# GW3 ROAD CLOSURE ECONOMIC ANALYSIS

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### EXECUTIVE SUMMARY

Regular road closures in the Greater Whitsunday region are identified to disrupt business and industry as well as household activities.

The disutility to households form road closure events is identified to amount to approximately \$499.1 million over 10 years in present value terms.<sup>1</sup>

The direct and flow on losses to the economy over a ten year period from road closures in present value terms is estimated to be \$2.16 billion in terms of output, \$1.40 billion in terms of gross regional product and \$126.1 million in terms of regional income.

#### BACKGROUND

The Greater Whitsunday region is known for its vibrant economy, diverse industries, and critical transportation networks that support both local and national needs. Comprising the Local Government Areas of Mackay, Isaac, and Whitsunday, the Greater Whitsunday region hosts a myriad of businesses ranging from agriculture to mining, tourism to manufacturing, and everything in between. However, the area is no stranger to heavy rainfall, leading to frequent and disruptive road closures. These closures halt people and freight movement and often result in airport closures, bringing many aspects of daily life and business activities to a standstill.

The direct impacts of these road closures are immediate and far-reaching. They include disruptions to operations, supply chain breakdowns, financial strain, accessibility issues, and more. Many sectors, such as tourism, mining retail, sugarcane production, face immediate challenges, crippling normal operations and resulting in immediate revenue losses. Yet, the consequences do not end when the roads reopen. Lagging impacts permeate through the socio-economic fabric, leading to long-term financial strains, strategic reconsiderations, and lasting damage to reputations and trust within the community.

Understanding the value of these impacts is vital for mitigation strategies and shaping future policies and investments in infrastructure and disaster response.

#### PURPOSE

This report aims to provide an in-depth analysis of these direct and lagging impacts, mapping the unique challenges faced by various sectors within the Greater Whitsunday region. By uncovering the breadth and depth of the economic effects, this study will shed light on the complexities and interdependencies that exist within the regions intricate economic ecosystem. The findings will be instrumental in driving more effective planning, decision-making, resilience building and funding for infrastructure upgrades, so the continued prosperity and well-being of the Greater Whitsunday region can continue and begin to operate on a new and higher plain.

#### **KEY FINDINGS**

#### Key Challenges of Road Closures

The Queensland Government, in the Mackay Isaac Whitsunday Regional Transport Plan, identifies that a larger portion of the Greater Whitsunday region relies heavily on the road network for connectivity and that this has a direct impact on regional liveability.

"The region is characterised by geographically disparate communities, particularly between employment and home locations. Road infrastructure connecting the communities in the region is, in some instances, at a lesser standard than the roads within the region's urban areas. Further, the requirement to drive long distances for some, such as drive-in-drive-out mining jobs, increases the risk of driver fatigue. This results

<sup>&</sup>lt;sup>1</sup> The road closures cause disruptions to the everyday happenings of residents located within the Greater Whitsunday region and this creates inconvenience and frustration for residents. This negative impact has been valued as a disutility to households.



in a high proportion of road users being exposed to comparatively more hazardous transport environments. In particular, the region is susceptible to a higher rate of crash fatalities in outer regional areas, compared to the rest of Queensland"

Queensland Government (2018, p. 30)

Road incidents including fatalities, minor injuries and major injuries can all result in road closure events in the region. The key drivers of the Greater Whitsunday region are mining, tourism and agriculture, all industries that rely heavily on connectivity through the road network.

In addition to road incidents and accident related closures, which are not economically quantified in this report, there are typically between three and five closure events per year across various areas of the region, which last for an average of two days – presenting an average annual road closure of eight days across four closure events. Businesses, industry and households are impacted in different ways, typically through:

- Lost production due to workers being unable to access their site of employment
- Lost sales revenue through buyers and markets being unable to connect
- Lost revenue through price and quality effects post harvest if perishable goods are delayed and begin to deteriorate
- Lost revenue through price and quality effects pre harvest if delivery windows are not hit
- Lost tourism activity and revenue to the region due to road closure
- Under realised tourism potential due to negative media and market expectations capping visitation to the region.

#### Impacts of Road Closures

#### Economic Impacts

Road closure events in the Greater Whitsunday region deleteriously impact the local residents, business and industry community. Key observed impacts expected to result from road closure events in the Greater Whitsunday region include<sup>2</sup>:

- A reduced utility to households of \$66.4 million annually (\$499.1 million over 10 years in present value terms)
- An estimated \$286.8 million in lost output (direct and flow on) annually on average and over ten years \$2.16 billion in present value terms
- An estimated \$186.4 million in lost GRP (direct and flow on) annually on average and \$1.40 billion in preset value terms over 10 years
- An estimated \$16.8 million in lost incomes (direct and flow on) annually on average and \$126.1 million in preset value terms over 10 years
- 215 FTE job years annually.

<sup>&</sup>lt;sup>2</sup> This is assuming flow-on activity is 75% of the modelled activity associated with the direct.



#### **Qualitative Impacts**

There were a number of impacts resulting from road closure that were not able to be quantified, that if quantified would significantly increase the values listed above – so the above figures should be taken as a conservative lower end estimate of the impact of road closure events in the Greater Whitsunday region. These impacts include:

- Retail impacts:
  - Erosion of customer trust & loyalty technological innovation has seen many businesses shift to online sales. The recurring road closures pose a substantial hurdle to shipping and the timely delivery of products to customers. Repeated delivery delays can erode the trust customers have in businesses, leading to diminished loyalty.
  - Escalation in shipping costs In the face of road closures, businesses frequently shift from standard delivery to airfreight shipping methods to ensure prompt delivery. Unfortunately, relying on airfreight significantly inflates shipping costs compared to traditional road transport and these costs are passed onto customers.
- Community impacts:
  - Family separation and distress Road closures introduce significant challenges, potentially causing separations between parents and their children and/ or grandparents. Such separations can be distressing and take on emotional toll on all parties involved.
  - Comprised rural liveability Rural communities in the Greater Whitsunday region, notably areas within Isaac, rely heavily on larger centres like Mackay for their primary service needs. The recurrent road closures of the main road network between key points like Mackay and Isaac critically undermine this reliance, making it challenging for residents to access essential services. This restricts the community's access to essential and emergency services, compromising the appeal of rural living.
- Event impacts:
  - Disruption of events Community events like festivals, parades, and local fairs are a significant part of creating and supporting local cohesion and a sense of belonging. Stakeholder engagement highlights that road closures within the Greater Whitsunday region can lead to the postponement of outright cancellation of these events. The disruption or inaccessibility of these events can weaken the sense of community. Residents might feel disconnected or miss out on shared experiences.
- Agricultural impact:
  - Disruptions in timely deliveries The agricultural industry's success hinges on prompt deliveries to markets, a crucial aspect especially for perishable goods. Road closures introduce challenges and cause delays in transporting produce to their intended destinations. These delays can result in a multiple of problems, with perishability being a prominent concern resulting in either a complete or partial loss of value.
- Tourism impacts:
  - Legacy impacts from road closures The frequent road closures accompanied by consequent negative media coverage cast an ever present shadow over the prime tourism hotspot region. Such adverse publicity highlights inconvenience, unpredictability, and safety concerns of organising travel in the region (and thereby inherently promotes other regions above the Greater Whitsunday region). This perception can deter potential tourists from choosing the Greater Whitsunday region as their destination. Given that tourism is a cornerstone of economic vitality, especially for areas like the Whitsunday region, sustained negative press can inflict lasting harm, undermining the region's tourism potential and economic health.



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### 1. INTRODUCTION

#### 1.1 BACKGROUND

The Greater Whitsunday region is known for its vibrant economy, diverse industries, and critical transportation networks that support both local and national needs. Comprising the Local Government Areas of Mackay, Isaac, and Whitsunday, the Greater Whitsunday region hosts a myriad of businesses ranging from agriculture to mining, tourism to manufacturing, and everything in between. However, the area is no stranger to heavy rainfall, leading to frequent and disruptive road closures. These closures halt people and freight movement and often result in airport closures, bringing many aspects of daily life and business activities to a standstill.

The direct impacts of these road closures are immediate and far-reaching. They include disruptions to operations, supply chain breakdowns, financial strain, accessibility issues, and more. Many sectors, such as tourism, mining, retail, sugarcane, face immediate challenges, crippling normal operations and resulting in immediate revenue losses. Yet, the consequences do not end when the roads reopen. Lagging impacts permeate through the socio-economic fabric, leading to long-term financial strains, strategic reconsiderations, and lasting damage to reputations and trust within the community.

Understanding the value of these impacts is vital for mitigation strategies and shaping future policies and investments in infrastructure and disaster response.

#### 1.2 PURPOSE OF THIS REPORT

The aim of this report is to provide an in-depth analysis of these direct and lagging impacts, mapping the unique challenges faced by various sectors within the Greater Whitsunday region. By uncovering the breadth and depth of the economic effects, this study will shed light on the complexities and interdependencies that exist within the regions intricate economic ecosystem. The findings will be instrumental in driving more effective planning, decision-making, resilience building and funding for infrastructure upgrades, so the continued prosperity and well-being of the Greater Whitsunday region can continue and begin to operate on a new and higher plain.

### 1.3 STRUCTURE OF THE REPORT

The remainder of the report has been structured as follows:

- **Chapter 2:** Provides a regional overview of the Greater Whitsunday region. This chapter includes an overview of the current economy (Gross Regional Product, employment, population), with consideration provided to key industry in the region.
- Chapter 3: Provides an overview of the road network within the Greater Whitsunday region including an overview of road closures per annum.
- **Chapter 4:** This chapter provides a qualitative of observed direct and lagging impacts to key industries and considers how the nature of the impact changes by the length of the closure.
- Chapter 5: This chapter describes the modelling assumptions for those industries where quantification of impacts was possible.
- Chapter 6: Presents the economic modelling (Input-Output) results, highlighting the impact of road closures on key industries within the Greater Whitsunday region, along with an overview of the qualitative impacts of road closures.

#### 1.4 STRATEGIC ALIGNMENT

There are five Government entities involved in transport infrastructure in the Greater Whitsunday region. Amongst all governments, there is a strong emphasis on the importance of addressing transport infrastructure both amongst specific transport infrastructure plans and greater economic development plans. Some of the common focuses across all levels of government are improving resilience and sustainability, as transport infrastructure has strong alignment with socio-economic development and growth.



A breakdown of all documents reviewed are identified in Appendix A, and includes:

- Integrated Transport Strategy (Mackay Regional Council, 2021)
- Regional Economic Development Strategy (Whitsunday Regional Council, 2022)
- Whitsunday Regional Council Corporate Plan 2021-2026 (Whitsunday Regional Council, 2021)
- Community Strategic Plan (Isaac Regional Council, 2015)
- Annual Operational Plan 2022-2023 (Isaac Regional Council, 2022)
- Queensland Transport Strategy (Queensland Government, 2020)
- Mackay Isaac Whitsunday Regional Transport Plan (Queensland Government, 2018)
- Northern Australia White Paper (Australian Government, 2015)
- Corporate Plan 2022-23 (Australian Government, 2022)
- Australian Infrastructure Plan (Australian Government, 2021).



### 2. GREATER WHITSUNDAY REGIONAL OVERVIEW

The Greater Whitsunday region is an economically diverse and vibrant area in Queensland. The region is home to significant natural resources, a bustling tourism industry, and strong agricultural, mining and manufacturing sectors. With its strategic location along the coast, it serves as a hub for both domestic and international commerce.

Demographically, the region has a growing and diverse population with a mix of urban centers and rural communities. The region, as a service centre supports education, healthcare, and community services as well as a range of local business and industry activities.

Tourism in the Greater Whitsunday region is a significant contributor to the economy. The region has one of Australia's most diverse natural landscapes and a numerous of recreational opportunities as well as industry (mining) tourism that cater to a wide range of visitors.

This chapter provides a regional overview of the Mackay, Isaac, and Whitsunday Local Government Areas for context.

#### 2.1 OVERVIEW

The following sections group and characterise the regions industries by Primary, Secondary, Tertiary, and Quaternary sectors, and provides a high-level structural view of the Greater Whitsunday regional economy, highlighting the breadth and diversity of the region's economy. It highlights the interdependencies and the complex nature of the region's economic system.

The table below provides an overview of the key sectors within the Greater Whitsunday region in terms of value, employment and wages and salaries paid:

- **Primary sectors**: Account for:
  - o 22,520 jobs
  - o \$29,202 million in GRP
  - o \$4,658 million in wages and salaries.
- Secondary sectors: Account for:
  - o 14,519 jobs
  - \$2,386 million in GRP
  - \$1,555 million in wages and salaries.
- Tertiary sectors: Account for:
  - o 25,889 jobs
  - \$3,174 million in GRP
  - \$2,161 million in wages and salaries.
- Quaternary sectors: Account for:
  - o 34,508 jobs
  - \$3,671 million in GRP
  - \$3,064 million in wages and salaries.



#### Table 2.1. Key Industries & Value

1 Digit Industry	CVM GVA 2021-22 (\$M)	Employment (PoW)	Wages & Salaries (\$M)	% Change in GVA
Primary Sectors	\$29,202.2	22,520	\$4,658.1	0.7%
Agriculture, forestry and fishing	\$1,495.6	4,266	\$1,114.5	28.3%
Mining	\$27,706.6	18,255	\$3,543.6	-0.5%
Secondary Sectors	\$2,386.5	14,519	\$1,555.4	9.6%
Manufacturing	\$801.2	4,820	\$539.8	1.0%
Electricity, gas, water and waste services	\$337.9	1,098	\$103.9	24.7%
Construction	\$1,247.4	8,600	\$911.7	12.0%
Tertiary Sectors	\$3,174.2	25,889	\$2,160.5	9.1%
Wholesale trade	\$640.8	2,482	\$441.9	35.9%
Retail trade	\$593.4	7,604	\$463.4	3.1%
Rental, hiring and real estate services	\$374.0	1,540	\$280.7	35.8%
Accommodation and food services	\$381.0	7,360	\$306.6	-10.2%
Transport, postal and warehousing	\$1,076.9	5,922	\$600.8	1.1%
Information media and telecommunications	\$53.5	238	\$25.1	-4.9%
Arts and recreation services	\$54.5	743	\$42.0	30.1%
Quaternary Sectors	\$3,671.1	34,508	\$3,064.1	12.4%
Financial and insurance services	\$319.7	774	\$99.5	-34.9%
Professional, scientific and technical services	\$520.5	3,469	\$452.2	9.4%
Administrative and support services	\$594.6	4,206	\$532.0	42.4%
Public administration and safety	\$473.0	3,876	\$395.6	27.5%
Education and training	\$521.7	7,194	\$464.1	2.5%
Health care and social assistance	\$899.0	10,125	\$829.3	23.6%
Other services	\$342.6	4,863	\$291.4	24.8%
Total	\$38,434.0	97,436	\$11,438.2	2.9%
Notes:				

CVM – Chain Volume Measure.

• GVA – Gross Value Add.

• PoW – Place of Work. Source: AEC (unpublished a & b).

The total GVA for the Greater Whitsunday region in 2021-22 was \$39,452 million including the value of ownership of dwellings and \$34,434 million excluding the value of ownership of dwellings (as highlighted in the table above).

In 2021-22, the tourism industry within the Greater Whitsunday region totalled \$1,012.4 million (including direct and indirect GVA) (see Table 2.2). The tourism industry represented 2.6% of the total GVA in the Greater Whitsunday

Figure 2.1 below provides an overview of the GVA for the Greater Whitsunday region over time.

#### Table 2.2. Tourism Industry GVA (\$M), 2021-22

region when considering the value of ownership of dwellings.

Industries	\$M
Accommodation	\$100.1
Ownership of dwellings	\$11.0
Cafes, restaurants and takeaway food services	\$68.7
Clubs, pubs, taverns & bars	\$44.0
Rail transport	\$9.0
Taxi transport	\$5.7
Other road transport	\$5.8
Air, water and other transport	\$76.9
Motor vehicle hiring	\$21.5
Travel agency and tour operator services	\$97.2
Cultural services	\$11.2



Industries	\$M
Casinos and other gambling services	\$4.9
Other sports and recreation services	\$10.9
Automotive fuel retailing	\$6.8
Other retail trade	\$76.2
Education and training	\$10.3
All other industries	\$22.2
Direct tourism GVA	\$582.4
Indirect Tourism GVA	\$430.1
Total GVA	\$1,012.4

Source: TRA (2022).

Tourism accounts for 5,428 full-time direct jobs within the Greater Whitsunday region and an additional 3,734 parttime direct jobs (TRA, 2022). The tourism industry also accounts for an additional 3,299 indirect jobs (TRA, 2022). These 12,461 jobs represent 12.8% of total employment by PoW for the Greater Whitsunday region – highlighting the importance of the tourism sector for the region.

#### 2.1.1 Gross Regional Product

Within the Greater Whitsunday region, the total Gross Regional Product (GRP) was estimated to reach \$42.1 billion in 2021-22. The figure below provides an overview of the current prices and the large spike in 2021-22 is driven by the mining industry and changes in commodity values. There has been a large increase in commodity prices, which has driven a significant increase in GRP (current prices) in the Greater Whitsunday region.



Figure 2.1. Gross Regional Product (\$M), Current Prices (Greater Whitsunday Region)

Source: AEC (unpublished a).

The average annual growth in chain volume measure GRP represents how the economy has grown in terms of overall activity, excluding price growth. The below figure indicates the changes in quantity between time periods, keeping the prices of goods and services constant. In chain volume measures, GRP has increased year on year from 2014-15 to 2018-19 rising from \$26.6 billion to \$50.1 billion. From 2018-19 total GRP softened, and this was largely driven by the decline in the mining industry, indicating activity has declined but value has increased. This activity could be a result of a number of impacts in the global market including China's informal import restrictions on Australian coal. exports to China ceased in October 2020 due to trade embargoes placed by the Chinese Government, with all restrictions being removed in early 2023 (Mining Technology, 2023).





#### Figure 2.2. Gross Regional Product (\$M), Chain Volume Measure

Source: AEC (unpublished a).

Mining was the largest industry in the Greater Whitsunday region, contributing \$27.7 billion to industry value add (IVA) in 2021-22. Agriculture, forestry and fishing was the second largest industry by IVA, contributing \$1.5 billion.

In terms of growth over the last 10 years, mining has experienced the largest increase, rising by \$1.5 billion. Agriculture, forestry and fishing was the second largest growth industry, increasing by \$403.4 million over the 10-year period, in Chain Volume terms. Construction on the other hand has experienced the largest decline, reducing by \$767.2 million.

Industry	2011-12	2021-22	Change 2011-12 to 2021-22 (No.)	Change 2011-12 to 2021-22 (%)
Primary Sectors	\$13,590.9	\$29,202.2	\$15,611.3	114.9%
Agriculture, forestry and fishing	\$1,092.2	\$1,495.6	\$403.4	36.9%
Mining	\$12,498.7	\$27,706.6	\$15,207.9	121.7%
Secondary Sectors	\$3,270.3	\$2,386.5	-\$883.8	-27.0%
Manufacturing	\$1,013.4	\$801.2	-\$212.2	-20.9%
Electricity, gas, water and waste services	\$278.8	\$337.9	\$95.6	39.5%
Construction	\$2,014.7	\$1,247.4	-\$767.2	-38.1%
Tertiary Sectors	\$2,936.2	\$3,174.2	\$237.9	8.1%
Wholesale trade	\$452.9	\$640.8	\$187.9	41.5%
Retail trade	\$607.9	\$593.4	-\$14.5	-2.4%
Rental, hiring and real estate services	\$320.5	\$374.0	\$53.5	16.7%
Accommodation and food services	\$452.6	\$381.0	-\$71.6	-15.8%
Transport, postal and warehousing	\$991.6	\$1,076.9	\$85.3	8.6%
Information media and telecommunications	\$64.6	\$53.5	-\$11.0	-17.1%
Arts and recreation services	\$46.2	\$54.5	\$8.3	18.0%

Table 2.3. Industry	v Value Add	(IVA) by	/ Industrv.	Chain	Volume	Measure	(\$M)
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Industry	2011-12	2021-22	Change 2011-12 to 2021-22 (No.)	Change 2011-12 to 2021-22 (%)
Quaternary Sectors	\$2,999.1	\$3,671.1	\$672.0	22.4%
Financial and insurance services	\$295.3	\$319.7	\$24.5	8.3%
Professional, scientific and technical services	\$485.5	\$520.5	\$35.0	7.2%
Administrative and support services	\$418.3	\$594.6	\$176.3	42.2%
Public administration and safety	\$431.8	\$473.1	\$41.2	9.5%
Education and training	\$504.6	\$521.7	\$17.1	3.4%
Health care and social assistance	\$534.4	\$899.0	\$364.6	68.2%
Other services	\$329.2	\$342.6	\$13.4	4.1%
Total	\$22,796.5	\$38,434.0	\$15,637.5	68.6%

Note: Industry value add excludes ownership of dwellings. Source: AEC (unpublished a).

#### 2.1.2 Employment

Over the past 10 years, employment by Place of Work (PoW) has increased from 91,928 persons in 2011-12 to 97,436 persons in 2021-22. This equates to a total increase of 5,507 employed persons within the Greater Whitsunday region, or an average annual growth rate of 0.6%.



Figure 2.3. Total Employment by Place of Work (PoW) (Greater Whitsunday Region), 2011-12 to 2021-22

Source: AEC (unpublished b).

Within the Greater Whitsunday region, the largest industry by employment (PoW) in 2021-22 was the mining industry. The mining industry accounted for 18.7% of total employment or 18,255 persons. The second largest industry by employment was health care and social assistance at 10,125 persons followed by construction at 8,600 persons.

Over the past 10 years, both mining and health care and social assistance services experienced significant growth, increasing by 3,649 and 3,424 persons respectively.



#### Figure 2.4. Employment by Industry (PoW) (Greater Whitsunday Region), 2011-12 & 2021-22



Source: AEC (unpublished b).

#### 2.1.3 Incomes

The average personal income in the Greater Whitsunday region was \$1,509 per week in 2021. The largest income by industry was mining at \$2,428 per week, followed by electricity, gas, water and waste services at \$1,718 per week.

Industry	\$
Primary Sectors	\$2,168
Agriculture, forestry and fishing	\$1,114
Mining	\$2,428
Secondary Sectors	\$1,558
Manufacturing	\$1,500
Electricity, gas, water and waste services	\$1,718
Construction	\$1,573
Tertiary Sectors	\$1,114
Wholesale trade	\$1,694
Retail trade	\$787
Rental, hiring and real estate services	\$1,432
Accommodation and food services	\$792
Transport, postal and warehousing	\$1,680
Information media and telecommunications	\$1,124
Arts and recreation services	\$806
Quaternary Sectors	\$1,346
Financial and insurance services	\$1,501
Professional, scientific and technical services	\$1,511
Administrative and support services	\$1,373
Public administration and safety	\$1,498
Education and training	\$1,288

#### Table 2.4. Weekly Personal Income by Industry, Greater Whitsunday Region (2021\$)



Industry	\$
Health care and social assistance	\$1,306
Other services	\$1,217
Total	\$1,509

Source: ABS (2022).

#### 2.2 SECTOR OVERVIEW

#### 2.2.1 Primary Production Sectors

The primary sector encompasses activities that directly utilise natural resources such as agriculture, fishing, and mining. These core economic drivers are vital to the Greater Whitsunday region, providing a foundation for further economic activities. The sectors account for 22,520 jobs, \$29,202 million in GVA, and \$4,658 million in wages and salaries.

- Agriculture, Forestry, and Fishing: This sector includes the key industries of cattle grazing, sugarcane farming and production, and aquaculture. The sector generates \$1,496 million in GVA, which has grown by 28.3% over the past 5 years, supports 4,266 jobs and \$1,115 million in wages and salaries to households.
- Mining: Mining, particularly coal mining, is a major driver of the region's economy and supply chain. The Bowen Basin's extensive coal reserves support various mining operations across a number of different mining companies, exporting significant amounts overseas. The sector generates \$27,707 million in GVA, which has declined by 0.5% over the past 5 years, supports 18,255 jobs and \$3,544 million in wages and salaries to households.

#### 2.2.2 Secondary Sectors

The secondary sectors include industries that transform raw materials into products, such as manufacturing and construction. This sector is instrumental in adding value to primary products and building the infrastructure of the region. The sectors account for 14,519 jobs, \$2,386 million in GVA, and \$1,555 million in wages and salaries.

- **Manufacturing**: Manufacturing in the Greater Whitsunday region is multifaceted, encompassing food processing, machinery production, and chemical manufacturing a large portion of this sector is part of the mining sectors supply chain. The sector generates \$801 million in GVA, which has declined by 1.0% over the past 5 years, supports 4,820 jobs and \$540 million in wages and salaries to households.
- **Construction**: Construction is integral to the region's growth, covering residential, commercial, and infrastructure projects. The sector generates \$1,247 million in GVA, which has increased by 12.0% over the past 5 years, supports 8,600 jobs and \$912 million in wages and salaries to households.
- Electricity, Gas, Water, and Waste Services: This sector provides essential utilities (i.e. electricity, natural gas, water, and waste) and management services. Infrastructure development, renewable energy projects, and waste recycling initiatives align with the region's sustainability goals and are expected to grow to be a more significant part of the regions economic transition over the next few decades. The sector generates \$338 million in GVA, which has increased by 24.7% over the past 5 years, supports 1,098 jobs and \$104 million in wages and salaries to households.

#### 2.2.3 Tertiary Sectors

The tertiary sector represents service industries such as retail, transport, accommodation, and professional services. These industries more closely support the daily lives of residents and the region's tourism base. The tertiary sectors account for 25,889 jobs, \$3,174 million in GVA, and \$2,161 million in wages and salaries.

• Wholesale and Retail Trade: This sector facilitates trade through various channels, from wholesale distributors to local retailers and includes agricultural markets, shopping malls, and online platforms. The sector generates \$1,234 million in GVA, supports 10,086 jobs and \$905 million in wages and salaries to households.



- Accommodation and Food Services: The region attracts significant volumes of tourists, needing a strong accommodation and hospitality industry, which includes resorts, hotels, restaurants, and cafes. The sector generates \$381 million in GVA, supports 7,360 jobs and \$307 million in wages and salaries to households.
- **Transport, Postal, and Warehousing**: Transport and logistics are key for regional connectivity, supporting freight and passenger movement, and include airports, seaports, railways and roads. This sector facilitates transport, warehousing and support for the regions key industries, including mining, manufacturing, agriculture and tourism. The sector generates \$1,077 million in GVA, supports 5,922 jobs and \$601 million in wages and salaries to households.
- Information Media and Telecommunications: This sector includes media such as newspapers, radio, television, and digital platforms, providing information and entertainment. Telecommunications infrastructure supports connectivity, enabling business operations and social interactions. The sector generates \$54 million in GVA, supports 238 jobs and \$25 million in wages and salaries to households.
- Rental, Hiring, and Real Estate Services: Real estate activities encompass residential, commercial, and industrial properties that support both household and business/ commercial activities. The sector generates \$374 million in GVA, supports 1,540 jobs and \$281 million in wages and salaries to households.
- Arts and Recreation Services: Arts and recreation ranges from museums and galleries to recreational parks and entertainment venues, this sector offers enriching experiences for both residents and tourists. The sector generates \$54 million in GVA, supports 743 jobs and \$42 million in wages and salaries to households.

#### 2.2.4 Quaternary Sectors

The quaternary sector includes industries focused on knowledge and information such as education, healthcare, and professional services. The quaternary sectors provide 34,508 jobs, \$3,671 million in GVA, and \$3,064 million in wages and salaries.

- Financial and Insurance Services: This sector supports and includes financial products and services (e.g. banking, insurance and investment management). Financial institutions are key to economic growth, providing capital and risk management solutions for businesses and individuals. The sector generates \$320 million in GVA, supports 774 jobs and \$100 million in wages and salaries to households.
- **Professional, Scientific, and Technical Services**: Professional services include legal, accounting, engineering, and scientific research. The sector generates \$520 million in GVA, supports 3,469 jobs and \$452 million in wages and salaries to households.
- Administrative and Support Services: Administrative services support core functioning of businesses and government bodies and include human resources, office management, and other support roles. The sector generates \$595 million in GVA, supports 4,206 jobs and \$532 million in wages and salaries to households.
- Public Administration and Safety: The public administration ensures sector supports community welfare, security and adherence to regulations and includes governmental functions, law enforcement, fire protection, and regulatory agencies. The sector generates \$473 million in GVA, supports 3,876 jobs and \$396 million in wages and salaries to households.
- Education and Training: Education covers primary to tertiary institutions, vocational training and adult education. The sector generates \$522 million in GVA, supports 7,194 jobs and \$464 million in wages and salaries to households.
- Health Care and Social Assistance: Healthcare provides essential medical services, including hospitals, clinics, and aged care facilities. Social assistance includes the welfare and community support services that support well-being across vulnerable cohorts of the population. The sector generates \$899 million in GVA, supports 10,125 jobs and \$829 million in wages and salaries to households.
- Other Services: This category encompasses various specialised services, including personal care, repair and maintenance, religious activities and advocacy. The sector generates \$343 million in GVA, supports 4,863 jobs and \$291 million in wages and salaries to households.



#### 2.2.5 Tourism

Tourism is a vibrant and important sector within the Greater Whitsunday region. Known for its stunning landscapes, tropical climate, unique mix of land and water based attractions, the region has become a prominent destination for both domestic and international travellers. This sector contributes significantly to the local economy, providing 12,461 direct and indirect jobs and generating \$1,012 million in direct and indirect GVA.

- Accommodation Providers: Accommodation options in the region range from hotels and resorts to hostels and campgrounds. These establishments provide lodging for 3.3 million visitors annually<sup>3</sup> and constitute a key component of the tourism infrastructure (TRA, 2023).
- Experience Operators:
  - Land-Based: Land-based experience operators are pivotal in showcasing the region's natural and cultural heritage. Activities include guided tours to national parks, bushwalking, cultural experiences, and wildlife spotting.
  - Water-Based: The coastal and marine environments provide a range of water-based experiences. From snorkelling in the Great Barrier Reef to sailing around the Whitsunday Islands, water-based tourism is a key attraction.
  - Within the Greater Whitsunday region, tourism generated \$2,571 million in expenditure in 2022.
- Events and Festivals: The region hosts several annual events and festivals that draw both domestic and international visitors. These events contribute to tourist influx during specific periods and have economic implications for local businesses. Celebrations like the Mackay Festival of Arts and Whitsunday Reef Festival attract visitors from across Australia and globally, providing opportunities for local businesses and building the region's cultural identity.

#### 2.3 SOCIO-DEMOGRAPHIC CHARACTERISTICS

The Greater Whitsunday region's socio-demographic profile reveals a multifaceted and complex community, with unique attributes and shared characteristics with the broader Queensland context. Understanding these nuances is vital for tailored policy development, strategic planning, and investment to foster social cohesion, economic growth, and community well-being.

- **Population & Density**: The Greater Whitsunday region contains 186,512 people and this represents 3.5% of Queensland population, and at 0.02 residents per Ha the region which is 67.2% less dense than the Queensland average and is lower than Townsville SA4 at 0.03 residents per Ha.
- **Population Growth**: In 2022, the estimated resident population of the Greater Whitsunday region totalled 186,512 persons. Over the past 10 years, the population within the region grew by 0.7% per annum (or 12,276 persons). Population is projected to grow by 39,486 persons from 2022 to 2041 to reach a total of 225,998 persons. The projected population growth is higher than the historical average annual growth rate of 1.0%.
- Age Structure The average age is 38.1 years, slightly below the Queensland average of 38.9 years. This reflects a blend of young professionals, established families, and retirees, contributing to a dynamic demographic landscape.
- Educational Qualifications: Education attainment in the region is diverse and typically below the state average. Approximately 5.7% of the population holds a tertiary qualification (2.5% vocational and 3.2% university), compared to the Queensland average of 8.1%. (2.7% vocational and 5.4% university), Vocational training and apprenticeships are also prominent, aligning with the region's industrial focus.
- Volunteerism: Volunteerism is a notable aspect of community life in the region. Approximately 12.0% of the population engages in volunteer activities, a figure that is slightly below the state average of 12.2%, but highlights a strong sense of community engagement and civic participation.

<sup>&</sup>lt;sup>3</sup> 3.3 million visitors in the 2022 calendar year.



- Employment & Income: The employment rate in the Greater Whitsunday region is 2.5% (Jobs and Skills Australia, 2023; ABS, 2023 b), with an average annual income personal of approximately \$78,480 (ABS, 2022). These figures compare favourably with the Queensland averages of 4.2% and approximately \$69,680, respectively. Key industries such as mining and agriculture contribute to these figures.
- **Cultural Diversity**: Cultural diversity enriches the social fabric of the Greater Whitsunday region. Approximately 14% of residents were born overseas, compared to 24% for Queensland. This mix of backgrounds fosters a multicultural environment, enhancing the region's cultural vibrancy.
- Housing & Living Arrangements: The average housing cost for a detached dwelling in the region is approximately \$416,000, with 86.5% of residences being occupied private dwellings (QGSO, 2023b). This compares to the Queensland averages of approximately \$624,000 and 90.1%, reflecting unique regional housing trends and preferences.



### 3. HISTORICAL ROAD CLOSURES

This chapter provides a high-level overview of the historical road closures within the Greater Whitsunday region.

#### 3.1 ROAD SYSTEMS

#### 3.1.1 Overview

The figure below provides an overview of the State-controlled roads and local roads of significance within the Greater Whitsunday region.

Because of the extensive distances between population centres and limited alternative transportation options, private vehicles are the predominant mode of travel in the region. For method of travel to work (PoW), within the Greater Whitsunday region 74.4% of people drove a car to work, in Queensland it was 67.6% and in South East Queensland it was 65.0% (ABS, 2022)<sup>4</sup>.

The region's primary transportation artery is the Bruce Highway, which plays a crucial role in connecting the northern and southern regions for both cargo and passenger transportation. This highway stretches from Brisbane to Cairns and passes through significant regional hubs in the Greater Whitsunday region such as Sarina, Mackay, and Proserpine.

For travel from east to west within the region, there are two primary routes: the Peak Downs Highway and the Bowen Developmental Road. The Peak Downs Highway connects Mackay to Clermont and serves as a vital transportation link for key centres like Moranbah and Nebo. This highway is of particular importance for freight transportation, especially for the Bowen Basin region. The Bowen Developmental Road serves as a critical connector to the Northern Bowen and Galilee Basins, fulfilling a significant role in the movement of commodities from the region's agricultural and grazing areas.

<sup>&</sup>lt;sup>4</sup> Proportion of those travelling to work as the driver of a car out of all modes of transport (excluding the count for those that did not go to work).





#### Figure 3.1. State Controlled Roads & Local Roads of Regional Significance, Greater Whitsunday Region



#### 3.1.2 Challenges

"Outside of Mackay, the generally dispersed settlement pattern has resulted in long travel distances for people to access jobs, educational and health facilities, shopping districts and other facilities. The region relies heavily on the existing road network for connectivity and accessibility, two key factors that have a significant impact on regional liveability" (Queensland Government, 2018, p. 30).

"The region is characterised by geographically disparate communities, particularly between employment and home locations. Road infrastructure connecting the communities in the region is, in some instances, at a lesser standard than the roads within the region's urban areas. Further, the requirement to drive long distances for some, such as drive-in-drive-out mining jobs, increases the risk of driver fatigue. This results in a high proportion of road users



being exposed to comparatively more hazardous transport environments. In particular, the region is susceptible to a higher rate of crash fatalities in outer regional areas, compared to the rest of Queensland" (Queensland Government, 2018, p. 30). Road incidents including fatalities, minor injuries and major injuries can all result in road closure events in the region.

Additionally, the Greater Whitsunday region is prone to natural disaster events that lead to flooding and road closures. "Key urban centres can be isolated when sections of the highway are flooded, further impacting freight movements and productivity. The situation is exacerbated by a lack of alternative routes" (Queensland Government, 2018, p. 32). In the Mackay Isaac Whitsunday Regional Transport Plan, the Queensland Government (2018) identified several corridors throughout the region that are prone to flooding, including:

- The Bruce Highway .
- The Peak Downs Highway .
- Proserpine-Shute Harbour Road .
- Fitzroy Developmental Road
- Gregory Developmental Road
- Suttor Developmental Road.

As the region is heavily focused on tourism and export related production (agriculture and mining) for economic growth, reliable and efficient all year round road and transport access is crucial.

#### 3.2 WET SEASON

#### 3.2.1 Wet Season Timeframes

In North Queensland, the wet season runs from November to April and typically presents a higher than usual chance of rain. This is the time of year when low pressure systems impact the region and threaten flash flooding.

The figure below provides an overview of the mean monthly rainfall within the Greater Whitsunday region and highlights that generally, the largest rainfall occurs from February to March. On average, rainfall drops to a low across August, September and October each year each year.





Notes:

Isaac = Moranbah Water Treatment Plant Site.

Whitsunday = Hamilton Island Airport.

Mackay = Mackay M.O.

Source: BOM (2023).



#### 3.2.2 Cyclone Impacts

Being situated along the east coast of North Queensland, the region is prone to the impact of cyclones with 18 recorded tropical cyclones passing within 100 km of Airlie Beach and the Whitsundays since 1969.

#### Figure 3.3. Cyclones Since 1996



#### 3.3 HISTORICAL ROAD CLOSURES

In the Mackay Isaac Whitsunday Regional Transport Plan (2018), the Queensland Government identified significant points of interest for flooding and crash hotspots. The figure is provided below, and it indicates that a significant volume of the flooding is situated around Proserpine.

Section 3.3.1, 3.3.2, and 3.3.3 provide an overview of the average number of road closures per annum based on engagement with each local government in the Greater Whitsunday region.







Source: Queensland Government (2018).

#### 3.3.1 Mackay Regional Council

The Mackay Regional Council have provided information on the road closures that impact the Mackay Local Government Area. There are a total of 15 roads that are impacted regularly, generally resulting from rain/ flooding/ water over the road. The table below highlights that there are an average of 16.5 closures per year within the region.

The longest road closures are generally Mackay – Eungella Road and the Marian – Eton Road.



Road Closure	Length of Road Closure (days)	Average Closures / Year	Total Days Closed Per Annum
Sarina - Homebush Road	1	3	3.0
Mackay - Eungella Road	1	0.5	0.5
Mackay - Eungella Road	1	0.5	0.5
Mackay - Eungella Road	14	1	14.0
Marian - Eton Road	7 - 14	4	42.0
Mirani - Eton Road	1	0.5	0.5
Mirani - Eton Road	1	0.5	0.5
Koumala - Bolingbroke Road	1	0.5	0.5
Bruce Highway - South	1	0.5	0.5
Mirani - Mt Ossa Road	1	0.5	0.5
Mirani - Mt Ossa Road	1	0.5	0.5
Mt Ossa - Seaforth Road	1	1	1.0
Maraju - Yakapari Road	1	1	1.0
North - Eton Road	2	2	4.0
Yakapari - Habana Road	1	0.5	0.5

#### Table 3.1. Average Annual Historical Road Closures, Mackay

Notes:

0.5 highlight a closure once every two years on average.

• Council have provided information for two roads located in the Isaac Regional Council (Marlborough – Sarina and Blue Mountain Road), these have been excluded from the table above.

Source: Mackay Regional Council (unpublished a).

#### 3.3.2 Isaac Regional Council

Isaac Regional Council (unpublished a) have provided information on the average annual road closures from events in 2020 to 2023. This information was converted to an average annual estimate, as highlighted in the table below.

On an average annual basis, it has been assumed that the number of road closures in the Isaac LGA total 41.7 and these are estimated to span for a total of 59 days. It is noted that majority of these closures are driven by flooding, followed by hazard and roadworks.

Without the impact of roadworks, there are approximately 37.3 road closure instances per annum.

Road Network	Crash	Flooding	Hazard	Roadworks	Total	Total Days Closed Per Annum
Bruce Highway	-	0.7	3.3	-	4.0	3.7
Clermont Alpha Rd - Clermont	0.3	4.7	1.7	0.3	7.0	15.0
Clermont Connection Rd, Clermont	-	0.7	-	-	0.7	0.7
Dysart Middlemount Rd - Dysart	-	-	0.7	0.3	1.0	0.7
Fitzroy Developmental Rd	-	1.0	1.3	0.3	2.7	5.3
Gregory Development Road	-	0.7	-	-	0.7	1.0
Gregory Highway	-	5.7	2.3	0.7	8.7	10.3
Marlborough Sarina Rd	-	6.3	0.3	0.3	7.0	8.7
May Downs Carfax Rd - May Downs; State Route 67 - Valkyrie	-	0.3	-	-	0.3	0.3

#### Table 3.2. Average Annual Historical Road Closures, Isaac



Road Network	Crash	Flooding	Hazard	Roadworks	Total	Total Days Closed Per Annum
May Downs Carfax Rd, May Downs	-	0.3	1.0	0.3	1.7	2.3
Peak Downs Highway	0.3	2.7	2.0	2.0	7.0	10.0
Suttor Developmental Rd - Nebo	-	1.0	-	-	1.0	1.0
Total	0.7	24.0	12.7	4.3	41.7	59.0

Note: Total including road works.

Source: Isaac Regional Council (unpublished a).

#### 3.3.3 Whitsunday Regional Council

Whitsunday Regional Council provided information on the average length and number of closures on statecontrolled roads per annum. The majority of the closures in the Whitsunday region stem from flooding events.

There was a significant flooding event in January 2023, where 56 local roads were closed for a duration of three to four days, with some remaining closed for 11 days.

#### Table 3.3. Average Annual Historical Road Closures, Whitsunday

Road Network	Road Incidents	Flooding	Length of Closure / Hours	Total Days Closed Per Annum
Shute Harbour	1-2	1-2	1	0.1
Hamilton Plains	-	6	24-48	9.0
Bruce Highway at Leathebrook	-	2	24-72	4.0
Bruce Highway at Merinda	-	2	24-72	4.0
Bruce Highways to the Whitsundays	5	-	3-8	1.7

Note: Total days closed was calculated based on 24 hours a day and the median of the range provided in the table above.

Source: Whitsunday Regional Council (unpublished a).

#### 3.4 ROAD CLOSURE SUMMARY

On average across the region there have been 71.8 road closures for 140.6 days annually. Across the local government areas, these data were on average:

- 16.5 closures for an average length of 4.2 days for Mackay LGA
- 37.3 closures<sup>5</sup> for an average length of 1.4 days for Isaac LGA
- 18.0 closures for an average length of 1.0 days for Whitsunday LGA.

Based on stakeholder engagement, it was indicated that the region could have between three to five closure instances per annum on average. For the purposes of the analysis, there is assumed to be four closure instances per annum, with each closure instance spanning a period of two days.

<sup>&</sup>lt;sup>5</sup> Excluding roadworks.



# 4. NATURE OF ROAD CLOSURE IMPACTS

It is important to understand the nature of road closure impacts to different sectors across different lengths of closure period. The following sections provide a high level overview of the impact of road closures to the Greater Whitsunday region that was used to inform and guide engagement with key sectors and subsequent modelling of road closure impacts.

### 4.1 TYPE OF IMPACTS OBSERVED

The Greater Whitsunday region has a number of roads that under heavy rainfall are flooded, preventing people and freight movement throughout the region and typically result in the closure of flights to and from the airport. Many industries and businesses in the region are impacted by these road closures. To best understand the nature of the impacts experienced by businesses in the region, the following section summarises four groupings (leveraging the detailed analysis and review contained in Appendix C and Appendix D) the typical and observed impacts in two ways:

- Direct Impacts: Those that are experienced during the road closure event
- Lagging impacts: Those that are experienced as a result of, but after the event.

The following summarises the direct (one, two, three days and longer road closure event) and lagging impacts as identified in Appendix C and Appendix D.

#### 4.1.1 Primary Sectors (Agriculture, Mining, etc.)

Observed direct impacts are expected to include:

- Short delays in the transportation of materials and produce
- Escalating supply chain disruptions with extended closures
- Significant operational challenges, and financial losses during longer closures
- Potential halt in activities like mining, farming, and fishing
- Impact on market prices.

Observed lagging impacts are expected to include:

- Long-term challenges in rebuilding supply chains
- Extended financial recovery
- Potential regulatory scrutiny and reputational damage.

#### 4.1.2 Secondary Sectors (Manufacturing, Construction, etc.)

Observed direct impacts are expected to include:

- Minor inconvenience in material transportation
- Moderate to major supply chain disruptions with extended closures
- Complete disruption of operations during longer closures
- Severe financial strain, potential shutdowns of factories and construction sites.

Observed lagging impacts are expected to include:

- Long-term challenges in re-establishing supply chains
- Extended recovery period with potential restructuring or downsizing.



#### 4.1.3 Tertiary Sectors (Retail, Food Services, Personal Services, Community Services, etc.)

Observed direct impacts are expected to include:

- Short delays in deliveries and appointments
- Noticeable disruption in services, supply chains, and retail operations
- Major cancellations and financial losses during longer closures
- Potential complete disruption in services, severe financial strain.

Observed lagging impacts are expected to include:

- Extended recovery in client relationships, service levels, and financial standing
- Potential long-term changes in operational procedures, and reputational damage.
- 4.1.4 Quaternary Sectors (Education, Health Services, Professional Services, Arts and Recreation, Defence, etc.)

Observed direct impacts are expected to include:

- Minor to major disruptions in transportation and operations
- Escalating delays and financial implications with extended closures
- Severe disruption in activities like education, health care, arts, defence during longer closures.

Observed lagging impacts are expected to include:

- Extended recovery period for service restoration and financial recovery
- Potential long-term changes in operational procedures, educational structures, healthcare delivery, cultural reputation, and national security considerations.

#### 4.2 IMPACT BY LENGTH OF ROAD CLOSURE

The impact of a road closure differs depending on the length of outage. The following summarises how the impacts may change, depending on the length of road closure for direct and lagging impacts. A more detailed and full list is contained in Appendix D.

#### 4.2.1 1-Day Road Closure Event

- Direct impacts:
  - Transport, Postal and Warehousing: Immediate disruption to logistics, delays in freight and transportation of goods
  - Agriculture, Forestry, and Fishing: Short-term delay in moving produce, potential spoilage of perishable items
  - o Retail Trade: Reduced customer footfall, delays in stock replenishments
  - o Accommodation and Food Services: Potential cancellations in bookings and reduced business
  - o Public Administration and Safety: Reduced mobility, possible minor delays in emergency response times.
- Lagging impacts: Manufacturing: Minor disruption in supply chain; short delays in production.

#### 4.2.2 2-Day Road Closure Event

- Direct impacts:
  - Transport, Postal and Warehousing: Prolonged disruption, significant delays, possible contractual penalties



- o Agriculture, Forestry, and Fishing: Increased potential for spoilage; financial losses
- Construction: Delays in accessing construction sites; potential contractual delays
- Mining: Possible delays in transporting materials and accessing mining sites.
- Lagging impacts:
  - Wholesale Trade: Possible longer-term disruptions in supply chain; increase in costs
  - Education and Training: Potential longer-term scheduling issues and disruptions.

#### 4.2.3 3-Day Road Closure Event

- Direct impacts:
  - Transport, Postal and Warehousing: Severe disruption to transportation networks, potential long-term reputational damage
  - o Retail Trade: Serious inventory issues, reduced sales, potential financial strain
  - Health Care and Social Assistance: Possible delays in reaching medical facilities.
- Lagging impacts:
  - o Manufacturing: Major disruption in supply chain; long-term delays in production schedules
  - Tourism: Potential longer-term reputational damage, reduction in tourist confidence and drop in bookings.



#### 4.3 IMPACT SUMMARY BY SECTOR

The following table highlights the anticipated direct and lagging impacts of road closures in the Greater Whitsunday region.

#### Table 4.1. Direct & Lagging Impact by Sector

Impact	_																					
	Sugarcane Production	Beef/Grazing	Hort & Aquaculture	Retail	Industrial/Man	Professional Service	Government	Emergency Services	Tourism	Health Services	Construction	Mining	Utilities	Wholesale Trade	Food Services	Transport	Education	<b>Community Services</b>	Personal Services	Other Services	Arts and Recreation	Defence
Direct Impacts																						
Closure of Venues/Facilities	-	-	-	Y	-	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-	Y	-
Event Cancellations/Postponements	-	-	-	-	-	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-	Y	-
Disruptions to Operations/Production	Y	-	Y	-	Y	-	-	-	-	-	Y	Y	-	-	-	-	-	-	-	-	-	-
Disruptions to Supply Chain and Logistics	Y	Y	Y	Y	Y	-	-	-	-	-	Y	Y	Y	Y	Y	Y	-	-	-	-	-	-
Mobility and Transportation Issues	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Accessibility Issues for Staff and Visitors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Disruptions to Service Delivery	-	-	-	Y	-	-	Y	Y	-	Y	-	-	-	-	-	-	Y	Y	Y	-	-	-
Coordination Issues with Civil Authorities	-	-	-	-	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	Y
Financial Strain Due to Immediate Revenue Loss	-	-	-	Y	-	-	-	-	Y	-	-	-	-	-	Y	-	-	-	-	-	Y	-
Disruptions to Training and Regular Activities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	Y	Y	-	Y	Y
Indirect (Lagging) Impacts																						
Long-term Financial Strain	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Reputation and Trust Challenges	-	-	Y	-	-	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-	Y	-
Long-term Strategic Reconsiderations	-	-	-	-	Y	-	-	-	-	-	Y	-	Y	-	-	Y	-	-	-	-	-	Y
Infrastructure Assessment and Investment	-	-	-	-	-	-	-	-	-	-	Y	Y	Y	-	-	Y	-	-	-	-	-	Y
Readiness and Training Delays	-	-	-	-	-	-	-	Y	-	-	-	-	-	-	-	-	-	-	-	-	-	Y
Community Engagement and Cultural Impact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Y	-	-	Y	-
Long-term Health and Well-being Concerns	-	-	-	-	-	-	-	-	-	Y	-	-	-	-	-	-	-	Y	-	-	-	-
Impact on Economic Growth & Development	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Source: AEC.																						



### 5. MODELLING ASSUMPTIONS

The chapter provides an overview of the modelling assumptions used to quantify the impact of road closures on industries within the Greater Whitsunday region – noting there are a number of non-quantified impacts that, if they were able to be quantified, may significantly increase the impact.

Stakeholder engagement identified that road closures have three types of impacts on industries within the Greater Whitsunday region, including:

- **Output** the direct impact that road closures have on daily revenue and production output. A reduction in output indicates a loss to the sector, and vice versa.
- Non-Labour Operating Costs the direct impact that road closures have on non-labour operating costs. A
  reduction in non-labour operating costs indicates a cost saving to the sector, and vice versa. While a reduction
  in non-labour operating costs reflects a cost saving to the sector, it also reflects a reduction in supply chain
  activity, and thereby a reduction in flow-on activity in the region.
- Labour Costs direct impact that road closures have on labour costs. A reduction in labour costs indicates a cost saving to the sector, and vice versa. It should be noted though that a reduction in labour costs would also reflect a loss of incomes for residents of GW3.

The section below provides an overview of the modelling assumptions across the three key impacts by industry. These impacts have been considered across all 114 industries within the region.

The assumptions for the tourism industry differs to that highlighted above and considers the impacts to visitor expenditure and expenditure patterns.

#### 5.1 MINING

Road closures impact the mining industry as local labour resources are not able to access the site (local being defined as workers that are not Fly-in Fly-out (FIFO)). If labour is not able to access the site, the mines incur a reduction in operating output (i.e., revenue). If a mine reduces operating activity the following is expected to be observed:

Output – Reduction in mining output resulting from a reduction in operating hours. Based on Input-Output (IO) transaction tables, it is estimated that the mining industry has an output of \$65.0 million per day. The \$65.0 million provides an indication of the output from all coal mines within the Greater Whitsunday region, however, not all mines will be impacted at once and if impacted may be able to 'manage' around these impacts. For modelling purposes, it has been assumed that approximately 25% of mines may be impacted during a road closure event on average, equating to an output of \$16.2 million per day of closure.

Stakeholder engagement indicates that for a mine closure, there could be up to three days of impact. For the purposes of modelling, it has been assumed that the mining industry is impacted an average of 12 days per annum.

Applying the number of days delayed per annum (12 days) to the daily impacted output provides an estimate for the impact on output to the coal mining industry of \$194.9 million per annum.

- Non-Labour Operating Costs Reduction in operating activity resulting from road closures results in some non-labour operating costs not being incurred (i.e. variable operating costs). The impact to non-labour operating costs was estimated based on the ratio of non-labour operating costs to output for the coal mining industry (based on Input-Output transaction tables). It has been assumed that 70% of these are variable costs and would not be incurred by the company, however, the remaining 30% are fixed costs and the fixed costs are assumed to still be incurred when there is a reduction in operating hours. This results in a reduction in non-labour operating costs of \$51.2 million that would not be incurred, representing a cost saving to the sector.
- Labour Costs Based on stakeholder engagement, it has been assumed that the majority of wages and salaries for mining workers are still paid if they are unable to access the site due to road closures (i.e., workers are paid on a salary basis). It is noted that some mines throughout the Greater Whitsunday region could be



different in structure, however, for the purposes of modelling impacts it has been assumed that labour would still be paid. As a result there is no reduction in wages and salaries paid, however, there is a reduction in productive labour hours at the mines, which translates to the reduction in output, despite labour costs being maintained.

The table below provides a summary of the impact per annum and the proportion of current activity this impact represents.

#### Table 5.1. Annual Impact to the Coal Mining Industry, \$M

Impact	Per Annum	% of Current Activity
Output	-\$194.9m	0.82%
Non-Labour Operating Costs	-\$51.2m	0.58%
Labour Costs	No Impact	0.00%

Source: ABS (2022), AEC (unpublished a & b).

The table above only considers the impact to the coal mining industry per day; however, it is important to consider additional impacts from the other key mining sectors within the Greater Whitsunday region including oil and gas extraction, iron ore mining, non ferrous metal ore mining, non metallic mineral mining and exploration and mining support services.

To understand the impacts on the other mining industries, the proportions of current activity highlighted in Table 5.1 are assumed to hold constant across output, non-labour operating costs and labour costs.

#### Table 5.2. Other Mining Impact, Per Annum \$M

Impact	Oil and gas extraction	Iron Ore Mining	Non Ferrous Metal Ore Mining	Non Metallic Mineral Mining	Exploration and Mining Support Services
Output	-\$9.3	-\$0.7	-\$2.5	-\$0.6	-\$5.7
Non-Labour Operating Costs	-\$1.7	-\$0.1	-\$1.3	-\$0.2	-\$2.2
Labour Costs	No Impact	No Impact	No Impact	No Impact	No Impact

Source: ABS (2022), AEC (unpublished a & b).

NOTE: There is also an impact on the mining services, which are examined in section 5.10. Some of these mining services may be impacted for a longer period than the mines, however, to ensure double counting is avoided these impacts have been excluded.

#### 5.2 SUGAR PRODUCTION

There are six mills within the Greater Whitsunday region and five of these are operational mills for sugar production from sugarcane. The table below provides an overview of the mills by LGA and operator.

Table 5.3. Mills in the	Greater	Whitsunday	Region
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Mill	Location (LGA)	Operator
Proserpine	Whitsunday	Wilmar
Farleigh	Mackay	Mackay Sugar
Racecourse <sup>1</sup>	Mackay	Mackay Sugar
Pleystowe	Mackay	Mackay Sugar
Marian	Mackay	Mackay Sugar
Plane Creek	Mackay	Wilmar

Notes:

Pleystowe Mill is no longer operational, but it houses cane supply, information systems, operations, technology and electrical departments, all of which support the Mackay Sugar Limited sites.

<sup>1</sup> Mill and refinery.

Source: AEC.

Stakeholder engagement indicates that a mill could be closed for approximately seven to 10 days (eight days average to be consistent with the closure days of the Greater Whitsunday region) on average per annum across



four instances on average per annum due to road closures. Of these closures, engagement highlights that 20% could be during the growing season (two days per annum) and the remaining 80% could be during the maintenance period (six days per annum). The closures have three key financial implications per mill:

- **Output –** a loss in revenue of \$100,000 per day. This loss in revenue only occurs over the two days during the growing season totalling \$200,000 per year on average per mill and \$1.0 million per annum across all operating mills within the region.
- Non-Labour Operating Costs an increase in double handling costs with the additional logistic cost of delayed truck access for delivery and removals of \$100,000 per closure instance per mill (four closure instances). This equates to \$400,000 per annum for one mill and \$2.0 million across the five mills.
- Labour Costs additional costs during the maintenance period (not growing period) for overtime work required. This is costed at approximately \$37/hour for each nine-hour days across approximately 80 maintenance workers and applied to the average days closed during the maintenance period (six days). Totalling \$159,840 per mill per annum and \$799,200 across the five mills.

The table below summarises the assumed costs for road closure events. These impacts were modelled through the Input-Output industry of sugar and confectionery manufacturing. When modelling, the industry support and the household consumption flow-on activities were adjusted to remove the impact of sugar production (on farm). To include these flow-on impacts could be double counting, as these impacts have been considered in the section below.

Impact	Impact (\$M) per Mill	Impact (\$M) 5 Mills
Output	-\$0.2	-\$1.0
Non-Labour Operating Costs	\$0.4	\$2.0
Labour Costs	\$0.2	\$0.8

#### Table 5.4. Annual Impact to the Sugar Production Industry, \$M

Note: Conservative assumption to exclude Pleystowe Mill as it is not an operational crushing mill.

Source: Stakeholder Engagement, AEC.

### 5.3 SUGARCANE PRODUCTION (ON FARM)

Not only do road closures directly impact the operational activity of sugar production (the mills), but they also have an impact on farm operations. At the end of the season, there is standover cane left in the paddock, some resulting from weather events and others resulting from road closure impacts. The difference between the two is that weather impacts cause flooding in the paddock, while road closures prevent cane from reaching the sugar mill.

The impact to sugar production was developed based on the estimated tonnes of standover cane, the daily processing capacity of the mills and the day of mill impacts due to road closures as highlighted below.

Stakeholder consultation indicated that in the 2022 season:

- Proserpine mill had approximately 85,000T of standover cane.
- Plane Creek mill had approximately 140,000T of standover cane.
- Mackay Sugar Limited mills had approximately 400,000 of standover cane.

The average length of closure during the growing season is two days (see section 5.2). It has been assumed that a portion of this standover cane is a result of road closures, but the remainder due to weather/ flooding events. The proportion of standover cane resulting from road closures is assumed to be equivalent to the number of days closed during the growing season and the average daily processing capacity. It is noted that Prosperine mill has a processing capacity of 14,000T per day, Plane Creek mill has a lower processing capacity of 11,000T per day and Mackay Sugar mills have an average processing capacity of 32,000T per day (based on information provided during stakeholder engagement).

The Commercial Cane Sugar (CCS) builds up in the cane throughout the growing season and then degrades quite quickly if it is not harvested within the ideal harvest window. The CCS in standover cane is therefore far lower than



cane that was able to be accessed and harvested. Farmers have a choice to either harvest standover cane the following season or the to remove the cane from the paddock (i.e. plough it in). It has been assumed that farmers will receive a lower price next season and therefore the revenue potential will be lower. This is a conservative estimate as farmers lose an additional year of crop if they decide to keep standover cane, i.e., farmers cannot plant a new crop on that parcel of land, resulting in an opportunity cost.

Estimating cane price is based on the following formula: sugar price x 0.009 x (CCS-4) + constant (Wilmar, undated).

In 2021, the average CCS was estimated to total 14.3 units across the harvest season. At Mackay Sugar mills and the Proserpine mill CCS was 14.3 units and at Plane Creek mill CCS was 14.32 units (SRA, 2023 a). Harvesting late or early has an impact on CCS "harvesting a variety that has high early-sugar late in the season, or a later-maturing variety early, can cost as much as 3.5 CCS units" (SRA, 2014). The table below provides an overview of the assumptions to estimate the price reduction received by farmers.

Variable	Units	Proserpine Mill	Plane Creek	Mackay Sugar Limited mills
Tonnes of stand over cane	Tonnes	85,000	140,000	400,000
Standover cane resulting from road closures	Tonnes	28,000	22,000	64,000
CCS Assumption	Unit	14.30	14.30	14.30
CCS unit loss	Unit	3.50	3.50	3.50
Potential CCS harvesting late	Unit	10.80	10.80	10.80
Average \$ per Tonne (2023 assumption)	\$/Tonne	\$800	\$800	\$800
Assumed constant	Unit	0.60	0.60	0.60
Revenue (\$) if harvested during season (per tonne)	\$/Tonne	\$75	\$75	\$75
Revenue (\$) if harvested next season (per tonne)	\$/Tonne	\$49	\$49	\$49
Potential loss in Revenue (\$)	\$	\$720,720	\$566,280	\$1,647,360

#### Table 5.5. Loss in Production Revenue from Road Closures

Sources: SRA (2014, 2023 a ), Wilmar (undated), MSF Sugar (2023).

Across the three impacts examined:

- **Output –** it is estimated that the farmers could lose \$2.9 million per annum as a result of lower price received from standover cane from road closures alone.
- Non-Labour Operating Costs There is no impact to non-labour operating costs as the cane will still be harvested at some point in time, therefore, these costs will still be incurred in the year of harvest.
- Labour Costs There is no impact to labour costs on the same basis as non-labour operating costs. This is a conservative assumption as there could be an increase in labour activity to cultivate the cane until harvest, however, this impact is minimal.

#### Table 5.6. Annual Impact to the Sugarcane Production (On Farm) Industry, \$M

Impact	\$M
Output	-\$2.9
Non-Labour Operating Costs	No Impact
Labour Costs	No Impact

Note: Conservative assumption to exclude Pleystowe Mill as it is not an operational crushing mill. Source: Stakeholder Engagement, AEC.



#### 5.4 OTHER AGRICULTURE

The most prominent impact of road closure on agriculture within the Greater Whitsunday region is food spoilage and the reduction in price received for goods. An article written by Tsiros, M and Heilman C (2005) highlighted that 'a grocery store may be able to increase its profits by as much as 15% by minimally reducing the shrinkage of perishable goods'.

Appendix B provides an overview of the value and volume of agricultural production in the Greater Whitsunday region in 2021. The table below provides a breakdown of value per day, highlighting an average value per day across the year. The value of agricultural production was obtained from the 2021 agricultural census from the Australian Bureau of Statistics (ABS, 2022 a) and aquaculture information was provided for 2021-22 based on DAF 2022 statistics. The production value has been indexed from 2021 dollars to 2023 dollars to provide a summary of the 2023 estimated production value.

It is important to note that a large number of agricultural products are seasonal, and the values are only received during a particular window of the year. The analysis has considered an average value per day as road closures can occur outside of peak production windows and if this were to occur, there would be no impact to the commodity – therefore appropriately representing the probabilistic risk of the impact over time, but significantly underestimating the impact of any single closure event.

The following is noted about the assumptions in the table below:

- For horticultural produce, a higher percentage reduction has been utilised for commodities that have peak harvesting seasons during the wet season (namely mangoes, capsicums, melons, sweet corn and tomatoes).
- Broadacre and hay are assumed to be not impacted by a reduction in revenue as majority of the produce can be stored for an extended period, particularly grain products. It has been assumed that there is appropriate storage on farm and there will be no loss to the quality resulting from road closures.
- Flowers and turf are estimated to be impacted by 50%, as these items are highly perishable and if a road closure caused a delay, these commodities would be significantly impacted.
- For livestock products, a higher percentage reduction has been utilised for commodities that are more perishable (milk).
- Aquaculture is a time sensitive product to get to market and therefore a 20% reduction in revenue has been assumed from spoilage.
- No impact has been attributed to animals (livestock) as a road closure would only likely modestly impact operational costs.

Commodity	Total Greater Whitsunday (\$)	Greater Whitsunday Value Per Day (\$)	% Reduction in Revenue
Horticulture	\$295,148,509.1	\$808,626.1	-
Mangoes	\$18,135,105.1	\$49,685	20%
Other Orchid Fruit	\$656,619.2	\$1,799	15%
Macadamias	\$12,661.3	\$35	15%
Strawberries	\$84,309.2	\$231	15%
All other berry fruit	\$15,175.6	\$42	15%
Bananas	\$182,295.5	\$499	15%
Pineapples	\$704,525.9	\$1,930	15%
All other fruit	\$714,608.8	\$1,958	15%
Beans	\$43,825,163.5	\$120,069	15%
Capsicums	\$44,343,749.8	\$121,490	20%
Carrots	\$323,570.7	\$886	15%
Cucumbers	\$474,759.7	\$1,301	15%

#### Table 5.7. Reduction in Revenue from Road Closures (2023\$)

#### GW3 ROAD CLOSURE ECONOMIC ANALYSIS



Commodity	Total Greater Whitsunday (\$)	Greater Whitsunday Value Per Day (\$)	% Reduction in Revenue
Melons	\$4,625,124.2	\$12,672	20%
Potatoes	\$5,756,918.2	\$15,772	15%
Pumpkins	\$1,836,353.1	\$5,031	15%
Sweet corn	\$70,181,312.2	\$192,278	20%
Tomatoes	\$85,982,133.4	\$235,567	20%
All other vegetables	\$17,294,123.9	\$47,381	15%
Broadacre	\$510,902,819.9	\$1,399,733.8	-
Wheat for grain	\$20,150,677.8	\$55,207	0%
Oats for grain	\$6,968.6	\$19	0%
Barley for grain	\$520,191.7	\$1,425	0%
Sorghum for grain	\$57,518,727.9	\$157,586	0%
Rice for grain	\$24,725.9	\$68	0%
Maize for grain	\$1,011,787.6	\$2,772	0%
Oilseeds - Other oilseeds	\$4,207,001.3	\$11,526	0%
Chickpeas	\$34,811,378.5	\$95,374	0%
Other pulses	\$2,757,842.7	\$7,556	0%
Sugarcane - Cut for crushing	\$370,924,692.5	\$1,016,232	Excluded
All other crops	\$1,674,701.6	\$4,588	0%
Нау	\$10,396,050.1	\$28,482	-
Нау	\$10,396,050.1	\$28,482	0%
Other	\$14,669,934.8	\$40,191.6	-
Nurseries - Undercover	\$971,382.6	\$2,661	0%
Nurseries - Outdoor	\$10,806,112.9	\$29,606	0%
Cut flowers - Undercover	\$91,358.5	\$250	50%
Cut flowers - Outdoor	\$156,123.5	\$428	50%
Cultivated turf	\$2,644,957.4	\$7,246	50%
Livestock Products	\$1,904,861.8	\$5,218.8	-
Wool	\$26,080.9	\$71	0%
Milk	\$904,831.4	\$2,479	20%
Eggs	\$973,949.5	\$2,668	15%
Other Livestock	\$987,726.6	\$2,706.1	-
Sheep and lambs	\$8,053.5	\$22	0%
Pigs	\$82,722.9	\$227	0%
Poultry	\$406,911.0	\$1,115	0%
Other	\$498,092.7	\$1,365	0%
Cattle and Calves	\$707,030,631.8	\$1,937,070	
Cattle and calves	\$707,030,631.8	\$1,937,070	0%
Aquaculture	\$124,342,315.6	\$340,664	
Aquaculture	\$124,342,315.6	\$340,664	20%

Note: Industries that have a value of less than \$200 have been excluded for the purposes of the analysis. Source: ABS (2022 a), DAF (2022).

Across the three impacts examined:

- **Output –** based on the information highlighted above and an assumed eight days of road closures per annum, the impact to the agricultural industry could total \$1.8 million per annum.
- Non-Labour Operating Costs the impacts highlighted in the table above provide an estimate for the price impacts received after harvest. As this negative impact on price occurs after harvest, there is assumed to be no change in fixed and variable operating costs (i.e., these costs will still occur).


• Labour Costs – similar to non-labour operating costs, there is no change in wages and salaries paid (i.e., these costs will still occur).

## Table 5.8. Annual Impact to the Other Agriculture, \$M

Impact	\$M Per Annum
Output	-\$1.8
Non-Labour Operating Costs	No Impact
Labour Costs	No Impact

Source: AEC.

## 5.5 TOURISM

Tourism plays a significant and material role in the Greater Whitsunday regional economy, particularly in the Whitsunday LGA, which is renowned for the Great Barrier Reef and the Whitsunday islands. Tourism touches nearly all sectors of the 'traditional' economy, with visitors spending money on accommodation, dining out, transportation, tours and various activities and shopping, creating jobs and generating income for local businesses.

Tourism is impacted significantly due to road closures, particularly with disruptions to travel plans. Disruptions can lead to cancellation or rescheduling of trips, as well as extended stays of visitors who become 'stuck' in the region, causing inconvenience to travellers. Visitors who are not able to enter the region are assumed to cancel or delay their trip, or reduce the length of their trip, and thereby reduce spend in the region. Visitors who are 'stuck' in the region are expected to result in an increase in spend in the region due to their extended stay, continuing to spending similar amounts on food and accommodation, but significantly lower on other items.

The importance of tourism to the region is highlighted in Appendix B.

To model the impact that road closures have on the Greater Whitsunday region, visitors numbers pre-COVID (2019) were used to understand travel patterns before international and Australia wide lockdowns. The use of 2019 visitation numbers better represents the number of international visitors to the region pre-COVID. The table below provides a summary of these visitors at a more detailed breakdown.

Consultation with regional airport operators indicate that in 2022, there were approximately 400,000 passengers through the Whitsunday Coast Airport and 500,000 passengers through the Hamilton Island Airport. The numbers for TRA only highlight the visitors that are coming into the region, while the airport numbers would also record visitors leaving the region. The TRA numbers below also include consideration for other regional airports within the Greater Whitsunday region.

	Aircraft	Self-drive vehicle	Bus/ other land	Other	Not stated/not asked
Day Trip (000)	36.3	1,301.1	7.5	8.7	-
Domestic Overnight (000)	595.4	962.0	45.5	70.3	14.9
International (000)	91.7	83.4	43.8	70.5	-
Total	723.5	2,346.5	96.8	149.4	14.9

## Table 5.9. Visitors (000) by Mode of Transport, 2019

Notes:

• For the purposes of modelling, not stated/ not asked and other has not been included in this analysis.

Bus/ other land excludes water transport, rail transport, walking and cycling.
Source: TRA (2023).

Appendix C provides an overview of expenditure and average length of stay and are summarised below for 2019. It is noted that the below table indexes 2019 dollars to 2023 dollars.

## GW3 ROAD CLOSURE ECONOMIC ANALYSIS



## Table 5.10. Expenditure and Average Length of Stay, 2019

Item	Day Trip	Domestic Overnight	International
Expenditure total (\$M)	\$277.4	\$1,227.5	\$195.9
Expenditure per trip (\$)	\$204.9	\$750.6	\$811.6
Average length of stay (days)	1	4.4	7.4
Expenditure per day (\$)	\$204.9	\$171.2	\$109.6

Source: TRA (2023).

There are two key impacts to be examined, the impact to:

- Self-drive and other transport visitors
- Visitors coming in through the airport.

## 5.5.1.1 Self-Drive and Bus/ Other Land Transport

#### Visitors to the Greater Whitsunday Region

For visitors who access the region via road transport, it has been assumed that road closures will result in a cancellation of day trip visitors and a reduction in the average length of stay for domestic overnight and international visitors.

Based on information highlighted in Table 5.9, there were approximately 3,585 day trip visitors per day that utilised road transport in 2019. Over an eight day road closure, this would equate to a loss of over 28,682 day trip visitors and at an average daily spend of \$204.9 (in 2023 dollar terms), this would be an average annual loss of approximately \$5.9 million.

For overnight visitors, there are two key travel options in the event of a road closure including cancellation of trip or reduction of the number of days spent in the region. For modelling, it has been assumed that for overnight visitors travelling via road (based on stakeholder consultation:

- Approximately 90% of visitors not yet in the region cancel their trip and the Greater Whitsunday region would lose the total expenditure for the entire trip, equating to a loss of \$17.0 million.
- For the remainder of people (10%) that are not yet in the region, visitors are estimated to reduce their trip by one day, resulting in a loss of \$0.4 million.

#### Visitors 'Stuck' in the Greater Whitsunday Region

The visitors that are already in the region and are 'stuck' within the Greater Whitsunday region due to road closures are also impacted. These visitors are likely to spend money as they are forced to stay extra days within the region, however, at a reduced rate as they transition towards the end of their holiday. Over eight closure days per annum, 22,082 domestic overnight visitors and 2,788 international visitors are impacted.

Day trip visitors have been excluded from those visitors 'stuck' in the Greater Whitsunday region as it has been assumed that 100% of these visitors cancel their trip.

The table below highlights the percentage reduction in expenditure across each Input-Output Industry. It has been assumed that \$3.2 million in additional tourism activity is generated each year as a result of those 'stuck' within the region.

Input-Output Industry	% Reduction in Spend
Air and Space Transport	0%
Road Transport	15%
Rail Transport	15%
Water, Pipeline and Other Transport	15%
Accommodation	0%

#### Table 5.11. Reduction in Expenditure



Input-Output Industry	% Reduction in Spend
Food and Beverage Services	20%
Retail Trade	50%
Personal Services	15%
Heritage, Creative and Performing Arts	15%
Sports and Recreation	15%
Gambling	15%
Postal and Courier Pick-up and Delivery Service	15%
Rental and Hiring Services (except Real Estate)	15%
Automotive Repair and Maintenance	15%
Primary and Secondary Education Services (incl Pre-Schools and Special Schools)	15%
Technical, Vocational and Tertiary Education Services (incl undergraduate and postgraduate)	15%
Arts, Sports, Adult and Other Education Services (incl community education)	15%
Source: AEC.	

## 5.5.1.2 Aircraft

## Visitors to the Greater Whitsunday Region

Stakeholder engagement highlights that the average number of times airlines are advised not to take off from their departing destination is approximately three times per year. This equates to a total of 5,946 visitors per annum (assuming 2019 visitation by aircraft numbers). Similar to those visiting the region via road transport, there are two impacts considered in the analysis including, cancellation of trip entirely and those that reduce the average length of stay. The following has been assumed, and was largely informed form stakeholder engagement:

- 100% of day trip visitors would cancel their trip, resulting in a loss of \$0.1 million per annum.
- Approximately 10-15% (15% for this analysis) of overnight visitors would cancel their trip and the Greater Whitsunday region would lose the total expenditure for the entire trip, equating to a loss of \$0.6 million.
- For the remainder of people (85%), visitors are estimated to reduce their trip by one day, resulting in a loss of \$0.8 million. This is a conservative assumption due to the increase in load factors since the impact of the COVID pandemic resulting from a drop in full capacity. Airlines would likely not increase services for flights the next day and there would be an increase in demand from the previous days cancellation. Stakeholder engagement indicates that airlines are likely one year away from operating at full capacity again.

### Visitors 'Stuck' in the Greater Whitsunday Region

The visitors that are stuck within the Greater Whitsunday region from airlines being advised not to take off are also impacted. These visitors are likely to spend more within the region, however, at a reduced rate as they transition towards the end of their holiday. Over eight closure days per annum, 4,894 domestic overnight visitors and 754 international visitors are impacted.

Day trip visitors have been excluded from those visitors 'stuck' in the Greater Whitsunday region as it has been assumed that 100% of these visitors cancel their trip.

As with overnight visitors that are 'stuck' in the region who travel via road, there will likely be a reduction in expenditure across each Input-Output industry as per Table 5.11. It has been assumed that \$0.7 million in additional tourism activity is generated each year as a result of those stuck within the region.

#### **Other Impacts**

The airport has other impacts that are not included in the above, including:

• The airport loses around \$20 spend per person per day. This loss is captured in the decline in visitor spend and to include it would double count impacts.



• The airport used to incur a cost of \$40,000 per day if the terminal was required to shut down. The airport is now on charging this cost to the airlines and this is therefore a cost that does not directly impact Greater Whitsunday region.

## 5.5.1.3 Combined Impact

Over eight days of road closure, the tourism industry could be expected to lose an estimated \$24.7 million in tourism expenditure per annum for those who cannot get to the region. For those who are stuck in the region due to road closure, the additional expenditure is estimated to total \$3.9 million on average per annum. Overall, the net loss to the tourism industry is estimated at \$20.8 million in reduced output.

All of the expenditure for retail trade has been excluded as the impact to retail trade has been assed separately (see section 5.6 below). This lowers the modelled tourism impact by \$7.7 million to reach a net loss of \$13.0 million on average per annum in **reduced output**.

This has been modelled across Input-Output industries based on the national expenditure splits by industry. Estimates of the reduction in **non-labour operating costs** and **labour costs** have been estimated based on the modelled results in the Input-Output model. It is important to note that these impacts are based on the loss from road closure and not the loss from flooding, which could also have longer impacts due to implications on attractions and travel patterns of visitors (i.e., people being less included to travel/ do activities).

## 5.6 RETAIL TRADE

The retail trade industry experiences significant impacts during road closures. Across the three key impacts considered, the following is noted:

- Output based on Input-Output Transaction Tables, the retail trade industry within the Greater Whitsunday region is estimated to produce an output of \$2.5 million per day. It is estimated that approximately 20% to 30% of retail trade output is impacted during road closures, however, after the road reopens there is an opportunity for a recovery in revenue (75% of the impacted output is recovered). Overall, it has been assumed that the retail trade industry is impacted by a 6.25% net loss in output, resulting in a \$1.2 million impact to the industry on average per annum.
- Non-Labour Operating Costs the impact to non-labour operating costs was estimated based on the ratio of non-labour operating costs to output for the retail trade industry (based on Input-Output transaction tables), assuming 70% of the non-labour operating costs are variable. This equates to a \$0.4 million reduction in operating costs for the retail trade industry.
- Labour Costs the impact on labour costs was estimated based on the ratio of labour operating costs to
  output for the retail trade industry (based on Input-Output transaction tables). It has been assumed that 50%
  are paid on an hourly rate and if labour cannot access businesses, there is a 50% reduction in the wages and
  salaries paid by businesses, translating to a reduction in wages received by employees. This equates to a \$0.3
  million reduction in labour costs paid by businesses, which also represents a reduction in the wages and
  salaries received by workers. With the retail trade industry, there is a reduction in labour costs and there is
  also a reduction in the hours worked due to road closures.

Impact	\$M Per Annum
Output	-\$1.2
Non-Labour Operating Costs	-\$0.4
Labour Costs	-\$0.3
Source: AEC.	

Table 5.12. Annua	I Impact to the	e Retail Trade Industr	у, \$M
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#### 5.7 TRANSPORT AND LOGISTICS – ROAD TRANSPORT

Road closures significantly disrupt transport and logistics by causing delays, congestion, increased costs, and supply chain disruptions. Road transport logistics are disrupted during road closures, and the impact has been quantified below. Across the three key impacts considered, the following is noted:

- Output based on Input-Output Transaction Tables, the road transport industry within the Greater Whitsunday region is estimated to produce an output of \$1.4 million per day. It is estimated that approximately 80% of road transport output is impacted during road closures, however, after the road reopens there is an opportunity for a recovery in revenue (75% of the impacted output is recovered). Overall, it has been assumed that the road transport industry is impacted by a 20% net loss in output, resulting in a \$2.3 million impact to the industry on average per annum.
- Non-Labour Operating Costs the impact to non-labour operating costs was estimated based on the ratio of non-labour operating costs to output for the road transport industry (based on Input-Output transaction tables), assuming 70% of the non-labour operating costs are variable. This equates to a \$1.0 million reduction in operating costs for the industry.
- Labour Costs the impact on labour costs was estimated based on the ratio of labour operating costs to output for the road transport industry (based on Input-Output transaction tables). It has been assumed that 50% are paid on an hourly rate and if labour cannot access the region, there is a 50% reduction in the wages and salaries paid by businesses, translating to a reduction in wages received by employees. This equates to a \$0.4 million reduction in labour costs paid by businesses, which also represents a reduction in the wages and salaries received by workers. This is a conservative assumption for labour costs as once the road reopen, there could be an increase in labour to support the recovery of output (i.e., due to the delays, workers that are paid hourly wages could be expected to work overtime to 'catch-up' the deliveries that were lost).

-\$2.3
ψ=:•
-\$1.0
\$0.4

#### Table 5.13. Annual Impact to the Road Transport Industry, \$M

Source: AEC.

#### HEALTH CARE SERVICES 5.8

Road closures can have significant impacts on accessing health care services, especially in rural and remote areas where health care facilities may be farther away. A large impact that road closures have on health care services is delayed or missed appointments is patients are unable to reach their scheduled medical appointments. Across the three key impacts considered, the following is noted:

- Output based on Input-Output Transaction Tables, the health care service industry within the Greater Whitsunday region is estimated to produce an output of \$1.7 million per day. It is estimated that approximately 20% to 30% of health care services output is impacted during road closures, however, after the road reopens there is an opportunity for a recovery in revenue (75% of the impacted output is recovered). Overall, it has been assumed that the industry is impacted by a 6.25% net loss in output, resulting in a \$0.9 million impact to the industry on average per annum.
- Non-Labour Operating Costs the impact to non-labour operating costs was estimated based on the ratio of non-labour operating costs to output for the health care services industry (based on Input-Output transaction tables), assuming 70% of the non-labour operating costs are variable. This equates to a \$0.2 million reduction in operating costs for the industry.
- Labour Costs There is assumed to be no change in labour costs as majority of health care workers would receive salaries. These workers may receive overtime pay for hours worked beyond their regular shift, but for the purposes of this study it is assumed that eight days of road closure per annum will not result in a material increase in overtime work.



## Table 5.14. Annual Impact to the Health Care Services Industry, \$M

Impact	\$M Per Annum
Output	-\$0.9
Non-Labour Operating Costs	-\$0.2
Labour Costs	No Impact

Source: AEC.

## 5.9 CONSTRUCTION

Road closures can have significant impacts on the day-to-day operational activity of construction businesses, including (but not limited to):

- Delays and disruptions: road closures can lead to delays in construction projects as workers, equipment, and materials may have difficulty accessing the construction site.
- Scheduling challenges: construction projects rely on carefully coordinated schedules, with various trades and tasks following a specific sequence. Road closures can disrupt this schedule, making it challenging to coordinate activities and maintain project timelines.

Across the three key impacts considered, the following is noted:

- **Output** based on Input-Output Transaction Tables, the construction industry (residential building construction, non-residential building construction, heavy and civil engineering construction and construction services) within the Greater Whitsunday region is estimated to produce an output of \$8.0 million per day. It is estimated that approximately 20% to 30% of construction industry output is impacted during road closures, however, after the road reopens there is an opportunity for a recovery in revenue (75% of the impacted output is recovered). Overall, it has been assumed that the industry is impacted by a 6.25% net loss in output, resulting in a \$4.0 million impact to the industry on average per annum.
- Non-Labour Operating Costs the impact to non-labour operating costs was estimated based on the ratio of non-labour operating costs to output for the construction industries (based on Input-Output transaction tables), assuming 70% of the non-labour operating costs are variable. This equates to a \$1.9 million reduction in operating costs for the industry.
- Labour Costs the impact on labour costs was estimated based on the ratio of labour operating costs to output for the road transport industry (based on Input-Output transaction tables). It has been assumed that 50% are paid on an hourly rate and if labour cannot access the site, there is a 50% reduction in the wages and salaries paid by businesses, translating to a reduction in wages received by employees. This equates to a \$0.5 million reduction in labour costs paid by businesses, which also represents a reduction in the wages and salaries received by workers. This is a conservative assumption for labour costs as once the road reopen, there could be an increase in labour to support the recovery of output (i.e., due to the delays, workers that are paid hourly wages could be expected to work overtime to meet construction deadlines).

Impact	Residential	Non- Residential	Heavy and Civil Engineering	Construction Services	Total
Output	-\$0.6	-\$0.3	-\$0.9	-\$2.2	-\$4.0
Non-Labour Operating Costs	-\$0.3	-\$0.2	-\$0.4	-\$1.1	-\$1.9
Labour Costs	\$0.0	\$0.0	-\$0.1	-\$0.3	-\$0.5
Source: AEC.					

#### Table 5.15. Annual Impact to the Construction Industry, \$M



#### 5.10 OTHER INDUSTRIES

Outside of the industries examined in the previous sections, there will be impacts felt across other industries within the Greater Whitsunday region due to road closures. These impacts would largely be based on the inability for workers to access the site/ business, and for some service based customers this would also translate to a reduction in customers being able to access local businesses. It is anticipated these impacts would thereby be similar to those felt in the retail trade and health care services sectors.

For the purposes of modelling the remaining industries, the following has been assumed:

- Output as with the modelling assumptions highlighted in the above industries, output has been estimated based on Input-Output Transaction Tables. It is estimated that approximately 20% to 30% of industry output is impacted during road closures, however, after the road reopens there is an opportunity for a recovery in revenue (75% of the impacted output is recovered). It has been assumed that there is an average 6.25% net loss in output across each industry.
- Non-Labour Operating Costs the impact to non-labour operating costs was estimated based on the ratio of non-labour operating costs to output for each industry (based on Input-Output transaction tables), assuming 70% of the non-labour operating costs are variable.
- Labour Costs the impact on labour costs was estimated based on the ratio of labour operating costs to output for each industry (based on Input-Output transaction tables). It has been assumed that 50% are paid on an hourly rate and if labour cannot access the site/ businesses, there is a 50% reduction in the wages and salaries paid by businesses, translating to a reduction in wages received by employees.

\$M Per Annum
-\$14.6
-\$7.4
-\$2.5

## Table 5.16. Annual Impact to the Other Industries, \$M

Source: AEC.



# 6. ECONOMIC IMPACT OF ROAD CLOSURES

This chapter provides an overview of the economic significance of the annual road closures to the Greater Whitsunday region.

## 6.1 QUANTIFIED IMPACTS

## 6.1.1 Approach

Economic modelling in this section estimates the economic activity supported lost from the assumed eight days of road closures per annum.

Input-Output modelling is used to examine the direct and flow on<sup>6</sup> activity that is estimated to be supported within the Greater Whitsunday regional economy. Modelling drivers used in the assessment are described below.

A description of the Input-Output modelling framework used is provided in Appendix E.

Input-output modelling describes economic activity by examining four types of impacts:

- **Output**: Refers to the gross value of goods and services transacted, including the cost of goods and services used in the development and provision of the final product. Output typically overstate the economic impacts as it counts all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
- **Gross** product: Refers the to the value after deducting the cost of goods and services inputs int the production process. Gross product (e.g., Gross Regional Product (GRP)) defines a true net economic contribution and is subsequently the preferred measure for assessing economic impacts.
- **Income**: Measures the level of wages and salaries paid to employees of the industry under the consideration and to other industries benefiting from the project.
- Employment: Refers to the part-time and full-time employment positions generated by the economic stimulus, both directly and indirectly through flow-on activity, expressed in full time equivalent (FTE) positions/ FTE job years<sup>7</sup>.

For an overview of the modelling drivers and assumptions, refer to chapter 5.

## 6.1.2 Input-Output Modelling Results

Modelling of the economic impacts has been undertaken using the modelling drivers outlined in chapter 5. The direct impacts include:

- Output a \$257.1 million loss in output (i.e., loss in revenues) to local businesses within Greater Whitsunday
  regional economy.
- Gross Regional Product (GRP) a \$171.2 million loss in GRP.
- Incomes and FTE a \$8.0 million loss in direct wages and salaries paid to approximately 116 FTEs.

The Input-Output model has also estimated the likely flow-on impacts associated with the above level of direct activity. The table below provides a summary of the modelling outputs.

<sup>&</sup>lt;sup>6</sup> Both production induced (Type I) and consumption induced (Type II) flow-on impacts have been presented in this report. Refer to Appendix A for a description of each type of flow-on impact.

<sup>&</sup>lt;sup>7</sup> Where one FTE Job year is equivalent to one person working full time for a period of one year.



Table 6.1. Economic Activity Impacted by Road Closures (\$M), Greater Whitsunday region, Average Per Annum

Impact	Output (\$M)	Gross Regional Product (\$M)	Incomes (\$M)	Employment (FTEs)
Direct Activity				
Initial Stimulus	-\$257.1	-\$171.2	-\$8.0	-116
Flow-On Activity				
Direct Requirement Impacts*	-\$17.2	-\$7.9	-\$5.2	-51
Industry Support Impacts*	-\$4.6	-\$2.2	-\$1.4	-15
Household Consumption Impacts	-\$17.8	-\$10.1	-\$5.1	-65
Sub-Total	-\$39.6	-\$20.2	-\$11.8	-131
Total Impact (Direct & Flow-On)				
Total	-\$296.7	-\$191.4	-\$19.7	-247

Notes:

\* Production induced flow-on (Type I) impacts.

Figures may not sum due to rounding.

Source: AEC.

To include all the flow-on activity (as highlighted in the table above) would overstate the actual impact, as each industry has been modelled with a direct impact. There is uncertainty around how much flow-on activity would be lost due to the road closures, however, if 25% of the above flow-on activity is lost, then the following level of activity could be expected:

- **Output** a \$257.1 million loss in output (i.e., loss in revenues) to local businesses within the Greater Whitsunday regional economy. An additional \$29.7 million could be expected to be lost in flow-on activity.
- Gross Regional Product (GRP) a \$171.2 million loss in direct GRP and an additional \$25.1 million could be expected to be lost in flow-on activity.
- **Incomes and FTE** a \$8.0 million loss in direct wages and salaries paid to approximately 116 FTEs. An additional \$8.8 million could be expected to be lost in flow-on wages and salaries to approximately 98 FTEs.

Table 6.2. Economic Activity Impacted by Road Closures (\$M), Greater Whitsunday region, Average Per Annum – Reduced Flow-On

Impact	Output (\$M)	Gross Regional Product (\$M)	Incomes (\$M)	Employment (FTEs)
Direct Activity				
Initial Stimulus	-\$257.1	-\$171.2	-\$8.0	-116
Flow-On Activity				
Direct Requirement Impacts*	-\$12.9	-\$5.9	-\$3.9	-38
Industry Support Impacts*	-\$3.4	-\$1.6	-\$1.1	-11
Household Consumption Impacts	-\$13.4	-\$7.6	-\$3.8	-49
Sub-Total	-\$29.7	-\$15.1	-\$8.8	-98
Total Impact (Direct & Flow-On)				
Total	-\$286.8	-\$186.4	-\$16.8	-215

Notes:

Production induced flow-on (Type I) impacts.

Figures may not sum due to rounding.

• The above table reflects 75% of the modelled flow-on activity.

Source: AEC.

When these average annual losses (direct and flow-on) are considered over a 10 year period they will total:

- \$2.87 billion in Output (\$2.16 billion in present value terms)
- \$1.86 billion in GRP (\$1.40 billion in present value terms)
- \$167.8 million in incomes (\$126.1 million in present value terms)
- 2,146 FTE years (or an average of 215 FTE positions per year).



## 6.1.3 Impact on Household Utility

Aside from the quantified impacts for Input-Output modelling, the road closures negatively impact those living within the Greater Whitsunday region. The road closures cause disruptions to the everyday happenings of residents located within the Greater Whitsunday region and this creates significant inconvenience and frustration for residents. This negative impact has been valued as a disutility to households.

The disutility has been conservatively estimated based on the leisure value of time impacted for each household. Leisure time has been valued at 40% of the average household income in the Greater Whitsunday region, in line with the approach for valuing travel time outlined by Australian Transport Assessment and Planning Guidelines (Australian Government, 2020). This approach provides an average value of approximately \$19.6 per hour per household (in 2023 dollar terms).

There were 70,412 occupied private dwellings within the Greater Whitsunday region (ABS, 2022 b). Applying the hourly disutility to the total number of households, provides an estimate of the disutility received across all households within the region for an hour (\$1.4 million).

Over eight days of road closure, as highlighted in section 5.1, it is assumed the road closure event could impact affected residents for a single day (i.e. 24 hours per closure incident). Overall, this indicates 192 hours of road closure disutility experienced by the region on average per annum. For households in the region, it has been assumed that only 25% of households actually experience the disutility. Across the Greater Whitsunday region the household disutility associated with road closures is estimated at \$66.4 million on average per annum.

When examined over a 10 year period this represents \$664.1 million or \$449.1 million in present value terms.

It is important to note that the impact on household utility has not been modelled through the Input-Output industry as this is the potential impact on community utility and therefore has no impact on local businesses as it is not transacted.

## 6.2 QUALITATIVE IMPACTS

The table below provides an overview of the impacts that were not able to be quantified to reach a value of impact. These impacts were identified through stakeholder engagement and research, and if quantified, would significant increase the economic impact listed above.

Impact	Context	Consequence
Retail: Erosion of Customer Trust & Loyalty	Technological innovation has supported many retail and wholesale businesses to be involved in online sales. Online selling broadens the customer base from local to regional, national, and international customers. Yet, the recurring road closures in the Greater Whitsunday region pose a substantial hurdle to shipping and the timely delivery of products to customers.	Repeated delivery delays can erode the trust customers have in businesses, leading to diminished loyalty. Over time, businesses face potential revenue losses due to this decreasing trust.
<b>Retail</b> : Escalation in Shipping Costs	In the face of road closures, businesses frequently shift from standard delivery to alternative shipping methods to ensure prompt delivery and maintenance of their business. This shift often sees airfreight emerging as the preferred choice for guaranteed shipments. Unfortunately, relying on airfreight significantly inflates shipping costs compared to traditional road transport.	The elevated costs have to be passed on to the customers, making products more expensive (often more expensive than a previous experience the shopper has had). Alternatively, some businesses absorb these costs out of loyalty to their customers, but it leads to reduced profits. Either way, the result is a loss of business activity and flow as customers seek more affordable options or as retail businesses grapple with tighter margins.

#### Table 6.3. Qualitative Impacts



Impact	Context	Consequence
<b>Community</b> : Family Separation and Distress	Family life, particularly those families with children, rely on road access to remain united and achieve their goals/ requirements for a standard week. Road closures introduce significant challenges, potentially causing separations between parents and their children and/ or grandparents. Such separations can be distressing and take on emotional toll on all parties involved.	Stakeholder engagement reveals that such separations do occur, sometimes leaving children unsupervised, requiring alternative care arrangements, which can be challenging to arrange on short notice.
<b>Community</b> : Compromised Rural Liveability	Rural communities in the Greater Whitsunday region, notably areas within Isaac, rely heavily on larger centres like Mackay for their primary service needs. The recurrent road closures of the main road network between key points like Mackay and Isaac critically undermine this reliance, making it challenging for residents to access essential services.	This restricts the community's access to essential and emergency services, compromising the appeal and feasibility of rural living.
<b>Community</b> : Hindered Access to Education	Consistent road access is required for regular school attendance and for parents to uphold their daily work routines. Road closures within the Greater Whitsunday region pose a direct threat, often disrupting daily school commutes for children and teachers. This can lead to irregular attendance patterns for students. Additionally, in the absence of alternative care, such disruptions might compel parents to forgo work to care for their children.	Children's education suffers due to missed classes, and parents face disruptions in their work schedules, potentially affecting their professional commitments and income and schools struggle to support gaps in the teaching schedule.
Event: Disruption of Events	Community events like festivals, parades, and local fairs are a significant part of creating and supporting local cohesion and a sense of belonging. Stakeholder engagement highlights that road closures within the Greater Whitsunday region can lead to the postponement of outright cancellation of these events.	The disruption or inaccessibility of these events can weaken the sense of community. Residents might feel disconnected or miss out on shared experiences.
Agriculture: Higher Transport Costs	Stakeholder engagement indicates the transport and logistics market within the Greater Whitsunday region is tight, with regional growers facing competitive disadvantages compared to their southern counterparts. This disparity stems from the transporters placing higher charges on the Greater Whitsunday region to account for the risks associated with potential delays or immobilisations due to road closures.	The higher transport costs can reduce profit margins for growers, making their produce less competitive in the market and potentially raising prices for consumers.

## GW3 ROAD CLOSURE ECONOMIC ANALYSIS



Impact	Context	Consequence
Agriculture: Disruptions in Timely Deliveries	The agricultural industry's success hinges on prompt deliveries to markets, a crucial aspect especially for perishable goods. Road closures introduce challenges and cause delays in transporting produce to their intended destinations. These delays can result in a multiple of problems, with perishability being a prominent concern resulting in either a complete or partial loss of value.	Delayed produce may fetch lower prices or risk being rejected altogether. This can result in financial losses for growers.
Tourism: Legacy Impacts from Road Closures	The Greater Whitsunday region holds a renowned reputation as a prime tourism hotspot, especially drawing in a considerable number of drive tourists. Tourism is a key driver of economic activity, particularly within the Whitsunday region.	The frequent road closures accompanied by consequent negative media coverage cast an ever present shadow over this image. Such adverse publicity highlights inconvenience, unpredictability, and safety concerns of organising travel in the region (and thereby inherently promotes other regions above the Greater Whitsunday region). This perception can deter potential tourists from choosing the Greater Whitsunday region as their destination. Given that tourism is a cornerstone of economic vitality, especially for areas like the Whitsunday region, sustained negative press can inflict lasting harm, undermining the region's tourism potential and economic health.

Source: AEC.



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# APPENDIX A: LITERATURE REVIEW

The Greater Whitsunday region has its transport policy and future economic development initiatives spread across five government entities. There is the Australian Government and the Queensland Government, representing the national and state governments, along with the three regional councils of Mackay, Isaac and Whitsunday representing the local government areas.

This section provides a summary review of recent strategic infrastructure policies and strategies from each government entity.

## Table A. 1. Literature Review/Strategic Alignment

Planning Priority Report: Content Summary – Strategic Alignment / Paper					
Mackay Regional Council					
Mackay Mackay	Integrated Transport Strategy				
Region Integrated Transport Strategy 2021 - 2036	The Mackay Regional Council released an Integrated Transport Strategy to align with its existing regional planning scheme while expanding on its concepts and providing detailed strategic outcomes.				
	<ul> <li>There are three main objectives of this transport strategy including:</li> <li>Objective 1: Integrate transport planning and land use planning</li> </ul>				
	<ul> <li>Objective 2: Invest to create a connected, accessible, resilient and safe transport system that leaves a positive legacy for future generations.</li> </ul>				
	<ul> <li>Objective 3: The community is engaged, and relevant technologies and systems are harnessed, to develop innovative transport solutions that reflect local conditions.</li> </ul>				
	Objective 2 looks at creating a safe and resilient transport system for the future. A strategic outcome of this objective is a safe and legible road network that facilitates the effective movement and access of people and goods and contributes to the liveability and financial sustainability of the region.				
	More specifically, this looks at securing the transport network from extreme weather and other unforeseeable events to facilitate the continued movements of goods and services in a way that is integrated with the region's emergency management plans and communications systems.				
Whitsunday Regional Council					
Whitsandag	Regional Economic Development Strategy				
	The 2022-2025 strategy has a goal to deliver more investment and more jobs, as the pathway to securing the economic and environmental sustainability of the Whitsunday region.				
	The strategy focuses on supporting key industries within the region including agriculture, aquaculture, mining, tourism and space launch. All local residents utilise the Whitsunday Coast Airport and the Bruce Highway for transport, placing pressure on the infrastructure to meet the growing needs to the local community.				
REGIONAL ECONOMIC DEVELOPMENT STRATEGY 2022-2025	Focusing on industry growth and transport infrastructure, a priority action from the plan is the development of a Whitsunday Freight Hub to support agricultural exports. This initiative is located at the Whitsunday Coast Airport and its purpose is to				
	infrastructure in place from on farm to the freight hub, the				

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## Planning Priority Report: Content Summary – Strategic Alignment / Paper

	potential for road closures could impact the delivery of agricultural goods to market.
Whitsanday Negoti Exert	Whitsunday Regional Council Corporate Plan 2021-2026
	The corporate plan sets Council's vision from 2021 to 2026 and outlines the areas of focus, priorities and specific initiatives that Council have committed to delivering.
	Specifically considering road infrastructure, an objective in the strategic plan is to improve the transport network with a focus on road safety and renewal of ageing infrastructure.

CORPORATE PLAN 2021-2028

#### **Isaac Regional Council**



## **Community Strategic Plan**

The Isaac Regional Council produced a Community Strategic Plan in 2015, outlining Council's 20-year vision.

As part of the infrastructure component, there is a section on the management of road infrastructure to help achieve their goal. As part of the strategic plan developed, Council undertook a strengths, weaknesses and threat analysis (SWOT), which mentions the aging nature of current transport infrastructure as a key weakness. It also identifies a lack of federal and state investment in infrastructure in the region.

The plan outlines a key opportunity for infrastructure within the region is the development of global standard rail and road infrastructure to enable future adaption. The strategic plan has a number of measuring success points and under infrastructure, a key measurement to success is plans to enable the effective and sustainable provision and maintenance of road infrastructure.

Annual Operational Plan 2022-2023

Council's operational plan provides an overview of how Council will deliver on the priorities in the corporate plan. In relation to road infrastructure, the following are noted as a key strategies:

- Plan, provide and maintain effective and sustainable road infrastructure to meet the needs to key economic and community activities.
- Ensure that the assets maintained and constructed are appropriate to the current and future needs of the region's industries.

The operational plan identifies other strategic that relate to community and economy. To support growth in the community and diversification and growth in the economy, sufficient transport infrastructure is crucial.



## Planning Priority Report: Content Summary – Strategic Alignment / Paper **Queensland Government Priorities Queensland Transport Strategy** The Queensland Transport Strategy outlines the State Government's 30-year plan for transport in Queensland, with the report outlining five key strategic outcomes: • Accessible, convenient transport. Safe journeys for all. Seamless, personalised journeys. Efficient, reliable and productive transport for people and goods. Sustainable, resilient and liveable communities. The main highway that connects the region is the Bruce Highway and is the main arterial route for the Mackay and Whitsunday region. Isaac has thee major arterial routes including the Bruce Highway, Great Inland Way/ Gregroy Highway and Peak Downs Highway. The transport strategy focuses on key initiatives including, and for the Bruce Highway, the strategy identified the following as initiatives that are underway or recently completed: · Addressing blackspots to improve safety. Implementation of Smart Motorways technology to monitor conditions, identify incidents and provide real-time information to drivers so they can plan their trips accordingly and avoid delays. • Enhancing roads across the state to improve flood resilience. As the Bruce Highway connects the Greater Whitsunday regions to both northern economic hubs like Townsville and Cairns and the south eastern corridor including Brisbane that contains the majority of the economic activity within the state, improving safety and accessibility is key. Mackay Isaac Whitsunday Regional Transport Plan In 2018, the Queensland Government's Department of Main MACKAY ISAAC Roads and Transport developed a series of regional transport WHITSUNDAY plans for all areas across the state, which have now come into effect. For the Greater Whitsunday region, this report detailed goals, challenges and opportunities for the area. It provides a pathway of priorities and actions the state government could utilise to achieve the goals. The plan includes four priorities: A transport system that supports economic development – including diversification of business and industry as a strategy for job creation and growth in the region. A more resilient transport network - that keep the region safe, • connected and well informed. A transport system that is safe for customers - driving towards zero transport deaths in the region. Liveable and connected communities - with a focus on • attracting and retaining people. There are a number of initiatives that have been undertaken to address safety and flood mitigation to support connectivity and economic activity. There are still a number of objectives to continue to support regional connectivity and economic development including: Facilitate supply chains that efficiently link producers, • distributors and consumers on an integrated network.



Planning Priority Report: Content Summa	ary – Strategic Alignment / Paper
Planning Priority Report: Content Summa	<ul> <li>Ary - Strategic Alignment / Paper</li> <li>Plan and develop a safe, legible and enjoyable transport experience accessing the destinations in the region that people want to visit.</li> <li>A transport system that remains resilient and reliable for customers, despite major weather events.</li> <li>Provide the emergency connections needed to keep locals safe.</li> <li>A transport system that enables our customers to make intelligent mobility decisions.</li> <li>A road network that allows customers to travel safely.</li> <li>Educated transport users that play a strong role in enhancing safety.</li> <li>Connect customers to major attractions, employment centres and</li> <li>essential services in an efficient, legible and equitable way.</li> <li>Provide customers with increased travel choice and mobility across the region.</li> </ul>
Australian Government Priorities	
	Northern Australia White Paper
Australian Gocument	The Northern Australia Overview, released in 2015, laid out several transport infrastructure investments across the region. The paper looks at funding high priority public infrastructure, while making it easier for private sector investments to invest in infrastructure where it can get a return.
	It promised \$600 million for an inland highways road package upgrade across northern Australia, and a \$3 billion specifically for the northern section of the Bruce Highway, from Rockhampton to Cairns (Northern Australia Roads Program). There was also a further \$100 million promised to help upgrade the cattle roads, which is an important component of the area's agricultural sector, with the express purpose of improving cattle supply chains.
	Under this funding, investment in the region included the Bowen Developmental Road and the Peak Downs Highway. Overall, the Northern Australia White Paper was developed to support economic growth in the north and road infrastructure that supports connectivity is a big component of growth.
infrastructure	Australian Infrastructure Plan
Reforms to meet Australia's future infrastructure needs	The 2021 Australian Infrastructure Plan was developed to explore the reforms required to meet Australia's future infrastructure needs. There are a number of key focus areas for infrastructure including transport.
2021 Australian Infrastructure Plan	<ul> <li>The 2036 vision for transport is "Transport services should seamlessly connect people and goods across our vast continent. From door-to door urban journeys to paddock-to-plate and pit-to port supply chains, transport should be reliable and simple to use".</li> <li>There were seven transport reform points identified, including:</li> <li>Transport – the great enabler.</li> <li>Regional connectivity – making the case.</li> <li>Door-to door journey's – part of the reform.</li> <li>Valued supply chains – connected markets.</li> <li>Staged outcomes – based on strategic place-based goals.</li> <li>Connected, autonomous, electric and shared vehicles – the revolution is happening.</li> <li>Pricing overhaul – all modes, for a more efficient network.</li> </ul>



## Planning Priority Report: Content Summary – Strategic Alignment / Paper



Source: Whitsunday Regional Council (2021 & 2022), Isaac Regional Council (2015 & 2022), Mackay Regional Council (2021), Queensland Government (2018 & 2020), Australian Government (2015, 2021 & 2022).



# APPENDIX B: MAJOR INDUSTRY OVERVIEW

This Appendix provides an overview of the major industries located in the Greater Whitsunday region. A breakdown into each Local Government Area (LGA) (Mackay, Isaac and Whitsunday) is provided in Appendix C.

## **MAJOR INDUSTRIES**

## Mining

Mining is a large industry in the Greater Whitsunday region, however, there are only a handful of mines. The Greater Whitsunday region reaps the benefits of close proximity to neighbouring mining areas, through spending and investment by workers.

The current mines in the Greater Whitsunday region include:

- Bowen LGA:
  - o Sonoma Coal Mine
  - Collinsville Coal Mine
  - Mount Carlton Gold Mine
- Isaac LGA:
  - o Byerwen Coal Mine
  - Hail Creek Coal Mine
  - o Goonyella Coal Mine
  - South Walker Creek Coal Mine
  - Moranbah North Coal Mine
  - o Grosvenor Coal Mine
  - o Coppabella Coal Mine
  - Broadlea Coal Mine
  - o Carborough Downs Coal Mine
  - Isaac Plains Coal Mine
  - o Moorvale Coal Mine
  - Millennium and Mavis Downs Coal Mine

- o Drake Coal Mine
- o Jax Coal Mine.
- Poitrel Coal Mine
- o Daunia Coal Mine
- o Caval Ridge Coal Mine
- Peak Downs Coal Mine
- Saraji Coal Mine
- o Lake Vermont Coal Mine
- o Blair Athol Coal Mine
- o Clermont Coal Mine
- o Middlemount Coal Mine
- Capcoal Coal Mine
- Foxleigh Coal Mine.



The map below provides an overview of the operating coal mines in the Greater Whitsunday region by LGA.

Figure B. 1. Operating Mines by LGA



Source: Australian Government (2021).

## AGRICULTURAL PRODUCTION

The Greater Whitsunday region is home to a diverse range of agricultural industries, producing a range of livestock, broadacre (including sugarcane), horticultural (both annual and perennial) and seafood products.

## **Overview of Production**

The total value of agricultural production in the region is estimated at \$1,352.9 million in 2021 (ABS, 2022a). As highlighted below, the Isaac LGA contributes the largest value of agricultural production at \$557.0 million. This is largely driven by the value of cattle and calves, representing approximately 76.6% of the total value of production in Isaac.

Agricultural production by value in the Mackay LGA is primarily driven by broadacre production, accounting for 80.0% of total value in 2021. Whitsunday on the other hand is driven by horticultural products, accounting for 58.0% of total value of production.







Broadacre Hay Horticulture Livestock Products Other Livestock Cattle and Calves Other Notes: Other includes nurseries, cut flower, and cultivated turf.

Source: ABS (2022a).

On a per tonne of product (t), broadacre is the largest industry in the Greater Whitsunday region. This was followed by horticulture and hay.

Meet cattle is a significant industry within the region, particularly within the Isaac LGA as highlighted in the figure above.

Commodity	Mackay	Isaac	Whitsunday	Total
Broadacre (t)	6,240,819	869,419	1,136,674	8,246,912
Meat Cattle (no.)	93,520	805,684	241,489	1,140,693
Horticulture (t)	1,071	1	102,358	103,430
Hay (t)	6,438	25,541	6,264	38,243
Other Livestock (No.)	23,404	2,105	1,296	26,805
Silage Production (t)	3,471	2,708	802	6,981
Eggs <sup>1</sup>	290,175	0	0	290,175
Notes:	·		·	

Table	R ·	1	Volume	of	Agricultural	P	Production	2021
Iaple	Ь.		volume	UI.	Agricultural		Touuction,	2021

<sup>1</sup> Commercial hen egg production for human consumption – total (dozens)

Other livestock includes sheep and lambs, dairy cattle and poultry.

Source: ABS (2022a).

#### **Broadacre Crops - Livestock**

## Value

The livestock industry is the largest contributor to the Greater Whitsunday region's agricultural sector, contributing \$628.6 million in 2021 (46.5% of total agricultural value). The livestock industry is dominated by beef cattle production, accounting for 99.9% of industry value. The remaining value is attributed to other livestock including sheep and lamb, pigs and poultry, which is not a regionally significant industry.





Figure B. 3. Value of Livestock Production (\$M)

Source: ABS (2022a).

## Table B. 2. Value of Livestock (\$), 2021

Commodity	Mackay	Isaac	Whitsunday	Total
Meat Cattle	\$51,946,848	\$442,250,227	\$133,540,401	\$627,737,477
Other Livestock	\$701,451	\$128,528	\$54,126	\$884,104
Source: ABS (2022a).				

Livestock Heard

In 2021, there were an estimated 1.1 million head of meat cattle in the Greater Whitsunday region. Approximately 70.6% of these cattle were in the Isaac LGA.





Figure B. 4. Livestock Heard, Volume (No.)

Source: ABS (2022a).

## Table B. 3. Volume of Livestock (No.), 2021

Commodity	Mackay	Isaac	Whitsunday	Total
Meat Cattle	93,520	805,684	241,489	1,140,693
Other Livestock	23,404	2,105	1,296	26,805
Source: APS (2022a)				

Source: ABS (2022a).

#### Broadacre - Sugarcane

## **Production Value**

In 2021, sugarcane production was valued at \$329.3 million, 24.3% of the total value of Greater Whitsunday agricultural production. The Mackay LGA provides the largest contribution (78.2%) at \$257.4 million, followed by Whitsundays LGA (Proserpine milling area) (14.2%) at \$46.8 million and Isaac LGA (Plane Creek milling area) (7.6%) at \$25.1 million.



#### Figure B. 5. Sugarcane Commodity by Value (\$M), 2021



Source: ABS (2022a).

## Table B. 4. Value of Sugarcane (\$), 2021

Commodity	Mackay	Isaac	Whitsunday	Total
Sugarcane	\$257,420,420	\$25,145,318	\$46,759,924	\$329,325,662
Source: ABS (2022	2a).			

The ABS does not report on the production factors of sugarcane, which include sugar, molasses and electricity. Stakeholder engagement with the Australian Sugar Milling Council indicated in 2022, for every dollar of cane supply, molasses is equivalent to \$0.17, electricity is equivalent to \$0.05 and raw sugar if \$1.79. Based on the total value of sugarcane in the Greater Whitsunday region in 2021, the production outputs could value:

- \$54.7 million molasses
- \$16.4 million electricity
- \$591.1 million raw sugar.

#### **Production Volume**

In 2021, the Greater Whitsunday region produced 8.0 million tonnes of sugarcane. Production was largely concentrated in the Mackay LGA, accounting for 78.2% of total production in the Greater Whitsunday region.

Five mills within the Greater Whitsunday region crush the sugarcane, including:

- Proserpine.
- Farleigh.
- Marian.
- Racecourse.
- Plane Creek.







Source: ABS (2022a).

## Table B. 5. Volume of Sugarcane (Tonnes), 2021

Commodity	Mackay	Isaac	Whitsunday	Total
Sugarcane	6,234,449	608,993	1,132,476	7,975,918
Source: ABS (2022	2a).			

### **Seasonality**

Harvest of sugar is generally undertaken between July and December, with the harvest dependent on weather conditions. Planting of sugarcane takes place in Mark and April with the cane not being able to be harvested until a year after growing.

#### Table B. 6. Sugarcane Seasonality

	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sugarcane												
Cycle	Plantin	g	Harves	t								
Source: AEC.												

#### Other Broadacre Crops

### **Production by Value**

A breakdown of broadacre production (excluding sugarcane) highlights that the Isaac is the leading LGA in terms of other broadacre production value in 2021. Three main commodities drove this activity including sorghum (\$49.5 million), chickpeas (\$30.8 million) and wheat (\$17.6 million).









## Table B. 7. Value of Other Broadacre Crops (\$), 2021

Commodity	Mackay	Isaac	Whitsunday	Total
Wheat	\$160,354	\$17,648,985	\$81,449	\$17,890,789
Oats	\$1,560	\$4,627	\$0	\$6,187
Barley	\$0	\$461,852	\$0	\$461,852
Sorghum	\$228,989	\$49,528,760	\$1,310,280	\$51,068,029
Rice	\$21,953	\$0	\$0	\$21,953
Maize	\$119,631	\$778,685	\$0	\$898,316
Other cereals	\$0	\$0	\$0	\$0
Cotton	\$0	\$0	\$0	\$0
Canola	\$0	\$0	\$0	\$0
Other Oilseeds	\$3,735,188	\$0	\$0	\$3,735,188
Chickpeas	\$147,107	\$30,760,192	\$0	\$30,907,299
Lentils	\$0	\$0	\$0	\$0
Lupins	\$0	\$0	\$0	\$0
Other pulses	\$82,238	\$2,366,314	\$0	\$2,448,552
Other	\$17,975	\$1,450,334	\$18,575	\$1,486,885

Source: ABS (2022a).

## **Production Volume**

In 2021, the Greater Whitsunday region produced 270,994 tonnes of broadacre crops (excluding sugarcane). This included 153,880 tonnes of sorghum, 51,340 tonnes of chickpeas and 54,914 tonnes of wheat.







Source: ABS (2022a).

Table B. 8.	Volume of	<b>Other Broadacre</b>	Crops	(Tonnes),	2021
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Commodity	Mackay	Isaac	Whitsunday	Total
Wheat	492	54,172	250	54,914
Oats	6	19	0	25
Barley	0	1,653	0	1,653
Sorghum	690	149,242	3,948	153,880
Rice	53	0	0	53
Maize	299	1,948	0	2,247
Other cereals	0	0	0	0
Cotton	0	0	0	0
Canola	0	0	0	0
Other Oilseeds	4,504	0	0	4,504
Chickpeas	244	51,096	0	51,340
Lentils	0	0	0	0
Lupins	0	0	0	0
Other pulses	80	2,297	0	2,377

Source: ABS (2022a).

## **Seasonality**

The table below provides an overview of seasonality by commodity. The following is noted:

- Sorghum is sown in September and October along with December and January. Harvesting takes place between February and May.
- Chickpea sowing begins in April through to June. The harvest of the crop is between October and November.
- Cereals (including commodities such as wheat, oats, and barley). The timeline is the same as chickpea production.

It is noted that winter crops include wheat, barley, oats and chickpeas while summer crops include sorghum, sunflowers, maize, mungbeans, soybeans and cotton (GrainGrowers, 2021).



## Table B. 9. Other Broadacre Crops Seasonality

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sorghum												
Chickpea												
Cereals												
Cycle	Sowing	)	Harves	st								
Source: GrainGro	wore (2021	1)										

Source: GrainGrowers (2021).

## Horticulture Crops

## **Production Value**

Based on Horticultural cropping value, the Whitsunday LGA is the largest driver of horticulture activity within the Greater Whitsunday region. There are a number of high value horticulture crops in the LGA, the top five are highlighted below:

- Tomatoes \$76.3 million.
- Sweet corn \$62.2 million.
- Capsicums \$39.4 million.
- Beans \$38.7 million.

## Figure B. 9. Value of Horticulture Crops (\$M), 2021



## Table B. 10. Value of Horticulture Crops (\$), 2021

Commodity	Mackay	Isaac	Whitsunday	Total
Mangoes	\$87,591	\$0	\$16,013,670	\$16,101,262
Other Orchid Fruit	\$248,042	\$334,938	\$0	\$582,980
Macadamias	\$11,241	\$0	\$0	\$11,241
Strawberries	\$65,269	\$9,585	\$0	\$74,854
All other berry fruit	\$13,474	\$0	\$0	\$13,474
Bananas	\$161,851	\$0	\$0	\$161,851
Pineapples	\$625,514	\$0	\$0	\$625,514

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## GW3 ROAD CLOSURE ECONOMIC ANALYSIS



Commodity	Mackay	Isaac	Whitsunday	Total
All other fruit	\$0	\$0	\$634,466	\$634,466
Beans	\$179,681	\$0	\$38,730,511	\$38,910,192
Broccoli	\$0	\$0	\$19	\$19
Capsicums	\$0	\$0	\$39,370,619	\$39,370,619
Carrots	\$0	\$0	\$287,282	\$287,282
Cucumbers	\$0	\$0	\$421,516	\$421,516
Herbs	\$126	\$0	\$0	\$126
Melons	\$43,525	\$0	\$4,062,893	\$4,106,419
Potatoes	\$0	\$0	\$5,111,283	\$5,111,283
Pumpkins	\$9,592	\$0	\$1,620,815	\$1,630,407
Sweet corn	\$66,754	\$0	\$62,243,757	\$62,310,511
Tomatoes	\$0	\$0	\$76,339,277	\$76,339,277
All other vegetables	\$82,269	\$0	\$15,272,327	\$15,354,596

Source: ABS (2022a).

## **Production Volume**

In 2021, 103,430 tonnes of horticultural crops were produced. The top five commodities by volume include:

- Tomatoes 29,854 tonnes
- Sweet corn 28,753 tonnes
- Capsicums 17,526 tonnes
- Beans 7,974 tonnes
- Potatoes 5,800 tonnes.

## Figure B. 10. Volume of Horticulture Crops (Tonnes), 2021







Table B. 11.	Volume of H	<b>Horticulture</b>	Crops	(Tonnes),	2021
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Commodity	Mackay	Isaac	Whitsunday	Total
Mangoes	29	0	5,328	5,357
Macadamias	2	0	0	2
Strawberries	10	1	0	11
Bananas	85	0	0	85
Pineapples	816	0	0	816
Beans	37	0	7,938	7,974
Capsicums	0	0	17,526	17,526
Carrots	0	0	294	294
Cucumbers	0	0	190	190
Melons	49	0	4,593	4,643
Potatoes	0	0	5,800	5,800
Pumpkins	13	0	2,113	2,126
Sweet corn	31	0	28,722	28,753
Tomatoes	0	0	29,854	29,854

Source: ABS (2022a).

## **Seasonality**

The table below provides an overview of the seasonality of a number of horticultural crops within Queensland.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mangoes												
Tomatoes												
Beans												
Capsicums												
Pumpkin												
Watermelon												
Potatoes												
Sweet Corn												

Availability Low Med High

Source: Hort Innovation (2022).

## Aquaculture

The ABS data utilised in the above sections do not account for aquaculture production. Aquaculture production is an up-and-coming industry within the Greater Whitsunday region.

Due to the current size of the industry, there is a lack of public information. The table below highlights the current value of aquaculture in the Greater Whitsunday region.

## Production by Region – Aquaculture

The Greater Whitsunday region was the most valuable aquaculture region in Queensland, producing \$116.3 million of goods in 2021-22 (51.8% of the state value). The Greater Whitsunday region produced 6,367.5 tonnes on 367.0 hectares of ponded area.

Table B. 13. Regional Aquaculture Production	n, 2021-22 by Statistical Area 4 (SA	4)
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SA4	Production (tonnes)	Ponded area (hectares)	Employment (FTE)	Total Production Value (\$M)		
Brisbane – East	-	-	7.3	\$0.2		
Cairns	3,641.9	356.4	194.8	\$54		
Gold Coast	1,014.3	111.5	83.2	\$18.6		

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## GW3 ROAD CLOSURE ECONOMIC ANALYSIS



SA4	Production (tonnes)	Ponded area (hectares)	Employment (FTE)	Total Production Value (\$M)	
Mackay, Isaac and Whitsunday	6,367.5	367.0	271.5	\$116.3	
Queensland – Outback	-	-	15.6	\$1.2	
Sunshine Coast	-	-	3.5	\$0.2	
Townsville	1,275.6	107.4	218	\$19.4	
Wide Bay-Burnett	272.4	159.3	60.7	\$7.3	
Total	13,022.7	1,165.7	889.4	\$224.6	

Note: Total may not sum due to rounding. Source: DAF (2022).

## **Seasonality**

Despite wild barramundi typically spawning between march and September, seasonality for aquaculture barramundi production is often observed year-round for both hatchery and harvesting.

Aquaculture prawns have peak harvesting seasons between December and January, and March and April. Hatchery in prawns is generally observed between June and September.

## Table B. 14. Seasonality of Aquaculture Prawns

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prawns												
Cycle	Harvest		Breedi	ng								

Source: Hort Innovation (2022).

## Tourism

The section below provides an overview of tourism for the entire Greater Whitsunday region unless stated otherwise. For a breakdown of tourism by LGA, refer to Appendix A.

## **Total Visitors**

In 2022, the Greater Whitsunday region attracted a total of 3.3 million visitors. Of total visitation, approximately 57.8% were domestic overnight, 40.2% were day trips and the remaining 2.0% were international visitors.

The visitation numbers in 2022 were the highest that has been recorded over 10 years. The increase in largely driven by the rise in domestic overnight visitors, which has experienced an average annual growth rate of 4.9% from 2012 to 2022.

It is important to acknowledge the impacts of the COVID-19 pandemic and the impact that the national and international boarder closures had on the tourism industry. Although there was a 22.0% decline in total visitation from 2019 to 2020, the Greater Whitsunday region has experienced a bounce back in tourism as boarders reopened. International visitation is still softer than pre-pandemic levels, though is still experiencing a recovery.





Figure B. 11. Total Visitors to the Greater Whitsunday Region (000), 2012 to 2022

Source: TRA (2023).

The table below provides an overview of total tourism to each LGA within the Greater Whitsunday region. It is important to note that each LGA cannot be summed to total the Greater Whitsunday region (which is highlighted above) as some visitors may visit more than one LGA on their trip and therefore this would double count visitors. The following is noted about the growth in visitation in each LGA from 2012 to 2022:

- Whitsunday has experienced a 3.8% average annual growth in visitors from 2012 to 2022.
- Mackay has experienced a 0.9% average annual growth in visitors from 2012 to 2022.
- Isaac has experienced a 4.3% average annual growth in visitors from 2012 to 2022.

Figure B. 12. Total Visitors for Each LGA (000), 2012 to 2022



Source: TRA (2023).

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## Average Length of Stay

In 2022, domestic overnight visitors stayed within the Greater Whitsunday region for approximately 4.9 nights. This is higher than pre-COVID-19 levels which were estimated to total 4.38 nights in 2019.

The average length of stay for international visitors to the Greater Whitsunday region has generally been declining from 2012. In 2022, the average length of stay for international visitors was estimated to total 6.91 nights. Before the impact of COVID-19 in 2019, the average length of stay for international visitors were estimated to total 7.4 nights.





Note: Excludes 2021 data due to limited travel (particularly international visitors) from the COVID-19 pandemic. Source: TRA (2023).

## Transportation

The self-drive vehicle is the most popular form of transportation used by visitors to the Greater Whitsunday region and this has been rising with the increase in visitors. In 2022, the self-drive vehicle form on transportation accounted for 72.4% of the total. This proportion increased slightly during the COVID-19 pandemic, reaching 81.1% of total transportation in 2020 and 76.8% in 2021.





## Figure B. 14. Transportation Used on Trip (000), Greater Whitsunday Region, 2012 to 2022

## **Tourism Expenditure**

The section below provides an overview of annual visitor expenditure to the Greater Whitsunday region. TRA data provides expenditure by tourism region and the figures below highlight visitor expenditure for the Mackay and the Whitsunday tourism region.

## Domestic Day Expenditure (\$M)

Within the Greater Whitsunday region, expenditure has experienced fluctuations over the years, peaking at \$322.6 million in day trip expenditure in 2022.





Source: TRA (2023).

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#### **Domestic Overnight Expenditure**

Similar to day trip expenditure, domestic overnight expenditure experienced a peak in 2022, reaching \$2,175.4 million.



#### Figure B. 16. Domestic Overnight Expenditure (\$M)

Source: TRA (2023).

#### **International Expenditure**

International expenditure within the Greater Whitsunday region has historically been driven by the Whitsundays Tourism Region. Similar with international visitors, international expenditure has significantly been impacted by international travel restrictions placed over the COVID-19 pandemic. International expenditure declined from \$168.8 million in 2019 to \$72.8 million in 2022.





Figure B. 17. International Expenditure (\$M)

Source: TRA (2023).

## PORT TRADE DATA

The table below provides a summary of the trade statistics for the three trade ports located in the Greater Whtisunday region.

Financial Year	2015-16	2016-17	2017-18	2018-19	2019-20
Export					
Abbot Point	27,053,965	25,407,736	27,992,820	28,943,291	31,882,050
Hay Point	115,768,354	106,454,734	120,439,007	118,317,132	110,862,552
Mackay	1,267,043	1,287,572	1,149,124	1,050,467	1,184,937
Import					
Mackay	1,562,421	1,619,383	1,858,656	1,860,060	1,992,956

#### Table B. 15. North Queensland Bulk Ports Trade Data (Tonnes)

Source: TMR (2020).

#### Port of Abbot Point

The Port of Abbot Point is located approximately 25km north of Bowen and it is known as Australia's northernmost export coal port. The Port is owned by North Queensland Bulk Ports (NQBP), but the port land has been leased to the Adani Group for a 99-year term.

All of the activity through the Port of Abbot Point (100%) is coal related.

Financial Year	2015-16	2016-17	2017-18	2018-19	2019-20
Total Exports					
Coal	27,053,965	25,407,736	27,992,820	28,943,291	31,882,050
Total Imports					
Imports	0	0	0	0	0
Total Throughput					
Throughput	27,053,965	25,407,736	27,992,820	28,943,291	31,882,050
Source: TMP (2020)					

#### Table B. 16. Abbot Point Throughput, 2015-16 to 2019-20

Source: TMR (2020).



#### Port of Mackay

The Port of Mackay is located approximately five km north of that Mackay CBD. It is a multi-cargo port and operates four berths/wharves.

The largest export commodity from the Port of Mackay was sugar and refined sugar (88.3% of total exports), supporting the local sugarcane industry. The largest imported community was petroleum products, accounting for 84.2% of the total imports in 2019-20.

Financial Year	2015-16	2016-17	2017-18	2018-19	2019-20
Total Exports					
General Cargo	48,592	35,533	0	10,892	0
Grain	139,550	228,638	148,245	46,049	77,105
Industrial Alcohol	20,438	21,092	21,625	14,081	18,258
Motor Vehicles	0	0	752	2,239	0
Molasses	0	66,487	47,375	0	0
Refined Sugar	256,163	270,633	281,883	284,647	256,305
Scrap Metal	8,067	18,324	52,109	65,184	41,952
Sugar	790,011	643,308	594,636	623,200	789,672
Tallow	4,222	3,557	2,499	4,175	1,645
Total exports	1,267,043	1,287,572	1,149,124	1,050,467	1,184,937
Total Imports					
Bulk Fertilisers	34,182	52,115	55,396	33,326	53,257
Cement	10,009	11,000	18,012	24,000	24,000
General Cargo	0	0	104,951	52,454	96,311
Iron Concentrates	124,092	155,156	106,668	166,246	140,646
Petroleum Products	1,380,251	1,401,112	1,573,629	1,584,034	1,678,742
Sulphuric Acid	13,887	0	0	0	0
Total imports	1,562,421	1,619,383	1,858,656	1,860,060	1,992,956
Total Throughput					
Throughput	2,829,464	2,906,955	3,007,779	2,910,527	3,177,893
Source: TMR (2020).					

Table B. 17. Mackay	Throughput,	2015-16 to	2019-20
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Port of Hay Point

The Port of Hay Point is located approximately 30 km south of Mackay and is one of the largest export coal ports in the world. There are two separate coal terminals at the Port of Hay Point, including Dalrymple Bay Coal Terminal (DBCT) and Hay Point Coal terminal (HPCT). These two terminals service coals mines in the Bowen Basin and the following is noted about each terminal (TMR, 2020):

- DBCT is leased from the state government Dalrymple Bay Infrastructure.
- HPCT is owned by BHP Billiton Mitsubishi Alliance and operated by Hay Point Services.

The DBCT have four shipping berths and HPCT have three shipping berths.



### Table B. 18. Hay Point Throughput, 2015-16 to 2019-20

Financial Year	2015-16	2016-17	2017-18	2018-19	2019-20
Total Exports					
Coal - DBCT	67,517,529	63,025,148	70,826,968	69,385,033	61,177,226
Coal - HPCT	48,250,825	43,429,586	49,612,109	48,932,099	49,685,326
Total exports	115,768,354	106,454,734	120,439,077	118,317,132	110,862,552
Total Imports					
Imports	0	0	0	0	0
Total Throughput					
Throughput	115,768,354	106,454,734	120,439,077	118,317,132	110,862,552

Source: TMR (2020).



# APPENDIX C: IMPACT IDENTIFICATION – ECONOMY & INDUSTRY

## AGRICULTURE, FORESTRY, AND FISHING

#### **Direct Impacts**

- 1 Day Closure: Minor delays in the transportation of goods, potential increase in operating costs.
- 2 Day Closure: Escalation in delays causing perishable goods to spoil, increased costs, potential disruption in supply chains.
- 3 Day Closure: Major disruption in supply chains, significant financial losses, potential lay-offs or downsizing.
- Longer Closure: Severe disruption in all operations, substantial financial losses, potential bankruptcies or closures.

#### Lagging Impacts

- Potential long-term damage to relationships with clients and suppliers.
- Extended recovery period with possible permanent changes in operation methods.

## MINING

#### **Direct Impacts**

- 1 Day Closure: Minimal disruption in the transportation of materials, slight increase in costs.
- 2 Day Closure: Moderate disruption in supply chains, potential delays in project timelines, financial implications.
- 3 Day Closure: Significant delays in projects, financial losses, potential contractual penalties.
- Longer Closure: Complete halt in some operations, severe financial and legal consequences, possible loss of market position.

#### Lagging Impacts

- Long-term repercussions on contracts and client relationships.
- Potential restructuring or downsizing depending on the scale of losses.

## MANUFACTURING

#### **Direct Impacts**

- 1 Day Closure: Short delays in the delivery of raw materials and finished goods, minimal cost implications.
- 2 Day Closure: Growing concerns with inventory levels, escalating costs, potential disruption in production schedules.
- 3 Day Closure: Significant disruption in production, financial losses, potential lay-offs.
- Longer Closure: Cessation of production, extreme financial strain, potential closures or bankruptcies.

#### Lagging Impacts

• Long-term challenges in recovering production levels, rebuilding client relationships, and restoring financial stability.



## **RETAIL TRADE**

#### **Direct Impacts**

- 1 Day Closure: Minor inconveniences in stock deliveries, possible short-term loss in revenue.
- 2 Day Closure: Increased difficulty in maintaining inventory levels, growing financial concerns.
- 3 Day Closure: Major disruption in availability of goods, significant revenue losses, potential temporary closures.
- Longer Closure: Severe financial strain, possible permanent closures of some establishments.

#### Lagging Impacts

• Extended recovery period with potential changes in consumer behaviour, possible downsizing or restructuring.

## CONSTRUCTION

#### **Direct Impacts**

- 1 Day Closure: Slight delays in construction material delivery, minimal effect on project timelines.
- 2 Day Closure: Noticeable disruption in the supply chain, potential delays in project completion, cost increases.
- 3 Day Closure: Significant delays in ongoing projects, financial strain, workforce challenges.
- Longer Closure: Severe delays or cessation of projects, major financial implications, potential contract breaches.

#### Lagging Impacts

• Long-term recovery of project timelines, potential legal disputes, reputational damage.

## SUGARCANE (GROWING, HARVESTING, AND PRODUCTION)

#### **Direct Impacts**

- 1 Day Closure: Minor delays in harvesting and transportation, disruption in production schedules (mill impacts) and financial impacts.
- 2 Day Closure: Escalation in harvest delays, material disruption in production schedules, moderate financial losses.
- 3 Day Closure: Major delays in harvesting, substantial disruption in production schedules, significant financial and contractual implications.
- Longer Closure: Complete disruption in supply chains, severe financial losses, potential cessation of operations.

#### Lagging Impacts

• Long-term damage to relationships with buyers and suppliers, extended recovery period.

## TOURISM

#### **Direct Impacts**

- 1 Day Closure: Minimal inconvenience for tourists, slight decrease in bookings.
- 2 Day Closure: Growing concerns with cancellations, revenue loss, impact on service providers (e.g., tours, hotels).



- 3 Day Closure: Major cancellations, significant revenue loss, potential temporary closures of facilities.
- Longer Closure: Severe impact on all tourism services, massive financial strain, potential bankruptcies.

• Extended recovery in tourism numbers, potential lasting damage to the region's reputation, restructuring, or downsizing.

## ELECTRICITY, GAS, WATER, AND WASTE SERVICES (ANZSIC SECTOR 26)

#### **Direct Impacts**

- 1 Day Closure: Minimal disruption to services, slight operational challenges.
- 2 Day Closure: Potential delays in maintenance or repairs, moderate financial implications.
- 3 Day Closure: Significant delays in projects, substantial operational challenges, potential service interruptions.
- Longer Closure: Major disruptions in service delivery, severe financial strain, reputational damage.

#### Lagging Impacts

• Extended recovery period for service restoration, long-term financial challenges, potential regulatory scrutiny.

## WHOLESALE TRADE

#### **Direct Impacts**

- 1 Day Closure: Short delays in deliveries, minor financial implications.
- 2 Day Closure: Escalating delays, potential disruptions in supply chains, moderate financial losses.
- 3 Day Closure: Major supply chain disruptions, significant financial and operational challenges.
- Longer Closure: Complete disruption of operations, massive financial losses, potential business closures.

#### Lagging Impacts

• Long-term challenges in rebuilding supply chains, extended financial recovery.

## TRANSPORT, POSTAL, AND WAREHOUSING

#### Direct Impacts

- 1 Day Closure: Slight delays in transportation schedules, minimal cost increases.
- 2 Day Closure: Noticeable delays in shipments, potential contractual challenges, moderate financial strain.
- 3 Day Closure: Significant delays in all operations, substantial financial and legal implications.
- Longer Closure: Complete disruption in operations, severe financial and legal challenges, potential loss of contracts.

#### Lagging Impacts

• Long-term recovery in service levels, potential restructuring or downsizing, reputational damage.



## EDUCATION AND TRAINING

#### **Direct Impacts**

- 1 Day Closure: Minor inconvenience in transportation, potential short-term disruption in schedules.
- 2 Day Closure: Increased difficulty in maintaining schedules, moderate financial implications.
- 3 Day Closure: Major disruption in education delivery, significant financial strain.
- Longer Closure: Severe disruption in all educational activities, potential closures or suspensions of institutions.

#### Lagging Impacts

• Extended recovery period with potential long-term changes in educational delivery methods, financial challenges.

## **OTHER SERVICES**

#### **Direct Impacts**

- 1 Day Closure: Minimal disruption in services, slight delays in appointments or projects.
- 2 Day Closure: Moderate disruption in scheduling, financial concerns.
- 3 Day Closure: Significant disruption in all services, potential temporary closures, major financial losses.
- Longer Closure: Complete disruption in services, severe financial strain, potential bankruptcies.

#### Lagging Impacts

• Long-term recovery in client relationships, potential changes in service delivery methods, financial recovery.

## ARTS AND RECREATION

#### **Direct Impacts**

- 1 Day Closure: Minor inconvenience for event attendees, slight decrease in ticket sales.
- 2 Day Closure: Growing concerns with cancellations, moderate revenue loss.
- 3 Day Closure: Major cancellations, significant revenue loss, potential temporary closures of facilities.
- Longer Closure: Severe impact on all arts and recreational services, massive financial strain, potential shutdowns.

#### Lagging Impacts

• Extended recovery in audience numbers, potential lasting damage to the region's cultural reputation.

## PERSONAL SERVICES

#### **Direct Impacts**

- 1 Day Closure: Minor disruption in appointments, slight financial implications.
- 2 Day Closure: Noticeable disruption in services, moderate financial strain.
- 3 Day Closure: Major cancellations, significant financial losses.
- Longer Closure: Complete disruption in services, severe financial strain, potential closures.



• Extended recovery in client relationships, financial recovery, potential restructuring.

## COMMUNITY SERVICES

#### **Direct Impacts**

- 1 Day Closure: Minimal disruption in services, slight operational challenges.
- 2 Day Closure: Potential delays in community support, moderate financial implications.
- 3 Day Closure: Significant delays in service delivery, substantial operational challenges.
- Longer Closure: Major disruptions in community support, severe financial strain, reputational damage.

#### Lagging Impacts

• Extended recovery period for service restoration, long-term financial challenges.

## DEFENCE

#### **Direct Impacts**

- 1 Day Closure: Minor inconvenience in transportation, potential short-term disruption in operations.
- 2 Day Closure: Increased difficulty in maintaining schedules, moderate financial implications.
- 3 Day Closure: Major disruption in defence activities, significant financial strain.
- Longer Closure: Severe disruption in operations, potential impact on national security.

#### Lagging Impacts

• Extended recovery period with potential long-term changes in operational procedures, financial challenges.

## FOOD SERVICES

#### **Direct Impacts**

- 1 Day Closure: Short delays in deliveries, minor disruption in operations.
- 2 Day Closure: Noticeable delays in supply chains, moderate financial strain.
- 3 Day Closure: Major disruption in food services, significant financial losses.
- Longer Closure: Complete disruption in operations, severe financial challenges, potential closures.

#### Lagging Impacts

Long-term recovery in service levels, potential restructuring or downsizing, reputational damage.





# APPENDIX D: IMPACT IDENTIFICATION – COMMUNITY

The impacts of road closures on households and the community can have a wide-ranging effect, affecting daily life, community well-being, and economic stability. Here's an overview:

## HOUSEHOLDS

#### **Direct Impacts**

- 1 Day Closure:
  - o Inconvenience: Short delays in commuting, minor disruptions in daily routines.
  - o Access to Services: Slight difficulty accessing essential services like groceries, health care.
- 2 Day Closure:
  - o Increased Disruption: Growing inconvenience in commuting, moderate disruptions in routines.
  - Limited Access: Escalating difficulty accessing essential services, potential concerns with essential supplies.
- 3 Day Closure:
  - Major Disruption: Significant inconvenience, substantial disruptions in daily routines.
  - o Restricted Access: Major difficulty in accessing services, potential panic-buying, and hoarding.
- Longer Closure:
  - o Severe Impact: Complete disruption in daily life, potential financial strain for those unable to work.
  - Blocked Access: Severe limitations in accessing essential services, potential health and wellbeing concerns.

#### Lagging Impacts

- Extended recovery in normal routines.
- Long-term financial challenges for those impacted by work disruptions.
- Potential mental health stress and community disconnection.

## GENERAL COMMUNITY

#### **Direct Impacts**

- 1 Day Closure:
  - o Community Events: Minor disruptions in community gatherings, slight impact on local morale.
  - Emergency Services: Short delays in emergency response times.
- 2 Day Closure:
  - o Growing Concerns: Moderate impact on community events, growing concerns about accessibility.
  - Emergency Services: Noticeable delays in emergency response, potential strain on resources.
- 3 Day Closure:
  - o Major Disruptions: Substantial impact on community well-being, significant concern about isolation.
  - o Emergency Services: Major challenges in emergency response, significant resource strain.



- Longer Closure:
  - Severe Impact: Major disruptions in community connections, potential long-term damage to community cohesion.
  - o Emergency Services: Severe challenges in providing necessary services, potential public safety concerns.

- Extended recovery period for community connections, rebuilding of local morale.
- Long-term impact on community well-being, potential changes in community structures, and relationships.
- Ongoing challenges in emergency response capabilities, potential changes in public safety protocols.

## YOUTH

#### **Direct Impacts**

- 1 Day Closure: Minor disruptions to schooling, extracurricular activities.
- 2 Day Closure: Growing educational disruptions, social isolation concerns.
- 3 Day Closure: Major disruptions in education, potential mental health stress.
- Longer Closure: Severe educational gaps, significant social isolation, and mental health concerns.

#### Lagging Impacts

• Long-term educational disparities, mental health challenges, and potential loss of social skills.

## THE AGED

#### **Direct Impacts:**

- 1 Day Closure: Minor inconvenience in accessing medical care.
- 2 Day Closure: Growing concerns about healthcare and isolation.
- 3 Day Closure: Major challenges in healthcare access, significant isolation.
- Longer Closure: Severe healthcare disruptions, intense isolation, and mental health impacts.

#### Lagging Impacts

• Ongoing health challenges, long-term mental health impacts, continued isolation.

## DISABLED (MENTAL OR PHYSICAL)

#### **Direct Impacts**

- 1 Day Closure: Minor disruptions in support services.
- 2 Day Closure: Moderate challenges in accessing essential services.
- 3 Day Closure: Major disruptions in essential services, increased isolation.
- Longer Closure: Severe disruptions in daily life, significant mental and physical health impacts.



• Long-term health challenges, continued isolation, potential decline in overall well-being.

## INDIGENOUS COMMUNITIES

#### **Direct Impacts**

- 1 Day Closure: Minor disruptions in cultural activities.
- 2 Day Closure: Growing concerns about access to services.
- 3 Day Closure: Major disruptions in cultural connections, healthcare, education.
- Longer Closure: Severe disruptions in community connections, intense economic disparities.

#### Lagging Impacts

• Long-term impacts on community cohesion, continued economic challenges, cultural disconnection.

## MENTAL HEALTH COMMUNITY

#### **Direct Impacts**

- 1 Day Closure: Minor inconvenience in therapy appointments.
- 2 Day Closure: Growing concerns about mental health support.
- 3 Day Closure: Major challenges in accessing mental health care.
- Longer Closure: Severe mental health deterioration, social isolation.

#### Lagging Impacts

• Long-term mental health challenges, ongoing isolation, difficulty rebuilding support networks.

## SOCIALLY ISOLATED COMMUNITY

#### **Direct Impacts**

- 1 Day Closure: Minor increase in feelings of isolation.
- 2 Day Closure: Growing challenges in accessing support.
- 3 Day Closure: Significant increase in isolation, difficulty accessing essential services.
- Longer Closure: Severe isolation, major challenges in daily life.

#### Lagging Impacts

• Long-term challenges in physical and mental well-being, ongoing difficulties in community connection.





# APPENDIX E: INPUT-OUTPUT METHODOLOGY

## INPUT-OUTPUT MODEL OVERVIEW

Input-Output analysis demonstrates inter-industry relationships in an economy, depicting how the output of one industry is purchased by other industries, households, the government and external parties (i.e. exports), as well as expenditure on other factors of production such as labour, capital and imports. Input-Output analysis shows the direct and indirect (flow-on) effects of one sector on other sectors and the general economy. As such, Input-Output modelling can be used to demonstrate the economic contribution of a sector on the overall economy and how much the economy relies on this sector or to examine a change in final demand of any one sector and the resultant change in activity of its supporting sectors.

The economic contribution can be traced through the economic system via:

- Initial stimulus (direct) impacts, which represent the economic activity of the industry directly experiencing the stimulus.
- Flow-on impacts, which are disaggregated to:
  - **Production induced effects (type I flow-on)**, which comprise the effects from:
    - Direct expenditure on goods and services by the industry experiencing the stimulus (direct suppliers to the industry), known as the first round or direct requirements effects.
    - The second and subsequent round effects of increased purchases by suppliers in response to increased sales, known as the industry support effects.
  - Household consumption effects (type II flow-on), which represent the consumption induced activity from additional household expenditure on goods and services resulting from additional wages and salaries being paid within the economic system.

These effects can be identified through the examination of four types of impacts:

- **Output**: Refers to the gross value of goods and services transacted, including the costs of goods and services used in the development and provision of the final product. Output typically overstates the economic impacts as it counts all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
- Gross product: Refers to the value of output after deducting the cost of goods and services inputs in the
  production process. Gross product (e.g., Gross Regional Product) defines a true net economic contribution
  and is subsequently the preferred measure for assessing economic impacts.
- **Income**: Measures the level of wages and salaries paid to employees of the industry under consideration and to other industries benefiting from the project.
- **Employment**: Refers to the part-time and full-time employment positions generated by the economic shock, both directly and indirectly through flow-on activity, and is expressed in terms of full time equivalent (FTE) positions.

Input-Output multipliers can be derived from open (Type I) Input-Output models or closed (Type II) models. Open models show the direct effects of spending in a particular industry as well as the indirect or flow-on (industrial support) effects of additional activities undertaken by industries increasing their activity in response to the direct spending.

Closed models re-circulate the labour income earned as a result of the initial spending through other industry and commodity groups to estimate consumption induced effects (or impacts from increased household consumption).



## MODEL DEVELOPMENT

Multipliers used in this assessment are derived from sub-regional transaction tables developed specifically for this project. The process of developing a sub-regional transaction table involves developing regional estimates of gross production and purchasing patterns based on a parent table, in this case, the 2018-19 Australian transaction table (ABS, 2021a).

Estimates of gross production (by industry) in the study areas were developed based on the percent contribution to employment (by place of work) of the study areas to the Australian economy (ABS, 2012; ABS, 2017; ABS, 2021b; DoESE, 2021), and applied to Australian gross output identified in the 2018-19 Australian table.

Industry purchasing patterns within the study area were estimated using a Flegg Location Quotient approach, as described in Flegg *et al.* (2021), with a fixed degree of convexity applied to the regional size scalar. Regional final demand estimates (except exports) developed based on the regional inter-industry sales estimated using the Flegg Location Quotient relative to national inter-industry sales and final demand estimates for each industry (noting regional exports are assumed to reflect the remainder of total uses).

Employment estimates were rebased from 2018-19 (as used in the Australian national Input-Output transaction tables) to current year values using the Wage Price Index (ABS, 2022 c).

## MODELLING ASSUMPTIONS

The key assumptions and limitations of Input-Output analysis include:

- Lack of supply-side constraints: The most significant limitation of economic impact analysis using Input-Output multipliers is the implicit assumption that the economy has no supply-side constraints so the supply of each good is perfectly elastic. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity.
- Fixed prices: Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In assessments using Input-Output multipliers, where factors of production are assumed to be limitless, this rationing response is assumed not to occur. The system is in equilibrium at given prices, and prices are assumed to be unaffected by policy and any crowding out effects are not captured. This is not the case in an economic system subject to external influences.
- Fixed ratios for intermediate inputs and production (linear production function): Economic impact analysis using Input-Output multipliers implicitly assumes that there is a fixed input structure in each industry and fixed ratios for production. That is, the input function is generally assumed linear and homogenous of degree one (which implies constant returns to scale and no substitution between inputs). As such, impact analysis using Input-Output multipliers can be seen to describe average effects, not marginal effects. For example, increased demand for a product is assumed to imply an equal increase in production for that product. In reality, however, it may be more efficient to increase imports or divert some exports to local consumption rather than increasing local production by the full amount. Further, it is assumed each commodity (or group of commodities) is supplied by a single industry or sector of production. This implies there is only one method used to produce each commodity and that each sector has only one primary output.
- No allowance for economies of scope: The total effect of carrying on several types of production is the sum of the separate effects. This rules out external economies and diseconomies and is known simply as the "additivity assumption". This generally does not reflect real world operations.
- No allowance for purchasers' marginal responses to change: Economic impact analysis using multipliers assumes that households consume goods and services in exact proportions to their initial budget shares. For example, the household budget share of some goods might increase as household income increases. This equally applies to industrial consumption of intermediate inputs and factors of production.
- Absence of budget constraints: Assessments of economic impacts using multipliers that consider consumption induced effects (type two multipliers) implicitly assume that household and government consumption is not subject to budget constraints.



Despite these limitations, Input-Output techniques provide a solid approach for taking account of the interrelationships between the various sectors of the economy in the short-term and provide useful insight into the quantum of final demand for goods and services, both directly and indirectly, likely to be generated by a project.

In addition to the general limitations of Input-Output analysis, there are three other factors that need to be considered when assessing the outputs of sub-regional transaction table developed using the above approach, namely:

- It is assumed the sub-region has similar technology and demand/ consumption patterns as the parent (Australia) table (e.g. the ratio of employee compensation to employees for each industry is held constant).
- Intra-regional cross-industry purchasing patterns for a given sector vary from the national tables depending on the prominence of the sector in the regional economy compared to its input sectors. Typically, sectors that are more prominent in the region (compared to the national economy) will be assessed as purchasing a higher proportion of imports from input sectors than at the national level, and vice versa.
- The size of the regional economy is assumed to have an inverse relationship with the requirement to import goods/ services to meet its needs (i.e. the smaller the economy, in general the greater the reliance on imports).

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## **OUTCOME DRIVEN**



OUTCOME DRIVEN