# 14 ROAD, RAIL, AIR AND PUBLIC TRANSPORT

Traffic impacts in the Gladstone region associated with the Queensland Curtis LNG (QCLNG) Project were described in the draft environmental impact statement (EIS) (*Volume 5, Chapter 14*). Subsequent to preparation of the draft, further refinement of Project workforce and logistics requirements (as summarised in *Volume 2* of this supplementary environmental impact statement) have resulted in changes in the modelled impacts. In response, further modelling and impact assessment has been undertaken, with the results summarised in this chapter (refer *Section 14.2* to *Section 14.9*) and presented in detail in *Appendix 5.8* attached. The modelling and impact assessment undertaken for this supplementary EIS supersedes that previously presented in the draft EIS.

## 14.1 RESPONSE TO SUBMISSIONS ON DRAFT EIS

Submissions relating to LNG Component traffic impacts (and in particular to draft EIS *Volume 5, Chapter 14: Road, Rail, Air and Public Transport*, and *Appendix 5.15 - LNG Facility – Traffic and Transport Impact Assessment*) as described and assessed in the draft EIS are summarised in *Table 5.14.1* below. Where applicable, these responses refer to the updated modelling and impact assessment undertaken subsequent to the draft EIS and summarised in this chapter.

### *Table 5.14.1 Response to Submissions on Draft EIS*

| Issue Raised | QCLNG Response | Relevant Submission(s) |
|---|---|---|
| Further detail on transportation of personnel to and from the site, shift start and finish time for workers and associated parking issues for worker transport, and consideration by QGC of use of buses to transport workers is requested. | The logistics plan outlined in this chapter incorporates a busing strategy for approximately 55 per cent of the total peak construction workforce, as well as car parking split between Auckland Point (for Gladstone residents) and an off-site location.<br>Details of the proposed shift roster for the construction workforce, which has been amended from that outlined in the draft EIS, is provided in *Volume 2, Chapter 13* of this supplementary EIS, and summarised in *Section 14.4.1* below, with the revised traffic modelling undertaken on this basis. This modelling is believed to represent the realistic worst case for personnel movement with regard to shift times, and a proposed traffic management measure is for shift start and finish times to be further revised to move further outside peak Gladstone traffic times. This is described further in *Section 14.4.1*.<br>The outcomes of the traffic impact assessment indicate that the even the worst case shift start and finish times will not have unacceptable levels of impact on Gladstone traffic with implementation of the proposed management and mitigation measures. The percentage increases in traffic volumes against 2008 background as a result of Project traffic on assessed road links is approximately 3 per cent on average. Link analysis indicates substantial remaining capacity in the network (apart from one link already over capacity), with no link upgrade works required as a direct result of the QCLNG Project. | 29 |
| Suggestion that the Project construct a multi-storey carpark in Gladstone for construction worker vehicles. | A multi-storey carpark is not proposed by QGC, as sufficient parking for the LNG Facility construction workforce is available on the sites selected without impacting on public car parking options in Gladstone. Refer *Section 14.4.1* below for more detail of car parking proposed for local and non-local workers. QGC considers that a large multi-storey carpark in central Gladstone may inadvertently cause serious traffic congestion, particularly at the PM peak. | 29 |
| Request for liaison on transport logistics with appropriate transport regulators and Gladstone Regional Council during both construction and operations. | QGC will continue to liaise with the Gladstone Regional Council and appropriate transport regulators with regard to logistics planning and proposed management and mitigation measures for identified impacts in the lead-up to commencement of construction, and as necessary throughout construction and operations of the LNG Facility. | 29 |

| Issue Raised | QCLNG Response | Relevant Submission(s) |
|---|---|---|
| If the Port of Gladstone is used for import of line pipe, as a minimum line pipe intended for the southern network should be transported as far as practicable on the rail network. Where rail is not used, reasons for not using rail should be explained. | While the revised modelling presented in this chapter and in *Appendix 5.8* remains focused on the worst case traffic scenario whereby materials and equipment for pipeline construction are transported by road, QGC is actively pursuing the utilisation of rail for transport of materials and where commercially viable will use availability that rail transport managers can provide. The availability of at least some rail transport is expected to reduce the impacts on the road network described in this chapter and *Appendix 5.8*, as well as *Volume 3, Chapter 14* and *Volume 4, Chapter 13* of this supplementary EIS. | 29 |
| Further detail is requested as to how equipment and materials will be transported to the Pipeline and to and from the LNG Facility during construction. | Discussion of movement of personnel, materials and equipment to and from the LNG Facility site during construction is provided in *Volume 2, Chapter 13* of this supplementary EIS. The movement of personnel, materials and equipment on the mainland in and around the Gladstone region is described in detail in *Section 14.4* in this chapter, as well as *Appendix 5.8* attached to this supplementary EIS. | 29 |
| The impact on the life of various road pavements due to the Equivalent Standard Axles (ESA) from the Project as well as the additional impact on the road surfaces due to tyre scrubbing by the very long trucks should be assessed. | Pavement impacts on roads controlled by Gladstone Regional Council have been considered in traffic impact assessment undertaken for the supplementary EIS. Further detail is provided in *Section 14.6.4* below and in *Section 11* of *Appendix 5.8*.<br>It should be noted that transport of pipeline is now anticipated to be undertaken in 12 m pipe lengths, not the 18 pipe lengths described in the draft EIS. This reduction in pipe length should mitigate concerns expressed regarding additional tyre scrubbing as result of very long trucks.<br>An updated pavement impact assessment has been undertaken for the supplementary EIS reflecting the revised traffic and logistic assumptions. This is summarised in *Section 14.6.4* and presented in detail in *Appendix 5.8*. | 29 |
| Concern was expressed about the impact of very long truck transporting 18 m lengths of pipe on rural intersections, as a result of the larger turning radii required on these trucks.<br>Additionally, concern was raised about potential safety issues associated with very long trucks, specifically with regard to overtaking. | Transport of pipeline is now anticipated to be undertaken in 12 m pipe lengths, not the 18 pipe lengths described in the draft EIS. | 29 |

| Issue Raised | QCLNG Response | Relevant Submission(s) |
|---|---|---|
| Potential cumulative impacts should be addressed. | The revised traffic impact assessment described in this chapter and in *Appendix 5.8* attached takes into consideration potential traffic impacts arising from other proposed projects for which sufficient information is publicly available (refer *Section 3.9 of Appendix 5.8* for a list of other projects considered as part of the traffic impact assessment). In addition, traffic growth rates of 5 per cent (rural) and 3 per cent (urban) were assumed as applying to Gladstone region throughout the Project life and were consequently factored into the impact assessment undertaken for this supplementary EIS. | 27, 29 |
| Further detail as to quantity of aggregate and other bulk materials required for construction, and transportation to the LNG Facility site. | Description of tonnages of aggregate required and indicative transport routes are provided in *Section 14.4.2.2* below, and the revised traffic impact assessment provided below and detailed in *Appendix 5.8* takes into consideration movement of this material. | 29 |
| Concern that little reference was made in the draft EIS to QCLNG logistics requirements during the operational stage of the LNG Facility, including servicing arrangements for waste, fuel transport, mechanical and structural maintenance. | Operational traffic impacts were described in *Volume 5, Chapter 14* of the draft EIS, although considerably more focus was applied to the construction phase as operations phase impacts are anticipated to be insignificant in comparison. Notwithstanding this lower anticipated level of impact, operations phase impacts have been updated and incorporated into the traffic impact assessment described below and in *Appendix 5.8*.<br>It should be noted that the revised traffic impact assessment considers the operations phase primarily under the normal operations scenario. Impacts associated with LNG Facility shutdowns or major maintenance are not considered in detail as these will be relatively infrequent and of short duration. | 29 |
| When assessing link capacities, the draft EIS made assumptions regarding hourly capacity establishment rather than using available data from the Department of Transport and Main Roads. | The Department of Transport and Main Roads has been contacted and available data has been used in the traffic impact assessment undertaken for this supplementary EIS, as summarised in this chapter and described in detail in *Appendix 5.8*. | 27 |
| With regard to developer contributions for pavements, the draft EIS only considers the routine maintenance contribution and does not take into account the rehabilitation contribution calculated in *Appendix F* of *Appendix 5.15: Traffic and Transport Impact Assessment*. | The rehabilitation contribution was calculated to be zero for all assessed scenarios as the bring forward date was always less than one year (one year is equivalent to a 5 per cent impact). So although a rehabilitation contribution was calculated, these costs are not required to be paid given impact of less than 5 per cent.<br>Confirmation of appropriate methodology has been sought from the Department of Transport and Main Roads, and has been applied to the revised traffic impact assessment. Revised pavement contribution estimates have been made to reflect the changes to Project logistics planning, and are detailed in *Appendix 5.8* to this supplementary EIS. | 27 |
| The EIS does not include a Crash Assessment and Safety Review of the impacted state-controlled roads. This should be undertaken in accordance with the Guideline for Assessment of Road Impacts of Development (GARID) 2006 or as amended. | Subsequent to receipt of this submission, QGC undertook consultation with the Department of Transport and Main Roads regarding the methodology for undertaking this assessment as applied to the QCLNG Project. After discussion, this was deemed by DTMR to be no longer required. | 27 |

## 14.2 REVISED TRAFFIC IMPACT ASSESSMENT

A revised traffic impact assessment for Project impacts in the Gladstone region during construction and operations has been undertaken[1]. A summary of assumptions, methodology and outcomes is provided below, with the full impact assessment provided as *Appendix 5.8*. This revised assessment takes into consideration revisions to the Project logistics planning, including:

- the revised construction and operations workforce estimates and shift rosters (as described in *Volume 2, Chapter 9* and *13* of this supplementary EIS, and summarised in *Section 14.4* below)
- revised estimates of heavy vehicle movement to the LNG Facility via the staging area at Auckland Point, based on further definition and refinement of the construction logistics plan
- revised estimates of transport of export pipeline, assumed to be imported through the Port of Gladstone and transported inland via road. It should be noted that refinement of pipeline transport continues, with QGC actively pursuing the use of rail for transport of materials. However, the revised modelling presented in this chapter has still assumed that all pipeline is transported by road
- further detail for movement of aggregates and other bulk materials required for construction of the LNG Facility and associated works in the Gladstone region.

Each of these is described in further detail below, with the data and traffic impact modelling presented in this chapter superseding that provided in the draft EIS, along with a summary of the methodology and outcomes of the revised traffic impact assessment for Gladstone.

## 14.3 IMPACT ASSESSMENT SCOPE AND METHODOLOGY

### 14.3.1 Assessment Scope

A summary of key analyses undertaken for the road impact assessment undertaken for this supplementary EIS is provided in *Table 5.14.2* below. Further details are provided in the full traffic impact assessment report provided in *Appendix 5.8*, including a full listing of specific road links and intersection analyses (refer *Tables 2.1, 2.2* and *2.3* of *Appendix 5.8*).

1 Halcrow, 2009. Queensland Curtis LNG Project - Supplementary EIS Traffic and Transport Impact Assessment. Unpublished report for QGC, Rev B 11 December 2009

***Table 5.14.2 Summary of Traffic Impact Assessment Analyses***

| Analysis | Tasks / Scope[1] |
|---|---|
| Link Assessment | • Without and with LNG Plant components<br>• During both construction and operational phases<br>• With cumulative impact of other major development proposals<br>• For four varying traffic generation and distribution options for travel demand accessing Auckland Point during the construction phase. |
| Intersection Assessment | • Without and with LNG Plant components<br>• During both construction and operational phases<br>• With cumulative impact of other major development proposals<br>• For four varying traffic generation and distribution options for travel demand accessing Auckland Point during the construction phase. |
| Pavement Impact Assessment | • Without and with LNG Plant components<br>• During both construction and operational phases<br>• For four varying traffic generation and distribution options for travel demand accessing Auckland Point during the construction phase. |

1 More details on scope, including specific road links and intersection analysed, are provided in *Section 2.1* of *Appendix 5.8.*

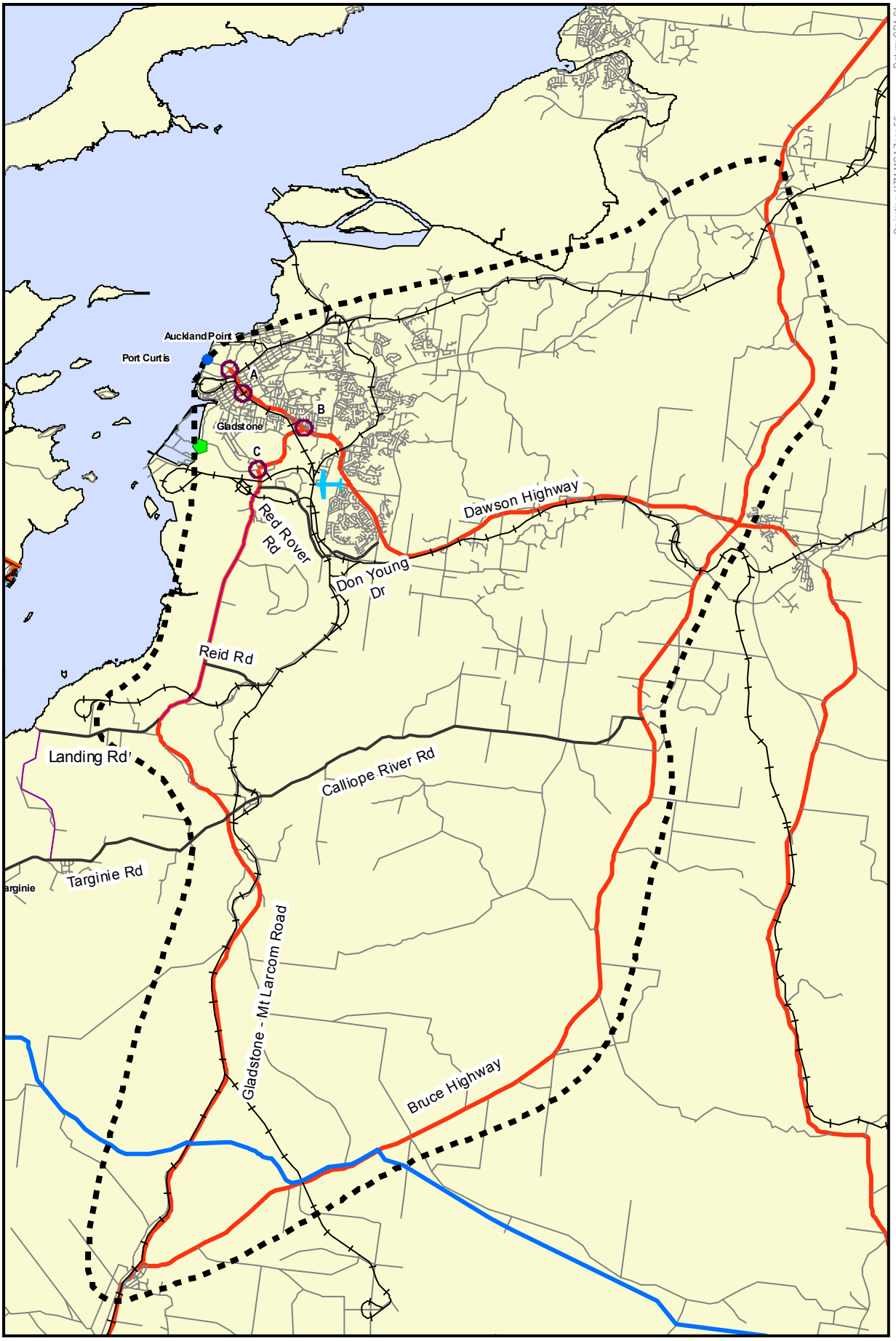
Assessment was undertaken with due consideration for the following reference sources:

- Guidelines for Assessment of Road Impacts of Development (GARID)
- Road Planning and Design Manual (RPDM) (DTMR, 2006)
- Pavement Design Manual (PDM) (DTMR, 2005)
- Roads and Transport Standard (GRC, 2005)
- Transport Infrastructure Policy (GRC, 2002).

In addition to road traffic impacts, impacts to air transport were assessed qualitatively through consultation with QantasLink. Impacts to rail transport were discussed with regard to Project-generated road traffic at all road/rail interfaces within the study area.

### *14.3.2 Geographic Scope*

The impact assessment focused on impacts arising from the Project within the Gladstone region. The geographic extent of the study area for the traffic impact assessment is shown in *Figure 5.14.1.*




QUEENSLAND CURTIS LNG
A BG Group business

| | |
|---|---|
| Project | Queensland Curtis LNG Project |
| Client | QGC - A BG Group business |

Title: **Road Impact Assessment Study Area**

ERM
Environmental Resources Management Australia Pty Ltd

| | | | |
|---|---|---|---|
| Drawn | KP | sEIS Volume 5 | Figure S5.14.1 |
| Approved | RS | File No: | 0086165b_EIS_GIS017_F5.14.1 |
| Date | 31.12.09 | Revision | 0 |

Disclaimer:
Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only.
ERM does not warrant the accuracy of any such Maps and Figures.

#### *14.3.2.1 Roads*

The key state-controlled road links which provide access to the Project site during construction and operational phases are:

- Bruce Highway
- Gladstone-Mt Larcom Road
- Dawson Highway
- Gladstone-Benaraby Road.

The key council-controlled road links which provide access to the Project site during construction and operational phases are:

- Calliope River-Targinie Road
- Blain Drive
- Glenlyon Road
- Red Rover Road/Don Young Drive
- Kirkwood Road.

More detailed description of these road links within the study area are provided in *Section 3* of *Appendix 5.8.*

In addition, the impact assessment gave consideration to proposed road improvements within the study area. Potential future road upgrades considered are itemised in *Section 3.5* of *Appendix 5.8*.

#### *14.3.2.2 Rail*

The impact assessment considered the existing rail network in the Gladstone region, being primarily:

- A north-south linkage between Brisbane and Cairns, which is termed the *North Coast Line*. This is also linked to the Blackwater system that carries thermal coal from the Central Bowen Basin to Gladstone.
- The *Moura system*, which is currently a rail connection between the southern Bowen Basin and Gladstone. This system is soon to be linked to the West Moreton system via the proposed Surat Basin Rail Project.

Proposed future developments to the rail network were also considered, with the most notable proposed upgrades including:

- *Surat Basin Rail Feasibility Study*, with approximately 210 km of new railway to be constructed between Wandoan and Banana. This new linkage will form part of the Moura System.
- *Moura Link-Aldoga Rail Project*, a proposed railway line which will connect the proposed Wiggins Island Coal Terminal to the Moura System.

Further detail on the existing and potential future rail network considered in the impact assessment is included in *Section 3.6* of *Appendix 5.8*.

#### *14.3.2.3 Port Facilities*

Existing and proposed future port facilities within the Port of Gladstone are described in *Section 3.7* of *Appendix 5.8.* For the purposes of the traffic impact assessment for the Project, the key port transport nodes are:

- Auckland Point, which will be the primary node for personnel, materials and equipment (excluding aggregates and other bulk materials) from the Gladstone mainland to and from Curtis Island during construction of LNG Trains 1 and 2.
- A Project marine terminal and aggregate load out facility to be constructed in the vicinity of the RG Tanna coal terminal, which is proposed to be the long-term marine transport node during the operations phase. It will also be used for aggregate transport during construction (between 2011 and 2014).
- Fisherman's Landing, which may be used as an aggregate and bulk materials load out facility for approximately the first six months of construction activity while the load out facility at RG Tanna is being constructed. However, this is subject to ongoing consultation with the Gladstone Ports Corporation and an alternate facility may yet be selected for use for aggregate load out during the early stages of LNG Facility construction.
- Project marine facilities to be constructed on Curtis Island at the LNG Facility site.

#### *14.3.2.4 Airport Facilities*

Gladstone Airport is located on Aerodrome Road, approximately 6 km from the city centre. It is currently operated by Gladstone Regional Council, with scheduled passenger services from the airport operated by QantasLink. In 2008, QantasLink was scheduled to operate 76 aircraft movements in and out of Gladstone Airport per week. Direct flights are available between Gladstone and Brisbane, Rockhampton, Mackay, Townsville, Cairns and occasionally Bundaberg.

The airport is undergoing an upgrade scheduled for completion mid-2010. This will result in the ability to receive larger aircraft as well as expanded car parking, baggage handling, and other facilities.

### *14.3.3 Impact Assessment Data*

Data used as inputs into the impact assessment included the following:

- Revised Project traffic and logistics assumptions, as described in *Section 14.4*.
- Existing road network details such as network geometry, existing road

hierarchy and posted speed limits.

- Future road network provision, including those proposed by other regionally significant projects.
- Tube (traffic axle count) and intersection count data, along with associated historical growth rates. Where existing data provision was insufficient, additional traffic counting was undertaken (refer *Appendix 5.8*).
- Existing pavement condition data and maintenance/rehabilitation cost rates.

### *14.3.4 Traffic Generation and Assignment*

Anticipated vehicle movements were determined through:

- review of Project-specific traffic and logistics plans
- conversion of these development details into peak-hour flows for the intersection impact assessment
- conversion of these development details into daily flows for the link assessment
- conversion of these development details into yearly traffic flows for the pavement impact assessment
- trip generation calculated from first principles and the knowledge of employee/heavy vehicle movements for different periods of the day.

Sensitivity testing of four alternative traffic generation and distribution scenarios was also undertaken for travel demand accessing Auckland Point during construction. These scenarios are described further in *Section 14.4.1.2*.

### *14.3.5 Traffic Impact Assessment*

The impact assessment included 24 tested scenarios, covering the period 2008 to 2025 (to cover both construction and operations phases of the Project) and considering a range of distribution options for construction workforce. These scenarios comprise a baseline condition with assumptions of workforce size, transport demand and four traffic distribution options. The scope of the assessment (as summarised in *Section 14.3.1* above and detailed in *Section 2.1* of *Appendix 5.8*) was tested under all 24 scenarios, and further detailed analyses were conducted for all conditions where development-generated traffic contributed to increases of greater than 5 per cent of existing demands on intersection movements and link demand. This methodology is consistent with the procedures specified in Guidelines for Assessment of Road Impacts of Developments (GARID).

Intersection analysis was undertaken in the SIDRA Intersection software platform, and in some instances, also undertaken in the micro-simulation modelling package, Paramics. The scope of the micro-simulation modelling and detailed methodology discussions are provided in *Section 9* of *Appendix 5.8*.

### *14.3.6 Traffic Impact Management and Mitigation*

Based on the outcomes of the intersection and link impact analysis, alternative intersection/link forms and proposed associated traffic management strategies have been developed for each phase of the Project. These potential alternate intersection/link forms and associated traffic management strategies took into consideration network needs under traffic demand imposed by background traffic, development traffic and traffic generated by other regionally significant projects.

### *14.3.7 Pavement Impact Assessment and Mitigation*

The pavement impact assessment was conducted in accordance with the procedures identified within GARID, supplemented by discussions of methodology undertaken directly with DTMR, Fitzroy District.

Impact mitigation for pavements has been estimated on the basis of Project contributions. Specific cost elements (such as dollar per kilometre for road maintenance) have been determined through consultation with the relevant agencies and the resultant rehabilitation and maintenance contributions were calculated for each of the 24 assessment scenarios.

### *14.3.8 Future Traffic Growth and Cumulative Impacts*

#### *14.3.8.1 Future Traffic Growth*

Department of Transport and Main Roads data for the major roads and highways in the vicinity of the study area was used to provide an indication of past traffic volume growth rates (period between 1997 and 2007). On the basis of this data, traffic modelling has assumed an annual growth of 5 per cent and 3 per cent (compounding) for rural and urban roads, respectively. This is considered to be a high growth rate given that the analysis horizon extends to 2025.

#### *14.3.8.2 Other Regionally Significant Projects*

Where data was available, traffic generated by other regionally significant projects was overlaid onto background volumes for each respective year so the cumulative impact of development could be assessed. A discussion of identified projects included is provided in *Section 3.9* of *Appendix 5.8*.

## *14.4 PROJECT TRAFFIC ASSUMPTIONS*

### *14.4.1 Construction Workforce*

#### *14.4.1.1 Workforce Numbers*

Construction workforce (for construction of the initial two LNG trains) is described in *Volume 2, Chapter 13* of this supplementary EIS, which describes accommodation of non-local personnel either in a camp within the LNG

Facility site boundary on Curtis Island, or in Gladstone (primarily for non-manual personnel). Local personnel will continue to reside in Gladstone and will commute to site daily, with transit via Auckland Point.

Construction workforce estimates provided in *Volume 2, Chapter 13* assume relatively unconstrained access to local labour. In the event that other projects in the Gladstone region or elsewhere being undertaken simultaneously result in limited availability of local labour, a higher percentage of non-local workers will be employed and total workforce numbers increase slightly as a result of shift effects (refer *Volume 2, Chapter 6* for further discussion of impacts of labour constraints on workforce numbers).

A summary of peak personnel numbers (for the constrained and unconstrained labour cases) and simplified shift rotation details, which formed the basis of the traffic impact assessment, are provided in *Table 5.14.3*. Detailed workforce histograms showing personnel numbers over the full construction period are provided in *Volume 2, Chapter 13*.

***Table 5.14.3 Assumed Peak Personnel Requirements – Construction (2012)***

| Construction Personnel | Shift Roster | Constrained Local Labour Case | Unconstrained Local Labour Case |
|---|---|---|---|
| Non-local (camp on island) | • 10 hours per day (Monday to Friday)<br>• Eight hours per day (Saturday)<br>• One in five weeks off-shift (20% of staff off-shift for a week at any given time)<br>• Major shift rotation occurs every Saturday | 2,195 | 1,741 |
| Non Local (Gladstone Based) | • 10 hours per day Monday to Friday<br>• Eight hours per day on Saturday<br>• Annual leave accrued and taken at varying times | 257 | 257 |
| Local (Gladstone Based) | • 10 hours per day Monday to Friday<br>• Eight hours per day on Saturday on an 'as need basis' – for the purposes of traffic impact assessment, it has been assumed that 50% of local personnel will be on-shift for Saturday<br>• Annual leave accrued and taken at varying times | 978 | 1,343 |
| | **Total Peak Workforce**[1] | 3,430 | 3,341 |

1 Total Peak Workforce includes non-local personnel who are off-shift for one week and therefore not accommodated in the construction camp

Given the continuing uncertainty about the availability of local personnel, for the purposes of the traffic impact the critical case, which is a combination of the worst conditions for the unconstrained and constrained cases (and hence would not occur in reality) was assumed. Thus the assumed peak personnel numbers used in the impact assessment were:

- **Daily movement – Monday to Friday**: Unconstrained labour case, given that the 1,600 personnel required at peak is greater than the 1,235 assumed for the constrained labour case.
- **End of Shift Movement – Saturday:** Constrained labour case, given that the 2,195 personnel required at peak is greater than the 1,741 assumed for the unconstrained labour case.

Consideration of these critical conditions will ensure that identification and mitigation of traffic impacts are based on a theoretical worse case scenario and would therefore cover the alternate workforce option, if it arises.

For non-peak construction years, (i.e., 2010, 2011, 2013), assumptions used in the development of employee numbers were based on the histogram of workforce requirements as shown in *Volume 2, Chapter 13* of this supplementary EIS. The ramp-up and ramp-down of personnel was therefore modelled as summarised in *Table 5.14.4*.

***Table 5.14.4 Modelled Construction Workforce, by Year***

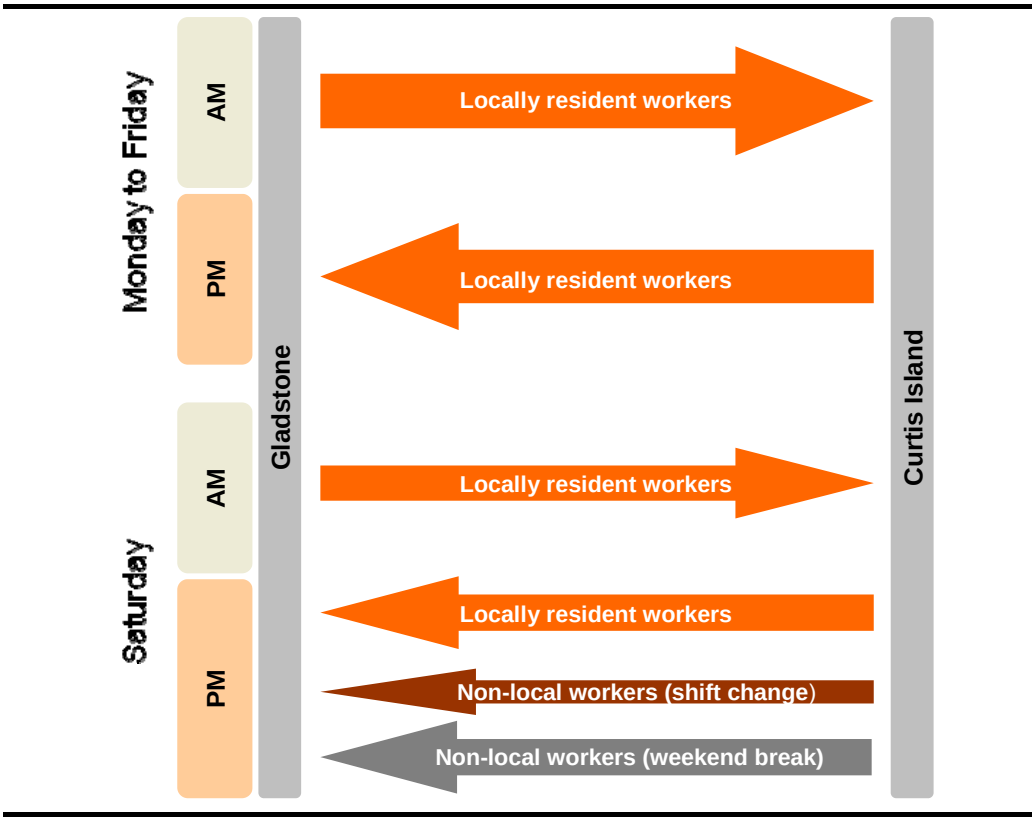
| Year | % of Peak Workforce |
|---|---|
| 2010 | 24% |
| 2011 | 55% |
| 2012 | 100% |
| 2013 | 62% |

Daily construction workforce movements (Monday-Friday), and Saturday movements, as modelled are described in detail in *Section 14.4.1.2* below. In summary, Monday to Friday locally resident personnel will transit between Gladstone and the LNG Facility site in the mornings and return to Gladstone in the afternoon. On Saturday morning, locally resident personnel working on Saturday (which will be only a proportion of the locally resident workforce) will transit from Gladstone to the LNG Facility site. On Saturday afternoon, these locally resident workers will return to Gladstone, along with:

- non-local (construction camp resident) personnel departing the LNG Facility for their week off-shift
- non local (construction camp resident) personnel departing the LNG Facility for Sunday off.

These personnel movements are summarised in *Figure 5.14.2* below.

***Figure 5.14.2 Summary of Construction Personnel Movements***




**Note**: Some non-local workers may depart the LNG Facility site at times other than Saturday PM. However, for the purposes of modelling the Saturday case, movements as above have been assumed.

*14.4.1.2 Construction Workforce Movements*

For the purposes of the revised traffic impact modelling, a number of assumptions were made regarding movement of personnel. These assumptions consider both elements within the control of QGC (such as shift start and finish times) and elements outside the control of QGC. Key assumptions about construction workforce movements include:

**Monday to Friday**

- Transit through Auckland Point for locally resident construction personnel is assumed for the purposes of traffic modelling to take place from 6am-7am and 5pm-6pm Monday to Friday. However, these assumed times have been selected to ensure the maximum potential Project impacts have been modelled, with actual Auckland Point transit times likely to be approximately 5am-6am and 6pm-7pm Monday to Friday.
- Locally resident construction personnel are assumed to park their vehicles within a Project car parking area to be constructed at Auckland Point. For the purposes of traffic modelling, it has been assumed that car pooling results in an average of 1.5 persons per car.
- Non-Gladstone based personnel accommodated in an island camp do not

transit to mainland Monday to Friday and so do not influence traffic flows on a week day.

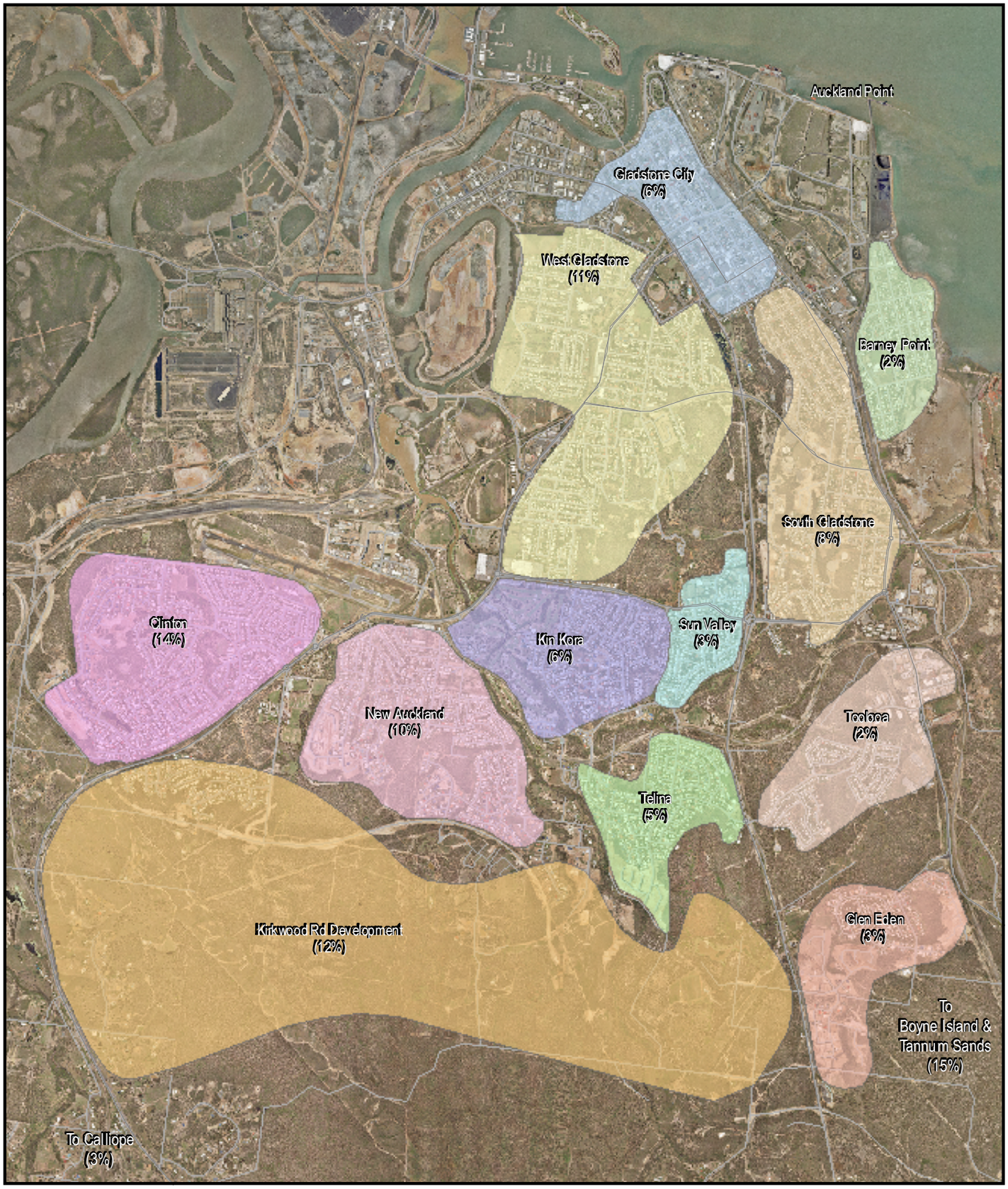
As shown in *Figure 5.14.4* below, coverage count data available for this study indicates that background traffic peaks generally occur at 8am and 4pm. The modelled assumption for peak Project-generated traffic already sits outside of the background peak, and so shifting Project flows further before and after the modelled assumption periods moves the peak construction workforce flows further into periods of lower background traffic volumes. Movement of the start and end times of the weekday construction shift from the modelled times therefore represents an effective mitigation of the impacts resulting from locally resident construction traffic movements.

On the basis of the above, the numbers of construction workers and personnel vehicles moving to and from Auckland Point (as modelled) are summarised in *Table 5.14.5*. The assumed distribution of Gladstone-based employee residences during construction is shown in *Figure 5.14.3*, with the proportion attributed to each suburb based upon information sourced from the 2006 Census as well as Project assumptions.

***Table 5.14.5 Daily Construction Personnel Movements[1]***

| Year | From Auckland Point to Gladstone Local | |
|---|---|---|
| | Number of Personnel per day | Number of Vehicle Trip Ends per day |
| 2010 | 607 | 810 |
| 2011 | 880 | 1,174 |
| 2012 | 1,600 | 2,134 |
| 2013 | 992 | 1,322 |

1 Based on the Unconstrained Labour Case, as described in *Section 14.4.1.1*




**Legend**

**Source Note:**
Aerial Photo - Department of Infrastructure and Planning for QCLNG Project

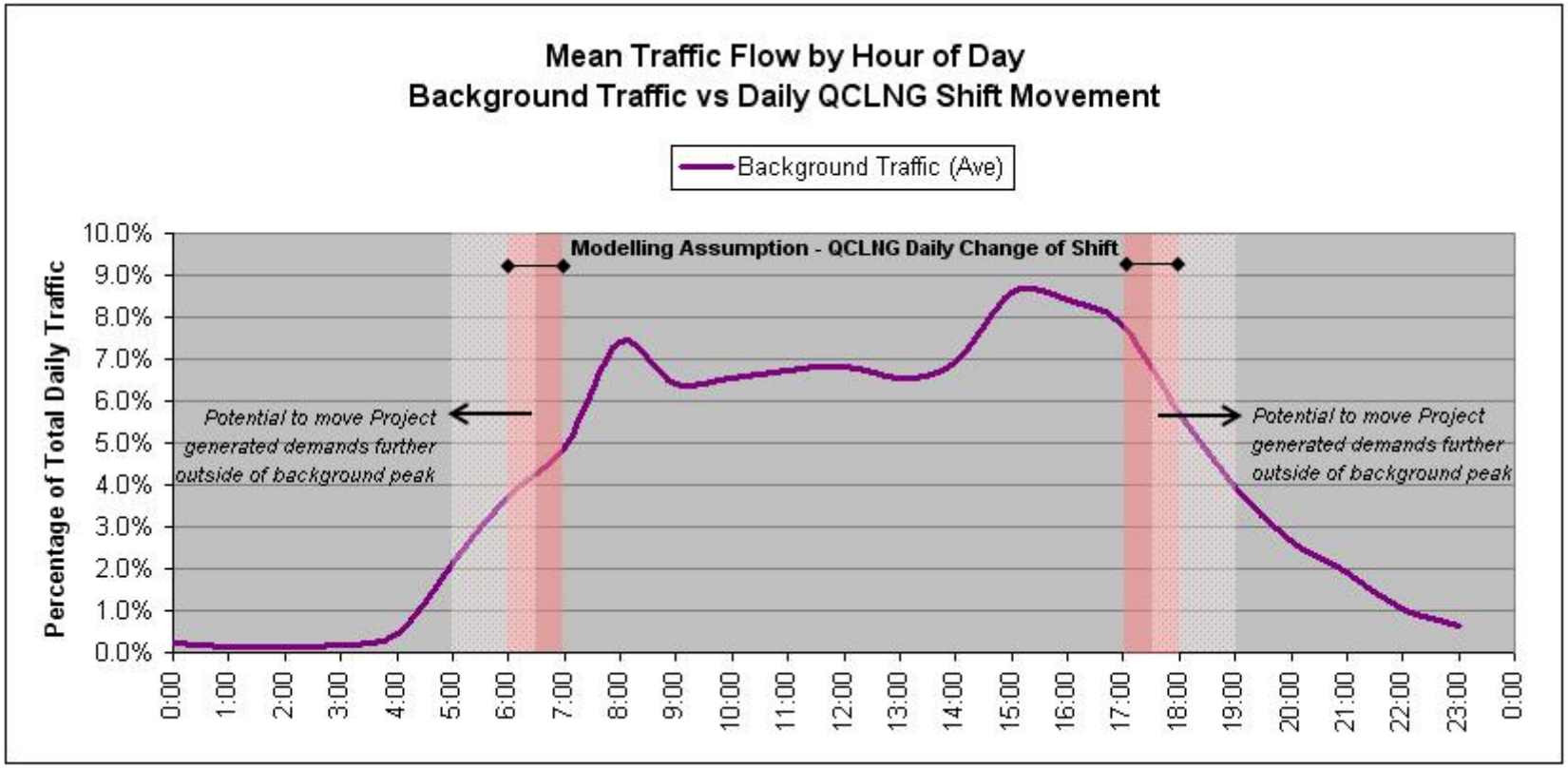
Projection: UTM MGA Zone 56 Datum: GDA 94

0 300 600 1,200 M

N

| | | | |
|---|---|---|---|
| QUEENSLAND CURTIS LNG | Project | Queensland Curtis LNG Project | Title **Gladstone Employee Based Residence - Suburb Distribuition** |
| | Client | QGC - A BG Group business | |
| ERM Environmental Resources Management Australia Pty Ltd | Drawn KP | sEIS Volume 5 Figure s5.14.3 | Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures. |
| | Approved RS | File No: 0086165b_EIS_GIS016_S5.14.3 | |
| | Date 31.12.09 | Revision 0 | |

***Figure 5.14.4 Mean Daily Traffic Flow by Hour***



**Movement of Personnel at Major Shift Rotation (Saturday)**

As described in *Section 14.4.1.1*, the constrained labour case was modelled for the major shift rotation (modelled as Saturday afternoon, although this may in fact be staggered through the week) as this results in a higher traffic load than the unconstrained labour case. The following assumptions were made about workforce movements at shift end:

- Saturday transit through Auckland Point for construction personnel will be 6am-7am (locally resident personnel departing for work on site) and 3pm-4pm (locally resident personnel returning from site, non-local personnel departing for week off shift, and some non-local personnel coming into town for Sunday off).
- 50 per cent of the locally resident personnel will be on Saturday shift and will drive their personal vehicles home from Auckland Point (as per Monday to Friday, assuming 1.5 persons per vehicle on average).
- For the non-local personnel leaving site for their off-shift rotation (i.e., 20 per cent of the non-local camp-accommodated personnel departing for one week off-site), the following assumptions were made:
  - 50 per cent are assumed to be transported by Project buses to Gladstone Airport.
  - The remaining 50 per cent are assumed to be taken by Project buses to a long-term car park located adjacent to Alf O'Rourke Drive. This car park will be constructed by the Project on a leased site which is not currently used for car parking, avoiding impact of car parking by non-local workers on existing car parking in Gladstone.
  - Of the non-local staff taken to the long-term car park, equal numbers are assumed to drive to regional towns to the north, south and west of Gladstone.
- Of the non-local personnel who are not leaving for a week off and only have Sunday off, the following personnel movements have been assumed for the purposes of traffic modelling:
  - 50 per cent are assumed to stay on Curtis Island within the construction camp for Saturday evening.
  - The remaining 50 per cent are assumed to depart the camp via ferry and are transported by shuttle bus to:
    - primary attractions located in and around the Gladstone CBD; or
    - the long-term carpark, from where it is assumed equal proportions travel to regional towns either north, south or west of Gladstone.

A schematic representation of these assumed personnel movements, for peak construction (2012) is provided in *Figure 5.14.5*. A breakdown of construction personnel movements at end of shift, broken down by year for traffic modelling, are summarised in *Table 5.14.6* and *Table 5.14.7*.

***Figure 5.14.5 Personnel Movement at End of Shift (Saturday Afternoon) - Peak Construction (2012)***

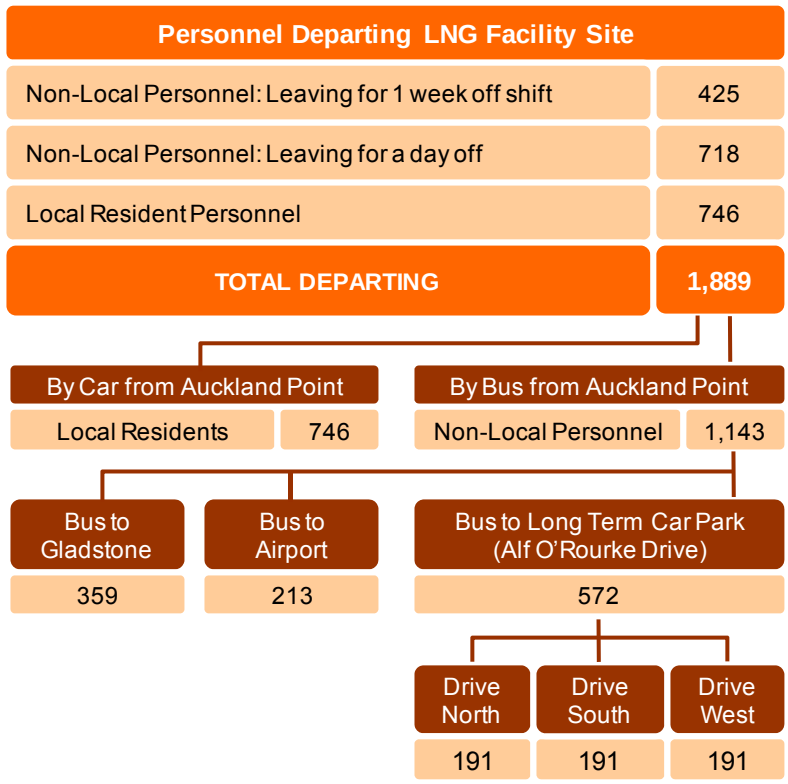



***Table 5.14.6 Construction Personnel Movements – End of Shift***

| Year | From AP to Gladstone Local (by private vehicle) | From AP by Shuttle Bus | | | From Long Term Car park (by private vehicle) | | |
|---|---|---|---|---|---|---|---|
| | | To Gladstone CBD | To Gladstone Airport | To Long-Term Car park | Drive North | Drive South | Drive West |
| 2011 | 410 | 197 | 117 | 315 | 105 | 105 | 105 |
| 2012 | 746 | 359 | 213 | 572 | 191 | 191 | 191 |
| 2013 | 463 | 223 | 132 | 355 | 118 | 118 | 118 |

***Table 5.14.7 Construction Personnel Movements at End of Shift – Number of Vehicle Movements per day***

| Year | From AP to Gladstone Local (by private vehicle) | From AP by Shuttle Bus | | | From Long Term Car park (by private vehicle) | | |
|---|---|---|---|---|---|---|---|
| | | To Gladstone CBD | To Gladstone Airport | To Long-Term Car park | Drive North | Drive South | Drive West |
| 2011 | 274 | 8 | 6 | 14 | 71 | 71 | 71 |
| 2012 | 498 | 16 | 10 | 24 | 128 | 128 | 128 |
| 2013 | 309 | 10 | 6 | 16 | 79 | 79 | 79 |

Note that modelling of the ‘‘start of shift’’ for the major shift rotation has not been undertaken as it is expected that personnel will return to site intermittently between Sunday morning and Monday morning. Anticipated impacts are therefore expected to be minor as the return movements will be distributed over the two-day period.

**Distribution Options for Access to Auckland Point**

In order to reduce network impacts, particularly on Port Access Road, four distribution options were investigated for the daily movement of personnel into and out of Auckland Point. These distribution options are described in *Table 5.14.8* and reflect varying amounts of traffic being distributed onto Port Access Road and the access to the south at Toolooa Street.

***Table 5.14.8 Distribution Options for Access to Auckland Point***

| Distribution Option | Description |
|---|---|
| 1 | Access to Auckland Point via Port Access Road only |
| 2 | 25% of workers access Auckland Point via Toolooa Street and the remaining 75% of workers access Auckland Point via Port Access Road |
| 3 | 50% of workers access Auckland Point via Toolooa Street and 50% of workers access Auckland Point via Port Access Road |
| 4 | Access to Auckland Point via Port Access Road only (Saturday scenario) |

The inclusion of these distribution options within the assessment represent a quantitative assessment of the effectiveness of re-routing construction personnel entering/exiting Auckland Point away from Port Access Road as an impact mitigation measure. Discussion of the effects of this measure on traffic impacts are described in *Section 14.6*.

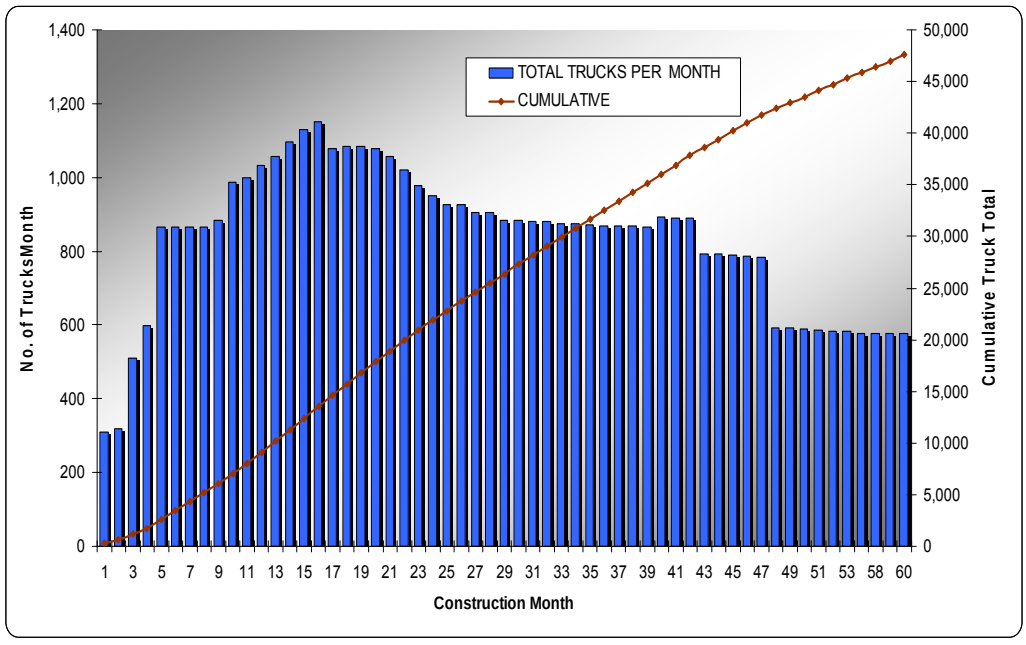
### 14.4.2 Construction Heavy Vehicle Demands

#### 14.4.2.1 Heavy Vehicles Through Auckland Point

As described in *Volume 2, Chapter 13*, a range of site plant, equipment, and materials (including consumables for both construction activities and the construction camp and workforce) will be sourced from the Gladstone region and/or transported through Gladstone to the LNG Facility site via Auckland Point. Wastes from the site will also be transported to the mainland via Auckland Point.

An indicative breakdown of anticipated truck movement through Auckland Point, by construction month, is provided in *Figure 5.14.6*. In summary, this indicates peak truck numbers through Auckland Point of approximately 1,150 trucks per month are anticipated, or 40 truck loads per day (assuming trucking operations are undertaken six days per week). Trucks carrying plant, equipment and consumables for the LNG Facility site will be loaded onto barges/ferries for transit to the island at Auckland Point. For the purposes of traffic modelling it has been assumed that trucks will transit Auckland Point in non-peak daylight and evening periods (assumed movement on a 10 hour per day, six day per week basis), although some night-time movement may be necessary.

***Figure 5.14.6 Indicative Breakdown – Total Trucks through Auckland Point, by Construction Month***




1 Figure represents indicative truck throughput at Auckland Point, whether for materials sourced in Australia of for material brought in through Brisbane via ocean freight. Truck count estimate based on standard truckloads

*14.4.2.2 Aggregate and Bulk Materials*

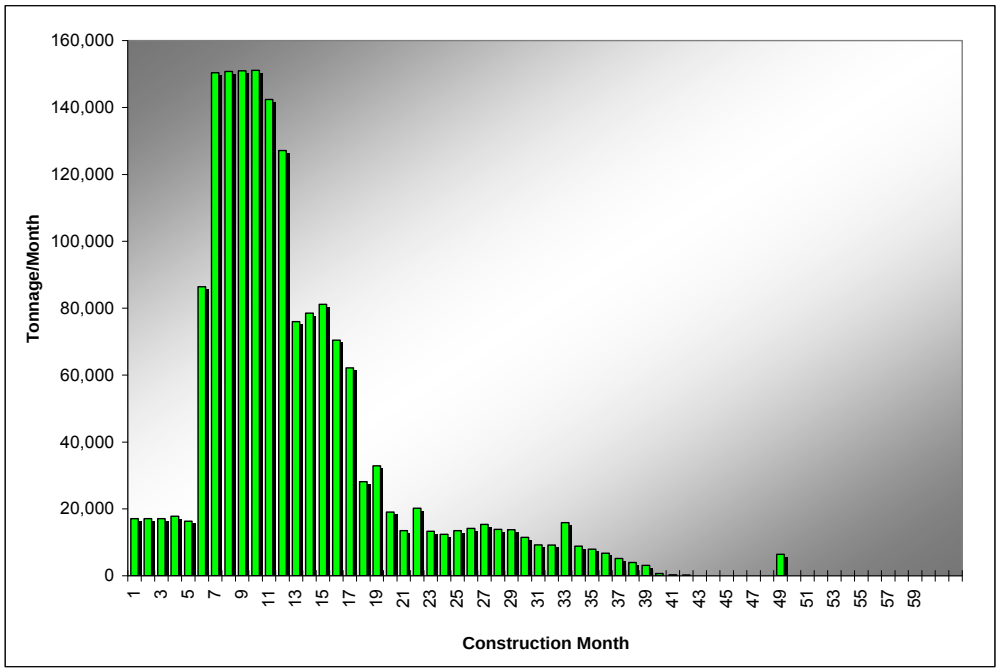
A range of bulk materials sourced from within the Gladstone region will be required for construction of the LNG Facility. These materials include select fill, base, sub-base, armour rock, and concrete sand, and will be sourced from existing quarries within the Gladstone Region and surrounds.

On reaching Gladstone, bulk materials will be transported to the LNG Facility site via barge from an aggregate dock to be constructed in the vicinity of RG Tanna wharf, at the site of the future operations terminal. For approximately the first six months of construction, while the load out facility at RG Tanna is being constructed, bulk materials may be loaded onto barges at Fisherman's Landing for transport to the LNG Facility site.

An indicative breakdown of bulk material tonnage (concrete sand, aggregates, base and sub-base, armour rock, etc) required to be transported to the LNG Facility on Curtis Island is provided in *Figure 5.14.7*. The following key assumptions have been made for the purposes of traffic modelling:

- bulk materials will be transported to RG Tanna/Fisherman's Landing via 40 T trucks
- transport of aggregate has been assumed for modelling purposes to be a seven-day week, 24-hour operation. However, as described in *Volume 5, Chapter 13*, the Project will aim to limit movement to approximately 18 hours per day to reduce potential noise issues for residents along the transport routes
- sourcing of aggregate will result in the following key routes being used:
  - 50 per cent of material comes from north of Gladstone via Mt Larcom Road.
  - 50 per cent of material comes from south of Gladstone, up Dawson Highway and to RG Tanna via Don Young Drive and Red Rover Road. Of the trucks from the south, it has been assumed that at the intersection of Dawson Highway and Bruce Highway 33 per cent of trucks come from west, 33 per cent from south, and 33 per cent from east.

***Figure 5.14.7 Indicative Breakdown – Bulk Material Tonnage for LNG Facility Construction***




**Note:** Quantities do not include aggregates for the construction of Auckland Point or other facilities on the mainland

*14.4.2.3 Pipe*

Auckland Point will also be used for importation of pipe lengths for construction of the Export Pipeline. The following key assumptions with regard movement of pipe from Gladstone have been made, although as noted previously these may change given ongoing consultation and planning with regard to the use of rail for transport:

- Approximately 260 km of pipe will be transported via Auckland Point. Pipe will be in 12 m lengths, with four lengths per truck.
- Transport of pipe will occur as a continuous 24-hour operation broken into two working shifts between 6am and 6pm.
- Pipe trucks are assumed to leave Auckland Point as soon as loaded.
- Pipe transport period will be approximately October 2010-September 2011.

*14.4.2.4 Summary of Construction Heavy Vehicle Demands*

On the basis of the above, construction heavy vehicle demands have been modelled as summarised in *Table 5.14.9* below:

***Table 5.14.9 Heavy Vehicle Demands during Construction – Number of Vehicle Trip Ends per day***

| Demand Type | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|
| Aggregate (to Fisherman's Landing) | 146 | - | - | - |
| Aggregate (to Auckland Point) | 88 | - | - | - |
| Aggregate (To RG Tanna) | - | 255 | 27 | 9 |
| General Transport | 70 | 91 | 73 | 70 |
| Pipe Transport | 32 | 32 | - | - |
| Shuttle Bus | Refer *Section 14.4.1.2* | | | |

### *14.4.3 Operations*

As stated in *Volume 2, Chapter 9*, personnel, materials and equipment for operations will transit to the LNG Facility via a marine terminal to be constructed near the existing RG Tanna coal terminal. The following assumptions have been applied for traffic modelling purposes:

#### *14.4.3.1 Light Vehicle Demands*

Light vehicle demands during the operations phase are anticipated to be:

- Train 1:
  - 120 vehicle trip ends per day (employees)
  - 40 vehicle trip ends per day (visitors).
- Train 1 & 2 combined:
  - 160 vehicle trip ends per day (employees)
  - 40 vehicle trip ends per day (visitors).

The vehicle trip ends were calculated by dividing the personnel and visitor requirements with assumed vehicle occupancy of 1.5 and one, respectively. For each vehicle, there will be one in and one out movement.

#### *14.4.3.2 Heavy Vehicle Demands*

Heavy vehicle demands during the operations phase are anticipated to be:

- transport of waste: two trucks per day, five days/week
- general deliveries: two trucks per day, five days/week
- transport relating to support contracts: three trucks per day, five days/week.

## 14.5 TRAFFIC ASSESSMENT SCENARIOS

Given the Project staging and traffic distribution options (refer *Table 5.14.8*), the traffic scenarios assessed are as shown in *Table 5.14.10*.

***Table 5.14.10 Traffic Assessment Scenarios***

| Year / Scenario | No Project | Construction | | Operation | | Distribution Option |
|---|---|---|---|---|---|---|
| | | Train 1 | Train 2 | Train 1 | Train 2 | |
| 2008 / Scenario 1 | ✓ | | | | | |
| 2010 / Scenario 2 | ✓ | | | | | |
| 2010 / Scenario 3a | | ✓ | ✓ | | | 1 |
| 2010 / Scenario 3b | | ✓ | ✓ | | | 2 |
| 2010 / Scenario 3c | | ✓ | ✓ | | | 3 |
| 2011 / Scenario 4 | ✓ | | | | | |
| 2011 / Scenario 5a | | ✓ | ✓ | | | 1 |
| 2011 / Scenario 5b | | ✓ | ✓ | | | 2 |
| 2011 / Scenario 5c | | ✓ | ✓ | | | 3 |
| 2011 / Scenario 5d | | ✓ | ✓ | | | 4 |
| 2012 / Scenario 6 | ✓ | | | | | |
| 2012 / Scenario 7a | | ✓ | ✓ | | | 1 |
| 2012 / Scenario 7b | | ✓ | ✓ | | | 2 |
| 2012 / Scenario 7c | | ✓ | ✓ | | | 3 |
| 2012 / Scenario 7d | | ✓ | ✓ | | | 4 |
| 2013 / Scenario 8 | ✓ | | | | | |
| 2013 / Scenario 9a | | | ✓ | ✓ | | 1 |
| 2013 / Scenario 9b | | | ✓ | ✓ | | 2 |
| 2013 / Scenario 9c | | | ✓ | ✓ | | 3 |
| 2013 / Scenario 9d | | | ✓ | ✓ | | 4 |
| 2015 / Scenario 10 | ✓ | | | | | |
| 2015 / Scenario 11 | | | | ✓ | ✓ | |
| 2025 / Scenario 12 | ✓ | | | | | |
| 2025 / Scenario 13 | | | | ✓ | ✓ | |

## 14.6 TRAFFIC IMPACT ASSESSMENT OUTCOMES

### 14.6.1 Link Analysis

The impact analysis presented in this section is based upon the principles defined within the *Guidelines for Assessment of Road Impacts of Developments* (GARID) (DTMR, 2006). In particular, the following reference states that:

> "*In general, Main Roads considers a development's road impacts to be insignificant if the development generates an increase in traffic on state-controlled roads (SCR) of no more than 5 per cent of existing levels… Traffic operation impacts need to be considered for any section of an SCR where the construction or operational traffic generated by the development*

*equals or exceeds 5 per cent of the existing annual average daily traffic (AADT) on the road section, intersection movements or turning movements*"

The following summary of link analysis outcomes therefore considers increases in development traffic as a proportion of existing traffic (i.e. 2008 volumes) to determine whether the triggers of GARID are met.

For links where the 5 per cent increase trigger is met, capacity analysis has been undertaken on the basis of The Austroads *Guide to Traffic Engineering Practice – Part 2 Roadway Capacity,* which specifies various link capacity formulae for varying road types. These formulae have been used to calculate hourly link capacities, which have then been translated to daily link capacities using peak conversion factors, which were estimated by analysing available count data.

Detailed discussion and breakdown of the link analysis undertaken is provided in *Section 6* of *Appendix 5.8*, addressing specific links and covering the period from 2010 to 2025. Graphs of outcomes at peak construction (2012) is provided in *Figure 5.14.8* to *Figure 5.14.15* below, showing:

- Development-Generated Traffic at 2012 and Percentage Increase in Traffic against 2008 Background Volumes.
- Development-Generated Traffic at 2012 and Residual Capacity.

Figures are also provided for each of the distribution options for personnel access to Auckland Point, as described in *Table 5.14.8*.

In summary, the combination of link analysis and capacity analysis indicates that no link upgrade works are required as a direct result of the QCLNG Project.

While under personnel distribution options one to three (Monday to Friday movement of personnel), link capacity is shown to be exceeded along the section of the Dawson Highway between Don Young Drive and Chapman Drive (refer *Figure 5.14.9*, *Figure 5.14.11* and *Figure 5.14.13*). This is a pre-existing exceedance not solely caused by the Project, and analysis indicates that this section of road requires upgrade to an undivided, four-lane, two-way road by 2012 regardless of whether the QCLNG Project proceeds. All other affected road sections are expected to operate well within existing design capacity constraints.

As the upgrade of the Dawson Highway between Don Young Drive and Chapman drive is triggered by background traffic (inclusive of cumulative impacts), no further works are specifically required as part of the Project proposal.

***Figure 5.14.8 Distribution Option 1 – Development-Generated Traffic at 2012 - Percentage Increase in Traffic against 2008 Background Volumes***

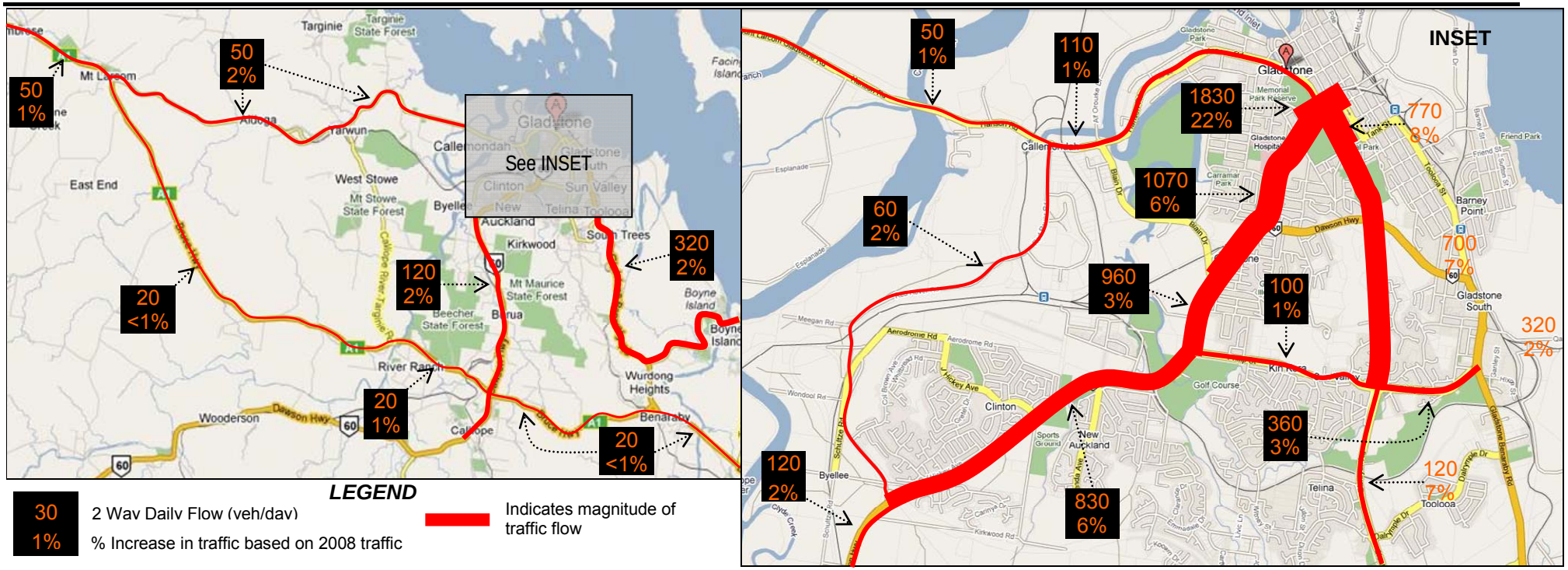
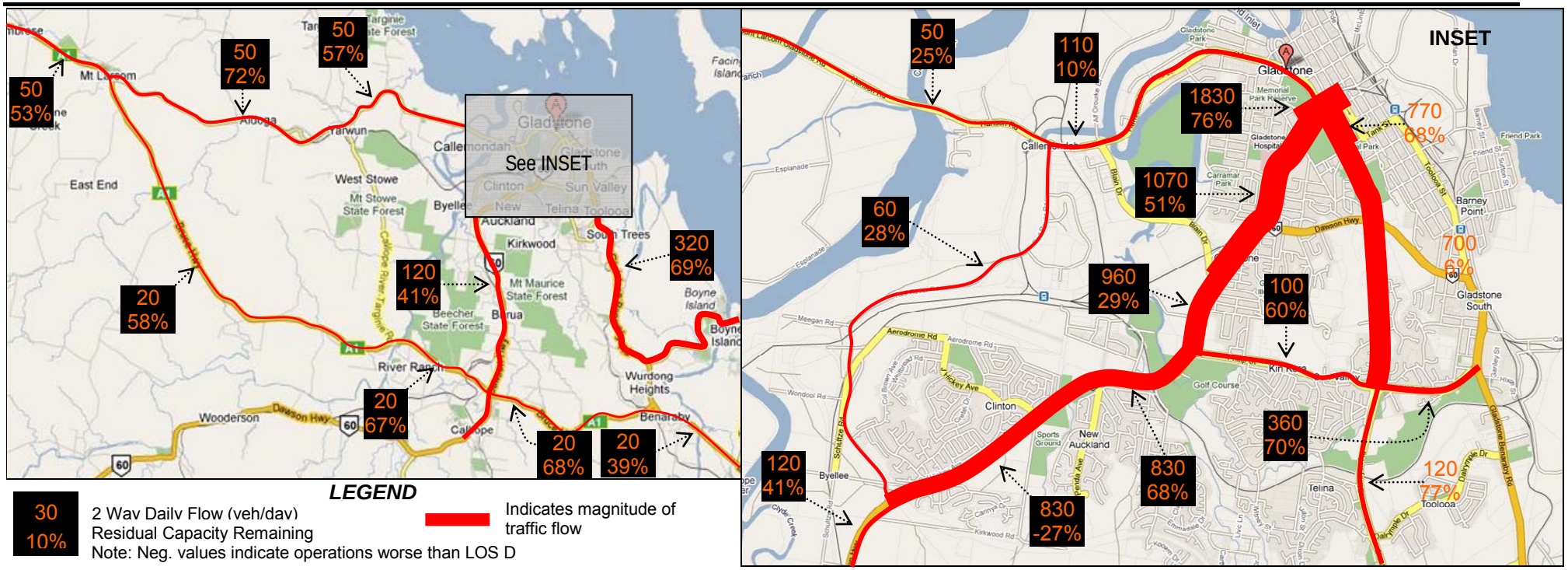


***Figure 5.14.9 Distribution Option 1 – Development-Generated Traffic at 2012 - Residual Capacity in Road Network***




**Note**: "LOS D" = "Level of Service D", with LOS D indicating a link that is nearing capacity.

***Figure 5.14.10 Distribution Option 2 – Development-Generated Traffic at 2012 - Percentage Increase in Traffic against 2008 Background Volumes***

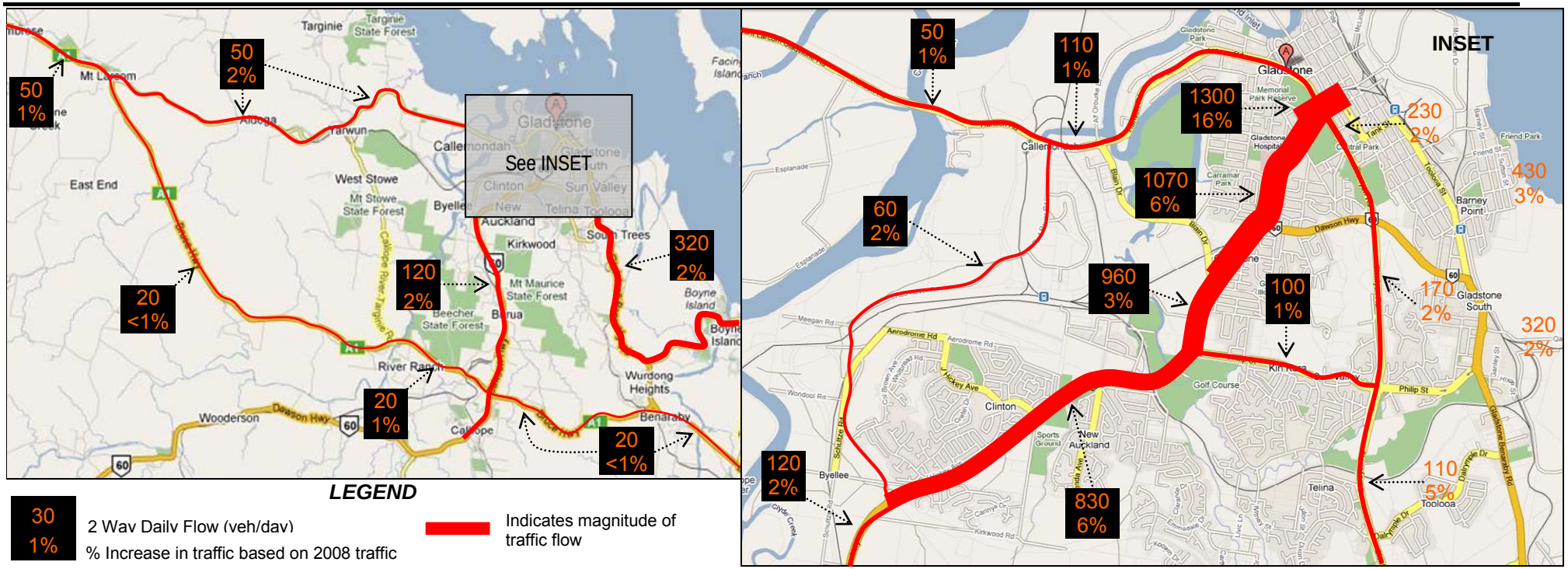
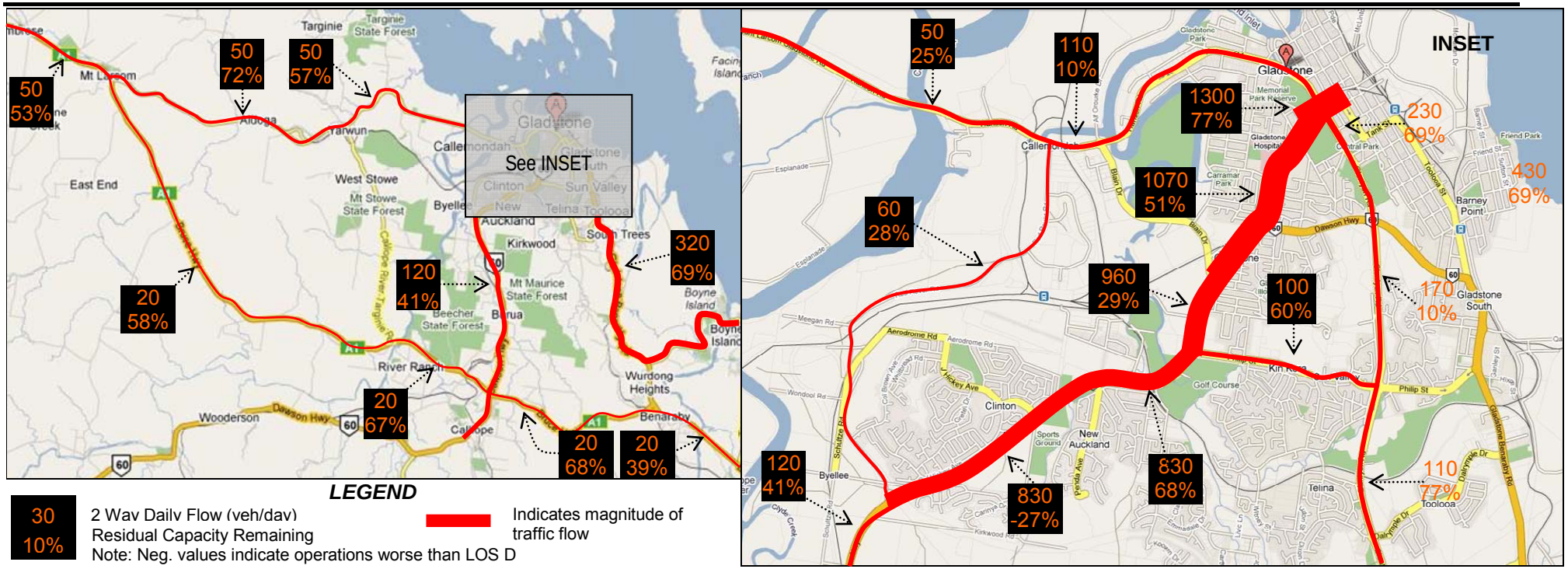


***Figure 5.14.11 Distribution Option 2 – Development-Generated Traffic at 2012 - Residual Capacity in Road Network***




**Note**: "LOS D" = "Level of Service D", with LOS D indicating a link that is nearing capacity.

*Figure 5.14.12 Distribution Option 3 – Development-Generated Traffic at 2012 - Percentage Increase in Traffic against 2008 Background Volumes*

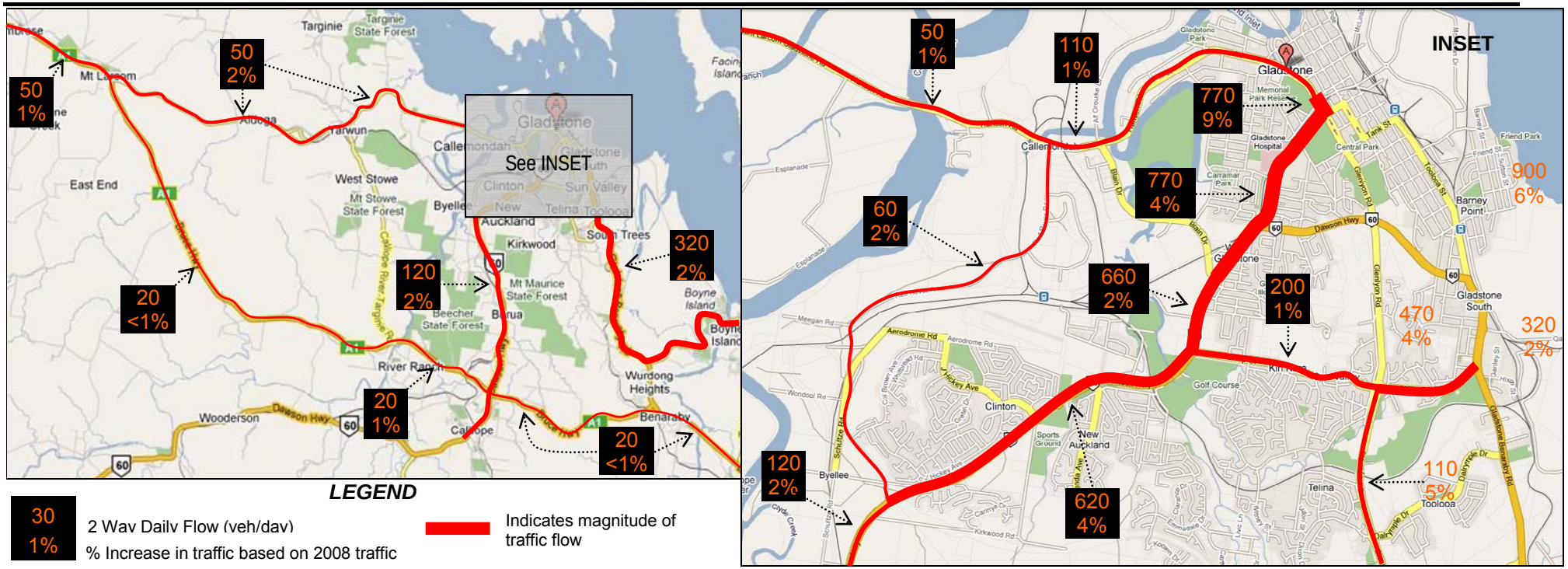
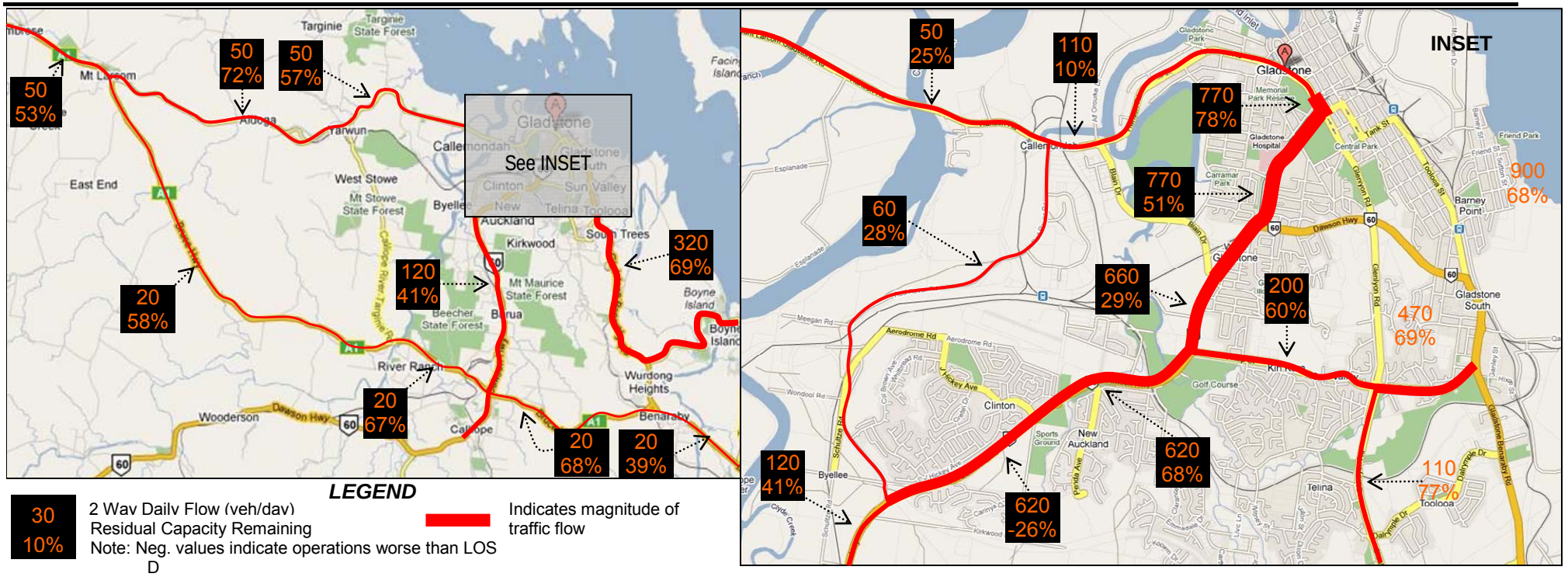


***Figure 5.14.13 Distribution Option 3 – Development-Generated Traffic at 2012 - Residual Capacity in Road Network***




**Note**: "LOS D" = "Level of Service D", with LOS D indicating a link that is nearing capacity .

*Figure 5.14.14 Distribution Option 4 (Saturday) – Development-Generated Traffic at 2012 - Percentage Increase in Traffic against 2008 Background Volumes*

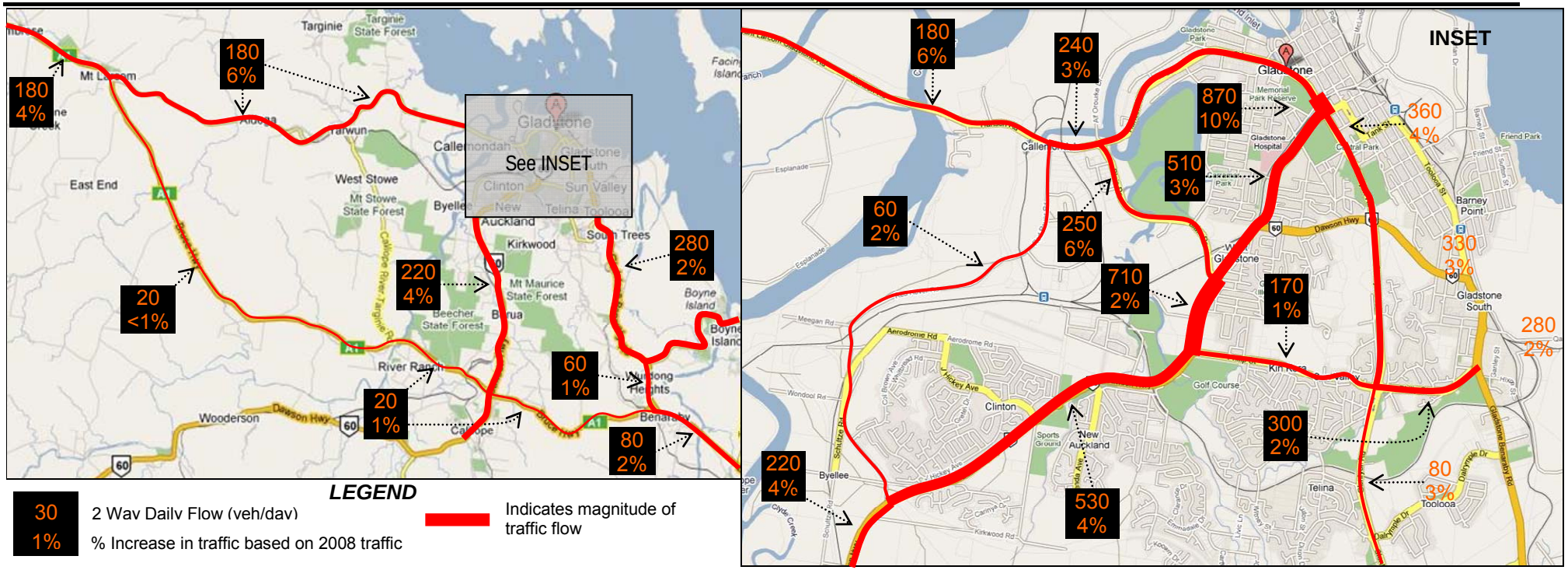
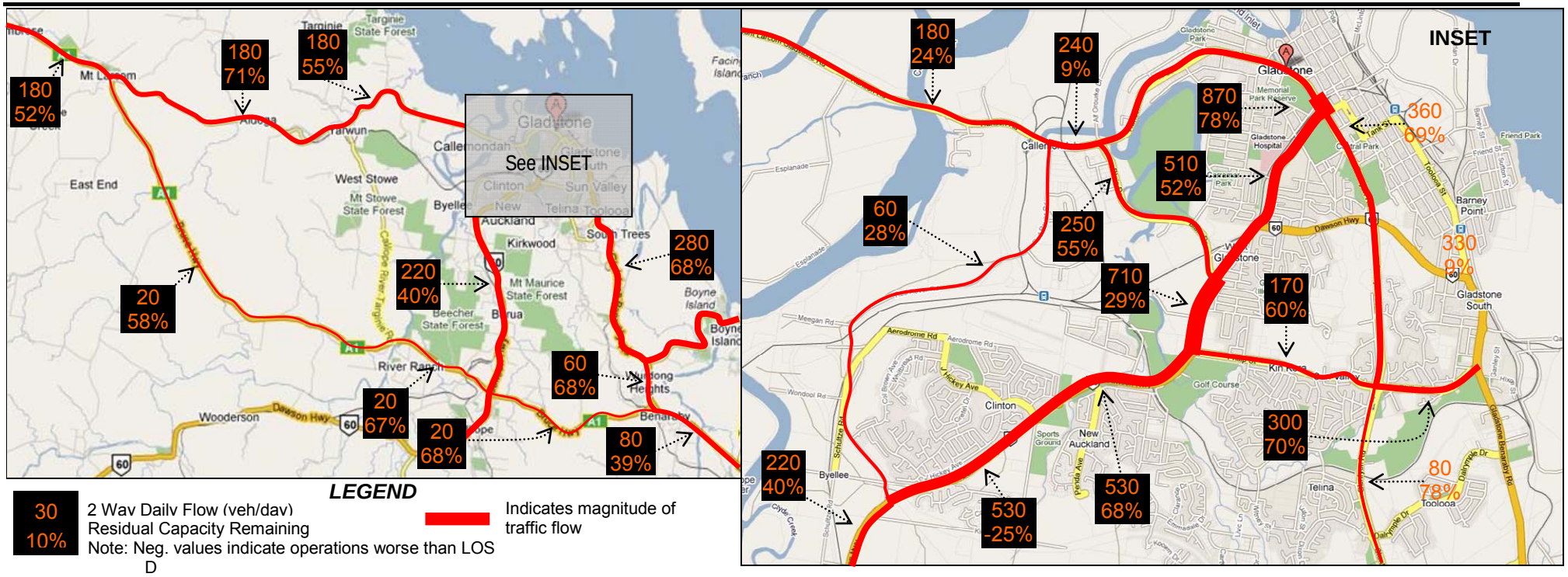


*Figure 5.14.15 Distribution Option 4 (Saturday) – Development-Generated Traffic at 2012 - Residual Capacity in Road Network*



### *14.6.2 Intersection Analysis*

As for the link analysis (refer *Section 14.6.1*), the intersection analysis followed the premise of using a 5 per cent increase in development traffic as a proportion of existing traffic (i.e. 2008 volumes) to determine whether the triggers of GARID are met.

SIDRA analyses have been undertaken for intersections where development-generated traffic increase anticipated volumes by equal to or more than 5 per cent for any existing intersection movement (i.e. 2008 background volumes). The assessment considered traffic scenarios at each of the following 20 intersections:

- Bruce Highway/Gladstone-Mt Larcom Road
- Gladstone-Mt Larcom Road/Calliope River Targinie Road
- Gladstone-Mt Larcom Road/Landing Road
- Hanson Road/Reid Road
- Hanson Road/Red Rover Road
- Hanson Road/Alf O'Rourke Drive/Blain Drive
- Glenlyon Road/Port Access Road
- Glenlyon Road/Dawson Highway/Bramston Street
- Port Access Road/Hopper Road/Mark Fenton Drive
- Toolooa Street/Young Street
- Glenlyon Road/Tank Street
- Dawson Highway/Blain Drive
- Gladstone-Benaraby Road/Phillip Street
- Glenlyon Road/Phillip Street
- Dawson Highway/Phillip Street
- Dawson Highway/Don Young Drive/Kirkwood Road
- Bruce Highway/Calliope River Targinie Road
- Bruce Highway/Dawson Highway
- Bruce Highway/Gladstone-Benaraby Road
- Gladstone-Benaraby Road/Boyne Island Road.

Following the intersection analyses, requirements for future year intersection upgrade works have been derived as a basis for determining potential mitigation measures that would address identified impacts.

Details of the intersection analysis and upgrade requirements are provided in *Section 7* and *Section 8* of *Appendix 5.8*. The intersection upgrade works proposed as being the responsibility of the Project under the various

personnel distribution options are summarised in *Table 5.14.11* to *Table 5.14.14*. *Table 5.14.11* is a summary of works required to be undertaken, regardless of distribution option, while *Table 5.14.12*, *Table 5.14.13* and *Table 5.14.14* describe additional works proposed as a result of distribution option one, two and three respectively.

Consultation with DTMR and/or Gladstone Regional Council (as applicable) will be undertaken to finalise intersection upgrade configurations and address issues of timing and Project contribution.

***Table 5.14.11 Intersection Upgrade Summary - All Distribution Options***

| Intersection | Required By | Upgrade Description |
|---|---|---|
| Gladstone-Mt Larcom Rd/Calliope River Targinie Rd | 2010 | • Addition of short right turn lane on southern Calliope River Targinie approach. |
| Gladstone-Mt Larcom Rd/Landing Rd | 2010 | • Bring forward contribution of 3 years for the re-designation of the priority movement on Gladstone-Mt Larcom Road. |
| Dawson Hwy/Blain Dr/Herbertson St | 2012 | • Addition of a left turn slip lane from the Dawson Hwy (north) into Herbertson Street.<br>• Modify kerbside lane on the Blain Drive approach to incorporate all movements. |

***Table 5.14.12 Intersection Upgrade Summary - Distribution Option 1 only***

| Intersection | Required By | Upgrade Description |
|---|---|---|
| Glenlyon Road/Port Access Road | 2010 | • Provision of a dual left-turn signalised slip lane from Port Access Road into Glenlyon Rd (south).<br>• Lengthening of median-side short lane on northern approach from 35 m storage to 100 m.<br>• Banning of the median-side right-turn movement from Glenlyon Road (north) into Railway Street.<br>• Conversion of the right-turn movement on the northern approach to a through only movement.<br>• Provision of a corresponding 30 m downstream short exit lane on Glenlyon Road (south).<br>• Banning of right and through movement from Railway Street into Port Access Road and Glenlyon Road (north).<br>• Addition of a 30 m right-turn short right turning lane from Port Access Road into Glenlyon Road (north).<br>• Reconfiguration of signal phasing. |
| Glenlyon Road/Dawson Highway/Bramston Street | 2011 | • Addition of a short and shared movement kerbside lane on the northern approach.<br>• Both short lanes on the northern approach to be extended to the northern intersection at Port Access Road.<br>• Addition of a short downstream exit lane on the southern Glenlyon Road approach.<br>• Reconfiguration of signal phasing. |

***Table 5.14.13 Intersection Upgrade Summary - Distribution Option 2 only***

| Intersection | Required By | Upgrade Description |
|---|---|---|
| Glenlyon Road/Port Access Road | 2010 | • Provision of a dual left-turn signalised slip lane from Port Access Road into Glenlyon Road (south)<br>• Lengthening of median-side short lane on northern approach from 35 m storage to 100 m<br>• Banning of the median-side right-turn movement from Glenlyon Road (north) into Railway Street<br>• Conversion of the right-turn movement on the northern approach to a through only movement<br>• Provision of a corresponding 30 m downstream short exit lane on Glenlyon Road (south)<br>• Banning of right and through movement from Railway Street into Port Access Road and Glenlyon Road (north)<br>• Reconfiguration of signal phasing. |
| Glenlyon Road/Dawson Highway/Bramston Street | 2012 | • Addition of a short and shared movement kerbside lane on the northern approach<br>• Both short lanes on the northern approach to be accommodated on the southern side of the adjacent rail bridge<br>• Addition of a short downstream exit lane on the southern Glenlyon Road approach.<br>• Reconfiguration of signal phasing. |

***Table 5.14.14 Intersection Upgrade Summary - Distribution Option 3 only***

| Intersection | Required By | Upgrade Description |
|---|---|---|
| Glenlyon Road/Port Access Road | 2010 | • Provision of a dual left-turn signalised slip lane from Port Access Road into Glenlyon Road (south).<br>• Reconfiguration of signal phasing. |

From these summary tables it can be seen that, should distribution option three (50 per cent of workers access Auckland Point via Toolooa Street and 50 per cent of workers access Auckland Point via Port Access Road) be employed, a total of four intersection upgrades would be required to ensure that Project impacts on intersections were mitigated to an acceptable level. Distribution option three therefore represents an effective mitigation measure compared to higher percentages of construction personnel transiting to Auckland Point via Port Access Road.

Existing intersection configurations, and proposed upgraded intersection layouts, are shown in *Section 8* of *Appendix 5.8*.

### *14.6.3 Microsimulation Network Analysis*

The purpose of the microsimulation modelling was to further enhance the findings of the SIDRA analyses. Although SIDRA is a robust and industry accepted software package, its intersection evaluation can sometimes be limited when more complex network considerations come into play. This could include situations where intersections are closely spaced or operating under signal co-ordination. Microsimulation packages can incorporate these network considerations, in addition to providing a visual medium in which to observe the modelled future scenarios. For the purposes of this study, microsimulation modelling was undertaken using the latest Paramics V6 software package.

Microsimulation models were established for the following:

- The section of **Glenlyon Road** which is bound by William Street in the north and Tank Street in the south, including the following intersections:
  - Glenlyon Road /William Street
  - Glenlyon Road /Port Access Road/Railway Street
  - Glenlyon Road /Bramston Street/Dawson Highway
  - Glenlyon Road /Herbert Street
  - Glenlyon Road /Tank Street
  - Bramston Road /Goondoon Street.

  This area was selected as it encompasses the key confluence of the two major roads within Gladstone City and will therefore form part of the route choice for peak construction generated traffic when Auckland Point is used.
- The **Dawson Highway/Phillip Street** signalised roundabout, incorporating the area surrounding the Dawson Highway/Phillip Street roundabout. This region was selected both because of the observed levels of congestion, and the presence of signal metering on the roundabout.
- The **Toolooa Street/Young Street** intersection, along with the adjacent priority controlled intersections located directly to the north and south. This area was chosen as it complements the Glenlyon Road model for distribution options two and three.

Microsimulation modelling has been undertaken for the peak development year of 2012 (incorporating future traffic growth and cumulative impacts as described in *Section 14.3.8*) for a number of key scenarios as detailed. Modelling took a two stage approach:

1. a do-nothing scenario (without QCLNG traffic) has been assessed against the existing road network configurations
2. the key Project development scenarios have been assessed against a do-something network layout (as developed to best cater for expected

development loadings).

The data presented in the assessment of the microsimulation modelling has been extracted from Paramics assignment runs and colour-coded according to the severity of performance degradation. The severity was judged through consideration of the number of blocked vehicles, the decrease in average vehicle speed and general engineering judgement obtained from visual inspection of the models.

Details of the microsimulation modelling undertaken, and detailed discussion of outcomes, are provided in *Section 9* and *Section 10* of *Appendix 5.8*. A summary of outcomes, with suggested intersection upgrades to address unacceptable levels of impact, is provided below. Consultation with DTMR and/or Gladstone Regional Council (as applicable) will be undertaken to finalise intersection upgrade configurations and address issues of timing and Project contribution.

*14.6.3.1 Works to be completed by 2012 'without QCLNG'*

- Phillip Street roundabout to be converted to a fully signalised intersection with further detailed works required to extend life beyond 2012.

*14.6.3.2 Works to be completed by 2012 'with QCLNG'*

- Port Access Road to incorporate a dual left-turn signalised slip lane, along with an extension of signal cycle time to 140 seconds.
- Railway Street to be converted to a left in/left out only access under distribution option one. While operationally, Railway Street can accommodate all movements under distribution option two, due to safety concerns with potential ''rat-running'' along Scenery Street, it is recommended that a left in/left out access also be retained for distribution option two.
- Dawson Highway/Glenlyon Road Intersection to incorporate minor lane reconfigurations on the northern and eastern approaches. Signal cycle time also to be extended to 140 seconds in order to co-ordinate with Port Access Road.
- Tank Street intersection to accommodate already proposed four laning of Glenlyon Road between Bramston and Derby Streets.

These microsimulation results represent a ''worst case scenario'' for the peak development year and peak distribution options.

*14.6.3.3 Summary of Microsimulation Outcomes*

Microsimlation modelling shows that, with the intersection upgrades as summarised in *Section 14.6.3.2* above (and discussed in more detail in Section 10 of *Appendix 5.8*), the number of blocked vehicles in the Glenlyon Road model and the Young Street model is zero. The number of blocked vehicles represents the number of vehicles which are queued outside of the model boundary at the end of the simulated period. This is effectively an

indication of the latent demand and increased numbers of blocked vehicles indicate undesirable operations. However, the presence of blocked vehicles does not automatically indicate poor network performance. In cases where signalised intersections are located close to the model cordon, the reported number of blocked vehicles could simply be the usual queuing during a red phase. Another situation where the presence of blocked vehicles would be deemed to be acceptable is when there is adequate space for vehicles to queue, and the presence of the queue would not impact upon the operations of the rest of the network.

For the Phillip Street model, modelling indicated that the upgraded roundabout is unable to accommodate the expected traffic growth for the "without QCLNG'' condition, and would also therefore not be able to accommodate ''with QCLNG'' scenarios for the morning peak demands. Twenty five per cent of the vehicle demand for the morning peak period is unable to access the network and is classified as ''blocked'' in the model results. Model results indicate that the proposed signalised arrangement at Philip Street would provide adequate capacity for the morning peak scenarios with a reduction in queuing over the upgraded roundabout of almost 200 vehicles. During the evening peak loadings, even the signalised intersection is expected to suffer considerable stress with 21 per cent of all trips (under Scenario 7a and 7b) being "blocked'' from entering the network during the peak period.

### *14.6.4 Pavement Impact Assessment*

A pavement impact assessment based upon the principles defined within GARID (DTMR, 2006) and direct advice received from DTMR has been undertaken and is described in detail in *Appendix 5.8*. The following reference, obtained from GARID, holds the general directive as to how impacts are assessed:

> "*Generally, pavement impacts need to be considered for any section of an SCR where the construction or operational traffic generated by the development equals or exceeds 5 per cent of the existing equivalent standard axles (ESA) on the road section.*"

In summary, results show that pavement impacts are greatest during the construction phase of the Project, with a number of transport links for which the anticipated increase in ESAs is greater than 5 per cent on both state and council-controlled roads. A maintenance contribution has been estimated on this basis.

During the operational phase, anticipated increase in ESAs are not expected to exceed 5 per cent for any year and no maintenance contribution is therefore required.

The results of the analyses indicate that pavement life does not decrease by more than one year for any state or council-controlled road within the study area. As such, contribution towards pavement rehabilitation is not required.

## 14.7 IMPACTS TO AIR TRANSPORT

At peak construction, it is assumed that approximately 215 non-local personnel will depart Gladstone by air transport with each major change of shift (once a week).

Information provided by QantasLink is as follows:

- There is opportunity to introduce more flights to cater for the expected increase in demand.
- Given the characteristics of the region, it is more likely that more flights would be provided, rather than providing bigger aircraft.
- Future transport provision has already been considered with five aircraft deliveries expected in early 2010, bringing the total fleet to 21 Q400 aircraft.
- Anticipated weekly capacity from March 2010 will be 37 services (equivalent to about 2610 seats) Brisbane to Gladstone and 42 services (about 2900 seats) Gladstone to Brisbane.
- QantasLink does not foresee any problems with sourcing additional pilots for the additional services.

Given the above, it is expected that QCLNG-generated demands can be accommodated, either within existing or planned future transport provision. Therefore, from a servicing perspective, impacts to air transport are expected to be minor. Impacts on Gladstone airport terminal are not anticipated to be significant, taking into consideration the proposed upgrades to the Arrival Hall and Departure Hall being undertaken as part of the Gladstone Regional Airport Reconstruction Project.

It should be noted that other airline operators such as Virgin Blue have also expressed interest in supplying regular passenger services to Gladstone Airport.

## 14.8 IMPACTS TO RAIL TRANSPORT

As stated previously, QGC is actively pursuing the use of rail for transport of materials, and where commercially viable will use availability that rail transport managers can provide. The availability of at least some rail transport is expected to reduce the impacts on the road network described in this chapter.

However, as the use of rail by the Project has not yet been fully defined, potential impacts to rail transport have only been assessed at road/rail interfaces.

A description of existing rail network and detail on anticipated impacts is provided in *Section 13* of *Appendix 5.8*. In summary, the increased traffic volumes at rail level crossings as a result of the Project are not expected to impact significantly on the rail or road network.

## 14.9 CONCLUSION

A detailed traffic impact assessment for the Gladstone region has been undertaken for the supplementary EIS, addressing issues raised in submissions on the draft EIS and the updated Project logistics plans (incorporating revised workforce numbers and shift rosters). The assessment also considered background growth in the traffic network over the Project life as well as, where applicable, potential impacts arising from other proposed projects in the Gladstone region.

The impact assessment undertaken is considered to represent a realistic worst case for Project impacts, as it:

- assumes no use of rail for transport of pipeline out of Auckland Point, while in fact QGC continues to pursue options for using rail for movement of export pipeline out of Gladstone
- assumes locally resident construction personnel will transit through Auckland Point between 6am-7am and 5pm-6pm Monday to Friday. In practice, the construction workforce is likely to transit Auckland Point up to an hour earlier in the morning and up to an hour later in the evening, when background traffic levels are considerably lower (refer *Figure 5.14.4*). These revised traffic movement times would therefore represent an effective measure to reduce the level of potential impact identified, although quantification of this reduced level of impact has not been undertaken.

Overall, key findings of the assessment include:

- Link Analysis: The percentage increases in traffic volumes against 2008 background as a result of Project traffic on assessed road links is approximately 3 per cent on average. Link analysis indicates substantial remaining capacity in the network (apart from one link already over capacity), with no link upgrade works required as a direct result of the QCLNG Project.
- Intersection and Microsimulation Analysis: Depending upon the traffic distribution option selected for the project, up to five intersections may require some level of upgrade to address potential impacts arising from Project traffic. The number of intersections requiring upgrade, and the level of upgrade required, could be reduced by the simple mitigation measure of managing construction personnel access to Auckland Point by requiring a percentage of local workers to access via Toolooa Street rather than Port Access Road. The most effective scenario modelled in terms of impact reduction was for 50 per cent of construction workers to access Auckland Point via Toolooa Street, and 50 per cent via Port Access Road.

  Consultation with DTMR and/or Gladstone Regional Council (as applicable) will be undertaken to finalise intersection upgrade configurations and address issues of timing and Project contribution.

- Pavement Impacts: Pavement maintenance contributions have been estimated for both state and council roads. Analysis indicates that

pavement life does not decrease by more than one year for any state or council-controlled road within the study area as a result of Project activities, and therefore Project contribution towards pavement rehabilitation is not required.

- Air Transport Impacts: QCLNG-generated demands can be accommodated either within existing or planned future transport provision, and therefore impacts to air transport are expected to be minor.
- Rail Transport Impacts: The increased traffic volumes at rail level crossings as a result of the Project are not expected to impact significantly on the rail or road network.

On this basis, the Project as presented in this sEIS (including provision of Project bus services for approximately 55 per cent of total construction workforce) is not anticipated to have a significant impact on state or local-controlled road or rail networks, or on transport infrastructure, facilities or services provided that recommended mitigation measures (i.e. implementation of Distribution Option Three with associated intersection upgrades) are implemented.