Australia Pacific LNG Project

Volume 2: Gas Fields

Chapter 17: Traffic and Transport

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17.1 Introduction

17.1.1 Purpose

This chapter of the Australia Pacific LNG environmental impact statement (EIS) forms the traffic and transport impact assessment of the gas fields' element of the Australia Pacific LNG Project (the Project). The assessment addresses the traffic and transport impacts associated with the development, construction and operation of the gas fields. It identifies the nature, magnitude and significance of the traffic and transport impacts and identifies appropriate measures for impact management and mitigation, which are designed to reduce negative impacts and maximise the positive benefits.

The technical report in Volume 5 Attachment 35 underpins the outcomes summarised in this chapter. It provides a detailed assessment of the impact on the whole transport network from all elements of the Project – the gas fields, gas pipeline and LNG facility. It covers the background, methodology, impacts, impact assessment and mitigation measures for each mode of transport across the whole transport network.

Australia Pacific LNG recognises that the construction and operation of the gas fields could create environmental and community impacts and that successful management of these impacts will be crucial throughout the life of the Project. To this end, the assessment of this project across all disciplines has incorporated recognised sustainability principles.

Of Australia Pacific LNG's 12 sustainability principles, key relevant principles for the traffic and transport component of the EIS are:

- Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas
- Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities.

17.1.2 Scope of work

The gas fields include eight development areas broadly centred around the town of Miles and on either side of the Warrego Highway.

Key infrastructure items within the gas fields include gas processing facilities (GPFs), water treatment facilities (WTFs), water transfer stations, gas wells, new roads, communication towers and pipelines.

In this chapter, the impacts of additional traffic generated by constructing and operating gas fields infrastructure are discussed. This includes a description of the existing transport infrastructure of the surrounding region, transport tasks and routes required by the Project, potential impacts and mitigation measures and proposed infrastructure alterations. This chapter relates to the infrastructure associated with the gas fields. Impacts from constructing and operating the gas pipeline and LNG facility, such as impacts on the Port of Gladstone, shipping movements and road intersections within the Gladstone area are discussed in Volume 3 Chapter 17 and Volume 4 Chapter 17, respectively.

The traffic and transport technical report provided in Volume 5 Attachment 35 assesses the impact of the Project on the whole study area. This included the gas fields' study area, the gas pipeline's study area, and an area on Curtis Island allocated to the LNG facility, as shown in Figure 17.1. The study area for assessing the potential impacts from the construction and operation of the gas fields is the general area within and adjoining the gas field tenements.

This is a portion of the total network investigated by this study and is also where project traffic will have the greatest impact. Although the gas fields' development will generate traffic outside of this area, the investigation of the impact of the whole project on regional roads determined that roads outside the gas field tenements will be negligibly impacted by the development of the gas fields only. For example, deliveries of materials to the gas fields' study area from Brisbane via the Warrego Highway will peak at less than 60 vehicles per day which is only 1.9% of the total vehicles on this section of road.

According to the 'Guidelines for the assessment of road impacts of developments', the Department of Transport and Main Roads (DTMR) generally considers a development's road impacts to be insignificant if the development generates an increase in traffic on state controlled roads of no more than 5% of existing levels.

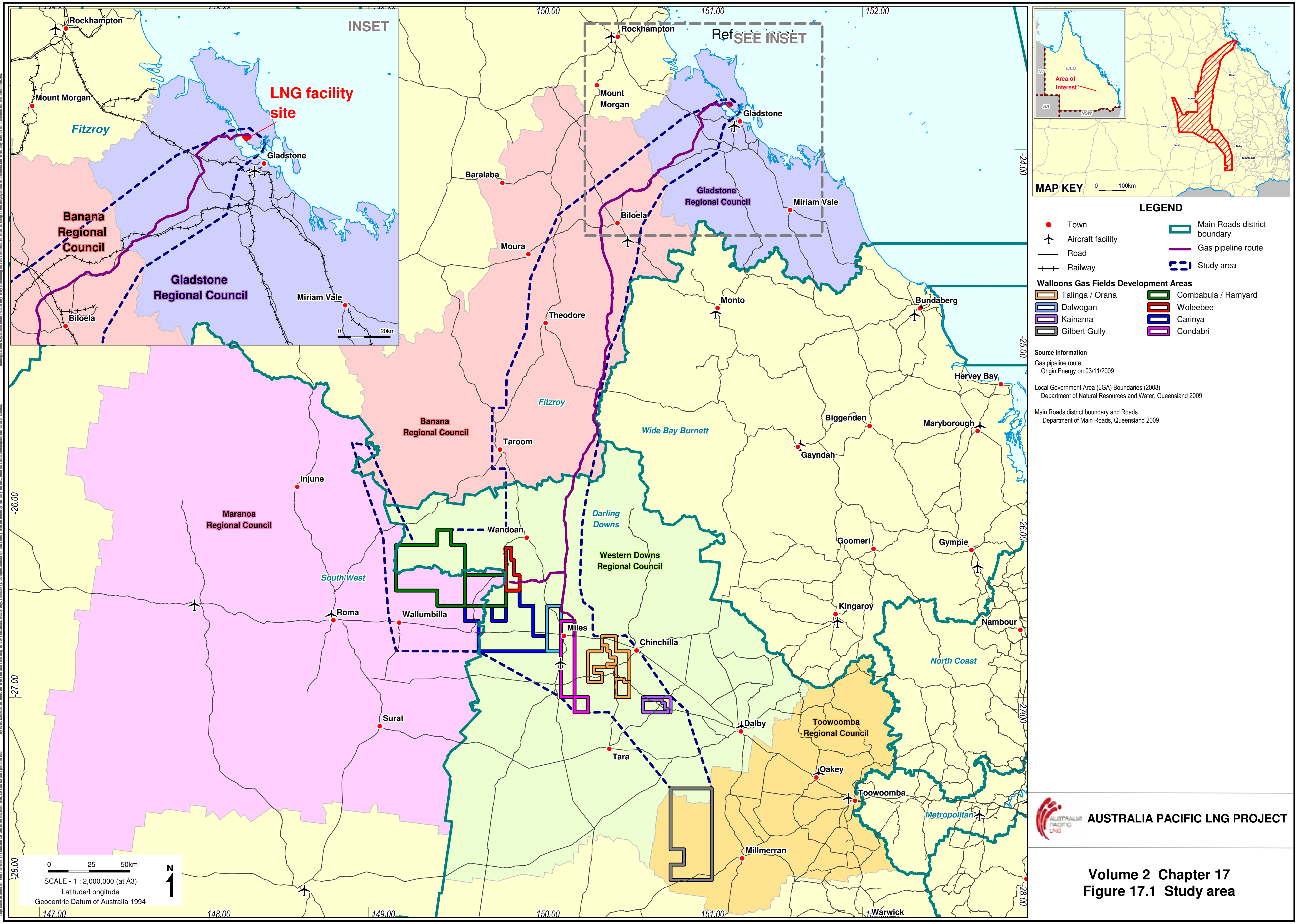
The analyses detailed in this chapter relates to a maximum development scenario. The Project configuration, timing, workforce requirements, route selection and materials requirements assumed in this chapter describe information as it is currently understood and depict the 'maximum case' scenario in terms of traffic and transport impacts. Consequently, any future changes to the Project made by Australia Pacific LNG, such as a decrease in workforce requirements, or change in location of a gas plant, are not likely to have an impact on the transport network greater than what is reported in this study.

Terms of reference

The Department of Infrastructure and Planning has produced the terms of reference (TOR) for the Project (December 2009). These provided the base assessment criteria for the Project. A series of issues to be addressed were identified for transport, including the need to describe and assess existing transport conditions, the proposed project and the likely impact of this project on the network, and the proposed mitigation measures.

The TOR for traffic and transport are provided in Volume 5 Attachment 35, Table 4.1. This table also outlines the issues raised in the TOR and where the issue has been addressed in the technical report.

Traffic generated by the Project may result in impacts outside of the scope of works of this traffic and transport report, but which are addressed in other EIS chapters. Table 17.1 lists the chapters in Volumes 2, 3 and 4 where issues identified in this report are further assessed.



Volume 2 Chapter 17
Figure 17.1 Study area

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Table 17.1 Cross referencing with other EIS chapters

Transport related issue	Chapter in EIS where addressed
Likelihood of product spill	Hazard and risk – Volume 2 Chapter 22, Volume 3 Chapter 22, and Volume 4 Chapter 22
Quarantine management/spreading of weeds/pests	Terrestrial ecology – Volume 2 Chapter 8, Volume 3 Chapter 8, and Volume 4 Chapter 8
Waste management	Waste – Volume 2 Chapter 16, Volume 3 Chapter 16, and Volume 4 Chapter 16
Greenhouse gas emissions	Greenhouse gases – Volume 2 Chapter 14, Volume 3 Chapter 14, and Volume 4 Chapter 14
Projected construction and operational workforce	Social impact – Volume 2 Chapter 20, Volume 3 Chapter 20, and Volume 4 Chapter 20
Impact of project shipping on marine environment	Marine ecology – Volume 3 Chapter 10 and Volume 4 Chapter 10
Construction and use of roads and other project infrastructure in flood prone areas	Water resources – Volume 3 Chapter 11 and Volume 4 Chapter 11
Impact on bridges of heritage value along roads used by project traffic	Shared cultural heritage – Volume 2 Chapter 19, Volume 3 Chapter 19, and Chapter 4 Chapter 19

17.1.3 Legislative framework

Government Acts and regulations

Many parts of the legislation and policies that Commonwealth, Queensland and local governments produce are relevant to transport operations. Together with the TOR, these provide the reference point for undertaking this assessment. Key documents are identified below in Table 17.2, along with their purpose and relevance to the Project.

Table 17.2 Government acts and regulations

Legislation	Objective or purpose of legislation	Relevance to this project
Transport Infrastructure Act 1994	Encourages effective integrated planning and efficient management of a transport infrastructure system.	Forms the basis for the road impact assessment. Outlines road design requirements and policy objectives for the efficient use of the network, and identifies the capital roads program – the Roads Implementation Program. Provides statutory requirements for rail safety.

Legislation	Objective or purpose of legislation	Relevance to this project
Transport Operations (Road Use Management) Act 1995	Establishes a scheme to effectively manage vehicles, drivers and access to the road network.	Identifies compliance requirements and procedures.
Transport Operations (Road Use Management – Mass, Dimensions and Loading) Regulation, 2005	Management of vehicle types on state-controlled roads	Defines the regulations for issuing of permits for oversized vehicles, which will be required for some project traffic.
Road Transport - Heavy Vehicle Driver Fatigue Act 2006 (as amended 29 September 2008)	The Act is a national model law that is intended to provide the basis for nationally consistent transport laws. The legislation makes all parties in the supply chain legally responsible for preventing driver fatigue. The new laws apply to both trucks and buses	As identified under the relevant Queensland legislation below mitigation measures identified in this chapter comply with this requirement.
Transport Operations (Road Use Management – Fatigue Management) Regulation, 2008	Provides for the safe management of fatigue for drivers using fatigue-regulated heavy vehicles.	The Project involves travel across long distances by road. Managing of driver hours to ensure road safety may form part of the mitigation measures identified in this chapter.
AusLink (National Land Transport) Act 2005	The objective of this Act is to assist national and regional economic and social development by the provision of Commonwealth funding aimed at improving the performance of land transport infrastructure.	The commonwealth provides funding to a number of state controlled highways used by project traffic and that may require alterations.
Transport Infrastructure (State Controlled Roads) Regulation, 2006	Regulations pertaining to access, road works and ancillary works encroaching on state-controlled roads.	Establishes regulations to be adhered to for pipelines crossing state-controlled roads and intersection works.
Civil Aviation Act 1988	Establishes the Civil Aviation Safety Authority and a regulatory framework for maintaining, enhancing and promoting the safety of civil aviation.	Defines the legislative requirements for operating air services that may be utilised by the Project.

Policy and network planning documents

Table 17.3 lists the various state and local government planning and policy documents that are relevant to traffic and transport. Other regulatory and non-regulatory plans and policies relevant to the Project, but not specifically transport, are described in Volume 2 Chapter 6 – Land use and planning.

Table 17.3 Policy and network planning documents

Policy and network planning document	Objective or purpose	Relevance to the Project
The Roads Implementation Program [2008/09–2012/13]	Details DTMR projects that have been allocated funds and includes information about the funding allocation and expected timing of the proposed works.	Identifies a number of road improvements on the Leichhardt Highway and a bridge replacement on the Dalby-Cecil Plains Road.
Coal Rail Infrastructure Master Plan, 2nd Ed. 2008	Seeks to identify the phased expansion of rail infrastructure to meet future expected growth.	Identifies rail as an option to aid in the Project's freight task.
Western Downs Regional Council Planning Scheme(s) There is an overall Regional Council plan in preparation. Council currently administers the Chinchilla, Murilla, Wambo and Taroom Town planning schemes	The current town planning schemes contain provisions for regulating, implementing and administering each area's specific planning scheme. In terms of transport policies, these schemes primarily address planning controls relating to new develop-ment such as car parking standards and access arrangements.	The bulk of the gas fields are located within the administrative area of this council. Miles is identified as a potential logistics hub, and there is a rolling program of development planned within the area for the next 30 years.
Maranoa Regional Council Planning Scheme(s) There is an overall Regional Council plan in preparation. Council currently administers the Roma Town Council and Bungil, Bendemere, Warroo and Booringa Shire Council Town planning schemes	Maranoa Regional Council (MRC) was officially formed on 15 March 2008 and named in June 2009, as part of the Queensland local government reform process. In terms of transport policies, these schemes primarily address planning controls relating to new development such as car parking standards and access arrangements.	Only a small part of the Maranoa Regional Council falls within the study area. However, Roma may act as a key local resource and distribution centre for materials, people and regional transport access.

17.2 Methodology

In this section, the methodology adopted to assess the potential impacts on the transport network from constructing and operating the gas fields is discussed.

This assessment of the transport network was undertaken within the following parameters:

- Movement of material and personnel to site will initially be by road-based transport
- Brisbane, Miles and Roma are proposed to have distribution centres for compiling, storing and managing construction and operational materials for the gas fields. Miles is proposed to act as the primary distribution centre for the Project. Wherever practicable, materials and consumables such as food will be sourced from local suppliers or Australian manufacturers.

17.2.1 Road network

Assessment timeframe

The year 2010 has been selected as the starting point for assessment purposes.

The Department of Main Road's publication Guidelines for the assessment of road impacts of developments indicates that, for staged developments, the planning horizon should be 10 years after the final stage opens. Therefore the timeframe for the assessment of any works continues until 2032, as the fourth and final LNG production train ('train') of the LNG facility is assumed to be fully operational by the year 2022.

Whilst the Project continues to 2045 and possibly beyond, development between 2032 and 2045 is generally limited to drilling activities and background traffic growth dominates during this period.

Traffic analysis scenarios

In general, the traffic scenarios modelled in the assessment were as follows:

- Background – this assessment was undertaken with the background traffic within the assessment timeframe and factored by the appropriate growth rates
- Background plus development– this assessment was undertaken with background traffic plus the addition of the traffic generated from the Project
- Background plus development and regionally-significant projects – this assessment was undertaken with background traffic, plus the addition of the traffic generated from the Project, and with traffic generated from other regionally-significant projects.

The assessment of intersection performance was undertaken for the following:

- Year 2010 – as detailed above, this is the first year of the project assessment period
- Year 2013 – this is the first peak traffic generation year of the Project, and is associated with constructing trains one and two. This coincides with the construction of the gas pipeline
- Year 2019 – this is the second peak traffic generation year of the Project, and is associated with constructing trains three and four. This coincides with the operation of trains one and two. While an earlier peak occurs in 2013, 2019 will be critical as it will be combined with a higher background traffic component
- Year 2032 – this is the final year of the project assessment period.

Assessment triggers

According to the DTMR's Guidelines for the assessment of road impacts of developments, a project's road impacts are considered insignificant if the project generates an increase on state-controlled roads of less than 5% of existing levels. In the event that the project generates an increase of more than 5% then the impact is deemed to be potentially significant and the impact needs to be assessed.

Growth rates

During the analysis period, there is predicted to be an increase in background traffic volumes due to growth in the region and independent of the Project. The growth rates are based on:

- Years 2008–2020 – applying the historic 10-year average growth rate based on the assumption that this growth rate continues to 2020

- Years 2020–2032 – applying a decaying growth rate based on the assumption that this 10-year growth rate is not realistically expected to continue, and that a more modest growth rate would occur. This was calculated by reducing the 2010 growth rates by 20% in 2032 and interpolating for the years in between. This reflects general background traffic growth and generally excludes this and other known regionally significant projects currently planned for the study area.

There were two other limitations exercised in the growth rate parameters, as follows:

- where the 10-year historical growth rate was less than 1%, including roads with negative growth, a growth rate of 1% per year was adopted
- where the 10-year historical growth rate was greater than 5%, a rate of 5% was adopted for the first 10 years. The growth rate then decays as detailed above.

Sketch planning model

A sketch planning model was developed to calculate project traffic. A sketch model is a transport model that aims to simplify/streamline the forecasting of traffic volumes. The Project's sketch model has been developed in a series of spreadsheets, with additional coding of traffic distribution and routes in the geographic information system (GIS). Full details on the structure, use and capability of this model are found in the technical report in Volume 5 Attachment 35.

Road components analysed

When determining the impact of the Project, four components of the road infrastructure network were analysed – road link, intersection, pavement and bridge capacity.

Road link, intersection and pavement capacity were assessed using the sketch planning model, which combined background traffic and growth rates with project-generated traffic.

The impact of the Project on bridges was assessed qualitatively, as only limited bridge condition data was made available for this assessment.

The methodology used to determine the Project's impacts are presented below for each of these components.

Road link capacity analysis

The following methodology was adopted to assess the road links within the gas pipeline study area:

- Identify the road links within the study area that could be utilised by project traffic
- Identify planned road alterations within the study area
- Gather all available data on existing traffic volumes on the road links within the study area
- Input traffic data into the sketch model
- Analyse the network over the analysis period of 2010 to 2032, by factoring the average annual daily traffic by the appropriate growth rates to determine background traffic to road links
- Identify and report deficiencies in the existing network (i.e. where road capacity is exceeded)
- Add project traffic to existing background traffic to calculate increased traffic due to the Project
- Identify the road links where the Project traffic has a significant impact (i.e. where project traffic exceeds 5% of existing traffic)

- For the road links deemed to have been significantly impacted by the Project, determine alteration requirements to maintain road link safety and capacity
- Determine whether alteration needs to be brought forward due to project traffic, and by how many years
- Repeat assessment for traffic generated by regionally-significant projects.

The capacity assessment of the road links has been generally based on the approach outlined in Austroads Guide to Traffic Engineering Practice – Part 2.

Level of Service (LOS) is a qualitative measure describing traffic operational conditions on a road and the perception of these conditions by motorists and/or passengers. Six levels are used, from A to F. LOS A represents free flow conditions in which individual drivers are virtually unaffected by the presence of other drivers. LOS C is a level where most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre on a road. LOS F represents congested conditions which experience large delays. Table 17.4 provides a summary of the adopted capacities for various road links within the study area. The capacities identified are based on LOS E.

Table 17.4 Roadway link capacities

Roadway type	Capacity (vehicles per day)
Rural, two lanes	16,000
Rural, four lanes with median	40,000
Urban, two lane	18,000
Urban, four lane no median, no access control	30,000
Urban, four lane with median, no access control	36,000

The road link capacity analysis for rural roads has also considered the operating LOS. Extended operation on rural road links at LOS D and E is considered intolerable.

Table 17.5 summarises the maximum average annual daily traffic (AADT) for various levels of service, following the Austroads guidelines for rural roads.

Table 17.5 Adopted maximum AADTs for various levels of service

Road link type	AADT for level of service				
	A	B	C	D	E
Rural, two lane	1,200	3,000	5,500	8,400	16,000
Rural, four lane	13,200	18,000	24,000	30,400	40,000

Intersection capacity analysis

The methodology adopted to undertake the intersection impact assessment was as follows:

- Identify intersections within the study area that could be significantly impacted by project traffic. The intersections were initially identified as those on road links where the project traffic could be more than five percent of existing background traffic

- Obtain background AM/PM peak hour traffic volumes for the intersections from the sketch model
- Analyse the existing intersection operation over the assessment timeframe
- Identify intersections that reach capacity within the assessment timeframe and the year at which the capacity is reached
- Obtain background plus development AM/PM peak hour traffic volumes for intersections from the sketch model
- Analyse existing intersection operation over the assessment timeframe for background plus project traffic
- Identify intersections that reach capacity within the assessment timeframe and the year at which capacity is reached for background plus project traffic
- For intersections that reach capacity within the assessment timeframe, determine intersection alterations required to maintain intersection capacity throughout the assessment timeframe
- Repeat the assessment for traffic generated by regionally-significant projects to determine cumulative impacts.

The SIDRA Intersection 3.2 analysis program was used to analyse key intersections for each of the analysis scenarios. This program calculates the operation of intersections based upon input parameters including geometry and traffic volumes. Output from the SIDRA intersection analyses provides values for the degree of saturation, queue lengths and delays. The degree of saturation (DOS) is a volume-to-capacity ratio and is a common variable for assessing intersection performance. The adopted upper limits for an intersection performing satisfactorily were as follows:

- Un-signalised priority intersections: 0.80
- Roundabouts: 0.85
- Signalised intersections: 0.90.

These DOS limits are based on the DTMR's Guidelines for the assessment of road impacts of developments limits. A DOS exceeding these values indicates that the intersection is nearing operational capacity. Above these values, users of the intersection are likely to experience unacceptable levels of service and delay.

Pavement capacity analysis

The following methodology was adopted for the impact assessment of the pavements on the state-controlled roads:

- Identify the road links within the study area that could be significantly impacted by project traffic (i.e. where project traffic exceeded 5% of existing background traffic)
- Obtain all available data about existing traffic volumes, vehicle classification, conditions and roughness on these road links
- Calculate current equivalent standard axles (ESA) to the road links
- Identify the year that the existing pavement would reach terminal roughness based on background traffic and determine the corresponding ESA. This represents the remaining life of

the road link pavement in ESAs and provides the year at which, under normal operating conditions, rehabilitation would be required

- Obtain the project traffic ESAs from the sketch model and add these to the background ESAs to calculate the increases pavement loading due to the Project
- Determine the year at which the existing pavement will reach terminal roughness based on background plus project ESAs. This year represents the year when pavement rehabilitation would be required due to project traffic.

The pavement analysis comprises two components – the impact on the timing of pavement rehabilitation and the increased maintenance required to the network due to project traffic. The assessment was based on a comparison of the cumulative ESA loads, with and without the Project during the analysis period.

The cumulative number of ESAs loaded onto the roadway segment to the terminal year was calculated based upon the ESA loading along the haulage routes. The background volumes were based on classified AADT volumes with a cumulative heavy vehicle growth rate equivalent to the normal background traffic growth. For this analysis, a value of 2.9 ESAs for each heavy vehicle was applied for the Bruce Highway, while 3.2 ESAs for each heavy vehicle were used for all other state-controlled roads.

Terminal roughness values for the various road links were broadly based on Figure 2.2 in the Queensland Transport's Pavement rehabilitation manual (1992). In general, rural roads were assumed to be equivalent to secondary roads with a terminal roughness of 175. With the exception of the Bruce Highway, all other roads were assigned a terminal roughness of 120, which was consistent with assumptions presented in the Gladstone LNG (Santos/Petronas) and Queensland Curtis LNG (QGC/BG) projects' environmental impact statements.

Pavement impacts on local roads could not be performed because of the lack of condition data and historic deterioration rates to these roads.

As pavement impact is a cumulative assessment, separate consideration of the other regionally-significant projects was not required. The impacts of these projects are to be assessed in isolation, to determine individual project contribution to pavement rehabilitation.

Bridge capacity analysis

Bridges potentially impacted by the Project along roads used by project traffic were identified and assessed. The assessment was based on information sourced from the DTMR database and site inspections of the haul routes. It included considering the potential loads to the bridges due to project traffic, as well as physical constraints such as the height and width of the bridges. Data was only available for bridges located on the state-controlled road network.

17.2.2 Rail network

The analysis methodology for determining the impact on the rail network was based on assessing the capacity of the existing network, and determining what additional infrastructure would be required. This was undertaken in consultation with Queensland Rail.

Investigation of the use of the rail network included assessing the potential transport of pipe segments and transporting personnel. This is discussed for the gas pipeline in Volume 3 Chapter 17 and Volume 5 Attachment 35. It is currently not envisaged to use the rail network for the construction and operation of gas fields' infrastructure.

17.2.3 Shipping network

The Project's impact on shipping was assessed by determining the capacity of existing port facilities and the shipping network against demand for the importation of pipe and other project material.

Consultation was held with a range of agencies including the Brisbane Ports Corporation (BPC).

17.2.4 Air services

The Project's impact on air services was assessed by comparing project traffic to airport capacity and current flight schedules. Discussions were held with the Western Downs Regional Council, and the Maranoa Regional Council about current operations and requirements for any future alterations to airports/aerodromes identified as potentially being impacted by the Project.

17.2.5 Cumulative analysis

A combination of quantitative and qualitative assessments was used to analyse the cumulative impact of other regionally-significant projects on the traffic and transport impact assessment of the gas fields element of the Australia Pacific LNG Project. The Department of Infrastructure and Planning's website was reviewed to identify other regionally-significant projects that may potentially impact the transport network. Not all projects outlined in the list could be assessed because of the lack of information available within the public domain.

Projects that were included in the analysis were as follows:

- Central Queensland Pipeline (Jemena)
- Gladstone LNG (Santos/Petronas)
- Gladstone LNG Project—Fisherman's Landing
- Queensland Curtis LNG Project (QGC/BG)
- Gladstone Pacific Nickel
- Surat to Gladstone Pipeline (Arrow/Shell)
- Wandoan Coal Mine
- Wiggins Island Coal Terminal
- Surat Basin Railway

These are further described in Volume 5 Attachment 35.

17.3 Existing environment

17.3.1 Existing road network

A number of key state-controlled roads within the study area may be impacted by project traffic. The roads are listed and described in Table 17.6 .

These roads will carry construction and/or operational traffic throughout the life of the Project. Sections of these roads do extend outside the investigation study area but are referenced and assessed within this document, because journeys along these roads do not always begin or terminate at the study area's boundaries.

Table 17.6 State-controlled roads in the study area

Road name	Description
Leichhardt Highway	The Leichhardt Highway is two lane undivided rural highway with a capacity of 16,000 vehicles per day. It has a speed limit of 100km/hr, with 60km/hr zones in towns. It is a designated road train haul route. The section of highway in the study area extends from Wandoan to just south of Miles. The road provides the primary road access from the gas fields north to Gladstone. The Leichhardt Highway is a national and state funded highway maintained under contract by the relevant local council within the project study area.
Warrego Highway	The Warrego Highway is two lane undivided rural highway with a capacity of 16,000 vehicles per day. It has speed limits of 100km/hr, 110km/hr and 60km/hr zones in towns. It is a designated road train haul route. The section of highway in the study area extends from Dalby to Roma. The road provides the primary road access to the gas fields from the east (Toowoomba) and the west (Roma). The Warrego Highway is a national and state funded highway maintained under contract by Maranoa and Western Downs Regional Councils within the project study area.
Dalby-Kogan Road	The Dalby-Kogan Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day. It has a speed limit of 100km/hr. and is a designated road train haul route.
Chinchilla-Tara Road	The Chinchilla-Tara Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day. It has a speed limit of 100km/hr and is a designated road train haul route.
Kogan-Condamine Road	The Kogan-Condamine Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day. It has a speed limit of 100km/hr, with 60km/hr zones in towns. It is a designated road train haul route. This road provides the primary east-west road access to the gas fields to the south and east of Miles.
Tara-Kogan Road	The Tara-Kogan Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day and a speed limit of 100km/hr.
Warra-Kogan Road	The Warra-Kogan Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day and a speed limit of 100km/hr.
Jackson-Wandoan Road	The Jackson-Wandoan Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day and a speed limit of 100km/hr. The Jackson-Wandoan Road runs from Jackson on the Warrego Highway, north-east to Wandoan on the Leichhardt Highway. It forms the primary access to the gas fields in this area.
Moonie Highway	The Moonie Highway is a two lane undivided rural highway with a capacity of 16,000 vehicles per day. It has a speed limit of 100km/hr, with 60km/hr zones in towns. It runs from Dalby to St George. The section within the study area extends from Dalby to the Surat Developmental Road.
Surat Developmental Road	The Surat Developmental Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day and a speed limit of 100km/h. It connects Surat with Dalby. The section within the study area extends from the Leichhardt Highway to the Moonie Highway.
Dalby-Cecil Plains Road	The Dalby-Cecil Plains Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day and a speed limit of 100km/hr. The Dalby-Cecil Plains Road runs from Dalby on the Warrego Highway, south to Cecil Plains where it becomes the Millmerran-

Road name	Description
	Cecil Plains Road.
Millmerran-Cecil Plains Road	The Millmerran-Cecil Plains Road is a two lane undivided rural road with a capacity of 16,000 vehicles per day and a speed limit of 100km/hr. The Millmerran-Cecil Plains Road runs from Millmerran on the Gore Highway, north to Cecil Plains where it becomes the Dalby-Cecil Plains Road.
Gore Highway	The Gore Highway is a two lane undivided rural highway with a capacity of 16,000 vehicles per day. It has a speed limit of 100km/hr, with 60km/hr in town. The Gore Highway runs from Goondiwindi to Toowoomba. It is a national and state funded highway maintained under contract by the relevant local council within the Project study area Only a short section is located within the study area, from near Toowoomba to Millmerran.

In addition to the state-controlled roads within the study area, the Project also potentially impacts a number of council-controlled roads. Local roads potentially impacted by gas fields' traffic are listed and described in Table 17.7.

Table 17.7 Local roads

Road name	Description
Avenue Road	Avenue Road is a Western Downs Regional Council road that connects with the Chinchilla Tara Road. The road has not been inspected, but is sealed, with a trafficable width of approximately 4m.
Bells Road	Bells Road is a Western Downs Regional Council road that connects with the Warrego Highway. The road has not been inspected, but is unsealed with a trafficable width of approximately 7m.
Colsons Road	Colsons Road is a Western Downs Regional Council road that connects with the Warrego Highway. The road has not been inspected, but is unsealed, with a trafficable width of approximately 7m.
Elerslea Ln East	Elerslea Ln East is a Western Downs Regional Council road that connects with the Leichhardt Highway. The road has not been inspected, but is unsealed, with a trafficable width of approximately 6m.
Giligulgul Road	Giligulgul Road is a Western Downs Regional Council road that connects with the Leichhardt Highway and Jackson Wandoan Road. The road has not been inspected, but is partially sealed, with a trafficable width of approximately 5–6m.
Gunbarwood Road	Gunbarwood Road is a Western Downs Regional Council road. The road has not been inspected, but is unsealed with a trafficable width of approximately 5m.
Homebush Road	Homebush Road is a Western Downs Regional Council road that connects with the Warrego Highway. The road has not been inspected, but is unsealed, with a trafficable width of approximately 7m.
Kerr's Road	Kerr's Road is a Western Downs Regional Council road that connects with the Tara-Kogan Road. The road has not been inspected, but is unsealed, with a trafficable width of approximately 5m.
Mclennans	Mclennans Road is a Western Downs Regional Council road that connects with the Leichhardt

Road name	Description
Road	Highway. The road has not been inspected, but is unsealed, with a trafficable width of approximately 7m.
Wallan Creek Road	Wallan Creek Road is a Western Downs Regional Council road that connects with the Warrego Highway. The road has not been inspected, but is unsealed with a trafficable width of approximately 5–6m.
Bogandilla West Road	Bogandilla West Road is a Maranoa Regional Council road that connects with the Jackson Wandoan Road. The road has not been inspected, but is unsealed, with a trafficable width of approximately 6m.
Cattle Creek Road	Cattle Creek Road is a Maranoa Regional Council road. The road has not been inspected, but is sealed, with a trafficable width of approximately 4m.
Crossroads Road	Crossroads Road is a Maranoa Regional Council road. The road has not been inspected, but is unsealed, with a trafficable width of approximately 6m.
Horse Creek Road	Horse Creek Road is a Maranoa Regional Council road. The road has not been inspected, but is partially sealed, with a trafficable width of approximately 4–6m.
Seaside Road	Seaside Road is a Maranoa Regional Council road. The road has not been inspected, but is unsealed with a trafficable width of approximately 4–6m.
Wallumbilla North Road	Wallumbilla North Road is a Maranoa Regional Council road. The road has not been inspected, but is sealed, with a trafficable width of approximately 4m.
Yuleba Taroom Road	Yuleba Taroom Road is a Maranoa Regional Council road that connects with the Warrego Highway. The road has not been inspected, but is sealed with a trafficable width of approximately 4m.

AADT data was obtained from the DTMR for the state-controlled road links within the gas fields' study area. The traffic volume information is summarised in Table 17.8. Similar data was not available for local roads, but traffic volumes on local roads are estimated to be less than 150 vehicles per day.

Table 17.8 Existing traffic volumes

DTMR region	Road name	DTMR No.	Section	AADT
Fitzroy	Leichhardt Highway	26A	Dawson Highway to Roma-Taroom Road (Ch 105.22 to 256.508)	124 - 858
		26B	Roma Taroom Road to Warrego Highway (Ch 0.0 to 127.61)	643 - 677
		26C	Warrego Highway to Gore Highway (Ch 0.0 to 205.21)	296 - 570
Darling Downs	Warrego Highway	18C	Moonie Highway to Leichhardt Highway (Ch 0.0 to 126.745)	2,066 – 7,551
		18D	Leichhardt Highway to Quintin Street (Ch 0.0 to 141.267)	1,255 – 3,217

DTMR region	Road name	DTMR No.	Section	AADT
	Dalby-Kogan Road	340	Warrego Highway to Tara-Kogan Road (Ch 0-47.682)	397-650
	Chinchilla-Tara Road	341	Kogan-Condamine Road to Dougall's Road (Ch 22.51-24.51)	436
	Kogan-Condamine Road	342	Warra-Kogan Road to Leichhardt Highway (Ch 0-71.410)	202
	Tara-Kogan Road	3402	Chinchilla-Tara Road to Dalby Kogan Road (Ch 34.8-43.03)	158
	Jackson-Wandoan Road	4302	Warrego Highway to Leichhardt Highway (Ch 0-81)	71-155
	Moonie Highway	35A	Warrego Highway to Surat Developmental Road (Ch 0-50.37)	1,466-6,870
	Surat Developmental Road	86A	0.3km east of Chinchilla-Tara Road to Leichhardt Highway (Ch 0-142.67)	292-2543
		86B	0.3km east of Chinchilla-Tara Road to Moonie Highway (Ch 0-40.39)	629-2097
	Dalby-Cecil Plains Road	325	Warrego Highway to Millmerran-Cecil Plains Road (Ch 0-39.08)	475
	Millmerran-Cecil Plains Road	3251	Dalby-Cecil Plains Road to Gore Highway (Ch 0-45.61)	128
	Gore Highway	28A	Warrego Highway to 44km east of Millmerran-Cecil Plains Road (Ch 0.0 to 79.54)	2271 – 19,936
		28B	44km east of Millmerran-Cecil Plains Road to Leichhardt Highway (Ch 0.0 to 121.55)	1241 - 1515

Bridges

There are four bridges identified on state-controlled roads within the gas fields' study area. These bridges are in the Darling Downs Main Roads Region, and are either load limited or in poor condition.

The DTMR vehicle restrictions for these bridges are:

- Dogwood Creek Bridge – restrictions include minimum axle spacing of 1.8m centres, maximum axle load of 10 tonne per axle and a 10km/hr speed limit
- Condamine River Bridge (Crawford Bridge) – restrictions include a maximum 13 tonnes per single axle, regardless of axle spacing, on heavy loaded platforms
- Woleebee Creek Bridge – this bridge is closed to vehicles operating under excess mass guidelines or excess mass permits

- One Arm Man Creek Bridge - this bridge is closed to vehicles operating under excess mass guidelines and vehicles with a gross vehicle mass greater than 30 tonnes.

Some bridges were identified during site inspections as being of concern and are highlighted as possible constraints. These are:

- Bridge ID 250 – Kogan Creek Bridge is a narrow timber bridge on Kogan-Condamine Road near Warra Kogan Road
- Bridge ID 253 – Fourteen Mile Creek Bridge on Kogan-Condamine Road is out of commission, and the crossing is prone to flooding
- Bridge ID 249 – Braemer Creek Bridge is a narrow timber bridge on Dalby-Kogan Road
- Bridge ID unknown (U1) – An additional closed timber bridge exists on Dalby-Kogan Road between Braemer Creek (249) and Condamine River (247). It has not been identified by DTMR and no ID number or other information has been provided
- Bridge ID unknown (U2) – Ashall Creek Bridge is a closed bridge with a diversion prone to flooding on Dalby-Cecil Plains Road between Oakey Creek Bridge (238) and Condamine River (8674). It is noted that the Roads Implementation Program identifies replacement of the bridge in the period 2009 – 2011.

Traffic incident history

Information about the traffic incident history from April 2003 to March 2008 was obtained from the DTMR. For each state-controlled road link within the study area the ratio of the number of crashes per million vehicle kilometres travelled (C/MVKT) was calculated. The links were assigned a level of risk according to C/MVKT ratios as detailed in Table 17.9 .

Table 17.9 Crash risk parameters

C/MVKT range	Risk
0 to 0.5	Low risk
0.5 to 1.0	Medium risk
1.0 to 1.5	High risk
> 1.5	Very high risk

Within the gas fields' study area, the road links with a high to very high risk are:

- Surat Developmental Road, along the main street of Tara to the west of Chinchilla-Tara Road – this road link has a crash risk ratio of 2.54. The number of accidents on this road is low, but the road is rated high due to the low volume of traffic. Over 75% of accidents occurred during the weekend
- Warra-Kogan Road, between Condamine Road and Warrego Highway – this road link has a crash risk ratio of 2.03. The number of accidents on this road is low, but the road is rated high due to the low volume of traffic
- Warrego Highway, west of Dalby – this road link has a crash risk ratio 1.19. Accidents have occurred within a 60km speed environment, generally at intersections.

Roads prone to flooding

Within the study area the existing Queensland and local government road infrastructure crosses a number of water courses and/or is located in a floodplain and is therefore susceptible to flooding.

Some of the key flood-affected roads that provide access to the gas fields include the Jackson Wandoan Road, the Warrego Highway crossing of Dogwood Creek at Miles, the Leichhardt Highway and Kogan-Condamine Road in the vicinity of the township of Condamine, and the Tara-Kogan Road south of Kogan.

Public and active transport network

Within the gas fields' study area, the public transport network includes school bus services and a limited taxi service in some of the towns. Due to the limited road network and the dispersed nature of residents in relation to schools, the majority of the roads used by project traffic are also school bus routes.

Stock routes

Stock routes are pathways for travelling stock on roads, reserves, unallocated state land and pastoral leases. Queensland's stock route network enables pastoralists to move livestock on the hoof around the state's main pastoral districts. This provides an alternative to trucking and other contemporary transport methods. There are a number of stock routes within the gas fields' study area.

17.3.2 Existing rail network

The rail network servicing the gas fields is the Western System. This includes all the line west of Ipswich, operating between Toowoomba and Roma.

This line carries a mix of long distance passenger trains, grain trains, and general freight, livestock, and coal trains. Coal is the predominant traffic between Toowoomba and Macalister. Outside of the grain season, at least 70% of the trains per week are transporting coal.

The frequency of trains varies depending on seasonal traffic. Outside of the grain season, traffic levels are in the range of four to six trains per day.

There are no current published plans for significant alterations to this rail system.

The existing rail network within the study area currently crosses the Warrego Highway at grade crossings at three locations:

- West of Miles, close to the Leichhardt Highway north/Warrego intersection
- At Miles, immediately south of Leichhardt south/Warrego intersection
- At Chinchilla, close to the Warrego Highway/Wambo Street intersection.

Investigation of the use of the rail network included assessing the potential transport of pipe segments and the transport of personnel. These are further described in Volume 3 Chapter 17 and Volume 5 Attachment 35. It is currently not envisaged to use the rail network for the construction and operation of gas fields' infrastructure.

17.3.3 Existing shipping network

Australia Pacific LNG has identified the Port of Brisbane as a possible port for the importation of one-off items associated with the gas fields' construction.

The Port of Brisbane is the major trading port for Queensland and is administered by the Port of Brisbane Corporation. A proportion of specialist plant items for the GPFs may be imported through this port. The Port has 28 operating berths, and over 7,700m of quay line at the Port of Brisbane and upriver facilities. A full description of the existing shipping at the Port of Brisbane is provided Volume 5 Attachment 35 and Volume 4 Chapter 17.

17.3.4 Existing air services

The possible fly-in/fly-out locations for gas fields' construction and operations personnel are the Miles aerodrome and Roma airport.

Miles aerodrome is adjacent to the Kooralbyn property and approximately 12km south of Miles and is classified as an aircraft landing area. It is not registered or certified, there are no regular passenger transport services, and it is currently only used occasionally by eight-seater aircraft but is capable of accepting larger aircraft. There is an apron capacity for two aircraft and a small terminal.

Western Downs Regional Council administers the aerodrome and there are currently no published plans to alter the facility.

Roma airport is a commercially operating airport, administered by Maranoa Regional Council. Qantas Link operates approximately 17 flights a week there, which equates to around two to three flights a day. This airport has the capacity to cater for Dash 8-300 aircraft which seats 50 passengers. There is apron capacity for two Dash 8-300 aircraft with 18 parks for light planes.

There are currently published plans by council to alter the Roma airport.

Additional details on existing air services in the region are given in Volume 5 Attachment 35.

17.4 Project traffic

17.4.1 Description and location of proposed facilities

The gas fields include eight development areas:

- Combabula/Ramyard, which includes Pine Hills and Reedy Creek
- Woleebee
- Carinya
- Condabri, which includes South and Central
- Talinga/Orana, which includes Orana North
- Dalwogan
- Kianama
- Gilbert Gully.

These locations are broadly centred around the town of Miles, north and south of the Warrego Highway.

The following key infrastructure items make up the gas fields' development:

- GPFs – maximum of 23 sites are proposed
- WTFs and the associated water transfer stations – six new WTFs are planned

- Up to 10,000 gas wells are planned from 2011 to 2045
- Gas and associated water gathering networks
- Eleven communication towers are proposed to support the Project
- Distribution centres are proposed at Miles, Roma and Brisbane, where project material can be stored and distributed as required
- A network of high pressure gas pipelines is proposed.
- Additional information on the gas fields' infrastructure is given in Volume 5 Attachment 35.

17.4.2 Road traffic

This section provides details of the traffic generated by the gas fields' development. It includes an assessment of construction and operational staffing, traffic generated during construction and operation and provides information on the routes assumed for the traffic distribution.

Construction staff

Australia Pacific LNG has advised that all construction staff movements may be as follows:

- Eighty percent by buses with a 20-passenger capacity
- Twenty percent by low occupancy vehicles consisting of three to seven seats with an average of 1.2 people per vehicle.

Table 17.10 below identifies the construction workforce adopted in the transport modelling for each gas processing facility.

Table 17.10 Construction workforce adopted in transport modelling

Component	No. staff	Shift	Notes
Temporary accommodation facilities	50	Five days per week	Accommodating the workforce at these facilities will allow initial civil works (e.g. clearing, earthworks, installation of services and utilities) to be undertaken without the need to source immediate accommodation within local towns.
Drilling wells	400	Two 12-hour shifts – two weeks on, two weeks off	This is an average figure based on 44 workers per gas well, working on 4.5 work sites simultaneously. Workers will move between the gas fields' temporary accommodation facilities as required.
Gathering network	120	12-hour shift – four weeks on, one week off	This is an average figure based on connecting 150 wells per annum per gas processing facility
GPFs	200 - 300	12-hour shift – four weeks on, one week off	This figure is the maximum number, and will depend on the size of the facility and the number of compressors.
Water treatment facilities/water transfer stations / brine ponds	75 - 90	12-hour shift – four weeks on one week off	This will depend on the capacity of the facility.

Component	No. staff	Shift	Notes
High pressure gas pipelines	80	12-hour shift – four weeks on one week off	This is an average figure per gas processing facility

These figures represent the maximum number of people working on site per day per gas processing facility. It is assumed that a portion of the workforce will be rotated on a daily basis.

Operations staff

Operations staff, exclusive of the staff at the distribution centres, will work a selection of rosters. Some may work 11-hour day shifts on a two weeks on and two week off basis. These workers will be accommodated at site within the relevant gas processing field's operations accommodation facility. Other personnel may work a standard day working Monday to Friday roster and others a nine days on and five days off roster. These people will travel home from site at the end of each day. All site personnel with the exception of site superintendents are responsible for their own transport to and from site. There will be 40 people required to operate each gas processing field. This includes personnel operating the GPFs, WTFs and water transfer sites, maintenance personnel and administration personnel for the remaining gas fields' infrastructure.

Construction traffic

In addition to the personnel movements, traffic movements will also include delivery of construction materials and plant.

While there is a preference for local and regional sourcing, it was assumed that construction machinery and temporary accommodation facilities would most likely be sourced from Brisbane. Other materials and consumables are generally supplied from the distribution centres in Miles and Roma, including a portion of the total water requirement.

A summary of the significant construction materials for the gas fields' infrastructure is given in Table 17.11. Most of the traffic will be heavy vehicles.

Table 17.11 Construction materials

Component	Activity/material	Quantity
Gas well (per well)	Cement	22.5m^3 (3 deliveries)
	Fuel	42,000l (3 deliveries)
	General materials	Six deliveries
	Construction machinery	Four heavy and staff vehicles
Gathering network	HDPE pipe	2.2 deliveries per gas well
	Construction machinery	20 deliveries
Gas processing facility (including temporary accommodation facility)	Temporary accommodation facility	525 average deliveries per site
	Support facilities/structures	70 deliveries
	Concrete	1,500m^3 per camp and 3,000m^3 per GPF

Component	Activity/material	Quantity
	Gravel	180,000t (2,500 deliveries)
	General materials	110 deliveries
	Construction machinery	12
	Pipes	14 deliveries
	Water	5.6Ml (280 deliveries)
	Fuel	1.5Ml (100 deliveries)
Water treatment facility	Construction materials	40–120 deliveries depending on capacity
	Concrete	1,000 m^3–3,000 m^3 depending on capacity

Operations traffic

There will be a number of deliveries in the operations phase of the Project for each project component. Table 17.12 provides a summary of the anticipated delivery schedules during operation.

Table 17.12 Delivery schedule

Component	Activity/Material	Frequency
Gas processing facilities and temporary accommodation facilities	Potable water	Two deliveries per week
	Non-potable water	One delivery per week
	Waste disposal	Two pick-ups (one solid and one liquid) per week
	Fuel	One delivery, every two weeks
	Food	One delivery, every week
	Maintenance vehicles	Two trucks per week
Drilling wells	Maintenance vehicles	One inspection per month

Traffic generation

A summary of the traffic generated by constructing and operating the gas fields' infrastructure is given in Figure 17.2.

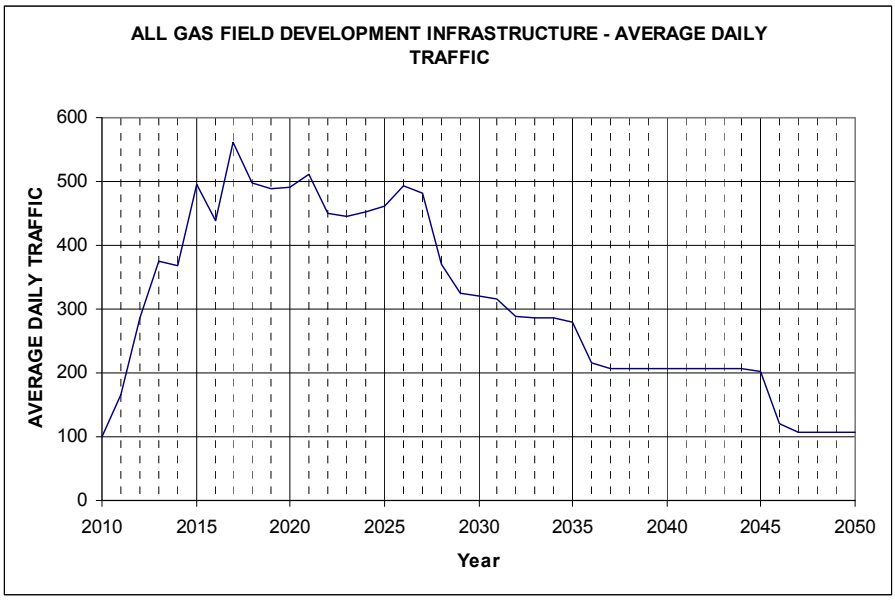

Figure 17.2 Traffic generated from the gas fields' development

Table 17.13 below identifies the average daily traffic generation from project traffic in vehicles per day (VPD) for the peak year in 2017.

Table 17.13 Peak daily traffic generation

	GPF	Drilling	Gathering network	WTF	Total
Total	153	228	151	30	562

In the peak year of the gas fields' development, the biggest influence on generated traffic is the construction of the drilling wells and associated gathering network construction.

The peak hour, peak daily and average daily traffic generation for the gas fields' development is given in Table 17.14.

Traffic distribution

Detailed analysis of the origin and destination of construction materials was obtained per facility per time period. This information was coded into the traffic model based on local availability and demand.

The construction traffic routes assumed for the gas fields are broadly described in Table 17.15.

Table 17.14 Summary of road based traffic generated by the gas fields' infrastructure

		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Peak hour traffic	Heavy vehicles	39	57	107	90	91	117	130	106	74	63	63	65	57
	Light vehicles	12	15	29	32	31	41	44	46	41	39	39	39	38
	All vehicles	51	72	135	121	123	158	173	152	115	102	102	104	95
Peak daily traffic	Heavy vehicles	395	566	1,068	896	912	1,172	1,299	1,056	741	633	633	650	575
	Light vehicles	46	62	114	127	126	164	174	185	166	156	155	157	151
	All vehicles	441	628	1,183	1024	1,037	1,336	1,474	1240	906	789	788	806	726
Average daily traffic	Heavy vehicles	74	131	228	299	284	389	334	423	363	352	355	371	319
	Light vehicles	26	34	57	75	84	107	104	139	135	136	136	139	131
	All vehicles	100	166	286	374	368	497	438	561	498	488	491	510	450

Table 17.15 Traffic routes

Item	Origin	Gas field	Route
Distribution centre materials and staff movements	Miles	Kianama, Talinga, Orana, Orana North, Condabri South	Leichhardt Highway south of Miles, then east onto the Kogan-Condamine Road.
		Gilbert Gully	Leichhardt Highway south of Miles then east onto the Surat Developmental Road to Dalby, then south on the Dalby Cecil Plains Road. Access to the southern fields from Miles follows the Leichhardt Highway, turning east onto the Gore Highway.
		Dalwogan	Leichhardt Highway north of Miles.
		Woleebee, Carinya	Leichhardt Highway north of Miles, then west onto Giligulgul Road, a local government road.
	Roma	Carinya, Combabula, Ramyard, Pine Hills, Reedy Creek	Warrego Highway east of Roma, then north onto the Jackson Wandoan Road, then onto local government roads – Crossroads Road, Yuleba Taroom Road and Cattle Creek Road.
Gathering network pipes	Townsville	Carinya, Combabula, Ramyard, Woleebee	Capricorn Highway south of Rockhampton, then the Burnett Highway to Biloela, Dawson Highway, Leichhardt Highway through Theodore and Taroom then the Jackson-Wandoan Road through Wandoan to site.
		Kainama, Talinga, Orana, Orana North, Condabri Central, Condabri South	Follows Leichhardt Highway as above, continuing through to Miles to turn east onto the Kogan-Condamine Road.
		Gilbert Gully	Leichhardt Highway south of Miles, then east on the Surat Developmental Road to Dalby, then south onto the Dalby Cecil Plains Road. Access to the southern fields from Miles follows the Leichhardt Highway, turning east onto the Gore Highway.
General materials	Brisbane	Kainama, Talinga, Orana, Orana North, Condabri South	Warrego Highway through Dalby, then the Kogan-Condamine Road.
		Combabula, Pine Hills, Reedy Creek, Condabri Central, Ramyard, Woleebee	Warrego Highway through Dalby and Miles, then north on the Leichhardt Highway.
		Carinya	Follows Warrego Highway through Dalby and Miles,

Item	Origin	Gas field	Route
			then west to Roma.
		Gilbert Gully	Warrego Highway to Toowoomba, then west on Gore Highway

17.5 Potential impacts

17.5.1 Road network

Road link capacity

The gas fields' development traffic does not bring forward the need to alter any of the state-controlled road links within the gas fields' study area by more than one year. This includes both the Australia Pacific LNG gas fields' construction and the cumulative impact of other regionally-significant projects.

The road links within the study area used by the project traffic will operate with a level of service C or better, which is considered satisfactory.

Council roads

Traffic associated with the gas fields' construction and operation will impact on some of the local roads within the gas fields' study area. For each local road, the average and peak daily project traffic has been determined and used to assess impacts. The impact on local roads is given in Table 17.16 and Table 17.17.

Although traffic count data for the council roads identified below is not available it is expected that these roads would on average carry less than 150 vehicles per day.

Intersections

The traffic associated with gas fields' construction will generate a maximum peak hour traffic of 173 trips throughout the network. This low level of traffic generation is unlikely to impact on intersection operations within the gas fields' study area.

The state-controlled Warrego Highway/Leichhardt Highway/Dawson Street and Warrego Highway/Leichhardt Highway intersections (both located in Miles) were identified for analysis based on the potential for the project traffic to significantly impact intersection operation. The existing intersections will operate within the capacity for the full planning horizon under background traffic only.

The project traffic and cumulative traffic from the regionally-significant projects will have a negligible impact on the operation of the existing intersections, and the intersections will operate within capacity for the full planning horizon.

Intersections of state-controlled roads with council–controlled roads, used by the Project for construction of the gas fields, will be impacted by increased turning movements. There may be warrants for alterations due to this increased turning traffic.

Table 17.16 Western Downs Regional Council roads impacted

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic
Avenue Road	4	Urban	Sealed	38	92	2012	This road is lightly impacted by the Project over a 12-month period, during construction of GPF_OAN_04 which is due to be online in 2013.
Bells Road	7	Rural	Unsealed	40	91	2022	This road is lightly impacted by the Project over a 12-month period, during the construction of GPF_CAS_05 which is due to be online in 2022.
Colsons Road	7	Rural	Unsealed	43	129	2019	This road is lightly impacted by the Project over a 12-month period, during the construction of GPF_BYM_03 which is due to be online in 2020.
Elerslea Lane East	6	Rural	Unsealed	29	120	2012	This road is lightly impacted by the Project over a 12-month period, during the construction of GPF_CNS_03 which due to be online in 2012.
Giligulgul Road	5–6	Rural	Sealed and unsealed	57	179	2015	This road is impacted by construction vehicles from 2014 to 2020, during the construction of GPF_WOL_01 and its associated WTFs and brine pond.
Gunbarwood Road	5	Rural	Unsealed	38	92	2012	This road is lightly impacted by the Project over a 12-month period, during construction of GPF_OAN_04 which is due to be online in 2013.
Homebush Road	7	Rural	Unsealed	38	91	2018	This road is lightly impacted by the Project over a 12-month period, during the construction of GPF_CAR_01a which is due to be online in 2018.
Kerrs Road	5	Rural	Unsealed	28	115	2015	This road is lightly impacted by the Project over a 12-month period during construction of GPF_KIA_01a which is due to be online in 2015.
Mclennans Road	7	Rural	Unsealed	51	189	2013	This road is moderately impacted from 2012 to 2016, during the construction and upgrade of GPF_CON_02b and associated water treatment facility. The GPF is due to be online in 2013 and upgraded in 2014. The associated water treatment

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic
							facility is due to be on line in 2012 and will be upgraded in stages, through to 2016.
Wallan Creek Road	5–6	Rural	Sealed	38	91	2018	This road is lightly impacted by the Project over a 12-month period during the construction of GPF_CAR_01a which is due to be online in 2018.

Table 17.17 Maranoa Regional Council roads impacted

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic
Bogandilla West Road	6	Rural	Unsealed	42	94	2019	This road is lightly impacted by the Project over a 12-month period, during the construction of GPF_NGA_02 which is due to be online in 2019.
Cattle Creek Road	4	Rural	Sealed	47	122	2013	This road is lightly impacted by the Project for two periods of approximately twelve months during the construction and upgrade of GPF_MUG_06. This is due to be online in 2014 and upgraded in 2016.
Crossroads Road	6	Rural	Unsealed	179	510	2012	This road is the most heavily impacted in the local road network. It may have a moderate impact over an extended period during the construction and upgrade of GPF_MUG_06, GPF_COM_03a, GPF_LUK_02a and GPF_RCK_04a. This includes their associated upgrades and WTFs. Construction is scheduled to begin in 2011 and continue to 2017.
Horse Creek Road	4 – 5	Rural	Sealed and unsealed	132	456	2012	This road is heavily impacted by the Project, with a moderate impact over an extended period during the construction and upgrade of GPF_MUG_06, GPF_COM_03a and GPF_RCK_04a with their associated WTFs. Construction on these GPFs is scheduled to begin in 2011 and continue to 2016.
Seaside Road	4 – 5	Rural	Unsealed	51	130	2012	This road is lightly impacted by the Project for two periods of approximately twelve months, during the construction and upgrade GPF_RCK_04a which is due to be online in 2013 and upgraded in 2015.
Wallumbilla North Road	4	Rural	Sealed	46	122	2013	This road is lightly impacted by the Project for two periods of approximately twelve months, during the construction and upgrade of GPF_MUG_06 which is due to be online in 2014 and upgraded in 2016.
Yuleba	4	Rural	Sealed	67	273	2011	This road is moderately impacted by the Project for an extended period during

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Nature of project traffic
Taroom Road							construction of GPF_MUG_06, GPF_COM_03a and GPF_RCK_04a. Construction of these GPFs is scheduled to begin in 2011 and continue to 2016.

Pavement rehabilitation and maintenance

The Project will contribute to the accelerated deterioration of some of the road pavements in the study area.

A maximum case development scenario may see the Project bring forward the need for rehabilitation by more than one year, and in some instances the project traffic may have an impact of greater than 5% of the existing traffic volume. Roads conforming to these conditions within the study area are detailed in Section 17.6.1.

Bridge capacity and constraints

The relevant restriction or constraint of each of the bridges within the gas fields' study area (refer Section 17.3.1) has been considered when determining the potential impact on the project traffic. These are given in Table 17.18 below.

Table 17.18 Project traffic impacts from bridges

Bridge name	Nature of project traffic and potential impact
Dogwood Creek Bridge	This bridge is on the western route from Miles. The bridge may be impacted by the Project during construction of both the pipeline and the gas fields' infrastructure. The average daily traffic volume peaks at 200 vehicles per day (VPD) on this bridge. The restriction on this bridge is unlikely to affect most of the project traffic
Condamine River Bridge (Crawford Bridge)	This bridge provides access from Miles/Condamine to the Condabri, Talinga/Orana and Kainama gas fields. It is likely to carry heavy project traffic, with the average daily peak being 204 vehicles per day (VPD). The load restriction on this bridge is unlikely to impact the Project
Woleebee Creek Bridge	This bridge provides access from Gladstone and Townsville to the Woleebee, Combabula/Ramyard gas fields. The restriction is not expected to impact the Project
One Arm Man Creek Bridge	This bridge provides access from Gladstone and Townsville to the Woleebee, Combabula/Ramyard gas fields. The restriction will impact vehicles with a GVM greater than 30 tonnes
Kogan Creek Bridge	This bridge provides access from Brisbane to the Talinga/Orana and Condabri gas fields. It also provides access from Miles and the Miles airport to the Kainama gas field. The narrow bridge will impact any wide loads delivered to the gas fields
Fourteen Mile Creek Bridge	This bridge provides access from Brisbane to the Talinga/Orana and Condabri gas fields. It also provides access from Miles and the Miles airport to the Kainama gas field. The constraint will impact traffic during flooding
Braemer Creek Bridge	This bridge provides access from Brisbane to the Kainama, Talinga/Orana and Condabri gas fields. The narrow bridge will impact any wide loads delivered to the gas fields
Unnamed bridge on Dalby-Kogan Road	This bridge provides access from Brisbane to the Kainama, Talinga/Orana and Condabri gas fields. It is likely that this crossing is affected by flooding

Bridge name	Nature of project traffic and potential impact
Ashall Creek Bridge	This bridge provides access from Gladstone to the Gilbert Gully gas fields. It is likely that this crossing is affected by flooding

The Project is not expected to impact on bridges within the study area and no alterations are anticipated based on mitigation measures proposed and DTMR data.

Traffic incident history

As outlined in Section 17.3.1 of this chapter, some road links within the gas fields' study area are identified as falling within a 'very high risk' or 'high risk' category. This assessment is based on the number of crashes per million vehicle kilometres travelled (C/MVKT). The road links identified with C/MVKT above 1.0 are:

- Surat Developmental Road, along the main street of Tara to the west of Chinchilla-Tara Road – this section has an existing crash risk ratio of 2.54, so is identified as a very high risk road for accidents. In 2019, the Project is predicted to add a further 85 vehicles per day to this road. This represents a 3% increase in traffic volume
- Warra-Kogan Road, between Condamine Road and Warrego Highway – it is not currently proposed for project traffic to use this road
- Warrego Highway, west out of Dalby – this section of highway has a crash risk ratio of 1.19, so is identified as being a high risk road for accidents. Although located just outside the gas fields' study area, it was included in the assessment as some project traffic may need to use this stretch of the highway to access the gas fields. With current transport arrangements in place, most of the non local operations and maintenance personnel employed in the Project will use this section of road for travel to and from their places of employment within the project area. In 2019, the Project is predicted to add a further 45 vehicles per day. This represents a 2% increase in traffic volumes.

Oversized vehicles

During gas fields' construction, oversized and/or overweight vehicles may need to travel along state-controlled roads and, in some cases, along council-controlled roads. Planning of these trip movements is ongoing, but oversized vehicle transportation will be required for the following:

- Compressor unit – total mass of 86t, sourced from North America or Asia, and shipped in multiple parcels
- Coolers – one per compressor, sized at 19m x 5m x 5m, 42t total, generally sourced from North America
- Dehydration package – oversize loads with two required for each gas processing facility, and transportation possibly from Melbourne to the facility site.
- Most oversized loads will originate from the Port of Brisbane.

Roads prone to flooding

A riverine flooding investigation was carried out, including modelling various scenarios within the gas fields' study area. The outcomes of this investigation are outlined in a report – 'Flood Investigation for Talinga Coal Seam Gas Development', WorleyParsons 2008.

This report concluded that most Queensland and local government roads experience a degree of inundation during storm events. Some major road corridors, such as the Warrego Highway and Leichhardt Highway, were also shown to suffer from inundation in the 10-year average recurrence interval (ARI) rainfall event at a number of locations. Some of the key roads affected provide access to the gas fields. This includes Jackson Wandoan Road, Warrego Highway, Leichhardt Highway and Kogan-Condamine Road. New access roads to the gas fields may also cross water courses or be located on floodplains.

The Project will limit traffic movement during and after flood events, in line with local traffic control measures.

Public and active transport network

Due to the limited road network within the gas fields' study area, project traffic will inevitability travel along roads also used as school bus routes.

Stock routes

Queensland's stock route network, as currently mapped by the Department of Environment and Resource Management, will be crossed by the gas pipeline and access roads at a number of locations. A detailed assessment is not possible at this stage, as access roads to the gas fields' facilities have not been fully finalised to date.

Full details of the potential impacts will be provided in relevant traffic management plans, once project details are confirmed along with timing, construction methods and operations.

Impacts will be partly related to present day levels, as defined in the stock route classifications outlined in Table 17.19.

Table 17.19 Stock route classification

Classification	Cattle equivalent for a five year period
Primary	> 9,000
Secondary	3,000–9,000
Minor	<3,000
Inactive	Local and unrecorded movements

The degree of impact is defined as follows:

- Minor – the underground pipeline crosses a stock route, temporarily severing access during the construction period. A stock route road is used to deliver construction material for a short time
- Moderate – stock route is crossed by an at-grade access track or another project infrastructure item that may require some local area modification to the route, such as slight realignment or a gated crossing. A stock route road is a primary haul route during the construction phase, but access is maintained. Impacts over the long term would be minimal, involving only temporary severance during construction and possibly occasional use for inspections and maintenance access
- Significant – a processed new facility and/or access track severs the route, requiring realignment or closure of the stock route access at this point.

Most of the impacts are expected to fall into the minor category, as there is limited need for new or altered roads that may impact stock routes. Potential impacts include severance, disruption, or increased risk of accidents for users.

Environmental impacts

Project traffic will utilise existing and new roads that may need to be constructed to access the proposed gas fields' infrastructure. This may cause of the following environmental impacts:

- Dust control – dust generation on roads used by project traffic during construction and operational phases may impact on roadside vegetation, the safety and general comfort of other road users, and adjoining land uses
- Weed, pest and disease control – it is acknowledged that the Project is located within a weed and pest control area. The movement of project vehicles throughout the study area increases the risk of spreading weeds and pests.
- Noise – it is acknowledged that the Project will increase road traffic noise levels, particularly during construction, however it is not expected that the project traffic will result in accepted noise thresholds for adjacent residences being exceeded.
- Product spill – it is acknowledged that the Project may increase the risk of product spill during the transportation of materials by road, for example fuel.

Any environmental impacts associated with the project traffic using existing roads and/or the construction of new roads will be documented and mitigations specified in the detailed design phase of the Project.

17.5.2 Rail

Australian Pacific LNG has investigated the possibility of using the Western Line to carry some construction material to the gas fields. This included discussions with Queensland Rail.

Preliminary investigations have indicated that this option is not preferred, although rail may well be a viable means of transporting pipes for the main gas transmission line (refer to Volume 2 Chapter 17). Road transport appears to be favoured on the basis of flexibility and reduced double handling, as well as the reduced need to alter resources and infrastructure for a relatively short time. The use of rail will continue to be investigated.

The Western Line is crossed twice by the Warrego Highway near Miles and Chinchilla, and once by the Leichhardt Highway in Miles. The details of the crossings and the project traffic impact on these crossings are detailed in Table 17.20.

17.5.3 Shipping

Port of Brisbane has been identified as the main port for importing and distributing construction materials to the gas fields. Discussions with Brisbane Port Authority have identified that there is sufficient berthing capacity at the Port of Brisbane to accommodate expected demand.

Shipping is further described in Volume 4 Chapter 17 and Volume 5 Attachment 35.

Table 17.20 Road/rail crossing points within the study area

Rail line	Current operation on line	Road – rail crossing location description	Crossing type	Highway crossing	Chainage	AADT - current	Speed limit	Additional total project traffic
Western line between Toowoomba and Roma	Line carries a mixture of long distance passenger trains, grain trains, general freight and coal (coal represents most train trips) Averages 4-6 trains a day	West of Miles, close to Leichhardt Highway north/Warrego intersection	Active control, such as flashing lights and signage	Warrego Highway	Ch 1.135 – 44.099	1,497	80km	138
Western line between Toowoomba and Roma	As above	Miles immediately south of Leichhardt south /Warrego intersection	Active control as above	Leichhardt Highway	Ch 0.00-32.020	489	60km	278
Western line between Toowoomba and Roma	As above	Chinchilla, close to Warrego Highway/Wambo Street intersection	Active control as above	Warrego Highway	Ch 80.175-83.155	2,751	60km	45

17.5.4 Air services

Miles aerodrome

The Miles aerodrome is impacted by gas fields' construction and operations personnel during shift changes when personnel are bussed to and from the aerodrome.

Based on a rotating shift pattern between 2012 and 2018 is estimated that up to 120 people in any one day may pass through the aerodrome. After 2018 this is expected to reduce to up to 50 people.

Process and exhaust gas plume rise

From time to time during the operation of the gas processing facility located 2.2km south west of the Miles Aerodrome, exhaust gas plume rises may occur which could possibly impact on aircraft operations.

Australia Pacific LNG has undertaken a process and exhaust gas plume rise assessment of this risk and has identified measures to ensure that the safety of aircraft is not compromised. Details are provided in Volume 2 Chapter 22.

Roma airport

The Roma airport is impacted by gas fields' construction and operations personnel during shift changes when personnel are bussed to and from the airport.

Based on a rotating shift pattern between 2012 and 2018, it is estimated that up to 60 people in any one day may pass through the airport. After 2018 this is expected to reduce to up to 10 people.

17.6 Mitigation and management

The analyses detailed in this chapter relates to a maximum development scenario. The Project's configuration, timing, workforce requirements, route selection and materials requirements assumed in this chapter describe information as it is currently understood and depict the 'maximum case' scenario in terms of traffic and transport impacts. Consequently, any future changes to the Project made by Australia Pacific LNG, such as a decrease in workforce requirements, or change in location of a gas plant, are not likely to have an impact on the transport network greater than what is reported in this study.

Actual mitigations implemented will be determined based on the final, approved project development plan.

17.6.1 Road network

Road link capacity

As discussed in Section 17.5.1 there are no requirements for link alterations in the state-controlled network that are directly associated with gas fields construction in the gas fields' study area.

Council roads

The gas fields' project traffic impacts on a number of council-controlled roads, and the nature, magnitude and significance of this impact has been discussed in Section 17.3.1. Appropriate measures for impact mitigation have been identified which aim to reduce any negative impacts and

maximise the positive benefits for adjacent land owners and road users. The broad mitigation strategy developed for the sections of local roads used by the Project, outlined in Table 17.21 and Table 17.22 is as follows:

- Type A – where the project traffic is associated only with the construction of a single gas plant including access to accommodation facilities and laydown areas, the project traffic will be of a low level (less than 150 vehicles per day) and is expected to occur over a short duration (for up to twelve months). Depending on traffic volume and load type, for local roads impacted it is proposed to alter the local road to a minimum unsealed six metre formation. This will enable two heavy vehicles to pass safely. Where the peak daily project traffic is above 150 vehicles per day the formation width may be increased to 8m. The alteration may involve re-sheeting of the existing gravel pavement to provide a pavement of suitable strength to cater for the increased heavy vehicle traffic generated by the Project. During construction more regular maintenance of the road should be undertaken including regular grading and dust control in accordance with a traffic management plan and where required to maintain safety.
- Type B – where the Project is associated with the construction of a number of components including multiple gas plants, the project traffic is expected to be of a higher level and may be undertaken over a longer duration. For these local roads it is proposed to provide a higher standard of roadway in accordance with Austroads – Part 3 which is a minimum 9.2m formation with a 7m seal and 0.5m sealed shoulders. This standard of carriageway will cater for daily traffic in the order of 150 to 500 vehicles per day.

It is anticipated that detailed negotiation will be held with the relevant authority with respect to the appropriate mitigation strategies for the local road network.

Generally, insufficient information was available from the regionally significant projects included in this report to enable a cumulative assessment of the local roads network. While details of the roads to be used by other projects were given in some of the other environmental impact statements, either the roads to be utilised by others were different, or the timing of the use of the road by others was different to the timing proposed for the Project.

Potential alterations which may be considered are given in Table 17.21 and Table 17.22. Australia Pacific LNG will work with the federal, Queensland and local governments and industry regarding the potential alterations, monitoring and maintenance required to meet the increased demands on local infrastructure.

Table 17.21 Western Downs Regional Council roads

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Minimum mitigation proposed
Avenue Road	4	Urban	Sealed	38	92	2012	Type A (6m)
Bells Road	7	Rural	Unsealed	40	91	2022	Type A (6m) Note: formation width currently adequate
Colsons Road	7	Rural	Unsealed	43	129	2019	Type A (6m)

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Minimum mitigation proposed
							Note: formation width currently adequate
Elerslea Lane East	6	Rural	Unsealed	29	120	2012	Type A (6m) Note: formation width currently adequate
Giligulgul Road	5–6	Rural	Sealed and unsealed	57	179	2015	Type B (9.2m)
Gunbarwood Road	5	Rural	Unsealed	38	92	2012	Type A (6m)
Homebush Road	7	Rural	Unsealed	38	91	2018	Type A (6m) Note: formation width currently adequate
Kerrs Road	5	Rural	Unsealed	28	115	2015	Type A (6m)
Mclennans Road	7	Rural	Unsealed	51	189	2013	Type B (9.2m)
Wallan Creek Road	5–6	Rural	Sealed	38	91	2018	Type A (6m)

Table 17.22 Maranoa Regional Council roads

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Minimum mitigation proposed
Bogandilla West Road	6	Rural	Unsealed	42	94	2019	Type A (6m) Note: formation width currently adequate
Cattle Creek Road	4	Rural	Sealed	47	122	2013	Type A (6m)
Crossroads Road	6	Rural	Unsealed	179	510	2012	Type B (9.2m)

Road name	Trafficable width (m)	Type	Surface	Average daily project traffic	Peak daily project traffic	Peak daily traffic year	Minimum mitigation proposed
Horse Creek Road	4–5	Rural	Sealed and unsealed	132	456	2012	Type B (9.2m)
Seaside Road	4–5	Rural	Unsealed	51	130	2012	Type A (6m)
Wallumbilla North Road	4	Rural	Sealed	46	122	2013	Type A (6m)
Yuleba Taroom Road	4	Rural	Sealed	67	273	2011	Type B (9.2m)

Intersection capacity

State-controlled roads

As discussed in Section 17.5.1, there are no intersection alterations on the state-controlled network directly associated with the construction of the gas fields.

Council-controlled roads

As discussed in Section 17.5.1, project traffic associated with the construction of the gas fields will use a number of rural intersections of state-controlled roads with council-controlled roads.

There will be no intersection capacity issues associated with these intersections. However, the intersections will need to be assessed during the detailed design stage, to determine if other alterations are required. Assessment should include reviewing all the intersections to ensure adequate safe intersection sight distance is being achieved. If the required safe intersection sight distance is not currently available, the intersection should be altered to achieve the required sight distance.

The DTMR Road Planning and Design Manual also provides the intersection form when minor roads meet state-controlled roads. The warrants are based on the number of turning movements, compared with the through movements on the state-controlled roads. Based on the through movement volume on the state-controlled roads at intersections with council-controlled roads, and the anticipated project turning volumes, it is anticipated that the intersection forms will be required to be a minimum 'basic right turn' and 'basic left turn' treatment. Australia Pacific LNG will work with government and industry in regard to the potential alterations, monitoring and maintenance.

Intersections of gas plant access roads with local roads

In some cases, access roads to GPFs or temporary accommodation facilities may intersect with a local road. If so, the access location should be selected to ensure that safe intersection sight distance is achieved for the local access road speed environment. It is likely that the intersection form would be a minimum basic right turn and basic left turn treatment.

Pavement rehabilitation

Calculations have been made for the significantly impacted roads within the gas fields' study area that require rehabilitation during the assessment period. These calculations are provided in Table 17.23.

Table 17.23 Pavement rehabilitation impacts

DTMR region	Road name	Chainage	Rehab year no project	Rehab year with project	Bring forward with project
Darling Downs	18D – Warrego Highway	Ch 0 to 1.135	2028	2026	1.9
		Ch 56.831 to 101.157	2020	2018	1.8
		Ch 101.157 to 135.247	2021	2020	1.1
	26B – Leichhardt Highway	Ch 60.47 to 127.61	2020	2018	1.8
	26C – Leichhardt Highway	Ch 0 to 32.02	2019	2010	8.6
		Ch 32.02 to 53.04	2012	2010	2.3
	3251 – Millmerran-Cecil Plains Road	Ch 0 to 45.61	2036	2019	17.2
	3402 – Tara-Kogan Road	Ch 34.8 to 43.03	2022	2018	4.1
	342 – Kogan-Condamine Road	Ch 0 to 45.82	2033	2024	8.8
		Ch 45.82 to 71.41	2031	2026	5.1
	4302 – Jackson-Wandoan Road	Ch 68.93 to 81.1	2033	2029	3.9
	86A – Surat Developmental Road	Ch 119.3 to 142.67	2010	2009	1.0
	86B – Surat Developmental Road	Ch 0.6 to 40.39	2013	2012	1.0

Road maintenance

The maintenance for the various road links was based on the Project's proportional use (by ESA) of the road over the analysis period. Roads that are impacted by more than 5% of the existing traffic volumes are shown in Table 17.24.

Table 17.24 Maintenance impacts

DTMR region	Road name	Chainage
Darling Downs	18D – Warrego Highway	Ch 0 to 1.135
		Ch 1.135 to 44.099

DTMR region	Road name	Chainage
		Ch 44.099 to 56.831
		Ch 56.831 to 101.157
		Ch 101.157 to 135.247
	26B – Leichhardt Highway	Ch 60.47 to 127.61
	26C – Leichhardt Highway	Ch 0 to 32.02
		Ch 32.02 to 53.04
		Ch 53.04 to 81.4
		Ch 81.4 to 127.42
		Ch 127.42 to 176.37
		Ch 176.37 to 205.21
	325 – Dalby-Cecil Plains Road	Ch 0 to 39.08
	3251 – Millmerran -Cecil Plains Road	Ch 0 to 45.61
	3402 – Tara-Kogan Road	Ch 34.8 to 43.03
	341 – Chinchilla-Tara Road	Ch 22.51 to 43.49
	342 – Kogan-Condamine Road	Ch 0 to 45.82
		Ch 45.82 to 71.41
	35A – Moonie Highway	Ch 11 to 50.37
	4302 – Jackson-Wandoan Road	Ch 47.94 to 68.93
		Ch 68.93 to 81.1
	86A – Surat Developmental Road	Ch 119.3 to 142.67
		Ch 142.67 to 146.95
		Ch 146.95 to 147.51
	86B – Surat Developmental Road	Ch 0.05 to 0.6
		Ch 0.6 to 40.39
South West	4302 – Jackson-Wandoan Road	Ch 0 to 47.94

Australia Pacific LNG will work with the federal, Queensland and local governments and industry in regard to potential maintenance requirements to meet the increased demands on regional infrastructure.

Bridge capacity and constraints

The proposed mitigation options for bridges impacted by project traffic are identified below:

- Dogwood Creek Bridge – heavy loads will need to travel with the appropriate restrictions. This includes loads that may be required for large gas plant items. There are no reasonable opportunities for alternative routes.

- Condamine River Bridge (Crawford Bridge) – no mitigation required
- Woleebee Creek Bridge – no mitigation required
- One Arm Man Creek Bridge – an alternative route is available via the Leichhardt Highway and Giligulgul Road. This route may be taken for any vehicle with a gross vehicle mass (GVM) in excess of 30 tonnes
- Kogan Creek Bridge – as this bridge is narrow, large loads originating from Brisbane may need to use an alternative route to access the gas fields. The route would be via the Warrego Highway through Chinchilla, then south on the Leichhardt Highway at Miles, then east on the Kogan-Condamine Road at Condamine
- Fourteen Mile Creek Bridge – as this bridge is prone to flooding, loads originating from Brisbane may need to use an alternative route to access the gas fields during flooding. The route would be via the Warrego Highway through Chinchilla, then south on the Leichhardt Highway at Miles, then east on the Kogan-Condamine Road at Condamine. Personnel transport to and from Miles and the Kianama gas fields may also be affected by flooding at this bridge. If so, it may be necessary to use the Warra-Kogan Road instead
- Braemer Creek Bridge – large loads bound for the Kianama gas fields would need to be diverted via the Warrego Highway and the Warra-Kogan Road. Large loads bound for the remaining gas fields may need to be diverted via the Warrego Highway through Chinchilla, then south on the Leichhardt Highway at Miles, then east on the Kogan-Condamine Road at Condamine
- Unnamed bridge on Dalby-Kogan Road – during flood periods, traffic to the Kianama gas fields would need to be diverted via the Warrego Highway and the Warra-Kogan Road. During flooding, traffic bound for the remaining gas fields may need to be diverted via the Warrego Highway through Chinchilla, then south on the Leichhardt Highway at Miles, then east on the Kogan-Condamine Road at Condamine
- Ashall Creek Bridge – during flood periods, traffic from the Gilbert Gully gas fields may need to be diverted south on the Dalby-Cecil Plains Road, west on the Gore Highway then north on the Leichhardt Highway to access Miles.

Traffic incident history

The Surat Developmental Road, along the main street of Tara to the west of the Chinchilla-Tara Road, was identified in Section 17.3.1 as falling within a 'very high risk' category. This is based on the number of crashes per million vehicle kilometres travelled (C/MVKT). The Project is predicted to add only a further 85 vehicles per day in 2019, which represents a 3% increase in traffic volumes. This is not significant and is not expected to increase the accident rate.

Two other road links were also identified. These were the Warrego Highway, west out of Dalby, and the Leichhardt Highway at various locations. In both cases, the additional project traffic will be below 5% of existing traffic and is not expected to increase the risk of accidents.

Australia Pacific LNG recognises that road safety is a vital part of project operations. A range of operational health and safety measures covering the operation of project vehicles will be in place to reduce the risk of motor vehicle accidents.

Driver training

There are two driver training programs offered to employees working on gas fields' developments:

- Urban to Outback – targeted at employees who drive from city-based office locations to field sites. The course covers driving and vehicle use policies, vehicle checks, defensive strategies, driver fatigue and vehicle operation, particularly on gravel roads
- Onsite driver training – designed for people who work at gas fields such as Spring Gully and Talinga.

Over 260 employees have completed these courses since the beginning of last year. Origin, on behalf of Australia Pacific LNG, is considering options for extending these programs to more employees.

Driver fatigue

The Project will aim to reduce private vehicle use as much as possible during construction, by providing transport to site, from designated pick up areas or to and from the local airport for fly-in/fly-out staff.

Journey management plans for vehicle travel will incorporate fatigue management considerations.

Construction and ongoing service deliveries to project facilities will be in accordance with the traffic management plan and relevant transport regulations. This will include strict adherence to driver travel and required rest periods and the adoption of safe driving techniques.

Oversized vehicles

All oversized and/or overweight vehicle movements will be undertaken in accordance with Queensland regulations and the *Transport Infrastructure Act 1994.* Traffic Management Plans will be in accordance with these regulations.

Decommissioning and rehabilitation of temporary accesses

Accesses to temporary facilities, laydown areas and stockpile sites that have been constructed as part of the Project will be decommissioned unless relevant federal, Queensland or local government agencies or landowners agree with the Project to leave them in place.

Access to construction sites

A number of temporary accommodation facility roads and local roads associated with the construction of the gas fields infrastructure will access directly onto state-controlled roads. The final locations of the new intersections will be selected to ensure that safe intersection sight distance is achieved for the speed environment on the state-controlled road. It is expected, based on the turning volumes in/out of the camps and facilities that the new and existing intersection forms are likely to be a minimum basic right turn and basic left turn treatment. This will be assessed as part of the traffic management plan.

Accesses to temporary facilities, lay down areas and stockpile sites that have been constructed as part of the Project will be decommissioned unless relevant federal, Queensland or local authorities or landowners agree to leave them in place.

Site access to construction sites will be arranged by the relevant contractor. However, access provisions are likely to include measures such as fencing, signage including health and safety requirements and security measures.

Stock route mitigation

Measures undertaken to minimise the impact on stock routes may include the following:

- Planning operations in close cooperation with Department of Environment and Resource Management, local councils and pastoralists
- Constructing project infrastructure to avoid stock routes, as far as practicable.

Post construction, stock routes will be rehabilitated to meet the surrounding conditions. It is also expected that access would be maintained, or in some cases improved where practicable.

Road flooding

In the event that a section of the Queensland or council road network becomes impassable during periods of flooding, alternative routes may be used if safe and practicable. Should access not be achievable during prolonged flooding events, then construction activities may need to be shut down and demobilised for a period.

The Project will limit traffic movement during and after flood events, in line with local traffic control measures.

The analysis has not identified any upgrades of any waterway crossings on the state-controlled network.

Some access roads will need to be constructed to provide permanent access to project facilities within the gas fields. All weather access is required to GPFs throughout the life of the Project. The alignment of these access roads is preliminary and will require further investigation.

When road locations, designs and level of flood immunity are finalised, it is proposed that further hydraulic modelling be carried out. This will ensure impacts are minimised and mitigation of any changes to flood behaviour does not adversely impact upstream or downstream properties. This is discussed in Volume 5 Attachment 22 and Volume 2 Chapter 11 – Surface water.

Public and active transport network

As indicated in Section 17.5.1, the project traffic will travel along roads used as school bus routes.

The Project's traffic management plan will consider measures to limit this impact during school drop-off and pick up times. Further details are found in Volume 2 Chapter 22 – Social assessment.

Environmental impacts

New roads will need to be constructed to access gas pipeline infrastructure. In determining the location of these facilities, consideration has been given to the proximity of existing roads and the local environment.

During all phases (construction, operation and ongoing road maintenance) of this project, sustainability measures will be implemented that will provide long term community benefits while minimising traffic impacts. The Project will also adopt road construction practices and technologies to reduce environmental impact and energy use, as far as practicable. In addition, the requirements of the *Environmental Protection Act 1994*, Main Roads Design Manual 2004, and other relevant legislation will be adhered to ensure environmental impacts will be are kept to a minimum as far as practicable. These will be consistent with Volume 5 Attachment 14 – Terrestrial ecology.

Earthworks, vegetation clearing, erosion, and runoff will be minimised as far as practicable, and sediment control and weed management measures will be put in place as discussed in Volume 5 Attachment 5 – Soils, geology and topography assessment, and Volume 5 Attachment 22 – Surface water.

Dust control

Australia Pacific LNG will implement conventional measures to minimise, as far as practicable, the generation of dust by project vehicles during construction. This may include regular application of water at appropriate locations, following DTMR's standard specification MRS11.02 – Provision for traffic.

Weed, pest and disease control

Australia Pacific LNG will participate in proactive weed management and will work closely with regional councils, as discussed in Volume 5 Attachment 14. Origin's weed management procedure will also be used to ensure that the risk of weed contamination is minimised.

Noise control

Australia Pacific LNG will implement a traffic management plan to minimise, as far as practicable, the potential impacts of road traffic noise from project traffic. This may include speed controls on project vehicles, and management of night-time traffic along roads adjacent to residential or other sensitive land uses.

Spill control

Australia Pacific LNG will implement a traffic management plan to minimise, as far as practicable, the potential impacts of product spill during the transportation of product and materials. This may include the use of suitably qualified fuel transport operators giving consideration to vehicle maintenance, driver training and cleanup procedures as part of emergency response plans.

Traffic management plan

For all road-based construction activity associated with the Project, a traffic management plan will be developed during the front end engineering design stage of the Project. The plan will be developed in conjunction with the relevant Queensland and local authorities and the local community.

The traffic management plan will address the movement of heavy vehicles associated with the Project throughout the road network, by:

- Setting routes to be used by the heavy vehicles, generally restricted to existing heavy haul routes
- Restricting heavy vehicle movements during certain times of the day or week, such as on routes which traverse school zones
- Restricting vehicle speeds near residences
- The possible installation of temporary or permanent signage in high risk areas to warn road users of increased heavy vehicle activities.

This traffic management plan will also address maintaining access for emergency vehicles and measures to be taken to prevent public access to project sites.

Conventional construction methods are expected to be used when constructing infrastructure works within the road reserve to mitigate the Project's impacts. At the front end engineering design stage, traffic management plans will be prepared according to DMR Specification MRS11.02 Provision for traffic and the Manual of uniform traffic control devices (MUTCD). Australia Pacific LNG's road construction contractors will be required to implement the plan when carrying out the works.

17.6.2 Rail network

The use of the rail network to transport materials to the gas fields is currently being investigated. At this stage, no mitigation measures are required.

Road/rail crossings

The three road/rail crossing points within the project area are currently managed by active control measures including flashing lights and signage. The increase in traffic at the crossings due to the Project is not considered a warrant to increase controls.

17.6.3 Shipping network

Consultation with the Port of Brisbane Corporation has indicated that there is sufficient capacity to cater for possible berth options for importing materials.

Details of the shipping impacts and mitigation are given in Volume 5 Attachment 35 and Volume 4 Chapter 17.

17.6.4 Air services

Miles aerodrome

As stated in Section 17.5.4, up to 120 people in any one day associated with the construction of the gas fields may use the Miles Aerodrome during the peak construction period. The current aerodrome can cater for Dash 8-200 aircraft capable of carrying 36 persons. Therefore, to cater for the impact of the gas fields' construction, up to an additional four Dash 8-200 aircraft movements may be required.

Australia Pacific LNG will work with Western Downs Regional Council and relevant government agencies and service providers to determine the most appropriate options for the use of Miles Aerodrome.

Roma airport

As stated in Section 17.5.4, up to 60 people in any one day associated with the construction of the gas fields may use the Roma Airport during the peak construction period. The current airport can cater for Dash 8-300 aircraft capable of carrying 50 persons. Therefore, to cater for the impact of the gas fields construction, up to an additional one to two Dash 8-300 aircraft movements may be required.

Australia Pacific LNG will work with Maranoa Regional Council and relevant government agencies and service providers to determine the most appropriate options for the use of Roma Airport and will support Maranoa Regional Council's applications for government funding to upgrade the Roma Airport.

17.7 Conclusions

17.7.1 Assessment outcomes

A summary of the environmental values, sustainability principles, potential impacts and mitigation measures in relation to traffic and transport for the gas fields is presented in Table 17.25. The residual risk for traffic and transport is also included.

A risk assessment has been undertaken to identify potential risks, causes and consequences associated with traffic and transport, using the project risk criteria in Volume 1 Chapter 4. Mitigation measures to reduce the risks have been nominated and the residual risk has been calculated. Further details of the risk assessment methodology are provided in Volume 1 Chapter 4.

Table 17.25 Summary of environmental values, sustainability principles, potential impacts and mitigation measures

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
Road					
The wellbeing of the local community and businesses. Efficient, sustainable and supportive transport network for all members of the local and business community. Flora and fauna habitat protection.	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities	Increased congestion and delay on road network.	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate components of the Project.	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures and intersection and road alterations. Reduce light vehicle use as much as possible during construction by providing transport to site, from designated pick up areas or to and from the local airport for fly in/out staff using busses. Develop traffic management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies.	Medium
	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by	Damage and increased wear-and-tear on the existing road infrastructure due to heavy vehicles.	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate components of the Project.	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures, intersection and	Medium

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
	its activities		Use of unsealed roads.	road alterations, pavement rehabilitation and road maintenance. Develop traffic management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies.	
	Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities	Increased risk of accidents on the road network resulting in fatalities and injuries to persons Injury/death of fauna Damage to property Impact on company reputation Release of containments to the environment (product spill)	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate project components. Increased long distance road travel. Vehicle defect or failure Incorrect management of load on vehicle Vehicle defect or failure Inadequate vehicle selection Collision (wildlife, fixed objects including power lines, third party vehicles) Road conditions and road	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures, intersection and road alterations, pavement rehabilitation and road maintenance. Reduce light vehicle use as much as possible during construction by providing transport to site, from designated pick up areas or to and from the local airport for fly in/out staff using busses. Work with Australian, Queensland and local governments and industry to improve road safety through clear road signage, improve road alignments and intersection geometry Develop and implement detailed traffic management plans and transport and logistics management plans for construction	High

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
			design Driver error/fatigue Environmental conditions and adverse weather Inadequate vehicle servicing and/or maintenance Environmental hazards such as glare from sunrise and sunset Lack of adequate awareness of vehicle movements associated with the Project by local stakeholders Excessive speed and failure to follow road rules Poor visibility and line of sight viewing on regional road Lack of adequate planning Not following vehicle and transportation procedures Lack of adequate awareness of vehicle	and operating the project infrastructure (including safety measures) to reduce the risk of accidents to employees and other transport network users from the Project's operations. Consultation and project operations information provided to local residents Liaise with local police and road authorities Implement a range of operational health and safety measure covering the operation of project vehicles to reduce the risk of motor vehicles accidents. Provide driver's training to relevant Australia Pacific LNG staff. Contractors will be required to have health and safety management system which includes safe driving. Emergency response and crisis procedures Health safety and environment management plans and procedures Journey management plans Drug and alcohol testing Licensed bus drivers Inductions, driver training and awareness notices	

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
			movements associated with the Project by local stakeholders	Use of appropriate project vehicles including safety features for vehicles Regular vehicle and equipment servicing Fire extinguishers in vehicles Escort vehicles for oversized or heavy vehicles Road side signage used for road works, dust suppression activities GPS tracking system installed in APLNG and hire vehicles Road suitability selection assessment process	
	Minimising adverse environmental impacts and enhancing environmental benefits associated with Australia Pacific LNG's activities, products or services; conserving, protecting, and enhancing where the opportunity exists, the biodiversity values and water resources in its operational areas	Increased risk of adverse impact on the environment such as air pollution, noise, dust, land take, loss of habitat, runoff, pest and weed spread. Release of containments to the environment (product spill, oil leaks Inappropriate disposal of wastes such as cigarette butts, cans and food wrappers due to social	Additional volumes of oversize, heavy and light vehicle traffic due to quantity of materials required to construct and operate project components. Need to alter or construct new roads Use of unsealed roads. Construction of new access tracks.	Work with Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures, intersection and road alterations, pavement rehabilitation and road maintenance. Reduce light vehicle use as much as possible during construction, by providing transport to site, from designated pick up areas or to and from the local airport for fly in/out staff. Journey management plans for	Medium

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities	behaviour Transportation and spread of pest and noxious weed Entanglement of flora species in vehicle exhaust system causing fire Injury/death of fauna	Not following vehicle and transportation procedures	vehicle travel will incorporate fatigue management considerations Develop traffic management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies. Environmentally sensitive road/bridge construction methodologies. Implement measures to ensure environmental impacts are reduced, as far as practicable, during the construction, operation and ongoing maintenance of existing and new roads, with works carried out in accordance with the requirements of the *Environmental Protection Act 1994*, the Main Roads Design Manual 2004, and other relevant legislation. Implement conventional measures to reduce, as far as practicable the generation of dust by project vehicles during construction. Participate in pro-active weed management and will work closely with regional councils, including wash down requirements (hygiene inspection and declaration) for vehicles coming from known weed infested areas and training on company and own vehicles	

Environmental values	Sustainability principles	Potential impacts	Possible causes	Mitigation and management measures	Residual risk level
				Inductions, driver training and awareness notices	
Air					
The wellbeing of the local community and businesses. Efficient, sustainable and supportive transport network for all members of the local and business community. Flora and fauna habitat protection.	Identifying, assessing, managing, monitoring and reviewing risks to Australia Pacific LNG's workforce, its property, the environment and the communities affected by its activities .	Increased congestion and delay at local airports and aerodromes	Movement of construction staff at breakdown/shift changes. Inadequate capacity at airport/aerodrome to support larger aircraft. Infrastructure not available or services reduced due to airport construction works.	Work with Maranoa and Western Downs Regional Councils and relevant government agencies and service providers to determine the most appropriate use of the relevant airport/aerodromes. Develop management and logistic plans to provide the safe and efficient movement of people and materials, following regulations and requirements of regulatory agencies. Manage work rosters to avoid peak times.	Medium

17.7.2 Commitments

To reduce the risk of accidents to employees and other transport network users from project operations, Australia Pacific LNG will develop and implement detailed traffic management plans and transport and logistics management plans for constructing and operating the gas fields. These plans will incorporate safety measures to be implemented across all relevant modes of transport.

A range of operational health and safety measures covering the operation of project vehicles will be implemented to reduce the risk of motor vehicle accidents. Australia Pacific LNG will adopt Origin's health and safety management system for the operation of the gas fields.

Australia Pacific LNG will:

- Rehabilitate, post construction, impacted stock routes
- Work with the Australian, Queensland and local governments and industry in regard to infrastructure alterations which may be required to meet the increased demands on the regional and local transport network which may include access road construction, flood mitigation measures, intersection and road modifications, pavement rehabilitation and road maintenance
- Decommission access roads to temporary facilities, laydown areas and stockpile sites that have been constructed as part of the Project, unless relevant government agencies or landowners agree with Australia Pacific LNG to leave them in place
- Implement measures to reduce, as far as practicable, the generation of dust by project vehicles
- Participate in pro-active weed management and will work closely with regional councils
- Work with Western Downs Regional Council and relevant government agencies and service providers to determine the most appropriate options for the use of Miles aerodrome
- Support Maranoa Regional Council's applications for government funding to upgrade the Roma airport.