Valley of the Winds

APPENDIX Q
ECONOMIC ASSESSMENT

RAMBØLL Bright ideas. Sustainable change.

Valley of the Winds
Wind Farm
Economic Assessment

Prepared for

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EXECUTIVE SUMMARY

UPC\AC Renewables Australia (UPC\AC) proposes to construct and operate the Valley of the Winds wind farm (the project). The project would consist of approximately 148 wind turbines and supporting infrastructure, including a high voltage transmission line which would run approximately 13 kilometres from the Girragulang Road cluster to a connection point with the Central-West Orana Renewable Energy Zone Transmission line proposed by TransGrid and the NSW Government. The project would supply approximately 800 megawatts (MW) of electricity into the National Electricity Market (NEM).

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 Warrumbungle Shire Local Government Area, during both the construction and operation phase. It would also result in some reduction in potential regional economic activity from cattle grazing and cultivation within the disturbance footprint. 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:

- $274M and $284M in annual direct and indirect output.
- $109M and $115M in annual direct and indirect value-added.
- $41M and $43M in annual direct and indirect household income.
- 518 and 569 direct and indirect jobs.

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

- $596M in annual direct and indirect output.
- $271M in annual direct and indirect value added.
- $159M in annual direct and indirect household income.
- 1,302 direct and indirect jobs.

The project is estimated to make up to the following total annual contribution to the regional economy:[1]

- $132M in annual direct and indirect regional value-added.
- $8M in annual direct and indirect household income.
- 106 direct and indirect jobs.

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

- $166M in annual direct and indirect regional value-added.
- $31M in annual direct and indirect household income.
- 270 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.

[1] Note that Output is not reported for the operation phase for reasons of commercial confidentiality.

While there will be a minor loss of potential agricultural activity to the region, 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 minor 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.

UPC\AC proposes to work in partnership with the Warrumbungle Shire Council and the local community to help maximise the projected regional economic benefits whist minimising any impacts. In this respect, a range of general economic mitigation and 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 entered into with Warrumbungle Shire 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

UPC Renewables Australia Pty Ltd, operating as UPC\AC Renewables Australia (UPC\AC) (the Proponent), proposes to construct and operate the Valley of the Winds wind farm (the project).

The project would consist of approximately 148 wind turbines and supporting infrastructure, including a high voltage transmission line which would run approximately 13 kilometres from the Girragulang Road cluster to a connection point with the Central-West Orana REZ Transmission line proposed by TransGrid and the NSW Government. The project would supply approximately 800 megawatts (MW) of electricity into the National Electricity Market (NEM).

The wind farm would be located close to the townships of Coolah and Leadville, with the transmission line running generally south to its connection with the Central-West Orana REZ Transmission line. The project would be entirely within the Warrumbungle Local Government Area (LGA).

The project would involve the construction, operation and decommissioning of three clusters of wind turbines, that would be connected electrically. These are:

- Mount Hope cluster – approximately 76 turbines.
- Girragulang Road cluster – approximately 51 turbines.
- Leadville cluster – approximately 21 turbines.

The project includes the following key components:

- approximately 148 wind turbines with a maximum tip height of 250 metres and a hardstand area at the base of each turbine
- electrical infrastructure, including:
    - substations in each cluster and a step-up facility at the connection to the Central-West Orana REZ Transmission line
    - underground 33 kilovolt electrical reticulation connecting the turbines to the substations in each cluster
    - overhead transmission lines (up to 330 kilovolt) dispatching electricity from each cluster
    - other electrical infrastructure as required including a potential battery energy storage system (BESS)
    - a high voltage transmission line (up to 500 kilovolt) connecting the wind farm to the Central-West Orana Transmission line
- other permanent on-site ancillary infrastructure:
    - permanent operation and maintenance facilities
    - meteorological masts (up to thirteen)
- access track network:
    - access and egress points to each cluster from public roads
    - operational access tracks and associated infrastructure within each cluster on private property
- temporary construction ancillary facilities:
    - potential construction workforce accommodation on site
    - construction compounds
    - laydown areas
    - concrete batching plants
    - quarry sites for construction material (rock for access tracks and hardstands).

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. Land surrounding the wind farm site is characterised by rolling pastoral hills, open flat valleys and ridgelines with scattered vegetation. The hill slopes are generally gentle in gradient and predominantly cleared of vegetation, except for patches of denser remnant vegetation on steeper terrain, near rocky outcrops and between saddles.

The townships of Coolah and Leadville are the closest population centres to the proposed site. These townships are located on gently sloping to level land within valleys near creeks. Most built structures are of low to moderate scale. The main street of Coolah is the focus for local retail and community services in the local area.

Land uses within the locality include:

- **farming** – predominantly grazing cattle and sheep, with small patches of cropping (cereal and fodder).
- **rural living** – scattered rural dwellings and sheds present throughout the landscape, with a higher density of dwellings in the townships.

1.3 Policy context

The project aligns with several key Australian and NSW Government policies, including:

- The 2015 UNFCCC "Paris Agreement".
- The Federal Government's Renewable Energy Target scheme.
- Draft Integrated System Plan 2020 (Draft ISP 2020) (exhibited December 2019 – February 2020).
- NSW Net Zero Plan Stage 1: 2020-2030.
- NSW Renewable Energy Action Plan 2013 and NSW Renewable Energy Action Plan Completion Report 2018.
- NSW Transmission Infrastructure Strategy 2018.
- NSW Electricity Strategy 2019 (adopted November 2019).
- NSW Electricity Infrastructure Roadmap 2020.

The NSW Government's Electricity Strategy 2019 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 Central-West Orana REZ was formally declared on 5 November 2021. Under the declaration, EnergyCo NSW has been appointed as the Infrastructure Planner for the REZ.

EnergyCo NSW will now lead development of the Central-West Orana REZ, including community and stakeholder consultation, property negotiations and environmental planning approvals.

During 2022, EnergyCo NSW will undertake a competitive procurement process to appoint a Network Operator to design, build, finance, operate and maintain the new REZ transmission infrastructure to which the project will connect.

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 Agriculture, Water and the Environment for potential impacts to matters of national environmental significance protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 13 July 2020, a delegate of the Federal Minister for the Department of Agriculture, Water and the Environment determined that the project was a controlled action under section 75 of the EPBC Act and therefore requires assessment and approval under the EPBC Act. This assessment is to be undertaken under the *Amended Bilateral Agreement* between the Department of Agriculture, Water and the Environment and the Department of Planning, Industry and Environment.

This report has been prepared to inform the environmental impact statement (EIS) and development application (DA) for the project.

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:	
an assessment of the social and economic impacts and benefits of the Project for the region and the 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.

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 mitigate and manage economic impacts.
- Conclusions are provided in Section 5.

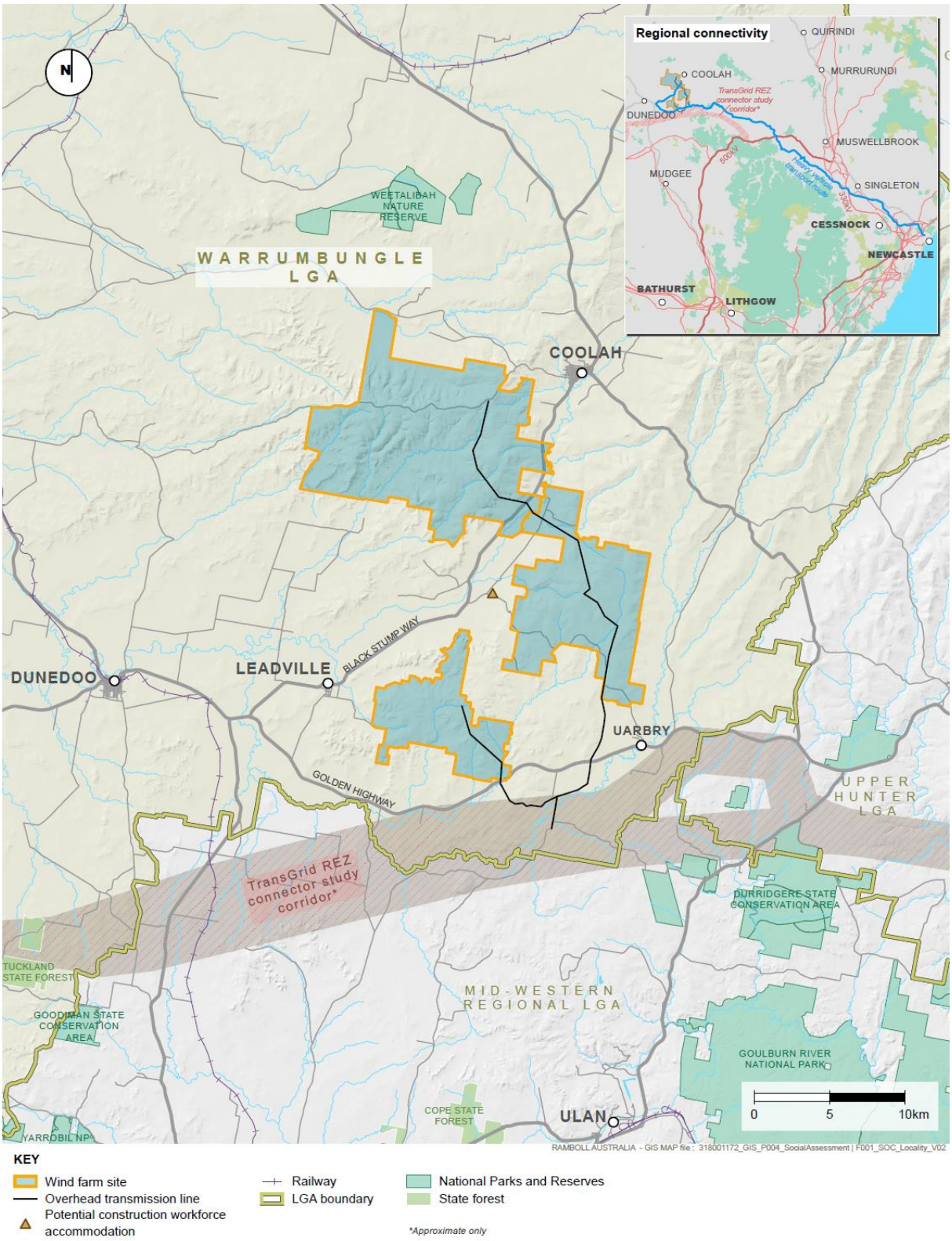


Figure 1.1 – Project Location

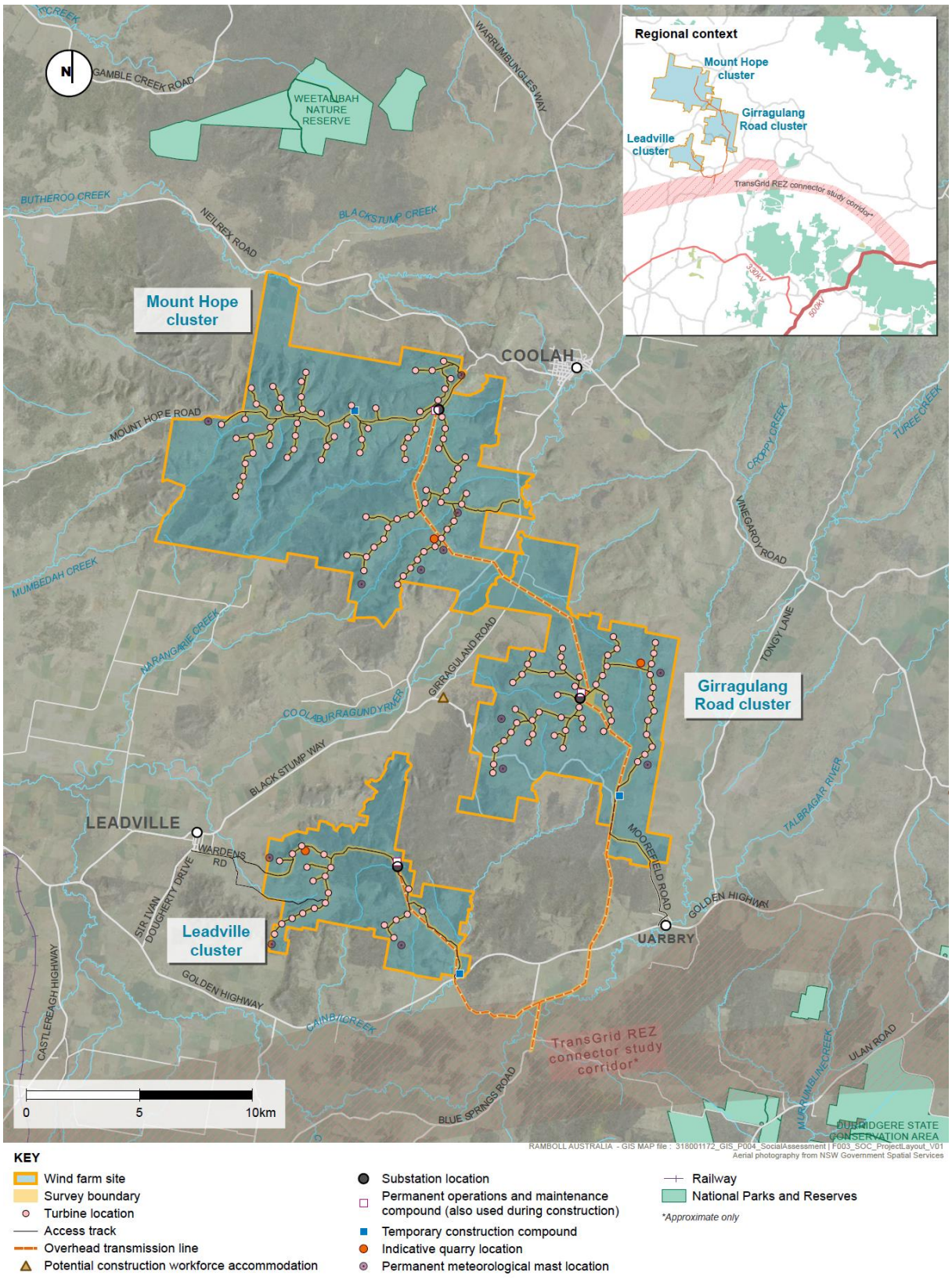


Figure 1.2 – Conceptual Layout

2 The Regional Economy

2.1 Introduction

The wind farm is in the Warrumbungle Shire LGA. Consistent with the Social Impact Assessment, the region for analysis is identified as the Warrumbungle Shire LGA.

2.2 Characterisation of the region

2.2.1 Usual residents

Table 2.1 provides some characteristics of the usual residents of Warrumbungle Shire LGA based on the 2016 ABS Census of Population and Housing. In 2016, the regional economy had a population of 9,384 and a labour force of 3,620. In 2016, there were 285 people unemployed.

The main occupations of usual residents were Managers (which includes farm managers), followed by Labourers and Professionals.

Table 2.1 - Characteristics of Usual Residents

	Warrumbungle Shire	
Demographics		
Population	9,384	
Median Age	49	
In labour force	3,620	38.6%
Unemployed	285	7.9%
Median household weekly income	$878	
Unoccupied private dwellings %	761	17.8%
Median rent	160	
Occupations	**No.**	**%**
Managers	890	26.7
Labourers	476	14.3
Professionals	469	14.1
Community and Personal Service Workers	373	11.2
Technicians and Trades Workers	341	10.2
Clerical and Administrative Workers	280	8.4
Machinery Operators and Drivers	218	6.5
Sales Workers	216	6.5

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

The main industry sectors in which usual residents were employed in 2016 is provided in Table 2.2. *Beef Cattle Farming (Specialised)* is the main sector of employment for usual residents followed by *Local Government Administration*, *Hospitals (except Psychiatric Hospitals)*, *Primary Education* and *Sheep Farming (Specialised)*. 11.6% of employed usual residents work outside the Warrumbungle Shire LGA, mainly in Mid-Western Regional LGA and Western Plains Regional LGA.

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

Warrumbungles Shire	No.	%
Beef Cattle Farming (Specialised)	346	10.7
Local Government Administration	178	5.5
Hospitals (except Psychiatric Hospitals)	121	3.8
Primary Education	110	3.4
Sheep Farming (Specialised)	106	3.3

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 can attract population immigration[2] 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 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).

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 region has declined by 4.32% since 2006, while the population of NSW has grown by 14.20% over the same period.

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

Table 2.3 - Population growth

Location	2006	2011	2016	Growth 2006 - 2011	Growth 2011 - 2016	Growth Rate 2006 - 2016
Warrumbungles Shire LGA	9,808	9,588	9,384	-2.24%	-2.13%	-4.32%
NSW	**6,549,177**	**6,917,658**	**7,480,228**	**5.60%**	**8.10%**	**14.20%**

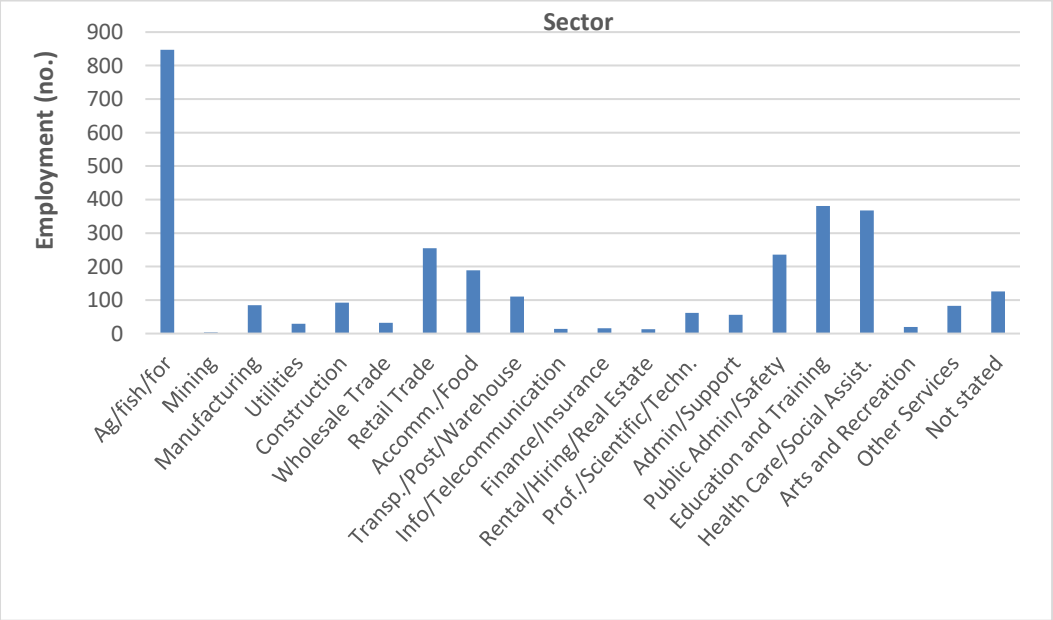
Source: Australian Bureau of Statistics, 2006, 2011, 2016 Census of Population and Housing, Community Profiles

Population of the Warrumbungle Shire LGA is expected to continue to decline by 2,200 people between 2016 and 2041 (NSW Government, 2019).

2.2.2 Economic Activity in the Region

An indication of the nature of the regional economy can be gained by examining place of work employment by industry data - refer to Figure 2.1. This indicates the significance of the *Agriculture* sectors (predominantly Beef Cattle farming and Sheep farming), followed by *Education and Training* sectors, and *Heath Care and Social Assistance* sectors). 97% of people who work in the region also live in the region.

Figure 2.1 - Place of work employment by industry



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

The Gross Regional Product (GRP) of the regional economy was estimated at $491 million for 2020. The region is a net exporter, with exports out of the region of $391.7M million and imports into the region of $279.0 million (REMPLAN,2022). The largest exporting industries are:

- *Agriculture, forestry and fishing* ($269.5M).
- *Manufacturing* ($26.3M).
- *Public administration and safety* ($23.4M).
- *Education and training* ($23.0M) (REMPLAN, 2022).

Exporting sectors are based on a region's endowments and competitive advantages, and in regional economic development economics are considered to be the key drivers of the economy.

Conversely, the largest importing industries in the region are:

- *Agriculture, forestry and fishing* ($110.7M).
- *Manufacturing* ($28.2M).
- *Construction* ($21.1M).
- *Accommodation and food services* ($19.3M) (REMPLAN, 2022).

In terms of value-added, it is estimated that *Agriculture, Forestry and Fishing; Rental, Hiring and Real Estate Services; Education and Training; Health Care and Social Assistance;* and *Public Administration and Safety* had the highest value-added in total, equal to approximately 71% of the regional economy and 64% of regional employment - Table 2.6.[3]

Table 2.6 - Gross Value Added for the 5 Largest Industries in the regional economy (ANZSIC One Digit Sectors)

Industry	Gross Value Added ($m)	Proportion of Regional Economy (%)	Proportion of Regional Employment (%)
Agriculture/Forestry/Fishing	120.8	27%	29%
Rental, Hiring and Real Estate Services	77.8	17%	1%
Education and Training	42.1	9%	13%
Health Care and Social Assistance	39.0	9%	13%
Public Administration and Safety	37.5	8%	8%

Source: REMPLAN (2022)

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

3 Regional Economic Impacts

3.1 Introduction

The project would provide economic activity to the regional economy during both the construction and operation phase. It would also result in some reduction in potential regional economic activity from foregone potential agricultural activity within the disturbance footprint. 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 4-year period at a total cost of around $1.8B (Muller Partnership Quantity Surveyors, 2021). Turbine and other component costs are estimated to comprise 76% of construction costs and imported from overseas. The remainder (24%) is associated with civil works and associated salaries (Muller Partnership Quantity Surveyors, 2021). 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)

% Construction Expenditure (excluding turbines and salaries)	Construction Exp Categories	Relevant Industry	Proportion
32%	Contract Administration and Site Design	*Heavy and Civil Engineering Construction*	50%
		Construction Services	50%
32%	Site Construction Works	*Heavy and Civil Engineering Construction*	50%
		Construction Services	50%
36%	Site Electrical Works	*Electrical Transmission*	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 380, over a four-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, $192M of expenditure would be required in these sectors (in the proportions given in Table 3.1) to generate an onsite workforce of 380.

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

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*	ADJUSTED TOTAL for 30% local workforce	ADJUSTED TOTAL for 70% local workforce
OUTPUT ($M)	192	75	24	99	291	274	284
Type 11A Ratio	*1.00*	*0.39*	*0.13*	*0.52*	*1.52*	*1.43*	*1.48*
VALUE ADDED ($M)	94	10	15	25	119	109	115
Type 11A Ratio	*1.00*	*0.11*	*0.16*	*0.27*	*1.27*	*1.16*	*1.22*
INCOME ($M)	34	6	5	11	45	41	43
Type 11A Ratio	*1.00*	*0.17*	*0.16*	*0.32*	*1.32*	*1.22*	*1.28*
EMPL. (No.)	380	101	125	226	606	518	569
Type 11A Ratio	*1.00*	*0.27*	*0.33*	*0.60*	*1.60*	*1.36*	*1.50*

Note: Totals may have minor discrepancies due to rounding.

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

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*
OUTPUT ($M)	192	206	199	404	596
Type 11A Ratio	*1.00*	*1.07*	*1.04*	*2.11*	*3.11*
VALUE ADDED ($M)	93	66	111	177	271
Type 11A Ratio	*1.00*	*0.71*	*1.19*	*1.90*	*2.91*
INCOME ($M)	33	65	60	125	159
Type 11A Ratio	*1.00*	*1.96*	*1.79*	*3.75*	*4.77*
EMPL. (No.)	380	304	618	922	1,302
Type 11A Ratio	*1.00*	*0.80*	*1.63*	*2.43*	*3.43*

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. UPC\AC advises that between 30% and 70% of the construction workforce are expected to be from the region. Consequently, the final two columns in Table 3.2 adjusts Total Effects to only include 30% and 70% 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 between:

- $274M and $284M in annual direct and indirect output.
- $109M and $115M in annual direct and indirect value-added.

- $41M and $43M in annual direct and indirect household income.
- 518 and 569 direct and indirect jobs.

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

- $596M in annual direct and indirect output.
- $271M in annual direct and indirect value added.
- $159M in annual direct and indirect household income.
- 1,302 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 1.16 for value-added up to 1.43 for output when 30% of direct labour is sourced from the region. The multipliers are slightly larger when 70% of direct workforce is sourced from the region. The NSW type 11A ratio multipliers for the construction workforce range from 2.91 for value-added up to 4.77 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.

3.3.4 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 flow-ons are likely to be *wholesale and retail trade, professional, scientific and technical services, employment, travel agency and other administrative services, food and beverage services and road transport*. For the NSW economy the *construction services sector and finance sector*, are also important 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 UPC\AC. For this new sector:

- the estimated gross annual revenue was allocated to the *Output* row.

- 85% the estimated wage bill of those residing in the region/NSW was allocated to the *household wages* row, with the remainder treated as on costs and allocated to *other value-added*.
- 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 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 is 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.[4]

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
VALUE ADDED ($'000)	123	7	3	10	132
Type 11A Ratio	*1.00*	*0.06*	*0.02*	*0.08*	*1.08*
INCOME ($'000)	4	3	1	4	8
Type 11A Ratio	*1.00*	*0.77*	*0.24*	*1.01*	*2.01*
EMPL. (No.)	50	35	22	56	106
Type 11A Ratio	*1.00*	*0.70*	*0.43*	*1.13*	*2.13*

Note: Totals may have minor discrepancies due to rounding.

[4] Direct and indirect Output is not reported for reasons of commercial confidentiality.

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
VALUE ADDED ($'000)	123	22	21	43	166
Type 11A Ratio	*1.00*	*0.18*	*0.17*	*0.35*	*1.35*
INCOME ($'000)	4	15	12	27	31
Type 11A Ratio	*1.00*	*4.02*	*3.01*	*7.03*	*8.03*
EMPL. (No.)	50	101	119	220	270
Type 11A Ratio	*1.00*	*2.01*	*2.38*	*4.40*	*5.40*

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:

- $132M in annual direct and indirect regional value-added.
- $8M in annual direct and indirect household income.
- 106 direct and indirect jobs.

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

- $166M in annual direct and indirect regional value-added.
- $31M in annual direct and indirect household income.
- 270 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 1.08 for value-added up to 2.13 for employment. 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 while at the same time only having a lower level of direct employment (relative to output levels). This tends to lead to a relatively high ratio multiplier for employment. A lower ratio multiplier for income (compared to employment) also generally occurs because of comparatively higher wage levels in the project compared to incomes in the sectors that would experience flow-on effects from the project. 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 1.35 for value-added up to 8.03 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, retail trade sector, professional, scientific and technical services sector, food and beverage services sector, health care services, road transport sector and wholesale*

trade sector. For the NSW economy, the *finance sector* and *non-residential property operators and real estate services sector* are 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	50	0	0	50
Primary	0	0	0	0
Mining	0	0	0	0
Manufacturing	0	1	0	1
Utilities	0	2	0	2
Wholesale/Retail	0	1	7	8
Accommodation, cafes, restaurants	0	1	4	4
Building/Construction	0	25	0	25
Transport	0	1	1	2
Services	0	4	9	13
Total	**50**	**35**	**22**	**106**

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	50	0	0	50
Primary	0	0	2	3
Mining	0	0	0	0
Manufacturing	0	7	6	13
Utilities	0	3	1	5
Wholesale/Retail	0	5	27	32
Accommodation, cafes, restaurants	0	2	16	18
Building/Construction	0	52	3	55
Transport	0	4	5	9
Services	0	26	59	85
Total	**50**	**101**	**119**	**270**

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

549 ha of land impacted by project disturbance footprint could potentially be used for agricultural production - beef cattle grazing and cultivation of oats or barley for grain. Detailed revenue, expenditure and employment information related to beef cattle farming and cultivation within the project disturbance footprint was not available. However, to gain an indication of the magnitude of the potential agricultural impact of the project, it was assumed that land with soil capability class 4 to 7 i.e. 347ha, could be used for cattle grazing while land of soil capability class 2 to 3 i.e. 203ha, could be used for cultivation of barley or oats for grain. No class 1 land occurs within the disturbance footprint. For the purpose of the analysis the average revenue per ha i.e. $485 per ha per year, across all types of beef grazing enterprise for which the NSW Department of Primary Industries (DPI) provides gross margin budgets, was used. For cultivation of oats and barley, average revenue per ha of $333/ha was used. This was based on average local value per ha for these activities based on the ABS data on agricultural production for the Central West (ABS 2021a, ABS2021b).

Foregone potential revenue would be in the order of $235,500 per annum. 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 Table 3.9.

Table 3.9 Annual Economic Impacts of Foregone Agriculture During Project Operation ($2021)

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*
OUTPUT ($M)	0.24	0.09	0.03	0.12	0.35
Type 11A Ratio	*1.00*	*0.36*	*0.13*	*0.49*	*1.49*
VALUE ADDED ($M)	0.09	0.04	0.02	0.06	0.15
Type 11A Ratio	*1.00*	*0.41*	*0.20*	*0.61*	*1.61*
INCOME ($M)	0.03	0.02	0.01	0.02	0.06
Type 11A Ratio	*1.00*	*0.50*	*0.20*	*0.70*	*1.70*
EMPL. (No.)	0.76	0.37	0.16	0.53	1.29
Type 11A Ratio	*1.00*	*0.48*	*0.20*	*0.69*	*1.69*

Note: Totals may have minor discrepancies due to rounding.

The agricultural impacts of the project are less than 0.26% 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 grazing of cattle or cultivation of oats and barley, 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 date 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 Mitigation and 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.

UPC\AC proposes to work in partnership with the Warrumbungle Shire Council and the local community to help maximise the projected economic regional benefits whist minimising any impacts. In this respect, a range of general economic mitigation and 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 entered into with Warrumbungle Shire 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 minor and insignificant 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.

UPC/AC proposes to work in partnership with the Warrumbungle Shire 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 impact mitigation and management measures are proposed and would include:

- Employment of regional residents where practicable – i.e. where they are motivated to work, have the required skills and experience and are able to adhere to occupational health and safety policies, construction and operations protocols and demonstrate a cultural fit with the relevant organisations.
- 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 Warrumbungle Shire Council that can then be directed to a range of community infrastructure needs and programs.

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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
		(*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).

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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.

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

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

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

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

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

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