Guideline

Guide to Traffic Impact Assessment

September 2017

Queensland Government

Feedback: Please send your feedback regarding this document to: tmr.techdocs@tmr.qld.gov.au

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1 Preface

The *Guide to Traffic Impact Assessment* supports planning and development decisions under the *Planning Act 2016* (and superseded planning legislation such as the *Sustainable Planning Act 2009*), the *State Development and Public Works Organisation Act 1971*, the *Environmental Protection Act 1994* and the *Economic Development Act 2012*.

This document also supports notifiable road use decisions under the *Mineral and Energy Resources (Common Provisions) Act 2014*, *Greenhouse Gas Storage Act 2009* and the *Petroleum Act 1923*.

Comments, suggestions for changes, further inclusions or errors can be submitted to: planningpolicy@tmr.qld.gov.au.

2 Definition of terms and acronyms

The terms and acronyms used in this document are defined in Table 2(a) and Table 2(b).

Table 2(a) – Definition of terms

Term	Definition
Access road	A trafficable connection between development land and a SCR which could either be a driveway or a road
Annual average daily traffic (AADT)	The total volume of traffic passing a roadside observation point over the period of a calendar year, divided by the number of days in that year (365 or 266 days)
Approved planning policy	A Department of Transport and Main Roads policy that provides a consistent and transparent statewide approach to protecting the department's transport planning, the policy articulates different planning categories which denote the level of protection for planning and how it may be used externally and in development assessment
Austroads	The association of Australian and New Zealand road transport and traffic agencies whose purpose is to contribute to the achievement of improved road transport outcomes
Base traffic	The traffic volume without development traffic
Capacity	The number of vehicles that can be accommodated on road infrastructure before it fails to function as it was intended
Crash rate	A ratio of the number of crashes to some common denominator, usually vehicle kilometres travelled, head of population or period of time
Current year	The year in which a development application is lodged
Delay	The additional travel time experienced by a vehicle or pedestrian with reference to a base travel time (for example, the free flow travel time)
Design horizon year	For access intersections and pavement works, the earliest year for which the asset should be designed to operate under its practical capacity
Design traffic	The cumulative traffic, often expressed in terms of equivalent standard axle loads, predicted to use a road or bridge over the structural design life of the pavement or bridge
Driveway	An area which extends from the edge of the pavement construction of a frontage road to the property boundary to connect the development to the pavement and carrying one or two-way traffic (a driveway is not a public road)

Term	Definition
Frontage works	Also known as front-gate works, includes works required to provide access between the development and road network and works to integrate the infrastructure and services within the road reserve to the planned standard of infrastructure in the area – the frontage may include works on both the frontage side and on the opposite side of the road to the frontage
Impact assessment area	An area as defined in Section 6.4 of this *Guide*, which identifies the SCR infrastructure elements for which development-generated impacts are assessed
Impact assessment year	The year when the development's impacts are compared to the base case impacts for offsets determination purposes
Impact mitigation period	(In relation to access and frontage works, and pavement impacts) is the period of time after the opening year for which a development's impacts and mitigation measures are the responsibility of the development
Intersection	The place at which two or more roads meet or cross
Journey to work data	Data derived from the five-yearly *Census of Population and Housing* conducted by the Australian Bureau of Statistics (ABS)
Level of service (LOS)	A qualitative index for ranking operating conditions on roads as well as pedestrian and cycling movement based on factors such as speed, flow rate, travel time, freedom to manoeuvre, interruptions, comfort, safety, and convenience
Limited access road	A road or part of a road declared as such under Section 54 of the *Transport Infrastructure Act 1994*
Major development	A project or activity of a type or scale likely to have significant traffic impacts, including: • projects made assessable outside the *Planning Act 2016*, subject to an environmental impact statement or meeting notifiable road use provisions, or • development made assessable under Section 43 of the *Planning Act 2016*
Mid-block capacity	The capacity of a road between intersections
No net worsening	A principle that seeks to ensure that the current and forecast characteristics of the transport network are not significantly worse than the current and forecast characteristics existing without the development
Notifiable road use	Criteria for road use prescribed within Queensland Government legislation, namely the *Petroleum Act 1923*, *Greenhouse Gas Storage Act 2009* and *Mineral and Energy Resources (Common Provisions) Act 2014* that, if met, may require a resource authority holder to notify Transport and Main Roads for assessment
Pavement	The portion of a road designed for the support of, and to form the running surface for, vehicular traffic
Peak hour(s)	The hour(s) of the day having the highest traffic volume and / or number of passengers; multiple peak hours in the day or week may need to be assessed because of different directional peaks

Term	Definition
Planned upgrades	An extension, upgrade, or duplication of state transport infrastructure or transport networks for which affected land has been identified in a publicly available government document (which includes Commonwealth, state or local government documents that include a statement of intent for, or a commitment to, a planning outcome or infrastructure provision), or in written advice to affected land owners
Queensland Transport and Roads Investment Program (QTRIP)	A Queensland Government infrastructure program that details transport and road projects planned for delivery over the next four years
Registered professional engineer of Queensland (RPEQ)	Certification that applies to performance and related outcomes of professional engineering services in Queensland pursuant to the *Professional Engineers Act 2002*
Road safety assessment	An evaluation of safety risks of a future road or traffic project and identification of measures to manage this risk; a road safety assessment is less detailed than a road safety audit
Road safety audit	A formal examination of a future road or traffic project, in which an independent, qualified person reports on its potential safety hazards and identifies remedial measures
Road-use management plan (RMP)	A document that describes how the road impacts of development traffic, will be managed by non-infrastructure means
Standard axle repetition (SAR)	A measure defining the cumulative damaging effect to the pavement of the design traffic, it is expressed in terms of the equivalent number of 80kN axles on the pavement
Standard axle repetition kilometre (SAR-km)	A value used to determine the marginal cost of road-wear, a SAR-km value is available for each SCR segment in Queensland
State controlled road (SCR)	A road or land, or part of a road or land declared as such under Section 24 of the *Transport Infrastructure Act 1994*
State development assessment provisions (SDAP)	A state planning instrument prescribed under regulation that sets out the matters of interest to the state for development assessment, where the chief executive administering the *Planning Act 2016* is responsible for assessing or deciding development applications
The department	The administrative unit of the Queensland Government at the time of use with responsibility for planning, management and protection of state controlled roads; at the time of initial publication (2017), the relevant administrative unit was the Department of Transport and Main Roads
Traffic	A generic term covering all vehicles, people, and animals using a road
Traffic impact assessment	The process of compiling and analysing information, and documenting the effects that a development is likely to have on the operation of the SCR network, and recommending works or contribution to works to mitigate the impacts generated – traffic impact assessments have previously been referred to as road impact assessments
Travel plan	A plan for a particular development that outlines initiatives that will be taken to reduce car use
Trip generation	The number of trips produced or attracted by a development
Vehicle volume / traffic volume	The number of vehicles or pedestrians passing a given point on a road during a specified period of time

Term	Definition
Warrant	A criterion, usually numerical, used to determine whether the construction of a traffic facility or the installation of a traffic control device may be justified
Year of opening	The year in which the development is proposed to commence operations: for developments with multiple stages, the year that each stage will commence operations

Table 2(b) – List of acronyms

Acronym	Definition
AADT	Annual average daily traffic
ABS	Australian Bureau of Statistics
DEHP	Department of Environment and Heritage Protection
DILGP	Department of Infrastructure, Local Government and Planning
DOS	Degree of saturation
EIA	Environmental impact assessment
EIS	Environmental impact statement
FAMLIT	Freight Axle Mass Limits Investigation Tool
GARID	Guidelines for Assessment of Road Impacts of Development
GFA	Gross floor area
LOS	Level of service
PDA	Priority development area
QTRIP	Queensland Transport and Roads Investment Program
RMP	Road-use management plan
RMS	Roads and Maritime Services, NSW
RPEQ	Registered Professional Engineer of Queensland
SAR	Standard axle repetition
SARA	State Assessment and Referral Agency
SCR	State-controlled road
SDA	State development area
SDAP	State Development Assessment Provisions

3 References

Following is a list of documents referenced in this *Guide*.

- Australian Road Research Board 2014, *Harmonisation of Pavement Impact Assessment – Technical Report*
- Australian / New Zealand Standard (AS/NZS) 2890 (Set): 2009, *Parking Facilities* Set
- AS/NZS 2890.1: 2004, *Parking facilities – Off-street car parking*
- AS/NZS 2890.6: 2009, *Parking facilities – Off-street parking for people with disabilities*

- Australian Standard (AS) 1742.2: 2009, *Manual of uniform traffic control devices – Traffic control devices for general use*
- AS 2890.2: 2002, *Parking facilities – Off-street commercial vehicle facilities*
- AS 2890.3: 2015, *Parking facilities – Bicycle parking facilities*
- Austroads 2015–2016, *Guide to Pavement Technology* Set
- Austroads 2008–2017, *Guide to Traffic Management* Set
- Austroads 2008–2016, *Guide to Road Design* Set
- Austroads 2006–2016, *Guide to Road Safety* Set
- Austroads Technical Report AP T68 06 2006, *Update of the Austroads Sprayed Seal Design Method*
- Austroads Technical Report AP T236 13 2013, *Update of Double / Double Design for Austroads Sprayed Seal Design Methods*
- Department of Infrastructure, Local Government and Planning 2017, *State Development Assessment Provisions*
- Department of Transport and Main Roads 2015, *Guide to Development in a Transport Environment: Rail*
- Department of Transport and Main Roads 2016, *Guideline for Preparing a Road use Management Plan*
- Department of Transport and Main Roads 2017, *Manual of Uniform Traffic Control Devices*
- Department of Transport and Main Roads 2013, *Pavement Design Supplement*
- Department of Transport and Main Roads 2012, *Pavement Rehabilitation Manual*
- Department of Transport and Main Roads 2013, *Road Planning and Design Manual*, 2nd edition
- Department of Transport and Main Roads 2017, Specifications Manual
- Department of Transport and Main Roads 2015, *Traffic and Road Use Management Manual*
- Department of Transport and Main Roads 2016, *Approved Planning Policy*
- Department of Transport and Main Roads 2014–2016, *Principal Cycle Network Plans*
- Institute of Transportation Engineers (ITE) 2012, *Trip Generation Manual*, 9th edition
- NSW Government Roads and Maritime Services 2013, *Guide to Traffic Generating Developments: Updated traffic surveys*
- NSW Government Roads and Traffic Authority 2002, *Guide to Traffic Generating Developments*
- Queensland Government 2006–2017, Traffic Generation Open Data

Part A – Context and purpose

4 Introduction

4.1 Context

Queensland's economic growth and liveability of communities depends on a system of road transport infrastructure that is safe, accessible, and reliable and provides efficient connections between people, places, goods and services. People use the road network every day to access employment, education, commercial, social and recreational opportunities. The road network is also used to transport the goods and services that underpin economic growth in Queensland and which many people depend on to support their way of life.

All development generates traffic movement that has the potential to impact on the surrounding road network. Developments may create movement of people and goods to, from and within a development. Assessing the impacts of traffic generation on the surrounding road network is an important consideration for the Department of Transport and Main Roads as well as for local governments.

As the custodian of Queensland's state-controlled road (SCR) network, Transport and Main Roads is responsible for maintaining the safety and efficiency of the SCR network in accordance with its legislative powers under the *Transport Infrastructure Act 1994*. The SCR network includes roads or parts of roads declared under Section 24 of the *Transport Infrastructure Act 1994*, as well as other transport infrastructure located within the SCR road reserve (including bus stops, cycling infrastructure and/or footpaths).

The state has a general responsibility to provide a SCR network that caters for existing and planned development, consistent with the department's objective of creating an integrated transport network accessible to everyone. The state has a defined budget for providing and maintaining SCRs, which means transport planning and infrastructure projects must be prioritised across the state according to community need and development pressures.

While Transport and Main Roads endeavours to plan and fund transport infrastructure to cater for development and growth on its road network, it is unable to fund the works needed to mitigate the impact of all development at the time that those impacts are generated. Traffic generated by a development during the development's operational stages can have an impact on the safety and functioning of a current or future SCR. Any adverse traffic impacts need to be properly assessed and addressed in order to maintain the safety, efficiency and infrastructure condition of the SCR network.

A traffic impact assessment is the process of compiling, analysing information on, and documenting the effect that a development is likely to have on the operation of the road network, and demonstrating how these impacts can be avoided, reduced, managed or mitigated. A traffic impact assessment assesses safety and efficiency impacts on users, as well as any impacts on the condition of transport infrastructure. A traffic impact assessment can also identify how a site can be accessed by traffic and in an urban context public transport, cyclists and pedestrians, and what infrastructure is needed to facilitate this. Efficient and effective traffic impact assessment processes can ensure that development projects do not compromise the safety, efficiency and infrastructure condition of Queensland's SCRs for all users.

A traffic impact assessment was previously referred to as a road impact assessment (RIA) in the Department of Main Roads' *Guidelines for Assessment of Road Impacts of Development* (GARID) 2006.

4.2 Purpose

The *Guide to Traffic Impact Assessment* (the *Guide*) provides guidance to stakeholders involved in development that can potentially impact on the safety, efficiency or infrastructure condition of the SCR network in Queensland. It outlines the principles and the framework for undertaking a traffic impact assessment and provides advice on mitigation strategies to address traffic impacts. This document is a guide only and each development needs to be assessed on its merits in accordance with applicable legislative and planning requirements.

The *Guide* is intended to be used by development proponents and traffic consultants in preparing a traffic impact assessment, as well as departmental staff within Transport and Main Roads to assess a traffic impact assessment. Its principles and strategies may also have application to local government.

The extent of the impacts of development traffic on other users and on SCR infrastructure can range from being localised to geographically extensive, depending on the scale of the development and its impacts relative to base conditions. This *Guide* seeks to address development-related traffic impacts on the broader SCR network whilst providing some guidance on the method to assess localised impacts. Further advice in relation to site specific development considerations that may cause an impact on safety, efficiency, infrastructure condition or amenity is addressed in the State Development Assessment Provisions (SDAP) and supporting guidance material.

The State Development Assessment Provisions (SDAP) and supporting guidance material provides statutory requirements on the state's interests in relation to development impacts such as building and structure impacts, filling and excavation impacts, stormwater and drainage impacts, vehicular access impacts, road network impacts, and environmental emission impacts (such as noise, vibration, air and light). The SDAP can be accessed at:

http://www.dilgp.qld.gov.au/planning/developmentassessment/state-development-assessment-provisions.html.

As of publication of this *Guide*, it was intended that a complementary guide would be prepared to provide guidance on interpreting and meeting the requirements of the SDAP.

The Austroads *Guide to Traffic Management* Part 12: *Traffic Impacts of Developments* (2016) provides guidance on traffic impacts arising from land use developments. While the Austroads *Guide* is a useful resource, it provides general guidance only and does not detail statutory requirements and other considerations as outlined and adopted in Queensland legislation planning instruments and in the *Guide to Traffic Impact Assessment*.

4.3 How to use this Guide

This *Guide* is structured into four parts:

- **Part A:** provides the context and purpose for the assessment of traffic impacts on SCRs in Queensland
- **Part B**: provides the principles and framework for undertaking traffic impact assessments
- **Part C**: provides direction on how traffic impact assessments and associated mitigation options are to be undertaken
- **Part D**: provides supplementary information to support this *Guide*.

5 Categories of development

In Queensland, the assessment of traffic impacts of development is primarily considered during regulatory processes for decision making about development proposals. Broadly, these types of development can be categorised as:

- development made assessable under the *Planning Act 2016*, and
- major development projects assessed outside of the *Planning Act 2016* (usually subject to an environmental impact statement (EIS), a notifiable road use, or within a state development area (SDA) or priority development area (PDA)).

The following sections outline further detail on different categories of development and developers' and Transport and Main Roads' roles in relation to assessing traffic impacts from development for each development pathway.

5.1 Assessable development under the Planning Act

Under Queensland's planning system, the *Planning Act 2016* provides the framework for integrated planning and development assessment by establishing an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, development assessment and related matters to facilitate the achievement of ecological sustainability.

Specified assessable development under the *Planning Act 2016* is triggered and must be referred to the State Assessment and Referral Agency (SARA), which will seek technical advice from Transport and Main Roads on transport implications of development.

The State Development Assessment Provisions (SDAP) set out the matters of interest to the state for development assessment, where the chief executive administering the *Planning Act 2016* is responsible for assessing or deciding development applications. SDAP contains assessment criteria which applications must meet in order for development to be approved by the state.

Where development is referred to SARA for assessment (as a result of proximity or threshold triggers in schedules 9 and 10 of the Planning Regulation 2017), SDAP requires development to ensure that it does not result in a worsening of safety, infrastructure condition or operating performance (that is, efficiency) of a state-controlled road. It is recommended that a traffic impact assessment be undertaken to demonstrate compliance with this requirement.

The advice provided within the *Guide to Traffic Impact Assessment* supports the following SDAP state codes:

- State code 1: Development in a state-controlled road environment
- State code 6: Protection of state transport networks.

> While SDAP has specific relevance to development assessment under the *Planning Act 2016*, Transport and Main Roads seeks to achieve similar outcomes in relation to other developments including major development projects.
>
> SDAP can be accessed at:
>
> http://www.dilgp.qld.gov.au/planning/development-assessment/state-development-assessment-provisions.html.

For an application under the *Planning Act 2016*, applicants may wish to obtain pre-lodgement advice in order to determine if a traffic impact assessment is necessary.

5.2 Coordinated projects

The *State Development and Public Works Organisation Act 1971* governs the process for dealing with state significant development and resource projects when declared as a ‘coordinated project’. The Coordinator-General determines if a project should be declared coordinated, having regard to criteria in the legislation.

Proponents of a coordinated project are generally required to prepare an environmental impact statement (EIS) for assessing the development’s impacts, including transport and road impacts. The EIS process includes preparation of terms of reference, and preparation of a traffic impact assessment in consultation with Transport and Main Roads and local government. The Coordinator-General has overall responsibility for the adequacy of the assessment of the EIS.

The Coordinator-General evaluates the adequacy of the EIS and prepares an assessment report. The report may direct that conditions be attached to the development approval or other Transport and Main Roads requirements.

5.3 Major development subject to an EIS under the Environmental Protection Act

The *Environmental Protection Act 1994* provides for the environmental regulation of a range of activities. For resource projects (mining or petroleum) that are considered to pose a high risk to the environment, an EIS may be used by the Department of Environment and Heritage Protection (DEHP) to assess impacts.

DEHP invites Transport and Main Roads to participate in EIS processes for projects with transport impacts. This provides an opportunity for Transport and Main Roads to review the traffic impact assessment for a particular project, and where relevant, require appropriate impact mitigation measures.

5.4 Notifiable road use

Certain resource projects may be referred to Transport and Main Roads where they trigger 'notifiable road use' provisions of legislation governing mineral and energy resources in Queensland, namely the *Mineral and Energy Resources (Common Provisions) Act 2014*, *Petroleum and Gas (Production and Safety) Act 2004*, and *Greenhouse Gas Storage Act 2009*.

These provisions require a resource authority holder (generally the proponent) to notify a road authority if they propose a notifiable road use, which includes hauling more than 50,000 tonnes per annum of a mineral, petroleum or gas product on SCRs. The provisions do not apply to coordinated projects, and are generally intended for projects not otherwise assessed under an EIS process.

The provisions empower Transport and Main Roads to give the proponent 'road-use directions' about preserving road safety or the condition of the road. These directions may prescribe matters about proponent use of SCRs and how impacts must be addressed.

5.5 Development within a SDA or PDA

Transport and Main Roads can be invited to review traffic impact assessments prepared for development within declared state development areas (SDA) under the *State Development and Public Works Organisation Act 1971*, or within priority development areas (PDA) under the *Economic Development Act 2012*.

SDAs are defined areas of land established by the Coordinator-General to promote economic development in Queensland and typically take the form of one of the following:

- industrial hubs for large-scale, heavy industry – typically located on the coast of Queensland, in close proximity to ports, rail and major road networks
- multi-user infrastructure corridors – for the co-location of infrastructure such as rail lines, water and gas pipelines, and electricity transmission lines, and/or
- major public infrastructure sites.

The Coordinator-General is responsible for the planning, establishment and ongoing management of SDAs throughout Queensland and assesses all applications and requests in a SDA in accordance with the relevant development scheme. Transport and Main Roads can be nominated as a referral entity and may request additional information or recommend conditions of approval.

PDAs are parcels of land within Queensland, identified for specific accelerated development with a focus on economic growth, declared under the *Economic Development Act 2012*. State government works with local government to streamline the planning, approval and development processes to foster results.

Each PDA is subject to a development scheme which controls land use, infrastructure planning and development in the PDA area. The development scheme:

- ensures development is well planned
- provides certainty to developers, local government, agencies and the wider community about the type and form of development that can occur in the PDA
- sets out the processes and procedures for the assessment of development applications, and
- overrides local and government planning instruments related to the use of land within a PDA.

Economic Development Queensland regularly liaises with Transport and Main Roads on setting appropriate development conditions for development applications within PDAs.

A PDA may also contain local government roads, which may be subject to local government traffic impact assessment requirements.

5.6 Infrastructure designation

Infrastructure designation of a premises in accordance with Chapter 2, Part 5 of the *Planning Act 2016* does not follow the same development assessment process as other development types. Infrastructure designated in this way, for example schools and hospitals, can be significant generators of traffic and should be supported by detailed traffic impact assessments. The assessment of traffic impacts for a designation project should occur during the designation process, typically when the proponent is preparing a draft environmental impact assessment.

The Department of Infrastructure, Local Government and Planning may consult with Transport and Main Roads on traffic impact assessment impacts for relevant infrastructure designation projects.

5.7 Development types requiring traffic impact assessment

In order to illustrate the traffic impact considerations that may be relevant for development assessment under different legislation, a summary of development categories, some typical considerations and examples of types of development is provided in Table 5.7.

Table 5.7 – Development categories and traffic impact assessment considerations

Assessment trigger	Legislation	Considerations	Example
Development under the *Planning Act 2016*			
Project for development made assessable under the Planning Regulation 2017 and for which referral to SARA in relation to SCRs is required	*Planning Act 2016*	A development application which is triggered under the Planning Regulation 2017 for assessment by SARA and referral is required under schedule 9 or 10 of the Planning Regulation 2017 or for a project exceeding the nominated thresholds as set out in schedule 22	A 300 lot residential development subdivision on land identified in the planning scheme for future urban purposes
Variation approval for development involving staging and overriding a local planning scheme	*Planning Act 2016*	S43 of the legislation allows for approvals for staged development which embed unique requirements which override standard local planning scheme requirements. As subsequent stages may not be referred to Transport and Main Roads for assessment, there may be a need to agree on a process for assessment of future stages or to assess and condition for all expected impacts with triggers for introducing mitigation measures.	A large master-planned community

Assessment trigger	Legislation	Considerations	Example
Major development projects			
Coordinated project requiring an EIS or impact assessment report	*State Development and Public Works Organisation Act 1971*	A project declared as 'coordinated' by the Queensland Coordinator-General and required to undergo an EIS or impact assessment report (IAR) assessment process; in this situation, the Office of the Coordinator-General coordinates the input of relevant Queensland and Australian government agencies to the EIS process	A large mine or tourist resort declared a coordinated project
Mining or resource projects requiring an EIS	*Environmental Protection Act 1994*	A project not declared as 'coordinated' under the *State Development and Public Works Organisation Act 1971*, but requiring an EIS as per the *Environmental Protection Act 1994*	A large mine that is not a coordinated project
Project located in a SDA impacting a SCR	*State Development and Public Works Organisation Act 1971*	A project triggered for assessment due to proximity to a SCR, future SCR or state-controlled transport tunnel that forms part of a SCR	An industrial development in a SDA (for example, Abbot Point or Gladstone) A housing development in a PDA (for example, Caloundra South or Greater Flagstone)
Project located in a PDA impacting a SCR	*Economic Development Act 2012*		
Project carrying out a notifiable road-use not involving development approval	*Mineral and Energy Resources (Common Provisions) Act 2014* *Greenhouse Gas Storage Act 2009* *Petroleum Act 1923*	In accordance with thresholds outlined in legislation, projects transporting in excess of 50,000 tonnes per annum on SCRs will be required to refer their proposed road use to Transport and Main Roads	Haulage of coal from a mine to a rail siding for a project that was not the subject of an EIS

Part B – Principles and framework for undertaking traffic impact assessments

6 Key principles for the assessment of traffic impacts of development

This section outlines the underlying principles that guide the assessment of development-related traffic impacts on the SCR network, and the preferred framework for addressing the impacts. In the event of any inconsistency between application of principles, an earlier principle is to take precedence over a latter principle (for example, Principle 1 will always take precedence over Principle 2).

6.1 Key principles

Principle 1: Development must not compromise safety on the SCR network.

Safety is paramount in the road environment. In accordance with the legislative obligations in the *Transport Infrastructure Act 1994*, the Department of Transport and Main Roads seeks to ensure adequate levels of safety for all users on the SCR network.

Accordingly, Transport and Main Roads would not permit any development outcome that would adversely impact road safety (for example, a development that increases the likelihood or severity of crashes with the potential to result in a fatality or serious injury) without commensurate mitigation works or road-use management strategies.

Principle 2: Development should seek to achieve no worsening to safety or infrastructure condition and no net worsening to efficiency across the impact assessment area.

Transport and Main Roads seeks to ensure that there is no worsening to safety or to the condition of transport infrastructure and no net worsening to efficiency to the impact assessment area as a result of development.

The principles of no worsening and no net worsening aim to ensure that the current and forecast characteristics of the transport network are not significantly worse than the current and forecast characteristics existing without the development.

The ‘net’ in no net worsening signifies that, when considered in isolation and with mitigation measures in place, the impacts of a proposed development may be worse in some locations but better in others compared to the base case but, overall across the impact assessment area, the impact is neutralised. This aims to overcome situations where it is not feasible to address certain impacts. Under no net worsening, impacts that cannot be addressed at their source are offset elsewhere and / or in other ways such that the net effect is no worsening of conditions for the community.

Principle 3: Development should seek to adopt a mitigation hierarchy of (in order of preference): avoiding impacts managing impacts and mitigating impacts.

Transport and Main Roads has adopted a preferred mitigation hierarchy to address the traffic impacts of development on the SCR network. Development should always seek to avoid or reduce impacts on the SCR network where possible. Where adoption of avoidance strategies leaves residual impacts, these impacts should be managed. Where this is insufficient, impacts should be mitigated through infrastructure works, or where there is no alternative, a monetary contribution equal to the value of the mitigation works.

Principle 4: Development access locations and permitted turning movements are consistent with the function and access limitation requirements of the road being accessed.

Transport and Main Roads has a responsibility to preserve the safety and efficiency of its road network. The primary function of the majority of SCRs is to carry through traffic including road freight vehicles. Additional property access points onto SCRs can compromise this function, particularly where right turn movements are allowed. Development should minimise traffic access and / or allowable turning movements at SCRs where alternative, safe, legal points of access are able to be provided.

Principle 5: Development proponents are responsible for all access and frontage works.

Development proponents are responsible for providing all access and frontage works required as a direct consequence of the development. Access and frontage works includes all roadworks required for a direct connection between the development site and the SCR network, and may also include works required as result of impacts on pedestrian and cycling infrastructure, public transport infrastructure, kerb and channelling and stormwater infrastructure.

Accesses to the SCR network should be minimised where safe and efficient alternative access points are available via the local government road network. Where an access is required to a local government road, proponents will need to seek local government approval for access works.

Principle 6: Development proponents are responsible for all works required to connect out of sequence development to the current and future SCR network while not compromising the implementation of planned transport infrastructure.

Transport and Main Roads has little control over the type, location and timing of development and given budgetary restraints, focuses its investment program on regional priorities rather than supporting individual projects.

Proponents of development that is out-of-sequence or unanticipated are responsible for all infrastructure required to connect to the SCR network. Out-of-sequence development must also plan for and take into account planned transport infrastructure identified in planning studies that may not yet be committed for construction.

Favourable consideration will be given to development proposals consistent with state and departmental approved planning, as outlined in local planning schemes or a Regional Plan or infrastructure plans such as the *State Infrastructure Plan* and QTRIP.

> Under the Department of Transport and Main Roads' *Approved Planning Policy*, 'approved planning' refers to gazetted future state-controlled roads and planned upgrades that have been subject to public consultation and that may be funded is publicly assessable.
>
> The State Development Assessment Provisions (SDAP) is supported by the Development Assessment Mapping System (DAMS), which spatially maps all future state-controlled roads and planned upgrades. DAMS can be accessed at:
>
> https://planning.dilgp.qld.gov.au/maps

6.2 Mitigation hierarchy

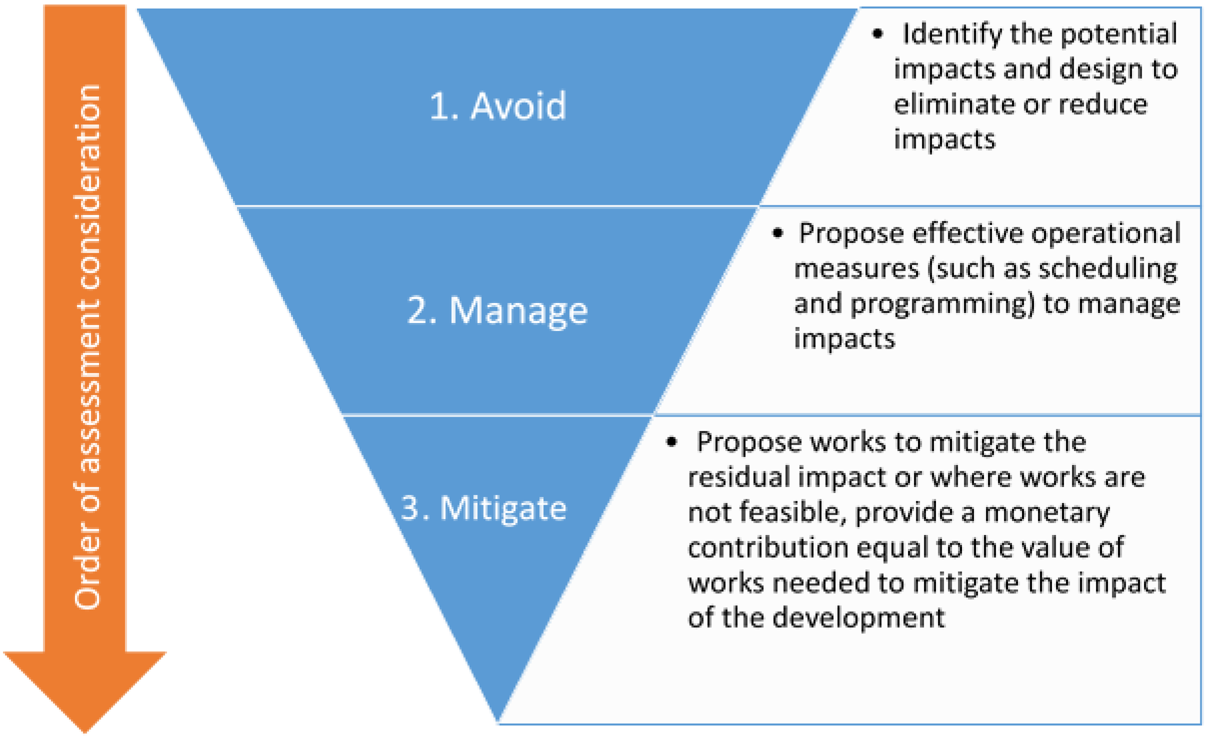
The mitigation hierarchy as defined in Principle 3 prioritises development strategies that avoid or reduce worsening of the SCR network as a result of the impacts of development traffic.

If impacts cannot be avoided and options to reduce impacts have been exhausted, then strategies should be developed to specifically manage the impacts to maintain the existing characteristics of the road transport network.

Finally, if avoidance, reduction and management cannot prevent worsening of the characteristics of the SCR network, then strategies (including programs and works) and / or monetary contributions to programs or works should be identified and implemented to mitigate the impacts of a proposed development so that the existing characteristics of the network are maintained.

Figure 6.2 illustrates the preferred mitigation hierarchy for dealing with traffic impacts of development, which is outlined in further detail in the following sections.

Figure 6.2 – Mitigation framework



6.2.1 Avoid

The first step in the impact mitigation process is to identify ways to avoid or reduce negative impacts at the early stages of development planning and design. The potential to avoid or reduce impacts will depend on the nature of the development, its location, size and other factors. Some examples of impact avoidance and reduction measures include:

- undertaking a road safety audit and pavement investigation survey at the design stage to identify avoidable issues
- making development land use changes – for example, modifying the development's land uses to those with lower parking requirements to encourage fewer private car trips
- designing development which complements surrounding land uses such that the site traffic generation is reduced with higher walking and cycling usage
- providing a better mix of complementary uses in developments to encourage increased internal travel
- encouraging public transport usage – development sites located within high frequency public transport catchments[1] might propose reduced parking rates (subject to local government requirements) to encourage public transport usage
- encouraging active transport use – through on-site facilities (for example, bike parking and end-of-trip facilities), and

[1] A high-frequency public transport catchment means an area serviced by public transport at an all-day service frequency of at least four services per hour (headway of 15 minutes).

- implementing travel demand management strategies such as travel plans that generate relevant actions with measureable and achievable outcomes for minimising the negative impacts of travel on the environment. Travel plans generally aim to reduce the number of private vehicle trips. A typical plan describes ways in which the use of sustainable transport can be encouraged by the development. This includes promoting public transport usage, cycling, walking, working from home, car share schemes and so on. These are most likely to be useful in built-up areas. If a travel plan is used to justify a reduction in traffic generation, the actions in the plan need to be definitive, measurable, and accountable. The Department of Transport and Main Roads, in its absolute discretion, can determine if a travel plan proposal can be enforceable over a reasonable period into the future and whether it can therefore be quantifiably used as part of an impact mitigation strategy.

For a major development project, measures could include:

- undertaking a high-level road safety review of the likely transport / supply road network that will be used for its construction and operational phases to select the route with least potential impacts, and
- preparing a logistics plan to minimise road transport associated with project construction and operation.

It is acknowledged that some avoidance measures are likely to be more effective with smaller urban development. In some areas, it may not be possible to avoid or reduce traffic impacts.

Avoidance and reduction measures should be clearly justified and identify what methods will be established to monitor their implementation and effectiveness and what actions may be required if the level of impact avoidance or reduction is not achieved.

6.2.2 Manage

Where avoiding or reducing all traffic impacts is not possible, impact management strategies may be appropriate in order to lessen any adverse impacts of the proposed development. Impact management measures include a variety of mostly non-physical changes to traffic operations within an impact assessment area. Examples of measures for managing the impacts may include:

- restricting traffic movements at access locations and other intersections
- limiting site access to lower order roads
- limiting the type and number of driveways along road links.

These measures must be justified in the traffic impact assessment, demonstrating they are measurable and auditable to ensure compliance and identify possible substitute strategies if they are unable to be met.

6.2.3 Mitigate

If assessed traffic impacts of a proposed development cannot be entirely avoided or managed, then works may be required to mitigate the impacts of the proposed development. If works cannot mitigate development impacts, then at the discretion of Transport and Main Roads, a monetary contribution equal to the value of works may be acceptable in lieu of works.

6.3 Impact types and mitigation works types

Where identified impacts cannot be suitably avoided or managed, then works may be required to mitigate the impacts. In cases where works are not possible or practical, contributions to the equivalent value of the works should be provided as described in Section 6.3.1.

Examples of the types of impacts generated and the associated types of works to mitigate these impacts are outlined in Table 6.3.

Table 6.3 – Impact type and mitigation works type

Impact type	Mitigation works type
Road safety	**Infrastructure works**: intersection upgrades, road corridor improvements (for example, guardrails, lane widening, foliage removal, and so on)
Access and frontage	**Frontage works**: potentially including access intersection works, kerb and channel, footpaths / cycle ways, stormwater infrastructure, bus stop relocation or provision and so on
Intersection delay	**Infrastructure works**: intersection upgrades and / or new intersections
Road link capacity	**Infrastructure works**: road widening or new roads or contributions to road widening or new roads
Pavement	**Infrastructure works**: pre and post condition surveys, contribution to pavement reconstruction, or rehabilitation works
Transport infrastructure	**Infrastructure works**: bridge or culvert upgrades and / or new bridges or culverts

Frontage works are works required solely due to the development and include both works on the frontage side of the development and potentially on the opposite side of the road as well. Frontage works include, but are not limited to, the construction of paved footpaths or shared paths (depending on the prevailing standards or requirement in the local cycleway strategy), kerbs and gutters, road pavement, drainage works, access intersection or access driveway works and any bus stop relocations required.

For major development projects such as gas pipeline infrastructure, frontage works would include, for example, temporary and permanent access points for construction and maintenance from public roads to the pipeline.

Infrastructure works are works required to mitigate safety impacts, delay impacts on other vehicles at intersections or to mitigate the impact of usage on infrastructure capacity. The objective of infrastructure works is to ensure no worsening so that the ‘with development’ conditions in the impact assessment year are neutralised to an extent that they are at the same level as the base case without the development in the impact assessment year. Infrastructure works can include (where considered appropriate) the provision of new, or upgrading to existing public or active transport infrastructure in the area.

For major development projects such as a mine, infrastructure works could include, for example, lengthening a turn-lane into a lower order road to allow project traffic volumes to be safely catered for during peak periods.

Frontage and infrastructure works need to be consistent with Transport and Main Roads design and construction standards, and with departmental planning and intentions in the locations where they are proposed.

6.3.1 Monetary contributions

If works alone are not sufficient to offset the impacts of traffic generated by the development, or if it is not feasible to construct the works, a monetary contribution to Transport and Main Roads may be an appropriate alternative mitigation strategy. Proposing a monetary contribution in lieu of works should only be considered where all reasonable attempts to identify reasonable mitigation works that are acceptable to the department have been exhausted.

The monetary value of the contribution is the construction value of the identified mitigation works at the year when the mitigation works are needed. Reasonable and equitable impact mitigation is the primary consideration for providing monetary contributions.

A monetary contribution that is collected by the department will be retained until sufficient funding can allow for the proposed infrastructure upgrade to proceed.

Subject to agreement by all parties, however, a monetary contribution can allow for impacts in one area to be offset by mitigation measures in a nearby area within the same impact assessment area or broader local government area, such that the community benefits provided are at least equal to the impacts generated.

However, any safety impacts from the development must be addressed at the impacted location.

Monetary contributions can also allow for mitigating impacts on one mode of transport to be offset by improvements in another mode of transport. Alternatively, if the department has plans for road widening that requires land within the development site, a proportion of the monetary contribution could be used for transfer of land for these purposes.

> If a monetary contribution is insufficient to fully fund development-specific infrastructure or programs at the impacted location, subject to agreement by the proponent and the department, the money may be used on the highest priority transport project (aligned to QTRIP or the planned upgrades in the defined geographic catchment)[2]. This is preferred over allocating the money to a particular transport project (specific to the development), which is unfunded or not programmed for construction by Transport and Main Roads.

Transport and Main Roads maintains a developer contribution register and a monetary contributions account for each local departmental district area, where monetary contributions by developers to compensate for the impacts generated by their development are held.

A monetary contribution amount is a condition of approval and should be paid prior to commencement of the development use.

[2] A geographic catchment is the local government area within which the proposed development will be located. For larger projects, where impacts are spread across local government boundaries, the geographic catchment will coincide with the larger impact area.

6.4 Impact assessment area

The extent of the impacts of development traffic on other users and on infrastructure can range from being localised to quite dispersed, depending on the size of the development and its catchment relative to the base traffic conditions. For practical reasons, a boundary needs to be defined within which to assess a reasonable level of impact of this additional development traffic. This boundary is the impact assessment area. The impact assessment area does not necessarily define where impacts will be but defines the extent of the intersections and links in the network surrounding the development that need to be assessed.

The impact assessment area varies for each impact type, and has been defined as outlined in Table 6.4.

Table 6.4 – Impact assessment area by impact type

Impact type	Impact assessment area
Road safety	All intersections where the development traffic exceeds 5% of the base traffic for any movement in the design peak periods[3] in the year of opening of each stage All road links where the development traffic exceeds 5% of the base traffic in either direction on the link in the design peak periods[3] in the year of opening of each stage
Access and frontage	The SCR corridor for the extent of the geometric frontage of the site, includes works on both the frontage side and potentially on the opposite side of the road
Intersection delay	All intersections where the development traffic exceeds 5% of the base traffic for any movement in the design peak periods[3] in the year of opening of each stage
Road link capacity	All road links where the development traffic exceeds 5% of the base traffic in either direction on the link's annual average daily traffic (AADT) in the year of opening of each stage
Pavement	All road links where the development standard axle repetitions (SARs) exceeds 5% of the base traffic in either direction on the link's SARs in the year of opening of each stage; the method for calculation of SARs is outlined in Section 13.3
Transport infrastructure	All road links where the development traffic exceeds 5% of the base traffic in either direction on the link's AADT in the year of opening of each stage, or where Transport and Main Roads identifies prevailing structural integrity issues of transport infrastructure (for example, bridges or culverts)

In addition, it is noted that, owing to the existing state of the network, there may be exceptional circumstances where an intersection or road link with development traffic less than 5% of base traffic would warrant inclusion within the impact assessment area. Examples of where an exception may be appropriate include:

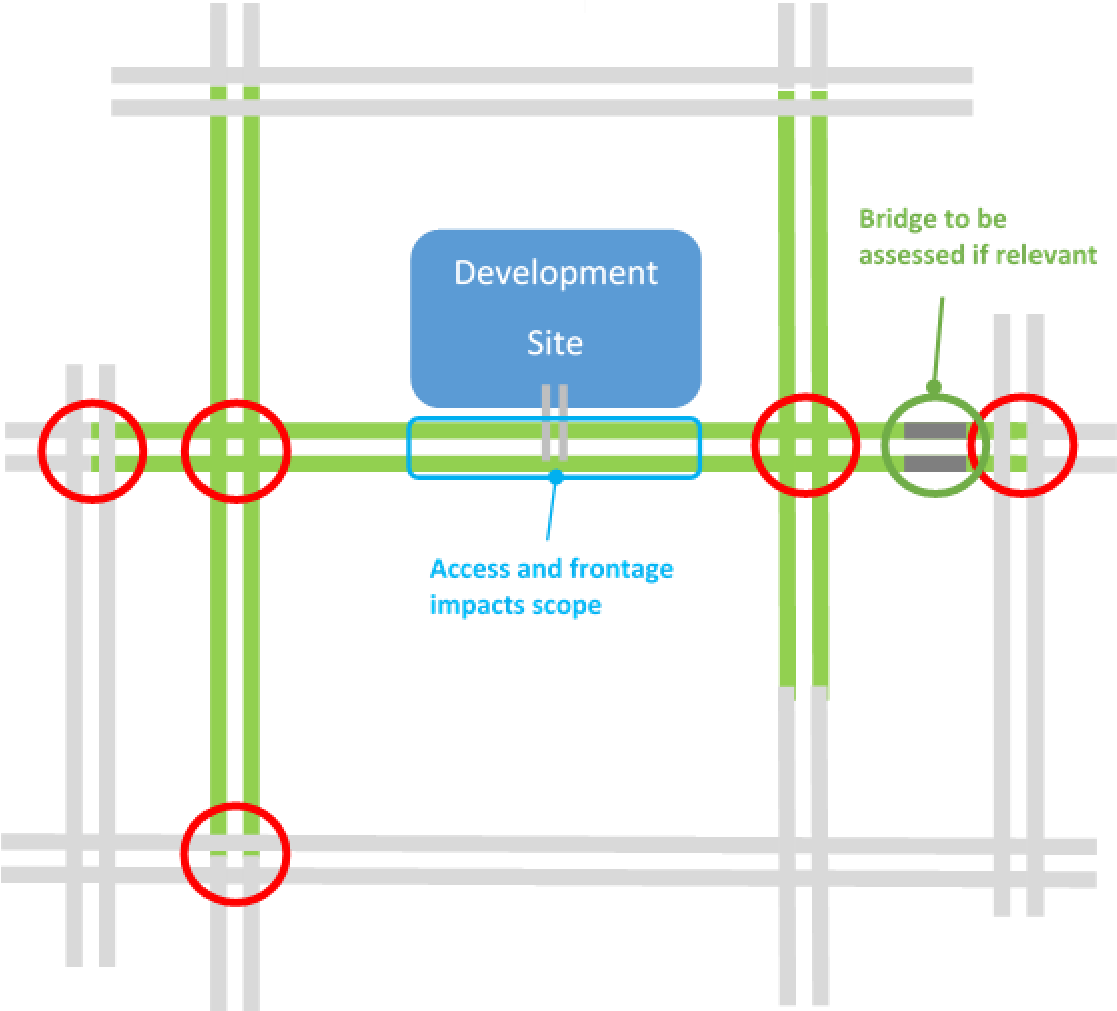
- an existing or potential safety or traffic issue that will be exacerbated
- where generated traffic applies to one turning movement

[3]Guidance on the selection of the design peak periods is provided in Part D.

- developments that will generate a different type of traffic that may require geometric improvements (for example, heavy vehicles, road trains).

Figure 6.4 provides a spatial representation of impact assessment areas by impact type.

Figure 6.4 – Spatial representation of impact types and impact assessment scope



Note: The impact assessment areas for each impact type may have different geographical coverages.

6.4.1 Local government intersections

It is recommended that local government intersections be included in the impact assessment area if triggered; however, no net worsening calculations on intersection delay for these intersections should only apply to intersections with at least one state-controlled road approach, unless advised otherwise by the relevant local government. Local government may choose to assess the impacts on its intersections and networks using an alternative methodology.

6.4.2 Construction impact assessment area

There may also be a need for a construction period assessment where, for example, heavy vehicle activity is significant. If so, the impact assessment area for this assessment is to be determined using the same criteria as outlined in Table 6.4. This area might be quite different from that needed for the operational period assessment.

6.5 Impact assessment year

The impact assessment year is the year at which the impacts of the development are assessed. The impact assessment year (as outlined in Table 6.5) varies by impact type because the effects of development can be quite different on infrastructure than they are on other users. Furthermore, some major developments, such as mines and large industrial developments, will have impacts in the construction period and will therefore have a construction-based impact assessment year(s) and operational assessment-based impact assessment year(s).

For staged developments the construction impact assessment year(s) and operational impact assessment year(s) may be the same as both types of traffic are generated by the development at the same time (for example, Stage 1 operational while Stage 2 being constructed).

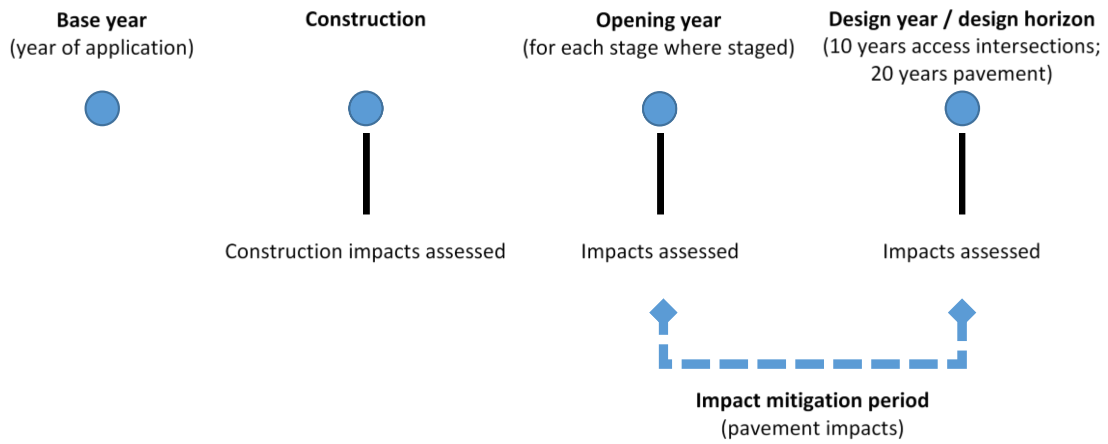
A visual representation of the impact assessment year and the relationship with other temporal milestones and their terminology is outlined in Figure 6.5. Table 6.5 summarises the impact assessment years to be used when assessing each type of impact.

The impact mitigation period is the period of time after the opening year for which the development's impacts and mitigation measures are the responsibility of the development. The standard impact assessment period is 20 years. The impact mitigation period only has application to pavement impacts that are assessed beyond opening of the final stage.

Table 6.5 – Impact assessment year by impact

Impact type	Impact assessment year(s)
Road safety	Year of opening of each stage including the final stage
Access and frontage	Year of opening of each stage including the final stage and 10 years after the year of opening of the final stage for access intersections (includes both new and amended accesses)
Intersection delay	Year of opening of each stage including the final stage
Road link capacity	Year of opening of each stage including the final stage
Pavement	Year of opening of each stage including the final stage Note that mitigation of pavement impacts occurs for a period of 20 years after the opening of the final stage
Transport infrastructure	Year of opening of each stage including the final stage.

Figure 6.5 – Visual representation of temporal aspects of impact assessment and mitigation



7 Traffic impact assessment contents and process

7.1 Overview

Any development will introduce impacts on the surrounding transport network. A traffic impact assessment documents the impacts a development proposal is likely to have on both the SCR network operation and on transport infrastructure, and recommends measures to avoid, manage and mitigate these impacts. The scope of a traffic impact assessment will depend on the location, type and scale of the development and the conditions of the road network expected at the impact assessment year. It should take into account relevant transport plans, traffic management strategies, strategic plans, planning policies and local development plans.

The preparation of a traffic impact assessment and proposed mitigation strategies should consider state government objectives for encouraging mode shift to more sustainable forms of transportation including active transport and public transport.

> Increasingly, in constrained urban environments, it is neither feasible nor desirable to provide improved road capacity at a rate that would satisfy ever-increasing demand. In addition, increasing motorised vehicle use can lead to deterioration in air quality, greenhouse gas emissions, noise and amenity. Accordingly, travel demand management and sustainable transport solutions should be given priority over simply using traffic-based ‘predict and provide’ methodologies. Travel demand management and sustainable transport can not only aid with reducing congestion growth, but can bring about health and social benefits as well as improved environmental outcomes.

7.2 Considerations when preparing a traffic impact assessment

In preparing a traffic impact assessment, proponents should consider the following:

- development scale, layout and type, including land use components
- proximity to a SCR (refer to Development Assessment mapping)

> The State Development Assessment Provisions (SDAP) is supported by the Development Assessment Mapping System (DAMS). DAMS can be accessed at:
>
> https://planning.dilgp.qld.gov.au/maps

- state transport planning including projects in the area identified in the State Infrastructure Plan, QTRIP or any other planned upgrades to transport infrastructure for the area

> The Queensland Transport and Roads Investment Program (QTRIP) can be accessed at:
>
> http://www.tmr.qld.gov.au/About-us/Corporate-information/Publications/Queensland-Transport-and-Roads-Investment-Program.aspx.
>
> The State Infrastructure Plan can be accessed at:
>
> http://www.dilgp.qld.gov.au/infrastructure/state-infrastructure-plan.html

- regional planning and land use context within which the site is located
- local government transport and infrastructure planning or strategies
- state land requirements
- information on existing or potential safety and traffic problems on the roads serving the proposed development (considerations may include: crash history, complex intersection geometry, roads operating at or close to capacity, intersection turn warrants, intersection lighting adequacy, vehicle swept paths and pavement condition)
- information on the expected increase in traffic generated (including any expected increase in the proportion of heavy vehicle traffic), changes to trip patterns and modal split, and the impact on current or projected operational characteristics of roads including safety, delays, queues, degree of saturation, turning movements, travel patterns and transport infrastructure
- impacts resulting from situations where traffic from other existing or proposed adjacent developments is likely to compound traffic impacts (for example, by increasing or complicating traffic demands due to the locations of existing and proposed driveways/intersections)
- impacts by accesses, frontage modifications and development generated traffic on pedestrians, cyclists, public transport users, vision and physically impaired people and on service vehicle accessibility
- impacts from developments that will generate a different type of traffic (for example, heavy vehicles, buses, road trains) that may require geometric improvements or cause damage to an existing pavement, bridge or culvert

- impact on the SCR network including potential queuing problems where a development is in proximity to a railway level crossing on a side road.

The Austroads *Guide to Traffic Management* Part 12: *Traffic Impacts of Developments* (2016) provides general guidance on traffic impact assessment considerations. Austroads' *Guide to Traffic Management* is available at:

http://www.austroads.com.au

7.3 Who prepares a traffic impact assessment?

Preparation of a traffic impact assessment constitutes a professional engineering service as defined under the *Professional Engineers Act 2002*. It must therefore be undertaken by, or under the direct supervision of, a Registered Professional Engineer in Queensland (RPEQ) in the same area of engineering expertise as that of the impact or infrastructure being assessed.

Despite the involvement of various disciplines in investigation, assessment and documentation, the determination of impacts on the transport network operation and on transport infrastructure and identification of impact mitigation strategies are matters that require relevant engineering expertise and experience.

Traffic impact assessments submitted to Transport and Main Roads for review must be certified and executed by a RPEQ in accordance with the requirements set out in Appendix B.

7.4 Traffic impact assessment contents checklist

The scope of a traffic impact assessment is likely to be significantly affected by a development's location, type, staging, scale and the ability of the receiving road network to handle traffic generated by the development; for example, the scope of a traffic impact assessment for a small industrial project might focus on SCR access issues, whereas a traffic impact assessment for a major shopping centre or a mining project expected to generate significant heavy commercial vehicle and other traffic during their construction and operational stages, will need a much broader focus. Table 7.4 provides a checklist of items that are recommended for inclusion in a traffic impact assessment.

The chapter headings in the checklist are expected to be common for all traffic impact assessments; however, the contents within each chapter are a guide only and their inclusion will depend on the scale and nature of the development as well as the surrounding land use, traffic and transport conditions.

Table 7.4 – Traffic impact assessment items checklist

Item	✓ or ✗
1. Introduction	
Background	
Scope and study area	
Pre-lodgement meeting notes	
2. Existing Conditions	
Land use and zoning	
Adjacent land uses / approvals	

Item	**✓ or ✗**
Surrounding road network details	
Traffic volumes	
Intersection and network performance	
Road safety issues	
Site access	
Public transport (if applicable)	
Active transport (if applicable)	
Parking (if applicable)	
Pavement (if applicable)	
Transport infrastructure (if applicable)	
3. Proposed Development Details	
Development site plan	
Operational details (including year of opening of each stage and any relevant catchment/market analysis)	
Proposed access and parking	
4. Development Traffic	
Traffic generation (by development stage if relevant and considering light and heavy vehicle trips)	
Trip distribution	
Development traffic volumes on the network	
5. Impact Assessment and Mitigation	
With and without development traffic volumes	
Construction traffic impact assessment and mitigation (if applicable)	
Road safety impact assessment and mitigation	
Access and frontage impact assessment and mitigation	
Intersection delay impact assessment and mitigation	
Road link capacity assessment and mitigation	
Pavement impact assessment and mitigation	
Transport infrastructure impact assessment and mitigation	
Other impacts assessment relevant to the specific development type / location (if applicable)	
6. Conclusions and Recommendations	
Summary of impacts and mitigation measures proposed	
Certification statement and authorisation	

A development may also create impacts on a SCR in the vicinity of the site and in particular where the site accesses the SCR network. This could include, for example, impacts from filling and excavation, stormwater and drainage, or amenity impacts from transport generated emissions. Further guidance on these impacts of development can be found in SDAP, available at:

http://www.dilgp.qld.gov.au/planning/development-assessment/state-development-assessment-provisions.html

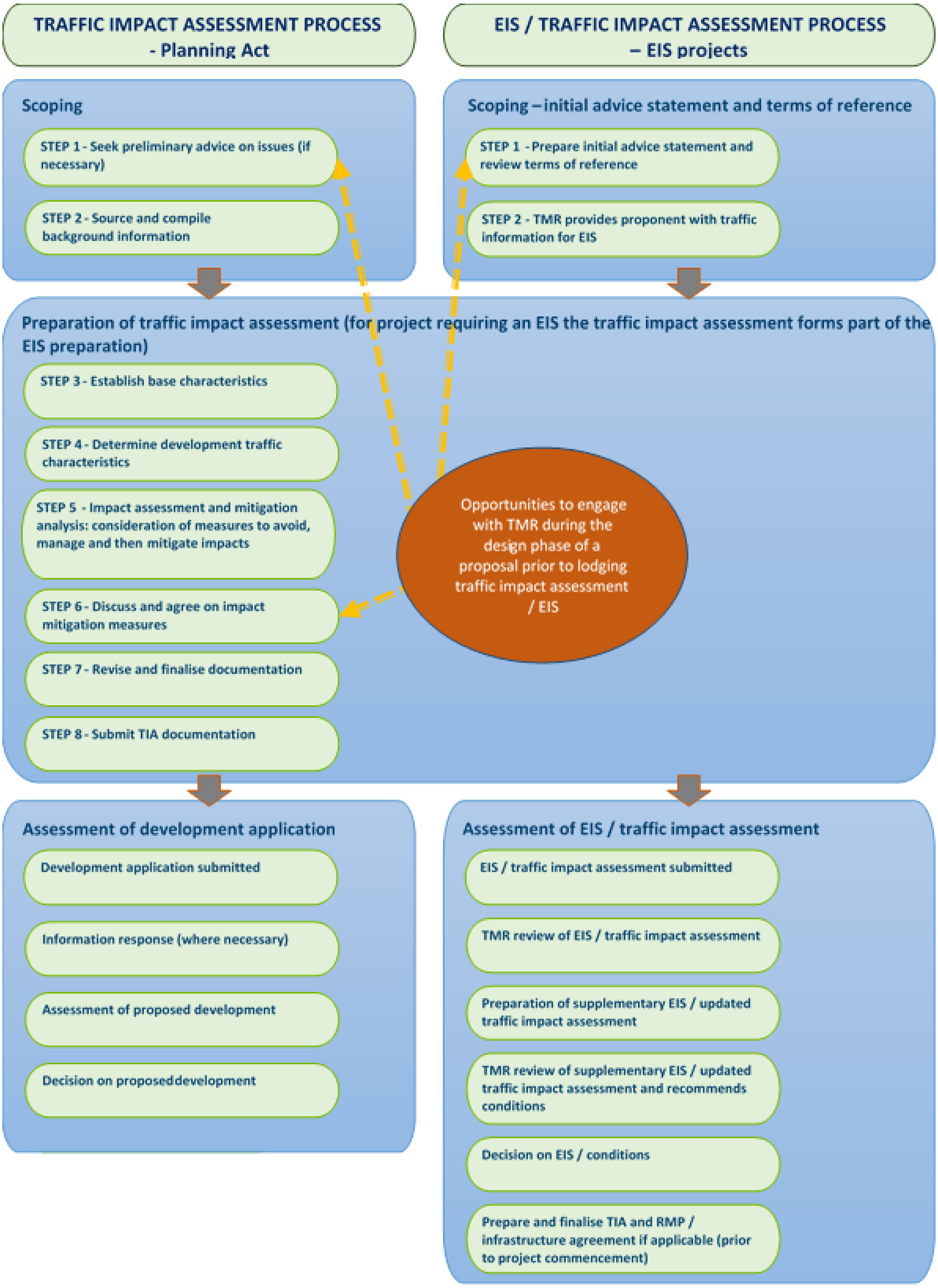
7.5 Overall traffic impact assessment process

7.5.1 Process flowchart

Figure 7.5.1 demonstrates a typical process for the preparation of a traffic impact assessment to accompany an application for development. The methodology suggested for each step is detailed following the Figure. The steps vary according to whether the development is under the *Planning Act 2016* or subject to an EIS. Section 7.6 describes additional requirements or differences for major development projects.

Proponents of major development projects are often required to prepare a traffic impact assessment as part of an EIS. This requires proponents to estimate traffic generation, identify routes proposed to be used, assess potential impacts and recommend impact mitigation strategies. ‘Soft’ strategies such as road use management strategies may avoid or manage potential impacts, whereas ‘hard’ or infrastructure-based strategies such as estimated pavement contributions may effectively mitigate other impacts. Proponents are required to provide best estimates of traffic generation in traffic impact assessments, along with the assumptions on which they are based. These draft traffic impact assessments are required before the EIS assessment report is prepared and may be finalised when project contractors are appointed and final traffic generation is clearer. Refer to Section 7.6 which provides further information about preparation of traffic impact assessments and development of road-use management plans for major development projects.

Figure 7.5.1 – Typical traffic impact assessment process for Planning Act developments and EIS developments



Step 1 – Seek preliminary advice

The department's regional offices can provide assistance with refining the scope for a traffic impact assessment, including advice and information on road condition, traffic volumes and future road plans near the site, which should be used in preparing a traffic impact assessment. When preparing a traffic impact assessment, Transport and Main Roads strongly recommends seeking advice from the relevant local departmental office during the scoping phase.

> For a development under the *Planning Act 2016*, a pre-lodgement meeting should be arranged with SARA in the first instance. Information on SARA's regional offices can be obtained from **13QGOV** (13 74 68) or at:
>
> http://www.dilgp.qld.gov.au/contact-us-dilgp/#regional-offices

> Transport and Main Roads has a number of regional offices across Queensland. To find the departmental office relevant to your proposal, call **13QGOV** (13 74 68) or check the regional contacts on the department's website:
>
> http://www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.aspx

Step 2 – Source and compile required information

This stage involves collecting and collating information required to undertake the traffic impact assessment. Discussion with Transport and Main Roads officers is recommended in order to determine available information that the department may be able to share as part of the traffic impact assessment. Typical information required is detailed in the following list.

Recommended input / information comprises:

- local government / state policies and strategies potentially influencing the site
- surrounding road configurations and access policies (existing and proposed)
- development plans (including GFA, access locations and configuration, parking layout and so on)
- development construction timeframes, staging and opening year(s)
- proposed site operations details and markets / catchments if relevant
- peak day and peak periods determination
- traffic count data (by assessment year and both peak and daily data, including heavy vehicle volumes where relevant)
- crash data
- standard axle repetition (SARs) data and existing pavement condition and structural data (if applicable)
- parking facilities and arrangements potentially influencing the SCR (if applicable)
- haulage route information (if applicable)

- pedestrian / bicycle facilities (existing and proposed) (if applicable), and
- public transport network and services (existing and proposed) (if applicable).

Step 3 – Establish base characteristics

The background traffic and transport conditions should consider existing traffic, public transport, walking and cycling, parking, pavement and transport infrastructure elements within each impact assessment area.

Elements to consider should include, but are not limited to:

- site location in its transport and land use context
- road network structure, road hierarchy, access limitations
- existing daily and peak hour traffic volumes for relevant vehicle types
  - this will usually be the morning and afternoon weekday commuter peaks although other periods may need to be considered depending on the development type and location (for example, Thursday night shopping, Saturday morning sports, special events, holidays, school peaks for development near schools and so on). In rural and regional areas and in tourist areas, seasonal traffic effects (for example, harvest periods) should also be considered where they vary significantly from average day peak traffic conditions. *Appendix A: Schedule of preferred input parameters* provides further guidance on these aspects.
- existing intersection operational performance
- existing road safety issues and risks
- existing cycling and pedestrian network and facilities (if relevant)
- existing infrastructure condition of potentially affected infrastructure (bridges, pavements and so on – if relevant)
- existing public transport network and services provision at the times when the development generates its peak demand (if relevant).

Step 4 – Determine development traffic characteristics

This step includes estimating the number of vehicle trips by type (including heavy vehicles) that the proposed development is likely to generate. Both the peak activity time of the development and of the adjacent road network should be considered. Daily traffic generation for an average day also needs to be determined for safety, road capacity, pavement and structural integrity assessments as relevant.

If any discounting is applied to conventional traffic generation rates, then the justification for these discounts should be clearly documented in this section of the report. Any discount factors need to be supported by survey data or references to relevant research.

The assessment should also identify and justify the traffic distribution and route choice assumptions of the development-generated traffic.

Appendix A: Schedule of preferred input parameters provides further guidance on these aspects.

Finally, the impact assessment areas and impact assessment years need to be determined for each relevant impact type in accordance with sections 6.4 and 6.5.

Step 5 – Impact assessment and mitigation analysis

Each impact type is to be assessed using the methodologies described in the subsequent sections of this *Guide*. Where impacts are identified and unable to be avoided or managed, mitigation measures are to be developed and assessed to demonstrate how they achieve no worsening and no net worsening principles.

In accordance with the mitigation hierarchy outlined in Section 6.2, this process is to commence with the identification of measures to avoid impacts. Where avoidance impacts can be identified, there may be a need to modify the traffic generation from Step 4. The process should then identify management measures to reduce traffic related impacts on the road system external to the development. Finally, the process would involve the identification and assessment of impact mitigation measures, such as infrastructure works. The consideration of the mitigation hierarchy should be documented in the traffic impact assessment.

Concept design plans of proposed upgrade works may be required in order to sufficiently demonstrate that the works can be constructed without the need to relax ordinary design standards and to provide sufficient confidence on property and utilities impacts.

For intersection delay impacts in some cases, reasonable measures to achieve no net worsening may not be possible or desirable in the location that the impact is generated, or in nearby locations in the impact assessment area, as reasonably determined by the department. In these instances, monetary contributions to the value of the impact mitigation works may be provided as an alternative.

Step 6 – Discuss and agree on impact mitigation measures

At this stage, depending on the scale and location of the development, the nature of the draft proposed mitigation measures and the legislation under which the application is being assessed, it would be prudent to consult with Transport and Main Roads to determine what measures are feasible, implementable and consistent with the department's transport planning.

For an EIS project, consultation can be organised by contacting Transport and Main Roads' regional office. If, however, the traffic impact assessment is related to a development that is a development under the *Planning Act 2016*, then consultation will be considered a pre-lodgement meeting and should be made by contacting the state department overseeing the approval processes for Planning Act applications. A meeting record should be completed at the meeting and may be submitted as part of the traffic impact assessment.

For a development under the *Planning Act 2016*, a pre-lodgement meeting should be arranged with SARA in the first instance. Information on SARA's regional offices can be obtained from **13QGOV** (13 74 68) or at:

http://www.dilgp.qld.gov.au/contact-us-dilgp/#regional-offices

For an EIS project, consultation should be arranged with the assessment manager, whether the Department of State Development or the Department of Environment and Heritage Protection, at:

www.statedevelopment.qld.gov.au/contact-us/
https://www.ehp.qld.gov.au/contactus/

> It is the department's preference that developers mitigate impacts in the location where the impacts are created. In previous versions of GARID where these works (typically intersection works) were either not possible or not desirable, the impacts remained unmitigated or the development was refused. Under a no net worsening principle, the introduction of monetary contributions to the value of the mitigation works is a mechanism designed to improve equity in mitigation responsibilities across all development regardless of when the development is applied for in the infrastructure provision cycle.

Step 7 – Revise and finalise documentation

The traffic impact assessment report should be prepared as a stand-alone compilation of all relevant material sourced and assessed to determine the traffic impacts that a development proposal is likely or projected to have on the SCR network. It should clearly identify any impact mitigation proposals or associated monetary contributions to the value of the impact mitigation proposals.

Complex or substantial mitigation strategies (especially infrastructure works) may require an infrastructure agreement and / or a works schedule.

The department accepts that mitigation proposals for larger EIS projects are best estimates and subject to review once construction contractors are appointed, traffic generation and traffic impact assessments are finalised before commencement of construction.

Step 8 – Submit traffic impact assessment documentation

The traffic impact assessment report will usually be submitted as part of an application for development approval made under the *Planning Act 2016* for which the assessment manager will be the relevant local government, and SARA the concurrence agency. Generally, applications requiring a traffic impact assessment will also be triggered to SARA for assessment of impacts on the SCR network.

There are also some situations where a traffic impact assessment is submitted to the department for assessment outside the statutory process of the *Planning Act 2016*.

If traffic models have been developed during the analysis, all electronic models and associated data are to be suitably documented and submitted with the traffic impact assessment report.

7.6 Additional requirements for major developments

7.6.1 Managing impacts via road-use management strategies

In addition to identifying impact mitigation measures in a traffic impact assessment for all applications, major developments must generally submit a road-use management plan (RMP). The purpose of the RMP is to detail how road impacts of project traffic, particularly from heavy vehicle use, will be avoided or managed during the life of the project using road-use management strategies that are verifiable. Specifically, the RMP should:

- summarise updated project traffic information on which the updated road impact assessment and proposed mitigation strategies are based
- briefly list roles and responsibilities for RMP implementation, and
- detail finalised impact mitigation strategies, focusing on controls-based or road-use management strategies. Road-use management strategies include use of variable message

signs; use of shuttle buses to transport workers; avoiding peak hour traffic, especially near schools / bus routes; fatigue management strategies; and so on, whereas infrastructure strategies include contributing to maintenance or upgrading an intersection, as required. Preparing a table of RMP commitments helps summarise and ensure these strategies are implemented.

Transport and Main Roads' *Guideline for preparing a Road-use Management Plan* and the *Traffic and Road Use Management Manual* should be used for guidance and as a source of reference for preparing a RMP. A RMP should be developed in consultation with the relevant department officers, to ensure management measures to minimise the potential impacts on the SCR network are implemented and mechanisms are in place to manage these impacts into the future.

> The draft *Guideline for preparing a Road use Management Plan* (RMP) is available by emailing:
>
> mdp@tmr.qld.gov.au
>
> The *Traffic and Road Use Management Manual* is available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx

7.6.2 Timing for preparation of traffic impact assessments and road-use management plans for larger EIS projects

Under the EIS process, a proponent is generally required to prepare a draft traffic impact assessment based on best traffic estimates at that stage. The traffic impact assessment must document traffic estimate assumptions including traffic generation numbers, vehicle types / volumes for construction and operational phases, inputs and outputs and routes proposed. It must also assess potential impacts of that traffic and propose impact mitigation strategies where impact avoidance techniques are not adequate. Impact mitigation may take two forms:

- 'soft' mitigation strategies such as road-use management strategies, and
- 'hard' or infrastructure strategies.

In some cases, a contribution towards mitigating impacts may be acceptable as outlined in the impact mitigation measures advice in sections 9 to 14 of this *Guide*.

8 Calculating development traffic

8.1 Peak hours and days for assessment

8.1.1 Design peak periods for turn movement assessments

Peak period data is used to define the coverage of the intersection delay and safety impact assessment areas and then used in the intersection or network analysis models which are based on the peak hours.

The appropriate peak periods to use for intersection and access assessments should reflect the combined effects of the development peak traffic and the road peak traffic in providing the worst case of intersection movement patterns for intersection analysis. For some development types, such as offices, this will typically relate to the conventional commuter peak hours. For shopping centres in some areas, this may also require the Saturday midday peak to be assessed. Restaurants, bars and fast food outlets may only require evening commuter peak assessments, whereas hardware and trade supplies have peaks towards late morning. For mining projects, peak periods are likely to be at shift changes. Each development will therefore require documentation within the traffic impact assessment of the reasoning for the peak hours selected for assessment.

Appendix A: Schedule of preferred input parameters provides guidance on how to select appropriate peak periods for the development under consideration.

8.1.2 Design day definition for road link volume assessments

Road link volumes are used for the definition of the coverage of the safety, road link capacity, pavement and transport infrastructure assessment areas.

While it may be desirable to assess the design day for traffic at the 85th percentile (or some other percentile) over a year as a design case, most developments do not have reliable data relating to the likely visitation profile for each day across the year. In addition, permanent traffic count data on surrounding roads can be sparse and rarely available near development sites for determination of a certain busiest day in the year. On this basis, it is recommended that design day(s) be determined from any typical weekday or weekend day traffic count data (available within the last three years or, preferably, recently collected for the traffic impact assessment), as relevant for the development being considered.

Appendix A: Schedule of preferred input parameters provides guidance on how to select appropriate periods for the development under consideration.

8.2 Peak and daily development traffic generation rates

8.2.1 Determining peak and daily traffic generation rates

The level of detail and quality of data sources available for traffic generation estimation varies significantly depending on land use type and location.

The preferred hierarchy of data sources for traffic generation rates is:

1. traffic generation survey of an existing development similar to the proposed development in terms of its land use, scale, location and so on
2. traffic generation data – 2006–2017 (Queensland) Open Data
3. *Guide to Traffic Generating Developments Updated traffic surveys*, RMS (2013)
4. *Guide to Traffic Generating Developments*, RTA (2002)
5. NZ Trips Database Bureau, 2010 – contains survey data and characteristics of each site providing detailed trip information and characteristics for over 700 sites from 1983 to 2011
6. first principles assessment preferably based on forecast usage data
7. *Trip Generation Manual*, 9th edition, ITE 2012 – US database and may need to be modified to suit Australian conditions.

The use of locally derived traffic generation rates is generally preferred to using rates generated elsewhere. Care should be taken to ensure that the land use area metric upon which the traffic generation rate has been developed is the same as the basis for applying the rate to the development site. Particular care should be taken in considering the spatial definitions of gross floor area (GFA), gross leasable floor area (GLFA) and total use area (TUA). Care should also be taken to ensure that any survey-based rates used account for the seasonal and locational effects of the specific development and location under consideration.

Appendix A: Schedule of preferred input parameters provides some further guidance on estimating traffic generation.

8.2.2 In / out directional splits

Most of the traffic generation rate references listed in Section 8.2.1 provide a total two-way traffic generation rate. Peak hour development-generated traffic volumes need to be split into entry (IN) and exit (OUT) volumes for assignment of this traffic to the access intersection and to the surrounding road network. Directional splits vary by type of land use and by peak hour being considered; for example, offices and residences have highly directional in / out splits in peak hours whereas high turnover uses such as convenience shopping, service stations, child care centres and so on have splits close to 50% in and 50% out in peak hours.

Appendix A: Schedule of preferred input parameters provides some further guidance on the development of these inputs.

8.2.3 Traffic generation discounts

In some instances, the traffic generation of a particular development may be less than a suggested standard-rate. These instances include where:

- specific measures introduced by the development to avoid or manage development traffic demand in accordance with Section 6.2 of this *Guide*
- justifiably high levels of trip internalisation within the site, such that the volume of traffic entering and leaving the site is reduced; the level of trip internalisation can be justified, based on the complementarity of the mix of land uses and based on the scale of the development
- justifiably high levels of public transport and / or active transport usage for access to / from the development based on household travel survey or Australian Bureau of Statistics' journey-to-work data for similar developments in a similar area, coupled with onsite parking restrictions and nearby on-street or off-street parking restrictions
- the presence of a proportion of drop-in and / or diverted trips which reduce the volume of new traffic generated (based on the application of traffic generation rates to land use) at locations away from the access point(s). For further guidance, refer to *Appendix A: Schedule of preferred input parameters*.

Development drop-in trips should also be accounted for in base traffic volumes as traffic that would travel past the site without the development.

Prior to the application of any discounting factors to 'standard' traffic generation rates, the source of the rates should be considered. For example, the RMS *Guide to Traffic Generating Developments* and the associated Technical Directions subsequently released by the RMS for specific land uses, include rates for high-density residential developments in transit-orientated town centres. Applying further discounts to these rates for public transport or active transport usage would most likely be double counting these effects.

8.3 Traffic distribution

The methodology used to determine the distribution of generated traffic to and from the surrounding road network should be identified and documented within the traffic impact assessment report. In most cases, this will be based on local knowledge and assumptions and these should be justified in the traffic impact assessment. In determining an appropriate set of traffic distribution assumptions, consideration should be given to:

- traffic counts/traffic surveys – such as origin-destination surveys, turning volumes from intersection counts, and travel time surveys
- market research to understand a development's catchment – undertaken by developments such as shopping centres, entertainment facilities and so on
- household travel survey data
- journey to work data
- local knowledge of travel patterns.

8.4 Route selection

8.4.1 Development traffic

The routes that development-generated traffic are assumed to use depends on a number of factors such as travel time, convenience of use, typical traffic conditions during peak periods, traffic movement restrictions in proximity of the site and trip distribution assumptions.

Route selection assumptions need to be justified and clearly documented. Assumptions can be based on:

- travel time comparisons of alternative routes – travel time data can be obtained from travel time surveys, traffic modelling, Google Maps and so on
- local knowledge.

The traffic impact assessment should include a diagram clearly showing the routes taken by the development-generated traffic across the whole impact assessment area.

Traffic assignment models may be used as an alternative for larger and more complex developments and these models should be provided to the department with the traffic impact assessment as part of the supporting material for review.

8.4.2 Heavy vehicle routes

Where a development is expected to generate significant volumes of heavy vehicle movements (for example, a quarry or mine), information showing the development's heavy vehicle routes from origin(s) to destination(s) should be provided. For major development projects, information summarising traffic data (using Austroads vehicle classes) for the construction and operations phases as well as a map of proposed routes should be provided.

In most cases, seasonal heavy vehicle traffic will have impacts on both local government roads and SCRs. The determination of the preferred heavy vehicle routes will therefore, be subject to consultation between Transport and Main Roads, local government and industry. Route determination will depend on the current function and capacity of the roads being used or proposed to be used by industry, the types of heavy vehicles expected and the frequency of movements.

Additional information in relation to heavy vehicles can be obtained from Transport and Main Roads' website at:

http://www.tmr.qld.gov.au/business-industry/Heavy-vehicles.aspx

Part C – Impact assessment and mitigation

9 Road safety

9.1 What is the issue?

Safety on the SCR network is the key consideration for development interacting with the SCR network. All new development may potentially affect road safety due to:

- increases in traffic volume
- increases in the number of conflict points between vehicles and other vehicles, pedestrians and cyclists
- the presence of new infrastructure such as access roads and driveways
- changes to sight lines
- changes to vehicle types using particular roads
- changes to on-street parking.

Development should ensure that a road's safety is not significantly worsened as a result of the development and that any pre-existing or development-introduced unacceptable safety risk is addressed. 'Significantly worsened' is defined in terms of the change in the safety risk rating (for example, from low to medium or from medium to high). Safety is not as readily quantifiable as efficiency and is scored based on expert opinion on the changes to likelihood and / or consequence of a risk being realised.

The condition of a road cannot be defined absolutely as being safe or unsafe. Rather, road safety is a relative measure benchmarked against an existing condition or an acceptable risk threshold.

For impacts of development on road safety, risk is considered in terms of changes in:

- likelihood – how often an event or situation is expected to take place, and
- consequence – the effect, result, or outcome of something occurring.

This considers, for example, how often a crash may result from the siting of new vehicular access infrastructure (a new driveway providing access to a new development) and whether that crash will involve only property damage (vehicles) and / or injury to people. Even developments that generate relatively small volumes of traffic may introduce an unacceptable safety risk; for example, a development may include works on the SCR network that reduce sight lines or clearance zones, or it may add a small amount of traffic to a right turn lane which then queues out into a through traffic lane in a high-speed environment.

An assessment is necessary to determine if there is likely to be any significant change to the level of road safety risk on the SCR network with the development (including during its construction).

The safety assessment potentially requires two stages during the preparation of the traffic impact assessment, as follows:

1. For all developments, a risk assessment (as outlined in Section 9.3.2) of the likelihood and consequence of safety risks being increased as a consequence of development traffic, pedestrians and cyclists or at the development access points, is required.
2. If any works are identified as being required either through the risk assessment or under another impact assessment type (for example, the intersection delay assessment), a road safety audit or road safety assessment will be required (as outlined in Section 9.3.3) to ensure that the design of the works does not introduce unacceptable safety risks.

9.2 What is the desired outcome?

The desired outcome is for road safety at any location on the SCR network to not be significantly worsened as a result of new development. ‘Significantly worsened’ is defined as a change to the level of safety risk. Safety risk is defined in terms of an increase in the likelihood of an incident and / or significant changes in the consequences if an incident occurred. Introduction of development should not significantly worsen road safety or change the existing status of road safety. While safety must not be worsened, it is acknowledged that interventions as a result of development may improve safety outcomes.

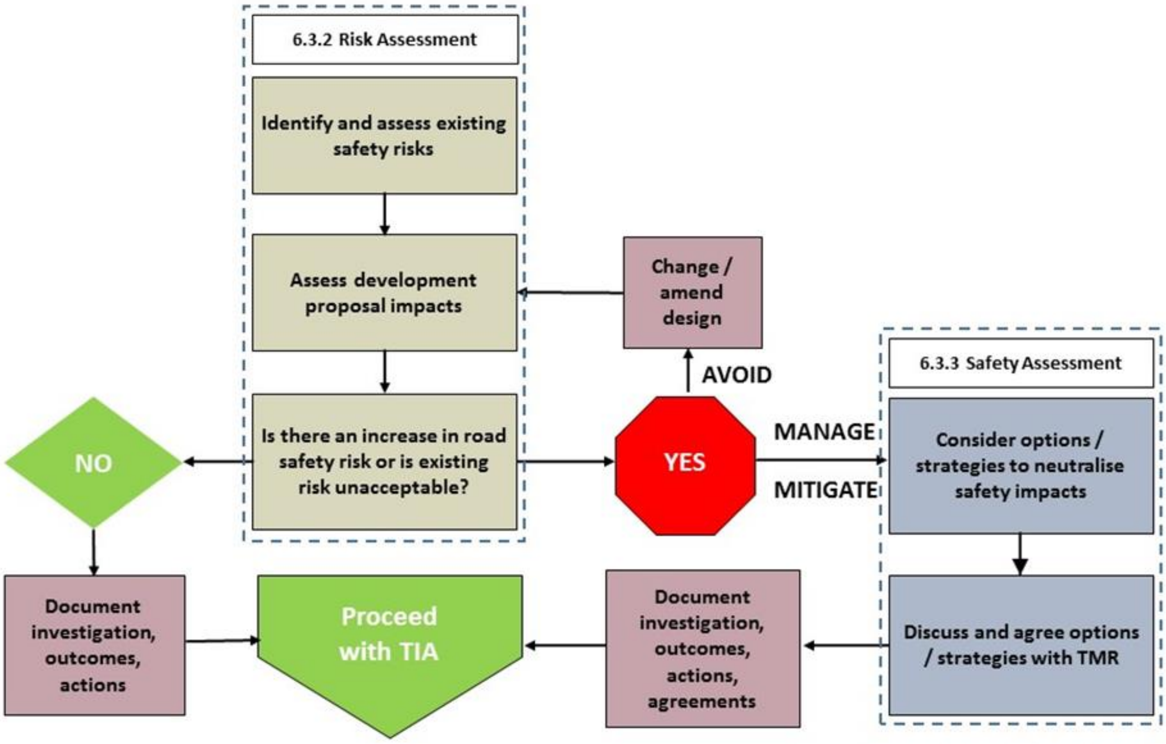
In existing high-risk areas, any development is likely to exacerbate existing safety conditions. In these circumstances, the development must also reduce the prevailing safety risk to a medium or low level as part of its mitigation package.

9.3 How to achieve the desired outcome

9.3.1 Impact assessment process

Figure 9.3.1 outlines the process for assessing safety risks and mitigating them if necessary.

Figure 9.3.1 – Key steps in the safety assessment



The road safety assessment process includes:

- identifying the current safety risks relevant to the development impact assessment area
- identifying the likely new risks or modified risks resulting from the scale of development and the relevant road environment, including the safety risk rating
- recommending management and mitigation works to ensure the existing safety risk rating for the road is not worsened as a result of the development and that any unacceptable safety risk is addressed.

9.3.2 Risk assessment and mitigation

The risk profile may change within the impact assessment area if the development proposal includes, but is not limited to, the following items:

- changes in the infrastructure network (for example, new driveways, pedestrian crossings, upgrade works)
- introduction or changes to pedestrian or cyclist desire lines
- increases in the posted speed limit
- changes in site operations that may have an external influence
- changes in visibility for movements to, from, or along the SCR network
- increases in traffic volumes, including more traffic introduced on narrow rural roads
- adding traffic to intersections to a level that turn pockets or short lanes fill up and queues spill into adjacent traffic lanes

- introduction or increases in over-dimension or heavy vehicles
- decreases in intersection performance due to increased delays and queues
- introduction of hours of operation outside daylight hours (if road or intersection not lit).

Safety risks should be considered for all transport modes (including safety risk for pedestrians and cyclists).

Traffic safety risks need to be identified and then scored using the risk scoring matrix in Figure 9.3.2(a). This scoring needs to be undertaken and tabulated for all risk items in the impact assessment area for the following cases:

- without development
- with development
- with development and with mitigation measures (if the score in the 'with development' situation is higher than in the 'without development' situation, or if the 'without development' score is in the 'high' category).

The objective is to return the risk score back to 'without development' levels and below the 'high' level with proposed mitigation measures.

Figure 9.3.2(a) – Safety risk score matrix

		Potential consequence				
		Property only (1)	**Minor injury (2)**	**Medical treatment (3)**	**Hospitalisation (4)**	**Fatality (5)**
Potential likelihood	**Almost certain (5)**	M	M	H	H	H
	Likely (4)	M	M	M	H	H
	Moderate (3)	L	M	M	M	H
	Unlikely (2)	L	L	M	M	M
	Rare (1)	L	L	L	M	M

L: Low risk
M: Medium risk
H: High risk

An example of the required assessment is demonstrated in Figure 9.3.2(b).

Figure 9.3.2(b) – Example risk assessment

Risk item	Without development: Likelihood	Without development: Consequence	Without development: Risk Score	With development: Likelihood	With development: Consequence	With development: Risk Score	Mitigation measures	With development & mitigation: Likelihood	With development & mitigation: Consequence	With development & mitigation: Risk Score
More left turning traffic at driveway; rear end collision with left turn entry	1	2	L	2	2	L	No action			
More right turn out movements into 4 lane road with no median storage	1	3	L	3	3	M	Widen median to allow two-part right turn	1	3	L
Right turn pocket of adjacent intersection queuing out into 80kph traffic; rear end crash	1	5	M	3	5	H	Extend right turn pocket to accommodate queues	1	5	M
Poor sight distance for right turns out of the access due to heavily planted frontage; potential for right-through crashes with vehicles, cyclists and pedestrians.	4	4	H[1]	5	4	H	Remove or trim foliage to provide adequate sight distance	2	4	M

[1] Even though the risk score has not changed with the development, this existing safety issue needs to be mitigated to lower the score below the 'high' level.

9.3.3 Safety assessment of proposed design

In addition to the risk assessment process described in Section 9.3.2, any changes to access configurations, nearby intersections, bus stop locations, cycling facilities, footpaths and so on, once designed, should be assessed to identify if they introduce any additional safety issues. There are two potential levels of assessment of these changes, namely:

- a road safety assessment
- a road safety audit.

The level of assessment required relates to the road environment the development is accessing and the scale of the potential risk, based on the scale of the development. Used together, tables 9.3.3(a) and 9.3.3(b) define the level of safety risk and the assessment required.

Table 9.3.3(a) – Road environment safety rating matrix (level of risk)

Traffic volume (AADT)	Speed (km/h)		
	Up to 50 km/h	**60 km/h to 70 km/h**	**80 km/h+**
≤ 8000	Low	Medium	Medium
> 8000	Medium	Medium	High

Table 9.3.3(b) – Type of road safety assessment based on road environment safety rating

Development type	Road environment safety rating		
	Low	**Medium**	**High**
Major Development	road safety assessment	road safety audit	road safety audit
Planning Act Development	road safety assessment	road safety assessment	road safety audit

Where a road safety audit has been identified as being required, concept design plans of the proposed works will be required as a basis for the road safety audit.

Road safety audit

Road safety audits must be undertaken by an accredited road safety auditor registered on Transport and Main Roads' register of approved road safety audit professionals.

> The Department of Transport and Main Roads register of approved road safety auditors is available at:
>
> http://www.tmr.qld.gov.au/Safety/Road-safety/Road-safety-auditors
>
> Contact road_safety_audit@tmr.qld.gov.au for registration-related enquiries.

A road safety audit must be prepared independently of the design team for the development to ensure the rigour of the audit and any recommendations for design changes or works to mitigate identified safety impacts.

To prepare a road safety audit, it is recommended that the proponent use the Austroads *Guide to Road Safety* Part 6: *Road Safety Audit* (2009) which provides a comprehensive guide to the road safety audit process. Other documents recommended for reference include:

- Austroads' guides to Road Safety, Traffic Management and Road Design
- Queensland-specific supplements available on Transport and Main Roads' website:
  - Manual of Uniform Traffic Control Devices
  - Road Planning and Design Manual
  - Traffic and Road Use Management Manual.

> Austroads' guides to Road Safety, Traffic Management and Road Design are available at:
>
> http://www.austroads.com.au
>
> Transport and Main Roads' *Manual of Uniform Traffic Control Devices*, *Road Planning and Design Manual*, and *Traffic and Road Use Management* manual are available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx
>
> The Road Safety Audit Toolkit is available at:
>
> www.rsatoolkit.com.au.

A road safety audit should be documented as a stand-alone report which is appended or otherwise referenced in the traffic impact assessment. Findings and recommendations from the road safety audit should be appropriately integrated into the traffic impact assessment. The RPEQ certifying the traffic impact assessment is required to sign off on any road safety audit recommendations included in the traffic impact assessment.

Road safety assessment

This type of assessment may be undertaken by:

- a road safety auditor registered on Transport and Main Roads' register of approved road safety audit professionals, or
- a RPEQ with road safety area engineering experience.

A road safety assessment is less detailed than a road safety audit and requires documented evidence that safety risks associated with proposed changes / designs have been evaluated. A road safety assessment is required in the traffic impact assessment and should describe the following:

- existing issues and any new issues introduced by the changes / design
- measures to address the safety issues identified with the designs.

9.3.4 Construction period impacts

Major developments such as mines, major industrial developments, long-term residential developments and major shopping centres may have significant impacts on the SCR network from traffic generated during their construction phase. For these types of developments, the safety impact assessment should also be undertaken for the construction phase.

9.3.5 Priority in mitigating safety impacts

In accordance with the hierarchy of principles as outlined in Section 6.1, safety outcomes must always be prioritised over other outcomes. Accordingly, where a required safety-related upgrade results in additional intersection delays to base traffic (for example, where an unsignalised intersection (including an access intersection) is upgraded to a signalised intersection), these intersection delay impacts do not need to be accounted for in the no net worsening assessment. That is, the base case with base traffic analysis would include the safety-related upgrade as part of the base case infrastructure condition.

9.3.6 Impact mitigation measures

Avoid

Development should be designed and constructed to avoid creating new road safety risks within the impact assessment area. To achieve this, road safety should be considered at each stage of the development.

Safety impact avoidance or reduction measures can include:

- site design to remove or reduce the number of potential conflict points on the SCR network
- removing as many conflict points between vehicles, pedestrians and cyclists as possible
- ensuring sufficient sight lines are achieved at access points.

Manage

A variety of non-physical impact management measures may be applicable depending on the safety risks identified. These could include:

- limiting site access to lower order roads
- utilising onsite turn movement restrictions (for example left-in / out only)
- restricting parking on / near the site
- adopting road-use management strategies (for example, transporting workers by bus to the site during the construction phase to reduce driver fatigue).

Mitigate

Mitigation measures which can be constructed include physical improvements to infrastructure to reduce the safety risk level to 'without development' conditions. These may include:

- improving visibility / sight distances (removal of vegetation and so on)
- providing signage or road humps near building exits to remind drivers of people walking or cycling
- installing additional safety facilities such as guardrails, crash barriers, guideposts, reflectors, warning signs, median barriers, and so on
- improving shoulders and edge treatment quality
- upgrading / modifying access or intersection layouts: for example, through the provision of turn pockets for safe deceleration
- providing and / or extending overtaking and merging facilities for safety
- improving road pavement.

10 Access and frontage

10.1 What is the issue?

The Department of Transport and Main Roads is responsible for maintaining the safety and the efficiency of the SCR network. As the majority of SCRs have a primary function of catering for through traffic, vehicular access management is a key consideration for ensuring that SCRs maintain this function. Accesses to the SCR network should be minimised where safe and efficient alternative access points can be provided via the local government road network in order to preserve the traffic-carrying function of the SCR network.

The location and configuration of access to SCRs from adjacent development or its roads can affect the safety and efficiency of SCRs by:

- providing another location where turning vehicle movements conflict with through vehicle movements
- providing new access or intersection infrastructure that could affect the safety of traffic, pedestrians and cyclists or the location of bus stop, footpath and cycleway infrastructure
- affecting the implementation of planned corridor improvements such as road widening, bus infrastructure (including bus stops), footpaths, cycle routes, noise barriers and so on.

Development of land fronting a SCR requires the configuration of that frontage to be consistent with the current or intended form of the SCR, by:

- ensuring the continuity of footpaths and cycling infrastructure along the frontage
- ensuring the continuity of drainage (kerb and channel, stormwater infrastructure and so on) along the frontage
- ensuring any impacts on bus infrastructure (including bus stops), turning lanes or other infrastructure in the road corridor are mitigated.

Any proposal for a new road access location or change to an existing permitted road access location to a SCR requires a decision from the Department of Transport and Main Roads under Section 62(1) of the *Transport Infrastructure Act 1994*. Under Section 33 of the *Transport Infrastructure Act 1994*, written approval is also required from the department to carry out road works, including road access works, on a SCR.

The State Development Assessment Provisions (SDAP) and supporting guidance material provide statutory requirements on the state's interests in relation to vehicular access. The content in this section should be read in conjunction with SDAP. The SDAP can be accessed at:

http://www.dilgp.qld.gov.au/planning/development-assessment/state-development-assessment-provisions.html

The Queensland Government has worked closely with local governments to develop principal cycle network plans and priority route maps to guide delivery of a connected and cohesive cycle network across Queensland. Routes are indicative and exist to guide further planning. Principal cycle network plans and priority route maps can be accessed at:

https://www.tmr.qld.gov.au/Travel-and-transport/Cycling/Principal-Cycle-Network-Plans

10.2 What is the desired outcome?

The desired outcomes are to:

- minimise impacts on the through-carrying function of SCRs
- ensure new accesses to a SCR do not worsen the safety or efficiency of the SCR
- ensure that SCR frontage works are constructed to ensure continuity of adjacent or planned infrastructure across the SCR frontage and to ensure existing infrastructure is not adversely impacted.

10.3 How to achieve the desired outcome

Transport and Main Roads' preference is for vehicular access to be obtained via the local road network. The department will generally not support any application requesting direct vehicular access to higher-order SCRs where an alternative vehicular access to a local road can be provided. Should a new access be proposed to a SCR, a traffic impact assessment should include appropriate justification demonstrating why safe access to the local road network is not feasible (for example, where there is no direct frontage to a local road). If a new access is needed, the traffic impact assessment should justify what access movements are necessary to be provided while aiming to preserve the through traffic carrying function of the SCR and minimise impacts at adjacent intersections.

10.3.1 Road access assessment

The management of road access to SCRs is a complex matter and varies from site to site. The traffic impact assessment for a development must therefore demonstrate that any associated vehicular access points to a SCR do not worsen the safety or efficiency of the SCR. The road access assessment must take into consideration:

- the number of access points already permitted to the SCR network

> Details of existing permitted access points can be sourced by contacting the local Transport and Main Roads regional office at:
>
> http://www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.aspx

- the type and number of vehicles in the peak hour(s) using the road access location and the volume by direction of turning movement into and out of the access
- the peak times of the day / night when the access is likely to be used
- the operational performance of the proposed access intersection, to demonstrate that it will operate within practical capacity for 10 years after the opening of the final stage of the development which uses the access and that it meets Transport and Main Roads' turn warrant requirements (as specified following)
- the methods used to minimise the impacts of internal site circulation on the safety and efficiency of the SCR
- the potential shared use of an access location, where practical and safe to do so
- the design, standard of construction and maintenance of the access
- the direction of access with entry and exit to be in a forward direction
- the location of any existing public transport infrastructure (such as bus stops and bus indents)
- the provision of adequate internal parking or vehicle space on site, to avoid traffic queuing onto the SCR.

Developments that will have a significant number of heavy vehicles (notably in rural and regional areas) will often require long acceleration and deceleration lanes designed in accordance with the department's *Road Planning and Design Manual* to ensure these vehicles can enter and leave the road safely and without significantly interrupting the prevailing speeds of vehicles using the road.

The road access assessment must also be supported by the following information:

- any existing decision or approval for the site made in accordance with sections 62 or 33 of the *Transport Infrastructure Act 1994*

- details of sight distances and achievement of sight distance requirements in accordance with the department's *Road Planning and Design Manual*, 2nd edition
- details regarding onsite vehicular manoeuvring
- plans, drawings or sketches demonstrating:
  - the location of the property, current number of road access locations and the proposed access design and location
  - grades of the access
  - the location of any roadside gullies, street trees, public utilities or public transport infrastructure that may affect the grade or position of the access
  - details of any proposed temporary access arrangements, and
  - details of any proposed road access locations to a local government road if any part of the land is within 100 metres of an intersection with a SCR
- information to address any limited access policies and access management plans, and
- photographs of the site, including any existing damage to the SCR.

Turn warrant assessments

A turn warrant assessment is typically applied to new T-junctions and private access roads where the major road comprises two traffic lanes (one in each direction), to determine what type of access / driveway would be required. Turn warrant assessments should be undertaken in accordance with Austroads' *Guide to Road Design*, Part 4A: *Unsignalised and Signalised Intersections*. Turn warrant assessments should be supplemented by an intersection analysis (for example, SIDRA analysis) to confirm queue storage lengths and geometrical requirements.

> Austroads' *Guide to Road Design* is available at:
>
> http://www.austroads.com.au

Intersection analysis

Analyses for determining access intersection configurations should preferably use SIDRA for access intersections that operate in isolation from adjacent intersections. If multiple intersections are proposed or a new access intersection is proposed within a complex and heavily trafficked section of road with multiple intersections, microsimulation modelling may be needed instead. SIDRA modelling should consider the preferred inputs as per *Appendix A: Schedule of preferred input parameters*.

Intersection layouts

Access intersection layouts should conform to Transport and Main Roads' *Road Planning and Design Manual*, 2nd edition, Austroads *Guide to Traffic Management* Part 6: *Intersections, Interchanges and Crossings* and Austroads *Guide to Road Design*, Part 4A: *Unsignalised and Signalised Intersections*. For further guidance refer to *Appendix A: Schedule of preferred input parameters*.

Austroads’ guides to Traffic Management and Road Design are available at:

http://www.austroads.com.au

Transport and Main Roads’ *Road Planning and Design Manual* is available at:

http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx

Sight distances

Sight distances at accesses need to conform to the *Road Planning and Design Manual*, Volume 3, Part 4: *Intersections and Crossings* and Austroads’ *Guide to Traffic Management* Part 6 requirements. For further guidance, refer to *Appendix A: Schedule of preferred input parameters*.

10.3.2 Construction period access

Major developments such as mines, major industrial developments, long-term residential developments and major shopping centres may have significant impacts on the SCR network from traffic access during their construction phase. For these types of developments, an access impact assessment should also be undertaken for the construction phase considering the busiest weekday of construction activity expected.

10.3.3 Road frontage assessment

A development with direct frontage to a SCR is responsible for ensuring the road condition of the road verge, road shoulder and transport and drainage infrastructure is consistent with the prevailing or planned conditions in the vicinity of the site within the SCR corridor.

The road frontage assessment should identify what works are required to:

- augment stormwater and drainage infrastructure with adjacent frontages consistent with the configuration intent for the SCR (for example, construction of kerb and channel, gully pits, stormwater pipes, swales and so on, as appropriate)
- connect to and provide footpath and cycling infrastructure consistent with adjacent infrastructure or planned infrastructure along the frontage
- identify any impacts to current or planned public transport stops / stations and how these will be mitigated
- identify impacts to turning pockets for adjacent accesses and intersections, or any reductions in road shoulder widths due to proposed access(es)
- seal any road shoulders to ensure that the road shoulder across the site frontage is consistent with adjacent conditions or planned conditions. Shoulders to be sealed will require a structural assessment and, if they are deficient, may require pavement design and pavement works to be undertaken.

10.3.4 Other considerations

Approvals required under the *Transport Infrastructure Act 1994*

Access to a SCR

Any proposal for a new road access location (including a driveway), or change to an existing permitted road access location to a SCR requires approval from the Department of Transport and Main Roads under the *Transport Infrastructure Act 1994*. Construction must be managed to ensure no adverse safety impacts for road users and construction workers. This is a two-stage process involving:

1. an application for a permitted road access location under Section 62 of the *Transport Infrastructure Act 1994*
2. an application to carry out road access works under Section 33 of the *Transport Infrastructure Act 1994*.

For road access approvals associated with a development application submitted under the *Planning Act 2016*, Transport and Main Roads will make the Section 62 decision and this will be attached to the response from SARA. The applicant will then need to apply to the department directly to obtain a road access works approval under Section 33 of the *Transport Infrastructure Act 1994*.

For road access approvals that are not associated with a Planning Act development application, the applicant needs to seek both sections 62 and 33 approvals under the *Transport Infrastructure Act 1994* from Transport and Main Roads directly.

Under Section 33 of the *Transport Infrastructure Act 1994*, written approval is required from the Department of Transport and Main Roads to carry out road works, including road access works, on a SCR. This approval must be obtained prior to commencing any works in the SCR corridor.

Applicants should contact the relevant Transport and Main Roads regional office to make an application for road works approval. The Section 33 approval process may require the approval of RPEQ-certified engineering designs of the proposed works.

Contact details for Transport and Main Roads regional offices are available at:

http://www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.aspx

Works and encroachments in a SCR corridor

An application for a road corridor permit is required for any ancillary works and encroachments in the SCR corridor under Section 50(2) of the *Transport Infrastructure Act 1994*. Ancillary works and encroachments include, but are not limited to, advertising signs or other advertising devices, paths or bikeways, buildings / shelters, vegetation clearing, landscaping and planting. For a full list of ancillary works and encroachments, refer to Schedule 6 of the *Transport Infrastructure Act 1994* and Part 5 and Schedule 1 of the Transport Infrastructure (State Controlled Roads) Regulation 2006.

If any ancillary works and encroachments are proposed, please contact the relevant Transport and Main Roads regional office to make an application for a road corridor permit.

Contact details for Transport and Main Roads regional offices are available at:

http://www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.aspx

Limited access roads

Under Section 54 of the *Transport Infrastructure Act 1994*, a SCR can be declared to be a limited access road. Where a Section 62(1) approval is required for access to a limited access road, the approval will only be given if it is consistent with the limited access policy for the road and the access management plan notified in the *Queensland Government Gazette* notice.

Road-specific access policies are prepared for limited access SCRs prior to a declaration being gazetted. These aim to be consistent with future planning requirements and road objectives, and outline how the state intends to deal with the management of access between individual properties and the limited access SCR, including, for example:

- the sections where access will be prohibited
- the locations where each permitted road access location will be allowed
- the specified location, type, or use of a road access location and conditions that apply.

Details of limited access roads can be obtained by contacting the relevant Transport and Main Roads regional office.

Contact details for Transport and Main Roads regional offices are available at:

http://www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.aspx

10.3.5 Impact mitigation measures

Avoid

Impacts from access to road corridors can be avoided or reduced by:

- not proposing a new or temporary road access location, or changing the use or operation of an existing permitted road access location to a SCR
- providing a road access location for the development from a lower order road where an alternative to the SCR exists
- removing or rationalising existing road access locations.

Manage

Impacts from access to road corridors can usually be managed by:

- limiting particular turning movements to and from the SCR: for example, providing for left in and left out turning movements only
- consolidating existing accesses or redirecting them via service roads or local government road links
- restricting use of access to particular types of vehicles or times of day

- minimising the speed difference between departing and entering traffic and through traffic within the SCR
- maximising the separation of the access to an intersection (for example, not having an access location within 100 metres of a road intersection with a SCR)
- locating road accesses to local roads as far as possible from where the road being accessed intersects with the SCR and considering existing operations and planned upgrades to the road being accessed and the SCR.

Mitigate

Impacts from access to road corridors can usually be mitigated by:

- ensuring a road access location meets the minimum standards associated with the vehicles that will use it, which includes:
  - designing road accesses to accommodate the forecast volume of vehicle movements in the peak periods of operation
  - meeting the sight distance requirements outlined in Volume 3, parts 3, 4, 4A, 4B and 4C of the *Road Planning and Design Manual*, 2nd edition
  - not exceeding the acceptable operation of an intersection with a SCR, including the degree of saturation, delay, queuing lengths and intersection layout
  - not locating an access within and / or adjacent to an existing or planned intersection in accordance with Volume 3, parts 4, 4A, 4B and 4C of the *Road Planning and Design Manual*, 2nd edition, and
  - not conflicting with another property's road access location and operation
- designing road accesses to accommodate 10-year traffic growth past completion of the final stage of development
- designing road accesses in accordance with Volume 3, parts 3, 4 and 4A of the Road Planning and Design Manual, 2nd edition
- providing mitigation measures to ensure that the flow of traffic on the SCR is not disturbed by traffic queuing to access the site
- providing mitigation measures due to impacts of turning, accelerating and decelerating / breaking vehicles on road surfacing.

> Transport and Main Roads' *Road Planning and Design Manual* is available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx

11 Intersection delay

11.1 What is the issue?

An increase in vehicles through an intersection as a result of development will likely increase traffic delays. Increases in delays have an economic and social impact on the community through increased travel times, driver impatience (leading to possible crashes) and the associated economic cost of these delays to both private and commercial / heavy vehicle trips.

All development generates impacts on road intersections; however, Transport and Main Roads considers that it is unreasonable to require quantifying the impacts on intersection delays unless the development creates an increase in traffic over a particular threshold level. This threshold level (as defined in Section 6.4) applies to all intersections where the development traffic exceeds 5% of the base traffic for any movement in the design peak periods in the year of opening of each stage. Guidance on the selection of the design peak periods is provided in *Appendix A: Schedule of preferred input parameters*.

11.2 What is the desired outcome?

The desired outcome is to ensure that the sum of intersection delays on base traffic in the impact assessment area does not significantly worsen (that is, does not increase average delay by more than 5% in aggregate) as a result of a development. In other words, the additional delays created by traffic generated by the development need to be mitigated by upgrades to intersections in the impact assessment area which reduce delays (in aggregate) to at least the pre-development levels, calculated across the impact assessment area.

For intersections assessed within the impact assessment area, the department considers it unreasonable to require the mitigation of impacts where the development increases average delay to base traffic movement by less than 5% in aggregate. Accordingly, a significant worsening to an intersection is where the average delay to base traffic movements is greater than 5% in aggregate.

> The application of the no net worsening approach to intersection delay analysis allows for the potential of some intersections being negatively impacted and some intersections being positively impacted, such that the net effect is no worsening of total delays across the impact assessment area. If no appropriate upgrades are possible to mitigate the delay impacts generated, contributions can be provided to the equivalent value of the works required to mitigate the impacts.

11.3 How to achieve the desired outcome

Additional traffic that is generated by development increases traffic at intersections. This increase in traffic leads to an increase in delays for base traffic and these additional delays can range from being very small to being substantial, depending on the scale of the development traffic generated, the distance of the intersection from the development and the pre-existing level of utilisation of the intersection’s capacity. The purpose of the impact assessment on intersections is to determine how much extra delay the development will impose on base traffic within the impact assessment area and then to determine how these delays can be mitigated across the impact assessment area to achieve no net worsening.

11.3.1 Impact assessment

Process for assessing intersection delay impacts

The assessment of delay impacts should be consistent with the following process:

1. Determine the development’s design peak periods for assessment and the impact assessment year(s) in accordance with Section 6 of this *Guide*.
2. Identify all of the intersections in the impact assessment area as defined in Section 6.4 of this *Guide*.

3. Analyse every intersection in the impact assessment area for the base case for the design peak periods in the opening year(s), using a recognised analytical methodology to determine intersection delays (for example, SIDRA, simulation models, first principles capacity calculations and so on). Where simulation models are used, the delays should be determined from the traffic demand flows and not just the flows that are able to clear the intersection within the design peak periods. Simulation models are only to be used in situations where SIDRA or SIDRA Network are not appropriate to properly assess queuing and delays.
4. Analyse every intersection in the impact assessment area for the 'with development case' for the design peak periods in the impact assessment year(s).
5. Add together the total vehicle-minutes across each intersection and across all design peak periods assessed for the 'base case' and the 'with development case'. The development impact is then:

$$\mathrm{ID} = \sum_{i=1}^{n} WD - \sum_{i=1}^{n} BC$$

where:

ID	is aggregate intersection-delay impact vehicle-minutes.
WD	is 'with development' intersection vehicle-minutes for design peak periods. This is calculated by multiplying the 'with development' average delay by movement to the base case volume on each movement, thus not counting the impact as delays to development traffic, only to pre-existing traffic that is affected by these additional delays.
BC	is base case intersection vehicle-minutes for design peak periods
n	is the number of intersections in the impact assessment area
i	is each intersection within the impact assessment area.

6. Identify possible intersection upgrades for the 'with development' case for intersections within the impact assessment area. The upgrades proposed need to be contained within the available road reserve (that is, not be reliant on third-party property acquisition) and be compatible with Transport and Main Roads and local government planning intentions for the subject intersections.
7. Analyse the intersections, including any proposed upgrades, across the design peak periods in the impact assessment year to demonstrate that the aggregate intersection-delay impact 'with development' is equal to or less than the aggregate intersection-delay impact in the base case.
8. Where development traffic adds less than 5% of delay to base traffic in aggregate, no mitigation to treat the intersection delay is required.

> The application of no net worsening to intersection delay analysis recognises that it is reasonable to only consider the vehicle minute impacts on base traffic; hence, there is a need to scale down the vehicle minutes of the 'with development' case to the base case traffic volumes. In addition, a +5% vehicle-minutes tolerance has been included, recognising the variabilities inherent in traffic estimation and delay analysis and to ensure that intersection works are required only in cases where a material increase in delays is experienced.

9. If the Department of Transport and Main Roads deems that proposed works are insufficient or inappropriate to achieve impact mitigation and reasonable alternative works cannot be identified in the impact assessment area, then the value of the works that are deemed not acceptable needs to be determined as a monetary contribution-in-lieu of providing these works.
10. Recommend the intersection delay mitigation works schedule and any monetary contribution-in-lieu values in the traffic impact assessment, including all calculations and justifications.

> Previous versions of GARID nominated degree of saturation (DOS) thresholds for priority intersections, roundabouts and signalised intersections. In contemporary urban networks, many intersections are already operating at a DOS greater than one, where the arrival flow on any approach exceeds the departure flow possible from that approach in peak hours. Under the no net worsening approach, DOS thresholds provide little relevance to determining the delay based economic impacts of the additional traffic generated by a development and impacting a particular intersection. Establishing the nexus between development traffic and DOS changes by approach is challenging and, whilst DOS may continue to be a useful reporting metric for identifying what proportion of the estimated demand at the intersection cannot be satisfied by the intersection's capacity, it is not as valuable a comparison measure of intersection operations in the 'without development' case compared to the 'with development' case when compared to the average delay metric outlined in Section 11.3.1.

Priority controlled intersections

For priority controlled intersections, where average peak hour delays for any turn movement exceeds 42 seconds (the LOS C / D threshold), then the intersection should be upgraded for safety reasons where it is practical to do so. If a priority controlled intersection's delay is worsened, the next logical upgrade works item should be determined such as an additional turn pocket or a median for two part turns, or then a complete intersection upgrade. A contribution to those works should be calculated based on proportionate contribution of development traffic to the need for those works. There may be some cases, in very low traffic volume situations, where an upgrade of any type is unlikely to ever be contemplated at an intersection. In these cases, waiving any upgrade requirement or contribution to an upgrade may be considered by the Department of Transport and Main Roads at its absolute discretion.

Roundabouts

For roundabouts, where average peak hour delays on any approach or on any movement exceed 42 seconds (the LOS C / D threshold), then the roundabout should be upgraded for safety reasons where it is practical to do so. If delays at a roundabout are worsened, then the next logical upgrade works item should be determined such as a left turn slip lane or upgrading to a two-lane roundabout, or then a complete intersection upgrade to traffic signals. A contribution to those works should be calculated based on proportionate contribution of development traffic to the need for those works.

Intersection analysis

Analyses for determining intersection configurations should preferably use SIDRA for intersections that operate in isolation from adjacent intersections. If multiple adjacent intersections are affected within a complex and heavily-trafficked section of road with multiple intersections, microsimulation modelling may be needed instead. SIDRA modelling should consider the preferred inputs as per *Appendix A: Schedule of preferred input parameters*.

Intersection layouts

For intersections (including accesses), the intersection layout should conform to Transport and Main Roads' *Road Planning and Design Manual*, 2nd edition, Austroads' *Guide to Traffic Management* Part 6 : *Intersections, Interchanges and Crossings* and Austroads' *Guide to Road Design*, Part 4A: *Unsignalised and Signalised Intersections*. For further guidance, refer to *Appendix A: Schedule of preferred input parameters*.

> Transport and Main Roads' *Road Planning and Design Manual* is available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx
>
> Austroads' *Guide to Road Design* is available at:
>
> http://www.austroads.com.au

Sight distances

Sight distances at intersections need to conform to the *Road Planning and Design Manual*, Volume 3, Part 4: *Intersections, Intersections and Crossings* and Austroads' *Guide to Traffic Management* Part 6 requirements. For further guidance, refer to *Appendix A: Schedule of preferred input parameters*.

> Transport and Main Roads' *Road Planning and Design Manual* is available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx
>
> Austroads' *Guide to Traffic Management* is available at:
>
> http://www.austroads.com.au

11.3.2 Supporting information

Analysis using traffic modelling software

A variety of traffic modelling software packages can be used for intersection analysis.

For intersections in lower volume areas where assessable intersections generally do not affect other intersections, use of SIDRA is recommended. For further guidance, refer to *Appendix A: Schedule of preferred input parameters*.

For corridor analysis in congested conditions where signal timing and coordination need to be assessed to determine the effects of the mitigation works, use of LinSig or TRANSYT is recommended, although microsimulation modelling could also be used.

Where reassignment of traffic within a network has to be considered and / or oversaturated conditions exist, the use of mesoscopic and microsimulation modelling is preferred, using packages such as SATURN, AIMSUN, PARAMICS or VISSIM.

The default parameter inputs for each software should be used in all cases except where clear justification is provided regarding unusual circumstances at the intersection being assessed that warrant the use of alternative values. For further guidance, refer to *Appendix A: Schedule of preferred input parameters*.

In order to be able to check the validity of a traffic impact assessment, Transport and Main Roads often requests that applicants submit their electronic traffic model files so the assumptions, inputs, and outputs of the model can be verified. All traffic models should be suitably calibrated and validated before being used for impact assessment.

> The choice of analytical method and software will depend on the development scale and location. Transport and Main Roads recommends SIDRA in most situations where isolated intersection impacts are likely and these impacts are unlikely to spread through adjacent controlled intersections. Where saturated conditions exist in the base network, then consideration should be given to traffic simulation models that allow delay and queue propagation to be more appropriately simulated. Other packages such as LinSig and Transyt may also be required where signal coordination effects need to be considered as part of a holistic mitigation strategy.

Sources of traffic volume data and growth projections

It is Transport and Main Roads' preference for intersection analysis to be based on traffic counts undertaken as part of the preparation of the traffic impact assessment. To assist with the preliminary estimation of the impact assessment area and, hence, the scope of the intersections likely to be required to be surveyed, potential sources of traffic volume data include:

1. traffic volume data enquiry from Transport and Main Roads (refer to nearest regional office)
2. traffic census data for the Queensland SCR network (https://data.qld.gov.au)
3. QLD Globe add-on to Google Earth.

Further guidance is provided in *Appendix A: Schedule of preferred input parameters*.

Growth rates

Traffic growth projections for any future year analysis required need to be sourced from Transport and Main Roads' nearest regional office or clearly justified if sourced from other means.

> Transport and Main Roads has a number of regional offices across Queensland. To find the departmental office relevant to your proposal, call **13QGOV** (13 74 68) or check the regional contacts on the department's website:
>
> http://www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.aspx

11.3.3 Priority in mitigating safety impacts

In accordance with the hierarchy of principles as outlined in Section 6.1, safety outcomes must always be prioritised over other outcomes. Accordingly, where a required safety-related upgrade results in additional intersection delays to base traffic (for example, where an unsignalised intersection (including an access intersection) is upgraded to a signalised intersection), these intersection delay impacts do not need to be accounted for in the no net worsening assessment. That is, the base case with base traffic analysis would include the safety-related upgrade as part of the base case infrastructure condition.

11.3.4 Impact mitigation measures

Avoid

Examples of measures for avoiding or reducing the proposed development’s impacts on intersection delays include, but are not limited to:

- reducing the number of trips generated by the development
- modal shift to reduce the volume of traffic entering and leaving the site
- locating access point(s) away from congested intersections.

Manage

Examples of measures to manage intersection delay impacts include:

- restricting movements (for example, reducing uncontrolled right turns).

Mitigate

Examples of intersection works to mitigate the identified impacts include:

- upgrading intersections to neutralise the additional delays introduced by development traffic
- building a new intersection or building an additional approach road to an existing intersection needed for the development
- building an alternative road link to bypass congested areas by ensuring:
  - any upgrade works for the development on, or associated with the SCR network are consistent with the requirements of Transport and Main Roads’ *Road Planning and Design Manual*, 2nd edition
  - design and staging of upgrade works on or associated with the SCR network are consistent with planned upgrades, and
  - the layout and design of a development directs traffic generated by the development to use lower order roads.

12 Road link capacity

12.1 What is the issue?

In most areas, and particularly in urban areas, increases in delay on SCRs away from intersection locations are not as evident as they are at intersections. Increasing traffic on roads is an outcome of normal growth through anticipated development. As a result, the no net worsening methodology is generally insensitive to road links when using conventional volume to capacity relationships. There are exceptions, however, such as where a development is significantly large and adjacent to a single SCR that is currently lightly trafficked. These conditions typically only occur for major developments which generate sufficient traffic to warrant additional road link capacity such as additional traffic lanes.

The assessment of road link capacity impacts is based on the incremental worsening of level of service (LOS) rather than on the delay-based costs imposed on the general community as considered for intersection delay impacts.

Increases in development-generated traffic may also result in safety impacts on road links, particularly in rural areas with limited road link capacity and where roads were designed for a different function to that needed for a proposed development. This should be considered on both safety (in accordance with Section 9) and capacity grounds as some of the mitigation measures may be complementary, such as sealing road shoulders or wider lanes.

12.2 What is the desired outcome?

The desired outcome is to ensure that traffic generated by development does not significantly worsen the operational capacity of SCR road links.

The introduction of a relatively small number of additional vehicles due to a development will have a negligible effect on vehicle speeds and hence on delays to other vehicles already on the road. Even if a road is almost at its mid-block capacity, it is far more likely that the critical locations for capacity will be at intersections along the road rather than mid-block.

For these reasons, road operational capacity impacts are only considered for major developments and link capacity assessments are not required unless new SCR road links are needed to be constructed to service the development.

12.3 How to achieve the desired outcome

12.3.1 Traffic usage of road capacity

Road link infrastructure upgrades are essentially step-changes in capacity (for example, upgrading a two-lane road to a four-lane road). Some LOS improvements can be achieved with improvements to Austroads-defined factors that contribute to LOS including lane widening, introducing auxiliary lanes and reducing access conflicts.

Examples may also include the sealing of unsealed shoulders and alignment improvements.

Developments generally cause incremental changes in LOS, which individually may not be sufficient to warrant mitigation through upgrades such as duplication. Minor link upgrades, however, can often be used to mitigate incremental LOS reductions due to the additional traffic generated.

12.3.2 Heavy vehicle impacts

Proposals which are expected to generate significant heavy vehicle movements (for example, mine haulage, extractive industry sites, sugar cartage) may have an impact on the LOS of road links where overtaking is limited by the horizontal alignment or where long sections of road with steep grades exist.

For these projects, modelling is required to assess the operation of the road section to quantify impacts and assist in determining the need for and location of overtaking lanes. Computer simulation models that represent overtaking manoeuvres, such as TRARR, can be used for this purpose. The intent of this assessment is to ensure no significant worsening of the LOS of each link in the impact assessment area as per the methodology discussed previously.

12.3.3 Impact mitigation measures

Avoid

Examples of measures to avoid or reduce a proposed development's negative impacts on road link capacity include, but are not limited to:

- reducing the number of trips generated
- modal shift to reduce the volume of traffic entering or leaving the site
- limiting the number of access driveways along the SCR
- developing road use management plans for heavy vehicles and considering rerouting vehicles to less congested roads and roads more capable of accommodating traffic increases.

Manage

Examples of measures to manage road link capacity impacts include:

- restricting movements (by type of vehicle, by movement and so on)
- improving pavement markings
- providing signage to improve traffic flow
- introducing operational strategies such as back loading delivery vehicles (for example, consumables in and waste out) to resource project to reduce overall trips
- transporting workers by bus from regional centres to resource or major developments to reduce private vehicle use.

Mitigate

Examples of road link capacity works to mitigate impacts include:

- widening crests and curves for road safety
- adding slow lanes or upgrading overtaking and merging facilities needed as a consequence of the development
- upgrading or contributing to the upgrading of the road link (adding lanes, extending lanes, widening lanes, providing auxiliary lanes and so on to cater for development traffic).

13 Pavement

13.1 What is the issue?

Generally, pavements are designed to carry a pre-determined amount of traffic (measured in standard axle repetitions (SAR)) over the expected life of the pavement.

The likely impacts of development on pavement occurs when the number of heavy vehicles using a SCR, or the loads they carry, increase significantly as a direct result of the development. The increase could be due to a number of factors such as servicing the needs of a proposed development in the case of a large commercial development, through to haulage of goods or raw materials in the cases of manufacturing or mining / extractive industry.

Impacts on SCRs in rural areas can be significant because pavements in these areas may not be designed for the type of repetitive traffic generated by the development of an intensive primary industry. In such cases, deterioration of pavements in combination with narrower surfaces and crumbling edges can quickly result in the SCR becoming unsafe and inefficient.

> Standard axle repetitions (SARs) has replaced the term equivalent standard axles (ESAs) used in previous versions of the GARID for assessment of pavement impacts. SARs is a measure defining the cumulative damaging effect to the pavement of the design traffic. It is expressed in terms of the equivalent number of 80kN axles on the pavement. This terminology has been used to align with more recent Austroads publications identifying the marginal cost of pavement impact based on SAR-kms.

13.2 What is the desired outcome?

The desired outcome is to ensure no worsening (that is, to avoid or reduce the damage caused) to SCR pavements as a result of increased vehicle traffic from development. Appropriate consideration of pavement impacts can ensure that pavement conditions remain within safe and acceptable limits of performance.

13.3 How to achieve the desired outcome

The impacts on the SCR network must be identified and measures implemented to avoid, reduce or mitigate the effects on the pavement life of the SCR.

Typical ways of dealing with pavement impacts that result from an increase in the number and / or size of vehicles using a SCR due to a development include:

- a need for extra pavement width (for example, to prevent edge degradation)
- a change in surfacing type or pavement thickness
- the need to seal an unsealed pavement
- increasing maintenance, and / or
- the need for unscheduled pavement rehabilitation or construction of new pavement.

Construction activities for some developments involve intensive, short-term haulage and the pavement impacts of this haulage over the construction period should also be assessed. Similarly, analysis is required for potential pavement impacts after commencement of development where higher than normal heavy vehicle volumes are generated compared to the SCR’s design, construction and carrying capacity.

13.3.1 Assessment process for sealed roads

Preparation of a pavement impact assessment report should be consistent with the following process:

1. Determine the existing SARs for each section of SCR on all affected SCRs in accordance with Section 6.4.
2. Determine the number and types of vehicles that will be generated by the development in both construction and operational phases, and determine sections of the SCR network where pavement assessment is required, based on the SAR thresholds defined in Section 13.3.2.
3. Determine if the development-generated construction or operational SARs will consume the remaining pavement SAR capacity during the impact mitigation period, on any section of SCR network, then prepare a pavement design for that section of pavement to return the

pavement to its pre-development SAR capacity at the end of the impact mitigation period. The design should be submitted to Transport and Main Roads' nearest regional office for approval and the development will be required to construct the pavement upgrades before pavement failure occurs.

4. For marginal SAR impacts, defined as cases where the remaining pavement SAR capacity will not be consumed during the impact mitigation period, identify the relevant marginal cost rate per SAR-km from Transport and Main Roads' marginal cost database (as detailed following) for each SCR section in the impact assessment area. Calculate the contribution required to offset pavement impacts using the following formula:

$$\text{Pavement contribution} = \sum_{i=1}^{n}[(C+O)_i \times MC_i \times L_i]$$

where:

I	is each road segment triggered
C	is construction period SARs
O	is operational period SARS for the impact mitigation period
MC	is the relevant marginal cost (per SAR-km) prescribed in the department's database for each road segment
L	is the length of road section in km
N	is the number of road segments triggered in the impact assessment area.

Transport and Main Roads has determined marginal cost values for road-wear due to increased axle loads for the entire SCR network (with the exception of concrete pavements). For sealed roads, these marginal costs are calculated by using the Freight Axle Mass Limits Investigation Tool (FAMLIT).

FAMLIT is a network-level pavement life-cycle costing analysis tool that has been specifically tailored to (a) produce load-wear-cost (LWC) relationships suitable for estimating the marginal cost of road-wear with increased axle loads and (b) calculate the total pavement maintenance cost over the life of the pavement. The department has used the FAMLIT software to calculate the marginal cost of road-wear caused by increased heavy vehicle traffic loads, with the increased load assumed to apply throughout the development period and beyond (that is, it offers a marginal cost based on the long run marginal cost of road-wear). The marginal cost is calculated for each kilometre road section and reported in cents per SAR-km, and includes estimates for asphalt over granular pavements, sprayed seal over granular pavements, and asphalt over cement stabilised pavements, and for different climate and soil conditions.

The FAMLIT model takes into account road type, traffic loading on the road and identifies the cost of works required due to pavement deterioration over the pavement life.

The FAMLIT software should also be used for more complicated and non-standard assessments that involve:

- pavement categories not defined previously
- cases where the increased loading is more intensive and is applied over a short period
- pavements are known to be very weak in relation to the task.

Specialist advice should also be sought in cases where horizontal shear forces and turning movements pose the greatest risk. These circumstances cannot be addressed using the current FAMILT model. Please contact the Transport System Asset Management Unit within the Department of Transport and Main Roads in the first instance for any queries in relation to the FAMLIT model.

> The Transport System Asset Management Unit with TMR can be contacted by emailing:
>
> RAM_support@tmr.qld.gov.au

13.3.2 Calculating SARs

Determining SARs for traffic generated by a specific development on a SCR is a function of heavy vehicle trip generation, trip distribution and route usage.

Traffic generation of the development considers the volume of product / goods being moved, the size of vehicles proposed to carry these loads / goods, the load efficiency (for example, due to bulking effects) and the frequency of back loading or return movements. Heavy vehicle traffic SAR needs to be assessed for vehicles both leaving and entering a site. Specialist advice should be sought for the calculation of SAR values for any specialised or custom-made vehicles being proposed by the development.

Traffic distribution of the development-generated traffic to its destinations should ideally be based on an understanding of the location to which the product / goods are being delivered. Where this is uncertain at the time of development (for example, for extractive industries, quarries and so on), an estimate of traffic distribution proportions is to be made and justified.

Traffic routes development-generated traffic will use depend on a number of factors such as travel time, convenience, typical traffic conditions at different times of the day and heavy vehicle movement restrictions in proximity of the site. Routes can be identified based on travel time comparisons of alternative routes, traffic modelling, local knowledge and so on. In many cases where significant heavy vehicle volumes are generated by a development, the haulage routes are typically known (for example, quarry or mine). Where haulage routes are known with reasonable confidence, these should be mapped to include both origin(s) and destination(s).

13.3.3 Assessment process for unsealed roads

The FAMLIT assessment methodology does not cater for unsealed roads. Transport and Main Roads has adopted the Australian Local Road Deterioration Study (LRDS) gravel loss model to calculate marginal cost estimates per vehicle pass for various combinations of network and traffic parameters, and grading frequency. For a development that provides impacts on an unsealed road, please contact the local Transport and Main Roads office for further information.

> Transport and Main Roads has a number of regional offices across Queensland. To find the departmental office relevant to your proposal, call **13QGOV** (13 74 68) or check the regional contacts on the department's website:
>
> http://www.tmr.qld.gov.au/About-us/Contact-us/In-person/Roads-offices.aspx

13.3.4 Surface condition assessment

The impact assessment advice provided in Section 13 seeks to account for the structural impact on pavement caused by development-generated traffic. Practitioners assessing pavement impacts may also need to consider the impacts on pavement surface if the surface condition is likely to be significantly worsened from development-generated traffic. In this instance, it is recommended that this be discussed with Transport and Main Roads in order to determine whether works or a monetary contribution is appropriate.

13.3.5 Impact assessment area and impact mitigation period considerations

For most development types, the impact assessment area and the impact mitigation period will be defined in Section 6 of this *Guide*.

For mining, extractive resources or similar projects with a lifespan or lease which may span decades, alternative arrangements may be discussed with Transport and Main Roads to determine a contribution rate per tonne produced (for example) to apply throughout the life of the operations.

For major developments not subject to application under the *Planning Act 2016*, construction period impacts should also be assessed in accordance with the process in Section 13.3.1.

13.3.6 Supporting information

Guidance on the nature and timing of required pavement works and the pavement design, traffic loading and construction standards to be achieved, can be obtained from Transport and Main Roads' *Pavement Design Supplement* and the *Pavement Rehabilitation Manual*, and from the Austroads' *Guide to Pavement Technology* in particular:

- Austroads *Guide to Pavement Technology* Part 2: *Pavement Structural Design* (2012)
- Austroads *Guide to Pavement Technology* Part 5: *Pavement Evaluation and Treatment Design* (2011)

In addition, guidance on pavement surfacings can be found in the following Austroads publications:

- Austroads *Guide to Pavement Technology* Part 3: *Pavement Surfacings* (2009)
- Austroads *Guide to Pavement Technology* Part 4B: *Asphalt* (2014)
- Austroads *Guide to Pavement Technology* Part 4K: *Seals* (2009)
- Austroads Report AP-T68-06 *Update of the Austroads Sprayed Seal Design Method* (2006)
- Austroads Report AP-T236-13 *Update of Double / Double Design for Austroads Sprayed Seal Design Methods* (2013).

> Transport and Main Roads' *Pavement Design Supplement* and *Pavement Rehabilitation Manual* are available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx
>
> Austroads' reports and the *Guide to Pavement Technology* are available at:
>
> http://www.austroads.com.au

13.3.7 Impact mitigation measures

Avoid

Examples of measures to avoid or reduce a proposed development's negative impacts on pavement include, but are not limited to:

- introducing business operational efficiency measures to reduce heavy vehicle volumes
- limiting heavy vehicle volumes / access on vulnerable pavements
- locating access points to minimise the length of SCR pavement affected.

Manage

Examples of pavement impact management include:

- establishing a traffic management plan / road use management plan for heavy vehicles that generate pavement usage efficiencies
- use of heavy vehicles that create lesser pavement impacts (that is, lower SAR-vehicles for the same load)
- limiting road use during wet weather.

Mitigate

Examples of measures to mitigate pavement impacts include:

- refreshing or updating pavement markings
- undertaking edge improvements, including sealing shoulders
- establishing a proactive pavement maintenance schedule for the SCR network
- undertaking pavement reconstruction (that is, for pavement failure caused by the development)
- undertaking pavement overlays.

14 Transport infrastructure

14.1 What is the issue?

Impacts on bridges, culverts, and other structures within the SCR network need to be considered in cases where heavy vehicles, during either the construction or operational phases of a development, have the potential to cause failure or significant degradation of these structures; for example, heavy vehicles, typically a Class 2, 3 or 4 vehicle (as defined by the National Heavy Vehicle Regulator) crossing bridges or other structures along a haulage route may adversely impact those structures due to their carrying capacity and / or the age of the structure. Typically, extractive industries and mining are types of development that generate heavy vehicle traffic likely to impact on transport structures.

> Approved haulage routes for Class 2, 3 or 4 vehicles are available at:
>
> http://www.tmr.qld.gov.au/business-industry/Heavy-vehicles/Performance-based-standards/Maps-PBS-Scheme-routes-in-Queensland.aspx

For railway level crossings, increased risk of crashes from additional traffic and queuing (particularly for heavy vehicles) is a significant transport issue. All development in the vicinity of railways should include reference to and assessment of matters under Transport and Main Roads' *Guide to development in a transport environment: Rail*.

> Transport and Main Roads' *Guide to development in a transport environment: Rail* is available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx

14.2 What is the desired outcome?

The desired outcome is to ensure that development does not worsen the structural integrity of bridges, culverts, and other structures on a SCR within the impact assessment area, to maintain their safety for use.

14.3 How to achieve the desired outcome

14.3.1 Structural integrity of transport infrastructure

It is critical that the structural integrity of a structure located on a SCR within the impact assessment area is maintained, despite its use by heavy vehicles generated by the proposed development. The requirements that apply to development-generating traffic involving Class 2, 3 or 4 vehicles are:

1. identifying all structures (including bridges and culverts) on the SCR network being used as haulage routes within the impact assessment area
2. determining the structural capacity / life of each structure in consultation with Transport and Main Roads
3. assessing the impact of the proposed haulage vehicles on these structures
4. identifying where structural strengthening or replacement is required and how this can be undertaken.

14.3.2 Railway crossing safety

A traffic impact assessment should consider and address safety issues for any railway level crossing within an impact assessment area. Transport and Main Roads' *Guide to development in a transport environment: Rail* provides further advice on the technical considerations for a traffic impact assessment in relation to railway level crossings.

> Transport and Main Roads' *Guide to development in a transport environment: Rail* is available at:
>
> http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx

14.3.3 Impact mitigation measures

Avoid

Examples of how to avoid or reduce impacts on bridges, culverts and structures include:

- establishing road-use management plans (RMPs) for heavy vehicles to avoid using vulnerable infrastructure

- modifying heavy vehicle sizes used (for example, use of smaller vehicles)
- onsite management of project inputs / outputs to reduce the volume of produce needing to arrive at or leave the site in the first place.

Manage

Examples of measures to manage impacts on bridges, culverts and structures include:

- erecting signage advising of alternative routes for structures with limited load limits
- implementing a monitoring program to ensure load limits on bridges, culverts and structures are not exceeded.

Mitigate

Examples of ways to mitigate impacts to bridges, culverts and structures include:

- upgrading bridges, culverts and / or structures to carry increased loads
- building new bridges, culverts and / or structures to cater for development heavy vehicle traffic.

15 Other considerations

15.1 Heavy vehicle road corridor use

> Section 15 deals specifically with Class B heavy vehicles as defined by the National Heavy Vehicle Regulator (NHVR). Specifically this includes the impacts of Class 2B, Class 3B and Class 4B vehicles that may be introduced by a development.

Transport and Main Roads has identified sections of the SCR network for use by B-Doubles (Level 2A), Type 1 Road Trains (Type 3A) and Type 2 Road Trains (Level 4A); however, if a proposed development will generate vehicles of Class B (NHVR), then a heavy vehicle assessment needs to be undertaken in accordance with Transport and Main Roads' *Performance Based Standards Queensland Network Classification Guideline – Level 2B, Level 3B, Level 4B Roads* (November 2014). This assessment includes consideration of:

- signal timing at intersections
- stacking distance at intersections
- storage lane length at intersections
- warning times at railway level crossings
- stacking distances at railway level crossings
- overtaking provision
- rest area, decoupling areas and enforcement bay sizes.

This assessment is required even if an assessment of traffic operations along an identified haulage route is not triggered otherwise as per the requirements of the NHVR.

> Details in relation to regulation under the National Heavy Vehicle Regulator are available at:
>
> https://www.nhvr.gov.au/

The necessary impact mitigation measures are to be determined through the assessment process using Transport and Main Roads' *Performance Based Standards Queensland Network Classification Guideline – Level 2B, Level 3B, Level 4B Roads* (November 2014).

> Information on Queensland's *Performance Based Standards* is available at:
>
> http://www.tmr.qld.gov.au/Business-and-industry/Heavy-vehicles/Performance-based-standards.aspx

15.2 Other transport-related development impacts

In addition to traffic-generated impacts, development can introduce many other impacts that may be relevant to consider in terms of transport-related impacts. This can include a number of impacts that typically create impacts at or near the development site's location. These include:

- impacts on the safety and operating performance of SCRs from buildings, structures, services and utilities
- impacts to the structural integrity of SCRs due to filling and excavation works undertaken by a development
- impacts to SCR infrastructure due to stormwater and drainage impacts of development
- impacts on vehicular access to and from a SCR including impacts from onsite parking and manoeuvring, such as insufficient onsite parking leading to queues on SCRs
- impacts affecting planned upgrades of SCRs
- impacts to human health and wellbeing due to road traffic-generated noise and other transport generated emissions (such as air, dust and light)
- impacts on the need to extend infrastructure or services due to the presence of the development (for example, the extension or addition of bus routes, cycleways or footpaths)
- impacts on current public transport and active transport infrastructure, such as access points creating conflict with existing bus stop locations, or development impeding sight lines for cyclists.

Development triggered for state assessment under the *Planning Act 2016* may require assessment of these impacts with reference to SDAP and supporting guidelines. In addition, some major development projects may also need to consider these impacts and in such a situation, the Department of Transport and Main Roads would seek to achieve similar outcomes to those articulated in SDAP.

> SDAP can be accessed at:
>
> http://www.dilgp.qld.gov.au/planning/development-assessment/state-development-assessment-provisions.html

Appendices

Appendix A: Schedule of preferred input parameters

This schedule is intended to assist applicants and their consultants by providing advice on preferred input parameters for traffic impact assessments. The submission of traffic impact assessments consistent with these preferred input parameters can be expected to be processed without disputation in respect of these parameters. It is intended that use of these parameters may alleviate the need for extensive Information Request responses.

The preferred input parameters are not prescriptive, however, and applicants obviously have the option to make alternative submissions when they consider the circumstances warrant the use of different traffic impact assessment input parameters.

A1. Design traffic and parking demands

Design development, of all types, should be assumed to be 85th percentile development, particularly in respect of design traffic generations and parking demands. That is, design development is not average development. The range of developments used to derive an average is likely to include at least some older, more poorly performing developments of that type. In general terms, new proposed development should be assumed to be more successful than average, and 85th percentile is generally the most appropriate parameter.

It should be noted that, when assessing the design traffic generations of aggregated development, such as a significant number of detached dwelling houses within a residential estate, it is not the 85th percentile traffic generation of an individual house which is relevant, but the 85th percentile generations of a residential estate. The larger the development, the more closely the design (85th percentile) rate will approach the average rate.

A2. Design peak periods

The peak periods which need to be assessed in traffic impact assessments will typically be the times of peak design traffic volumes (design traffic volumes being the base traffic volumes plus generated traffic); however, assessment of more than one peak period will frequently be necessary, such as the weekday AM peak hour, weekday PM peak hour and possibly the weekend midday peak (for example, for hardware and building supply developments or shopping centres). Other peak periods might need to be assessed if the subject development generates its peak traffic volumes outside the network background peak periods. Development conditions that should be considered when selecting appropriate peak hours for assessment include:

- distance from the CBD or centre for commuting-based land uses such as residential dwellings
- urban location size and industry base and the relative scale of the school traffic and construction peak compared to a typical commuter peak in a CBD environment
- seasonal effects in tourist areas, mining towns, farming regions and so on. The ‘high season’ should be used in these cases for determining base case traffic volumes, using whatever average day to high season traffic factors are available.

Turn lane lengths identified as necessary might only be needed for one of these peak periods but not for others; that is, design recommendations might be based on assessments of more than one peak period.

A3. Use of locally collected data

Data for traffic impact assessments can and should come from as wide a variety of sources as possible, particularly including locally collected data; however, the data collected should be for a development which is directly comparable to the development being assessed. Problems can arise when using locally collected data, in circumstances such as:

- Seasonal variations. The data collected do not take appropriate account of seasonal variations or other special circumstances, including the effects of school holidays.
- Immaturity of catchments. For example, it is common for supermarket-based shopping centres to be developed several years in advance of the residential catchments they are intended to serve. Traffic generation data from centres with still-growing catchments will be of limited value.
- Immaturity of developments. This is particularly an issue in industrial estates when premises are leased or purchased in anticipation of future business growth. Traffic generation data from immature developments will also be of limited value. Often, average plot ratios grow with time in industrial subdivisions as well.

A4. Background traffic growth rates

Due to yearly variations in background traffic growth rates, it is recommended that background traffic growth rates are discussed with Transport and Main Roads prior to the traffic impact assessment being undertaken.

Background traffic growth rates are most commonly derived from extrapolations of past data. It is preferable that extrapolation of long-term trend lines be adopted, based on the most recently available traffic volumes. Simple growth is generally considered preferable to compound growth assumptions. If reliable forecasts are available for the drivers of traffic growth (such as population growth), these can be a sound basis for traffic growth forecasts. Particular care should be exercised when analysing and extrapolating growth rates in newly developing areas, where very high short-term growth rates (usually from a very low base) can be recorded.

A5. SIDRA analyses – default values

SIDRA analyses should preferably be based on default values. The adoption of any values other than default values should be documented (and justified) in all SIDRA analyses relied upon. The most common changes are those relating to peak hour factors, lane capacities, and gap acceptance parameters. The data needed to justify a departure from default values will typically need to be extensive, and able to be shown to be directly applicable in the design situation.

The following exceptions to these requirements apply for the calibration / validation of SIDRA models:

- for priority-controlled intersections: adjustment of the gap acceptance parameters
- for roundabouts: adjustment of the ‘environment’ factor
- for signalised intersections: adjustment of the ‘area’ factor.

Any adjustments made for model calibration / validation are to be retained for the impact assessment models, except where a different intersection control method is being assessed.

A6. Signal system phase arrangements

Traffic impact assessment reports frequently report pre-existing signal system phase arrangements or cycle times at Transport and Main Roads-controlled signal systems which are perceived as sub-optimal. Amended arrangements are then recommended as producing a benefit to fully or partially offset the impact of generated traffic. In some cases, the pre-existing phase arrangements are necessary because the individual signal set is part of a coordinated system. At other times, phase and cycle time arrangements are sub-optimal for other reasons.

Where signals form part of a linked signal set, then there should be a like-for-like comparison of the 'without' and 'with development' cases. Similarly, if the pre-existing arrangements are necessary to comply with broader system requirements, then the existing arrangements should be used for both the 'without' and the 'with development' assessments. In these cases, care is necessary to ensure like-with-like comparisons.

If, however, there appears to be no logical reason for the phasing to be the way it is, and an analysis reveals that the intersection efficiency can be proven to be improved overall with the development and with intersection phasing / timing changes, then this is a legitimate impact mitigation measure to propose. It is important to note that, when additional traffic is added into an intersection, it may alter the flow balance in any event and there can be occasions where phasing and timings can be altered with no detriment to the through traffic streams and a better overall outcome can be achieved.

A7. Right turn lane lengths

Right turn lane lengths are typically coded as an input to models such as SIDRA. The lane lengths coded should be the actual length of full-width lanes, exclusive of tapers; however, in deciding the acceptability or otherwise of an output 95th percentile queue length, it might be reasonable to base that assessment on the length of the full-width lane plus that part of the taper where the width available is in excess of 2.0 metres.

A8. Directional distributions – linked and diverted trips

Directional distributions will usually be estimates based on limited available data. They can, however, be based on material typically included in 'need analysis' reports. Estimation of linked and diverted trip proportions is likely to be based on even less data, and it will vary both with development type and location. Usually, because only localised areas are being investigated in a traffic impact assessment, the most relevant consideration relates to the identification of trips which would be on the localised road network with or without the subject development, albeit with modified routes through that local network. Consideration should also be given to multi-purpose (internal trips), particularly in mixed-use developments.

A9. Use of Austroads or the Road Planning and Design Manual

Information requests often refer to various elements of the Transport and Main Roads *Road Planning and Design Manual*, 2nd edition. While Austroads guides are acceptable to use for design standards, where Queensland exceptions are noted in the *Road Planning and Design Manual*, 2nd edition, these exceptions have precedence over Austroads publications.

A10. Use of extended design domain

Analyses and upgrading recommendations should preferably be based on the normal design domain. There will be very few circumstances where the extended design domain should be used in respect of traffic impact assessments dealing with new development, even when intersections (or other traffic design features) already exist.

For further discussion on extended design domain, refer to Transport and Main Roads' *Road Planning and Design Manual*, Volume 3.

A11. Sight distance standards

The provision of appropriate sight distances is fundamental to road safety. Approach sight distance should be provided at every proposed intersection or driveway access. Public road intersections should have safe intersection sight distance unless the characteristics of the road or the site totally preclude it. In those circumstances, minimum gap sight distance should be provided.

The design speed adopted should be 10 km/hr in excess of the posted speed limit unless speed survey data is available to substantiate the 85th percentile approach speed to use as the design speed. The design speed of upstream traffic features (such as a horizontal curve) should not be assumed to constrain approach speeds to the design speed of the feature in all conditions; for example, the design speed of a horizontal curve is effectively based on the assumption of wet pavements, whereas actual operating speeds in dry weather might be significantly higher.

A12. Appropriate design vehicles for geometric design

Geometric designs should be based on the largest design vehicle likely to use the facility on a regular basis; however, what constitutes usage on a regular basis is frequently debated. Unless special circumstances exist, the design vehicle for geometric design purposes should be the largest vehicle which is likely to use the facility at least once per week. The frequency of use by different vehicle classes will be more relevant to calculations of queue requirements.

Appendix B: Traffic impact assessment certification

Certification of Traffic Impact Assessment Report

Registered Professional Engineer Queensland

for

Project title:	

As a professional engineer registered by the Board of Professional Engineers of Queensland pursuant to the *Professional Engineers Act 2002* as competent in my areas of nominated expertise, I understand and recognise:

- the significant role of engineering as a profession, and that
- the community has a legitimate expectation that my certification affixed to this engineering work can be trusted, and that
- I am responsible for ensuring its preparation has satisfied all necessary standards, conduct and contemporary practice.

As the responsible RPEQ, I certify:

(i) I am satisfied that all submitted components comprising this traffic impact assessment, listed in the following table, have been completed in accordance with the *Guide to Traffic Impact Assessment* published by the Queensland Department of Transport and Main Roads and using sound engineering principles, and

(ii) where specialised areas of work have not been under my direct supervision, I have reviewed the outcomes of the work and consider the work and its outcomes as suitable for the purposes of this traffic impact assessment, and that

(iii) the outcomes of this traffic impact assessment are a true reflection of results of assessment, and that

(iv) I believe the strategies recommended for mitigating impacts by this traffic impact assessment, embrace contemporary practice initiatives and will deliver the desired outcomes.

Name:		RPEQ No:	
RPEQ competencies:			
Signature:		Date:	
Postal address:			
Email:			

Traffic impact assessment components to which this certification applies	✓
1. Introduction	
Background	
Scope and study area	
Pre-lodgement meeting notes	
2. Existing Conditions	
Land use and zoning	
Adjacent land uses / approvals	
Surrounding road network details	
Traffic volumes	
Intersection and network performance	
Road safety issues	
Site access	
Public transport (if applicable)	
Active transport (if applicable)	
Parking (if applicable)	
Pavement (if applicable)	
Transport infrastructure (if applicable)	
3. Proposed Development Details	
Development site plan	
Operational details (including year of opening of each stage and any relevant catchment / market analysis)	
Proposed access and parking	
4. Development Traffic	
Traffic generation (by development stage if relevant and considering light and heavy vehicle trips)	
Trip distribution	
Development traffic volumes on the network	
5. Impact Assessment and Mitigation	
With and without development traffic volumes	
Construction traffic impact assessment and mitigation (if applicable)	
Road safety impact assessment and mitigation	
Access and frontage impact assessment and mitigation	
Intersection delay impact assessment and mitigation	
Road link capacity assessment and mitigation	
Pavement impact assessment and mitigation	
Transport infrastructure impact assessment and mitigation	
Other impacts assessment relevant to the specific development type / location (if applicable)	

Traffic impact assessment components to which this certification applies	✓
6. Conclusions and Recommendations	
Summary of impacts and mitigation measures proposed	
Certification statement and authorisation	
[change above and / or insert other component as needed]	