QGC – TRANSPORT STUDIES (UPSTREAM COMPONENT)

Road impact assessment report – March 2009

Prepared for:

QUEENSLAND GAS COMPANY PTY LTD
ABN 11 089 642 553
Level 11, 307 Queen Street
BRISBANE QLD 4000

Prepared by:

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317
10/60 Nerang Street
NERANG QLD 4211
Telephone (07) 5502 4660, Facsimile (07) 55024600

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KBR derived the data in this report primarily from visual inspections, and data supplied by Department of Main Roads and the Client. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, KBR has relied upon and presumed accurate certain information (or absence thereof) relative to existing traffic and potential traffic provided by government officials and authorities, the Client and others identified herein. Except as otherwise stated in the report, KBR has not attempted to verify the accuracy or completeness of any such information.

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Executive summary

INTRODUCTION

This report sets out the impact assessment on transport infrastructure for the Queensland Gas Company (QGC) proposal to develop approximately 6000 natural gas wells in the Surat Basin over a period of 23 years.

The impact on the state controlled and local government controlled road networks for the duration of construction, operation of the upstream gas fields has been assessed in accordance with the Queensland Department of Main Roads (DMR) *Guidelines for assessment of road impacts of development* (DMR Guidelines).

The assessment of impacts for local government controlled road network will be on the basis of agreement between QGC and the relevant authority on the condition of affected roads prior to the project traffic using particular roads. These roads will be maintained to a similar minimum standard while project traffic is using the road and after project traffic ceases to use the road.

As the decommissioning involving the removal of the above surface facilities will occur beyond the 23 year life of the project, a final assessment of the impacts on transport infrastructure would occur at that time.

DEVELOPMENT / ROAD USE PROFILE

Project description

The project involves the development of 6000 wells in the Surat Basin over a 23 year period. The wells are expected to produce 3–4 million tonnes of liquified natural gas (LNG) each year. The coal seam gas (CSG) will be transported by pipeline to Gladstone. Currently there are some CSG fields in place and in use, but QGC's proposed development of a total of 6000 wells will increase the production of CSG dramatically.

The development of the gas fields includes the construction of a 2000 km interconnecting pipe network and 36 compressor stations made up of 27 field compressor stations (FCS) throughout the CSG fields and nine central processing plants (CPP). Each CPP is fed by three FCSs. The CPPs feed into the collection header (approximately 220 km long), which comprises a 1050 mm diameter pipeline which links into the export pipeline just east of Miles. The export pipeline

(approximately 380 km long) transports the gas to Curtis Island north of Gladstone. The project also includes a 200 km collection lateral to connect other CSG areas to the export pipeline.

The project is being developed under the *State Development and Public Works Organisation Act 1971*.

The assessment for development of the CSG wells is based over the 23 year life of the project. The construction of the various FCSs and CPPs will occur on an as-needed basis to meet the increase in demand as the fields are developed and brought on line over the life of the project.

The decommissioning will be undertaken in accordance with the requirements of the relevant legislation and will involve removing the above surface equipment with the subsurface construction remaining in situ.

Location of wells and haul routes

The gas fields cover a large area (approximately 468,700 ha) and are located in areas between Woleebee Creek and Tara. Wells are typically spaced 750 m apart from one another within these areas. An indicative map of the wells is attached in Appendix A.

Time span of haulage

The proposal is to develop 6000 wells over a period of 23 years, with development of up to 500 wells in the peak year of construction (approximately 2012). The construction is due to commence in 2009 and be completed in 2032. In the operational phase there will be minimal generated traffic as the activities will include operating and maintaining the well heads, the field compressor stations and the central processing plants. The operational and maintenance personnel will be approximately 100 employees spread throughout the well precincts.

Haulage regime—days and times of operation

The nominated haulage regime for analysis is for all of the materials and equipment to be sourced from Brisbane and hauled by road throughout the gas fields.

Long haulage of items, notionally from Brisbane, could be around the clock, i.e., 24 hours per day, seven days per week. However, there may be some restriction to trucks travelling between 9.00 pm and 6.00 am through residential areas in provincial cities and townships.

Surrounding road network details

The haulage operation involves long distance travel over the state controlled network. The majority of the state controlled roads have two bitumen sealed lanes and varying widths of sealed and unsealed shoulders.

Local roads will need to be accessed by trucks when entering site. The majority of local roads are seen to be unsealed, paved roads which vary from 4–8 m in width.

There are load restrictions on some bridges, particularly on local government controlled roads.

Description of proposed vehicles

The transportation of the components for the wells and pipelines will be undertaken using conventional articulated vehicles, i.e. semitrailer and/or B-double. Vehicles carrying some of the pipeline materials may be extended semitrailers.

PAVEMENT IMPACT ASSESSMENTS

Current pavement loadings

The current pavement loadings on the state controlled road network have been assessed using traffic count volumes, proportion of heavy vehicles and annual growth rates provided by the following Department of Main Roads regions:

The ESAs per vehicle class is the average of the particular vehicle fully loaded and completely unloaded (tare weight only). The average ESA per commercial vehicle on each road ranged between 2.52 and 4.36.

Traffic loading from the construction has been calculated for the 20 year life of the pavement. Table 1 lists the state controlled roads where the average daily produced ESA is greater than 5% of the current ESA, and also illustrates the impact on the 20 year design load.

Table 1 Pavement impact

Road	Section	Generated ESAs (ESA/day)	Maximum daily impact (ESA/day)	Increase in 20 year pavement loading
Warrego Highway	Ipswich–Toowoomba	180	6%	0.7%
	Toowoomba–Dalby	180	5–25%	3.1%
	Dalby–Miles	627	25–65%	3.3–6.0%
	Miles–Roma	627	45–90%	1.5–5.8%
	Miles–Mitchell	450	23–66%	2–5.4%
Leichhardt Highway	Taroom–Miles	615	158%	4.6%
	Miles–Goondiwindi	625	155–240%	15.4%
Moonie Highway	Dalby–St George	625	12–57%	23.0%
Surat Developmental Road	Tara–Dalby	625	27–133%	28.2%
Dalby–Kogan Road		625	325–545%	55.8%
Kogan–Condamine Road		625	710%	64.4%
Jackson–Wandoan Road		180–625	430–2700%	152.7%
Dalby–Jandowae Road		445	230–300%	125.8%

The impact of the haulage on the Warrego Highway (Ipswich–Toowoomba and Toowoomba–Dalby) and the Leichhardt Highway (Taroom–Miles) is less than the 5% stated in the DMR Guidelines and is therefore considered not to be significant.

The impact of the haulage on the 20 year pavement loading is significant on sections of the Warrego Highway (Dalby–Miles, Miles–Roma and Roma–Mitchell), Leichhardt Highway (Miles–Goondiwindi), Moonie Highway (Dalby–St George), Surat Developmental Road (Tara–Dalby), Dalby–Kogan Road, Kogan–Condamine Road, Jackson–Wandoan Road and Dalby–Jandowae Road as they exceed the usage of the 20 year design load by 5% or greater as specified by the DMR Guidelines.

The pavement loading on individual local government controlled roads will be less than that for the state controlled roads. However, as these are unsealed and with only nominal pavement, additional maintenance in the form of more regular heavy grading and re-sheeting will be required. The extent of this increased maintenance will depend on the actual amount of haulage that occurs on these roads.

TRAFFIC OPERATIONS ASSESSMENT

Road link analysis

The changes to the LOS by the traffic generated by the development of the CSG field will not reduce the current level of service on the state controlled road network as set out in Table 2.

Table 2 Levels of service over state controlled roads

Road	Section	Current AADT	Generated traffic volumes (VPD)	Existing level of service	New level of service
Warrego Highway	Toowoomba–Dalby	4500–17,500	350	C–E	C–E
	Dalby–Miles	2100–6,500	510	B–D	B–D
	Miles–Roma	1200–3000	510	A–B	A–B
	Roma–Mitchell	750–1028	160	A	A
Leichhardt Highway	Taroom–Miles	640	720	A	B
	Miles–Goondiwindi	300–1850	720–740	A	A–B
Moonie Highway	Dalby–St George	1300–6400	740	A–C	A–C
Surat Developmental Road	Tara–Dalby	600–2200	580–720	A–B	A–B
Dalby–Kogan Road		300–500	740	A	A
Kogan–Condamine Road		130	440	A	A
Chinchilla–Tara Road		350–720	480	A	A
Tara–Kogan Road		160	480	A	A
Jackson–Wandoan Road		70–200	704	A	B
Dalby–Jandowae Road		600–800	160	A	A

The changes to levels of service are summarised as follows:

- Leichhardt Highway (Taroom–Miles) from LOS A to LOS B
- Leichhardt Highway (Miles–Goondiwindi) from LOS A to LOS A and B
- Jackson Wandoan Road from LOS A to LOS B.

Intersection analysis

For the purpose of assessing the impact on intersections, it is assumed that the peak hour volumes are 10% of the daily volumes. The increase in traffic on the Warrego Highway during the peak hour volume in the major direction through Toowoomba is 25 vehicles per hour and 35 vehicle per hour in one direction through Dalby. These volumes will have minimal impact on the operation of intersections through Toowoomba and Dalby.

The access to the construction camps will have the most impact on the road network. These accesses will affect roads with an AADT of less than 2000. The maximum numbers of vehicles leaving and entering the camp at any one period is 160 vehicles. The average delays to vehicles entering and leaving the camps either at the camp access itself or at intersections on the road network will, on average, be less than two seconds.

Road use management plan

The haulage of materials will be via conventional vehicles.

IMPACT MITIGATION FOR ROADS

State controlled roads

The impacts on the state controlled road network are summarised as follows:

- a significant increase in the volume of traffic using the roads as set out in Table 5.1
- as shown in Table 5.3, these increases in traffic volume change the current level of service from LOS A to LOS B on the Leichhardt Highway and on the Jackson–Wandoan Road. This change in LOS is related to a minor change in the freedom of drivers to choose their own speeds. On all other roads the LOS does not change
- an increase in traffic volume on the Jackson–Wandoan Road may require the widening of the pavement to two lanes over the existing narrow floodways
- the haulage on the 20 year pavement loading is significant on sections of the Warrego Highway (Dalby–Miles, Miles–Roma and Roma–Mitchell), Leichhardt Highway (Miles–

Goondiwindi), Moonie Highway (Dalby–St George), Surat Developmental Road (Tara–Dalby), Dalby–Kogan Road, Kogan–Condamine Road, Jackson–Wandoan Road and Dalby–Jandowae Road.

An assessment of the cost contribution will undertaken on sections of the Warrego Highway (Dalby–Miles, Miles–Roma and Roma–Mitchell), Leichhardt Highway (Miles–Goondiwindi), Moonie Highway (Dalby–St George), Surat Developmental Road (Tara–Dalby), Dalby–Kogan Road, Kogan–Condamine Road, Jackson–Wandoan Road and Dalby–Jandowae Road.

Local government controlled road

As the majority of the local government roads are unsealed, the increases in traffic volumes on the roads listed in Table 3.2 may significantly accelerate the deterioration of these roads and require amelioration treatments. The appropriate treatments for these roads will be negotiated with the relevant local government councils. The amelioration could be:

- more regular maintenance grading
- gravel re-sheeting
- dust suppression
- paving and sealing roads near construction camps
- upgrade of intersections where sight distances do not meet standards.

1 Introduction

This report sets out the impact assessment on transport infrastructure for the Queensland Gas Company (QGC) proposal to develop approximately 6000 natural gas wells in the Surat Basin over a period of 23 years.

This report examines the quantity of traffic generated during the construction of the gas fields, as well as quantifying the impact that this traffic will have on the road network throughout areas affected by the construction. The traffic is expected to be generated from the transportation of:

- construction personnel, work based and non-work based, trips
- drilling machinery
- interconnecting pipes
- bore casings
- well head equipment
- screw and reciprocating compressors
- tri-ethylene glycol (TEG) units
- campsite components (modular buildings)
- heavy plant for construction, e.g. bulldozers, graders, trucks, excavators, loaders, side boom tractors, padding machines, wheel ditching machines and water trucks
- quarry materials for access tracks and hardstands around facilities and camps.

The impact on the state controlled and local government controlled road networks for the duration of construction, operation of the upstream gas fields has been assessed in accordance with the Queensland Department of Main Roads (DMR) *Guidelines for assessment of road impacts of development* (DMR Guidelines).

The assessment of impacts for local government controlled road network will be on the basis of agreement between QGC and the relevant authority on the condition of affected roads prior to the project traffic using particular roads. These roads will be maintained to a similar minimum standard while project traffic is using the road and after project traffic ceases to use the road.

As the decommissioning involving the removal of the above surface facilities will occur beyond the 23 year life of the project, a final assessment of the impacts on transport infrastructure would occur at that time.

2 Development / road use profile

2.1 PROJECT DESCRIPTION

The project involves the development of 6000 wells in the Surat Basin over a 23 year period. The wells are expected to produce 3–4 million tonnes of liquified natural gas (LNG) each year. The coal seam gas (CSG) will be transported by pipeline to Gladstone. Currently there are some CSG fields in place and in use, but QGC's proposed development of a total of 6000 wells will increase the production of CSG dramatically.

The development of the gas fields includes the construction of a 2000 km interconnecting pipe network and 36 compressor stations made up of 27 field compressor stations (FCS) throughout the CSG fields and nine central processing plants (CPP). Each CPP is fed by three FCSs. The CPPs feed into the collection header (approximately 220 km long), which comprises a 1050 mm diameter pipeline which links into the export pipeline just east of Miles. The export pipeline (approximately 380 km long) transports the gas to Curtis Island north of Gladstone. The project also includes a 200 km collection lateral to connect other CSG areas to the export pipeline.

The impact of the construction and operation of the "pipelines" component of the project comprising the collection header with an associated parallel 525 mm diameter water main, export pipeline and the collection lateral pipeline is the subject of a separate assessment report, and the impacts are not considered in this report.

The peak workforce will be approximately 2500 personnel housed in five 400 personnel construction camps located throughout the gas field with a further 500 personnel residing in the towns.

The actual operation of the gas fields is expected to generate minimal traffic throughout their years of operation. Traffic will however be generated during the construction of the wells, FCSs and CPPs.

The project is being developed under the *State Development and Public Works Organisation Act 1971*.

The assessment for development of the CSG wells is based over the 23 year life of the project. The construction of the various FCSs and CPPs will occur on an as-needed basis to meet the increase in demand as the fields are developed and brought on line over the life of the project.

The decommissioning will be undertaken in accordance with the requirements of the relevant legislation and will involve removing the above surface equipment with the subsurface construction remaining insitu.

2.2 LOCATION OF WELLS AND HAUL ROUTES

The gas fields cover a large area (approximately 468,700 ha) and are located in areas between Woleebee Creek and Tara. Wells are typically spaced 750 m apart from one another within these areas. An indicative map of the wells is attached in Appendix A. For the purpose of this assessment it is assumed that all equipment necessary for the well construction is transported by road from Brisbane. Multimodal transport (rail to Chinchilla or Miles and then by road to the wells) is not considered in this report; however, it may be considered during the construction phase.

The state controlled road network elements considered for road haulage routes of all equipment and plant to the gas field worksites as well as construction worker trips are:

- Warrego Highway 18A (Ipswich–Toowoomba) including Cohoe Street and Jones Street, Toowoomba
- Warrego Highway 18B (Toowoomba–Dalby) including James Street, Tor Street and Bridge Street, Toowoomba
- Warrego Highway 18C (Dalby–Miles), 18D (Miles–Roma) and 18E (Roma 6–Mitchell)
- Leichhardt Highway 26B (Taroom–Miles) and 26C (Miles–Goondiwindi)
- Moonie Highway 35A (Dalby–St George)
- Surat Developmental Road 86B (Tara–Dalby)
- Dalby–Kogan Road 340
- Chinchilla–Tara Road 341
- Kogan–Condamine Road 342
- Dalby–Jandowae Road 421
- Tara–Kogan Road 3402
- Jackson–Wandoan Road 4302

The haul routes on major roads are shown in Appendix B.

The construction materials will be hauled over local government controlled roads. The following is a list of the major local government controlled roads involved:

- Beelbee Road
- Fairymeadow Road
- Gadsby's Road
- Gurulmundi Road
- Kumbarilla Lane
- Old Moonie Road
- Weranga North Road.

2.3 LOCATION OF CONSTRUCTION CAMPS AND HAUL ROUTE

Camp for construction workers are to be set up within designated areas throughout the gas fields in order to service its camp-specific number of wells. Each camp is expected to service approximately 1100–1200 wells and will accommodate approximately 400 construction workers. The workers will be housed in accommodation blocks containing up to six rooms with shared en suites. The camps will each have approximately 230 modules (two bedrooms with one en suite), seven central ablution units, two messing units, a recreational room and three office buildings. The pickup point for these buildings is in south-east Queensland where they are manufactured. They are trucked to site and assembled.

The haul routes for the camps will be similar to that of the materials for the construction of the wells and compressor stations and has been set out in Appendix C.

2.4 TIME SPAN OF HAULAGE

The proposal is to develop 6000 wells over a period of 23 years. It is proposed to develop up to 500 wells in the peak year of construction (approximately 2012). The construction is due to commence in 2009 and be completed in 2032. In the operational phase there will be minimal generated traffic as the activities will include operating and maintaining the well heads, the field compressor stations and the central processing plants. The operational and maintenance personnel will be approximately 100 employees spread throughout the well precincts.

2.5 HAULAGE REGIME—DAYS AND TIMES OF OPERATION

The nominated haulage regime for analysis is for all of the materials and equipment to be sourced from Brisbane and hauled by road throughout the gas fields. The analysis has not considered the use of rail from Brisbane to Chinchilla and Miles, or that some equipment may come from interstate via Goondiwindi. The nominated regime is considered to be the worst case scenario for impacts on the road network. Other transport options will be considered during the detailed design phase but do not form part of this study.

Haulage will be undertaken using semitrailers for pipeline and construction camp components, as well as components for the field compressor stations and the central processing plants. Fuel will be delivered in semitrailers or by B-double.

Long haulage of items, notionally from Brisbane, could be around the clock, i.e., 24 hours per day / seven days per week. However, there may be some restriction to trucks travelling between 9.00 pm and 6.00 am through residential areas in provincial cities and townships.

2.6 OPERATIONS

2.6.1 Terminology

For the purpose of this report the following terminology is used:

Trucks The number of loaded trucks to transport the materials

Trips One trip is the movement of a vehicle from its origin to its destination. The return movement is counted as a separate trip.

2.6.2 Personnel

The staged development of approximately 6000 wells and 36 compressor stations for connection to the collection header pipeline within the Surat Gas Basin will require 2500 persons per day on site at the peak period. A further 830 personnel will be away from site on rostered leave. The construction personnel numbers are shown in Table 2.1.

Table 2.1 Construction personnel distribution

Number of on-site personnel	Description	Shift
2000	Construction workers	Day
500	Construction workers	24 hour rotation

2.6.3 Camp and personnel traffic movements

Construction personnel will be housed in dedicated camp facilities located throughout the Surat Basin and some will be accommodated within the towns.

There will be 400 construction personnel (excluding camp based personnel) working from one camp at any one time. At any one time 75% (400 personnel) of the workforce will be in camp and 25% (135 personnel) will be on leave. Personnel will not keep their rooms during the rostered days off and may be assigned different rooms when they return.

Personnel will have access to their private vehicles for private travel. For camp-based works trips, the construction personnel will be transported in four wheel drive utilities to the specified point of construction. It is assumed that there will be two personnel to a vehicle. The locations of the well precincts will require traffic movements of the personnel along local government controlled roads which are typically dry weather paved roads between the Woleebee Creek and Tara region.

The camp will incorporate office and workshop facilities. There will be work-based trips associated with the office and workshop as well as trips servicing the camp. It is assumed that these trips will be between the camp and the provincial towns.

Non work-based trips for the camp personnel include the following:

- personnel travelling to and from the camp to the nearby towns outside the work shift
- personnel travelling to and from the camp on recreation leave rotation. The proposed work roster is 21 days on and 7 days off. It is assumed that on any one day, 25% of the total personnel will leave the camp on the last day of the working roster and 25% of total personnel will be returning on the same day to commence their roster the next day. The rosters will be staggered between camps so that only one camp has the changeover occurring on any one day. This will eliminate large volumes of construction worker recreational based travel on the road network on any one day.

The proposed construction of the CSG field within the Surat Basin will increase the number of vehicles per day entering and moving within the region during the construction phase. Table 2.2 illustrates the estimated number of personnel vehicle movements generated during this phase.

The personnel will work on a roster of 28 days on and 9 days off.

Table 2.2 Generated personnel traffic movements

Purpose	Description	Employees/ camp	Trips/day	Vehicle occupancy	Trips/day/ camp
Camp servicing	General deliveries	20	2	1	40
Workshop servicing	Deliveries: in and out	10	2	1	20
Personnel	Worker transportation to site	400	2	2	400
Office	Office related activities	20	1	1	20
Personnel	Non work-based trips	450	0.4	1.2	150
Personnel	7 day off trips	150	2 every 7days	1.2	250

2.6.4 Spoil transport

It is envisaged that for the development of the CSG field infrastructure, including wells and interconnecting pipelines, spoil will be spread over the well site and pipeline corridors. There will be no removal of spoil from site, Creek and spoil will not be hauled over the road network.

2.6.5 Pipe transport

The proposed pipelines in the CSG field include the connection of wells to the FCS, the FCS to the CPP, and a water collection pipeline. The weights of these pipes are set out in Table 2.3. The increased truck volumes generated by these activities entering the Woleebee Creek to Tara region are set out in Table 2.4.

Table 2.3 Pipe weights for transport

Pipe description	Pipe diameter (mm)	Weight/metre (kg)	Total length / truck (m)	Pipe weight / truck (tonnes)
Steel interconnect pipe	315	77.8	280	21.8
Poly interconnect pipe	315	14.3	980	14.1
Water collection pipe (poly)	450	43.2	500	21.6
FCS to CPP pipe (steel)	315	77.8	280	21.8

Table 2.4 Truck volumes for pipe deliveries

Pipe description	Approximate length (km)	Pipe diameter (mm)	Total trucks	Approximate trips/day
Steel interconnect pipe	1000	315	3586	4
Poly interconnect pipe	1000	315	1032	2
Water collection pipe (poly)	2000	450	4032	2
FCS to CPP pipe (steel)	400	315	1431	4
Total	**4400**		**10,106**	**12**

It is anticipated that crews laying the interconnecting and water collection pipes will work at a rate of 450–500 m a day. This will be on an as-required basis and therefore the timing of both the haulage and construction will not always be on consecutive days, i.e. the pipe may be hauled to site one day and laid, but then there may be no haulage operations until more pipe is required days or weeks later.

As previously discussed in Section 2.2, the proposed haulage routes for the upstream pipework being sourced from Brisbane will use a select number of state controlled roads before entering the well precincts through a multitude of local government roads and access tracks within QGC's allotted tenements.

2.6.6 Quarry transport

The locations from where quarry products would be sourced have not been finalised. For the purpose of this assessment it has been assumed that the quarry material will be sourced from existing quarries north of Dalby and Amby, east of Mitchell. The quantities of quarry material required for the development of the CSG fields are illustrated in Table 2.5.

Table 2.5 Quarry material requirements

Item	Material	Volume (m^3)	Approximate weight (tonnes)	Truck loads (28 t/truck)
Camps	Gravel	30,000	72,000	2,570
Access tracks	Gravel	1,000,000	2,400,000	85,720
CPPs	Gravel	47,000	113,200	4,040
FCSs	Gravel	101,000	242,600	8,660
Well heads	Gravel	2,250,000	5,400,000	193,000
Total		**3,428,000**	**8,227,800**	**293,990**

2.6.7 Well equipment transport

The transportation of well equipment is expected to add additional trucks in the delivery of general well equipment, bore casings, separator units, and drilling machinery. These volumes are outlined in Table 2.6.

Table 2.6 Truck volumes for well production

Equipment	Total trucks	Trips/day	Approximate number of days
General products	11,992	6	3997
Bore casings	11,992	12	2004
Separators	1,008	2	1008
Total	**24,992**	**20**	

The delivery of the bore casings and general well products require two trucks per well, whereas a single truck delivering six MIDC separators would service six well sites. The network of roads used in the delivery of well equipment will be similar to that used for transporting the pipework within the well precincts and QGC easements, and on state and local government controlled roads.

2.6.8 Compressor unit transport

The production of nine CPPs (containing 10 reciprocating compressor units per CPP) and 27 FCSs (containing eight screw compressors per FCS), comprising a total of 90 reciprocating compressors and 216 screw compressors between the 36 sites, will require haulage by heavy vehicles, as set out in Table 2.7.

Table 2.7 Truck volumes servicing FCS and CPP

Compressor type	Total trucks	Trips/day	Approximate number of days over the life of the project
Screw	648	16	81
Reciprocating	270	20	27
Total	**918**		**108**

As with the pipe deliveries, the compressors will also be delivered as required, and thus the numbers of days are non-consecutive. The compressors are expected to be delivered as the wells come online and necessitate the use of FCS and CPP facilities.

Conventional semitrailers will be used to haul the components of each of the two types of compressor from Brisbane to the desired locations within the well precinct. The traffic movements for delivery will, as much as possible, remain on the state controlled road network, with use of local government controlled roads being limited to those specifically within the well precincts.

2.6.9 Tri-ethylene glycol (TEG) unit transport

TEG units will be transported to the CPPs as an ancillary component where there will be one TEG unit per two reciprocating compressors (i.e. five TEG units per CPP). These TEG units will be transported by conventional semitrailers. Each TEG unit is transported on one semitrailer with an additional two semitrailers carrying supplementary equipment. There will be approximately 45 TEG units required during the proposed development of the CSG fields. Traffic volumes generated by the delivery of the TEG units to the CPPs as they are developed has been estimated in Table 2.8.

Table 2.8 Truck volumes delivering TEG units

Component	Total trucks	Trips/day	Approximate number of days over the life of the project
Tri-ethylene glycol unit	135	6	45

2.6.10 Construction camp components (modular buildings) transport

Modular buildings will be used to house workers for the duration of the CSG field construction as well as for offices, messing units, ablutions and a wet mess with a recreation lounge. Table 2.9 shows the expected truck movements for the haulage per camp. For the purpose of the analysis it has been assumed that only one camp will be constructed at any one time at a rate of 10 truck loads per day for prefabricated buildings and furniture and fittings.

Table 2.9 Truck volumes construction of camp per camp

Item	Quantity of item	Units required	Truck loads
Rooms	230	12 m x 3 m	230
Central ablution	7	12 m x 9 m	21
Mess	2	12 m x 33 m	22
Recreation room	1	12 m x 33 m	11
Offices	3	12 m x 33 m	33
Furniture and fittings			317
Total trucks per camp			**634**

2.6.11 Heavy plant equipment transport

The well and compressor site preparation requires the use of several different types of heavy plant equipment. Table 2.10 below shows the quantity of each specific type of plant expected within the well precincts. It is anticipated that the plant will be transported to site from south-east Queensland via state controlled roads initially, and remain within the QGC tenements for the duration of that site specific construction.

Table 2.10 Heavy plant required quantities

Plant item	Transported via	Quantity required	Truck loads
Bulldozers	Semitrailer	10	10
Graders	Independent	20	20
Rollers	Semitrailer	5	8
Excavators	Semitrailer	20	20
Boom cranes	Independent	4	4
Heavy cranes	Independent	2	2
Drill rigs	Independent	20	20
Total			**84**

2.6.12 Fuel transport

Based on the fuel usage for the wells currently under construction within existing approvals it is estimated that some 273 million litres of fuel will be required over the life of the project. It is assumed that the fuel will be hauled from Brisbane in 25,000 litre tankers at a average rate of three tankers per day during the peak construction period. The haulage of the fuel is set out in Table 2.11.

Table 2.11 Fuel supplies

Equipment	Total trucks	Trips/day	Approximate number of days
General fuel	10,920	6	3640
Total	**10,920**	**6**	**3640**

2.7 ON-SITE ASPECTS

The well construction will be in exploration leases in favour of QGC. The land will be cleared prior to works to provide a 100 m x 100 m cleared flat area for the well construction. Access tracks will be made to provide entry and exit points from both state controlled roads and local government controlled roads.

An application will be made to the relevant road authority for each proposed access to the road network. The proposed access points will be where the sight distance is appropriate for the type of vehicles and the operating speed of the through road. The layout of the access, i.e. auxiliary lanes, will be assessed on the traffic volumes on the through road and the access in accordance with Chapter 13 of the DMR *Road planning and design manual*. The accesses will be constructed in accordance with the relevant road authority's conditions of approval.

There will be a network of internal tracks within the gas fields to allow access to multiple well sites over the construction and operational life of the wells.

FCS and CPP sites will be developed within the gas fields. These components will be transported via the same routes as the well components and moved on site via access tracks provided for the well construction.

The construction camps will be assembled at a point where sufficient access to all camp specific works is enabled. These campsites will be at a point where the maximum distance to site is 60–70 km to enable construction personnel to travel to their designated site and complete a full day's work with minimal time spent travelling.

2.8 SURROUNDING ROAD NETWORK DETAILS

2.8.1 Road conditions

As set out in Section 2.2, the haulage operation involves long distance travel over the state controlled network. The majority of the state controlled roads have two bitumen sealed lanes and varying widths of sealed and unsealed shoulders (see Figures 2.1 to 2.5).

Pavement conditions vary on the roads that will be affected by the pipeline and well component haulage. As mentioned above, most state controlled roads are sealed with two lanes. Not all affected roads have been line marked, and some highways show rutting in the wheel paths.

Figure 2.1
WARREGO HIGHWAY WEST OF OAKEY—2 M WIDE SEALED SHOULDERS

Figure 2.2
WARREGO HIGHWAY EAST OF DALBY—UNSEALED SHOULDERS

Figure 2.3
LEICHHARDT HIGHWAY 26B (TAROOM–MILES)—SEALED SHOULDER

Figure 2.4
KOGAN–CONDAMINE ROAD—UNSEALED SHOULDERS

Figure 2.5
JACKSON–WANDOAN ROAD—SINGLE LANE BITUMEN FLOODWAY

Local roads will need to be accessed by trucks when entering site. The majority of local roads are seen to be unsealed, paved roads which vary from 4–8 m in width (see Figures 2.6 and 2.7).

Figure 2.6
WERANGA NORTH ROAD—PAVED AND UNSEALED

Figure 2.7
12 MILE ROAD—PAVED AND UNSEALED

There are load restrictions on some bridges, particularly on local government controlled roads as in Figure 2.8.

Figure 2.8
LOAD LIMITS ON GREENSWAMP ROAD

2.8.2 Other users

The roads affected by the haulage of materials in rural areas do not have on or off road cycle facilities. There are no on road cycle lanes on the Warrego Highway through Toowoomba, Dalby and Chinchilla where the majority of cycling activities would occur. The Warrego Highway through Miles has wide shoulders which enable on road cycling clear of the traffic lanes.

Some of the routes are designated school bus routes. Queensland Transport's approved routes for road trains and B-double combinations specifies no travel within school bus hours on the Chinchilla–Tara Road (map updated 26/06/2002).

2.8.3 Existing traffic

Data obtained from DMR on the traffic using the various road links is summarised in Table 2.12.

Table 2.12 Existing traffic—state controlled network

Road	Section	AADT	% Trucks	% Articulated	% Road trains
Warrego Highway	Ipswich–Toowoomba	13,000–20,500	5.7–7.5%	4.0–7.0%	3.4–4.7% B-double only
	Toowoomba City	19,800–22,000	5.7–7.1%	3.2–4.2%	2.0–2.4% B-double only
	Toowoomba–Dalby	4400–17,500	2.6–6.6%	1.1–5.5%	0.4–7.8%
	Dalby–Miles	2100–6,500	6.6–11.0%	3.5–6.0%	4.8–9.2%
	Miles–Roma	1200–3000	8.1–9.0%	4.1–6.6%	6.8–13.2%
	Roma–Mitchell	750–4000	9.0–12.0%	2.0–6.0%	4.0–13.0%
Leichhardt Highway	Taroom–Miles	600–700	8.4–9.6%	8.5–10.6%	10.8–12.9%
	Miles–Goondiwindi	300–3400	6.3–9.0%	7.8–15.9%	11.9–22.6%
Moonie Highway	Dalby–St George	1300–6400	5.0–8.8%	1.3–4.8%	0.9–4.8%
Surat Developmental Rd	Tara–Dalby	600–2200	5.6–11.4%	1.7–4.7%	1.5–4.6%
Dalby–Kogan Road		300–500	8.7–15.4%	4.4–4.8%	5.0–7.5%
Kogan–Condamine Road		130	9.1%	8.7%	16.1%
Chinchilla–Tara Road		350–720	10.7–11.8%	2.4–4.9%	0.5–1.0%
Tara–Kogan Road		160	9.3%	1.3%	0.2%
Jackson–Wandoan Road		70–200	10.6–12.0%	4.4–5.8%	4.1–5.1%
Dalby–Jandowae Road		600–800	6.2–7.4%	4.7–5.5%	3.0–3.2%

No traffic data has been obtained from the local government bodies for traffic volumes on local government controlled roads. Based on the traffic volumes on the lower traffic state controlled roads, the annual average daily traffic (AADT) volumes on the majority of local government controlled roads would range between 20 and 200 trips per day.

2.9 DESCRIPTION OF PROPOSED VEHICLES

The transportation of the components for the wells and pipelines will be undertaken using conventional articulated vehicles, i.e. semitrailer and/or B-double. Vehicles carrying some of the pipeline materials may be extended semitrailers.

It is not envisaged that there will be any large components requiring the use of heavy load platform vehicles under permit conditions. Should these items arise, the procedures to obtain the necessary permits will be followed. Planning of the haulage will be part of the procurement process for such items to ensure that the road authorities have sufficient time to consider the applications.

Construction personnel will be transported between the construction camps and the various works sites in four wheel drive utilities.

During the operation phase, maintenance workers will travel to site by four wheel drive utilities, and the operators of the FCSs and CPPs will travel using conventional vehicles.

The workforce will use private vehicles to travel to destinations outside the Surat Basin for recreational pursuits.

3 Traffic generation and distribution

3.1 TRAFFIC GENERATION OF THE HAULAGE ACTIVITY

The analysis of traffic impacts on each road is based on the following assumptions:

- Generated traffic volume on each road assumes the peak year of construction (i.e. 500 wells per year) in any one gas field as there is no indication of what fields will be developed in particular years. This conservative approach has been adopted to provide flexibility in the locations of wells developed each year.
- The field compressor stations and central processing plants will be developed progressively as the wells come on line. This may involve establishing a number of these facilities as a first stage in the initial years, with additional modules being added when increased capacity is required as more wells come on line.

The estimated number of haulage vehicles has been determined based on the following factors:

- the quantities of each component associated with the development of the wells, i.e. bore casing and well heads, pipelines, FCS compressors, CPP compressors, TEG units, construction camp modular items and quarry materials (for hard stand areas and access roads)
- the type and number of trucks required to haul the quantity of each component.

The number of vehicles generated by the establishment of the construction camps is based on the assumed distribution for the vehicles generated as listed in Table 2.2 on the road network

The distribution of traffic on the state controlled network is based on the more direct routes from Brisbane to each gas field area.

The number of vehicles on the state controlled road network is summarised in Table 3.1.

Table 3.1 Peak daily traffic distribution state controlled roads

Road	Section	Generated construction worker light traffic (VPD)	Generated haulage traffic (VPD)
Warrego Highway	Ipswich–Toowoomba	250	100
	Toowoomba–Dalby	250	100
	Dalby–Miles	250	260
	Miles–Roma	250	160–260
	Roma–Mitchell	0	160
Leichhardt Highway	Miles–Goondiwindi	480	260
	Taroom–Miles	460	240
Moonie Highway	Dalby–St George	400	260
Surat Developmental Road	Tara–Dalby	460	260
Dalby–Kogan Road		480	260
Kogan–Condamine Road		180	260
Chinchilla–Tara Road		480	0
Tara–Kogan Road		480	0
Jackson–Wandoan Road		480	260
Dalby–Jandowae Road		0	160

The local government roads that will be used during the haulage have not been definitively identified at this stage; however, it is likely that traffic from the construction camps and haulage will affect the local government controlled roads set out in Table 3.2.

Table 3.2 Peak daily traffic distribution—local government controlled roads

Road	Generated construction worker light traffic (VPD)	Generated haulage traffic (VPD)
Beelbee Road	135	170
Fairymeadow Road	400	150
Gadsby's Road	0	170
Gurulmundi Road	100	150
Kumbarilla Lane	0	170
Old Moonie Road	135	170
Weranga North Road	120	170
Weldons Road	200	0
Giligulgul Road	100	0
Reserved Road	135	0
Cartens Lane	350	0
Goranba Lane	350	0
Carmodys Lane	240	0
Mcleod Road	160	0

4 Pavement impact assessments

4.1 CURRENT PAVEMENT LOADINGS

The current pavement loadings on the state controlled road network have been assessed using traffic count volumes, proportion of heavy vehicles and annual growth rates provided by the following Department of Main Roads regions:

- Darling Downs Region
- South West Region
- Metropolitan (Brisbane) Region.

None of the regions were able to provide equivalent standard axles (ESAs) per commercial vehicle. The calculation of the current daily ESAs for each section of state controlled roads is based on the annual average daily traffic (AADT) and the proportion of trucks, articulated vehicles and road trains. The axle groups for each class of vehicle are assumed as follows:

- truck single axle and tandem dual drive axles
- articulated vehicle single axle and tandem dual drive axles and tandem triaxle on the trailer
- road trains single axle and tandem dual drive axles and tandem dual axles on trailer dollies and rear tandem triaxle on the trailers.

The ESAs per vehicle class is the average of the particular vehicle fully loaded and completely unloaded (tare weight only). The ESAs adopted for each vehicle type are summarised in Table 4.1.

Table 4.1 Existing traffic ESA per vehicle type

Vehicle	ESA		
	Loaded	Empty	Average
Single unit truck	3.7	0.7	2.2
Semitrailer	5.1	0.8	2.95
Road train Type 1	8.6	0.8	5.58
Road train Type 2	12.1	0.8	

The average ESA per commercial vehicle on each road ranged between 2.52 and 4.36.

The pavement loading over the next 20 years using the growth rates provided by the DMR regions is set out in Appendix D as the Base Case. Where traffic counts show negative growth rates, the calculations adopt a zero growth rate. Where the growth rates over the last five years show growth in excess of 5% per annum, a maximum growth rate of 5% has been adopted.

On the local government controlled roads there is no data from which to derive traffic loadings. The majority of the local government controlled roads are unsealed.

4.2 PROPOSED HAULAGE DEVELOPMENT LOADINGS

The proposed haulage loadings have been based on haulage vehicles being loaded to the maximum loads as advised by QGC as summarised in Table 4.2. The ESAs per vehicle have been calculated using the following parameters:

- 1 ESA on single axle single wheel 5.4 tonnes
- 1 ESA on single axle dual wheels 8.1 tonnes

Table 4.2 ESAs per commercial vehicle

Vehicle	Haulage	Pay load (tonnes)	Truck load (tonnes)	ESA
Single unit truck	General well equipment	1.8	10.8	1.35
Semitrailer	315 mm dia. steel pipe 450 mm dia. PE water pipe	22.0	36.0	4.13
Semitrailer	Bore casing	17.0	31.0	2.57
Semitrailer	315 mm dia. PE water pipe	14.1	28.5	2.1
Low loader	Reciprocating compressors construction plant	26.5	42	5.1
Semitrailer	Screw compressors	26.5	42	5.1
Semitrailer	Fuel	25.0	42	5.1
Semitrailer	Modular buildings	3.5	17.5	1.14
Semitrailer	Quarry material	28	42	5.1

The assumed vehicle configurations are single wheel single steer axle, tandem axle dual wheel drive axle group, and tandem axle dual wheel trailer axle group, except for fuel trailers which are more likely to have a triaxle group on the trailer.

4.3 PROPOSED VEHICLE COMBINATIONS, AXLE TYPES AND CONFIGURATIONS

The proposed vehicle combinations will be single unit trucks and semitrailers with possibly a small proportion of B-doubles. Given the proximity of the site to Toowoomba, east of which road trains cannot travel, it is envisaged that minimal use will be made of road trains.

Some heavy machinery items for the central processing plant may require the use of heavy load platform vehicles operating under permit conditions. The number of items requiring the use of such vehicles is envisaged to be less than 20 over the development of the gas field.

4.4 PAVEMENT IMPACT ASSESSMENT

Appendix D also sets out the assessment of the additional haulage on the pavements on the various elements of the state controlled road network. In accordance with DMR Guidelines Section 3.3, Criteria 2 (Pavement impact assessment) states that 'Generally pavement impacts need to be assessed for any section of a SCR (state controlled road) where the construction or operational traffic generated by the development exceeds 5% of the existing ESA on the road section'. Traffic loading from the construction has been calculated for the 20 year life of the pavement. Table 4.3 lists the state controlled roads where the average daily produced ESA is greater than 5% of the current ESA, and also illustrates the impact on the 20 year design load.

Table 4.3 Pavement impact

Road	Section	Generated ESAs (ESA/day)	Maximum daily impact (ESA/day)	Increase in 20 year pavement loading
Warrego Highway	Ipswich–Toowoomba	180	6%	0.7%
	Toowoomba–Dalby	180	5–25%	3.1%
	Dalby–Miles	627	25–65%	3.3–6.0%
	Miles–Roma	627	45–90%	1.5–5.8%
	Miles–Mitchell	450	23–66%	2–5.4%
Leichhardt Highway	Taroom–Miles	615	158%	4.6%
	Miles–Goondiwindi	625	155–240%	15.4%
Moonie Highway	Dalby–St George	625	12–57%	23.0%
Surat Developmental Road	Tara–Dalby	625	27–133%	28.2%
Dalby–Kogan Road		625	325–545%	55.8%
Kogan–Condamine Road		625	710%	64.4%
Jackson–Wandoan Road		180–625	430–2700%	152.7%
Dalby–Jandowae Road		445	230–300%	125.8%

The impact of the haulage on the Warrego Highway (Ipswich–Toowoomba and Toowoomba–Dalby) and the Leichhardt Highway (Taroom–Miles) is less than the 5% stated in the DMR Guidelines and is therefore considered not to be significant.

The impact of the haulage on the 20 year pavement loading is significant on sections of the Warrego Highway (Dalby–Miles, Miles–Roma and Roma–Mitchell), Leichhardt Highway (Miles–Goondiwindi), Moonie Highway (Dalby–St George), Surat Developmental Road (Tara–Dalby), Dalby–Kogan Road, Kogan–Condamine Road, Jackson–Wandoan Road and Dalby–Jandowae Road as they exceed the usage of the 20 year design load by 5% or greater as specified by the DMR Guidelines.

The pavement loading on individual local government controlled roads will be less than that for the state controlled roads. However, as these are unsealed and with only nominal pavement, additional maintenance in the form of more regular heavy grading and re-sheeting will be required. The extent of this increased maintenance will depend on the actual amount of haulage that occurs on these roads.

5 Traffic operations assessment

5.1 ROAD LINK ANALYSIS

Table 5.1 shows the roads where increases in traffic volumes from haulage and worker transportation exceed 5% of the current AADT and are therefore deemed to be significant in accordance with the DMR Guidelines. Appendix E illustrates the current AADT, the generated volumes of traffic and the percentage increase in traffic volumes. Appendix F shows a diagrammatic representation of the current AADT, truck loads, and construction worker traffic along the state controlled network.

Table 5.1 Impacted state controlled roads

Road	Section	Current AADT	Generated traffic volumes (VPD)	Maximum impact
Warrego Highway	Toowoomba–Dalby	4500–17,500	350	6–8%
	Dalby–Miles	6500–2100	510	8–25%
	Miles–Roma	1200–3000	510	5–41%
	Roma–Mitchell	750–4000	160	16–21%
Leichhardt Highway	Taroom–Miles	640	720	112%
	Miles–Goondiwindi	300–478	720–740	155–240%
Moonie Highway	Dalby–St George	1300–6400	740	12–57%
Surat Developmental Road	Tara–Dalby	620–2200	580–720	23–117%
Dalby–Kogan Road		300–500	740	150–240%
Kogan–Condamine Road		130	440	340%
Chinchilla–Tara Road		350–720	480	140%
Tara–Kogan Road		160	480	310%
Jackson–Wandoan Road		70–200	704	530–1120%
Dalby–Jandowae Road		600–800	160	20–25%

The level of service (LOS) generally describes the operational conditions within a traffic stream, and their perception by motorists. These conditions are described in terms of factors such as speed, travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. In general there are six levels of service, from A to F, with level of service A representing the best operation and level F the worst.

Table 5.2 lists the maximum AADTs for various levels of service following the DMR *Road planning and design manual* (Chapter 5, August 2004) and 'Guide to traffic

engineering practice–Part 2' (Table 3.9, *Austroads* 1988) [*GTEP -PT2*]. A standard K-factor ratio of 0.1 was adopted, and the AADTs in Table 3.9 *GTEP-PT2* were adjusted for standard 3.3 m lanes with 1.0 m shoulders as set out in Table 3.3 *GTEP-PT2*.

Table 5.2 Adopted maximum AADTs for various levels of service

Level of service				
A	B	C	D	E
Level terrain				
2000	4000	6550	11,200	19,000
Rolling terrain				
830	2300	4300	6600	12,300

The changes to the LOS by the traffic generated by the development of the CSG field will not reduce the current level of service on the state controlled road network as set out in Table 5.3.

Table 5.3 Levels of service over state controlled roads

Road	Section	Current AADT	Generated traffic volumes (VPD)	Existing level of service	New level of service
Warrego Highway	Toowoomba–Dalby	4500–17,500	350	C–E	C–E
	Dalby–Miles	2100–6,500	510	B–D	B–D
	Miles–Roma	1200–3000	510	A–B	A–B
	Roma–Mitchell	750–1028	160	A	A
Leichhardt Highway	Taroom–Miles	640	720	A	B
	Miles–Goondiwindi	300–1850	720–740	A	A–B
Moonie Highway	Dalby–St George	1300–6400	740	A–C	A–C
Surat Developmental Road	Tara–Dalby	600–2200	580–720	A–B	A–B
Dalby–Kogan Road		300–500	740	A	A
Kogan–Condamine Road		130	440	A	A
Chinchilla–Tara Road		350–720	480	A	A
Tara–Kogan Road		160	480	A	A
Jackson–Wandoan Road		70–200	704	A	B
Dalby–Jandowae Road		600–800	160	A	A

The changes to levels of service are summarised as follows:

- Leichhardt Highway (Taroom–Miles) from LOS A to LOS B
- Leichhardt Highway (Miles–Goondiwindi) from LOS A to LOS A and B
- Jackson Wandoan Road from LOS A to LOS B.

The difference between LOS A and LOS B is as follows:

- LOS A—the individual drivers are virtually unaffected by the presence of other drivers in the stream. The freedom to select the desired speeds and to manoeuvre within the traffic stream is extremely high and the general level of comfort and convenience provided is excellent.
- LOS B is in a zone of reasonable freedom to select their desired speed and to manoeuvre within the general traffic stream, although the general level of comfort and convenience is a little less than with LOS A.

The change from LOS A to LOS B means that drivers have less freedom to select their own speed, but they are not 'somewhat restricted' in selecting their own speed.

On all of the local government controlled roads, the increases in the traffic volumes on unsealed roadways will need to be addressed on a road by road basis. The options will be:

- additional road maintenance in the form of additional light grading, heavy grading and gravel re-sheeting
- widening of the existing unsealed road formation and additional maintenance
- paving and sealing of the more highly trafficked roads, e.g. local government controlled roads providing access to construction.

5.2 INTERSECTION ANALYSIS

The peak hour volumes generated by the project will vary between the volumes travelling through the city of Toowoomba and the town of Dalby as opposed to the roads in the vicinity of the construction camps.

Table 5.1 shows that the volume of generated traffic through Toowoomba is 350 vehicles (of which 250 are private vehicles) per day. For the purpose of assessing the impact on intersections, it is assumed that the peak hour volumes are 10% of the daily volumes, the increase in traffic on the Warrego Highway is 35 vehicles per hour. Based on a 70%/30% directional split, the peak hour volume in the major direction is 25 vehicles per hour. These volumes will not have any impact on the operations of the intersection through the city. Similarly the volume of generated traffic through Dalby is 510 vehicles per day with 35 vehicles travelling in one direction in the peak hour. An increase from 300 vehicles per hour to 335 vehicles per hour in one direction will have minimal impact on the operation of intersections through Dalby.

The access to the construction camps will have the most impact on the road network. These accesses will affect roads with an AADT of less than 2000. The maximum numbers of vehicles leaving and entering the camp at any one period is 160 vehicles. The average delays to vehicles entering and leaving the camps either at the camp access itself or at intersections on the road network will, on average, be less than two seconds. At present the definitive locations of these camps has not been decided, and assessment of the intersections with the road network will be conducted post confirmation.

Traffic generated by construction workers residing in the towns will generate approximately 100 vehicles per hour, assuming 250 personnel are accommodated in any one town. The AADTs on the Warrego Highway through Chinchilla and Miles are 2500 and 2100 respectively.

5.3 ROAD USE MANAGEMENT PLAN

The haulage of materials will be via conventional vehicles.

5.4 PERFORMANCE / CONDITION MONITORING OF BRIDGES/STRUCTURES

None of the bridges on the state controlled road network have signed load limits. As the haulage will be undertaken with standard truck loads, no specific measures in relation to these bridges are necessary. This may change if during the course of the development a need arises to transport materials on larger vehicles, in which case details will be obtained on the heavy vehicle load capacity of the affected bridges.

The bridges on the state controlled road network do not have signed load limits. The capacity of timber bridges will be sought from the Department of Main Roads to ensure that the structure is capable of withstanding the proposed number and loading of haulage vehicles.

On local government controlled roads, the load limits on the bridges will be complied with. In addition, condition assessments will be undertaken on any timber bridge or culvert if the local government council has not undertaken an assessment.

6 Safety review

6.1 SAFETY CHECK LIST

6.1.1 Intersections and access

Sight distances to the intersections of local government controlled roads with state controlled roads generally meet the safe intersection criteria. On the local government controlled road network there are currently intersections where the safe intersection criteria have not been achieved due to sight distance limitations on the approaches to the intersections and insufficient signage. Each intersection on the local government controlled road network likely to be used by construction worker traffic to obtain access to and from side roads will be assessed. The remedial actions may be to find alternative routes or improve the sight distance.

Accesses to camps and the gas fields will be subject to the requirements of the relevant road authority.

6.1.2 Pedestrians, cyclists and motor cyclists

The haulage of the materials is predominately along rural highways and roads. The interaction of the haulage vehicles with pedestrians, cyclists and motorcyclists occurs in cities and towns, e.g. Toowoomba, Dalby, Chinchilla and Miles. The increased hourly traffic volumes along the roads are considered to be insignificant, and therefore there is no increase in the safety risk to these other road users.

Interaction with the other road users will be associated with construction workers residing in the townships of Miles and Chinchilla when they leave town in the morning and return in the afternoon. There will not be any significant construction worker traffic between these times. The workers will be distributed around the townships and will only concentrate on the major roads out of the town travelling to and from the diverse locations of the gas fields.

6.1.3 School bus routes

School bus routes exist along a number of both state controlled and local government controlled roads. Construction worker traffic will occur outside the times when the school buses are operating. The number of trucks using local government controlled roads will be fewer than for state controlled roads, as the wells are dispersed throughout the local government controlled road network. Similarly the number of days materials are hauled over the local road network will be fewer than for the state controlled network.

Regardless of the road hierarchy, the interaction of haulage traffic and times when children are being picked up or set down by the school bus will be assessed on a road by road basis for all school bus routes. The details of the school bus routes and operators will be sourced from Queensland Transport. Discussions will be held with the operators to determine how to reduce the construction traffic and the bus operations with more emphasis the safety of children waiting for and leaving buses. This may be achieved by restricting construction traffic at particular times on particular roads or re routing construction traffic away from school bus routes.

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7 Environmental and other issues

7.1 OVERVIEW

This report is part of the environmental impact study (EIS) for the development of the QGC CSG fields in the Surat Basin, the construction of a 380 km gas transmission line (and other associated pipelines) and the construction of a liquefied natural gas plant and export terminal near Gladstone. This report is specific to the development of the CSG fields in the Surat Basin component of the project. Separate reports are being prepared for the pipeline and LNG plant sections of the project.

7.2 ROAD NOISE

The volume of vehicles generated by the development of the Surat Basin will not generate the need for specific road noise measures. However, residences adjacent to the Warrego Highway through Toowoomba, Dalby, Chinchilla, Miles other provincial towns may need to be considered if any late night /early hours haulage is to take place.

7.3 DUST CONTROL

The majority of state controlled roads affected by the project are sealed.

The majority of local government controlled roads are unsealed. The appropriate treatment of these roads will be negotiated with the relevant local government council. This may include increased attention to more regular maintenance grading of the unsealed roads with rollers and water trucks to ensure both a smooth running surface and a reduction in the nuisance of dust. In particular instances, consideration will be given as to whether it will be more cost effective to the project to bitumen seal the road.

7.4 ROADWORKS IN THE ROAD AND RAIL RESERVE

Works will be conducted within road reserves for the following activities:

- constructing accesses
- pipe road crossings.

Works within roads reserves will be subject to the approval of the relevant road authority. The project will have a traffic management plan for work within the reserves. This plan will set out the procedure for preparing traffic control plans (TCPs), submission of TCPs to the relevant authority in advance of the work progressing, obtaining permits for Queensland Police Service and handover to traffic controllers once all approvals are in place.

Where approved by the relevant road authority, the pipe crossings will be by open trenching. Where open trenching is not approved, the pipes will be installed by trenchless construction methods.

All crossings of rail formations will be constructed by trenchless construction methods.

7.5 ACCESS CONTROL

All access will be unsignalised and the road rules will be iterated with the appropriate regulatory signage. The establishment of access to the camps and CSG fields will be subject to the approval of the relevant road authority.

7.6 ON-SITE PARKING REQUIREMENTS

On-site parking will be provided for all vehicles associated with the project in the construction camps and the construction sites. Any vehicles associated with construction work within road reserves will be required to park at a safe distance from the road formation.

7.7 ANCILLARY WORKS AND ENCROACHMENTS

At this stage there are no specific details of the routes of the pipelines, and where pipelines cross road reserves, it is unknown if it is proposed to install pipelines longitudinally. Any proposal to cross road reserves or lay pipelines along road reserves will be negotiated with the relevant road authority during the concept design stage.

7.8 OVER-DIMENSION VEHICLES

At this stage the use of over-dimension vehicles may be required to transport large earthmoving plant (nominally dozers and excavators) and drill rigs initially to the Surat Basin and then between gas fields. These vehicles will operate within the conditions of the operational permit. The use of these vehicles will be on an ad hoc basis.

8 Impact mitigation for roads

8.1 STATE CONTROLLED ROADS

8.1.1 Impacts

The impacts on the state controlled road network are summarised as follows:

- a significant increase in the volume of traffic using the roads as set out in Table 5.1
- as shown in Table 5.3, these increases in traffic volume change the current level of service from LOS A to LOS B on the Leichhardt Highway and on the Jackson–Wandoan Road. This change in LOS is related to a minor change in the freedom of drivers to choose their own speeds. On all other roads the LOS does not change
- an increase in traffic volume on the Jackson–Wandoan Road may require the widening of the pavement to two lanes over the existing narrow floodways
- the haulage on the 20 year pavement loading is significant on sections of the Warrego Highway (Dalby–Miles, Miles–Roma and Roma–Mitchell), Leichhardt Highway (Miles–Goondiwindi), Moonie Highway (Dalby–St George), Surat Developmental Road (Tara–Dalby), Dalby–Kogan Road, Kogan–Condamine Road, Jackson–Wandoan Road and Dalby–Jandowae Road.

8.1.2 Cost / contribution methodology

An assessment of the cost contribution will undertaken on sections of the Warrego Highway (Dalby–Miles, Miles–Roma and Roma–Mitchell), Leichhardt Highway (Miles–Goondiwindi), Moonie Highway (Dalby–St George), Surat Developmental Road (Tara–Dalby), Dalby–Kogan Road, Kogan–Condamine Road, Jackson–Wandoan Road and Dalby–Jandowae Road.

8.2 LOCAL GOVERNMENT CONTROLLED ROAD

As the majority of the local government roads are unsealed, the increases in traffic volumes on the roads listed in Table 3.2 may significantly accelerate the deterioration of these roads and require amelioration treatments. The appropriate treatments for these roads will be negotiated with the relevant local government councils. The amelioration could be:

- more regular maintenance grading
- gravel re-sheeting
- dust suppression

- paving and sealing roads near construction camps
- upgrade of intersections where sight distances do not meet standards.

9 References

Queensland Department of Main Roads *Guidelines for assessment of road impacts of development* (2006) Queensland Department of Main Roads

Queensland Department of Main Roads *Manual of uniform traffic control devices* (DMR 2003 Edition) Queensland Department of Main Roads.

Queensland Department of Main Roads *Road planning and design manual* (Chapter 5, August 2004) Queensland Department of Main Roads

Austroads *Guide to traffic engineering practice—Part 2* (Table 3.9, Austroads, 1988) [GTEP-PT2].

Appendix A

WELL PRECINCT MAP

CLIENT: QGC & BG International

PROJECT: Queensland Curtis LNG Project

TITLE: Upstream - Gas Fields

DATE: 19-January-2009

DATA SOURCE:

1:250,000 Topographic Raster copyright Geoscience Australia

> Prepared by Mipela G.I.S > Phone: +61-7-3252 5589 > Web: www.mipela.com.au > Email: info@mipela.com.au

SCALE: 1:750,000 (A3) GDA94 Lat/Long

-10 0 10 20 30 40

Kilometres

LEGEND

PL

EPP

PROPOSED PIPELINE ALIGNMENT	REV NO	DATE	SUPPLIED BY
Main Pipeline & KPs	Rev C	05-12-2008	Unidel
Collection Lateral & KPs	Rev C	17-11-2008	Unidel
Approx. Upstream Infrastructure Corridor & KPs	Rev A	26-11-2008	Unidel

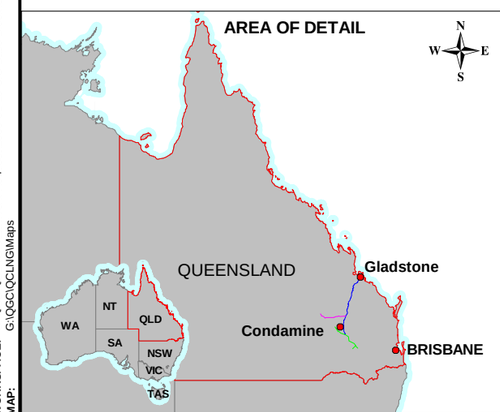
QUEENSLAND CURTIS LNG

A BG Group – QGC Alliance

Level 5, 30 Herschel Street
Brisbane QLD 4000

GPO Box 3107
Brisbane QLD 4001

Telephone: (07) 3020 9000
Facsimile: (07) 3012 8411
Web: http://www.qgc.com.au
Email: qgc@qgc.com.au



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Appendix B

WELL HAULAGE ROUTES

CLIENT: QGC & BG International

PROJECT: Queensland Curtis LNG Project

TITLE: Upstream - Haulage Routes for Wells

DATE: 12-January-2009

DATA SOURCE:

1:250,000 Topographic Raster copyright Geoscience Australia

> Prepared by Mipela G.I.S > Phone: +61-7-3252 5589 > Web: www.mipela.com.au > Email: info@mipela.com.au

SCALE: 1:1,000,000 (A3) GDA94 Lat/Long

-20 -10 0 10 20 30 40

Kilometres

LEGEND

Well Haulage Route

PROPOSED PIPELINE ALIGNMENT	REV NO	DATE	SUPPLIED BY
Main Pipeline & KPs	RevC	05-12-2008	Unidel
Collection Lateral & KPs	RevC	17-11-2008	Unidel
Approx. Upstream Infrastructure Corridor & KPs	RevA	26-11-2008	Unidel

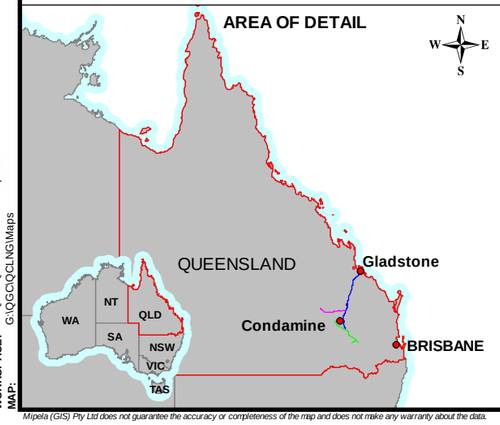
QUEENSLAND CURTIS LNG

A BG Group – QGC Alliance

Level 5, 30 Herschel Street
Brisbane QLD 4000

GPO Box 3107
Brisbane QLD 4001

Telephone: (07) 3020 9000
Facsimile: (07) 3012 8411
Web: http://www.qgc.com.au
Email: qgc@qgc.com.au



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MAP: G:\QGC\QCLNG\Maps

Appendix C

MODULAR BUILDING HAULAGE ROUTES

CLIENT: QGC & BG International

PROJECT: Queensland Curtis LNG Project

TITLE: Upstream - Haulage Routes for Camps

DATE: 12-January-2009

DATA SOURCE:

1:250,000 Topographic Raster copyright Geoscience Australia

> Prepared by Mipela G.I.S > Phone: +61-7-3252 5589 > Web: www.mipela.com.au > Email: info@mipela.com.au

SCALE: 1:1,000,000 (A3) GDA94 Lat/Long

-20 -10 0 10 20 30 40

Kilometres

LEGEND

Camp

Camp Haulage Route

PROPOSED PIPELINE ALIGNMENT	REV NO	DATE	SUPPLIED BY
Main Pipeline & KPs	RevC	05-12-2008	Unidel
Collection Lateral & KPs	RevC	17-11-2008	Unidel
Approx. Upstream Infrastructure Corridor & KPs	RevA	26-11-2008	Unidel

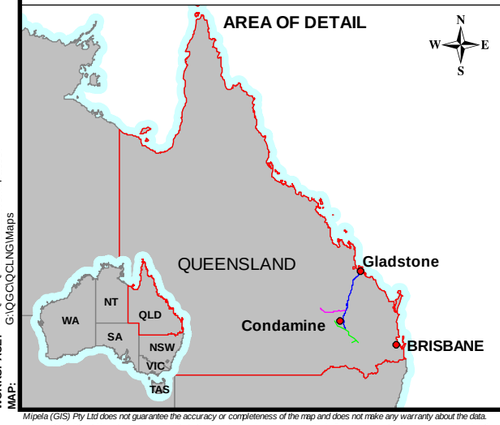
QUEENSLAND CURTIS LNG

A BG Group – QGC Alliance

Level 5, 30 Herschel Street
Brisbane QLD 4000

GPO Box 3107
Brisbane QLD 4001

Telephone: (07) 3020 9000
Facsimile: (07) 3012 8411
Web: http://www.qgc.com.au
Email: qgc@qgc.com.au



WORKSPACE: G:\QGC\QCLNG\Data\Workspaces\
MAP: G:\QGC\QCLNG\Maps

Appendix D

TRAFFIC GROWTH RATE - 20YEAR PAVEMENT LOAD

QGC Upstream Pavement Impact Assessment

5 Year Growth Rate +
20 Year Pavement Load

Impact Summary

Road						Existing Traffic										
Number	Name	Section	Chainage	Distance	Region	AADT / T	Growth Rate 5Yrs	% trucks	% Articulated	% B Double Route Only	% Road Trains	% Commercial Vehicle	ESA's / Comm	ESA's /Day/ Direction		20year Pavement Load
18A	Warrego Highway	Ipswich - Toowomba	28.900- 44.260	15.36	Toowomba	18021	1.12%	6.9%	7.0%	4.4%		18.3%	2.96	4871		3.56E+07
18A	Warrego Highway	Ipswich - Toowomba	44.260- 47.860	3.6	Toowomba	17209	3.49%	6.6%	6.7%	4.6%		17.9%	2.98	4581		3.36E+07
18A	Warrego Highway	Ipswich - Toowomba	47.860- 55.520	7.66	Toowomba	17751	2.29%	7.0%	7.1%	4.7%		18.8%	2.97	4943		3.62E+07
18A	Warrego Highway	Ipswich - Toowomba	55.520- 75.370	19.85	Toowomba	12958	4.06%	5.2%	6.1%	4.4%		15.7%	3.03	3077		2.26E+07
18A	Warrego Highway	Ipswich - Toowomba	75.370- 83.350	7.98	Toowomba	16490	1.49%	6.0%	5.4%	3.4%		14.7%	2.92	3548		2.59E+07
18A	Warrego Highway	Ipswich - Toowomba	83.350- 92.760	9.41	Toowomba	20469	2.88%	7.5%	4.1%	3.6%		15.2%	2.86	4456		3.26E+07
18A	Warrego Highway	Ipswich - Toowomba	92.760- 94.580	1.82	Toowomba	19897	0.01%	5.7%	4.1%	2.4%		12.2%	2.83	3430		2.50E+07
18A	Warrego Highway	Ipswich - Toowomba	94.580- 95.010	0.43	Toowomba	20291	0.01%	6.0%	4.9%	2.1%		12.9%	2.79	3653		2.67E+07
18B	Warrego Highway	Toowomba - Dalby	0.000- 0.990	0.99	Toowomba	24055	0.38%	6.2%	3.2%		2.0%	11.3%	3	4077		2.98E+07
18B	Warrego Highway	Toowomba - Dalby	0.990- 2.210	1.22	Toowomba	22080	0.50%	7.1%	3.9%		2.0%	12.9%	2.95	4201		3.07E+07
18B	Warrego Highway	Toowomba - Dalby	2.210- 3.740	1.53	Toowomba	17513	0.85%	6.5%	4.3%		2.1%	12.8%	3.01	3378		2.47E+07
18B	Warrego Highway	Toowomba - Dalby	3.740- 4.520	0.78	Toowomba	11653	0.01%	2.6%	1.1%		0.6%	4.3%	2.84	709		5.18E+06
18B	Warrego Highway	Toowomba - Dalby	4.520- 6.630	2.11	Toowomba	16255	0.57%	4.5%	1.4%		0.4%	6.3%	2.58	1323		9.66E+06
18B	Warrego Highway	Toowomba - Dalby	6.630- 10.590	3.96	Toowomba	13564	4.97%	6.3%	1.6%		0.6%	8.5%	2.57	1484		1.09E+07
18B	Warrego Highway	Toowomba - Dalby	10.590- 26.830	16.24	Toowomba	11482	3.91%	6.1%	3.0%		2.9%	12.0%	3.19	2190		1.61E+07
18B	Warrego Highway	Toowomba - Dalby	26.830- 80.820	53.99	Toowomba	4433	5.00%	8.3%	5.7%		7.8%	21.8%	3.61	1742		1.28E+07
18B	Warrego Highway	Toowomba - Dalby	80.820- 84.189	3.369	Toowomba	5639	3.25%	6.6%	4.2%		4.5%	15.3%	3.4	1461		1.07E+07
18C	Warrego Highway	Dalby - Miles	0.000-1.090	1.09	Toowomba	6429	1.18%	6.6%	3.5%		4.8%	14.8%	3.47	1656		1.21E+07
18C	Warrego Highway	Dalby - Miles	1.090- 25.115	24.025	Toowomba	2375	5.00%	8.7%	5.5%		7.8%	22.0%	3.59	938		6.88E+06
18C	Warrego Highway	Dalby - Miles	25.115- 45.195	20.08	Toowomba	2229	5.00%	11.0%	6.4%		8.9%	26.3%	3.53	1033		7.58E+06
18C	Warrego Highway	Dalby - Miles	45.195- 80.175	34.98	Toowomba	2101	5.00%	9.0%	6.2%		8.8%	24.0%	3.64	918		6.74E+06
18C	Warrego Highway	Dalby - Miles	80.175- 83.155	2.98	Toowomba	2474	3.12%	8.7%	5.2%		7.9%	21.8%	3.6	970		7.10E+06
18C	Warrego Highway	Dalby - Miles	83.155- 106.355	23.2	Toowomba	2063	3.92%	7.9%	6.0%		9.2%	23.0%	3.75	889		6.52E+06
18D	Warrego Highway	Miles - Roma	0.000-1.135	1.136	Roma	2675	5.00%	8.8%	5.6%		8.2%	22.5%	3.62	1090		8.00E+06
18D	Warrego Highway	Miles - Roma	1.135-44.099	42.965	Roma	1489	5.00%	8.9%	6.1%		10.9%	25.9%	3.8	733		5.38E+06
18D	Warrego Highway	Miles - Roma	44.099-56.831	12.733	Roma	1231	5.00%	8.6%	6.6%		12.9%	28.1%	3.93	680		4.99E+06
18D	Warrego Highway	Miles - Roma	56.831-101.157	44.327	Roma	1188	5.00%	8.4%	6.5%		13.2%	28.0%	3.96	659		4.84E+06
18D	Warrego Highway	Miles - Roma	101.157-135.247	34.09	Roma	1562	5.00%	9.0%	5.6%		11.0%	25.6%	3.82	764		5.61E+06

QGC Upstream Pavement Impact Assessment

5 Year Growth Rate +
20 Year Pavement Load

Impact Summary

Road						Existing Traffic										
Number	Name	Section	Chainage	Distance	Region	AADT / T	Growth Rate 5Yrs	% trucks	% Articulated	% B Double Route Only	% Road Trains	% Commercial Vehicle	ESA's / Comm	ESA's /Day/ Direction		20year Pavement Load
18D	Warrego Highway	Miles - Roma	135.247-141.267	6.02	Roma	2949	5.00%	8.1%	4.1%		6.8%	19.0%	3.57	999		7.33E+06
18E	Warrego Highway	Roma - Mitchell	0-1.05	1.05	Roma	3958	5.00%					15.0%	3.2	1899.84		1.39E+07
18E	Warrego Highway	Roma - Mitchell	1.05-3.42	2.37	Roma	1028	5.00%					24.0%	3.2	789.504		5.79E+06
18E	Warrego Highway	Roma - Mitchell	3.42-39.90	36.48	Roma	746	5.00%					30.0%	3.2	716.16		5.26E+06
18E	Warrego Highway	Roma - Mitchell	39.90-75.58	35.68	Roma	751	5.00%					28.0%	3.2	672.896		4.94E+06
26B	Leichardt Highway	Taroom - Miles	0.000- 60.470	60.47	Roma	654	5.00%	9.6%	8.5%		10.8%	28.9%	3.69	348		2.55E+06
26B	Leichardt Highway	Taroom - Miles	60.470- 127.610	67.14	Roma	638	5.00%	8.4%	10.6%		12.9%	31.9%	3.83	389		2.85E+06
26C	Leichardt Highway	Miles - Goondiwindi	0.000-32.020	32.021	Roma	478	4.83%	8.9%	7.8%		12.3%	29.0%	3.84	266		1.95E+06
26C	Leichardt Highway	Miles - Goondiwindi	32.020-53.040	21.021	Roma	300	0.01%	7.0%	9.5%		14.3%	30.8%	4.01	185		1.35E+06
35A	Moonie Hwy	Dalby - St George	0.00- 2500	2.5	Toowomba	6392	2.05%	5.0%	1.3%		0.9%	7.2%	2.76	630		4.61E+06
35A	Moonie Hwy	Dalby - St George	2.500-11.00	8.5	Toowomba	1858	2.07%	8.1%	4.0%		4.1%	16.2%	3.25	489		3.58E+06
35A	Moonie Hwy	Dalby - St George	11.00- 50.370	39.37	Toowomba	1307	1.67%	8.7%	4.8%		4.8%	18.3%	3.29	393		2.87E+06
86B	Surat Development Road	Tara - Dalby	0-0.05	0.05	Warrick	2118	3.90%	5.6%	1.7%		1.5%	8.9%	2.92	274		2.01E+06
86B	Surat Development Road	Tara - Dalby	0.05-0.6	0.55	Warrick	930	3.90%	5.7%	4.1%		4.6%	14.5%	3.51	236		1.73E+06
86B	Surat Development Road	Tara - Dalby	0.6-40.39	39.79	Warrick	618	3.90%	11.4%	4.7%		3.7%	19.7%	3.02	184		1.35E+06
340	Dalby Kogan Road		0.000- 19.292	19.292	Toowomba	510	5.00%	15.4%	4.8%		5.0%	25.1%	3.01	193		1.42E+06
340	Dalby Kogan Road		19.292- 47.682	28.39	Toowomba	310	5.00%	8.7%	4.4%		7.5%	20.6%	3.6	115		8.44E+05
342	Kogan Condamine Road		0.000- 45.820	45.82	Toowomba	130	5.00%	9.1%	8.7%		16.1%	33.9%	3.99	88		6.46E+05
421	Dalby-Jandowae Road		0.000-24.400	24.4	Toowomba	808	1.22%	7.3%	4.7%		3.1%	15.2%	3.13	192		1.40E+06
421	Dalby-Jandowae Road		24.400-47.410	23.01	Toowomba	634	3.13%	6.2%	5.5%		3.0%	14.6%	3.19	148		1.08E+06
4302	Jackson Wandoan Road		0.00- 68.930	68.93	Roma	66	5.00%	10.6%	5.8%		5.1%	21.5%	3.25	23		1.69E+05
4302	Jackson Wandoan Road		68.930- 81.100	12.17	Roma	132	5.00%	12.0%	4.4%		4.1%	20.6%	3.1	42		3.08E+05

Appendix E

TOTAL GENERATED ESAS - PERCENTAGE OF TOTAL 20YEAR PAVEMENT LOAD

QGC Upstream Pavement Impact Assessment

Total Generated ESAs +
% Total 20yr Pavement Load

Impact Summary

Road						Existing Traffic												
Number	Name	Section	Chainage	Distance	Region	AADT / T	Growth Rate 5Yrs	% trucks	% Articulated	% B Double Route Only	% Road Trains	% Commercial Vehicle	ESA's / Comm	ESA's /Day/ Direction	Total Generated ESA/s		% of total 20 year pavement Load
18A	Warrego Highway	Ipswich - Toowomba	28.900- 44.260	15.36	Toowomba	18021	1.12%	6.9%	7.0%	4.4%		18.3%	2.96	4871	1.58E+05		0.444%
18A	Warrego Highway	Ipswich - Toowomba	44.260- 47.860	3.6	Toowomba	17209	3.49%	6.6%	6.7%	4.6%		17.9%	2.98	4581	1.58E+05		0.471%
18A	Warrego Highway	Ipswich - Toowomba	47.860- 55.520	7.66	Toowomba	17751	2.29%	7.0%	7.1%	4.7%		18.8%	2.97	4943	1.58E+05		0.437%
18A	Warrego Highway	Ipswich - Toowomba	55.520- 75.370	19.85	Toowomba	12958	4.06%	5.2%	6.1%	4.4%		15.7%	3.03	3077	1.58E+05		0.701%
18A	Warrego Highway	Ipswich - Toowomba	75.370- 83.350	7.98	Toowomba	16490	1.49%	6.0%	5.4%	3.4%		14.7%	2.92	3548	1.58E+05		0.610%
18A	Warrego Highway	Ipswich - Toowomba	83.350- 92.760	9.41	Toowomba	20469	2.88%	7.5%	4.1%	3.6%		15.2%	2.86	4456	1.58E+05		0.485%
18A	Warrego Highway	Ipswich - Toowomba	92.760- 94.580	1.82	Toowomba	19897	0.01%	5.7%	4.1%	2.4%		12.2%	2.83	3430	1.58E+05		0.631%
18A	Warrego Highway	Ipswich - Toowomba	94.580- 95.010	0.43	Toowomba	20291	0.01%	6.0%	4.9%	2.1%		12.9%	2.79	3653	1.58E+05		0.593%
18B	Warrego Highway	Toowomba - Dalby	0.000- 0.990	0.99	Toowomba	24055	0.38%	6.2%	3.2%		2.0%	11.3%	3	4077	1.58E+05		0.531%
18B	Warrego Highway	Toowomba - Dalby	0.990- 2.210	1.22	Toowomba	22080	0.50%	7.1%	3.9%		2.0%	12.9%	2.95	4201	1.58E+05		0.515%
18B	Warrego Highway	Toowomba - Dalby	2.210- 3.740	1.53	Toowomba	17513	0.85%	6.5%	4.3%		2.1%	12.8%	3.01	3378	1.58E+05		0.641%
18B	Warrego Highway	Toowomba - Dalby	3.740- 4.520	0.78	Toowomba	11653	0.01%	2.6%	1.1%		0.6%	4.3%	2.84	709	1.58E+05		3.055%
18B	Warrego Highway	Toowomba - Dalby	4.520- 6.630	2.11	Toowomba	16255	0.57%	4.5%	1.4%		0.4%	6.3%	2.58	1323	1.58E+05		1.636%
18B	Warrego Highway	Toowomba - Dalby	6.630- 10.590	3.96	Toowomba	13564	4.97%	6.3%	1.6%		0.6%	8.5%	2.57	1484	1.58E+05		1.452%
18B	Warrego Highway	Toowomba - Dalby	10.590- 26.830	16.24	Toowomba	11482	3.91%	6.1%	3.0%		2.9%	12.0%	3.19	2190	1.58E+05		0.985%
18B	Warrego Highway	Toowomba - Dalby	26.830- 80.820	53.99	Toowomba	4433	5.00%	8.3%	5.7%		7.8%	21.8%	3.61	1742	1.58E+05		1.237%
18B	Warrego Highway	Toowomba - Dalby	80.820- 84.189	3.369	Toowomba	5639	3.25%	6.6%	4.2%		4.5%	15.3%	3.4	1461	1.58E+05		1.477%
18C	Warrego Highway	Dalby - Miles	0.000-1.090	1.09	Toowomba	6429	1.18%	6.6%	3.5%		4.8%	14.8%	3.47	1656	3.94E+05		3.253%
18C	Warrego Highway	Dalby - Miles	1.090- 25.115	24.025	Toowomba	2375	5.00%	8.7%	5.5%		7.8%	22.0%	3.59	938	3.94E+05		5.721%
18C	Warrego Highway	Dalby - Miles	25.115- 45.195	20.08	Toowomba	2229	5.00%	11.0%	6.4%		8.9%	26.3%	3.53	1033	3.94E+05		5.194%
18C	Warrego Highway	Dalby - Miles	45.195- 80.175	34.98	Toowomba	2101	5.00%	9.0%	6.2%		8.8%	24.0%	3.64	918	3.94E+05		5.845%
18C	Warrego Highway	Dalby - Miles	80.175- 83.155	2.98	Toowomba	2474	3.12%	8.7%	5.2%		7.9%	21.8%	3.6	970	3.94E+05		5.543%
18C	Warrego Highway	Dalby - Miles	83.155- 106.355	23.2	Toowomba	2063	3.92%	7.9%	6.0%		9.2%	23.0%	3.75	889	3.94E+05		6.043%
18D	Warrego Highway	Miles - Roma	0.000-1.135	1.136	Roma	2675	5.00%	8.8%	5.6%		8.2%	22.5%	3.62	1090	1.35E+05		1.683%
18D	Warrego Highway	Miles - Roma	1.135-44.099	42.965	Roma	1489	5.00%	8.9%	6.1%		10.9%	25.9%	3.8	733	1.35E+05		2.502%
18D	Warrego Highway	Miles - Roma	44.099-56.831	12.733	Roma	1231	5.00%	8.6%	6.6%		12.9%	28.1%	3.93	680	2.83E+05		5.666%
18D	Warrego Highway	Miles - Roma	56.831-101.157	44.327	Roma	1188	5.00%	8.4%	6.5%		13.2%	28.0%	3.96	659	2.83E+05		5.846%
18D	Warrego Highway	Miles - Roma	101.157-135.247	34.09	Roma	1562	5.00%	9.0%	5.6%		11.0%	25.6%	3.82	764	2.68E+05		4.778%
18D	Warrego Highway	Miles - Roma	135.247-141.267	6.02	Roma	2949	5.00%	8.1%	4.1%		6.8%	19.0%	3.57	999	2.68E+05		3.654%
18E	Warrego Highway	Roma - Mitchell	0-1.05	1.05	Roma	3958	5.00%					15.0%	3.2	1899.84	2.68E+05		1.922%

QGC Upstream Pavement Impact Assessment

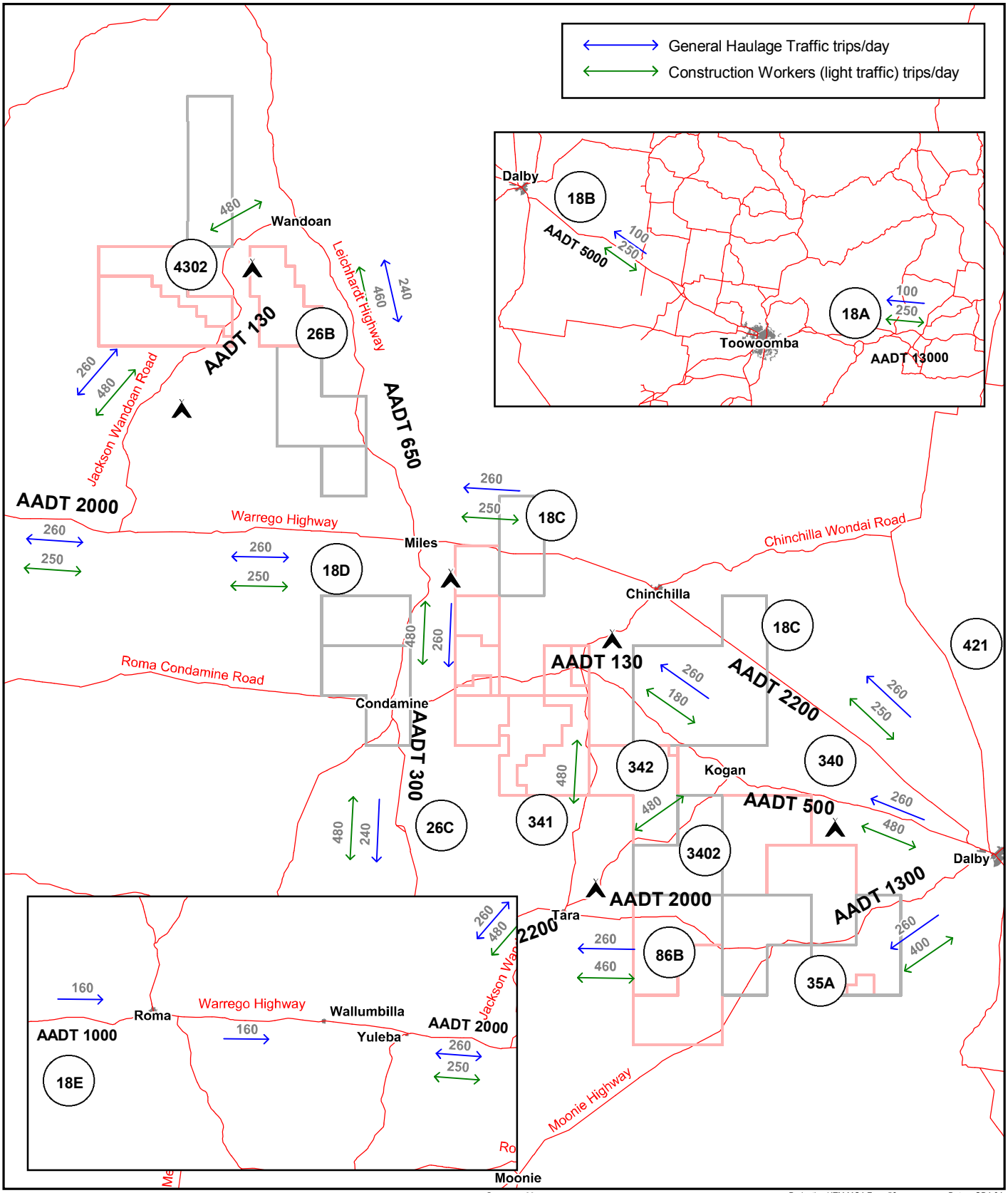
Total Generated ESAs +
% Total 20yr Pavement Load

Impact Summary

Road						Existing Traffic											
Number	Name	Section	Chainage	Distance	Region	AADT / T	Growth Rate 5Yrs	% trucks	% Articulated	% B Double Route Only	% Road Trains	% Commercial Vehicle	ESA's / Comm	ESA's /Day/ Direction	Total Generated ESA/s		% of total 20 year pavement Load
18E	Warrego Highway	Roma - Mitchell	1.05-3.42	2.37	Roma	1028	5.00%					24.0%	3.2	789.504	2.68E+05		4.624%
18E	Warrego Highway	Roma - Mitchell	3.42-39.90	36.48	Roma	746	5.00%					30.0%	3.2	716.16	2.68E+05		5.097%
18E	Warrego Highway	Roma - Mitchell	39.90-75.58	35.68	Roma	751	5.00%					28.0%	3.2	672.896	2.68E+05		5.425%
26B	Leichardt Highway	Taroom - Miles	60.470- 127.610	67.14	Roma	638	5.00%	8.4%	10.6%		12.9%	31.9%	3.83	389	1.31E+05		4.599%
26C	Leichardt Highway	Miles - Goondiwindi	0.000-32.020	32.021	Roma	478	4.83%	8.9%	7.8%		12.3%	29.0%	3.84	266	2.70E+05		13.818%
26C	Leichardt Highway	Miles - Goondiwindi	32.020-53.040	21.021	Roma	300	0.01%	7.0%	9.5%		14.3%	30.8%	4.01	185	2.08E+05		15.401%
35A	Moonie Hwy	Dalby - St George	0.00- 2500	2.5	Toowomba	6392	2.05%	5.0%	1.3%		0.9%	7.2%	2.76	630	6.59E+05		14.308%
35A	Moonie Hwy	Dalby - St George	2.500-11.00	8.5	Toowomba	1858	2.07%	8.1%	4.0%		4.1%	16.2%	3.25	489	6.59E+05		18.434%
35A	Moonie Hwy	Dalby - St George	11.00- 50.370	39.37	Toowomba	1307	1.67%	8.7%	4.8%		4.8%	18.3%	3.29	393	6.59E+05		22.946%
86B	Surat Development Road	Tara - Dalby	0-0.05	0.05	Warrick	2118	3.90%	5.6%	1.7%		1.5%	8.9%	2.92	274	7.07E+02		0.035%
86B	Surat Development Road	Tara - Dalby	0.05-0.6	0.55	Warrick	930	3.90%	5.7%	4.1%		4.6%	14.5%	3.51	236	7.07E+02		0.041%
86B	Surat Development Road	Tara - Dalby	0.6-40.39	39.79	Warrick	618	3.90%	11.4%	4.7%		3.7%	19.7%	3.02	184	3.80E+05		28.153%
340	Dalby Kogan Road		0.000- 19.292	19.292	Toowomba	510	5.00%	15.4%	4.8%		5.0%	25.1%	3.01	193	4.71E+05		33.249%
340	Dalby Kogan Road		19.292- 47.682	28.39	Toowomba	310	5.00%	8.7%	4.4%		7.5%	20.6%	3.6	115	4.71E+05		55.800%
342	Kogan Condamine Road		0.000- 45.820	45.82	Toowomba	130	5.00%	9.1%	8.7%		16.1%	33.9%	3.99	88	4.16E+05		64.374%
421	Dalby-Jandowae Road		0.000-24.400	24.4	Toowomba	808	1.22%	7.3%	4.7%		3.1%	15.2%	3.13	192	1.36E+06		97.132%
421	Dalby-Jandowae Road		24.400-47.410	23.01	Toowomba	634	3.13%	6.2%	5.5%		3.0%	14.6%	3.19	148	1.36E+06		125.756%
4302	Jackson Wandoan Road		0.00- 68.930	68.93	Roma	66	5.00%	10.6%	5.8%		5.1%	21.5%	3.25	23	2.58E+05		152.715%
4302	Jackson Wandoan Road		68.930- 81.100	12.17	Roma	132	5.00%	12.0%	4.4%		4.1%	20.6%	3.1	42	1.77E+04		5.744%

Appendix F

POTENTIAL TRANSPORT ROUTES AND AADT MAPS



Legend:

CSG Fields - Authority to Prospect

CSG Fields - Petroleum Lease/Petroleum Lease Application

Proposed Camps

Source Note:

1:250,000 Topographic vector copyright Geoscience Australia
AADT information from Kellogg Brown & Root Pty Ltd

Projection UTM MGA Zone 56 Datum GDA 94

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Kilometres

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QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Potential Transport Routes**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Mipela	**Volume** 3 **Figure** 14.1	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
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