VEOLIA

Appendix DD

Economic assessment

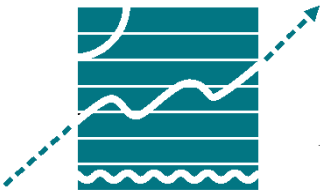
Economic Assessment

Woodlawn Advanced Energy Recovery Centre

Prepared for

Veolia Environmental Services (Australia) Pty Ltd

By



Gillespie Economics
Email: gillecon@bigpond.net.au
Web: gillespieeconomics.com

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EXECUTIVE SUMMARY

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located approximately 50 km south of Goulburn and 70 km north of Canberra. As the next phase of development at the Eco Precinct, Veolia proposes to develop the Woodlawn Advanced Energy Recovery Centre (ARC) (the project), an energy recovery facility (ERF). It is proposed that the ARC will treat approximately 380,000 tonnes per annum of waste that would otherwise go to landfill.

The project will provide economic activity to the Goulburn Mulwaree regional economy during both the construction and operation phase. These regional economic impacts were assessed using Input-Output analysis.

Construction activities will occur over a three-year period. In the peak year of construction, the project will make up to the following contribution to the regional economy:

- $227M in annual direct and indirect regional output or business turnover;
- $98M in annual direct and indirect regional value-added;
- $45M in annual direct and indirect household income; and
- 603 direct and indirect jobs.

Project operation will result in a contraction of economic activity associated with managing 380,000 tonnes per annum of waste via landfill and an increase in economic activity from the treatment of this amount of waste in the ARC. Overall, there will be an increase in regional economic activity. This arises because relative to the management of waste via landfill, the project results in a reduction in landfill levy costs that accrue outside the region, but an increase in actual processing and treatment costs that occur within the region.

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

- $37M in annual direct and indirect regional output or business turnover;
- $39M in annual direct and indirect regional value added;
- $7M in annual direct and indirect household income; and
- 120 direct and indirect jobs.

1 Introduction

1.1 Background

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located on Collector Road, approximately 6 kilometres (km) west of Tarago, approximately 50 km south of Goulburn and 70 km north of Canberra. The Eco Precinct is located in the Goulburn Mulwaree local government area (LGA). The Eco Precinct has provided sustainable and innovative waste management services since 2004.

The Eco Precinct comprises the following integrated waste management operations, energy recovery technologies and energy generation, and other sustainable land uses, including the following:

- Woodlawn Bioreactor (the Bioreactor) – a putrescible residual waste landfill in which leachate is recirculated to help bacteria break down the waste, enhancing the early generation of gas, enabling more efficient, capture and extraction of landfill gas, including leachate and landfill gas management systems.
- Woodlawn BioEnergy Power Station – utilises landfill gas from the Bioreactor to generate electricity.
- Woodlawn Mechanical Biological Treatment (MBT) Facility – processes municipal solid waste (MSW) to extract the organic content for use in tailings dam remediation.
- Agriculture – includes a working farm (sheep and cattle) that applies sustainable management practices.
- Aquaculture and horticulture – use of captured waste heat from the BioEnergy Power Station for use in sustainable fish farming and hydroponic horticulture at the Eco Precinct.
- Renewable energy generation – the Woodlawn Wind Farm (operated by Iberdrola) which has an installed capacity to generate up to 48.3 MW, and a solar farm (operated by Veolia) with installed capacity to produce up to 2.3 MW.

The Eco Precinct is served by the Crisps Creek Intermodal (IMF) near the village of Tarago. The Crisps Creek IMF is located approximately 8.5 km to the east of the Eco Precinct (by road). Operations are augmented by two waste transfer terminals located in Sydney; the Clyde Transfer Terminal, which commenced operation in 2004 with the Bioreactor and Crisps Creek IMF, and the Banksmeadow Transfer Terminal, which commenced operating in 2016.

Waste is transported from the Sydney transfer terminals in purpose-built shipping containers by rail on the Goulburn-Bombala Railway line to the Crisps Creek IMF from the Eco Precinct. At the Crisps Creek IMF the containers are loaded on to trucks for delivery to the Eco Precinct. Waste from the local area is also approved to be transported to the Eco Precinct by road.

Veolia proposes to develop and operate the Woodlawn Advanced Energy Recovery Centre (ARC) (the project), an energy recovery facility (ERF), at the Eco Precinct. This involves the development of an additional waste management technology at the Eco Precinct, processing a portion of the waste stream which is already approved to be received as part of integrated waste management operations, and recovering energy from the process.

1.2 Project Overview

The project will involve construction and operation of the following key components comprising the ARC:

- construction of the ARC, comprising an ERF for the thermal treatment of residual MSW and commercial and industrial (C&I) waste (the residual waste feedstock) that will otherwise be disposed of to landfill;
- thermal treatment in the ARC of approximately 380,000 tonnes per annum (tpa) of the residual waste feedstock;
- installed capacity of up to 30 megawatts (MW) of electricity (generation of up to 240,000 megawatt hours (MWh) of electricity per annum);
- on-site management of residual by-products generated by the ARC, including construction of an encapsulation cell; and
- construction of ancillary infrastructure to facilitate construction and operation of the project, including a new access road.

1.3 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 2 July 2021. The SEARs identify matters which must be addressed in the EIS. A copy of the SEARs is attached to the EIS as Appendix A, while 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
an analysis of any potential economic impacts of the development, including a discussion of any potential economic benefits to the local and broader community.	Section 3 of this report

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 the DPIE when preparing the SEARs.

There are no economic assessment guidelines for this type of project.

1.4 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.

2 The Regional Economy

2.1 Introduction

The project is located in the Local Government Area (LGA) of Goulburn Mulwaree. This is the region that has 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

2.2.1 Residents of the Region

Table 2.1 provides some characteristics of the usual residents of the Goulburn Mulwaree LGA regional economy based on the ABS 2016 Census of Population and Housing. In 2016, the regional economy had a population of 29,609 and a labour force of 13,578. In 2016, there were 851 people unemployed.

The main occupations of usual residents were *Professionals* followed by *Managers* (which includes farm managers) and *Technicians and Trade Workers*. Twenty-one per cent of the employed usual residents work outside the region, with the main locations being the ACT, No Fixed Address (NSW), Wingecarribee LGA, Queanbeyan-Palerang Regional LGA and Upper Lachlan Shire LGA.

Fifty-eight per cent of employed usual residents of the region work within the region. The next most significant location for employment was ACT (5%), No Fixed Address (NSW) (3%), Wingecarribee (2%). Queanbeyan-Palerang Regional (1%) and Upper Lachlan Shire (1%).

Table 2.1 - Characteristics of Usual Residents

	Goulburn Mulwaree LGA	
Demographics	**No.**	**%**
Population	29,609	
Median Age	42	
In labour force	13,578	45.9%
Unemployed	851	6.3%
Median household weekly income	$1,196	
Unoccupied private dwellings	1,928	15.0%
Median rent	$260	
Occupations	**No.**	**%**
Community and Personal Service Workers	1,947	15.3%
Technicians and Trades Workers	1,845	14.5%
Professionals	1,844	14.5%
Clerical and Administrative Workers	1,550	12.2%
Labourers	1,501	11.8%
Managers	1,468	11.5%
Sales Workers	1,266	10.0%
Machinery Operators and Drivers	1088	8.6%

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

The main industry sectors (4–digit Australian and New Zealand Industry Classification (ANZSIC)) in which usual residents were employed in 2016 is provided in Table 2.2. *Hospitals (except Psychiatric Hospitals), Aged Care Residential Services, Supermarket and Grocery Stores, Other Social Assistance Services and Takeaway Food Services* were the top five employing sectors for usual residents.

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

4-digit ANZSIC	No.	%
Hospitals (except Psychiatric Hospitals)	524	4.2%
Aged Care Residential Services	363	2.9%
Supermarket and Grocery Stores	349	2.8%
Other Social Assistance Services	333	2.6%
Takeaway Food Services	330	2.6%

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[1] 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 from Table 2.3 that the population of the region has grown relatively strongly and at a similar rate to NSW.

Table 2.3 - Population growth

	2006	2011	2016	Growth 2006 - 2011	Growth 2011 - 2016	Growth Rate 2006 - 2016
Goulburn Mulwaree	26,086	27,481	29,609	5.3%	7.7%	13.5%
NSW	6,549,177	6,917,658	7,480,228	5.6%	8.1%	14.2%

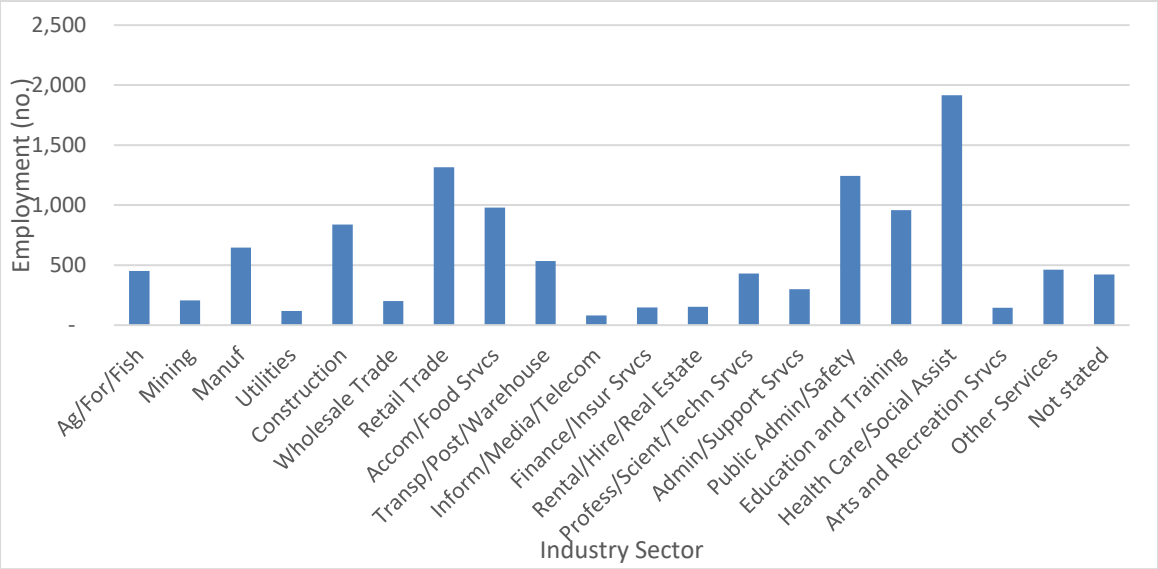
Source: Australian Bureau of Statistics, 2016 Census of Population and Housing, Community Profiles

[1] This can be considered symptomatic of key drivers in the economy based on the regions natural and manmade endowments that give it a comparative advantage in certain sectors.

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 1-digit ANZSIC industry data industry data - refer to Figure 2.1. This indicates the significance of the *Health Care and Social Assistance, Retail Trade and Public Administration and Safety*.

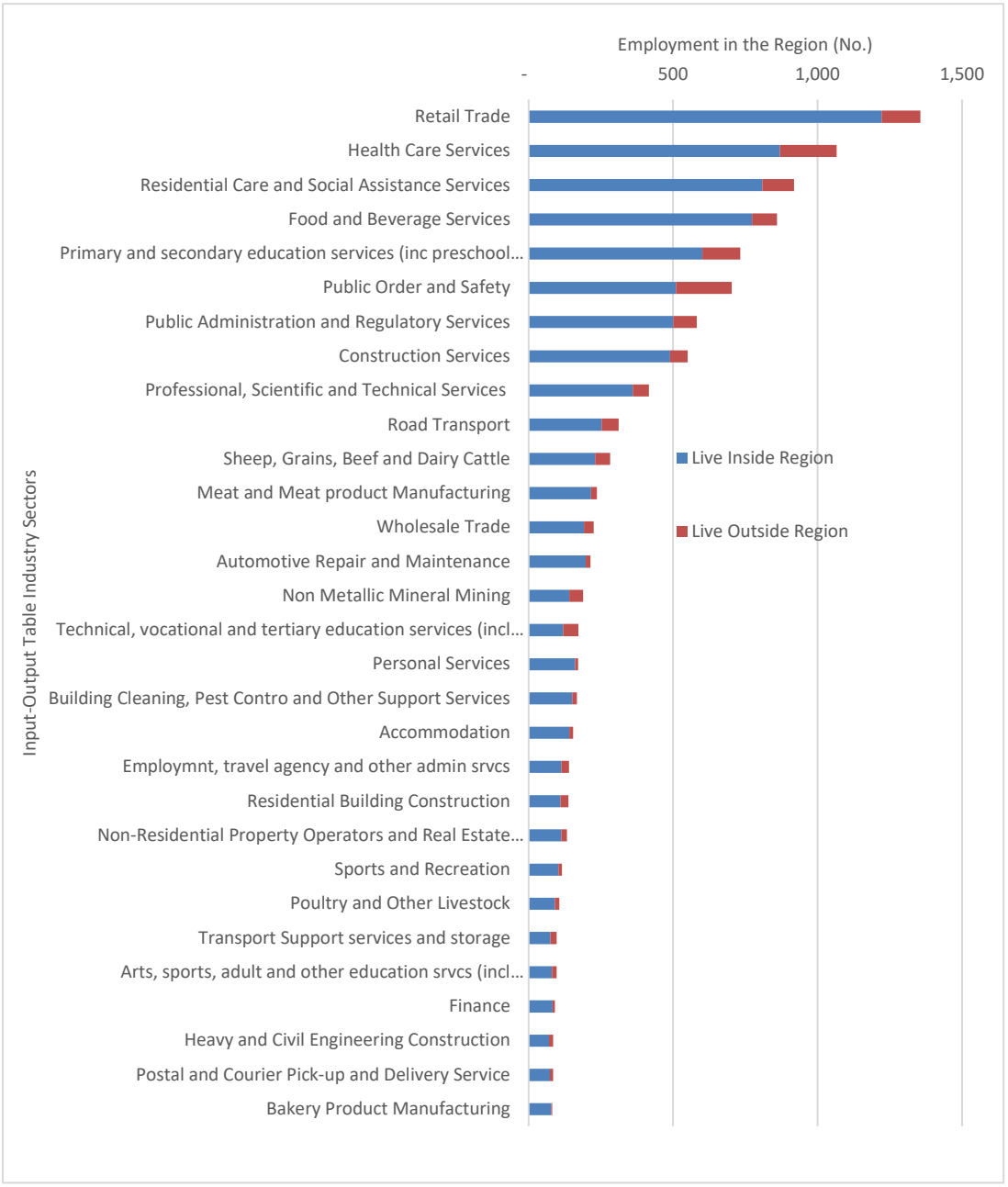
Figure 2.1 - Place of work employment by industry (1-Digit ANZSIC)



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

Figure 2.2 shows the top 30 input-output (IO) sectors of employment in the regional economy by place of residence. It indicates that *Retail Trade* is the greatest employing sector in the regional economy, followed by *Health Care Services, Residential Care and Social Assistance Services,* and *Food and Beverage Services*. Across all industry sectors in the regional economy, 85% of people who work in the region also reside in the region. Other key sources of labour are Upper Lachlan (5%), Wingecarribee (2%) and ACT (1%).

Figure 2.2 - Main Employing Sectors in the Regional Economy by Place of Residence



Source: Input-Output Table of the Goulburn Mulwarree LGA developed by Gillespie Economics

The Gross Regional Product (GRP) of the regional economy was estimated at $1,372 million for 2019/20 (prolife.id.com.au/Goulburn).

The region is a net importer, with exports out of the region of $865 million and imports into the region of $1,319 million. The largest exporting industries by output value are:

- *Manufacturing* ($186 million);
- *Public Administration and Safety* ($168 million);
- *Transport, Postal and Warehousing* ($112 million); and
- *Mining ($107 million)* (prolife.id.com.au/Goulburn).

Exporting sectors are considered to be key drivers of regional economies and reflect a region's endowments and competitive advantages. These sectors drive growth in "enabling" industries (that provide specialised inputs into export sectors e.g. repairs and maintenance of machinery) and "population serving" industries (that service the consumer needs of the population e.g. retail and personal services sectors, health sectors etc). Waste management undertaken by Veolia can be considered an exporting sector primarily providing services to Sydney. Its operations are based on around endowments associated with mining i.e. a void, and its location in close proximity to Sydney.

Based on the ANZSIC One–digit industry classification, in terms of value–added, it is estimated the most significant sectors of the regional economy are *Public Administration and Safety, Construction, Health Care and Social Assistance, Education and Training,* and *Manufacturing* – equal to approximately 52 per cent of the regional economy and 49 per cent of regional employment – Table 2.4. The five largest industry sectors contributed 89% of value added and 49% of regional employment.

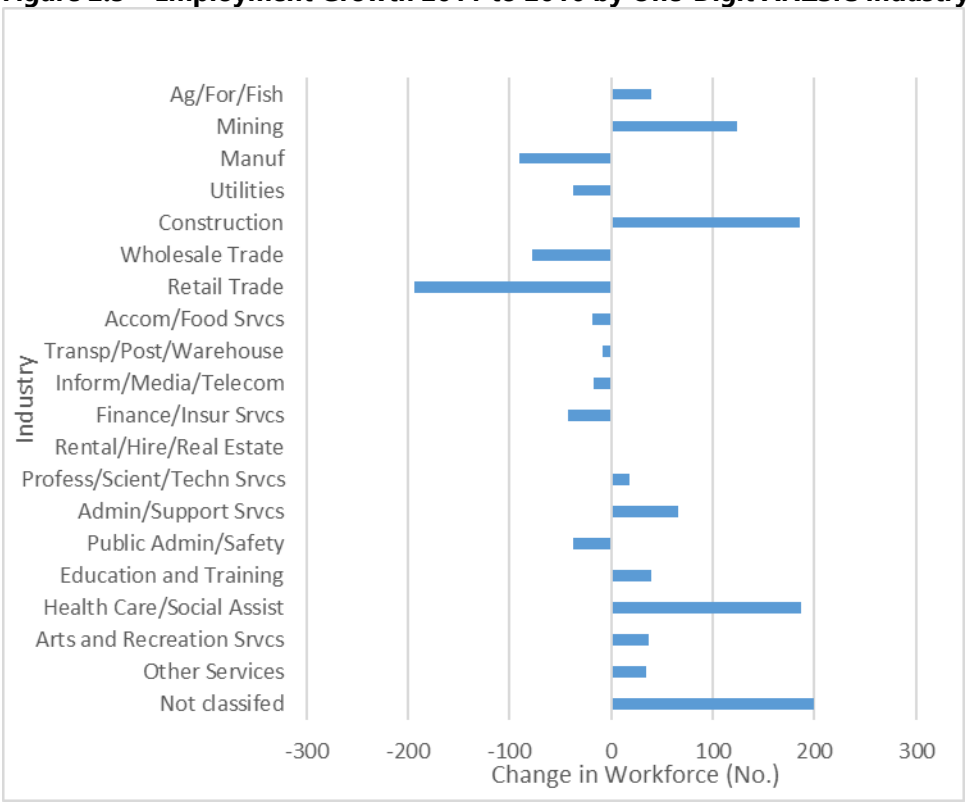
Table 2.4 – Gross Value Added for the 5 Largest Industries in the Regional Economy (ANZSIC One–Digit Sectors)

Industry	Gross Value Added ($m)	Proportion of Regional Economy Value Added (%)	Proportion of Regional Employment (%)
Public Administration and Safety	189.1	13.8	10.8
Construction	169.6	12.4	7.2
Health Care and Social Assistance	158.4	11.6	16.6
Education and Training	101.1	7.4	8.3
Manufacturing	94.5	6.9	5.6

Source: (prolife.id.com.au/Goulburn)

The region has experienced employment growth of 3.6% between 2011 and 2016 (prolife.id.com.au/Goulburn) compared to 4.8% for NSW (ABS Census of Population and Housing, Working Population Profile). The main sectors (One-digit ANZSIC) driving growth in employment was *Health Care and Social Assistance (mainly Hospitals and Other Social Assistance Services), Construction and Mining (*mainly *Construction Material Mining)).* Refer to Figure 2.3.

Figure 2.3 – Employment Growth 2011 to 2016 by One-Digit ANZSIC Industry Sectors



Source: (prolife.id.com.au/Goulburn)

3 Regional Economic Impacts

3.1 Introduction

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

3.2 Input-Output Analysis

IO analysis essentially involves two steps:

- Construction of an appropriate IO table (regional transaction table) that can be used to identify the economic structure of the region and multipliers for each existing sector of the economy; and
- Identification of the impact or stimulus of the project (construction/operation of the project) 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. It is also based on average rather than marginal effects. 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 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).

3.3 Construction Phase

3.3.1 Introduction

Direct economic activity associated with the project construction is estimated to mainly occur within four sectors of the economy, namely:

- the *heavy and civil engineering construction sector* which includes businesses involved in onsite assembly of heavy electrical machinery from prefabricated components;

- the *non-residential building construction sector* which includes businesses involved in the construction of industrial buildings;
- the *construction services sector* which includes businesses involved in site preparation services, plumbing, electrical and other trades; and
- the *specialised and other machinery and equipment manufacturing sector* which includes the manufacturing of industrial machinery and equipment.

3.3.2 Impact on Regional Economy

Given the largely specialist nature of capital equipment and the relatively small size of the regional economy, for the purpose of this analysis a conservative assumption is made that all such purchases are made outside the regional economy. Therefore, regional economic activity from the project construction phase primarily relates to the three construction sectors.

The average annual construction workforce required for the project during construction is estimated by Veolia at 200 in 2023, 300 in 2024, and 150 in 2025. Based on the IO coefficients of the three construction sectors, the level of construction expenditure required to generate this level of employment across the three construction sectors is $87M, $131M, and $66M, respectively.

The direct and indirect regional economic impact of this level of expenditure in the regional economy is reported in Table 3.1. See Section 3.3.3 for an explanation of Type 11A Ratio multipliers. The consumption induced effects have been adjusted to account for estimated 30% of the construction workforce commuting from outside the region.[2]

[2] Based on ABS data on residential location of regional workforce in the three relevant construction sectors.

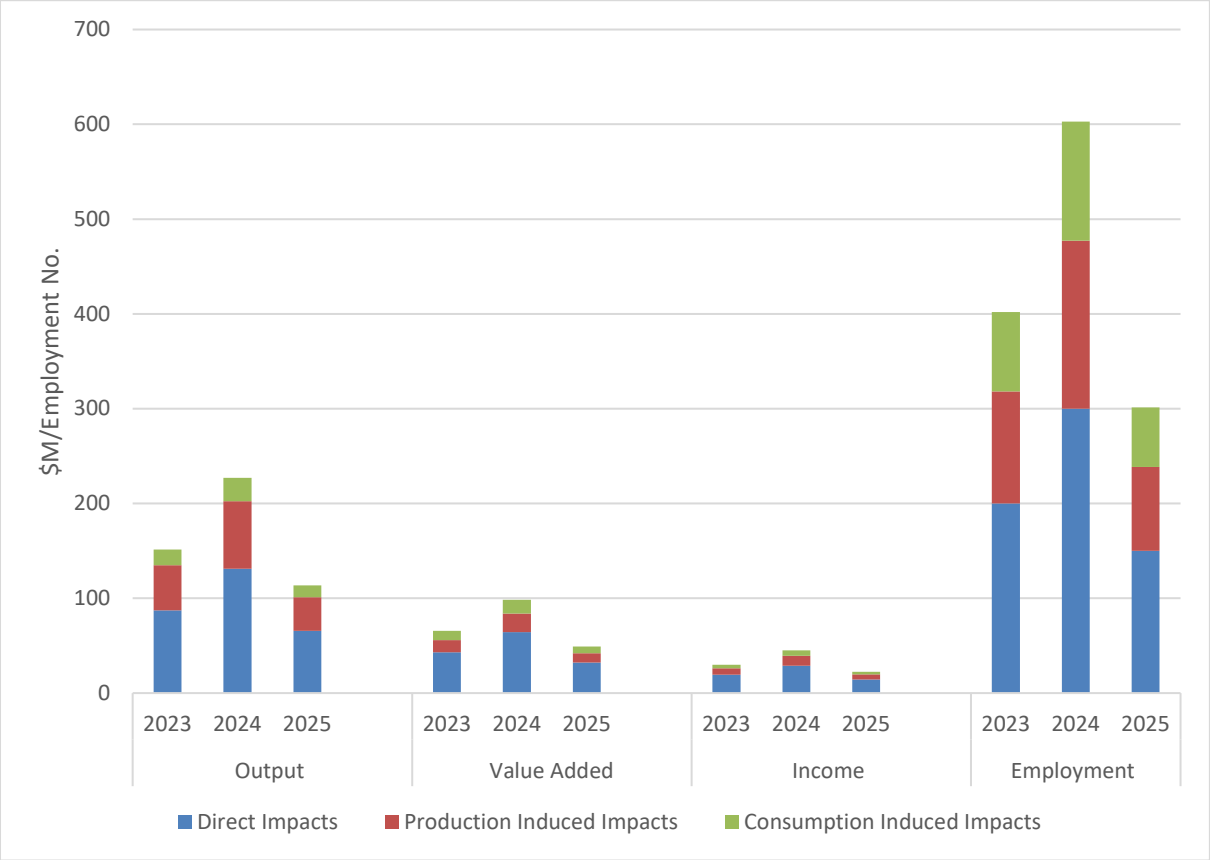
Table 3.1 - Economic Impacts of Construction on the Regional Economy

2023	Direct Effect	Production Induced	Consumption Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($M)	87	48	16	64	151
Type 11A Ratio	1.00	0.54	0.19	0.73	1.73
VALUE ADDED ($M)	43	13	10	23	66
Type 11A Ratio	1.00	0.30	0.23	0.53	1.53
INCOME ($M)	19	7	4	11	30
Type 11A Ratio	1.00	0.36	0.19	0.55	1.55
EMPL. (No.)	200	118	84	202	402
Type 11A Ratio	1.00	0.59	0.42	1.01	2.01
2024	**Direct Effect**	**Production Induced**	**Consumption Induced**	**Total Flow-on**	**TOTAL EFFECT**
OUTPUT ($M)	131	71	25	96	227
Type 11A Ratio	1.00	0.54	0.19	0.73	1.73
VALUE ADDED ($M)	64	19	15	34	98
Type 11A Ratio	1.00	0.30	0.23	0.53	1.53
INCOME ($M)	29	10	6	16	45
Type 11A Ratio	1.00	0.36	0.19	0.55	1.55
EMPL. (No.)	300	177	126	303	603
Type 11A Ratio	1.00	0.59	0.42	1.01	2.01
2025	**Direct Effect**	**Production Induced**	**Consumption Induced**	**Total**	**TOTAL EFFECT**
OUTPUT ($M)	66	36	12	48	114
Type 11A Ratio	1.00	0.54	0.19	0.73	1.73
VALUE ADDED ($M)	32	10	7	17	49
Type 11A Ratio	1.00	0.30	0.23	0.53	1.53
INCOME ($M)	14	5	3	8	22
Type 11A Ratio	1.00	0.36	0.19	0.55	1.55
EMPL. (No.)	150	89	63	151	301
Type 11A Ratio	1.00	0.59	0.42	1.01	2.01

Note: Totals may have minor discrepancies due to rounding.

These annual impacts are summarised graphically in Figure 3.1.

Figure 3.1 - Economic Impacts of Construction on the Regional Economy



In the peak year of construction, the project will make up to the following contribution to the regional economy (Table 3.1):

- $227M in annual direct and indirect regional output or business turnover;
- $98M in annual direct and indirect regional value-added;
- $45M in annual direct and indirect household income; and
- 603 direct and indirect jobs.

3.3.3 Main Sectors Affected

As can be seen from Figure 3.1 direct economic activity effects dominate, apart from for employment where the flow-on (production induced and consumption induced) employment impacts are greater than direct employment impacts.

Flow-on impacts from the project construction affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added, income and employment production induced flow-ons are:

- *Professional, Scientific and Technical Services;*
- *Non-Residential Property Operators and Real Estate Services;*
- *Employment, Travel Agency and Other Administrative Services;*
- *Wholesale Trade;*

- *Road transport;*
- *Rental and Hiring Services (except Real Estate); and*
- *Retail trade.*

The sectors most impacted by output, value-added, income and employment consumption induced flow-ons are:

- *Retail Trade;*
- *Food and Beverage Services;*
- *Health Care Services;*
- *Wholesale Trade;*
- *Residential Care and Social Assistance; and*
- *Primary and Secondary Education.*

3.4 Operation Phase

3.4.1 Introduction

For the analysis of the operational phase of the project, two IO sectors were developed. The first represented the annual revenues, costs and employment associated with the continued management of 380,000 tonnes per annum waste via landfill. The second IO sector represented the revenues, costs and employment associated with the treatment of 380,000 tonnes per annum of waste in the ARC. These sectors were developed from financial and employment information provided by Veolia.

In the generation of these sectors:

- the estimated gross annual revenue was allocated to the *Output* row;
- the estimated wage bill of those residing in the region was allocated to the *household wages* row, with any remainder allocated to *imports*;
- non-wage expenditure was initially allocated across the relevant *intermediate sectors* in the economy, *imports* and *other value-added*;
- allocation was then made between *intermediate sectors* in the local economy and *imports* based on regional location quotients;
- purchase prices for expenditure in each sector in the region 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 in the region was allocated to the *employment* row.

These sectors were inserted one at a time into an IO table of the regional economy and flow-on impacts estimated using computer program EconImp developed by Gillespie Economics. The difference between the two impact assessments represents the incremental impact of the project to the regional economy.

3.4.2 Impacts on the Regional Economy

The total and disaggregated annual impacts of continued management of 380,000 tonnes per annum waste via landfill and 380,000 tonnes per annum of waste in the ARC is shown in Table 3.2.

Table 3.2 - Annual Economic Impacts of the Project on the Regional Economy ($2021)

LANDFILL TREATMENT	Direct Effect	Production Induced	Consump. Induced	Total Flow-on	TOTAL EFFECT
OUTPUT ($'000)	105	6	2	9	113
Type 11A Ratio	1.00	0.06	0.02	0.08	1.08
VALUE ADDED ($'000)	28	3	1	4	32
Type 11A Ratio	1.00	0.10	0.05	0.15	1.15
INCOME ($'000)	1	1	1	2	3
Type 11A Ratio	1.00	1.30	0.46	1.76	2.76
EMPL. (No.)	15	27	12	39	54
Type 11A Ratio	1.00	1.80	0.79	2.58	3.58
ARC TREATMENT	**Direct Effect**	**Production Induced**	**Consump. Induced**	**Total Flow-on**	**TOTAL EFFECT**
OUTPUT ($'000)	115	27	8	35	150
Type 11A Ratio	1.00	0.23	0.07	0.30	1.30
VALUE ADDED ($'000)	56	11	5	15	71
Type 11A Ratio	1.00	0.19	0.08	0.27	1.27
INCOME ($'000)	3	6	2	7	10
Type 11A Ratio	1.00	1.89	0.58	2.46	3.46
EMPL. (No.)	40	94	40	134	174
Type 11A Ratio	1.00	2.36	0.99	3.34	4.34
INCREMENTAL IMPACT	**Direct Effect**	**Production Induced**	**Consump. Induced**	**Total Flow-on**	**TOTAL EFFECT**
OUTPUT ($'000)	10	21	5	26	37
Type 11A Ratio	1.00	1.98	0.52	2.51	3.51
VALUE ADDED ($'000)	28	8	3	11	39
Type 11A Ratio	1.00	0.28	0.12	0.40	1.40
INCOME ($'000)	2	4	1	5	7
Type 11A Ratio	1.00	2.24	0.65	2.89	3.89
EMPL. (No.)	25	67	28	95	120
Type 11A Ratio	1.00	2.69	1.11	3.80	4.80

Note: Totals may have minor discrepancies due to rounding.

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

- $37M in annual direct and indirect regional output or business turnover;
- $39M in annual direct and indirect regional value added;
- $7M in annual direct and indirect household income; and
- 120 direct and indirect jobs.

3.4.3 Multipliers

The Type 11A ratio multipliers for the treatment of waste in the ARC are higher than those associated with the treatment of the equivalent amount of waste via landfill. This is particularly the case for production induced flow-on component of the ratio multiplier. This arises because relative to management of waste via landfill, the project results in a reduction in landfill levy costs that accrue outside the region, but an increase in actual processing and treatment costs that occur within the region.

The higher income and employment ratio multipliers for both landfill and the ARC (compared to output and value-added multipliers) occur because capital intensive industries 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 capital intensive sectors compared to incomes in the sectors that would experience flow-on effects from the project. Capital intensive sectors 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.

3.4.4 Main Sectors Affected

Flow-on impacts from the project operation affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added, income and employment production induced flow-ons are:

- *Basic Chemical Manufacturing;*
- *Construction services;*
- *Professional, Scientific and Technical Services;*
- *Other Repairs and Maintenance;*
- *Wholesale Trade;*
- *Road transport;* and
- *Retail trade.*

The sectors most impacted by output, value-added, income and employment consumption induced flow-ons are:

- *Retail Trade;*
- *Food and Beverage Services;*
- *Health Care Services;*
- *Wholesale Trade;*
- *Residential Care and Social Assistance;* and
- *Primary and Secondary Education.*

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.

4 Mitigation and Management Measures

It is evident from Section 4 that construction and operation of the project will have net positive impacts on the level of economic activity in the regional economy.

Veolia proposes to continue to work in partnership with the Goulburn Mulwaree 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 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.

5 Conclusion

The project will provide economic activity to the Goulburn Mulwaree regional economy during both the construction and operation phase.

Construction activities will occur over a three-year period. In the peak year of construction, the project will make up to the following contribution to the regional economy:

- $227M in annual direct and indirect regional output or business turnover;
- $98M in annual direct and indirect regional value-added;
- $45M in annual direct and indirect household income; and
- 603 direct and indirect jobs.

Project operation will result in a contraction of economic activity associated with managing 380,000 tonnes per annum of waste via landfill and an increase in economic activity from the treatment of this amount of waste in the ARC. Overall, there will be an increase in regional economic activity. This arises because relative to management of waste via landfill, the project results in a reduction in landfill levy costs that accrue outside the region, but an increase in actual processing and treatment costs that occur within the region.

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

- $37M in annual direct and indirect regional output or business turnover;
- $39M in annual direct and indirect regional value added;
- $7M in annual direct and indirect household income; and
- 120 direct and indirect jobs.

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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