Economic Impact of the Geelong Port

A report to

Victorian Regional Channels Authority

Prepared by

econsearch

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EXECUTIVE SUMMARY

Role and Impact of Ports

The operation of a port generates employment and income for the local community, as well as flow-on effects to other local industries. In addition, all levels of government receive revenue from taxes and other charges on these activities.

In recent years, there has been increased pressure across Australia to restrict the scope of port activities in response to changing perceptions (real or otherwise) about the pollution generated by ports and the contribution to congestion on main roads. Such restrictions can reduce the efficiency of a port and the competitiveness of shippers that use the port. There may also be adverse effects on local income and employment.

Port economic impact studies can contribute to a balanced assessment of the role of ports and to informed consideration of issues such as port planning (Bureau of Transport Economics 2000).

The Port of Geelong

The Port of Geelong is the key feature of Victoria's largest provincial city, Geelong, located approximately 75 km (by road) west of Melbourne. The Port of Geelong is the second largest port in the State of Victoria, with a total throughput of 12.1 million tonnes in 2014/15. The cargo traded during the year had an estimated value of approximately $8.2 billion. Despite below average seasonal conditions for grain production, trade in 2014/15 was slightly above (4%) the average for the decade of 11.5 million tonnes.

Crude oil and petroleum products account for the majority of trade in the port in terms of volume. Grain, woodchips and fertiliser also make a significant contribution to the total volume and value of goods shipped through the port.

The major facilities at the port are located around the shore of Corio Bay, from Point Wilson in the north to Point Henry to the south. There are 15 operational berths available including specialist and general cargo berths. The refinery and tanker berths are located on the northern side of the port. There are numerous general purpose berths and wharves and associated storage and processing facilities located between the refinery and Point Henry.

Conduct of the Study

The study of the Port of Geelong was undertaken using the general framework for port impact studies developed by the Bureau of Transport Economics (2000). The framework was initially applied in a study of the Port of Fremantle.

The study aimed to measure the economic impact of port-related activity at the regional and state levels. For the purposes of this study, port-related activity was defined as the activity undertaken by firms and organisations in moving cargo through the Port of Geelong and in providing goods and services to directly facilitate the movement of cargo through the port. Port

impact was measured in terms of output, value added, household income and employment (refer to the Glossary for definition of these measures).

The estimates of port impact cover the direct effects of the port and the subsequent flow-on effects to other sectors of the regional and state economies. The analysis was based on shipping, cargo and financial data for 2014/15 and updated survey data collected for a similar study conducted three years ago (EconSearch 2012). Input-output models for the Barwon region and Victoria were used to calculate the flow-on effects to other industry sectors.

Estimates of Port Impact

Tables 1 and 2 present estimates of the overall impact of the Port of Geelong at the regional and state levels, respectively, incorporating the direct and flow-on effects.

Direct effects

The ***direct impact*** of port-related activity on output, value added, household income and employment is shown in the first column of Table 1 (Table 2 for Victoria). The value of output, estimated to be $289 million, is the sum of gross business revenue of firms defined as port-related (or that proportion of firms' revenues attributable to port-related activity), and gross expenditure by port-related government, semi-government and non-profit organisations. These are revenues generated and expenditure incurred in the Barwon region. The direct impacts are the same for Victoria as a whole.

Table 1 Economic Impact of the Port of Geelong, 2014/15 (Barwon)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact* [b]
Output ($m)	289	158	447
Value added ($m)	146	83	229
Household income ($m)	64	44	109
Employment[a]	855	574	1,429

[a] Number of jobs (full-time equivalent).

[b] Rounding errors occur.

Source: EconSearch analysis

Table 2 Economic Impact of the Port of Geelong, 2014/15 (Victoria)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Output ($m)	289	280	570
Value added ($m)	146	147	293
Household income ($m)	64	77	141
Employment[a]	855	945	1,800

[a] Number of jobs (full-time equivalent).

[b] Rounding errors occur.

Source: EconSearch analysis

The value added from port-related activity was estimated to be $146 million. Direct employment (full-time equivalents) was estimated to be 855, and corresponding household income was $64 million. This indicates an average gross annual income of around $75,000 for those employed in firms and organisations engaged in port-related activity. Household income includes overtime payments and income tax, although is net of payroll tax and other related charges.

Flow-on effects

The flow-on effects of port-related activity in the Barwon region total $158 million in output ($280 million for Victoria), $83 million in value added ($147 million for Victoria), 574 jobs (945 for Victoria) and $44 million in corresponding household income ($77 million for Victoria) (Tables 1 and 2).

Trade, finance and business services and manufacturing are the three sectors where port-related activity has the largest impact. For all four measures of economic impact (output, value added, employment and income), around 60 per cent of the total flow-on effect occurred in these three sectors. For employment, the combined impact in these sectors was around 350 jobs in the Barwon region and approximately 570 jobs state wide, of the total employment flow-on from port-related activity.

Total impact

The operation of the Port of Geelong in 2014/15 generated, in terms of output, an estimated total impact on the Barwon economy of over $447 million and around $570 million on the Victorian economy as a whole.

Value added attributable to the operation of the port was estimated to be $229 million in the Barwon region ($293 million state wide). This was equivalent to approximately 2.1 per cent of gross regional product, which provides a measure of the overall level of economic activity in the Barwon region. In terms of the State's economy, it represented 0.09 per cent of Victoria's gross state product.

Household income generated by the operation of the port totalled $109 million in the Barwon region ($141 million in Victoria). Employment was estimated at almost 1,430 jobs (full-time equivalent), which represented 1.6 per cent of total employment in the Barwon region. At the State level, the estimated employment effect of around 1,800 fte jobs was just over 0.07 per cent of Victoria's employment.

There were 709 ship visits per year to the Port of Geelong by commercial cargo vessels in 2014/15. The results of the analysis indicated that each ship call at the Port of Geelong involved the following impact on the economies of the Barwon region and Victoria (Table 3).

Table 3 Average impact per ship call for the Port of Geelong, 2014/15

Indicator	Barwon region	Victoria
Output	$631,000	$803,000
Value added	$324,000	$413,000
Household income	$154,000	$199,000
Jobs (full-time equivalent)	2.0	2.5

Detailed Impact Measures

Estimated port impacts have been disaggregated to identify the relative contribution of the individual port functions and cargo types. These detailed impact measures are provided for the Barwon region in Table 4 and for Victoria in Table 5.

Table 4 Detailed measures of the total economic impact of the Port of Geelong, 2014/15 (Barwon)

Component	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment (fte)*
Function				
Port administration	75.3	47.5	20.0	203
Ship operations	85.0	40.0	19.8	264
Ship loading/unloading	72.0	43.1	20.2	256
Land transport & storage	208.8	95.9	46.9	675
Government agencies	6.0	2.8	2.0	30
Total [a]	*447.2*	*229*	*108.9*	*1,429*
Cargo Type				
Woodchips	92.5	47.7	22.4	295
Fertiliser	94.6	46.4	22.3	304
Grain	50.2	24.5	11.8	162
Other Dry Bulk	45.6	22.4	10.7	146
Steel Products	23.2	12.2	5.8	77
Crude Oil & Petroleum Products	94.4	51.4	24.0	296
Chemicals	14.7	8.2	3.8	48
Other Cargo	31.9	16.7	8.0	103
Total [a]	*447.2*	*229.4*	*108.9*	*1,429*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Port Function

The largest impacts occurred in the *land transport and storage* sector (including road and rail transport). The value of services provided by this sector was almost $141 million, with flow-ons to other sectors in the Barwon economy of $67 million, which gives a total output impact of $209 million ($275 million in Victoria). The employment impact of land transport and storage was estimated to be 675 fte jobs (878 in Victoria), 422 directly in the sector and flow-on

employment in other sectors estimated to be over 250. Associated household income for the 675 Barwon region jobs came to almost $47 million.

Table 5 Detailed measures of the total economic impact of the Port of Geelong, 2014/15 (Victoria)

Component	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Function				
Port administration	91.7	55.9	24.0	249
Ship operations	107.9	51.7	25.9	336
Ship loading/unloading	87.4	51.2	24.3	302
Land transport & storage	274.6	130.2	64.4	878
Government agencies	7.9	3.8	2.5	35
Total [a]	*569.6*	*292.8*	*141.1*	*1800*
Cargo Type				
Woodchips	118.0	60.9	29.1	372
Fertiliser	122.2	60.6	29.6	388
Grain	64.9	32.1	15.7	207
Other Dry Bulk	58.8	29.3	14.2	186
Steel Products	29.3	15.4	7.4	95
Crude Oil & Petroleum Products	117.9	63.4	30.1	366
Chemicals	18.2	10.0	4.8	58
Other Cargo	40.3	21.0	10.2	128
Total [a]	*569.6*	*292.8*	*141.1*	*1800*

The *ship loading and unloading* sector, comprised mainly of bulk cargo handling, had a direct and indirect output impact in the Barwon region of over $72 million. Employment generated directly and indirectly by this sector was measured at more than 250, with associated household income of approximately $20 million.

Cargo type

The most significant cargo types in terms of the total volume of trade through the Geelong Port in 2014/15 were:

- crude oil and petroleum products
- woodchips
- fertiliser
- grain.

Together, these four commodity groups accounted for almost 75 per cent of the total port economic impact (Tables 4 and 5).

Impact of Port Users and Port Commodities

In the case of the Port of Geelong, as with most other ports, there is a certain amount of economic activity in the Port's hinterland that would not occur in the local economy if the Port did not have its particular location. Employment data that were collected for ten significant port users for the previous impact studies (EconSearch 2005, 2010, 2012) and this was extended in the analysis for this study. These firms account for direct employment of an estimated 2,260 people (full-time equivalents) in the Barwon economy. Each firm was categorised by industry sector and standard employment to output ratios for each industry sector were applied to the employment data to estimate the value of production by these firms. These data were then used in the Barwon regional economic model to estimate the direct and indirect effects of the operations of these businesses to the local economy.

The results indicate that the locally based Port of Geelong users generated direct business turnover of over $3.8 billion in 2014/15 with flow-ons of $1.5 million giving an estimated total output impact (direct plus flow-ons) on the Barwon economy of around $5.3 billion.

Value added attributable to the operation of the port user firms was estimated to be just under $870 million in the Barwon region, with flow-ons of $770 million. This provided a total contribution of approximately $1.6 billion or more than 14 per cent of gross regional product in the Barwon region in 2014/15.

Household income generated by the locally based Port users totalled $271 million in the Barwon region, with flow-ons of $460 million. Direct employment was estimated at 2,260 jobs (full-time equivalent) and flow-ons of 5,725 fte, giving total employment (direct plus flow-on) generated by the Port users as an estimated 7,985 fte. This represented around 9.3 per cent of total employment in the Barwon region in 2014/15.

Impact of Future Trade Flows

Summary trade forecasts for the principal growth commodities are shown in Table 6. The change in trade volumes will have a significant impact on the economies of the Barwon region and Victoria, particularly the forecast growth in woodchips, fertiliser, grain, other dry bulk, steel products and chemicals.

The prospect of expanding trade through the Port of Geelong will generate economic impacts in two broad forms: the impacts arising from the construction and upgrade of port facilities and the impacts associated with the movement of the additional cargo. This second aspect of economic impact has been the focus in this analysis. Included in the analysis is the impact of the potential increase in cruise ship visitation to the port.

Table 6 Forecast trade flows for main commodities (medium scenario) through the Port of Geelong (kt)

	Year				
Commodity	2014/15	2019/20	2024/25	2029/30	2034/35
Woodchips & Logs	1,329	1,387	1,497	1,620	1,755
Fertiliser	1,489	1,968	1,993	2,018	2,043
Grain	876	2,102	2,209	2,322	2,440
Other Dry Bulk	751	854	854	854	854
Steel Products	158	180	180	180	180
Crude Oil & Petroleum Products	6,841	6,985	6,985	6,985	6,985
Chemicals	378	430	430	430	430
Other Cargo	233	286	308	334	364
Total	*12,055*	*14,192*	*14,457*	*14,743*	*15,052*

Source: GeelongPort, GrainCorp, EconSearch analysis.

The estimated impacts of this set of 'medium scenario' trade flows, measured in terms of employment and contribution to gross regional product, are presented in Table 7. Note that these estimates represent the impacts of *total* forecast trade and include the impacts reported in Tables 1 and 2. Note that if there were no change in trade volumes over time the economic impact of the Port would decline as incremental productivity improvements would reduce the resources (labour and capital) required to move the cargo through the Port.

Table 7 Economic impact of forecast increases in trade (medium scenario) through the Port of Geelong

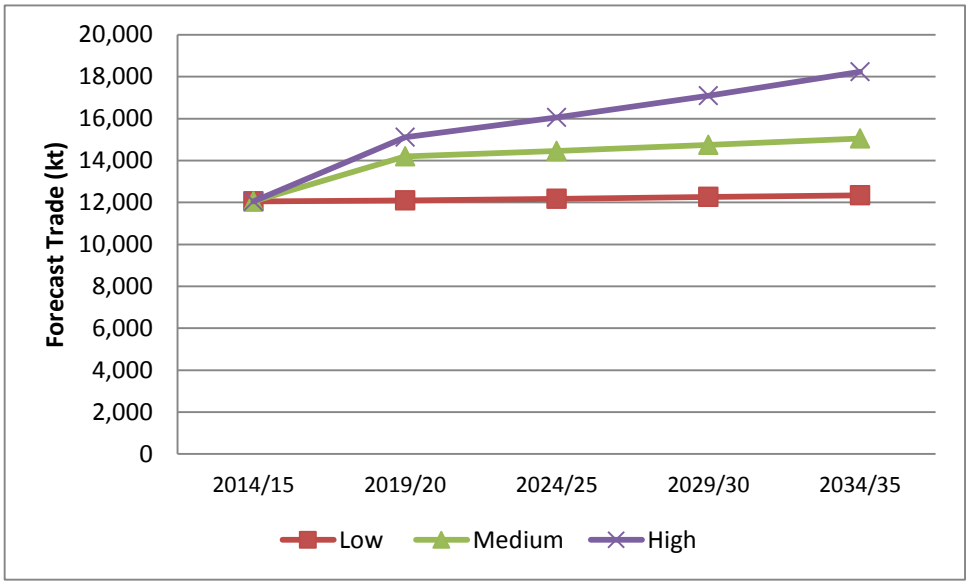
	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Employment (fte, direct + indirect)					
Barwon Region	1,430	1,793	1,804	1,818	1,835
Total Victoria	1,800	2,263	2,277	2,295	2,317
GRP ($m, direct + indirect)					
Barwon Region	229	285	287	289	291
Total Victoria	247	321	324	328	333

Source: EconSearch analysis

Clearly, the impacts of the increased trade will occur mainly in the Barwon region, with some additional impacts elsewhere in Victoria, mostly Melbourne.

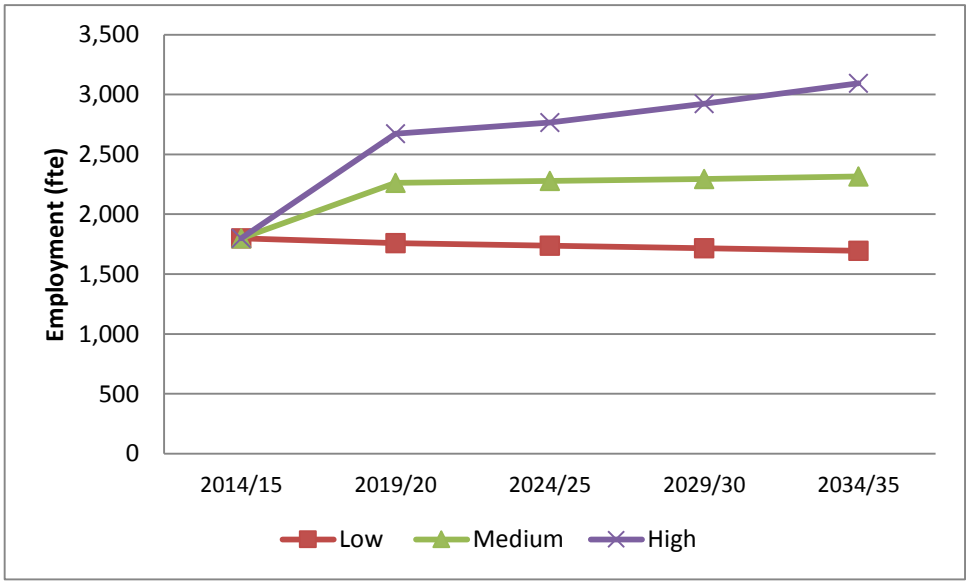
Summary low, medium and high trade forecast scenarios for the Port of Geelong are illustrated in Figure 1 with associated employment and gross state product estimates for Victoria in Figures 2 and 3, respectively.

Figure 1 Port of Geelong forecast trade: low, medium and high scenarios (kt)



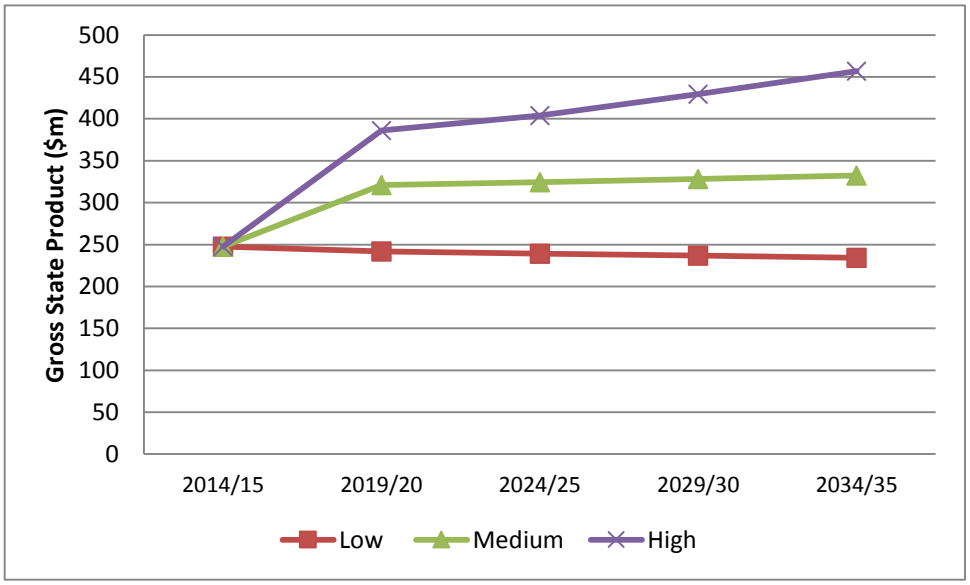
Source: GeelongPort, GrainCorp, EconSearch analysis.

Figure 2 Employment estimates: low, medium and high scenarios (Victoria)



Source: EconSearch analysis

Figure 3 Gross state product estimates: low, medium and high scenarios (Victoria)



Source: EconSearch analysis

Note that if there were no change in trade volumes over time, or even low level increases as with the low growth scenario, the economic impact of the Port would decline as incremental productivity improvements would reduce the resources (labour and capital) required to move the cargo through the Port.

Interpreting the Results

The estimates of economic impact from this type of analysis indicate the general magnitude of effects associated with the port's activities. They do not provide precise estimates, as only approximate data were available for some parts of the analysis.

The results of the study provide estimates of the impact attributable to activities required for the movement of ships and cargo through the port. They do not indicate net economic benefits, technical efficiency, competitiveness, trade facilitation effects or the contribution of port infrastructure to regional development.

1. INTRODUCTION

1.1 Background

The role of ports is to provide the point of interface between land and sea transport in the transportation of cargoes in coastal and international trade. Ports facilitate inter-state and international trade by providing important elements of the basic infrastructure and services necessary for cargo shipping and exchange (ORG 1999).

The provision of this infrastructure and the general operation of a port generates employment and income for the local community, as well as flow-on effects to other local industries. In addition, all levels of government receive revenue from taxes and other charges on these activities.

In recent years, there has been increased pressure across Australia to restrict the scope of port activities in response to changing perceptions (real or otherwise) about the pollution generated by ports and the contribution to congestion on main roads. Such restrictions can reduce the efficiency of a port and the competitiveness of shippers that use the port. There may also be adverse effects on local income and employment.

Port economic impact studies can contribute to a balanced assessment of the role of ports and to informed consideration of issues such as port planning (Bureau of Transport Economics 2000).

1.2 Study Brief

The objectives of the Economic Impact Study are to identify the economic significance of the Port of Geelong and the contribution that the port makes to employment, Gross Regional Product, Gross State Product, etc. and to reflect the data in the following manner with direct and indirect benefits identified separately.

1. Economic impact per vessel visiting the port.
2. Multiplier effect per dollar of port activity.
3. Economic impact of existing and forecast trade separately.
4. The market value of existing and forecast trade.

In general terms, the requirement of the Economic Impact Study is to obtain data to support a Business Case for the development of port-related infrastructure on the basis of expected trade levels and the economic benefit to the state, particularly the Barwon region.

More specifically, the study is to provide:

- the economic contribution of the Port itself to the Barwon and Victorian economies in 2014/15

- the economic value to the region of increased trade resulting from the ability to export/import through the Port of Geelong.

In measuring the economic impact of the Port, the following aspects to the study were required:

1. The study must utilise the general framework and methodology set out in Bureau of Transport Economics (2000) Regional Impacts of Ports, Report No. 101, BTE, Canberra.
2. The impact measures should be calculated in terms of:
    - output
    - value-added
    - household income
    - employment.
3. The impact measures should be able to be disaggregated in terms of:
    - port function (i.e. the major activities undertaken within the port – Port administration, towage, pilotage, stevedoring, etc.)
    - cargo type (e.g. general cargo, break-bulk, dry bulk, bulk liquid as appropriate for the port).

1.3 Study Aims

The objective of the project was to assess the direct and indirect economic impact of the movement of cargo through the Port of Geelong. The income and expenditures of the firms engaged in port-related activity and of firms transporting freight to and from the port comprise the direct economic impact.

These direct impacts were used as a basis for assessing the indirect economic impacts of port-related activity. All impacts were measured in terms of household income, output, value added and employment. These measures are defined in more detail in the Glossary at the end of this report.

The impacts were disaggregated by major port functions, which are listed below.

- Administration
- Ship operations and ship movement
- Ship loading and unloading/cargo services
- Land transport and storage (including road and rail transport)
- Government agencies

The impacts were also disaggregated by cargo type, as detailed in the terms of reference and as listed below.

- Woodchips

- Logs
- Fertiliser
- Grain
- Other dry bulk
- Steel products
- Crude oil & petroleum products
- Chemicals
- Other cargo

1.4 Port-related Activity

For the purpose of measuring the impact of *port-related activity* on the economy, it is necessary to have a clear definition of what comprises such activity.

Port-related activity is the activity undertaken by firms and organisations in moving cargo through the Port of Geelong and in providing goods and services to directly facilitate the movement of cargo through the port.

Included under this definition are firms that provide various maritime services such as transport firms, stevedoring companies and shipping agents. However, users of the port are not included. For example, manufacturing firms, distributors and retailers that import and export goods through the port in the course of their business, although dependent on the port to move their cargo, are not considered to be firms directly involved in *port-related activity*[1]. Also, activities related to commercial fishing and recreational boating are excluded from the definition.

[1] Some port users are involved in cargo loading and unloading, for example, and the expenditures associated with this part of their operations are included in the analysis.

2. THE PORT OF GEELONG

2.1 Introduction

The Port of Geelong is the second largest port in the State of Victoria and is the key feature of Victoria's largest provincial city. The port is located on Corio Bay, approximately 75 km (by road) west of Melbourne. The Port of Geelong handled approximately 12 million tonnes of cargo in 2014/15 with a total of 709 ship calls.

The governance arrangements for the Port of Geelong are more complex than other commercial trading ports in Victoria with two land managers, a separate channel management authority and a number of large port reliant industries. Geelong Port's major facilities are owned by Ports Proprietary Ltd and managed by GeelongPort. In addition, GrainCorp own and operate a specialist grain pier.

Imports include crude oil, petroleum products, fertilisers, bulk liquids, steel and pig iron. Major exports include petroleum products, fertilisers, grain and woodchips.

Victoria has four major commercial trading ports: Melbourne, Geelong, Hastings and Portland. Geelong is the second largest of these ports behind the Port of Melbourne. In terms of total volume of trade the Port of Geelong contributed 24 per cent of the total trade of the four major Victorian Ports in 2013/14 (Table 2.1).

Table 2.1 Trade activity of Victorian major ports, 2013/14

	Ship Visits		Total Trade	
Port	Number	Share (%)	Million tonnes[a]	Share (%)
Melbourne	3,076	75%	35.0	62%
Geelong	661	16%	13.6	24%
Portland	300	7%	6.2	11%
Hastings	55	1%	2.0	4%
Total	**4,092**	**100%**	**56.8**	**100%**

[a] Mass tonnes.

Source: GeelongPort, Port of Hastings Corporation, Melbourne Port Corporation and Portland Port Corporation.

2.2 Infrastructure, Facilities and Port-related Activity

The port's major facilities are located around Corio Bay, extending from Point Wilson in the north to Point Henry in the south (Figures 2.1 and 2.2). Towards the northern end of the port is the Viva Energy refinery and associated tanker berths. In the south is the now decommissioned aluminium smelter berth. Between these are general-purpose facilities, berths and wharfs and the associated storage and processing facilities. There are 14 berths in total including specialist berths for:

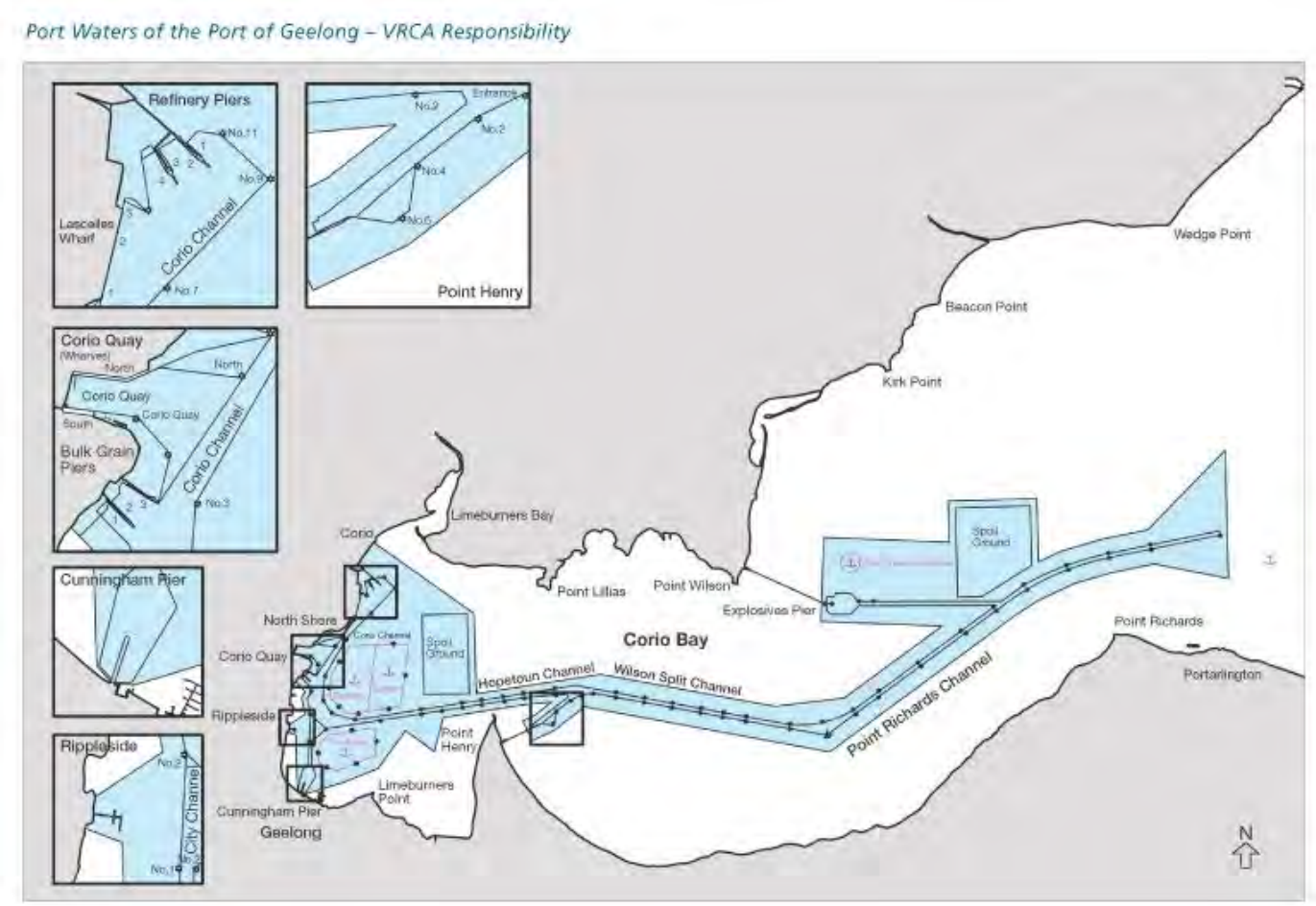
- oil and petroleum products

- bulk handling of grain
- general cargo
- alumina
- fertilisers
- chemicals
- LPG
- woodchips.

Transport of commodities to or from the port is generally by road or rail depending on the type of goods being transport. Products such as oil are processed at the refinery located at the port. Only minimal quantities of these commodities are transported in their raw form from the port.

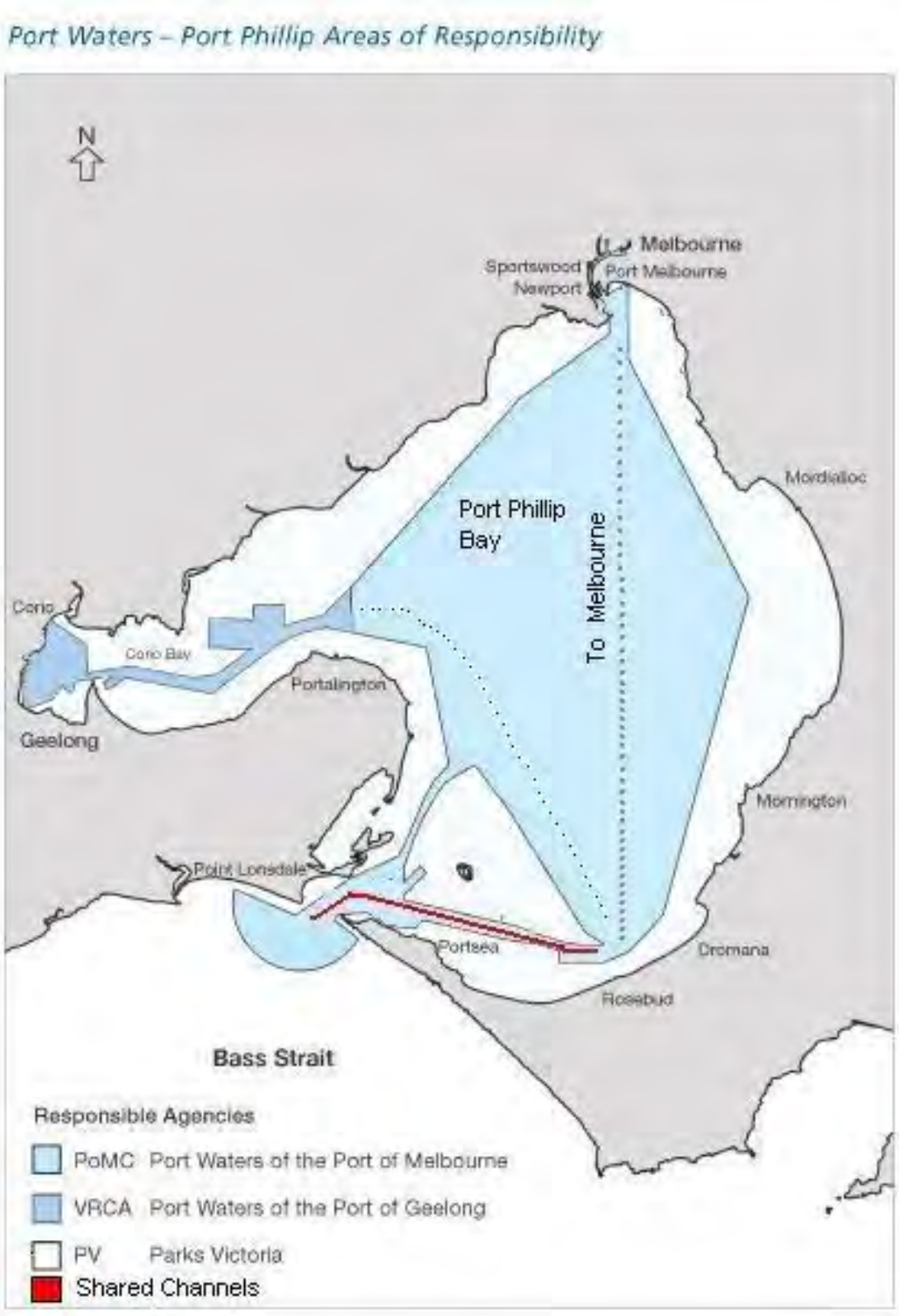
As noted earlier, the firms and organisations involved in *port-related activity* can be grouped according to their function. A brief explanation of each group is provided in Appendix I.

Figure 2.1 Facilities at the Port of Geelong



Source: VRCA

Figure 2.2 Port of Geelong and Port Phillip Bay



Source: VRCA

2.3 Cargo and Trade Patterns

2.3.1 Volume of trade

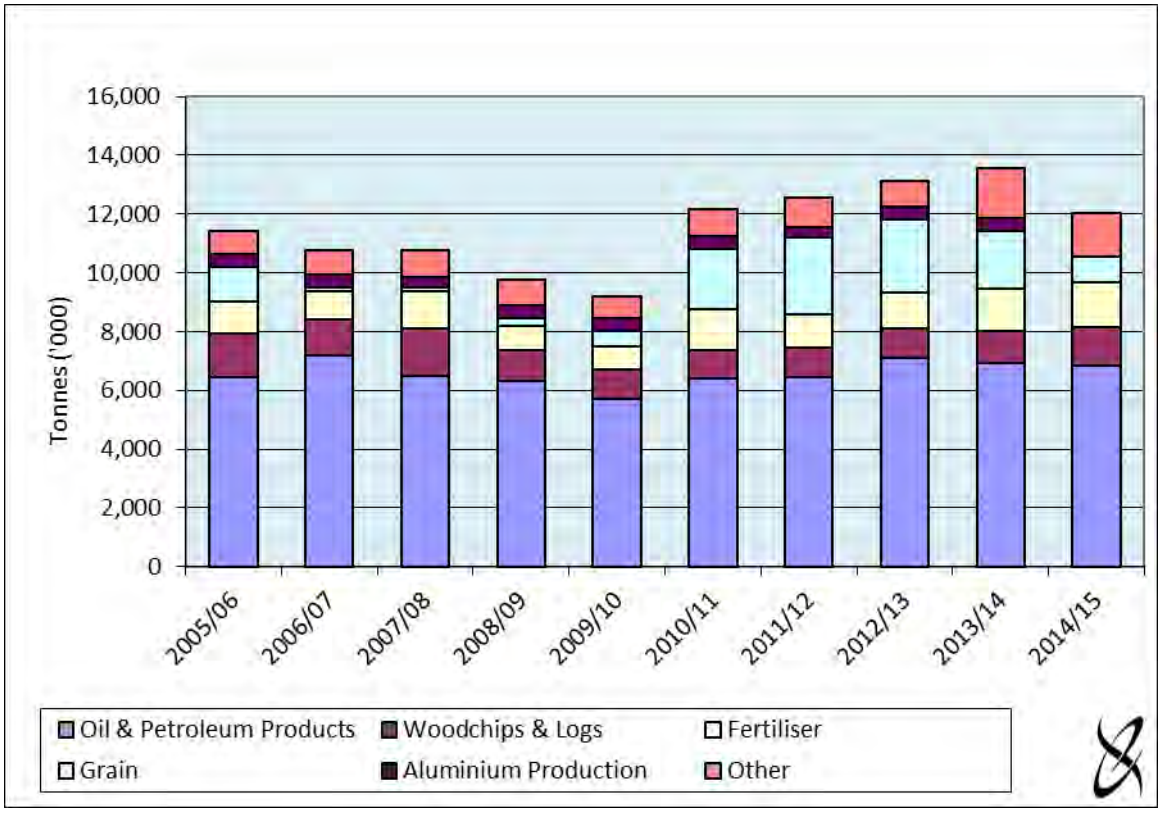
Total cargo moved through the Port of Geelong, on a tonnage basis, has been relatively steady over the ten years to 2014/15 (Figure 2.3 and Table 2.3), with the greatest year-to-year variations due to fluctuations in grain production, which was severely impacted by drought over the 3 years to 2008/09, and to a lesser extent woodchips. The share of the major commodities is shown in Table 2.2 and compared with the average for the years 2005/06 to 2014/15.

Table 2.2 Major commodities traded through the Port of Geelong, 2014/15

Commodity	2014/15	Ten Year Average 2005/06 - 2014/15
Crude oil & petroleum products	57%	59%
Grain	7%	11%
Fertiliser	12%	10%
Woodchips & logs	11%	11%
Aluminium products	0%	3%
Other	13%	6%
Total	**100%**	**100%**

Source: GrainCorp and GeelongPort

Figure 2.3 Total trade volume through the Port of Geelong, 2005/06 to 2014/15



Source: Table 2.3

Table 2.3 Cargo traded through the Port of Geelong, 2005/06 to 2014/15 (mass tonnes)

Cargo Type	Tonnes										Average
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	**2005/06 - 2014/15**
Woodchips & logs	1,483,006	1,252,865	1,631,247	1,048,642	1,000,364	978,282	1,000,276	995,440	1,098,243	1,329,128	**1,181,749**
Fertiliser	1,121,078	948,797	1,241,689	841,723	790,368	1,380,622	1,135,371	1,263,815	1,429,529	1,489,020	**1,164,201**
Grain	1,171,168	116,680	152,263	268,552	532,978	2,043,611	2,591,783	2,461,483	1,948,827	875,803	**1,216,315**
Other dry bulk	158,250	198,923	190,090	143,133	224,014	206,968	172,206	211,775	840,614	751,096	**309,707**
Aluminium products	442,189	427,883	359,702	444,271	421,442	446,746	352,297	444,864	444,263	0	**378,366**
Steel products	145,313	159,898	181,443	194,079	150,465	245,172	185,221	179,565	205,894	158,112	**180,516**
Crude oil & petroleum products	6,438,247	7,178,748	6,486,061	6,297,882	5,712,789	6,403,112	6,461,397	7,091,041	6,938,995	6,840,937	**6,584,921**
Chemicals	179,619	184,269	180,236	185,633	202,361	201,865	275,938	236,633	256,138	275,408	**217,810**
Other	301,480	293,701	347,360	336,895	176,086	277,493	377,877	244,611	393,436	335,382	**308,432**
Total	**11,440,350**	**10,761,764**	**10,770,091**	**9,760,810**	**9,210,868**	**12,183,871**	**12,552,367**	**13,129,227**	**13,555,939**	**12,054,886**	**11,542,017**

Source: GrainCorp and GeelongPort

The total trade volume in 2014/15 of approximately 12.1 million tonnes was around 0.6 million tonnes above the average annual trade for the previous decade. Fertiliser and other dry bulk were both well above the long term average (0.3 and more than 0.4 million tonnes, respectively), whereas grain was 0.4 million tonnes below the long term average. There was no trade in aluminium products in 2014/15 due to the closure of the smelter in 2013/14.

Crude oil and petroleum products

Oil and petroleum product imports generally consist of crude oil for refinery processing and of refined petroleum based products. Exports are mostly of petroleum based refined products. There is a dedicated refinery pier to the north of the port where ships are berthed.

Grain

Grain includes bagged and bulk grain, the major varieties include wheat, barley, oilseeds, pulses and rice. Grain that is handled by GrainCorp is through a specialised facility towards the northern end of the port. Grain that is exported by companies other than GrainCorp is through the GeelongPort berth at Lascelles Wharf.

Forestry products

Woodchip exports are from either plantation pine, hardwood or plantation blue gum. They are shipped by two major exporters (Midway and SPE) from either the Corio Quay or the GrainCorp terminal. Traditionally the majority of exports comprised of softwood chips, sourced from plantation timber. There has been an increasing amount of hardwood chips exported as plantation blue gums are reaching maturity. Hardwood chips are also sourced from old growth forests in the Gippsland region. Softwood chips are transported either via road or rail to the port where they are chipped and stored adjacent to the wharves.

Fertiliser

Fertiliser trade comprises of imports of both raw materials and manufactured products and the export of manufactured products. Sulphuric acid is imported and used in fertiliser production.

Aluminium

There is a dedicated smelter berth at the southern end of the Port of Geelong which was used for unloading smelter related raw material imports. The smelter closed in 2014.

2.3.2 Value of trade

In line with the steady volume of products traded through the Port, the total value of the cargo has been relatively stable in recent years. Table 2.4 shows that in the ten years to 2014/15 the value of trade through the Port fluctuated between $6.4 billion and $9.1 billion, averaging just over $7.6 billion for the nine year period.

Table 2.4 Estimated value of cargo shipped through the Port of Geelong, 2005/06 to 2014/15 ($m) [a]

Cargo Type	Value ($m)									
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Imports										
Dry Bulk	755	716	930	951	735	941	827	899	1,166	709
Liquid Bulk	3,344	3,748	4,235	3,770	3,112	3,877	3,962	4,309	4,237	4,186
Other	259	309	341	477	220	408	422	258	490	351
Total Imports	*4,358*	*4,773*	*5,505*	*5,198*	*4,068*	*5,226*	*5,210*	*5,466*	*5,893*	*5,246*
Exports										
Dry Bulk	533	272	411	404	444	957	1,218	1,106	1,199	881
Liquid Bulk	1,256	1,525	1,611	1,461	1,324	1,532	1,754	1,809	2,040	2,029
Other	296	250	188	179	152	330	0	1	10	277
Total Exports	*2,085*	*2,047*	*2,209*	*2,044*	*1,920*	*2,819*	*2,972*	*2,917*	*3,249*	*3,187*
Total Trade	***6,442***	***6,819***	***7,715***	***7,242***	***5,988***	***8,045***	***8,183***	***8,382***	***9,142***	***8,433***

[a] Average annual prices were estimated for each commodity and applied to the trade volumes specified in Table 2.3.

Source: ABS (2015b), ABARES (2014), EconSearch analysis.

3. INPUT-OUTPUT METHOD AND PORT-RELATED MULTIPLIERS

3.1 Method of Analysis

As required in the project brief, the approach adopted for this analysis follows that described in Bureau of Transport Economics (2000). The method was detailed in the previous economic impact analysis reports (EconSearch 2005, 2010, 2012) and is summarised here. The concept, nature and methodology of impact measurement at the regional level are described in general terms in Appendix III.

The main steps in undertaking the analysis are summarised below.

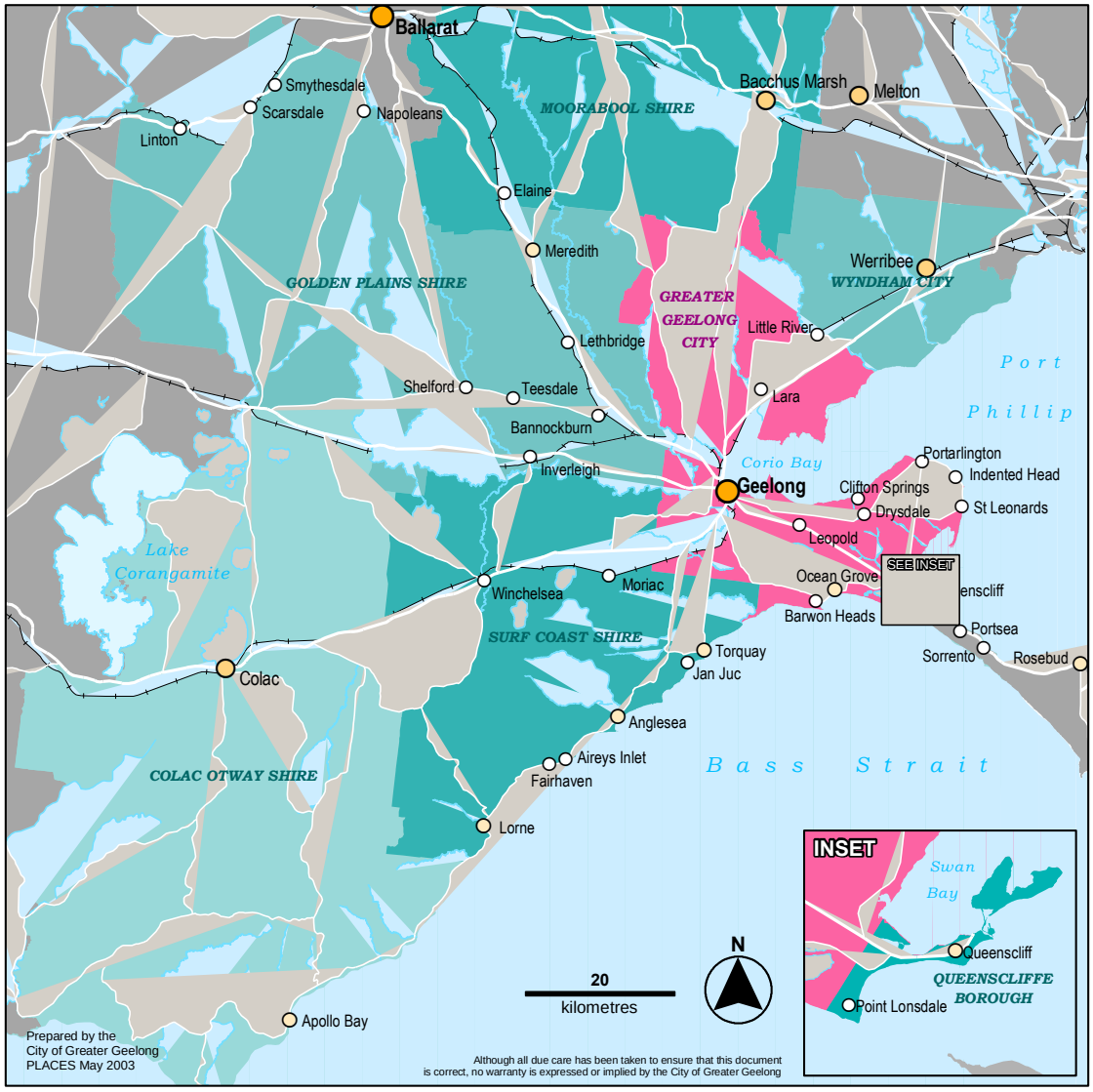
Step 1 Preparation of input-output tables – tables were required for the Barwon region (Figure 3.1) and Victoria. A Barwon region table was provided courtesy of the City of Geelong. An input-output table for Victoria was prepared in-house by EconSearch. This is an update of the model used in the previous study.

Step 2 Definition and estimation of the economic structure of each port-related sub-sector - total port-related activity was disaggregated into five categories of port-related activity (sub-sectors), detailed in Section 2.2. As well, nine cargo sectors, also detailed in Section 2.2, were identified for separate representation in the impact estimation procedure. These cargo types were distinguished largely by method of handling; for example, the different handling requirements of dry bulk cargoes and general cargoes impose different mixes of support service requirements in the port.

Step 3a Data collection – survey: A series of succinct questionnaires were prepared for completion by firms and government agencies that undertake economic activity in, or related to, the Port of Geelong. The questions were designed to elicit the scale of the respondent's port-related activity, the amounts paid by the respondent to other parties for the labour and other inputs used in such port-related work, and the amounts of revenue received from customers in payment for such work. For both payments and receipts, information was sought on how the amounts were divided between parties located within, and parties located outside, the Barwon region. The full questionnaires are reproduced in Appendix II.

Step 3b Data collection – aggregate port data: the survey data were complemented with information provided by GrainCorp, GeelongPort and VRCA. These statistics provided information on cargo tonnages and estimates of various ship and cargo costs broken down by commodity type. These costs included wharfage, pilotage, navigation services, ships utilities and site occupation. Data were also provided on ship numbers, on a cargo type basis.

Figure 3.1 Map of the Barwon region



Source: G21 Geelong Regional Alliance Ltd.

Step 4 Estimation of total port-related activity - total port-related activity was calculated by aggregating the estimates derived for the five sub-sectors defined in Step 2. This provided an indication of the total direct contribution of port activity to the economies of the Barwon region and Victoria.

Step 5 Final model adjustment - the preceding steps provided the necessary basic data for the impact estimation process. Step 5 involved the insertion into the input-output table of the rows and columns developed for representation of the five port-related sectors and the three cargo groups. Adjustments were carried out to comply with certain technical requirements of the input-output technique, including the avoidance of double counting and the subtraction of these 'new' sectors from the existing sectors of the table.

Step 6 Estimation of the economic impact of the port - the completion of Step 5 provided an input-output table with rows and columns showing the five port-related sectors and another table showing the nine cargo sectors. These rows

and columns represented the direct impact of the port sectors on the economy of the Barwon region. The final stage of the study involved the manipulation of the input-output table (calculation of multipliers) to produce estimates of the direct and indirect impacts of these sectors on the Barwon regional and Victorian state economies.

3.2 Estimation of the Flow-on Effects

The input-output tables, modified so as to include Geelong port-related activities[2], were used to prepare the port-specific multipliers. The essence of impact measurement is the empirical measurement of the relationship between cause and effect, or between the impacting agent and the expected impact. This relationship can be expressed in terms of a multiplier.

In this study, output, income, employment and value added multipliers were used to express impacts in terms of a 'per unit of output of port-related activity'.

Each multiplier can be disaggregated into a number of components, differentiating the direct and flow-on effects of port-related activity. *Direct effects*, sometimes referred to as *initial effects*, are the stimulus for the impact analysis and correspond, in this analysis, to port-related activity. *Flow-on effects* measure the economic activity in other sectors of the economy in response to the initial stimulus. The various multiplier components are shown in Table 3.1.

Flow-on effects are divided into two components, *production-induced effects,* which are a measure of business-to-business transactions, and *consumption-induced effects*, which represent the expenditure of household income received as payments for labour used in producing the additional output. Production-induced effects can be further divided into *first-round effects* and *industrial-support effects*.

Utilising the Barwon and Victorian input-output tables, which incorporated the Port of Geelong sector, a range of multipliers were calculated for the various dimensions of impact analysis required in the study brief. Aggregate multipliers are shown in Tables 3.2 to 3.5. Disaggregated multipliers are provided in Appendix V for the Barwon region and Appendix VI for Victoria.

[2] Section 3.1 of this report and BTE (2000, pp. 96-97) describe the process of modifying input-output tables and preparing port-specific multipliers.

Table 3.1 Input-output multiplier components

Multiplier component	Description
Direct (initial) effect	The stimulus for the impact analysis – normally assumed to be a dollar change in sales to final demand
Flow-on effects:	
-Production-induced effects:	
First-round effects	Refers to the purchases of inputs required from other sectors in the economy in order to produce the additional output
Industrial-support effects	Refers to second, third and subsequent-round industrial flow-on effects triggered by the purchases in the first round
-Consumption-induced effects	Stem from the spending of household income received as payments for labour used in producing the additional output
Total effect	Direct effect+ flow-on effects
Type I multiplier	(Direct + production induced)/direct
Type II multiplier	(Direct + production induced + consumption induced)/direct

Multipliers are usually presented in 'per unit of output terms', as they are here. The port sector output multiplier in the Barwon region (Table 3.2) can be interpreted as follows: an initial $1 of output in the port sector leads to a flow-on effect in other sectors of the Barwon regional economy of 55 cents, giving a total effect of $1.55. Each dollar of output also generates 22 cents in direct household income (i.e., wages and salaries paid to employees of port-related firms and organisations) and a further 15 cents to workers in associated industries. Similarly, each dollar of output results in 51 cents in value added in the port sector and a further 29 cents in value added in other sectors of the economy.

Employment multipliers are expressed in terms of jobs per *million* dollars of output and relate to full-time equivalent jobs. In Table 3.2, the direct effect of 3.0 jobs per million dollars of output in the port sector results in 2.0 jobs in other sectors of the economy, realising a total effect of 4.9 jobs per million dollars of port sector output.

Table 3.2 Multipliers for Geelong port industry, 2014/15 (Barwon)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact* [c]
Output[a]	1.00	0.55	1.55
Value added[a]	0.51	0.29	0.79
Household income[a]	0.22	0.15	0.38
Employment[b]	3.0	2.0	4.9

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

[c] Rounding errors occur.

Source: EconSearch analysis

Utilising the Victorian input-output table, multipliers for the Geelong port industry were calculated for Victoria as a whole and are presented in Table 3.3. The direct effects are identical to those for the Barwon region; however the flow-on effects are greater, reflecting the additional linkages the Port of Geelong has with the broader Victorian economy. The interpretation of the multipliers is the same as for the Barwon region.

Table 3.3 Multipliers for Geelong port industry, 2014/15 (Victoria)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact* [c]
Output[a]	1.00	0.97	1.97
Value added[a]	0.51	0.51	1.01
Household income[a]	0.22	0.27	0.49
Employment[b]	3.0	3.3	6.2

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

[c] Rounding errors occur.

Source: EconSearch analysis

As noted earlier, multipliers were estimated not only for the port as a whole but also for the port activity disaggregated on the basis of port function (port company operations, ship operations, etc.) and cargo type (woodchips, grain, etc.). These multipliers are presented in Table 3.4 for the Barwon region and Table 3.5 for Victoria. Note that in both tables they are *total* multipliers, as defined in Table 3.1, and correspond to the "Total Impact" multipliers presented in Tables 3.2 and 3.3.

Table 3.4 Multipliers for components of Geelong port industry, 2014/15 (Barwon)

Port component	*Output* [a]	*Value added* [a]	*Household income* [a]	*Employment* [b]
Function				
Port administration	1.64	1.03	0.43	4.4
Ship operations	1.67	0.79	0.39	5.2
Ship loading/unloading	1.48	0.89	0.42	5.3
Land transport & storage	1.48	0.68	0.33	4.8
Government agencies	1.92	0.88	0.64	9.5
Total	*1.55*	*0.79*	*0.38*	*4.9*
Cargo Type				
Woodchips	1.52	0.79	0.37	4.9
Fertiliser	1.53	0.75	0.36	4.9
Grain	1.51	0.74	0.36	4.9
Other Dry Bulk	1.52	0.75	0.36	4.9
Steel Products	1.54	0.81	0.39	5.1
Crude Oil & Petroleum Products	1.61	0.87	0.41	5.0
Chemicals	1.58	0.88	0.41	5.1
Other Cargo	1.59	0.83	0.40	5.1
Total	*1.55*	*0.79*	*0.38*	*4.9*

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

Source: EconSearch analysis

Table 3.5 Multipliers for components of Geelong port industry, 2014/15 (Victoria)

Port component	*Output* [a]	*Value added* [a]	*Household income* [a]	*Employment* [b]
Function				
Port administration	2.00	1.22	0.52	5.4
Ship operations	2.12	1.02	0.51	6.6
Ship loading/unloading	1.80	1.05	0.50	6.2
Land transport & storage	1.95	0.93	0.46	6.2
Government agencies	2.54	1.21	0.80	11.3
Total	*1.97*	*1.01*	*0.49*	*6.2*
Cargo Type				
Woodchips	1.94	1.00	0.48	6.1
Fertiliser	1.97	0.98	0.48	6.3
Grain	1.96	0.97	0.47	6.2
Other Dry Bulk	1.96	0.98	0.47	6.2
Steel Products	1.94	1.02	0.49	6.3
Crude Oil & Petroleum Products	2.00	1.08	0.51	6.2
Chemicals	1.96	1.07	0.51	6.3
Other Cargo	2.01	1.05	0.51	6.4
Total	*1.97*	*1.01*	*0.49*	*6.2*

[a] Dollar impact of $1.00 of output in port industry.

[b] Number of jobs (full-time equivalent) per $million of output in port industry.

Source: EconSearch analysis

4. ECONOMIC IMPACT OF THE PORT OF GEELONG

This section presents estimates of the regional and state impact of the Port of Geelong for 2014/15 in terms of output (gross revenue/expenditure), value added (payments to primary inputs of production), household income and employment. Detailed impact measures cover the impact attributable to individual port functions, commodities, and cargo types.

Although output provides a readily understandable indicator of economic activity, problems of double counting can arise when the output of a number of firms are aggregated to give an industry view. For example, if the output of the Port Administration is added to the output of the firms that provide services to the administrative firms (e.g. dredging services, pest control, etc.), then the value of those services will be counted twice in the aggregate figure. A more appropriate indicator of the port's relative contribution to the State's economy is value added (payments to primary inputs of production, i.e. gross operating surplus plus wages and salaries). Value added can be directly compared to gross state product and it avoids the problem of double counting.

4.1 Overall Impact

Tables 4.1 and 4.2 present estimates of the overall impact of the Port of Geelong at the regional and state levels, incorporating the direct effects and the flow-on effects.

Direct effects

The ***direct impact*** of port-related activity on output, value added, household income and employment in the Barwon region is shown in the first column of Table 4.1 (Table 4.2 for Victoria). The value of output, estimated to be $289 million, is the sum of gross business revenue of firms defined as port-related (or that proportion of firms' revenues attributable to port-related activity), and gross expenditure by port-related government, semi-government and non-profit organisations. These are revenues generated and expenditure incurred in the Barwon region. The direct impacts are the same for Victoria as a whole.

The value added from port-related activity was estimated to be $146 million. Value added refers to the difference between the total revenue of a firm and the cost of bought-in materials, services and components. It represents payments to the primary inputs of production (labour, capital and land), and can be used to describe the contribution of an industry to gross regional (or state) product.

Direct employment (full-time equivalents) was estimated to be 855, and corresponding household income was $64 million. This indicates an average gross annual income of around $75,000 for those employed in firms and organisations engaged in port-related activity.

Household income includes overtime payments and income tax, although is net of payroll tax and other related charges.

Table 4.1 Economic impact of the Port of Geelong, 2014/15 (Barwon)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact* [b]
Output ($m)	289	158	447
Value added ($m)	146	83	229
Household income ($m)	64	44	109
Employment[a]	855	574	1,429

[a] Number of jobs (full-time equivalent).

[b] Rounding errors occur.

Source: EconSearch analysis

Table 4.2 Economic impact of the Port of Geelong, 2014/15 (Victoria)

Measure	*Direct effects*	*Flow-on effects*	*Total Impact*
Output ($m)	289	280	570
Value added ($m)	146	147	293
Household income ($m)	64	77	141
Employment[a]	855	945	1,800

[a] Number of jobs (full-time equivalent).

Source: EconSearch analysis

Flow-on effects

As described earlier, input-output multipliers can be used to estimate the ***indirect (flow-on) impact*** of Geelong port-related activity on the economy of the Barwon region and Victoria. Multipliers were used to calculate flow-on effects for each of the four economic indicators: output, value added, employment and household income, and are shown in Tables 3.2 and 3.3.

The flow-on effects of port-related activity in the Barwon region total $158 million in output ($280 million for Victoria), $83 million in value added ($146 million for Victoria), 574 fte jobs (945 for Victoria) and $44 million in corresponding household income ($77 million for Victoria) (Tables 4.1 and 4.2).

Flow-on impacts from port-related activity occur in many sectors of the Barwon and Victorian economies. A unique characteristic of the input-output model is the facility to calculate the size of the flow-on multiplier and the extent of the impact in each of the other sectors in the local economy. The sectoral distribution and ranking of the indirect (flow-on) impacts, in terms of output, value added, employment and household income, are shown in Table 4.3 for the Barwon region and Table 4.4 for Victoria.

Table 4.3 Flow-on effects for the Port of Geelong by industry sector, 2014/15 (Barwon)

Sector [a,b]	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment (fte)*
Primary	1.3	0.7	0.3	5
Mining	0.3	0.2	0.1	0
Manufacturing	23.4	7.3	4.4	75
Utilities	6.4	2.8	0.9	11
Construction	5.0	1.6	1.2	14
Wholesale and retail trade, etc.	23.9	13.4	9.8	144
Accomm, restaurants, etc.	7.9	4.1	3.0	54
Transport, storage (excl port)	12.7	5.7	3.6	46
Communication	7.4	3.5	1.4	14
Finance, business services	36.6	20.6	10.3	84
Ownership of dwellings	16.0	12.3	0.0	0
Public administration	1.7	0.9	0.8	9
Community services	9.1	7.0	6.4	72
Recreation, personal services	6.4	3.0	2.4	46
Total flow-on [c]	*158.0*	*83.1*	*44.5*	*574*

[a] Individual sectors are ranked by value added.

[b] Refer to Appendix IV for detailed sector definitions.

[c] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Table 4.4 Flow-on effects for the Port of Geelong by industry sector, 2014/15 (Victoria)

Sector [a,b]	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Primary	6.2	3.1	1.7	31
Mining	4.1	2.6	0.9	2
Manufacturing	41.5	13.2	7.7	130
Utilities	13.0	5.6	1.7	23
Construction	7.6	2.4	1.8	22
Wholesale and retail trade, etc.	39.8	22.0	16.1	235
Accomm, restaurants, etc.	9.6	5.0	3.7	66
Transport, storage (excl port)	23.8	10.6	6.7	85
Communication	17.4	7.9	3.0	30
Finance, business services	75.6	44.5	23.1	186
Ownership of dwellings	23.4	18.0	0.0	0
Public administration	0.0	0.0	0.0	0.0
Community services	10.8	8.2	7.6	85
Recreation, personal services	9.6	4.6	3.6	61
Total flow-on [c]	*280.4*	*146.5*	*76.7*	*945*

[a] Individual sectors are ranked by value added.

[b] Refer to Appendix IV for detailed sector definitions.

[c] Components may not sum to totals due to rounding.

Source: EconSearch analysis

The ranking of sectors is determined, to a certain extent, by the labour intensity of the impacting industry (in this study, the Geelong Port sector). Generally, if the industry is labour intensive and direct purchases of goods and services by firms in the industry are relatively small, then the flow-on effects will occur predominantly in those sectors providing goods and services to households, i.e. those sectors where households spend the wages and salaries earned working in the impacting sector. It will be these sectors which are ranked highly in terms of economic impact.

To identify the nature of the linkage between the impacting sector and other sectors in the economy, a distinction is made between *consumption-induced* and *production-induced* flow-on effects in calculating sector multipliers. Consumption-induced effects are those brought about by household expenditures, while production-induced effects are generated by the direct purchases of local goods and services by firms in the impacting sector. Generally, in a relatively labour intensive sector the consumption induced effects will be large and the production-induced effects relatively small. The port sector has traditionally been labour intensive, but with the productivity improvements of recent years and where the majority of cargo is handled in bulk, such as at the Port of Geelong, the labour intensity is much less than was previously the case. For the Geelong Port sector, about 55 per cent of the flow-ons were estimated to be consumption-induced and about 45 per cent production-induced. These proportions were similar for the output, value added, employment and household income flow-on effects (see Appendices V and VI for details).

As revealed in Tables 4.3 and 4.4, trade, finance and business services, and manufacturing are the three sectors where port-related activity has the largest flow-on impact. For all four measures of economic impact (output, value added, employment and income), over 50 per cent of the total flow-on effect occurred in these three sectors. For employment, the combined impact in these sectors was 303 jobs in the Barwon region and 551 jobs state wide, of the total employment flow-on from port-related activity.

Total impact

The operation of the Port of Geelong in 2014/15 generated, in terms of output, an estimated total impact on the Barwon economy of over $447 million and around $570 million on the Victorian economy as a whole (Tables 4.1 and 4.2).

Value added attributable to the operation of the port was estimated to be $229 million in the Barwon region ($293 million state wide). This was equivalent to approximately 2.1 per cent of gross regional product, which provides a measure of the overall level of economic activity in the Barwon region. In terms of the State's economy, it represented just over 0.09 per cent of Victoria's gross state product in 2014/15.

Household income generated by the operation of the port totalled $109 million in the Barwon region ($141 million in Victoria). Employment was estimated at almost 1,430 jobs (full-time equivalent), which represented 1.6 per cent of total employment in the Barwon region. At the State level, the estimated employment effect of around 1,800 fte jobs was just over 0.07 per cent of Victoria's employment.

There were 709 ship visits per year to the Port of Geelong by commercial cargo vessels in 2014/15. The results of the analysis indicated that each ship call at the Port of Geelong involved the following impact on the economies of the Barwon region and Victoria (Table 4.5).

Table 4.5 Average impact per ship call for the Port of Geelong, 2014/15

Indicator	Barwon region	Victoria
Output	$631,000	$803,000
Value added	$324,000	$413,000
Household income	$154,000	$199,000
Jobs (full-time equivalent)	2.0	2.5

Source: EconSearch analysis

4.2 Components of Port Impact

Estimated port impacts have been disaggregated to identify the relative contribution of the individual port functions and cargo types. The proportion for a particular component often varies according to the impact measure being used. This variation reflects differences in factors such as profitability, capital intensity, average income and labour intensity.

Port functions

As described in Section 2, total port-related activity was partitioned into five specific functions: port management; ship movement; ship loading and unloading; land transport and storage; and government services. The dimensions of these sectors, in terms of output, value added, employment and household income, are detailed in Tables 4.6 and 4.7 for the Barwon region and Victoria, respectively.

Total multipliers were calculated for each of these port-related sectors and are shown in Tables 3.4 and 3.5. Tables 4.6 (Barwon) and 4.7 (Victoria) provide estimates of the total impacts calculated using these multipliers.

The largest impacts occurred in the *land transport and storage* sector (including road and rail transport). The value of services provided by this sector was $141 million, with flow-ons to other sectors in the Barwon economy of $68[3] million, which gives a total output impact of $209 million ($275 million in Victoria). The employment impact of land transport and storage was estimated to be 675 fte jobs (878 in Victoria), 422 directly in the sector and flow-on employment in other sectors estimated to be over 250. Associated household income for the 675 Barwon region jobs came to almost $47 million ($64 million in the whole of Victoria).

[3] The flow-on impact of $68.1 million is calculated as the difference between the total impact of $208.8 million and the direct effect of $140.7 million (see Table 4.6).

Table 4.6 Economic impact of the Port of Geelong by port function, 2014/15 (Barwon)

Function	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment (fte)*
Direct Effects				
Port administration	45.9	32.6	11.9	100
Ship operations	50.8	22.6	10.3	142
Ship loading/unloading	48.6	30.2	13.6	172
Land transport & storage	140.7	59.6	27.4	422
Government agencies	3.1	1.2	1.2	19
Total[a]	*289.2*	*146.3*	*64.4*	*855*
Total Impact				
Port administration	75.3	47.5	20.0	203
Ship operations	85.0	40.0	19.8	264
Ship loading/unloading	72.0	43.1	20.2	256
Land transport & storage	208.8	95.9	46.9	675
Government agencies	6.0	2.8	2.0	30
Total[a]	*447.2*	*229.4*	*108.9*	*1,429*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Table 4.7 Economic impact of the Port of Geelong by port function, 2014/15 (Victoria)

Function	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Direct Effects				
Port administration	45.9	32.6	11.9	100
Ship operations	50.8	22.6	10.3	142
Ship loading/unloading	48.6	30.2	13.6	172
Land transport & storage	140.7	59.6	27.4	422
Government agencies	3.1	1.2	1.2	19
Total[a]	*289.2*	*146.3*	*64.4*	*855*
Total Impact				
Port administration	91.7	55.9	24.0	249
Ship operations	107.9	51.7	25.9	336
Ship loading/unloading	87.4	51.2	24.3	302
Land transport & storage	274.6	130.2	64.4	878
Government agencies	7.9	3.8	2.5	35
Total[a]	*569.6*	*292.8*	*141.1*	*1,800*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

The *ship loading and unloading* sector, comprised mainly of bulk cargo handling, provided services valued at over $48 million, with flow-ons to other sectors in the Barwon regional economy of around $24 million ($39 million state wide). Employment in the sector was measured at over 170 with associated household income of approximately $14 million. Flow-on employment in other sectors was estimated to be 84 (130 in Victoria), earning over $6 million in household income during 2014/15 ($10 million in the whole of Victoria).

The *ship operations* sector had impacts similar to the ship loading and unloading sector. Direct and flow-on employment in the ship operations sector accounted for around 260 full-time equivalent jobs (336 state wide), generating household income of almost $20 million in the Barwon region (approximately $26 million in Victoria in total).

The *port administration* sector is an important component of total port-related activity, particularly in terms of direct and flow-on employment of over 200 jobs in the Barwon region (249 jobs in Victoria) and corresponding household income of $20 million ($24 million state wide). The port-related activity of *government agencies* comprises a minor component of the total port impact.

Cargo type

Tables 4.8 and 4.9 show the breakdown of direct and total impacts by the major cargo types traded in 2014/15 for the Barwon region and Victoria, respectively. Details on tonnages for that year are provided in Table 2.3. The interpretation of the results is the same as that described above for the various port functions.

Of the eight commodity groups, the four largest, woodchips, fertiliser, grain and crude oil and petroleum, account for around 75 per cent of the total port impact.

Table 4.8 Economic impact of the Port of Geelong by cargo type, 2014/15 (Barwon)

Cargo type	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment (fte)*
Direct Effects				
Woodchips	60.8	30.9	13.4	179
Fertiliser	62.0	29.1	13.1	184
Grain	33.2	15.5	6.9	99
Other Dry Bulk	30.0	14.2	6.3	89
Steel Products	15.1	7.9	3.6	47
Crude Oil & Petroleum Products	58.8	32.9	14.1	168
Chemicals	9.3	5.3	2.3	29
Other Cargo	20.1	10.5	4.7	60
Total[a]	*289.2*	*146.3*	*64.4*	*855*
Total Impact				
Woodchips	92.5	47.7	22.4	295
Fertiliser	94.6	46.4	22.3	304
Grain	50.2	24.5	11.8	162
Other Dry Bulk	45.6	22.4	10.7	146
Steel Products	23.2	12.2	5.8	77
Crude Oil & Petroleum Products	94.4	51.4	24.0	296
Chemicals	14.7	8.2	3.8	48
Other Cargo	31.9	16.7	8.0	103
Total[a]	*447.2*	*229.4*	*108.9*	*1429*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Table 4.9 Economic impact of the Port of Geelong by cargo type, 2014/15 (Victoria)

Cargo type	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment no.*
Direct Effects				
Woodchips	60.8	30.9	13.4	179
Fertiliser	62.0	29.1	13.1	184
Grain	33.2	15.5	6.9	99
Other Dry Bulk	30.0	14.2	6.3	89
Steel Products	15.1	7.9	3.6	47
Crude Oil & Petroleum Products	58.8	32.9	14.1	168
Chemicals	9.3	5.3	2.3	29
Other Cargo	20.1	10.5	4.7	60
Total[a]	*289.2*	*146.3*	*64.4*	855
Total Impact				
Woodchips	118.0	60.9	29.1	372
Fertiliser	122.2	60.6	29.6	388
Grain	64.9	32.1	15.7	207
Other Dry Bulk	58.8	29.3	14.2	186
Steel Products	29.3	15.4	7.4	95
Crude Oil & Petroleum Products	117.9	63.4	30.1	366
Chemicals	18.2	10.0	4.8	58
Other Cargo	40.3	21.0	10.2	128
Total[a]	*569.6*	*292.8*	*141.1*	*1,800*

[a] Components may not sum to totals due to rounding.

Source: EconSearch analysis

4.3 Interpreting the Results

As noted in BTE (2000, pp. 107-108), the estimates of economic impact from this type of analysis indicate the general magnitude of effects associated with the port's activities. They do not provide precise estimates, as only approximate data were available for some parts of the analysis.

The results of the study provide estimates of the impact attributable to activities required for the movement of ships and cargo through the port. They do not indicate net economic benefits, technical efficiency, competitiveness, trade facilitation effects or the contribution of port infrastructure to regional development.

Data from the study may potentially be used to forecast the likely impact of increased trade through the port. However, such an assessment should not be based on a mechanistic application of multipliers estimated as part of this study. Such estimates should take account of factors such as the cargo types involved, economies or diseconomies of scale and existing capacity utilisation.

5. THE ECONOMIC IMPACT OF FUTURE TRADE FLOWS

In 2012, EconSearch reported forecasts to the year 2030 for the Port of Geelong. These forecasts have been reviewed, updated and extended to 2035 as part of this project. In this section of the report the 'medium case' forecast is reported (Table 5.1). The medium case forecast anticipated that by 2035 overall trade through the port would grow by 25 per cent above the 2014/15 level. Forecasts for the low case and high case are provided in Appendices VII and VIII, respectively.

Table 5.1 Forecast trade flows for main commodities, Port of Geelong: medium case (kt)

	Year				
Commodity	2014/15	2019/20	2024/25	2029/30	2034/35
Woodchips & Logs	1,329	1,387	1,497	1,620	1,755
Fertiliser	1,489	1,968	1,993	2,018	2,043
Grain	876	2,102	2,209	2,322	2,440
Other Dry Bulk	751	854	854	854	854
Steel Products	158	180	180	180	180
Crude Oil & Petroleum Products	6,841	6,985	6,985	6,985	6,985
Chemicals	378	430	430	430	430
Other Cargo	233	286	308	334	364
Total	*12,055*	*14,192*	*14,457*	*14,743*	*15,052*

Source: GeelongPort, GrainCorp, EconSearch analysis

As noted in the 2013 Geelong Port and Land Infrastructure Plan (GHD and Juturna Consulting 2013), the trade growth predicted for the Port of Geelong has implications for the provision of wharves and backup land, road and rail access. The report indicated a range of infrastructure development priorities that would help alleviate the current constraints to trade growth. These include:

- New berth(s) at Lascelles Wharf (growth in fertiliser trade and forestry industries). The three berths presently in operation in the Lascelles precinct reach operational capacity during peak periods, to the extent that the amount of additional cargo that can expect to be shipped through the berths is extremely limited
- Additional berths at Corio Quay (increased demand for export of woodchips at Corio Quay North and increased demand for steel products imports, including coil, plate, bulk minerals, mineral sands at Corio Quay South). The existing berths restrict the amount of additional cargo that can be shipped through the port. They are depth constrained, in relation to the channel and vessel capacity, and also constrained in terms of their age and condition. They key issue is the shortage of available backup land)

- Restricted navigation channel – bulk carriers. The dredged depth and width of the channel at the entrance to Port Phillip Bay limits the maximum vessel draft to 14m and constrains accessibility for some vessel types. This is an overarching conditioner of depth potential and vessel size for future shipping profiles and trade flows considered for Corio Bay. For future bulk commodities (and international containers), it might be expected that the priority for unlocking constraints on access to Port Philip Bay would involve a focus on modifications to address vessel manoeuvring requirements (e.g. widening the entrance).
- Restricted navigation channel – Geelong Port channel. The existing Geelong port channel (width and depth) limits the maximum size of vessel that can service the port. This acts as a barrier to attract new port users and offer efficiency gains to current users and is expected to be a growing constraint as larger vessels enter the market. This is most important for future trades, in particular alternate and new trades. A solution to these issues is therefore to widen and/or deepen the main channel servicing the Lascelles and Corio Quay berths to a minimum that will meet the future needs of the port (GHD and Juturna Consulting 2013, pp. 33-34).

The capacity of the port to realise the forecasts detailed in Table 5.1 will also be dependent on addressing land availability and land transport access issues. For example, the Port Land and Infrastructure Plan indicates a range of land-based infrastructure constraints:

- There is no recognised heavy freight operations zone around the port.
- High capacity vehicle access to all port precincts from the Princes Freeway is limited. Port exit routes for trucks heading west are different to those for trucks heading east.
- Truck access to/from the port through or around recognised (dedicated) heavy vehicle route across the city of Geelong.
- There is a lack of third party commercial access models to achieving infrastructure improvements.
- Rail access and volumetric capacity (by rail) to port berths is limited, there are no long term high capacity rail solutions planned for the port precincts.
- Access to Standard Gauge rail is complicated. The port does not yet connect easily to the national standard gauge network in an operational sense, despite its very close proximity to this infrastructure.
- Port zones suitable for stockpiling dry bulk materials appear to be limited especially when combined with rail connectivity shortcomings.
- The port has limited transport connectivity with the Geelong Ring Road Employment Precinct (GREP) Industrial Area; this has the potential to restrict growth in fertiliser / grain-based industries and future intermodal operations (GHD and Juturna Consulting 2013, p. 24).

The anticipated expansion of trade through the Port of Geelong will generate economic impacts in two broad forms: the impacts arising from the construction and upgrade of port facilities and the impacts associated with the movement of the additional cargo. This section provides

estimates of the second of these two categories of impact, namely the economic impacts of increased trade.

The economic value to the region of increased trade resulting from the ability to export/import through Port of Geelong was estimated based on the trade forecasts detailed in Table 5.1 and the Barwon regional economic model, developed for the impact analysis presented in Section 4.

The estimated impacts of forecast trade (medium case), measured in terms of employment and contribution to gross regional product, are presented in Table 5.2 for the Barwon region and Table 5.3 for Victoria.

The impacts on the State and regional economies have been estimated on the basis of:

- current employment to output ratios in each of the industries;
- labour productivity improvements of 0.5% per annum over the forecast period;
- total factor productivity of 0.5% per annum over the forecast period; and
- current economic linkages expressed in the Barwon region and Victorian economic models.

Note that the estimated impacts presented in Tables 5.2 and 5.3 represent the impacts of port related activity associated with the forecast trade. The estimates do not include the impacts of the construction activity that will be necessary to enable the forecast growth to occur.

Clearly, the impacts of the increased trade will occur mainly in the Barwon region, with some additional impacts elsewhere in Victoria, mostly Melbourne.

Table 5.2 Economic impact on the Barwon region of forecast increases in trade through Port of Geelong: medium case

	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Employment Impact (direct + indirect)					
Woodchips & Logs	295	302	318	335	354
Fertiliser	304	393	388	384	379
Grain	162	380	390	400	409
Other Dry Bulk	146	163	159	155	151
Steel Products	77	86	84	81	79
Crude Oil & Petroleum Products	296	296	288	281	274
Chemicals	48	53	52	51	49
Other Cargo	103	121	126	132	139
Total Employment Impact (fte)	**1,430**	**1,793**	**1,804**	**1,818**	**1,835**
Total GRP Impact ($m)	**229**	**285**	**287**	**289**	**291**

Source: EconSearch analysis

Table 5.3 Economic impact on Victoria of forecast increases in trade through Port of Geelong:

	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Employment Impact (direct + indirect)					
Woodchips & Logs	372	380	401	423	446
Fertiliser	388	502	496	490	483
Grain	207	486	498	511	523
Other Dry Bulk	186	208	202	197	193
Steel Products	95	106	103	101	98
Crude Oil & Petroleum Products	366	366	357	348	339
Chemicals	58	65	63	62	60
Other Cargo	128	150	156	164	173
Total Employment Impact (fte)	**1,800**	**2,263**	**2,277**	**2,295**	**2,317**
Total GRP Impact ($m)	**247**	**321**	**324**	**328**	**333**

Source: EconSearch analysis

Estimated impacts for the low case and high case are provided in detail in Appendices VII and VIII, respectively, and are summarised in Table 5.4.

Table 5.4 Summary economic impact of forecast increases in trade through Port of Geelong: low, medium and high cases

	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Forecast Trade Flows (kt)					
Low	12,055	12,099	12,177	12,260	12,345
Medium	12,055	14,192	14,457	14,743	15,052
High	12,055	15,114	16,058	17,096	18,239
Employment (fte, direct + indirect)					
Barwon Region					
Low	1,430	1,397	1,379	1,362	1,345
Medium	1,430	1,793	1,804	1,818	1,835
High	1,430	1,836	1,933	2,072	2,224
Total Victoria					
Low	1,800	1,759	1,736	1,715	1,694
Medium	1,800	2,263	2,277	2,295	2,317
High	1,800	2,673	2,767	2,923	3,093
GRP ($m, direct + indirect)					
Barwon Region					
Low	229	224	221	218	215
Medium	229	285	287	289	291
High	229	294	310	332	356
Total Victoria					
Low	247	242	239	237	234
Medium	247	321	324	328	333
High	247	386	404	429	457

Source: Tables 5.2 and 5.3, Appendices VII and VIII.

6. THE ECONOMIC IMPACT OF PORT USERS

Users of the Port of Geelong include a variety of companies which trade in liquid and dry bulk and break-bulk products. Some of these are large firms with large volumes of trade while others are smaller operations moving modest levels of cargo through the port each year. The activities of these firms, large and small, are, for the most part, not included in the impacts reported in Section 4 of this report. The following sections provide an overview of the significance of the Port to five Geelong based firms (Section 6.1) and an estimate of the impact that the top port users have on the local economy (Section 6.2).

6.1 Examples of Local Port Users and Operators

For a range of companies the Port of Geelong is integral to the location of their operations, either as a source of inputs, as a facility for efficient export of end products or, in some cases, the infrastructure to facilitate both imports and exports. This section provides a brief description of the nature of the dependence on the Port of five locally operating firms, namely Viva Energy, GrainCorp, GeelongPort, Terminals Pty Ltd and Incitec Pivot Limited (IPL).

The Geelong Viva Energy Refinery is one of four remaining refineries in Australia. The refinery is a nominal 120,000 bbls/day operation located across 2 sites in Corio and Lara totalling approximately 260Ha. It supplies around 55 per cent of Victoria's refined petroleum fuel requirements.

The major products produced at the Viva Energy refinery include petrol, diesel fuel, jet fuel, bitumen, LPG, specialty solvents and avgas. It is the only remaining manufacturer of solvents, bitumen and avgas in Australia.

Approximately 80 per cent of the refinery's feed is sourced from overseas via ship with the balance mostly derived from local sources via pipeline and truck. The refinery is heavily reliant on the Port of Geelong because the use of ships for transport is the only economically feasible way of supplying the refinery. Viva Energy accounts for over 50 per cent of the total annual volume shipped through the Port of Geelong.

Approximately 400 people are employed on site at the Geelong refinery, as well as up to 350 contractors. The refinery employs a highly skilled workforce expected in a complex manufacturing organisation, ranging from process operators and maintenance tradespeople through to business functions and technical and engineering professionals.

Geelong refinery view from Corio Bay
Source: http://www.vivaenergy.com.au

There are now 13 apprentices at Geelong Refinery – eight are working towards a dual trade (electrical and instrumental) and five mechanical fitters. Two of the apprentices are females. Three new apprentices joined the refinery in 2015. Two of the apprentices have come from Alcoa and four from Northern Futures. The refinery has provided two traineeships in 2015; one from Northern Bay Guarantee and the other from Northern Futures.

Viva Energy actively works with industry, port-users and providers, government and community liaison committees to actively encourage the development of the port. Key projects of interest around port infrastructure include the following.

- There is opportunity to improve efficiencies through deepening the Port of Geelong's channels. The Geelong channels are currently draft limited to maximum 11.7 metres, this compares to the Port of Melbourne's channels which can accommodate vessels with drafts up to 14.7 metres under the right tidal conditions. Implementation of the Dynamic Underkeel Clearance System will deliver some improvements, however deepening the Geelong channels has the potential to drive significant economic growth for the local region by supporting manufacturing businesses like Viva Energy, and also local agricultural and other export businesses. The Port of Geelong is expected to remain the principal bulk port in Victoria.
- Viva Energy with the support of the VRCA and Port Phillip Sea Pilots is seeking to establish a dedicated Geelong anchorage area at the entrance to the Geelong Channel. This requires a change to the gazetted port limits for Port of Geelong / Port of Melbourne and will deliver significant savings of upwards of $100,000 per annum.

The refinery undertakes a range of Community Capacity Building programmes. Viva Energy works actively with the community to help equip students and young adults with the necessary information and skills to obtain future employment with Viva Energy and other employers.

The refinery has had a long history of being actively involved in the community. Each year the refinery contributes hundreds of thousands of dollars towards the Geelong community through its community programs. Viva Energy is committed to communicating and engaging actively with the community, partnering with organisations including the. Committee for Geelong, G21, Geelong Chamber of Commerce and Geelong Manufacturing Council.

Viva Energy also holds a Community Advisory Panel that meets quarterly. Viva Energy also has a range of information regarding its operations and community involvement on the website: http://www.vivaenergy.com.au/operations/geelong/community.

terminals pty ltd

Terminals is Australia's largest independent operator of bulk liquid and gas storage facilities with plants located at major ports throughout Australia. The company's Geelong operation at Corio has facilities capable of handling flammable liquids, combustible liquids, corrosive liquids, oils, elevated temperature liquids, and hazardous and non-hazardous liquids. Site facilities include ship loading and unloading, five dock lines, road tanker loading and unloading, nitrogen blanketing and product heating.

The site comprises approximately 7.6 ha of land and water area leased from GeelongPort. The site is within an industrial area that is strategically located in relation to the deep-water port and road and rail transport. Storage capacity on site is 76,000 cubic metres with an annual throughput of approximately 275,000 tonnes from around 35 to 40 ship visits per year.

The site commenced operations in 1973 for the importation and storage of Vinyl Chloride Monomer (VCM) for PVC manufacture. The facility has developed over the past 30 years to comprise 4 Horton spheres for the storage of VCM, 1 Horton sphere for butadiene storage, 1 semi-pressurised tank, 16 atmospheric storage tanks, 1 atmospheric tank with internal floating roof for Avgas and 4 atmospheric storage tanks for bitumen.

The site handles products vital to the viability of Geelong and Western District companies including various local and regional asphalt companies, the local dairy industry, several Geelong manufacturers and Warrnambool food producers.

Aerial view of Terminals' Geelong operation at Corio.
Source: Terminals Pty Ltd

Terminals is committed to providing a safe facility for its staff, the community and the environment. It achieves this through the site Safety Management System. This system, based on proven international standards, ensures that the facilities are designed, constructed,

operated and maintained in a safe manner. The system includes operating procedures, work permits, training, maintenance procedures, emergency plan, management of change and auditing. Overlaying these systems is Terminals' principle of 'continual improvement'.

Currently 14 people are employed at the Geelong site as well as a part-time contractor.

Terminals Corio facility
Source: www.terminalspl.com.au

Terminals is committed to working with the community to help make Geelong an even better place to work and live. To enhance its involvement with the local community, Terminals established a Geelong Community Engagement Group (GCEG).

Terminals also established a community grants program and since early 2012 has distributed more than $35,000 to North Geelong schools, community groups and junior sports clubs.

GeelongPort

The Port of Geelong was privatised in 1996 and GeelongPort (an Asciano subsidiary) manages and operates the port for and on behalf of the joint venture owners.

As noted earlier in this report, GeelongPort is Victoria's largest regional port. As well as handling bulk cargoes such as petroleum products, fertiliser, grain, soya meal, woodchips, logs and break-bulk products such as steel, GeelongPort is also a support base for the Bass Strait oil industry. It provides berths for rig supply vessels as well as lay-up berths for tugs and oil rig maintenance.

Major customers of GeelongPort include:

- Viva Energy
- Incitec Pivot
- Midway Wood Products
- Terminals
- Wengfu
- GrainCorp
- Swire Shipping
- Toyota
- Omya
- Origin Energy

Port assets operated and maintained by GeelongPort include wharfs, sheds, pavements, cranes, mobile plant, ship loaders, and management of 14 shipping berths and 95 hectares of port-side land.

GeelongPort is responsible for the management of the port operations (including safety, environmental and maritime security requirements), harbour control, maintenance of port related infrastructure, upgrade of infrastructure and extension of the assets useful life, and the administration of all port leases.

GeelongPort has direct contractual relationships with all port customers and stakeholders and convenes regular meetings to discuss performance and to highlight efficiencies. Key external stakeholders are:

- State Government
- City of Greater Geelong
- Emergency Agencies (Police, CFA, Ambulance, SES)
- Victorian Regional Channels Authority
- Australian Customs and Border Protection Service
- Department of Agriculture Fisheries and Forestry
- Local community via a regular community consultative committee
- Utility agencies that utilise port land for their infrastructure (water, sewer, gas, power and telecommunications)

GeelongPort also convenes and participates in focus port user groups such as the bulk liquid and fertiliser group and is a member of the Geelong Manufacturing Council, Committee for Geelong and other local organisations.

GrainCorp

GrainCorp's export terminal is the end point of a rail and road network extending throughout Victoria and into southern NSW. Most grain exported from Victoria goes via the Geelong terminal and this will increase when Victoria's rail network becomes a fully dual gauge system.

There are approximately 40 permanent staff onsite including a maintenance team, comprising electricians and fitters.

GrainCorp's Geelong facility has an annual elevation capacity of 3.5 MT and an ability to service vessels up to 70,000 deadweight tonnes. Total storage capacity for grain at the facility is around

785,000 tonnes with an additional 125,000 tonnes at the Corio bunker site. Bulk grain exports through Geelong have ranged from 125,000t to 2.7Mt over the past decade, averaging 1.13Mt.

GrainCorp facility, Port of Geelong
Source: GrainCorp

GrainCorp is constantly seeking new opportunities to diversify the products handled by the Geelong terminal and new infrastructure investment to improve efficiencies. A $10 million fumigation and state of the art containerisation facility built was recently commissioned. As well, a new Quad Hopper installation and Twin Hopper system was recommissioned in the fertilizer shed, which is now capable of despatching from the three different outload points.

GrainCorp Containers Geelong is located at GrainCorp's Geelong Port Terminal and is capable of packing a full range of grains. Customers using GrainCorp Containers Geelong can draw stocks from bulk terminal storage or receive delivery of commodities by road or rail. Geelong has the added advantage of offering convenient outturn to the domestic market and direct delivery to two malt houses via conveyor belt.

GrainCorp are involved with the Northern Futures Group which offer Storage and Logistics training to under privileged participants in our local area. The company has its own Health and Well Being Committee that raised nearly $20,000 in 2015 for local charities. GrainCorp is also heavily involved with the other Port users around the Port of Geelong's SEMP and Port security.

GrainCorp is a member of the Committee for Geelong and the Geelong Port Users Group, coordinated by the VRCA. The company helped fund and develop the Ports 50 year Strategy Plan.

Incitec Pivot Limited (IPL) is a leading global chemicals company with nitrogen-based manufacturing at its core. The company's four main business areas are manufacturing, fertilisers, explosives and trading. As part of the fertiliser business area Incitec Pivot import significant quantities of the commodity through the Port of Geelong, as well as have a plant on site with the capacity to manufacture 250,000 tonnes of single superphosphate per year.

IPL annually dispatches around 800,000 tonnes of fertiliser product from its Geelong operations (500,000 tonnes arriving as finished product for distribution and 200,000 tonnes arriving as raw material for production). The operation includes import of phosphate rock (150,000 tonnes via conveyor) and sulphuric acid (100,000 tonnes via pipe) direct from Lascelles wharf. Liquid fertiliser is piped to Terminals site. The Seabreeze site includes fertiliser and chemical production, storage, blending and road/rail distribution.

The importing and distribution business make IPL a significant operator at the Port with employment of around 51 permanent employees. There are also up to 53 locally employed contract personnel from the Geelong region to meet the seasonal needs of the business and local farmers. The organisation employs a full array of skills expected in this type of operation, ranging from semi-skilled employees through to professionals. With a focus on safety and skill development, the company has an on-going training and competence program.

IPL facility, Port of Geelong; Source: Vek Rancic, IPL

IPL has been involved in a number of water saving projects in recent years, increasing stormwater storage capacity from 5 to 9 megalitres, installing an effluent treatment and process water recycling system, and installing a stormwater collection and treatment system to simultaneously eliminate discharges to Corio Bay and reduce mains water consumption. In total, these initiatives to recycle, reprocess and reuse process water, and capture, treat and use stormwater have resulted in a reduction in mains water by IPL Geelong of up to 50 megalitres per annum.

The site works closely with and supports the North Shore Residents community Group, and is a member of the Geelong Manufacturing Council.

The company is actively seeking growth opportunities in fertiliser and industrial chemicals related activities to expand the Geelong operations.

6.2 Economic Impact on the Barwon Economy of Ten Port Users

The main purpose of this study has been to provide an analysis of port-related activity at the Port of Geelong; the economic activity involved in the movement of ships in and out of the Port, the movement of cargo to and from the Port and on and off ships, and the ancillary services that supports this movement of ships and cargo. These various activities define the operation of the Port and, collectively, they generate, directly and indirectly, an impact on the Barwon and Victorian economies that was reported in detail in Section 4.

The results presented in Section 4 provide a contained and well-defined economic impact that is consistent with the Bureau of Transport and Regional Economics (BTRE) definition of regional port impact. The method has been applied in numerous studies of ports across Australia (e.g. BTE (2000, 2001); EconSearch (2001, 2002, 2015); EconSearch and NIEIR (2002); GHD and EconSearch 2014)). The BTRE framework, quite intentionally, excludes from the calculated regional impact the economic contribution that port users have on the local economy. For example, the activities of a manufacturing firm that imports raw materials and then exports processed products through the port is not included in the BTRE definition of port-related activity. The economic activity associated with the movement of the raw material and processed product back and forth across the wharf is included, however the processing activity itself is not. In striving to develop a method that gives a consistent and comparable measure of regional economic impact, this is a reasonable approach because it would be otherwise very difficult to define in a consistent manner those manufacturing activities that are attributable to the port and those that are not.

Nevertheless, in the case of the Port of Geelong, as with most other ports, there is a certain amount of economic activity in the Port's hinterland that would not occur in the local economy if the Port did not have its particular location. Employment data were collected for around 10 significant port users. These are not necessarily the largest users of the Port of Geelong but are firms that have a high level of dependence on the Port for their local operations and have a prominent presence in the local economy. The firms account for direct employment of an estimated 2,260 people (full-time equivalents) in the Barwon economy. Each firm was categorised by industry sector and standard employment to output ratios for each industry sector were applied to the employment data to estimate the value of production by these firms. These data were then used in the Barwon regional economic model to estimate the direct and indirect effects of the operations of these businesses to the local economy. The results of the analysis are provided in Table 6.1.

The operation of the locally based Port of Geelong users generated direct business turnover of over $3.8 billion in 2014/15 with flow-ons of $1.5 billion giving an estimated total output impact (direct plus flow-ons) on the Barwon economy of just under $5.4 billion.

Table 6.1 Direct and flow-on effects of Port of Geelong users, Barwon region, 2014/15

Sector [a]	*Output ($m)*	*Value added ($m)*	*Household income ($m)*	*Employment (fte)*
Direct Effect				
Port Users	*3,827.1*	*868.9*	*271.4*	*2,260*
Flow-on Effect				
Primary	10.7	5.8	2.5	44
Mining	38.7	24.6	9.1	23
Manufacturing	291.3	77.0	49.6	806
Utilities	36.2	19.3	5.7	62
Construction	50.7	16.6	14.4	185
Wholesale and retail trade, etc.	198.8	108.0	78.2	1,125
Accomm, restaurants, etc.	83.2	43.9	31.6	540
Transport, storage (excl port)	106.6	48.6	27.8	361
Communication	21.6	10.8	4.7	44
Finance, business services	471.5	279.7	111.2	961
Public administration	69.1	36.7	34.6	332
Community services	89.9	68.7	62.9	715
Recreation, personal services	69.0	33.5	27.5	527
Total flow-on Effect	*1,537.2*	*773.3*	*459.7*	*5,725*
Total [b]	*5,364.3*	*1,642.2*	*731.1*	*7,985*

[a] Refer to Appendix IV for detailed sector definitions.

[b] Components may not sum to totals due to rounding.

Source: EconSearch analysis

Value added attributable to the operation of the port user firms was estimated to be $869 million in the Barwon region, with flow-ons of $773 million. This provided a total contribution of approximately $1.6 billion or 14.8 per cent of gross regional product in the Barwon region in 2014/15.

Household income generated by the locally based Port users totalled $271 million in the Barwon region, with flow-ons of $460 million. Direct employment was estimated at 2,260 jobs (full-time equivalent) and flow-ons of 5,725 fte, giving total employment (direct plus flow-on) generated by the Port users as an estimated 7,985 fte. This represented around 9.3 per cent of total employment in the Barwon region in 2014/15.

APPENDIX I PORT RELATED ACTIVITY

The firms and organisations involved in *port-related activity* can be grouped according to their function as described below.

(1) Administration

This function is comprised of general port management and operations.

(2) Ship operations

Three sub-groups make up the shipping group. The first of these relates to the activities of shipping lines and agents. The local expenditures incurred by these companies in the operation of their business comprise part of the shipping component of port-related activity.

The second sub-group relates to moving the ships into and out of the port. This includes towage, linesmen services and mooring and unmooring.

The third sub-group includes services provided to ships while they are in the port. Firms providing these services include ship chandlers and provedores, ship repairers and oil bunkering companies.

(3) Ship loading and unloading and cargo services

This group relates to the movement of cargo on and off the ship. For containers and other general cargo, this generally involves moving the cargo across the wharf and onto (or off) some form of land-based transport (road or rail). This type of cargo movement is undertaken by stevedoring companies. Bulk cargoes (oil, chemicals, gas, etc) are generally moved through specialised facilities, sometimes owned and operated by the importing/exporting firm.

This group also includes all those firms associated with the documentation for importing and exporting cargo (shipping and customs agents and freight forwarders), container services (container repair and storage) and fumigation.

(4) Land transport and storage

This group comprises the activities of the railways and road transport firms in moving cargo to and from the port. Only expenditures directly related to cargo moving through the port are included in this component of port-related activity. Port-related storage is also included in this category.

The Geelong Port is serviced by a system of road and rail transportation systems. There are some limitations on the Ports ability to compete for some bulk product trade due to the lack of rail access to Lascelles Wharf and Corio Quay.

Table I.1 Definition of port functions

Port industry group	*Components*
Port company operations	Planning, co-ordination & promotion
	Land and property management
	Safety and emergency response
	Port maintenance
	Dredging
Ship operation & ship movement	Shipping lines
	Ship managers
	Ship repairs and maintenance [a]
	Bunkering
	Ship chandlers/provedores [b]
	Marine and cargo surveyors
	Waste disposal
	Shipping channels
	Navigation aids
	Ship agents
	Towage operators
	Pilots
	Mooring/unmooring services [c]
Ship loading/unloading	Wharves, berths, jetties, etc. [d]
	Stevedoring (non-bulk)
	Bulk cargo loading/unloading
	Passenger terminals
Cargo services	Customs agents
	Freight forwarders
	Container packing/unpacking
	Container parks
	Fumigation
Land transport and storage [e]	Road transport
	Rail transport
	Storage facilities
Government agencies	Customs
	Quarantine
	Ship safety [f]

a. Only for vessels in the port for the purpose of bringing in or taking out cargo.

b. Supply of stores and provisions to ships. Excludes supplies to commercial fishing or recreational boating sectors.

c. Includes linesmen and launch service.

d. Construction and maintenance.

e. Port-related activities only. Involves movement of cargo within the port and between the port and closest inland points (e.g. warehouses, bonded storage).

f. Australian Maritime Safety Authority.

(5) Government agencies

This group includes cargo inspection and regulation (customs, quarantine, and environmental inspections) as well as ship safety.

Several Commonwealth agencies oversee port related activities at the Port of Geelong. The Australian Quarantine and Inspection Service (AQIS) undertakes import and export inspection and certification. The Australian Maritime Safety Authority (AMSA) undertakes inspections to ensure that ships meet specified safety standards. The Australian Customs Service examines cargoes to ensure that import and export requirements and restrictions are not breached.

APPENDIX II SURVEY QUESTIONNAIRES

This appendix contains the version of the questionnaire that was sent to firms whose activities were primarily Geelong port-related.

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PORT OF GEELONG ECONOMIC IMPACT STUDY 2014/15 – PORT SERVICE – PROVIDERS QUESTIONNAIRE

Please read this first:

- If exact figures are not available, please provide careful estimates.
- Please report all monetary values in ***thousands of dollars*** ($'000).
- An electronic version of this questionnaire can be sent to you by email, if requested.

1. Company Information

   Company Name: _____

   Contact Name: _____

   Contact Phone Number: _____

   Port – Related Activities (see attached list): _____

   _____

2. Staff numbers and associated costs incurred in Victoria related to activities through the Port of Geelong (average for financial year 2014/15, including working proprietors, managers, directors):

   Full Time _____

   Part Time _____ (total)

   _____ (full – time equivalents)

   Contractors _____ (full – time equivalents)

   Gross wages & salaries in 2014/15 ($'000) _____

   (including associated costs, e.g. superannuation, but excluding payroll tax)

3. What other major costs, in addition to gross wages and salaries, were incurred in 2014/15 related to activities through the Port of Geelong: (e.g. fuel, repairs and maintenance, contractors, power)

Expenditure item	($'000)	% in Barwon Region	% in rest of Victoria

4. Please break down your Port of Geelong related revenue by cargo type and estimate market share for each cargo type (i.e. your firm's share of the Geelong market for that cargo type).

Cargo Type	Revenue in 2014/15 ($'000)	Estimated market share for each cargo type (%)
Woodchips		
Logs		
Fertiliser		
Grain		
Other dry bulk		
Aluminium products		
Steel products		
Crude oil & petroleum products		
Chemicals		
Other (please specify)		
TOTAL		

5. If your activity in the Port of Geelong in 2014/15was not a typical year, please explain in what way(s) it differed from the norm.

6. How has your activity in the Port of Geelong changed over the past 5 years?

7. In what ways do you expect your activity to change over the next 5 years?

8. What infrastructure investments or other changes are required to enable the Port of Geelong to increase the volume of trade through the Port?

9. How would you describe your firm's dependence on the Port (e.g. if the Port wasn't there how would it affect your business operations)?

10. Any other comments about the Port of Geelong?

Thank you for your time and cooperation.

Please return the questionnaire by email to jbmorison@econsearch.com.au or by fax to (08) 8431 7710.

If you have any queries don't hesitate to contact Julian Morison on 08 8431-5533 or 0419 869-633

APPENDIX III ECONOMIC IMPACT ANALYSIS

This study provides estimates of the economic impact of *port-related activity* on the economy of the Barwon region and the state of Victoria. The methodological basis for the study is input-output analysis. In this appendix the concept of economic impact, the process of impact measurement and the use of input-output models in impact measurement are briefly reviewed. The research methodology applied in this study is outlined in more specific terms in Section 3.

The input-output model is suitable for the detailed description of regional economies and for measuring the impacts of existing industries, new industries or changes in the size of industries on the regional economy. It is therefore appropriate to apply the model in estimating the impact of port-related activity on the economy of the Barwon region.

In the following sections the method of economic impact analysis is outlined and the structure of the input-output model and multipliers, the tools used in the estimation of economic impacts, are detailed.

Economic impact analysis

The term *impact* has no unambiguous meaning; it is used in a wide variety of contexts, and synonymously with several terms such as *results*, *incidence*, *effect*, *significance*, *contribution*, *consequence* and *importance*. It is therefore important to define clearly the concept of economic impact, and the particular use of the term applied in this study.

One of the main ends of economic research is the study of impacts, where the term refers generally to the consequences of some expected or hypothetical phenomenon, either physical or social. For example, the recent emergence of environmental impact statements reflects a desire on the part of authorities to be informed on the likely consequences of a new development, both in terms of effects on the physical environment and the socio-economic environment. An impact study is intended to isolate and identify the more significant consequences of an event or phenomenon for planning purposes.

It is necessary to distinguish between the *impacting agent*, which is the phenomenon or event under study, and the *impacts*, which are the results of the existence of, or change in, the impacting agent. Socio-economic impact studies tend to be restricted to the consequences of significant existing or new phenomena. These phenomena cause a wide variety of impacts to occur in economic, sociological, political, physical and welfare terms. For example, the activity associated with the port in Geelong has resulted in a wide variety of impacts on the regional, social and economic structure of Geelong and the Barwon region as a whole. Apart from the economic consequences of the port, some of which are the subject of this study, virtually every facet of the regional social structure will be affected by the existence of the port.

Since this study is concerned solely with economic impact, it omits the wide variety of non-economic impacts of the industry on the region, many of which are clearly significant. The *economic* consequence of the presence of the port will be felt in many aspects of activity in the Geelong region, ranging from levels of regional output, income and employment, to land prices (including residential, commercial and industrial land), house and building prices, local government rates, supply and demand of labour, demand and supply of urban infrastructure and so on. Unfortunately, fully comprehensive models, including all aspects of regional economic activity, are not available and more complex econometric models with an ability to include a wide variety of economic phenomena have not been satisfactorily developed for impact analysis at a regional level in Australia.

Consistent with the BTE (2000) approach, the input-output model was considered the most appropriate for this economic impact assessment. This model is, however, limited to those aspects of impact which can be represented in the input-output model, ie output, income, employment and value added. The procedures used in input-output analysis are detailed in the following section.

While it is quite clear that significant economic and social impacts are associated with port-related activity, measurement of these impacts does not, *per se*, constitute an economic evaluation of the industry. Such an evaluation is possible only through a comprehensive cost-benefit analysis of the industry, which would take into account both the direct and indirect impacts of the industry as recorded in this study.

In summary, an economic impact may be defined in general terms as the measured economic effect of, or change which is attributable to, the impacting agent[4] on the economy in question.

Multipliers and impact measurement

The essence of impact measurement is the empirical measurement of the relationship between cause and effect, or between the impacting agent and the expected impact. This relationship can be expressed in two ways:

(i) on a 'per unit of impact' basis. This is normally expressed in terms of a multiplier which expresses the cause-effect relationship in empirical terms. In this study, output, income, employment and value added multipliers are used to express impacts in terms of a 'per unit of output of port-related activity'.

(ii) on an aggregate value basis. This expresses the total absolute effect, measured in terms of output, income, employment, and value added of the existence of port-related activity.

[4] The impacting agent may be an actual or potential source of economic change, or an industry which is established and operating in the economy.

The selection of methodology for impact measurement is therefore selection of the most appropriate method of estimation of multipliers. Four general methods are available for this purpose, namely economic base multipliers, regional Keynesian multipliers, econometric models and input-output models. The consultants had access to an established methodological and research structure for the calculation of an input-output table for the Barwon region, and to methods of calculating multipliers from these tables. There was, therefore, a distinct advantage in the use of the input-output technique, apart from the fact that it is generally considered to be methodologically superior to the simpler techniques such as the economic base approach or the use of regional Keynesian employment multipliers. This superiority is generally considered to be attributable to the following factors (Jensen and West 1986):

(i) In terms of the incidence of impact, the economic base and the Keynesian approaches normally provide impact measurement only in aggregate terms, i.e. the total impact felt by all sectors collectively. Input-output multipliers allow the analyst to examine the manner in which the total impact is distributed among the sectors of the economy. This is a reflection of the internal linkages and interdependencies in the economy which are specified in the input-output table.

(ii) Input-output multipliers also allow the identification of the components of the multiplier; the economic base and Keynesian models do not, in their standard form, provide all of these details. The components are as follows:

(a) the **initial** effect, which is the stimulus for the impact analysis – normally assumed to be a dollar change in sales to final demand;

(b) the **first-round** effect, which refers to the purchases of inputs required from other sectors in the economy in order to produce the additional output;

(c) the **industrial-support** effect, which refers to second, third and subsequent-round industrial flow-on effects triggered by the purchases in the first round; and

(d) the **consumption-induced** effects, which stem from the spending of household income received as payments for labour used in producing the additional output.

Regional econometric models, including models of the general equilibrium family, were not available for the region or project in question, and were not considered necessary for the view of impact taken in this study.

Input-output analysis

An outline of the input-output technique can be found in any one of a number of standard texts dealing with the subject (see, for example, Hewings (1985), Midmore and Harrison-Mayfield (1996), Miller and Blair (1985), Jensen and West (1986) and West (1993, 1995, 1999). An input-

output table is a simple mathematical representation of the production aspects of an economy viewed at a particular point in time. In the purely hypothetical case of no significant change in the economy from one time period to another, the table would remain relatively unchanged over that period. In reality, any economy continually experiences many types of shocks or stimuli (positive and negative) and these may be ephemeral in nature or lead to long-term structural changes in the nature of the economy. Many of these stimuli can be represented in the input-output model by appropriate adjustments to the input-output table. Some of these methods are outlined in the following section.

Methods of impact measurement using input-output analysis

The task of measuring economic impacts through the input-output model is largely one of representing the impact in the most appropriate manner in the transactions table. Once this has been completed, the analytical derivation of the impact is possible through multiplier calculation in the conventional manner.

The responsibility of the input-output analyst is to determine the nature of the impact under study, the relationship of the impacting agent with the economy in question, and to simulate this relationship as closely as possible in the transactions table of the regional economy. Some common types of impact, requiring different treatment of the input-output table, are listed below.

(a) A change in the level of output of a sector or sectors, due to changes in the level of final demand, may be traced by use of multipliers or by matrix multiplication using the table in its original form.

(b) A change in the technology or trading patterns of an existing industry would be reflected in changed column or row entries in the existing transactions table. The effects of this type of change would be measured by comparing multipliers, output levels and employment levels before and after the impact occurred.

(c) A new or existing firm or industry can be incorporated into the study in either of two ways. If the impact is regarded as of little significance, or if the firm is thought to show a cost structure (ie a column in the A matrix) similar to the average existing firm in the table, the new firm can be adequately represented by the existing sector of the table without any significant strain on the assumptions of the model. If, however, the firm or industry to be examined is considered to be of some significance, or if the requirements of the study called for a detailed study of the firm or industry *per se*, a new row and column representing that firm or industry should be prepared and incorporated into the input-output table and normal multiplier calculation carried out. Only in this manner is a detailed study of the impact of the firm or industry possible. The latter procedure was used in this study and new rows and columns were prepared for each aspect of port-related activity, as described in Chapter 3.

Limitations of input-output analysis

The input-output model, like all economic models, is not capable of a perfect or near-perfect simulation of economic reality. It is therefore important to clarify the limitations of the model. Two points are made in the context of the present study.

The first point refers to the accuracy of multiplier estimates. The results of any social or economic analysis must, by the nature of the data and the techniques of analysis used, be interpreted in a broad accuracy framework. While the mathematical operations of the technique produce results which appear to be precise, a professional assessment of accuracy in general terms is necessary. The accuracy of the estimates in this study as in other studies of this nature, should be interpreted in an 'order of magnitude' holistic framework (Jensen 1980).

The second point refers to the question of the linearity assumption of the input-output model. The notion of linearity is common to most methods of impact analysis, including most of the alternative methods discussed above. This or some other equally convenient assumption is usually necessary to achieve workable economic models. The main question is not the existence of the assumption but the extent to which it results in unacceptable inaccuracies in empirical work. In this study it was felt that since port-related activity is long-established, and clearly a 'permanent' and integrated part of the regional economy, the linearity assumption posed no problem in the estimation and interpretation of the significance of the industry in the economy of the Barwon region.

APPENDIX IV INPUT-OUTPUT SECTOR DEFINITIONS

Aggregated Barwon & Victorian input-output table sectors	Corresponding national input-output table sectors [5]
1. Primary	0101 Sheep 0102 Grains 0103 Beef cattle 0104 Dairy cattle 0105 Pigs 0106 Poultry 0107 Other agriculture 0200 Services to agric., hunting & trapping 0300 Forestry and logging 0400 Commercial fishing
2. Mining	1100 Coal; oil and gas 1301 Iron ores 1302 Non-ferrous metal ores 1400 Other mining 1500 Services to mining

[5] Concordance between the national input-output sectors and ANZSIC sectors can be found in Australian Bureau of Statistics (2015a).

3. Manufacturing	2101 Meat & meat products 2102 Dairy products 2103 Fruit and vegetable products 2104 Oils and fats 2105 Flour & cereal foods 2106 Bakery products 2107 Confectionery 2108 Other food products 2109 Soft drinks, cordials and syrups 2110 Beer and malt 2111 Wine & spirits 2112 Tobacco products 2201 Textile fibres, yarns etc. 2202 Textile products 2203 Knitting mill products 2204 Clothing 2205 Footwear 2206 Leather & leather products 2301 Sawmill products 2302 Other wood products 2303 Pulp, paper & paperboard 2305 Paper bags and products 2401 Printing & services to printing 2402 Publishing; recorded media etc.

Aggregated Barwon & Victorian input-output table sectors	Corresponding national input-output table sectors
3. Manufacturing (cont.)	2501 Petroleum & coal products 2502 Basic chemicals 2503 Paints 2504 Pharmaceuticals etc. 2505 Soap & other detergents 2506 Cosmetic & toiletry preparations 2507 Other chemical products 2508 Rubber products 2509 Plastic products 2601 Glass & glass products 2602 Ceramic products 2603 Cement, lime and concrete slurry 2604 Plaster & other concrete products 2605 Other non-metallic mineral products 2701 Iron & steel 2702 Basic non-ferrous metals etc. 2703 Structural metal products 2704 Sheet metal products 2705 Fabricated metal products 2801 Motor vehicles & parts; other t/port equip 2802 Ships and boats 2803 Railway equipment 2804 Aircraft 2805 Photographic & scientific equipment 2806 Electronic equipment 2807 Household appliances 2808 Other electrical equipment 2809 Agricultural, mining etc. machinery 2810 Other machinery & equipment 2901 Prefabricated buildings 2902 Furniture 2903 Other manufacturing
4. Utilities	3601 Electricity 3602 Gas 3701 Water, sewerage and drainage
5. Building and construction	4101 Residential building 4102 Other construction
6. Wholesale and retail trade, etc., trade	4501 Wholesale trade 5101 Retail trade 5401 Mechanical repairs 5402 Other repairs
7. Accommodation, cafes & restaurants	5701 Accommodation, cafes & restaurants

Aggregated Barwon & Victorian input-output table sectors	Corresponding national input-output table sectors
8. Transport (excl Port)	6101 Road transport 6201 Rail, pipeline & other transport 6301 Water transport 6401 Air & space transport 6601 Services to transport; storage
9. Port	This sector is a composite of parts of a number of other sectors including 6601, 6101 and 6201.
10. Communication	7101 Communication services
11. Finance, business services	7301 Banking 7302 Non-bank finance 7303 Financial asset investors 7401 Insurance 7501 Services to finance etc. 7702 Other property services 7801 Scientific research, technical and computer services 7802 Legal, accounting etc. 7803 Other business services
12. Ownership of dwellings	7701 Ownership of dwellings
13. Public administration	8101 Government administration (part) 8201 Defence
14. Community services	8601 Health services 8401 Education 8701 Community services
15. Recreation, personal services	9101 Motion picture, radio etc. 9201 Libraries, museums & the arts 9301 Sport, gambling etc. 9501 Personal Services 9601 Other services

APPENDIX V DISAGGREGATED MULTIPLIERS - BARWON

Table V.1 Disaggregated output multipliers for the Port of Geelong, 2014/15 (Barwon)

Sector [a]	*Initial*	*Production* [b]	*Consumption* [c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.00	0.3	0.00	0.8
Mining	0.00	0.00	0.00	0.00	0.1	0.00	0.2
Manufacturing	0.00	0.05	0.03	0.08	5.2	0.08	14.8
Utilities	0.00	0.01	0.01	0.02	1.4	0.02	4.0
Construction	0.00	0.02	0.00	0.02	1.1	0.02	3.2
Wholesale and retail trade, etc.	0.00	0.04	0.05	0.08	5.4	0.08	15.2
Accommodation, restaurants, etc.	0.00	0.00	0.02	0.03	1.8	0.03	5.0
Transport, storage (excl port)	0.00	0.03	0.01	0.04	2.8	0.04	8.1
Port	1.00	0.00	0.00	1.00	64.7	0.00	0.0
Communication	0.00	0.02	0.01	0.03	1.7	0.03	4.7
Finance, business services	0.00	0.09	0.04	0.13	8.2	0.13	23.1
Ownership of dwellings	0.00	0.00	0.06	0.06	3.6	0.06	10.1
Public administration	0.00	0.01	0.00	0.01	0.4	0.01	1.1
Community services	0.00	0.00	0.03	0.03	2.0	0.03	5.8
Recreation, personal services	0.00	0.01	0.02	0.02	1.4	0.02	4.0
Total	1.00	0.27	0.27	1.55	100.0	0.55	100.0

a. Sector definitions are given in Appendix IV.

b. Production-induced effects = first-round + industrial-support effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.27

Type II Multiplier 1.55

Source EconSearch analysis.

Table V.2 Disaggregated value added multipliers for the Port of Geelong, 2014/15 (Barwon)

Sector [a]	*Initial*	*Production* [b]	*Consumption* [c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.00	0.3	0.00	0.84
Mining	0.00	0.00	0.00	0.00	0.1	0.00	0.19
Manufacturing	0.00	0.02	0.01	0.03	3.2	0.03	8.76
Utilities	0.00	0.01	0.00	0.01	1.2	0.01	3.38
Construction	0.00	0.00	0.00	0.01	0.7	0.01	1.96
Wholesale and retail trade, etc.	0.00	0.02	0.03	0.05	5.8	0.05	16.11
Accommodation, restaurants, etc.	0.00	0.00	0.01	0.01	1.8	0.01	4.96
Transport, storage (excl port)	0.00	0.01	0.01	0.02	2.5	0.02	6.92
Port	0.51	0.00	0.00	0.51	63.8	0.00	0.00
Communication	0.00	0.01	0.00	0.01	1.5	0.01	4.19
Finance, business services	0.00	0.05	0.02	0.07	9.0	0.07	24.76
Ownership of dwellings	0.00	0.00	0.04	0.04	5.4	0.04	14.78
Public administration	0.00	0.00	0.00	0.00	0.4	0.00	1.12
Community services	0.00	0.00	0.02	0.02	3.0	0.02	8.40
Recreation, personal services	0.00	0.00	0.01	0.01	1.3	0.01	3.62
Total	0.51	0.13	0.16	0.79	100.0	0.29	100.0

a. Sector definitions are given in Appendix IV.

b. Production-induced effects = first-round + industrial-support effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier	1.26
Type II Multiplier	1.57

Source EconSearch analysis.

Table V.3 Disaggregated income multipliers for the Port of Geelong, 2014/15 (Barwon)

Sector [a]	*Initial*	*Production* [b]	*Consumption* [c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.00	0.3	0.00	0.7
Mining	0.00	0.00	0.00	0.00	0.1	0.00	0.2
Manufacturing	0.00	0.01	0.01	0.02	4.0	0.02	9.9
Utilities	0.00	0.00	0.00	0.00	0.8	0.00	1.9
Construction	0.00	0.00	0.00	0.00	1.1	0.00	2.7
Wholesale and retail trade, etc.	0.00	0.01	0.02	0.03	9.0	0.03	22.0
Accommodation, restaurants, etc.	0.00	0.00	0.01	0.01	2.8	0.01	6.8
Transport, storage (excl port)	0.00	0.01	0.00	0.01	3.3	0.01	8.1
Port	0.22	0.00	0.00	0.22	59.2	0.00	0.0
Communication	0.00	0.00	0.00	0.00	1.3	0.00	3.2
Finance, business services	0.00	0.02	0.01	0.04	9.4	0.04	23.1
Ownership of dwellings	0.00	0.00	0.00	0.00	0.0	0.00	0.0
Public administration	0.00	0.00	0.00	0.00	0.7	0.00	1.7
Community services	0.00	0.00	0.02	0.02	5.9	0.02	14.4
Recreation, personal services	0.00	0.00	0.01	0.01	2.2	0.01	5.4
Total	0.22	0.07	0.08	0.38	100.0	0.15	100.0

a. Sector definitions are given in Appendix IV.

b. Production-induced effects = first-round + industrial-support effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier	1.34
Type II Multiplier	1.69

Source EconSearch analysis.

Table V.4 Disaggregated employment multipliers[a] for the Port of Geelong, 2014/15 (Barwon)

Sector[b]	*Initial*	*Production*[c]	*Consumption*[d]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.01	0.01	0.02	0.4	0.02	1.0
Mining	0.00	0.00	0.00	0.00	0.0	0.00	0.0
Manufacturing	0.00	0.17	0.09	0.26	5.2	0.26	13.1
Utilities	0.00	0.03	0.01	0.04	0.8	0.04	1.9
Construction	0.00	0.04	0.01	0.05	0.9	0.05	2.4
Wholesale and retail trade, etc.	0.00	0.22	0.28	0.50	10.1	0.50	25.1
Accommodation, restaurants, etc.	0.00	0.02	0.16	0.19	3.8	0.19	9.4
Transport, storage (excl port)	0.00	0.12	0.04	0.16	3.2	0.16	8.0
Port	2.96	0.00	0.00	2.96	59.8	0.00	0.0
Communication	0.00	0.04	0.01	0.05	1.0	0.05	2.5
Finance, business services	0.00	0.19	0.10	0.29	5.9	0.29	14.6
Ownership of dwellings	0.00	0.00	0.00	0.00	0.0	0.00	0.0
Public administration	0.00	0.03	0.00	0.03	0.6	0.03	1.5
Community services	0.00	0.01	0.24	0.25	5.1	0.25	12.6
Recreation, personal services	0.00	0.04	0.12	0.16	3.2	0.16	8.0
Total	2.96	0.91	1.07	4.94	100.0	1.98	100.0

a. Jobs per million dollars.

b. Sector definitions are given in Appendix IV.

c. Production-induced effects = first-round + industrial-support effects.

d. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.31

Type II Multiplier 1.67

Source EconSearch analysis.

APPENDIX VI DISAGGREGATED MULTIPLIERS - VICTORIA

Table VI.1 Disaggregated output multipliers for the Port of Geelong, 2014/15 (Victoria)

Sector [a]	*Initial*	*Production* [b]	*Consumption* [c]	*Total*	*% Flow-on*		*%*
Primary	0.00	0.01	0.01	0.02	1.1	0.02	2.2
Mining	0.00	0.01	0.01	0.01	0.7	0.01	1.5
Manufacturing	0.00	0.08	0.07	0.14	7.3	0.14	14.8
Utilities	0.00	0.03	0.02	0.04	2.3	0.04	4.6
Construction	0.00	0.02	0.01	0.03	1.3	0.03	2.7
Wholesale and retail trade, etc.	0.00	0.06	0.08	0.14	7.0	0.14	14.2
Accommodation, restaurants, etc.	0.00	0.01	0.03	0.03	1.7	0.03	3.4
Transport, storage (excl port)	0.00	0.05	0.03	0.08	4.2	0.08	8.5
Port	1.00	0.00	0.00	1.00	50.8	0.00	0.0
Communication	0.00	0.04	0.02	0.06	3.1	0.06	6.2
Finance, business services	0.00	0.15	0.11	0.26	13.3	0.26	27.0
Ownership of dwellings	0.00	0.00	0.08	0.08	4.1	0.08	8.3
Public administration	0.00	0.01	-0.01	-0.01	-0.3	-0.01	-0.7
Community services	0.00	0.00	0.03	0.04	1.9	0.04	3.8
Recreation, personal services	0.00	0.01	0.03	0.03	1.7	0.03	3.4
Total	1.00	0.46	0.51	1.97	100.0	0.97	100.0

a. Sector definitions are given in Appendix IV.

b. Production-induced effects = first-round + industrial-support effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier 1.46

Type II Multiplier 1.97

Source EconSearch analysis.

Table VI.2 Disaggregated value added multipliers for the Port of Geelong, 2014/15 (Victoria)

Sector[a]	*Initial*	*Production*[b]	*Consumption*[c]	*Total*	*% Flow-on*		*%*
Primary	0.00	0.00	0.01	0.01	1.1	0.01	2.10
Mining	0.00	0.01	0.00	0.01	0.9	0.01	1.80
Manufacturing	0.00	0.02	0.02	0.05	4.5	0.05	8.98
Utilities	0.00	0.01	0.01	0.02	1.9	0.02	3.85
Construction	0.00	0.01	0.00	0.01	0.8	0.01	1.66
Wholesale and retail trade, etc.	0.00	0.03	0.04	0.08	7.5	0.08	15.01
Accommodation, restaurants, etc.	0.00	0.00	0.01	0.02	1.7	0.02	3.42
Transport, storage (excl port)	0.00	0.02	0.01	0.04	3.6	0.04	7.24
Port	0.51	0.00	0.00	0.51	50.0	0.00	0.00
Communication	0.00	0.02	0.01	0.03	2.7	0.03	5.41
Finance, business services	0.00	0.09	0.07	0.15	15.2	0.15	30.34
Ownership of dwellings	0.00	0.00	0.06	0.06	6.1	0.06	12.25
Public administration	0.00	0.00	-0.01	0.00	-0.4	0.00	-0.80
Community services	0.00	0.00	0.03	0.03	2.8	0.03	5.58
Recreation, personal services	0.00	0.00	0.01	0.02	1.6	0.02	3.15
Total	0.51	0.22	0.28	1.01	100.0	0.51	100.00

a. Sector definitions are given in Appendix IV.

b. Production-induced effects = first-round + industrial-support effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier	1.44
Type II Multiplier	2.00

Source EconSearch analysis.

Table VI.3 Disaggregated income multipliers for the Port of Geelong, 2014/15 (Victoria)

Sector[a]	*Initial*	*Production*[b]	*Consumption*[c]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.00	0.00	0.01	1.2	0.01	2.2
Mining	0.00	0.00	0.00	0.00	0.6	0.00	1.1
Manufacturing	0.00	0.01	0.01	0.03	5.4	0.03	10.0
Utilities	0.00	0.00	0.00	0.01	1.2	0.01	2.2
Construction	0.00	0.00	0.00	0.01	1.3	0.01	2.4
Wholesale and retail trade, etc.	0.00	0.02	0.03	0.06	11.4	0.06	21.0
Accommodation, restaurants, etc.	0.00	0.00	0.01	0.01	2.6	0.01	4.8
Transport, storage (excl port)	0.00	0.02	0.01	0.02	4.8	0.02	8.8
Port	0.22	0.00	0.00	0.22	45.7	0.00	0.0
Communication	0.00	0.01	0.00	0.01	2.2	0.01	4.0
Finance, business services	0.00	0.04	0.04	0.08	16.4	0.08	30.1
Ownership of dwellings	0.00	0.00	0.00	0.00	0.0	0.00	0.0
Public administration	0.00	0.00	-0.01	0.00	-0.6	0.00	-1.2
Community services	0.00	0.00	0.02	0.03	5.4	0.03	9.9
Recreation, personal services	0.00	0.00	0.01	0.01	2.5	0.01	4.6
Total	0.22	0.13	0.14	0.49	100.0	0.27	100.0

a. Sector definitions are given in Appendix IV.

b. Production-induced effects = first-round + industrial-support effects.

c. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier	1.57
Type II Multiplier	2.19

Source EconSearch analysis.

Table VI.4 Disaggregated employment multipliers[a] for the Port of Geelong, 2014/15 (Victoria)

Sector[b]	*Initial*	*Production*[c]	*Consumption*[d]	*Total*	*%*	*Flow-on*	*%*
Primary	0.00	0.04	0.07	0.11	1.7	0.11	3.3
Mining	0.00	0.00	0.00	0.01	0.1	0.01	0.2
Manufacturing	0.00	0.25	0.20	0.45	7.2	0.45	13.7
Utilities	0.00	0.05	0.03	0.08	1.3	0.08	2.4
Construction	0.00	0.05	0.03	0.08	1.2	0.08	2.3
Wholesale and retail trade, etc.	0.00	0.36	0.46	0.81	13.0	0.81	24.8
Accommodation, restaurants, etc.	0.00	0.03	0.20	0.23	3.7	0.23	7.0
Transport, storage (excl port)	0.00	0.19	0.10	0.29	4.7	0.29	9.0
Port	2.96	0.00	0.00	2.96	47.5	0.00	0.0
Communication	0.00	0.06	0.04	0.10	1.7	0.10	3.1
Finance, business services	0.00	0.36	0.29	0.64	10.4	0.64	19.7
Ownership of dwellings	0.00	0.00	0.00	0.00	0.0	0.00	0.0
Public administration	0.00	0.03	-0.07	-0.04	-0.6	-0.04	-1.1
Community services	0.00	0.03	0.27	0.29	4.7	0.29	9.0
Recreation, personal services	0.00	0.04	0.17	0.21	3.4	0.21	6.5
Total	2.96	1.49	1.78	6.22	100.0	3.27	100.0

a. Jobs per million dollars.

b. Sector definitions are given in Appendix IV.

c. Production-induced effects = first-round + industrial-support effects.

d. Consumption refers to consumption-induced effects.

Note Components may not sum to totals due to rounding.

Type I Multiplier	1.50
Type II Multiplier	2.11

Source EconSearch analysis.

APPENDIX VII FORECAST TRADE AND TRADE IMPACTS: LOW CASE

Appendix Table VII-1 Forecast trade flows for main commodities, Port of Geelong: low case (kt)

	Year				
Commodity	2014/15	2019/20	2024/25	2029/30	2034/35
Woodchips & Logs	1,329	1,080	1,131	1,186	1,243
Fertiliser	1,489	1,757	1,757	1,757	1,757
Grain	876	820	841	862	884
Other Dry Bulk	751	786	786	786	786
Aluminium Products	0	0	0	0	0
Steel Products	158	165	165	165	165
Crude Oil & Petroleum Products	6,841	6,841	6,841	6,841	6,841
Chemicals	378	396	396	396	396
Motor Vehicles	0	0	0	0	0
Other Cargo	233	254	260	267	273
Total	*12,055*	*12,099*	*12,177*	*12,260*	*12,345*

Source: GeelongPort, GrainCorp, EconSearch analysis

Appendix Table VII-2 Economic impact on the Barwon region of forecast increases in trade through Port of Geelong: low case

	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Employment Impact (direct + indirect)					
Woodchips & Logs	295	233	238	243	248
Fertiliser	304	348	339	331	323
Grain	162	147	147	147	147
Other Dry Bulk	146	148	144	141	137
Aluminium Products	0	0	0	0	0
Steel Products	77	78	76	74	72
Crude Oil & Petroleum Products	296	287	280	273	266
Chemicals	48	48	47	46	45
Motor Vehicles	0	0	0	0	0
Other Cargo	103	108	107	107	106
Total Employment Impact (fte)	**1,430**	**1,397**	**1,379**	**1,362**	**1,345**
Total GRP Impact ($m)	**229**	**224**	**221**	**218**	**215**

Source: EconSearch analysis

Appendix Table VII-3 Economic impact on Victoria of forecast increases in trade through Port of Geelong: low case

	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Employment Impact (direct + indirect)					
Woodchips & Logs	372	293	300	306	313
Fertiliser	388	444	433	422	412
Grain	207	188	188	188	188
Other Dry Bulk	186	189	184	180	175
Aluminium Products	0	0	0	0	0
Steel Products	95	97	94	92	90
Crude Oil & Petroleum Products	366	355	346	337	329
Chemicals	58	59	58	56	55
Motor Vehicles	0	0	0	0	0
Other Cargo	128	134	134	133	133
Total Employment Impact (fte)	**1,800**	**1,759**	**1,736**	**1,715**	**1,694**
Total GRP Impact ($m)	**247**	**242**	**239**	**237**	**234**

Source: EconSearch analysis

APPENDIX VIII FORECAST TRADE AND TRADE IMPACTS: HIGH CASE

Appendix Table VIII-1 Forecast trade flows main commodities, Port of Geelong: high case (kt)

	Year				
Commodity	2014/15	2019/20	2024/25	2029/30	2034/35
Woodchips & Logs	1,329	1,502	1,750	2,028	2,339
Fertiliser	1,489	1,693	1,869	2,064	2,278
Grain	876	2,693	2,901	3,126	3,367
Other Dry Bulk	751	854	943	1,041	1,149
Steel Products	158	180	198	219	242
Crude Oil & Petroleum Products	6,841	7,456	7,556	7,656	7,756
Chemicals	378	430	475	524	579
Other Cargo	233	306	365	439	530
Total	*12,055*	*15,114*	*16,058*	*17,096*	*18,239*

Source: EconSearch analysis

Appendix Table VIII-2 Economic impact on Barwon of forecast increases in trade through Port of Geelong: high case

	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Employment Impact (direct + indirect)					
Woodchips & Logs	295	321	360	406	457
Fertiliser	304	335	361	388	418
Grain	162	450	458	481	506
Other Dry Bulk	146	155	157	169	182
Aluminium Products	0	0	0	0	0
Steel Products	77	85	91	98	106
Crude Oil & Petroleum Products	296	313	309	305	302
Chemicals	48	51	53	57	61
Motor Vehicles	0	0	0	0	0
Other Cargo	103	127	145	167	193
Total Employment Impact (fte)	**1,430**	**1,836**	**1,933**	**2,072**	**2,224**
Total GRP Impact ($m)	**229**	**294**	**310**	**332**	**356**

Source: EconSearch analysis

Appendix Table VIII-3 Economic impact on Victoria of forecast increases in trade through Port of Geelong: high case

	Year				
	2014/15	2019/20	2024/25	2029/30	2034/35
Employment Impact (direct + indirect)					
Woodchips & Logs	372	389	417	453	493
Fertiliser	388	419	445	473	504
Grain	207	994	1,027	1,093	1,162
Other Dry Bulk	186	183	174	178	181
Steel Products	95	108	119	130	142
Crude Oil & Petroleum Products	366	378	372	367	361
Chemicals	58	60	60	63	66
Other Cargo	128	143	154	168	184
Total Employment Impact (fte)	**1,800**	**2,673**	**2,767**	**2,923**	**3,093**
Total GRP Impact ($m)	**247**	**386**	**404**	**429**	**457**

Source: EconSearch analysis

GLOSSARY

Consumption-induced effects are additional output, employment and income resulting from re-spending by households that receive income from employment in direct and indirect activities. Consumption-induced effects are sometimes referred to as “induced effects”.

Direct effects are the initial round of output, employment and income generated by an economic activity.

Employment is the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent jobs.

Flow-on effects are the sum of the production-induced effects and the consumption-induced effects.

Gross regional product (at factor cost) is a measure of value added on a regional basis. It can be calculated using two methods. The income method calculates GRP as household income plus other value added. The expenditure method calculates GRP as household expenditure plus other final demand, that is, in total, gross regional expenditure, plus exports less imports.

Household income is wages and salaries and other payments to labour including overtime payments and income tax, but excluding payroll tax.

Input-output analysis is an accounting system of inter-industry transactions based on the notion that no industry exists in isolation.

Input-output table is a transactions table that illustrates and quantifies the purchases and sales of goods and services taking place in an economy at a given point in time. It provides a numerical picture of the size and shape of the economy and its essential features. Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

Multiplier is an index (ratio) indicating the overall change in the level of activity that results from an initial change in economic activity. They are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. They can be used to estimate the impact of a change in that particular sector on the rest of the economy. See Table 4.1 for a description of multiplier components.

Output is gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies.

Production-induced effects are additional output employment and income resulting from re-spending by firms that receive income from the sale of goods and services to firms undertaking, for example, agricultural activities. Production-induced effects are sometimes referred to as “indirect effects”.

Total impact is the sum of the direct effects and the flow-on effects.

Type I multiplier is calculated as (direct effects + production induced effects)/direct effects.

Type II multiplier is calculated as (direct effects + production induced effects + consumption induced effects)/direct effects.

Value added is calculated as the value of output less the cost of goods and services (including imports) used in producing the output. It represents payments to the primary inputs of production (labour, capital and land). Value added is consistent with standard measures of economic activity, such as gross domestic, state or regional product, and it provides an assessment of the net contribution to regional economic growth of a particular enterprise or activity.

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