Guide to Traffic Generating Developments.

Version 2.2

October 2002

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IDENTIFICATION: TTR - 002.

ISSUE NUMBER: 2.2.

DATE OF ISSUE: October 2002.

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First Published 1984 as Policies, Guidelines and Procedures to Traffic Generating Developments.

ISBN 0 7305 9080 1.

CRB No. 93.159.

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Revision record.

Please note that all pages in this Guide are marked Issue 2.2, dated October 2002. The revision record page(shown on page vii of the printed Guide) will be re-issued every time amendments are sent to the registered owner.

About this Guide.

Purpose.

This Guide outlines all aspects of traffic generation considerations relating to developments. The Guide provides information regarding traffic issues for those submitting Development Applications, and for those involved in the assessment of these applications. The overall objective is that both parties have access to common information relevant to the development approval process.

The information provided gives background into the likely impacts of traffic from various types of developments, thereby illustrating the importance of accurate development assessment.

Who uses this Guide?

Those who may find the Guide most useful are traffic engineers, town planners, architects, council officials, developers, police, RTA personnel and any others involved in the approval process of Development Applications.

How to use this Guide.

The Guide is separated into a number of sections each dealing with specific issues relating to traffic generating developments. The index complements the Table of Contents, and will assist you in locating relevant information in the Guide. A list of significant terms is provided in the Glossary. There are also a large number of topics listed alphabetically in the on-line help search list. Selecting an item from the search list will take you immediately to the relevant topic. Each section is divided and colour coded. Also, various paragraphs are numbered sequentially within each section.

Section 1 Policies and issues.

This section discusses the policies and issues concerning all kinds of traffic generating developments. It also sets out some general principles for design relating to developments.

Section 2 Traffic impact studies.

This section looks at traffic impact studies and the key issues of their use. It outlines methods of conducting traffic impact studies and compiling traffic impact statements. It also includes a checklist style table of information required to conduct such studies, and indicates the source of relevant information.

Section 3 Land use traffic generation.

The traffic generation rates for a number of land uses surveyed by the RTA are explained in this section. A summary table of generation rates is included, and should be used in conjunction with the additional information supplied with each land use.

Section 4 Interpretation of traffic impacts.

Once the generation rate for a particular land use has been established, either using data from Section 3 or by a survey, this section is used to determine the impact of the proposed development on the surrounding road network. The type of impact then determines the requirements which make the development acceptable.

Section 5 Parking requirements for specific land uses.

Based on surveys conducted by the RTA on a variety of land uses, parking requirements and driveway types are recommended in this section. Definitions for each land use are also included, as well as a summary table of relevant land uses.

Section 6 Access and parking area design.

This section deals with geometric design aspects of access to developments, as well as internal roads and parking areas within developments. Also included are swept paths for buses.

Section 7 Residential subdivisions - traffic and safety.

The design of residential subdivisions is discussed in this section. The general principles of traffic and safety matters of design are presented.

Section 8 Cost impacts of traffic generated by developments.

Section 94 of the Environmental Planning and Assessment Act, deals with recovery of cost due to development. This section outlines the various means of assessing costs associated with the impact of a development on the surrounding road network.

Section 9 Administration of the State Environmental Planning Policy No 11.

The State Environmental Planning Policy No11 - Traffic Generating Developments, is the legislation which sets the levels of consultation in the approval procedure for developments. This section discusses this policy in relation to Development Committees. Also included is a schedule of consultation for development as per SEPP11.

Section 10 Reference Material.

This section contains reference material (a bibliography and a glossary) which enhances the main body of information in the Guide.

Table of Contents.

Introduction.

This Guide examines ways in which road systems may best accommodate increased demands for movement and parking of traffic. These include the provision of new roads and parking facilities, the improvement of existing roads and traffic management facilities, the consideration of future changes in land use and the provision of public transport. Development does not always cause an increase in traffic generation. However more significant sites require a thorough evaluation and application of appropriate management measures.

Facts relating to traffic generation in this document have been drawn from many sources, including major surveys conducted by the Authority. While most development sites have much in common, circumstances particular to individual developments must also be considered. For example, the traffic generation rate of a group of houses in the suburbs is relatively stable compared with the amount of traffic generated by a hotel.

Safety is a primary consideration in planning for developments. If a development is located in an area with a high accident level then provision must be made to demonstrably reduce the potential for accidents. Also, where a development generates a lot of pedestrian movement, appropriate remedial measures must be taken to maintain safety standards.

When a development has a significant impact on traffic conditions, adequate traffic facilities must be provided to maintain a suitable level of service. However, an excessive allocation of facilities to a particular development can be inappropriate and expensive. The misinterpretation of traffic standards, or the over zealous application of such standards may contribute to this, as may inappropriate traffic generation projections. This is why this document is termed a guide, not a standard. Professional judgement is recommended in the application of this Guide.

Two planning and design approaches that may be useful in moderating traffic flow are traffic calming measures (such as designing roads to suit the local environment), and travel demand management (which aims at reducing the rate of vehicular travel per person).

Traffic calming measures, which are an extension of local area traffic management strategies seek to reduce the overall impact of traffic in residential streets. These measures assist in traffic management by reducing the speed of traffic, widening footpaths and providing parking. In predominantly commercial areas similar traffic calming treatments are being adopted in an attempt to improve the pedestrian environment by reducing vehicle speeds.

Travel demand management seeks to reduce vehicular demand through a range of strategies. These include:

- encouragement of and access to pedestrian facilities.
- encouragement of car pooling.
- improved access to public transport facilities.
- mixed land uses.
- reduction in the rate of vehicular trips per person through the use of teleworking.
- the encouragement of fuel and energy conservation.

A major concern of new development is the provision of parking This Guide sets out the range of parking demands likely to occur at an isolated site, recognising the impact it may have on transport policy and travel demand.

Developments which generate a high demand for short stay parking (such as fast food outlets), should provide parking which is exclusively off-street. This is particularly so for a development on an arterial

road which has a clearway, or which is difficult for a pedestrian to cross. Conversely, many fast food outlets are located in shopping strips with no off-street parking, particularly where traffic calming measures have been taken to improve pedestrian safety. Development must always be seen in the context of the local parking plan.

Developers often see council's parking code requirements as onerous and costly. They are seldom seen as a necessary control for the development to operate efficiently. Parking requirements reflect a balance between the developers' interest in improving their own viability and the councils' interest in the provision of satisfactory facilities as required by the development.

The provision of adequate parking facilities attracts extra customers, whereas a restrictive parking code may deter the establishment of new developments. There are cases where an existing development does not have sufficient on-street / off-street parking provisions based on council's current parking code. It may be the case that the code is in excess of current demand and is therefore an impediment to economic development. However, any change to a parking code requires an independent parking survey to establish the synergy between the mix of activities at any new development.

The issue of parking and the intrusion of traffic into residential areas must also be considered. The provision of additional off-street parking, for commercial or retail activities, might not necessarily result in less parking in the local streets, as more commuters may travel to the development and park in the vicinity. However, parking intrusion into local areas can be prevented by the implementation of period parking schemes.

The system as set out in this Guide, is intended to simplify the complexities of urban planning, not disguise them. The standard definitions of the four tier road hierarchy have been retained in this document and have been complemented by traffic calming approaches.

This Guide provides a common approach for decision making and traffic planning, keeping in mind the individual requirements of a particular development. Traffic management is but one of the considerations in the development of civic planning for the community.

Section 1 Policies and Issues.

1.1 Introduction.

This section discusses policies and issues concerning all kinds of traffic generating developments. It also sets out general design principles for developments.

1.2 Legislation.

The relevant government legislation and planning instruments that determine policy for traffic generating developments are:

- State Environmental Planning Policy No.11, Traffic Generating Developments (SEPP11).
- Environmental Planning and Assessment Act 1979, Section 90 Matters for Consideration.

SEPP11 requires councils to consult with the RTA on all development applications for land uses listed in Schedules 1 and 2 of the policy. The current schedules are listed in Appendix A of Section 9 of this Guide. These schedules are subject to change and the RTA will advise on the level of consultation as required.

The Environmental Planning and Assessment Act 1979, provides the framework for development control within New South Wales. Section 90 of this Act specifies matters to be considered in the assessment of a development application. The provisions of Section 90 relevant to traffic and safety are:

(b) the impact of that development on the environment (whether or not the subject of an environmental impact statement) and, where harm to the environment is likely to be caused, any means that may be employed to protect the environment or to mitigate that harm.

(i) whether the proposed means of entrance to and exit from that development and the land to which that development application relates are adequate and whether adequate provision has been made for the loading, unloading, manoeuvring and parking of vehicles within that development or on that land.

(j) the amount of traffic likely to be generated by the development, particularly in relation to the capacity of the road system in the locality and the probable effect of that traffic on the movement of traffic on that road system.

(k) whether public transport services are necessary and, if so, whether they are available and adequate for the development.

(n) any representations made by a public authority in relation to that development application, or to the development of the area, and the rights and powers of that public authority.

(o) the existing and likely future amenity of the neighbourhood.

1.3 Issues.

SEPP11 and Section 90 of the EP & A Act promote consideration of the following issues:

- Traffic impact of developments.
- Access to developments.
- Site consolidation.
- Parking impact of developments.
- Road improvements for developments.

1.3.1 Traffic impact of developments

The two major functions of the road network are:

- providing access to development.
- enabling the safe and efficient movement of goods and people.

In performing these functions roads from the four tier functional classification system can be broadly categorised as either:

minor roads: relatively low overall volumes of traffic, primarily provision of access to developments and low volumes of through traffic (local and collector roads fall into this category), or.

major roads: high volumes of traffic providing links between major centres, with priority being given to the safe and efficient movement of through traffic (arterial and sub-arterial roads fall into this category).

It is important to acknowledge the relationship between road and land use planning. Roads should be designed and constructed in order to provide a service to existing and planned development rather than promoting inappropriately located development.

All developments generate traffic. The amount of traffic generated depends on the type, location and size of the development. The traffic generated affects surrounding developments and the adjacent transport network. This effect should be in keeping with the current classification and functions of the adjoining network. That is, the impact of the development should not cause the adjacent roads to be forced into performing a function of higher road classification.

1.3.2 Access to developments.

An important consideration of the planning process is access control. When planning access to developments, consider the following objectives:

- maintaining safety standards.
- maintaining traffic flow standards.
- protecting the environment.
- maintaining and improving pedestrian flow along footpaths.

Maintaining safety standards.

Statistics indicate that accident rates increase as the intensity of roadside developments increase (eg. commercial activities).

The amount of traffic generated and attracted by a development depends on the location, the type of land use and the size of the development. One possible outcome of an increase in traffic flow, can be an increase in the number of accidents. Therefore access to the development and the road system must be designed to minimise conflicts between vehicles and pedestrians.

Generally, it is advisable to avoid direct access between developments and major roads. If such access is proposed, the RTA requires studies which demonstrate that the resulting situation does not adversely affect safety. Where possible, vehicle access to developments should be from service roads / lanes. (See Figure 1.1)

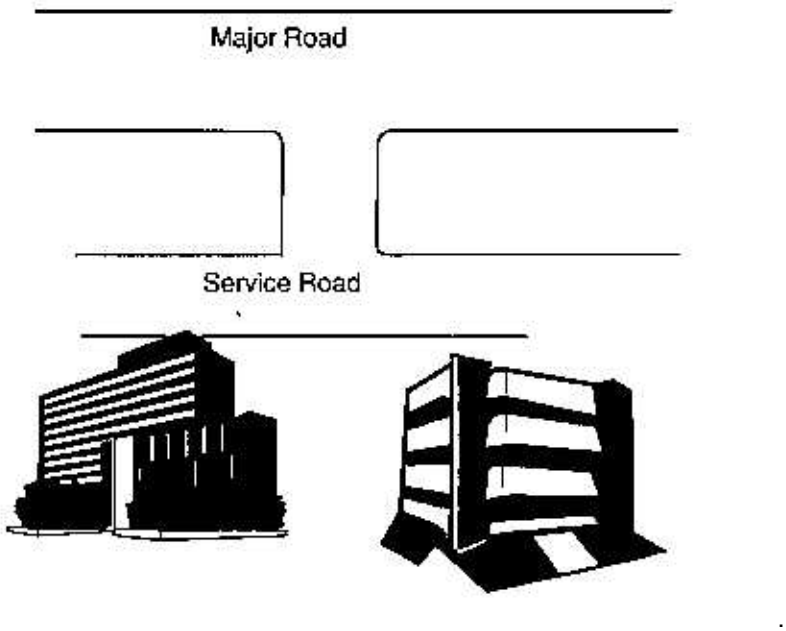

Figure 1.1 Access to developments from service roads.

Vehicles entering and leaving an isolated development are a potential hazard to other vehicles and to traffic flow in general, even if sight distance is good. Also, high speed accidents in rural areas can occur where traffic enters from isolated developments and where main road traffic operates at high speed. Such situations should be avoided.

Safe pedestrian access must also be provided to developments. Mid-block crossings of major roads should be avoided. In any new development, a general principle of design is to maintain road safety and, where possible, improve it.

Maintaining traffic flow efficiency.

Traffic management is undertaken to assist the movement of traffic in both urban and rural areas. However, traffic management is ineffective if unplanned or unsuitable roadside development is permitted.

When considering the design of a development, suitable provision must be made to maintain traffic flow standards on the road network.

The design of direct vehicular access to developments fronting major roads should include the provision of:

- deceleration lanes.
- acceleration lanes.
- right turn lanes.

These measures should be designed in accordance with RTA guidelines.

Where proposed developments front minor roads, issues relating to traffic safety and amenity are of greater importance than traffic efficiency. Nevertheless, some assessments of traffic efficiency impacts are appropriate where the level of parking required for the development is 50 or more spaces as stipulated in SEPP 11.

Protecting the environment.

Developments should be planned so as to maintain compatibility between the type and scale of the development and its environment. This can be achieved by adequate consideration of both the amenity of a development and its built and natural environment.

Measures implemented to improve traffic safety and efficiency, may have a detrimental effect on the environment, e.g. an increase in noise levels on local roads. Where this is the case, the overall benefit of the measure in question must be assessed in terms of both traffic considerations and environmental concerns. By encouraging traffic to use the major roads instead of local streets, safety and environmental amenity of the local streets improve markedly as compared to marginal reduction in safety and efficiency of major roads.

Pedestrian flow efficiency.

Many developments attract pedestrian traffic, particularly commercial developments in retail and CBD areas. It is important that proper assessment is made of pedestrian traffic on footpaths, e.g. the sufficiency of footpath widths. Pedestrian safety also needs to be considered, especially at conflict points such as entry / exit driveways leading to basement and vehicle parking areas. One way of reducing conflict is to divert pedestrian traffic around driveways. In some instances, this may require buildings being set back a considerable distance from the roadway.

1.3.3 Site consolidation.

Development or redevelopment of sites fronting major roads should not extend or intensify traffic conflicts. Redevelopment in particular, and in some cases new development, frequently provides an opportunity to consolidate individual sites, thereby reducing fragmented roadside activity. Site consolidation design should keep direct access to major roads at a minimum.

While site consolidation often causes an increase in higher density land use, it may also facilitate an improvement in traffic conditions which may not have occurred had the sites been developed independently. An improvement in traffic efficiency occurs when resources are allocated to improvements, thereby lessening access points to the network.

Local governments are advised to devise a development control plan for site consolidation, particularly in existing developed areas. Where site consolidation is not possible, the plan must consider limiting the number of access points to a development by implementing measures such as the provision of a service road (see Figure 1.2).

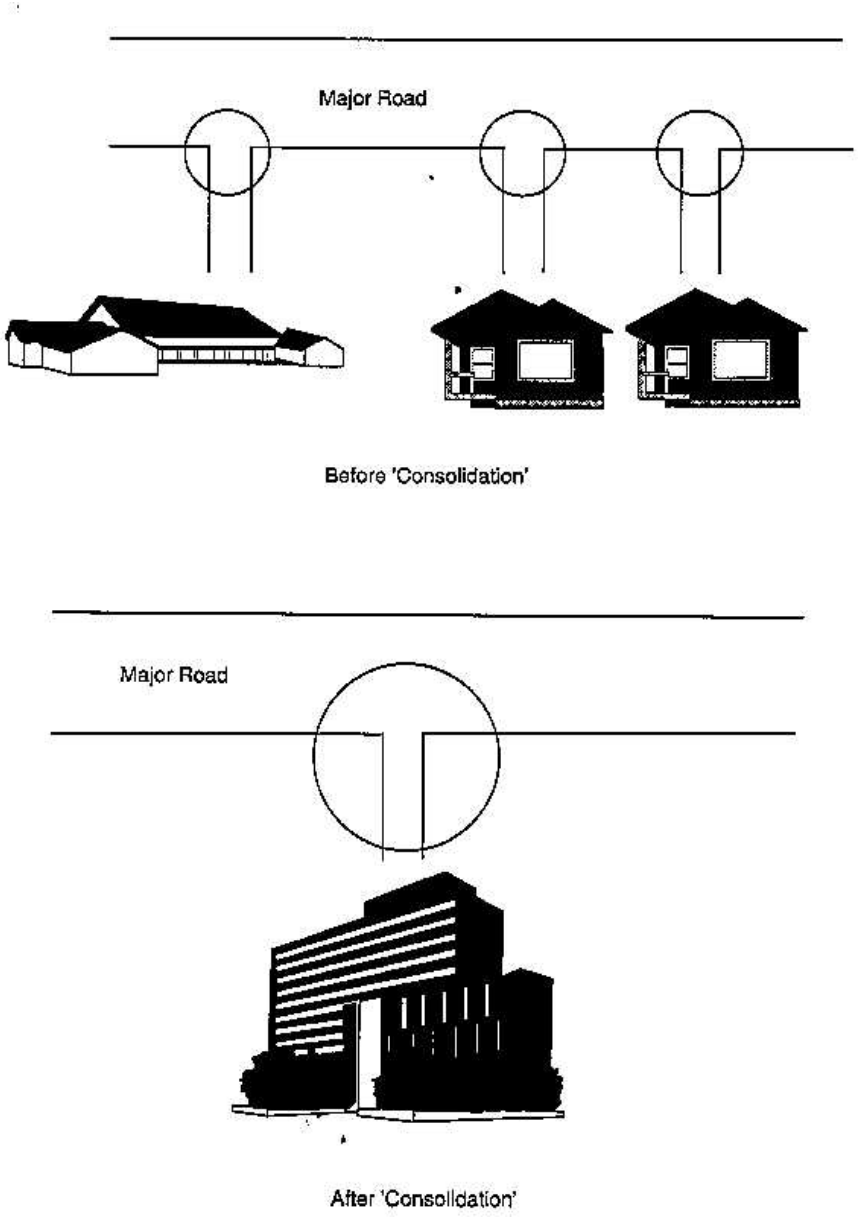

Figure 1.2 Site consolidation concept.

1.3.4 Parking impact of developments.

Consider the following parking impact issues when determining development applications:

- local parking plans.
- assessment of parking requirements.
- contributions in lieu.

Local parking plans.

The Authority has formulated a Metropolitan Parking Policy which is designed to ensure that transport initiatives are complemented by appropriate parking plans.

Local parking plans have a number of functions including:

- controlling parking within local precincts by the local authority.
- reflecting the capacity of the road system to cater for additional traffic.
- indicating the availability of public transport.
- ensuring the full use of existing off-street parking areas.
- developing an awareness of current and proposed parking amendments in the vicinity of the project.

Assessment of parking requirements.

The parking demand of a proposed development can be estimated by referring to Section 5. These estimates can be confirmed by surveys. Developers should then consult with Councils to determine if on-site parking requirements may be met by the use of existing public parking areas.

In some locations, the existence of adequate public transport facilities, and / or limited access roads to a town centre, may lead to a council restricting parking supply below the level suggested in this Guide.

Contributions in lieu.

In some circumstances where it is not possible to provide off-street parking, developers may pay contributions in lieu to the council, thereby placing the responsibility of the provision of such parking on the council. Such arrangements can be particularly useful for small developments (less than 200m^2 GFA), for which the provision of adequate off-street parking spaces may be difficult to achieve. There are some situations where parking provision (either on-site or through contributions in lieu) is not necessary, for example, small developments along main street shopping centres and in the adaptive re-use of historic buildings. In such circumstances, the shortfall of parking caused by environmental site constraints may be balanced by the benefits.

1.3.5 Road improvements for developments.

The following considerations are relevant in determining road improvements for developments:

- schedule of required works.
- section 94 of the Environmental Planning and Assessment Act 1979.

Schedule of required works.

Ideally, a development should be able to operate without the need to introduce changes to the road system. However, there are instances where improvements are required, so that safe and convenient access to the site is ensured, and the safety and efficiency of the road system is maintained.

Where road improvements are required, that requirement must constitute a condition of consent for the approval of the development. In this situation, developers should be aware of the following:

- developers are to contribute to the cost of road improvements which arise from the development.
- the level of contribution required is proportional to the need for improvements which are a direct result of the development.
- the minimum level of contribution is assessed on the basis of maintaining the existing level of service on the adjacent road network.

Where road improvements have already been planned, the contribution is adjusted in order to advance the works schedule and coincide with the completion of the development. Where planned

improvements are considered essential, it is advisable that the development be deferred until such time as funds are available. Alternatively, the developer (and other beneficiaries of the required works) may be required to fund work that council or the Authority may not be able to fund in the foreseeable future.

Section 94 of the Environmental Planning and Assessment Act 1979.

Section 94 of the Environmental Planning and Assessment Act 1979 empowers authorities to secure contributions from developers for community amenities, services and improvements to the road network for traffic facilities.

Section 94 contributions have largely arisen from considerations of roadway capacity in terms of:

- number of lanes required.
- improvements to intersections to cope with the additional traffic (including traffic control devices).
- Improvements to infrastructure for pedestrians, cyclists and public transport.

1.4 Limitations and Qualifications.

The recommendations in this Guide may not be appropriate in all development situations. Where substantial departures from the recommendations are proposed, developers must present sufficient information to councils and the Authority to support such departures.

It is recommended that users of this Guide consider the following points when dealing with Development Applications:

- guides are not meant to be standards that are rigidly applied.
- the key to the interpretation of technical requirements is to make assessments on a case by case basis.
- the most significant departures from this Guide may occur in off-street parking provisions.
- while parking demand might not be substantially different between local government areas and within precincts in local government areas, desired levels of parking supply may vary where based on local, state or strategic policies.

It is recommended that the parking provision in this Guide be viewed as the minimum desirable requirement, while Councils' parking codes are considered to be minimum mandatory requirements.

It should also be noted that any requirement embodied in existing or future planning legislation, overrides these guidelines and Council's code.

The RTA has adopted design vehicles presented in the *Australian Standard 2890 - Parking facilities* which determine site geometric requirements. Rural roads, with traffic volumes substantially lower than those found in metropolitan areas, may call for driveway designs of a lower standard than those recommended.

If, however, a driveway is to be located on a road where vehicle speeds are high, then special design features may be required to minimise the risk to public safety.

Section 2 Traffic impact studies.

2.1 Introduction.

This section looks at traffic impact studies and the key issues of their use. It is important to ensure that all relevant traffic impacts are identified and assessed. The findings of a traffic impact study may be used for local development control, ensuring the provision of a safe and efficient road system.

2.2 What is a traffic impact study?

A traffic impact study is a simplified technical appraisal of the traffic and safety implications relating to a specific development. The information provided in the study report should enable the relevant authorities (i.e. council and the RTA) to assess the traffic impact of a development.

Information collected in such studies should reflect the size and type and location of the development as well as its relationship to surrounding developments and the adjacent transport network.

The following outlines issues to be addressed in traffic impact studies:

- existing proposals for improvements to the adjacent road network and hierarchy.
- impact on road safety.
- impact of traffic noise.
- AADT-- annual average daily traffic. It is the estimated yearly total of traffic movements divided by 365.
- examine volumes and historical trends on key adjacent roads.
- peak period traffic volumes and congestion levels at key adjacent intersections.
- existing parking supply and demand in the vicinity of the proposed development.
- existing public transport services in the vicinity of the proposed development.
- parking provisions appropriate to the development (in relation to demand and statutory requirements).
- traffic generation / attraction and trip distribution of the proposed development.
- safety and efficiency of internal road layout, including service and parking areas.
- impact of generated traffic on key adjacent intersections, streets in the neighbourhood of the development, the environment and other major traffic generating development sites in close proximity.
- safety and efficiency of access between the site and the adjacent road network.

All proposed developments listed in Schedules 1 and 2 of SEPP 11 require referral to either a Regional Development Committee or a Council Development Committee.

(See Section 9, Appendix B).

2.2.1 Schedule 1 developments.

In most situations, a traffic impact study is required for developments listed in Schedule 1. In circumstances where the impact on traffic will be minimal, a statement relating to the impact of development on traffic is sufficient. Developments involving transport terminals, bulk stores and liquid fuel depots, or small developments with low traffic movements into and out of the site, are examples of developments that may require a traffic impact statement.

Consider the following factors when planning Schedule 1 Developments.

Location.

The impact of a development varies depending on whether it is located in an urban or rural environment.

Existing infrastructure.

The introduction of heavy vehicles into areas such as the inner city with its narrow road widths would have substantial impact.

Developments in sensitive areas.

Any development with a higher generation rate than the existing adjacent developments, will have an impact on the environment and amenity of the affected area.

2.2.2 Schedule 2 developments.

The scale of the development is the major determinant of whether a traffic impact study is required for developments listed in Schedule 2. As a minimum requirement, driveway location and design and the internal site layout should be investigated.

Schedule 2 developments which require a detailed traffic impact study are:

- clubs and licensed premises.
- drive-in take away food outlets.
- service stations and convenience stores.

2.3 Issues to be addressed.

A traffic impact study should follow the standard format and structure that is listed in Table 2.1. This format covers the key issues to be addressed in determining the impact on traffic of a development. Use of this format and the checklist will ensure those involved in the preparation and / or assessment of Development Applications that the most significant matters are considered.

Table 2.1
Key issues in preparing traffic impact studies

Procedures & Key Parameters	Source	Check✓
Brief description of the development		
Application and study process		
Introduction		
Background		
Scope of report		
The key issues and objectives of a traffic impact study		
General Data Collection / Existing Conditions		
Description of the Site and Proposed Activity		
Site location		
Current land use characteristics (zoning) of the proposed site and land use in the vicinity	Development Consent Authority	
Site access		
The Existing Traffic Conditions		
Road hierarchy; including the identification of the classified road network (major and minor roads) which may be affected by the development proposal	Council / RTA	
Inventory of road widths, road conditions, traffic management and parking control	Council / RTA and Survey	
Current and proposed roadworks, traffic management works and bikeways	Council / RTA	
Traffic Flows		

Procedures & Key Parameters	Source	Check✓
Selection of key streets - possibly divided into the major and the minor road network; selection of key assessment periods, chosen to cover the times at which the development would be expected to have its major impacts	Section 3	
AADT on key streets	Council / RTA and Survey	
Daily traffic flow hourly distribution, particularly in or near residential areas	Survey	
Estimate of the speed of traffic on the road to which vehicular access is proposed	Survey	
Current traffic generation of site	Survey	
Daily and peak period heavy vehicle flows and percentages	Survey	
The adaptation of appropriate computer models or techniques for assessing levels of traffic congestion and queuing conditions		
Traffic Safety		
Accident history of road network in the area	Council / RTA	
Parking Supply and Demand		
On-street parking provision	Council	
Off-street parking provision	Council / Survey	
Current parking demand, including utilisation by time of day and turnover rates	Survey	
Short term pick up and set down areas	Council / Survey	
Modal Split		
Public Transport		
Rail station locations	State Rail / Cityrail	
Bus routes and bus stop locations; Pedestrian access to bus stops; Constraints and conflicts	STA / Private Operators / Council / Survey	
Rail and bus service frequencies, ideally separated into Monday to Friday, Saturday and Sunday, for both peak and off-peak times	State Rail / Cityrail / Survey	

Procedures & Key Parameters	Source	Check✓
Commuter parking provision	State Rail / Cityrail / Survey	
Pedestrian Network		
Identify major pedestrian routes	Survey	
Pedestrian flows and potential conflicts with vehicles, particularly where such conflicts cause capacity constraint on either vehicular or pedestrian movement	Survey	
Pedestrian infrastructure	Survey	
Proposed developments in the vicinity		
Proposed Development		
The Development		
Plan reference, if plans not contained in study report		
Nature of development		
Gross floor areas of each component of development		
Projected number of employees/users/residents		
Hours and days of operations		
Staging and timing of development		
Selection of appropriate design vehicles for determining access and circulation requirements	Section 6	
Access		
Driveway location, including review of alternative locations	Sections 5, 6	
Sight distance of driveways and comparisons with stopping and desirable minimum sight distances	Section 6	
Service vehicle access	Section 6	
Analysis of projected queuing at entrances	Section 6	
Current access to site and comparison with proposed access		
Provision for access to, and by, public transport	Section 6	

Procedures & Key Parameters	Source	Check✓
Circulation		
Proposed pattern of circulation	Section 6	
Internal road widths	Section 6	
Provision for bus movements	Section 6	
Service area layout		
Parking		
Proposed supply		
Parking provision recommended by State Government policy	RTA / DUAP	
Council code and local parking policies and plans	Council	
Parking layout		
Projected peak demand, based where appropriate on similar research reports and on surveys of similar developments;	Section 5	
Parking for Service / courier vehicles and bicycles	Section 5	
Impact of Proposed Development		
Traffic generation during design periods		
Daily and seasonal factors		
Pedestrian generation and movements		
Traffic Distribution and Assignments		
Hourly distribution of trips		
Assignments of these trips to the road system based where possible on development feasibility studies or on origin/ destination surveys undertaken at similar developments in the areas		
Impact on Traffic Safety		
Assessment of Road Safety Impact		
Impact of Generated Traffic		
Daily traffic flows and composition on key streets and their expected effect on the environment particularly in residential areas		

Procedures & Key Parameters	Source	Check✓
Peak period volumes at key intersections and effect of generated traffic on congestion levels	Survey	
Impact of construction traffic during construction stages		
Other proposed developments in the vicinity their timing and likely impact, if known		
Assessment of traffic noise		
Public Transport		
Options for extensions and changes to bus routes and bus stops following discussions with the STA and or private bus operators	STA / Private Operators	
Provision for pedestrian access to bus stops		
Recommended Works		
Improvements to site access and circulation		
Improvements to roads, signals, roundabouts and other traffic management measures		
Improvements to pedestrian facilities		
Effect of recommended works on the operation of adjacent developments		
Effect of recommended works on public transport services including access to bus routes and bus stops		
Provision of LATM measures		
Funding of proposed improvement projects		
Noise attenuation measures		

Section 3 Land Use Traffic Generation.

3.1 Introduction.

The traffic generation potential of developments can be assessed in many situations by referring to the Authority's *Land Use Traffic Generation - Data and Analysis*, reports. Surveys of existing developments similar to the proposal, can also be undertaken and comparisons may be drawn. This section does not attempt to explain these techniques in detail, but provides a summary of basic traffic generation information for various land uses to assist people who may not have traffic engineering training. By simplifying generation rates, site-by-site variations from the average are not taken into account. Comparisons may be drawn, however, between the traffic generation potential of various land use types enabling a rough assessment of the traffic generation implications of land use zoning. Departures from the average generation rates for individual development proposals may be adopted, in which case such a departure should be justified with relevant supporting facts.

This section discusses each land use briefly and lists some of the factors contributing to variations in traffic generation rates. Generation rates for daily (24 hour) and evening peak hour periods are given where possible.

Note: In this Guide a trip is defined as a one way vehicular movement from one point to another excluding the return journey. Therefore, a return trip to / from a land use is counted as two trips.

3.2 Traffic impact assessment.

3.2.1 Daily traffic volumes.

Existing daily traffic volumes on roads adjacent to a proposed development should be compared with estimated daily traffic volumes. (Existing daily traffic volumes are often available in the form of annual average daily traffic (AADT) volumes.) This enables the functions of roads in the overall hierarchy of roads to be reviewed in the context of the proposed development. Daily traffic volumes can be of particular interest when assessing the impact of a proposed development on the amenity of adjacent residential areas.

3.2.2 Peak traffic volumes.

Two periods of traffic generation need to be considered:

- the peak activity time of the development itself.
- the peak activity time of the adjacent road network.

The first of these is generally used as a basis for reviewing access to the site and driveway design requirements. The second and possibly more important period is used to assess the effect of the development on the road system. Such an assessment should identify whether any road improvements or traffic management measures are required to accommodate the increased traffic on the system.

The peak period assessment (of adjacent road network) is usually undertaken using computer programs to assess the operation of the intersection under traffic signal, roundabout or priority control. Programs such as SCATES, INTANAL, SIMSET and INSECT are typically used, giving indications not only of total intersection delay but also of average delays per vehicle.

3.3 Residential.

3.3.1 Dwelling houses.

Rates.

Daily vehicle trips = 9.0 per dwelling
Weekday peak hour vehicle trips = 0.85 per dwelling.

Factors.

The above rates are based on surveys conducted in areas where new residential subdivisions are being built. Public transport accessibility in such areas is often limited. Traffic generation rates in inner metropolitan areas where public transport is more accessible could be lower. However in inner metropolitan areas that are more affluent, higher car ownership rates often counter-balance better public transport accessibility.

With new subdivisions, where *standard* lots are given, some additional allowance may be made for dual occupancy and group homes, where there are sufficient numbers of these types of residences. The *Australian Model Code for Residential Development* (AMCORD) assumes a daily vehicle generation rate of 10.0 per dwelling, with 10% of that taking place in the commuter peak period. The use of these figures provides some allowance for later dual occupancy development.

Note that not all trips are external trips. As a guide, about 25% of trips are *internal* to the subdivision, involving local shopping, schools and local social visits. When reviewing the impact of the traffic generated on sub-regional and regional roads, some adjustment is necessary, depending on the location of shops, schools and recreational facilities.

3.3.2 Medium density residential flat building.

Rates.

Smaller units and flats (up to two bedrooms):

Daily vehicle trips = 4-5 per dwelling
Weekday peak hour vehicle trips = 0.4-0.5 per dwelling.

Larger units and town houses (three or more bedrooms):

Daily vehicle trips = 5.0-6.5 per dwelling
Weekday peak hour vehicle trips = 0.5-0.65 per dwelling.

Factors.

Comments regarding internal and external trips made under *Factors, Dwelling Houses* also apply to medium density developments.

The basic generation rates for developments in less affluent areas and for public housing may in some cases be lower than stated.

3.3.3 High density residential flat building.

Rates.

Metropolitan Regional (CBD) Centres.

Daily vehicle trips = not available
Peak Hour Vehicle Trips = 0.24 trips per unit.

Metropolitan Sub-Regional Centres.

Daily vehicle trips = not available
Peak Hour Vehicle Trips = 0.29 trips per unit.

Factors.

The above rates include visitors, staff, service / delivery and on-street movements such as taxis and pick-up / set-down activities.

The rates do not include vehicle generation for commercial use. Refer to the appropriate guidelines for vehicle generation rates of specific commercial uses, allowing for minor residential usage of those vehicles.

3.3.4 Housing for aged and disabled persons.

Rates.

Daily vehicle trips = 1 - 2 per dwelling
Evening peak hour vehicle trips = 0.1 - 0.2 per dwelling.

Factors.

These figures at the lower end of the above rates are based on research conducted by the Authority. This research concentrates on *subsidised* developments (often run by religious organisations). Generation rates of *resident funded* developments are often greater, as indicated at the higher end of the range.

3.4 Casual accommodation.

3.4.1 Motels.

Rates.

Daily vehicle trips = 3 per unit
Evening peak hour vehicle trips = 0.4 per unit.

Factors.

The above rates assume 100% occupancy of units. When comparison is drawn between existing *similar* developments and unit occupancy where data is available, rates based on 85 percent occupancy on the peak day of the week may be appropriate.

When a restaurant within a motel attracts a substantial volume of non-resident patrons, vehicle trip generation and parking demand is higher.

3.4.2 Hotels - traditional.

Original RTA research indicated a large variance in the traffic generation rates of hotels. This variation is due to such factors as the location and age of the building, its internal design, the provision of live music and other such facilities, etc. Since these surveys were undertaken some changes have occurred in the use of hotels, partly due to the introduction of random breath testing. These changes have generally reduced traffic generation rates of hotels. It is recommended that the analysis of proposed hotel developments be based on surveys of similar existing hotels.

Where hotels are to be located in or near residential areas, an assessment of traffic generation in the late evening period must be undertaken in order to determine the impact of noise.

3.4.3 Hotels - tourist.

NSW based data is not available.

3.5 Office and commercial.

Rates.

Daily vehicle trips = 10 per 100 m^2 gross floor area
Evening peak hour vehicle trips = 2 per 100 m^2 gross floor area.

Factors.

Mode split has a major impact, and car occupancy rates must also be considered. The above generation rates are based on sites with a mean peak hour mode split for cars of 0.62 and a mean peak hour car occupancy of 1.19, i.e. 52% car drivers. A site-specific analysis may indicate different figures.

Employee density varies depending on the type of commercial development proposed. The above generation rates are based on a mean employee density of 4.75 employees per 100 m^2 gross floor area, or 21 m^2 GFA per employee. Surveys of private sector offices in the North Sydney / Sydney central business district found employee densities vary, as indicated below.

Industry	Density (m^2 gross leasable area/employee)
Computers, High Tech	35
Health	29
Finance, Banking	6
Insurance	18
Accountancy, Management	17
Legal	16

Public sector offices often have higher densities of employees than private sector offices. To assess a proposed development the likely future tenant mix needs to be determined, keeping in mind that it may change in the future.

These rates assume that 80% of employees leave the site in the evening peak hour. This could vary with the location and type of office. A single public service office usually has a high proportion of staff leaving in the peak hour, although the introduction of flexitime has reduced this number. This figure is probably lowest where there is a combination of different businesses within the one development.

3.6 Retail.

3.6.1 Shopping centres.

Extensive surveys of shopping centres in 1990 indicated reduced traffic generation rates when compared with 1978 survey results. This could be partly the result of extended retail trading hours. In addition, a trend towards less car use was noted, with the number of car drivers reducing by about 15%.

The survey data indicates that the division of the floor area into retail categories improves the accuracy of prediction. The total floor area may be used but generation rates will vary according to the size of the centre.

Prediction methods using both divided floor area categories and using total floor area ranges are presented.

As with most land uses, it is preferable to base a traffic generation estimate for a shopping centre on a similar development.

Peak Period Traffic Generation.

Models.

For Thursdays and Fridays, the models are for the vehicle trips in the evening peak hour - V(P) - where this period has been taken as 4.30-5.30 pm.

For Saturday morning, the peak vehicle hour has been used - PVT. This is typically 11.00 am-12.00 pm. Localised variations in these peak hours can occur.

Thursday:

$V(P) = 20\ A(S) + 51\ A(F) + 155\ A(SM) + 46\ A(SS) + 22\ A(OM)$
(vehicle trips per $1000m^2$).

Friday:

$V(P) = 11\ A(S) + 23\ A(F) + 138\ A(SM) + 56\ A(SS) + 5\ A(OM)$
(vehicle trips per $1000m^2$).

Saturday:

$PVT = 38\ A(S) + 13\ A(F) + 147\ A(SM) + 107\ A(SS)$
(vehicle trips per $1000m^2$).

where:

A(S): Slow Trade gross leasable floor area (Gross Leasable Floor Area in square metres) includes major department stores such as David Jones and Grace Bros., furniture, electrical and whitegoods stores.

A(F): Faster Trade GLFA - includes discount department stores such as K-Mart and Target, together with larger specialist stores such as Fosseys.

A(SM): Supermarket GLFA - includes stores such as Franklins and large fruit markets.

A(SS): Specialty shops, secondary retail GLFA - includes specialty shops and take-away stores such as McDonalds. These stores are grouped as they tend to not be primary attractors to the centre.

A(OM): Office, medical GLFA: includes medical centres and general business offices.

Average Rates.

Table 3.1
Peak hour traffic generation rate

Range in Total Floor Area. (GLFA - m^2).	Peak Hour Generation Rate. (vehicles per 100m^2 GLFA)		
	Thursday. (V(P)/A)	Friday. (V(P)/A)	Saturday PVT(A)
0 - 10,000	12.3	12.5	16.3
10,000 - 20,000	7.6	6.2	7.5
20,000 - 30,000	5.9	5.6	7.5
30,000 - 40,000	4.6	3.7	6.1

Model.

The highest daily traffic generation usually occurs on a Thursday. The floor area types are as given above.

- Thursday:

DVT= 314 A(S) + 528 A(F) + 1475 A(SM) + 555 A(SS) + 51 A(OM)
(per 1000m^2).

Average Rates.

Table 3.2
Daily Traffic Generation rates

Range in Total Floor Area. (GLFA - m^2)	Daily Generation Rate -Thursday. (vehicles per 100m^2 GLFA)
0 - 10,000	121
10,000 - 20,000	78
20,000 - 30,000	63
30,000 - 40,000	50

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Factors.

Trip generation varies according to the days of the week, as indicated in Table 3.2. Surveys of individual sites over Thursday, Friday and Saturday indicate that the evening peak hour generation rate on Friday was 94% of the Thursday rate. The Saturday peak hour rate was 126% of the Thursday rate. (These figures were averaged over all floor areas.) The variation of daily traffic flows (based on surveys at four sites over four months) is:

Day	Variation (compared with average)	Day	Variation % (compared with average)
Monday	0.88	Friday	1.00
Tuesday	0.85	Saturday	1.05
Wednesday	0.85	Sunday	0.18
Thursday	1.32		

Trip generation rates also have seasonal variations.The monthly variation in daily traffic flows (based on surveys over four years at one site) is:

Month	Variation (compared with average)	Month	Variation % (compared with average)
January	0.89	July	1.03
February	0.87	August	1.01
March	0.97	September	0.96
April	0.96	October	0.98
May	1.01	November	1.08
June	0.97	December	1.28

The generation rates given are based on (GFLA) which provides a better indication of trip generation than gross floor area. As a general guide, 100 m^2 gross floor area equals 75 m^2 gross leasable floor area.

Mode split and car occupancy have an impact on trip generation. The generation rates given are based on car driver percentages - that is, mode split (car)/car occupancy - of 49% (0-10,000 m^2), 38% (10,000-20,000 m^2), 38% (20,000-30,000 m^2) and 42% (over 30,000 m^2).

The incidence of linked and multi-purpose trips can reduce overall trip generation rates. A linked trip is a trip taken as a side-track from another trip, for example, a person calling in to the centre on the way home from work. A multi-purpose trip is where more than one shop or facility is visited. Any trip discounts would apply differently in new free-standing centres and for new shops within existing centres. Discounts in the former case vary depending on the nature of the adjacent road network. With the latter case, an average discount of about 20% is suggested, with this figure reducing with increasing centre size, with rates of 25% (less than 10,000 m^2 GLFA), 20% (10,000-30,000 m^2 GLFA) and 15% (over 30,000 m^2 GLFA) indicative. Note that these discounts apply to trip generation but not to parking demand. Discounts of this nature should not apply without adequate substantiation.

Further information on shopping centres can be found in *Land Use Traffic Generation - Data and Analysis 4/2 - Shopping Centres*.

3.6.2 Service stations and convenience stores.

Rates.

Evening peak hour vehicle trips = 0.04 A(S) + 0.3 A(F).

or.

Evening peak hour vehicle trips = 0.66 A(F)
Average vehicle trips (9 pm-12 midnight) = 0.6 A(F).

where.

A(S) = area of site (m^2).

A(F) = gross floor area of convenience store (m^2).

Factors.

For standard service stations without convenience store facilities, A(F) should be taken as zero. Thus, the evening peak hour generation is 0.04 A(S). Neither the late night generation rate nor the alternative rate applies for the evening peak hour generation based solely on gross floor area.

Daily trip generation rates depend on the site's operating hours. For example, at one convenience store surveyed over 24 hours, the total daily trip generation was 19 times the evening peak hour generation. For trips associated with fuel sales, the total daily trip generation was 17 times the evening peak hour generation.

The proportion of fuel trips to store trips can vary substantially depending upon the location of the service station and the time of day. Convenience stores surveyed in 1990, indicated that the average percentage of total trips between 3.00 and 6.00 pm for fuel, was 46% (whether goods were purchased as well or not). Between 9.00 pm and 12.00 am the equivalent figure was 29%. Further information on site and hourly variations can be found in the *Land Use Traffic Generation - Data and Analysis 19: Convenience Stores report*.

3.6.3 Motor showrooms.

Rates.

Evening peak hour vehicle trips = 0.7 per $100m^2$ site area.

Factors.

Trip generation rates for motor showrooms vary widely. The above rate is based generally on showrooms with both new and used car sales as well as servicing facilities.

3.6.4 Car tyre retail outlets.

Rates.

Daily vehicle trips = 10 per $100m^2$ site area
Evening peak hour vehicle trips = 1 per $100m^2$ site area.

3.6.5 Roadside stalls.

NSW based data is not available. See the *ITE Trip Generation manual* for comparible rates from the USA.

3.6.6 Drive-in liquor stores.

NSW based data is not available. See the *ITE Trip Generation manual* for comparible rates from the USA.

3.6.7 Markets.

Rates.

Daily vehicle trips:

Centres open 7 hours
8.00am - 3.00pm = 18 trips per stall.

Peak hour vehicle trips
Sub Regional Markets = 4 trips per stall.

Factors.

- Mode split and availability of other markets in the area have a significant impact. The above generation rates are based on a mode split for cars of 0.80 and a reasonable availability and convenience of alternative markets in the area.
- Generation rates may be higher in the outer suburbs where mode split for cars and distance between markets is greater.
- The presence of an attached retail / commercial use does not significantly increase traffic generation.
- Traffic generation was found to be a function of the number of stalls involved, and not the site area which is a site specific variable depending on the available spaces.
- Daily trip generation rates depend on hours of operation. A market open for 12 hours a day would be expected to have a higher daily generation rate than that suggested above.
- There is a general trend for trip generation rates to reduce with increasing market size.
- These rates reflect high private usage with a mean mode split for cars of 0.80 and a mean car occupancy of 2.30. Sites with greater numbers of walk, public transport or dual purpose trips would have a correspondingly lower generation rate.

3.6.8 Bulky goods retail stores.

Overview.

Surveys were undertaken in 1990 of a variety of bulky goods retail stores, ranging from specialist furniture stores to lighting and electrical appliance retailers. The trip generation rates varied so widely that average generation rates cannot be recommended. The generation rates were generally less than those of average retail shops. In the Thursday evening peak period the average generation rate surveyed was 2.5 veh/hr/100 m^2 gross leasable floor area, with a range extending from 0.1 to 6.4 veh/hr/100 m^2 GLFA. The average generation rate was higher on the weekend, with a mean peak rate of 6.6 veh/hr/100 m^2 GLFA. However, as with the weekday evening peak period flows, there was a range varying from 0.7 to 16.9 veh/hr/100 m^2 GLFA. In order to make comparisons with similar retail outlets refer to the *Land Use Traffic Generation - Data and Analysis 18: Bulky Goods Retail Stores* report.

3.6.9 Video stores.

Overview.

Surveys of 10 video stores in the Sydney region in 1990 found that this retail type had a significantly higher traffic generation rate than average retail outlet. As with average retail outlets, traffic generation for video stores is best expressed as vehicles per hour/100 m^2 gross floor area. The range in floor areas of the sites surveyed was 40 to 604 m^2. However such a wide variation in generation rates

occurred (according to the video stores' locations) that average generation rates cannot be recommended. The mean rates determined by the surveys are presented for indicative purposes. For information on specific developments, or to make comparisons with similar developments refer to the *Land Use Traffic Generation - Data and Analysis 17: Video Stores report*.

Factors.

These surveys covered the Friday evening period and the 5.00 - 8.00 pm period on Saturdays and Sundays. The mean generation rates determined by the surveys and the standard deviation of the data is summarised (see Table 3.3 Traffic generation rates).

The wide variation in generation rates is not explained by the variation in transport mode. During the Friday 3.00-9.00pm period the mean number of customers who drove to the centre, (not including customers who were car passengers), was 43%, with a range of 13% to 51%. The equivalent figures for the weekend period of 5.00-8.00pm had a mean of 46% car drivers with a range of 28% to 66%.

The average length of stay of customers in the video stores had some uniformity, with a mean of 9.3 minutes and standard deviation of 1.4 minutes.

Table 3.3
Traffic generation rates

Day	Period	Period generation rate	
		Mean (veh/h/100m$^{2)}$	Standard Deviation (veh/h/100m$^{2)}$
Friday	4–6 pm Peak	22.8	17.2
	6-9 pm Average	28.3	24.3
Saturday / Sunday	5–8 pm Peak	49.9	33.0
	5-8 pm Average	41.0	28.0

3.7 Refreshments.

3.7.1 Drive-in take away food outlets.

Overview.

Surveys in 1990 of McDonalds and Kentucky Fried Chicken outlets found substantially different generation rates. Gross floor area did not provide a good indication of the generation rates. The general guidelines presented provide a basis for assessment. If these guidelines are considered to be inappropriate in the circumstances, the applicant should prove why other rates might be more appropriate, preferably through comparison with other similar sites. The *Land Use Traffic Generation - Data and Analysis 22: Drive-Through Restaurants* (1993), Report provides further information on specific developments. The 1980 report *Land Use Traffic Generation - Data and Analysis 5 - Fast Food*, provides further information.

Rates - McDonalds.

Evening peak hour vehicle trips:

- assume 180 veh/hr for average development (mean of survey results).
- for sensitivity test, assess effect of 230 veh/hr (maximum of survey results).

Factors.

Daily vehicle trips depend largely on the hours of operation. Sites open for breakfast will generate more daily traffic than sites open only from lunch to dinner.

The peak site traffic generation surveyed was 340 veh/hr, with a mean of 260 veh/hr on weekdays and 280 veh/hr on weekends. If direct access is critical, a peak generation analysis might be required.

The proportion of passing trade is typically about 35%. This discount should be taken into account in assessing external traffic impact.

Rates - Kentucky Fried Chicken.

Evening peak hour vehicle trips:

- assume 100 veh/hr for average development (mean of survey results).
- for sensitivity test, assess effect of 120 veh/hr (maximum of survey results).

Factors.

Daily vehicle trips depend on the hours of operation.

The peak site traffic generation surveyed was 190 veh/hr (two-way) with a mean of 150 veh/hr on weekdays and 120 veh/hr on weekends. If direct access is critical, a peak generation analysis might be required.

The proportion of passing trade is typically at least 50%. This discount should be taken into account in assessing external traffic impact.

3.7.2 Restaurants.

Overview.

The traffic generation characteristics of restaurants vary substantially, depending on the nature and type of restaurant, and to a lesser extent on the location. The traffic generation of proposed restaurants may be determined from surveys of similar restaurants, noting such factors as the number of seats, seat occupancy, the transport mode of patrons and the distributions of arrivals and departures. Each of these factors can be estimated or surveyed.

It is not advisable to assume 100% seat occupancy, when assessing traffic generation. Ideally, the 85 percentile occupancy should be used. Of the ten restaurants surveyed by the RTA in 1981, the mean peak seat occupancy was 91%, varying from 63% to 133%. (Figures over 100% may indicate the use of separate bar areas or of take-away facilities.).

The traffic generation rate in the evening peak period will depend on the type of restaurant. While suburban restaurants with take-away facilities often have significant levels of trading occurring near the end of the evening peak period, more traditional restaurants may not have any patrons arriving at this time. Average rates based on the sites surveyed by the RTA are given below, as indicative figures.

Rates.

Evening peak hour vehicle trips = 5 per 100 m^2 gross floor area.
Daily vehicle trips = 60 per 100m^2 gross floor area.

Factors.

Total daily vehicle trips will be substantially greater if the restaurant also serves lunch.

These rates reflect a high private transport usage, with a mean mode split for cars of 0.85 and a mean car occupancy of 2.2. Sites with greater numbers of customers who use public transport have correspondingly lower vehicle generation rates.

The average rates given are based on the gross floor area of the restaurant. The ideal method of calculation bases the assessment of traffic generation on the number of seats. The number of staff also can be relevant in assessing the peak parking demand. At development application stage, some idea of seating and staffing is known, although both can change. RTA surveys indicate that the mean gross floor area per seat was 2.1 m^2, while the mean eating floor space per seat was 1.5 m^2. The mean staffing ratio was 9.7 seats / staff.

If located in or near a residential area, a restaurant might have an effect on residents in the evenings, depending on the nature of the restaurant. Some estimates of late evening traffic generation would assist in the assessment of noise generation potential.

3.7.3 Clubs.

Overview.

Surveys of licensed clubs conducted by the RTA in 1978 indicate that it is difficult to generalise on their traffic generation because of the diversified nature of clubs. Traffic generation is affected by such factors as the provision of live entertainment, gambling facilities, number of members and club location. Behavioural changes since 1978, such as the introduction of random breath testing, also make such generalisations more difficult.

The 1978 surveys of clubs found an evening peak period traffic generation of 10 veh/hr/100 m^2 licensed floor area, and a total vehicle generation over the 4.00 pm to 1.00 am period of 90 veh/100 m^2 licensed floor area.

A traffic generation assessment of new clubs should be based on recent surveys of similar clubs. For extensions to an existing club, the assessment should be based on the relevant club.

If a club is located in or is adjacent to a residential area, late-night traffic generation must also be assessed in order to determine noise effects.

3.8 Recreational and tourist facilities.

Overview.

Recreational and tourist facilities are site and type specific in their operation and traffic generation, often with seasonal variations in usage. Ideally, analysis of proposed developments should be based on surveys of similar developments. If this is not possible a *first principles analysis* is required.

3.8.1 Recreation facilities.

Analysis should be based on the predicted 85 percentile usage rather than usage at capacity, taking into account weekly and seasonal variations. For example, the weekly peak hour traffic generation of a proposed golf course might be assessed over several months, to establish a distribution of usage.

Some indication of traffic generation is provided for three recreational / tourist facilities. For other facilities, surveys of similar developments are required.

Squash courts.

Rates

Evening peak hour vehicle trips = 3 per court
Total evening vehicle trips = 20 per court.

Factors.

Where regular competitions are held generation rates may be higher.

Tennis courts.

Rates.

Evening peak hour vehicle trips = 4 per court
Daily vehicle trips = 45 per court.

Factors.

The provision of regular competitions, night tennis, and lights during winter are just some factors that influence the rates of traffic generation.

Bowling alleys.

NSW based data is not available – See the *ITE Trip Generation manual* for comparible rates from the USA.

Bowling greens.

NSW based data is not available – See the *ITE Trip Generation manual* for comparible rates from the USA.

3.8.2 Gymnasiums.

Rates.

- Metropolitan Regional (CBD) Centres.

Daily Vehicle Trips = 20 trips per 100m^2 GFA
Evening Peak Hour Vehicle Trips = 3 trips per 100m^2 GFA .

- Metropolitan Sub Regional Areas.

Daily Vehicle Trips = 45 trips per 100m^2 GFA
Evening Peak Hour Vehicle Trips = 9 trips per 100m^2 GFA.

Factors.

Variables include staff, delivery, service and on-street movements such as taxis and pick-up/set-down.

They also include the vehicle generation of supplementary services such as health care and massage but not that of auxiliary facilities such as squash and tennis courts. Refer to the guidelines for recreational facilities Section 3.8.1 for the generation rates of auxiliary facilities with appropriate allowance for dual or complementary use.

The peak generation generally occurs between 6.00pm and 7.00pm on a weekday evening.

3.8.3 Tourist facilities.

Caravan parks.

NSW based data is not available – See the *ITE Trip Generation manual* for comparible rates from the USA.

Marinas

Substantial seasonal variations in marina usage involve peak traffic generation occurring particularly during weekends in summer. While a weekday evening peak hour generation rate is not given below, events such as summer evening yacht racing may have to be considered.

Generation rates vary with the type of berth and the type of boat. The rates given below are based on a marina with a mix of boat types (both power boats and yachts); the design is based on a summer weekend day. These rates also include an allowance for shore-based facilities such as boat sales and repairs.

Rates

Daily vehicle trips = 2.7 per fixed berth + 1.4 per swing mooring.

Factors.

The two key factors in the traffic generation of marinas are the level of usage and the transport mode of boats. Boats that are more accessible (in wet marina berths) are more likely to be used than boats in dry berths or on swing moorings. Use also varies with boating purposes. For example, yachts which engage in regular racing, are used more often than yachts used only for social outings. Surveys of four marinas in Pittwater in 1978 over the summer weekend/public holidays found an average utilisation of 30% over all berths. Surveys of racing yachts at one club on Middle Harbour in 1990/91 found an average utilisation on summer racing days of 65%.

Traffic generation also varies with the boat crew numbers. Larger boats, that are often in wet marina berths, can accommodate larger numbers of crew/passengers than smaller boats that might be stored in dry berths or on swing moorings.

The transport mode of boat users will vary according to the location of the marina and the trip purpose. Social boat users usually travel by private vehicle, depending on parking availability. Racing crews with less to carry might find public transport convenient.

3.9 Road transport facilities.

3.9.1 Road transport terminals.

Rates.

Daily vehicle trips = 5 per 100 m^2 gross floor area
Peak hour vehicle trips = 1 per 100 m^2 gross floor area.

Factors.

Vehicle generation rates, and the type of vehicles involved, vary with the type of transport terminal operation. For example, air freight terminals have quite different characteristics to interstate truck depots. The above rates are based on surveys of a wide range of sites, including both of these types. The peak hour vehicle trip rate is an average taken over both morning and evening peak hours.

3.9.2 Container depots.

NSW based data is not available. See the *ITE Trip Generation manual* for comparible rates from the USA.

3.9.3 Truck stops.

NSW based data is not available. See the *ITE Trip Generation manual* for comparible rates from the USA.

3.10 Industry.

Overview.

The peak traffic generation period for industrial land use is generally determined by three key factors: employee density, travel mode and peak period travel distribution. The employee density will vary with the industry type - from a low density at traditional warehouses to a high density at *high-tech* industrial developments. The peak period travel distribution (i.e. the proportion of workers who travel to or from the site in the peak hour), varies with the type and extent of development. A single use factory generally has a higher proportion of workers travelling in the peak hour than a factory unit development, where different employees have different work patterns. As work patterns continue to overlap, the percentage of those travelling in the peak hour declines.

The generation rates given below are for single use developments. Lower rates might be appropriate for multiple-use developments, as discussed above.

3.10.1 Factories.

Rates.

Daily vehicle trips = 5 per 100 m^2 gross floor area
Evening peak hour vehicle trips = 1 per 100 m^2 gross floor area.

Factors.

The first variable to consider is employee density. The average gross floor space per employee found in the 1978 RTA surveys was 50 m^2 per employee. This figure is similar to survey results in two modern industrial estates in Sydney, although variations do occur. For example, within five high-tech industrial developments in Homebush, the area per employee varied from 26 to 127 m^2, with an average of 57 m^2.

The average gross floor space per employee depends on the proportion of floor space used for office-type uses. This space typically has an employee density similar to that of standard offices. If the office space component of the development exceeds 20% of the total floor area, allowance ought to be made for additional traffic generation for the floor area in excess of 20% (unless the estimates are based on employees and not floor area).

If the number of employees is not known, estimates can be made from the size of the proposed floor area. If the proposed floor area is not known, (such as when strategic planning is being undertaken for large industrial estates), an indicative figure of 28 employees per developed hectare could be assumed.

The site location also can affect the transport mode of employees. The mean figures found in 1978 RTA surveys were 86% car users, with an average car occupancy of 1.26. This indicates an overall figure of 68% car drivers.

As mentioned above, the overall percentage of commuter trips from the site can vary with the type of factory and with the number of businesses on the site. For a single business, the survey data indicates that about 67% of commuter traffic is in the peak hour. For industrial unit developments, a distribution figure of about 60% in the peak hour is recommended. For total industrial estates, a distribution figure of about 55% is appropriate.

An indication of the overall hourly traffic distribution of an industrial estate can be obtained by aggregating all the RTA survey data. The example below is based on a situation of 1000 employees in a wide range of factory types.

Table 3.4
Traffic generation distribution of industrial estates – cars and commercial vehicles.

Period	Cars/hr/1000 staff	CVs/hr/1000 staff	Total Vehicles
7-8 am	100	1	101
8-9	307	11	318
9-10	206	28	234
10-11	108	33	141
11-12 pm	83	33	116
12-1	132	31	163
1-2	162	34	196
2-3	113	26	139
3-4	163	31	194
4-5	265	24	289
5-6	350	15	365
6-7	43	1	44
Total	**2032**	**268**	**2300**

The figures in Table 3.4 are presented only as a general indication of traffic generation. Commercial vehicle trip generation particularly depends on industry type.

In summary, the type of industry proposed affects both employee density and commercial vehicle trip generation. General trends for these factors are set out in Table 3.5.

Table 3.5
Vehicle generation rates

Industry Type	Employee Density (Non C-V generation rate)	Commercial Vehicle generation rate
Chemical, petroleum & coal products	Low	Low
Basic metal products	Low	Low
Food, beverages	Medium	Medium
Wood,wood products	Medium	Medium
Transport equipment	Medium	Medium
Glass, clay & non-metallic mineral products	Medium	High
Other industrial machinery & household appliances	Medium	Medium
Textiles	High	Low
Clothing & footwear	High	Medium
Paper,paper products,printing	High	Medium
Precision, electrical, radio & electronic engineering	High	Medium
Fabricated metal products	High	High
Leather, rubber & plastic products	High	High
Vehicle manufacture	High	High

If the development includes such uses as bulky goods retailing, then traffic generation would be higher. This component should be assessed separately.

3.10.2 Warehouses

Rates

Daily vehicle trips = 4 per 100m^2 gross floor area
Morning peak hour vehicle trips = 0.5 per 100m^2 gross floor area

Factors

Vehicle generation rates vary substantially depending upon the type of goods being warehoused and the nature of the particular manufacture / retail system.

Where retailing is permitted from the site, traffic generation rates are higher.

Particular care should be taken in assessing industrial unit developments where a high proportion of warehouse uses are proposed. These developments can also suit small factory operations such as electronics / computer assembly and repairs. Uses such as these can substantially increase trip generation and parking demands.

3.10.3 Plant nurseries

A *plant nursery* is any place where horticultural stock is propagated for the purpose of sale. Horticultural stock means tree, vine, plant, shrub or other vegetation.

Plant Nurseries have a peak traffic generation during the weekend period. The peak generation occurs during the Sunday midday period.

Rates

Peak hour vehicle trips two-way (PVT) = 57 vehicles plus 0.7 vehicles per 100m^2 of site area.

Factors

Variables include staff, delivery, service and on-street movements such as taxis and pick-up / set-down.

The variables also include the vehicle generation of supplementary services such as refreshment, gift and landscaping facilities but not that of auxiliary facilities such as retail, hardware, fruit market etc. Refer to the appropriate guidelines for vehicle generation rates of auxiliary facilities with appropriate allowance for dual or complementary use.

Surveys

The report *Land Use Traffic Generation - Data and Analysis 26 - Plant Nurseries,* outlines research undertaken on the traffic and parking characteristics of plant nurseries.

3.10.4 Business parks

Overview

The term *Business Park* refers to developments that permit a range of land-use types in an integrated complex. The developments generally incorporate a number of individual units of similar size. The developments typically include elements of industrial, manufacture, research, warehousing, office space, retail, commercial, refreshment and recreational activity. They are generally located in industrial areas and the uses within the park are generally to a scale appropriate for the anticipated workforce and zoning. The business parks selected for the survey ranged in size from some 7,300 m^2 to some 38,200m^2 with on-site parking ranging from some 70 marked spaces to some 650 spaces.

Rates

Peak Vehicle Trips (PVT)

Two equations are provided below for determining the traffic generation predicted for business parks. Equation (a) could generally be used for the prediction of Peak Vehicle Trips (PVT) per hour. When the office / showroom and factory / warehouse components of the development are available, it would be desirable to use equation (b).

Equation (a) -

Peak hour vehicle trips (PVT) = 1.1 vehicles per hour two-way per 100m^2 of total gross leasable area;

Equation (b) -

Peak hour vehicle trips (PVT) = 1.2 vehicles per hour two-way per 100m^2 of gross leasable office / showroom area + 1.0 vehicle per hour two-way per 100m^2 of gross leasable factory / warehouse area.

Peak Service Vehicle Trips (PSVT)

Peak Service Vehicle Trips (PSVT) = 0.5 vehicles per hour two-way per 100m^2 of gross leasable factory / warehouse area.

Factors

Vehicle generation rates vary substantially depending on the types of uses incorporated in the business park, particularly office and retail uses. Where the proportion of office area and retail area are high within the business park, traffic generation rates are generally higher.

Further information on business parks and their traffic generation and parking requirement can be found in *Land Use Traffic Generation - Data and Analysis 27 - Business Parks.*

3.11 Health and community services

3.11.1 Professional consulting rooms

Data is not available.

3.11.2 Extended hours medical centres

Surveys were undertaken in 1991 to determine the extended hours on Sunday and Monday for 19 medical centres in the Sydney region. A range of site variables such as gross floor area, number of consulting rooms and the number of medical practitioners was collected, as well as trip generation data. The variable that best reflected trip generation rate was gross floor area. The number of consulting rooms was the next best indicative variable, interrelated with the floor area.

The variance of generation rates in this data indicates that satisfactory prediction rates can not be recommended. Analysis needs to be based on

comparisons with similar sites. This data can be found in the Land Use Traffic Generation - Data and Analysis 20: Extended Hours Medical Centres report.

Factors

Monday traffic generation rates were observed to be higher than Sunday rates, although on occasions a higher peak parking demand occurred on Sunday. During the Monday evening peak period the mean peak vehicle trip generation rate was 8.8 veh/hr/100 m^2 gross floor area, with a range of 3.1-19.4 veh/hr/100 m^2. In the morning period of 9.00 am to 12.00 pm the mean peak vehicle trip generation rate was 10.4 veh/hr/100 m^2 gross floor area, with a range of 4.4-19.0 veh/hr/100 m^2.

The range in gross floor area of the sites surveyed was 110 to 935 m^2, with a mean of 462 m^2. The number of consulting rooms varied from 2 to 15, with a mean of 7.

The transport mode of patients/visitors was not closely related to the trip generation rate. The average percentage of patients arriving by car was 66%, with the range 14%-94%. If generation rates are corrected for the average mode split, the modified survey data still does not provide a more accurate basis for estimation.

There is a more apparent relationship between the data and the peak parking demand, with a mean of about one car space per 25 m^2 gross floor area. The mean average length of stay was approximately 27 minutes.

3.11.3 Child care centres

Overview

Surveys were undertaken in 1992 of pre-school, long day-care and before / after school care centres in the Sydney region. The best indicator of peak traffic generation was found to be the number of children that attended each centre. The time that traffic activity was at a peak varied with the differing operating hours of the child care centres. Pre-school centres typically had peaks in the periods 8.00-9.00 am and

2.30-4.00pm. Long day-care centres typically had peaks in both commuter peak periods. Before/after school care centres generally have their highest peak activity in the afternoon commuter peak period. The vehicle generation rates given below are the mean peak generation rates for each centre type in the periods specified. As these figures are mean figures, rates may be higher or lower, depending on the circumstances.

Rates

Table 3.6
Traffic generation rates

Centre Type	Peak Vehicle Trips / Child		
	7.00-9.00am	2.30-4.00pm	4.00-6.00pm
Pre-school	1.4	0.8	-
Long-day care	0.8	0.3	0.7
Before/after care	0.5	0.2	0.7

Factors

The centres surveyed had between 25-60 children attending pre-schools, between 29-66 children in long day-care and between 22-55 children in before / after school care. The gross floor area was the next best indicator of traffic generation. The centres surveyed had gross floor areas in the range 145-470 m^2 for pre-schools, 160-595 m^2 for long day-care and 52-150 m^2 for before / after care. The mean floor area per child was 6.7 m^2 for pre-schools, 7.8 m^2 for long-day care and 3.2 m^2 for before / after care.

The mean proportions of children transported to each centre type by car was 94% for the pre-schools, 93% for the long day-care and 75% for the before /after school care.

Parking demand was highest for the pre-school and lowest for the before / after school care, averaging over all centres 0.23 cars per child at any one time, with the average length of stay for all centres being 6.8 minutes.

3.11.4 Private hospitals

Overview

The term *private hospital* refers to those developments referred to in the Private Hospitals and Day Procedures Centre Act, 1988, No. 123 as “premises at which patients are provided with medical, surgical or other treatment, and with ancillary nursing care, for fee, gain or reward”.

Private hospitals are usually identified through the provision of services i.e. general, surgical, obstetric, rehabilitation and psychiatric. Special services (such as paediatric, accident and emergency and cardiac catheterisation) may also be provided by private hospitals with Department of Health approval.

Surveys were undertaken in 1994 of 19 private hospitals in the Sydney region. The best indicator of peak traffic generation or peak vehicle trips (PVT) was found to be a combination of the number of beds (B) and the number of staff per weekday day shift (ASDS). If the average number of staff per weekday day shift (ASDS) is unknown or unavailable the number of beds (B) alone was found to be a good indicator of peak traffic generation or peak vehicle trips (PVT). The models based on numbers of beds (B) should only be used when the average number of staff per weekday day shift (ASDS) is unknown.

The time at which traffic activity was at a peak varied between hospitals, with the most common time being 3.00 pm - 4.00 pm. This time incorporates a staff shift change. The vehicle trip generation in the morning commuter peak hour (MVT), i.e. 8 am - 9 am, and the vehicle trip generation in the evening commuter peak hour (EVT), i.e. 5 pm - 6 pm, were both modelled by a combination of the number of beds (B) provided and the average number of staff per weekday day shift (ASDS) and by the number of beds (B) only.

Peak Period Traffic Generation

Models

PVT = -14.69 + 0.69 B + 0.31 ASDS	(R^2 = 0.74)
MVT = -10.21 + 0.47 B + 0.06 ASDS	(R^2 = 0.64)
EVT = -2.84 + 0.25 B + 0.40 ASDS	(R^2 = 0.69)
PVT = -22.07 + 1.04 B	(R^2 = 0.63)
MVT = -12.41 + 0.57 B	(R^2 = 0.55)
EVT = -11.96 + 0.69 B	(R^2 = 0.44)

It is recommended that the models based on the number of beds (B) should only be used when staffing data is unknown.

Factors

The hospitals surveyed had between 30 - 99 beds (B), and between 10 - 102 average staff per weekday day shift (ASDS).

The mean proportion of people who travelled to the site by vehicle was 87.4%, with a range of 67.3% - 98.2%. Average vehicle occupancy was found to be 1.3 persons per car.

Further information on private hospitals and their traffic generation and parking requirements can be found in Land Use Traffic Generation - Data and Analysis 28 - Private Hospitals.

Table 3.7
Summary table of land use traffic generation Rates

Land Use	Traffic generation rates	
	Daily Vehicle Trips	Peak Hour Vehicle Trips
Residential		
Dwelling houses	9.0 / dwelling	0.85 per dwelling
hMedium density residential flat building	*Up to 2 bedrooms*	
	4-5 / dwelling	0.4-0.5 / dwelling
	3 bedrooms or more	
	5-6.5 / dwelling	0.5-0.65 / dwelling
High density residential flat building	*metropolitan regional centres*	
	-	0.24 / unit
	metropolitan sub-regional centre	
	-	0.29 / unit
Housing for aged and disabled persons	1-2 / dwelling	0.1-0.2 / dwelling
Casual accommodation		
Motels	3 / unit	0.4 / unit
Hotels - traditional Hotels - tourist	See section 3.4.2 See Section 3.4.3	-
Office and commercial		
Commercial premises	10 / 100m^2 GFA	2 / 100m^2 GFA
Retail		
Shopping centres	see section 3.6.1	-
Service stations and convenience stores	see section 3.6.2	-
Motor showrooms	-	0.7 / 100m^2 Site Area
Car tyre retail	10 / 100m^2 Site Area	1 /100m^2 Site Area
Road side stalls	-	-
Drive-in liquor	-	-
Markets	18 / stall	4 / stall
Bulky goods retail	see section 3.6.8	-
Video stores	see section 3.6.9	-

Land Use	Traffic generation rates	
	Daily Vehicle Trips	Peak Hour Vehicle Trips
Drive-in take-away food outlets	See section 3.7.1	-
Restaurants	60 / 100m^2 GFA	5 / 100m^2 GFA
Clubs	see section 3.7.3	-
Recreation and Tourist facilities		
Squash courts	-	3 / Court
Tennis courts	4-5 / Court	4 / Court
Bowling greens	-	-
Gymnasiums	*metropolitan regional centre*	
	20 / 100m^2 GFA	3 / 100m^{2}GFA
	metropolitan sub-regional areas	
	45 / 100m^2 GFA	9 / 100m^2 GFA
Caravan parks	-	-
Marinas	see section3 .8.2	-
Road transport facilities		
Road transport terminals	5 / 100m^2 GFA	1 / 100m^2 GFA
Container depots	-	-
Truck stops	-	-
Industry		
Factories	5 / 100m^2 GFA	1 / 100m^2 GFA
Warehouses	4 / 100m^2 GFA	0.5 / 100m^2 GFA
Plant nurseries	See section 3.10.3	-
Business parks	See section 3.10.4	-
Health and community services		
Professional consulting rooms	-	-
Extended hours medical centres	see section 3.11.2	-
Child care centres	see section 3.11.3	
Private hospitals	see section 3.11.4	-
Public car parks		
Public car parks	see section 3.12	-

Section 4 Interpretation of Traffic Impacts.

4.1 Introduction.

This section complements Section 3 which outlines traffic generation rates of various land uses. The interpretation of the resulting traffic impact is discussed here and guidelines are presented which assess the degree of each effect.

Traffic can have an impact in a number of ways eg:

- impact on traffic efficiency.
- impact on amenity.
- impact on safety.
- impact on road pavement life.

In addition, the traffic impact assessment needs to take into account implications on public transport and pedestrian movement. Private vehicle movements must be viewed in the context of the overall transport task.

Each of these effects is discussed in the following sections. Where appropriate, impacts should be assessed against appropriate performance standards. The assessment needs to take into account the function of roads within the road hierarchy. Traffic efficiency primarily involves the performance of major roads. Amenity is primarily a concern of minor roads, although it can also be an issue on major roads (e.g where strip shopping centres are located on major roads). Safety is a concern affecting all roads. Safety is arguably the most important, although its assessment does not lend itself to quantitative review. Finally, road pavement effects can occur on all classes of road. However assessment is only required when substantial numbers of heavy vehicle movements are proposed. Car traffic has little impact on road pavements.

4.2 Impact on traffic efficiency.

4.2.1 Levels of service.

An important consideration in determining the impact of a development proposal on the road system is to assess the effect on traffic efficiency, the objective of which is to maintain the existing level of service. Adverse effects must be identified and corrective measures designed. The level of service is used as the performance standard. This is a qualitative assessment of the quantitative effect of factors such as speed, volume of traffic, geometric features, traffic interruptions, delays and freedom to manoeuvre. There are six levels of service (LOS), as described below, from AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity*, (1988).

Level of Service A.

This, the top level is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.

Level of Service B.

This level is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is little less than that of the level of Service A.

Level of Service C.

This service level is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.

Level of Service D.

This level is close to the limit of stable flow but is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.

Level of Service E.

This occurs when traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause a traffic-jam.

Level of Service F.

This service level is in the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow break-down occurs and queuing and delays result.

Strictly, the above descriptions characterise levels of service for uninterrupted flow conditions, ie. no interruption to traffic occurs because of factors external to the traffic stream, such as intersection controls. However, the concept of level of service can also be applied to other situations through different measures of effectiveness, as summarised in Table 4.1.

Table 4.1
Measures of effectiveness for level of service Definition

Facility		Measures of effectiveness.
Intersections	Sign or merge control	Average delay (secs/veh) Delay to critical movements Queue Length for critical movements
	Traffic Signals	Average delay (secs/veh) Delay to critical movements Degree of Saturation Cycle Length Queue Length for critical movements
	Roundabouts	Average delay (secs/veh) Delay to critical movements Degree of Saturation Queue Length for critical movements
Urban/suburban arterials (with interrupted flow)		average travel speed (km/hr) volume/capacity ratio.
Multi-lane highway (including freeways)		density (pcu/km/lane) volume/capacity ratio
Two-lane highway		average travel speed (km/hr) percent time delayed (%) volume/capacity ratio

4.2.2 Intersections.

The effect of differing levels of traffic flow on the operating performance of intersections has traditionally been assessed by considering the intersection volume / capacity ratios (referred to as Y values), and intersection degrees of saturation (referred to as X values). The X value eliminates the variability caused by lost time within an intersection. It does not however always adequately describe operating conditions, such as when minimum phase times are determined by pedestrian facilities.

While computer based intersection assessment programs may be effective they are not perfect. These programs rely on accurate input data and interpretation of the output by a skilled user. They rely on accurate input data and interpretation of the output by a skilled user. Programs such as SIMSET, INSECT, SCATES, SIDRA and INTANAL provide as output the measures of effectiveness shown in Table 4.1. SIMSET allows complex signalised intersection geometry and phasing designs to be evaluated. INSECT provides a modelling capability for all forms of intersection control, the simulation is portrayed graphically and consequently is extensively used as a teaching aid. SCATES is mainly used to model multiple signalised intersections in co-ordinated systems, although single signalised intersections can be modelled. SIDRA can be used to model complex signalised and roundabout intersections. INTANAL can be used with all forms of intersection control. These programs operate on IBM compatible personal computers.The best indicator of the level of service at an intersection is the average delay experienced by vehicles at that intersection. For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (with *Stop* and *Give Way* signs or operating under the T-junction rule) the critical movement for level of service assessment should be that with the highest average delay.

With traffic signals, delays per approach tend to be equalised, subject to any over-riding requirements of signal co-ordination as well as to variations within individual movements. With roundabouts and priority - control intersections, the critical criteria for assessment is the movement with the highest delay per vehicle. With this type of control the volume balance might be such that some movements suffer high levels of delay while other movements have minimal delay. An overall average delay for the intersection of 25 seconds might not be satisfactory if the average delay on one movement is 60 seconds.

The average delay for level of service E should be no more than 70 seconds. The accepted maximum practical cycle length for traffic signals under saturated conditions is 120-140 seconds. Under these conditions 120 seconds is near maximum for two and three phase intersections and 140 seconds near maximum for more complex phase designs. Drivers and pedestrians expect cycle lengths of these magnitudes and their inherent delays in peak hours. A cycle length of 140 seconds for an intersection which is almost saturated has an average vehicle delay of about 70 seconds, although this can vary. If the average vehicle delay is more than 70 seconds, the intersection is assumed to be at Level of Service F.

The intersection degree of saturation (DS) can also be used to measure the performance of isolated intersections. The DS value can be determined by computer based assessment programs. At intersections controlled by traffic signals, both queue length and delays increase rapidly as DS approaches 1.0. An upper limit of 0.9 is appropriate. When DS exceeds 0.8 - 0.85, overflow queues start to become a problem. Satisfactory intersection operation is generally achieved with a DS of about 0.7 - 0.8. (Note that these figures are based on isolated signalised intersections with cycle lengths of 120 seconds. In co-ordinated signal systems DS might be actively maximised at key intersections).

Table 4.2 sets out average delays for different levels of service. There is no consistent correlation between definitions of levels of service for road links as defined elsewhere in this section, and the ranges set out in Table 4.2. In assigning a level of service, the average delay to the motoring public needs to be considered, keeping in mind the location of the intersection. For example, drivers in inner-urban areas of Sydney have a higher tolerance of delay than drivers in country areas. Table 4.2 provides a recommended baseline for assessment.

Table 4.2
Level of service criteria for intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode

The figures in Table 4.2 are intended as a guide only. Any particular assessment should take into account site-specific factors including maximum queue lengths (and their effect on lane blocking), the influence of nearby intersections and the sensitivity of the location to delays. In many situations, a comparison of the current and future average delay provides a better appreciation of the impact of a proposal, and not simply the change in the level of service.

Although in some situations additional traffic does not alter the level of service, particularly where the level of service is E or F, additional capacity may still be required. This is particularly appropriate for service level F, where small increases in flow can cause disproportionately greater increases in delay. In this situation, it is advisable to consider means of control to maintain the existing level of absolute delay.

4.2.3 Urban roads.

The capacity of urban roads is generally determined by the capacity of the intersections. Where major reconstruction of intersections is proposed, the ability of the approach roads to feed the intersection at appropriate flow rates may need to be reviewed. As set out in Table 4.3 (reproduced from Table 7.1 of AUSTROADS Guide to Traffic Engineering *Practice - Part 2: Roadway Capacity*, (1988)), typical one-way mid-block lane capacities on urban arterial roads under interrupted flow conditions are 900-1000 veh/hr/lane. This calculation assumes *Clearway* conditions. The capacity falls to 600 veh/hr/lane for a kerbside lane with occasional parked vehicles. These capacities at times may increase under ideal conditions to 1200-1400 veh/hr.

The mid-block level of service on urban roads is assessed on a vehicle's average travel speed. Travel speed surveys may be undertaken to determine the existing level of service. Table 7.2 of AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity*, (1988) sets out levels of service for different travel speeds.

When assessing the mid-block road capacity requirement in a strategic planning study, the traffic flow limits for different levels of service are of value. Table 4.4 sets out peak hour flows for one and two lanes of unidirectional travel, based on volume / capacity ratios applicable for rural roads in level terrain with no sight distance restrictions on overtaking. It should be noted that these are indicative figures based on the rural volume / capacity ratios with a lane capacity of 1400 veh/hr. This figure can be achieved under normal urban interrupted flow conditions. The lower per lane capacity for one-lane

carriageways in comparison with two-lane carriageways reflects a restriction on drivers' ability to travel at their desired speed.

Table 4.3
Typical mid-block capacities for urban roads with interrupted flow

Type of Road	One-Way Mid-block Lane Capacity (pcu/hr)	
Median or inner lane:	Divided Road	1,000
	Undivided Road	900
Outer or kerb lane:	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 lane undivided:	Occasional Parked Cars	1,500
	Clearway Conditions	1,800
4 lane divided:	Clearway Conditions	1,900

Table 4.4
Urban road peak hour flows per direction

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

The figures in Table 4.4 are provided for strategic planning purposes only, and are not intended as a substitute for basic exercises in intersection analysis.

In summary, when assessing a development application (and road works that may be required as a result of that application) the intersection upgrading requirements must be determined. If additional capacity is required then additional works which are needed to maintain appropriate levels of traffic flow must be identified.

4.2.4 Rural roads.

Developers should consider the following points when designing developments near rural roads:

- as intersections are less frequent in rural areas, they are less of a determinant of rural road capacity.
- the need for overtaking opportunities on two-lane roads is greater, as the level of service is determined by average travel speeds and the percentage of time spent delayed.
- determine if the volume threshold from one lane to two lanes per direction may be reached.

Table 4.5 sets out two-way hourly road capacities for two-lane roads for different levels of service, with a design speed of 100 km/hr, based on different terrain types. The capacity assumes a 60/40 directional split of traffic. Where design speeds of 80 km/hr are used, the resulting capacities are

between 85-95% of the figures quoted, depending on the level of service. Single lane capacities are affected by overtaking opportunities. For specific applications, refer to AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity*, (1988), or to the TRB *Highway Capacity Manual - Special Report 209*, (1985).

Table 4.5
peak hour flow on two-lane rural roads (veh/hr)
(Design speed of 100km/hr)

Terrain	Level of Service	Percent of Heavy Vehicles			
		0	5	10	15
Level	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290
Rolling	B	500	420	360	310
	C	920	760	650	570
	D	1370	1140	970	700
	E	2420	2000	1720	1510
Mountainous	B	340	230	180	150
	C	600	410	320	260
	D	1050	680	500	400
	E	2160	1400	1040	820

The data for Table 4.5 assumes the following criteria:

- *terrain level* with 20% no overtaking.
- *rolling* with 40% no overtaking.
- *mountainous* with 60% no overtaking.
- 3.7 m traffic lane width with side clearances of at least 2m.
- 60/40 directional split of traffic.

The performance standards recommended below, reflect the fact that recreational peak hour periods (weekend peaks, or peaks associated with particular tourist or recreational activity), occur less frequently than weekday commuter peak hour periods.

Weekday Peak Hour Flows.

Major roads: Level of service C
Minor roads: Level of service C desirable.

Recreational Peak Hours (weekends).

Major roads: Level of service D
Minor roads: Level of service D desirable.

Table 4.5 is presented as a guide to when two traffic lanes per direction are required, based on the projected peak hour traffic flows and on the appropriate level of service as shown above.

4.3 Impact on amenity.

4.3.1 Road hierarchy considerations.

Traffic on any class of road has an impact on the amenity of an area. Noise and pedestrian access are also important factors to be considered in the development of new properties abutting major roads. Traffic limits such as volumes, speed limits, do not generally apply to major roads, although emphasis is currently being placed on traffic calming issues on sub-arterial roads in retail areas.

Traffic limits are necessary on minor roads as pedestrian safety here is of primary concern. Environmental capacity considerations are relevant to streets in residential areas, neighbourhood shopping centres and educational precincts. For further reference, see *The Significance of Environmental Capacity in the Assessment of the Traffic Impacts of Developments*, Stapleton and Hallam (1993).

Meeting the needs of both traffic and pedestrian access is the main objective in accommodating new development. This is achieved in a different manner with new areas compared to the approach of developments in existing areas.

4.3.2 New areas.

The average speed of traffic often defines the safety of pedestrian access. It is advisable therefore that the design of residential streets promotes a 30km/h limit. This objective is also applicable to roads in retail and residential areas which have pedestrian crossings. A 30 km/h speed limit is also suitable for quiet laneways in commercial and industrial areas.

In commercial areas, the trend towards footpath activities, such as pavement coffee shops, is catered for by limiting driveways to approximately one per 50 metres. However, small industrial developments require many driveways and are therefore most suited to quiet roads which carry up to only 5000vpd. Where the flow in an industrial area exceeds 5000vpd large establishments should have access at intervals of more than 50 m. As the speed of traffic inevitably increases under these circumstances, on-street parking is discouraged. Comparatively busier roads in commercial areas are suitable for large offices which require locations with good exposure. In such cases more pedestrian activity is often generated necessitating a side road to accommodate parking. The introduction of mixed uses in new development areas also enhances traffic efficiency, particularly in the provision of public transport.

4.3.3 Existing areas.

Generally principles established in existing areas form the basis of principles to govern new areas. In some situations trade-offs are required, for example when the functional class of the road needs to be considered. On major roads, traffic efficiency is a primary consideration, whereas on minor roads safety and amenity take precedence.

4.3.4 Factors effecting environmental capacity.

The Environmental Capacity of an area is determined by the impact of traffic, roads and various aspects of the location.

Traffic characteristics:

- traffic volume.
- traffic composition, in particular the proportion of heavy vehicles.
- vehicle speed.

Road characteristics:

- road reserve and carriageway width.
- number of traffic lanes.
- gradient.
- road surface condition.

Locality characteristics:

- distance from road carriageway to property boundary.
- nature of intervening surfaces.
- setback of building from property boundary.
- type and design of building.

A number of measures can be used to determine the impact that a road will have on Environmental Capacity. In *Traffic in Towns* (1963), Buchanan uses the pedestrian delay / safety method, taking into account carriageway width and the vulnerability of pedestrians. A 7.5 m wide street in a subdivision road pattern (typical of current Australian designs), with high pedestrian vulnerability was found to have an Environmental Capacity of just over 180 pcu/hr.

In *The Streets Where We Live*, Landcom (1984), pedestrian safety and delay are further considered. This resulted in the definition of various behavioural thresholds, such as the observation that at 90 veh/hr children tend to stop playing in the street, and a 300 veh/hr limit is required for aged pedestrians to safely cross the average street.The impact of traffic noise on the Environmental Capacity of an area is a particularly important factor.

Issues such as vehicle volume, traffic speed, heavy vehicle percentage and the distance of the noise source should be considered. Environmental Capacity can be defined in terms of the acceptable level of noise at a building or dwelling. The Environment Protection Authority defines an environmental goal of Leq(24 h) = 55 dBA, while the RTA defines a design goal of Leq(24h) = 60 dBA. The environmental goal is more appropriate for minor roads whereas the design goal is more appropriate for major roads. An Leq(24h) of 55 dBA on a street with 5% heavy vehicles and with traffic speeds of 40 km/hr is equivalent to a daily traffic flow of just under 2100 veh/day. When speed increases to 60 km/hr the threshold reduces to just over 1400 veh/day.

Considerable research has been undertaken on residents' attitudes to traffic in their streets. In work by Coady & Associates - *Environmental Capacity of Residential Streets*, (1982), a critical range of 3,000-6,000 veh/day was found. Based on the specific data on the particular streets surveyed this is equivalent to peak hour flows of 250-500 veh/hr. This study however made no distinction between different types of residential streets. The 58 streets sampled ranged from arterial (Hume and Pacific Highways) to local. Residents on different types of streets would be expected to have differing expectations. Further analysis of the data supports the performance standards presented below.

Analysis of traffic volumes for new residential subdivisions has focussed on allotting appropriate maximum traffic volumes for new areas. The *Australian Model Code for Residential Development*, (1990), for example, cites daily volume maximum of 1,000-2,000 veh/day for different types of local access streets, and 6,000 veh/day for trunk collector streets. This subject is discussed further in Section 7 of these guidelines.

4.3.5 Performance standards.

Environmental Capacity is best estimated by considering a range of differing perceptions and attitudes to traffic impacts in a particular area. The environmental expectations of residents often varies significantly, even within the same district. It is accepted that the performance standard usually occurs

at the top end of a range. While it can be argued that there is no particular threshold beyond which problems may emerge, this standard is subject to the same constraints as all other standards. Engineering standards are often based on concepts of good practice, with a concerted focus on safety factors. While it is generally accepted that a departure from this standard may be accommodated to a degree, developers must justify plans where designs significantly exceed the standard. Table 4.6 sets out the recommended Environmental Capacity performance standards. This table relates to streets with direct access to residential properties. Trunk collector and spine roads with no direct property access can carry higher traffic flows.

Table 4.6
Environmental capacity performance standards on residential streets

Road class	Road type	Maximum Speed (km/hr)	Maximum peak hour volume (veh/hr)
Local	Access way	25	100
	Street	40	200 environmental goal
			300 maximum
Collector	Street	50	300 environmental goal
			500 maximum

Note: Maximum speed relates to the appropriate design maximum speeds in new residential developments. In existing areas maximum speed relates to 85th percentile speed.

In the performance standards set out in Table 4.6, two levels are given - one for the desirable maximum (the environmental goal), and one for the absolute maximum. There may be situations where alterations to these levels might be appropriate, however it is up to the developer to justify a departure from the standards.

For example, a road with a wide central-median, and with separate carriageways of approximately 5 metres width would have less impact on pedestrian safety than an undivided road of width 7 metres, and hence could accommodate a higher traffic flow for the same degree of safety.

Table 4.6 indicates that the functional classification of the street is important. While two streets may be similar, if one street functions as a collector street, then local access, safety and amenity are not the only issues to be considered. The movement of traffic along the street from adjoining areas also becomes a planning issue. Since it is still a residential area both traffic movement and planning issues need to be accommodated.

Table 4.6 takes into account both amenity and safety considerations. The maximum speeds given are design speeds for new residential areas. They might not be achieved in existing areas without the assistance of traffic calming methods. In assessing a proposed development, the existing average speed (even if over the desirable limit), is the starting point in determining the existing level of hazard. The Environmental Capacity of a street can be increased through a reduction in speed. For example, on an existing residential street where traffic volumes reach the Environmental Capacity maximum (and a proposed development could cope with the volume over the standard), traffic speed may be reduced by the introduction of traffic calming methods.

In general, the distance required by a vehicle to stop when unexpectedly confronting a pedestrian on the road is proportional to the speed of the vehicle squared. Thus a reduction in speed can cause a disproportionate improvement in pedestrian safety. In situations where Environmental Capacity standards are already exceeded, rather than allowing the situation to be made slightly worse with additional traffic, speed reduction measures can be introduced. These may have a positive effect on traffic noise, and ensure that the existing level of pedestrian safety remains the same, or is reduced.

4.4 Impact on safety.

Traffic safety is of primary importance for developments on both minor and major roads. The internal site layout and access to the development should be considered. Vehicle / vehicle and vehicle / pedestrian conflict points should also be reviewed.

Guidance on the provision of safety in the road and traffic environment is given in the RTA's *Road Environment Safety Guidelines* (September 1992). These guidelines set out the principles of road environment safety and give specific advice on the safety aspects of transport and planning, including land use developments.

It is advisable that three-year accident histories of adjacent intersections and proposed transport routes, are obtained for developments with the potential of significantly adding to total traffic movements and / or heavy vehicle movement. These accident histories should identify the types of accidents, the total number of accidents, and make note of any vehicle / pedestrian accidents. Particular attention should be paid to the impact of increased traffic volumes at intersections which already have accident problems.

Where the accident history of a proposed transport route is presented, accident details (such as the type of conflict and vehicle involved) must be provided. Accident numbers alone are not sufficient for safety appraisal.

It should be noted that existing accident rates are merely indicators of safety. If accident rates are high, the situation requires further investigation. Similarly, if the proposed development is likely to have a significant effect on the volume, direction or composition of traffic (including interaction with non-motorised traffic) then further investigation of the safety potential is required. Use of the road safety audit approach is recommended here.

A checklist of issues and procedures for undertaking road safety audits can be found in the RTA's *Road Safety Audits* (July 1991). The manual outlines a safety review and assessment process that is applicable to both existing road situations and to proposed development projects.

Possible corrective measures may be developed for areas where accident *black spots* have been identified. The funding of ameliorative measures should be considered in the same manner as the funding of road works for traffic efficiency or traffic calming reasons, through Section 94 of the Environmental Planning & Assessment Act. Traffic safety works should be considered as an integral part of any Section 94 Contributions Plan for road and traffic works. As with any Section 94 works, there must be a causal relationship between the works and the traffic generated by the proposed development.

Performance standards for traffic safety improvements are not easily defined. The worst 100 *black spot* intersections in New South Wales in 1990 (based on total intersection accidents in 1989 and 1990) had an average of 13.6 accidents per year, ranging from 11 to 24. For these 100 intersections the average severity of the accident index was 15.3. This index is based on one year of accidents, with a weight of 3.0 for fatal accidents, 1.8 to serious injury accidents, 1.3 to other injury accidents and 1.0 to non-injury accidents.

When considering accident data it is essential to use a consistent data base for any comparisons of average figures. The accident rates referred to in this section are based on the RTA accident data base, where accidents involved personal injuries or where a vehicle was towed away.

For road links, the rates given in Table 4.7 are for roads in the Sydney region in 1989.

Table 4.7
Accident rates by road classification, Sydney 1989
(accidents per million veh.km of travel)

Road Classification	Fatal Injury	Serious Injury	Other Injury	Property Damage	Total
Local /Sub-arterial	0.015	0.151	0.551	1.152	1.87
Arterial	0.016	0.120	0.429	0.989	1.55
Freeway	0.003	0.0037	0.091	0.230	0.36
Total Sydney	0.014	0.130	0.468	1.023	1.64

Source: Economic Analysis Manual, RTA (1990).

Accident rates are generally lower in rural areas. For all accidents on rural main roads / highways in 1988, the rate for divided roads (4 lanes or more) was 0.32, while the rate for undivided roads (less than 4 lanes) was 0.49 accidents/M.veh.km.

The above rates are best used as a guide for reviewing the need for traffic safety improvements. The rates are variable (the rural undivided rate of 0.49 had a standard deviation of 0.44) and should not be regarded as precise. It is recommended that a review of the road safety implications of a proposed development is conducted, by either examining the accident history of an area or through a more detailed road safety audit.

4.5 Impact on road pavement.

In assessing the impact of developments on road pavements, consider the following points:

- an assessment of the proposed transport routes is necessary where a development causes a significant increase in movements of heavy vehicles (with a possible need for pavement reconstruction).
- where road pavements are reconstructed up-front to carry projected loads, (without requiring further reconstruction during the life of the development) a contribution for subsequent road reconstruction is not required, with the possible exception of a small contribution for resealing.
- where road pavements are not reconstructed up-front, a contribution for subsequent pavement reconstruction is required.

Consider the following factors when assessing existing road pavements:

- visual condition.
- structural capacity.
- pavement depth and roughness.
- rut depth.

Pavement management systems can be of use, either in simple inventory form or as a sophisticated software package.

In assessing the amount of contribution for pavement reconstruction, it is desirable that a detailed engineering investigation be undertaken, generally as part of the Environmental Impact Study process. This investigation is required to provide details on the existing road pavement and the projected traffic loads as well as additional traffic loads on roads within the local government area. The existing traffic patterns also need to be reviewed through vehicle classification counts.

There could be situations where discounts might be appropriate. For example, if a council is currently transporting road materials for use in its area from another area and a local quarry is proposed, a discount for *local* consumption might be considered.

Developer contributions for road pavement damage are further discussed in Section 8.

4.6 Public transport services.

In any new development, opportunities to optimise the use of public transport must be pursued. Section 90 of the Environmental Planning and Assessment Act requires an evaluation of the question of whether public transport services are necessary and, if so, whether they are available and adequate for that development.

With retail and commercial developments, direct pedestrian routes to bus stops and / or railway stations must be taken into account in the design. Wherever possible, the design should encourage the use of public transport, and where significant public transport usage is likely, development *bonuses* such as reduced on-site parking may be considered.

Residential subdivisions should be located in proximity to existing development when possible, to assist in the design of bus routes. Subdivisions should ideally have at least two entrances to the major road network, to avoid circuitous bus routing. At least 90% of dwellings are to be within 400 metres safe walking distance from an existing or potential bus route, and not more than 500 metres from the nearest stop or potential stop. With medium density residential developments, opportunities should be developed to ideally reduce walking distances to within 200 metres of a bus route.

4.7 Pedestrian circulation.

Development plans should ensure that the internal circulation system and the external access points are designed for pedestrian safety thereby minimising pedestrian / vehicle conflicts. This plan must cater for access to public transport services as well as to (and within) public parking areas. Pedestrian safety is a critical issue in the design of new residential estates. This is discussed in more detail in Section 7.

Where heavy pedestrian flows are anticipated, levels of service must be evaluated. Table 4.8 sets out pedestrian levels of service, based on the *Highway Capacity Manual Special Report 209* (1985).

Table 4.8
Pedestrian level of service on walkways

Level of Service	Space (m^2/ped)	Average Speed (m/min)	Flow Rate (ped/min/m)
A	over 12.1	over 79	less than 7
B	3.7-12.1	76-79	7-23
C	2.2-3.7	73-76	23-33
D	1.4-2.2	69-73	33-49
E	0.6-1.4	46-69	49-82
F	< 0.6	< 46	variable

Section 5 Parking Requirements for Specific Land Uses.

5.1 Introduction.

This section details parking requirements for specific land uses. The basis of recommended parking provisions is discussed in Section 5.2. The design of parking areas and site access, including access driveways and auxiliary lanes, is discussed in Section 6. Refer to *Australian Standard 2890* for details of parking area layout and design, including access driveways. A summary table of land uses and associated parking requirements can be found at the end of this section.

5.2 Basis of recommended parking provisions.

Adequate off-street parking is the main criterion in the assessment of parking areas provided for developments. Adequate provision of off-street parking discourages on-street parking, thereby maintaining the existing levels of service and safety of the road network.

As adequate parking also contributes to the economic viability of a development, it is recommended that adequate parking facilities be provided for the following types of vehicles:

5.2.1 Car parking.

The recommended numbers of car parking spaces to be provided for each land use type are generally based on surveys and research conducted by the RTA. These recommended levels represent parking requirements needed to meet the peak parking accumulations observed. In the RTA's research, trial surveys established the peak hours and days of the week without consideration of seasonal variations. The recommended parking levels are based on these surveys. Where a proposed development is expected to have strong seasonal variations, an assessment of the impact of these variations is desirable. Consideration of factors such as mode split and car occupancy is also desirable.

The RTA's land use / traffic generation research has concentrated on establishing empirical relationships in order to explain characteristics of traffic generation and parking. The empirical relationships involved illustrate the existing operation of the developments surveyed. However, the independent variables used in these relationships are not always suitable for predicting future traffic generating characteristics of a proposed development. For example, while the number of employees at a development can often be used to provide a good explanation of traffic and parking behaviour, this number is not always accurately known at the time that a development application is lodged. Also, specific uses of the development might change with time. In the case of factories, traffic and parking behaviour can vary substantially between different types of factories although they may be of the same size. Change in the use of developments does not always require planning consent.

The parking provisions recommended in this section are based, wherever possible, on physical characteristics of the proposed development, particularly the gross floor area.

The importance of parking must be kept in perspective in the overall planning assessment. There may be situations where it may not be physically possible to provide parking, but the potential planning benefits of the proposal are significant. For example, the adaptive re-use of an historic building may not include on-site parking as it could have an adverse impact on the structure of the building or on its curtilage. Another example is the case of a change of use of a small shop that is part of a traditional strip shopping centre and cannot provide extra parking space. Alternatives, such as contributions for off-site parking provision must be explored. It is stressed that a shortage of parking (both on-site and off-site) is not necessarily detrimental to the success of a proposed development. It is but one of many issues that need to be considered in determining development proposals.

Potential variations between local government areas must also be considered. An average parking rate for the State is not necessarily applicable in all areas of the State.

Ultimately it is the responsibility of the applicant to prove that either the proposed level of parking provision is adequate, or that the overall planning benefits of the proposed development outweigh these needs.

For internal design of car parking areas, consult the *Australian Standard 2890.1, 1993 - Off-street car parking*.

5.2.2 Courier vehicles.

Provision must be made on-site at a convenient location for one car and a motorcycle (potential courier vehicles), in office and commercial developments. Larger developments may require more.

5.2.3 Delivery / service vehicles.

Provision must be made on-site at a convenient location for the type of delivery service vehicles appropriate to the type of development, and a number of parking spaces provided to suit the scale of development. Consideration should also be given to the future use of the site and the type of service vehicles which may service the site.

The number of service bays required for a development depends on the size and nature of the development. The Council of the City of Sydney has developed a code for the provision of service bays based on surveys undertaken in 1972. Table 5.1 gives relevant details from this code for general guidance. Because of the age of the data used in this code, major developments should ideally quantify their service vehicle requirements through new surveys of similar developments.

When dealing with a combination of different types of developments, the code suggests that the total spaces required should be determined by adding the individual components and rounding upwards to the nearest space.

For residential flat buildings, the code suggests that the total spaces required is determined by adding the individual components and rounding upwards to the nearest space. The code allows the service area requirements for residential flat buildings to be waived in cases where visitor parking spaces are available to trucks and delivery vans.

The code also requires that spaces should be provided for taxis to stand while waiting for passengers from hotels, motels or residential flat buildings. Service area spaces may be sufficient for this purpose if they are accessible to taxis. If service area space is not sufficient, the code requires provision for taxi spaces at the rate of one space per 100 bedrooms or part thereof for hotels and motels, and one space per 100 flats or home units or part thereof in the case of residential flat buildings. Visitor parking spaces are acceptable to use for this purpose.

Refer to the *Australian Standard 2890.2- Commercial vehicles* for information on the internal design of service vehicle areas.

Table 5.1
Provision of areas for delivery and service vehicles

Type of Development	Minimum Requirements	
Commercial premises (50% of spaces adequate for trucks)	*< 20,000m² GFA*	*>20,000 m² GFA*
	1 space per 4,000m² GFA	5 + 1 space per 8,000m² over 20,000m²
Department Stores (all spaces adequate for trucks)	*< 6,000m² GFA*	*> 6,000m² GFA*
	1 space per 1,500m² GFA	4 + 1 space per 3,000m² over 6,000m²
Supermarkets,shops and restaurants (all spaces adequate for trucks)	*< 2,000m² GFA*	*> 2,000m² GFA*
	1 space per 400m² GFA	5 + 1 space per 1,000m² over 2,000 m²
Wholesale, Industrial (all spaces adequ ate for trucks)	*< 8,000m² GFA*	*> 8,000m² GFA*
	1 space per 800m²	10 + 1 space per 1,000m² over 8,000 m²
Hotels and Motels (50% of spaces adequate for trucks)	*< 200 bedrooms or bedroom suites*	*> 200 bedrooms or bedroom suites*
	1 space per 50 bedrooms	4 + 1 per 100 bedrooms over 200
	plus	
	1 space per 1,000 m² of public area set aside for bar, tavern, lounge and restaurant,	
Residential flat buildings (50% of spaces adequate for trucks)	*< 200 flats or home units*	*> 200 flats or home units*
	1 space per 50 flats or home units	4 + 1 per 100 units over 200
	plus	
	1 space per 1,000 m² of public area set aside for bar, tavern, lounge and restaurant,	
Other uses (50% of spaces adequate for trucks)	1 space per 2,000m²	

Source: Council of the City of Sydney *Draft Parking Code* (1980). Currently under review.

5.2.4 Bicycle parking.

The security and protection of bicycles parked within or near a development must be provided for in the parking design. It is recommended that cyclists are able to secure the frame and two wheels of a bicycle to a fixed, secure stand, preferably with the cyclist's own lock and chain. The parking facility must cater for all types of bicycles.

Refer to the *Australian Standard 2890.3, 1993 - Bicycle parking facilities* for all requirements for bicycle parking facilities.

5.3 Design requirements for land uses.

Essentially there are two components of design requirements:

- access requirements to the site including driveways, auxiliary lanes such as acceleration / deceleration lanes, and right turning bays.
- internal roads and parking area design showing access to parking or service areas.

While brief mention is made of these two components in this section, designers are referred to Section 6 of this Guide and to the relevant *Australian Standard AS2890 - Parking facilities for further information*.

5.4 Residential.

5.4.1 Dwelling houses.

Definition.

A *dwelling house* is a building containing one, but no more than one dwelling.

Parking.

A minimum of one parking space (preferably two) is recommended for dwelling houses. If there is dual occupancy on a residential lot, a minimum of two parking spaces is recommended.

Parking requirements for dwelling houses can vary substantially between local government areas, due to varying levels of public transport accessibility as well as geographic and socio-economic factors.

Driveways.

See Table 6.1 and Table 6.2 for details relating to driveways.

5.4.2 Medium density residential flat buildings.

Definition.

A *medium density* residential flat building is a building containing at least 2 but less than 20 dwellings. This includes villas, town houses, flats, semi-detached houses, terrace or row houses and other medium density developments. This does not include aged or disabled persons' housing.

Parking.

The recommended minimum number of off-street, resident parking spaces is 1 space for each unit, plus an additional 1 space per each 5 x 2 bedroom unit or part thereof. Also, an additional 1 space per each 2 x 3 or more bedroom unit or part thereof is recommended.

An additional one space per each five units for visitor parking or part thereof is recommended.

The comments made above in *Dwelling houses - Parking* are equally applicable to medium density residential flat buildings. Consideration of the locality, and projected levels of parking demand are also particularly important for large developments.

Visitor parking spaces must be clearly designated and readily accessible. Appropriate signposting should be provided at the entrance to the site.

Driveways.

See Table 6.1 and Table 6.2 for details relating to driveways.

Parking area and internal road design.

Consideration must be given to the type of service vehicles requiring access to the site and their geometric movement requirements. For example, the requirements of garbage truck movements are relevant design considerations if garbage collection is to take place on-site.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 14 - Home Units* (1981), outlines research undertaken on the traffic and parking characteristics of home unit developments.

5.4.3 High density residential flat buildings.

Definition.

A *high density residential flat building* refers to a building containing 20 or more dwellings. This does not include aged or disabled persons' housing. *High density residential flat buildings* are usually more than five levels, have basement level car parking and are located in close proximity to public transport services. The building may contain a component of commercial use.

Parking.

The recommended minimum number of off-street resident parking spaces is as follows:

Metropolitan Regional (CBD) Centres:

- 0.4 spaces per 1 bedroom unit.
- 0.7 spaces per 2 bedroom unit.
- 1.20 spaces per 3 bedroom unit.
- 1 space per 7 units (visitor parking).

Metropolitan Sub-Regional Centres:

- 0.6 spaces per 1 bedroom unit.
- 0.9 spaces per 2 bedroom unit.
- 1.40 spaces per 3 bedroom unit.
- 1 space per 5 units (visitor parking).

Metropolitan Regional Centres (Central Business District) provide high levels of local employment as well as access to rail and bus services and therefore may have less parking requirements.

The recommended minimum number of off-street visitor parking spaces is one space for every 5 to 7 dwellings. Councils may wish to reduce this requirement for buildings located in close proximity to public transport, or where short term unit leasing is expected.

Provision for delivery and service vehicles.

The provision of at least one loading dock for residential use is desirable, although a dock intended for commercial uses may be sufficient.

Provision for commercial component.

The parking provisions for commercial use within a high density residential flat building should be separately established by referring to the relevant guidelines for those specific uses.

Driveways.

See Table 6.1 and Table 6.2 for details relating to driveways.

Surveys.

The report - *Land Use Traffic Generation - Data and Analysis 14 - High Density Residential* outlines the research undertaken regarding the traffic and parking characteristics of high density residential developments.

5.4.4 Housing for aged and disabled persons.

Definitions.

An *aged* person is a person aged 55 years or over.(Source: *State Environmental Planning Policy No. 5*).

A *disabled* person is a person of any age who has a mental, physical or sensory impairment, either permanently or for an extended period.

A *hostel* is a residence which houses aged or disabled persons, and provides cooking, dining, laundering and other care facilities on a shared basis. Hostels are maintained on a full-time basis by persons who have nursing, social work or other similar experience.

Housing for aged or disabled persons refers to residential accommodation (in any building form), which is used or is intended to be used permanently as accommodation for aged persons or disabled persons. Housing of this kind may consist of hostels, a grouping of self-contained dwellings, or a combination of both. This accommodation usually includes one or more of the following facilities:

- accommodation for staff employed or to be employed in connection with the development.
- chapel or other place of worship.
- medical consulting room.
- meeting room, recreation facility.
- shops.
- therapy room.
- any other facilities for the use or benefit of aged or disabled persons.

A *self-contained dwelling* is a dwelling or part of a building (whether attached to another building or not), which houses aged or disabled persons. Private facilities for cooking, sleeping and washing are included in the dwelling, or part of the building. Laundry and other facilities for use by the residents of that dwelling may also be provided on a shared basis.

Parking.

Housing for aged and / or disabled persons generally takes the form of self-contained unit developments, hostels and nursing homes. They are generally constructed in one of two basic categories, resident funded developments or subsidised developments. Resident funded developments tend to have a higher per unit cost and attract residents with higher financial resources. The car ownership levels of such residents is likely to be relatively high, as is the associated traffic generation and parking requirements of these residents. Subsidised developments, which are often run by religious organisations, are usually associated with lower car ownership levels and consequently lower corresponding generation rates. In assessing the parking demands for aged or disabled persons' housing, consideration must be given to the funding arrangement proposed for the development. Clarification from the developer may also be required in this matter. A lower parking provision can only be approved when it can be clearly demonstrated that low car ownership levels will prevail. The following parking provisions are recommended.

Resident funded development.

Self-contained units:

- 2 spaces per 3 units (residents) plus.
- 1 space per 5 units (visitors).

Hostels, nursing and convalescent homes:

- 1 space per 10 beds (visitors) plus.
- 1 space per 2 employees plus.
- 1 space per ambulance.

Subsidised development:

Self-contained units:

- 1 space per 10 units (residents) plus.
- 1 space per 10 units (visitors).

Hostels, nursing and convalescent homes:

- 1 space per 10 beds (visitors) plus.
- 1 space per 2 employees plus.
- 1 space per ambulance.

Note:

The reference to employees indicates the number of staff on site at any one time during the peak operating period. It is advisable that suitable parking provision be made when shifts overlap.

Recommended parking provisions at subsidised developments are based on the RTA's research. In the case of resident funded developments, the recommended parking provisions are based on observations and experience of planners involved in this type of development. The overall resident parking demand of 2 spaces per 3 units represents the average parking needs of resident funded developments.

Visitor parking spaces must be clearly designated and readily accessible. Appropriate signposting should be provided at the entrance to the site.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Consideration must be given to the type of service vehicles requiring access to the site and their geometric movement requirements. For example, the requirements of garbage truck movements are relevant design considerations if garbage collection is to take place on-site. It is advisable that provision be made for the movement of buses on-site (ideally connecting with the village centre), to accommodate potential diversions of scheduled services and for charter services. For bus access loops within a private development on which parking is not permitted, the recommended minimum carriageway width for two-way movement is 6.0 metres with adequate provision for manoeuvring at corners.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 16 - Homes for the Aged* outlines research undertaken on the traffic and parking characteristics of homes for the aged. It must be noted that all of the homes surveyed were affiliated with various religious organisations and tended to have parking demands in line with the recommended provision for subsidised developments.

5.5 Casual accommodation.

5.5.1 Motels.

Definition.

A *motel* is a building or buildings (other than a hotel, boarding-house or residential flat building) used substantially for overnight accommodation of travellers and their vehicles, whether or not the building or buildings is also used to provide meals to those travellers or the general public.

Parking.

The recommended number of off-street car parking spaces is:

- 1 space for each motel unit, plus.
- 1 space per 2 employees.

If a restaurant and / or function room is to be included as part of the development, then the amount of off-street parking must be reviewed and increased as necessary. If the restaurant primarily serves motel customers, then additional parking may not be required. However, the possibility of a future change in patronage of the restaurant must be considered.

The following parking options apply to situations where the restaurant and / or function room operates entirely independently of the motel:

- 15 spaces per 100m^2 gross floor area of restaurant / function room facility,
  or.
- 1 space per 3 seats, whichever is the greater.

The total parking provision for motels with restaurants / function rooms may be reduced if it can be demonstrated that the peak parking demand of each facility will not coincide. Factors such as the time of usage, and possible future usage, must be taken into consideration when meeting parking requirements.

Service vehicles.

Adequate parking provision must be made on-site for the type of vehicles most likely to service the development.

Coaches.

Adequate provision must be made for the parking of coaches if their use is anticipated.

Driveways.

See Table 6.1 and Table 6.2 Section 6 for information regarding driveways.

Parking area and internal road design.

Reception offices must be located so that entering vehicles travel a distance of at least 12 metres from the entrance to the point at which the vehicle is required to stop. Vehicles parked at the reception office must not block vehicular access to the motel units.

Consideration must be given to the type of service vehicles requiring access to the site, and their geometric movement requirements. In addition, provision must be made for the movement and parking of coaches if their use is anticipated.

See Section 6 for Internal Design guidelines.

Surveys.

The report Land Use Traffic Generation - Data and Analysis 6 - Motels outlines research undertaken on the traffic and parking characteristics of motels. Also, refer to the report Land Use Traffic Generation - Data and Analysis 15 - Restaurants.

5.5.2 Hotels – traditional.

Definition.

A *hotel* is any building used for purposes as specified in a hotelier's licence, granted under the Liquor Act, 1982.

Parking.

The RTA's research on parking has found no strong relationship between peak car parking accumulation and floor area, or function room capacity, at ten hotel sites surveyed.

The range in parking demand rates resulting from early research was broad, making it difficult to generalise. This variation was due to factors such as the location and age of the building, the internal design, the provision of live music and other facilities. Since the surveys were undertaken, behavioural changes have occurred in the use of hotels, due to factors such as the introduction of random breath testing. These changes have generally served to reduce parking demand rates. It is recommended that proposed hotel developments be compared to similar existing developments, noting the existing supply of, and demand for parking in the area, and of the peak parking periods of individual facilities within the hotel.

When a proposed development includes a function room for live music performances (or a nightclub), particular attention must be paid to parking requirements to meet peak demands.

Service vehicles.

Adequate parking provision is to be made on-site for the types of vehicles most likely to service the development.

Coaches.

Adequate provision must be made for the parking of coaches if their use is anticipated.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Consideration must be given to the type of service vehicles requiring access, as well as their geometric movement requirements. In addition, provision must be made for the movement of coaches if coach parking is provided.

If a drive-in liquor store is included in the development, the general design principles established for such a store must be followed. (See *Drive-in liquor stores* Section 5.7.6).

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 13 - Hotels* outlines research on the traffic and parking characteristics of hotels.

5.5.3 Hotels - tourist.

Definition.

A *tourist hotel* is a building or buildings (other than a hotel licensed under the Liquor Act, 1912, motel, boarding house or residential building) substantially used for the accommodation of tourists.

Hotels with a 3, 4 or 5 star rating are generally considered to be tourist hotels. The level of accommodation and facilities provided determine a hotel's rating. For example, 5 star international hotel developments incorporate the operational characteristics of retail, entertainment, conference facilities and health clubs which cater for the international visitor market.

The RTA has no current research data on 3, 4 and 5 star tourist hotels. Based on the 1988 Traffic Management Strategy Study conducted by Travers Morgan on *Traffic Generation and Design Requirements of Tourist Related Developments in Sydney CBD*, trip characteristics of an international tourist hotel are determined by:

- number of rooms / beds in the hotel development.
- type of facilities available in the hotel, such as conference facilities and function rooms.
- location of the hotel.

The survey findings revealed the following specific traffic issues relating to 3, 4 and 5 star tourist hotel developments.

Parking provision.

Based on a modal average from survey results, the suggested hotel parking rate is similar to the current Sydney City Council Parking Code, which is 1 space per 5 rooms for a 5 star international hotel. The above requirement excludes the parking demand generated by other hotel functions such as conference activities.

The survey also recorded more driving trips for 3 and 4 star hotels. The provision recommended therefore is 1 space per 4 bedrooms in 3 and 4 star hotels.

Coach movements.

The same survey showed coach movements vary significantly. Most of the coach pick up and set down activities were conducted at the main entrance of the hotel. It is suggested that an adequate coach lay-by be incorporated at the hotel entrance and on-site coach parking be provided. A minimum of two spaces is recommended.

Taxi facilities.

A large proportion of hotel guests and conference patrons were recorded arriving by taxi. The survey findings indicated that the derived demand for taxi use to hotels is given by the relationship of 1 taxi trip per hour per 10 hotel rooms. The relationship provides an indication for the provision of taxi pick-up and drop off facilities.

Service vehicles.

Peak deliveries were recorded on Thursdays and Fridays. The suggested minimum service vehicle bay is 1 space per 100 rooms. This rate has been adopted by both Sydney City and South Sydney City Councils.

Stacked parking.

If public car parking is provided by a hotel complex, stacked parking should not be used unless a valet parking service is also available.

Adequate parking should be provided for hotel executives, visiting VIPs and major hotel tenants.

5.6 Office and commercial.

Definition.

The term *commercial premises* refers to a building or place used as an office or for other business or commercial purposes. This includes non-medical professional consulting rooms.

Parking.

The car parking requirements for office and commercial developments vary with the parking policies of local government areas. As discussed in the RTA's publication *Metropolitan Parking Policy and Guidelines*, it is the responsibility of local government to determine parking policy in commercial centres. Distinction needs to be drawn between whether the parking demand is to be met on-site (unrestrained situation) or whether car parking supply is to be used as a policy tool to restrict commuter movement by private vehicles into a commercial centre (restrained situation). On this basis, the following car parking provision is recommended:

- unrestrained situation - 1 space per 40m^2 gross floor area.
- restrained situation - refer to council parking code and applicable local plans.

The unrestrained situation assumes a peak hour mode split for cars of 0.62, car occupancy of 1.19 and a mean employee density of 4.75 employees per 100m^2 gross floor area. The unrestrained figure is based on 1979 surveys and has not been updated. For this reason other references, such as specific town centre studies, should preferably be used to establish an appropriate figure.

Courier vehicle requirements.

Provision must be made on-site for courier car parking space in a convenient and appropriately signposted location preferably with access off the principal street frontage. Additional parking for courier motorcycles is desirable.

Service vehicles.

Adequate parking provision must be made on-site for vehicles most likely to service the development.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 1 - Office Blocks* outlines research undertaken on the traffic and parking characteristics of office developments.

5.7 Retail.

5.7.1 Shopping centres.

Definition.

The term *shop* refers to a building or place used for the purpose of selling, exposing or offering for sale by retail, goods, merchandise or material.

Parking.

Table 5.2 indicates the minimum recommended level of off-street parking.

Table 5.2
Off Street Parking

Gross leasable floor area (GLFA) m^2	Car Parking Spaces per $100m^2$ of GLFA
0-10,000	6.1
10,000-20,000	5.6
20,000-30,000	4.3
Over 30,000	4.1

Gross leasable floor area is preferred to gross floor area for this land use category, because it refers most specifically to the factor that generates / attracts trips. The term *gross leasable floor area* means the sum of the areas at each floor of a building. In this instance, the area of each floor is taken to be the area within the internal faces of the walls, excluding stairs, amenities, lifts, corridors and other public areas, but including all stock storage areas. As a guide, about 75% of the gross floor area is deemed gross leasable floor area. However, this percentage can vary substantially between developments.

The above car parking provisions are based on unrestrained demand for parking, in isolation to adjacent developments. When it can be demonstrated that the time of peak demand for parking associated with the proposed shopping centre and the adjacent land uses do not coincide, or where common usage reduces total demand, a lower level of parking provision may be acceptable. Provision of public transport may also reduce the demand for car parking spaces. If the proposed development is an extension of an existing retail development, additional parking demand could be less than proportional to the increase in floor area.

The above car parking provisions reflect the mean results of the centres which were surveyed, for the peak parking demand on either Thursday, Friday or Saturday. There may be situations where parking

provision at these levels would be inadequate. However, provision based on the 85 percent level of demand must be considered.

The parking provisions outlined above are based on aggregated retail categories. The relative parking demand characteristics of different floor area types can be seen in the following indicative model:

Peak Parking Demand = 24 A(S) + 40 A(F) + 42 A(SM) + 45 A(SS) + 9 A(OM) (per 1,000m^2).

where:

A(S): Slow Trade GLFA, includes major Department stores such as David Jones and Grace Brothers, furniture, electrical and utility goods stores.

A(F): Faster Trade GLFA, includes discount department stores such as K-Mart and Target, together with larger specialist stores such as Fosseys.

A(SM): Supermarket GLFA, includes stores such as Franklins and large fruit markets.

A(SS): Speciality Shops and Secondary retail GLFA, includes speciality shops and take-away stores such as McDonalds. These stores are grouped since they tend not be primary attractors to the centre.

A(OM): Offices, medical GLFA.

Service delivery vehicle parking.

Adequate number of parking spaces should be provided on-site at convenient locations.

Driveways.

Separate access driveways should be provided, wherever possible for service vehicles and for car parking.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Provision must be made for the movement and loading / unloading of service vehicles as appropriate. Reference should be made to *Australian Standard 2890.2 Commercial vehicles*.

Separate internal circulation systems must be provided for service and customer vehicles wherever possible, particularly for proposed developments of greater than 5,000m^2 gross leasable floor area.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 4/2 - Shopping Centres* outlines the most recent research undertaken on the traffic and parking characteristics of shopping centres.

5.7.2 Service stations and convenience stores.

Definitions.

A *service station* is a building or place used for the fuelling of motor vehicles, involving the retail sale of petrol, oil and other petroleum products. This term is applied to any establishment which in addition is used for any one or more of the following purposes:

- the sale by retail of spare parts and accessories for motor vehicles.
- washing and greasing of motor vehicles.
- installation of accessories.
- repairing and servicing of motor vehicles involving the use of hand tools (other than repairing and servicing which involves a top overhaul of motors, body building, panel beating, spray painting, or suspension, transmission or chassis restoration).

The term *convenience store* refers to a drive-in retail facility, usually established by the modification of existing service stations. This type of establishment usually combines the retailing of petrol and other goods, with the hours of operation extending beyond normal retail hours.

Parking.

Adequate off-street parking must be provided for employees and for vehicles being serviced. As a guide, 6 spaces per work bay is suggested.

If a convenience store is provided on-site, additional parking at the rate of 5 spaces per 100m^2 gross floor area is recommended.

If a restaurant is provided, additional parking at the rate of 15 spaces per 100m^2 gross floor area or 1 space per 3 seats, whichever is the greater, is recommended.

The above recommended facilities may be reduced where it is demonstrated that the times of peak demand for the various facilities do not coincide. Parking must be provided to satisfy the peak cumulative parking requirements of the development as a whole, by superimposing the parking demand for each facility separately.

All parking must be clearly designated and located so as to not obstruct the normal sale of petrol and must minimise the potential for vehicular / pedestrian conflicts.

Driveways.

Separate driveways are recommended, with widths as follows:

- entry driveway width- 8-10 metres.
- exit driveway width- 8-10 metres.
- minimum spacing between a pair of driveways - 10 metres.

There must not be more than two driveways on any one street frontage.

See Table 6.1 and Table 6.2 for information relating to driveways.

Internal roads and parking area design.

Petrol pumps must not be closer than 4 metres to the property alignment of any public street.

Inlets to bulk storage tanks must be situated so that when tankers are discharging fuel, they will stand completely on the site and not obstruct the safe and convenient entry to the site by other vehicles.

Design requirements for single unit car wash.

The holding area of a single unit car wash must be one or two lanes wide between the entrance driveway and the car wash structure. It must be able to accommodate at least 5 cars. It is preferable that cars proceeding to the car wash area do not pass through the petrol servicing area.

Vacuum-cleaning or other service facilities are to be located so that they do not obstruct the normal sale of petrol or the entry / exit path of vehicles.

The finishing area must be able to accommodate at least 3 cars and must allow direct movement from the car wash structure to the exit driveway.

Car wash structures must be designed to allow vehicles to pass through in one direction only.

Design requirements - conveyor car wash.

The holding area must be one or two lanes wide between the entrance driveway and the car wash structure. It must be able to accommodate at least 10 cars. It is preferable that cars proceeding to the car wash do not pass through the petrol servicing area.

Vacuum-cleaning or other service facilities are to be located so that they do not obstruct the normal sale of petrol or the entry / exit path of vehicles.

The finishing area must be able to hold at least 5 cars and must allow direct movement from the car wash structure to the exit driveway.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 7 - Service Stations* outlines research undertaken on the traffic and parking characteristics of service stations, while the report *Land Use Traffic Generation - Data and Analysis 19 - Convenience Stores* provides similar information for convenience stores.

5.7.3 Motor showrooms.

Definition.

A *motor showroom* is a building or place used for the display and sale of motor vehicles, caravans or boats, and where accessories for these items are sold or displayed. Vehicle servicing facilities may be included as part of the development.

Parking.

Off-street customer / visitor car parking at the rate of 0.75 spaces per 100m^2 of site area is recommended.

Where vehicle servicing facilities are provided, additional off-street parking must be provided. As a guide, 6 spaces per work bay are suggested.

Customer / visitor parking spaces must be readily accessible from the principal road frontage and appropriately signposted and marked. These spaces must not be used for the display of vehicles or other merchandise or for the loading / unloading of vehicles onto or from car floats or trucks.

Driveway.

Separate entry and exit driveways are recommended, each with a width of 8 to 10 metres and a minimum separation of 3 metres.

In general, it is not desirable to have a motor showroom with direct access to a major road.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

The site design must make allowance for the movement and manoeuvring requirements of the type of vehicles likely to enter the site. In particular, site design must provide for the movement of articulated vehicles if their use is anticipated. The *Australian Standard 2890.2* provides information on the geometric requirements of selected design vehicles.

The loading and unloading of vehicles from car floats and transporters must be carried out on site.

A continuous separation between site activities and the road frontage, excluding driveways, must be provided. A separation of minimum depth of 3 metres from the site boundary, featuring no advertising material or displays is desirable.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 9 - Car Sales and Spares* outlines research undertaken on the traffic and parking characteristics of motor showrooms.

5.7.4 Car tyre retail outlets.

Definition.

The term car tyre retail outlet refers to a building or place used for the purpose of retailing and fitting tyres to motor vehicles or agricultural machinery.

Parking.

Off-street parking at the rate of 3 spaces per 100m^2 gross floor area or 3 spaces per work bay (whichever is the greater), is recommended.

Driveways.

A combined entry / exit driveway of 6 to 9 metres width is recommended.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

The loading and unloading of goods from delivery vehicles must be carried out on-site, independently of tyre fitting bays and customer parking areas.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 10 - Car Accessories, Tyres* outlines research undertaken on the traffic and parking characteristics of car accessory and tyre retailers.

5.7.5 Roadside stalls.

Definition.

A *roadside stall* is a building or place not exceeding 20m^2 in floor space or area, where only primary products produced on the property on which the building or place is situated are exposed or offered for sale or sold by retail.

A larger building, or a stall selling goods not produced on the property is defined as a *shop*, and is therefore subject to requirements as specified in Section 5.7.1.

Parking.

A minimum of 4 off-street parking spaces is recommended for roadside stalls.

Driveway.

Where possible, separate entry / exit driveways each of 4 metres minimum width is recommended for stalls on a major road. However, in certain circumstances a combined entry / exit driveway of 6 metres minimum width may be acceptable.

On a minor road, a combined entry / exit driveway of 3 metres minimum width is recommended.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

A continuous separation between site activities and the road frontage (excluding driveways) must be provided. A separation of a minimum depth of 3 metres from the site boundary (with no advertising material or displays), is desirable.

On major roads, particularly on isolated and / or high speed sections, motorists are to be discouraged from parking on the opposite side of the road to a development and crossing the road to the site. This may be achieved by provision of right turn bays or the use of physical pedestrian barriers.

See Section 6 for Internal Design guidelines.

5.7.6 Drive-in liquor stores.

Definition.

A *drive-in liquor store* is a premises licensed for retail under the Liquor Act 1982, where customers must drive their motor vehicles to and from the point of sale.

General design principles.

The drive-in facility (if a component of a large development) must be integrated with the overall development so as to limit the number of access points.

The internal roadway must be a minimum of 2 lanes wide, each lane being at least 3 metres wide, with one way circulation. Off-street parking spaces for *browse-room* customers and employees must also be provided which must not inhibit the free flow of vehicles.

An adequate holding area must be provided to ensure that vehicles are not forced to park on the street. Vehicles must travel a minimum distance of 30 metres before reaching the serving area.

Separate entry / exit driveways are recommended, each with a minimum width of 4 metres and with a minimum separation of 1 metre.

All loading and unloading must take place off-street. If this is to take place from a service area adjacent to the customer driveway, it must not inhibit the free flow of vehicles. The minimum height clearance of this service area must be 3.6 metres.

For further details See Section 6 of this guide.

5.7.7 Markets.

Definition.

A *market* is a gathering of stalls in an open place, a covered area or a building, in which goods are exposed for sale on a sub-regional or local basis, at a frequency of generally between once or twice a week to once a month.

The range of goods at a market may vary from second-hand goods traditionally associated with Trash and Treasure markets (operated by church / community groups, Lions, Rotary clubs, etc), art and craft type goods associated with some of the specialty markets and the larger regional markets displaying the full range of goods such as clothes, toys, electrical appliances, jewellery, footwear, sporting apparel, plant and nursery items, foodstuffs etc.

Smaller markets are often located in church / school grounds, community halls or other larger building areas of that nature. Medium sized to larger markets are generally located in open areas, such as showgrounds, car parks, drive-in theatres, racecourses or on-street.

Parking.

The minimum and desirable levels of off-street customer car parking are:

- minimum provision 2 spaces per stall.
- desirable provision 2.5 spaces per stall.

These figures are based on unrestrained demand for parking and do not include stall holders vehicles. Separate provision should be made for these vehicles.

Where a market is located within an existing shopping centre, consideration must be given to multiple usage requirements of parking facilities.

Parking requirements are usually determined by the number of participating stalls in the market place.

The provision of parking at the recommended level would not be necessary in all situations. If it can be demonstrated that peak times of parking demand associated with the proposed markets and those of the existing adjacent land uses do not coincide, or where common usage reduces total demand, a lower level of parking provision may be acceptable. If the proposed development is an extension of an existing retail development, additional parking demand could be less than proportional to the increase in site area.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 25 - Markets* outlines research undertaken on the traffic and parking characteristics of markets.

5.7.8 Bulky goods retail stores.

Definition.

A *bulky goods retail store* is a building or place which sells homewares, such as furniture, electrical appliances and lighting, or material for the home, such as carpet and building materials.

Parking.

It is not possible in this Guide to make conclusive recommendations on parking provision for bulky goods retail stores, as the variation of results of surveys of peak parking demand rates (RTA 1990) differ so vastly. For example, the peak parking demand rates varied from 0.3 to 5.1 vehicles/100m^2 GLFA, with a mean and standard deviation of 1.9 and 1.5 vehicles/100m^2 GLFA respectively. Provision ought to be made for car / trailer combinations at strategic locations. It is advisable that reference be made to the report *Land Use Traffic Generation - Data and Analysis 18 - Bulky Goods Retail Stores* for further information on specific developments. It is recommended that comparisons be drawn with similar developments.

Service / delivery vehicles.

An adequate number of on-site parking spaces should be provided at a convenient location (and separated from customer parking).

Driveways.

Ideally driveways should be provided for service / delivery vehicles, as well as car driveways. Separated entry and exit driveways, each of 8 to 10m wide with a minimum of 3 metres separation, are recommended.

See Table 6.1 and Table 6.2 for information relating to driveways.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 18 - Bulky Goods Retail Stores* outlines research undertaken on the traffic and parking characteristics of bulky goods retail stores.

5.7.9 Video stores.

Definition.

A *video store* is a building or place where the primary business activity is hiring video cassettes. Ancillary activities might include the retailing of video cassettes and related material.

Parking.

The minimum level of off-street car parking recommended is 6.1 spaces per 100m^2 of gross floor area, this also being the basic rate for small shopping centres.

A lower level of parking provision may be acceptable if it can be demonstrated that the times of peak demand for parking associated with the proposed video store and the adjacent land uses do not coincide, or where common usage reduces total demand.

Surveys of video stores undertaken in 1990 found that this retail type had a significantly higher traffic generation rate than average retail stores. However this usage was characterised by relatively short lengths of stay, and peak parking demands which are lower than those of average retail stores. The range of video store peak parking demand was 1.7 to 11.8 cars per 100m^2 of gross floor area, with a mean of 4.7. The average length of stay was 9.3 minutes, with the surveyed range being 6.6 to 11.7 minutes. With short lengths of stay, it is essential to provide convenient parking, thereby minimising

illegal parking. The video store surveys also showed that the times of peak parking demand were typically in the period 5.30 to 6.30 pm.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Surveys.

The report - *Land Use Traffic Generation - Data and Analysis 17 - Video Stores*, outlines research undertaken on the traffic and parking characteristics of video stores.

5.8 Refreshments.

5.8.1 Drive-in take-away food outlets.

Definition.

The three types of *drive-in take-away food outlets* referred to in this section are:

- developments where customers park their vehicles on-site and walk to the food outlet for take-away service, with no seating provided for the on-site consumption of food.
- developments where customers park their vehicles on-site and walk to the food outlet for take-away service, with seating also being provided for on-site food consumption.
- developments with features of the above second category with the addition of a drive-through service for customers not wishing to consume the food on the premises.

Parking.

The recommended number of off-street parking spaces for drive-in take-away food outlets is:

- developments with no on-site seating or no drive-through facilities:

  12 spaces per 100m^2 GFA.

- developments with on-site seating but no drive through facilities:

  12 spaces per 100m^2 GFA, or the greater of.

  1 space per 5 seats (both internal and external seating), or.

  1 space per 2 seats (internal seating).

- developments with on-site seating and drive-through facilities greater of.

  1 space per 2 seats (internal), or.

  1 space per 3 seats (internal and external).

In addition to this, an exclusive area for queuing of cars for a drive through facility is required (queue length of 5 to 12 cars measured from pick up point; see below for details). There should also be a minimum of four car spaces for cars queued from ordering point.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Consideration must be given to the type of service vehicles requiring access and their geometric movement requirements. It is recommended that the *Australian Standard 2890.2* be consulted for further information on service area design.

The development must be planned in such a way as to provide a high level of protection for pedestrians. In particular, building entry / exit doors must be clear from any obstruction by parked vehicles.

Drive through facility.

The following stipulations apply to outlets incorporating a drive-through service:

- *McDonalds*: The drive through capacity should be 10 car lengths. However the queue must be able to extend to 12 car lengths without unreasonably disrupting car parking operations or extending onto the street for restaurants with single booths or potential high turnover.
- *Kentucky Fried Chicken*: A drive through capacity of 6 car lengths should be provided. This requirement could be reduced to 5 car lengths for restaurants with low potential turnover. However the queue must be able to extend to 8 car lengths without unreasonably disrupting car parking operations or extending onto the street for restaurants with single booths or potential high turnover.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 5 - Fast Food* outlines research undertaken on the traffic and parking characteristics of drive-in take-away food outlets with no drive-through facility. The report *Land Use Traffic Generation Data and Analysis 22 - Drive Through Restaurants* outlines surveys undertaken in 1990 of drive-through outlets.

5.8.2 Restaurants.

Definition.

A *restaurant* is a refreshment room where food is served to customers. It can either be licensed or unlicensed. This definition includes cafes, tea rooms, eating houses, etc.

Parking.

For developments with a gross floor area greater than $100m^2$, the recommended car parking provision should be the greater of:

- 15 spaces per $100m^2$ gross floor area, or.
- 1 space per 3 seats.

For developments with a gross floor area less than $100m^2$, the parking provision recommended above is desirable but must take into account car parking available in adjacent parking areas, including on-street, and its time of usage.

An alternative method of assessing restaurant parking demand would be by a comparison with a similar restaurant, where the following model may be applied:

- Peak Parking Demand = No. of Seats x Design Occupancy x Modal Split for cars.

The design occupancy could be less than the seating capacity. If appropriate data is available, the 85th percentile peak demand could be used.

The average floor space per seat can vary with the style of the restaurant. For example, in the sites surveyed by the RTA there was an average of 1.53m^2 eating area per seat and 2.10m^2 gross floor area per seat. There were approximately 10 seats per employee.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 15 - Restaurants* outlines research undertaken on the traffic and parking characteristics of restaurants.

5.8.3 Clubs.

Definition.

The term *club* refers to an establishment used by persons associated with, or by a body incorporated for social, literary, political, sporting, athletic or other lawful purposes whether of the same or of a different kind and whether or not the whole or a part of such building is the premises of a club registered under the Registered Clubs Act, 1976.

Parking.

Off-street car parking must be provided to satisfy the average maximum demand. Research has indicated that the demand for parking varies substantially depending on the type of club and cannot readily be related to building floor areas or to the membership. The determination of the number of parking spaces required is therefore based on the characteristics of the proposed development. Comparisons must be drawn with similar clubs.

For ten licensed clubs surveyed in 1978, the mean peak number of cars parked per 100m^2 of public or licensed floor area (bar, lounge, dining plus games) was 26.4, varying from 7.2 to 69.9, with a sample standard deviation of 17.4. However, since 1978 there have been some behavioural changes in the use of clubs, partly due to random breath testing.

The determination of peak parking demand must consider the peak demand time of the various activities within the development. Parking must be provided to satisfy the peak cumulative parking requirements of the development as a whole, by superimposing the parking demand for each activity.

Service / delivery vehicles.

Adequate provision must be made on-site for a reasonable number of service / delivery vehicles, depending on the scale of the development.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 3 - Licensed Clubs* outlines original research undertaken on the traffic and parking characteristics of clubs.

5.9 Recreational and tourist facilities.

5.9.1 Recreational facilities.

Definition.

A *recreation facility* is a building or place used for indoor or outdoor recreation, but does not include places of assembly. A billiard saloon, table tennis centre, squash centre, swimming pool, gymnasium, health studio, bowling alley, fun parlour or any other building of a like character used for recreation (whether or not used for the purpose of gain), is considered to be a recreation facility.

Parking.

Off-street car parking must be provided to accommodate peak demand periods at the facility. Analysis ideally should be based on a predicted 85th percentile usage. In the case of large recreation developments, development applications must be supported by a traffic impact statement which incorporates a survey of similar developments.

Research by the RTA has failed to find a conclusive relationship between parking demand and the size and nature of the recreation facilities surveyed, indicating that the number of parking spaces required is best determined by the nature of the proposed development. Comparisons may be drawn from surveys conducted by the RTA on particular recreation facilities and other similar facilities.

The following parking provisions have been found to be adequate in several local government areas:

- squash courts: 3 spaces per court.
- tennis courts: 3 spaces per court.
- bowling alleys: 3 spaces per alley.
- bowling greens: 30 spaces for first green and 15 spaces for each additional green.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

See Section 6 for Internal Design guidelines.

Surveys.

Early research undertaken on the traffic and parking characteristics of recreation facilities is outlined in the report *Land Use Traffic Generation - Data and Analysis, 8.Recreation*.

5.9.2 Gymnasiums.

Definition.

A *gymnasium* is a building, room or a number of rooms, used for organised or instructed indoor exercise, typically including aerobics, weight / circuit training, etc. Ancillary facilities such as health care services, spa / sauna and a small apparel sales area are commonly provided within gymnasiums. Specialised facilities such as squash and tennis courts are auxiliary to the gymnasium usage.

Parking.

Metropolitan regional (central business district) centres.

If a gymnasium is located within a regional centre and is in close proximity to rail / bus services, the recommended off-street parking provision is 3.0 spaces per 100m^2 GFA.

Metropolitan sub-regional areas.

If a gymnasium is located in a sub-regional area the recommended levels of off-street parking are:

- minimum provision: 4.5 spaces per 100m^2 GFA.
- desirable provision: 7.5 spaces per 100m^2 GFA.

Parking provisions for auxiliary facilities associated with a gymnasium are not included in these figures, and must be established by referring to Section 5.9.1.

The peak activity period for gymnasiums generally occurs between 5.30 and 6.30pm hours on week days. The peak parking accumulation is usually characterised by a short pronounced peak just prior to the commencement of the main evening class.

If a gymnasium is located within a commercial or retail complex, appropriate allowance must be made for dual and complementary usage of the common off-street parking area.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis - 24 Gymnasiums* outlines research conducted into the traffic and parking characteristics of gymnasiums.

5.9.3 Tourist facilities.

Definition.

A *tourist facility* is an establishment which provides holiday accommodation or recreation. This may include a boat shed, boat landing facilities, camping ground, hotel, houseboat, marina, motel, playground, refreshment room, water sport facilities, or a club used in connection with any like activities.

Parking - Caravan parks.

For caravan parks, one parking space must be provided for each caravan site.

Parking - Marinas.

Parking demands at marinas vary substantially depending on the season, the type of berth or mooring and the type of boat. Ideally, surveys should be undertaken of similar developments, over summer weekends. Boats parked in wet marina berths are more accessible and therefore more likely to be used than boats in dry berths or on swing moorings. Use also varies with boating purpose. While a typical marina might have 30% of boats used on a summer weekend, racing yachts are more highly utilised with an average of over 60% at one club surveyed. The size of the boat affects the number of crew or passengers, while the location of the marina affects the crew's transport mode.

If a survey is not conducted of similar developments, the following levels of parking are recommended:

- 0.6 spaces per wet berth.
- 0.2 spaces per dry storage berth.
- 0.2 spaces per swing mooring.
- 0.5 spaces per marina employee.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Consideration must be given as to the type of service vehicles that will require access, and their geometric movement requirements. It is recommended that *Australian Standard 2890.2* is consulted to provide further information on service area design requirements.

Tourist facilities which feature a reception office where tourists check-in, are required to position the office so that entering vehicles travel a distance of no less than 30 metres to the point at which the vehicle is required to stop. Vehicles and caravans / trailers parked at the reception office must not block vehicular access to the development.

When designing boat launching ramps and marina facilities, reference must be made to *Marina Guidelines*, Public Works Department, New South Wales.

Traffic calming devices such as speed humps should be considered in areas of high pedestrian / vehicular conflict, particularly in caravan parks.

Note: For design guidelines for:

- motels see Section 5.5.1,
- hotels see Section 5.5.2
- restaurants see Section 5.8.2

5.10 Road transport facilities.

5.10.1 Road transport terminals.

Definition.

A *road transport terminal* is a building or place used for the principal purpose of the bulk handling of goods for transport by road. This includes facilities for the loading and unloading, parking, servicing and repair of those vehicles.

Container depots are discussed separately in Section 5.10.2.

Parking.

Off-street employee and visitor parking must be provided to satisfy the peak demand, as determined by appropriate surveys of similar existing developments.

The number of off-street truck parking spaces provided must be based on one space for each vehicle present at the time of peak vehicle accumulation on the site. Therefore provision must be made for both fleet vehicles and contract / operator vehicles. Under no circumstances is the parking of trucks on a public street acceptable.

Consideration must be given to providing suitable on-site overnight truck parking.

Driveways.

Ideally, separate driveways should be provided for car parking and trucks.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

It is recommended that road transport terminals be located in industrial areas. If this is not possible, intrusion to residential areas must be minimised.

Adequate provision must be made for the loading, unloading and manoeuvring of vehicles on the site.

Road transport terminals may be equipped with rail siding if required. The construction of a railway siding will be subject to the approval of the State Rail Authority.

Minimum carriageway widths for internal roads (on which parking is not permitted), are 6.5 metres for two-way operations and 4.5 metres for one-way operations. If parking is permitted, these widths must be increased by 2.4 metres for each lane of car parking, and by 3.0 metres for each lane of truck parking.

Trucks must travel a minimum distance of 30 metres from the road before being required to stop. This distance must be increased if necessary to ensure that drivers are not forced or encouraged to stand their vehicles on a public road.

A minimum height clearance of 5 metres is recommended for all loading areas to assist the efficient loading / unloading of goods.

5.10.2 Container depots.

Definition.

A *container depot* is a road transport terminal where one or more of the following operations are performed:

- unloading of containers for the purposes of delivery to individual consignees.
- consolidation of goods from different consignors into full container loads for dispatch.
- repair, refitting and / or storage of containers.

Parking.

Off-street employee parking (i.e. fleet and contract operated) as well as visitor parking, must be provided to satisfy the peak demand, as determined by surveys of similar existing developments. The location of this parking must be independent of the normal operations of the depot.

An area of $50m^2$ per vehicle must be provided for vehicles held or queued on the site. Consideration must be given to providing suitable on-site parking (overnight or unattended) for trucks.

Driveways.

Ideally, separate driveways should be provided for car parking and trucks.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

A container depot must be located in an industrial area and must be adequately served by major roads. Intrusion into residential streets should not occur, or must be minimised.

Adequate provision must be made for the loading, unloading and manoeuvring of vehicles on the site.

Container depots must be equipped with rail sidings wherever possible. The construction of a railway siding will be subject to the approval of the State Rail Authority.

Minimum carriageway widths for internal roads, (on which parking is not permitted), are 6.5 metres for two-way operations and 4.5 metres for one-way operations. If parking is permitted, these widths must be increased by 2.4 metres for each lane of car parking, and by 3.0 metres for each lane of truck parking.

Trucks must travel a minimum distance of 30 metres from the road before being required to stop. This distance must be increased if necessary to ensure that drivers are not forced, induced or encouraged to stand their vehicles on a public road.

A minimum height clearance of 5 metres is recommended for all areas traversed by trucks.

5.10.3 Truck stops.

Definition.

A *truck stop* is a building or place located on or near a major road which is used for the principal purpose of providing support facilities for road transport vehicles. Such facilities may include the retailing of fuel, maintenance and repair facilities and overnight accommodation.

Parking.

If overnight accommodation is provided, one truck parking space must be provided for each motel unit. The provision of one car space per two employees is also recommended.

If a public restaurant is present (and open to the public), additional parking must be provided at the rate of 15 spaces per 100m^2 gross floor area, or 1 space per 3 seats, whichever is the greater.

Of these parking spaces allocated to overnight accommodation and restaurant facilities, 50% should be truck parking spaces. A suitable manoeuvring area should also be provided.

Driveways.

If a truck stop is allowed in a rural area, access must be designed to ensure a minimum of interference to through traffic. However, the number of such developments must be limited.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Internal roadways must be designed so that drivers can enter the site and park their vehicles in an easy and convenient manner. Drivers must not be forced, induced or encouraged to stand their vehicles on a public road.

Minimum carriageway widths for internal roads on which parking is not permitted are 6.5m for two-way operations, and 4.5m for one-way operations. When parking is permitted, these widths must be increased by 2.4m for each lane of car parking, and 3.0m for each lane of truck parking.

A minimum height clearance of 5 metres is recommended for all areas traversed by trucks.

For more details See Section 6 of this Guide.

5.11 Industry.

5.11.1 Factories.

Definition

A *factory* is a place or building used for the purpose of industry, where industry means:

- any manufacturing process within the meaning of the Factories, Shops and Industries Act 1962.
- the breaking up or dismantling of any goods or any article for trade, sale, gain or as ancillary to any business.

Parking.

All new factories on undeveloped sites must provide on-site parking for all vehicles used by employees of the firm. Wholly redeveloped sites must be treated individually. Provision of 1.3 spaces per 100m^2 gross floor area is recommended.

Variations to the recommended rate of parking provision must be considered in the context of both current and potential users.

Parking provision rate is increased when:

- retailing is permitted on-site (refer to *Shopping centres* for parking requirements).
- office space component is in excess of 20% of the floor area (refer to *Commercial premises* for parking requirements).

Parking provision is reduced when:

- a high proportion of the labour force utilises public transport.
- employee parking demand is substantially less than the recommended rate.

For some types of factory developments, a lower parking rate may initially seem appropriate. However, provision must be made for additional future use by setting aside (but not necessarily surfacing) space for car parking.

On-site parking for staff must be located in places which are readily accessible from the principal staff entrances to buildings.

The number of on-site truck parking spaces provided must be on the basis of one space for each vehicle present at any one time (excluding those vehicles in loading docks). Under no circumstances is the parking of trucks on contiguous public streets acceptable.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Minimum carriageway widths of 6.5m for two-way operations and 4.5m for one-way operations are recommended for internal roads which do not allow parking. If parking is permitted, these widths must be increased by 2.4m for each lane of car parking and by 3.0m for each lane of truck parking. For very small developments, a two-way internal road of width 4.5 metres with no parking permitted is only

acceptable if visibility is adequate, if passing bays are provided for each 30 metres length and if it can be shown that such an arrangement will not cause queuing onto the public road.

Wherever possible, trucks must travel a minimum distance of 30 metres before being required to stop. This must be increased where necessary to ensure that drivers are not forced, induced or encouraged to stand their vehicles on a public road.

There must be adequate provision made for the manoeuvring, loading and unloading of vehicles on the site. *Australian Standard 2890.2* provides further information on the requirements of service vehicle areas.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 2 - Factories* outlines research undertaken on the traffic and parking characteristics of factory developments.

The report *Government Regulation of Industrial Property Development* by Richard Cardew for the Australian Institute of Urban Studies addresses car parking requirements for factories.

5.11.2 Warehouses.

Definition.

A *warehouse* is a building or place used for the storage of goods, merchandise or materials pending their sale and distribution to persons engaged in retail trade.

Parking.

All new warehouses on undeveloped sites must provide on-site parking for all vehicles used by employees. In the case of wholly redeveloped sites each site is treated on its merit. Provision of one car space per 300m^2 gross floor area is recommended.

Variations on the recommended parking rate must be considered in the context of both current and potential users. While surveys might justify a lesser parking rate for a particular development, provision must be made for future users by setting aside (but not necessarily surfacing), space for car parking. The recommended rate of parking provision is in the middle range parking rate observed in the RTA's survey. The rates vary from one space per 80m^2 to one space per 960m^2, the mean and sample standard deviation figures being 338m^2 and 280m^2 respectively based on a sample of 10 sites. A particular situation where a parking rate greater than that recommended above is warranted, would be for a development with a greater than average employment density. The mean floor area per employee at the warehouses surveyed by the RTA was 226m^2 per employee.

On-site parking for staff must be located in places readily accessible from the principal staff entrances to buildings.

When retailing occurs at a warehouse, additional parking must be provided, in proportion to the floor area associated with the retailing activities, at the rate given in Section 5.7.1 *Shopping centres*.

Care must be taken in assessing industrial unit developments where a larger number of warehouse uses are proposed. Such developments can also suit small factory operations with greater parking demands.

Driveways.

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design.

Minimum carriageway widths of 6.5m for two-way operations and 4.5m for one-way operations are recommended for internal roads where parking is not permitted. If parking is permitted, these widths must be increased by 2.4m for each lane of car parking and by 3.0m for each lane of truck parking. For very small developments, a two-way internal road of 4.5 metres width with no parking permitted, might be acceptable if visibility is adequate, if passing bays are provided for each 30 metres length and if it can be shown that such an arrangement will not cause queuing back onto the public road.

When possible, trucks must travel a minimum distance of 30 metres before being required to stop. This must be increased when necessary to ensure that drivers are not forced, induced or encouraged to stand their vehicles on a public road.

There must be adequate provision made for the loading, unloading and manoeuvring of vehicles on the site. *Australian Standard 2890.2* provides further information on the requirements of service vehicle areas.

See Section 6 for Internal Design guidelines.

Surveys.

The report *Land Use Traffic Generation - Data and Analysis 11 - Warehouses* outlines original research undertaken on the traffic and parking characteristics of warehouse developments.

5.11.3 Plant nurseries

Definition

The term *Plant Nurseries* refers to places at which horticultural stock is propagated for the purpose of sale.

Parking

Off-street car parking should be provided to accommodate peak parking periods at the facility.

The recommended number of off-street parking spaces for plant nurseries should be the greater of:

- 0.5 spaces per 100m^2 of site area
- minimum of 15 spaces

Parking provision for auxiliary facilities associated with a plant nursery are not included in these figures. Refer to appropriate guidelines for parking provision rates of auxiliary facilities with appropriate allowance for dual or complementary use.

Provision ought to be made for car / trailer combinations at strategic locations.

Driveways

See Tables 6.1 and 6.2 for details relating to driveways.

Parking area and internal road design

Consideration should be given to the type of service vehicles requiring access and their geometric movement requirements. It is recommended that the Australian Standard *AS 2890.2* be consulted for further information on service area design.

The development should be planned in such a way as to provide a high level of protection for pedestrians. In particular, building entry / exit doors should be clear from any obstruction by parked vehicles.

Considerations should be given to providing sufficient area within the car park for the manoeuvring of trolleys and for the loading / unloading of goods from trolleys.

Surveys

The report *Land Use Traffic Generation - Data and Analysis 26 - Plant Nurseries,* outlines research undertaken on the traffic and parking characteristics of Plant Nurseries.

5.11.4 Business parks

Definition

The term *business park* refers to developments that permit a range of land-use types in an integrated complex. The developments generally incorporate a number of individual units of similar size. The developments typically include elements of industrial, manufacture, research, warehousing, office space, retail, commercial, refreshment and recreational activity. They are generally located in industrial areas and the uses within the park are generally to a scale appropriate for the anticipated workforce and zoning.

The business parks selected for the survey ranged in size from some 7,300 m^2 to some 38,200 m^2 with on-site parking ranging from some 70 marked spaces to some 650 spaces.

Parking

All new business parks on undeveloped sites should provide on-site parking for all vehicles used by employees. In the case of wholly redeveloped sites each site should be treated on its merits.

The recommended minimum number of off-street parking spaces for business parks can generally be assessed from the following:

- 1.5 spaces per 100m^2 of total gross leasable area.

When the office / showroom and factory / warehouse components of the development area are available, it is desirable to use the following rate of off-street parking spaces:

- 1.8 spaces per 100m^2 of gross leasable office / showroom area
  plus 1.2 spaces per 100m^2 of gross leasable factory / warehouse area.

Reduction of this provision may be considered where alternative public parking is available close to the proposed development.

Driveways

See Tables 6.1 and 6.2 for details relating to driveways.

Parking area and internal road design

Minimum carriageway widths of 6.5m for two-way operations and 4.5m for one-way operations are recommended for internal roads which do not allow parking. If parking is permitted, these widths must be increased by 2.4m for each lane of car parking and by 3.0m for each lane of truck parking. For very small developments, a 4.5m wide two-way internal road would be acceptable providing that no parking is permitted and visibility is adequate.

Wherever possible, trucks must travel a minimum distance of 30 metres before being required to stop. This must be increased when necessary to ensure that drivers are not forced, induced or encouraged to stand their vehicles on a public road.

There must be adequate provision made for the manoeuvring, loading of vehicles on the site. *Australian Standard AS 2890.2* provides further information on the requirements of service vehicle areas.

See Section 6 for Internal Design Guidelines.

Surveys

The report *Land Use Traffic Generation - Data and Analysis 27 - Business Parks* outlines research undertaken on the traffic and parking characteristics of business park developments.

5.12 Health and community services

5.12.1 Professional Consulting Rooms

Definition

The term *professional consulting rooms* refers to a room or a number of rooms forming either the whole or part of, attached to or within the cartilage of a dwelling house used by not more than three legally qualified medical practitioners, or by not more than three health care professionals, who practise medicine, dentistry or health care on the premises. Also, more than one of these professionals must practise in partnership, and must employ not more than three employees in connection with that practice.

Parking

The RTA has no data on the parking demand for professional consulting rooms. As a guide, three spaces per surgery has been found to be adequate in several local government areas.

If it can be shown that not all surgeries will be in concurrent operation, it is acceptable to reduce the parking provision suggested above.

Consideration could be given to reducing the parking required, if convenient on-street parking is available, providing that the use of such parking does not adversely affect the amenity of the adjacent area.

5.12.2 Extended hours medical centres

Definition

A *medical centre* is an establishment which is used by health care personnel for professional purposes, but does not comply with the definition *professional consulting rooms* as outlined in Section 5.12.1. *Extended hours medical centres* are those centres with hours of operation extending beyond normal business hours.

Parking

The minimum number of parking spaces required by medical centres is 4 per 100 m^2 *gross floor area*, based on the RTA's survey conducted 1991.

This rate is based on Sunday and Monday parking figures and reflects the mean peak parking demand surveyed on those days. For reference, the 85 percent demand produced a rate of 5 spaces per 100 ^{2} gross floor area.

As the average length of stay at a medical centre is approximately 27 minutes, parking facilities must be provided in a convenient location.

Driveways

See Table 6.1 and Table 6.2 for information relating to driveways.

Surveys

The report *Land Use Traffic Generation - Data and Analysis 20 - Extended Hours Medical Centres* outlines research undertaken on the traffic and parking characteristics of extended hours medical centres.

5.12.3 Child care centres

Definition

A *child care centre* is a building or place used for child care as defined in Part VII of the Child Welfare Act, 1939.

The centre can provide pre-school care, long day care, before / after school care or a combination of the above.

Parking

Off-street parking must be provided at the rate of one space for every four children in attendance.

Given the short length of stay (the RTA's surveys found an average length of stay of 6.8 minutes), parking must be provided in a convenient location, allowing safe movement of children to and from the centre.

Consideration could be given to reducing the parking required if convenient and safe on-street parking is available (e.g. indented parking bays), provided that the use of such parking does not adversely affect the amenity of the adjacent area.

Driveways

See Table 6.1 and Table 6.2 for information relating to driveways.

Surveys

The report *Land Use Traffic Generation - Data and Analysis 21 - Child Care Centres* outlines research undertaken on the traffic and parking characteristics of child care centres.

5.12.4 Private Hospitals

Definition

The term *private hospital* refers to those developments which the Private Hospitals and Day Procedures Centre Act, 1988, No. 123 refers as “premises at which patients are provided with medical, surgical or other treatment, and with ancillary nursing care, for fee, gain or reward”.

Parking

The peak parking accumulation (PPA) at a private hospital may be estimated by

- PPA = -19.56 + 0.85 B + 0.27 ASDS (R^2 = 0.74)

The hospitals surveyed had between 30 - 99 beds (B) and between 10 - 102 average staff per weekday day shift (ASDS).

When the average number of staff per weekday day shift (ASDS) is unknown, the peak parking accumulation (PPA) may be estimated by

- $PPA = -26.52 + 1.18\ B \qquad R^2 = (0.63)$

The average length of stay at a private hospital varies according to the purpose of the trip. The average length of stay for a member of staff, i.e. nurses, doctors, etc. is 5.1 hours. The average length of stay for visitors to the hospital is 1.1 hours.

Car parking should be provided in accordance with the peak parking accumulation with due consideration being given to reducing the parking required if convenient and safe on-street parking is available provided that the use of such parking does not adversely affect the amenity of the surrounding area.

Driveways

See Tables 6.1 and 6.2 for details relating to driveways.

Parking area and internal road design

See Section 6 for Internal Design Guidelines.

Surveys

The report *Land Use Traffic Generation - Data and Analysis 28 - Private Hospitals* outlines research undertaken on the traffic and parking characteristics of private hospital developments.

5.13 Public car parks

Definition

A *public car park* means any premises used for the purpose of accommodating vehicles of members of the public on payment of a fee.

Operation of public car parks requires the RTA's concurrence to council approval.

Driveways

See Table 6.1 and Table 6.2 for information relating to driveways.

Parking area and internal road design

The queuing area provided for the approach to a ticket issuing machine or a reception point must be based on the *Australian Standard 2890.1*

The internal design of a public car park should conform to a class 3 user type facility, Australian Standard 2890.1.

If a public car park caters for special events (such as concerts), the exit ramps and driveways must be designed, where possible, to achieve a maximum dispersion rate to the surrounding street system.

5.14 Summary table for parking requirements

The following table should only be used in conjunction with the information provided under each land use in this document.

Table 5.3
Parking requirements

Land Use	Parking Requirements
Residential	
Dwelling houses	1 - 2 spaces per dwelling
Medium density residential flat buildings	1 space per unit +1 space for every 5 x 2 bedroom unit +1 space for every 2 x 3 bedroom unit +1 space for 5 units (visitor parking)
High density residential flat buildings	Metropolitan regional centres (CBD) 0.4 spaces per 1 bedroom unit 0.7 spaces per 2 bedroom unit 1.2 spaces per 3 bedroom unit +1 space per 7 units (visitor parking) Metropolitan sub-regional centres 0.6 spaces per 1 bedroom unit 0.9 spaces per 2 bedroom unit 1.40 spaces per 3 bedroom unit +1 space per 5 units (visitor parking)
Housing for aged and disabled persons	*Resident funded developments* Self-contained units: 2 spaces per 3 units +1 space per 5 units (visitor parking) Hostel, nursing and convalescent homes: 1 space per 10 beds (visitors) +1 space per 2 employees +1 space per ambulance *Subsidised development* Self-contained units: 1 spaces per 10 units (residents) +1 space per 10 units (visitor parking) Hostel, nursing and convalescent homes: 1 space per 10 beds (visitors) +1 space per 2 employees +1 space per ambulance

Land Use	Parking Requirements
Casual Accommodation	
Motels	1 space for each unit + 1 space per 2 employees *If restaurant included then add the greater of:* 15 spaces per 100m^2 GFA of restaurant / function room, or 1 space per 3 seats
Hotels –traditional -tourist	Comparisons should be drawn with regard to similar developments
Office and Commerical	
Commercial premises	Unrestrained situation: 1 space per 40m^2 GFA Restrained situation: refer to council parking code
Retail	
Shopping centres	GLFA (m^2) spaces per 100m^2 GLFA 0-10,000 6.1 10,000-20,000 5.6 20,000-30,000 4.3 over 30,000 4.1
Service stations and convenience stores	Requirements are additive: 6 spaces per work bay 5 spaces per 100m^2 GFA of convenience store *(if restaurant present, then greater of:* 15 spaces per 100m^2 GFA, or 1 space per 3 seats)
Motor showrooms	0.75 spaces per 100m^2 site area + 6 spaces per work bay (for vehicle servicing facilities)
Car tyre retail outlets	whichever is the greater of: 3 spaces per 100m^2 GFA, or 3 spaces per work bay
Roadside stalls	4 spaces
Drive-in liquor stores	not applicable
Markets	2.5 spaces per stall (customers only)
Bulky goods retail stores	Comparisons should be drawn with similar developments
Video stores	6.1 spaces per 100m^2 GFA

Land Use	Parking Requirements
Refreshments	
Drive-in take-away food outlets	Developments with no on-site seating: 12 spaces per 100m^2 GFA Developments with on-site seating: 12 spaces per 100m^2 GFA or greater of: 1 space per 5 seats (internal and external),or 1 space per 2 seats (internal) Developments with on-site seating and drive through facilities: greater of: 1 space per 2 seats (internal), or 1 space per 3 seats (internal and external) plus queuing area for 5 to 12 cars (see 5.8.1)
Restaurants	whichever is greater of: 15 spaces per 100m^2 GFA, or 1 space per 3 seats
Clubs	Comparisons should be drawn with similar clubs
Recreational and Tourist Facilities	
Recreational facilities ■ squash courts	3 spaces per court
■ tennis courts	3 spaces per court
■ bowling alleys	3 spaces per alley
■ bowling greens	30 spaces for first green +15 spaces for each additional green
■ Gymnasiums	Metropolitan regional centres 3 spaces per 100m^2 GFA Metropolitan sub-regional centres 7.5 spaces per 100m^2 GFA (desirable) 4.5 spaces per 100m^2 GFA (minimum)
Tourist facilities ■ caravan parks	1 space per caravan site

Land Use	Parking Requirements
Recreational and Tourist Facilities	
Tourist Facilities ▪ marinas	If a survey of a similar existing development has not been undertaken, the following figures may serve as a general guide: 0.6 spaces per wet berth 0.2 spaces per dry storage berth 0.2 spaces per swing mooring 0.5 spaces per marina employee
Road Transport facilities	
Road transport terminals	Surveys should be undertaken of similar developments
Container depots	Surveys should be undertaken of similar developments
Truck stops	1 truck parking space per motel unit + 1 car space per 2 employees *For restaurant facilities, the greater of:* 15 spaces per 100m^2 GFA, or 1 space per 3 seats
Industry	
Factories	1.3 spaces per 100m^2 GFA
Warehouses	1 space per 300m^2 GFA
Business parks	1.5 spaces per 100m^2 of total GLA. 1.8 spaces per 100m^2 gross leasable office / showroom leasable factory / warehouse are (where information on component developments is available).
Plant nurseries	Whichever is greater of: 15 spaces; or, 0.5 spaces per 100m^2 of site area.
Health and Community Services	
Professional consulting rooms	Comparisons should be drawn with similar developments
Extended hour medical centres	4 spaces per 100m^2 GFA
Child care centres	1 space for every 4 children in attendance
Private Hospitals	Comparisons should be drawn with similar developments (Refer to Section 5.12.4)
Public Car Parks	
Public car parks	not applicable

Note:
1. Parking spaces, unless stipulated otherwise, are for cars.
2. Depending on land use type, parking for delivery / service vehicles, courier vehicles, bicycles should also be provided.

Section 6 Access and Parking Area Design.

6.1 Introduction.

This section deals with the geometric design aspects of access requirements to developments, internal roads and parking areas within developments.

Parking areas include tenant / customer car parking, public car parks, service delivery vehicles manoeuvring and parking, bicycle parking and bus and coach parking.

The RTA has adopted as its standard the *Australian Standard AS2890 - Parking facilities*. Parts of this Standard relevant to this topic are:

AS2890.1 - 1993 *Off-street car parking.*

AS2890.2 - 1989 *Commercial vehicles facilities*.

AS2890.3 - 1993 *Bicycle parking facilities*.

AS2890.4 - *Bus parking (yet to be published)*.

AS2890.5 - 1993 *On-street parking*.

Designers, such as engineers and architects may find this section of particular use.

Note: Users of this Guide are advised to obtain copies of the relevant Australian Standards to be used in conjunction with these guidelines.

6.2 Access requirements.

All developments require access from the frontage road to car parking and service facilities. While in some instances access driveways may be sufficient some developments may require auxiliary lanes and / or right turn bays to maintain efficiency and safety.

6.2.1 Access Driveways - safety considerations.

Public safety is the main consideration when planning the location of access to a development. The location of access depends on the following factors:

- type of frontage road.
- sight distance.
- intersections.
- potential conflicts.

Type of frontage road.

Direct access across the boundary with a major road is to be avoided wherever possible.

In non-urban areas, particularly on high speed roads, access should be subject to special consideration, determined by consultation with the road authority.

Auxiliary lanes, (deceleration and acceleration lanes), may need to be provided to minimise conflicts between entering / leaving traffic and fast moving through traffic. In many cases, right turn movements into a site may need to be banned, unless an exclusive right turn bay is provided.

Sight distance.

It is advisable that access driveways be located so as to obtain maximum sight distance. It is necessary that any vehicle entering or leaving the driveway is visible to approaching vehicles and pedestrians. The absolute minimum requirement to achieve this is stopping sight distance. This is known as *Approach Sight Distance* (ASD).

Ideally, the sight distance required is that which enables the driver of a vehicle waiting to leave a driveway to select a gap in the through traffic and to join the street without causing a major disruption. This is the desirable sight distance. This is known as *Safe Intersection Sight Distance* (SISD).

AS2890.1: *Off-Street Car Parking* gives minimum and desirable sight distances for a range of frontage road speeds.

Intersections.

Refer to AS2890.1: *Off-Street Car Parking* for further information on the positioning of driveways from intersections.

Potential conflicts.

Potential conflicts associated with driveways are often proportional to the traffic generating potential of the development which they serve.

Where possible, avoid positioning driveways with high traffic volumes in the following locations:

- on major roads.
- close to intersections.
- opposite other developments generating a large amount of traffic (unless separated by a median).
- where there is a heavy and constant pedestrian movement along the footpath.
- where right turning traffic entering the facility may obstruct through traffic.
- where traffic using the driveways interferes with or blocks the operations of bus stops, taxi ranks, loading zones or pedestrian crossings.

6.2.2 Access driveways - design considerations.

Design Principles.

Follow these general design principles when planning access driveways for developments:

- position the entrance at the first vehicular driveway from the adjacent kerbside lane.
- avoid reversing movements into or out of public streets (except in the case of individual dwelling houses).
- avoid arrangements which may result in on-street queuing.
- promote the use of physical pedestrian barriers to discourage motorists from parking on the opposite side of the development and crossing the road to get to the site.

- position each driveway so that it is clear of all obstructions, e.g. poles, trees, which may prevent drivers from having a timely view of pedestrians.
- design each driveway so that it is relatively level within 6 metres of the site boundary or any pedestrian way; the recommended maximum grade is 5%.

  signpost each driveway with appropriate *entry*, *exit* and *keep left* signs.

Selection of driveway types.

The RTA has adopted seven types of access driveways - type 1 to 5 for cars (or light vehicles) and types 6 and 7 for heavy vehicles. Types 1 to 5 driveways are the same as those adopted in AS2890.1.

Table 6.1 shows entry and exit driveway widths, and separation between the two where applicable.

Table 6.2 shows type of driveways to serve certain numbers of parking spaces.

Users are referred to *AS2890.1 - Off-Street Car Parking* for the design requirements for access driveways.

When selecting a driveway for a particular development consider the following factors:

- type of land use.
- frontage road type.
- size of the parking facility.
- type of vehicles likely to enter the development.

Consider the following points when designing driveways:

- where a development is served by multiple access points, the number of access driveways is determined by the number of parking spaces effectively served by that driveway.
- the recommended driveway types do not imply that frontage on to a major road is acceptable in all situations.
- where a range of driveway types are given, the choice must be based on the particular circumstances of the proposed development.

Table 6.1
Recommended driveway types

Type	Entry Width (Metres) W	Exit Width (Metres) W	Min Separation of Driveways (Metres)	Splay at Kerbline (Metres) S	Kerb Return Turnout Radius (Metres) R
1	3-6	combined	NA	0.5	-
2	6-9	combined	NA	1	-
3	6	4-6	1-3	1	2-9
4	6-8	6-8	1-3	1	2-9
5	Direct feed from a controlled intersection via a dedicated public roadway				
6	8-10	8-10	3	1	2-9
7	10-12	10-12	3	1	2-9

Table 6.2
Selection of driveway type based on parking spaces Road

Frontage	Number of Car Parking Spaces Served by the Driveway					
	Less than 25	25-100	101-300	301-600	More than 600	Heavy Vehicles
Major	1 - 2	2 - 3	3 - 4	4	5	7
Minor	1	1 - 2	2 - 3	3 - 4	4	6

Splays and kerb returns.

Consider the following points when choosing either splays or kerb returns for driveways:

- type of frontage road.
- volume of traffic.
- nature of the adjacent land use.
- volume of pedestrians crossing the driveway.

The main advantages of using splays are:

- minimising driveway widths, which in turn reduces pedestrian risk.
- reducing driveway vehicle speed.
- facilitating the needs of the disabled.

The inclusion of kerb returns enhances driveway design by:

- minimising interference to vehicle flow on public roads by the use of easier turning movements.
- allowing vehicles to turn into and out of the driveway from the kerbside lane (provided that the turnout radius is adequate) thereby minimising the impact of the driveway on vehicles on the public road.

A principal design objective is that vehicles are able to turn into the kerbside lane from the driveway and vice versa. It is necessary in these instances that all vehicles are able to complete turning manoeuvres without crossing the road centre line.

The choice of turnout radius for a kerb return driveway design depends on the type of vehicle being accommodated. Refer to the design vehicle swept path figures for further information on kerb return driveway design. Table 6.3 gives the minimum turn-out radii for different driveway widths, for the maximum dimension rigid truck and for the maximum dimension articulated truck. The recommended figures are based on the minimum radius which permits a vehicle to turn in or out of the kerbside lane, with the wheel track not extending more than 3.4m from the kerb line. It should be noted that larger turning radii are required for movements out of the driveway than for movements into the driveway and so the minimum outward movement should be the movement considered for design purposes.

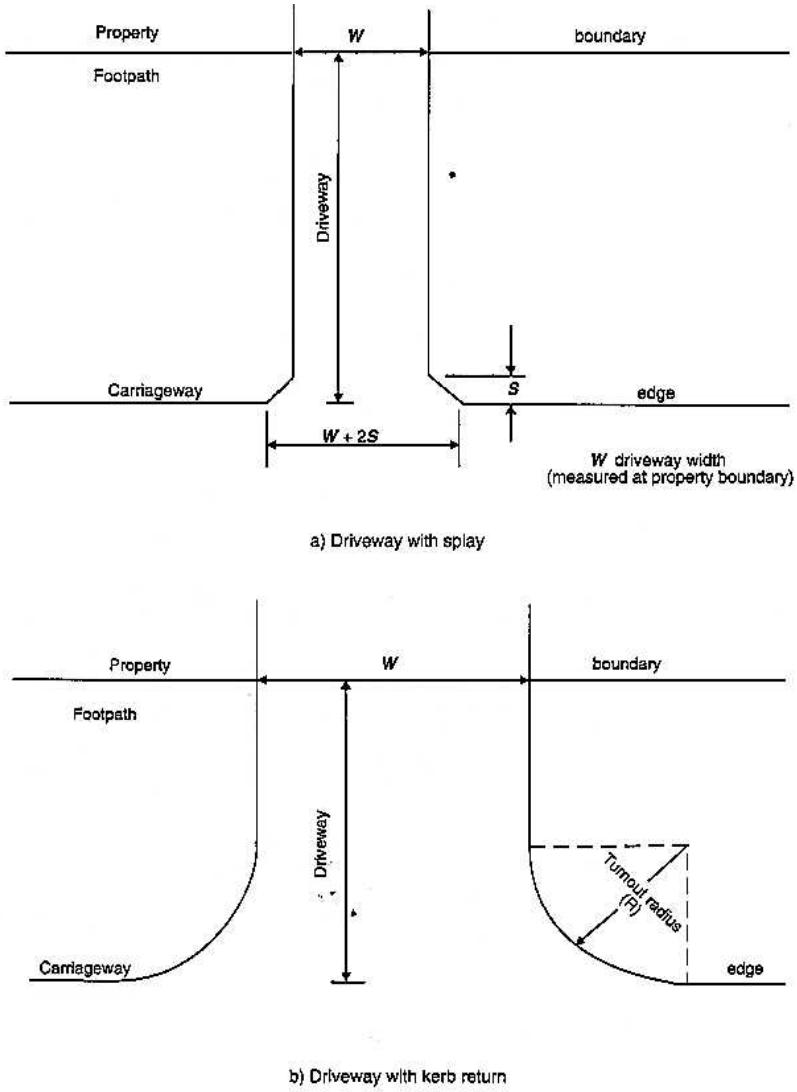

Figure 6.1 Use of Splays and Kerb returns.

Table 6.3
Minimum turning radii of driveway

Driveway Width (Metres)	6		8		10		12	
Direction of Movement	**In**	**Out**	**In**	**Out**	**In**	**Out**	**In**	**Out**
Maximum dimension rigid truck	6	8	4	6	2	4	2	2
Maximum dimension articulated truck	-	-	8	-	6	-	4	9

This table is based on vehicle swept paths for design turning circles of 25.0 metres.

Note: Where turnout radius of driveway is not given, the truck cannot stay within the kerb lane

6.2.3 Auxiliary lanes.

Acceleration and deceleration lanes.

The design of access to a development from a high speed or high volume road, should not allow hazardous diverging or merging manoeuvres to occur on the through traffic lanes. The construction of auxiliary speed-change lanes is an appropriate method to control slowing and merging manoeuvres.

Deceleration and acceleration lanes are often provided as respective entry and exit points to high traffic generators. These measures are often implemented in areas where developments adjoin isolated sections of high speed rural roads.

Particular attention must be paid to safe pedestrian movement in any design. If pedestrian volumes on the footpath adjacent to the driveway are heavy, the design must minimise vehicle speeds at the point of conflict with pedestrians and ensure that adequate visibility is provided.

Right turn bays.

Right turn bays for vehicle movement into proposed developments should be provided on major roads where the conflict between the right turn volume and any opposing major road traffic, may cause a substantial traffic delay or present danger.

Refer to the Austroads publication *Guide to Traffic Engineering Practice, Part 5 - Intersections at Grade* (1988) for further design details.

6.3 Internal road design.

All internal roads (or access roadways) should be designed for low speed environments. Generally vehicular speeds should be less than 30km/h, but where heavy pedestrian use is expected, design speeds should be 10km/h.

For internal roads (or circulation roadways as defined in *AS2890.1*) between the driveway and the parking area, the recommended minimum carriageway width depends on the number of parking spaces and service bays served. These minimum widths are presented in Table 6.4. Consideration should be given to increasing these widths where high levels of heavy vehicle usage is anticipated. By definition, circulation roadways should not have parking on them. However parallel parking can be accepted in special circumstances.

Table 6.4
Recommended minimum circulation roadway width - two way traffic

	Number of Parking Spaces / Services Bays		
	1-24 spaces and length not exceeding 40m	25-50 spaces or 1-24 spaces plus service bay(s)	Over 50 spaces, or Over 24 spaces plus service bay(s)
Width (metres)	3.5	5.0	6.0 - 6.5

Note: Table 6.4 assumes no parking is allowed on either side of carriageway. Widths need to be increased by 2.4 metres or 4.8 metres if parallel parking is to be allowed on one or both sides of the carriageway.

For the over 50 spaces category ie. 6.0 to 6.5 metre width, the choice of the width depends on parking turnover rates and the length of the internal road, with the higher figure being appropriate for high turnover parking and / or long lengths of internal road.

With complex developments, particularly where shared use of the side roads by cars and service vehicles is anticipated, Table 6.4 should be used as a guide only, with the design determined from a study of the site traffic generation and vehicle characteristics.

Figure 6.2 illustrates the use of Table 6.4.

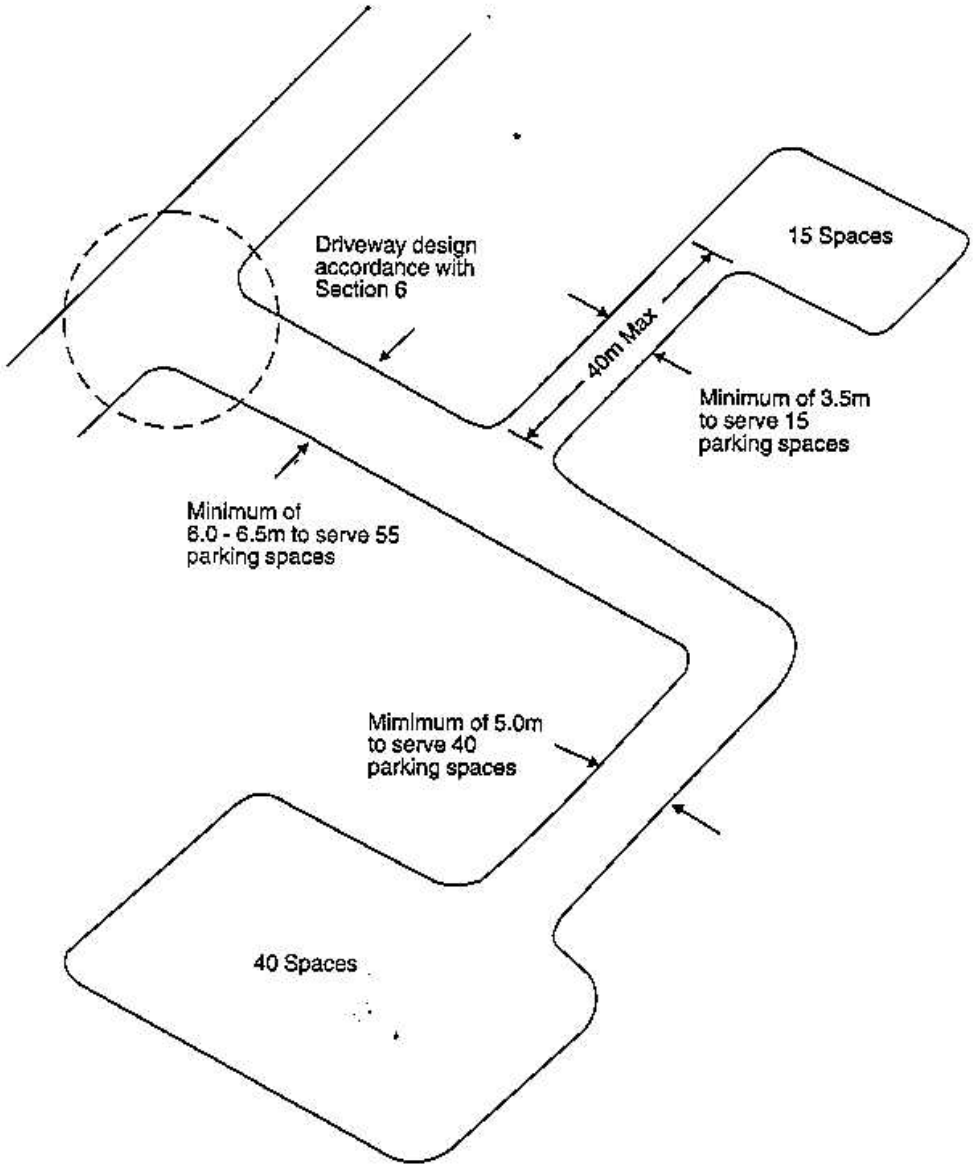

Figure 6.2 Internal Roads (or Circulation Roadway).

6.4 Parking area design.

The RTA's parking policy stipulates that cars and service vehicles, as well as other vehicles (eg. buses and bicycles) are accommodated by on-site or off-street parking provision in close proximity to the development. On-street parking or loading / truck zones do not meet these requirements.

6.4.1 Car parking areas.

Tenant / customer car parking.

The design of these areas are to conform to *Australian Standard AS 2890.1 - 1993 Car Parking.*

Public car parks.

Public car parks must be designed as Class 3 Off-Street car parking facilities (See AS2890.1). Additionally, council is obliged, under Local Government (Approvals) Regulations 1993 (Division 1 of Part 6) to give consideration to a number of criteria before an approval is given to the operation of public car parks.

Mechanical car parking systems.

A mechanical car parking system is where cars are parked by mechanical means, rather than by the driver of the vehicle. The system provides on-site parking in areas that were previously considered unsuitable for parking. These systems are of particular value in the redevelopment of older buildings where traditional parking cannot be provided because of physical or conservation constraints.

Consider the following principles when implementing mechanical car parking systems:

- structural elements are to comply with industry standards, with particular emphasis on safety.
- systems must protect vehicles.
- noise level kept to a minimum.
- appropriate measures must be predetermined to cope with an emergency.
- queuing must not occur on-street.
- trained personnel are to operate the parking system.

6.4.2 Services vehicle areas.

Design considerations.

The principles of design for service vehicle areas are similar to those for car parking areas with the exception that consideration must be given to the larger sizes of service vehicles and the types of goods being loaded / unloaded. However, it is not possible to specify dimensions which may be suitable for all service vehicles, because of the range of vehicles used in this respect. A service area may have to be designed to meet certain requirements which are peculiar to the vehicles or to the operations to be performed within the service area.

The following design principles, however, are generally applicable to all service vehicle areas:

- the layout of the service area should be designed to facilitate operations relevant to the development and to thus discourage on-street loading and unloading.
- service area should be a physically defined location which is not used for other purposes, such as the storage of goods and equipment.

- separation of service vehicle and car movements should be a design objective, although such an arrangement may not always be feasible.
- all vehicles are to enter and leave a site in a forward direction.
- internal circulation roadways should be adequate for the largest vehicle anticipated to use the site.

In the case of existing buildings being redeveloped, it may not be possible for all the design principles to be met. However, every effort must be made to ensure that public safety is not compromised in any way.

Dimensions of service areas.

As discussed above, specific dimensions covering all situations cannot be specified. Some knowledge of the type of service vehicle to be used is required. Table 6.5 provides dimension details for a range of service vehicle types.

Table 6.5
Service vehicle dimensions (in metres)

	Service Vehicle Dimensions (m)			
Vehicle Type	**Length**	**Width**	**Max Height**	**Turning Circle (kerb-to-kerb)**
Station Wagon	4.7	1.9	1.4	11.0
Utilities	4.7	1.9	1.4	11.0
Van	5.4	2.1	2.5	13.5
Small rigid truck	6.6	2.1	4.3	14.4
Maximum rigid truck	11.0	2.5	4.3	21.7
Maximum articulated truck	17.5	2.5	4.3	16.2

The dimensions of a service bay will depend on the vehicle to be accommodated. Generally, the minimum width should be 3.5 metres. For courier vehicles, standard car parking space dimensions are usually satisfactory.

The heights of the loading platform in the service bay and of the service bay itself will vary with vehicle type and loading / unloading methods. The dimensions in Table 6.6 are presented as a guide:

Table 6.6
Loading platform dimensions (in metres)

Vehicle	Platform Height	Bay Height
Utilities & Panel Vans	0.635 - 0.740	2.30
Vans	0.960 - 1.120	3.60
Large trucks & Semi Trailers	1.120 - 1.30	3.60 - 5.00

For maximum height trucks, a bay height of 5000mm is recommended where access to the top of the load is required. Bay height should be clear of sprinkler systems, air ducts and other protuberances.

Where vehicles with hydraulic tailgate loaders might use a dock, the provision of a cavity 3.0 metres wide by 2.4 metres deep at the base of the dock allows normal dock face rear end loading in most situations.

In situations where the bed heights of the trucks likely to use the dock will vary substantially, the installation of a dock leveller would aid loading and unloading.

Service vehicle manoeuvring areas.

Australian Standard 2890.2 - 1989 Commercial Vehicles Facilities should be used for the design of manoeuvring of service vehicles appropriate to particular developments.

6.4.3 Bicycle parking.

Each development is to provide appropriate bicycle parking facilities either on-site or close to the development.

Refer to the *Australian Standards AS2890.3-1993 - Bicycle Parking Facilities* for further information on the design of bicycle parking facilities.

6.4.4 Bus and coach parking.

Large developments, such as shopping centres and hotels require parking on-site for regular passenger buses (and taxis), shopper-coaches, tourist coaches etc. Parking for sufficient numbers of vehicles at convenient places (usually at main entrance points) should be provided on-site. However, in some instances, on-street waiting areas for public passenger vehicles (buses, coaches and taxis) may be most appropriate.

Australian Standard AS 2890.4 for bus parking is currently under preparation.

Refer to Table 6.7,Figure 6.3 and Figure 6.4**,** for further information on bus and coach parking.

Figure 6.5, Figure 6.6, Figure 6.7 and Figure 6.8 may also be of assistance.

Table 6.7 Bus dimensions (in metres)

Bus Type	Stand Length	
	Parallel (A) (See Figure 6.3)	**Sawtooth (B) (See Figure 6.4)**
Large interstate coach	21	17.5
Urban single deck rigid	19	15.5
Urban Articulated	27	23

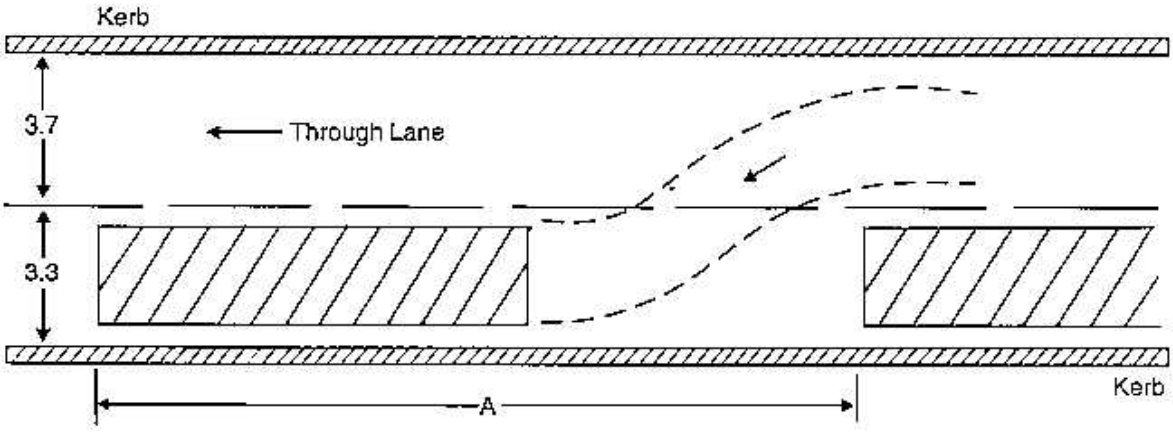

Figure 6.3 Parallel Parking.

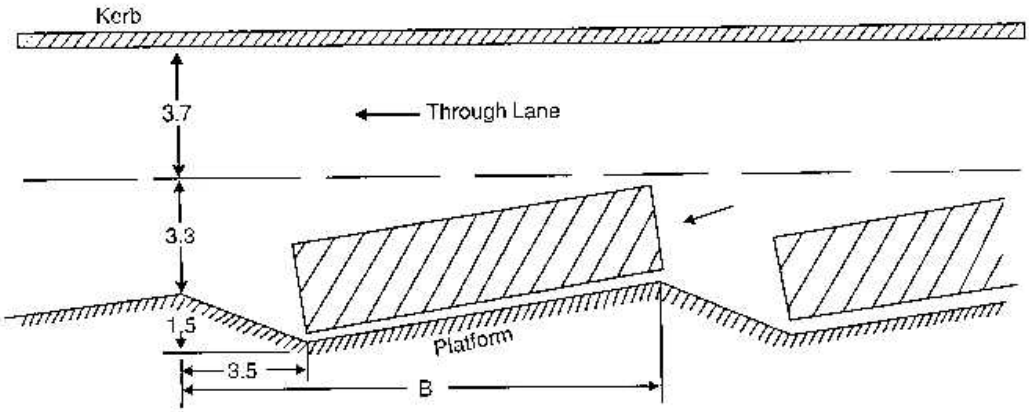

Figure 6.4 Sawtooth Parking.

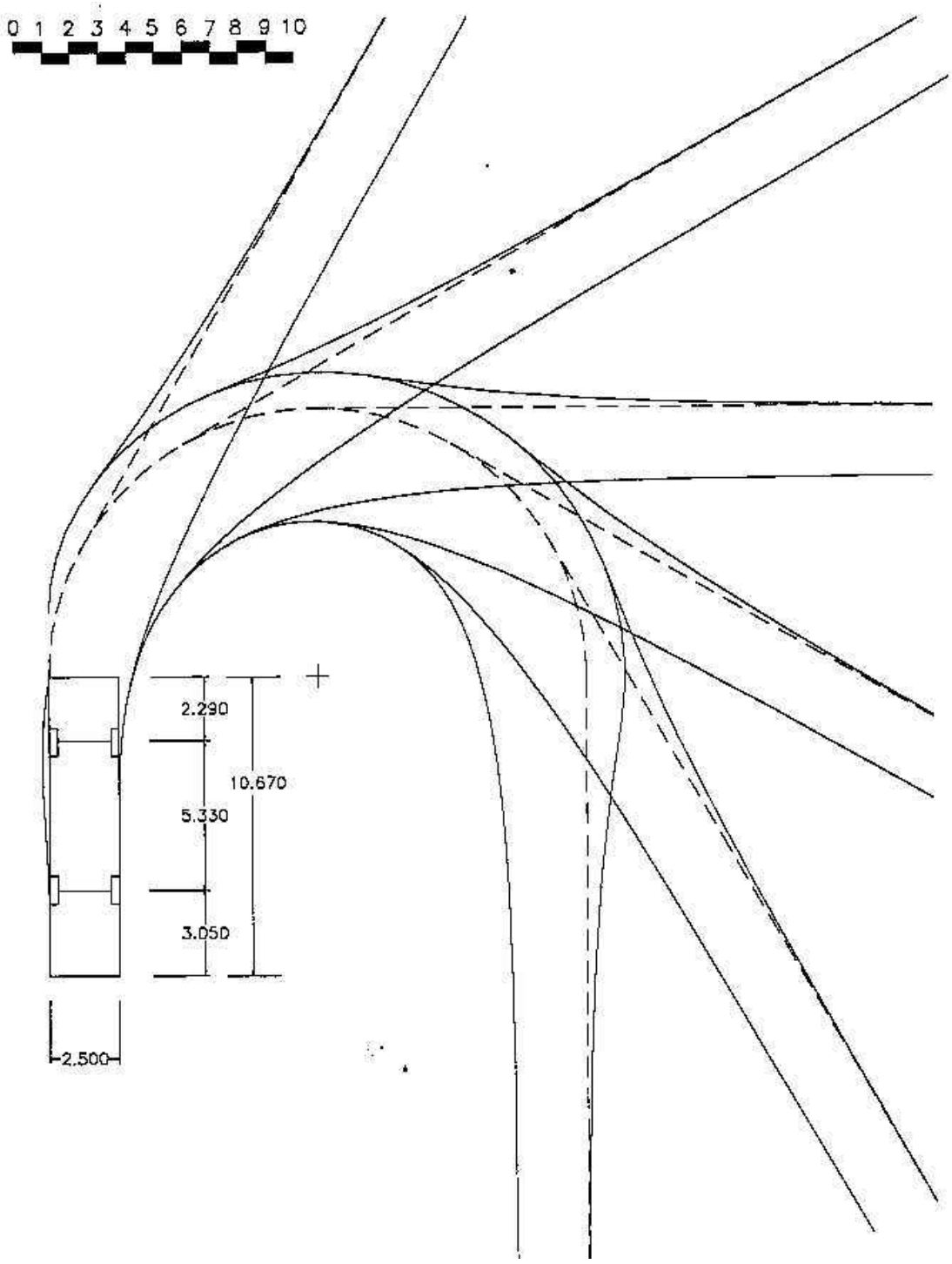

Figure 6.5 Mercedes Single Deck 10.67m.

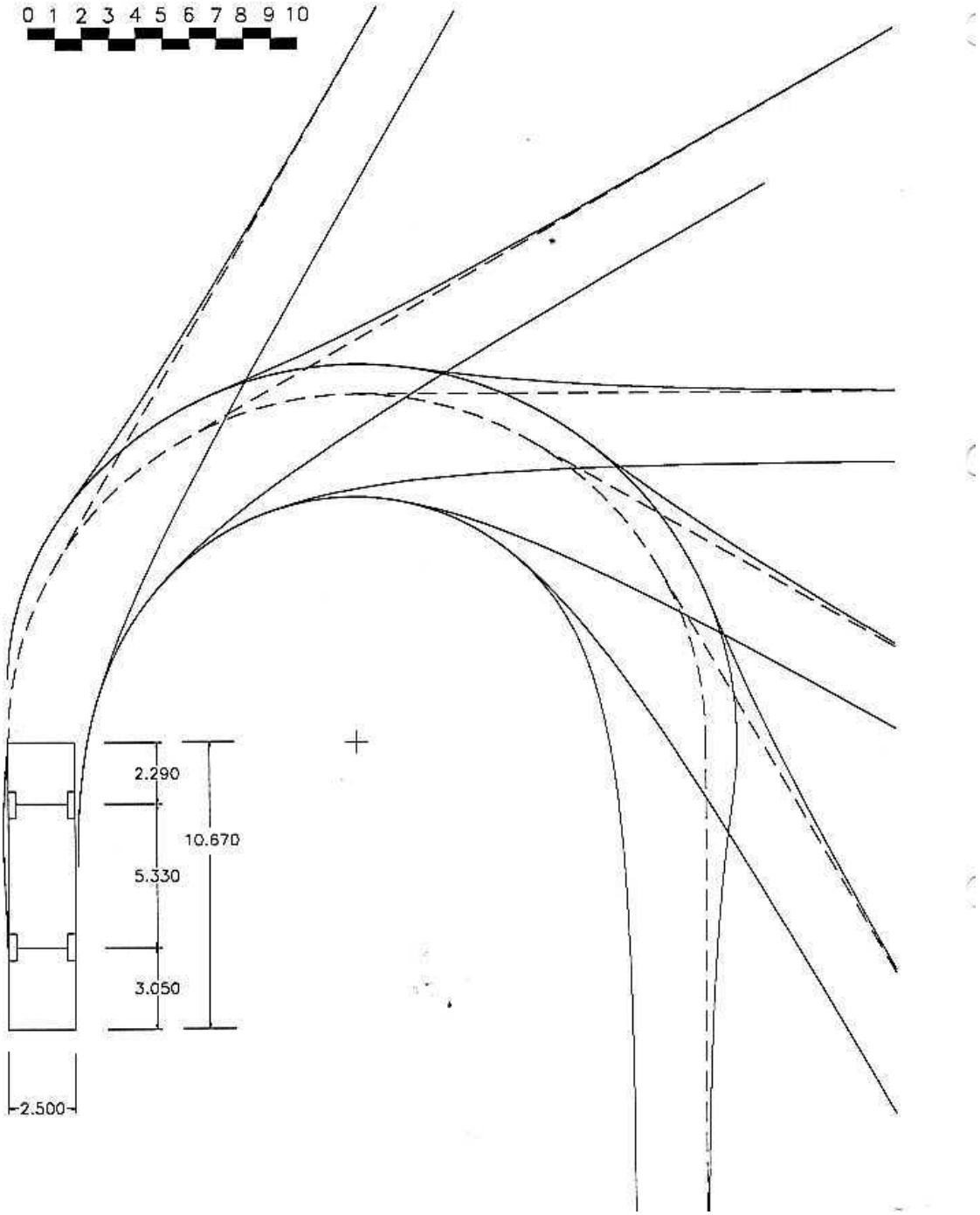

Figure 6.6 Mercedes Single-Deck 10.67m.

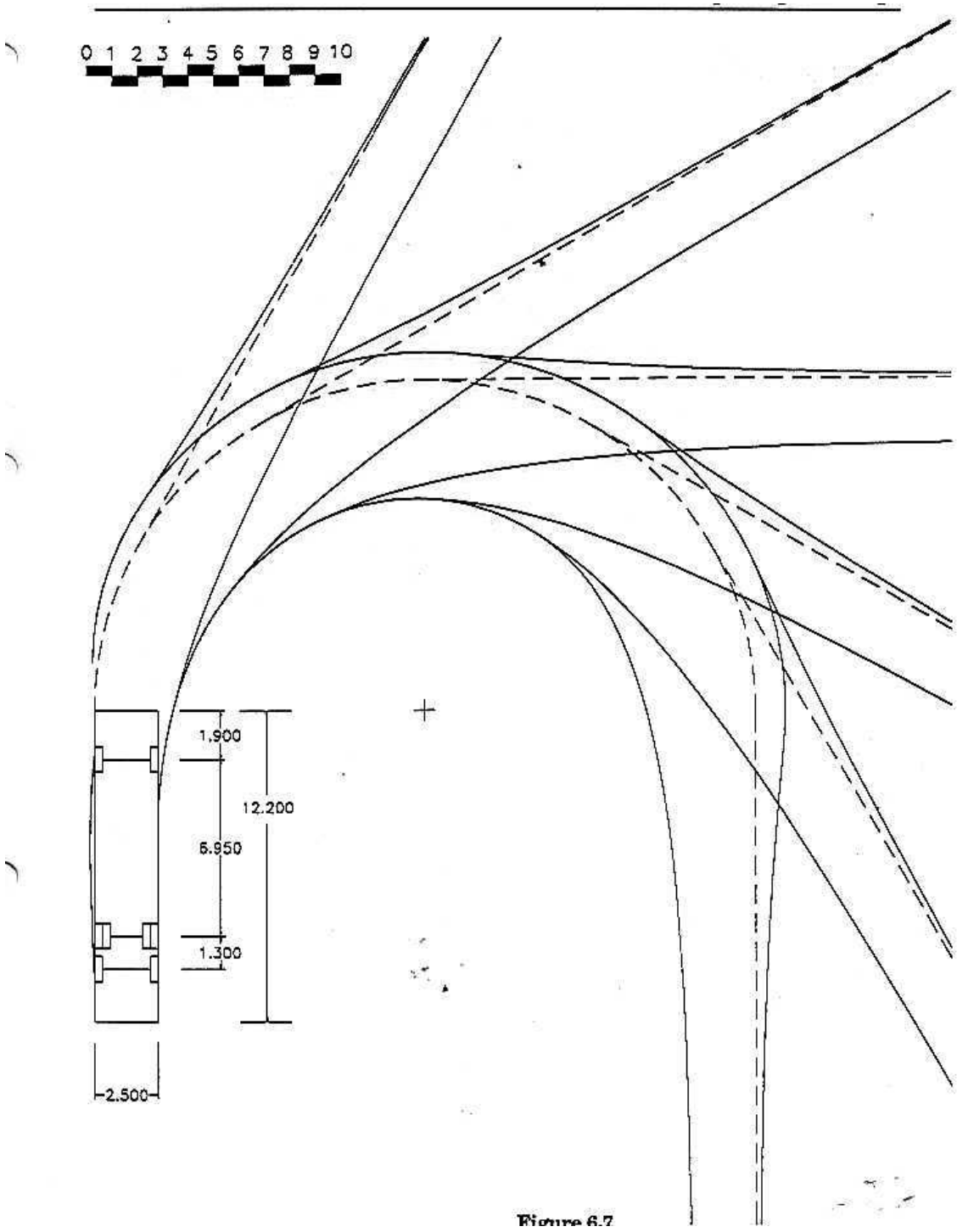

Figure 6.7 Tourist Coach 12.2m.

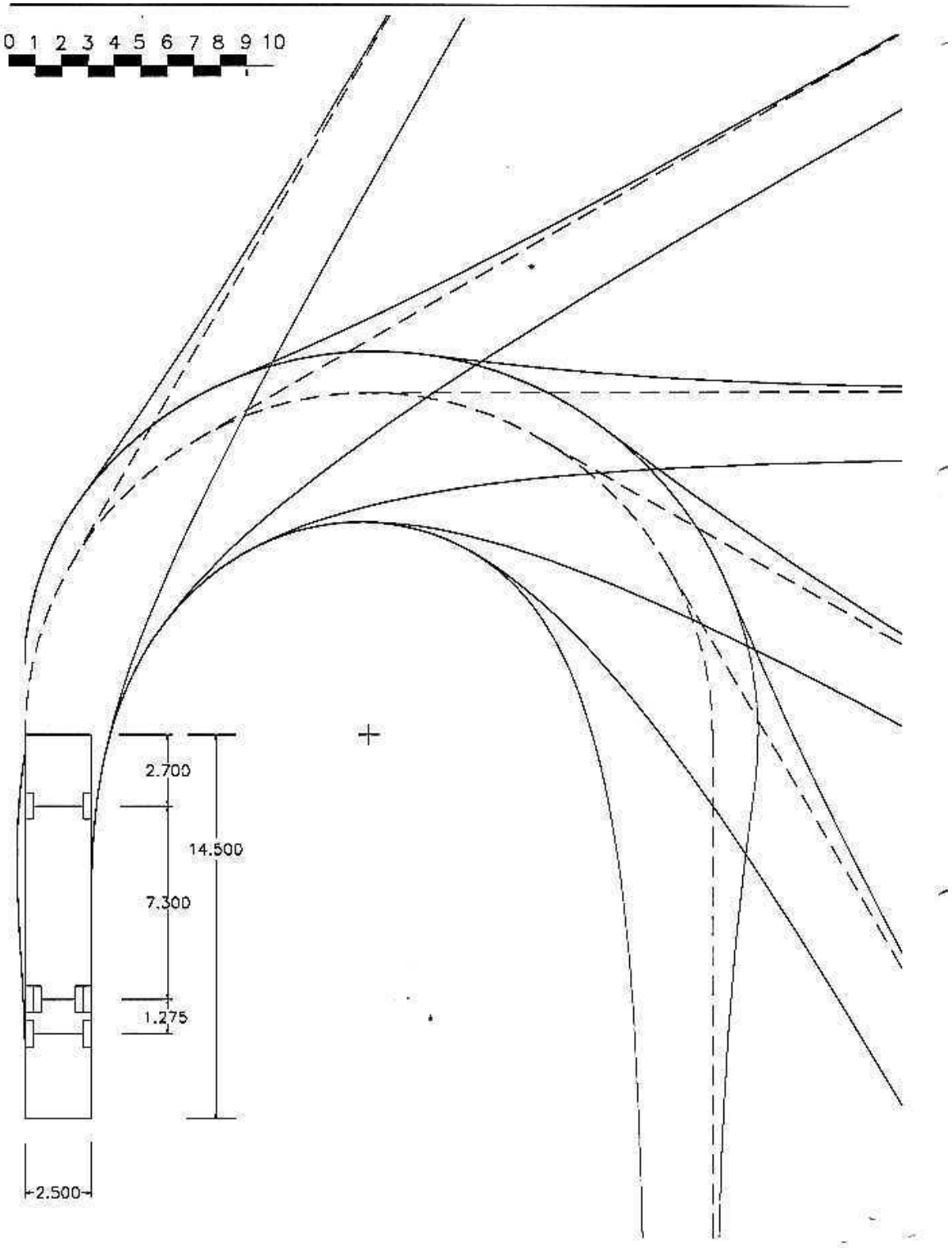

Figure 6.8 Scania L113 14.50m.

6.5 Pedestrians.

In the design of driveways, internal roads and parking areas every attempt must be made to resolve conflict with pedestrians.

Facilities which cater for pedestrians on the street, may also be applicable within developments. These facilities include zebra crossings, pedestrian signals, shared traffic zones and low speed limit signs / traffic calming devices.

Land uses in the Central Business District often generate heavy pedestrian traffic, including general pedestrian traffic walking across the site. Where driveways are located for entry into underground parking areas, consideration should be given to diverting pedestrians around the entry and exit driveways. Often the organisation of appropriate landscaping at the conflict point of pedestrians and vehicles eradicates this problem.

6.6 Traffic control within developments.

Internal roads etc within developments function as public streets and normal road traffic rules apply. Hence these roads are to be managed to minimise conflicts and maximise safety.

For more details on traffic control, refer to RTA guidelines (currently Section 7.4 of the Roads & Traffic Authority's *Guidelines for Traffic Control Facilities.* This document is currently being revised).

Section 7 Residential Subdivisions - Traffic and Safety.

7.1 Introduction.

This section concentrates on providing principles of residential subdivision design which support road safety objectives.

The preceding parts of this Guide concentrate on issues primarily concerned with traffic generation and the traffic impacts of developments. However, a Development Application for a residential subdivision requires somewhat different treatment because of special issues involving public roads and general traffic and safety concerns. Residential subdivisions are dealt with somewhat differently in this section, because of this fundamental difference.

The national context in which this Guide fits, is explained in the *Australian Model Code for Residential Development* (AMCORD, 1990) and AMCORD Urban (1992) a draft code for higher density housing. Another useful reference is the *Victorian Code for Residential Development Subdivision and Small Dwellings*, (1992).

These documents outline aspects relevant to development design, such as street and parking issues, turning and access facilities, street construction, and a number of traffic controlling measures.

The RTA has developed a strategic plan for road safety in New South Wales called *Road Safety 2000* (1992).

Some of the relevant aims presented in *Road Safety 2000* include:

- promoting the use of transport and land use strategies which achieve other social objectives such as resource conservation and protection for the environment.
- encouraging the consideration of road safety in all road network development.
- developing and implementing an acceptable system of speed management.

It is within this strategy context that the following design principles are stated. Of principle importance are the two following aims:

- maximum speed should be limited in residential subdivisions by appropriate road design (i.e. speeds should be self-enforcing).
- traffic volumes should be limited in residential subdivisions by attention to the connectivity between roads with different functions.

7.2 Limiting traffic speed.

In existing residential environments, 40km/h is an acceptable speed objective, usually achieved by LATM schemes e.g. adjusting existing roadways with retrofitted design items such as speed humps and slow points. *AMCORD URBAN* (1992), recommends 30km/h for new residential subdivisions, and this design speed is supported by research which indicates that vehicles travelling at 30km/h or less cause minor levels of injury to passengers, pedestrians, and other vehicles if involved in an accident.

Speed can be limited to 30km/h by the provision of traffic calming measures, and by promoting the concept that each street is a shared environment. The speed calculations are based on a combination of figures found in *AMCORD*, (1990) and *The Streets Where We Live*, Landcom (1984).

Traffic calming measures often implemented to control the speed of traffic are:

- limiting the distance between intersections to 70m or less
- limiting cul de sacs to 80m or less in length.

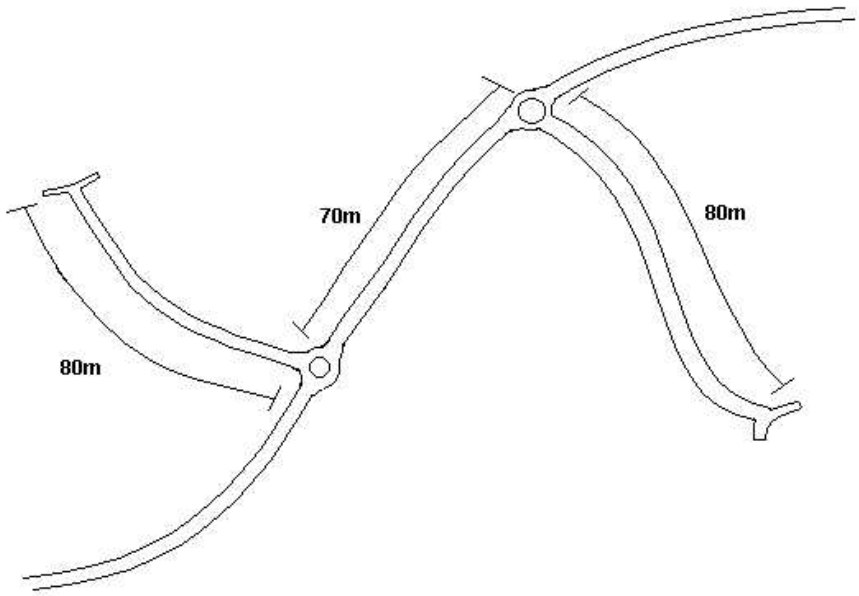

Figure 7.1 Traffic calming principles to reduce speed.

Care should be taken to ensure that drivers do not need to cross too many controls to access the furthest lot in a subdivision.

7.2.1 Limiting carriageway widths.

In instances where traffic volumes are low streets may be designed with a width of 3 to 3.5 metres. This measure in turn reduces speed as vehicles must slow down to let each other pass at specifically designated locations. This design produces a general sense of constraint but does not affect parking or passing opportunities. However, it is advisable that some parking bays are provided at the side of the traffic lane (one space per three households is a common provision, in addition to off-street parking). In areas where it is possible to provide off-street visitor parking one space is required for every three households.

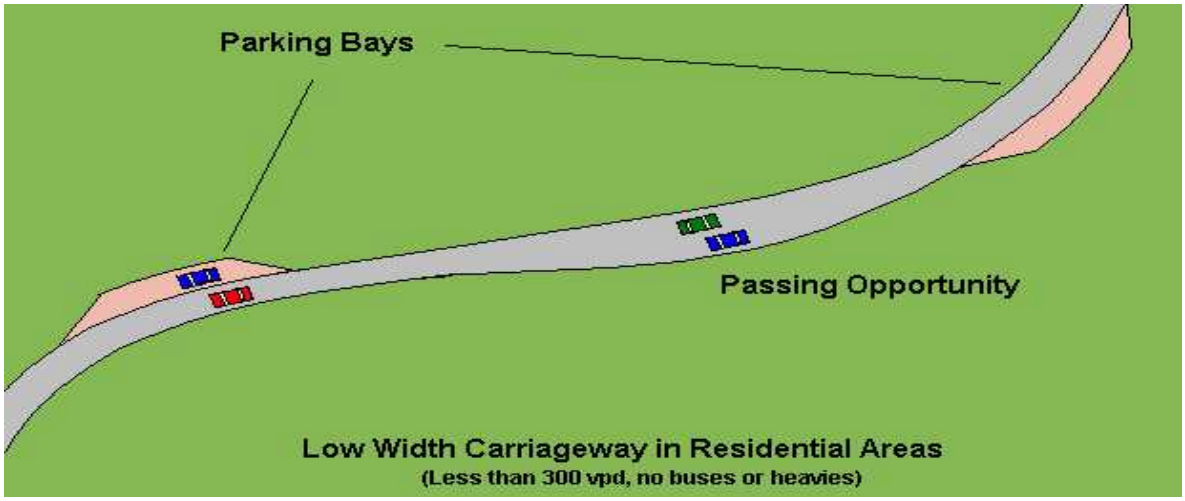

Figure 7.2 Parking bays at the side of a traffic lane.

The edge of the traffic lane generally indicates the division between the traffic lane and parking areas. This can be achieved by one of several measures such as implementing a dish gutter paving strip, or a different paving texture.

It is emphasised that overtaking opportunities, where the road is wide enough for two vehicles to pass, must be provided and it should be obvious that parking is prohibited in these places.Depending on the number of passing opportunities a 3 to 3.5 metre wide carriageway is best suited to an average of less than 100 houses. If 100 households are served primarily by narrow streets such as these, then busy sections may experience excessive delays unless 50% of the length of the street is available for overtaking. According to *Streets Where We Live*, Landcom (1984), a length of 20% is required for overtaking for streets serving 30 households. No overtaking space is required for a cul de sac serving 15 households assuming that drivers can see from one passing place to the next, or to the end of the street. A street which is 7.0m wide, may not slow traffic sufficiently, but may be accepted because a high level of on-street parking is planned, and trees are proposed for the carriageway at regular intervals.

7.3 Limiting traffic volume.

Research indicates that many residents prefer to live in a street where the flow of traffic is 2000 vpd or less (where the environmental capacity is 2000vpd).

There is no precise level at which the traffic environment can be said to be acceptable or unacceptable to residents. However, the desirability of a street does not just depend on its traffic characteristics. Often, residents accept a high flow of traffic in a street which is well designed or which offers activities or aspects that are considered important.

Despite the difficulty of arriving at accurate figures, consideration should be given to the level of comfort that may be appropriate for residents. In most cases it is reasonable to require that the flow of traffic passing 85% of households should not exceed 1500 vpd, as a design objective.

AMCORD Urban (1992) defines *environmental traffic capacity* as the maximum number of vehicles that should be permitted to pass through a given environmental situation over time under prevailing environmental conditions. The desire to limit traffic volumes in new residential subdivisions is generated by a wish to preserve the amenity of residents by designing street connections to keep traffic volumes on all residential streets within their environmental traffic capacity. The connectivity of a road system determines the flow of traffic on individual streets.

In determining traffic volume objectives, it is advisable to note the following points:

- it is not necessary to create a series of cul de sacs to maintain the flow of traffic at below 1500 vpd.
- connective road system serving as many as 1200 households with good access to a sub-arterial road system may contain residential streets all with a flow of less than 1000 vpd, and internal collector roads with less than 2000 vpd.
- fewer links onto a collector road results in more traffic on each of the links.
- in situations where access to the major road system is restricted (possibly because of the placement of an arterial road), stub roads are an alternative which draw traffic together for access onto the major road.

Good connectivity of street, and footpath links for pedestrians reduces the distance travelled, and therefore saves energy and provides incentive for a reduction in car use.

The value of good connectivity, and the loss of it in some recent subdivisions, (particularly those in the USA) has led to the emergence of a number of current thematic approaches to urban design e.g. VICCODE, Transit Orientated Design (TOD), Traditional Neighbourhood Design (TND), Non-traditional Design (NTD) plus others (Stapleton & Lawson 1993, Bookout 1992, Duany 1991, Calthorp 1990).

These themes tend to use connectivity as the main attribute. They have also included the layout of streets, in particular proposals for orthogonal grid road networks (NTD). More recently the TOD has been more firmly defined as having good access to public transport foci, whereas the TND is more concerned with mixed land uses and the consequent benefits. This is highlighted by proposals for urban villages and the belief that intense urban consolidation can reduce travel demand while increasing the rate of participation in social activities.

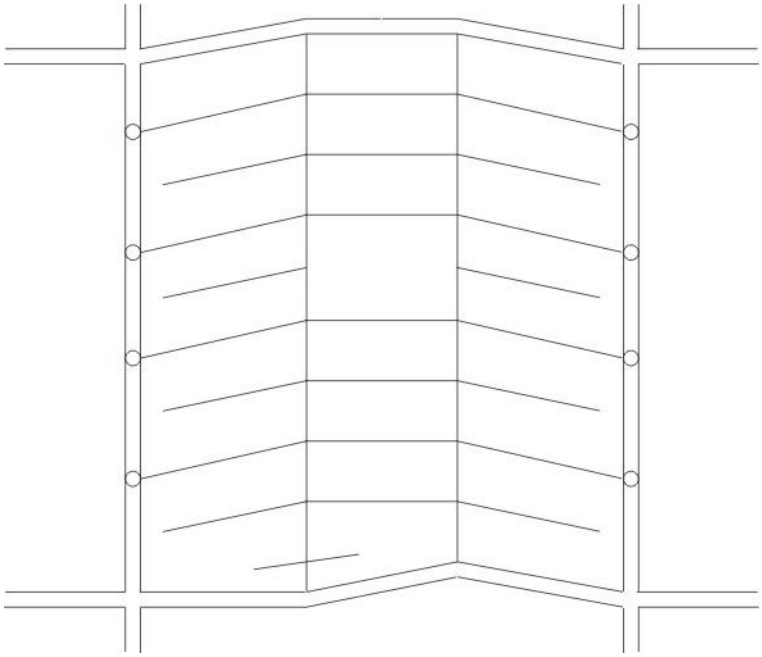

Figure 7.3 Road connectivity.

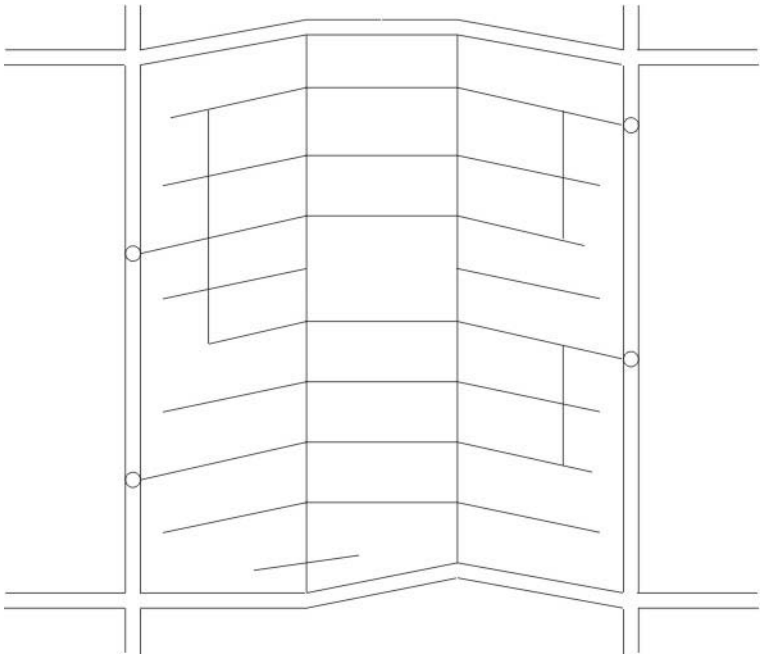

Figure 7.4 Alternative design with fewer connecting roads.

7.4 Pedestrians.

Where there is likely to be a heavy pedestrian demand, (such as a route serving more that 200 dwellings), traffic details of the area must be examined carefully to deter pedestrians from crossing diagonally at intersections. Visibility is a significant factor which must be considered in assessing these situations. In some cases it may be necessary to install roundabouts where heavy traffic flow is likely to occur, or at least to implement designs with very careful channelling of footpaths to crossing points.

It is advisable that pedestrian crossings on busy, new roads be located either at traffic signals or at places where the speed of traffic is reduced to 30km/h or less. The latter situation could be achieved by implementing a design where drivers must negotiate at least one bend with a radius of about 15m before reaching the crossing.

Where an exact path is not defined (because the route follows a diagonal crossing of a busy road), measures must be taken to direct pedestrians to one crossing point.

The group of pedestrians most vulnerable to traffic is children leaving school in the afternoon. Accident statistics from 1981 indicate that approximately 27% of pedestrian accidents occur on local and collector roads (*LATM and Road Safety: Accidents in Road Classes in Melbourne*, Andreassen & Hoque, 1986). Further analysis of data collected between 1980 and 1984 indicates that 35% of pedestrian accidents in local areas involve children. Of these, a significant proportion occur between 3.00pm and 4.00pm, when students are travelling home from school.

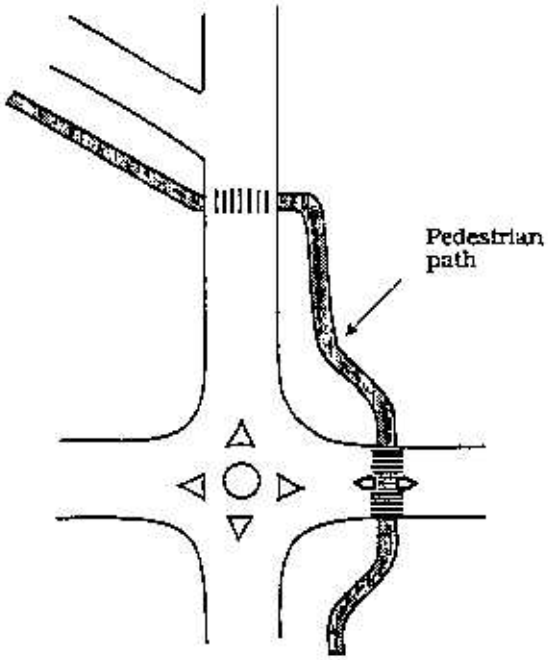

Figure 7.5 Pedestrian path principles.

In 1970, 49% of students walked home from school. By 1984 this figure had dropped to 31%. This, however, is not necessarily an improvement, as 44% of the remaining 69% travelled home by car (Social Development Committee, 1987). Increased car travel to and from school has had an impact on the safety of the remaining students who walk. The increase in car travel by students has contributed to the general increase in the hazardous nature of the school vicinity.

In evaluating school pedestrian safety, it is advisable to consider the following points. Pedestrians generally take the shortest route between two points irrespective of potential road danger. Therefore, the most direct route from the entrance of the school to any street in the development is the most preferred route, unless very specific measures are taken to divert the journey to a safer route. When crossing arterial and other busy roads the majority of children will use traffic signals, school crossings

or marked crossings. However, the random crossing of streets on all road types is still a matter of concern.

School entrances require special attention, particularly in locations where narrow streets (both residential and sub-arterial), do not provide the opportunity for pick-up, set-down or overspill parking.

Provision must be made for buses (including a set down area) as well as parking facilities for approximately 40 vehicles on a regular basis (depending on the size of the school), in addition to the demands of the school staff. As the school entrance area is used by children en route to home and to parents' cars, it is important that the most popular routes are traced and appropriate safety measures are added.

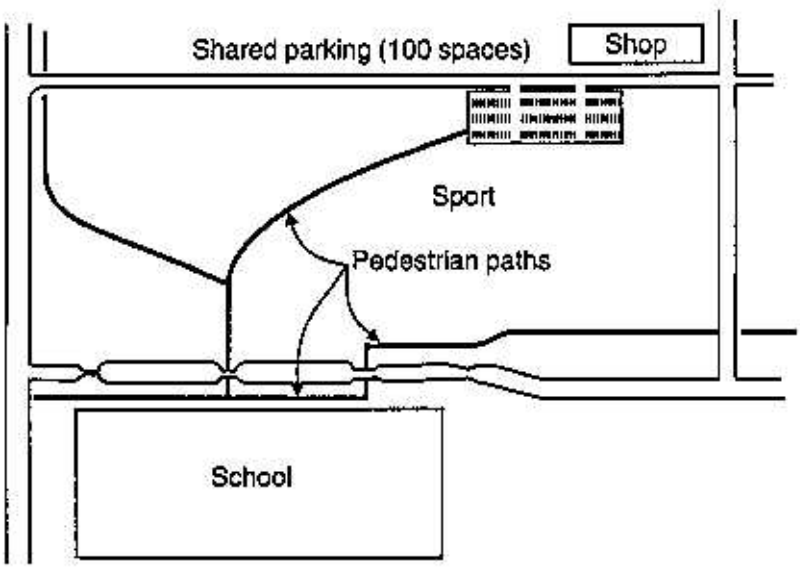

Figure 7.6 Significant pedestrian linkages near schools (see Figure 7.7 for more details).

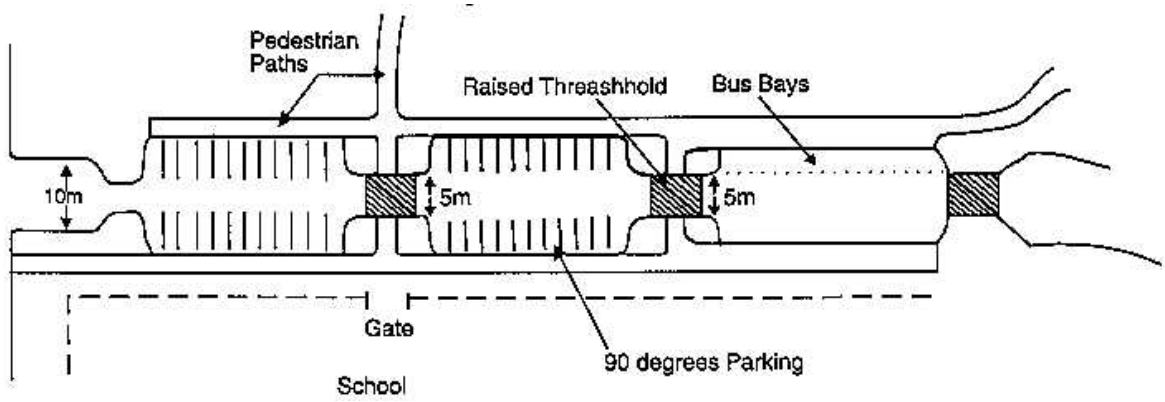

Figure 7.7 Appropriate safety measures near schools.

In addition to the regular parking demand, special occasions at a school attract additional traffic. While it may not be necessary to provide a special car park for these occasions it is important to note where people are likely to park outside the school precinct on such occasions. Such irregular demand for external parking emphasises the significance of satisfactory footpath standards.

Where conditions are considered to be potentially hazardous, an analysis of pedestrian safety can be undertaken using the procedure set out in *The Streets Where We Live*, Landcom (1984). A

fundamental objective for a residential environment is to allow pedestrians to cross the streets without undue delay. The delay factor varies according to traffic flow, the width of the carriageway and the degree to which parked cars cause difficulties for pedestrians wishing to cross the road. Many pedestrians prefer to allocate enough time to cross a road without slowing down an approaching vehicle. That is, if it takes a pedestrian (1.0m/sec) seven seconds to cross a carriageway and a vehicle can approach at 50km/h then the pedestrian should be able to see about 100m to make a crossing in comfort, without stress.

One method of reducing the difficulty of crossing a busy road is to separate the carriageway so that the crossing can be made in two attempts. While it is not necessary that all parts of a residential street accommodate cross pedestrian movement, vulnerable pedestrians should be protected at intersections. Vulnerable pedestrians are usually defined as children, the elderly and other mobility impaired pedestrians.

If traffic is approaching an intersection at 20km/h a pedestrian needs visibility of 50m to cross a 7m street in comfort. However, this level of visibility is almost impossible to achieve in some situations, such as at a roundabout, where traffic can approach from a number of directions and may not be seen by a pedestrian at one crossing point.

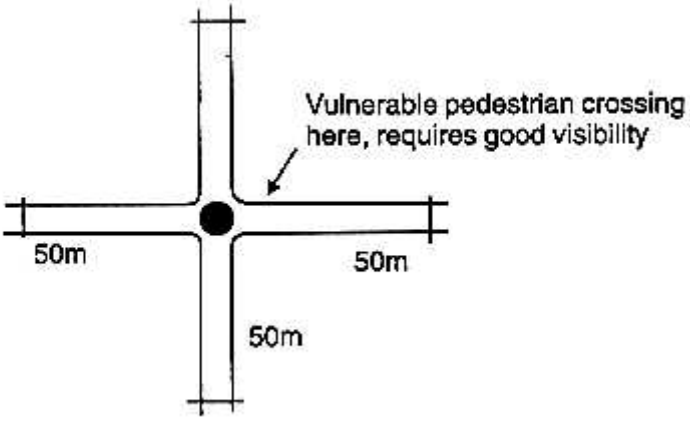

Figure 7.8 Visibility requirements.

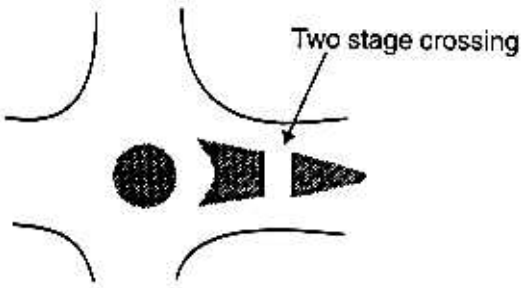

Figure 7.9 Two-stage crossing at roundabout.

Pedestrians may be separated from traffic by moving the point of crossing away from the intersection, (although this may be an instance of over-design for a quiet area). Alternatively, the crossing may be separated into two parts. Designs in the reference documents illustrate various methods of slowing traffic.

A footpath is normally provided on at least one side of all streets carrying more than 1000 vpd. A footpath is usually provided on both sides of a street if the traffic flow exceeds 1500 vpd.

7.5 Cyclist safety.

Cyclists are not generally subject to adverse traffic conditions on residential streets where the speed is 30km/h or less. However, pinch points are a danger to cyclists on busy streets. Also, residential streets are not specifically designed for high speed commuter cyclists. Slow streets (30 km/h or less) are more suited to play activities, including the use of bicycles.

The needs of local cyclists should be accommodated either on local roads or bicycle paths. For information concerning the design of regional bicycle facilities (including bicycle paths), refer to the *Guide to Traffic Engineering Practice, Part 14 Bicycles* (AUSTROADS, 1993).

The safety of pedestrian activities in residential streets can be maintained by prohibiting high speed bicycle movements. If a commuter route is proposed in a quiet street, the design of the bicycle path should be similar to that of the carriageway, but not so that it encourages speeding by cyclists.

The low flow of traffic is not a threat to cyclists and no special features are needed, unless the proposed bicycle path is expected to be particularly crowded, such as on a recreational route.

At times, the general flow of traffic (combined with the implementation of traffic control measures) may create pinch points, which hinder cyclists' activity. A street which has a design speed of 50km/h and no pinch points is generally acceptable as a bicycle route, although it may be without any special cycling features. Appropriate measures need to be taken in order to accommodate cyclists where roads are marked by pinch points. This often takes the form of a small bicycle lane.

If the flow of traffic on a residential street is expected to reach 5000 vpd, separate bicycle facilities are recommended, irrespective of the speed of traffic. These facilities may take the form of wider lanes, separately marked bicycle lanes, a bicycle path or the provision of an adjacent route.

7.6 Bus route provision.

It is advisable to identify bus routes in new residential subdivisions so that appropriate planning measures may be taken. For more information, refer to the *Technical Bulletin, 19*, Department of Urban Affairs and Planning, NSW, (1989).

Bus operators seek to minimise operating costs through high operating speed and good connectivity of roads. On a broader front, the success of public transport as competition to the private car, depends on service as well as the availability and convenience of the facility. The location of access points to public transport facilities is another contributing factor in determining the level of success of the facility.

Some sites are suited to running bus services along adjacent collector or sub-arterial roads, resulting in the provision of a service within 400m of most houses. In other instances it is necessary to provide a bus service within a residential area positioned within approximately 400m of the majority of households.

The bus route is therefore usually one of the first traffic considerations shown on a sketch plan of a proposed subdivision.

A convenient through route on its own may attract other traffic, which may be too high for residential amenity. While the provision of a *bus-only* link may ease this problem, this restrictive arrangement may inconvenience residents who need to drive around the bus only section. (The fact that some residents may drive through the link is not so significant that it should cancel such a proposal. However, a location which is likely to attract regular through traffic may require special treatment.)

Bus operators tend to require two traffic lanes even for low frequency routes and therefore tend to operate on streets where the speed is relatively high. This is often at odds with the overall plan for an

estate, and worse still, the bus routes may attract pedestrians onto the most potentially dangerous streets in an estate. One solution to this is to implement traffic slowing measures adjacent to bus stops and allow more free speed between these points. Hence it is better that the bus route should operate generally on 50km/h streets, with 30km/h areas near bus stops. Referring to the earlier section on carriageway width, buses are wide vehicles and operators tend to want a road width which allows two buses to pass, or allows 6.0m between parked vehicles. This can be achieved by using parking bays. (The possibility of an excessively high operating speed can be limited by a number of designs discussed in the reference documents. However, most of these controls result in non-connective road networks which are counterproductive to bus operations.).

7.7 Parking provision.

The former Traffic Authority of NSW recommended that all parking demand for residents be provided on site, with visitor parking ideally provided off-street. However, on-street parking often has a potentially beneficial affect in that it creates *friction* to reduce speed in relatively narrow roads.

Refer to *AMCORD* (1990) and *AMCORD URBAN* (1992) for more information on this issue. The brief discussion in this section is only an introduction to the issues discussed in the reference documents.

Parking behaviour is heavily influenced by street design. It is generally preferable to avoid signposting for parking restrictions in new residential subdivisions. The presence of a narrow carriageway, parking bays, driveways, intersections and other design elements should make it obvious where a car can be reasonably parked. Areas set aside for two vehicles passing each other, or for access by service vehicles, such as garbage trucks, should be obvious to the driver to maximise self enforcement of appropriate parking behaviour.

In using reference documents, the designer and approving authority are judging the balance required between the various design elements. This includes width carriageway, length between passing opportunities (in one-lane roads), location of parking bays, kerb and gutter treatments, verge treatments, and so on.

7.8 The link to detailed geometric design.

Part 11 of AUSTROADS *Guide to Traffic Engineering Practice*, 1988, deals with parking. Desired space requirements and required manoeuvring space as described here and in the *Australian Standard - AS2890 Parking facilities* provide guidance of detailed geometric designs for parking facilities.

However, the above mentioned documents do not emphasise the design elements required in new residential subdivisions with a desired travel speed of 30km/h. There is a balance to be achieved between the need to provide sufficient space for vehicles (particularly service vehicles such as garbage trucks) and the desire to provide narrow streets with treatments that make it uncomfortable for drivers to exceed 30km/h until they reach a collector type of road.

It is the approving authority, usually the local Council, which must judge if the overall design is operationally practical as well as likely to achieve traffic speed and traffic volume objectives.

Emergency vehicles, such as fire engines, should be able to travel from a (wider) collector road to the most remote lot in a new residential subdivision in a reasonable time. This should be taken into account in the overall street layout of the subdivision.

Section 8 Cost Impacts of Traffic Generated by Developments.

8.1 Introduction.

Developer or beneficiary contributions are often arrived at by negotiation, rather than through a mandatory procedure. Negotiated contributions may differ to the calculations suggested in this Guide, because of factors such as land / cash trade-offs, timing of works, Council policy and the consideration of wider benefits. The intention of this Guide is not to recommend specific levels of contributions, but to provide a policy framework as well as facts to assist the negotiating process.

8.2 Current legislation in NSW.

Council rates are based on the value of property, with revenue partly spent on local roads. Councils also obtain financial contributions from developers whose developments have an impact on the road system. The legislation which allows this, but excludes the costs incurred beyond the local government area (LGA), is outlined below.

Environmental Planning and Assessment Act 1979.

Section 94 of the EP&A Act grants councils the power to levy contributions from developers for public services and public amenities required as a consequence of a development within a local government area. It codifies a practice of levying contributions for developments which previously existed via legal precedent.

Section 94AB provides that councils prepare contribution plans and set out council policies for levying and spending contributions. The plan must explain the nexus between the proposed development and the facilities the developer will help fund.

Two useful references for Section 94 contributions are:

- NSW Department of Urban Affairs and Planning *Section 94 Contributions Plans Manual* (1992). This document specifically refers to Public Roads, Traffic Management Measures and Car Parking.
- *Guidelines for Section 94 Contributions for the provision of roads, traffic and parking facilities - Stage 2 Report* (November 1991), Stapleton & Hallam Pty Ltd for the Western Sydney Regional Organisation of Councils (especially Chapter 3 - The Preparation of Section 94 Contribution Plans).

8.3 The impact of development.

8.3.1 Types of impact.

The major types of impact created by traffic may be categorised as:

- impact on traffic efficiency.
- impact on road safety.
- impact on road pavement.
- impact on amenity.

Traffic efficiency.

Section 94 contributions based on Section 94 of the *Environmental Planning and Assessment Act* 1979, regarding traffic generating developments have largely arisen from considerations of roadway capacity. Consideration should be given to both the number of lanes required and improvements to intersections (including traffic control devices), to cope with the additional traffic.

In order to obtain a contribution from a developer, roads need to be identified in a council's Section 94 Contributions Plan.

A general approach in determining contributions is to:

- ascertain vehicle trips generated by a development.
- establish the existing situation by conducting a traffic study - particularly of the critical peak traffic times (eg. morning peak, business hours or lunchtime peak and / or afternoon peak).
- establish an appropriate standard for road and intersection level of service.
- estimate works required to ensure the effective peak hour operation of road(s) adjacent to the site and appropriate approach roads.
- cost the required works.
- allocate only the costs (under Section 94) associated with the road and intersection improvements required by additional traffic generated by the new development.

Design standards for traffic efficiency do not always reflect actual capacity. Alternatively an approach based on levels of service experienced during peak periods may be adopted. The same approach can be used in undertaking an Environmental Impact Statement (EIS) on a proposed development. With the adoption of a performance standard (such as level of service C or D), some consistency in approach can be maintained. Roads where traffic flows have reached these limits will provide a performance standard. Beyond these limits additional traffic lanes are usually required.

In some areas different levels of service may be adopted for different times. For example, level of service C may be most appropriate for weekday peak periods while level of service D may be adopted for weekend recreational peak demands. This approach recognises that the latter occurs less frequently and therefore a lower level of service can be tolerated.

For further information on this approach refer to:

- Guidelines for Section 94 Contributions for the Provision of Roads, Traffic and Parking Facilities - Stage 2 Report, Stapleton & Hallam for the Western Sydney Regional Organisation of Councils, November 1991.
- Guide to Traffic Engineering Practice (particularly Part 2: Roadway Capacity), AUSTROADS, 1988.

Road safety.

Traffic safety issues are often provided for in road design standards. These tend to be absolute requirements, for example a right turn must be banned, additional sign posting must be provided or access is not allowed from the major road, etc. Such absolute requirements are usually determined by professional judgements, based on appropriate guidelines, such as the sections of AUSTROADS *Guide to Traffic Engineering Practice*, and various RTA guidelines.It is important to note that safety issues are often closely related to amenity issues. For example, a Local Area Traffic Management scheme implemented in a residential precinct next to an arterial road (which carries traffic from a major development), improves pedestrian safety as well as reducing traffic noise, intrusion etc.

Impact on road pavement.

The impact of projected extra traffic loading can be assessed in order to estimate the cost of works required. A pavement management system can provide a basis for subsequent Section 94 assessment. This may take the form of a relatively simple inventory or a sophisticated software package available from the RTA or other suppliers.

Many councils currently have some form of pavement management system. The need for a sophisticated system depends on the frequency of use for Section 94 assessments, which in turn depends on factors such as the frequency of extractive or heavy industry developments. If the traffic modelling software system has been set up for other purposes (such as assessing the impact of malls, town centre bypasses and other developments) the same system may be useful in the Section 94 assessment. However, Section 94 assessments alone might not justify the purchase of such a system.

An engineering study should be carried out on the particular road lengths and haulage proposed by a development application. It is advisable that this study should constitute part of the EIS and cover both traffic and pavement conditions. Specific investments required to provide adequate traffic and structural capacity can then be determined.

Amenity.

A traffic impact which is not usually considered in depth in Section 94 contributions is amenity. Amenity relates to the *environmental capacity* of a street. The amenity of a development is primarily a concern in residential areas. If a commercial development fronts a major road, traffic efficiency is important but amenity can still be a relevant consideration. For example sub-arterial roads which serve through traffic may have significant amenity implications. Additional traffic speed and volume may be reduced by lowering speed limits and applying physical design measures.

Amenity issues depend on the function of the road within the hierarchy. For example, a collector road has a higher traffic volume limit and therefore can have a lower amenity. Note that these limits are more accurate when based on maximum hourly flows rather than on maximum daily flows. Further for a given limit, the acceptable volume may vary with the speed of the traffic. In residential design standards - such as *Streets Where We Live* (Landcom, 1984), and *Planning and Road Design for New Residential Subdivisions* (Director-General of Transport, South Australia) a hazard rating concept was developed, where the degree of hazard relates to volume, pedestrian flow and speed squared. Distance from road to residential properties is also a factor. If traffic calming measures can be introduced to reduce traffic speed then the allowable maximum volume of traffic may be increased. If an additional development is proposed for an existing urban residential road where the current traffic volume is at the environmental limit, the proposal may be considered if traffic calming measures ensure that the hazard rating of the street is not substantially increased.

8.3.2 Types of work.

The types of work for which contributions in money or kind are sought include:

- noise amelioration measures.
- pedestrian bridges.
- traffic signals.
- landscaping.
- public transport corridors.
- traffic calming measures.

Facilities such as shuttle buses which transport commuters between railway stations and offices have been suggested as they limit pedestrian flow and maintain performance levels of classified roads.

While such proposals need to be treated cautiously, they are indicative of the type of innovation which is possible.

Some facilities may be more difficult to justify than others, but provided that council as the collecting agency is convinced of the need for such facilities, then negotiations can be undertaken in terms of Section 94.

8.3.3 Areas of impact.

A traffic impact study (as described in Section 2 of this Guide) in identifying the area of impact may be conducted alone or as part of an EIS. It is important to note that measurable impacts (resulting from an increase in traffic generation) on road safety, road pavement and amenity caused by an increase in traffic generation may vary in degree.

On site.

All necessary works and management measures must be provided by the developer and owner / operator.

Adjacent to site.

Identified works may be needed as a result of a new development. Works adjacent to the site may include footpaths, upgrading of road pavements, traffic control facilities to ensure safe entry and exit, and any adjustment to traffic control facilities on intersections.

Surrounding road network

Councils, as a consent authority, should seek contributions for works on classified roads. These may include contributions towards the cost of major roundabouts and rates per tonne/kilometre of material hauled for reconstruction of classified roads.

The influence of traffic generated by a development can be extensive. However, under Section 94, councils may only seek contributions within the Local Government area concerned.

Contributions towards the classified road network.

The appropriate contribution for classified roads is a matter for assessment between the beneficiaries. Section 94 contributions can be levied when council has the responsibility (including a shared or delegated responsibility) for the road or other facilities.

Legal action has been necessary in some instances to determine these contributions. They have been decided on the basis of satisfaction of the tests of nexus and reasonableness, and because councils themselves have been held to maintain some responsibility for the classified roads involved.

8.3.4 Undertaking a traffic impact study.

Contributions to road works, including road construction, road improvement, traffic management improvements and parking supply are traditionally obtained from larger developments. Some consent authorities do not consider it necessary to negotiate a contribution from small developments. However, many small developments can generate an impact on trafffic flows which, when aggregated, have a considerable effect on the surrounding transport system.

Councils may seek contributions from any size of development, including single dwellings. From 1 July 1993 councils wishing to levy contributions under Section 94 must have in force a *Section 94 Contributions Plan*, as described in the *Department of Urban Affairs and Planning Section 94 Contributions Plans Manual*, 1992.

Significant developments need to be referred for comment to either:

- a Regional / Zonal Development Committee (Schedule 1).
- a Council Development Committee (Schedule 2).

Refer to Table 9.1 and Table 9.2 for further details.

It is recommended that a traffic impact statement and, if necessary, a traffic impact study be carried out in respect of developments listed in Schedules 1 and 2, as these developments generate significant traffic.

Incremental developments, where the increment is greater than 10% in terms of traffic generation, should be examined as a whole, incorporating the original development. Any existing or prior contributions or similar arrangements for the existing development should be taken into account.

8.4 Cost assessment.

Having considered different types of cost impacts in Section 8.3 this section outlines techniques for assessing cost impacts and achieving cost recovery.

8.4.1 Cost impacts.

The impact of developments as described in Section 8.3 gives rise to a variety of cost types. For example, an extractive industry such as a quarry might require an initial capital cost to build an access road, as well as a periodic cost for damage to the access road and other feeder roads.

Periodic payments can be converted to an equivalent net payment if sufficient information is available. A single lump sum payment may be preferred by a council and / or the RTA as it is more certain than future periodic payments. This method of payment may be preferable in cases where an original developer on-sells a project.

Road efficiency cost impacts.

This is usually the capital cost (or part thereof) of required works. However, new facilities such as traffic signals create a known yearly maintenance cost.

For example, on tunnel constructions and extensions in the Sydney Metropolitan area the yearly maintenance cost of items such as cleaning, lighting, ventilation, painting, etc. was translated to an agreed lump sum payment.

Road safety cost impacts.

Road safety cost impacts usually refer to a capital cost for required items.

Road pavement cost impacts.

This usually refers to a periodic cost impact which may be converted to a lump sum payment.

Road amenity cost impacts.

This usually refers to a capital cost for required works e.g. Local Area Traffic Management schemes, road closures.

8.4.2 Lump sum calculations.

Lump sum calculations can cover the cost of works required now, or a lump sum equivalent for the cost of proposed work, depending on developer requirements and phasing.

Current cost of capital works.

These are relatively simple to calculate, once the required works are identified, using the available unit costs (see Section 8.5). Works required are identified by an engineering study covering both structural and traffic capacity considerations.

Development proposals impacting significantly on the public road network will need to cater for additional traffic generated and to absorb additional public infrastructure costs such as upkeep. For this purpose a transportation study should be included as part of the Environmental Impact Statement (EIS).

This study needs to address the following issues:

- the routes which will be affected.
- the type and number of vehicles introduced.
- the road condition and alignment over the entire length of impact in engineering terms.

It is advisable that the engineering assessment considers the following points:

- existing pavement condition and width.
- existing pavement composition and structural capacity.
- existing shoulder conditions.
- existing alignment, specifically detailing those areas which fail to meet current standards.
- the number of overtaking opportunities and climbing lanes, and the impact that increased traffic will have on existing travel times and accident Rates.
- an analysis in accordance with AUSTROADS principles of the existing road length showing current levels of service, and any assumptions made in their calculation.

The following lists some of the impacts a development may have on existing road conditions:

- the expected rate of pavement deterioration, assessed in conjunction with the expected number of heavy vehicle movements (expressed as Equivalent Standard Axles - ESA).
- the reduction in pavement life which may be expected.
- the cost to the community to repair the resulting pavement damage, and maintain the pavement in an acceptable condition.
- the capacity of existing bridge structures and the additional maintenance costs attributable to the development.
- changes to the existing levels of service over the affected routes.
- noise generated by additional traffic, specifically the problems associated with high level acoustic events, such as the rattling of empty trucks.
- the measures that the developer intends to introduce to ensure that all heavy transport vehicles used by the development conform to regulatory load and dimension limits.

Design standards for roads.

If a proposal significantly increases the traffic on a particular road, the road authority must assess whether the general design standard of the road needs to be upgraded to maintain the existing levels

of service and safety. This may involve the construction of climbing lanes, additional lanes or even the provision of a dual carriageway. A proportion of the cost of any such improvements would need to be met by the developer for those developments generating the additional traffic.

Minor improvements for road safety.

The road authority determines if any improvement works are required for the road or to intersections, in the interests of road safety. Such works may include the widening of intersections, intersection channelisation, the provision of turn bays, slip lanes or sight distance improvements. The developer would be responsible for all costs associated with these works.

Cost of advancing road program

Even for projects in existing forward works programs, there is an argument that a developer should pay the full cost; having a project in the program does not mean it will definitely proceed. It is the developer's action which triggers the road authority's involvement in the project.

If the road authority does finance part of a project, it is strictly the opportunity cost that matters, not the financing cost. This is because the road authority would have spent its funds elsewhere in absence of the developer's project. Therefore the loss to the road authority, which the developer should be funding, is the difference between the net present benefit the road authority will achieve on its investment in the developers project, versus the return it would have achieved on the foregone project.

Contributions should be negotiated in the following way:

- list all road projects identified in current plans as being needed or recommended, and list the year (Y_1) by which each project is recommended for completion.
- categorise each project.
  - CATEGORY A projects planned to be constructed at some future date irrespective of whether or not the development goes ahead. These projects would normally be a State or local government responsibility but may need to be brought forward for the development.
  - CATEGORY B projects identified for the first time by the road authority; projects extremely unlikely to be constructed at any time in the future if the development does not go ahead. The cost of these projects is considered to be the developer's responsibility.
  - CATEGORY C projects needed by the development, but also planned to overcome an existing problem. These projects are considered to be a shared responsibility of the State or local government and developer. There may need to be an advancement of the State share of costs.
- calculate the cost of advancing the projects in Category A and / or Category B.
- forecast the year in which a project is likely to be constructed if the development does not go ahead (Y_2).
- calculate the net present cost of advancing the project from Y_2 to Y_1, using discount rate recommended by NSW Treasury (7 per cent in 1993).
- calculate what percentage of the project's cost in year Y_1 is equal to the cost of advancing the project from Y_2 to Y_1.
- consider the financial consequences for the road authority if developer funds are accepted for advancing projects in Categories A and C. In addition, for projects in Category C, the developer's share should be contributed as well as the cost of advancing the RTA's share.

See Section 8.7.1 for methods of calculating lump sum payments.

8.4.3 Periodic payment calculations.

A periodic payment may be calculated instead of a yearly fee for many capital works, if the various parties agree. Facilities, needed because of an increase in volume and / or change in type of traffic generation (such as new traffic lights or increased pavement strength), may raise initial capital cost and maintenance charges. The net present value of all of those charges is converted to a yearly charge (usually indexed to inflation) over the life of the project.

8.4.4 Non-money payments.

Land may be contributed in lieu of a monetary payment under Section 94 of the Environmental Planning and Assessment Act. The land valuation involved is arrived at by negotiation between the parties.

If a developer can provide some of the required works to an appropriate standard and within an appropriate time frame, at less than Council and RTA costs, this may be accepted by the consent authority.

8.5 Sources of cost estimation.

8.5.1 Council unit costs.

Many councils keep up to date cost information including unit costs and lump sum estimates for some road works. These estimates and unit costs may vary from area to area. Interested parties are advised to contact councils directly if works are to be either undertaken by the council itself, or if the council unit rate is the agreed rate to be used.

8.5.2 RTA unit costs.

RTA unit costs are included in the 1991 *RTA Estimating Manual*, Part 7, Historical Cost Database. (This reference also includes useful information and techniques in relation to discounting, cost-benefit analysis, financial analysis, etc). RTA databases are maintained on a regional basis.

For further information, contact the RTA Regional Offices

8.5.3 RTA Regional Offices

SYDNEY	81 - 85 Flushcombe Rd, Blacktown 2148 (P.O. Box 558). Tel: (02) 9831 0911 Fax: (02) 9672 2593. DX 8120 Blacktown
WESTERN	51 - 55 Currajong St, Parkes 2870 (P.O. Box 334). Tel: (02) 6861 1444 Fax: (02) 6861 1414. DX 520256 Parkes
NORTHERN	31 Victoria St, Grafton 2460 (P.O. Box 576). Tel: (02) 6640 1300 Fax: (02) 6640 1301. DX 7610 Grafton
HUNTER	59 Darby St, Newcastle 2300 (Locked Bag 30). Tel: (02) 4924 0240 Fax: (02) 4924 0344. DX 7813 Newcastle

SOUTHERN	90 Crown St Wollongong 2500 (P.O. Box 477, Wollongong East 2520). Tel: (02) 4221 2460 Fax: (02) 4227 3705. DX 5178 Wollongong
SOUTH WESTERN	1 Simmons St, Wagga Wagga 2650 (P.O. Box 484). Tel: (02) 6938 1111 Fax: (02) 6938 1183. DX 5407 Wagga Wagga

8.6 Section 94 Contributions.

8.6.1 Council use of Section 94.

In a recent survey of 15 councils, most of the councils responded that Section 94 contributions were used for open space and community facilities as well as some form of road works, whether local or arterial roads. Some councils have also used Section 94 funds for Local Area Traffic Management schemes (LATMs) and public transport facilities.

For example Newcastle Council has used Section 94 to provide roundabouts, new road works and road widening for a new shopping centre. The developers were not asked to contribute funding but were asked to complete the road works required.

8.6.2 RTA approach to Section 94.

The NSW Government is anxious to improve economic efficiency in transport, requiring a *user pays* approach for the use of road resources. An important element in this process is developer funding, to fund relevant road transport impacts.

The Environmental Planning and Assessment Act recognises that charging developers for the environmental impact of development is more equitable than imposing those costs on the general community. The impact of development on roads and traffic is an environmental impact, in the broad sense, and this has been recognised by the judicial system in several cases of quarrying and mining developments.

Although Local Government is responsible for administering Section 94 payments, the RTA must be consulted on road and traffic matters relating to development proposals. The RTA may impose conditions on the approval of development applications, including the recovery of certain costs imposed on the roads and traffic system by the development.

8.6.3 Environmental protection.

Local road traffic management schemes.

Warringah Shire Council has obtained a contribution for a local area traffic management scheme (LATM) for the Frenchs Forest / East Belrose area.

8.6.4 Public transport facilities.

Contributions to these facilities range from bus / rail interchanges (or provision of some within large retail / commercial developments) to quite minor matters.

8.6.5 Road pavement damage.

RTA Policy.

The estimation of road pavement damage is a particular application of the procedure outlined in Section 8.3.

This approach has been used by the RTA in relation to *extractive* industry, such as quarries and coal mines.

The developer's consultant, in consultation with the RTA and Council should estimate an appropriate contribution to cover damage (wear and tear) to a road. The contribution would most likely be a rate per tonne kilometre of payload or a single up-front payment to cover the rehabilitation of substandard sections of pavement. The amount of the contribution is determined by considering the existing condition of that road, its classification, the cost of road repairs on the specific length and the relative increase in heavy vehicle usage of the road generated by the development. The request for a contribution for road wear is therefore based on analytical calculation, using a Pavement Management System.

Council Example.

Baulkham Hills Shire Council has used Section 94 funds (rate per tonne extracted) for road upgrading and maintenance, for a development at Maroota.

8.7 Examples.

8.7.1 Method of calculating lump sum payments.

Consider the project - add two lanes to a main road, needed by 1995.

The project is not in the current 1990 RTA development program. The best estimate is that the project would be constructed by about the year 2000 if the development did not proceed.

Therefore the cost to the RTA of $3M (1990 $) would be advanced from the year 2000 budget to 1995.

A dollar in 1990 is worth $0.71299 in 1995, and $0.50835 in the year 2000 (assuming a 7% discount rate).

The additional cost (in 1990 $) for advancing works is.

$3M x (1 - 0.71299) = $3M x (0.28701) (in 1995$)

and $3M x (1 - 0.50835) = $3M x (0.49165) (in 2000$)

The net present cost to the RTA of advancing the project is:

$3M x (0.49165 - 0.28701).

= $3M x 0.20464.

= $614,000.

Alternatively, if the developer made a contribution in 1995 to the cost of advancing the project by five years, the amount would be $3M x 0.28701 = $861,000 (1990 $). The developer could pay 28.7% of the project cost in 1995 (1995 $) to compensate for advancing the project by five years.

8.7.2 Calculating the cost of traffic signals and pavement maintenance.

Total capital costs:

Traffic signals	$100,000
Upgrade access road to concrete pavement	$1,000,000
Maintenance charges (over 20 year period) in $1991:	
Traffic signals (say)	$10,000 pa
Pavement maintenance (avg)	$50,000 pa

Periodic payment equivalent of capital cost:

$$PP = \frac{PV * i}{1-(1+i)^{-n}} .$$

and here:

PP = Periodic yearly payment
PV = Present Value
I = interest rate , 0.07 say
n = period/life , say 20 years.

$$PP = \frac{1{,}100{,}000 * 0.07}{1-(1+0.07)^{-20}} .$$

PP = $104,000 per year.

Total Annual Charge (7% interest rate) in $1991:

PV = $104,000 + $ 10,000 + $ 50,000.

= $164,000 for 1991 (to increase by actual inflation rate in subsequent years).

8.7.3 A development requiring an extension of an existing tunnel.

Discount rate to be used: **7%** (advice from NSW Treasury).
This calculation is in $1990.
Using the discounted cash technique the present value of an annual cost of $S for 99 years is:

$$\frac{\$S \times \left[(1+i)^{n}-1\right]}{i(1+i)^{n}} .$$

For i = 7%.

Present value = $S x 14.26.

Crew cost

Cost of maintenance crew ($/ day)	
1 leading hand tradesperson	$210
2 labourers (including truck driver)	$370
1 RTA truck	$120
Miscellaneous stores (including water cost)	$130
TOTAL	**$830**

Annual maintenance activities		
Washing tunnel walls		
Rinse	at 4 weekly intervals of 4 hours duration (13 x 4/8 = 6.5 days/year)	= 6.5 x $830 = $5395
Scrub	at 13 weekly intervals of 4 hours duration (4 x 4/8 = 2 days/year)	= 2 x $830 =$1160
Routine maintenance of lighting, ventilation, CO Monitors, etc	at 4 weekly intervals of 12 hours duration (13 x 12/8 = 19.5 days/year)	= 19.5 x $830 = $16185
Replacement of light fittings	average cost of $2600/year	=$2600
Fire security routine maintenance	$65/week (52 x 65)	= $3380
Direct Costs (Total		$29220
Electricity costs - based on costs for existing tunnels:		$26000
Therefore total annual maintenance costs		$26000 + $29220 = $55220
Present value of annual maintenance		55220 x 14.26 =$787438
Approx:		**$787500**

(It should be noted that normal maintenance charges cannot be sought as contributions under Section 94).

Major Overhaul of Equipment	
Lighting - assume a 30 year life, cost of major overhaul = $60000 present value: $60000\left(\frac{1}{1.07^{30}}+\frac{1}{1.07^{60}}+\frac{1}{1.07^{90}}\right)$. = 60000 x (0.13137 + 0.01726 + 0.00227) = 60000 x 0.1509	=$ 9050
Ventilation system - assume a 30 year life, cost of major overhaul = $30000. present value: $30000\left(\frac{1}{1.07^{30}}+\frac{1}{1.07^{60}}+\frac{1}{1.07^{90}}\right)$. = 30000 (0.13136 + 0.01725 + 0.00226) = 30000 x 0.1509 =	$ 4530
CO monitors – assume a 15 year life, cost of major overhaul = $20000. present value: $20000\left(\frac{1}{1.07^{15}}+\frac{1}{1.07^{30}}+\frac{1}{1.07^{45}}+\frac{1}{1.07^{60}}+\frac{1}{1.07^{75}}+\frac{1}{1.07^{90}}\right)$. = 20000 x (0.36244 + 0.13136 + 0.04761 + 0.01725 + 0.00625 + 0.00226) = 20000 x 0.56717 =	$11340
Painting walls - assume a 10 year life. cost of repainting = $4000. present value: $20000\left(\frac{1}{1.07^{10}}+\frac{1}{1.07^{20}}+\frac{1}{1.07^{30}}+\frac{1}{1.07^{40}}+\frac{1}{1.07^{50}}+\frac{1}{1.07^{60}}+\frac{1}{1.07^{70}}+\frac{1}{1.07^{80}}+\frac{1}{1.07^{90}}\right)$ = 4000 x (0.50834 + 0.25841 + 0.13136 + 0.06678 + 0.03394 + 0.01725 + 0.00877 + 0.00445 + 0.00226). = 4000 x 1.0316 =	$ 4130
Total present value of major overhaul =. **SAY:**	$29050 **$29000**

Summary.	
Routine annual maintenance. Major overhaul. **TOTAL**.	$787500 $29000 **$816500**

8.7.4 Construction vehicle road damage - Badgery's Creek Airport Stage 1.

Objective.

The objective of this development was to construct the first stage of Badgery's Creek Airport to a general aviation standard. The RTA's concern was primarily related to the works required to cope with heavy vehicles during the construction phase. The developer is the Federal Department of Transport and Communications. (Implementation was by agreement between the Federal and State Ministers).

Existing context.

Badgery's Creek airport site occupies an area of approximately 1,770ha and is located about 48km by road from Sydney GPO. The access roads readily available to the site are limited.

The airport site now forms part of South Creek Valley Development Area. A draft Development Plan by the NSW Department of Urban Affairs and Planning was in preparation at the time but difficulties had arisen over infrastructure costs and servicing problems.

It was proposed that South Creek Valley be developed in stages. The first stage proposed for 1992 originally involved development adjacent to Camden at the southern end of the site to accommodate up to 25,000 residents. The later stages would see development to accommodate a population of approximately 180,000 over the following 20 years.

A major transportation study undertaken by consultants for the Department of Urban Affairs and Planning resulted in a draft Major Road Network for South Creek Valley. Difficulties in financing such an extensive regional road framework were resolved.

Program of works.

The Sydney Western Region of the RTA published its 5 Year Road Development Plan prior to negotiating with the developers. This Plan did not include any major road development projects to support increased traffic from the airport site.

To accommodate the development of Badgery's Creek Airport to Stage One a number of specific proposals were required.

Details of the considerations by RTA's Sydney Region were as follows.

Network development.

F4 - Western Freeway: East facing ramps at Wallgrove Road.

The current Network Development Program indicates that construction of the east facing ramps at Wallgrove Road Eastern Creek is due to commence in the 1994/95 financial year under the ACRD funding program.

With the proposed accelerated development of the second Sydney Airport, additional funding is required to construct the Wallgrove Road ramps earlier than programmed. The completion of this interchange is necessary to cater for trips with origins and destinations in the central and northeast sectors of Sydney which will be generated by the airport. Without the assistance of these ramps, travel to and from the airport will be channelled through the intersection of the Great Western Highway and Wallgrove Road. However, this is not a desirable route as the intersection is already saturated with a current signal cycle time of 180 seconds.

These ramps will make the Western Freeway / Wallgrove Road / Elizabeth Drive route attractive to through traffic away from the Luddenham Road / Mamre Road / Erskine Park Road route.

Network development costs		
90/91	**91/92**	**TOTAL**
$1.5M	$4.6M	$6.1m

Road condition improvement.

The Northern Road.

Pavements have generally been designed and constructed for rural conditions, and would not withstand the impact of anticipated traffic growths. The proposed rehabilitation works have been directed to lengths of The Northern Road (a major access route) already showing structural distress. These lengths would suffer accelerated deterioration under the impact of construction traffic unless remedial action is taken.

Road condition improvement costs		
90/91	**91/92**	**TOTAL**
$4.8M	$2.4M	$7.2M

Intersection improvements.

The rural nature of the existing roads around the Badgery's Creek Airport site, and anticipated increases in construction and general traffic generated by the airport development, will necessitate intersection improvements at a number of sites along Elizabeth Drive and The Northern Road. These improvements will include roundabouts, channelisation, traffic passing lanes and improved geometry, as well as necessary directional signposting to BCA.

Bridge related works.

The anticipated traffic increases will also necessitate the widening of three bridges and / or their approaches along Elizabeth Drive.

Safety and traffic		
90/91	**91/92**	**TOTAL**
$3.0M	$3.7M	$6.7M

Total program of works		
90/91	**91/92**	**TOTAL**
$9.3M	$10.7M	$20.0M

State funded works.

The State has plans to undertake a number of works separate to those listed above.

Road Safety Audit.

A road safety audit will be conducted along access routes to BCA. It will cover the need for linemarking; directional, advisory and regulatory signposting; street lighting; accident profile

countermeasures; roadside furniture; roadside hazard reductions; intersection treatments (including passing lanes); bridge and culvert hazard reduction; guard rails and fences.

Works identified as necessary by the audit will be undertaken by the State.

Road rehabilitation.

Rehabilitation works are required on routes additional to The Northern Road. Elizabeth Drive west of Badgery's Creek Road and almost all of the length of Bringelly Road are in particularly poor condition. These works are planned to take place under the 3x3 and State Works Programs.

Wallgrove Road between Elizabeth Drive and The Horsley Drive is currently being reconstructed under the 3x3 Program. Works are also intended for isolated sections of Wallgrove Road between The Horsley Drive and Western Freeway.

Reporting and conclusion.

This information was provided to the Federal Department of Transport and Communications on a *no prejudice* basis. The FDT&C agreed to pay the RTA $20 million for the works required.

8.7.5 Particular arrangements: Rouse Hill Infrastructure Consortium.

This development was the first part of a potentially major development to house a population of 300,000 people in the North West Sector in Sydney. This example particularly relates to water-based services, but is useful as an example of the innovative arrangements that are possible.

(The following is based on an article by Alex Nedeljkovic, Chief Executive Officer of the Rouse Hill Infrastructure Consortium, whose permission to include this section is gratefully acknowledged).

Existing context.

The involvement of Rouse Hill Infrastructure Consortium in the North West Sector was a major initiative for private sector involvement in what have traditionally been areas of government undertaking.

The development of a new major urban release area was however, a joint cooperative effort between State Government, local government and the private sector. The Consortium's role was largely restricted to the major water-based services.

The First Stage Release Area is approximately 5,000 hectares centred principally on Rouse Hill, which has the potential for some 24,000 residential lots and approximately 6,000 industrial and commercial lots. This First Stage Release Area is the area with which the Consortium is primarily involved, although the intention is to ultimately service the whole of Rouse Hill Development Area (equivalent to some 70,000 residential lot equivalents).

Program of works.

In late 1988, the Water Board and the consortium's technical advisers, identified a series of works necessary to provide major water supply, sewerage and stormwater drainage services to the Rouse Hill Development Area. These works would normally be provided by the Water Board (for sewerage and water supply), and by councils (for stormwater drainage). Since the Rouse Hill Development Area straddles the local government areas of Blacktown and Baulkham Hills, the government decided to involve the Water Board in the major trunk stormwater drainage systems to ensure an integrated stormwater drainage system, and also to take advantage of the consortium's financing offer. The Rouse Hill Development Area, thus became a designated drainage area administered by the Water Board in accordance with its Act.

The Consortium provided funding to carry out the design, construction and commissioning of all work necessary to service the Rouse Hill Development Area, whether or not those works were located in the

area. The Consortium, working closely with the Water Board, will also design, construct and commission those works, with the Water Board retaining ownership and operation of all of the works, at all times.

The costs of works that directly service the Rouse Hill Development Area, together with the appropriate financing and holding costs, are the basis for the calculation of Section 27 contributions to the Water Board by all developers in the Rouse Hill Development Area.

The works to be constructed are spread over a program ending in the year 2005, assuming construction starts in mid 1992.

The Rouse Hill Development Area has arbitrarily been divided into 12 areas by the Consortium and the Water Board, in order to simplify administration of the works, and the letting and administration of contracts. Each area (known as a precinct) has been allocated a date for completion of all services within that precinct.

This concept provides flexibility in the staging of construction, and release, of land for development. The completion dates of all precincts can be varied to suit development demand in the Rouse Hill Development Area. Precinct 1, which contains the majority of consortium members' lands, also contains works necessary to service the remainder of the Rouse Hill Development Area, such as the proposed sewage treatment plant at Rouse Hill.

Of the total currently estimated costs of some $500 million, it is expected that the Section 27 contributions will be assessed on an estimated $350 million for the Rouse Hill Development Area. It is stressed that these figures are not final. Considerable review is being carried out on the scopes of works and estimates will be submitted on a regular basis.

Road works.

A particular agreement between the Consortium and the RTA allows for the developers in the Consortium to provide funds to bring forward required works on both local and arterial roads.

The arrangements between the Consortium and the RTA provide for the RTA to collect equivalent funds from non Consortium land owners as they develop the site. The rate of funding was $22,500 per developable hectare, indexed to CPI from March 1989.

It is suggested that particular arrangements such as used in Rouse Hill, are most useful for very large developments but could potentially be used for any development.

Section 9 Administration of the State Environmental Planning Policy No 11.

9.1 Introduction.

This section deals with the administration of the State Environmental Planning Policy No 11 - Traffic Generating Developments (SEPP 11).

It provides procedures to be followed by councils before and after a determination is made by council concerning developments listed in SEPP 11.

Figure 9.1 indicates how this Guide is used, and signifies the role of the RTA in the development process.

9.2 Legislation.

9.2.1 Transport Administration Act 1988.

In accordance with the Transport Administration Act 1988 (s52A), the RTA has the responsibility of:

- reviewing traffic arrangements in the State and formulating / adopting proposals for the improvement of such arrangements.
- establishing general standards and principles in connection with the design and provision of traffic control facilities.
- establishing priorities for carrying out activities, works or services that are items of approved expenditure.
- promoting traffic safety.
- coordinating the activities of public authorities which are directly involved in matters connected with RTA functions.

The RTA therefore functions as the central point of reference for traffic matters. It has a responsibility to provide advice about a development's impact on traffic generation, and to provide guidelines on vehicular movement and parking requirements for such developments.

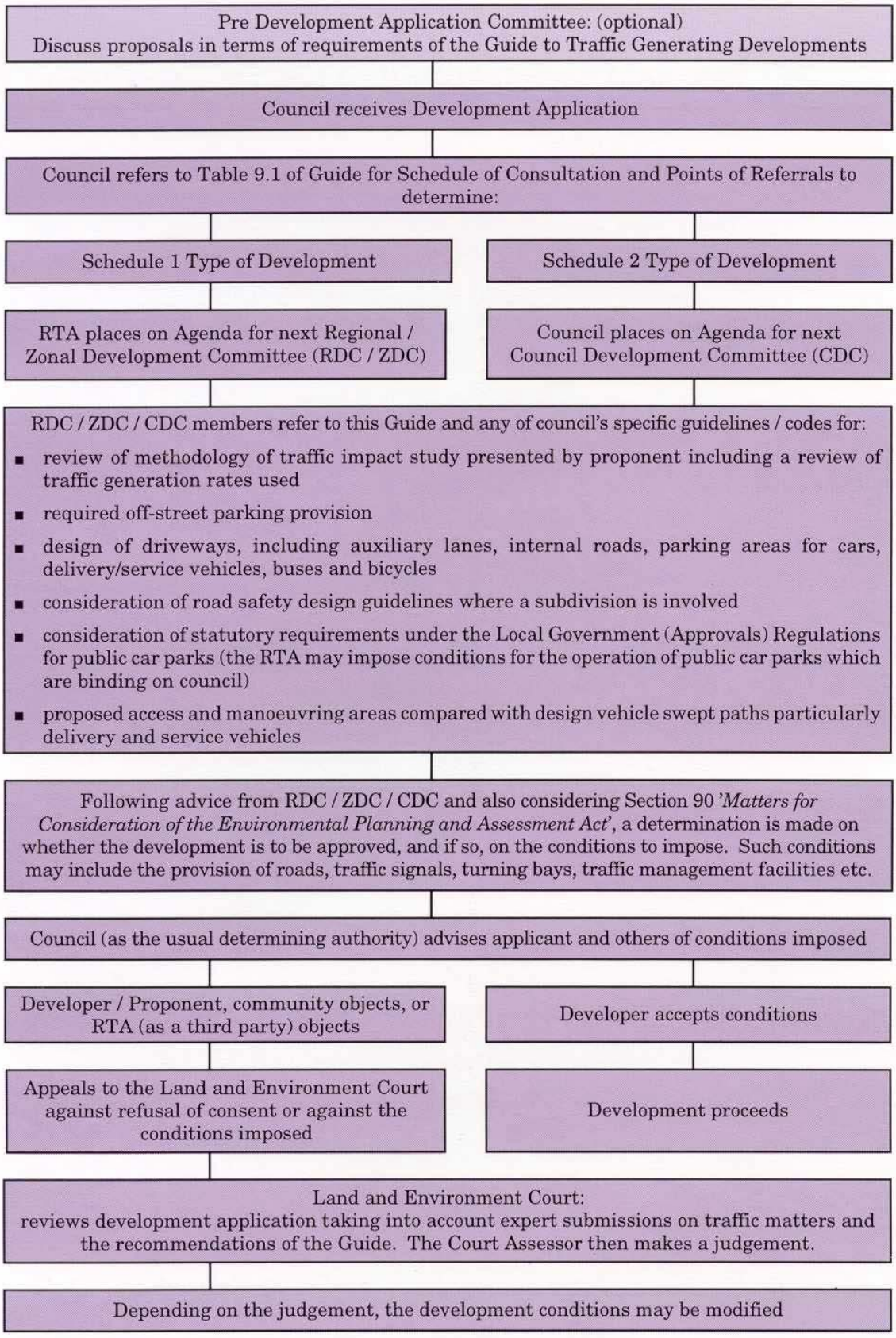

Figure 9.1 Use of the Guide and the RTA role in the Development Process.

9.2.2 Environmental Planning and Assessment Act 1979.

The SEPP 11 was developed under the Environmental Planning and Assessment (EP&A) Act.

The aim of the SEPP 11 is to notify the RTA of developments known to have significant traffic and safety effects, and to give the RTA an opportunity to make representations concerning these developments.

SEPP 11 overrides the provisions in existing planning instruments. It does not, however, affect councils in terms of their responsibilities under Section 90 of the EP&A Act.

Note: Because of the recent changes to the Local Government Act (see below), any development matter which includes the construction of a public car park may be dealt with as a SEPP 11 matter. Depending on the size of the public car park (Schedule 1 or 2), the development will be dealt with by the appropriate Development Committee.

9.2.3 Local Government Act 1993.

Effective 1st July 1993, the Local Government Act 1919 and related Ordinances were repealed and a new Local Government Act 1993 and Local Government (Approvals) Regulation 1993 introduced. The new legislation has the following impact in so far as public car parks (previously known as parking stations) are concerned.

The following legislation is effective as from 1st July 1993:

- sections 270J/JA/JB under the Local Government Act 1919 dealing with the construction of car parking stations have been repealed.
- ordinance 34B under Local Government Act 1919 dealing with the operation of parking stations has been repealed.
- part 6, Division 1 - public car parks of the Local Government (Approvals) Regulation 1993, replaces the above repealed legislation to some extent. Under this new legislation RTA's concurrence with Council's approval to operate public car parks, is required under Clause 127.
- council is required (under Clauses 114 to 126) to take into consideration certain matters in determining whether to approve the operation of a public car park.

Note that RTA's concurrence is also required for applications to change free or tenant parking area to operate as a public car park.

9.3 Consultation procedures.

Consultation is to be carried out at the local or regional / zonal level, in keeping with RTA policy on dealing with traffic and related matters at levels appropriate to the scale of the development.

The consultation procedure is shown in Figure 9.2.

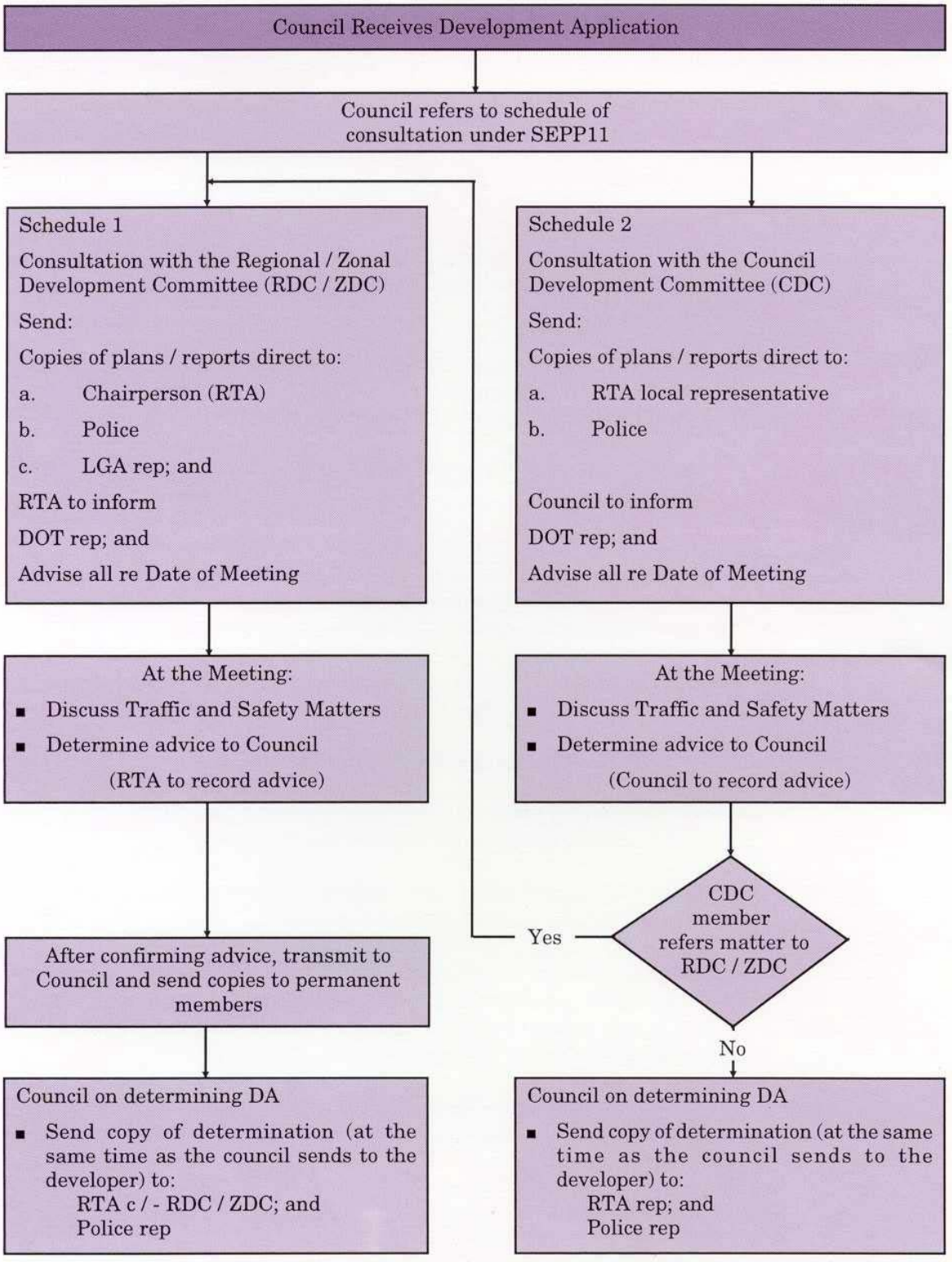

Figure 9.2 Consultation Process.

Delegations.

There are no formal delegations from the RTA regarding development committees. The SEPP 11 requires councils to consult with the RTA on all Development Applications on land uses listed in Schedules 1 and 2 of the SEPP 11 (see Appendix A). The SEPP 11 requires that council:

- dispatch all relevant information to the RTA within 7 days of receiving a development application so that it can provide advice to councils on the traffic and safety implications of the proposed development within 21 days.
- send a copy of the determination to the RTA.

These requirements are fulfilled when:

- a development matter is referred to a Council Development Committee (see Table 9.1), and Council consults representatives of that Committee and considers the advice in the determination.
- a development matter is referred to a Regional / Zonal Development Committee (see Table 9.1), and Council consults with the Committee and considers the advice in the determination of the matter.

It is essential that the RTA be advised of Council's determination of a Development Application so that the effectiveness of advice given may be assessed, and the incremental impact of the development monitored. This process enables the RTA to review its policy on the matter.

Circulars will be issued from time to time by the RTA to indicate any change to procedures for consultation.

Schedule of Consultation and points of referral

Table 9.1 lists the schedule of consultation and points of referral. Table 9.2 shows the schedule of consultation for those developments not listed in either Schedule 1 or Schedule 2 of SEPP 11.

Table 9.1
Schedule of consultation and points of referral.

Item	Type of Development	Scale of Development	SEPP 11 Schedule No.
1	Residential Flat- Building *New/E/E	75 to 300 dwellings	2
		More than 300	1
2	Retail *New/E/E	500m^2 to 2000m^2GFA	2
		more than 2000m^2GFA	1
3	Retail and Commercial *New/E/E	1000m^2 to 4000m^2GFA	2
		more than 4000m^2 GFA	1
4	Commercial *New/E/E	5000m^2 to 20000m^2GFA	2
		more than 20000m^2 GFA	1
5	Commercial and Industry *New/E/E	4000m^2 to 15000m^2 GFA	2
		more than 15000m^2 GFA	1
6	Industry *New/E/E	5000m^2 to 20000m^2 GFA	2
		more than 20000m^2 GFA	1

Item	Type of Development	Scale of Development	SEPP 11 Schedule No.
7	Residential Subdivision *New/E/E	50 to 200 allotments	2
		more than 200 allotments	1
8	a) Tourist Faclities b) Recreational Facilities c) Showgrounds d) Sportsgrounds *New/E/E	50 to 250 car parking spaces	2
		more than 250 spaces	1
9	a) Clubs b) Hotels *New/E/E.	50 to 250 car parking spaces	2
		more than 250 spaces	1
10	a) Places of Assembly b) Places of Public Worship *New/E/E.	50 to 250 car parking spaces	2
		more than 250 spaces	1
11	a) Refreshment Rooms	more than 300m^2 GFA	2
	b) Restaurants.		
12	Drive-In Take-Away Food Outlets *New/E/E.	50 to 250 car parking spaces	2
		more than 250 spaces	1
13	Service Stations *New/E/E.	Any Scale	2
14	Motor Showrooms (*New/E/E)	More than 50 car parking spaces.	2
15	Hospitals *New/E/E	100 to 250 car parking spaces	2
		more than 250 spaces	1
16	Roadside Stalls	Any Scale	2
17	Educational Establishments *New/E/E	50 to 500 students	2
		more than 500 students	1
18	Drive-In Theatres *New/E/E.	Any Scale	1
19	a) Transport Terminals b) Bulk Stores d) Liquid Fuel Depots *New/E/E	less than 4000m^2 GFA or site area	2
		more than 4000m^2 2GFA or site area	1
20	a) Junk Yards b) Waste Disposal Depot (*New/E/E).	Any Scale	1

Item	Type of Development	Scale of Development	SEPP 11 Schedule No.
21	a) Heliports b) Airports c) Aerodromes (*New/E/E).	Any Scale	1
22	a) Extractive Industry b) Mining (*New/E/E).	Any Scale	1
23	Parking Area	50 to 250 car spaces	2
		more than 250 car parking spaces.	1

*New/E/E = New or Extension or Enlargement.

Note:

Schedule 1 developments are those developments with scale as indicated, regardless of where the access is and are referred to the Regional/Zonal Development Committees.

Schedule 2 developments are those developments with scale as indicated and having access to an arterial road or a road connecting with an arterial road, if the access is within 90 metres of the alignment of the arterial road and are referred to the Council Development Committees.

Table 9.2
Other developments not listed in schedules 1 or 2.

Land Use	Relevant Item Number in Table 9.1
Housing for aged/disabled	Residential (Item 1)
Motels	Hotels (Item 9)
Shopping centre	Retail (Item 2)
Convenience store	Service Stations (Item 13)
Car tyre retail outlets	Retail (Item 2)
Restaurants	Refreshment Rooms (Item 11)
Truck stops	Transport Terminals Etc (Item 19)
Factories	Industry (Item 6)
Warehouses	Industry (Item 6)
Video stores	Retail (Item 2)
Bulky goods stores	Retail (Item 2)
Child care centres	Educational Establishments (Item 17)

Land Use	Relevant Item Number in Table 9.1
Extended hours medical centres	Retail (Item 2)
Gymnasiums	Recreation (Item 8)
Markets	Retail (Item 2)
Professional consulting rooms	Commercial (Item 4)
Public car parks	Parking Area (Item 23)

Note: If a proposed development is not listed in Schedules 1 or 2 above, it may be referred to the Regional / Zonal Development Committee for consideration.
Where the increment for a development is greater than 10% in terms of traffic generation, the development should be examined as a whole, incorporating the original development and then referred to the appropriate committee.

Consultation on development matters outside the policy.

Development Applications for development proposals not specified, and which are of a scale less than that shown in Schedules 1 and 2 of SEPP 11, do not require consultation with the RTA. Council may however recommend consultation if it believes the proposal has special features which under Section 90 should be referred to the RTA (or Council or Regional / Zonal Development Committees) for advice.

Councils are encouraged to seek advice from RTA regional / zonal offices (when necessary) concerning the following matters:

- local environmental studies.
- draft local environmental plans.
- development control plans.

Consultation prior to lodgement of Development Application.

Council may consult with Regional / Zonal offices of the RTA (and the police) on any development matter before a Development Application is lodged by a developer. The developer may be required to attend such a meeting.

Schedule of consultation and points of referral.

Table 9.1 lists the schedule of consultation and points of referral.

Table 9.2 shows the schedule of consultation for those developments not listed in either Schedule 1 or Schedule 2 of SEPP 11.

9.4 Committee structure for administration of the SEPP 11.

The administration of the SEPP 11 consists of a two-level structure of advisory committees. These are:

Regional / Zonal Development Committee.

Council Development Committee.

Under SEPP 11 Council is required to consult with the relevant committee on development matters listed in SEPP 11, and send a copy of any determination about a development matter to the committee.

9.4.1 Regional / Zonal Development Committee.

Regional / Zonal Development Committees are created by the RTA to advise councils on its behalf.

A Regional / Zonal Development Committee consists of the following members:

- RTA representative (Chairperson).
- Police Service representative.
- Local Government Association representative.
- Department of Transport representative (casual member).
- Transport Worker's Union (casual member).

Schedule 1 developments are referred to Regional / Zonal Development Committees.

Section 9.3 sets out the procedures for consultation with Regional / Zonal Development Committees. Following the determination of a development, (which has been considered by the Committee), Council must advise that Committee, the RTA and the police of its determination.

Regional / Zonal Committees are served by the RTA's Regions / Zones. For a list of Regional / Zonal Development Committees and councils served by each of the committees, see Appendix B.

9.4.2 Council Development Committee.

Council Development Committees advise Councils on behalf of the RTA.

A Council Development Committee consists of the following members:

- Council representative (Chairperson).
- RTA representative.
- Police Service representative.
- Department of Transport representative (casual member).

Schedule 2 developments are dealt with by Council Development Committees.

Section 9.2 sets out procedures for consultation with this Committee. It should be noted that following the determination of a Development Application (which has been considered by the Council Development Committee), Council must advise the RTA and police of its determination.

Council Development Committees are serviced by Councils.

9.5 Functions and responsibilities of organisations.

9.5.1 Planning NSW.

Under the Environmental Planning and Assessment Act 1979, planning instruments may be required to give statutory effect to planning policies, and to provide a framework for the management of urban, regional and State development.

Planning NSW has gazetted SEPP 11 to ensure that councils consult with the RTA before making a determination about a development matter known to have a significant impact on traffic and / or safety.

9.5.2 Council.

After receiving a Development Application from a developer council must ascertain whether consultation with either of the two committees is required.

If consultation is required, council must ensure that the plans contain all information required to assess the Development Application by either of the two committees. This information must include:

- location plans showing the surrounding street system.
- land uses immediate to the proposal.
- location and dimensions of driveways.
- schedules of areas of the site and the buildings.
- location of parking, loading / unloading and manoeuvring areas.
- traffic impact of the proposal and it's effect on the surrounding street system, as outlined in this Guide.

If a matter requires consultation with a Council Development Committee, council must:

- send a copy of the plan to the RTA and police representatives.
- advise representatives of the Transport NSW (or the State Transit RTA where appropriate) in writing of the subject matter of the Development Application.

If a matter requires consultation with a Regional / Zonal Development Committee council must send a copy of the plan to the Secretary of the Regional / Zonal Development Committee, the police representative and the Local Government Association representative.

Note: Council is required to carry out the above tasks within 7 calendar days of receiving a Development Application.

On matters referred to the Council Development Committee:

At a routine meeting (chaired by council) the committee should discuss the traffic and safety implications of the proposal. Matters to be considered include:

- the provision of sufficient number of parking spaces.
- the number and location of driveways in terms of safe sight distance and adequate width to cater for the type of traffic generated.
- the adequacy of the parking / servicing area provided for queuing immediate to the property boundary, so that no vehicles are forced to wait on the road or reverse into / out of the property.

- any traffic management measures or road works required by the proposal.

The Committee's decision, and any other oral advice given should be recorded. The developer may be represented at the meeting, at the Chairperson's discretion.

Council must send minutes of the meeting to permanent representatives for endorsement. On determination of a matter, council must send a copy of the determination to the RTA's Regional / Zonal Office and Police representative as per council's arrangements.

If a committee is not formally established, council may seek views directly from the permanent and casual members in lieu of a formal meeting. Before council prepares advice on behalf of the RTA however, such advice must be confirmed by the permanent members by phone, fax or letter.

On matters referred to Regional / Zonal Development Committees.

After receiving advice from a Regional / Zonal Development Committee council should consider such advice in the context of Section 90 of the Environmental Planning and Assessment Act 1979. After reaching a determination council should send a copy of the determination to the RTA's Regional or Zonal Office and police representative as per Council's arrangements.

Note: .

1. Council may discuss a development matter before a Development Application is lodged. Such discussions may take place at an informal Pre Development Application meeting with the RTA, the police and the developer.

2. In respect of public car parks, Council may choose to send Development Applications to relevant committees or RTA direct if RTA concurrence to operate said car park is required at an early stage.

9.5.3 Roads and Traffic Authority.

As a member of Council Development Committee.

After receiving a Development Application the RTA must evaluate the proposal by:

- assessing the type of parking spaces provided.
- estimating the amount of traffic generated, and its impact on the surrounding street network.
- evaluate the need for new traffic management measures or road works, including whether access control may be required.
- any other related matter.

At the meeting, the Development Application should be discussed in terms of the above considerations. Council must then be advised of any matters to be considered in the determination of the proposal.

When the RTA (Regional / Zonal Office) receives a copy of Council's determination of a matter, it must evaluate the advice and inform Council if an appeal is likely to be lodged.

As a convenor of Regional / Zonal Development Committee:

After receiving a copy of the development plans / papers from Council, the RTA must ensure that all the relevant information is included and then inform casual members about the proposal and date of the meeting.

At the meeting the proposal should be discussed in terms of its traffic and safety implications. The RTA must prepare minutes of the meeting and note any objections.

The developer may be represented at the meeting, at the discretion of the Chairperson.

After confirmation of the minutes, the RTA must prepare the advice tendered, and send copies of such advice to Council and the permanent members.

When the RTA's Regional / Zonal office receives a copy of Council's determination of a matter, the RTA should study the determination and inform Council if an appeal is likely to be lodged.

Note:

1. The RTA may discuss a development matter before a Development Application is lodged. Such discussions may take place at an informal Pre-Development Application meeting with Council, police and the developer.

2. In respect of development applications for a public car park, the RTA will advise Councils directly of its concurrence to operate a public car park. Any conditions which the RTA may impose will be on the basis of consultations with Development Committees.

9.5.4 Police Service.

As a member of Council Development Committee.

After receiving a copy of a Development Application it is recommended that the Police Service representative evaluate the proposal for:

- the number and location of driveways (site visit is necessary).
- adequacy of parking / servicing area, including manoeuvrability.
- any other related matter.

At the meeting the Development Application should be discussed in terms of the above considerations. Council must then be advised of any matters to be considered in the determination of the proposal.

As a member of the Regional / Zonal Development Committee.

After receiving a copy of a Development Application the Police Service representative must evaluate the proposal for:

- adequacy of number and location of driveways (site visit is necessary).
- adequacy of parking / servicing area, including manoeuvrability.
- any other related matter.

9.5.5 Local Government and Shires Associations.

The Local Government and Shires Associations is represented on all Regional / Zonal Development Committees, as a permanent member.

It is the Associations' responsibility to nominate a permanent member of each of the Regional / Zonal Development Committees.

This nominee provides advice on:

- the internal arrangements of a development proposal.
- parking requirements, including the implication of a variation to Council code.
- any other matters of concern, including the implications of the approval or refusal of a Development Application.

9.5.6 Transport NSW.

Transport NSW's representative (State Transit Authority or DOT staff) provides oral or written advice on public passenger transport matters associated with any proposal. This representative's attendance at meetings is optional.

9.5.7 Transport Workers' Union.

The Transport Workers' Union may be requested (by Council or the RTA) to provide oral or written advice on heavy vehicle requirements and the effect these vehicles have on the road system. This representative's attendance at meetings is optional.

9.6 Appeals.

The RTA, the police or any member of a Development Committee may appeal directly to the Land and Environment Court as a 'third party' (under Section 123 of the EP&A Act). An appeal may be lodged if there is a breach of the EP&A Act, for example, if Council did not give proper consideration to the advice given to it.

Under SEPP 11, Council is required to send a copy of the determination of developments listed in SEPP 11 to the RTA's Regional / Zonal Offices and the police at the same time that Council notifies the applicants pursuant to Section 92 of the EP&A Act. This facilitates the process of lodging an appeal.

If Council's determination is contrary to advice given to it by Council / Regional / Zonal Development Committees, then Council should ascertain the RTA's or police views on the likelihood of an appeal. If an appeal is likely the applicant should be notified.

An appeal may also be lodged under Section 98 of the EP& A Act if the RTA or Police was an objector to a designated development at the time of the Development Application.

Appendix A: SEPP 11.

State Environmental Planning Policy No. 11
Traffic Generating Developments.

Citation.

1. This State environmental planning policy may be cited as "State Environmental Planning Policy No.11 Traffic Generating Developments".

Aims, objectives, etc.

2. The aims, objectives, policies and strategies of this Policy are to ensure that the Roads and Traffic Authority.

(a) is made aware of; and.

(b) is given an opportunity to make representations in respect of, developments referred to in Schedule 1 or 2.

Interpretation.

3. (1) In this Policy, except in so far as the context or subject matter otherwise indicates or requires- "arterial road" means-.

(a) a road shown on a map or an environmental planning instrument by-.

(i) a continuous or intermittent red line on white between firm black lines;

or.

(ii) a broken red band on white between black lines:

(b) a road proclaimed to be a main road under either the Roads Act 1993; and.

(c) a road declared to be a secondary road under the Roads Act 1993;

"roadside stall" means a building or place where only primary products produced on the property on which the building or place is situated are exposed or offered for sale;

"Roads and Traffic Authority " means the Roads and Traffic Authority of New South Wales.

(2) A reference in Schedule 1 or 2 to the erection of a building does not include a reference to the making of structural alterations to the building, except where the structural alternations have the effect of increasing the gross floor area beyond the figure specified in Schedule 1 or 2 in relation to the building.

Application of Policy.

4. This Policy applies to the State.

Certain provisions in environmental planning instruments to be of no force or effect.

5. A provision contained in any other environmental planning instrument requiring a consent authority, before determining a development application, to consult with and to take into consideration in determining that application any representations of the Police Service or the Roads and Traffic Authority shall, to the extent only of the requirement, be of no force or effect.

Model Provisions.

6. The definitions in clause 4(1) of the Environmental Planning and Assessment Model Provisions, 1980 (except for the definitions of 'arterial road', 'general store', 'main road' and 'roadside stall') are adopted for the purposes of this Policy.

Development applications to be referred to the Roads and Traffic Authority.

7. (1) Subject to subclause (2), this clause applies to applications for development consent to carry out development specified in Schedule 1 or 2.

(2).Where the Roads and Traffic Authority has notified a consent authority that this clause does not apply to a development application (whether by reference to the type, purpose or location of the development the subject of the application or otherwise) this clause shall not apply to that development application.

(3).Where a consent authority receives a development application to carry out development specified in Schedule 1, the consent authority shall, within 7 days of its receipt of the application, forward a copy of the application to the Roads and Traffic Authority

(4). Where a consent authority receives a development application (other than a development application to which subclause (3) relates) to carry out development specified in Schedule 2, being development on or of land that has direct vehicular or pedestrian access to-.

(a) an arterial road; or.

(b) a road connecting with an arterial road, if the access is within 90 metres (measured along the road alignment of the connecting road) of the alignment of the arterial road, the consent authority shall, within 7 days of its receipt of the application, forward a copy of the application to the Roads and Traffic Authority

(5) Where a copy of a development application has been forwarded to the Roads and Traffic Authority pursuant to subclause (3) or (4), the consent authority shall not determine the application until-.

(a).it has received a representation with respect to the application from the Roads and Traffic Authority, or.

(b).the Roads and Traffic Authority has informed the consent authority that it does not wish to make any representation with respect to the application; or.

(c).21 days have elapsed after the date on which the copy of the application was forwarded to the Roads and Traffic Authority;

whichever first occurs.

(6).The consent authority shall forward to the Roads and Traffic Authority a copy of any determination of a development application referred to in subclause (3) or (4) when giving notice of that determination to the application pursuant to section 92 of the Act.

SCHEDULE 1

Development for the purpose of or being -.

(a).the erection of, or conversion of a building into, a residential flat building comprising 300 or more dwellings or the enlargement of extension of a residential flat building by the addition of 300 or more dwellings;

(b).the erection of a building for the purposes of shops where the gross floor area of the building is or exceeds 2,000 square metres or the englargement or extension of a building used for the purposes of shops where the gross floor area of the enlargement or extension is or exceeds 2,000 square metres;

(c).the erection of a building for the purposes of shops and commercial premises where the gross floor area of the building is or exceeds 4,000 square metres or the enlargement or extension of a building used for the purposes of shops and commerical premises where the gross floor area of that enlargement or extension is or exceeds 4,000 square metres;

(d).the erection of a building for the purposes of commercial premises where the gross floor area of the building is or exceeds 10,000 square metres or the enlargement or extension of a building used for the purposes of commerical premises and industry where the gross floor area of that enlargement or extension is or exceeds 10,000 square metres;

(e). the erection of a building for the purposes of commercial premises and industry where the gross floor area of the building is or exceeds 15,000 square metres or the enlargement or extension of a building used for the purposes of commerical premises and industry where the gross floor area of that enlargement or extension is or exceeds 15,000 square metres;

(f).the erection of a building for the purposes of industry where the gross floor area of the building is or exceeds 20,000 square metres or the enlargement or extension of a building used for the purposes of industry where the gross floor area of that enlargement or extension is or exceeds 20,000 square metres;

(g).subdivision of land into 200 or more allotments where the subdivision includes the opening of a public road;

(h).drive-in theatres of the enlargement or extension of existing drive-in theatres so as to enable the accommodation of more than 200 motor vehicles;

(i).educational establishments accommodating 50 or more students or the enlargement or extension of existing educational establishments to accommodate an additional 50 or more students;

(j).transport terminals, bulk stores, container depots or liquid fuel depots or the enlargement or extension of any existing transport terminal bulk store, container depot or liquid fuel depot by increasing by more than 8,000 square metres the area of land or the gross floor area of buildings used for that purpose;

(k).junk yards or depots or regional depots, within the meaning of the Waste Disposal Act, 1970;

(l).heliports, airports or aeordromes;

(m).extractive industry or mining;

(n). areas used exclusively for parking or any other development having ancillary accommodation for 200 or more motor vehicles, or the enlargement or extension of a parking area where the enlargement or extension accommodates 200 or more motor vehicles.

SCHEDULE 2

Development for the purposes of or being -

(a).the erection of, or the conversion of a building into, a residential flat building comprising 75 or more dwellings or the enlargement or extension of a residential flat building by the addition of 75 or more dwellings;

(b).the erection of a building for the purposes of shops where the gross floor area of the building is or exceeds 500 square metres or the enlargement or extension of a building used for the purposes of shops where the gross floor area of that enlargement or extension is or exceeds 500 square metres;

(c). the erection of a building for the purposes of shops and commercial premises where the gross floor area of the building is or exceeds 1,000 square metres or the enlargement or extension of a building used for the purposes of shops and commerical premises where the gross floor area of that enlargement or extension is or exceeds 1,000 square metres;

(d).the erection of a building for the purposes of commercial premises where the gross floor area of the building is or exceeds 5000 square metres or the enlargement or extension of a building used for the purposes of commerical premises where the gross floor area of that enlargement or extension is or exceeds 5000 square metres;

(e).the erection of a building for the purposes of commercial premises and industry where the gross floor area of the building is or exceeds 4,000 square metres or the enlargement or extension of a building used for the purposes of commercial premises and industry where the gross floor area of that enlargement or extension is or exceeds 4,000 square metres;

(f).the erection of a building for the purposes of industry where the gross floor area of the building is or exceeds 5,000 square metres, or the enlargement or extension of a building used for the purposes of industry where the gross floor area of that enlargement or extension is or exceeds 5,000 square metres;

(g).subdivision of land into 50 or more allotments;

(h).tourist facilities, recreation facilities, showgrounds or sportsgrounds, each case having accommodation for 50 or more motor vehicles or the enlargement or extension of any existing tourist facilities, recreation facilities, showgrounds or sportsgrounds where that enlargement or extension includes accommodation for 50 or more motor vehicles;

(i).premises licensed under the Liquor Act, 1982, or the Registered Clubs Act, 1976, in each case having accommodation for 50 or more motor vehicles or the enlargment or extension of any such premises where the enlargement or extension includes accommodation for 50 or more motor vehicles;

(j).places of assembly or places of public worship, in each case having accommodation for 50 or more motor vehicles, or the enlargement or extension of any existing places or assembly or places of public worship where that enlargement or extension includes accommodation for 50 or more vehicles;

(k).the erection of a building for the purposes refreshment rooms where the gross floor area of that building is or exceeeds 300 square metres or the enlargement or extension of a building used for the purposes of refreshment rooms where the gross floor area of that enlargement or extension is or exceeds 300 square metres;

(l).drive-in take-away food outlets;

(m).service stations (including service stations which have retail outlets);

(n).motor showrooms having accommodation for 50 or more motor vehicles, or the enlargement or extension of any existing motor showrooms where that enlargement or extension includes accommodation for 50 or more motor vehicles;

(o).the erection of a building for the purposes of a hospital with accommodation for 100 or more beds or the enlargement or extension of a building for the purposes of a hospital where that enlargement or extension provides accommodation for 100 or more beds;

(p).roadside stall;

(q).areas used exclusively for parking or any other development, in each case having ancillary accommodation for 50 or more motor vehicles, or the enlargement or extension of a parking area where the enlargement or extension accommodates 50 or more motor vehicles.

Appendix B: Council Membership on Regional / Zonal Development Committees

Sydney Regional Development Committee.

C / - Roads and Traffic Authority
PO Box 558
BLACKTOWN 2148

Ashfield	Canterbury	Liverpool	South Sydney
Auburn	Fairfield	Manly	Strathfield
Bankstown	Hawkesbury	Marrickville	Sutherland
Baulkham Hills	Holroyd	Mosman	Sydney
Blacktown	Hornsby	North Sydney	Warringah
Blue Mountains	Hunters Hill	Parramatta	Waverley
Botany Bay	Hurstville	Penrith	Willoughby
Burwood	Kogarah	Pittwater	Woollahra
Camden	Ku-ring-gai	Randwick	
Campbelltown	Lane Cove	Rockdale	
Canada Bay	Leichhardt	Ryde	

Hunter Regional Development Committee.

C / - Roads and Traffic Authority
P.O. Box 3059, Darby Street
NEWCASTLE 2300

Cessnock	Merriwa
Dungog	Murrurundi
Gloucester	Muswellbrook
Gosford	Newcastle
Great Lakes	Port Stephens
Greater Taree	Scone
Lake Macquarie	Singleton
Maitland	Wyong

Northern Regional Development Committee.

C / - Roads and Traffic Authority
PO Box 576
GRAFTON 2460

Armidale Dumaresq	Glen Innes	Lismore	Richmond Valley
Ballina	Grafton	Maclean	Severn
Barraba	Gunnedah	Manilla	Tamworth
Bellingen	Guyra	Nambucca	Tenterfield
Bingara	Hastings	Nundle	Tweed
Byron	Inverell	Parry	Uralla
Coffs Harbour	Kempsey	Pristine Waters	Walcha
Copmanhurst	Kyogle	Quirindi	Yallaroi

Western Regional Development Committee.

C / - Roads and Traffic Authority
PO Box 334
PARKES 2870

Bathurst	Cobar	Gilgandra	Orange
Blayney	Coolah	Lachlan	Parkes
Bogan	Coonabarabran	Lithgow	Rylstone
Bourke	Coonamble	Moree Plains	Un-Incorporated Area
Brewarrina	Cowra	Mudgee	Walgett
Broken Hill	Dubbo	Narrabri	Warren
Cabonne	Evans	Narromine	Weddin
Central Darling	Forbes	Oberon	Wellington

Southern Regional Development Committee

C / - Roads and Traffic Authority
PO Box 477
WOLLONGONG EAST 2520

Bega Valley	Goulburn	Shellharbour	Wingecarribee
Bombala	Gunning	Shoalhaven	Wollondilly
Cooma-Monaro	Kiama	Snowy River	Wollongong
Crookwell	Mulwaree	Tallaganda	Yarrowlumla
Eurobodalla			

South Western Regional Development Committee.

C / - Roads and Traffic Authority.
PO Box 484 WAGGA WAGGA 2650

Albury	Corowa	Jerilderie	Tumut
Balranald	Culcairn	Junee	Urana
Berrigan	Deniliquin	Leeton	Wagga Wagga
Bland	Griffith	Lockhart	Wakool
Boorowa	Gundagai	Murray	Wentworth
Carrathool	Harden	Murrumbidgee	Yass
Conargo	Hay	Narrandera	Young
Coolamon	Holbrook	Temora	
Cootamundra	Hume	Tumbarumba	

Section 10 Reference Material

10.1 Glossary.

The definitions used in this Guide are given below.

For the most part they are those applying to the Environmental Planning and Assessment Act 1979 or those currently in use by AUSTROADS or Australian Standards.

The definitions used in this Guide are given below. For the most part they are those applying to the Environmental Planning and Assessment Act 1979 or those currently in use by Austroads or Australian Standards.

Aged person: a person aged 55 years or over.

(Source: *State Environmental Planning Policy No. 5*).

Annual average daily traffic volume (AADT): the estimated yearly total of traffic movements divided by 365.

Bulky goods retail store: a shop selling homewares, such as furniture, electrical appliances and lighting, or material for the home, such as carpet and building materials.

Car tyre retail outlet: a building or place used for the purpose of retailing and fitting tyres to motor vehicles or agricultural machinery.

Carriageway: that portion of the road assigned to the use of vehicles, inclusive of shoulder and auxiliary lanes.

Circulation roadway: a roadway which is used solely for circulation and to gain access to parking aisles.

Child care centre: a building or premises owned, leased or subleased by private or public sectors to provide child minding services under the provision of Part VII of the Child Welfare Act, 1939. The centre may provide preschool care, long day care, before / after school care or a combination of both.

Club: a building used by persons associated, or by a body incorporated, for social, literary, political, sporting, athletic or other lawful purposes whether of the same or of a different kind and whether or not the whole or a part of such building is the premises of a club registered under the Registered Clubs Act, 1976.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Commercial premises: a building or place used as an office or for other business or commercial purposes, but does not include a building or place elsewhere specifically defined or a building or place used for a purpose elsewhere specifically defined.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Container depot: a road transport terminal where one or more of the following operations are performed. These include:

- unloading of containers for the purpose of delivery to individual consignees.
- consolidation of goods from different consignors into full container loads for despatch.
- repair, refitting and / or storage.

Convenience store: a drive-in retail facility, usually developed by the modification of an existing service station, which combines petrol and other goods retailing, with hours of operation extending beyond normal retail hours.

Designated development: any development that is likely to have significant impact on the environment and which is subject to special development control procedures.

(Source: *Environmental Planning and Assessment Act, 1979*.).

Driveway: that part of the vehicular access on a road lying between the edge of the carriageway and the abutting property boundary.

Driveway width: the width of the driveway measured along the abutting property boundary.

Drive-in liquor store: premises licenced for retail under the Liquor Act 1982, where customers drive their motor vehicles to and from the point of sale.

Drive-in take away food outlet: a refreshment room where the emphasis is on fast service, with or without provision for the consumption of food on the premises. Drive-in take-away food outlets can be developments where customers park their vehicles on-site and walk to the food outlet for service or where customers stay in their vehicles to give their orders and wait for their delivery.

Dwelling: a room or suite of rooms occupied or used or so constructed or adapted as to be

capable of being occupied or used as a separate domicile.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Dwelling house: a building containing one, but no more than one dwelling.

Environmental capacity: the volume of moving vehicles which can be accommodated in a street or area, having regard to the need to maintain environmental standards.

Extended hours medical centres: centres for professional practice by health care professionals, which are not professional consulting rooms. Extended hours medical centres are those centres with hours of operation extending beyond normal business hours.

Factory: a place or building used for the purpose of industry where industry means:

- any manufacturing process within the meaning of the Factories, Shops, and Industries Act, 1962.
- the breaking up or dismantling of goods or articles for trade, sale, gain or as ancillary to any business.

Fast food outlet: a building or leased premises used as an eat-in fast food restaurant which provides fast service for eat-in, drive-through or take-away services (see also drive-in take-away food outlet).

Floor: that space within a building which is situated between one floor level and the floor level above, or if there is no floor above, the ceiling or roof above.

Gross floor area: the sum of the areas of each floor of a building where the area of each floor is taken to be the area within the outer face of the external enclosing walls as measured at a height of 1400 millimetres above each floor level excluding:

- columns, fin walls, sun control devices and any elements, projections or works outside the general line of the outer face of the external wall.

- lift towers, cooling towers, machinery and plant rooms, and ancillary storage space and vertical air-conditioning ducts.
- car-parking specificationswhich meet requirements of council and internal access thereto.
- space for the loading and unloading of goods.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Gross leasable floor area: the sum of the area of each floor of a building where the area of each floor is taken to be the area within the internal faces of the walls, excluding stairs, amenities, lifts corridors and other public areas but including stock storage area.

Gymnasium: a building, a room or a number of rooms used for organised, instructed, indoor exercise typically including aerobics, weight / circuit training and similar activities. Ancillary activities such as health care services, spa / sauna and a small clothing / apparel sales area are commonly provided within gymnasiums. However specialised facilities such as squash and tennis courts are separate and auxiliary to the gymnasium usage.

Health care professional: a person who renders professional health services to members of the public, and includes:

- a chiropodist registered under the Chiropodists Registration Act, 1962.
- a chiropractor or an osteopath of a chiropractor and osteopath registered under the Chiropractic Act, 1978.
- a physiotherapist registered under the Physiotherapists Registration Act, 1945.
- an optometrist registered under the Optometrist Act, 1930.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

High density residential flat building: a multi-level building containing 20 or more dwellings. These buildings are usually more than five levels, have secure basement level car parking and are located in close proximity to public transport services.

Hospital: a building or place used as a:

- general hospital.
- sanatorium.
- health centre.
- nursing home.
- home for aged, infirm, incurable or convalescent persons.

A hospital may be public or private, and include a shop or dispensary used in conjunction therewith, but does not include an institution.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Hostel: a hostel housing aged or disabled persons where cooking, dining, laundering, cleaning and other facilities are provided on a shared basis and where nursing and social services are provided for residents on a full-time basis.

(Source: *Environmental Planning Policy No. 5*.).

Hotel: any premises specified in a hotelier's licence granted under the Liquor Act, 1982.

Housing for aged or disabled persons: residential accommodation which may take any building form, which is or is intended to be used permanently as housing for the accommodation of aged or disabled persons. The hostel may consist of residences or a grouping of 2 or more self-contained dwellings and include any of the following facilities:

- accommodation for staff.
- chapels.
- medical consulting rooms.
- meeting rooms.
- recreation facilities.
- shops.
- therapy rooms.
- any other facilities for the use or benefit of aged persons or disabled persons.

(Source: *State Environmental Planning Policy No. 5*.).

Incremental development: development which may occur in stages, whereby a developer extends or intends to extend a development at some time in the future.

Industry:

- any manufacturing process within the meaning of the Factories, Shops and Industries Act, 1962.
- the breaking up or dismantling of any goods or any article for trade or sale or gain or as ancillary to any business. (Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Main road: a main road within the meaning of the Roads Act 1993.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Major road: an arterial or sub-arterial road; where:

- arterial road means a road that predominantly carries through traffic from one region to another forming principal avenues of communication for metropolitan traffic movements. They are usually part of the proclaimed Main Roads system, including highways and freeways. Freeways are those roads having full access control and grade separated intersections, whose primary function is to service large traffic volumes.
- sub-arterial road means a road that connects the arterial roads to areas of development and carries traffic directly from one part of a region to another. It may also relieve traffic on arterial roads in some instances.

Market: a gathering of stalls in an open space, a covered area or a building in which goods are exposed for sale on a sub-regional or local basis at a frequency of generally between once a week to once a month.

Medical centre (extended hours): a building with a subdivision of rooms being used by legally qualified general medical practitioners, dentists within the meaning of the Dentists Act, 1934, and registered health care professionals.

Medium density residential flat building: a building containing at least 2 but less than 20 dwellings. This includes villas, town houses, flats, semi-detached houses, terrace of row houses and other medium density developments, but does not include aged or disabled persons' housing.

Minor road: a collector or local road where:

- collector road means the road which connects the sub-arterial roads to the local road system in developed areas.
- local road means the subdivisional road within a particular developed area. Local roads are used solely as local access roads, but traffic volumes and types of vehicles will depend on the intensity and nature of the development.

Motel: a building or buildings (other than a hotel, boarding-house or residential flat building) substantially used for the overnight accommodation of travellers (and their vehicles) whether or not the building or buildings are also used for providing of meals to those travellers or the general public. (Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Motor showroom: a building or place used for the display or sale of motor vehicles, caravans or boats, whether or not motor vehicle accessories, caravans accessories or boat accessories are sold or displayed therein or thereon.

(Source: *Environmental Planning and Assessment Model Provisions 1980*.).

Parking aisle: the area of pavement used by cars to gain access to parking spaces, and to manoeuvre into and out of parking spaces.

Parking space: a place set aside for occupancy by a single parked vehicle.

Place of worship: a building or place used for the purpose of religious worship, whether or not the building or place is also used for counselling, social events, instruction or religious training by a congregation or religious group.

Professional consulting rooms: a room or a number of rooms forming either the whole of or part of, attached to or within the curtilage of a dwelling-house and used by not more than three legally qualified medical practitioners or by not more than three dentists within the meaning of the Dentists Act, 1934 or by not more than three health care professionals, who practise medicine, dentistry or health care respectively, and if more than one, practise in partnership, and who employ not more than three employees in connection with that practice.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Public car park: any premises used for the purpose of accommodating vehicles of members of the public on payment of a fee.

(Source: Local Government Act 1993.).

Queuing area: area available for the storage of vehicles along an entrance driveway between the property alignment (or boundary) and the vehicular control point for the storage of vehicles.

Recreation establishment: health farms, religious retreat houses, rest homes, youth camps and the like, but does not include a building or place elsewhere specifically defined or a building or place used or intended for use for a purpose elsewhere specifically defined.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Recreation facility: a building or place used for indoor or outdoor recreation, a billiard saloon, table tennis centre, squash court, swimming pool, gymnasium, health studio, bowling alley, fun parlour or any other building of a like character used for recreation and whether used for the purpose of gain or not, but does not include a place of assembly.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Residential flat building: a building containing two or more dwellings.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Restaurant: a refreshment room where food is served to customers. It can either be licensed or unlicensed and can include cafes, tea rooms, eating houses or the like.

Road transport terminal: a building or place used for the principal purpose of the bulk handling of goods for transport by road, including facilities for the loading and unloading of vehicles used to transport those goods and for the parking, servicing and repair of those vehicles.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Roadside stall: a building or place not exceeding 20 square meters in floor space or area respectively where only primary products produced on the property on which the building or place is situated are exposed or offered for sale or sold by retail.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Schedule 1 development: a development application of such scale that it must be referred to the Regional / Zonal Development Committee.

Schedule 2 development: a development of such scale that it must be referred to Council Development Committee.

Self contained dwelling: a dwelling or part of a building, whether attached to another dwelling or not, housing aged persons or disabled persons, where private facilities for cooking, sleeping and washing are included in the dwelling or part of the building, but where clothes washing facilities or other facilities for use in connection with the dwelling or part may be provided on a shared basis.

(Source: *State Environmental Planning Policy No. 5*.).

Service centre: a development which has exclusive access to a freeway or restricted access highway and provides service and facilities to the travelling public, such as:

- petrol and diesel fuel.
- restaurant facilities.
- parking for cars, buses and trucks.
- limited emergency repair facilities.

Service station: a building or place used for the fuelling of motor vehicles involving the sale by retail of petrol, oil and other petroleum products whether or not the building or place is also used for any one or more of the following purposes:

- the sale by retail of spare parts and accessories for motor vehicles.
- washing and greasing of motor vehicles.
- installation of accessories.
- repairing and servicing of motor vehicles involving the use of hand tools (other than repairing and servicing which involves top overhaul of motors, body building, panel beating, spray painting, or suspension, transmission or chassis restoration).

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Shop: a building or place used for the purpose of selling, exposing or offering for sale by retail, goods, merchandise or materials, but does not include a building or place elsewhere specifically defined or a building or place used for a purpose elsewhere specifically defined.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Site area: the area of land to which an application for consent under the Act relates, excluding there from any land upon which the development to which the application relates is not permitted by or under the local environmental plan. (Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Tavern: any premises specified in a hotelier's licence endorsed as a tavern granted under the Liquor Act 1982.

Tourist facility: an establishment providing for holiday accommodation or recreation which may include a boat shed, boat landing facilities, camping ground, caravan park, holiday cabins, hotel, house boat, marina, motel, playground, refreshment room, water sport facilities or a club used in connection with any such activities.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Transport terminal: a building or place used as an airline terminal, a road transport terminal, a bus station or a bus depot.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

Trip: a one-way vehicular movement from one point to another excluding the return journey. Therefore a vehicle entering and leaving a land use is counted as two trips.

Truck stop: a building or place on a major road used for the principal purpose of providing support facilities for road transport vehicles. Such facilities could include the retailing of petrol / diesel, maintenance and repair facilities and overnight accommodation.

Turnout radius: the radius of the curve provided between the edge of the driveway and the edge of the carriageway.

Video store: a shop where the primary business activity is hiring video cassettes. Ancillary activities might include the retailing of video cassettes and related material.

Warehouse: a building or place used for the storage of goods, merchandise or materials pending their sale and distribution to persons engaged in the retail trade.

(Source: *Environmental Planning and Assessment Act Model Provisions 1980*.).

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Land Use Traffic Generation - Data and Analysis 3 - Licensed clubs (1979).

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Land Use Traffic Generation - Data and Analysis 5 - Fast food (1980).

Land Use Traffic Generation - Data and Analysis 6 - Motels (1979).

Land Use Traffic Generation - Data and Analysis 7 - Service stations (1979).

Land Use Traffic Generation - Data and Analysis 8 - Recreation (1980).

Land Use Traffic Generation - Data and Analysis 9 - Car Sales and Spares (1980).

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10.3 Credits.

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