EPURON

APPENDIX O

Economics

BOWMANS CREEK
WIND FARM

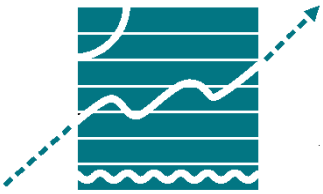
environmental impact statement

Bowmans Creek Wind Farm
Economic Impact Assessment

Prepared for

Hansen Bailey

By



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EXECUTIVE SUMMARY

Epuron Projects Pty Ltd (Epuron) is seeking approval for the construction, operation, maintenance and decommissioning of the Bowmans Creek Wind Farm (Project), located at Bowmans Creek, approximately 10 km east of Muswellbrook and 120 km from the Port of Newcastle in NSW. The Project extends predominantly across two Local Government Areas (LGAs), being the Muswellbrook and Singleton LGAs. A small number of turbines are additionally proposed in the Upper Hunter Shire LGA.

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

The Project will provide economic activity to the regional economy of Singleton, Muswellbrook and Upper Hunter Shire LGAs, during both the construction and operation phase. It would also result in some contraction in regional economic activity from current cattle grazing activity within the disturbance footprint. These regional economic impacts were assessed using Input-Output analysis.

The peak construction year (Year 1) of the Project is estimated to make up to the following total contribution to the regional economy:

- $114M in annual direct and indirect output;
- $48M in annual direct and indirect value-added;
- $17M in annual direct and indirect household income; and
- 209 direct and indirect jobs.

The peak construction year (Year 1) of the Project is estimated to make up to the following total contribution to the NSW economy:

- $218M in annual direct and indirect output;
- $99M in annual direct and indirect value added;
- $58M in annual direct and indirect household income; and
- 494 direct and indirect jobs.

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

- $65M in annual direct and indirect regional output or business turnover;
- $53M in annual direct and indirect regional value-added;
- $2M in annual direct and indirect household income; and
- 30 direct and indirect jobs.

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

- $74M in annual direct and indirect regional output or business turnover;
- $57M in annual direct and indirect regional value-added;
- $6M in annual direct and indirect household income; and
- 58 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.

While there will be a minor loss of 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 foregone agricultural activity are minor and significantly less than those of the construction and operation of the Project. Therefore, as well as the private landholders being better-off than they were before, 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.

Epuron proposes to work in partnership with the Councils (i.e. Singleton, Muswellbrook and Upper Hunter Shire) 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.
- Purchase local non-labour inputs to production, preferentially where local producers can be cost, terms and quality competitive, to support local industries.

The proposed Voluntary Planning Agreement would contribute a payment Muswellbrook Shire Council, Upper Hunter Shire Council and Singleton Shire Council that can then be directed to a range of community infrastructure needs and programs.

1 Introduction

1.1 The Project

Epuron Projects Pty Ltd (Epuron) is seeking approval for the construction, operation, maintenance and decommissioning of the Bowmans Creek Wind Farm (Project).

The Project is located at Bowmans Creek, approximately 10 km east of Muswellbrook and 120 km from the Port of Newcastle in NSW. Refer to Figure 1.1.

Epuron seeks State Significant Development (SSD) Development Consent approval under Division 4.7 of Part 4 of the *Environmental Planning & Assessment Act 1979* (EPA Act) for the Project (SSD 10315). Epuron also seeks an Approval from the Commonwealth Department of Agriculture, Water and the Environment (DAWE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The two Applications are supported by the '*Bowmans Creek Wind Farm Environmental Impact Statement*' (EIS) (Hansen Bailey, 2020). This Assessment supports the EIS.

The Project extends predominantly across two Local Government Areas (LGAs), being the Muswellbrook and Singleton Council LGAs. A small number of turbines are additionally proposed in the Upper Hunter Shire LGA.

The Project will generally involve the construction, operation, maintenance and decommissioning comprised of:

- Up to 60 wind turbine sites consisting of:
    - A three-blade rotor mounted onto a tubular tower;
    - Crane hardstand area; and
    - Turbine laydown area;
- Electricity infrastructure:
    - Up to two substations;
    - A 330 kv transmission line to transmit the generated electricity into the existing Transgrid network;
    - Connections between the wind turbines and the substations, which will include a combination of underground reticulation cables and overhead powerlines;
- Ancillary infrastructure;
    - Operation and Maintenance Facility (O&M Facility);
    - Construction compound and storage facilities;
    - Unsealed access tracks within the Project Boundary;
    - Ongoing use of existing and additional monitoring masts and other monitoring;
    - Temporary construction facilities (including concrete batching plant, laydown areas and rock crushing facilities);
- Minor upgrades to the road network to facilitate delivery of oversized loads (such as wind turbine components) to the Project; and
- Administrative activities (including boundary adjustments and subdivisions).

The conceptual Project layout is shown on Figure 1.2.

This Assessment generally applies to the Project Boundary unless otherwise stipulated in this Assessment.

1.2 Assessment guidelines and requirements

The Economic Impact 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 23 July 2019. The SEARs identify matters which must be addressed in the EIS. Table 1.1 lists the individual requirements relevant to this Economic Impact 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 Main Volume 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 taken into account by the Secretary for DPIE when preparing the SEARs.

There are no economic assessment guidelines for wind farms.

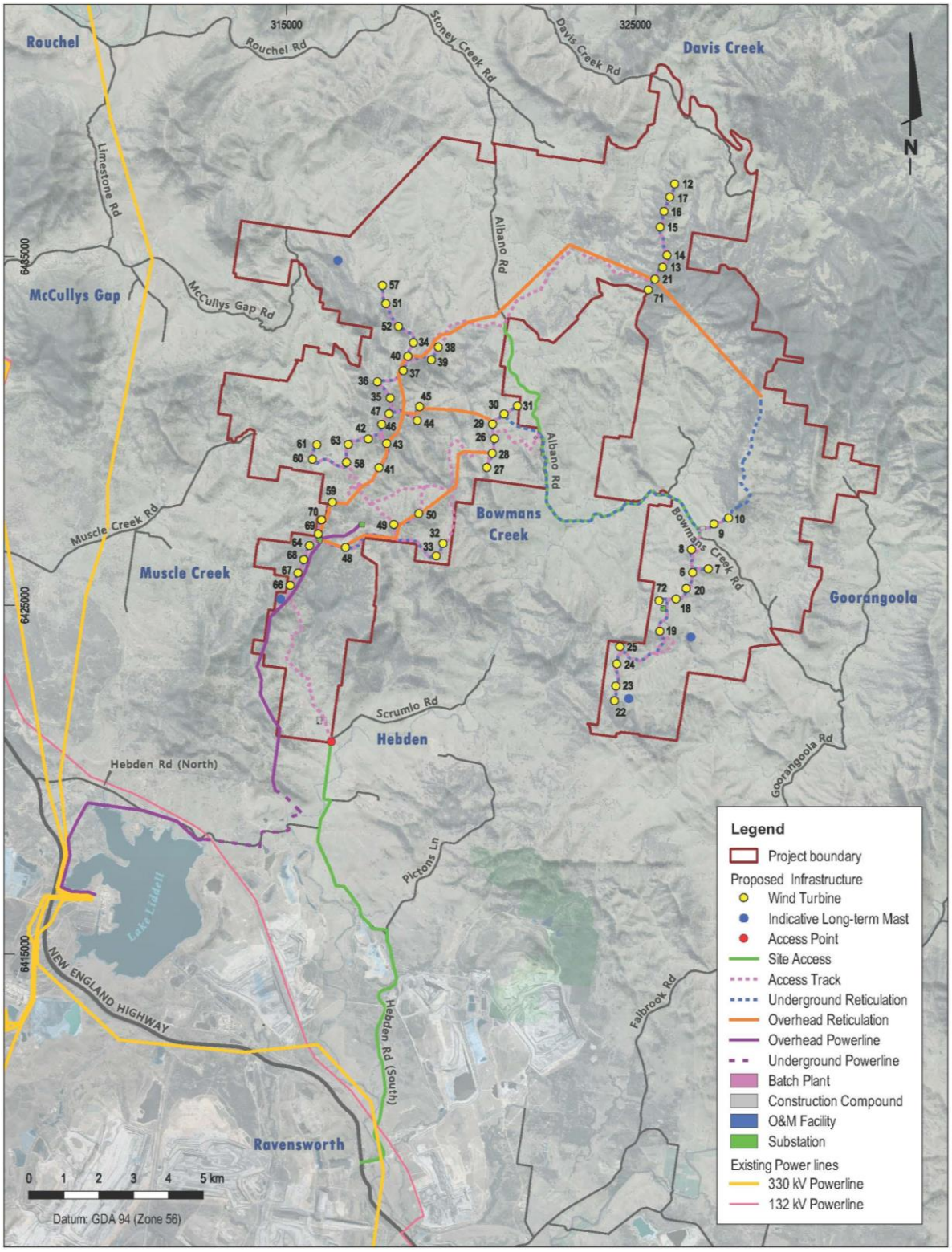
1.3 Structure of the report

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; and
- Conclusions are provided in Section 5.

Figure 1.1 – Project Location

Figure 1.2 – Conceptual Layout



2 The Regional Economy

2.1 Introduction

The Project is located across three local government areas (LGAs), Muswellbrook, Singleton and Upper Hunter. These LGAs comprise the regional economy and have the potential to contribute to the Project and derive economic benefits from both the construction and ongoing operation of the Project.

2.2 Characterisation of the region

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 53,185 and a labour force of 25,477, with Singleton LGA being the largest. In 2016, there were 1,628 people unemployed with the majority of these located in Singleton LGA although the unemployment rate was highest in Muswellbrook LGA.

The main occupations of usual residents were Technicians and Trade Workers followed by Machinery Operators and Drivers, and Labourers. The percentage of usual residents employed as Technicians and Trade Workers, and Machinery Operators and Drivers was greatest in Muswellbrook LGA, while the percentage of usual residents employed as Labourers was greatest in Upper Hunter LGA.

Table 2.1 - Characteristics of Usual Residents

	Muswellbrook		Singleton		Upper Hunter		Total Region	
Demographics								
Population	16,086		22,987		14,112		53,185	
Median Age	35		36		41			
Unemployed %	8.20%		6.10%		4.80%		6.40%	
No.	603		705		320		1,628	
In labour force	7,331		11,531		6,615		25,477	
Median household weekly income	1,346		1,682		1,242			
Unoccupied private dwellings %	15.60%		11.10%		14.30%		13.41%	
No.	1,065		972		862		2,899	
Median rent	16,086		22,987		14,112		53,185	
Occupations	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Technicians and Trades Workers	1,347	20.0%	1,922	17.80%	1060	16.80%	4,329	18.46%
Machinery Operators and Drivers	1,201	17.9%	1,873	17.30%	823	13.10%	3,897	16.61%
Labourers	870	12.9%	1,073	9.90%	1005	16.00%	2,948	12.57%
Professionals	717	10.7%	1,325	12.30%	768	12.20%	2,810	11.98%
Clerical and Administrative Workers	684	10.2%	1,179	10.90%	589	9.40%	2,452	10.45%
Managers	650	9.7%	1,186	11.00%	1,030	16.40%	2,866	12.22%
Community and Personal Service Workers	607	9.0%	1,224	11.30%	482	7.70%	2,313	9.86%
Sales Workers	533	7.9%	860	9.70%	447	7.10%	1,840	7.84%

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. Coal Mining is the most significant industry sector for employment of residents from all three LGAs. Defence is the next most significant employing sector for residents of Singleton LGA while Horse Farming is the next most significant sector for the employment of Muswellbrook LGA residents. Beef Cattle Farming (Specialised) and Horse Farming are also significant sectors for the employment of Upper Hunter Shire LGA residents.

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

Muswellbrook	**No.**	**%**	**Singleton**	**No.**	**%**	**Upper Hunter**	**No.**	**%**
Coal Mining	1,351	20.3	Coal Mining	2,367	22.0	Coal Mining	689	11.0
Horse Farming	198	3.0	Defence	448	4.2	Beef Cattle Farming (Specialised)	442	7.0
Fossil Fuel Electricity Generation	195	2.9	Takeaway Food Services	277	2.6	Horse Farming	378	6.0
Supermarket and Grocery Stores	189	2.8	Primary Education	210	2.0	Meat Processing	221	3.5
Primary Education	153	2.3	Cafes and Restaurants	192	1.8	Local Government Administration	184	2.9

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

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

Trends in regional economies 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; and
- preference of many of today's fastest growing industries for locating in large cities (Collits 2000).

The result is that there has been declining population in many rural LGAs that are located in non-coastal areas 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 grown at a rate of 6.05% since 2006, less than half the growth rate of NSW. This growth has been strongest in the Upper Hunter Shire LGA.

Table 2.3 - Population growth

LGA	2006	2011	2016	Growth 2006 - 2011	Growth 2011 - 2016	Growth Rate 2006 - 2016
Muswellbrook	15,236	15,791	16,086	3.64%	1.87%	5.58%
Singleton	21,937	22,694	22,987	3.45%	1.29%	4.79%
Upper Hunter Shire	12,976	13,754	14,112	6.00%	2.60%	8.75%
Total Region	**50,149**	**52,239**	**53,185**	**4.17%**	**1.81%**	**6.05%**
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

NSW DPIE population forecasts for the three LGAs are given in Table 2.4. This suggests continued population growth at a rate greater than Regional NSW, predominantly driven by Muswellbrook and Singleton LGAs.

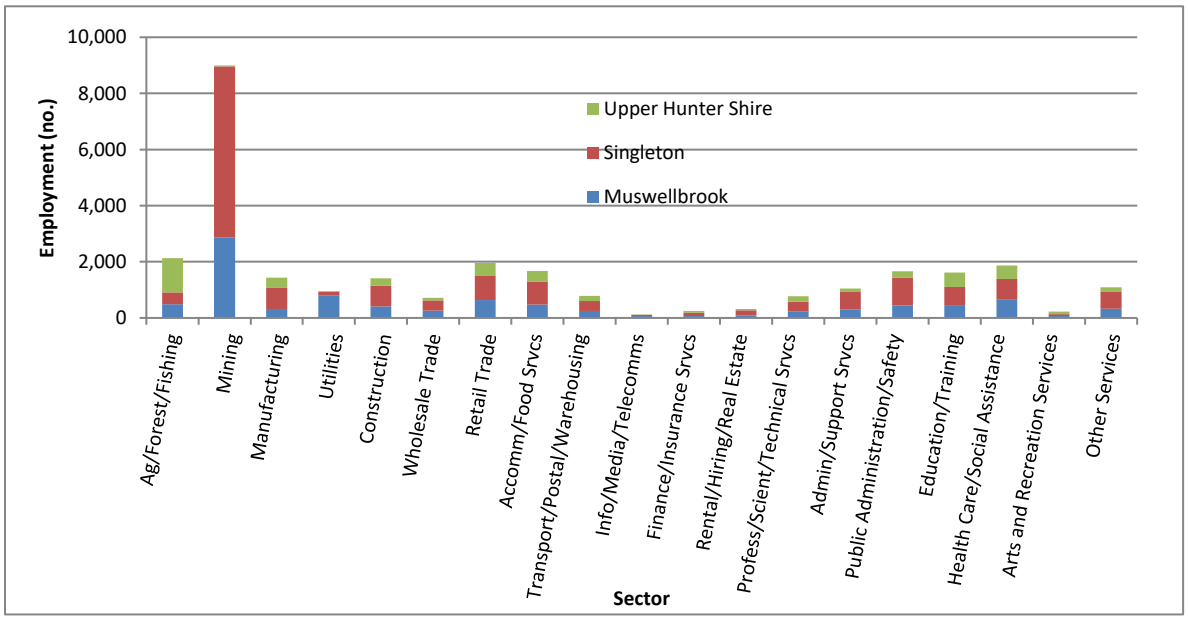
Table 2.4 - Average annual population growth rate projections

	2016 to 2021	2021 to 2026	2026 to 2031	2031 to 2036
Muswellbrook	1.00%	0.90%	0.80%	0.80%
Singleton	0.90%	0.80%	0.70%	0.60%
Upper Hunter Shire	0.60%	0.50%	0.40%	0.30%
Total Region	**0.87%**	**0.75%**	**0.65%**	**0.60%**
Regional NSW	**0.80%**	**0.71%**	**0.62%**	**0.54%**
NSW	**1.37%**	**1.28%**	**1.19%**	**1.12%**

Source: NSW Department of Planning and Environment, 2016 NSW population and household projections.

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 Mining Sectors (predominantly Coal Mining), followed by Agriculture, Forestry and Fishing Sectors (predominantly Beef Cattle Farming and Horse Farming). Mining employment is mainly located in the Singleton and Muswellbrook LGAs while employment in the Agriculture, Forestry and Fishing Sectors is mainly in the Upper Hunter Shire LGA.

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 $10,341 million for 2016. The region is a net exporter, with exports out of the region of $11,129 million and imports into the region of $5,427 million. Using the IO industry classifications, the largest exporting industries by value are:

- Coal Mining ($10,047M);
- Meat and Meat Products Manufacturing ($239M);
- Sheep, Grains, Beef and Dairy Cattle Farming ($150M); and,
- Electricity Generation ($132M).

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:

- Coal Mining ($2,042M);
- Electricity Generation ($319M);
- Construction Services ($119M); and
- Sheep, Grains, Beef and Dairy Cattle Farming ($95M).

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

Using the IO industry classifications, in terms of value-added, it is estimated that Coal Mining; Poultry and Other Livestock Farming; Electricity Generation; Sheep, Grains, Beef and Dairy Cattle Farming; and Employment, Travel Agency and Other Administration Services had the highest value added in total, equal to approximately 73% of the regional economy and 41% of regional employment - Table .[1]

Table 2.5 - Gross Value Added for the 5 Largest Industries in the regional economy (IO Sectors)

Industry	Gross Value Added ($m)	Proportion of Regional Economy (%)	Proportion of Regional Employment (%)
Coal Mining	6,812.6	66%	30%
Poultry and Other Livestock Farming	213.5	2%	2%
Electricity Generation	198.6	2%	2%
Sheep, Grains, Beef and Dairy Farming	171.1	2%	4%
Employment, Travel Agency and Other Admin Services	163.0	2%	2%

Source: Gillespie Economics Input-Output Table

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

Based on the ANZSIC One digit industry classification, in terms of value-added, it is estimated that Mining; Agriculture, Forestry and Fishing; Utilities; Rental, Hiring and Real Estate Services; and Public Administration and Safety had the highest value added in total, equal to approximately 80% of the regional economy and 48% 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)

Industry	Gross Value Added ($m)	Proportion of Regional Economy (%)	Proportion of Regional Employment (%)
Mining	6,932	67%	31%
Agriculture/Forestry/Fishing	440	4%	7%
Utilities	349	3%	3%
Rental, Hiring and Real Estate Services	296	3%	1%
Public Administration and Safety	271	3%	6%

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. It would also result in some contraction in regional economic activity from current cattle grazing activity within the disturbance footprint. These regional economic impacts are assessed using 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 cattle farming) 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 a number of 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; and
- Employment – the number of people employed (including self-employed, full-time and part-time).

As well as providing an indication of gross economic activity in a region, economic activity analysis can have important links to social impact assessment since changes in income and employment levels can impact population levels and their ability to maintain community infrastructure (schools, hospitals, housing etc), broader community and cultural value systems and inter-relationships.

3.3 Construction Phase

3.3.1 Introduction

Construction is estimated to occur over a 1.5-year period at a total cost of around $569M. Turbine and other component costs are estimated by Epuron to comprise 43% of construction costs and imported from overseas. The remainder (57%) is associated with civil works and associated salaries. 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 156. 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, $70M of expenditure would be required in these sectors (in the proportions given in Table 3.1) to generate an onsite workforce of 138.

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 - Economic Impacts of the Construction Workforce on the Regional Economy (Year 1)

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*	ADJUSTED TOTAL EFFECT
OUTPUT ($M)	70	36	10	46	116	114
Type 11A Ratio	1.00	0.52	0.14	0.66	1.66	1.63
VALUE ADDED ($M)	37	6	6	12	49	48
Type 11A Ratio	1.00	0.17	0.15	0.32	1.32	1.29
INCOME ($M)	12	3	2	5	17	17
Type 11A Ratio	1.00	0.25	0.18	0.43	1.43	1.39
EMPL. (No.)	138	39	39	79	217	209
Type 11A Ratio	1.00	0.28	0.28	0.57	1.57	1.51

Note: Totals may have minor discrepancies due to rounding.

Table 3.3 - Economic Impacts of the Construction Workforce on the NSW Economy (Year 1)

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*
OUTPUT ($M)	70	75	73	148	218
Type 11A Ratio	1.00	1.07	1.04	2.11	3.11
VALUE ADDED ($M)	36	22	40	63	99
Type 11A Ratio	1.00	0.62	1.12	1.74	2.74
INCOME ($M)	20	16	22	38	58
Type 11A Ratio	1.00	0.78	1.07	1.84	2.84
EMPL. (No.)	138	122	235	356	494
Type 11A Ratio	1.00	0.88	1.70	2.58	3.58

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 located 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. Epuron advises that 80% of the construction workforce are expected to be from the region. Consequently, the final column in Table 3.2 adjusts consumption-induced flow-ons to only include 80% 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 peak construction year (Year 1) of the Project is estimated to make up to the following total contribution to the regional economy:

- $114M in annual direct and indirect output;
- $48M in annual direct and indirect value-added;
- $17M in annual direct and indirect household income; and
- 209 direct and indirect jobs.

In year 2 of construction the following impacts are estimated for a six-month period:

- $57M in annual direct and indirect output;
- $24M in annual direct and indirect value-added;
- $8M in annual direct and indirect household income; and
- 209 direct and indirect jobs.

The peak construction year (Year 1) of the Project is estimated to make up to the following total contribution to the NSW economy:

- $218M in annual direct and indirect output;
- $99M in annual direct and indirect value added;
- $58M in annual direct and indirect household income; and
- 494 direct and indirect jobs.

In year 2 of construction the following impacts for NSW are estimated for a six-month period:

- $109M in annual direct and indirect output;
- $49M in annual direct and indirect value added;
- $29M in annual direct and indirect household income; and
- 494 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 1.29 for value-added up to 1.63 for output. The NSW type 11A ratio multipliers for the construction workforce range from 2.74 for value-added up to 3.58 for employment. 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 a number of 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

Average annual operating costs of the Project are estimated at $10M, including $1.35M in wages to 15 full-time employees. Non-labour operating costs are assumed to be spread across three sectors of the economy as per Table 3.4.

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*.

Average annual revenue is estimated at $58M.

Based on this information a Project operation sector consistent with the IO tables format was developed. This is summarised in Table 3.5.

Table 3.5 – Initial Allocation of Expenditure

Sectoral Expenditure	$
Other Repairs and Maintenance/Heavy and Civil engineering sector	$6,530,818*
Construction Services	$1,224,528
Electrical Transmission	$408,176
Intermediate - exp less wages	**$8,163,523**
Wages inside region	$1,350,000
Wages outside region	$0
Other Value Added	$48,081,562
Imports	$0
Output	**$57,595,085**
Employment	15

*50% of repair costs are assumed to be imported equipment costs.

For the analysis of the operational phase of the Project, a new Project sector was inserted into the regional and NSW IO tables reflecting average annual operation:

- 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;
- 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*;* and
- 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.

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 2020 dollars) is shown in Table 3.6 and Table 3.7, respectively .

Table 3.6 - Annual Economic Impacts of the Project on the Regional Economy ($2020)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	58	6	1	7	65
Type 11A Ratio	1.00	0.10	0.02	0.12	1.12
VALUE ADDED ($'000)	49	2	1	3	53
Type 11A Ratio	1.00	0.05	0.02	0.06	1.06
INCOME ($'000)	1	1	0	1	2
Type 11A Ratio	1.00	0.75	0.25	1.01	2.01
EMPL. (No.)	15	10	5	15	30
Type 11A Ratio	1.00	0.67	0.35	1.02	2.02

Note: Totals may have minor discrepancies due to rounding.

Table 3.7 - Annual Economic Impacts of the Project on the NSW Economy ($2020)

	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	58	9	8	17	74
Type 11A Ratio	1.00	0.16	0.13	0.29	1.29
VALUE ADDED ($'000)	49	4	4	8	57
Type 11A Ratio	1.00	0.08	0.09	0.16	1.16
INCOME ($'000)	1	3	2	5	6
Type 11A Ratio	1.00	2.31	1.99	4.30	5.30
EMPL. (No.)	15	18	25	43	58
Type 11A Ratio	1.00	1.21	1.64	2.84	3.84

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:

- $65M in annual direct and indirect regional output or business turnover;
- $53M in annual direct and indirect regional value-added;
- $2M in annual direct and indirect household income; and
- 30 direct and indirect jobs.

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

- $74M in annual direct and indirect regional output or business turnover;
- $57M in annual direct and indirect regional value-added;
- $6M in annual direct and indirect household income; and
- 58 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 1.06 for value-added up to 2.02 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 as a result 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 1.16 for value-added up to 5.30 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 a number of different sectors of the regional and NSW economy. The sectors most impacted by output, 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, wholesale trade sector, retail trade sector, professional, scientific and technical services sector,* and *employment, travel agency and other administrative services sector*. For the NSW economy, the *finance sector* and *health care 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 3.8 and 3.9).

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

Sector	Average Direct Effects	Production-induced	Consumption-induced	Total
Impact Sector	15	0	0	15
Primary	0	0	0	0
Mining	0	0	0	0
Manufacturing	0	0	0	1
Utilities	0	1	0	1
Wholesale/Retail	0	0	2	2
Accommodation, cafes, restaurants	0	0	1	1
Building/Construction	0	7	0	7
Transport	0	0	0	0
Services	0	1	2	3
Total	**15**	**10**	**5**	**30**

Note: Totals may have minor discrepancies due to rounding.

Table 3.9 - Sectoral Distribution of Annual Employment Impacts on the NSW Economy

Sector	Average Direct Effects	Production-induced	Consumption-induced	Total
Impact Sector	15	0	0	15
Primary	0	0	0	1
Mining	0	0	0	0
Manufacturing	0	1	1	2
Utilities	0	1	0	1
Wholesale/Retail	0	1	6	7
Accommodation, cafes, restaurants	0	0	3	4
Building/Construction	0	9	1	10
Transport	0	1	1	2
Services	0	5	12	17
Total	**15**	**18**	**25**	**58**

Note: Totals may have minor discrepancies due to rounding.

Tables 3.8 and 3.9 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

375 ha of land impacted by Project disturbance footprint could potentially be used for cattle grazing. Detailed revenue, expenditure and employment information related to cattle farming 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 the land could be used for cattle grazing on

unimproved pastures. For the purpose of the analysis the average revenue per ha i.e. $154.20 per ha per year, across three types of grazing enterprise for which the NSW Department of Primary Industries (DPI) provides gross margin budgets, was used i.e. Inland Weaner, Coastal weaners – unimproved pasture and Feeder steers.

Foregone revenue would therefore in the order of $58,000 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 3.10.

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

	Direct	Production induced	Consumption induced	Total Flow on*	TOTAL EFFECT*
OUTPUT ($M)	0.06	0.03	0.01	0.03	0.09
Type 11A Ratio	1.00	0.43	0.14	0.57	1.57
VALUE ADDED ($M)	0.03	0.01	0.00	0.02	0.04
Type 11A Ratio	1.00	0.45	0.18	0.63	1.63
INCOME ($M)	0.01	0.00	0.00	0.01	0.01
Type 11A Ratio	1.00	0.59	0.23	0.82	1.82
EMPL. (No.)	0.17	0.07	0.03	0.10	0.27
Type 11A Ratio	1.00	0.39	0.19	0.58	1.58

Note: Totals may have minor discrepancies due to rounding.

The agricultural impacts of the Project are less than 0.012% of agricultural activity in the region and hence are insignificant.

While there is a loss of 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 foregone agricultural activity are less than those of the construction and operation of the Project. Therefore, as well as the Project landholders being better-off than they were before, 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 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 - all of which 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; and
- 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 windfarms 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 windfarms investigated. The only properties where a possible effect was observed were lifestyle properties in Victoria within 500 m of a windfarm.

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 windfarms 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 windfarms 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.

Epuron proposes to work in partnership with the Councils (i.e. Singleton, Muswellbrook and Upper Hunter Shire) and the local community to help maximise the projected economic regional benefits whist minimising any impacts. In this respect, a range of general economic impact mitigation and management measures are proposed and would include:

- Employment of regional residents preferentially where they have the required skills and experience and are able to demonstrate a cultural fit with the organisation.
- Participating, as appropriate, in business group meetings, events or programs in the regional community.
- Locally source non-labour inputs to production where local producers can be cost and quality competitive, to support local industries.

A Voluntary Planning Agreement (VPA) will be entered into with Muswellbrook Shire Council, Upper Hunter Shire Council and Singleton Shire Council generally in accordance with Division 7.1(a) of Part 7 of the EP&A Act. Payments to councils 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 current cattle grazing 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.

Epuron proposes to work in partnership with the Councils (i.e. Singleton, Muswellbrook and Upper Hunter Shire) 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.
- Purchase local non-labour inputs to production, preferentially where local producers can be cost and quality competitive, to support local industries.

The proposed VPA would contribute a payment Muswellbrook Shire Council, Upper Hunter Shire Council and Singleton Shire 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; and
- 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); and
   - 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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