EMM
creating opportunities

APPENDIX P – Environmental Impact Statement

Economic assessment

Prepared for Lake Lyell Project Pty Ltd

Lake Lyell Pumped Hydro Energy Storage
Economic Assessment

Prepared for

EMM Consulting Pty Ltd

By

Gillespie Economics

November 2025

Contact

Dr Rob Gillespie
Principal
Gillespie Economics
114/5 Wulumay Close
Rozelle, NSW 2039

Email: gillecon@bigpond.net.au
gillespieeconomics@gmail.com
Web: gillespieeconomics.com

CONTENTS

ECONOMIC DEFINITIONS

Consumption-induced flow-on	the economic impacts that come from households spending the wages they earn through jobs created by a project. As people use their income to buy goods and services, it drives further activity in sectors like retail, transport, and hospitality.
Economic activity	the production, distribution, and consumption of goods and services within an economy. Measures of economic activity include output, value-added, income and employment.
Economic impact	refers to the effect of a project on economic activity within a local area, region, state or nation.
Employment	the number of people employed (including full-time and part-time).
Gross regional product	one of several measures of the size of an economy. It is the market value of all final goods and services produced by all firms in an economy.
Direct impact	economic activity of the project itself e.g. revenue, employment, value-added and wages/income.
Household income	the wages paid to employees including imputed wages for self-employed and business owners.
Indirect impact	economic activity that arises from the project purchasing inputs to production and the supplier of those inputs to production in turn purchasing inputs to its production, etc, and employment from the project spending their wages to purchase goods and services, and the provider of those goods and services in turn purchasing goods and services etc.
Input-output analysis	a method to assess the direct and indirect economic activity generated by a proposal through spending.
Multiplier	summary measures used for predicting the total impact on all industries in an economy from changes in the demand for the output of any one industry. There are many types of multipliers.
Output	total revenue or business turnover.
Production-induced flow-on	the economic impacts that arise from increased demand for goods and services across the supply chain, triggered by a project's direct activity. These effects reflect the flow-on production required by suppliers and subcontractors to support the project's delivery.
Type 11a ratio multiplier	summarises the total impact on all industries in an economy in relation to the initial own sector effect e.g. total income effect from an initial income effect and total employment effect from an initial employment effect, etc.
Value-added	the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output.

ABBREVIATIONS

Abbreviation	Meaning
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ANZSIC	Australian and New Zealand Standard Industrial Classification
CSSI	Critical State Significant Infrastructure
DIDO	Drive-In Drive-Out
DPHI	Department of Planning, Housing and Infrastructure (NSW)
EIS	Environmental Impact Statement
FIFO	Fly-In Fly-Out
GL	Gigalitre(s)
GRIT	Generation of Regional Input Output Tables
HV	High Voltage
ID	.id (informed decisions) – data provider
IO	Input-Output
LGA	Local Government Area
MAT	Main Access Tunnel
MWh	Megawatt hour(s)
MW	Megawatt(s)
NSW	New South Wales
PHES	Pumped Hydro Energy Storage
SEARs	Secretary's Environmental Assessment Requirements
WAF	Worker Accommodation Facility

EXECUTIVE SUMMARY

Introduction

EnergyAustralia Portfolio Holdings Pty Ltd (EnergyAustralia) in partnership with EDF power solutions Australia (EDFA), referred to as Lake Lyell Project Pty Ltd (LLP) as trustee propose to construct and operate the Lake Lyell Pumped Hydro Energy Storage (PHES) Project (the project), five kilometres (km) west of Lithgow within the Lithgow Local Government Area (LGA).

The project has been declared critical State significant infrastructure (CSSI) as it is a development that is essential for the State for economic, social, and environmental reasons. This Economic Assessment analyses the potential economic impacts of the construction and operation of the project on the regional and NSW economy. It forms part of the Environmental Impact Statement (EIS) for the project.

The impacts have been assessed in accordance with the Secretary's environmental assessment requirements (SEARs) issued by the NSW Department of Planning, Housing and Infrastructure (DPHI) and against the relevant legislation and guidelines as they apply to economics.

Methodology

The benefit of the project, as an integral component of the NSW Electricity Strategy which aims to deliver reliable, affordable and sustainable electricity systems for NSW, is assessed qualitatively.

Regional and NSW economic activity impacts are assessed using input-output (IO) analysis. Qualitative consideration is also given to potential impacts of the project on demand for regional and NSW labour resources and other inputs to production.

Existing environment

The study area/regional economy for this economic impact assessment is defined as the Lithgow local government area (LGA). This is the region in which the project is located and has the potential to provide labour and non-labour inputs to, and derive economic benefits from, the construction and operation of the project. While the region is the focus of the analysis, impacts on the NSW economy are also assessed.

The population of the region in 2021 was 20,842 and has been growing at less than 20 per cent of the rate of NSW, according to Australian Bureau of Statistics (ABS) Census of Population and Housing data. The forecast population growth rate for Lithgow LGA is negative. The median population of Lithgow LGA had a higher percentage of Aboriginal and/or Torres Strait Islanders than NSW, was older than the NSW population, and had lower levels of education. The main occupations of usual residents in the region were Technicians and Trades Workers, and Community and Personal Service Workers.

Four-digit Australian and New Zealand Industry Classification (ANZSIC) place of work data for the region indicates the significance of the Coal Mining, State Government Administration, Supermarket and Grocery Stores, Aged Care Residential Services, and Hospitals (except Psychiatric Hospitals) sectors.

Exporting sectors are key drivers of regional economies and reflect a region's endowments and competitive advantages. Using the one-digit ANZSIC, the largest exporting industries in the region by value are Mining, Public Administration and Safety, Electricity, Gas, Water and Waste Services, Health Care and Social Assistance, and Construction.

Potential construction impacts

Over the five-year construction phase the average annual direct construction employment is estimated at 426. The average annual impacts on the regional economy (Lithgow LGA) of this level of construction activity are estimated at up to:

- $400M in annual direct and indirect output.
- $166M in annual direct and indirect value-added.
- $72M in annual direct and indirect household income.
- 658 direct and indirect jobs.

The average annual construction impacts of the project on the NSW economy are estimated at up to:

- $566M in annual direct and indirect output.
- $276M in annual direct and indirect value added.
- $102M in annual direct and indirect household income.
- 912 direct and indirect jobs.

The impacts of construction of the workforce accommodation facility (WAF) are included in the above. However, the operation of the WAF will also provide some economic activity to the region, estimated at up to:

- $12M in annual direct and indirect output.
- $4M in annual direct and indirect value-added.
- $1M in annual direct and indirect household income.
- 17 direct and indirect jobs.

The construction of the project will create demand for regional labour resources and regional inputs to production which may result in some observable regional wages and price increases. However, these impacts will be moderated by the project using a WAF to accommodate in the order of 65 per cent of the construction workforce.

Potential operational impacts

The project aims to support Australia's transition to renewable energy by providing large-scale, flexible, and dispatchable electricity storage and generation, addressing the challenges of intermittent renewable sources like wind and solar. It will enhance grid reliability and resilience, reduce reliance on fossil fuel-based peaking plants, and contribute to lower electricity costs and greenhouse gas emissions, while delivering benefits such as the ability to store excess renewable energy, operational flexibility, improved reliability, cost savings, and environmental advantages aligned with government infrastructure targets.

The project operation will also provide economic activity to the regional and NSW economies. The project operation is estimated to make up to the following total contribution to the regional economy:

- $290M in annual direct and indirect regional output.
- $237M in annual direct and indirect regional value-added.
- $4M in annual direct and indirect household income.
- 50 direct and indirect jobs.

The project operation is estimated to make up to the following total annual contribution to the NSW economy:

- $306M in annual direct and indirect regional output.
- $246M in annual direct and indirect regional value-added.
- $8M in annual direct and indirect household income.
- 72 direct and indirect jobs.

The construction and operation impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy i.e., the NSW economy because of its size and diversity is better placed to provide more of the inputs to production than the regional economy.

Businesses that can provide the inputs to the production process required by the project and/or the products and services required by the workforce would directly benefit from the project by way of an increased economic activity. However, because of the inter-linkages between sectors, many indirect businesses also benefit.

The operation of the project will create a small demand for regional labour resources and regional inputs to production. Consequently, no wage or price increases or production shortages are anticipated.

Management measures

The positive local employment and business opportunities can be maximised via:

- Employment of regional residents where they have the required skills and experience.
- Participating, as appropriate, in business groups, events or programs in the regional community.
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- Establishment of a Community Benefit Fund (or equivalent) to be managed through a Voluntary Community Benefits Program coordinated with Lithgow City Council with the intention of supporting local non-profit organisations, community programs/events, local businesses, training, and services/infrastructure.

1 INTRODUCTION

1.1 Background

EnergyAustralia Portfolio Holdings Pty Ltd (EnergyAustralia) in partnership with EDF power solutions Australia (EDFA), referred to as Lake Lyell Project Pty Ltd (LLP) as trustee, is developing the Lake Lyell Pumped Hydro Energy Storage (PHES) Project (the project). The project will have the capacity to store up to 3,080 megawatt hours (MWh) of energy and generate at 385 megawatts (MW) for 8 hours or generate up to around 440 MW for a shorter period. At a basic level, it will consist of upper and lower water reservoirs, a pipeline connecting them, and a hydro-electric power station connected to the national energy grid that is capable of generating or consuming electricity.

The project is located approximately 5 kilometres (km) west of Lithgow and 110 km west of the Sydney central business district. The project takes advantage of existing infrastructure (i.e. Lake Lyell) associated with Mt Piper power station which will be decommissioned in the coming decades and allows Lake Lyell to continue to serve a specific purpose in electricity generation (consistent with its existing use).

In June 2024, the Minister for Planning and Public Spaces declared the project to be critical State significant infrastructure (CSSI). Accordingly, approval for the project is required under Part 5, Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This requires the preparation of an environmental impact statement (EIS) for the project in accordance with Secretary's environmental assessment requirements (SEARs) and the approval of the Minister.

This Economic Assessment is an appendix to the project's EIS and should be read in conjunction with it. The Economic Assessment addresses the Secretary's environmental assessment requirements (SEARs) issued for the project.

1.2 Assessment guidelines and requirements

This Economic Assessment has been prepared in accordance with the requirements of the NSW Department of Planning, Housing and Infrastructure (DPHI) and relevant agencies, which are set out in the SEARs for the project, issued on 17 November 2025. The SEARs identify matters which must be addressed in the EIS. Gillespie Economics has been engaged to undertake an Economic Assessment to address these requirements. Individual requirements relevant to this Economic Assessment and where they are addressed in this report are listed in Table 1.1.

Table 1.1 – Economic Assessment Related SEARs

Requirement	Section addressed
Economic and Benefit Sharing, including:	
an assessment of the economic impacts and benefits of the project on the locality and the State as a whole, and	Chapters 5, 6, 7, 8 and 9 of this report.
details of any proposed voluntary benefit-sharing scheme	See the Social Impact Assessment appended to the EIS

1.3 Structure of the report

This report is structured as follows:

- Chapter 3 outlines the methodology used for the Economic Assessment.
- Chapter 4 provides an overview of the regional economy within which the project is located.
- Chapter 5 assesses the economic impacts of construction of the project on the regional and NSW economy.
- Chapter 6 assesses the economic impacts of operation of the project on the regional and NSW economy.
- Chapter 7 assesses the regional and NSW impacts of project decommissioning.

- Chapter 8 considers potential cumulative impacts on the region and State.
- Chapter 9 identifies measures to mitigate and manage economic impacts.
- Chapter 10 provides the conclusions of the assessment.

2 DESCRIPTION OF THE PROJECT

A detailed description of the project, including an overview of its design, construction and operation is provided in the project's environmental impact statement (EIS). The EIS (specifically Chapter 3 and Appendix B) should be read in conjunction with this report. A summary of the project's key elements is provided below.

The project design, can be broadly categorised into:

- pumped hydro generation components – including a 5.3 gigalitre (GL) upper reservoir to be constructed behind the southern ridge of Mount Walker, a 33.5 GL lower reservoir (existing Lake Lyell), inlet/outlet structures, and an underground powerhouse, surge shaft and waterway tunnels
- transmission connection components – including a new high voltage switchyard and connection to the existing 330 kilovolt (kV) transmission line that runs through the site
- site access and ancillary facilities – including upgrade of existing and construction of new access roads and bridges, a diversion and infill of a section of Lake Lyell, administration and utilities
- other construction components or works – including geotechnical investigations, temporary workforce accommodation, site work pads, laydown areas and facilities, and spoil management.

Construction will be completed in stages, including:

- pre-construction / enabling works – consisting of initial access works (internal and external roads), geotechnical investigations, site establishment and preparation of the worker's accommodation camp
- main works – consisting of all other construction activities needed to enable operation of the project.

During operation, the project will act as an electrical energy storage system through the conversion of electrical to kinetic energy to gravitational energy and back via water as it is transferred from the elevated upper reservoir to a lower reservoir. The project will provide services to the wholesale 'spot' market on the National Electricity Market (NEM), and support ancillary services used to manage the power system reliably.

After the 80 to 100-year design life of the project, the asset may remain viable for a plant refurbishment and extension of life as has been seen for other older assets globally. Following the plants final refurbishment or once it has reached the end of its serviceable life then the project would look to return the site to a more natural state and encourage community beneficial use.

3 Methodology

3.1 Overview

The project would form an integral component of the NSW Electricity Strategy which aims to deliver reliable, affordable and sustainable electricity systems for NSW. The benefits of the project to the NSW electricity system have been assessed qualitatively.

The project would also generate economic activity within the regional and NSW economy, during construction, operation and decommissioning. The assessment of these economic impacts has been undertaken using input-output (IO) analysis. Other potential impacts are discussed qualitatively.

3.2 Study area

The project is in the Lithgow local government area (LGA). The study area/regional economy for this economic assessment is therefore defined as the Lithgow LGA as this represents the project locality. This is the immediate region that has the potential to provide labour and non-labour inputs to, and derive economic benefits from, the construction, operation and decommissioning of the project. While the region is the focus of the analysis, impacts on the NSW economy are also assessed.

3.3 Description of the regional economy

Prior to the assessment of impacts using IO analysis, a description of the regional economy is provided. This is based on Australian Bureau of Statistics (ABS) Census of Population and Housing data and information from the model of the regional economy developed for the IO analysis. Data is provided at different levels of aggregation, i.e. one-digit and four-digit Australian and New Zealand Standard Industrial Classification (ANZSIC),[1] and IO sector classifications,[2] to provide a more complete picture of the regional economy.

3.4 Input-output analysis

IO analysis is used to assess the direct and indirect impacts (gross economic footprint) of the construction and operation of the project on the regional and NSW economy.

IO analysis involves two key steps:

- Development of an appropriate IO table (regional transaction table) that can be used to identify the economic structure of the region and multipliers for each existing sector of the economy. IO tables for the regional and NSW economy were developed using the Generation of Regional Input Output Tables (GRIT) procedure developed by the University of Queensland and recognised internationally - Refer to Annexure 1.
- Identification of the direct impact or stimulus of the project, in a form that is compatible with the IO equations, so that the IO multipliers and flow-on effects for the impacts or stimulus of the project can then be estimated (West, 1993). The direct impact of the project was estimated from data provided by the proponent, published data and production ratios in the IO tables (see more detailed explanation below). Indirect effects were estimated using the *EconImp2* program.[3]

IO analysis identifies the economic activity of a project on the economy in terms of four main indicators:

- Gross regional output – the gross value of business turnover in a region.

[1] The ANZSIC classifies industries at four levels – Divisions (the broadest level), Subdivisions, Groups and Classes (the finest level). The broadest level of Divisions (one-digit level) comprises 17 industries and provides a broad overall picture of the economy. The finest level of Classes (four-digit level) comprises 720 industry categories.

[2] Input Output Product Classifications are based on the characteristic products of industry sectors. There are currently 115 intermediate sector classifications.

[3] The EconImp2 program uses the Leontief Inverse Matrix and marginal technical coefficients to estimate indirect effects.

- Value-added – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output. These costs exclude wage costs.
- Income – the wages paid to employees including imputed wages for self-employed and business owners.
- Employment – the number of people employed (including self-employed, full-time, and part-time).

IO analysis is focused on economic activity that occurs in a geographical area. Direct effects (e.g. output, value-added, income and employment) of construction of the project in the geographical area are counted even if these effects do not accrue to existing regional businesses and residents in that area. Production induced flow-on effects and consumption induced flow-on are estimates of flow-on effects to the geographical area that arise from the direct expenditures that occur in the area.

The IO method is based on several assumptions that are outlined in Annexure 2. Most notably IO analysis assumes that the regional economy has access to sufficient labour and capital resources (from both inside and outside the region) so that an individual project does not result in any regional price changes, e.g. wages in other industries or house rentals, which would lead to contractions ("crowding out") of economic activity in other sectors in the same region. Any "crowding out" is assumed to occur outside the region where the project is concentrated, and the regional impact analysis is focused. A dynamic computable general equilibrium modelling approach may overcome the limitation of IO analysis but is unlikely to be warranted at local or regional scale or with small scale impacts.

Another major assumption of the standard IO method is that each industry exhibits constant returns to scale in production. This linearity assumption implies a strict proportional relationship between output changes and inputs, including labour. In this study, this assumption has been addressed by using marginal (elasticity-adjusted) technical coefficients rather than average technical coefficients. Consequently, the IO model reflects sectoral supply responsiveness—yielding more realistic, "next-unit" estimate of gross economic impact.

Qualitative consideration is given to potential "crowding out" impacts from the project and cumulative projects on the region and State.

3.5 Assessing construction direct impacts

Construction expenditure is associated with manufacturing of equipment and expenditure across the following three construction sectors of the IO industry classification:

- The *Heavy and Civil Engineering Construction Sector* which includes businesses involved in engineering construction and project management services for a diverse range of activities including on-site assembly of heavy electrical machinery from prefabricated components, transmission lines, road construction etc.
- The *Construction Services Sector* which includes businesses involved in earthmoving work such as levelling of construction sites, excavation of foundations, trench digging, concreting services, electrical services, hire of earthmoving plant with operator, etc.
- The *Non-Residential Building Construction Sector* which includes businesses engaged in the construction of industrial buildings including WAFs.

Conservatively, all machinery manufacturing is assumed to occur outside Australia. It is recognised that some machinery may be sourced from the region and in particular NSW, however no data is currently available to include this is the analysis.

Project construction over a five-year period is estimated to be associated with an average annual FTE workforce of 426 workers, with 38% sourced from the region, and 78% from NSW. Based on the IO coefficients of the *Heavy and Civil Engineering Construction* sector, *Construction Services* sector, and *Non-Residential Building* sector in the IO transactions table for the local area, $256M of expenditure would be required across these sectors for this workforce. Construction impacts are therefore based on expenditure of $256M.

3.6 Assessing operation direct impacts

For the analysis of the operational phase of the project, a new project operation sector was developed, reflecting average annual operation.

This sector is based on costs and revenues/output at the project boundary. Output was estimated from the installed capacity and an estimate of the wholesale bundled electricity and renewable energy certificate revenue per annum. The proponent advised of an operational employment of 20 (of which 18 are assumed to reside in the region with the remainder from nearby localities). Wages for this level of employment were based on IBISworld (2024). Total nonwage expenditure was estimated from Aurecon (2024). Nonwage expenditure was allocated between imports and 115 intermediate sectors based on an assumed expenditure breakdown and application of regional location quotients, and converted to basic values, taxes and margins.

3.7 Assessing operation of the Worker Accommodation Facility

For the analysis of the operation of the WAF, a new project operation sector was developed, reflecting average annual operation.

This sector is based on an estimate of the total cost ($7M), direct employment (7 FTE jobs), and nonlabour expenditure profile for a 500-person facility. It was assumed that all direct labour would reside in the Lithgow LGA. Nonwage expenditure was allocated across the relevant 115 intermediate sectors based on an assumed expenditure breakdown and application of regional location quotients, and converted to basic values, taxes and margins. The largest expenditure item, catering (including food supply), was assumed to be sourced from outside the region.

4 THE REGIONAL ECONOMY

4.1 Introduction

This section characterises the regional economy from two perspectives, residents of the region and workers in the region.

4.2 Residents of the Region

Table 4.1 provides some characteristics of the usual residents of the regional economy based on the 2021 ABS Census of Population and Housing. In 2021, the region had a population of 20,842, 0.26 per cent of the NSW population. The percentage of the regional population that is Aboriginal and/or Torres Strait Islanders was 7.8 per cent compared to 3.4 per cent for NSW. The population of Lithgow LGA was older (median age 46 and 24.5 per cent of the population 65 years or more) than the population of NSW (median age 39 and 17.7 per cent of the population 65 years or more) and had lower levels of education, with 11.6 per cent having a bachelor's degree or higher compared 27.8 per cent for NSW.

The older population of the regional economy is reflected in a lower proportion of the population being in the workforce (42 per cent), compared to NSW (48 per cent). In the 2021 Census, 5.5 per cent of the regional labour force was unemployed compared to 4.9 per cent for NSW.

The main occupations of residents in the region (refer to Table 4.1 and Figure 4.1) were Technicians and Trades (16.6 per cent), Community and Personal Service Workers (14.0 per cent) and Professionals (13.4 per cent). While for NSW the main occupations of residents were Professionals (25.8 per cent), Managers (14.6 per cent) and Clerical and Administrative Workers (13.0 per cent).

Median weekly household incomes were lower in the region ($1,196) compared to NSW ($1,829) and median weekly rents were lower at $270 compared to $420 for NSW.

Figure 4.1 – Employment by Occupation of Usual Residents

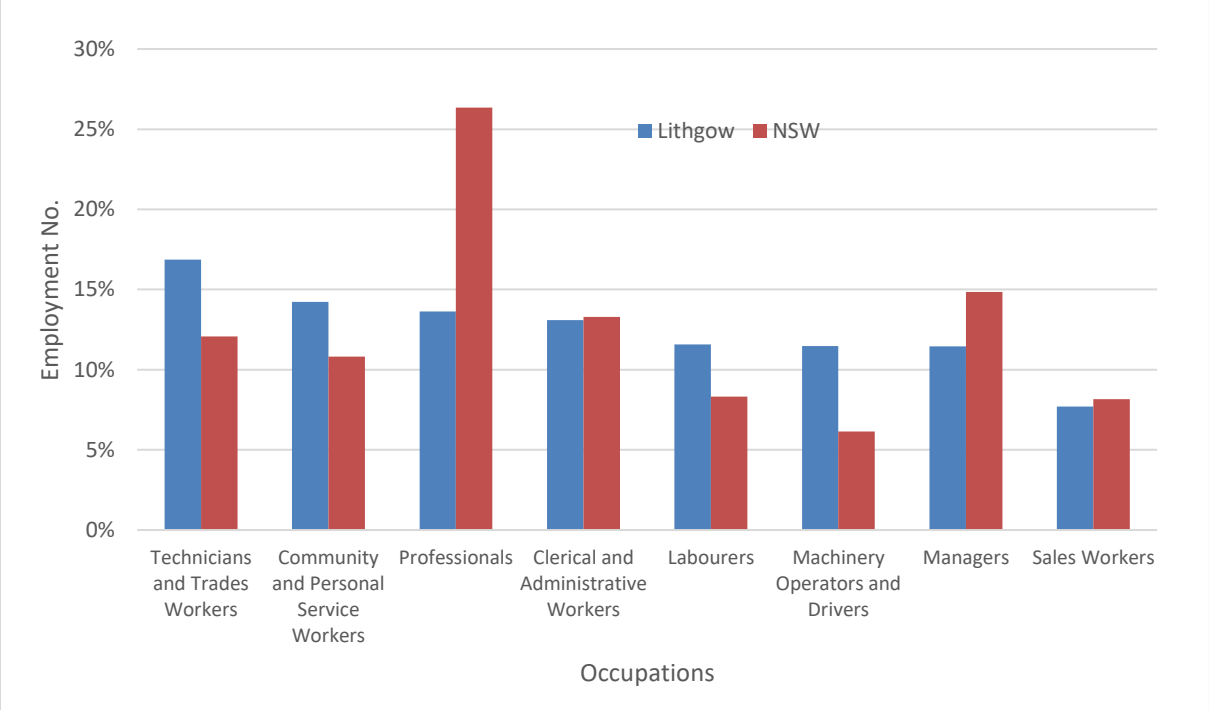


Table 4.1 - Characteristics of Usual Residents

		Lithgow LGA		NSW	
Population		20,842		8,072,163	
% Aboriginal and/or Torres Strait Islanders		7.8%		3.4%	
Median Age		46		39	
% of population <15 years		16.4%		18.2%	
% of population 65+		24.5%		17.7%	
In labour force		8,790		3,874,012	
Unemployed	%	5.5%		4.9%	
	No.	483		189,852	
Labour force to population ratio		42.2%		48.0%	
Median household weekly income		1,196		1,829	
Unoccupied private dwellings	%	13.2%		9.4%	
	No.	1,261		299,524	
Median weekly rent		270		420	
Level of highest education attainment - 15+		**%**	**No.**	**%**	**No.**
Year 9 or below		11.5%	2,008	7.4%	487,855
Year 10		17.0%	2,954	10.6%	698,390
Year 12		10.6%	1851	14.5%	954,987
Bachelor Degree and above		11.6%	2023	27.8%	1,838,502
Occupations		**No.**	**%**	**No.**	**%**
Technicians and Trades Workers		1,377	16.6	436,589	11.9
Community and Personal Service Workers		1,161	14.0	390,779	10.6
Professionals		1,112	13.4	952,131	25.8
Clerical and Administrative Workers		1,068	12.9	480,612	13.0
Labourers		945	11.4	300,966	8.2
Machinery Operators and Drivers		936	11.3	222,186	6.0
Managers		935	11.3	536,820	14.6
Sales Workers		629	7.6	294,889	8.0

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Community Profiles

The main four-digit ANZSIC sectors in which usual residents were employed in 2021 is provided in Table 4.2. Coal Mining, Aged Care Residential Services, Supermarket and Grocery Stores, State Government Administration and Local Government Administration were the most significant employment sectors for usual residents of the region. For NSW, Hospitals (except Psychiatric Hospitals), Supermarket and Grocery Stores, Other Social Assistance Services, Computer System Design and Related Services, and Aged Care Residential Services were the most significant employment sectors for usual residents.

Twenty-six per cent of employed usual residents work outside the region, mainly the LGAs of Blue Mountains (6.2 per cent), Bathurst Regional (6.2 per cent), No usual address (NSW) (4.8 per cent), and Oberon (1.2 per cent).

Table 4.2 - Top 5 Industry Sectors of Employment for Usual Residents (Four Digit ANZSIC)

Lithgow	**%**	**NSW**	**%**
Coal Mining	6.9	Hospitals (except Psychiatric Hospitals)	4.2
Aged Care Residential Services	3.4	Supermarket and Grocery Stores	2.5
Supermarket and Grocery Stores	3.1	Other Social Assistance Services	2.4
State Government Administration	3.0	Computer System Design and Related Services	2.3
Local Government Administration	2.9	Aged Care Residential Services	2.2

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Community Profiles

An indication of the health of an economy can be gained from population changes. This theory of regional economic growth suggests that places that can attract population immigration[4] create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a cycle of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen, 1990).

Trends in regional economies of NSW because of globalisation and associated structural adjustment include:

- Loss of significant industries such as abattoirs and timber mills from many rural areas.
- Increased mechanisation of agriculture and aggregation of properties, resulting in loss of employment opportunities in this industry.
- Growth of regional centres, at the expense of smaller towns.
- Preference of Australians for coastal living, particularly for retirement.
- Preference of many of today's fastest growing industries for locating in large cities (Collits, 2000). [5]

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

Against this backdrop, it is evident that the population of the regional economy has been growing at an average annual rate of 0.2 per cent since 2006, compared to 1.3 per cent per annum for NSW. The region did experience a decline in population between 2016 and 2021.

[4] Mainly due to natural endowments and comparative advantage in certain industry sectors.

[5] The tree change trend does not change this finding as most tree change is to larger regional centres and coastal areas.

Table 4.3 - Population growth

	Population				Average Annual Growth Rate			
Region	**2006**	**2011**	**2016**	**2021**	**2006 - 2011**	**2011 - 2016**	**2016 - 2021**	**2006 - 2021**
Lithgow LGA	20,186	20,850	21,484	20,854	0.7%	0.6%	-0.6%	0.2%
NSW	**6,742,690**	**7,218,529**	**7,732,858**	**8,093,815**	**1.4%**	**1.4%**	**0.9%**	**1.3%**

Source: Australian Bureau of Statistics, 2023 Estimated Resident Population, Local Government Areas, Australia

The population of the region (Table 4.4) is predicted to decline between 2021 and 2041 (-0.07 per cent population growth rate per annum) compared to a population growth rate of 1.0 per cent per annum for NSW.

Table 4.4 – Projected population growth

Region	2021	2041	Change	Annual %
Lithgow LGA	21,477	21,174	-303	**-0.07**
NSW	**8,166,757**	**9,872,934**	**1,706,176**	**1.0%**

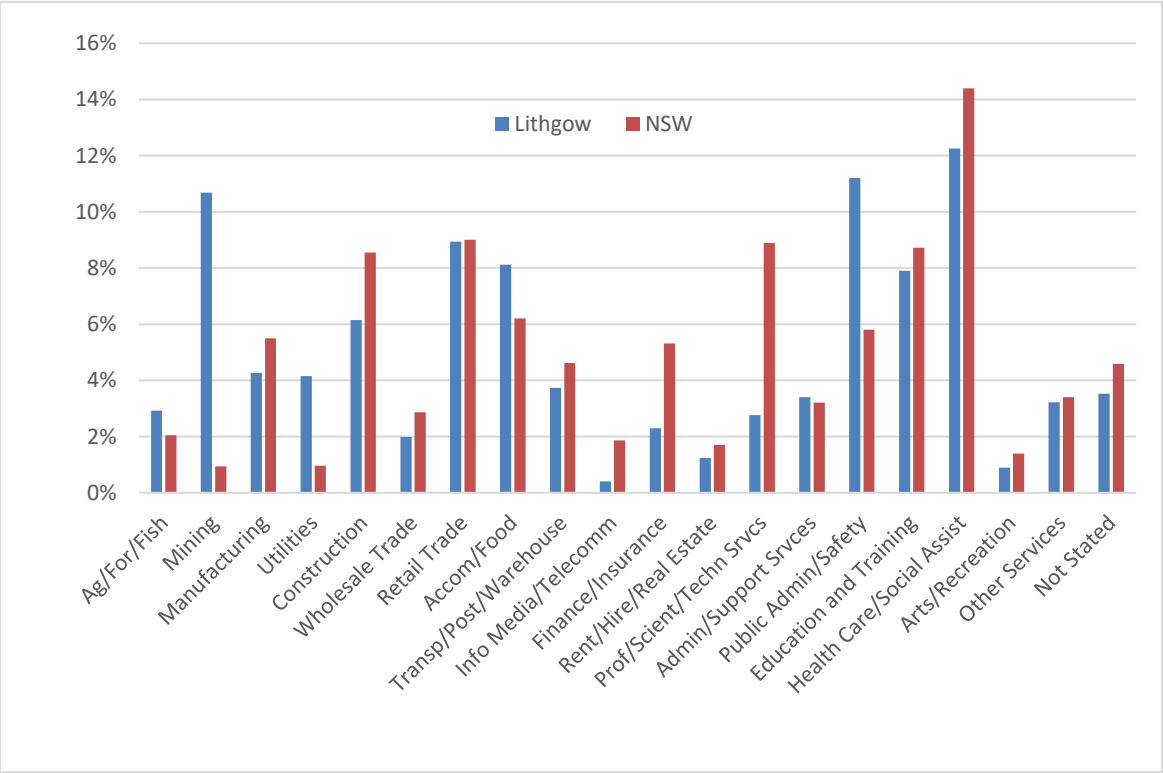
Source: NSW Department of Planning and Environment (2022)

4.3 Workers in the Region

An indication of the nature of the regional economy can be gained by examining one-digit ANZSIC place of work employment data - refer to Figure 4.2. This indicates the relative significance of Agriculture, Forestry and Fishing, Mining, Utilities (Electricity, Gas, Water and Waste Services), Accommodation and Food Services, and Public Administration and Safety, compared to NSW.

Twenty per cent of people who work in the region live outside the region, mainly in the LGAs of Bathurst Regional (7.0 per cent), Blue Mountains (6.7 per cent), Mid-Western Regional (1.1 per cent) and Oberon (0.7 per cent).

Figure 4.2 - Place of work employment by industry (One-digit ANZSIC)



Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Working Population Profiles

At the more disaggregated level (place of work employment by four-digit ANZSIC) the main industry sectors of employment in the region are Coal Mining, State Government Administration, Supermarket and Grocery Stores, Aged Care Residential Services and Hospitals (except Psychiatric Hospitals). For NSW the main industry sectors of employment are Hospitals (except Psychiatric Hospitals), Supermarket and Grocery Stores, Other Social Assistance Services, Computer System Design and Related Services and Aged Care Residential Services.

Table 4.5 - Place of Work Top 5 Industry Sectors of Employment (Four-digit ANZSIC Sectors)

Lithgow LGA	%	NSW	%
Coal Mining	9.5%	Hospitals (except Psychiatric Hospitals)	4.1%
State Government Administration	3.6%	Supermarket and Grocery Stores	2.5%
Supermarket and Grocery Stores	3.4%	Other Social Assistance Services	2.4%
Aged Care Residential Services	3.2%	Computer System Design and Related Services	2.3%
Hospitals (except Psychiatric Hospitals)	2.9%	Aged Care Residential Services	2.2%

Source: Australian Bureau of Statistics, 2021 Census of Population and Housing, Table Builder

Exporting sectors are based on a region's endowments and competitive advantages, and in regional economic development economics are the key drivers of the economy. The largest exporting industries (One-digit ANZSIC) are:

- Mining ($1,684 million) mainly Coal Mining.
- Electricity, Gas, Water and Waste Services ($132 million), mainly Electricity Generation.
- Manufacturing ($56million) mainly Ships and Boat Manufacturing, Basic Non-Ferrous Metal Manufacturing, and Cement, Lime and Ready Mixed Concrete Manufacturing.
- Public Administration and Safety ($43 million) mainly Public Administration and Regulatory Services, and Public Order and Safety.
- Accommodation ($33 million) (.id, 2024).

In combination these five industries accounted for $1,946 million in total or 94 per cent of the total exports by industry in the region. Mining accounts for 82 percent of total exports (.id, 2024).

In terms of value-added, the ANZSIC one-digit industry sectors of Mining, Public Administration and Safety, Electricity, Gas, Water and Waste Services, Health Care and Social Assistance, and Construction had the highest value-added in total, equal to approximately 66% of the regional economy and 49% of regional employment - Table 4.6.

Table 4.6 - Gross Value Added for the 5 Largest Industries in the regional economy (ANZSIC One Digit)

Industry	Gross Value Added ($m)	Proportion of Regional Economy (%)	Proportion of Regional Employment (%)
Mining	534	40%	11%
Public Administration and Safety	99	7%	12%
Electricity, Gas, Water and Waste Services	98	7%	4%
Health Care and Social Assistance	73	5%	13%
Construction	72	5%	10%
Total	**877**	**66%**	**49%**

Source: .id (2024)

5 CONSTRUCTION IMPACTS

5.1 The project

5.1.1 Impacts

During the construction phase, the average annual construction employment is as per Table 5.1. Over the five-year construction phase, average annual construction employment is 426. [6]

Table 5.1 Average Annual Construction Employment

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Average Yearly
Average	387	372	454	549	367	426

As identified in Section 3, based on the IO coefficients of the abovementioned three construction sectors in the regional IO table, $256M of expenditure would be required across these sectors to generate an average annual 426 onsite workforce.

The estimated direct and indirect regional economic impact of $256M expenditure in the regional and NSW economy is reported in Table 5.2 and Table 5.3.

Table 5.2 – Average Annual Economic Impacts of the Construction on the Regional Economy ($2025)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT ($M)	256	120	24	144	400
Type 11A Ratio	1.00	0.47	0.09	0.56	1.56
VALUE ADDED ($M)	75	73	18	91	166
Type 11A Ratio	1.00	0.98	0.24	1.22	2.22
INCOME ($M)	54	15	3	18	72
Type 11A Ratio	1.00	0.27	0.06	0.33	1.33
EMPL. (No.)	426	174	58	232	658
Type 11A Ratio	1.00	0.41	0.14	0.54	1.54

Note: Totals may have minor discrepancies due to rounding.

Table 5.3 – Average Annual Economic Impacts of the Construction on the NSW Economy ($2025)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT ($M)	256	222	88	310	566
Type 11A Ratio	1.00	0.87	0.35	1.21	2.21
VALUE ADDED ($M)	75	138	63	202	276
Type 11A Ratio	1.00	1.86	0.85	2.71	3.71
INCOME ($M)	54	33	14	48	102
Type 11A Ratio	1.00	0.62	0.26	0.88	1.88
EMPL. (No.)	426	307	178	486	912
Type 11A Ratio	1.00	0.72	0.42	1.14	2.14

Note: Totals may have minor discrepancies due to rounding.

[6] The IO model of the regional economy is based on average annual revenue, expenditure, and employment for each industry sector. So, to model impacts it is necessary to base it on average annual employment impacts rather than peak employment.

In estimating the average annual regional impacts, it is important to separate the flow-on effects that are associated with firms buying goods and services from each other (production-induced effects) and the flow-on effects that are associated with employing people who subsequently buy goods and services as households (consumption-induced effects). This is because these two effects operate in different ways and have different spatial impacts.

Production-induced effects occur in a near-proportional way within a region, whereas the consumption-induced flow-on effects only occur in a proportional way if workers and their families are in the region or migrate into the region. Where workers commute from outside the region, some of the consumption-induced flow-on effects leak from the region.

It is estimated by LLP that approximately 38 per cent of the construction workforce would be sourced from the region, with the remainder residing outside the region and commuting.

Based on the above, it is assumed for this analysis that approximately 62 per cent of the consumption induced expenditure leaks from the region. Consequently, Table 5.2 has been adjusted to only include 38 per cent of consumption-induced flow-ons. Seventy-eight per cent of the workforce are assumed to come from NSW and so 78 per cent of all consumption induced impacts are included in Table 5.3.

The average annual construction impacts of the project on the regional economy are estimated at up to:

- $400M in annual direct and indirect output.
- $166M in annual direct and indirect value-added.
- $72M in annual direct and indirect household income.
- 658 direct and indirect jobs.

The average annual construction impacts of the project on the NSW economy are estimated at up to:

- $566M in annual direct and indirect output.
- $276M in annual direct and indirect value added.
- $102M in annual direct and indirect household income.
- 912 direct and indirect jobs.

The impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy and hence greater production induced and consumption induced flow-on effects.

5.1.2 Multipliers

Multipliers are summary measures used for predicting the total impact on all industries in an economy from changes in the demand for the output of any one industry (ABS, 1995). There are many types of multipliers that can be generated from IO analysis (refer to Annexure 2). Type 11A ratio multipliers summarise the total impact on all industries in an economy in relation to the initial own sector effect e.g. total income effect from an initial income effect and total employment effect from an initial employment effect, etc.

At the regional level, the adjusted type 11A ratio multipliers for the construction workforce of the project range from 1.33 for income up to 2.22 for value added. The NSW type 11A ratio multipliers for the construction workforce range from 1.88 for income up to 3.71 for value added. The multipliers are large for the NSW economy because of the greater level of intersectoral linkages in the larger economy and hence larger level of flow-on impacts i.e., less leakages compared to the regional economy.

5.1.3 Main Sectors Affected

The IO analysis indicates construction is most likely to directly impact the Heavy and Civil Engineering Construction Sector, Construction Services Sector and Non-Residential Building Construction Sector. Flow-on impacts from the construction of the project are likely to affect several different sectors of the regional and NSW economy.

The sectors of the regional economy most impacted by output, value-added, income and employment production induced flow-ons are likely to be as follows:

- Professional, Scientific and Technical Services.
- Wholesale and Retail Trade.
- Cement Lime and Ready-Mixed Concrete Manufacturing.
- Road Transport.
- Non-Residential Property Operators and Real Estate Services.
- Employment, Travel Agency and Other Administrative Services
- Building Cleaning, Pest Control and Other Support Services.

For the NSW economy the Finance sector, and Auxiliary Finance and Insurance sector, are also important production induced flow-on sectors.

Consumption induced flow-on effects in the region will be mainly in the following sectors:

- Retail and Wholesale Trade.
- Food and Beverage Services.
- Health Care Services.
- Actual Rent for Housing.
- Residential Care and Social Assistance.
- Insurance and Superannuation Funds.
- Employment, Travel Agency and Other Administrative Services.
- Primary and Secondary Education.
- Personal Services.

For the NSW economy the Finance; Professional, Scientific and Technical Services; Insurance and Superannuation; Other Services, are also important consumption induced flow-on sectors.

5.2 Temporary worker accommodation

Construction of the temporary worker accommodation would result in spending in the *Non-Residential Building Construction* sector. The impacts from construction of the WAF are a subcomponent of the impact of the project in Section 5.1. Overall, construction of the temporary WAF would represent a minor component of overall construction impacts and has not been assessed separately.

However, the operation of the WAF will also provide some economic activity to the region. The estimated direct and indirect regional economic impact of the WAF operation on the regional economy is reported in Table 5.4.

Table 5.4 –Economic Impacts of the WAF Operation on the Regional Economy ($2025)

	Direct	Production induced	Consumption induced	Total Flow on	TOTAL EFFECT
OUTPUT ($M)	7	3	1	4	12
Type 11A Ratio	1.00	0.47	0.12	0.59	1.59
VALUE ADDED ($M)	1	2	1	3	4
Type 11A Ratio	1.00	1.71	0.49	2.20	3.20
INCOME ($M)	1	1	0.1	1	1
Type 11A Ratio	1.00	0.73	0.17	0.90	1.90
EMPL. (No.)	7	8	2	10	17
Type 11A Ratio	1.00	1.15	0.30	1.45	2.45

Note: Totals may have minor discrepancies due to rounding.

The impacts of the WAF operation on the regional economy are estimated at up to:

- $12M in annual direct and indirect output.
- $4M in annual direct and indirect value-added.
- $1M in annual direct and indirect household income.
- 17 direct and indirect jobs.

The main sectors impacted are Road Transport, Electricity Transmission, Distribution, On Selling and Electricity Market Operation, Public Order and Safety, Building Cleaning, Pest Control and Other Support Services, Personal Services, Water Supply, Sewerage and Drainage Services, Construction Services and Retail Trade.

The assessment of construction impacts in Section 5.1.1 and the operation of the WAF, above, assume that the wages of those residing in the WAF who were sourced from outside the region and outside of NSW, would be spent outside the region and NSW, respectively. However, some portion of the non-local construction workforce wages may be spent in the region. The likelihood and magnitude of this spending is greater the more integrated the WAF is with the Lithgow township. However, the overall magnitude of this spending is likely to be a small component of the regional economic impacts of the project.

5.3 Other impacts

The construction of the proposed project will create demand for regional labour resources and regional inputs to production. Where there is excess capacity in the regional economy, or the region has access to labour and other resources from outside the region this demand will increase economic activity in the region as per the above analysis.

Non-marginal changes in labour demand from an individual project can in the short run potentially lead to increased construction wages, attraction of workers from other relevant sectors of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), rising prices as firms pass wage costs onto consumers etc. The extent of these impacts for regional economies will depend on the balance of labour supply from inside the region, outside the region and drive-in drive-out (DIDO)/fly-in fly-out (FIFO), as well as adjustment of the overall labour market to respond to increased demand, e.g. increased labour force participation.

In addition, in the short run excess demand for inputs to construction of an individual project such as quarry materials, concrete etc can result in rising costs for these factor inputs and potentially shortages for other uses.

Whether, and the extent to which these types of effects will arise from an individual project is uncertain. For this project where direct average annual construction demand during the peak year of construction is for in the order of 426 workers in a region with a labour force of 8,790, some observable price effects may occur. However, 62 per cent of the construction workforce is estimated to be sourced from outside the region and utilise a construction camp. Consequently, any local price effects will be moderated. Furthermore, any "crowding out" of other economic activities represents the operation of the market system where scarce resources are reallocated to where they are most highly valued and where society will benefit the most from them. This reallocation of resources is therefore a positive impact for the economy not a negative.

6 OPERATION IMPACTS

6.1 Project benefits

The Australian and State Governments are managing significant changes in electricity generation within the National Electricity Market (NEM). As Australia progresses towards a net zero emissions future, coal-fired and other fossil fuel-based generation are being replaced by renewable energy sources, energy storage, and other forms of firming capacity.

The project would provide significant scale, deep storage and flexible, dispatchable generation to serve NSW's energy reliability needs and the objectives of the NSW Electricity Infrastructure Roadmap (the Roadmap) and the *Electricity Infrastructure Investment Act 2020* (EII Act). Roadmap and the EII Act. The benefits of pumped hydro energy generation and LDS in a market dominated by intermittent variable renewable generation are significant. This technology can help to address the challenges posed by the intermittency and variability of wind and solar power, while also improving grid flexibility, reliability and resiliency. By reducing the need for fossil fuel-based peaking power plants and improving overall system efficiency, pumped hydro and LDS can also help to lower the cost of electricity and greenhouse gas emissions. The direct benefits of the project include:

- ability to store excess electricity from renewable resources for later use.
- increased flexibility in operation of the electricity grid.
- improved reliability and resiliency.
- cost savings.
- environmental benefits related to reducing demand on fossil fuel-based sources of energy and associated reductions in other greenhouse gas emissions.

6.2 The project

6.2.1 Impacts

On this basis the total and disaggregated average annual impacts of the project on the regional and NSW economy (in 2025 dollars) is shown in Tables 6.1 and 6.2.

Table 6.1 – Annual Economic Impacts of the project on the Regional Economy ($2025)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($M)	250	37	3	40	290
Type 11A Ratio	1.00	0.15	0.01	0.16	1.16
VALUE ADDED ($M)	212	23	2	25	237
Type 11A Ratio	1.00	0.11	0.01	0.12	1.12
INCOME ($M)	2	2	0.4	3	4
Type 11A Ratio	1.00	1.21	0.20	1.41	2.41
EMPL. (No.)	20	24	6	30	50
Type 11A Ratio	1.00	1.19	0.32	1.51	2.51

Table 6.2 – Annual Economic Impacts of the project on the NSW Economy ($2025)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($M)	250	48	7	56	306
Type 11A Ratio	1.00	0.19	0.03	0.22	1.22
VALUE ADDED ($M)	210	30	5	36	246
Type 11A Ratio	1.00	0.14	0.03	0.17	1.17
INCOME ($M)	2	5	1.2	6	8
Type 11A Ratio	1.00	2.46	0.65	3.10	4.10
EMPL. (No.)	20	37	15	52	72
Type 11A Ratio	1.00	1.86	0.76	2.61	3.61

The project operation is estimated to make up to the following total annual contribution to the regional economy:

- $290M in annual direct and indirect regional output.
- $237M in annual direct and indirect regional value-added.
- $4M in annual direct and indirect household income.
- 50 direct and indirect jobs.

The project operation is estimated to make up to the following total annual contribution to the NSW economy:

- $306M in annual direct and indirect regional output.
- $246M in annual direct and indirect regional value-added.
- $8M in annual direct and indirect household income.
- 72 direct and indirect jobs.

The impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy.

6.2.2 Multipliers

The Type 11A ratio multipliers for the project's impact on the regional economy range from 1.12 for value-added up to 2.51 for employment. Capital intensive developments tend to have a high level of linkage with other sectors in an economy thus contributing relatively high rates of flow-on employment and income while at the same time only having a lower level of direct employment and income (relative to output levels). This tends to lead to a relatively high ratio multiplier for employment and income. The project also has a relatively low ratio multiplier for output and value-added reflecting the relatively high direct output and value-added compared to that in flow-on sectors.

The NSW Type 11A ratio multipliers for the project range from 1.17 for value-added up to 4.10 for income. The multipliers are large for the NSW economy because of the greater level of intersectoral linkages in the larger economy and hence larger level of flow-on impacts i.e. less leakages compared to the regional economy.

6.2.3 Main Sectors Affected

The sectors of the regional economy most impacted by output, value-added, income and employment production induced flow-ons are likely to be as follows:

- Electricity Transmission, Distribution, On Selling and Electricity Market Operation.
- Finance.
- Construction Services.

- Electricity Generation.
- Professional, Scientific and Technical Services.
- Employment, Travel Agency and Other Administrative Services.
- Wholesale Trade.
- Rental and Hiring Services (except Real Estate).
- Road Transport.
- Retail Trade.
- Food and Beverage Services.

For the NSW economy the Computer Systems Design and Related Services, and Auxiliary Finance and Insurance are also important production induced flow-on sectors.

Consumption induced flow-on effects in the region will be mainly in the following sectors:

- Retail and Wholesale Trade.
- Food and Beverage Services.
- Health Care Services.
- Actual Rent for Housing.
- Primary and Secondary Education.
- Employment, Travel Agency and Other Administrative Services.
- Residential Care and Social Assistance.
- Insurance and Superannuation Funds.

For the NSW economy the Finance; Professional, Scientific and Technical Services; and Other Services sectors are also important consumption induced flow-on sectors.

6.3 Other impacts

The operation of the project will create a very small demand for regional labour resources (20 direct jobs in a labour market of 8,790) and regional inputs to production (that from the IO analysis represent less than 1% of interindustry transactions in the region). Consequently, no material "crowding out" effects on other industry sectors are anticipated.

7 DECOMMISSIONING IMPACTS

At the end of the operating life of the project the proponent may:

- upgrade or replace the pumped hydro infrastructure.
- remove the pumped hydro infrastructure and rehabilitate the site.

However, from an economic impact perspective both will provide stimulus to the regional and NSW economy via spending on inputs to refurbishment or decommissioning, and demand for labour and associated wage expenditure. These economic impacts would only be short-term and less than those associated with the construction of the project.

8 CUMULATIVE IMPACTS

8.1 Approach to cumulative impacts

The cumulative impact assessment approach involves considering the impacts of the project together with the impacts of other relevant future projects on economic activity. Relevant major projects nearby the project area with the potential for cumulative impacts with the project are identified in Table 8.1.

The cumulative impact of multiple projects in the region will see the magnification of impacts addressed in this report and competition for resources. These are discussed qualitatively below based on general principles of supply and demand and reference to available reports on cumulative impacts of regional projects.

Table 8.1 Significant projects in the Region

Project	Approximate straight-line distance from project	Project status	Indicative construction timing	Indicative operational timing	Indicative construction workforce (average & peak)	Indicative operational workforce (average & peak)	LGA
Wallerawang Battery Energy Storage System (SSD-14540514)	6.2 km north	Approved – MOD submitted	• Construction: 12–24-month period from Q2 2026 (overlaps project construction)	Operation: 2028—2053 (overlaps project construction and operation)	100 (peak)	5	Lithgow City Council
Great Western Highway Blackheath to Little Hartley (SSI-22004371)	10.4 km south-east	On hold	Project on hold with no forecasted timeframe for recommencement		900 (peak) 100 (average)	Unknown	Lithgow City Council, Blue Mountains City Council
Mt Piper Battery Energy Storage System (SSD-50903958)	13.4 km north-west	Approved – not yet constructed	• Construction: 18–24-month period from 2026 (overlaps project construction)	Operation: 2028—2053 (overlaps project construction and operation)	200 (peak)	0 (average) 2 (routine maintenance)	Lithgow City Council
Great Western Battery Energy Storage System (SSD-12346552)	8.3 km north	Approved—not yet constructed	• Construction: 12–16-month period (overlaps project construction)	Operation: 2028—2048 (overlaps project construction and operation)	Unknown	5-6	Lithgow City Council
Wallerawang Quarry (MOD 4) (DA344-11-2001)	4.4 km north	Operational – Modification under assessment		Operation: current – 2050 (overlaps project construction and operation)	Unknown	Unknown	Lithgow City Council

Project	Approximate straight-line distance from project	Project status	Indicative construction timing	Indicative operational timing	Indicative construction workforce (average & peak)	Indicative operational workforce (average & peak)	LGA
Mount Piper to Wallerawang Transmission Line Upgrade Project (SSI-70279722)	8.5 km north	Proposed – response to submissions	Construction: 20-month period from 2026 (overlaps project construction)		150 (peak) 60 (average)	Unknown Regular maintenance required	Lithgow City Council
Ben Bullen Wind Farm (SSD-79294216)	24 km north-west	Proposed – EIS in preparation	Construction: 12 – 24-month period from 2028 (overlaps project construction)	Operation: 2030 – 2065. (overlaps project construction and operation)	200 (peak)	15 FTE	Lithgow City Council
Sunny Corner Wind Farm (SSD-80027992)	15.2 km north-west	Proposed – EIS in preparation	construction: 36-month period from 2027 (overlaps project construction)	Operation: 2032 – 2062 (overlaps project operation)	475 (peak)	35 (peak)	Lithgow City Council
Mount Lambie Wind Farm (SSD-86097208)	4.9 km west	Proposed – EIS in preparation	construction: 18-month period from 2027 (overlaps project construction)	Operation:2029 – 2034 (overlaps project construction and operation)	150 (peak)	6-8	Lithgow City Council
Pinecrest Battery Energy Storage System (SSD-83308708)	9.7 km north	Proposed – EIS in preparation	Construction: 18-month period from Q4 2026 (overlaps project construction)	Operation: 2028 – 2053 (overlaps project construction and operation)	250 (peak)	5	Lithgow City Council

Project	Approximate straight-line distance from project	Project status	Indicative construction timing	Indicative operational timing	Indicative construction workforce (average & peak)	Indicative operational workforce (average & peak)	LGA
Marrangaroo Quartzite Quarry Extension	2.8 km north	Operational – EIS in preparation for extension of operations		Operation: current – 2056 (overlaps project construction and operation)	Unknown	9 FTE	Lithgow City Council
Angus Place Coal Mine (MP06_0021)	10.7 km north	Operational – MOD submitted		Operation: current – 2046 (overlaps project construction and operation)	Unknown	Unknown	Lithgow City Council
Mount Piper Power Station (DA80/10060)	13.2 km north-west	Operational – MOD submitted		Operation: current – 2040 (overlaps project construction and operation)	N/A	250 (direct and indirect)	Lithgow City Council
Springvale coal mine (SSD-5594)	10.17 km north-east	Operational		Operation: current – 2040 (rehabilitation thereafter) (overlaps project construction and operation)	N/A	310 FTE	Lithgow City Council
Springvale Water Treatment Facility (SSD-7592)	9.4 km north	Operational – MOD submitted		Operation: current – unknown (overlaps project construction and operation)	N/A	22	Lithgow City Council

Project	Approximate straight-line distance from project	Project status	Indicative construction timing	Indicative operational timing	Indicative construction workforce (average & peak)	Indicative operational workforce (average & peak)	LGA
Western Coal Services (SSD-5579)	12.8 km north-west	Operational – MOD submitted		Operation: current – 2040 (consent end date) (overlaps project construction and operation)	N/A	Unknown	Lithgow City Council

8.2 Potential cumulative impacts

8.2.1 Initial Cumulative Labour Stimulus

The main cumulative economic impact of these projects is to generate a large demand for a suitably qualified construction workforce in the region.

This labour demand will be met from:

- the region:
  - the unemployment pool.
  - increased labour force participation.
  - workers from other industries.
- the rest of NSW and Australia, with labour:
  - moving into the region to live during the employment period; or
  - commuting from outside the region e.g. Fly-in-fly-out (FIFO) and Drive-in-drive-out (DIDO).

8.2.2 Population Impact

It is unlikely all the cumulative labour demand can be met from the existing residents of the region, only. To the extent that the cumulative job stimulus results in workers (and their families) relocating to regional areas, even temporarily, or workers from the region not emigrating from the region in search of work, this can provide population growth (or abate population decline), including in areas experiencing population decline. Trends in regional economies of NSW (because of globalization and associated structural adjustment) has resulted in many non-coastal rural areas in NSW experiencing population stagnation or decline. There has also been stagnation or decline in the population of smaller towns even in regions where the population has been growing.

Population growth is an important driver of the health of regional economies. Places that can attract population immigration create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a 'vicious cycle' of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen 1990).

8.2.3 Accommodation Impacts

Cumulative regional population changes driven by cumulative regional employment growth will increase demand for short-term and long-term accommodation. The impacts can be increases in housing prices and rents, and shortages of short-term accommodation that might otherwise be used for tourism or other purposes.

From an economic perspective, increases in the cost of housing are predominantly a transfer between local owners and renters, or local owners and buyers. The existing homeowners and accommodation providers of the property benefit when this happens, and the renters/buyers experience increased costs (DAE, 2012). However, price rises also impact lower income households who may get squeezed out of the market. In situations where there are no market distortions, and cumulative population changes are longer term, the local housing supply would normally adjust to demand, and prices return to their previous levels (DAE, 2012). However, given the more temporary nature of population change due to construction projects, normal longer term housing supply adjustments may be tempered and so there may be a need to encourage and facilitate the provision by the private sector of additional accommodation including temporary workforce camps, adaptive reuse or extension of existing buildings, use of existing granny flats and spare bedrooms, use of vacant housing etc.

The extent of residual housing price impacts for regional economies would depend on the balance of labour supply from inside the region, outside the region and DIDO/FIFO, the level of provision by the private sector of WAFs across multiple projects, and other accommodation options, as well as adjustment of the overall housing supply in response to increased demand. Early provision of additional accommodation across multiple projects can reduce housing price impacts.

8.2.4 Regional Job Growth

Cumulative demand for labour in regional areas can help address the jobs growth imbalance between Australia's biggest cities which have grown by an average of 2.4 per cent per annum since 2000 and the regions which have grown at 1.0 per cent per annum (Sobyra, 2022). This imbalance has been attributed to the economy creating relatively more demand for high skilled jobs than previously with the vast majority of these located in big cities rather than regions (Sobyra, 2022).

Regional jobs growth from the cumulative project demand can partly offset this trend by providing opportunities for the existing and future regional workforces, attracting middle-and high-skilled workers and families to regional areas, reducing outmigration of the regional workforce to look for employment in cities, and increase regional labour force participation. Regional projects can therefore provide a boom to non-coastal regional economies that have experienced low growth or decline because of globalisation and associated structural adjustment.

8.2.5 Stimulus to Regional Economic Activity

Cumulative projects in regional NSW will provide a substantial boost in direct economic activity in the region as well as flow-on economic activity to businesses that are able to supply the goods and services:

- required for project construction and operation; and
- demanded by workers i.e. expenditure of wages.

Based on the Economic Assessment in Sections 5, 6 and 7 cumulative project construction is most likely to directly impact the heavy and civil engineering construction sector, construction services sector and non-residential building construction sector, and will indirectly impact a range of sectors.

However, any business that can provide the goods and services demanded for project construction and operation, and by workers, will benefit from the cumulative economic activity.

8.2.6 Impacts on Other Sectors of the Economy

Notwithstanding the above, cumulative demand for construction workers can in the short run lead to increased construction sector (and other sector) wages, attraction of workers from other relevant sectors of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), rising costs as firms pass wage costs onto consumers etc.

In addition, in the short run, excess demand for inputs to construction such as quarry materials, concrete etc can result in rising costs (prices) for these factor inputs and potentially shortages for other uses. The extent of these short run impacts for regional economies would depend on the balance of labour supply from inside the region, outside the region and DIDO/FIFO, as well as adjustment of the overall labour market, and other markets, in response to increased demand. However, in the medium-term markets will adjust to some extent (e.g. increased labour force participation, new quarry proposals to supply demand for aggregate etc) and enable wages and prices to return to previous levels.

Notwithstanding, any price increases and crowding out of other economic activities in the region represents the operation of the market system where scarce resources are reallocated to where they are most highly valued and where society would benefit the most from them. This reallocation of resources is therefore a positive thing for the economy not a negative. Notwithstanding, it may be associated with social impacts.

8.2.7 Mitigation Measures

The magnitude and duration of cumulative wage, price and supply shortages will largely depend on the ability of the labour, housing, and other markets to make supply adjustments.

Greater use of FIFO/DIDO labour will reduce impacts on the regional labour market (wage increases and labour shortages) and accommodation market (price/rent increases) but will also reduce regional economic activity benefits, because FIFO/DIDI workers will repatriate most of their income back to their home region.

The ability of the labour, housing, and other markets to make timely supply adjustments, may in some instances (e.g. housing supply adjustments, new quarry proposals) be impacted by local planning systems, and so Council's should be cognisant of the planning required to facilitate market adjustments in housing and other markets.

9 MITIGATION AND MANAGEMENT MEASURES

It is evident from Section 5 and 6 that the project will provide regional economic activity to a region that has only been experiencing modest growth over time.

LLP propose to work in partnership with the local council and community to help maximise the projected economic regional benefits whilst minimising any adverse impacts. In this respect, a range of general economic mitigation and management measures are proposed and would include:

- Employment of regional residents where they have the required skills and experience.
- Participating, as appropriate, in business groups, events or programs in the regional community.
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- Establishment of a Community Benefit Fund (or equivalent) to be managed through a Voluntary Community Benefits Program coordinated with Lithgow City Council with the intention of supporting local non-profit organisations, community programs/events, local businesses, training, and services/infrastructure.

The Social Impact Assessment (appended to the EIS) provides additional management measures which are relevant to the impacts discussed in this report.

10 CONCLUSION

The project will support Australia's transition to net zero emissions by providing reliable and flexible energy storage, helping to address challenges from the increased use of renewable energy and enhancing grid reliability and resilience.

The project will also provide economic activity to the regional economy during the construction, operation and decommissioning phases, with the most economic activity provided during the five-year construction phase.

EnergyAustralia and EDF propose to work in partnership with local councils and the local community so that, as far as possible, the benefits of the projected economic growth in the region are maximised and impacts minimised. In this respect, a range of general economic impact mitigation and management measures are proposed.

11 REFERENCES

Australian Bureau of Statistics (1995) *Information Paper Australian National Accounts Introduction to Input-Output Multipliers*. Cat. No. 5246.0.

Australian Bureau of Statistics, *2021 Census of Population and Housing, Community Profiles*.

Australian Bureau of Statistics, *2021 Census of Population and Housing, Working Population Profiles*.

Deloitte Access Economics (2012) Economic and social impacts of the Warkworth Extension Project, prepared for Singleton Council.

IBISworld (2024) *Hydro-Electricity Generation in Australia, Industry Report*.

.id, (2024) *Lithgow LGA profile,* https://id.com.au.

NSW Department of Planning and Environment (2022) *NSW Population Projections*, Planning Portal, pp.planningportal.nsw.gov.au/populations

Sorensen, A.D. (1990) Virtuous Cycles of Growth and Vicious Cycles of Decline: Regional Economic Change in Northern NSW. In *Change and Adjustment in Northern New South Wales*. Ed D.J. Walmsley, University of New England, Armidale.

West, G. (1993) *Input-Output Analysis for Practitioners, Version 7.1, User's Guide*.

ANNEXURE 1 – THE GRIT SYSTEM FOR GENERATING INPUT-OUTPUT TABLES

The Generation of Regional Input-Output Tables (GRIT) system was designed to:

- combine the benefits of survey-based tables (accuracy and understanding of the economic structure) with those of non-survey tables (speed and low cost).
- enable the tables to be compiled from other recently compiled tables.
- allow tables to be constructed for any region for which certain minimum amounts of data were available.
- develop regional tables from national tables using available region-specific data.
- produce tables consistent with the national tables in terms of sector classification and accounting conventions.
- proceed in a number of clearly defined stages.
- provide for the possibility of ready updates of the tables.

The resultant GRIT procedure has a number of well-defined steps. Of particular significance are those that involve the analyst incorporating region-specific data and information specific to the objectives of the study. The analyst has to be satisfied about the accuracy of the information used for the important sectors. The method allows the analyst to allocate available research resources to improving the data for those sectors of the economy that are most important for the study.

An important characteristic of GRIT-produced tables relates to their accuracy. In the past, survey-based tables involved gathering data for every cell in the table, thereby building up a table with considerable accuracy. A fundamental principle of the GRIT method is that not all cells in the table are equally important. Some are not important because they are of very small value and, therefore, have no possibility of having a significant effect on the estimates of multipliers and economic impacts. Others are not important because of the lack of linkages that relate to the particular sectors that are being studied. Therefore, the GRIT procedure involves determining those sectors and, in some cases, cells that are of particular significance for the analysis. These represent the main targets for the allocation of research resources in data gathering. For the remainder of the table, the aim is for it to be 'holistically' accurate (Jensen, 1980). This means a generally accurate representation of the economy is provided by the table, but does not guarantee the accuracy of any particular cell. A summary of the steps involved in the GRIT process is shown in Table A1.1 (Powell and Chalmers, 1995).

Table A1.1

The GRIT Method

Phase	Step	Action
PHASE I		ADJUSTMENTS TO NATIONAL TABLE
	1	Selection of national input-output table (1114-sector table with direct allocation of all imports, in basic values).
	2	Adjustment of national table for updating.
	3	Adjustment for international trade.
PHASE II		ADJUSTMENTS FOR REGIONAL IMPORTS
		(*Steps 4-14 apply to each region for which input-output tables are required*)
	4	Calculation of 'non-existent' sectors.
	5	Calculation of remaining imports.
PHASE III		DEFINITION OF REGIONAL SECTORS
	6	Insertion of disaggregated superior data.
	7	Aggregation of sectors.
	8	Insertion of aggregated superior data.
PHASE IV		DERIVATION OF PROTOTYPE TRANSACTIONS TABLES
	9	Derivation of transactions values.
	10	Adjustments to complete the prototype tables.
	11	Derivation of inverses and multipliers for prototype tables.
PHASE V		DERIVATION OF FINAL TRANSACTIONS TABLES
	12	Final superior data insertions and other adjustments.
	13	Derivation of final transactions tables.
	14	Derivation of inverses and multipliers for final tables.

Source: Bayne and West (1988).

REFERENCES

Bayne, B. and West, G. (1988) *GRIT – Generation of Regional Input-Output Tables: Users Reference Manual*. Australian Regional Developments No. 15, Office of Local Government, Department of Immigration, Local Government and Ethnic Affairs, AGPS.

Jensen, G. (1980) The concept of accuracy in regional input-output models. *International Regional Science Review*, 5:2, pp.139-54.

Powell, R. and Chalmers, L. (1995) *The Regional Economic Impact of Gibraltar Range and Dorrigo National Park*. A Report for the NSW National Parks and Wildlife Service.

ANNEXURE 2 – UNDERLYING ASSUMPTIONS AND INTERPRETATIONS OF INPUT-OUTPUT ANALYSIS AND MULTIPLIERS

1. "The *basic assumptions* in IO analysis include the following:

   - there is a fixed input structure in each industry, described by fixed technological coefficients (evidence from comparisons between IO tables for the same country over time have indicated that material input requirements tend to be stable and change but slowly; however, requirements for primary factors of production, that is labour and capital, are probably less constant).
   - all products of an industry are identical or are made in fixed proportions to each other.
   - each industry exhibits constant returns to scale in production.
   - unlimited labour and capital are available at fixed prices; that is, any change in the demand for productive factors will not induce any change in their cost (in reality, constraints such as limited skilled labour or investment funds lead to competition for resources among industries, which in turn raises the prices of these scarce factors of production and of industry output generally in the face of strong demand).
   - there are no other constraints, such as the balance of payments or the actions of government, on the response of each industry to a stimulus.

2. The multipliers therefore describe *average effects, not marginal effects*, and thus do not take account of economies of scale, unused capacity or technological change. Generally, average effects are expected to be higher than the marginal effects.

3. The IO tables underlying multiplier analysis only take account of one form of *interdependence***,** namely the sales and purchase links between industries. Other interdependence such as collective competition for factors of production, changes in commodity prices which induce producers and consumers to alter the mix of their purchases and other constraints which operate on the economy as a whole are not generally taken into account.

4. The combination of the assumptions used and the excluded interdependence means that IO multipliers are higher than would realistically be the case. In other words, they tend to *overstate* the potential impact of final demand stimulus. The overstatement is potentially more serious when large changes in demand and production are considered.

5. The multipliers also do not account for some important pre-existing conditions. This is especially true of Type II multipliers, in which employment generated and income earned induce further increases in demand. The implicit assumption is that those taken into employment were previously unemployed and were previously consuming nothing. In reality, however, not all 'new' employment would be drawn from the ranks of the unemployed; and to the extent that it was, those previously unemployed would presumably have consumed out of income support measures and personal savings. Employment, output and income responses are therefore overstated by the multipliers for these additional reasons.

6. The most *appropriate interpretation* of multipliers is that they provide a relative measure (to be compared with other industries) of the interdependence between one industry and the rest of the economy which arises solely from purchases and sales of industry output based on estimates of transactions occurring over a (recent) historical period. Progressive departure from these conditions would progressively reduce the precision of multipliers as predictive device" (ABS 1995, p.24).

To overcome some of the limitations of standard IO analysis, this project uses the program *EconImp2* which uses marginal technical coefficients rather than average coefficients to assess flow-on impacts and multipliers.

Multipliers indicate the total impact of changes in demand for the output of any one industry on all industries in an economy (ABS, 1995). Conventional output, employment, value-added and income multipliers show the output, employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

Components of the conventional output multiplier are as follows:

Initial effect - which is the initial output stimulus, usually a $1 change in output from a particular industry (Powell and Chalmers, 1995; ABS, 1995).

First round effects - the amount of output from all intermediate sectors of the economy required to produce the initial $1 change in output from the particular industry (Powell and Chalmers, 1995; ABS, 1995).

Industrial support effects - the subsequent or induced extra output from intermediate sectors arising from the first round effects (Powell and Chalmers, 1995; ABS, 1995).

Production induced effects - the sum of the first round effects and industrial support effects (i.e. the total amount of output from all industries in the economy required to produce the initial $1 change in output) (Powell and Chalmers, 1995; ABS, 1995).

Consumption induced effects - the spending by households of the extra income they derive from the production of the extra $1 of output and production induced effects. This spending in turn generates further production by industries (Powell and Chalmers, 1995; ABS, 1995).

The *simple multiplier* is the initial effect plus the production induced effects.

The *total multiplier* is the sum of the initial effect plus the production-induced effect and consumption-induced effect.

Conventional employment, value-added and income multipliers have similar components to the output multiplier, however, through conversion using the respective coefficients show the employment, value-added and income responses to an initial output stimulus (Jensen and West, 1986).

For employment, value-added and income, it is also possible to derive relationships between the initial or own sector effect and flow-on effects. For example, the flow-on income effects from an initial income effect or the flow-on employment effects from an initial employment effect, etc. These own sector relationships are referred to as ratio multipliers, although they are not technically multipliers because there is no direct line of causation between the elements of the multiplier. For instance, it is not the initial change in income that leads to income flow-on effects, both are the result of an output stimulus (Jensen and West, 1986).

A description of the different ratio multipliers is given below.

$$\text{Type 1A Ratio Multiplier} = \frac{\text{Initial + First Round Effects}}{\text{Initial Effects}}$$

$$\text{Type 1B Ratio Multiplier} = \frac{\text{Initial + Production Induced Effects}}{\text{Initial Effects}}$$

$$\text{Type 11A Ratio Multiplier} = \frac{\text{Initial + Production Induced + Consumption Induced Effects}}{\text{Initial Effects}}$$

$$\text{Type 11B Ratio Multiplier} = \frac{\text{Flow-on Effects}}{\text{Initial Effects}}$$

Source: Centre for Farm Planning and Land Management (1989).

REFERENCES

Australian Bureau of Statistics (1995) Information Paper Australian National Accounts Introduction to Input-Output Multipliers. Cat. No. 5246.0.

Centre for Farm Planning and Land Management (1989) *Consultants report to State plantations impact study*. CFPLM, University of Melbourne.

Jensen, R. and West, G. (1986) *Input-output for Practitioners: Theory and Applications*. Prepared for Department of Local Government and Administrative Services, Local Government and Regional Development Division, Australian Government Publishing Service.

Powell, R. and Chalmers, L. (1995) *The Regional Economic Impact of Gibraltar Range and Dorrigo National Park*. A Report for the NSW National Parks and Wildlife Service.

EMM

creating opportunities

www.emmconsulting.com.au