

20. TRAFFIC AND TRANSPORT

This chapter presents the findings of the traffic and transport supplementary assessment prepared by GTA Consultants (QLD) Pty Ltd (GTA), which is attached as Appendix 13. At the time the Arrow LNG Plant EIS (Coffey Environments, 2012) was finalised, the details of the location and operation of pioneer facilities and the volumes of heavy vehicle traffic during construction were limited. Logistics investigations subsequently undertaken by Arrow Energy as part of the project front end engineering and design (FEED) have provided additional information. The traffic and transport assessment has been revised to take this additional information into account.

20.1 Studies and Assessments Completed for the EIS

This section provides an overview of the traffic and transport assessment completed for the Arrow LNG Plant EIS and describes the main conclusions from that assessment.

GTA was engaged to examine potential road, rail and air traffic impacts arising from the project. GTA's investigation was supplemented with information from additional studies and modelling commissioned by Arrow Energy examining risks and impacts of shipping and marine construction traffic. GTA's assessment was presented as Appendix 23 of the EIS. The findings of GTA's report and the various marine studies were presented in Chapter 28, Traffic and Transport, of the EIS.

20.1.1 Road Network

The assessment examined the suitability of the road network to cater for project traffic requirements. This involved identification of the key roads and intersections likely to be used by the project, the existing condition of those roads and intersections, the predicted timing of project related travel, and the background traffic growth rate projections applicable to those roads and intersections (i.e., the growth of traffic likely to occur regardless of the project proceeding). The potential for the Arrow LNG Plant and the other LNG projects to impact roadway link capacities and intersection performance was then assessed for four design years. The design years considered represent key points in the project's construction and operation schedule and include: first year of early works (2014), peak construction phase for stage 1 (2016), peak construction phase for stage 2 (2024), and post-construction/operations (2026). Importantly, the transport scenarios assessed assumed the use of launch site 1 and 4N, and temporary workforce accommodation facilities (TWAF) 7 and 8.

Subject to final TWAF/mainland launch site selection and completion of the detailed logistics strategy, the EIS identified road and intersection upgrades that may be necessary under different transport scenarios (refer to Table 28.9 of the EIS) to ensure that they operate at an acceptable standard. The cumulative impact assessment utilised data provided by other LNG proponents as part of the Department of Infrastructure and Planning (now Department of State Development, Infrastructure and Planning) 'Road Transport Infrastructure Cumulative Impacts Study – Proposed LNG Industry Impacts', with estimated traffic volumes reflecting the ramp-up and ramp-down of the construction of the other projects. Potential upgrade works identified included:

- Upgrades to the Gladstone–Mount Larcom Road. Upgrades are planned but consideration is required as to the planned timing of the upgrade and whether upgrades need to be brought forward as a result of Arrow LNG Plant traffic.

- Design of a new intersection to facilitate access to the proposed mainland tunnel launch site from Gladstone–Mount Larcom Road to account for the Arrow LNG Plant.
- Improvement of Intersection A: Hanson Road/Blain Drive/Alf O'Rourke Drive. DTMR have identified works to this intersection with baseline traffic triggering upgrades at 2024; however, the cumulative project impact may generate the need for additional works in 2016. Timing of Department of Transport and Main Roads (DTMR) works may need to be brought forward (applicable to all transport scenarios).
- Improvement to Intersection B: Gladstone–Mount Larcom Road/Landing Road. The existing intersection layout is not expected to accommodate project related traffic at 2024 and 2026, or cumulative project traffic in 2026. DTMR has identified works at this intersection (four lanes required between 2020 and 2030). Timing of DTMR works may need to be brought forward to early in the 2020 to 2030 period to accommodate project traffic (applicable to transport scenario 2).
- Improvement to Intersection C: Gladstone–Mount Larcom/Red Rover Road. DTMR have identified works to this intersection for which baseline traffic triggers upgrades in 2016; however, the project may generate the need for additional works as this upgrade may not sufficiently accommodate cumulative project traffic to the 2026 design year (applicable to transport scenario 2).

Notably, the roadway link capacity and intersection performance assessment undertaken for the EIS considered personnel transport routes, with preliminary high level estimates for heavy vehicle volumes. Heavy vehicle routes and material volumes had not been determined and were therefore not assessed in detail.

20.1.2 Rail Network

Impacts on the rail network were determined by identifying existing rail network infrastructure in the Gladstone region and project activities related to the use and/or interaction with rail network resources. As the project is not expected to cause interruptions to or require alterations to rail infrastructure, or generate impacts related to safety, dust, noise or vibration along rail corridors, the significance of project impact on the rail network is considered negligible.

20.1.3 Air Services

Air travel requirements were projected for early construction (2014), peak construction (2016 and 2024) and post-construction/operations (2026). While the peak construction phase produces the greatest demand for air services, the assessment found that recent upgrades to the Gladstone Airport enable project demand to be accommodated with negligible impact.

20.1.4 Alternative Local Transport

The assessment considered potential impacts to bus passenger services, taxis and the pedestrian cycling network. Overall, the significance of impacts from the project on alternative local transport requirements was considered low.

20.1.5 Shipping

The EIS described the estimated type, number and frequency of marine vessels that would be used during peak construction (2016) and post construction/operations (2026). It discussed shipping routes, protocols that would apply to all LNG carriers transiting to and from Arrow Energy's LNG jetty, and issues and impacts in relation to shipping and foreshore accidents, impacts on existing shipping activity, potential risk of spills and impacts on recreational activities.

From the various risk assessments commissioned by Arrow Energy, the significance of each of these potential impacts was deemed low.

20.1.6 Traffic and Transport Commitments

A number of traffic and transport commitments were developed based on the assessment and advice of GTA. Table 20.1 lists the commitments proposed for managing aspects and impacts of the project that are related to transport.

Table 20.1 Commitments: traffic and transport

No.	Commitment
C28.01	Develop a traffic management plan for the project in consultation with DTMR and Gladstone Regional Council. Methods to ensure public safety at project sites, avoid obstruction to other road users, address seasonal weather influences on transport arrangements and manage any issues including driver fatigue will be detailed in the plan. The traffic management plan will address the movement of oversized loads. Common with Chapter 29, Hazard and Risk.
C28.02	Undertake a pavement intersection assessment and bridge capacity assessment when preferred transport routes are identified.
C28.03	Implement a formal local workforce car-pooling or busing strategy to minimise the number of local project personnel using the roads during peak hour and to maximise usage of accommodation on Curtis Island. A busing strategy may comprise a number of small buses travelling from areas central to where personnel live. A staff matching or car pooling strategy will also be considered.
C28.04	Use DTMR/Gladstone Regional Council preferred freight routes where practical.
C28.05	Separate pedestrian access from vehicle access in access to construction and operational work sites (where practical).
C28.07	Consult with providers of air services to Gladstone on the timing of construction and operations weekly shifts to aid commercial decision making by service providers on the frequency of services and capacity of aircraft.
C28.08	Provide a share of funding toward the new instrument landing system at Gladstone Airport upon project FID.
C28.09	Develop a shipping activity management plan in consultation with Gladstone Regional Council, Gladstone Ports Corporation, Maritime Safety Queensland and all contractors operating within the Gladstone Port. Common with Chapter 29, Hazard and Risk.
C28.10	Operators of project vessels, Arrow Energy staff and contractors, to comply with the Gladstone port procedures manual, which details LNG operating parameters.
C28.11	Ensure that operators of project vessels, Arrow Energy staff and contractors comply with the LNG marine operations maritime safety management plan if/when this plan is agreed between Maritime Safety Queensland, Gladstone Ports Corporation and the other LNG proponents. Common with Chapter 29, Hazard and Risk.
C28.12	Ensure that operators of project vessels, Arrow Energy staff and contractors comply with Arrow Energy rules for marine vessels and LNG shipping operations in addition to following the Oil Companies International Marine Forum (OCIMF) and Society of International Gas Tanker and Terminal Operators guidelines (SIGTTO). Rules will address crew competencies, a three stage approvals process for each LNG vessel (i.e., vetting of ships and operators prior to engagement to transport LNG), scheduling and other requirements and quality assurance. For the construction period, additional rules will address safety and competency requirements of smaller marine vessels and vessel operators involved with the project.
C28.13	Provide support for tug and LNG carrier pilot training organised by all proponents, the Gladstone Ports Corporation, Maritime Safety Queensland and SMIT tugs.

20.2 Study Purpose

The supplementary traffic and transport assessment has addressed changes to the project description, particularly those relating to mainland workforce accommodation options that have arisen after the EIS was finalised and exhibited. In addition, findings presented in the EIS traffic and transport assessment did not include discussion of heavy vehicle routes or pavement impact assessment. With additional information now available from the project FEED, these matters have been addressed in the supplementary traffic and transport assessment. Further detail of changes, additional information, and public submissions that have had bearing on the supplementary traffic and transport assessment are presented below.

It should be noted that the pavement impact assessment has been undertaken for state-controlled roads only. A pavement impact assessment for council-controlled roads will be undertaken in accordance with Gladstone Regional Council's 'Pavement Impact Assessment Guidelines' (GRC, 2010), after pioneer launch site locations have been confirmed and detailed logistics plans are available from Arrow Energy's construction contractor.

20.2.1 Project Description Changes

Project description changes that are material to the supplementary traffic and transport assessment include:

- Pioneer launch sites: Separate pioneer launch sites (temporary launch sites to be used prior to the commissioning of the mainland launch site, launch site 1 or launch site 4N) are being considered for personnel, materials and equipment, and bulk materials transport to and from Curtis Island. For personnel, options under consideration include Mission Landing at Gladstone Marina, and existing or new facilities at Auckland Point/Barney Point. Gladstone Marina would be accessed by Bryan Jordan Drive; Auckland Point/Barney Point from Hanson Road and Port Access Road. Land adjacent to Australia Pacific LNG's mainland launch site at Fishermans Landing, at the site of the old barge landing, is being considered for bulk materials, as well as Gladstone marina. Fishermans Landing has also been modelled as a pioneer launch site for personnel movements, however this location is least likely to be taken forward. Access to the bulk materials launch site would be via Landing Road.
- Mainland launch site: Launch site 1, near the mouth of the Calliope River, remains the preferred mainland launch site for transfer of personnel, equipment and materials to Curtis Island. Launch site 4N in the Western Basin Reclamation Area bund wall has been retained as an option.
- Mainland accommodation: TWAF 7 will no longer be used for accommodation but may be used as a staging area for the transfer of personnel and potentially materials for early works and to the mainland launch site (launch site 1). Arrow Energy has retained TWAF 8 as an option however as with launch site 4N, this is not preferred. The use of third-party accommodation facilities in the Gladstone region is being considered for early works and, if the Curtis Island camp reaches capacity, for the peak construction phase of the project. For the purposes of modelling Calliope was used as the most conservative location relating to traffic and transport impacts for workforce accommodation.

The locations of the pioneer and mainland launch sites and mainland accommodation facilities will influence travel routes used by the project and therefore the potential project related impacts on the Gladstone road network. Project description changes have resulted in different personnel transport routes being modelled in the supplementary assessment to those presented in the EIS.

The above project description changes are not expected to result in changes to the assessment of rail network, alternative local transport, or shipping impacts. However, it is possible that (limited) use will be made of the rail transport system to reduce trucking impacts of goods and materials from Brisbane via the Bruce Highway.

The Arrow LNG Plant will require additional marine construction traffic to operate in Gladstone Harbour. Estimated vessel movements during construction and operations are described in Chapter 7, Project Description: Logistics (Section 7.1.1 and Section 7.2.1 respectively).

Managing the potential impacts of marine construction traffic is the focus of the Gladstone Harbour Construction Vessels Scheduling and Safety Committee, which comprises LNG proponents and their contractors, Gladstone Ports Corporation and Maritime Safety Queensland. Participation in this forum provides the most effective means of managing potential project and cumulative LNG project impacts (congestion, safe passage of LNG and other vessels) on Gladstone Harbour, in consultation with maritime authorities. Arrow Energy will continue to consult with this forum, and require its principal construction contractors to work with this committee. Extensive studies and simulations for the safe navigation of LNG carriers within the Port of Gladstone have been carried out in consultation with Maritime Safety Queensland, the Regional Harbour Master, Gladstone Ports Corporation and other LNG proponents.

Marine construction traffic associated with the Arrow LNG Plant must also have regard to Maritime Queensland's Standard for Marine Construction Activities in Gladstone Harbour (MSQ, 2011).

20.2.2 Additional Information

Logistics investigations commissioned by Arrow Energy during FEED have identified bulk materials sources in the Gladstone region. Transport of bulk materials from these sites to the LNG plant site has been accounted for in the supplementary assessment.

Similarly, quantities of materials in freight equivalent tonnes have been developed to assemble a preliminary estimate of truck and barge movements within Australia. These materials and equipment estimates are included in Chapter 7, Project Description: Logistics.

20.2.3 Submissions

As set out above, findings presented in the EIS traffic and transport assessment did not include discussion of heavy vehicle routes or a pavement impact assessment. Absence of detail around these matters was the topic of a number of public submissions. Furthermore, some submissions indicated a need for increased detail on traffic impacts associated with the use of a pioneer launch site during the early works (2014) phase of the project. With the additional information now available from FEED, GTA has addressed these matters where applicable in the supplementary traffic and transport assessment. A number of specific submissions that were not dependant on remodelling are addressed directly in Part B of this SREIS.

20.3 Legislative Update

No policy, guideline or legislative amendments have occurred which have influenced the conduct of the supplementary traffic and transport assessment.

Transport and Main Road's Queensland Transport and Roads Investment Program (QTRIP) 2012/13 to 2015/16 (TMR, 2012) was released in late 2012. Projects considered of relevance to the Arrow LNG Plant include:

- Calliope crossroads intersection upgrade (Bruce Highway / Dawson Highway intersection).
- Bruce Highway St Lawrence to the Kolan River reconstruction works.

Further details of this infrastructure planning are provided in Section 2.1 of Appendix 13.

20.4 Study Method

The supplementary traffic and transport assessment has focused on impacts to the road network. Changes arising from the completion of FEED are not expected to result in notable changes to the assessment of rail network, alternative local transport, or shipping impacts.

The road impact assessment in the EIS was completed in accordance with the standard methodology outlined in DTMR's Guidelines for the Assessment of Road Impacts of Development (GARID)(TMR, 2006). In addition to the assessment completed in accordance with GARID, the assessment of significance was also applied to the identified impacts to provide strategic guidance in identifying key issues pertaining to traffic in the EIS.

The GARID assessment considers impacts for any section of a state controlled road where the construction or operational traffic generated by the development equals or exceeds 5% of the existing average annual daily traffic (AADT) on the road section, intersection movements or turning movements.

Further road impact assessment completed for the SREIS follows only the GARID. Road link and intersection performance has been remodelled, accounting for new accommodation options, potential sources of materials and equipment, and refined heavy vehicle volumes and proposed haulage routes. Design years have remained the same as presented in the EIS. The scenarios considered in the supplementary assessment are as set out below.

20.4.1 Personnel Movement Assumptions

Table 20.2 presents the personnel movements that have been included in the assessment for each design year. Notably, three scenarios for the early construction phase (2014) have been assessed to account for different pioneer launch site options. Ferry transport assumptions and shift operating times are as set out in Chapter 7, Project Description: Logistics. The use of third-party accommodation facilities at Calliope has been assumed as a conservative case for modelling purposes.

Table 20.2 Personnel movements modelled

Design Year	Vehicle Movements by Workers	
	Car Movements	Bus Movements
Early construction phase (2014): Scenario 1 – Auckland Point/Barney Point pioneer launch site Scenario 2 – Gladstone Marina pioneer launch site Scenario 3 – Fishermans Landing pioneer launch site	<ul style="list-style-type: none"> • Local Gladstone workforce to TWAF 7 (staging area).¹ • Local Gladstone workforce to the tunnel launch site. • Bruce Highway (50% north; 50% south) drive-in, drive-out (DIDO) workforce to third-party camp (Calliope). 	<ul style="list-style-type: none"> • TWAF 7 to pioneer launch site. • Third-party camp (Calliope) to Gladstone Airport. • Third-party camp to the pioneer launch site. • Local Gladstone workforce to the tunnel launch site. • TWAF 7 to mainland launch site (construction).

Table 20.2 Personnel movements modelled (cont'd)

Design Year	Vehicle Movements by Workers	
	Car Movements	Bus Movements
Peak construction phase—stage 1 (2016)	<ul style="list-style-type: none"> Local Gladstone workforce to TWAF 7 (staging area). Local Gladstone workforce to the tunnel launch site. Bruce Highway (50% north; 50% south) drive-in, drive-out (DIDO) workforce to third-party camp. 	<ul style="list-style-type: none"> TWAF 7 to launch site 1. Launch site 1 to Gladstone Airport. Third-party camp to launch site 1.
Peak construction phase—stage 2 (2024)	<ul style="list-style-type: none"> Local Gladstone workforce to TWAF 7 (staging area). Bruce Highway (50% north; 50% south) drive-in, drive-out (DIDO) workforce to third-party camp. 	<ul style="list-style-type: none"> TWAF 7 to launch site 1. Launch site 1 to Gladstone Airport.
Post construction / operations (2026)	<ul style="list-style-type: none"> Local Gladstone workforce to mainland launch site (parking capped at 200). 	<ul style="list-style-type: none"> Local Gladstone workforce to mainland launch site (20-seat buses).

1. Other options for staging areas may be considered during the detailed design phase of the project. Any alternative staging areas would be assessed as part of future road impact approvals in consultation with DTMR and GRC.

20.4.2 Heavy Vehicle Assumptions

The origin of unitised materials and construction equipment is not currently known. The following approximate splits have been assumed:

- 20% from Gladstone.
- 40% from Brisbane.
- 40% from Central Queensland (e.g., Rockhampton, Mackay).

Similarly, volumes of construction equipment and materials as set out in Chapter 7, Project Description: Logistics have been broadly separated into bulk movements, unitised movements, construction equipment and tunnel site entry movements. Some items of plant and equipment, particularly modules for constructing the LNG plant will be delivered by sea and are to be landed at Boatshed Point MOF. Direct delivery of modules by sea will limit the impact on the road network of Gladstone. As the annual movement distributions are currently uncertain, the following split has been assumed:

- 2014 – 20% of total movements.
- 2015 – 50% of total movements.
- 2016 – 20% of total movements.
- 2017 – 10% of total movements.

The same distributions are assumed for construction of trains 3 and 4 over the years 2022 to 2025.

As with personnel movements, three scenarios have been modelled for the year 2014, to account for alternative pioneer launch site options. Depending on design year, movements are assumed to occur as follows:

- Gladstone, local quarry, Bruce Highway South (e.g., Brisbane), Bruce Highway North (e.g., Rockhampton, Mackay), TWAF 7 and third party camp to pioneer launch site.

- Gladstone, local quarry, Bruce Highway South (e.g., Brisbane), Bruce Highway North (e.g., Rockhampton, Mackay) and TWAFF 7, third party camp and Benaraby landfill to launch site 1.
- Gladstone, cement supplier and local quarry to tunnel launch site.
- Launch site 1 to Gladstone Airport.

Operations phase heavy vehicle movements will relate to general delivery and refuse collection and have been assumed to contribute to heavy vehicle movements from 2018 to 2026.

Indicative heavy vehicle routes are shown in Appendix 13, Supplementary Report - Traffic and Transport Impact Assessment.

20.5 Study Findings

This section describes the key findings of the supplementary traffic and transport assessment, including any changes to the impacts outlined in the EIS.

20.5.1 Existing Environment

Since the finalisation of the EIS, the extension of Kirkwood Road between the Dawson Highway and Gladstone-Benaraby Road has been constructed. This link is a two-lane, two-way 80 km/h road, which is intended to act as a ring road to direct traffic to the south of central Gladstone. Ultimately, the road will form a grade separated interchange with the Dawson Highway.

The upgrade of the Bruce Highway and Dawson Highway intersection to a grade separated overpass also commenced in August 2012, with works expected to take two years to complete.

20.5.2 Potential Impacts and Management Measures

Impacts identified through the road link assessment, assessment of intersection performance and the pavement impact assessment are described below.

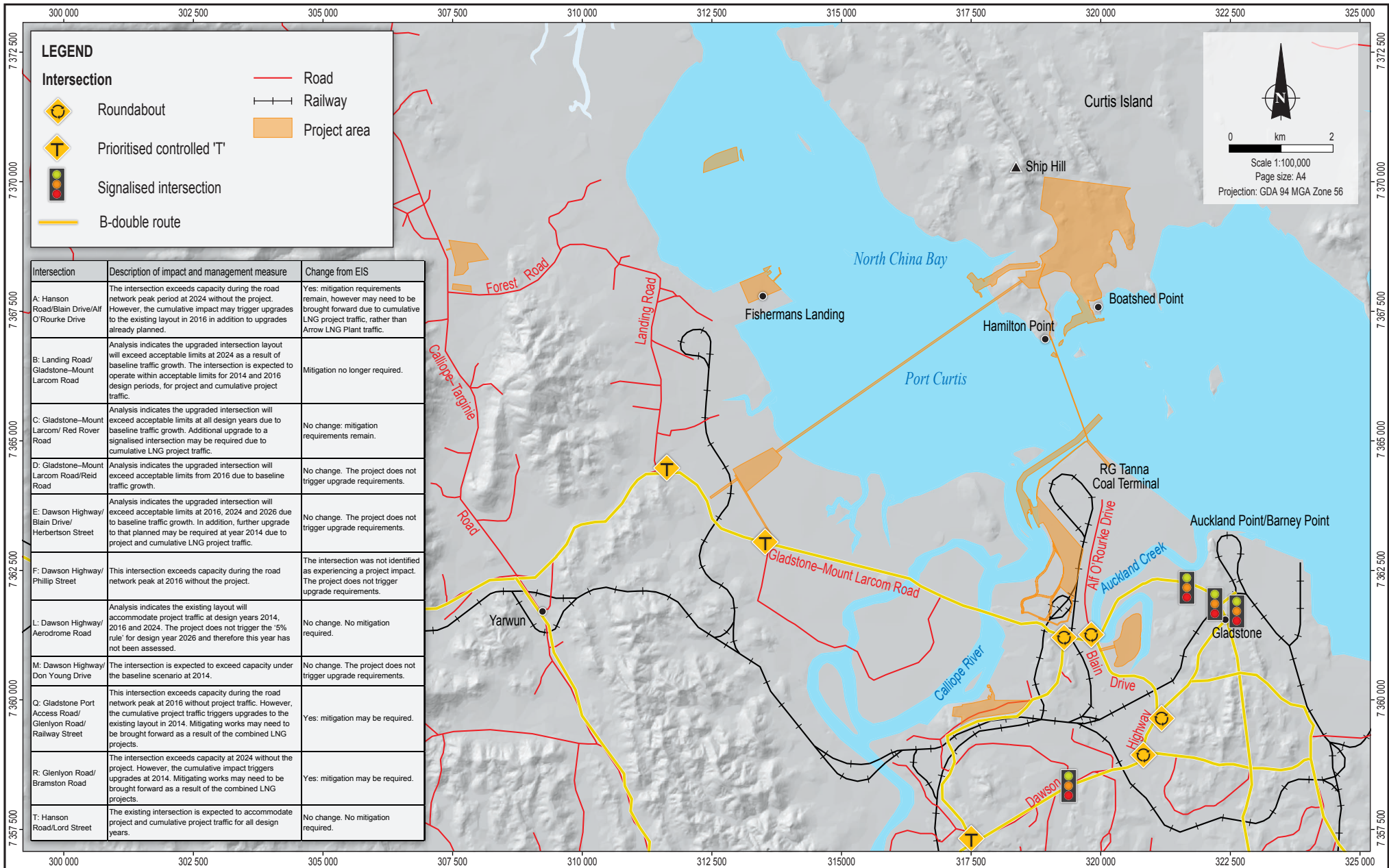
Road Link Assessment

The road link assessment undertaken for the EIS considered potential impacts to sections of the Dawson Highway, Gladstone-Mount Larcom Road, and Blain Drive. The supplementary road link assessment re-examined the above roads, and was extended to include the Bruce Highway, Landing Road, Red Rover Road and Gladstone Port Access Road. All roads are expected to operate satisfactorily when assessed in accordance with the GARID.

Investigation of the proposed timing of upgrades to the Reid Road to Red Rover Road, and Landing Road to Reid Road sections of the Gladstone-Mount Larcom Road, as proposed in the EIS, was found to be unnecessary. The increase to AADT resulting from the project was found to be less than 5%.








Intersection Performance

Table 20.3 summarises the potential impacts on intersections shown in Figure 20.1. Intersections shown are those which will experience a greater than 5% increase in peak hour volumes as a result of project traffic. Where applicable, DTMR future planned upgrades have been identified and their suitability for accommodation of project traffic was assessed. DTMR intersection upgrade plans are included in Appendix E of the Traffic and Transport Impact Assessment, which is presented as Appendix 23 of the EIS.



LEGEND

Intersection

-  Roundabout
-  Prioritised controlled 'T'
-  Signalised intersection
-  B-double route
-  Road
-  Railway
-  Project area

Intersection	Description of impact and management measure	Change from EIS
A: Hanson Road/Blain Drive/Air O'Rourke Drive	The intersection exceeds capacity during the road network peak period at 2024 without the project. However, the cumulative impact may trigger upgrades to the existing layout in 2016 in addition to upgrades already planned.	Yes: mitigation requirements remain, however may need to be brought forward due to cumulative LNG project traffic, rather than Arrow LNG Plant traffic.
B: Landing Road/Gladstone-Mount Larcom Road	Analysis indicates the upgraded intersection layout will exceed acceptable limits at 2024 as a result of baseline traffic growth. The intersection is expected to operate within acceptable limits for 2014 and 2016 design periods, for project and cumulative project traffic.	Mitigation no longer required.
C: Gladstone-Mount Larcom/ Red Rover Road	Analysis indicates the upgraded intersection will exceed acceptable limits at all design years due to baseline traffic growth. Additional upgrade to a signalised intersection may be required due to cumulative LNG project traffic.	No change: mitigation requirements remain.
D: Gladstone-Mount Larcom Road/Reid Road	Analysis indicates the upgraded intersection will exceed acceptable limits from 2016 due to baseline traffic growth.	No change. The project does not trigger upgrade requirements.
E: Dawson Highway/Blain Drive/Herbertson Street	Analysis indicates the upgraded intersection will exceed acceptable limits at 2016, 2024 and 2026 due to baseline traffic growth. In addition, further upgrade to that planned may be required at year 2014 due to project and cumulative LNG project traffic.	No change. The project does not trigger upgrade requirements.
F: Dawson Highway/Phillip Street	This intersection exceeds capacity during the road network peak at 2016 without the project.	The intersection was not identified as experiencing a project impact. The project does not trigger upgrade requirements.
L: Dawson Highway/Aerodrome Road	Analysis indicates the existing layout will accommodate project traffic at design years 2014, 2016 and 2024. The project does not trigger the '5% rule' for design year 2026 and therefore this year has not been assessed.	No change. No mitigation required.
M: Dawson Highway/Don Young Drive	The intersection is expected to exceed capacity under the baseline scenario at 2014.	No change. The project does not trigger upgrade requirements.
Q: Gladstone Port Access Road/Glenlyon Road/Railway Street	This intersection exceeds capacity during the road network peak at 2016 without project traffic. However, the cumulative project traffic triggers upgrades to the existing layout in 2014. Mitigating works may need to be brought forward as a result of the combined LNG projects.	Yes: mitigation may be required.
R: Glenlyon Road/Bramston Road	The intersection exceeds capacity at 2024 without the project. However, the cumulative impact triggers upgrades at 2014. Mitigating works may need to be brought forward as a result of the combined LNG projects.	Yes: mitigation may be required.
T: Hanson Road/Lord Street	The existing intersection is expected to accommodate project and cumulative project traffic for all design years.	No change. No mitigation required.

Source:
Place names, roads and railway from DME.
Intersections and B-double routes from GTA.
Project area and digital elevation model from Coffey Environments.



Date:
12.12.2012
MXD:
7033CC_16_GIS107_v1_1
File Name:
7033_16_F20.01_GIS_VS

Arrow Energy
Arrow LNG Plant



Intersections of relevance to the project

Figure No:
20.1

Notably, assessment of intersection performance for the 2014 design year was not presented in the EIS. This design year was included in the supplementary report to take into account the three scenarios including pioneer launch sites at Gladstone Marina, Auckland Point/Barney Point and/or Fishermans Landing, and also consider the cumulative impacts of the LNG projects. Assessment of the 2014 design year generates changes to potential intersection upgrade requirements that are different to those presented in the EIS.

Table 20.3 Intersection assessment – design years 2014, 2016, 2024 and 2026

Intersection	Description of Impact and Management Measure	Change from EIS
A: Hanson Road/Blain Drive/Alf O'Rourke Drive	<p>The intersection exceeds capacity during the road network peak period in 2024 without the contribution of the project. However, the cumulative impact may trigger a requirement for upgrades to the existing layout in 2016 that are in addition to upgrades already planned.</p> <p>The proposed upgrade layout 1, which incorporates a signalised intersection, is anticipated to operate within acceptable bounds up to the 2026 baseline scenario. However, at this time, the project triggers a requirement for the lengthening of the right turn lanes on the western approach from 115 m to 160 m (referred as upgrade layout 2). This requirement is triggered as a direct result of the proposed construction activities of the plant.</p>	<p>Yes: mitigation requirements remain, however these may need to be brought forward due to cumulative LNG projects' traffic, rather than the Arrow LNG Plant traffic in isolation.</p> <p>Whilst the upgrade is initially triggered by the cumulative impact of development, the construction of the Arrow LNG plant brings forward an additional requirement to upgrade to layout 2.</p>
B: Landing Road/Gladstone–Mount Larcom Road	<p>The intersection is expected to operate within acceptable limits for the 2014, 2016, 2024 and 2026 design periods, for project and cumulative project traffic.</p>	<p>Proposed project specific mitigation no longer required.</p>
C: Gladstone–Mount Larcom/ Red Rover Road	<p>Analysis indicates that the existing intersection will exceed acceptable limits in all design years (i.e., 2014, 2016, 2024 and 2026) due to baseline traffic growth. Additional upgrade to a signalised intersection, however, may be required due to cumulative LNG projects' traffic at 2016.</p>	<p>Mitigation requirements remain. Upgraded Layout 1 (i.e., roundabout configuration) has been modified to include an additional 30 m approach on the southern leg. Upgrade Layout 2 (i.e., signalised configuration) remains as identified in the EIS.</p>
D: Gladstone–Mount Larcom Road/Reid Road	<p>The existing intersection layout is not expected to accommodate baseline traffic projections at 2014. Subject to improvements necessary for baseline operations, the intersection can cater for project and cumulative traffic impacts at 2024 when cumulative impacts are expected to result in the need for upgrades.</p>	<p>No change. The project does not trigger upgrade requirements, although an upgrade is required for baseline traffic growth.</p>
E: Dawson Highway/Blain Drive/Herbertson Street	<p>The existing intersection layout is not expected to accommodate cumulative development traffic at 2014. Subject to upgrades required for the cumulative traffic at 2014, the intersection is anticipated to operate within acceptable limits for all design years.</p>	<p>Both the EIS and SREIS require that an upgrade to a signalised intersection be undertaken. The SREIS identified additional requirements to the signalised intersection configuration, incorporating an extension to the left turn slip lane on the southern approach.</p>

Table 20.3 Intersection assessment – design years 2014, 2016, 2024 and 2026 (cont'd)

Intersection	Description of Impact and Management Measure	Change from EIS
F: Dawson Highway/ Phillip Street	This intersection exceeds capacity during the road network peak at 2014 due to baseline traffic growth (without the contribution from the project).	No change. The project does not trigger upgrade requirements, although an upgrade is required for baseline traffic growth.
L: Dawson Highway/ Aerodrome Road	Analysis indicates that the existing layout will accommodate project traffic in the design years of 2014, 2016 and 2024. The intersection, however, fails as a result of background traffic (during the network peak) at 2014, 2016, 2024, and 2026. The project does not trigger the '5% rule' for design year 2026 and therefore this year has not been assessed.	No change. Project specific mitigation is not required.
M: Dawson Highway/ Don Young Drive	The intersection is expected to exceed capacity due to baseline traffic growth in 2014. Subject to improvements necessary for baseline operations, the intersection can cater for project and cumulative traffic impacts.	No change. The project does not trigger upgrade requirements.
Q: Gladstone Port Access Road/ Glenlyon Road/ Railway Street	This intersection exceeds capacity during the road network peak at 2016 due to baseline traffic growth. However, the cumulative project traffic triggers a need for upgrade to the existing layout in 2014. Mitigating works may need to be brought forward as a result of the impact of the combined LNG projects.	Yes: mitigation may be required.
R: Glenlyon Road/ Bramston Road	The existing intersection layout is not expected to accommodate traffic associated with cumulative impacts at 2014 and associated with baseline traffic in 2024. With upgrades, the intersection is expected to operate within acceptable limits to 2024, at which point acceptable limits will be exceeded with baseline traffic.	No change. Upgrade layout identified in the EIS needs to be investigated further for the 2024 design horizon.
T: Hanson Road/Lord Street	The existing intersection is expected to accommodate project and cumulative project traffic in all design years.	No change. No mitigation required.

Pavement Impact – State-controlled Roads

A pavement impact assessment for state-controlled roads has been constructed in accordance with the DTMR Central District's 'Assessment of Road Impacts of Development Proposals – Notes for Contribution Calculations' (TMR, 2009). Impacts and maintenance contribution estimates remain preliminary due to ongoing refinement of launch site and accommodation options. Preliminary estimates are available to stakeholders as a confidential appendix to the supplementary traffic and transport assessment. Maintenance contributions will be formalised in an infrastructure agreement with TMR and GRC.

Figure 20.2 outlines the process that Arrow Energy will follow between completion of the SREIS and signing of the infrastructure agreement. The process includes finalisation of a road impact assessment, road use management plan, logistics plan and traffic management plan.

Table 20.4 presents a summary of road links where the project generated pavement impacts (measured in terms of equivalent standard axles (ESAs)) are expected to result in an increase of greater than 5% of the baseline level of ESAs.

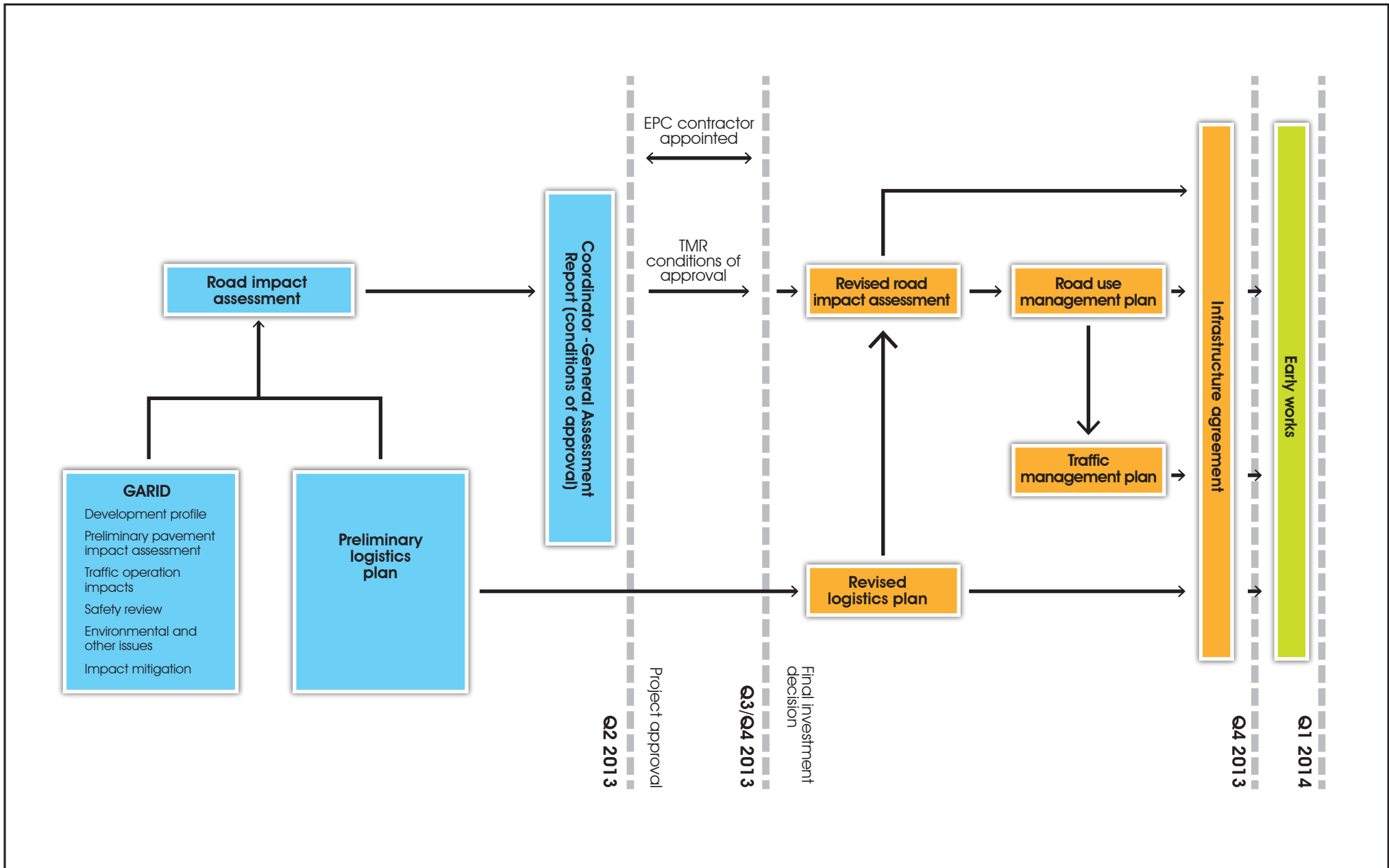


Table 20.4 Pavement impact identification

Road	Section	Year of Impact		
		Scenario 1 Auckland Point/ Barney Point	Scenario 2 Gladstone Marina	Scenario 3 Fishermans Landing
Dawson Highway	Hanson Road to Breslin Street	2014	-	-
	Breslin Street to Blain Drive	2014	-	-
	Chapman Drive to Red Rover Road	2014	-	-
	Red Rover Road to Harvey Street	2014-2016	2014-2016	2015-2016
	Harvey Street to Bruce Highway	2014-2015	2014-2015	2015
Gladstone– Mount Larcom Road	Blain Drive to Red Rover Road	2014	2014	2014
	Red Rover Road to GML Ring Road	2014	2014	2014
	GML Ring Road to Tunnel launch site entry	2014-2015	2014-2015	2014-2015
	Tunnel launch site entry to Landing Road	2014-2015	2014-2015	2014-2015
	Landing Road to Yarwun Quarries	2014-2015 and 2023	2014-2015 and 2023	2014-2015 and 2023
Yarwun Quarries to Calliope River Road	2015	2015	2014-2015	
Bruce Highway	Gladstone Benaraby Road to Dawson Highway	2015	-	2015
	Dawson Highway to Calliope River Road	-	-	2014
Tannum Sands Road	Tannum Sands Road	2014-2016 and 2023	2014-2016 and 2023	2014-2016 and 2023
Gladstone Port Access Road	Gladstone Port Access Road	2014	-	-

20.6 Conclusion

The supplementary traffic and transport assessment has focused on impacts to the road network. Changes to the project description arising as a result of the completion of FEED are not expected to result in notable changes to the assessment of rail network, alternative local transport, or shipping impacts.

The road link assessment and assessment of intersection performance were remodelled. Road linkages assessed were found to operate satisfactorily, though may require upgrade at a later time to account for baseline traffic growth (rather than project impact).

Intersections B, C, D, F, L, M, and T are likely to require upgrade due to baseline traffic growth. Subject to the provision of upgrades required to accommodate background traffic growth, these intersections are anticipated to operate within acceptable limits for all project affected design years.

Upgrades (or the bringing forward of upgrades) may be required at the following intersections as a result of the cumulative impact of the four LNG projects:

- Intersection A: Hanson Road / Alf O'Rourke / Blain Drive.
- Intersection E: Dawson Highway / Blain Drive / Herbertson Street.
- Intersection Q: Gladstone Port Access Road / Glenlyon Road / Railway Street.
- Intersection R: Dawson Highway/ Glenlyon Road/ Bramston Street.

Following these triggers which have been identified as a result of cumulative impacts, a comparison of the proposed upgrade requirements indicates that the project brings additional requirements for upgrade works (as a direct result of project construction activities) at Hanson Road / Alf O'Rourke Drive / Blain Drive (Intersection A). Whilst the upgrade is initially triggered by the cumulative impact of development, the construction of the Arrow LNG plant brings forward an additional requirement to upgrade to layout 2.

An initial pavement impact assessment for state-controlled roads has been undertaken, including an estimate of road maintenance contributions in accordance with DTMR Central District's 'Assessment of Road Impacts of Development Proposals – Notes for Contribution Calculations' (TMR, 2009). Estimates are preliminary only and will be made available to DTMR separately.

A final road impact assessment will be undertaken in conjunction with the development of a road use management plan, logistics plan and traffic management plan. The final assessment will be prepared by Arrow Energy and the EPC contractor in consultation with DTMR and GRC, and will be used as the basis for entering into infrastructure agreements with DTMR and GRC. Such agreements will establish road maintenance contributions.

20.7 Commitments Update

Two of the management measures (commitments) presented in the EIS relevant to traffic and transport have been revised and are presented in Table 20.5. Other measures are unchanged and are included in Attachment 7, Commitments Update.

Table 20.5 Commitments update: traffic and transport

No.	Commitment	Comment
C28.09A	Develop a shipping marine activity management plan in consultation with Gladstone Regional Council, Gladstone Ports Corporation, Maritime Safety Queensland and all contractors operating within the Gladstone Port.	Updated with correct plan name
C28.11A	Ensure that operators of project vessels, Arrow Energy staff and contractors comply with the LNG marine Operations Maritime Safety management plan if/when this plan is agreed between Maritime Safety Queensland, Gladstone Ports Corporation and the other LNG proponents.	Updated with correct plan name