adjoining Port Stephens, Newcastle, Maitland, Lake Macquarie, and Mid-Coast; however, decorative, and high PAFV (polished aggregate friction value) products with travel further and have wider markets (i.e., Sydney, Lithgow, Canberra, Port Macquarie, and Coffs Harbour).

3.2 SIGNIFICANCE OF RESOURCE

A range of materials can be extracted from quarries, including that used for road base, crusher dust, aggregates, high grip aggregates, decorative materials, and rock. These raw materials are essential to the construction and maintenance of infrastructure.

As outlined in Table A. 11 in the Major Projects Section of Appendix A, numerous quarrying projects in the Catchment are extending operations through to between 2030 and 2050, whilst two major quarries are anticipated to cease over the next few years. Several new quarries have also been proposed for the region and are currently in assessment or EIS phases. As such, the region's supply is expected to increase compared to existing supply capacity moving forward.

The Greater Sydney Region, to the south of the Catchment, estimates around 600,000 tonnes per week of quarry products (or 31.2 million tonnes per annum) of quarry product are currently flowing into the area from feeder regions (such as the Catchment) (Quarry Magazine, 2021). As the population of the Catchment and surrounding regions

continues to grow, the accessibility and availability of construction materials has become critical for providing affordable housing, buildings, roads, and other infrastructure pertinent to supporting the population and growth. As such, demand within the Catchment is anticipated to record strong growth over the next five years, with the national construction sector anticipated to experience forecast annual growth of 2.4% per annum on average (National Industry Insights, 2020). Further to this, a number of major projects within the Catchment, including the $400 million Newcastle Power Station project (in construction), the Jesmond to Rankin Park Bypass (2022), M1 to Heatherbrae Fly Over Bypass (2024) and the Newcastle Gas Terminal (EIS in preparation), will require quarry products (AGL, 2021; Department of Planning, Industry and Environment, 2021).

The Project will provide a new and alternative supply source to the market which will service the strengthening demand for construction material within the Catchment, together with several other planned new suppliers coming online in the Catchment. The Project will thereby improve the security of supply within the Catchment to meet the significant number of planned infrastructure and other projects.

The Project is anticipated to provide up to 500,000 tpa of extracted materials on average over the peak operational years. While this rate of production and significance of the resource for this Project constitutes a State Significant Development, relative to overall demand and supply for quarried materials the Project's output will represent a relatively small component of the market and be an important project for supporting anticipated future growth in demand.

3.3 PROJECT SCENARIO

Modelling of economic impacts undertaken for this Project has examined the economic activity associated with and supported by the development, operations, and closure / rehabilitation of the DCQ.

Modelling conducted for the economic impact assessment is based on a scenario in which construction activity commences in the 2021-22 financial year. Construction activity is anticipated to be completed by the end of 2022-23.

The Project is estimated to peak at around 500,000 tpa of total quarried material (ROM), with a total of approximately 11.83 Mt of quarried material (ROM) anticipated to be extracted over the life of the quarry (Ironstone, unpublished). The scenario modelled in this assessment is for quarrying to be undertaken over a period of approximately 30 years, from financial year 2023-24 to financial year 2051-52.

Material extracted from these deposits will be crushed/ processed onsite. Modelling has assumed that crushing/ processing occurs the same year in which the material is extracted. Modelling is based on a scenario of approximately 11.83 Mt of saleable material being produced over the Project's life.

Products are expected to then be sold to domestic concrete batch plants or construction sites where required, with the majority of these customers anticipated to be within New South Wales.

Modelling of economic impacts has been undertaken in financial years.

Note: All dollar values presented in this Section are in Australian dollar terms unless otherwise specified.

3.3.1 Construction

3.3.1.1 Construction Costs and Timing

The capital cost for developing the Project is estimated to be $5.8 million (Goeldner CIV, unpublished). Modelling is based on construction commencing in 2021-22, with all works completed by the end of 2022-23. For modelling purposes, the capital costs by component have been allocated to industries represented in the Input-Output (IO) model (based on the Australian and New Zealand Industrial Classification (ANZSIC) categories). A breakdown of construction cost components by industry used for modelling is presented in Table 3.1.

Table 3.1. Construction Cost Estimates for Project, $'000s

Construction Component	IO Industry	Cost ($'000s)
Bulk Earthworks		
Bulk Earthworks	Construction Services	$730.0
The Bucketts Way Intersection		
Clearing	Construction Services	$46.7
Topsoil	Construction Services	$10.6
Earthworks	Construction Services	$8.1
Sediment and Erosion Controls	Construction Services	$0.0
Pavements	Heavy and Civil Engineering Construction	$210.4
Stormwater Drainage	Heavy and Civil Engineering Construction	$0.0
Signage	Construction Services	$9.2
Line Marking	Construction Services	$9.0
Lead in Road		
Clearing	Construction Services	$31.0
Topsoil	Construction Services	$32.1
Earthworks	Construction Services	$27.0
Sediment and Erosion Controls	Construction Services	$0.0
Pavements	Heavy and Civil Engineering Construction	$889.9
Stormwater Drainage	Heavy and Civil Engineering Construction	$266.0
Signage	Construction Services	$18.6
line marking	Construction Services	$16.2
Fencing	Construction Services	$44.9
Office, Weighbridge and Maintenance Area		
Clearing	Construction Services	$18.8
Topsoil	Construction Services	$23.4
Earthworks	Construction Services	$2.6
Sediment and Erosion Controls	Construction Services	$0.0
Pavements	Heavy and Civil Engineering Construction	$437.8
Stormwater Drainage	Heavy and Civil Engineering Construction	$0.0
Signage	Construction Services	$6.4
Line Marking	Construction Services	$2.8
Building/ Facilities Pads (incl. weighbridge)	Specialised and other Machinery and Equipment Manufacturing	$2.8
Pit Road		
Clearing	Construction Services	$5.5
Topsoil	Construction Services	$6.8
Earthworks	Construction Services	$1.3
Sediment and Erosion Controls	Construction Services	$0.0
Pavements	Heavy and Civil Engineering Construction	$148.1
Stormwater Drainage	Heavy and Civil Engineering Construction	$17.0
Signage	Construction Services	$4.8

Construction Component	IO Industry	Cost ($'000s)
Deep Creek Road Diversion		
Clearing	Construction Services	$4.7
Topsoil	Construction Services	$4.7
Earthworks	Construction Services	$2.4
Sediment and Erosion Controls	Construction Services	$0.0
Pavements	Heavy and Civil Engineering Construction	$110.0
Stormwater Drainage	Heavy and Civil Engineering Construction	$30.5
Signage	Construction Services	$4.2
Line Marking	Construction Services	$0.0
Fencing	Construction Services	$14.1
Material Stockpile Area		
Clearing	Construction Services	$52.5
Topsoil	Construction Services	$19.5
Earthworks	Construction Services	$82.1
Sediment and Erosion Controls	Construction Services	$14.0
Pavements	Heavy and Civil Engineering Construction	$552.6
Facilities		
Office Area	Non-Residential Building Construction	$314.0
Maintenance Area	Non-Residential Building Construction	$260.5
Services		
Electrical and Communication Reticulation	Electrical Equipment Manufacturing	$102.5
Water Reticulation	Construction Services	$0.0
Sewer Reticulation	Construction Services	$50.0
Quarry		
Fencing	Construction Services	$61.6
Other		
Design and Procurement	Professional, Scientific and Technical Services	$235.4
Contractor Preliminaries	Professional, Scientific and Technical Services	$423.7
Contractor Margin	Heavy and Civil Engineering Construction	$470.8
Total	**-**	**$5,837.8**

Notes: Totals may not sum due to rounding.
Source: Goeldner CIV (unpublished).

Further to the above, once the quarry is operational there will be purchases and/ or hiring of second-hand equipment, including 1 x water truck, 2 x 40 tonne dumpers, 2 x cat 792 loaders, and 1 or 2 x 33 to 36 tonne excavators (Ironstone, unpublished). Crushers and screens will also be hired to start with, and eventually purchased by the quarry once the customer base and sales demand grows. This equipment is expected to total approximately $1.8 million, which is likely to be purchased from another quarry (rather than a manufacturer). It has, therefore, been assumed this is a transfer payment and excluded from IO modelling. Once the quarry is fully established with steady state production and a strong, stable customer base is established, Ironstone Developments may also explore the purchase of new equipment to replace the second hand equipment used during early establishment phase of the quarry. However, this may be considered as an alternative future scenario, and has not been included in modelling.

As indicated in the information provided by Ironstone Developments, the majority of construction works has been assumed to be carried out in the first financial year (2021-22), with the remainder completed in 2022-23. The table below provides a summary of construction expenditure by industry assumed for modelling purposes.

Table 3.2. Construction Costs by Input-Output Industry, $'000s

IO Industry	2021-22	2022-23	Total
Professional, Scientific and Technical Services	$548.8	$110.3	$659.1
Construction Services	$1,233.3	$132.3	$1,365.6
Heavy and Civil Engineering Construction	$3,133.2	$0.0	$3,133.2
Electrical Equipment Manufacturing	$51.3	$51.3	$102.5
Non-Residential Building Construction	$243.1	$331.5	$574.6
Specialised and other Machinery and Equipment Manufacturing	$1.7	$1.1	$2.8
Total	**$5,211.3**	**$626.5**	**$5,837.8**

Notes: Totals may not sum due to rounding.
Source: Goeldner CIV (unpublished).

3.3.1.2 Construction Labour

Information regarding on-site construction labour associated with developing the quarry was provided by Ironstone Developments, encompassing activities associated with the industries of construction services, heavy and civil engineering construction and non-residential building construction outlined in Table 3.2. Information regarding labour associated with non-construction activities (such as professional and manufacturing services) was not provided, and instead was estimated based on the expenditure within each sector outlined in Table 3.2 and applied to IO multipliers for these industries to estimate the associated labour.

Based on this, between 2021-22 and 2022-23 the development of the Project is estimated to directly require a total of approximately 9 FTE workers, of which 6 FTE workers represent on-site construction labour. Timing for construction labour used in modelling is outlined in the table below, including estimated labour costs (noting these labour costs are included within the construction costs outlined above).

3.3.1.3 Source of Goods / Services

Construction will use labour from the Catchment where feasible, with the rest of the construction workforce supplemented by workers outside the Catchment. The economic analysis assumes the majority of goods, services and labour will be sourced from the Catchment, with the exception of professional services and manufacturing services which will require more specialised goods, services and skillsets not available within the Catchment.

Assumptions regarding the source of goods, services and labour from within the Catchment during construction were based on anticipated skills required and capacity within the Catchment's labour market. An overview of the existing labour market is provided in Section 4 and Appendix A.

For the purposes of the economic impact assessment, assumptions regarding where goods, services and labour will be sourced from were developed in consideration of the IO sectors used. A summary of the assumptions used is presented in Table 3.3.

Table 3.3. Assumed Sources of Goods, Services and Labour During Construction

Component	Catchment	Rest of NSW	Rest of Australia/ Overseas
Professional, Scientific and Technical Services	25%	50%	25%
Construction Services	75%	25%	0%
Heavy and Civil Engineering Construction	75%	25%	0%
Electrical Equipment Manufacturing	30%	50%	20%
Non-Residential Building Construction	75%	25%	0%
Specialised and other Machinery and Equipment Manufacturing	30%	50%	20%

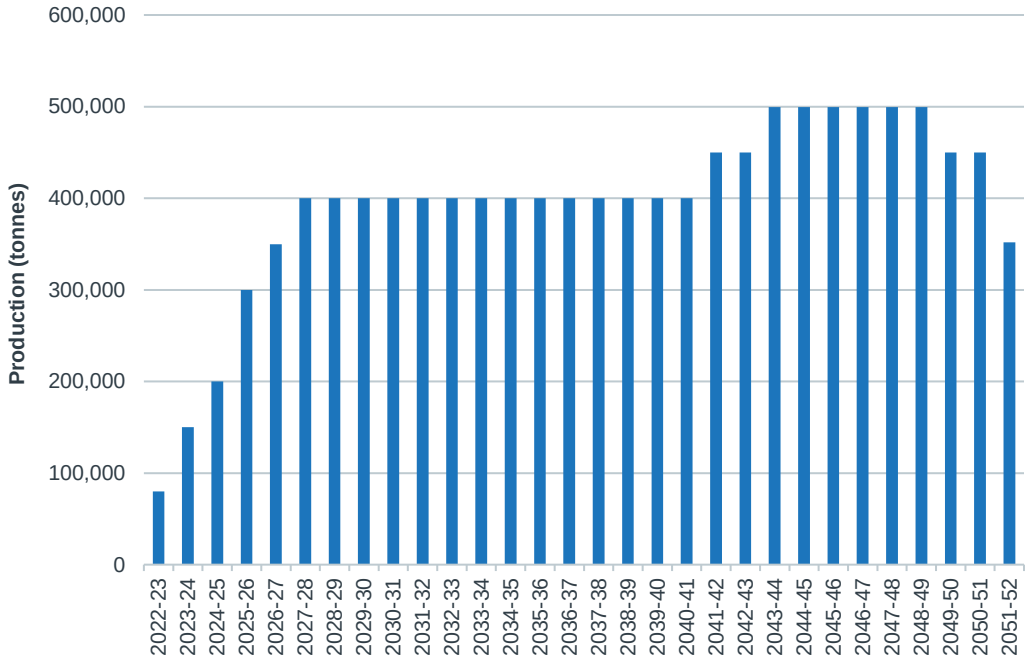
Source: AEC.

3.3.2 Operations

3.3.2.1 Production and Timing

Figure 3.1 outlines the annual production of processed material from the DCQ (in aggregate) on a financial year basis, between 2022-23 to 2051-52, as per the scenario used in modelling economic impacts. This excludes unprocessed rock produced.

Figure 3.1. Annual Production of Processed Material (Tonnes)



Source: Ironstone (unpublished).

Over the life of the quarry, the following material is anticipated to be processed (Ironstone, unpublished):

- Road base (10% of total processed product on average).
- Crusher dust (30% of total processed product on average).
- Aggregates (60% of total processed product on average).

Quarried material extracted from the DCQ has been assumed to be processed in the year it is extracted for modelling. In addition to the above, approximately 14,000 t of unprocessed rock product will be produced over the life of the quarry, increasing from 100 t in 2022-23 to a long term peak of 500 tpa from 2026-27 through to the end of quarry life in 2051-52.

3.3.2.2 Prices

Estimates of annual prices received for road base, crusher dust, aggregates, and rock product were provided by Ironstone Developments based on anticipated price movements for these materials. Whilst prices may vary year to year, over the life of the Project, prices are assumed to be, on average (Ironstone, unpublished):

- $22.0 per tonne for road base throughout the analysis period.
- $22.0 per tonnes for crusher dust.
- $30.0 to $35.0 per tonne for aggregates.
- $50.0 per tonne for rock.

3.3.2.3 Operating Expenditure

Operating expenditure associated with quarrying activities has been estimated based on estimates of revenue within the non-metallic mineral mining sector, and applied to IO multipliers for this industry. Based on IO transaction tables, the key spend items for activity/ operations within this sector includes:

- Construction services.
- Cement, lime, and ready-mixed concrete manufacturing.
- Forged iron and steel product manufacturing.
- Heavy and civil engineering construction.
- Other non-metallic mineral product manufacturing.
- Iron and steel manufacturing.

3.3.2.4 Operations Labour

Estimates of employment during operations were provided by the Ironstone Development. The estimated number of operations employees at DCQ is expected to remain stable over the operating period at 10 FTE staff through from 2022-23 to 2051-52. The majority of labour is associated with direct quarrying activities (6 FTEs), followed by crushing activities (2 FTEs), maintenance (1 FTE), and transport and handling (1 FTE).

3.3.2.5 Source of Goods / Services

All operational labour is anticipated to be sourced from within the Catchment, due to the availability of appropriate labour and skillsets. For the purposes of the economic impact assessment, assumptions regarding where goods and services will be sourced from were derived from standard industry structures for the quarrying and processing industries aligning with activity of the Project and in consideration of the local capacity in the supply chain to meet demands.

3.3.3 Post-Extraction Decommissioning and Rehabilitation

Decommissioning / rehabilitation activity will occur following cessation of quarrying activities at the DCQ, during the financial year 2051-52. Information regarding the anticipated costs for decommissioning and rehabilitation works associated with the Project was provided by Ironstone Developments, indicating total costs for decommissioning and rehabilitation of approximately $0.8 million in 2051-52. This does not include any progressive rehabilitation that may be undertaken during quarrying. Decommissioning / rehabilitation labour is assumed to be entirely sourced from within the Catchment, with employment estimates developed based on standard industry multipliers for the construction services industry for this level of expenditure.

3.4 WORKFORCE ACCOMMODATION

Quarrying and processing activity at the DCQ will result in increased construction and operational activity in the Catchment, and hence growth of the workforce in the Catchment.

As outlined in Section 3.4, all operational labour is anticipated to be sourced from within the Catchment. As such, there is not anticipated to be a tangible impact on workforce accommodation requirements, with operational workers already residing in the region.

The construction workforce, however, will result in a small increase in demand for temporary accommodation compared to existing levels during 2021-22 and 2022-23. Whilst the Project will primarily be supported by a workforce from within the Catchment, non-local workers will be utilised where more specialised skillsets are required that the local workforce does not provide (i.e., professional, scientific, and technical services and manufacturing). The sources of labour have been outlined as per Section 3.3.1.3, with 3 FTE construction workers sourced from outside the Catchment in 2021-22 and 1 FTE construction worker sourced from outside the Catchment in 2022-23. The construction workers sourced from outside the region will likely require temporary accommodation over the construction period.

The Catchment typically records high dwelling vacancy levels (with unoccupied dwellings representing 11.1% of total housing stock in 2016, see Section 4). Given the significant capacity in the local area and relatively modest number of workers requiring accommodation it is anticipated the non-local construction workforce will be sufficiently accommodated within existing stock.

3.5 CONTRIBUTION OF LAND OFFSET

The site of development/ the resource area contains a variety of vegetation (including Spotted Gum, Broad-Leaved Mahogany, Red Ironbark, Blackbutt Grass, Tallowwood, Smooth-Barked Apple, Brown Stringybark, Hairpin Banksia) and threatened species (including the Tetratheca Juncea and Callistemon Linearifolius).

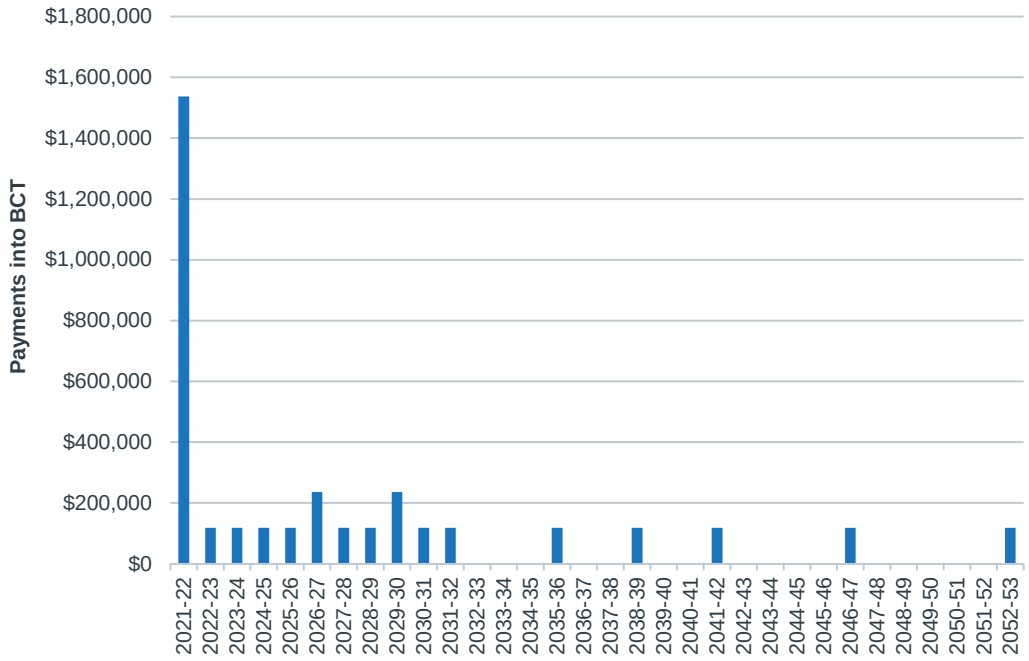
Ironstone Developments are in the process of finalising an approach to managing/ offsetting the biodiversity impacts. Ironstone Developments has identified there is potential to address this biodiversity impact through a mixture of purchased offset credits for some species and ecosystem credits, and onsite offsets that will be managed using released funds from the Biodiversity Conservation Trust Fund (BCT). For the purposes of this assessment, it has been assumed this approach is undertaken. The information regarding the contribution of the land offset in this report is indicative only based on information provided by Ironstone Developments (unpublished) and is anticipated to present the potential worst case scenario for offsetting biodiversity costs.

The BCT is a statutory not for profit body, delivering private land conservation programs and fulfilling certain roles under the NSW Biodiversity Offsets Scheme, in particular acting as the fund manager for the Biodiversity Stewardship Payments Fund (BCT, 2021). Biodiversity credits represent the expected improvement in biodiversity that will result from the protection and management of the site. Any landholder seeking to offset their biodiversity impact (i.e., protect or enhance the biodiversity values of their land) can make a payment into the fund to fulfil their biodiversity credit. The BCT then takes on the obligation to fund activities that will fulfil the biodiversity credits. The price of a credit is comprised of both the cost of future maintenance activities and the cost associated with the restricted use of the land once an offset (under a Stewardship Agreement).

Ironstone Developments has been provided information which indicates, under the worst-case-scenario, up to approximately $1.5 million may be required to be deposited by the landholder into the Biodiversity Conservation Trust in the first year (i.e., 2021-22) to retire sufficient credits to offset the initial disturbance area. Additional offset credit payments will then be made each year to 2031-32 in line with progressive disturbance, and then periodically through to 2052-53 based on area disturbed each year.

The following figure outlines the annual offset payments assumed.

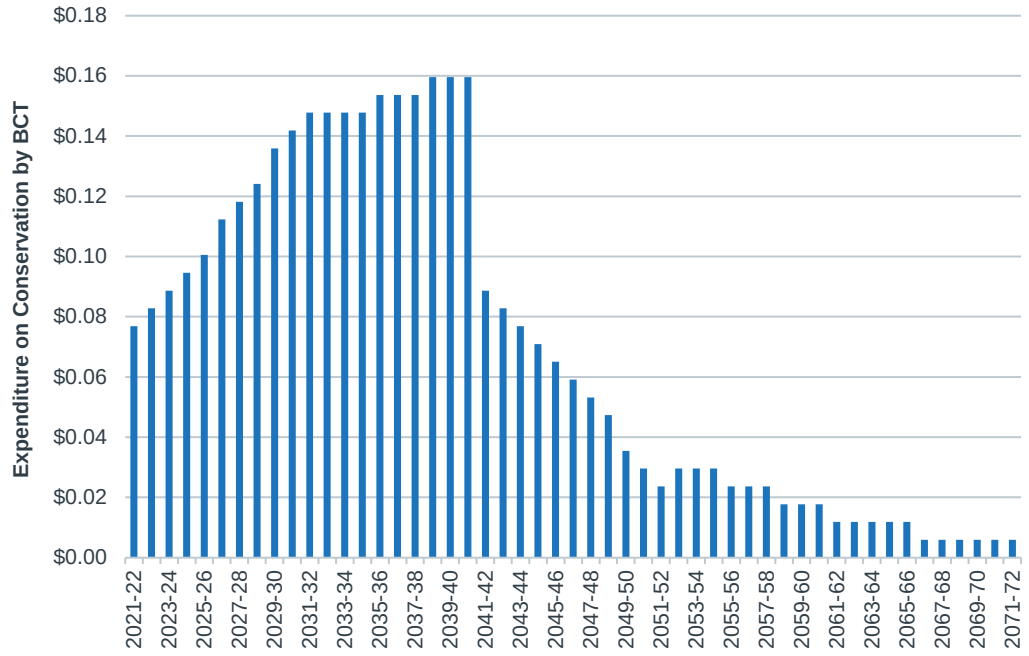
Figure 3.2. Annual Offset Payments into BCT ($)



Source: Ironstone (unpublished).

Funds paid towards biodiversity offset credits are dispensed and regulated by the BCT for biodiversity conservation activities on offset lands over a period of 20 years from deposit of the funds. Based on the offset payments, the figure below highlights the anticipated annual expenditure on biodiversity conservation activities by the BCT fund manager over the period between 2021-22 to 2071-72. It should be noted that these costs assume all offset credit requirements are satisfied through payment directly to the BCT and include the cost associated with securing land in perpetuity for offsets. As IDPL are likely to be able to satisfy a portion of the offset requirements using their own land, the costs are likely to be lower. Therefore, this is expected to represent a worst-case scenario, and the actual cost will likely be much less due to onsite offsetting of proponent owned property.

Figure 3.3. Expenditure on Biodiversity Conservation by the BCT ($M)



Source: Ironstone (unpublished).

3.6 CONSEQUENCES OF NOT PROCEEDING WITH PROJECT

In understanding the implications of the Project not proceeding it is important to note the Project will deliver additional quarrying and processing activities within the Catchment. With the Project, quarrying and processing activity and supply contracts will continue to increase in the region and will support demand from the construction sector which is forecast to grow by 2.4% per annum on average over the next five years (National Industry Insights, 2020). The Project thereby represents an important contributor to increasing activity and jobs supported by DCQ into the early 2050s.

Where the Project does not proceed, the economic contribution by DCQ to the local and State economies would not be realised. All economic modelling undertaken in this study (i.e., IO modelling and CBA) presents a comparison of Project impacts against a base case where the Project does not proceed. These analyses present the net change that would occur due to the Project, compared to this base case.

The quarried materials supplied by DCQ will also support development of a range of domestic infrastructure and other projects. Without DCQ, while it is still expected this infrastructure and other projects would proceed, it may reasonably be expected that unless other quarries are developed elsewhere in the Catchment the supply of materials may be sourced from further afield at potentially a greater cost.

4. EXISTING ECONOMIC ENVIRONMENT

This Section provides a summary of the socio-economic environment of the Catchment, with comparisons to New South Wales. This Section provides an assessment and overview of the prevailing conditions of the economy based on available datasets at the time of writing, however, the timing of release of many datasets means recent developments and macro-economic conditions (including ramifications of COVID-19) are unlikely to be fully reflected in the statistics and data presented. Appropriate interpretive context and analysis regarding recent impacts and ramifications of COVID-19 for the Catchment and New South Wales economies have been provided where possible. The analysis and findings below are supported in more detail in Appendix A.

The following are key attributes of the Catchment's existing environment:

- **The Catchment has recorded consistently lower population growth than the State over the seven years to 2019:** Historically, the Catchment population has recorded moderate growth, averaging 1.0% per annum between 2001 and 2019, to reach a population of approximately 715,900 people by 2019. Average annual population growth between 2001 and 2019 was 0.2 percentage points lower than that of the State, with annual growth for the Catchment consistently trending below the State average over the seven years to 2019.
- **Population growth in the Catchment is anticipated to remain lower than the State to 2041:** While the Catchment's resident population is expected to continue to increase, the annual growth rate is projected to remain lower than the State, averaging 0.7% per annum to reach approximately 833,200 people by 2041.
- **The Catchment's economy has recorded consistent annual growth:** In 2018-19, the Catchment's economy recorded GRP of approximately $51.0 billion in chain volume terms. Between 2006-07 and 2018-19, the economy recorded moderate growth of approximately 1.9% per annum on average, slightly lower than the 2.3% recorded for the State. The two largest sectors contributing to Gross Value Added (GVA) activity between 2006-07 and 2018-19 include mining (13.5% of GVA) and construction (9.4% of GVA).
- **Quarry activity will be supported by the significant developments in the region over the coming years:** Quarrying activity (specifically activity generating road base, crusher dust, high grip aggregates and decorative materials) is driven primarily by demand for heavy and civil engineering construction activities. There are a significant number of developments in various stages of planning of this nature, which will support growth of the heavy and civil engineering construction sector and consequently quarrying activity over the coming years (Department of Planning, Industry and Environment, 2020).
- **Population serving sectors were the top employers in the Catchment in 2018-19:** In 2018-19, the largest employing industry in the Catchment was healthcare and social assistance, representing 17.1% of jobs, followed retail trade (10.4%) and construction (10.1%).
- **Unemployment in the Catchment has recovered from peak levels in 2015:** The Catchment's labour force was relatively flat between 2010 and 2014 (with growth of 0.8% per annum on average), however, experienced a more rapid expansion (compared to historically) between 2015 and 2019 of 2.4% growth per annum on average (prior to the COVID-19 pandemic). The unemployment rate fluctuated between 4.5% to just above 5.5% between 2010 and 2014, consistent with the State average, however spiked to above 8.0% in 2015 (this is consistent with the large decline in manufacturing employment in this year). Following this period, the unemployment rate dropped back to around 5.0% to just above 5.5% in 2017 and fluctuated slightly above the State average for the remainder of the period.
- **The COVID-19 pandemic had a more significant impact on employment in the Catchment than the State:** The COVID-19 pandemic reached Australia in early January 2020, which led to reduced business activity, redundancies, and rising unemployment rates by mid-2020. As a result, the unemployment rate in the Catchment increased from 4.8% in March 2020 to 5.6% in June 2020 (a 0.8 percentage point increase). This rise is double that recorded for the State. Over this period, employment in the Catchment declined as workers transitioned to unemployment or became discouraged and left the labour force (evidenced by the rise in unemployment levels and decline in labour force).

- **Construction was the industry most heavily impacted by the pandemic:** Indicative estimates suggest, as of 2 January 2021, the pandemic resulted in a decline of approximately $1.9 billion in IVA in the Catchment, or 4.6%. The construction sector recorded the largest decline ($815.8 million) followed by manufacturing ($306.5 million).
- **Businesses are decreasingly applying for JobKeeper in the Catchment:** In the Catchment, an average of approximately 21,200 businesses applied for JobKeeper each month from April to September 2020 (Treasury, 2020). The month-on-month JobKeeper rate declined in August 2020 and again in September 2020. There is potential that some of the small-medium businesses covered by the JobKeeper payment may struggle to recover once the payment has ended.
- **The Catchment is both highly self-sufficient and self-contained:** The Catchment is 97.1% self-sufficient, indicating the majority of local jobs are held by residents and there is an appropriate match between skillsets. This is largely due to the high number of healthcare and social assistance workers who live and work in the Catchment. The Catchment also has a high self-containment rate (94.3%), reflecting the vast majority of residents found work in the region, or relocated to the region for work purposes.
- **Demand for rental stock has remained steady in the Catchment, whilst more subdued demand is evident in the housing market[1]:** The number of house sales declined by 3.1% per month (on average) from June 2017 to June 2020. Whilst prices also declined over the two years to September 2019, there was a recovery over the three months to June 2020 to reach an average price of approximately $533,300. The number of rental bonds lodged follows a cyclical trend, with March a key month for residents entering the rental market or moving between rental properties. Rental prices grew by 0.7% on average per annum over the 24 months to September 2020, significantly higher than that for the State where rental prices have remained relatively stable. This growth in prices has occurred despite demand in the rental market remaining relatively flat on a year-to-year basis.
- **Vacancy rates are higher the Catchment than New South Wales on average:** Approximately 11.1% of the Catchment's housing stock is comprised of unoccupied private dwellings, compared to 9.3% for New South Wales.

[1] Due to lack of information availability regarding housing and rental information at the SA3 level, an aggregation of LGAs were used to form a similar Catchment to that presented in Section 2.3 – see Appendix A for a list of LGAs included and a map of the Catchment utilised for this dataset.

5. LOCAL EFFECTS ANALYSIS

The following Section examines the economic impacts of the Project within the Catchment (i.e., analysis of local effects), as well as impacts to the State of NSW for context.

This analysis uses economic modelling as well as findings from the literature review and existing environment to inform the assessment of economic impacts as appropriate. **All modelling outcomes are presented in 2020 Australian dollar values** unless otherwise specified. IO modelling has been used in modelling impacts to the Catchment and State (modelling of impacts to the rest of Australia have not been reported as the vast majority of impacts will occur within NSW). The modelling outcomes identified throughout this impact assessment depict the impact value of a range of economic indicators anticipated as a result of the Project. A description of the IO modelling framework used is provided in **Appendix B**.

Modelling results used in this Section present both direct (i.e., the **initial stimulus** from the Project) and flow-on (i.e., **production-induced**) impacts of the Project. Only the production-induced flow-on impacts are included (i.e., type I flow-on), which reflects the first-round supply chain impacts as well as the second and subsequent round effects of increased purchases by suppliers in response to increased sales resulting from demand for goods and services from the mine and associated infrastructure manufacturing and development activity. Household consumption induced flow-on impacts (i.e., type II flow-on impacts) are excluded from this analysis to provide a more conservative estimate of impacts.

IO modelling has been conducted for construction, operations, and decommissioning / rehabilitation phase activities separately. The direct activity associated with each phase (construction, operations, and decommissioning/ rehabilitation) is outlined in Section 3.2. In reporting impacts:

- Construction phase impacts have been assessed and reported in aggregate over the two-year construction phase, between 2021-22 and 2022-23.
- Operations phase activities have been assessed and reported as an average annual impact between 2022-23 and 2051-52, reflecting the full operational period of production activity.
- Decommissioning and rehabilitation phase impacts have been assessed and reported for the year 2051-52, when all decommissioning and rehabilitation is anticipated to occur.

Annual estimates of total Project impacts have also been presented, reflecting the annual direct and flow-on impacts on key measures from all phases in combination.

5.1 CONTRIBUTION TO THE ECONOMY

The Project will generate economic activity directly through the construction of the quarry and supporting infrastructure, extraction, processing, and transport of quarried product during operations, and through onsite rehabilitation / decommissioning activities during and post-extraction activity. Economic activity will also be supported through the supply of goods and services to support the Project across all these phases (flow-on activity). Impacts of the Project on gross product across construction, operation and decommissioning / rehabilitation phases are examined in this Section. The analysis disaggregates impacts between:

- GRP for impacts accruing in the Catchment.
- Gross State Product (GSP) for impacts accruing in the rest of NSW (or when referring to the total NSW impact, this includes the Catchment and rest of NSW impact in aggregate).

Gross product (e.g., GRP / GSP) refers to the value of goods and services produced after deducting the costs of intermediate purchases of goods and services used as inputs in the production process. That is, gross product defines the true net economic contribution of a project (or value added).

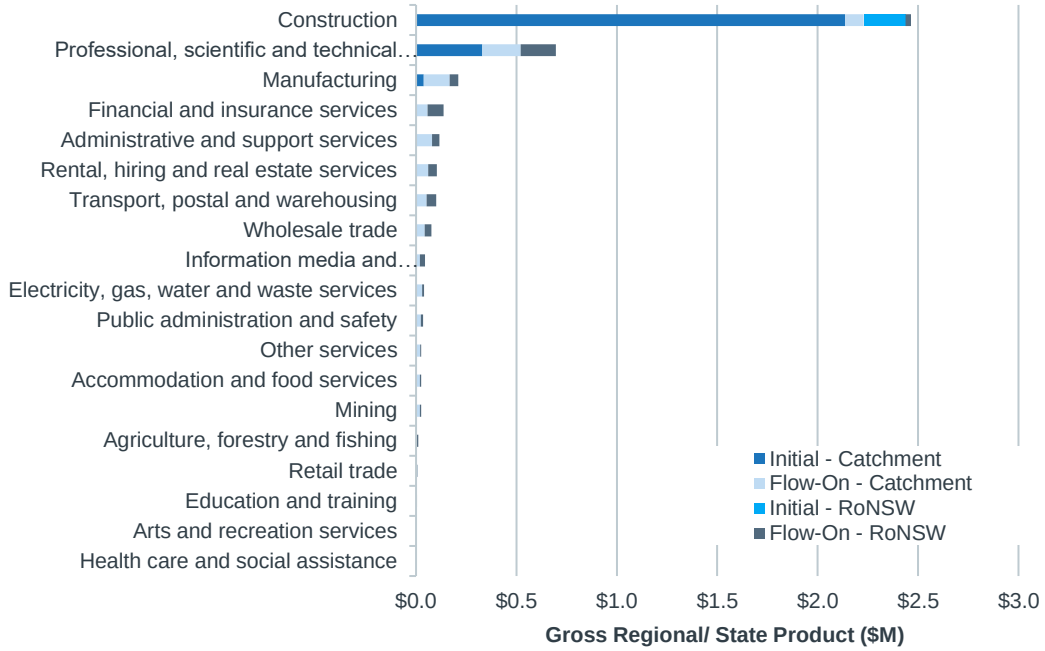
5.1.1 Construction Phase Impacts

The construction phase of the Project is expected to commence in the 2021-22 financial year and end in 2022-23. The Project is estimated to generate a total of $3.4 million in GRP in the Catchment economy during the two-year construction phase, including $2.5 million through direct activity and $0.9 million through production-induced flow on impacts.

An additional $0.8 million in GSP is estimated to be generated in the rest of NSW, $0.2 million of which will be supported by direct activity and $0.6 million through flow-on activity.

The following figure (Figure 5.1) outlines the quantum of GRP / GSP supported in aggregate during the construction phase, by industry. The construction industry is estimated to receive approximately 59.5% of total GSP impacts from construction, with professional, scientific, and technical services (16.8%) and manufacturing (5.1%) the other main industries estimated to receive a boost in activity.

Figure 5.1. GRP / GSP ($M) Supported During Construction Phase, Aggregate Impacts (2021-22 to 2022-23)



Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Goeldner CIV (unpublished), Ironstone (unpublished), AEC.

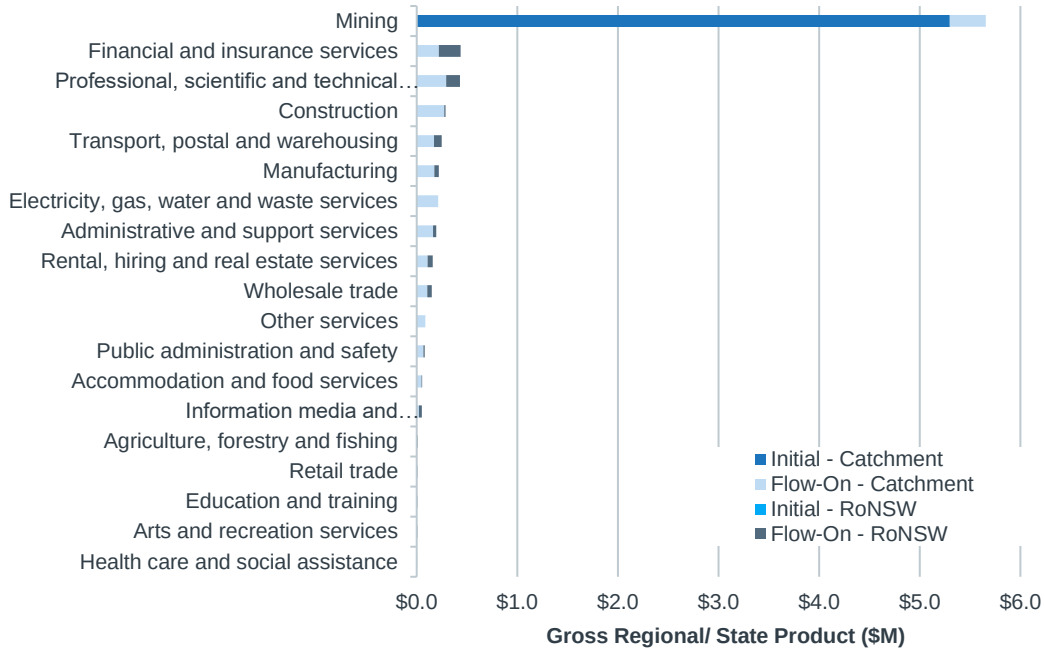
5.1.2 Operations Phase Impacts

The Project is anticipated to commence operations in 2022-23 with quarrying and processing activities expected to continue through to 2051-52.

The Project is estimated to support an average of $7.6 million in GRP in the Catchment per annum, including $5.3 million supported directly through quarrying and crushing/ processing activity and $2.4 million supported through flow-on activity. An additional $0.7 million in GSP per annum is estimated to be supported in the rest of NSW through flow-on activity.

Figure 5.2 outlines the quantum of GRP and GSP supported on average each year during operations, broken down by industry. The mining industry is estimated to record approximately 68.1% of total GSP impacts during operation, the majority a result of direct Project operating activity. The financial and insurance services industry is anticipated to receive approximately $0.4 million per annum on average in GSP as a result of flow-on activity, followed by the professional, scientific, and technical services sector which is also anticipated to receive approximately $0.4 million per annum on average in GSP.

Figure 5.2. GRP / GSP ($M) Supported During Operations Phase, Average Annual Impacts During Operations



Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Ironstone (unpublished), AEC.

Over the entire operational period between 2022-23 and 2051-52 the Project is estimated to support a total of $229.5 million in GRP within the Catchment (including $158.9 million directly and $70.5 million through flow-on activity), with a further $16.4 million supported through flow-on activity in the rest of NSW.

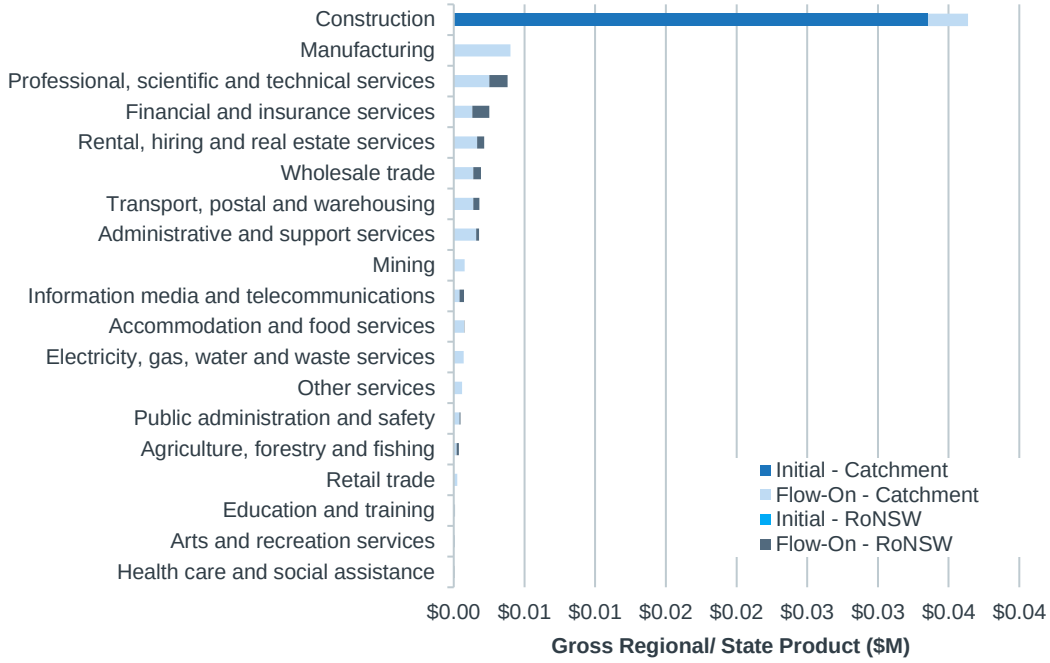
5.1.3 Decommissioning and Rehabilitation Phase Impacts

Decommissioning / rehabilitation activity will occur following cessation of quarrying activities at the DCQ, during the financial year 2051-52.

The expenditure and activity for the decommissioning / rehabilitation phase is estimated to support approximately $54,400 in GRP in the Catchment in aggregate in 2051-52. This includes approximately $33,600 directly through decommissioning / rehabilitation phase activities, with $20,900 supported through flow-on activity. An additional $4,800 in GSP is estimated to be supported in the rest of NSW through flow-on activity.

Figure 5.3 outlines the quantum of GRP and GSP supported through decommissioning and rehabilitation phase activities in 2051-52, broken down by industry. The construction industry is estimated to account for approximately 61.5% of total contribution to GSP from decommissioning and rehabilitation phase activities.

Figure 5.3. GRP / GSP ($M) Supported During Decommissioning / Rehabilitation Phase, 2051-52



Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Ironstone (unpublished), AEC.

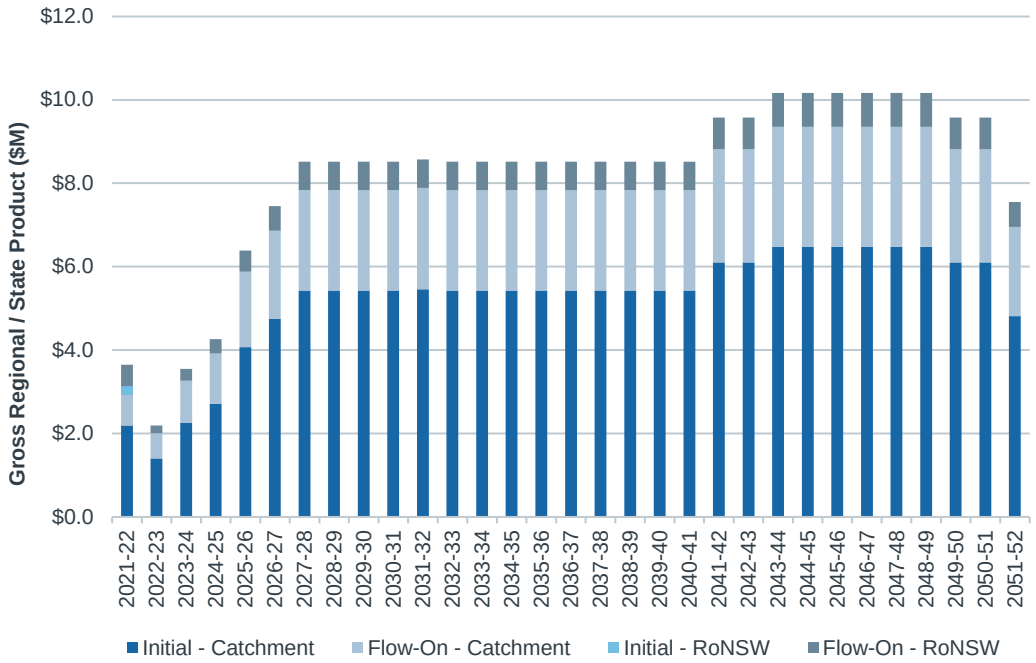
5.1.4 Annual Impacts on GRP / GSP

Modelling outcomes of the annual impacts of the Project on the Catchment's GRP and NSW GSP between the commencement of construction through to the completion of operations and decommissioning / rehabilitation are presented in Figure 5.4, based on the timing of these phases outlined in the Project overview and assumptions (Section 3.3). Both direct and flow-on impacts of the Project are presented.

The contribution to GSP will increase from approximately $3.7 million in 2021-22 (first year of construction) to approximately $8.5 million per annum between 2027-28 and 2040-41. The contribution to GSP is then estimated to rise to peak at $10.2 million per annum between 2043-44 and 2048-49 before operations winds down and ceases by 2051-52. A contribution of approximately $7.6 million is estimated in 2051-52 as a result of final operations and decommissioning and rehabilitation activities.

In total, the Catchment is estimated to capture approximately 91.9% of the total contribution to GSP across the assessment period (from 2021-22 to 2051-52), with the rest of NSW accounting for approximately 8.1%.

Figure 5.4. Annual Impact on GRP / GSP in the Catchment and Rest of NSW



Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Goeldner CIV (unpublished), Ironstone (unpublished), AEC.

5.2 CONTRIBUTION TO EMPLOYMENT AND WAGES

This Section examines the modelled impacts of the Project on employment across the construction, operations, and decommissioning / rehabilitation phases of the Project, including direct and production induced flow-on impacts. It also outlines modelled estimates of incomes (i.e., wages and salaries) paid to employees. In interpreting the results in this Section, it should be noted that COVID-19 is having a significant short-term impact on the NSW and Catchment economy and labour market, and these impacts are anticipated to continue to be felt in the longer-term (as outlined in Section 4). This Project will provide an important boost to both the Catchment and NSW, supporting jobs and economic growth at a time where such stimulus is required to stabilise the State economy.

5.2.1 Construction Phase Impacts

Both direct and flow-on estimates of employment during construction of the Project were developed using assumptions of construction activity outlined in Section 3.3.1 and IO multipliers.

Overall, the construction phase is estimated to directly support:

- 6 full time equivalent (FTE)[2] on-site construction workers over the two-year construction period between 2021-22 and 2022-23 in the Catchment, 5 FTEs of which are estimated to be sourced from the Catchment, and 1 sourced from elsewhere in NSW.
- 3 FTE jobs supported in the professional, scientific, and technical services in the Catchment between 2021-22 and 2022-23.
- 0.3 FTE jobs supported in the manufacturing industry in the Catchment between 2021-22 and 2022-23.

For construction phase impacts, on-site construction workers sourced from outside the Catchment have not been included in the Catchment impacts on the basis that construction jobs are highly mobile and short-term in nature, and these workers are likely to primarily operate out of their usual place of residence / business location. As such,

[2] Where one FTE is equivalent to one person working full time for a period of one year.

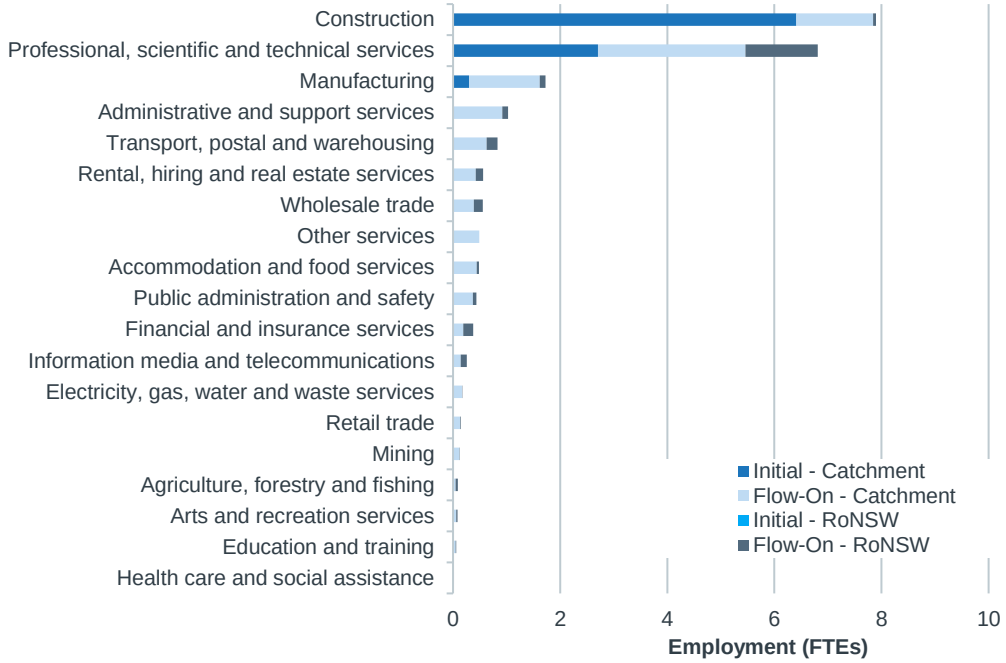
these represent jobs for people outside the Catchment. The same approach has been used in estimating NSW employment impacts for workers sourced from outside NSW.

The construction phase of the Project is estimated to support 18 FTE jobs for local residents in the Catchment in total over the course of the two-year construction phase (2021-22 to 2022-23), 8 of which will be supported directly by the Project with a further 10 FTE jobs supported through flow-on activity. This is estimated to support a total of $1.9 million in wages and salaries in the Catchment (including direct and flow-on activity).

An additional 4 FTE jobs are estimated to be supported by construction phase activity in the rest of NSW (including direct and flow on activity). These jobs will pay an additional $0.5 million in wages and salaries.

A breakdown of construction phase impacts on employment across industries in the Catchment and rest of NSW is presented in Figure 5.5. The majority of jobs during construction in the Catchment and rest of NSW are expected to be employed in the construction sector, followed by the professional, scientific, and technical services industry due to the large expenditure directly on design, procurement, and preliminaries (see Section 3.3.1.1 for detail).

Figure 5.5. Employment by Place of Work (FTEs) Supported During Construction Phase, Aggregate Impacts (2021-22 to 2022-23)



Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Goeldner CIV (unpublished), Ironstone (unpublished), AEC.

5.2.2 Operations Phase Impacts

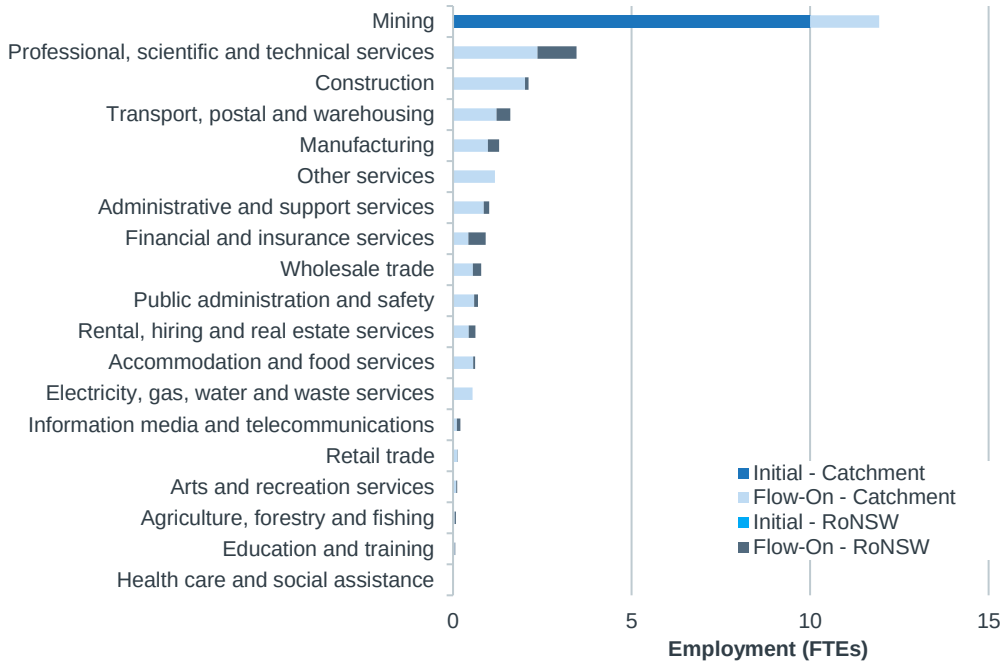
Estimates of the direct operations workforce are based on information provided by Kleinfelder (unpublished), as outlined in Section 3.3.2.4. Flow-on estimates of employment during operations were developed using assumptions of operational activity outlined in Section 3.3.2 and IO multipliers. All operations phase employment has been assumed to be sourced from within the Catchment.

The Project is estimated to support an average of 24 FTE jobs annually in the Catchment, 10 of which will be supported directly by quarrying and processing activities and 14 through flow-on activity. This is estimated to support a total of $2.0 million in wages and salaries in the Catchment (including direct and flow-on activity).

An additional 3 FTE jobs per annum are estimated to be supported in the rest of NSW during operational activity, through flow-on impacts. These jobs are estimated to support an average of $0.3 million in employee incomes each year over this period.

The mining industry will account for around 43.6% of jobs supported in NSW during peak operations, with around 12.6% in the professional, scientific, and technical services industry (Figure 5.6).

Figure 5.6. Employment (FTEs) Supported During Operations Phase, Average Annual Impacts During Operations



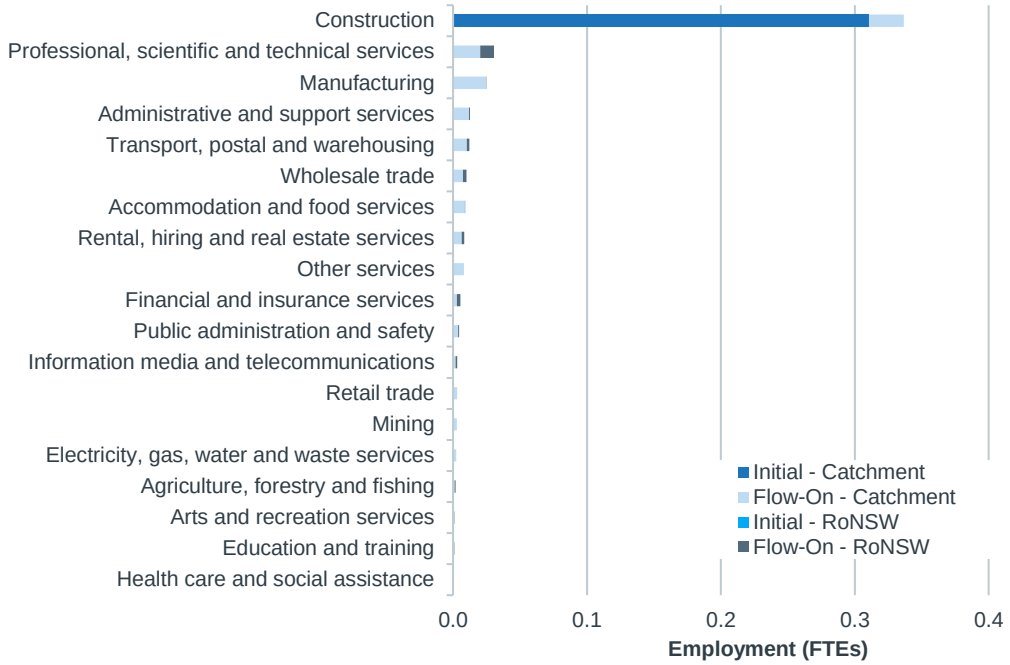
Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Ironstone (unpublished), AEC.

5.2.3 Decommissioning and Rehabilitation Phase Impacts

Decommissioning / rehabilitation activity is estimated to support 0.5 FTE jobs in the Catchment in 2051-52 (0.3 FTEs directly and the remainder through flow-on activity). These jobs will support a total of approximately $30,000 in wages and salaries during the decommissioning / rehabilitation phase. Approximately 0.02 additional FTE jobs will also be supported in the rest of NSW, paying $2,500 in wages and salaries.

Approximately 70.6% of total FTE jobs supported in NSW by decommissioning / rehabilitation phase activities will be within the construction industry (Figure 5.7).

Figure 5.7. Employment (FTEs) Supported During Decommissioning / Rehabilitation Phase



Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Ironstone (unpublished), AEC.

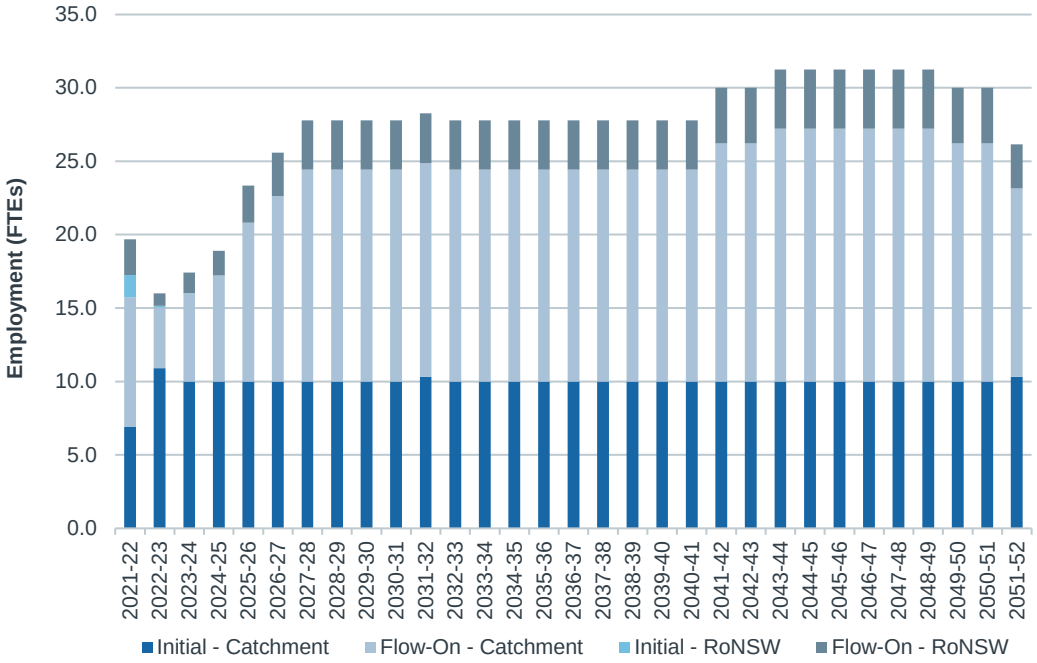
5.2.4 Annual Impacts on Employment

Annual employment impacts are presented in Figure 5.8 and follow a similar path as annual impacts on GRP / GSP outlined in Section 5.1.4, with the number of jobs supported rising to a peak of 27 FTEs in the Catchment and 31 FTEs supported in NSW between 2043-44 and 2048-49 during peak production and operations. Including direct and flow-on activity:

- Approximately 20 FTE jobs are estimated to be supported in NSW in the first year of construction (2021-22), which decreases in line with construction activity to 2022-23 before operational activity commences in 2023-24 with 17 FTEs.
- FTE jobs supported in NSW are estimated to rise from 17 in 2023-24 to 31 FTE jobs by 2043-44 and through to 2050-51.
- Employment is then estimated to fall to 26 FTE jobs in 2051-52 as production winds up and ceases and decommissioning and rehabilitation activities occur.

Approximately 87.8% of jobs supported in NSW will be within the Catchment, with the remainder in the rest of NSW.

Figure 5.8. Annual Impact on Employment (FTEs) in the Catchment and Rest of NSW



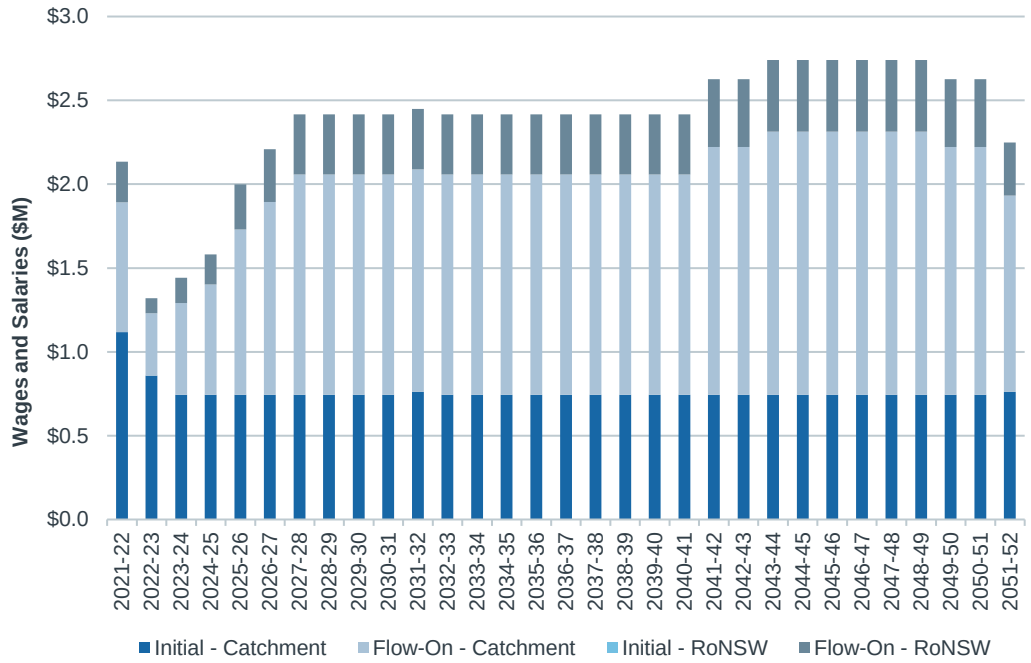
Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Goeldner CIV (unpublished), Ironstone (unpublished), AEC.

5.2.5 Impacts on Incomes

A total of $73.7 million in wages and salaries is estimated to be paid to workers in NSW either directly engaged by the Project or engaged through flow-on activity between 2021-22 and 2051-52, across the combined construction, operations, and decommissioning / rehabilitation phases. Of this, approximately 85.4% ($63.0 million) of total wages and salaries paid in NSW as a result of the Project will be for jobs in the Catchment, and 14.6% ($10.7 million) in the rest of NSW.

Annual estimates of wages and salaries paid to employees is presented in Figure 5.9, highlighting incomes paid will peak at $2.7 million in NSW between 2043-44 and 2048-49, in line with the peak year of employment.

Figure 5.9. Annual Impact on Incomes in the Catchment and NSW



Note: RoNSW = Rest of NSW.
Sources: ABS (2012; 2017a; 2020e; 2020f; 2021), DoESE (2020), Goeldner CIV (unpublished), Ironstone (unpublished), AEC.

The income estimates above include all incomes paid to quarrying and processing workers directly engaged by the Project, however, some of these incomes of non-locally sourced workers will be repatriated to their place of residence. Of the $74.7 million of total wages and salaries paid for jobs in the Catchment, of which:

- $62.7 million will be paid to local workers.
- $11.0 million to workers sourced from the rest of NSW.

5.3 IMPACTS TO BUSINESSES

5.3.1 Benefical Impacts

5.3.1.1 Benefits to Business Upstream in the Supply Chain

The Project will increase quarrying and processing activities in the Catchment and thereby support and create opportunities for suppliers in the Catchment and NSW, providing additional security and longevity of business incomes (and employment). The Project will also create opportunities to secure new contracts and increase sales to supply and service the needs of the Project through flow-on impacts in the supply chain, during all phases of the Project.

The construction phase is estimated to support business revenues for local businesses within the Catchment of approximately $5.8 million through direct construction activity. Flow-on supply chain impacts during construction are estimated to support an additional $3.3 million in business revenue in the Catchment. An additional $0.9 million in business revenues are estimated to be supported in the rest of NSW through direct and flow-on activity.

During operations, the Project is estimated to support approximately $15.7 million in business revenues per annum on average in the Catchment through direct and flow-on activity, with a further $1.3 million in revenues supported for businesses in the rest of NSW.

These business revenues in the Catchment and rest of NSW would not be supported without the Project.

5.3.1.2 Benefits to Business Downstream in the Supply Chain

DCQ is anticipated to become an important supplier of road base, crusher dust, aggregates, and rock domestically. The general resource market areas for the products of the quarry include Port Stephens, Newcastle, Maitland, Lake Macquarie and Mid-Coast.

Decorative and high Polishing Aggregate Friction Value (PAFV) products will travel further and have a wider market, including Sydney, Lithgow, Canberra, Port Macquarie and Coffs Harbour.

The Project will provide a new and alternative supply source to the market which, as outlined in Section 3.2, is projected to record strong growth in demand. The Project will thereby improve security of supply within the Catchment to meet the significant number of planned infrastructure and other projects. Without the Project, future demand for quarried materials may require supply from outside the Catchment and further afield (if the new developments are not sufficient to fully service the growth in demand), which may place increased cost pressures on input costs for these customers due to longer transport distances. To this end the Project can be seen as important for the longer-term security of supply of domestic production, while also supporting transport and logistics business for the transport of products to customers.

5.3.2 Adverse Impacts

5.3.2.1 Impacts on Business from Competition for Resources

While the Project will provide opportunities for businesses within the quarrying supply and value chain, some businesses and industries may be adversely impacted by the Project. For instance, quarrying Projects typically compete with industries such as manufacturing and construction for labour as these industries have similar skill sets, which can drive up costs for labour in these industries. The Project can also lead to increases in other costs of business as competition for goods and services drives input prices up.

The flow-on impacts of the Project presented in the economic modelling do not account for potential adverse impacts on business and industry due to the above factors. However, it is anticipated any adverse impacts of the Project on other businesses will be negligible. The Project has a relatively small construction and operational workforce in a region with a large workforce, broad skill set and spare capacity.

5.3.2.2 Impacts on Businesses from Competition for Consumers

Increased supply of materials typically impacts upon the competitiveness of businesses located within the region or within proximity of the key markets. However, as outlined in Section 3.2, demand for quarried materials is expected to grow through to 2050 while planned supply in the Catchment is not currently anticipated to expand in line with this growth in demand. Due to the forecasted growth within the construction sector, and associated anticipated increased demand for quarry products, the Project is expected to complement other similar businesses in the Catchment and assist in servicing the strengthening demand for quarried materials within the Catchment and minimise requirements for imported goods.

5.4 CONTRIBUTION TO GOVERNMENT REVENUES

5.4.1 Approach

Estimates of taxation revenue to the NSW and Australian Government have been developed based on benchmarks of taxation revenue received (using latest information available as at April 2nd 2021) compared to relevant NSW and Australian measures and applied to results from IO modelling for NSW[3]. The following benchmarks were applied by taxation item:

- Personal income tax (Australian Government): total income tax received (ABS, 2020f) compared to total wages and salaries paid to Australian employees (ABS, 2020b; ABS, 2021) between the financial years of 2009-10 and 2018-19. This was applied to estimates of incomes paid in NSW from the IO modelling.
- Fringe benefits tax (Australian Government): total fringe benefits tax received (ABS, 2020f) compared to total wages and salaries paid to Australian employees (ABS, 2020b; ABS, 2021) between the financial years of 2009-10 and 2018-19. This was applied to estimates of incomes paid in NSW from the IO modelling.
- Company income tax (Australian Government): total company tax received (ABS, 2020g) compared to total gross profit of businesses in Australia (i.e., total GDP less total wages and salaries paid to employees) (ABS, 2019a; ABS, 2020g; ABS, 2021) between the financial years of 2009-10 and 2018-19. This was applied to estimates of GDP less incomes paid in NSW from the IO modelling.
- Goods and Services Tax (GST) (Australian Government): total GST received (ABS, 2020g) compared to total Australian GDP (ABS, 2020e) between the financial years of 2009-10 and 2018-19. This was applied to estimates of GSP for NSW from the IO modelling.
- Payroll tax (NSW Government): total payroll tax received (ABS, 2020g) compared to total wages and salaries paid to NSW employees (ABS, 2020b; ABS, 2021) between the financial years of 2009-10 and 2018-19. This was applied to estimates of incomes paid in NSW from the IO modelling.

Both direct and flow-on impacts are included in the estimation of the above taxation revenues.

In addition to the above, Ironstone Development Pty Ltd will also pay the Mid-Coast and Port Stephens Councils a road levy, which is intended to assist with road maintenance and repairs on The Bucketts Way. Road levy payments were provided by Ironstone Developments and are anticipated to equal approximately $0.94 per tonne of quarried material, which equates to $11.1 million over the operational life of DCQ.

5.4.2 Tax Revenues

Details of anticipated taxation revenue from both direct and flow-on activity associated with the Project are summarised in Table 5.1. The NSW Government is expected to receive approximately $1.5 million in additional revenue, over the life of the Project. The Australian Government is estimated to receive approximately $23.8 million in various taxes. It should be noted that a portion of Australian Government revenues are likely to provide benefits to NSW, with the State allocated a portion of GST revenue as well as through the subsequent expenditure and redistribution of Australian Government revenues to provide services and infrastructure throughout Australia (including NSW). Local Governments are expected to receive $11.1 million in road levy revenue over the operational life of DCQ.

[3] Modelling results for NSW were used for Australian Government revenue impacts as modelling for Australia was not undertaken. As the Project is anticipated to primarily source goods, services and labour from NSW the vast majority of impacts are anticipated to occur within the NSW economy and as such the NSW results are considered a reasonable approximation for the national impact.

Table 5.1. Aggregate Government Revenues from the Project

Taxes	Estimated Impact ($M)
Local Government Revenues	
Levies	$11.1
Total	**$11.1**
NSW Government Revenues	
Payroll Tax	$1.5
Total	**$1.5**
Australian Government Revenues	
Personal Income Tax	$10.8
Fringe Benefits Tax	$0.3
Company Tax	$7.8
GST	$5.0
Total	**$23.8**

Note: Totals may not sum due to rounding.
Source: ABS (2019e), ABS (2020f), ABS (2020g), ABS (2020g), Goeldner CIV (unpublished), Ironstone (unpublished), AEC.

5.5 IMPACT OF CONTRIBUTION OF LAND OFFSET

As per Section 3.5, Ironstone Developments have provided a potential worst case scenario for offsetting biodiversity impacts through the payment into the Biodiversity Conservation Trust Fund. Using the funds invested in the trust, employees will carry out biodiversity conservation activities. This may result in minor increases in revenue and incomes for those undertaking conservation activities over the relevant period.

5.6 DEMAND FOR LOCAL INFRASTRUCTURE AND SERVICES

Aside from the infrastructure developed as part of the Project, the Project is not anticipated to require additional local infrastructure and services to be provided to support the Project and its workforce. The Project will deliver new operational activity and workforce opportunities in the Catchment, with labour primarily sourced from within the Catchment. There will, therefore, likely be a minimal impact on local infrastructure and services due to no net increase in demand from workers and production activity.

The *Traffic Impact Assessment* (2021) identified there will be no major failures or areas of deterioration to the road pavements due to increased traffic from the Project site, except where minor shoulder drainage is (already) causing problems. Therefore, there is not anticipated to be any significant impact upon road maintenance (i.e., road maintenance expenditure) as a result of the development, and the road levy paid to Council provides capital to cover the costs of any required maintenance works.

5.7 IMPACT ON LOCAL PROPERTY MARKET

As outlined in Section 3.4, all operational labour is anticipated to be sourced from within the Catchment. As such, there is not anticipated to be a tangible impact on the local property market with operational workers already residing in the region.

The construction workforce, however, will result in a small increase in demand for temporary accommodation compared to existing levels during 2021-22 and 2022-23. Whilst the Project will primarily be supported by a workforce from within the Catchment, non-local workers will be utilised where more specialised skillsets are required that the local workforce does not provide (i.e., professional, scientific, and technical services and manufacturing). The sources of labour have been outlined as per Section 5. High vacancy levels are typically apparent in the Catchment (based on 2016 estimates), with unoccupied dwellings representing 11.1% of total housing stock. Whilst demand for rental stock has remained relatively stable since 2017 (see Appendix A), it is anticipated there will be sufficient accommodation available for these additional temporary workers.

Overall, the Project is not anticipated to have a material impact on the local property market. In consideration of the existing high vacancy levels, the short-term increase in demand during construction may be considered to

provide a small positive impact on demand and prices, though any impact is unlikely to be noticeable against background market conditions.

5.8 IMPACTS ON TRADE BALANCE AND EXCHANGE RATES

Whilst the Project is not anticipated to result in a net change in exporting activity (as the market is domestically based), there is anticipated to be a lift in imports to support the Project (relative to what would otherwise occur without the Project).

On average, the Project is estimated to support approximately $1.0 million in additional imports to Australia per annum. While the Project is anticipated to result in a small increase in net imports for Australia, the value of imports generated by the Project is relatively small in consideration of existing annual imports for Australia ($298.67 billion in in imports in 2019-20) (DFAT, 2020).

While the Project will support economic growth and the value of the Australian dollar, in the context of Australia's trade balance the impact of increased imports on factors such as exchange rates and the value of the Australian dollar is anticipated to be negligible.

6. CUMULATIVE IMPACT ASSESSMENT

This Section provides an assessment of the cumulative economic impacts arising from the proposed quarry operating in combination with other established quarries and expected future quarry operations in the Catchment, as well as other potential major projects.

6.1 CUMULATIVE IMPACT ASSESSMENT FRAMEWORK

The cumulative impact assessment examines the potential cumulative impact of a number of existing quarries as well as anticipated future quarry operations (including the DCQ Project) occurring concurrently in the Catchment, and other major projects.

The cumulative impact assessment is based on the potential for cumulative development to exacerbate the impacts of the DCQ Project (as outlined in Section 5) and to what degree. The impact assessment does not assess the aggregate impacts of all developments in combination, but rather the relative implications of developing the Project should other projects also be undertaken concurrently.

As outlined in Table A. 11 in the Major Projects Section of Appendix A, the majority of proposed quarry projects for the region are extensions that will replace or augment activities from existing operations that are nearing completion. Where this occurs, these projects will effectively result in a continuation (and slight increase) of jobs and economic activity rather than a significant lift in activity (outside of short-term construction impacts). Only the short-term construction impacts of these existing operational projects have been included in the cumulative impact assessment; operations of these existing operational projects are inherently incorporated in the analysis as they form part of the existing economic conditions in the regional catchment for which the assessment of impacts in Section 5 was undertaken.

In addition to this, there are several proposed new quarries which are either in the assessment or EIS phase (including Hillview, Eagleton, Stone Ridge, Karuah South, and Bob's Farm Sandpit. If DCQ and these other proposed quarries were to commence construction at a similar point in time (and, therefore, operate concurrently), this will result in an increase in jobs and economic activity, demand for infrastructure and services, and demand for supplies. The degree to which these impacts are expected to be felt is investigated in the below section.

Summary details of the projects considered are provided in Table A. 11 in the Major Projects Section of Appendix A.

6.2 POTENTIAL CUMULATIVE IMPACTS

The combination of the continued and/ or augmented operations of existing quarries (incl. any additional construction activity in the short term) and construction and operations of the proposed new quarries outlined in Appendix A is unlikely to have any significant negative implications regarding the impacts of DCQ upon the Catchment's economy, beyond that outlined in Section 5.

Where these projects go ahead concurrently to DCQ, there may be:

- Increases in output, GRP, employment, and household income estimates in the Catchment over the relevant period.
- Short-term increases in demand for property during construction which may be considered to provide a small positive impact on demand and prices. This impact is anticipated to be normalised across the catchment, and not result in significant strain.
- Increased demand for some suppliers, trades, and services, resulting in temporary short-term delays in accessing trades or increased use of suppliers, trades, and services from outside the catchment.
- Provision of increased accessibility to competitively priced and accessible quarried materials in the region.

7. MITIGATION AND ENHANCEMENT STRATEGIES

Assessment of the economic impacts of the Project in Section 5 and Section 7 identified the Project is not anticipated to generate any adverse economic issues, risks or impacts of significance. Economic impacts of the Project are anticipated to be overwhelmingly positive, with minimal adverse economic impacts.

While the potential adverse economic impacts from the Project are minimal, there are some potential areas that should be monitored and strategies employed to ensure benefits of the Project to the Catchment and NSW are maximised and any potential adverse impacts minimised:

- To maximise local benefits derived from the Project, the proponent and contractors engaged by the proponent will be encouraged to source labour locally where possible and practical and provide training opportunities where practical.
- To maximise local benefits derived from the Project, the proponent and contractors engaged by the proponent will provide sufficient opportunities and access to information for local businesses to understand the Project's supply contract arrangements and requirements, and improve their ability to secure supply contracts.

It should be recognised that these strategies form part of IDPL's Project planning, and modelling of impacts in this report has been based on these strategies being implemented.

8. COST BENEFIT ANALYSIS

8.1 METHOD AND APPROACH

The following CBA to assess the net impact of the Project has been conducted at the state (NSW) level. The analysis examines the impacts resulting from the Project compared to the base case (or 'without project' scenario) to present a net stream of benefits and costs, to understand the public benefit of the Project to the NSW community.

The methodology used in conducting the CBA is outlined in Appendix C. Other key considerations for the CBA include:

- Modelling for the majority of impacts has been undertaken starting from the financial year ending June 2022, with impacts examined to the financial year ending June 2072. While the vast majority of project impacts will occur between the financial year ending June 2022 and the financial year ending June 2052, aligning with the anticipated construction, operations and decommissioning / rehabilitation periods for the Project, potential costs and activities associated with administering the BCT will extend beyond the life of the Project and thereby the CBA has been examined over 51 years (i.e. construction plus 30 years of operation, plus 20 years of administering biodiversity management activities (with last payment to the Biodiversity Conservation Trust (BCT) in 2052-53).
- A base discount rate of 7% has been used for demonstration purposes (in line with many State and national standards for real discount rates used in economic appraisal of projects), with additional discount rates also examined (4% and 10%). As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e., it is a real discount rate, as opposed to a nominal discount rate).
- All values are expressed in 2021 Australian dollars.

Decision Criteria:

The Net Present Value (NPV) and Benefit Cost Ratio (BCR) will be the primary decision criteria for the economic appraisal. The NPV of a project expresses the difference between the present value (PV) of future benefits and PV of future costs, i.e.: NPV = PV Benefits – PV Costs. The BCR provides the ratio between the PV of benefits and PV of costs, i.e., BCR = PV Benefits / PV Costs.

Where the economic appraisal results in a:

- Positive NPV and BCR above 1: the project will be deemed as being desirable.
- NPV equal to zero and BCR of 1: the project will be deemed neutral (i.e., neither desirable nor undesirable).
- Negative NPV and BCR below 1: the project will be deemed undesirable.

The Internal Rate of Return (IRR), which indicates the discount rate which would return an NPV of $0 and a BCR of 1, is also reported.

8.2 DEFINITION OF WITH PROJECT AND BASE CASE SCENARIOS

The CBA examines the net or incremental impacts (benefits and costs) of a project compared to a 'base case' scenario of what would be expected to occur without the project.

- The 'with Project' scenario is as per the Project description in Section 3.3.
- The 'base case' scenario assumes the Project is not developed. By not proceeding with the Project, the NSW economy would thereby **not** receive the activity outlined in Section 3.3, which details the project scenario. While it is still expected the other major infrastructure projects (as outlined in the 'Major Projects' Section of Appendix A) would proceed, without the development of DCQ it may reasonably be expected that unless additional quarries of significant size are developed elsewhere in the Catchment, the supply of materials may need to be sourced from further afield at potentially a greater cost. It can, therefore, be expected that the base case scenario would result in higher costs of materials for major projects in the region. Whilst an important

consideration, this impact has not been modelled in the following sections due to data limitations for quantifying potential price impacts (and thereby the benefits of the Project may be considered conservative).

8.3 COSTS AND BENEFITS EXAMINED

8.3.1 Costs

8.3.1.1 Construction Costs

Construction expenditure for developing the Project is estimated to cost of total of $5.84 million. A summary of construction expenditure by year is provided in Section 3.3.1.1. As per Section 3.3.1.1, the second-hand purchases of machinery, totalling approximately $1.8 million, have not been included in the CBA modelling as it is likely purchased from another quarry in New South Wales. This purchase would represent a transfer payment, with the cost to DCQ reflecting an associated revenue stream for another party, and hence there is no net cost for the State.

8.3.1.2 Operating Costs

Details of annual operating costs are outlined in Section 3.3.2.3. These costs include operating expenses related to extraction of the resource, crushing/ processing, transport, etc. Royalty and tax payments have been excluded from the operating costs as these represent a transfer payment.

8.3.1.3 Decommissioning and Rehabilitation Costs

Details of decommissioning and rehabilitation costs are outlined in Section 3.3.3. The costs for decommissioning and rehabilitation are estimated at approximately $0.8 million as operations cease in 2051-52.

8.3.1.4 Biodiversity Offset Payments

Construction and operations within the proposed quarry site are expected to lead to some degree of biodiversity loss.

As outlined in section 3.5, Ironstone Developments are currently investigating approaches for managing biodiversity impacts of the Project. For the purposes of this assessment, it is assumed biodiversity offsets will be used as a mechanism to assist in achieving the aim of development and biodiversity conservation. The payments to the Biodiversity Conservation Trust for biodiversity conservation activities have been outlined in Section 3.5. This has been modelled from commencement of construction in 2021-22 to the final payment in 2052-53.

8.3.1.5 Costs of Increased Travel

The Project will generate transport movements for the movement of labour to the DCQ as well as transport of associated general freight, movement of fuel and supplies, as well as transport of quarried products. For modelling in the CBA, only the labour movements and deliveries of freight to the site have been included; transport of quarried materials has been excluded on the following basis.

As outlined in the base case scenario section 8.2, where the Project does not proceed, it is still expected the other major infrastructure projects (as outlined in the 'Major Projects' Section of Appendix A) would proceed, as well as numerous road infrastructure projects to support population and business growth, with many of these requiring quarried materials during development. That is, overall demand for quarried material is not assumed to differ between scenarios; rather it is anticipated the Project will deliver a shift in where demand for quarried materials is sourced from. As such, on a net basis, the Project is not anticipated to result in a material increase in the number of heavy vehicle movements, just where those movements originate from.

Given projected growth in demand, without the development of DCQ it may reasonably be expected that unless additional quarries of significant size are developed elsewhere in the Catchment, the supply of materials may need to be sourced from further afield, resulting in potentially increased overall vehicle kilometres being travelled without the Project (and thereby the Project would deliver a benefit through reduced transport requirements). However, to be conservative it has been assumed there is no material change in overall heavy vehicle movements or kilometres travelled between scenarios.

Based on the above:

- Additional vehicle movements for employees and inward deliveries have been included and modelled as a net cost.
- Haulage vehicle movements have been excluded from modelling as it has been assumed there will be no material change in vehicle movements associated with haulage activities on the basis that it is uncertain whether an alternative source of supply for quarried materials in the base case would come from elsewhere in NSW, or result in a tangible increase in labour/ delivery requirements at other quarries.

The net additional employee and inward delivery movements will result in increased vehicle fuel and maintenance costs as well as increase the risk of accidents due to increased travel. As discussed in Section 5.5, there will be no major failures or areas of deterioration to the road pavements due to increased traffic from the Project site, except where minor shoulder drainage is (already) causing problems. As such this impact has not been quantified.

The Traffic Impact Assessment (Intersect Traffic, 2021) outlines:

- The quarry is expected to operate for 49 weeks of the year, for 5.5 days per week.
- It is anticipated that 10 staff would be employed for the operation of the quarry (see Section 3.3.2.4) with approximately 6 inward deliveries/ visitors per day.

Further to the above assumptions, construction and decommissioning employees were assumed in line with that presented in Section 5.2.4.

The Traffic Impact Assessment examines the net increase in traffic from existing levels to understand the traffic impact at peak traffic movements. For the CBA, an estimate of the additional traffic and vehicle kilometres travelled has been developed in order to quantify and value the overall vehicle fuel and maintenance costs and cost of crashes due to increased travel each year.

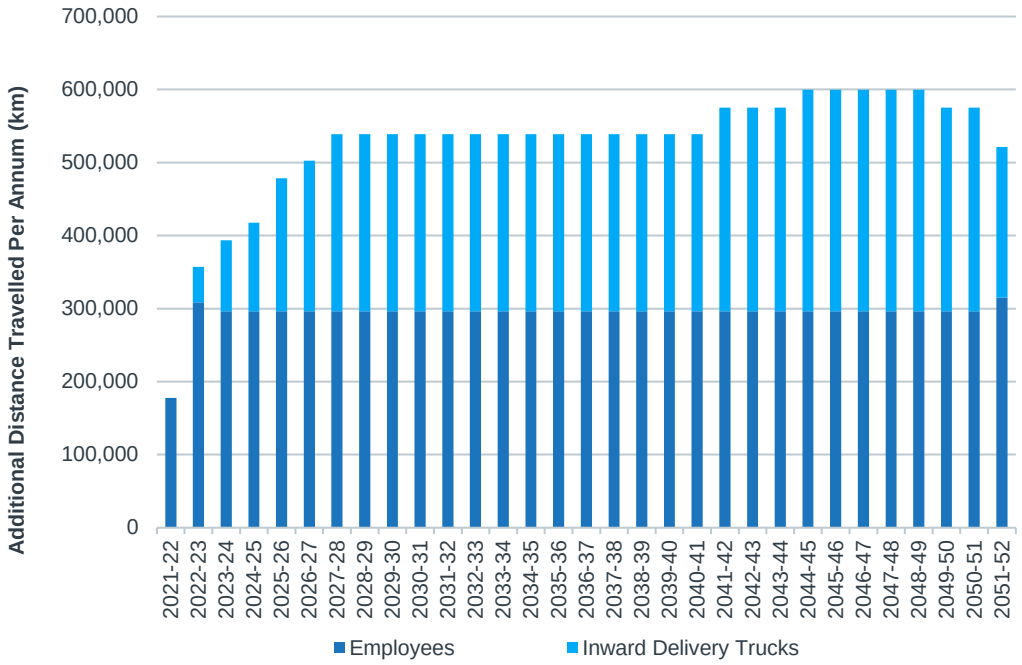
Based on the assumptions above, vehicle movements estimated included an average of approximately 5,340 vehicle movements by employees per annum and approximately 3,240 vehicle movements by inward delivery trucks.

In estimating the additional distance travelled due to the additional vehicle movements, it was assumed:

- Employees travel an average of 55 kilometres per vehicle movement. This reflects the distance from the site to Newcastle, the main city within the Catchment. It is possible this is a conservatively high assumption on daily commute for workers, and that employees may choose to live closer to the quarry site.
- Inward deliveries travel an average of 75 kilometres per vehicle movement. It is likely that, as the main city and primary service area within the Catchment with one of Australia's largest ports, the majority of inward deliveries may be transported from Newcastle (approximately 55km from the quarry site). However, to be conservative, a longer average distance of 75km has been assumed.
- In 2021-22, only the employee traffic has been modelled, as the Traffic Impact Assessment (Intersect Traffic, 2021) indicated that the traffic generated by construction would mainly involve employee/ contractor traffic, as the plant equipment (e.g., excavator, roller, grader, trip trucks, etc.) is anticipated to remain onsite during construction and, therefore, movement of these vehicles will be minimal.
- During operational years, a ramp up period has been included for the average daily movements of inward delivery trucks. This has been assumed to increase in line with quarried material per annum (outlined in 3.3.2.1), on average, this equates to 6 inward delivery vehicles outlined in the Traffic Impact Assessment corresponding with quarry production between 2027-28 and 2040-41. Estimates of daily traffic in other years was scaled linearly with the difference in production from this period.

Based on this, the total distance travelled was estimated at approximately 524,827 kilometres per annum on average, shown in the figure below.

Figure 8.1. Additional Distance Travelled Per Annum (km)



Source: Intersect Traffic (2021), Ironstone (unpublished).

The cost of increased travel due to the Project has been measured through:

- Additional fuel and vehicle maintenance costs.
- Road safety costs due to increased travel.

These costs are examined below.

Fuel and Maintenance Costs

Estimated fuel costs for road traffic were based on an average price in near DCQ for unleaded fuel of 138.00 cents per litre (c/L) and of diesel of approximately 132.00 cents per litre (c/L) (PetrolSpy, 2021). This price reflects the average cost for diesel as of 13th May 2021. GST of 10% and fuel excise rate of 42.70 c/L (ATO, 2020) were subtracted from these prices to provide the resource cost for diesel and unleaded petrol. Average kilometres travelled per litre of diesel were estimated at 0.11 litres per kilometre for light vehicles and 0.29 litres per kilometre for rigid trucks (ABS, 2020b).

Additional maintenance costs for road vehicles were estimated based on data from ATAP (2016) and accounting for inflation (ABS, 2021a) at:

- Employee travel: 6.48 cents per kilometre (c/km) for average cars.
- Inward delivery travel: 13.48 cents per kilometre (c/km) for rigid trucks (medium).

These rates were applied to the travel distances as estimated above.

Safety Cost

The increase in travel may be expected to provide an increased risk of road crashes. The Traffic Impact Assessment (Intersect Traffic, 2021) outlines that The Bucketts Way is a two lane two-way sealed road with approximately 3.2 metre travel lanes and varying sealed shoulders from 0.5 to 1 metre wide. While the routes travelled will incorporate more than The Bucketts Way, this road has been used as an indicator of the type of road that vehicles will primarily travel along. Data from ATAP (2016) provides average crash rates on non-urban roads per 100 million vehicle kilometres travelled for a range of road types and widths.

Based on The Bucketts Way, the following average estimated crash rates per 100 million vehicle kilometres travelled were used:

- 1.13 crashes resulting in a fatality.
- 21.38 crashes resulting in serious injury.
- 35.50 crashes resulting in minor injuries/ property damage.

The following values per crash type were used, based on value estimates from ATAP (2016) inflated to 2021-dollar terms (ABS, 2021a):

- Fatal crashes (including medical costs, insurance, workplace production losses, legal costs, vehicle and property repair costs, and other costs such as travel delays and emergency service provision): approximately $2.73 million per crash.
- Serious injury crashes: approximately $611,600 per crash.
- Minor injury / property damage crashes: approximately $10,600 per crash.

These crash rates and values per crash were applied to the travel distances as estimated above.

8.3.2 Benefits

8.3.2.1 Revenue From Operations

Assumptions used for estimating revenues supported by the Project are summarised in Sections 3.3.2.1 and 3.3.2.2.

8.3.2.2 Benefits to Labour

While expenditure on employees represents a cost (and is included in the operating costs in Section 3.3.2.3), employment also represents a social benefit to those employed through a number of avenues, including the provision of incomes (and thereby providing higher standards of living), a sense of identity, self-worth, and satisfaction. Employment has also been linked with a number of positive mental and physical health benefits.

Labour benefits are often excluded from CBA. The primary reason for this exclusion is due to the use of "shadow wages"[4] in estimating operating costs, or the use of a highly conservative assumption that the labour would otherwise be employed elsewhere with minimal difference in compensation. However, for simplicity and consistency with the LEA, this CBA has used a market wage in estimating operating costs and an assumption that labour would otherwise be employed elsewhere with minimal difference in compensation is considered inappropriate where labour would not otherwise be gainfully employed.

The impacts of COVID-19 are having a significant short-term impact on the national and NSW labour market, and research in both Australia and overseas suggests the economic ramifications of COVID-19 may be felt for decades. The Project will deliver an important continuation of employment opportunities for at DCQ. It is, therefore, considered appropriate to consider the employment supported by the Project as a benefit to those employed.

Employment can be valued in terms of the wages and salaries labour receives less income tax and the opportunity cost to these individuals for their time. The opportunity cost is often valued based on the alternative income they would receive without the Project, either through alternative employment or through social security payments. For the purposes of this assessment it has been assumed that 25% of the wages and salaries paid to operations staff represents a net benefit to these individuals compared to the base case. Estimated labour and labour compensation has been assumed as modelled in the LEA (see Section 5.2).

[4] The shadow wage refers to the opportunity cost of labour. Where a shadow wage (rather than market wage) is used in estimating operating costs, the labour benefit is inherently captured in the CBA and should not be measured separately.

8.3.3 Impacts That Have Not Been Quantified

8.3.3.1 Ecological Impact

The Biodiversity Development Assessment Report (2020) identified the study area has four vegetation zones forming a total area of 29.02 hectares – this represents the total impacted area of the development. This area is comprised of native vegetation in addition to a Tetratheca Juncea Habitat, Koala Habitat and a Southern Myotis Habitat. The total impacted land area of 29.02 hectares, has the potential to be impacted through:

- Clearing of native vegetation.
- Removal of hollow bearing trees/ habitat trees, resulting in fauna injury and mortality.
- Impacts to surface and groundwater quality and quantity due to sediment run-off and/or contaminant runoff into adjacent watercourses (see Section 8.3.3.7).
- Vehicle collision with fauna.
- Transfer of weeds and pathogens to and from site.
- Noise, vibration, waste, and air pollution impacts to adjacent sensitive habitat area.

Whilst the Biodiversity Development Assessment Report (2020) revealed there are not anticipated to be serious and irreversible impacts within the development site, approximately 29.02 hectares of land has the potential to be impacted under a worst-case scenario.

The payments into the BCT, as discussed in Section 3.5, will compensate for the full biodiversity values lost to the quarry site at another location (an offset site[5]) to achieve a standard of 'no net loss' of biodiversity (i.e., no net ecological impact). The primary purpose of this is to facilitate development in an environmentally sustainable manner, and to ensure the development does not have unacceptable impacts on native ecosystems and species. As such, for modelling purposes it has been assumed that the premise of the BCT is to result in 'no net loss' of biodiversity, so overall there is, at a minimum, no net change in ecosystem value due to payment into the BCT, and that losses in ecological/ biodiversity value on-site are fully offset.

8.3.3.2 Lower Cost of Supply of Quarried Materials

The development of DCQ will contribute to increased supply of materials for the Catchment and broader New South Wales region. This increased availability of supply, coupled with the reduced requirements for imported quarried materials due to local availability, will likely result in lower costs of products for businesses and infrastructure projects. However, as outlined in section 8.2, this was not included in the modelling due to data limitations.

8.3.3.3 Revenues/ Incomes from BCT Management Activities

As discussed in previous sections, managers of the BCT will carry out biodiversity conservation activities to offset the loss to the ecosystem impacted by DCQ in an equivalent area as that disturbed by DCQ. These activities will result in the generation of revenues for the businesses engaged, as well as incomes for the employees. Whilst the costs of carrying out these activities also need to be considered, it is reasonable to expect some level of net benefits in terms of revenues and incomes as a result, in addition to that discussed in Section 8.3.

8.3.3.4 Impact on Amenity

Amenity impacts to the public from quarry construction and operational activities have the potential to arise in the form of visual amenity impacts and noise/ dust amenity impacts. The Visual Impact Assessment (2021) report identified the visual impacts for the project are limited, as the proposed quarry itself is not visible from any residences and is shielded by ridge lines and bushland that surround it. The bushland will remain in place and, therefore, the only impacts posed will be the private access road as it approaches and connects to The Bucketts

[5] An offset site is a location where native vegetation condition and threatened species habitat are protected in perpetuity and can be improved by management actions such as fencing, weed control, pest control and planting native species.

Way and views from one resident using Deep Creek Road to access their property. As such, due to the low traffic volumes on The Bucketts Way and the limited view of the quarry site, the impact on visual amenity is anticipated to be negligible and has not been quantified. Furthermore, due to the distance between residential areas and the project location, the impacts of noise and dust on the public are anticipated to be minor, and hence this impact has not been quantified.

8.3.3.5 Air Quality

The Air Quality Impact Assessment (2021) identified that the quarry will comply with the applicable assessment criteria and, therefore, would not lead to any unacceptable level of environmental harm or impact in the surrounding area. Despite this, the site will still apply appropriate dust management measures to ensure it minimises the potential air emissions from the site. As such, the air quality impact has not been quantified as it is anticipated to be negligible.

8.3.3.6 Cultural and Archaeological

The Aboriginal Cultural Heritage Assessment Report (2021) did not identify any specific cultural values associated with the study area, and located four isolated finds of low archaeological significance. As such, the cultural and archaeological impact has not been quantified as it is anticipated to be negligible, or intangible.

8.3.3.7 Ground Water and Surface Water

The Groundwater Assessment (2021) of DCQ revealed the construction and operations of the quarry have the potential to:

- Change groundwater levels within the quarry area and immediate area (i.e., likely less than 40m but no more than several hundred metres).
- Will change base flow conditions on groundwater dependent ecosystems, but not significantly.
- Have no significant risk of acid mine drainage or iron contamination.
- Negligible potential to change physical and chemical conditions of the water source, assuming suitable water management systems are in place.
- Will not cause impacts on other groundwater users.
- Will not impact on any groundwater related cultural sites.

It was determined that the risk of the above impacts occurring is low, largely due to the quarry intercepting only a small amount of the regional groundwater, discharge to the Deep Creek being minor, any groundwater seepage being captured in the quarry which will evaporate or be stored for onsite activities, and having no known cultural areas of risk within the site boundary.

The Surface Water Impact Assessment (2021) identified the following potential impacts to the site area as a result of quarrying construction and operations:

- Will have a minimal impact on flow regimes, as operations are unlikely to intercept significant groundwater resources and the potential for impacts to streamflow regimes in Deep Creek are considered small.
- Will have a minimal impact on water quality in downstream watercourses, due to water management system activities.
- Will not have a significant impact on the geomorphological, hydrological, riparian, and ecological values.
- Will have minor impacts on the annual flow volumes in Deep Creek, however, there are no known licensed water users on Deep Creek.

The assessment did not identify any material impacts to the above. As such, both groundwater and surface water impacts are anticipated to be negligible and have not been quantified.

8.4 CBA RESULTS

Table 8.1 below outlines the PV of the identified costs and benefits associated with the Project, between the financial year ended June 2022 and financial year ended June 2072, at discount rates of 4%, 7% and 10%.

The CBA modelling for the Project at the discount rate of 7% is economically desirable, with the following results:

- NPV of $22.7 million over the assessment period with total PV benefits of approximately $110.3 million compared to an aggregated PV costs of approximately $87.6 million.
- A BCR of 1.26, highlighting that the Project is estimated to return $1.26 for every dollar cost.

The CBA identifies that at a 7% discount rate the Project is economically desirable with the benefits outweighing the costs. The Project returns a desirable result across each of the discount rates examined, with the BCR ranging between 1.22 (10% discount rate) and 1.29 (4% discount rate). The CBA is insensitive to the discount rate used with minimal change in BCR across discount rates examined. The Project has an IRR of 25.6%.

Table 8.1. Summary CBA Results of Project Impacts to NSW

Impact	Total Value ($M)	PV ($M) – 4% Discount Rate	PV ($M) – 7% Discount Rate	PV ($M) – 10% Discount Rate
Costs				
Capital Spend	$5.8	$5.6	$5.4	$5.3
Operational Spend	$226.3	$117.6	$77.8	$54.5
Decommissioning and Rehabilitation	$0.1	$0.0	$0.0	$0.0
Biodiversity Offset Cost	$3.5	$2.8	$2.5	$2.3
Fuel & Maintenance Costs	$2.4	$1.3	$0.9	$0.6
Safety Cost	$2.8	$1.5	$1.0	$0.7
Total Costs	***$240.9***	***$128.8***	***$87.6***	***$63.4***
Revenue From Operations	$314.6	$163.5	$108.2	$75.7
Employee Benefits	$5.6	$3.1	$2.2	$1.6
Total Benefits	***$320.2***	***$166.6***	***$110.3***	***$77.3***
Summary				
Net Present Value (NPV)	**-**	**$37.8**	**$22.7**	**$14.0**
Benefit Cost Ratio (BCR)	**-**	**1.29**	**1.26**	**1.22**

Source: AEC.

8.5 SENSITIVITY ANALYSIS

The sensitivity analysis has been undertaken using a Monte Carlo analysis (refer to Appendix C) across the key assumptions used in the CBA modelling (the base assumptions used are outlined in Section 8.3).

Each of the assumptions has been tested in isolation with all other inputs held constant, with the results reported in Table 8.2 in terms of the modelled change in NPV resulting from the variance in the base assumptions at a discount rate of 7%. The final row of the table examines each assumption simultaneously to provide a “combined” or overall sensitivity of the model findings to the assumptions used. The table also outlines the distribution used allowing for a 10% confidence interval, with the “5%” and “95%” representing a 90% probability that the distribution and NPV will be within the range outlined in the table.

The table shows that, at a discount rate of 7%, there is a 90% probability the Project will provide an NPV between $0.4 million and $44.3 million. The NPV is highly sensitive to the net operating result (i.e., difference between revenue from operations and operational spend in the table below); the larger the net operating result the larger

the NPV. Sensitivity testing returned a positive NPV across 98.3% of the 5,000 iterations run in Monte Carlo analysis.

Table 8.2. Sensitivity Analysis Summary, Discount Rate 7%

Variable	NPV ($M)	
	5%	95%
Costs		
Capital Spend	$21.8	$23.4
Operational Spend	$9.9	$35.5
Decommissioning and Rehabilitation	$22.7	$22.7
Biodiversity Offset Cost	$22.4	$23.0
Fuel & Maintenance Costs	$22.4	$23.0
Safety Cost	$21.9	$23.5
Benefits		
Revenue From Operations	$4.9	$40.5
Employee Benefits	$22.4	$23.1
Combined	**$0.4**	**$44.3**

Notes: The percent distributions used for each variable are provided below:
- Capital Spend: maximum 30% higher, minimum 20% lower.
- Operating Spend: normally distributed with standard deviation of 0.1.
- Decommissioning and Rehabilitation Spend: normally distributed with standard deviation of 0.1.
- Biodiversity Offset Cost: maximum 20% higher, minimum 20% lower.
- Fuel & Maintenance Costs: normally distributed with standard deviation of 0.2.
- Safety Cost: normally distributed with standard deviation of 0.2.
- Revenue from Operations: normally distributed with standard deviation of 0.1.
- Employee Benefits: normally distributed with standard deviation of 0.1.

Source: AEC.

REFERENCES

ABS (2012). *Census of Population and Housing 2011 – Employment by Place of Work*. Cat. No. 2068.0. Australian Bureau of Statistics, Canberra.

ABS (2017a). *Census of Population and Housing, 2016.* Cat no. 2071.0. Australian Bureau of Statistics, Canberra

ABS (2020a). *Regional Population Growth, Australia, 2019.* Cat no. 3218.0. Australian Bureau of Statistics, Canberra.

ABS (2020b). *Average Weekly Earnings, Australia*. Cat. No. 6302.0, Australian Bureau of Statistics, Canberra.

ABS (2020c). *Building Approvals, Australia, April 2020. Cat no. 8731.0.* Australian Bureau of Statistics, Canberra

ABS (2020d). *Australian Statistical Geography Standard (ASGS): Volume 3 - Non ABS Structures, June 2020.* Cat no. 1270.0.55.003. Australian Bureau of Statistics, Canberra.

ABS (2020e). *Australian National Accounts: Input-Output Tables – Electronic Publication, 2017-18 tables*. Cat. No. 5209.0.55.001, Australian Bureau of Statistics, Canberra.

ABS (2020f). *Labour Force, Australia, Detailed, Quarterly*. Cat. No. 6291.0.55.003, Australian Bureau of Statistics, Canberra.

ABS (2020g). *Taxation Revenue, Australia, 2018-19.* Cat. No. 5506.0, Australian Bureau of Statistics, Canberra.

ABS (2021a). *Consumer Price Index, Australia*. Cat. No. 6401.0, Australian Bureau of Statistics, Canberra.

ABS (2021b). *Survey of Motor Vehicle Use, Australia*. Cat. No. 9208.0, Australian Bureau of Statistics, Canberra.

AEC (unpublished[a]). *Gross Regional Product Model 2018-19.* AEC Group, Brisbane

AEC (unpublished[b]). *Employment Estimates Model 2018-19.* AEC Group, Brisbane

AGL (2021). *Newcastle Power Station Project.* Available from: https://www.agl.com.au/about-agl/how-we-source-energy/newcastle-power-project. Accessed: 11 May 2021.

ATAP (2016). *Australian Transport Assessment and Planning Guidelines - PV2 Road Parameter Values.* Published by Australian Transport Assessment and Planning Guidelines Steering Committee, Transport and Infrastructure Council, Australian Government, Canberra.

ATO (2020). *Excise and Excise Equivalent Goods.* Available from: https://www.ato.gov.au/business/excise-and-excise-equivalent-goods/fuel-excise/excise-rates-for-fuel/. Accessed: 13 May 2021.

BCT (2021). *Biodiversity Offsets Program.* Available from: https://www.bct.nsw.gov.au/biodiversity-offsets-program. Accessed: 5 March 2021.

Bio Regional Assessments (2018). *Duralie Coal Extension Plan.* Available from: https://www.bioregionalassessments.gov.au/assessments/12-resource-assessment-gloucester-subregion/12312-duralie-coal-extension-plan. Accessed: 10 May 2021.

CCAA (2021). *Quarry Overview.* Available from: https://www.ccaa.com.au/iMIS_Prod/CCAA/Industry/Quarry/CCAA/Public_Content/Quarries/Quarry_Overview.aspx?hkey=3e03adf1-686b-4a2c-bdf2-ac6e74ac3220. Accessed: 5 March 2021.

Constanza et al (2014). *Changes in the global value of ecosystem services.* Available from: https://doi.org/10.1016/j.gloenvcha.2014.04.002. Accessed: 14 May 2021.

Daily Liberal (2020). *Glencore will keep selling coal but Liddell and Integra mines facing closure.* Available from: https://www.dailyliberal.com.au/story/7047784/mines-to-close-as-glencore-unveils-climate-change-transition-policy/. Accessed: 10 May 2021.

Department of Planning Industry and Environment (2021). *Major Projects.* Available from: https://www.planningportal.nsw.gov.au/major-projects/project/10801. Accessed: 2 February 2021.

DFAT (2020). *Trade Statistical Pivot Tables.* Available from: https://www.dfat.gov.au/about-us/publications/trade-statistical-pivot-tables. Accessed:14 May 2021.

DoESE (2020). *Small Area Labour Markets Publication - December Quarter 2019.* Department of Education, Skills and Employment, Canberra.

Donaldson Coal (2021). *Tasman Extension.* Available from: https://www.doncoal.com.au/page/about/tasman/. Accessed: 10 May 2021.

DPIE (2019). *2019 NSW Population Projections.* Department of Planning, Industry and Environment, Sydney.

Energy Water Management (2021). *Ironstone Developments Pty Ltd Deep Creek Quarry Surface Water Impact Assessment.* Newcastle, New South Wales.

FACS (2020). *Rent and Sales Report – Interactive Dashboard.* Family and Community Services. Available from: https://www.facs.nsw.gov.au/resources/statistics/rent-and-sales/dashboard. Accessed: 21 September 2020.

Glencore (2021). *Integra Underground.* Available from: https://www.glencore.com.au/operations-and-projects/coal/current-operations/integra-underground. Accessed: 10 May 2021.

Goeldner CIV (unpublished). *Capital Expenditure Estimates.* Coffs Harbour, New South Wales.

Hydrominex Geoscience Consulting (2021). *Groundwater Assessment Deep Creek Quarry.* Greenwich, New South Wales.

Insite Heritage (2021). *Aboriginal Cultural Heritage Assessment Report.* Morisset, New South Wales.

Intersect Traffic (2021). *Traffic Impact Assessment Quarry Development.* Intersect Traffic, New South Wales.

Ironstone (2020). *Biodiversity Development Assessment Report.* Black Hill, New South Wales.

Ironstone (unpublished). *Request for Information.* Black Hill, New South Wales.

Mara Consulting (2021). *Visual Impact Assessment Deep Creek Quarry.* Stockton, New South Wales.

National Industry Insights (2020). *Construction.* Available from: https://nationalindustryinsights.aisc.net.au/industries/construction. Accessed: 5 March 2021.

Newcastle Herald (2015). *Last chance for say on Mandalong mine extension.* Available from: https://www.newcastleherald.com.au/story/3272497/last-chance-for-say-on-mandalong-mine-extension/. Accessed: 11 May 2021.

NSW Department of Planning and Environment (2021). *Planning Secretary's Environmental Assessment*

NSW Energy (2020). *United Wambo Open Cut Coal Mine.* Available from: https://www.nsenergybusiness.com/projects/united-wambo-open-cut-coal-mine/. Accessed: 10 May 2021.

NSW Government (2019). *Employment Projections.* Available from: https://opendata.transport.nsw.gov.au/dataset/employment-projections. Accessed: 6 May 2021.

NSW Government (2021). *Major Projects.* Available from: https://www.planningportal.nsw.gov.au/major-projects/projects/search. Accessed: 7 May 2021.

Petrol Spy (2021). *Petrol Spy Australia.* Available from: https://petrolspy.com.au/map/latlng/-32.46261999977154/151.96393950791366. Accessed: 14 May 2021.

Port Stephens Examiner (2020). *Fullerton Cove Sand Quarry A 'Time Bomb Says Residents, Feedback Invited'.* Available from: https://www.portstephensexaminer.com.au/story/6698283/sand-quarry-a-time-bomb-say-residents/. Accessed: 10 May 2021.

QMEB (2020). *Major coal mine expansion approved.* Available from: https://www.qmeb.com.au/major-coal-mine-expansion-approved/. Accessed: 11 May 2021.

Quarry Magazine (2021). *Greater Sydney Construction Materials Report Released.* Available from: https://www.quarrymagazine.com/2021/02/11/greater-sydney-geological-report-released/. Accessed: 12 May 2021.

RBA (2021). *Exchange Rate Data - Monthly Data - Table F11.* Available from: http://www.rba.gov.au/statistics/tables/index.html#exchange_rates. Accessed: 14 May 2021.

RLB (2019). *Quantity Surveyor Certificate of Cost.* Available from: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSD-9490%2120200221T050003.775%20GMT. Accessed: 10 May 2021.

Singleton Argus (2020). *Glencore's $95 million Bulga Optimisation Project Modification 3 has been approved through the NSW government's fast tracked assessment process.* Available from: https://www.singletonargus.com.au/story/6852866/bulga-coal-modification-3-approved/. Accessed: 11 May 2021.

Todoroski Air Sciences (2021). *Air Quality Impact Assessment Deep Creek Quarry.* Eastwood, New South Wales.

Treasury (2020). *Economic Response to the Coronavirus.* The Treasury, Australian Government. Available from: https://treasury.gov.au/coronavirus/jobkeeper/data. Accessed: 21 September 2020.

West, G. R. (1993). *User's Guide, Input-Output Analysis for Practitioners An Interactive Input-Output Software Package Version 7.1*. Department of Economics. University of Queensland, 1993.

APPENDIX A: SOCIO-ECONOMIC OVERVIEW

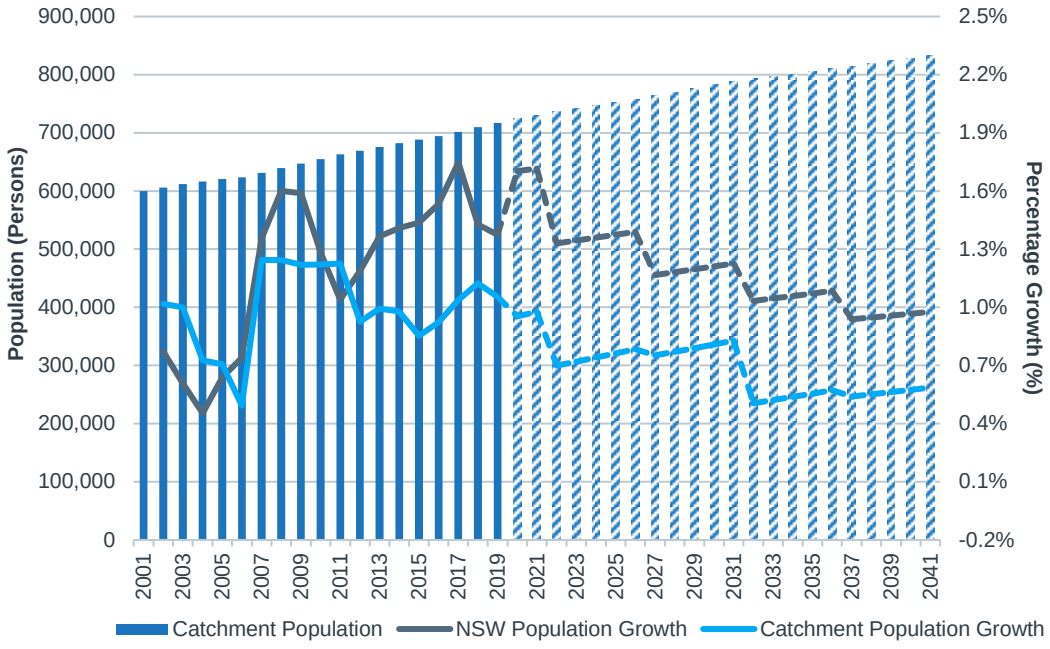
This Section provides a summary of the socio-economic environment of the Catchment, with comparisons to New South Wales. The economic profiling in this Section provides an assessment and overview of the prevailing conditions of the economy based on available datasets at the time of writing. However, the timing of release of many datasets can lag by three to six months (and in the case of Census data this is only available every five years), which can mean recent developments and macro-economic conditions (including ramifications of COVID-19) are unlikely to be fully reflected in the statistics and data presented. Appropriate interpretive context and analysis regarding recent impacts and ramifications of COVID-19 for the Catchment and New South Wales economies have been provided where possible.

POPULATION

Historically, the Catchment population has recorded moderate growth, averaging 1.0% per annum between 2001 and 2019, to reach a population of approximately 715,900 people by 2019 (ABS, 2020a). Average annual population growth between 2001 and 2019 was 0.2 percentage points lower than that of the State, with annual growth for the Catchment consistently trending below the State average over the seven years to 2019.

Population projections from the Department of Planning, Industry and Environment (2019) suggest the Catchment's resident population is expected to continue to increase, though at a slower rate than historically, with the average annual rate of growth projected to reach 0.7% from 2019 to 2041. In contrast, the State is projected to increase by 1.2% per annum on average to 2041. By 2041, the Catchment's population is projected to increase to approximately 833,200 people and is expected to represent 7.9% of the New South Wales population. These projections may be further reduced over the next few years, due to reduced migration resulting from the international travel ban implemented in March 2020 as a result of the COVID-19 pandemic.

Figure A. 1. Historical and Projected Population Growth, 2001 to 2041



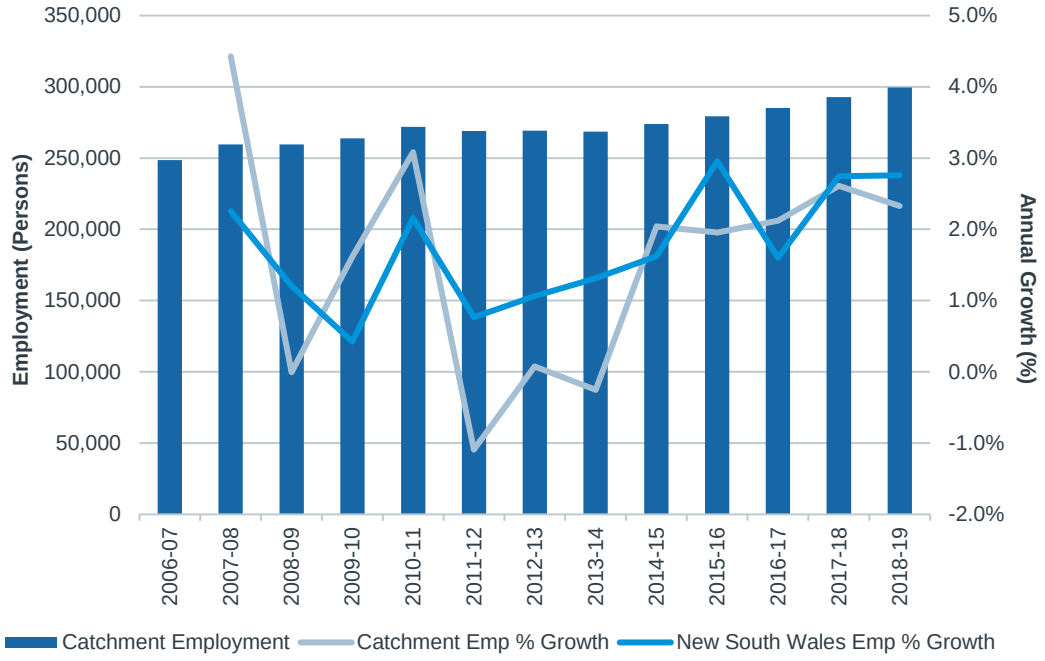
Note: The solid lines represent historical growth, whilst the dashed lines represent projected growth estimates.
Source: ABS (2020a), DPIE (2019),

LABOUR MARKET

The number of workers in the Catchment (by place of work) has recorded average growth of 1.6% per annum since 2006-07 to reach a peak of nearly 300,000 jobs by 2018-19. Employment growth was at its strongest in 2007-08

at 4.4% from the previous year (due to high growth in the mining sector), however, growth slowed over the years to 2011-12 where negative growth was recorded. Employment growth rates recovered from the slump by 2014-15, where growth has stabilised between 2.0% and 3.0%. Consistent with economic growth, employment growth recorded by the Catchment was slightly below that of the State (which recorded 1.7% growth on average per annum). Though compared to employment growth, employment estimates demonstrates much more volatility year to year. This is likely due to the volatile nature of some of the key sectors.

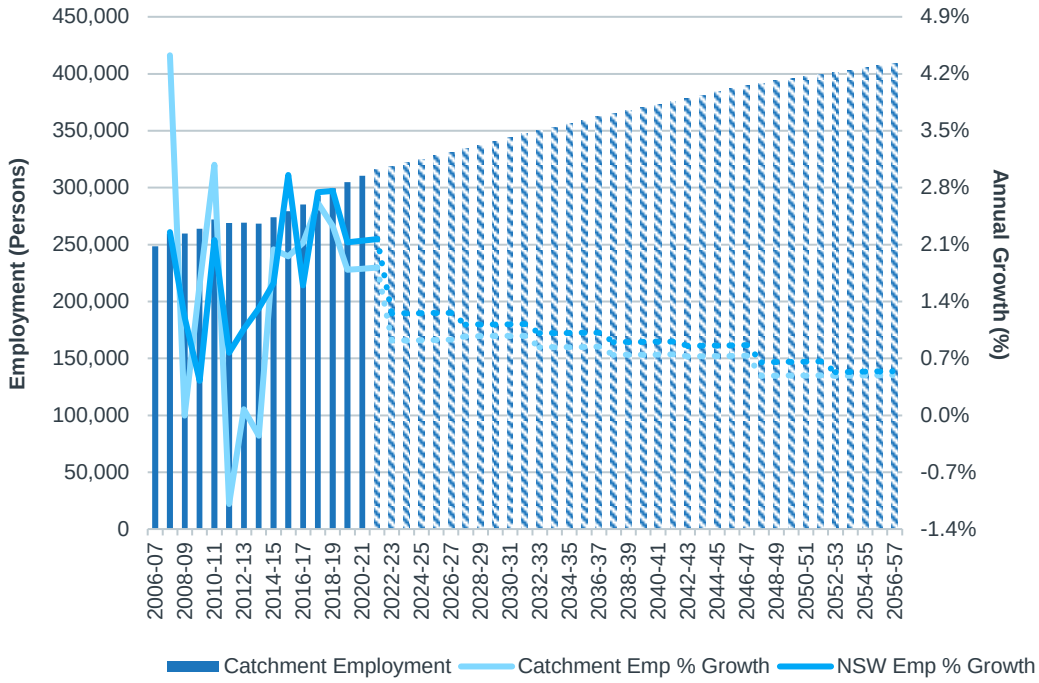
Figure A. 2. Total Employment, PoW, 2006-07 to 2018-19



Source: AEC (unpublished[b]).

The number of workers in the Catchment (by place of work) is anticipated to reach approximately 409,357 by 2056, an increase of approximately 109,883 people since 2018-19. Over the period between 2018-19 and 2056-57, growth is anticipated to slow from that experienced over the previous five years, to record average annual growth of approximately 0.8% compared to 1.0% for the State. Over this period, population serving sectors are anticipated to record the highest growth, including healthcare and social assistance (1.4% growth per annum on average), professional, scientific, and technical services (1.4% growth per annum on average), and education and training (1.1% growth per annum on average). Growth in the construction sector is anticipated to slow compared to historical growth rates, to just 0.5% growth per annum on average until 2056-57. Demand for quarrying activity will continue to be supported by construction activity, though at a slowing rate.

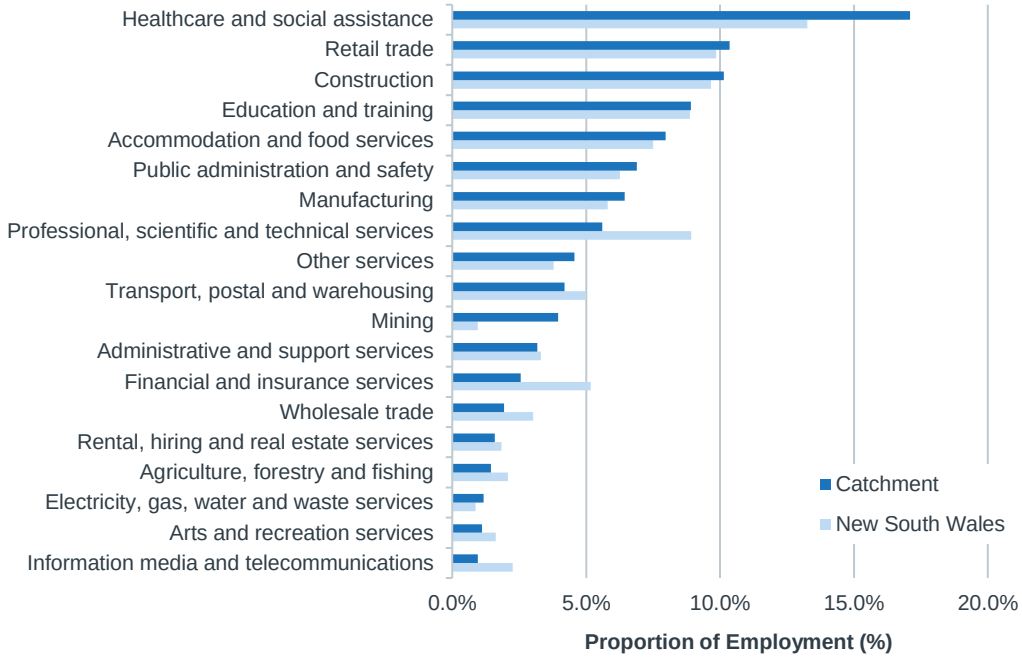
Figure A. 3. Projected Employment, PoW, 2006-07 to 2056-57



Source: AEC (unpublished[b]), NSW Government (2019).

In 2018-19, the largest employing industry in the Catchment was healthcare and social assistance, representing 17.1% of jobs, followed retail trade (10.4%) and construction (10.1%).

Figure A. 4. Employment by Industry, PoW, 2018-19



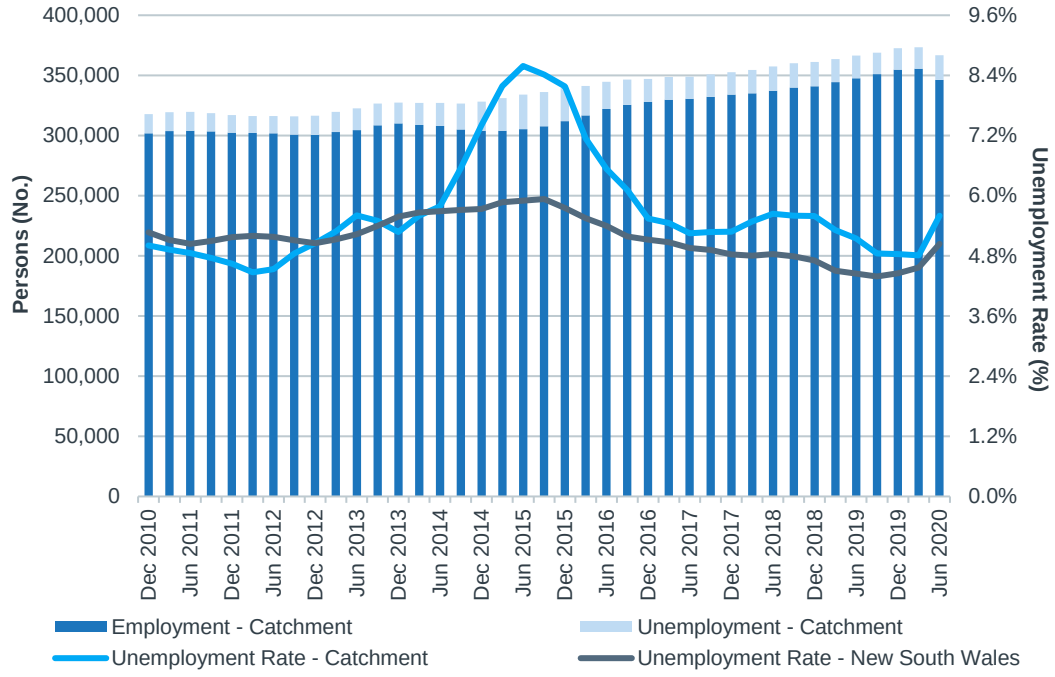
Source: AEC (unpublished[b]).

The Catchment's labour force was relatively flat between 2010 and 2014 (with growth of 0.8% per annum on average), however, experienced a more rapid expansion (compared to historically) between 2015 and 2019 of 2.4% growth per annum on average (prior to the COVID-19 pandemic) (DoESE, 2020). The unemployment rate fluctuated between 4.5% to just above 5.5% between 2010 and 2014, consistent with the State average, however spiked to above 8.0% in 2015 (this is consistent with the large decline in manufacturing employment in this year).

Following this period, the unemployment rate dropped back to around 5.0% to just above 5.5% in 2017 and fluctuated slightly above the State average for the remainder of the period.

The COVID-19 pandemic reached Australia in early January 2020, which led to reduced business activity, redundancies, and rising unemployment rates by mid-2020. As a result, the unemployment rate in the Catchment increased from 4.8% in March 2020 to 5.6% in June 2020 (a 0.8 percentage point increase). This rise is double that recorded for the State. Over this period, employment in the Catchment declined as workers transitioned to unemployment or became discouraged and left the labour force (evidenced by the rise in unemployment levels and decline in labour force).

Figure A. 5. Labour Force and Unemployment



Source: DoESE (2020).

The JobKeeper Payment Scheme was introduced in April 2020 to support businesses and individuals during the pandemic by providing $1,500 payments to employers for eligible employees each fortnight. In the Catchment, an average of approximately 21,200 businesses applied for JobKeeper each month from April to September 2020 (Treasury, 2020). There is potential that some of the small-medium businesses covered by the JobKeeper payment may struggle to recover once the payment has ended. The month-on-month JobKeeper rate declined in August 2020 and again in September 2020.

Table A. 1. JobKeeper Application Counts, April to September 2020 [a, b]

Area	April	May	June	July	August	September
Catchment Application Counts	20,208	21,346	21,685	21,802	21,578	20,942
Catchment Growth (%)		5.6%	1.6%	0.5%	-1.0%	-2.9%

Notes: (a) JobKeeper application counts were available at the postcode level, however, postcodes which recorded less than 5 applications did not provide data. Hence, the above estimates record a slight undercount on true volumes. (b) JobKeeper application counts are not cumulative between months.
Source: Treasury (2020).

Professionals were the most prevalent occupation held in the Catchment in 2016 (19.6%), followed by technicians and trades workers (15.8%) which is driven by mining and construction activity (ABS, 2017a). The high activity in the mining and construction sectors within the Catchment is demonstrated by the higher proportion of technicians and trades workers, machinery operators and drivers, and labourers (by comparison to the State).

Table A. 2. Employment by Occupation, PoW, 2016

Occupation	Catchment	NSW
Managers	10.3%	13.7%
Professionals	19.6%	24.1%
Technicians & Trades Workers	15.8%	12.9%
Community & Personal Service Workers	12.1%	10.6%
Clerical & Administrative Workers	13.3%	14.1%
Sales Workers	10.2%	9.4%
Machinery Operators & Drivers	7.8%	6.2%
Labourers	10.8%	9.0%
Total	**100.0%**	**100.0%**

Source: ABS (2017a).

In 2016, approximately 271,200 people lived and worked in the Catchment, whilst approximately 8,100 people were classified as imported labour, and approximately 16,300 people as exported labour (ABS, 2017a). Based on these figures, the Catchment is 97.1% self-sufficient[6], indicating the majority of local jobs are held by residents and there is an appropriate match between skillsets. This is largely due to the high number of healthcare and social assistance workers who live and work in the Catchment. The Catchment also has a high self-containment[7] rate (94.3%), reflecting the vast majority of residents found work in the region, or relocated to the region for work purposes.

Table A. 3. Journey to Work by Job Location, Catchment, 2016

Industry	Live and Work Local[(a)]	Imported Labour[(b)]	Total Local Workers (PoW)[(c)]	Exported Labour[(d)]
Agriculture, Forestry and Fishing	4,479	101	4,581	470
Mining	10,224	774	10,998	1,741
Manufacturing	17,904	409	18,314	1,416
Electricity, Gas, Water and Waste Services	3,730	174	3,904	422
Construction	24,796	1,408	26,204	1,987
Wholesale Trade	5,315	172	5,487	193
Retail Trade	29,859	699	30,557	1,345
Accommodation and Food Services	23,481	329	23,810	642
Transport, Postal and Warehousing	11,474	402	11,876	609
Information Media and Telecommunications	2,326	57	2,384	80
Financial and Insurance Services	7,476	224	7,700	300
Rental, Hiring and Real Estate Services	4,345	72	4,416	147
Professional, Scientific and Technical Services	14,555	271	14,825	524
Administrative and Support Services	9,620	226	9,845	425
Public Administration and Safety	17,624	736	18,360	1,331
Education and Training	23,597	662	24,259	1,733
Health Care and Social Assistance	44,940	1,029	45,969	2,286
Arts and Recreation Services	3,277	43	3,320	198
Other Services	12,198	286	12,484	439
Total	**271,221**	**8,073**	**279,294**	**16,286**

Notes: (a) The number of workers that both live and work in the catchment. (b) The number of workers that work in the catchment but live elsewhere (i.e., people that do not live in the catchment but commute to or temporarily stay in the catchment for work). (c) The combination of the first and second column, representing the total jobs located in the catchment (i.e., place of work employment data). (d) The number of workers that live in the catchment but work elsewhere (i.e., people that live in the catchment but commute from or temporarily stay outside the catchment for work). The combination of this column with the first column represents the total number of people residing in the catchment that have a job (i.e., place of usual residence employment data).
Source: ABS (2017a).

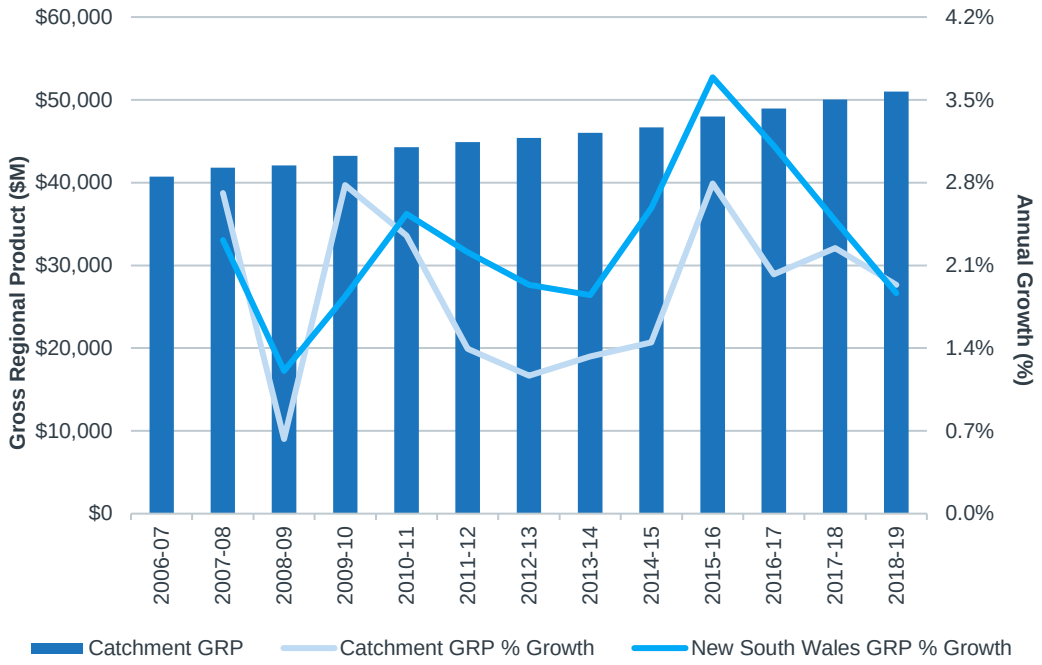
[6] Self-sufficiency refers to the proportion of people that live and work in the Catchment compared to the total that work in the Catchment.

[7] Self-containment refers to the proportion of people that live and work in the Catchment compared to the total that live in the Catchment.

ECONOMY

In 2018-19, the Catchment's economy recorded Gross Regional Product (GRP) of approximately $51.0 billion in chain volume terms[8], accounting for 8.2% of New South Wales Gross State Product (GSP) (AEC, unpublished[a]). Between 2006-07 and 2018-19, the economy recorded moderate and relatively steady growth of approximately 1.9% per annum on average, slightly lower than the 2.3% recorded for the State. The Catchment has recorded consistent annual growth over the period between 2006-07 and 2018-19, fluctuating between 0.6% and 2.8%. The Catchment's two largest industries (in terms of contribution to GRP) are mining and construction which contributed to 13.5% and 9.4% of total sector Gross Value Added (GVA) activity[9], respectively, in 2018-19. Growth within these industries has been volatile over the years, due to their cyclical natures.

A. 6. Gross Regional Product ($M), Chain Volume Measures, 2006-07 to 2018-19

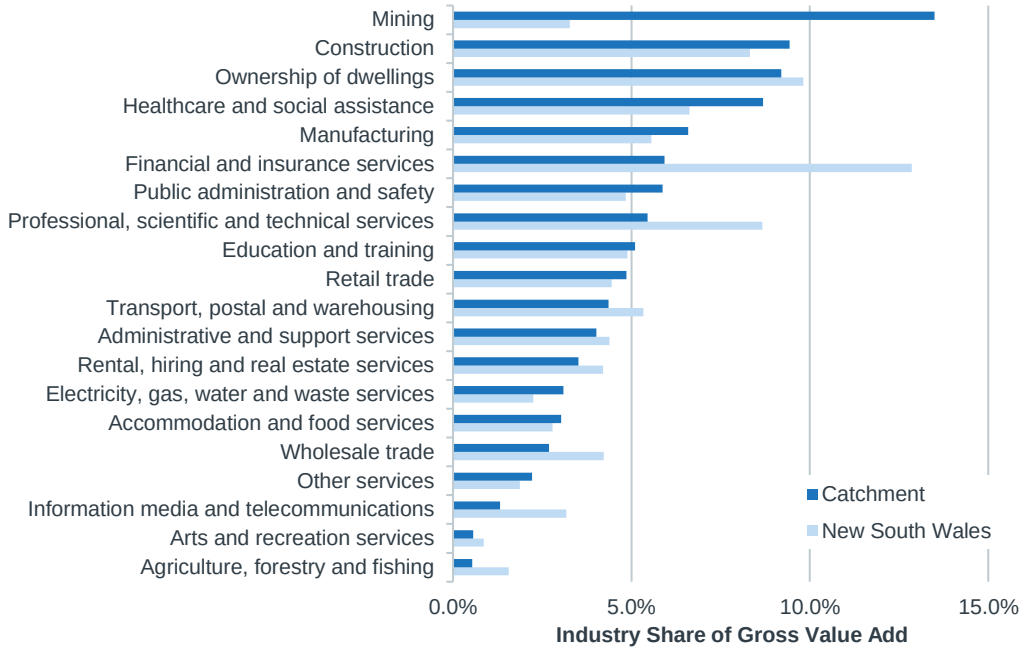


Source: AEC (unpublished[a]).

[8] Estimates of GRP are presented in 2018-19 real price terms.

[9] Sector GVA represents the contribution of all industries as well as the sector of ownership of dwellings to GRP, excluding taxes less subsidies on products.

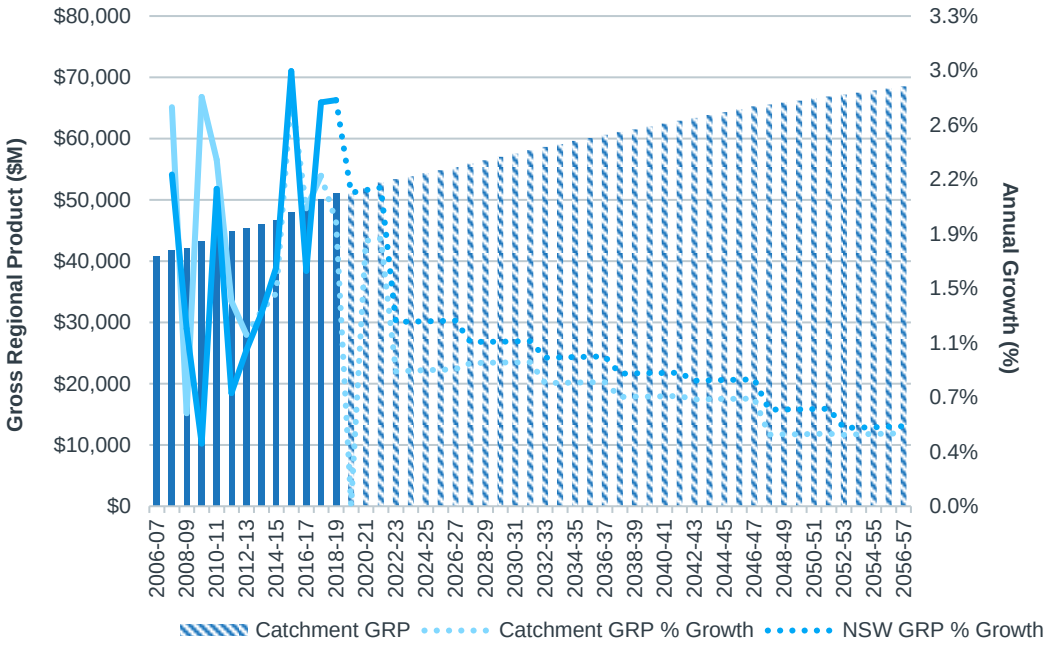
Figure A. 7. Industry Share of Gross Value Add, 2018-19



Source: AEC (unpublished[a]).

An average GRP per FTE employed in the region between 2006-07 to 2018-19 of $0.17 million was estimated for both the Catchment and State. Once applied to employment projections, this reveals GRP is anticipated to reach approximately $68.5 billion by 2056-57, an increase of approximately $17.5 billion since 2018-19. Due to the estimation approach, a similar growth profile to employment projections is observed in the below figure.

Figure A. 8. Projected GRP, 2006-07 to 2056-57



Source: AEC (unpublished[a]), NSW Government (2019).

Indicative estimates of the impact of COVID-19 to the Catchment and New South Wales economy to 2 January 2021 have been developed based on data from the Australian Bureau of Statistics (ABS, 2021a) outlining impacts on employment at the State level by industry. Indicative estimates of employment impacts for the Catchment were developed assuming the proportional change in industry activity at the State have been experienced in the Catchment as well. Impacts on Industry Value Added (IVA) were inferred considering both the estimated change

in employment as a result of the COVID-19 pandemic and the estimated change in labour productivity (value added activity per full time employee) experienced since 2019. Based on these indicative estimates, the impact on IVA has been slightly less pronounced than that for the State, with the Catchment recording a decline of approximately $1.9 billion in IVA due to the pandemic, a decline of 4.6%, compared to a decline of 5.8% for the State. In the Catchment, the construction sector recorded the largest decline ($815.8 million) followed by manufacturing ($306.5 million).

Table A. 4. COVID-19 IVA Impact, as of 2 January 2021

Area	2018-19 IVA ($B)	Estimated IVA as of 2 January 2021 ($B)	Numerical Change ($B)	Percentage Change
Catchment	$41.9	$40.0	$1.9	-4.6%
NSW	$522.9	$492.6	$30.3	-5.8%

Source: ABS (2020b), AEC.

PROPERTY MARKET

Building approval trends provide an indication for demand for residential dwellings as well as demand of population supporting infrastructure, both of which are driven by population growth. Residential building approval volumes in the Catchment have grown by a significant 10.5% per annum on average since 2012-13 (compared to growth of 4.8% for the State). (ABS, 2020c). These growth rates in residential approvals do not corroborate with anticipated population growth, hence, this may be due to a low starting value (2012-13) Residential approval values have experienced the same trend. These results are suggestive of increasing demand for construction materials and hence the products of quarrying.

Table A. 5. Residential Building Approval Values ($000) and Volumes (No.)

Financial Year	Catchment	NSW
Value		
2012-13	$984,372	$13,316,343
2013-14	$1,174,846	$16,543,353
2014-15	$1,256,369	$19,737,860
2015-16	$1,368,121	$24,561,262
2016-17	$1,432,455	$25,433,781
2017-18	$1,834,314	$26,688,321
2018-19	$1,829,304	$21,869,021
2019-20 YTD[(a)]	$2,344,972	$23,353,805
Average Annual Growth (2012-13 to 2018-19)	13.2%	8.4%
Number		
2012-13	3,343	42,789
2013-14	4,346	54,067
2014-15	4,238	63,344
2015-16	4,622	73,314
2016-17	4,529	73,045
2017-18	5,299	72,630
2018-19	4,932	57,423
2019-20 YTD	6,713	59,607
Average Annual Growth (2012-13 to 2018-19)	10.5%	4.8%

Source: ABS (2020c).

Table A. 6. Non-Residential Building Approval Values ($000)

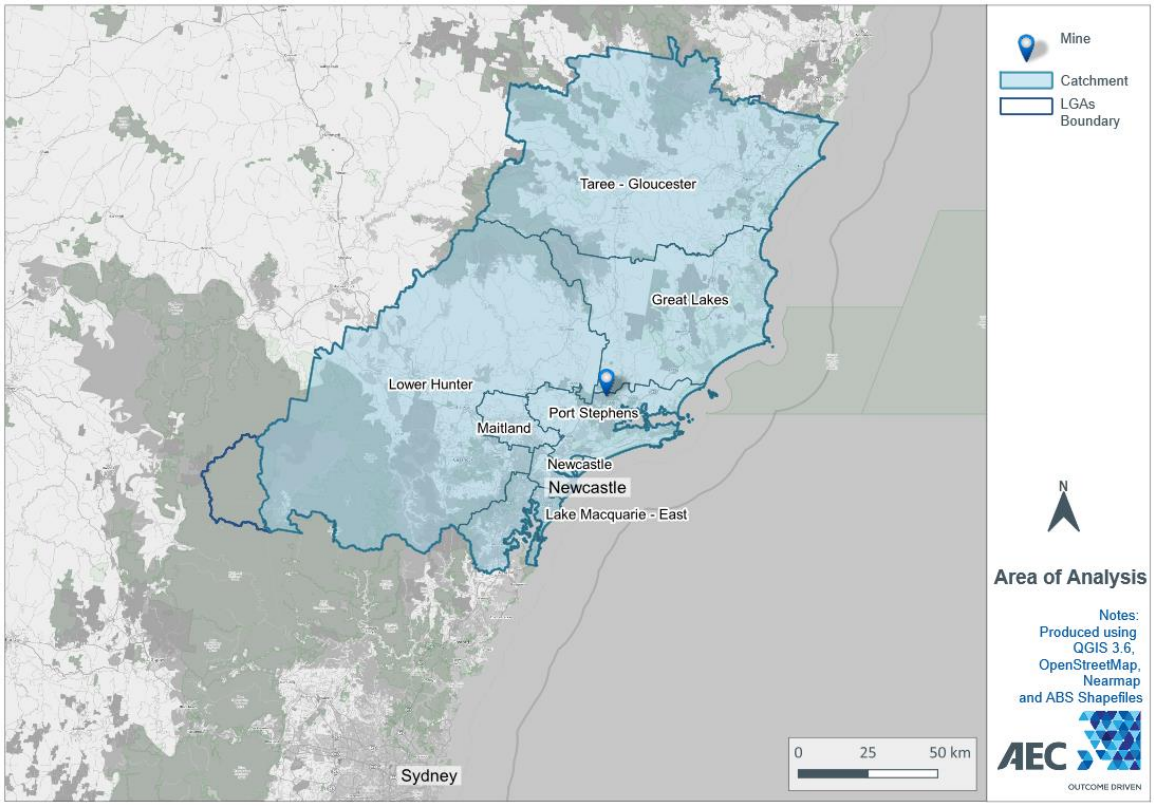
Financial Year	Catchment	NSW
Value		
2012-13	$487,205	$8,702,809
2013-14	$413,445	$12,428,147
2014-15	$726,630	$9,377,691
2015-16	$1,141,536	$11,289,934
2016-17	$1,000,487	$14,358,156
2017-18	$794,580	$14,681,503
2018-19	$908,539	$16,608,114
2019-20 YTD	$1,549,257	$20,348,546
Average Annual Growth (2012-13 to 2018-19)	18.0%	12.9%

Source: ABS (2020c).

In 2016, vacancy rates were higher in the Catchment than New South Wales on average; approximately 11.1% of the Catchment's housing stock is comprised of unoccupied private dwellings, compared to 9.3% for New South Wales.

Family and Community Services (FACS) New South Wales does not release property rent and sales reports for SA3s, which the original Catchment outlined in Section 2.3 is comprised of. As such, a Catchment comprised of LGAs has been developed which best reflects the geographical boundary of the original Catchment. The LGAs of Mid-Coast, Dungog, Port Stephens, Newcastle, Lake Macquarie, Cessncok, Singleton, and Maitland have been included the the Catchment (see Figure A. 9). This Catchment has been utilised for the remaining components of the property market Section.

Figure A. 9. Property Market Catchment Map

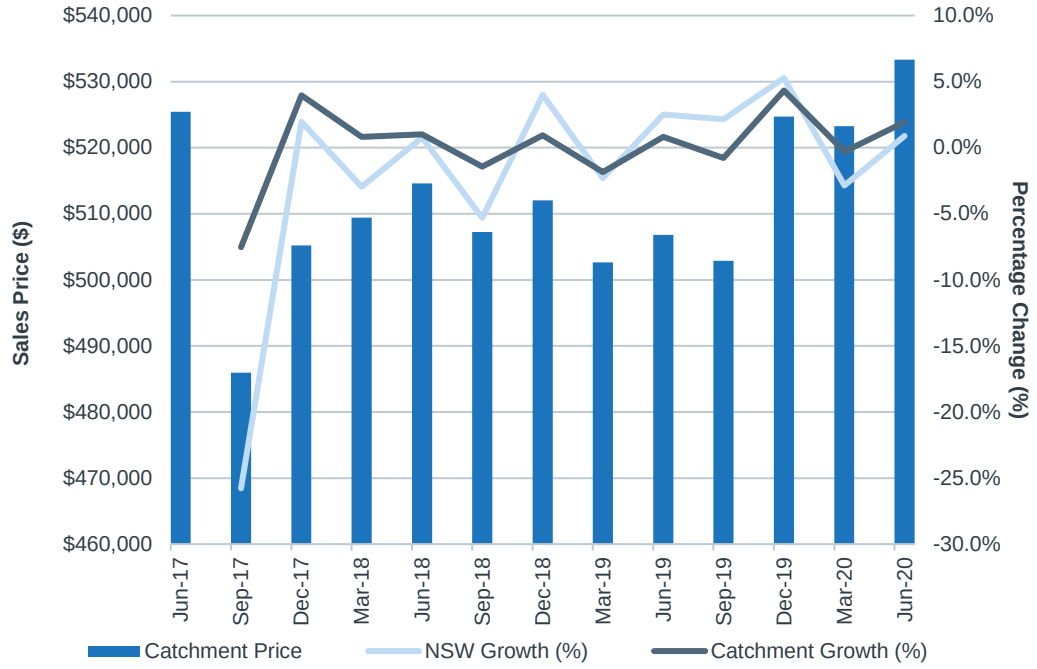


Source: AEC.

Property market activity in the Catchment is currently characterised by lowered demand for housing stock (despite the low interest rate environment), whilst demand for rental stock is strong.

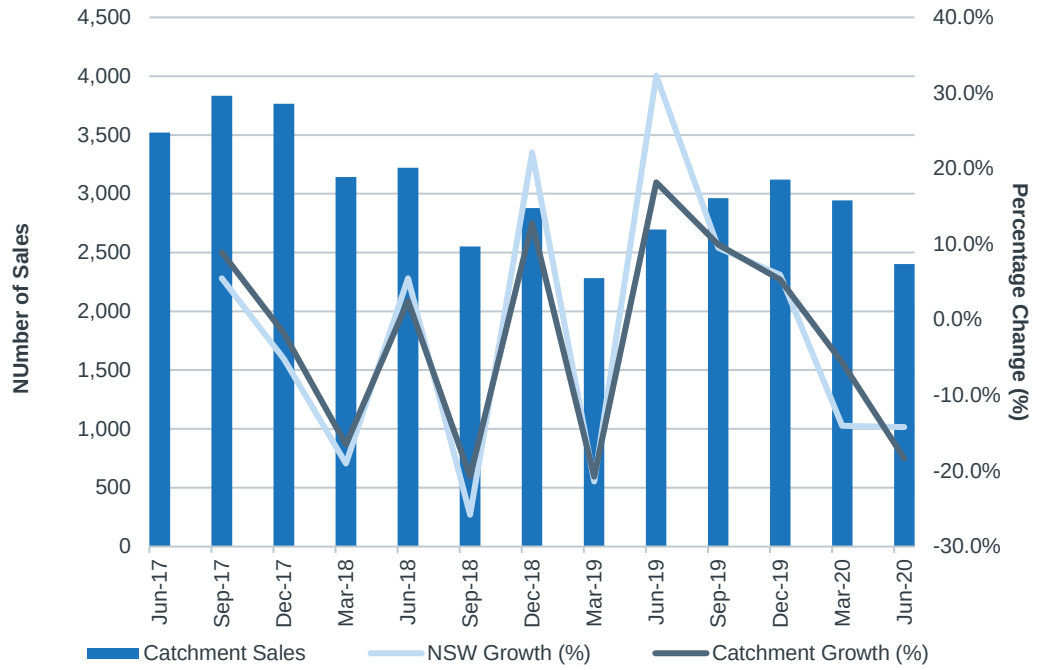
Referring to the above Catchment, the number of house sales has declined by 3.1% per month (on average) from June 2017 to June 2020. Whilst prices also declined over the two years to September 2019, there has been a recovery over the three months to June 2020 to reach an average price of approximately $533,300 in June 2020. House prices have consistently remained below that for the State.

Table A. 7. Median Sales Price ($)



Source: FACS (2020).

Table A. 8. Number of Sales

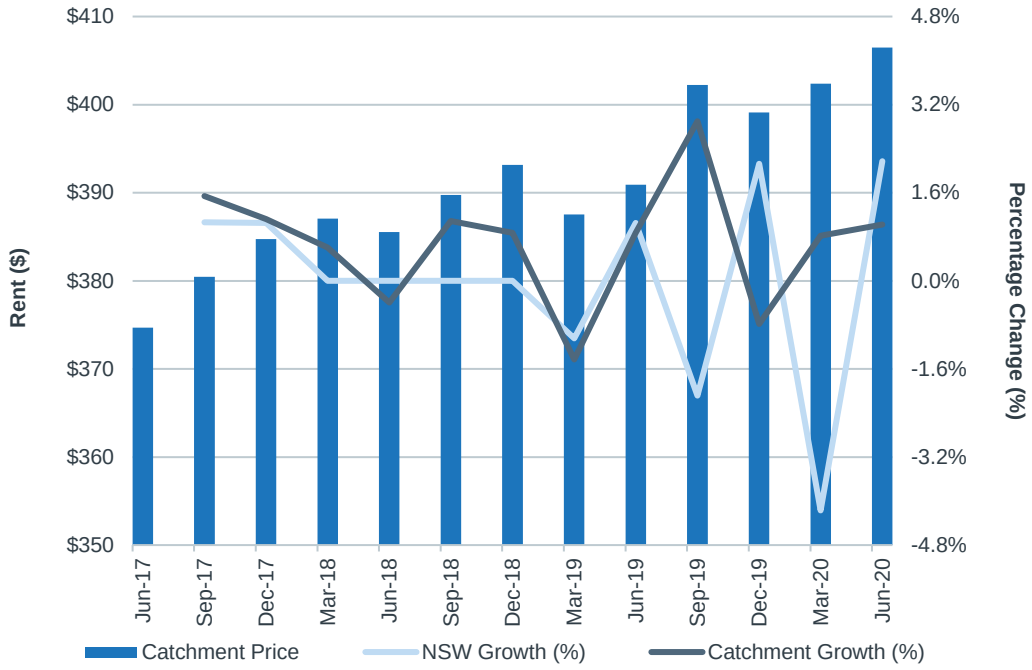


Notes: The LGA of Dungog has been excluded from the totals in the above graph, as less than 30 dwellings were sold and hence the actual value was not provided for privacy reasons. The above values, therefore, are a slight undercount of the number of sales.
Source: FACS (2020).

The number of rental bonds lodged follows a cyclical trend, with March a key month for residents entering the rental market or moving between rental properties. Rental prices have grown by 0.7% on average per annum over the 24 months to September 2020, significantly higher than that for the State where rental prices have remained

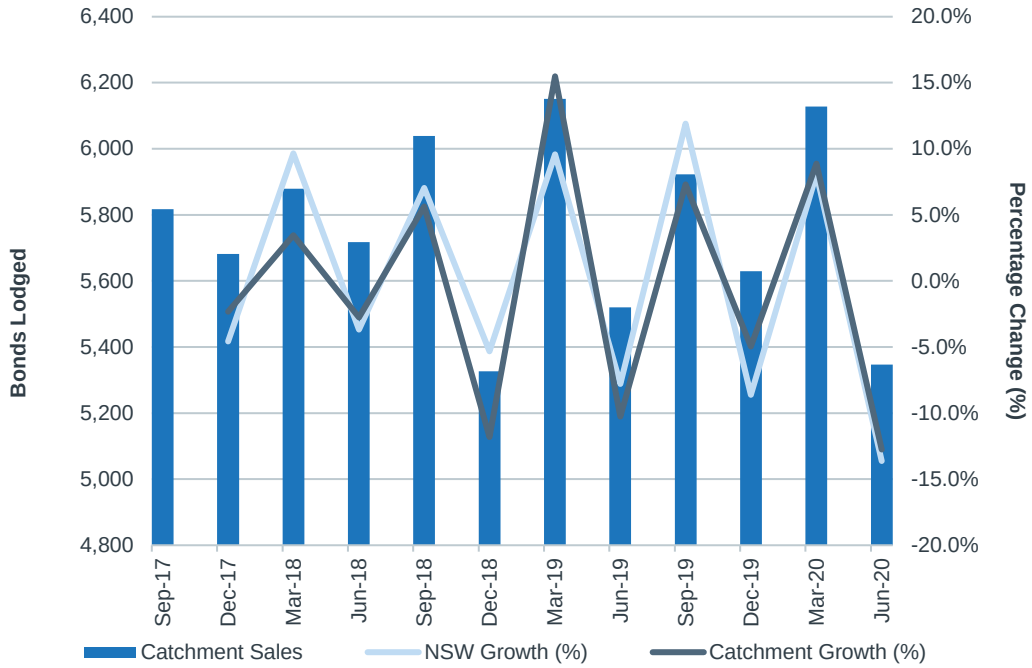
relatively stable. This growth has occurred despite demand in the rental market remaining relatively flat on an annual basis, though varying considerably quarter by quarter.

Table A. 9. Median Rent ($)



Source: FACS (2020).

Table A. 10. Number of Rental Bonds Lodged



Notes: The LGA of Dungog has been excluded from the totals in the above graph, as less than 30 rental bonds were lodged and hence the actual value was not provided for privacy reasons. The above values, therefore, are a slight undercount of the number of bonds lodged.
Source: FACS (2020).

MAJOR PROJECTS

The following table presents a list of identified existing projects with proposed extensions as well as new projects proposed for the region, largely related to mining and quarrying activity. The projects listed in the below table predominantly represent extensions that will replace or augment activities from existing operations that are nearing

completion. Where this occurs, these projects will effectively result in a continuation of jobs and economic activity rather than a genuine lift in activity (outside of short-term construction impacts). The majority of proposed projects for the region are of this nature.

Table A. 11. Major Projects

Project	Description	Cost	Phase/ Timing
Hillview Hard Rock Quarry	Development of a new quarry for the extraction and processing of hard rock (1.5 million tonne/annum over a 30-year life).	Unknown	EIS in Preparation
Eagelton Quarry Project	Proposed new quarry to extract and process up to 600,000 tonnes of hard rock per annum for 30 years.	Unknown	Assessment Phase
Stone Ridge Quarry	Proposed new quarry to extract up to 1.5 million tonnes per annum of hard rock from a Forestry site. The quarry is planned to operate for 30 years.	Unknown	EIS in Preparation
Bobs Sand Farm	Proposed to establish and operate a sand quarry to extract up to 750,000 tonnes per annum for a period of up to 15 years.	Unknown	Assessment Phase
Karuah South Quarry	Proposed to develop and operate a new hard rock quarry located approximately 4 km northeast of Karuah, to extract the known hard rock resource of the site from a single extraction area covering up to approximately 12 ha.	Unknown	Assessment Phase
Fullerton Cove Quarry	Dredging of the 500,000-tonne sand quarry pit, which will extend the life of the current mine site beyond 2028.	Unknown	Continued Operations
Cabbage Tree Road Sand Quarry	Clearing of 42.25 hectares of land to establish an extraction area, site facilities, processing and stockpile areas and a quarry entry and deceleration and acceleration lanes on Cabbage Tree Road. The quarry is anticipated to have a 15-year life.	Unknown	Continued Operations
Bloomfield Coal Mine	Extension of operations at the site until 2030, based on current production rates and estimated remaining coal reserves.	Unknown	Continued Operations
West Wallsend Coal Mine	Extension to allow for continued operations for a further 12 years, to extract up to 5.5 Mtpa of ROM coal.	$1.5 million	Continued Operations
Tasman Coal Mine Extension	Extension of underground mining into the West Borehole Seam to allow for operations until 2029.	Unknown	Continued Operations
Stratford Mine Extension	Continuation and extension of operations at the mining complex, allowing an additional 11 years of mining at up to 2.6 million tonne per annum.	Unknown	Continued Operations
Duralie Mine Extension	Expansion activities include the drilling of ten holes of varying depths into known coal measure areas to further delineate open-cut activity of the existing operations.	Unknown	Continued Operations
Karuah East Quarry Project	Staged development next to an existing quarry of a new standalone quarry, which will extract 29 million tonnes over 20 years. During full production, the quarry will employ up to 30 plant operators.	$5 million	Continued Operations
United Wambo Open Cut Coal Mine	The project was approved in August 2019 for extraction of an additional 150 million tonnes of coal at a rate of up to 10 million tonnes per annum over a period of 23 years. The project is expected to create approximately 500 full-time job opportunities.	$380 million	Continued Operations
Rix's Creek Coal Mine Extension	The project involves continued operations for another 21 years by expanding mining activities to the south of the existing Pit 1 and northwest of the existing Pit 3.	Unknown	Continued Operations
Teralba Quarry	Extension to the existing quarry to allow for operations until 2038 due to further development and operation of 2 extraction areas.	$25,000,000	Continued Operations
Ashton Coal Project	Approved for underground mining through to 2027.	Unknown	Continued Operations

Project	Description	Cost	Phase/ Timing
Hunter Valley Operations Continuation Project	Continuation of mining at the HVO North open cut coal mining complex until 2050, including extension of approved mining areas, mining of deeper coal seams and realignment of Lemington Road.	Unknown	EIS in Preparation
Mount Owen Coal Continued Operations	Approved for expansion of the existing Barrett open put by 4.3 hectares and clearing of 4 km^2 of native vegetation. Once operational, the enlarged pit is estimated to yield an additional 1.97 million tonnes of ROM coal and extend the mine's lifespan to 2044.	Unknown	Continued Operations
Brandy Hill Expansion Project	Approved to expand existing operations on site and increase the maximum extraction and processing rates to 1.5 million tonnes per annum.	$22.5 million	Continued Operations
Bulga Coal Mine Optimisation/ Extension Project	Approved for extraction of coal from under an existing tailing dam which will require removal along with some infrastructure including workshops and fuel storage. The project is expected to employ 1,000 workers and extend the life of the mine until 2039.	$95 million	Continued Operations
Warkworth Coal Mine Continuation	Approved for extension of the existing Warkworth open-cut coal mine to extract a further 230 million tonnes of coal over 21 years, with tailings and overburden to be transferred to the Mt Thorley mine.	Unknown	Continued Operations
Possum Brush Quarry	Approved for continued extraction and processing of hard rock at an average rate of 370,000 tpa and a maximum rate of 500,000 tpa over a 30-year period.	Unknown	Continued Operations
Newstan Mine Extension Project	The project aims to extract up to 25.9 Mt of coal at a maximum rate of 4 Mtpa at the Newstan Colliery.	Unknown	EIS in Preparation
Mandalong Mine Extension	Approved for extraction of up to 12 million tonnes of thermal coal over 25 years at the existing rate of a million tonnes a year. This will result in the creation of 115 jobs.	Unknown	Continued Operations
Stockton Quarry	Extension of operations at the site, through extraction of sand from a former sandpit by excavator and dredging.	$3.4 million	Assessment Phase

Source: NSW Government (2021), RLB (2019), Port Stephens Examiner (2020), Donaldson Coal (2021), Bio Regional Assessments (2018), NS Energy (2020), Glencore (2021), Department of Planning, Industry and Environment (2020), QMEB (2020), Singleton Argus (2020), Newcastle Herald (2015), AGL (2021),

Further to the above, the below mining operations are anticipated to cease over the next decade:

- Integra Underground Mine (cease in 2023)
- Liddell Mine Open Cut Mine (cease in 2023) (Daily Liberal, 2020).

APPENDIX B: INPUT-OUTPUT METHODOLOGY

INPUT-OUTPUT MODEL OVERVIEW

Input-Output analysis demonstrates inter-industry relationships in an economy, depicting how the output of one industry is purchased by other industries, households, the government and external parties (i.e. exports), as well as expenditure on other factors of production such as labour, capital and imports. Input-Output analysis shows the direct and indirect (flow-on) effects of one sector on other sectors and the general economy. As such, Input-Output modelling can be used to demonstrate the economic contribution of a sector on the overall economy and how much the economy relies on this sector or to examine a change in final demand of any one sector and the resultant change in activity of its supporting sectors.

The economic contribution can be traced through the economic system via:

- **Initial stimulus (direct) impacts**, which represent the economic activity of the industry directly experiencing the stimulus.
- **Flow-on impacts**, which are disaggregated to:
    - **Production induced effects (type I flow-on)**, which comprise the effects from:
        - Direct expenditure on goods and services by the industry experiencing the stimulus (direct suppliers to the industry), known as the first round or direct requirements effects.[10]
        - The second and subsequent round effects of increased purchases by suppliers in response to increased sales, known as the industry support effects.
    - **Household consumption effects (type II flow-on)**, which represent the consumption induced activity from additional household expenditure on goods and services resulting from additional wages and salaries being paid within the economic system.

These effects can be identified through the examination of four types of impacts:

- **Output**: Refers to the gross value of goods and services transacted, including the costs of goods and services used in the development and provision of the final product. Output typically overstates the economic impacts as it counts all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
- **Gross product**: Refers to the value of output after deducting the cost of goods and services inputs in the production process. Gross product (e.g., Gross Regional Product) defines a true net economic contribution and is subsequently the preferred measure for assessing economic impacts.
- **Income**: Measures the level of wages and salaries paid to employees of the industry under consideration and to other industries benefiting from the project.
- **Employment**: Refers to the part-time and full-time employment positions generated by the economic shock, both directly and indirectly through flow-on activity, and is expressed in terms of full time equivalent (FTE) positions.

Input-Output multipliers can be derived from open (Type I) Input-Output models or closed (Type II) models. Open models show the direct effects of spending in a particular industry as well as the indirect or flow-on (industrial support) effects of additional activities undertaken by industries increasing their activity in response to the direct spending.

Closed models re-circulate the labour income earned as a result of the initial spending through other industry and commodity groups to estimate consumption induced effects (or impacts from increased household consumption).

[10] Modelling note: In assessing construction impacts, AEC's modelling approach treats subcontractors in the construction services sector engaged through first round effects as part of the initial stimulus impact rather than as part of the production induced impact.

MODEL DEVELOPMENT

Multipliers used in this assessment are derived from sub-regional transaction tables developed specifically for this project. The process of developing a sub-regional transaction table involves developing regional estimates of gross production and purchasing patterns based on a parent table, in this case, the 2017-18 Australian transaction table (ABS, 2020a).

Estimates of gross production (by industry) in the study areas were developed based on the percent contribution to employment (by place of work) of the study areas to the Australian economy (ABS, 2012; ABS, 2017; ABS, 2020b; DoESE, 2020), and applied to Australian gross output identified in the 2017-18 Australian table.

Industry purchasing patterns within the study area were estimated using a process of cross industry location quotients and demand-supply pool production functions as described in West (1993).

Where appropriate, values were rebased from 2017-18 (as used in the Australian national Input-Output transaction tables) to current year values using the Consumer Price Index (ABS, 2021a).

MODELLING ASSUMPTIONS

The key assumptions and limitations of Input-Output analysis include:

- **Lack of supply-side constraints**: The most significant limitation of economic impact analysis using Input-Output multipliers is the implicit assumption that the economy has no supply-side constraints so the supply of each good is perfectly elastic. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity.
- **Fixed prices**: Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In assessments using Input-Output multipliers, where factors of production are assumed to be limitless, this rationing response is assumed not to occur. The system is in equilibrium at given prices, and prices are assumed to be unaffected by policy and any crowding out effects are not captured. This is not the case in an economic system subject to external influences.
- **Fixed ratios for intermediate inputs and production (linear production function)**: Economic impact analysis using Input-Output multipliers implicitly assumes that there is a fixed input structure in each industry and fixed ratios for production. That is, the input function is generally assumed linear and homogenous of degree one (which implies constant returns to scale and no substitution between inputs). As such, impact analysis using Input-Output multipliers can be seen to describe average effects, not marginal effects. For example, increased demand for a product is assumed to imply an equal increase in production for that product. In reality, however, it may be more efficient to increase imports or divert some exports to local consumption rather than increasing local production by the full amount. Further, it is assumed each commodity (or group of commodities) is supplied by a single industry or sector of production. This implies there is only one method used to produce each commodity and that each sector has only one primary output.
- **No allowance for economies of scope**: The total effect of carrying on several types of production is the sum of the separate effects. This rules out external economies and diseconomies and is known simply as the “additivity assumption”. This generally does not reflect real world operations.
- **No allowance for purchasers’ marginal responses to change**: Economic impact analysis using multipliers assumes that households consume goods and services in exact proportions to their initial budget shares. For example, the household budget share of some goods might increase as household income increases. This equally applies to industrial consumption of intermediate inputs and factors of production.
- **Absence of budget constraints**: Assessments of economic impacts using multipliers that consider consumption induced effects (type two multipliers) implicitly assume that household and government consumption is not subject to budget constraints.

Despite these limitations, Input-Output techniques provide a solid approach for taking account of the inter-relationships between the various sectors of the economy in the short-term and provide useful insight into the quantum of final demand for goods and services, both directly and indirectly, likely to be generated by a project.

In addition to the general limitations of Input-Output analysis, there are two other factors that need to be considered when assessing the outputs of sub-regional transaction table developed using this approach, namely:

- It is assumed the sub-region has similar technology and demand/ consumption patterns as the parent (Australia) table (e.g. the ratio of employee compensation to employees for each industry is held constant).
- Intra-regional cross-industry purchasing patterns for a given sector vary from the national tables depending on the prominence of the sector in the regional economy compared to its input sectors. Typically, sectors that are more prominent in the region (compared to the national economy) will be assessed as purchasing a higher proportion of imports from input sectors than at the national level, and vice versa.

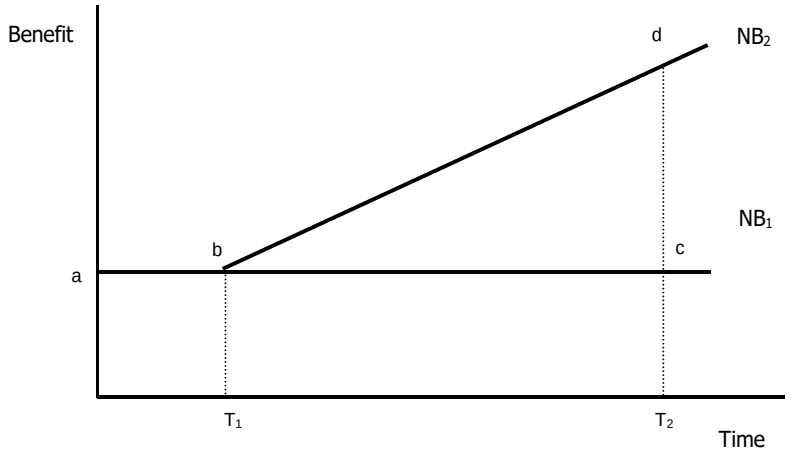
APPENDIX C: COST BENEFIT ANALYSIS

STEP 1: DEFINE THE SCOPE AND BOUNDARY

To enable a robust determination of the net benefits of undertaking a given project, it is necessary to specify base case and alternative case scenarios. The base case scenario represents the 'without project' scenario and the alternative or 'with project' scenario examines the impact with the project in place.

The base case (without) scenario is represented by line NB_1 (bc) over time T_1 to T_2 in Figure C.1. The investment in the project at time T_1 is likely to generate a benefit, which is represented by line NB_2 (bd). Therefore, the net benefit flowing from investment in the project is identified by calculating the area (bcd) between NB_1 and NB_2.

Figure C.1. With and Without Scenarios



Source: AEC.

STEP 2: IDENTIFY COSTS AND BENEFITS

A comprehensive quantitative specification of the benefits and costs included in the evaluation and their various timings is required and includes a clear outline of all major underlying assumptions. These impacts, both positive and negative, are then tabulated and where possible valued in dollar terms.

Some impacts may not be quantifiable. Where this occurs the impacts and their respective magnitudes will be examined qualitatively for consideration in the overall analysis.

Financing costs are not included in a CBA. As a method of project appraisal, CBA examines a project's profitability independently of the terms on which debt finance is arranged. This does not mean, however, that the cost of capital is not considered in CBA, as the capital expenses are included in the year in which the transaction occurs, and the discount rate (discussed below in Step 5) should be selected to provide a good indication of the opportunity cost of funds, as determined by the capital market.

STEP 3: QUANTIFY AND VALUE COSTS AND BENEFITS

CBA attempts to measure the value of all costs and benefits that are expected to result from the activity in economic terms. It includes estimating costs and benefits that are 'unpriced' and not the subject of normal market transactions but which nevertheless entail the use of real resources. These attributes are referred to as 'non-market' goods or impacts. In each of these cases, quantification of the effects in money terms is an important part of the evaluation.

However, projects frequently have non-market impacts that are difficult to quantify. Where the impact does not have a readily identifiable dollar value, proxies and other measures should be developed as these issues represent real costs and benefits.

One commonly used method of approximating values for non-market impacts is 'benefit transfer'. Benefit transfer (BT) means taking already calculated values from previously conducted studies and applying them to different study sites and situations. In light of the significant costs and technical skills needed in using the methodologies outlined in the table above, for many policy makers utilising BT techniques can provide an adequate solution.

Context is extremely important when deciding which values to transfer and from where. Factors such as population, number of households, and regional characteristics should be considered when undertaking benefit transfer. For example, as population density increases over time, individual households may value nearby open space and parks more highly. Other factors to be considered include, depending on the location of the original study, utilising foreign exchange rates, demographic data, and respective inflation rates.

Benefit transfer should only be regarded as an approximation. Transferring values from similar regions with similar markets is important, and results can be misleading if values are transferred between countries that have starkly different economies (for example a benefit transfer from the Solomon Islands to Vancouver would likely have only limited applicability). However, sometimes only an indicative value for environmental assets is all that is required.

STEP 4: TABULATE ANNUAL COSTS AND BENEFITS

All identified and quantified benefits and costs are tabulated to identify where and how often they occur. Tabulation provides an easy method for checking that all the issues and outcomes identified have been addressed and provides a picture of the flow of costs, benefits and their sources.

STEP 5: CALCULATE THE NET BENEFIT IN DOLLAR TERMS

As costs and benefits are specified over time it is necessary to reduce the stream of benefits and costs to present values. The present value concept is based on the time value of money – the idea that a dollar received today is worth more than a dollar to be received in the future. The present value of a cash flow is the equivalent value of the future cashflow should the entire cashflow be received today. The time value of money is determined by the given discount rate to enable the comparison of options by a common measure.

The selection of appropriate discount rates is of particular importance because they apply to much of the decision criteria and consequently the interpretation of results. The higher the discount rate, the less weight or importance is placed on future cash flows.

The choice of discount rates should reflect the weighted average cost of capital (WACC). For this analysis, a base discount rate of seven percent has been used to represent the minimum rate of return, which is in line with NSW and Australian Government guidelines. As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e. it is a real discount rate, as opposed to a nominal discount rate).

To assess the sensitivity of the project to the discount rate used, discount rates either side of the base discount rate (seven percent) have also been examined (four percent and ten percent).

The formula for determining the present value is:

$$PV = \frac{FV_n}{(1+r)^n}$$

Where:

PV = present value today

FV = future value n periods from now

r = discount rate per period

n = number of periods

Extending this to a series of cash flows the present value is calculated as:

$$PV = \frac{FV_1}{(1+r)^1} + \frac{FV_2}{(1+r)^2} + \cdots + \frac{FV_n}{(1+r)^n}$$

Once the stream of costs and benefits have been reduced to their present values the Net Present Value (NPV) can be calculated as the difference between the present value of benefits and present value of costs. If the present value of benefits is greater than the present value of costs, then the option or project would have a net economic benefit.

In addition to the NPV, the internal rate of return (IRR) and benefit-cost ratio (BCR) can provide useful information regarding the attractiveness of a project. The IRR provides an estimate of the discount rate at which the NPV of the project equals zero, i.e. it represents the maximum WACC at which the project would be deemed desirable. However, in terms of whether a project is considered desirable or not, the IRR and BCR will always return the same result as the NPV decision criterion.

STEP 6: SENSITIVITY ANALYSIS

Sensitivity analysis allows for the testing of the key assumptions and the identification of the critical variables within the analysis to gain greater insight into the drivers to the case being examined.

A series of Monte Carlo analyses has been conducted to test the sensitivity of the model outputs to changes in key variables. Monte Carlo simulation is a computerised technique that provides decision-makers with a range of possible outcomes and the probabilities they will occur for any choice of action. Monte Carlo simulation works by building models of possible results by substituting a range of values – the probability distribution – for any factor that has inherent uncertainty. It then calculates results over and over, each time using a different set of random values from the probability functions. The outputs from Monte Carlo simulation are distributions of possible outcome values.

During a Monte Carlo simulation, values are sampled at random from the input probability distributions. Each set of samples is called an iteration, and the resulting outcome from that sample is recorded. Monte Carlo simulation does these hundreds or thousands of times, and the result is a probability distribution of possible outcomes. In this way, Monte Carlo simulation provides a comprehensive view of what may happen. It describes what could happen and how likely it is to happen.

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