



Economic Contribution of RAAF Base Amberley

A report for the Department of Defence

17 March 2017

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Executive Summary

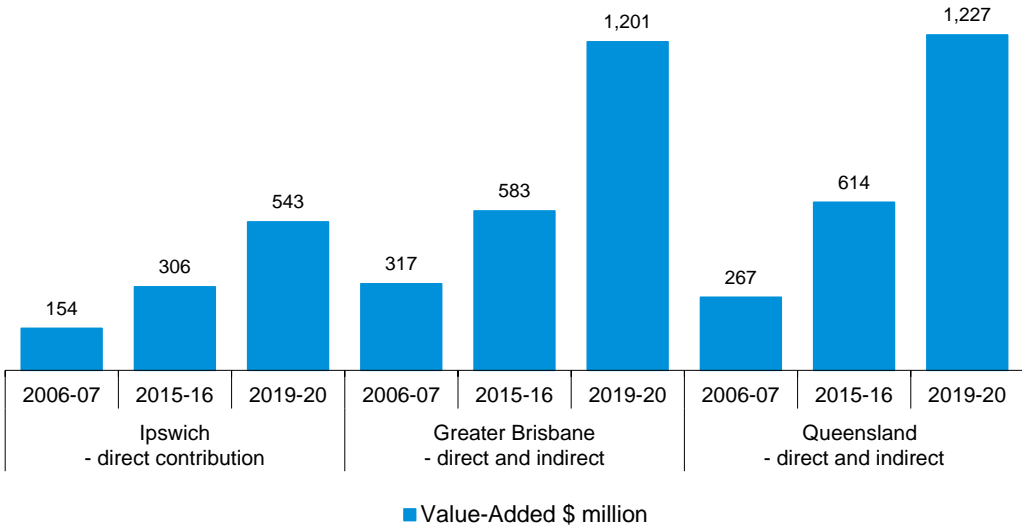
RAAF Base Amberley (referred to henceforth as “the Base”) is the largest airbase in Australia and plays an essential role in the Royal Australian Air Force operations. The Base also provides important support for Australian Army operations.

KPMG has been engaged by the Department of Defence to provide an update of the economic contribution of RAAF Base Amberley to the local and state economy. In 2008, the Department of Defence commissioned a report by SGS Consulting which examined the economic contribution of the Base at that time. As both the operations of the base and the local economy has changed, it is timely now for these estimates to be updated.

The past, current and potential future contribution of RAAF Base Amberley has been estimated in this analysis, using an economy-wide model combined with the best available data on the Base’s operations and the Queensland economy. Specifically, the past contributions are represented by 2006-07 activity, the current contributions are represented by 2015-16 activity, and the future contributions are represented by the potential activity in 2019-20. These results highlight the important and changing role that the Base plays in the economy.

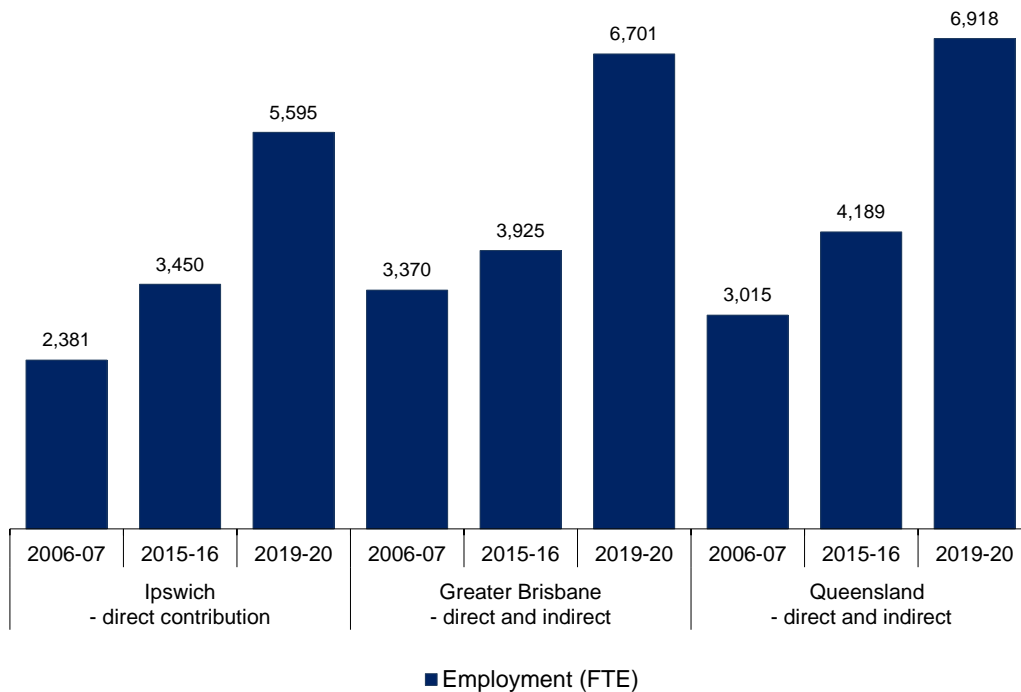
Employment by the base, demand for local goods and services, and spending by those local businesses and employees stimulate economic activity in the region.

Figure A: Contribution of RAAF Base Amberley to the Queensland and regional economies (value-added, deviation from baseline, \$million)



It is estimated that the Greater Brisbane economy is \$583 million larger (as measured by Gross Regional Product) in 2015-16 as a result of the Base’s activity, with this contribution potentially growing to \$1.2 billion by 2019-22. This is regional economic activity that would be lost without the Base’s presence and operations.

Figure B: Contribution of RAAF Base Amberley to Queensland state and regional employment (FTE jobs, deviation from baseline)



The Base also contributes to job creation across the Ipswich and broader Greater Brisbane region, and the state as a whole.

With direct full-time equivalent (FTE) employment by RAAF Base Amberley estimated at 3,450 in 2015-16¹, the Base's additional indirect contribution to employment across the Greater Brisbane region (by other sectors up and down the supply chain from the Base) is estimated at 475 FTE jobs. Thus it is estimated that the Base currently directly and indirectly contributes total FTE employment of 3,925 to the Greater Brisbane economy. By 2019-20, this direct and indirect job creation by the Base could reach over 6,700 FTE workers across the Greater Brisbane region, and almost 7,000 FTE workers in total across the state.

¹ Converted into FTE from 4,158 total ADF, APS and Reserves jobs

1. Introduction

Located 50 kilometres southwest of Brisbane, the Royal Australian Air Force Base Amberley (the Base) is an enduring Defence base and has operated since 1940. Providing operational and maintenance support for aircraft has been the main activity carried out at the Base. As the largest operational RAAF base in Australia today, the base has approximately 6,300 employees (ADF, APS, Reserves and Defence Contractors) as well as substantial space for development to accommodate further Australian Defence Force activities. The 2016 Defence White Paper / Defence Integrated Investment Program² has specifically identified significant future infrastructure investment in the Base, including investment in new and enhanced weapons and explosive ordnance facilities, and investment in new hangars, tarmac and aprons, and new facilities to support the planned introduction of additional aircraft and base personnel.

RAAF Base Amberley operates within the Ipswich City local government area. Land use in the Ipswich City Centre, which is located five kilometres to the east of the Base, includes residential, retail and commercial uses as well as community facilities and services. To the immediate south, west and east of the Base, land use is generally rural.

RAAF Base Amberley is home to Super Hornet and Growler flying operations. The main objectives of these operations are to provide preliminary conversion training to aircrew, and conduct operational practice for qualified aircrew. The operations follow standard flight paths and altitudes and generally occur on weekdays when operating within the vicinity of Amberley. The RAAF is conducting these operations at RAAF Base Amberley under the Australian Super Hornet Noise Management Plan so as to manage potential aircraft noise effects.³

Detailed analysis of the economic contribution that the Base makes to the local, regional and state economies highlights the potential opportunity cost of urban development in restricting the activities of the Base and its ability to expand.

Previous economic modelling of the Base's activities was prepared in 2008. Since then, the Base's operations have grown and the structure of the local, regional and Queensland economies has also changed. For example, the number of ADF, APS and Reserves at the base has increased from around 2,870 in 2006-07 to around 4,160 in 2015-16, and almost \$1 billion worth of infrastructure projects have been delivered by the Base in the last decade. Over the same period employment in the local economy (Ipswich City) has grown by almost 25 per cent, which is significantly faster than the 18 per cent increase in employment recorded by the Greater Brisbane region and the 16 per cent increase in employment recorded by QLD.

1.1 Scope

The purpose of this report is to assess the economic contribution that the RAAF Base Amberley makes to the Ipswich City Local Government Area (LGA), the Greater Brisbane region (Greater Capital City Statistical Area) and to Queensland.

To the extent permitted by publicly available data and data supplied by the Department of Defence this report summarises:

- the historical direct economic contribution of RAAF Base Amberley to the Ipswich City LGA, Greater Brisbane and Queensland regions; and
- the current economic profile of the Ipswich City LGA, the Greater Brisbane region and Queensland.

² 2016 Defence Integrated Investment Program (2016), <http://www.defence.gov.au/whitepaper/Docs/2016-Defence-Integrated-Investment-Program.pdf>

³ Australian Super Hornet, Noise Management Plan V2.1 (2012), <http://www.airforce.gov.au/docs/ASH-Noise-Management-Plan.pdf>.

It is beyond the scope of this assignment to undertake detailed modelling to forecast the economic prospects of the Ipswich City LGA, the Greater Brisbane region and QLD.

This analysis then uses computable general equilibrium (CGE) modelling to estimate the economic contribution (including both the direct and flow-on impacts) of the RAAF Base Amberley to the Greater Brisbane region and to Queensland. This provides estimates of:

- the extent to which businesses in the Greater Brisbane and Queensland regions are directly or indirectly dependant on activity at the Base;
- the number of military and civilian jobs that can be attributed directly and indirectly to the presence of the Base; and
- the direct and indirect contribution of the Base to economic activity in the Greater Brisbane and Queensland regions.

1.2 Economic Measures

- **Value-added by sector** is a measure that captures the return to a sector's labour and capital and other fixed factors. Value-added is therefore the sector contribution to GDP or GSP (except for indirect tax payments). By excluding goods and services inputs from other sectors and imports, 'value-added' avoids double counting as it does not include the value-added from other sectors.
- **Gross State Product (GSP)** is a measure of the total value-added of sector in the state plus indirect tax income to government. GSP is a measure of production activity in the state economy, but does not account for the destination or the nationality of those accruing income.
- **Employment** refers to the total number of people employed (full time and part time).
- **Full-time equivalent (FTE) employment** – converts total employment into a full-time basis. That is, one FTE is defined as equivalent to one employee working full-time.

1.3 Report Structure

The remainder of this report is structured as follows:

- Section 1 has outlined the scope and objectives of this report.
- Section 2 summarises RAAF Base Amberley and the economic context.
- Section 3 presents the direct and indirect impacts of RAAF Base Amberley.
- The appendices contain details of the economic modelling methodology used in the study.

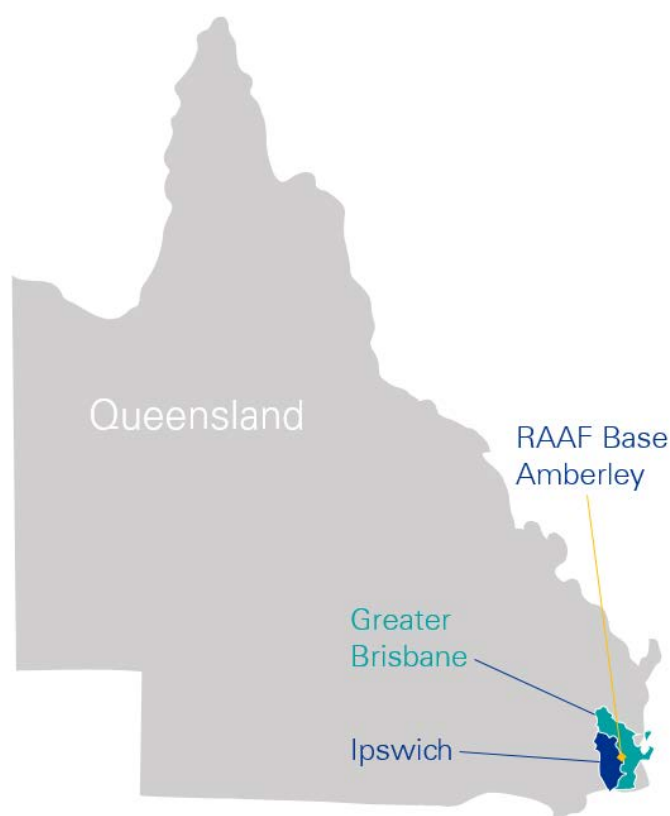
2. Economic Context

RAAF Base Amberley is located approximately 50kms west of Brisbane and 5 kms north of Ipswich City. It falls within the Ipswich statistical region, which is also a part of the Greater Brisbane statistical area (see Figure 1).

For the purposes of this report, the areas of interest have been aligned to the Australian Statistical Geographic Standard (ASGS) as:

- Local economy – The level 4 statistical area of Ipswich (SA4 region 310). Note that the boundary of this area differs from the local government area of Ipswich, but provides a better concordance with local statistics.
- Regional economy – Greater Brisbane as defined by the Greater Capital City Statistical Area (GCCSA). GCCSA's are designed to represent a functional extent of capital cities by covering an area where populations typically reside, commute to work and socialise.
- State economy – the Queensland economy as defined by state borders.

Figure 1: Ipswich and Greater Brisbane statistical regions



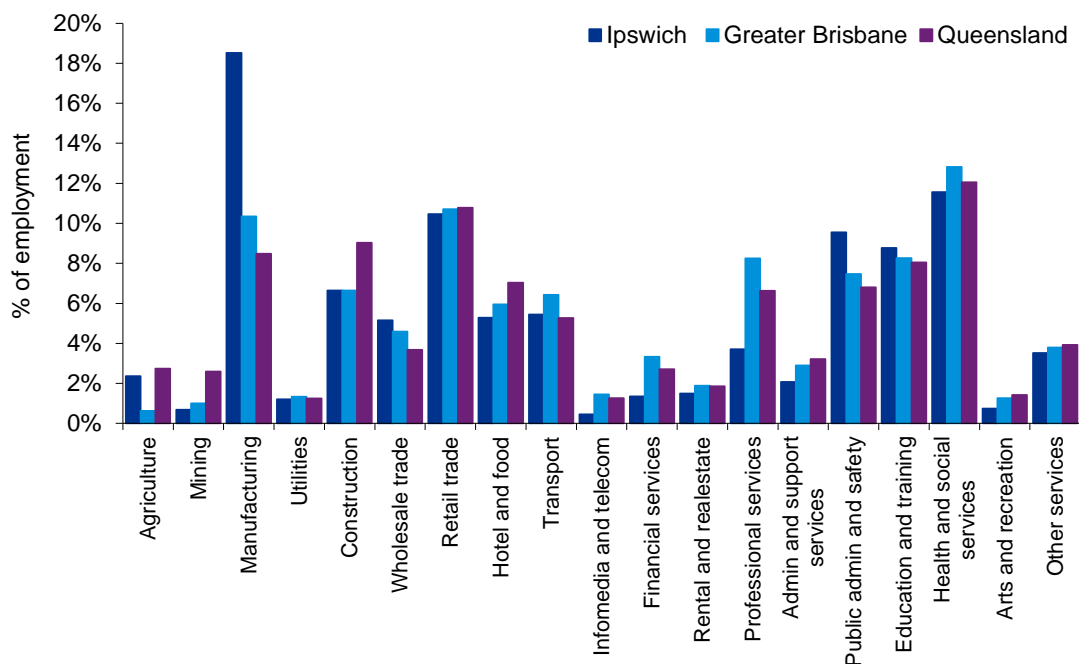
Source: ABS Catalogue No. 1270.0.55.001: Australian Statistical Geographic Standard.

Note: Ipswich is the Statistical Area level 4 region (SA4), Greater Brisbane is the Greater Capital City Statistical Area (GCCSA)

2.1 Labour force and industry structure

According to the latest census estimates (2011) employment in Ipswich was around 92,000 in 2011. This compares to around 1.1 million in the Greater Brisbane region, and almost 2 million in Queensland in the same year. Figure 2 shows the employment breakdown in Ipswich, compared to the Greater Brisbane and Queensland regions. Ipswich's economy has a higher share of employment in both *Manufacturing* and *Public Administration and Safety* (which includes defence) sectors compared to the Greater Brisbane and Queensland regions. Relative to Greater Brisbane and Queensland, employment in the *Financial Services* and *Professional Service* sectors is under-represented in Ipswich.

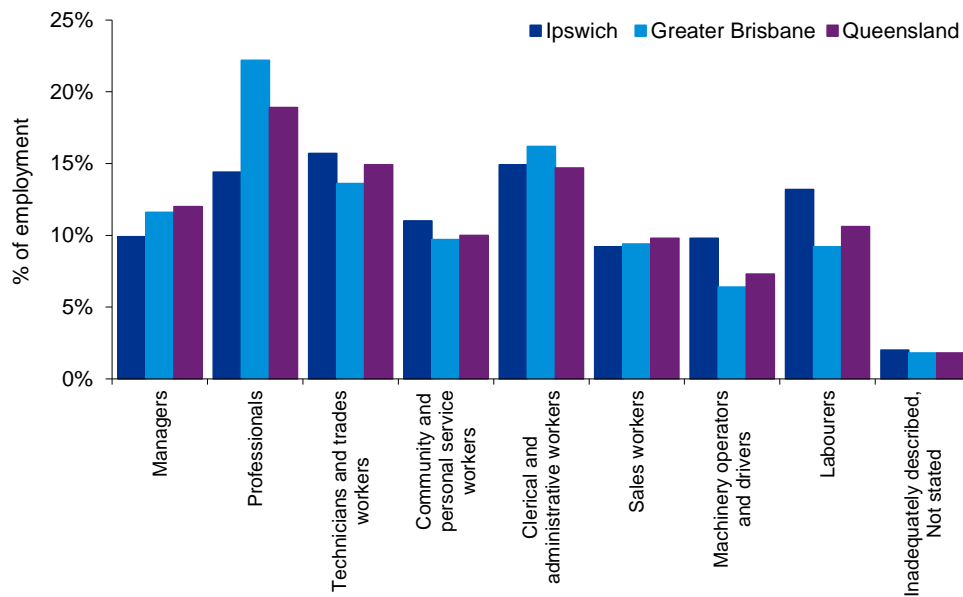
Figure 2: Employment by Industry (2011)



Source: Census 2011

These regional differences in industry structure are also reflected in the occupational profiles of the regions. At the occupation level, employment in Ipswich has a greater share of technicians and trades workers, machinery operators and drivers and labourers than the Queensland average. There are relatively fewer managers and professionals according to the 2011 census.

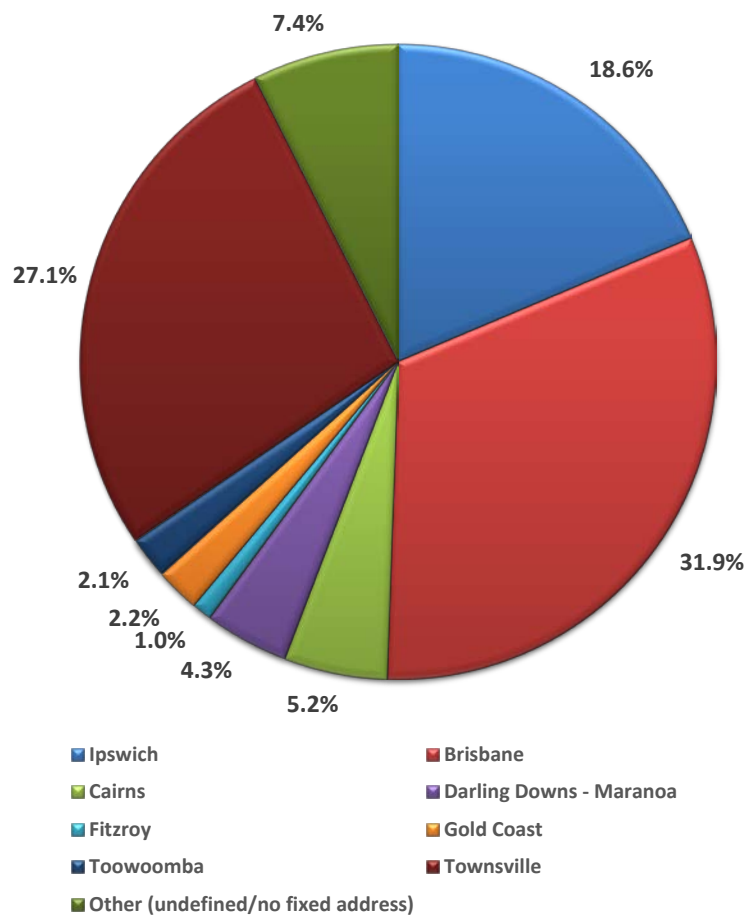
Figure 3: Employment by Occupation



Source: Census 2011

Focussing on *Defence* employment in Queensland, Figure 4 shows that the Ipswich region is the third largest region for Defence employment, accounting for almost 20 per cent of Queensland's Defence employment.

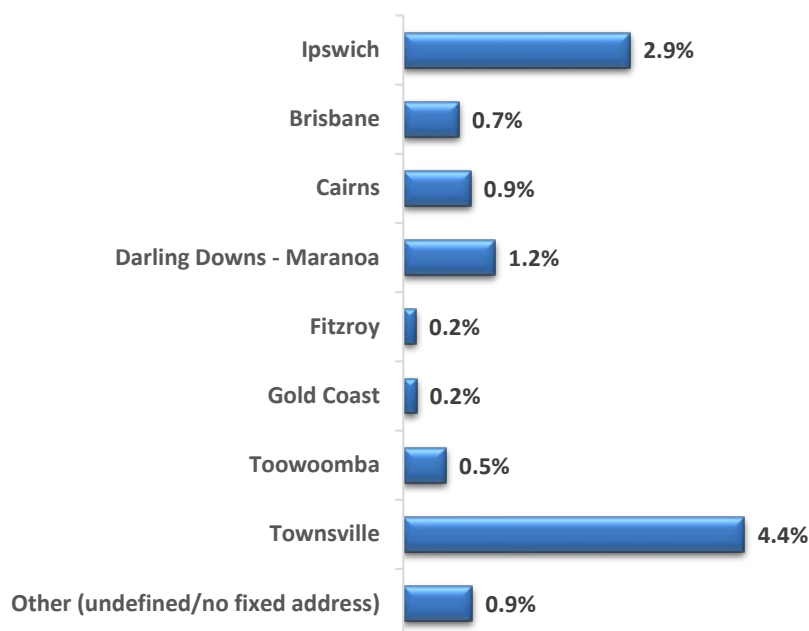
Figure 4: Regional share of QLD Defence employment (2011)



Source: Australian Bureau of Statistics, 2011 Census

One measure of the importance of the *Defence* sector to the regional economy is the share of total employment accounted for by the *Defence* sector. Figure 5 reports the *Defence* sector's share of employment in Queensland regions. The *Defence* accounts for almost 3 per cent of jobs in Ipswich, making it second only to Townsville, which has the greatest share of local employment by defence at 4.4 per cent.

Figure 5: Defence share of Regional employment (2011)



Source: Australian Bureau of Statistics, 2011 Census

2.2 Households and income

The median employment income in Ipswich is slightly higher than the Queensland average, but below the average for Greater Brisbane. Family sizes are slightly larger in Ipswich, with an average family size of 3.1, compared to 3.0 in Greater Brisbane and 2.6 across Queensland as a whole. Around 27 per cent of the Ipswich population is born overseas, which is close to the state average.

Table 1: Income, family size and migration

	Ipswich	Greater Brisbane	Queensland
Median employment income (\$)	47,971	49,578	47,567
Average family size (persons)	3.1	3	2.6
Lone person households	20%	22%	23%
Group households	3%	5%	5%
Family households	76%	73%	72%
Total households	94821	732493	1547304
Population density (persons/km2)	47.3	143.7	2.7
Population born overseas (% of population)	26.8%	29.7%	26.3%

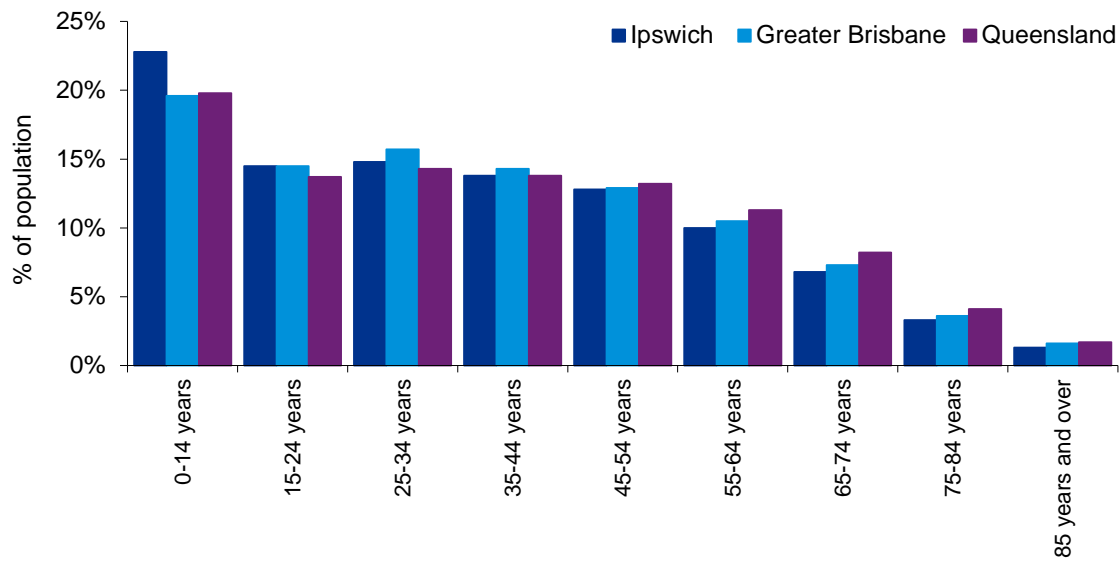
Source: Census 2011

2.3 Population

According to the ABS regional statistics, the populations of Ipswich, Greater Brisbane and Queensland were 316,254, 2,274,560, and 4,722,447 respectively in 2014. This means that Ipswich makes up almost 7 per cent of the total Queensland population.

Breaking this down by age groups, Ipswich has a particularly high proportion of persons aged 14 years and under, representing 23 per cent of the Ipswich population, compared to 20 per cent in both Greater Brisbane and Queensland.

Figure 6: Resident population by age



Source: Census 2011

3. Economic Contribution

This section contains an analysis of the economic contribution of RAAF Base Amberley to the Ipswich, Greater Brisbane and Queensland economies.

- Section 3.1 provides an overview of the methodology used to estimate the economic contribution.
- Section 3.2 reports the direct economic contribution of RAAF Base Amberley to the Ipswich economy.
- Finally, section 3.3 reports estimates of the total economic contribution of the Base, including direct and indirect contributions, to the Greater Brisbane and Queensland economies.

3.1 Overview of methodology

KPMG has used a computable general equilibrium (CGE) model to estimate the economic contribution of RAAF Base Amberley. KPMG-REG is a proprietary CGE model that divides the national economy into eight fully integrated economic regions. The industrial structure of each region is modelled in detail and links between regions are captured by inter-state flows of goods and services, factors of production and migration of people. KPMG-REG's detailed representation of the industrial structure of the Queensland economy and its interactions with the rest of the Australian economy make the model ideally suited to an analysis of the direct and flow-on economic impacts of RAAF Base Amberley. A more detailed summary of KPMG-REG is presented in Appendix A.

To model the economic contribution of RAAF Base Amberley, several scenarios were simulated:

- **Baseline** – The baseline for the CGE simulation is a representation of the Queensland economy without RAAF Base Amberley present.
- **Historical** – This scenario captures the expenditure and employment of RAAF Base Amberley in 2006-07.
- **Present** – This scenario captures the expenditure and employment of RAAF Base Amberley in 2015-16.
- **Future** – This scenario captures potential 2019-20 expenditure and employment of RAAF Base Amberley using estimates of a potential future employment and expenditure scenario (provided by Defence).

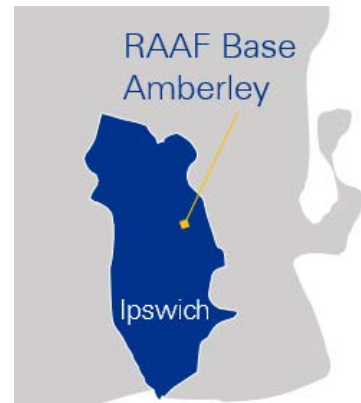
The inputs used in each scenario are detailed in the next section. The next section analyses the direct contribution of the base according to expenditure and employment in the local Ipswich economy. These direct contributions are then used as inputs in KPMG-REG to estimate the total economic impact to the Queensland economy. A top-down methodology is used to estimate the share of impacts that occurs in the Greater Brisbane region, providing an indication of RAAF Base Amberley's contribution to local and state economies.

3.2 Contribution to the Ipswich Economy

The direct contributions reported here represent the direct employment and expenditure by RAAF Base Amberley. These direct impacts occur in the Ipswich region where the base is located.

RAAF Base Amberley's direct expense items include payments to military and civilian personnel, expenditure on operations and maintenance and capital expenditure on facilities and major equipment.

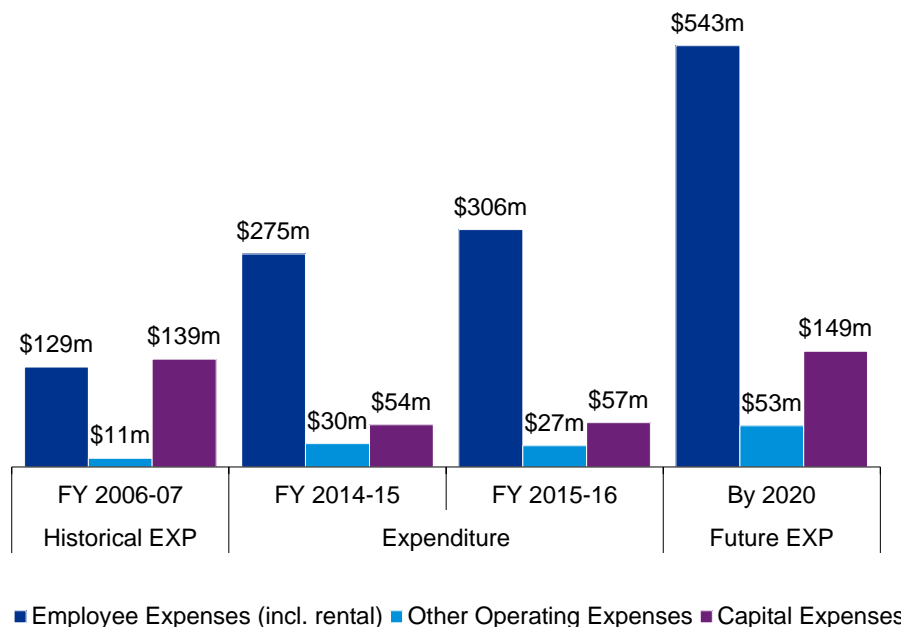
It is estimated that in FY 2006-07 nearly \$280 million was spent by the base (see Figure 7). Of this, almost \$130 million was spent on employees compensation (including rent and rental assistance), accounting for over 45 per cent of total expenditure. Capital expenditure of close to \$140 million accounted for almost 50 per cent of total expenditure in that year.



Over 2014-15 and 2015-16, employee expenses were higher than in 2006-07 due to inflation and increased personnel numbers. In contrast, the nominal amount spent on capital expenditure in 2014-15 and 2015-16 was less than half the amount spent in 2006-07. Overall, total Defence expenditure in 2014-15 and 2015-16 has been estimated at \$360 million and \$390 million, respectively.

Over the next 5 years, nominal capital expenditure at the Base is anticipated to return to 2006-07 levels (on average), while potential increases in personnel numbers may boost expenditure on employees. Overall, by 2020, total annual expenditure by the Base is estimated at almost \$745 million.

Figure 7: Direct Expenditure by the Base

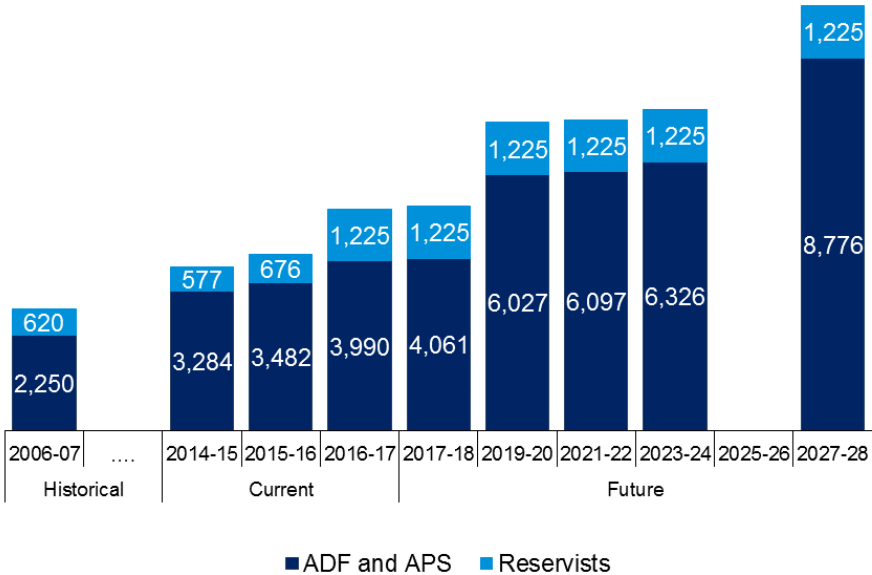


Source: 2006-07 estimates from SGS (2008); 2014-28 estimates provided by Department of Defence.

Figure 8 shows that during 2006-07, there were around 2,250 APS and ADF personnel and 620 Reserves at the base. By 2015-16, employment at the base is estimated to have increased to around 3,500 APS and ADF personnel and 577 Reserves. With potential increases in base population,

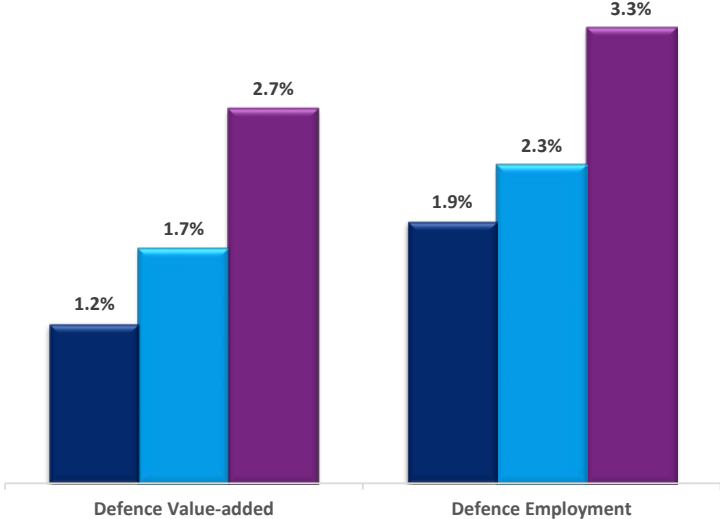
it is estimated that by 2020 there could be around 6,000 APS and ADF personnel and 1,225 Reserves at the base, and by 2028 the ADF and APS personnel numbers could reach almost 8,780.

Figure 8: Direct Employment at the Base (jobs)



Source: 2006-07 estimates from SGS (2008); 2014-28 estimates provided by Department of Defence.

Figure 9: Defence’s Direct Contribution to the Ipswich region



Sources: KPMG estimates based on data from ABS Labour Force Survey, ABS Census and Department of Defence.

Figure 9 indicates that Defence is a growing part of the Ipswich economy. During 2006-07, it is estimated that Defence directly accounted for around 1.2 per cent of Ipswich’s total value-added and 1.9 per cent of employment. It is estimated that this direct contribution has grown to reach around 1.7 per cent of Ipswich value-add and 2.3 per cent of total Ipswich employment. By 2019-20 this direct contribution by the Base could reach 2.7 per cent and 3.3 per cent of Ipswich value-add and employment, respectively.

3.3 Contribution to Greater Brisbane and Queensland

This section presents the total economic contribution of RAAF Base Amberley, taking into account both the direct and indirect impacts to the Greater Brisbane and Queensland economies. These impacts have been estimated using KPMG-REG and represent the additional economic activity and employment across the economy that is generated by RAAF Base Amberley's operations (compared to a baseline economy without the Base).

Note that, for consistency and comparison, all figures across the years are presented in 2015-16 dollars.

3.3.1 Contribution to Greater Brisbane Economy

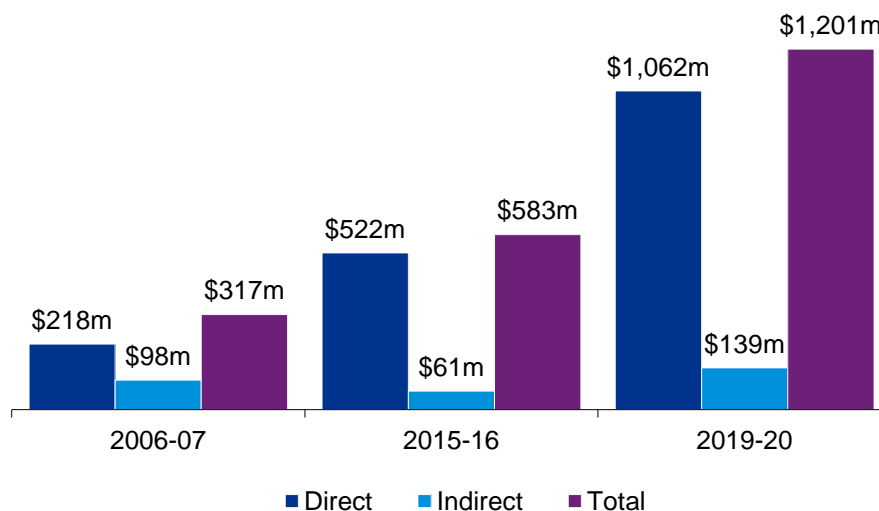
3.3.1.1 Gross Regional Product (GRP) Impacts

RAAF Base Amberley plays an important role in the Ipswich and Greater Brisbane economy. Figure 10 shows that the Base is estimated to have contributed a total of \$583 million to GRP (similar to value add)⁴ in the Greater Brisbane economy in 2015-16. The direct economic contribution of the Base is estimated to be \$522 million. The Base's indirect economic contribution, which captures flow-on impacts across industries up and down the supply chain, is estimated to be around \$61 million.



The Base's contribution to the Greater Brisbane region is expected to continue to grow, potentially reaching a total contribution of around \$1.2 billion by 2019-20, further highlighting the significant level of economic activity generated by the Base's operations.

Figure 10: Contribution of RAAF Base Amberley to the Greater Brisbane economy GRP (deviation from baseline, \$million)



Source: KPMG estimates Note: all values are presented in 2015-16 dollars

⁴ Value add is a measure of economic activity that takes the sales of an industry and subtracts the cost of inputs. The resulting number indicates the value that industries are adding to production processes in the economy. The cumulative value add of all industries in a region, plus indirect taxes, equals the gross regional product (GRP) for that area's economy.

3.3.1.2 Employment Impacts

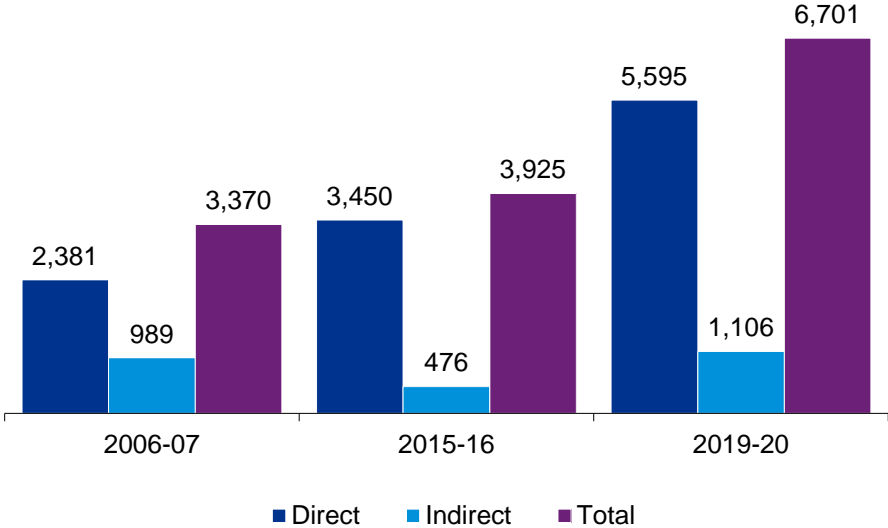
The economic activity generated by RAAF Base Amberley also increases employment in the Greater Brisbane region.

Figure 11 shows that in 2006-07 the Base is estimated to have supported around 3,370 FTE jobs in the region with 2,381 of these jobs relating to direct FTE employment by the Base.

In 2015-16, the direct and indirect FTE employment supported by the Base increased to almost 4,000 jobs. This increase was predominately due to an increase in direct employment at the Base, with almost 3,500 estimated direct FTE employees in that year. In contrast, the indirect (or flow-on) impacts were smaller in this year compared to 2006-07 as a result of reduced capital expenditure at the Base. In particular, with less infrastructure development there was less flow-on activity to the construction sector.

Anticipated growth of RAAF Base Amberley’s activities will support higher levels of employment in the Greater Brisbane region. The higher levels of activity anticipated for the Base have the potential to support around 6,700 (direct and indirect) FTE jobs by 2019-20.

Figure 11: Employment generated by RAAF Base Amberley in the Greater Brisbane region (FTE)



Source: KPMG estimates

3.3.2 Contribution to the Queensland Economy

3.3.2.1 Macroeconomic Impacts

As outlined above, RAAF Base Amberley generates a significant amount of economic activity that benefits not just the local economy, but also the Queensland economy more broadly.

Direct value add by the Base is estimated to have been around \$218 million in 2006-07, with an additional \$49 million value add generated through flow on impacts. In total, the Base is estimated to have made a total contribution to Queensland Gross State Product (GSP) of around \$267 million.

The Base's contribution to Queensland GSP is estimated to have increased to \$614 million in 2015-16, comprising \$522 million and \$92 million direct and indirect contributions, respectively.

RAAF Base Amberley is anticipated to continue playing an important role in the Queensland economy in the future, with direct contribution estimated to potentially increase to over one billion in direct value add, and \$165 million in indirect value add in 2019-20. This combines to give an estimated potential total contribution of over \$1.2 billion in Queensland GSP in 2019-20.

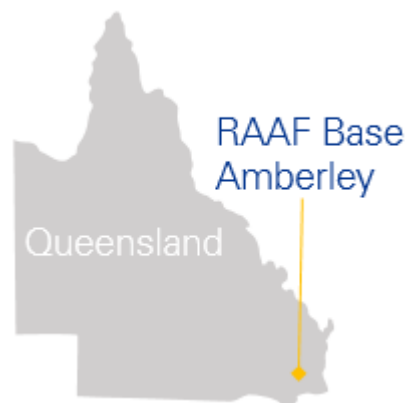
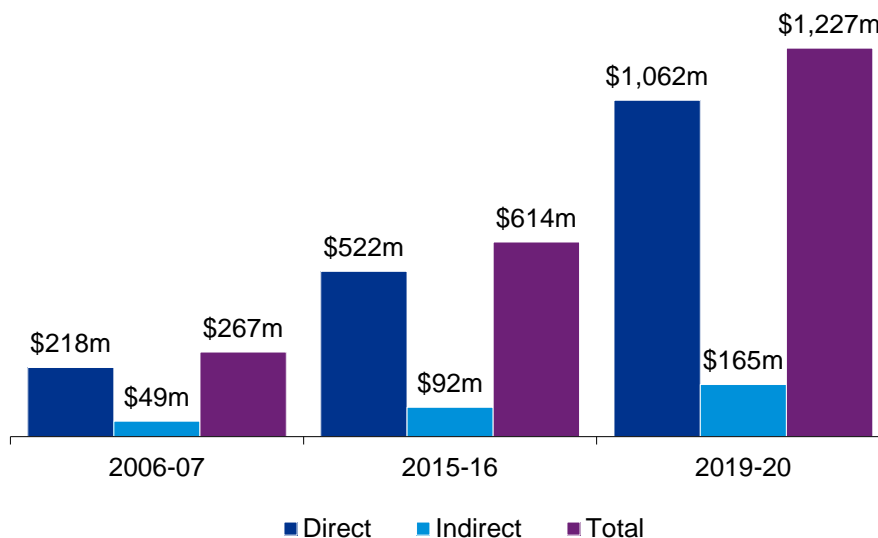


Figure 12: Contribution of RAAF Base Amberley to Queensland GSP (deviation from baseline, \$million)



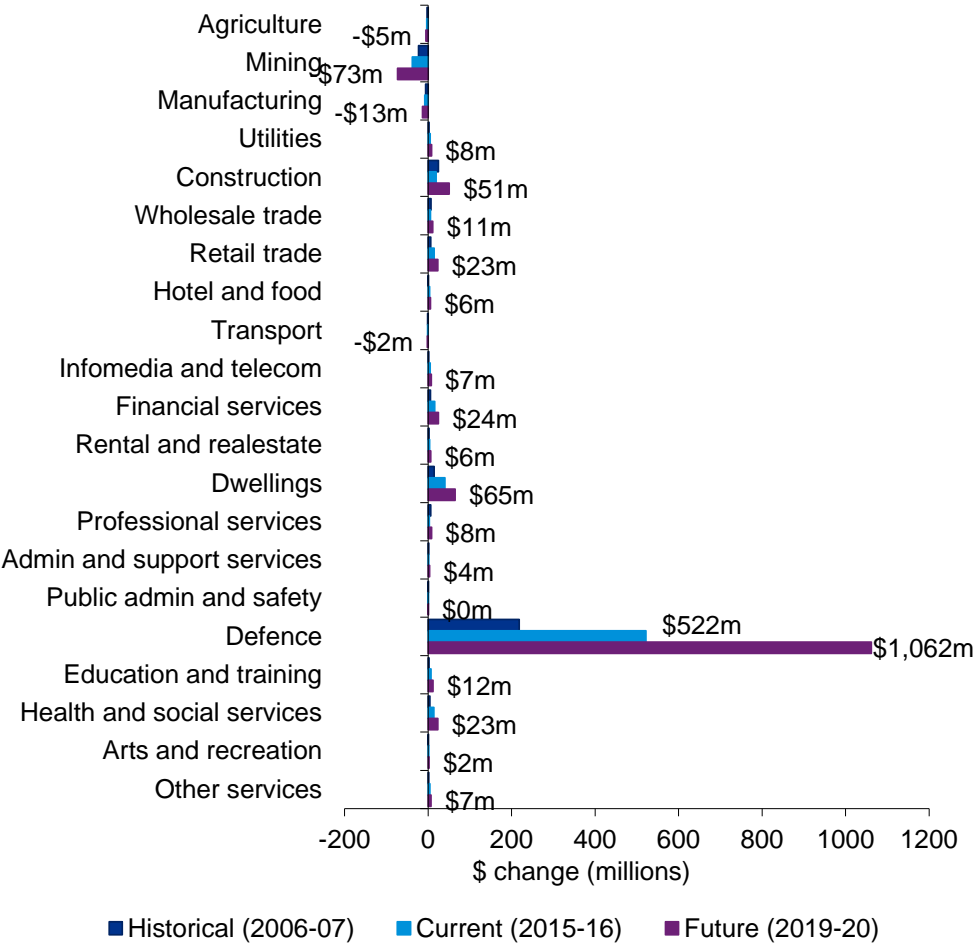
Source: KPMG estimates
Note: all values are presented in 2015-16 dollars

3.3.2.2 Industry Impacts

The Queensland macro-economy benefits from the economic activity generated by RAAF Base Amberley. However, the industrial composition of the Base’s economic impacts is not even.

The key industry impacted by RAAF Base Amberley is to Queensland’s *Defence* industry with value added in this industry estimated to have been \$522 million greater in 2015-16 and projected to potentially increase to over \$1 billion by 2019-20 (as shown as direct impacts in the previous subsection and the Defence industry impacts in the chart below). These results reflect the large direct economic contribution of the Base to the Queensland *Defence* industry.

Figure 13: Economic contribution to QLD industry



Source: KPMG estimates

The flow-on or indirect impact of the Base on the economy are reflected in the positive contributions made to QLD’s real value added by the *Construction* and *Business Services* sectors (which includes the *Financial Services*, *Rental & Real Estate*, and *Professional & Technical Services* industries) as these industries benefit from demand from the *Defence* sector for their products and services.

The *Wholesale Trade*, *Retail Trade*, *Hotel and Food* and *Telecommunications* industries also benefit from a boost in demand driven by the increase business activity and household incomes.

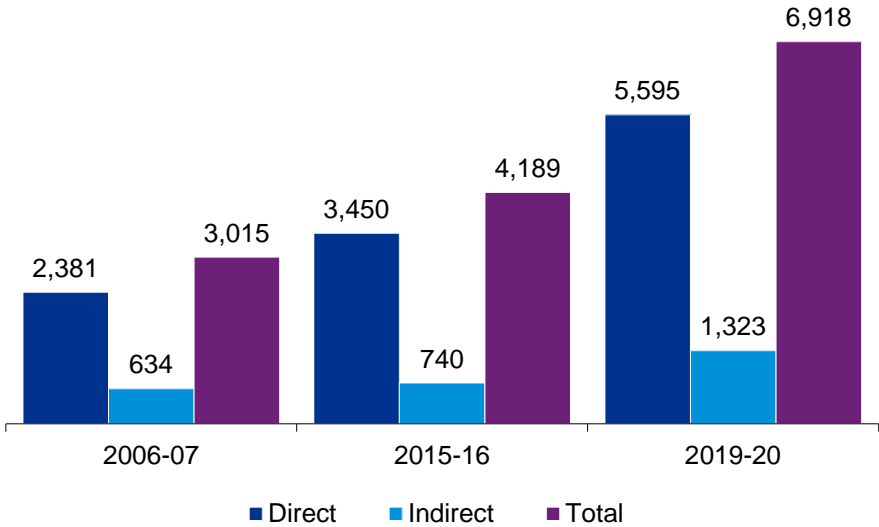
There is some displacement of activity in the trade exposed industries, including *Agriculture*, *Mining* and *Manufacturing*. The stimulus generated by the Base requires resources to shift into those parts of the economy that directly benefit. An increased real wages is the mechanism by which labour is attracted to the expanding sectors. The increase in real wages reduces the competitiveness of the trade-exposed parts of the economy and they release resources to the industries that are stimulated by the Base’s activities.

3.3.2.3 Employment Impacts

The impact of RAAF Base Amberley in QLD employment is summarised in Figure 14. The Base directly supported almost 3,500 full-time equivalent APS, ADF and Reserve jobs in the Queensland economy in 2015-16 and this will potentially rise to around 5,600 APS, ADF and Reserves FTE jobs in 2019-20.

The indirect or flow-on impacts of the Base’s activities is estimated to have supported an additional 740 FTE jobs in the QLD economy in 2015-16. In total, the Base is estimated to have supported almost 4,200 FTE jobs in QLD in 2015-16. With anticipated growth in the Base activities over the coming years, the Base could potentially support (directly and indirectly) a total of nearly 7,000 FTE jobs in Queensland by 2019-20.

Figure 14: Employment generated by RAAF Base Amberley in QLD (FTE)



Source: KPMG estimates

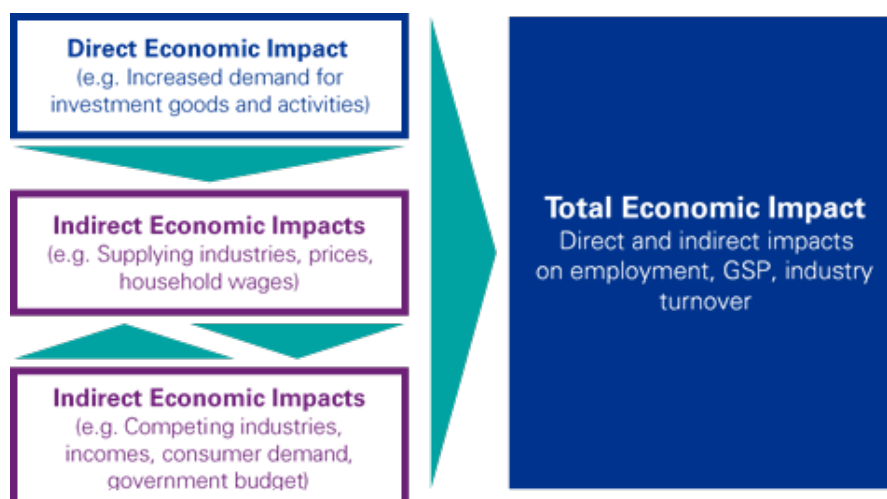
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Appendix A: KPMG's Regional Model

KPMG has utilised the KPMG-REG model to capture the economic contribution of RAAF Base Amberley to the Queensland economy. KPMG-REG is a computable general equilibrium (CGE) model that represents the Australian economy and the state and territory economies. It has been created by KPMG to provide detailed insights into economic impacts at a state and territory level, by dividing the national economy into eight fully integrated economic regions. Inter-state flows of goods and services, factors of production and population have been specified, allowing a state-specific analysis of the Queensland economy.

The diagram below presents a conceptual idea of how the CGE model capture both direct and indirect impacts in the economy.



Model theory

KPMG-REG models the economy as a system of interrelated economic agents operating in competitive markets. Economic theory is used to specify the behaviour and market interactions of economic agents, including consumers, investors, producers and governments operating in domestic and foreign goods, capital and labour markets. Defining features of the theoretical structure of KPMG-REG include:

- Optimising behaviour by households and businesses in the context of competitive markets with explicit resource constraints and budget constraints;
- The price mechanism operates to clear markets for goods and factors such as labour and capital (i.e. prices adjust so that supply equals demand); and
- At the margin, costs are equal to revenues in all economic activities.

Model data

The key data input used by KPMG-REG is an input-output table that quantifies the flows of goods and services between producers and various users (e.g., intermediate inputs to other producers, inputs to capital creators, households, governments and foreigners) and the flows associated with primary factor inputs (i.e., labour, capital, land and natural resources). In KPMG-REG the input-output database is combined with the model's theoretical structure to quantify sophisticated economic behavioural responses, including to:

- Price and wage adjustments driven by resource constraints;
- Price and tax and/or government spending adjustments driven by budget constraints;
- Allow for input substitution possibilities in production (e.g., allowing the combination of labour, capital, and other inputs required to produce a particular output to vary in response to relative price changes);
- Capture a wide set of economic impacts driven by the responses of consumers, investors, foreigners and other agents to changes in prices, taxes, technical change and taste changes; and
- Detailed modelling of state and federal government fiscal accounts and balance sheets, including the accumulation of public assets and liabilities.

Regional Impacts

Regional results have been reported in this report using a top-down methodology from the state level output provided by the KPMG-REG model. State level impacts have been divided by sub-state regions according to the amount of employment across sectors for the production side of the economy, and divided by population across regions to estimate the demand side of the economy. Also factored into the sub-state aggregation is the split between tradeable and localised industries in each region.

This methodology has assumed that growth by each sector in the economy in the baseline matches the anticipated growth rates reported by Queensland Treasury employment projections (Queensland Treasury, 2016).

Why use a CGE model?

The theory described above is necessary to quantify impacts across the entire economy. Models without general equilibrium linkages can miss feedback effects that occur from economic agents. Moreover, input-output multipliers over-estimate impacts by ignoring relevant economic constraints such as prices and limited quantities of inputs.



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