

Chapter 1

Framework of the Road Planning and Design Manual

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Chapter 1 Amendments - August 2004

Revision Register

Issue/ Rev.No	Reference Section	Description of Revision	Authorised By	Date
1		First Issue	Steering Committee	Nov 2000
2	1.2	New Section 1.2 and new Figure 1.1	W.Semple	May 2001
	1.5 (Now 1.6)	Modification to Table 1.2		
		Modification to Clause 1.5.3 (now 1.6.3)		
3	1.5	Additional dot point regarding cycle and pedestrian facilities	Steering Committee	July 2001
	1.6	"DR" (District Roads) added	W.Semple	
	1.6.3	Paragraph on regional investment strategies modified		
	New	Relationship to other chapters		
4		Complete chapter reviewed	Steering Committee	August 2004



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Chapter 1

Framework of the Road Planning and Design Manual

1.1 Introduction

1.1.1 Policy

Main Roads' vision for Queensland roads is "A road system that enhances the social, cultural and environmental well-being of Queensland communities". The blueprint for this vision is contained in "Roads Connecting Queenslanders" (Main Roads 2002a).

This Planning and Design Manual is one of a suite of manuals that has been developed to assist in the delivery of this vision. There are also legislative requirements contained in the *Transport Infrastructure Act*, one of the fundamental requirements being the Chief Executive must ensure that:

- (a) the construction, maintenance and operation of the road network is carried out in accordance with the Chief Executive's published standards that are designed to achieve:

1. efficiency;
2. affordable quality;
3. cost effectiveness;

and

- (b) construction, maintenance and operation are carried out in a way that:

1. takes into account national and international benchmarks and international best practice;

2. promotes, within overall transport objectives, the safe transport of persons and goods; and
3. encourages efficient and competitive behaviour in the construction and maintenance of transport infrastructure.

This Manual has been developed to help meet these requirements and sets the policy and framework for the planning and design of new roads and existing roads to be upgraded in Queensland. It is the Department's primary technical reference for people engaged in the planning and design of roads, providing sufficient information for them to undertake their routine daily work without continual reference to other documents. **However, it has been assumed that when matters out of the ordinary are encountered, the subject will be examined in more detail by consulting relevant experts and/or using the source documents as follows (listed in order of priority):**

- Other Main Roads specialist manuals (including the Manual of Uniform Traffic Control Devices [MUTCD]);
- Austroads publications and Australian Standards;
- Lay, M.G. – Handbook of Road Technology;
- Design Guides (Manuals) from other Australian States;
- AASHTO – A Policy on Geometric Design of Highways and Streets;

- Geometric Design Guide for Canadian Roads (especially the Chapters on Philosophy and Design Consistency)

Other international design guides may be consulted where they address a particular issue in a more comprehensive way than those in the list. Other references are provided in each of the Chapters and these may also be consulted. This manual provides detailed guidance primarily on geometric standards for the planning and design of roads; it does not address all the issues associated with the overall planning and design of the whole road. The Department produces a number of other manuals to deal with other specialist areas (refer to Section 1.1.3).

The purpose of the Manual is to ensure that all road projects are built in accordance with an agreed set of corporate standards that include considerations of local circumstances. Competent planners and designers should apply this manual in an intelligent way to tailor each design to the particular circumstances of a project.

It brings together a range of information from internal Departmental Manuals and external publications from Australia and other countries. It cross-references other departmental manuals and generally does not repeat information included in them.

When clarification of any part of the manual is required, the relevant specialist personnel should be consulted (e.g. refer to the “Contents and Contact Table” at the front of this manual).

The major test for the reasonableness of a standard adopted for a particular project is that of fitness for purpose in a whole of life context. (refer to Chapter 2 of this manual). The approach of this manual is to define the processes and standards that will provide appropriate levels of fitness for purpose in the context of the investment strategies. Planners and designers should always place

this test on the conclusions that they have drawn from applying the manual and make sensible adjustments to ensure that the project truly represents fitness for purpose.

For Queensland Department of Main Roads’ projects, where non-compliance with the design requirements of this manual is proposed, written approval is first required from the Manager (Transport Planning) or Manager (Infrastructure Delivery), as relevant, of the District/s concerned. At the same time advice must also be sent to the Principal Manager (Infrastructure Design), Planning Design and Environment Division, Road System and Engineering.

1.1.2 Terminology Convention

The terminology convention adopted to provide a platform for developing a uniform understanding of Main Roads processes and the terminology used in the various pre-construction processes are defined in Chapter 1 of the Preconstruction Processes Manual (Main Roads).

It is important that planners and designers develop a common understanding to avoid any misconceptions when performing planning and design activities on Main Roads projects.

1.1.3 Relationship to Other Manuals

This manual is as comprehensive as possible in addressing the range of parameters and issues, (particularly those related to geometry), affecting the planning and design of roads. To that end, relevant sections of previously published information have been included where feasible. However, to avoid undue repetition and duplication, cross-referencing to other Manuals and Codes of Practice has been included where appropriate.

This Manual therefore forms part of a suite of publications providing comprehensive coverage of requirements for the planning and design of roads. The relevant publications are included as references in the various Chapters of this Manual and include:

- Road System Manager (formerly the Strategic Framework for Road System Asset Management);
- Pre-construction Processes Manual;
- Project Cost Estimating Manual;
- Cost Benefit Analysis Manual for Road Infrastructure Investment;
- Public Consultation Policy, Standards and Guidelines;
- Road Project Environmental Management Processes Manual;
- Environmental Legislation Register;
- Fauna Sensitive Road Design;
- Roads in the Wet Tropics;
- Cultural Heritage Manual;
- Road Landscape Manual;
- Road Traffic Noise Management: Code

of Practice;

- Pavement Design Manual;
- Pavement Rehabilitation Manual;
- Road Drainage Design Manual;
- Traffic and Road Use Management Manual;
- Manual of Uniform Traffic Control Devices (MUTCD), Qld;
- Guide to Pavement Markings;
- Roads Policy Manual;
- Standard Drawings Roads Manual;
- Guide to the Management of Roadside Advertising; and,
- Standard Specifications Roads, Volumes 1 and 2.
- Engineering Technical Notes and Engineering Policies.
- Drafting and Design Presentation Standards.
- Integrated Transport Planning Framework.

The various Manuals are in harmony as far as relevant standards are concerned and are intended to complement each other in defining the practices to be adopted. Where a conflict occurs, the Manual with the latest publication date takes precedence. However, any such conflict should be reported through the feedback process so that the necessary adjustments can be made.

(Note: The above list is not a comprehensive one; Main Roads publishes a number of additional manuals. References to Main Roads manuals have been included in this manual as appropriate).

1.1.4 Document control

This manual is not available in hard copy. Users may obtain an electronic copy by accessing the Main Roads intranet (i.e. Junction) or the internet site (<http://www.mainroads.qld.gov.au/>) As the only controlled document is the one that appears on these sites, users should regularly check these sources to ensure that they remain informed and up to date.

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1.2 Legislative Accountability

1.2.1 Principal Legislation

The Department of Main Roads receives its authority from the Acts of Parliament that enable it to function and define its responsibilities and powers. In addition, the other Acts of the Parliament of Queensland and the Commonwealth of Australia impact on the activities of the Department. In all circumstances, the Department has to act in accordance with the prevailing laws of the State and Commonwealth.

Further, the particular policies of the Government of the day must be implemented in accordance with the prevailing laws and Acts.

The principal Acts applying to the normal activities of the Department of Main Roads are shown in Table 1.1. In addition, environmental legislation that may apply to Main Roads activities is described in the Department's Environmental Legislation Register. The Register is intended as a guide only, identifying the key legislative provisions and providing a layman's interpretation of the legislation. The Register does not proclaim to identify all possible provisions that may affect Main Roads operations. If required, expert advice should be sought if any matter is to be relied upon or considered in detail.

1.2.2 Other Legislation

The "Environmental Legislation Register" (Main Roads) provides summaries of a range of other Acts impinging on Main Roads activities. The Register provides comment on the areas where this impact occurs but detail can only be obtained by reading the relevant Act. Copies of the Legislation (i.e. Acts) can be obtained by:

- ordering hard copies from GOPRINT (<http://www.goprint.qld.gov.au/web/web/>) or,
- downloading electronic copies from the Queensland Parliamentary Council website (i.e. <http://www.legislation.qld.gov.au/>). (Note: Users must read and understand the various Disclaimer notices associated with this site.)

In addition, particular attention is required by planners and designers where legislation requires approvals/permits from other agencies. The environmental Legislation Register provides details of environmental approvals permits.

Table 1.1 Principal Legislation Affecting Main Roads

Legislation	Objective or Purpose of Legislation	Administering Authority	Output Documents
Transport Infrastructure Act	To provide a regime that allows for and encourages effective integrated planning and efficient management of a system of transport infrastructure.	Main Roads	<ul style="list-style-type: none"> Transport infrastructure strategies Roads Implementation Programs
Transport Planning and Coordination Act	The objective of the act is to improve the economic trade and regional development performance of Queensland; and the quality of life of Queenslanders by achieving overall transport effectiveness and efficiency through strategic planning and management of transport resources.	Queensland Transport	<ul style="list-style-type: none"> Transport Coordination Plan
Environmental Protection Act	The object of the act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends ("ecological sustainable development").	Environmental Protection Authority	<ul style="list-style-type: none"> Environmental Protection Policies Environmental authorities; Environmental Management programs Codes of Practice
Integrated Planning Act (IPA)	The IPA seeks to achieve ecologically sustainable development through the coordination, integration, and streamlining of a number of land use planning processes. The Act focuses on land use planning outcomes, the management of development processes, and the management of effects on the environment by development.	Department of Local Government and Planning	<ul style="list-style-type: none"> Plans for Infrastructure (PFI) Statement of Intent (SOI)
Environment Protection and Biodiversity Conservation Act	To establish a new legislative framework for commonwealth environmental law with an emphasis on the protection of those aspects of the environment that are of "national environment significance".	Commonwealth of Australia	<ul style="list-style-type: none"> Management Plans

1.3 Hierarchy of Roads

The road network and the role of each element within it need to be understood to enable proper management of the road system. Failure of any link to perform its task can lead to local or wider network failure. In urban areas, for example, traffic congestion leading to “rat running” is a common symptom. In such cases the road system fails to meet community (amenity) or environmental expectations of residential streets, for example calm zones where social issues may be more important than traffic efficiency. Conversely, inappropriate access on major through roads affects road safety and capacity, again failing to meet community expectations and legislative intent.

The functions of a roadway may be broadly classified in terms of desirable criteria relative to the environment, access, and traffic (local and through). Not all of these criteria will be applicable for every road, and the degree to which a roadway should be designed to cater for each of them should be identified to enable priorities to be assigned. One way of achieving this is to develop a road hierarchy based on a functional classification of the roads in the system. If properly developed on this basis, the road hierarchy is a useful planning tool that will assist decision making for ongoing activities such as:

- network planning;
- traffic management;
- route signing;
- access management;
- land use consideration;
- assessing deciding on appropriate safety;
- transport modes including cycle and pedestrian facilities;

- environmental management; and
- allocation of funding.

Policies for these operational and management needs can be usefully and directly tied to the functional hierarchy. The road hierarchy is therefore pivotal in the identification of the function proposed for all the elements of the road system. Road hierarchies have been described in a number of ways for different purposes (e.g. by traffic function, by design standard, or by administrative responsibility).

The functional road hierarchy is determined by grouping roads according to the character of service they provide and is the most useful approach for planning and design purposes. The hierarchy resulting from this approach includes the following groupings:

- controlled access roads (traffic movement function);
- major roads (largely traffic movement function);
- collector / distributor roads (traffic, transition and access function);
- local roads (largely property access function).

Refer to Tables 2.3A and 2.3B of the Preconstruction Processes Manual (Main Roads) for the desirable performance criteria for roads of different function in urban and rural roads respectively.

There are a number of benefits in providing a road system that reflects the functional hierarchy because it:

- encourages appropriate traffic speeds and operating conditions across the various elements of the network;
- generally improves traffic safety by separating traffic flows with different operating characteristics (i.e. by

separating local and through traffic movements);

- results in the easier organisation and management of the traffic system;
- generally results in a better understanding of the road system and its functions since there is a consistency of standard matching the different functions; and
- can be designed to minimise the impact on sensitive development areas.

It is this latter objective that is highly significant to modern planning and an issue that can be significantly influenced by the type and scale of traffic using various parts of the road system.

The functional hierarchy also provides an opportunity to address land use/transport deficiencies from a range of land use or transport investment perspectives.

Road networks accommodate two types of traffic movement namely;

- traffic with direct business in, or having a direct relationship with an area being considered. These movements include access to, or circulation within, an area.
- traffic that has no direct business in, or relationship with, the area under consideration. These movements are sometimes referred to as “through” traffic or “bypass” traffic.

Travel is an activity derived from land use, so the structure of the land use is a major determinant of the type and scale of travel that occurs on individual road links. Because the hierarchy is directly related to travel function it follows that the road hierarchy itself will be highly influenced by the structure of the land use it serves.

If a land use structure is ill-defined or inappropriate, the resulting pattern of travel and traffic functions will be confused and

potentially difficult to accommodate in a way that fosters efficiency and amenity objectives. The intent of the Integrated Planning Act (IPA) legislation is to allow appropriate development to occur and for the Local Government strategic plans to direct this development.

These will define the overall structure of land use and allow a consistent definition of traffic with business in the area and the appropriate road function in the hierarchy to service that traffic. Specific areas of concern are land use elements within which it is desirable to restrict traffic movements to those with direct business in the area. Boundaries of these land use elements in existing areas may be partially defined by the existing major road system and should recognise planned facilities. Other features may also be used as boundaries with the aim of defining specific areas which:

- are relatively homogeneous in land use;
- support the need for transport interactions to be freely made;
- have only that traffic necessary for the functioning of the area, i.e. they are free of non-essential or through traffic; and
- have a balance between the volume of essential traffic and the nature of the area, e.g. higher volumes might be more acceptable in industrial areas than in residential areas.

For these reasons, it is important that the road planning processes are in harmony with the strategic planning processes of Local Government. Considerable liaison is required and the end result should be achieved through an iterative process where appropriate compromises are made to produce the best result.

Useful guidance may also be found in the Integrated Transport Planning Framework (Queensland Transport) which is a practical

guide for integrating transport planning in Queensland.

Roads, as noted earlier, serve a variety of functions that range from the provision of access to properties, pedestrian paths and bus routes to catering for through traffic. Many roads serve more than one function to varying degrees but it is clear that mixing of incompatible functions can lead to friction, conflict and a breakdown in the principal function. The concept of a hierarchy of roads is thus used to define the main function of each road, which can then form the basis of ongoing planning of land uses and system management aimed at reducing the mixing of incompatible functions.

The function that a particular corridor fulfils in the hierarchy has to be determined either by examining the role the corridor serves with respect to the overall land use of the area, or by surveying travel patterns, or by way of a travel demand model.

The way that a particular corridor accesses higher order corridors and indeed the types of roads that access it can assist in establishing its hierarchical status.

Austrroads has defined a functional road classification that has been used effectively in assessing appropriate design standards for the road network.

In Queensland, the classification system has changed with time as the type of roads under the stewardship of Main Roads has become more closely aligned with higher order functions of the network. From an overall planning point of view, the function of the road has more significance than who has the administrative responsibility for it.

Main Roads now has stewardship of roads of State significance and therefore does not have direct responsibility for local and collector roads in general. However, exceptions to this do exist.

It is important to take account of the whole road system when undertaking planning of road corridors, and to ensure that the traffic using the various elements of the system is appropriate to the function of those elements.

Main Roads has four administrative classifications in its hierarchy of roads: These are

1. National Highway (NH);

The following three (3) classification are often grouped under the term Other State Controlled Roads (OSCRs). This is not a classification but merely a convenient term to separate these roads from National Highways.

2. State Strategic Road (SSR);
3. Regional Road (RR); and,
4. District Road (DR).

Figure 1.1 shows the four road sets for State-controlled roads. Table 1.2 shows how the four (4) road sets fit into a general functional classification and compares it with other systems.

While there is a high degree of compatibility between this administrative classification and the relevant functional classification, there is not always a direct relationship between them. For example, some District Roads have the characteristics of an arterial road and carry high volumes of traffic. In these cases, planners and designers should adopt the appropriate standards for the function the road performs.

National Highways and the State Strategic Road Network function as the backbone of the state's road network, catering for long distance movements by linking the major economic regions within and external to Queensland. These roads have an important role in providing transport linkages for the

movement of people, and the import and export of goods using high-productivity freight vehicles. The length of these roads in Queensland comprises some 9,300km of road.

The Regional Road Network provides important links for commercial, freight and commuter traffic within regions. This network consists of approximately 10,100 km of roads across Queensland.

The District Road Network provides links generally within and across local government boundaries. They are State Controlled Roads that do not in general serve a network purpose for longer distance through traffic. Sometimes they provide important links between towns within a region and often serve a local traffic demand. They are often important feeder routes to the Regional and State Strategic networks. The total length of these roads in Queensland comprises some 14,300km.

These road classifications are used for the strategic planning processes incorporated into Roads Connecting Queenslanders (Main Roads 2002b) and the Investment Strategies developed by each Main Roads Region.



Table 1.2 Comparison between Hierarchy Definitions

Functional Hierarchy	Queensland Main Roads	Queensland Streets	A.R.R.B	AUSTROADS
Highway	State Strategic Road and National Highway	Freeway	Arterial	Freeway
Arterial	Regional Road	Major Arterial	Sub Arterial	Primary (other Arterial)
Distributor	District Road	Arterial	Distributor	Secondary Arterial
		Sub-Arterial		
Trunk Collector	Not Covered	Trunk Collector	Collector	Distributor
Collector		Residential Collector	Local	Collector
Access Street		Access Street		Local

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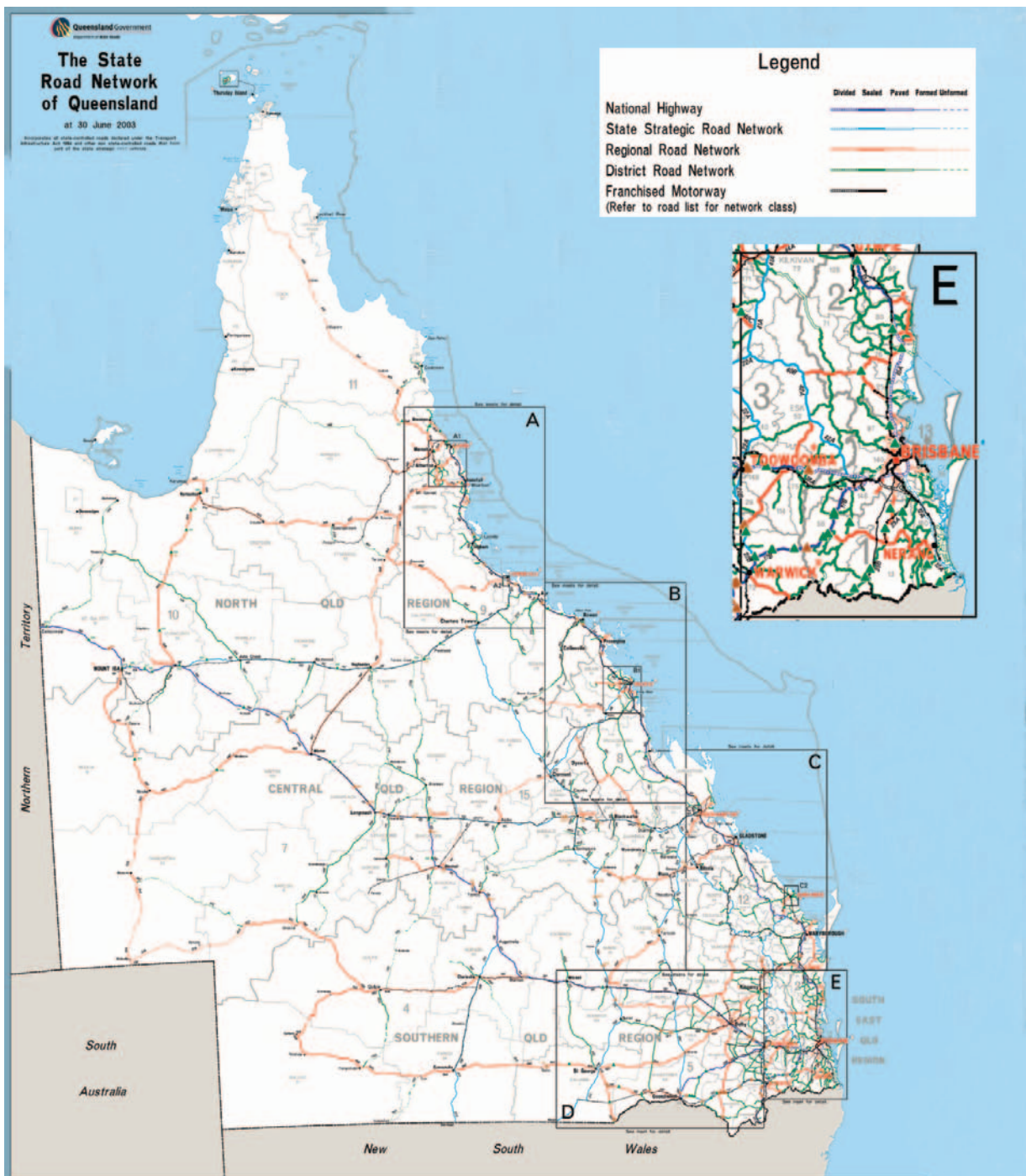


Figure 1.1 Queensland Road Sets

1.4 Strategic Vision

1.4.1 Roads Connecting Queenslanders

The overall approach to the development of the Queensland road system is contained in “Roads Connecting Queenslanders” (Main Roads). This document sets out the Department’s approach to its role as custodian of the Queensland road system, and the approach taken in developing the various elements of that role.

The four road outcomes sought are:

- safer communities;
- industry competitiveness and growth;
- liveable communities; and
- environmental conservation.

In meeting stakeholders’ needs and the challenges to achieve a more sustainable future for Queensland from roads, Roads Connecting Queenslanders (Main Roads) has identified four road outputs to support these four complementary road outcomes. The four interrelated road outputs and road outcomes are:

- Safer roads to support safer communities means investing in a safer road network by setting standards and interventions that achieve the best impact for the whole road system, through:
 - improved road network safety using a risk management approach;
 - safer travel for all road users;
 - safer access to the road system for cyclists and pedestrians;
 - safety for the community;
 - worksite safety; and

- considerations with other government agencies in partnership.
- Efficient and effective transport to support industry competitiveness and growth means maximising the effectiveness of the existing road system and improving consistency of road travel across the state through:
 - a strategic approach to an efficient and effective road system;
 - links to other transport modes; and
 - considerations with other government agencies in partnership.
- Fair access and amenity to support liveable communities means investing in roads for community quality of life, including access, employment, cultural heritage and amenity, through:
 - fair access across Queensland;
 - roads programs that contribute to employment objectives;
 - respecting culture and conserving cultural heritage;
 - integrating roads into the community; and
 - considerations with other government agencies in partnership.
- As stewards of the land in roads, Main Roads will encourage sensible development and use of roads and surrounding land, through:
 - minimising land degradation;
 - maintaining biodiversity;
 - managing road system and societal impacts;
 - resource conservation; and

- considerations with other government agencies in partnership.

These principles have guided the development of this manual and planning and design decisions must be based on them. Chapter 3 “Road Planning and Design Fundamentals” has been structured according to the four output areas for Main Roads to demonstrate how the planning and design process meets these requirements.

- Phase 6 – Audit; and
- Phase 7 – Reviews (outcome performance and system review).

Each of these phases requires inputs from a wide range of sources. The Road Planning and Design Manual is an essential tool for Phases 2 to 6. The principles developed in the Road Planning and Design Manual must be used in deciding on the details of the strategies and project proposals.

The Preconstruction Processes Manual (Main Roads) details the process for pre-construction activities as part of the Strategic Asset Management and Project Management frameworks that apply to road infrastructure projects in Queensland. Planners and Designers should be familiar with these documents and ensure that the results of their work are in accord with the requirements contained in them.

1.4.2 Road System Asset Management

The Road System Manager concept (formally the Strategic Framework for Road System Asset Management) (Main Roads 2003a) represents the total process for Main Roads’ direction setting, stewardship, delivery and performance review of the state controlled road system. It also represents the important over-arching process for Main Roads being a good road agency and a good government agency in delivering the Queensland Government’s social, economic and environmental objectives as defined in “Roads Connecting Queenslanders”. The framework references this broader role to ensure that the stewardship of the road system is integrated with the overall transport and land use system, and stakeholder needs at all levels.

1.4.3 Local Government Alliance

The Local Government Association of Queensland (LGAQ) and Main Roads have formed an alliance whose aim is to deliver an improved regional road network by providing an appropriate management framework that further consolidates and builds on the existing relationship between Main Roads and Local Governments. (MR & LGAQ, 2000) The desired outcome is to achieve the best possible regional road network for community and economic development in Queensland. The focus, however, will be on achieving integrated outcomes using practical strategies that deliver better roads more efficiently, in the appropriate timeframe and within available resources.

Main Road’s activities are encompassed in the seven phases of the total process:

- Phase 1 – Outcomes and Direction;
- Phase 2 – Road System Planning and Stewardship (15+ years);
- Phase 3 – Corridor Planning and Stewardship (<15 years);
- Phase 4 – Program Development (<7 years);
- Phase 5 – Program Delivery;

Roads included in the alliance are the lower function state government controlled roads and the higher function local government controlled roads.

The investment strategies, timings and

upgrading requirements for roads included in the Alliance will be determined through the structures set up to administer the Alliance.

Further details are available in the Memorandum of Agreement and the documents that support its implementation. (MR & LGAQ, 2000)

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Relationship to Other Chapters

This chapter sets the environment in which planning and design takes place. The standards adopted from the range available for specific elements from other chapters must be in accord with the overall strategy decided for the road in question.

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