

**Paling Yards  
Wind Farm  
Economic Assessment**

*Prepared for*

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## EXECUTIVE SUMMARY

Global Power Generation Australia Pty Ltd (GPG), through its wholly owned subsidiary Paling Yards Development Pty Ltd (PYDPL or Proponent) proposes to construct and operate the Paling Yards Wind Farm (the Project). The Project would consist of up to 47 wind turbines and supporting infrastructure. The Project would have a total generation capacity of up to 287 megawatts (MW) of electricity. It aligns with several key commonwealth, state and local government policies and directives. The Project aims to contribute to transition across the National Electricity Market to low-emission energy sources.

The Project is a State Significant Development (SSD). An environmental impact statement (EIS) is a requirement of the approval process. This Economic Assessment report forms part of the EIS.

The Project will provide economic activity to the regional economy of Oberon, Upper Lachlan, and Goulburn Mulwaree Local Government Areas, during both the construction and operation phase. These regional economic impacts were assessed using Input-Output analysis.

The average annual construction impacts of the Project on the regional economy are estimated at between:

- \$41M in annual direct and indirect output.
- \$17M in annual direct and indirect value-added.
- \$7M in annual direct and indirect household income.
- 94 direct and indirect jobs.

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

- \$70M in annual direct and indirect output.
- \$32M in annual direct and indirect value added.
- \$19M in annual direct and indirect household income.
- 152 direct and indirect jobs.

The project is estimated to make up to the following total annual contribution to the regional economy:<sup>1</sup>

- \$40M in annual direct and indirect regional value-added.
- \$3M in annual direct and indirect household income.
- 43 direct and indirect jobs.

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

- \$46M in annual direct and indirect regional value-added.
- \$8M in annual direct and indirect household income.
- 65 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.

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<sup>1</sup> Note that Output is not reported for the operation phase for reasons of commercial confidentiality.

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.

While there might be negligible loss of potential agricultural activity for the host properties, this is a private economic decision made by the landholders for which they are compensated. The regional economic activity impacts of potential foregone agricultural activity are negligible and significantly less than those of the construction and operation of the Project. Therefore, as well as increased benefit to the private landholders, in terms of economic activity, the regional economy will also be better-off. Impacts on agricultural activity are for the term of the project and will not impact the capability of the land for future agricultural production.

GPG proposes to work in partnership with the Oberon Council and the local community to help maximise the projected regional economic benefits whilst minimising any impacts. In this respect, a range of general economic management measures are proposed and would include:

- Employment of regional residents preferentially where they have the required skills and experience and can demonstrate a cultural fit with the organisation.
- Participating, as appropriate, in business group meetings, events or programs in the regional community.
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- A neighbouring property benefit scheme so the eligible properties neighbouring the wind farm site see a direct benefit from the project.
- Provision of community grants through various initiatives and programs within the local community, including the education, arts, sporting, and culture sectors.

A Voluntary Planning Agreement (VPA) will be offered to Oberon Council generally in accordance with Division 7.1(a) of Part 7 of the EP&A Act. Payments to council can then be directed to a range of community infrastructure needs and programs.

# 1 Introduction

## 1.1 Project overview

Global Power Generation Australia Pty Ltd (GPG), through its wholly owned subsidiary Paling Yards Development Pty Ltd (PYDPL or Proponent) is seeking approval for the construction, operation, and decommissioning of the Paling Yards Wind Farm (Project).

The Project is located at the western extent of the Great Dividing Range in NSW, 60km south of Oberon, 60km north of Goulburn and approximately 140km west of Sydney.

The project includes the following key components:

- up to three (3) wind monitoring masts fitted with the associated instruments.
- up to forty-seven (47) Wind Turbines Generators (WTG) with an overall maximum blade tip height of 240m and a total of three blades per turbine.
- on-site electrical substations (collector substation and connection substation) with approximately 9km of overhead powerline to connect to the Mount Piper to Bannaby 500kV transmission line (including control room and other associated grid connection facilities).
- a control room, maintenance buildings, switchgear, and associated control systems in the vicinity of the wind turbine towers.

The Project would have a total generation capacity of up to 287 megawatts (MW) of electricity.

At the end of its practical life, the wind farm would be decommissioned, and the site returned to its pre-existing land use in consultation with the affected landholders.

## 1.2 Site context

The Project location is shown in Figure 1.1. The Project site includes four separate land holdings referred to as 'Mingary Park', 'Paling Yards', 'Middle Station' and 'Hilltop'. Most of the site has been cleared of native vegetation, although scattered trees are common within the site, and thicker vegetation exists near the boundaries. The topography is heavily undulating with some steep slopes. The site includes several ephemeral creeks and drainage lines across the site, which drains into Abercrombie River which forms the southern boundary of the site. The site is primarily used for agricultural purposes such as sheep and cattle grazing.

The site is bisected by Abercrombie Road, which links the towns of Oberon and Taralga. Abercrombie National Park borders the site to the west and south. The site is bordered by national parks and uncleared land to the south-east all of which are heavily vegetated. To the east of the site is the Wiabarborough Nature Reserve and Blue Mountains National Park.

## 1.3 Policy context

The Project aligns with several key commonwealth, state and local government policies and directives, including:

- The 2015 United Nations Framework Convention on Climate Change – the "Paris Agreement".
- The Commonwealth governments Technology Investment Roadmap: First Low Emissions Technology Statement – 2020.
- Australia's Long-Term Emissions Reduction Plan: A whole-of-economy Plan to achieve net zero by 2050.

- The Australian Energy Market Operator’s (AEMO) Integrated System Plan (ISP).
- NSW Electricity Strategy (2020).
- NSW Net Zero Plan Stage 1: 2020-2030.
- NSW Electricity Infrastructure Roadmap 2020.
- Central West and Orana Regional Plan 2036.
- Oberon Local Strategic Planning Statement 2040 – Oberon - More than You Imagine

The NSW Government’s Electricity Strategy 2020 and Electricity Infrastructure Roadmap 2020 set out a plan to deliver the state’s first five Renewable Energy Zones (REZs). The Central-West Orana REZ is the first REZ and is expected to unlock 3 gigawatts of new network capacity by the mid-2000s. The Project is located within the Central-West Orana REZ.

The Project aims to contribute to transition across the National Electricity Market to low-emission energy sources.

### 1.4 Purpose of this report

The capital value of the Project would be more than \$30 million. Accordingly, the Project is a State Significant Development (SSD) under the *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP SR&D) and Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Under Section 4.12(8) of the EP&A Act, a development application (DA) for SSD must be accompanied by an environmental impact statement (EIS) that is lodged with the NSW Department of Planning, Industry and Environment for Development Consent.

The Project was also referred to the Commonwealth Department of Environment and Heritage for potential impacts to matters of national environmental significance protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In March 2005 the Minister determined that the Project was not a controlled action and approval under Part 9 of the EPBC Act was not required.

This report has been prepared to inform the environmental impact statement (EIS) and development application (DA) for the Project under the NSW EP&A Act.

### 1.5 Assessment guidelines and requirements

The Economic Assessment was prepared in accordance with the requirements of the NSW Department of Planning, Industry and Environment (DPIE), which are set out in the Secretary’s Environmental Assessment Requirements (SEARs) for the Project, dated 9 June 2020. The SEARs identify matters which must be addressed in the EIS. Table 1.1 lists the individual requirements relevant to this Economic Assessment and where they are addressed in this report.

**Table 1.1 - Relevant Matters Raised in SEARs**

Requirement	Section addressed
The EIS must include and assessment of:	
Any benefits of the economic impacts or benefits of the project for the region and State as a whole	Chapter 4 of this report.
including consideration of any increase in demand for community infrastructure services.	Refer Social Impact Assessment prepared as part of the EIS.
And details of how the construction workforce will be managed to minimise local impacts, including a consideration of the construction workforce accommodation	Refer Social Impact Assessment prepared as part of the EIS.

To inform preparation of the SEARs, DPIE invited relevant government agencies to advise on matters to be addressed in the EIS. These matters were considered by the Secretary for DPIE when preparing the SEARs.

There are no economic assessment guidelines for wind farms.

## **1.6 Structure of the report**

This report is structured as follows:

- Section 2 provides an overview of the regional economy.
- Section 3 assesses the economic impacts of the Project on the regional economy.
- Section 4 identifies measures to manage economic impacts.
- Conclusions are provided in Section 5.

Figure 1.1 – Project Location

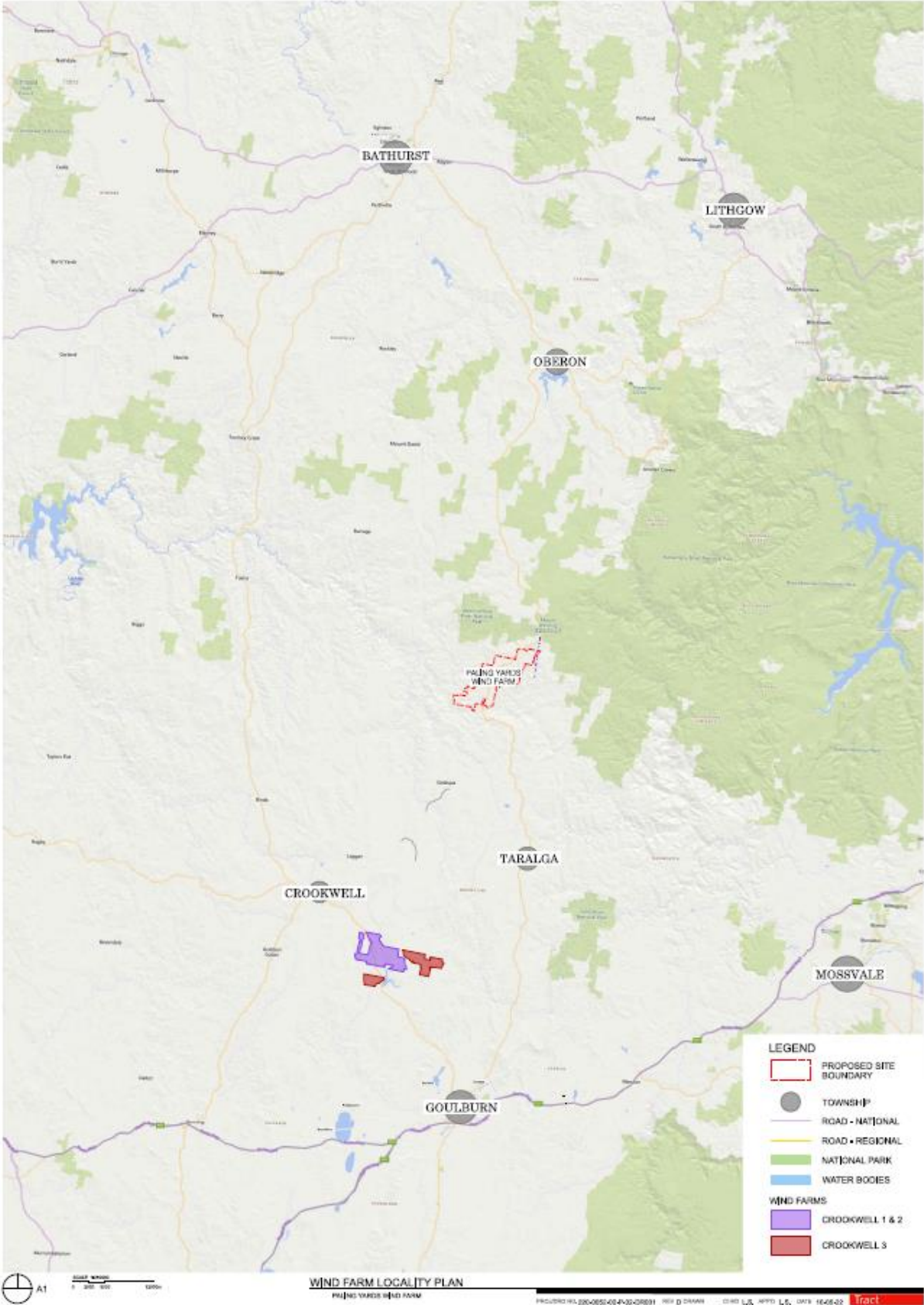
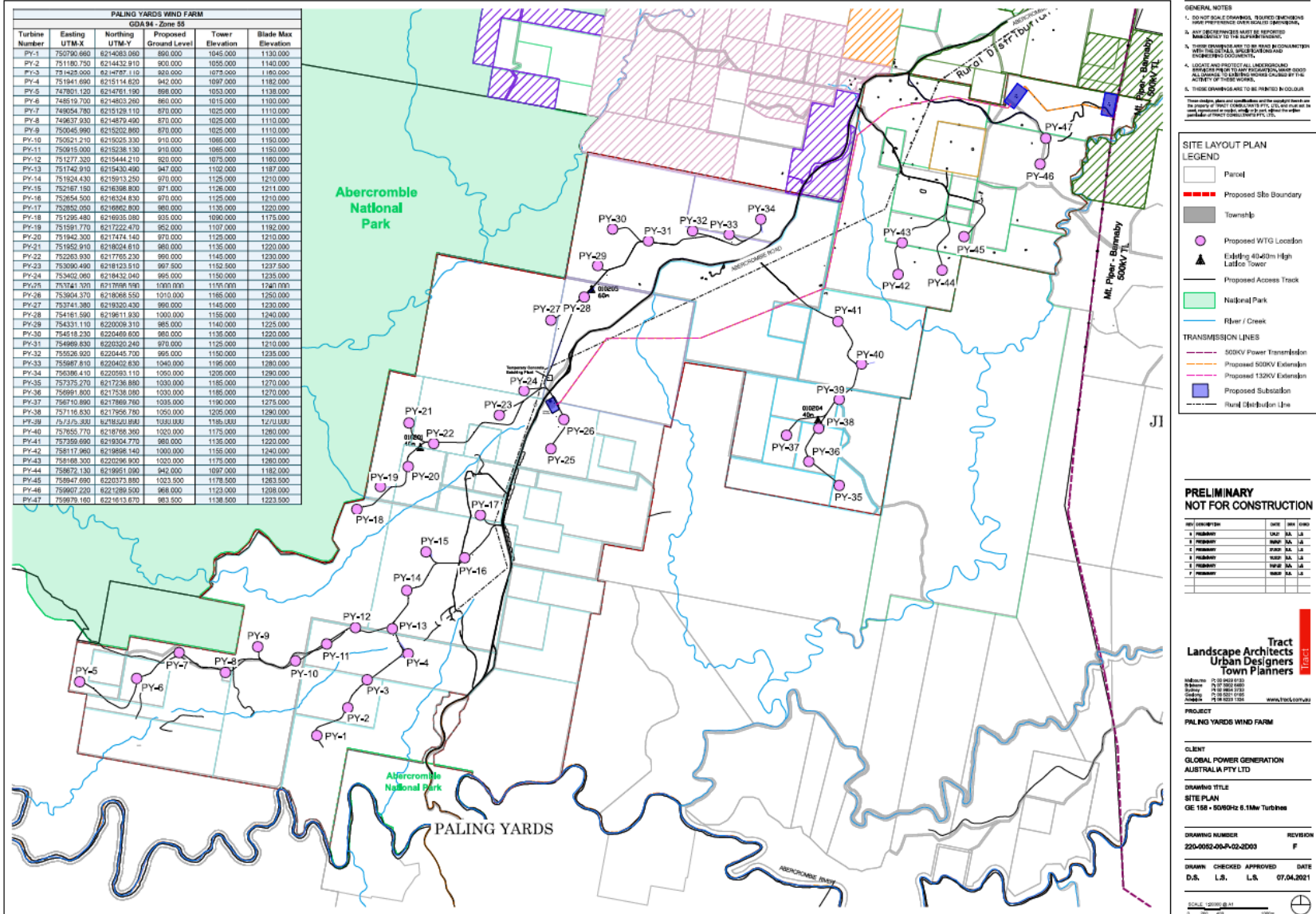




Figure 1.2 – Site Layout



## 2 The Regional Economy

### 2.1 Introduction

While the Project is situated in the Oberon Local Government Area (LGA), it is near the border with the Upper Lachlan LGA. The major regional centre servicing this area is Goulburn which is in the Goulburn-Mulwaree LGA. The region for analysis has therefore been identified as the combine LGAs of Oberon, Upper Lachlan and Goulburn-Mulwaree.

### 2.2 Characterisation of the region

#### 2.2.1 Usual Residents

Table 2.1 provides some characteristics of the usual residents of the three LGAs comprising the regional economy based on the 2016 ABS Census of Population and Housing. In 2016, the regional economy had a population of 42,605 and a labour force of 19,638, with Goulburn-Mulwaree LGA being the largest. In 2016, there were 1,130 people unemployed with the majority of these located in Goulburn-Mulwaree LGA. Goulburn-Mulwaree LGA also had the highest unemployment rate.

The main occupations of usual residents in the region were Managers (including farm managers), followed by Technicians and Trade Workers and Professionals. The percentage of usual residents employed as Managers was greatest in both the Upper Lachlan and Oberon LGAs, while the percentage of usual residents employed as Technician and Trade Workers and Professions was greatest in Goulburn Mulwaree LGA.

**Table 2.1 - Characteristics of Usual Residents**

	Oberon		Upper Lachlan		Goulburn Mulwaree		Total Region	
<b>Demographics</b>								
Population	5,301		7,695		29,609		42,605	
Median Age	45		48		42			
Unemployed	%	5.75	3.86		6.27		5.75	
	No.	137	142		851		1,130	
In labour force		2,384	3,676		13,578		19,638	
Median household weekly income		1,239	1,161		1,196			
Unoccupied private dwellings	%	21.20	27.90		15.00		18.47	
	No.	506	1,125		1,928		3,559	
Median rent		210	190		260			
<b>Occupations</b>	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>
Managers	417	18.6	946	26.8	1,468	11.5	2,831	15.5
Technicians and Trades Workers	321	14.3	482	13.7	1,845	14.5	2,648	14.5
Machinery Operators and Drivers	319	14.2	229	6.5	1,088	8.6	1,636	9.0
Professionals	268	12.0	452	12.8	1,844	14.5	2,564	14.1
Labourers	268	12.0	401	11.4	1,501	11.8	2,170	11.9
Clerical and Administrative Workers	225	10.0	381	10.8	1,550	12.2	2,156	11.8
Community and Personal Service Workers	209	9.3	378	10.7	1,947	15.3	2,534	13.9
Sales Workers	159	7.1	195	5.5	1,266	10.0	1,620	8.9

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

The main industry sectors (4-digit ANZSIC) in which usual residents were employed in 2016 is provided in Table 2.2. Hospitals (except Psychiatric Hospitals) is the most significant industry sector for employment of residents in the region, driven by employment of residents in Goulburn Mulwaree LGA. Sheep Farming (Specialised) is the most significant industry of employment for Upper Lachlan residents while Log Sawmilling is the most significant industry of employment for Oberon residents.

**Table 2.2 - Top 5 Industry Sectors of Employment for Usual Residents**

<b>Oberon</b>	<b>No.</b>	<b>%</b>	<b>Upper Lachlan</b>	<b>No.</b>	<b>%</b>	<b>Goulburn Mulwaree</b>	<b>No.</b>	<b>%</b>	<b>Total Region</b>	<b>No.</b>	<b>%</b>
Log Sawmilling	106	4.9	Sheep Farming (Specialised)	385	11.1	Hospitals (except Psychiatric Hospitals)	524	4.2	Hospitals (except Psychiatric Hospitals)	656	3.6
Beef Cattle Farming (Specialised)	91	4.2	Beef Cattle Farming (Specialised)	165	4.8	Aged Care Residential Services	363	2.9	Sheep Farming (Specialised)	547	3.0
Sheep-Beef Cattle Farming	79	3.7	Sheep-Beef Cattle Farming	140	4.1	Supermarket and Grocery Stores	349	2.8	Aged Care Residential Services	515	2.8
Local Government Administration	74	3.4	Local Government Administration	126	3.6	Other Social Assistance Services	333	2.6	Local Government Administration	471	2.6
Road Freight Transport	67	3.1	Age Care Residential Care Services	106	3.1	Takeaway Food Services	330	2.6	Supermarket and Grocery Stores	466	2.5

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

An indication of the health of an economy can be gained from population changes. This theory of regional economic growth suggests that places that are able to attract population immigration<sup>2</sup> create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen, 1990). Conversely, population losses can contribute to a 'vicious cycle' of decline whereby reduced populations results in closure of services, which in turn makes it difficult to attract new populations (Sorensen, 1990).

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

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

The result is that there has been declining population in many rural LGAs that are 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.

<sup>2</sup> Mainly due to natural endowments and comparative advantage in certain industry sectors.

Against this backdrop, it is evident that the population of the region has grown at an average annual growth rate of 1.16% since 2006, less than the growth rate of NSW. This growth has been strongest in the Goulburn Mulwaree LGA. Oberon LGA had the lowest average annual growth rate of LGAs in the region.

**Table 2.3 - Population Growth**

LGA	2006	2011	2016	Average Annual Growth 2006 - 2011	Average Annual Growth 2011 - 2016	Average Annual Growth Rate 2006 - 2016
Oberon	5,030	5,040	5,301	0.04%	1.04%	0.54%
Upper Lachlan	7,053	7,193	7,695	0.40%	1.40%	0.91%
Goulburn Mulwaree	26,086	27,481	29,609	1.07%	1.55%	1.35%
<b>Total Region</b>	<b>38,169</b>	<b>39,714</b>	<b>42,605</b>	<b>0.81%</b>	<b>1.46%</b>	<b>1.16%</b>
<b>NSW</b>	<b>6,549,177</b>	<b>6,917,658</b>	<b>7,480,228</b>	<b>1.13%</b>	<b>1.63%</b>	<b>1.42%</b>

Source: Australian Bureau of Statistics, 2006, 2011, 2016 Census of Population and Housing, Community Profiles

NSW DPE population forecasts for the three LGAs are given in Table 2.4. This suggests continued population growth at a rate greater than Regional NSW (but generally less than NSW), predominantly driven by Goulburn Mulwaree LGA. Oberon LGA growth rate is forecast to decline and become negative after 2031.

**Table 2.4 - Average Annual Population Growth Rate Projections**

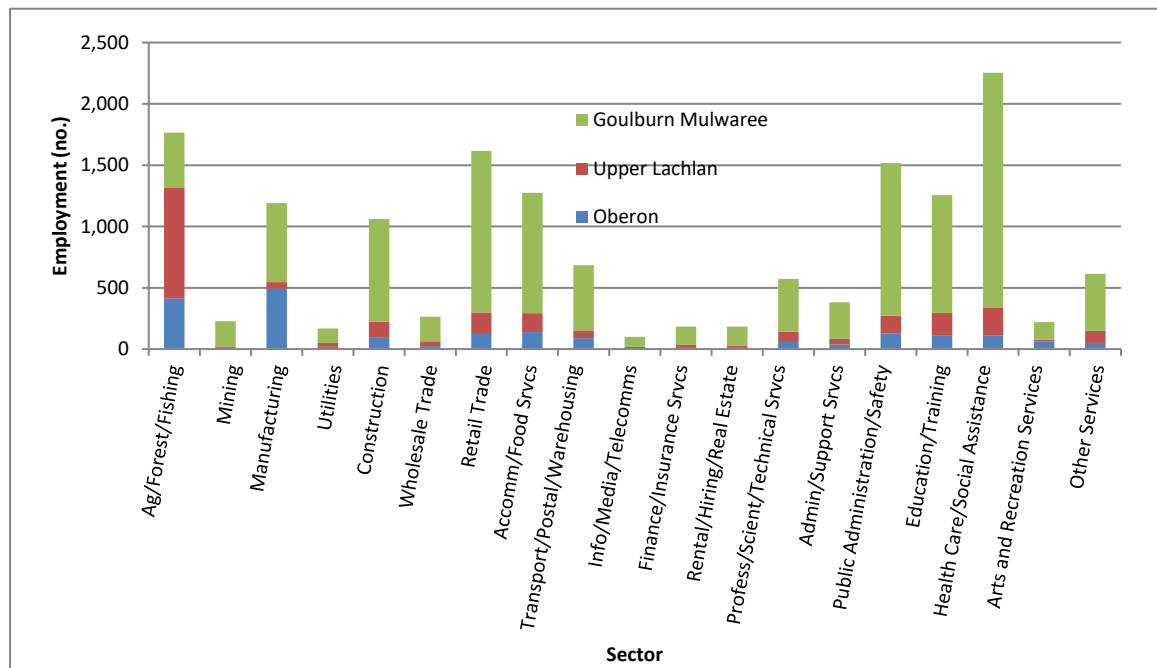
LGAs	2016 to 2021	2021 to 2026	2026 to 2031	2031 to 2036	2036 to 2041
Oberon	0.27%	0.13%	0.03%	-0.04%	-0.08%
Upper Lachlan	1.21%	1.00%	0.86%	0.69%	0.55%
Goulburn Mulwaree	1.02%	1.29%	1.30%	1.18%	1.06%
<b>Total Region</b>	<b>0.96%</b>	<b>1.10%</b>	<b>1.08%</b>	<b>0.96%</b>	<b>0.85%</b>
<b>Regional NSW</b>	<b>0.77%</b>	<b>0.83%</b>	<b>0.92%</b>	<b>0.85%</b>	<b>0.78%</b>
<b>NSW</b>	<b>1.12%</b>	<b>0.72%</b>	<b>1.11%</b>	<b>1.05%</b>	<b>1.00%</b>

Source: NSW Department of Planning and Environment (2022)

## 2.2.2 Economy

An indication of the nature of the regional economy can be gained by examining 1-digit ANZSIC place of work employment by industry data - refer to Figure 2.1. This indicates the significance of the Health Care and Social Assistance sectors, Agriculture, Forestry and Fishing sectors, Retail Trade sectors and Public Administration and Safety sectors. This is mainly driven by the larger Goulburn-Mulwaree LGA, apart from the significance of the Agriculture, Forestry and Fishing sectors which is mainly driven by the Upper Lachlan LGA. In the Oberon LGA the most significant sectors are the Manufacturing sectors and the Agriculture, Forestry and Fishing sectors.

**Figure 2.1 - Place of Work Employment by Industry**



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

Gillespie Economics has also developed an Input-Output (IO) table for the regional economy using the Generation of Regional Input Output Tables (GRIT) procedure developed by the University of Queensland and recognised internationally - Refer to Attachment 1. This provides additional information on the nature of the regional economy.

Based on the IO table of the regional economy, the Gross Regional Product (GRP) of the regional economy was estimated at \$2,013 million for 2016. The region is a net importer, with exports out of the region of \$836million and imports into the region of \$1,621 million. Using the IO industry classifications, the largest exporting industries by value are:

- Sheep, Grains, Beef and Dairy Cattle Farming (\$272M).
- Basic Non-Ferrous Metal Manufacturing (\$104M).
- Meat and Meat Products Manufacturing (\$93M).
- Sawmill Product Manufacturing (\$91M).
- Non-Metallic Mineral Mining (\$46M).

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

Using the IO industry classifications, in terms of value-added, it is estimated that Sheep, Grains, Beef and Dairy Cattle Farming; Public Administration and Regulatory Services; Retail Trade; Residential and Social Assistance Services; and Health Care Services had the highest value added in total, equal to approximately 26% of the regional economy and 39% of regional employment - Table <sup>3</sup>.

<sup>3</sup> Gross Value Added (GVA) measures the value of goods and services produced in a region.

**Table 2.5 - Gross Value Added for the 5 Largest Industries in the Regional Economy (IO Sectors)**

<b>Industry</b>	<b>Gross Value Added (\$m)</b>	<b>Proportion of Regional Economy (%)</b>	<b>Proportion of Regional Employment (%)</b>
Sheep, Grains, Beef and Dairy Cattle	163	8%	9%
Public Administration and regulatory Services	99	5%	5%
Retail Trade	94	5%	10%
Residential Care and Social Assistance Services	90	4%	7%
Health Care Services	87	4%	8%

Source: Gillespie Economics Input-Output Table

Based on the ANZSIC One digit industry classification, in terms of value-added, it is estimated that Rental, Hiring and Real Estate Services; Agriculture, Forestry and Fishing; Public Administration and Safety Mining; Health Care and Social Assistance; and Manufacturing had the highest value added in total, equal to approximately 49% of the regional economy and 44% of regional employment - Table 2.6.

**Table 2.6 - Gross Value Added for the 5 Largest Industries in the Regional Economy (ANZSIC One Digit Sectors)**

<b>Industry</b>	<b>Gross Value Added (\$m)</b>	<b>Proportion of Regional Economy (%)</b>	<b>Proportion of Regional Employment (%)</b>
Rental, Hiring and Real Estate Services	278	14%	1%
Agriculture/Forestry/Fishing	210	10%	11%
Public Administration and Safety	184	9%	10%
Health Care and Social Assistance	177	9%	15%
Manufacturing	145	7%	7%

Source: Gillespie Economics Input-Output Table

## **3 Regional Economic Impacts**

### **3.1 Introduction**

The Project would provide economic activity to the regional economy during both the construction and operation phase.. These regional economic impacts are assessed using input-output (IO) analysis.

### **3.2 Input-Output Analysis**

IO analysis essentially involves two steps:

- Construction 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; and
- Identification of the impact or stimulus of the project (construction/operation of the project and reduced potential agricultural activity) 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 IO method is based on several assumptions that are outlined in Attachment 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.

The consequence of the assumptions of IO analysis, is that IO modelling results provide an upper bound economic activity impact estimate. Notwithstanding, it provides some indication of relative positive and negative impacts.

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.
- 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 income 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).

### 3.3 Construction Phase

#### 3.3.1 Introduction

Construction is estimated to occur over a 2-year period at a total cost of around \$600M. Turbine and other component costs are likely to comprise most of the construction costs and imported from overseas. The remaining costs are associated with civil works and associated. Civil works and associated salary costs are assumed to be spread across construction expenditure categories and industry sectors as per Table 3.1.

**Table 3.1 – Expenditure Breakdown of Construction Expenditure (excluding Turbines and Salaries)**

<b>% Construction Expenditure (excluding turbines and salaries)</b>	<b>Construction Exp Categories</b>	<b>Relevant Industry</b>	<b>Proportion</b>
32%	Contract Administration and Site Design	<i>Heavy and Civil Engineering Construction</i>	50%
		<i>Construction Services</i>	50%
32%	Site Construction Works	<i>Heavy and Civil Engineering Construction</i>	50%
		<i>Construction Services</i>	50%
36%	Site Electrical Works	<i>Electrical Transmission</i>	100%

Source: Derived from SKM (2012).

Accordingly, nonlabour construction expenditure occurring in Australia is spread across the following three sectors:

- the *heavy and civil engineering construction sector* which includes businesses involved in engineering construction and project management services for a diverse range of infrastructure projects for public and private sector clients, including windfarms.
- the *construction services sector* which includes businesses involved in site preparation services, concreting services, structural steel erection services, electrical services, hire of construction machinery with operator etc.
- the *electricity transmission, distribution, on selling and electricity market operation sector*.

#### 3.3.2 Impact on Regional and NSW Economy

Construction is estimated to be associated with an average annual full-time equivalent workforce of 50, over a two-year period. Based on the IO coefficients of the *heavy and civil engineering construction sector*; *construction services sector* and *electricity transmission, distribution, on selling and electricity market operation sector* in the regional economy IO transactions table, \$22M of expenditure would be required in these sectors (in the proportions given in Table 3.1) to generate an onsite workforce of 55.

The direct and indirect regional economic impact of this level of expenditure in the regional and NSW economy is reported in Tables 3.2 and 3.3.



**Table 3.2 – Average Annual Economic Impacts of the Construction Workforce on the Regional Economy**

	<b>Direct</b>	<b>Production induced</b>	<b>Consumption induced</b>	<b>Total Flow on*</b>	<b>TOTAL EFFECT*</b>	<b>ADJUSTED TOTAL for 85% local workforce</b>
<b>OUTPUT (\$M)</b>	22	14	5	20	42	41
<i>Type 11A Ratio</i>	1	0.64	0.23	0.88	1.88	1.84
<b>VALUE ADDED (\$M)</b>	12	3	3	6	18	17
<i>Type 11A Ratio</i>	1	0.22	0.26	0.49	1.49	1.45
<b>INCOME (\$M)</b>	5	1	1	3	7	7
<i>Type 11A Ratio</i>	1	0.31	0.26	0.57	1.57	1.53
<b>EMPL. (No.)</b>	50	23	25	48	98	94
<i>Type 11A Ratio</i>	1	0.45	0.51	0.96	1.96	1.88

Note: Totals may have minor discrepancies due to rounding.

**Table 3.3 – Average Annual Economic Impacts of the Construction Workforce on the NSW Economy**

	<b>Direct</b>	<b>Production induced</b>	<b>Consumption induced</b>	<b>Total Flow on*</b>	<b>TOTAL EFFECT*</b>
<b>OUTPUT (\$M)</b>	22	24	23	47	70
<i>Type 11A Ratio</i>	1.00	1.07	1.04	2.11	3.11
<b>VALUE ADDED (\$M)</b>	12	7	13	20	32
<i>Type 11A Ratio</i>	1.00	0.54	1.07	1.61	2.61
<b>INCOME (\$M)</b>	7	5	7	12	19
<i>Type 11A Ratio</i>	1.00	0.69	1.01	1.70	2.70
<b>EMPL. (No.)</b>	50	30	72	102	152
<i>Type 11A Ratio</i>	1.00	0.60	1.44	2.04	3.04

Note: Totals may have minor discrepancies due to rounding.

In estimating the total 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. GPG advises that between 85% of the construction workforce are expected to be from the region. Consequently, the final column in Table 3.2 adjusts Total Effects to only include 85% of consumption-induced flow-ons. At the NSW level all the construction workforce is expected to come from NSW and hence no adjustment to consumption induced flow-ons is made.

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

- \$41 in annual direct and indirect output.
- \$17M in annual direct and indirect value-added.
- \$7M in annual direct and indirect household income.

- 94 direct and indirect jobs.

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

- \$70M in annual direct and indirect output.
- \$32M in annual direct and indirect value added.
- \$19M in annual direct and indirect household income.
- 152 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.

### 3.3.3 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 Attachment 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 1.45 for value-added up to 1.88 for employment. The multipliers are large for the NSW economy because of the higher 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.

### 3.3.4 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 electricity transmission, distribution, on selling and electricity market operation 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 *professional, scientific and technical services, road transport, wholesale trade, non-residential property operators and real estate service, wholesale and retail trade, employment, travel agency and other administrative services, cement, lime and ready-mixed concrete manufacturing, and rental and hiring services*. For the NSW economy the *finance, auxiliary finance and insurance, transport support services and finance sector*, and telecommunications services are also important production induced flow-on sectors.

Consumption-induced flow-ons in the region will be mainly in the following sectors: retail and wholesale trade, food and beverage services, health care services, primary and secondary education, residential care and social assistance services. For the NSW economy the *finance, professional, scientific and technical services, insurance and superannuation, non-residential property operators and real estate services* are also important consumption induced flow-on sectors.

### 3.4 Operation Phase

#### 3.4.1 Introduction

For the analysis of the operational phase of the Project, a new Project sector was inserted into regional and NSW IO tables reflecting average annual operation. The revenue and expenditure data for the new sector were obtained from commercial-in-confidence financial information provided by GPG. For this new sector:

- the estimated average annual gross revenue was allocated to the *Output* row.
- the estimated wage bill of those residing in the region (70%)/NSW (100%) was allocated to the household wages row, with any remainder allocated to a secondary wages row that is excluded from the impact assessment.
- non-wage expenditure was initially allocated across the relevant *intermediate sectors* in the economy as per Table 3.4.
- 50% of repairs and maintenance was allocated to the heavy and civil engineering sector with the remainder allocated to *imports*.
- allocation was then made between *intermediate sectors* in the economy and *imports* based on location quotients. For the NSW economy a larger proportion of expenditure was captured compared to the regional economy.
- purchase prices for expenditure in each sector were adjusted to basic values and margins and taxes and allocated to appropriate sectors using relationships in the National IO Table.
- the difference between total revenue and total costs was allocated to the *other value-added* row.
- direct employment in the region was allocated to the *employment* row.

Lease payments to Project landholders were included as part of other value-added (OVA). It was conservatively assumed that lease payments to Project landholders were not reinvested in the region.

**Table 3.4 – Expenditure Breakdown Non-Labour Operating Costs**

Construction Exp Categories	Proportion
Other Repairs and Maintenance/Heavy and Civil Engineering Construction*	80%
Construction Services	15%
Electricity Transmission	5%

Source: SKM (2012).

\*SKM allocates repairs and maintenance to the *other repairs and maintenance sector* however, as identified in ABS1993, general repairs of nonbuilding heavy and civil engineering structures are allocated to the *heavy and civil engineering construction sector*.

#### 3.4.2 Impacts on the Regional and NSW Economy

The total and disaggregated average annual impacts of the Project on the regional and NSW economy (in 2021 dollars) is shown in Table 3.5 and Table 3.6, respectively.<sup>4</sup>

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<sup>4</sup> Direct and indirect Output is not reported for reasons of commercial confidentiality.

**Table 3.5 - Annual Economic Impacts of the Project on the Regional Economy (\$2021)**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
<b>VALUE ADDED (\$'000)</b>	36	3	1	5	40
<i>Type 11A Ratio</i>	1.00	0.09	0.04	0.13	1.13
<b>INCOME (\$'000)</b>	1	2	0	2	3
<i>Type 11A Ratio</i>	1.00	1.79	0.56	2.35	3.35
<b>EMPL. (No.)</b>	14	19	10	29	43
<i>Type 11A Ratio</i>	1.00	1.36	0.75	2.11	3.11

Note: Totals may have minor discrepancies due to rounding.

**Table 3.6 - Annual Economic Impacts of the Project on the NSW Economy (\$2021)**

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
<b>VALUE ADDED (\$'000)</b>	36	5	5	10	46
<i>Type 11A Ratio</i>	1.00	0.14	0.15	0.28	1.28
<b>INCOME (\$'000)</b>	1	3	3	6	8
<i>Type 11A Ratio</i>	1.00	2.73	2.24	4.96	5.96
<b>EMPL. (No.)</b>	14	22	29	51	65
<i>Type 11A Ratio</i>	1.00	1.57	2.04	3.61	4.61

Note: Totals may have minor discrepancies due to rounding.

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

- \$40M in annual direct and indirect regional value-added.
- \$3M in annual direct and indirect household income.
- 43 direct and indirect jobs.

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

- \$46M in annual direct and indirect regional value-added.
- \$8M in annual direct and indirect household income.
- 65 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.

### 3.4.3 Multipliers

The Type 11A ratio multipliers for the Project's impact on the regional economy range from 1.13 for value-added up to 3.35 for income. Capital intensive industries such as wind farms tend to have a high level of linkage with other sectors in an economy thus contributing substantial 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. Capital intensive projects also typically have 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 1.28 for value-added up to 5.96 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.

### 3.4.4 Main Sectors Affected

Flow-on impacts from the Project are likely to affect several different sectors of the regional and NSW economy. The sectors most impacted by value-added and income flow-ons are likely to be the *heavy and civil engineering construction sector, construction services sector, electricity transmission, distribution, on selling and electricity market operation sector, professional, scientific and technical services sector, retail trade sector, food and beverage services sector, health care services, road transport sector, employment, travel agency and other administrative services, and wholesale trade sector*. For the NSW economy, the *finance sector* is also relevant.

Examination of the estimated direct and flow-on employment impacts gives an indication of the sectors in which employment opportunities would be generated by the Project (Tables 3.7 and 3.8).

**Table 3.7 - Sectoral Distribution of Annual Employment Impacts on the Regional Economy**

Sector	Average Direct Effects	Production-induced	Consumption-induced	Total
Impact Sector	14	0	0	14
Primary	0	0	0	0
Mining	0	0	0	0
Manufacturing	0	1	0	1
Utilities	0	1	0	1
Wholesale/Retail	0	1	3	4
Accommodation, cafes, restaurants	0	0	2	3
Building/Construction	0	12	0	13
Transport	0	1	0	1
Services	0	3	4	8
<b>Total</b>	<b>14</b>	<b>19</b>	<b>10</b>	<b>43</b>

Note: Totals may have minor discrepancies due to rounding.

**Table 3.8 - Sectoral Distribution of Annual Employment Impacts on the NSW Economy**

Sector	Average Direct Effects	Production-induced	Consumption-induced	Total
Impact Sector	14	0	0	14
Primary	0	0	1	1
Mining	0	0	0	0
Manufacturing	0	1	1	3
Utilities	0	1	0	1
Wholesale/Retail	0	1	6	8
Accommodation, cafes, restaurants	0	0	4	4
Building/Construction	0	11	1	12
Transport	0	1	1	2
Services	0	6	14	20
<b>Total</b>	<b>14</b>	<b>22</b>	<b>29</b>	<b>65</b>

Note: Totals may have minor discrepancies due to rounding.

Tables 3.7 and 3.8 indicate that direct, production-induced and consumption-induced employment impacts of the Project on the regional and NSW economy are likely to have different distributions across sectors. Production-induced flow-on employment would occur mainly in the building/construction

sectors, while consumption induced flow-on employment would be mainly in the services sectors, wholesale/retail trade and accommodation/cafes/restaurants.

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.

### 3.5 Agricultural Impacts

Construction of the Project will impact approximately 161 ha of agricultural land that could potentially be used for agricultural production – sheep and cattle grazing. During operation of the Project impacted agricultural land will reduce to approximately 80 ha. Detailed revenue, expenditure and employment information related to sheep and cattle grazing within the Project disturbance footprint was not available. However, to gain an indication of the magnitude of the potential agricultural impact of the Project, an average revenue per ha i.e. \$800, across all types of sheep grazing enterprise for which the NSW Department of Primary Industries (DPI) provides gross margin budgets, was used.<sup>5</sup>

Foregone potential revenue would be in the order of \$129,000 per annum during the construction phase, reducing to \$64,000 per annum during operation. Using revenue, expenditure and employment ratios in the *sheep, beef and dairy cattle* sector of the regional IO table, the direct and indirect impact of this level of revenue is summarised in Tables 3.9 and 3.10.

**Table 3.9 Annual Economic Impacts of Foregone Agriculture During Project Construction (\$2020)**

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*
<b>OUTPUT (\$M)</b>	0.13	0.06	0.03	0.09	0.22
<i>Type 11A Ratio</i>	1.00	0.46	0.22	0.68	1.68
<b>VALUE ADDED (\$M)</b>	0.05	0.03	0.02	0.04	0.09
<i>Type 11A Ratio</i>	1.00	0.52	0.33	0.85	1.85
<b>INCOME (\$M)</b>	0.02	0.01	0.01	0.02	0.04
<i>Type 11A Ratio</i>	1.00	0.64	0.33	0.97	1.97
<b>EMPL. (No.)</b>	0.41	0.24	0.14	0.37	0.78
<i>Type 11A Ratio</i>	1.00	0.57	0.33	0.91	1.91

Note: Totals may have minor discrepancies due to rounding.

**Table 3.10 Annual Economic Impacts of Foregone Agriculture During Project Operation (\$2020)**

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*
<b>OUTPUT (\$M)</b>	0.06	0.03	0.01	0.04	0.11
<i>Type 11A Ratio</i>	1.00	0.46	0.22	0.68	1.68
<b>VALUE ADDED (\$M)</b>	0.03	0.01	0.01	0.02	0.05
<i>Type 11A Ratio</i>	1.00	0.52	0.33	0.85	1.85
<b>INCOME (\$M)</b>	0.01	0.01	0.00	0.01	0.02
<i>Type 11A Ratio</i>	1.00	0.64	0.33	0.97	1.97
<b>EMPL. (No.)</b>	0.20	0.12	0.07	0.18	0.39
<i>Type 11A Ratio</i>	1.00	0.57	0.33	0.91	1.91

<sup>5</sup> The average revenue per ha for sheep grazing was higher than the average revenue per ha for cattle grazing.

Note: Totals may have minor discrepancies due to rounding.

The agricultural impacts of the Project are less than 0.05% of agricultural activity in the region and hence are insignificant.

While there is a loss of potential agricultural activity to the region, this is a private economic decision made by the Project landholders for which they are compensated. The regional economic activity impacts of potential foregone agricultural activity are less than those of the construction and operation of the Project. Therefore, as well as the economic benefit to Project landholders, in terms of economic activity, the regional economy will also be better-off.

Impacts on agricultural activity are for the term of the Project and are not anticipated to impact the capability of the land for future agricultural production. Once the Project reaches the end of its investment and operational life, the Project infrastructure will be decommissioned and the development footprint returned to its pre-existing land use, namely suitable for sheep grazing, or another land use as agreed by the Project owner and the landholder at that time.

### **3.6 Land Value Impacts**

The economic value of private land is determined by the interaction of demand and supply in the market, with the market price for land reflecting the willingness to pay of a potential purchaser. Willingness to pay reflects the discounted future potential returns from the land (whether from agriculture, rural residential uses, mining and extractive industries, recreation uses and potential (real or otherwise) to convert to higher value uses e.g. rural residential, urban, industrial or commercial uses). These potential future returns reflect the structural, access and environmental attributes of the land.

Structural attributes include lot size and shape, house attributes, other property improvements, land capability, resource endowments, current zoning, future subdivision potential, road frontage, water, sewerage, electricity, communication services etc.

Access includes proximity to major cities and the employment and community and the social services this offers.

Environmental attributes may include:

- noise, water quality and scenic amenity – noise negatively impacts property prices while higher water quality and scenic amenity positively impact land values.
- the presence of native vegetation and biodiversity - which can have a positive impact on private land values in terms of amenity and a negative impact on private land values in terms of restrictions on current and potential use of the land.
- the presence of hazards such as flood prone land and bushfire hazard - which reduce private land values by limiting land use opportunities or increase land values by supporting particular farming activity e.g. floodplains.

The value of private lands on the urban fringe are potentially determined by both agricultural characteristics of the land (i.e. future potential agricultural returns) and urban influences including access to the urban area (and associated physical and social infrastructure including employment, schools, hospitals etc.) and potential for urban conversion.

Where no potential for urban conversion exists in the next say 20 to 30 years, potential agricultural production and/or access to urban areas (employment and physical and social infrastructure) are likely to be major potential determinants of land values. Given enough distance from an urban area, land

parcels are valued for agricultural uses only (Guiling *et al* 2009) and land values increase linearly with size.

Preston Rowe Patterson (2009) in a study of the impact of wind farms on property values found that properties in rural/agricultural areas appeared to be the least affected by wind farm development, with no reductions found near any of the eight wind farms investigated. The only properties where a possible effect was observed were lifestyle properties in Victoria within 500 m of a wind farm.

A literature review by Urbis (2016) of Australian and international studies found that the majority of published reports conclude that there is no impact or a limited defined impact of wind farms on property values. Those studies which identified a negative impact are based in the northern hemisphere and are associated with countries with higher population densities and a greater number of traditional residential and lifestyle properties affected by wind farms. This is generally contrary to the Australian experience, with most wind farms being located in low population density environments that derive the majority of their value from productive farming purposes (Urbis 2016).

Urbis (2016) undertook an assessment of the impact of wind farms on surrounding land values in NSW and Victoria. It found that there is insufficient sales data to provide a definitive answer utilising statistically robust quantitative analysis techniques. However, from its case study assessments it did not identify any conclusive trends that would indicate that wind farms have negative impacts on property values. Its property resale analysis indicated that all of the properties examined demonstrated capital growth that aligned with the broader property market at the time. Consequently, Urbis (2016, p. 21) concluded:

*"In our professional opinion, appropriately located windfarms within rural areas, removed from higher density residential areas, are unlikely to have a measurable negative impact on surrounding land values."*



## 4 Economic Management Measures

It is evident from Section 3 that construction and operation of the Project will have net positive impacts on the level of economic activity in the regional economy.

GPG proposes to work in partnership with the Oberon Council and the local community to help maximise the projected economic regional benefits whilst minimising any impacts. In this respect, a range of general economic management measures are proposed and would include:

- Employment of regional residents preferentially where they have the required skills and experience and can demonstrate a cultural fit with the organisation.
- Participating, as appropriate, in business group meetings, events or programs in the regional community.
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- A neighbouring property benefit scheme so the eligible properties neighbouring the wind farm site see a direct benefit from the Project.
- Provision of community grants through various initiatives and programs within the local community, including the education, arts, sporting, and culture sectors.

A Voluntary Planning Agreement (VPA) will be offered to Oberon Council generally in accordance with Division 7.1(a) of Part 7 of the EP&A Act. Payments to council can then be directed to a range of community infrastructure needs and programs.

## 5 Conclusion

The Project will provide economic activity to the regional economy during both the construction and operation phase. It would also result in a negligible contraction in regional economic activity from agricultural activity within the Project boundary and, more specifically, the development footprint. These regional economic impacts were assessed using IO analysis.

The construction and operation of the Project will have net positive impacts on the level of economic activity in the regional and NSW economy.

GPG proposes to work in partnership with the Oberon Council 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 management measures are proposed and would include:

- Employment of regional residents preferentially where they have the required skills and experience and can demonstrate a cultural fit with the organisation.
- Participating, as appropriate, in business group meetings, events or programs in the regional community.
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive.
- A neighbouring property benefit scheme so the eligible properties neighbouring the wind farm site see a direct benefit from the Project.
- Provision of community grants through various initiatives and programs within the local community, including the education, arts, sporting, and culture sectors.

The proposed VPA would contribute a payment to Oberon Council that can then be directed to a range of community infrastructure needs and programs.

## 6 References

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## **ATTACHMENT 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 <i>(Steps 4-14 apply to each region for which input-output tables are required)</i>
	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).

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## ATTACHMENT 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).

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.

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

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

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

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

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

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