



Government  
of South Australia



Local Government Association  
of South Australia

*Roads Infrastructure Database Project*

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**DEVELOPMENT OF A  
ROADS INFRASTRUCTURE DATABASE  
PROJECT REPORT**

*December 2001*

# A CKNOWLEDGMENTS

The Roads Infrastructure Database Project Report is the culmination of extensive analysis and consultation with many key stakeholders throughout South Australia.

The Report recommends guidelines and a database to assist Councils, the State Government and the SA Local Government Grants Commission in making funding decisions relating to expenditure on local roads. Results will be reviewed after a year.

Moreover, the Report offers a valuable road data resource to governments for purposes such as transport planning, development and related infrastructure.

In summary, the main outcome is the development and modelling of a database which can analyse the category selection, proposed upgrading (on a “fit-for-purpose” basis) and prioritisation of local roads for funding, and the identification of the sources and availability of the data required.

The project was a joint initiative of the State Government through the Office of Local Government and the Local Government Association of SA. The Report, produced by Ian Dixon and Associates and HDS Australia Pty Ltd., is being provided for information to Councils, Regional Associations and relevant State Government agencies.

A copy is also to be placed on the Office of Local Government website at <http://www.localgovt.sa.gov.au>

Many people have contributed to the findings of the Report and particular thanks are extended to :

- Mayor Brian Hurn OAM, Chairman, Local Roads Advisory Committee (LRAC), and Immediate Past President of the Local Government Association of South Australia
- Mr Flett Steele, Director, Investment and Planning, Department for Transport, Urban Planning and the Arts, and member of the LRAC
- Ms Jane Gascoigne, Executive Officer, SA Local Government Grants Commission, member of the LRAC and Project Manager for the Roads Infrastructure Database Project
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# 1

## EXECUTIVE SUMMARY

The Roads Infrastructure Database Project was initiated as part of the State/Local Government Partnerships Program and developed by the Local Roads Advisory Committee (LRAC). The aim of the project was to address the need for improved information in making funding decisions relating to expenditure on local roads.

The key outcomes defined for the Roads Infrastructure Database Project were:

- To develop and model a database which could be used to analyse candidate road proposals and assist in determining the prioritisation of these roads.
- To identify sources of required data, its availability and issues related to resourcing the collection and maintenance of data.

Ian Dixon Pty Ltd - Strategic Advisors, in association with HDS Australia Pty Ltd, were engaged to undertake this consultancy project.

To assist LRAC and the consultants, a Consultative Committee was established. This Committee met on a number of occasions throughout the consultancy and provided feedback and input during the development of the prototype database. One early task of this Committee was to select eleven candidate roads for use by the consultants in developing the database and guidelines.

Consultation was undertaken with key stakeholders ranging from individual councils, to representatives of regional associations, to State Government agencies and peak bodies. Work undertaken as part of recent State and regional strategic planning processes was also reviewed. It was clear from these consultations that all bodies were grappling with this issue and were seeking some form of consistent framework to assist them in planning and prioritising road proposals.

New guidelines were developed as part of this project, which are based on a “fit for purpose” approach. The proposed guidelines will enable Councils, regional associations and LRAC to assess in a more consistent manner the purpose of a particular candidate road, the desired standard required and the costs and benefits of upgrading to this standard.

The “fit for purpose” approach is based on three new primary purpose categories for the local road network, which are defined as follows:

### FREIGHT

- Facilitates industry development by linking key industries to major transport routes and contributes to efficient movement of large volumes of heavy freight vehicles.

### TOURISM

- Provides access to tourism sites and locations, and enables people to view scenic attractions in a safe and enjoyable manner.

### SOCIAL

- Provides for community development and equitable access to community facilities, whilst minimising the impact of heavy vehicles on the community.

## EXECUTIVE SUMMARY (Cont.)

The approach proposed will enable LRAC to develop priority lists of projects within each primary purpose category based on a weighted benefit process. A process has also been proposed to develop a weighted/cost benefit score, however, this calculation needs to be treated carefully and it is recommended that it be used only as a means of further differentiating proposals within individual LGA Regions, or across (or within) individual councils, rather than on a statewide basis.

Based on feedback from discussions at the Consultative Committee meetings and in interviews with various Councils and regional associations, no formal methodology for comparing road proposals across primary purpose categories can be recommended at this stage

A key element to the introduction of any new guidelines and database will be the acceptance and ownership by the key stakeholders, in particular individual Councils and regional associations. For this reason, it is recommended that the new guidelines be introduced on a trial basis for the next 12 months and be used as part of the funding application process for 2002. Following a formal review of this trial, it is then recommended that Stage 2 development of the full database should proceed.

It is proposed that should Stage 2 development of the database proceed, the South Australian Local Government Grants Commission should have control of the entry and management of data to be held in the system, while the Department for Environment & Heritage should be responsible for the dissemination of information contained in the Stage 2 database to individual councils and regional associations through mechanisms currently being implemented.

The guidelines proposed will enable a consistent framework to be used in developing regional strategic plans and for assessing the priority of various road proposals, whether they be in an individual council, a region or across the State.

# 2

## INTRODUCTION

The State/Local Government Partnerships Program has been established by the Minister for Local Government and the Local Government Association (LGA) as a framework for exploring partnership opportunities designed to improve the planning and delivery of services to the South Australian community.

Within this framework, the Partnerships Program has initiated the Roads Infrastructure Database Project in order to address the need for improved information in making funding decisions relating to expenditure on local roads. The development of this database and associated guidelines will assist councils, the state government and the Local Government Grants Commission in these strategic decision-making processes.

Given recent increases in funding levels for local roads, there is a strong need to promote a co-ordinated and strategic approach to the allocation of these funds to ensure the maximum return on funds invested, to the benefit of both state and local communities.

Increased demands on road networks and their key role in regional economic and social development has placed greater emphasis on decision making processes and the need for reliable consistent data that is accepted by all key stakeholders.

This project is timely as regional local government associations and the State Government are currently undertaking a number of strategic transport planning projects throughout South Australia. Whilst national, state and local governments have undertaken considerable work, there is no consistent database or guidelines that are universally accepted by these stakeholders to assist in the prioritisation of roads for funding.

The Local Roads Advisory Committee (LRAC), under the auspices of the State/Local Government Partnerships Program, developed a consultancy project to address this need. The consultancy project has been designed to investigate the feasibility of establishing guidelines, as well as a prototype roads infrastructure database, that addresses the identified need. A potential second stage project would be the development of the database to a fully operational status.

# 3 OBJECTIVES

The initial brief for the consultancy project proposed the development of guidelines for the categorisation of candidate roads according to the predominant purpose for which the road is used. It also proposed an assessment of the issues relevant to the development and implementation of a database to hold this information.

The required outcomes were:

- To develop and model a database which can analyse the category selection and proposed upgrading (on a “fit for purpose” basis) and assist in determining the prioritisation of these roads.
- To identify sources of required data, its availability and issues related to resourcing the collection and maintenance of data.

LRAC sought to assess the benefits and constraints of developing a collaborative solution to this complex and sensitive issue by developing a single database for access by both sectors (i.e. state and local government) as well as relevant funding bodies.

A key outcome from this consultancy was to be the level of ownership and commitment displayed by the key stakeholders to a single database and the level of acceptability that would enable Stage 2 of the project to be undertaken.

# 4

## TERMS OF REFERENCE

The following terms of reference were specified for the consultancy project:

*The State and Local Government wish to investigate opportunities for the creation of credible and consistent definitional guidelines and a road database system for the identification of strategic local roads to assist Councils, the Local Roads Advisory Committee and the Minister of Transport in the allocation of road funds.*

1. Develop an understanding of the local road network in South Australia, including the strategic local road network, and the funding distribution process used by the Minister of Transport and the Local Roads Advisory Committee.
2. Develop guidelines for determining the predominant PURPOSE for which each strategic road is used.
3. Define minimum performance standards for each of the defined PURPOSES.
4. Develop parameters for use in making a broad based assessment of the current state of the candidate roads.
5. Determine parameters for estimating benefit and cost for proposed upgrading to bring candidate roads up to the specified level of performance.
6. Recommend a means to assist in prioritising proposals for the funding across the program.
7. Determine design specifications for a database to accumulate and manipulate this information having regard to the potential to enhance already established data bases which include relevant roads data.
8. Model and test the database and assess issues associated with resourcing the entry of information, on-going maintenance and other related issues.
9. Recommend a body to develop and maintain the database system.
10. Report to the Local Roads Advisory Committee.

# 5

## METHODOLOGY

The methodology used for this project was developed with the following aims:

- To work collaboratively with the stakeholder network through appropriate consultation processes;
- To build on the existing information and knowledge base on road data already held by state and local government;
- To take account of related projects being conducted through state government and the LGA; and
- To enable thorough assessment of the benefits and constraints of developing a single roads database for use by all key stakeholders in prioritising funding allocations.

The project incorporated five key phases, namely:

### **1. Project Initiation**

Ensure overall project goals were clarified, conduct detailed planning and establish key stakeholder relationships.

### **2. Research and Consultation**

Review all previous relevant information and consult appropriately with key stakeholders to enable analysis and database development activities to be undertaken.

### **3. Analysis**

Assess all information gained from research of current material and documentation and from the consultation process, and then determine guidelines and parameters for the selection and prioritisation of candidate roads.

### **4. Development of Prototype Database**

Design, develop and test the prototype of a proposed roads infrastructure database which can, in its final version, be used to store and manipulate data and be accessed by all relevant stakeholders.

### **5. Reporting**

Prepare an interim and final report, which encapsulates all of the terms of reference as set out in the project brief.

## METHODOLOGY (Cont.)

As part of the project, a Consultative Committee to LRAC was formed to provide advice throughout the development of the methodology. This Consultative Committee comprised representatives of rural and metropolitan councils, and state government agencies.

The consultants met with the Consultative Committee on a number of occasions throughout the consultancy period.

As part of the development of the database methodology, the Consultative Committee selected eleven candidate roads to test the proposed approach. These selections were made from roads that have, over time, been nominated by individual councils through their regional associations, under the Special Local Roads Program.

To ensure that differences between regions were incorporated into the database methodology, the Consultative Committee selected roads from across the state. At least one road was chosen from each region, including the metropolitan area.

# 6

## CONSULTATION

### 6.1 Purpose

The consultancy project has involved considerable consultation with key stakeholders involved in the development or approval of road funding proposals, and in particular special local road funding.

The purpose of the consultation process was:

- To explain and promote the project, including the role of the Consultative Committee;
- To gain an insight into current council processes in the selection and prioritising of road proposals;
- To gain information on the types of road data and collection methods currently in place in councils; and
- To ascertain the level of support for a consistent set of guidelines and a roads infrastructure database that could assist with prioritising various road proposals.

### 6.2 Process

Due to the complexity of the project and the number of stakeholders involved, considerable effort was made to communicate throughout the consultancy as the project developed.

A newsletter explaining the project was distributed to all councils and regional associations in the early stages of the project (Refer Appendix A).

The consultation process involved meetings with:

- The Local Roads Advisory Committee
- Consultative Committee
- Elected members and staff from selected councils
- Local Government Association
- Local Government Grants Commission
- Transport SA
- Mayors and Chairpersons of Councils
- Representatives of Regional Local Government Associations
- Metropolitan CEO's Group
- Partnership Forum

A number of these meetings were essential in engaging people in the process to determine if the stakeholders would accept commitment and ownership of new guidelines and a database produced by LRAC.

## CONSULTATION (Cont.)

The consultation with regional councils was based on roads that were selected by the Consultative Committee. Regional areas visited included Eyre, Central, Murray and Mallee, South East and Southern & Adelaide Hills. Several councils in the metropolitan area were also visited. A full list of all personnel consulted is included in Appendix B1.

Prior to the commencement of consultation visits, a questionnaire was prepared which sought to ascertain council views on a number of aspects of the special local road grant process and how data and information was collected, stored and analysed within councils. Responses during the visits not only detailed each council's individual approach to the grant application process, but also provided the consultants with valuable insights into issues faced by individual councils and regional associations during the grant application process. A copy of the questionnaire is included in Appendix B2.

### 6.3 Roads Selected for Investigation

As mentioned above, the Consultative Committee selected a number of roads from across the state and supplied information on these proposals to the consultants for use in the design and assessment of the guidelines and database. It should be noted, though, that the consultants were not involved in the selection process for the 2001/2002 round of grant funding for any of the funding categories.

The roads selected were as follows:

#### *Metropolitan Submissions:*

1. Wyatt Road - City of Salisbury
2. Norwood Parade - City of Burnside
3. Hawthorndene Drive - City of Mitcham

#### *Rural Submissions:*

1. Dublin Road - DC Mallala
2. Gomersal Road - Barossa Council/Light Regional Council
3. Pallamana Road - Rural City of Murray Bridge
4. Schell Road - DC Berri Barmera
5. Davenport Creek Road - DC Ceduna
6. Gawler Ranges Road - DC Le Hunte
7. Caves Hynam Road - DC Naracoorte & Lucindale
8. Nangkita Road - Alexandrina Council

## CONSULTATION (Cont.)

### 6.4 Outcomes of Consultation

Councils throughout the state are at vastly different levels of development in understanding, documenting and analysing their road systems in a strategic manner. Whilst some of the councils have quite sophisticated asset management systems in place, many other councils are still grappling with the extent and current condition of their road network.

The process used by councils to select candidate roads varies considerably from council to council. However, there is now a recognition that councils will have to employ a more rigorous and strategic approach in analysing and prioritising their infrastructure upgrades, both within their own organisations and particularly when applying for external funding. This has been reinforced by the recent transport strategy planning projects undertaken in the South East and Southern & Adelaide Hills Regions, with further studies planned in the near future.

All councils consulted as part of this project were endeavouring to classify their roads into various categories and to develop appropriate standards to ensure that improvements proposed were "fit for purpose".

Councils were also looking at improved methods of collecting and storing information on their road infrastructure. A number had GIS based data management tools in place, while others used spreadsheet databases or simply hardcopy files to store and retrieve information.

It was apparent that councils generally were acquiring improved traffic counting equipment and now recognise the need for a greater level of information on their road infrastructure.

With respect to current funding processes for special local road funding, there were many different views as to how the current guidelines should be interpreted. Comments varied from:

*"road proposals should only be funded if they were new roads or upgrading due to economic development and not if it was just repairing a failed sealed road (with no other justification)"*

to

*"funding should be provided for reconstruction of existing roads to bring them to a fit for purpose standard"*

In reviewing the applications submitted to LRAC, there was also a large variation in the scope and amount of information that was submitted as part of the application process.

In summary, it was clear that a lot of activity was taking place at individual council level. However, this was all being developed individually, and there appeared to be no consistent, coherent approach being undertaken.

### 6.5 Future Situation

In looking to the future, all those councils interviewed expressed positive support for a standard set of guidelines that provided a better framework for decision making. This was often qualified with the view that they didn't want to be disadvantaged in their own area for future funding allocations. There was a view expressed that a more rigorous approach at the council level would assist in achieving a more strategic approach at regional association level.

In addition, a more complete set of criteria for evaluating priorities was also seen as a positive step forward. Whilst considerable work has been done in the recently completed regional strategic plans, currently both councils and regional associations are developing their own framework and criteria for such strategic plans.

There was a general view from all stakeholders that if one framework and set of criteria could be established, this would be a positive step and would be supported by councils and regional associations.

# 7

## GUIDELINES DEVELOPMENT

### 7.1 Overview

The current policy and associated guidelines for the Special Local Roads Program emphasise that candidate projects shall:

*“Comprise significant local roads, that have one or more of the following attributes:*

- *The road provides for extraordinarily high seasonal traffic;*
- *The road facilitates development of a particular industry and/or trade and commerce;*
- *The road provides a significant link in the local road network facilitating access to other local roads, and thus is of some regional, rather than purely local importance.*

*The proposed works may be either sealing, reconstruction or major rehabilitation, but must be of a significant nature so as to enhance the level of service provided by the road.”*

The current guidelines in place are now outdated and need to be more appropriate for the development of a roads infrastructure database, where a greater degree of rigour and a more strategic approach is required. Hence, a new set of guidelines have been proposed as part of the development of the roads infrastructure database, in order to make the product a useful planning and decision-making tool.

The project brief clearly stated that the proposed database was to be designed around determining the predominant “purpose” for a road and then identifying what is required to bring that road up to a “fit for purpose” standard.

The first step in developing the new guidelines and database involved design of an analysis process as outlined in Figure 1 (refer next section).

Following initial analysis, individual components of the flow chart were expanded, a data flow / data table structure (refer Appendix E1) was developed and a new set of guidelines produced. The development of the database has evolved from both the analysis flow chart and the data flow / data table structure, both of which were required to support the proposed new guidelines and database.

#### *Candidate Projects*

Three primary purpose categories have been developed as a basis for the new approach, namely:

#### FREIGHT

- *Facilitates industry development by linking key industries to major transport routes and contributes to efficient movement of large volumes of heavy freight vehicles.*

#### TOURISM

- *Provides access to tourism sites and locations, and enables people to view scenic attractions in a safe and enjoyable manner.*

## GUIDELINES DEVELOPMENT (Cont.)

### SOCIAL

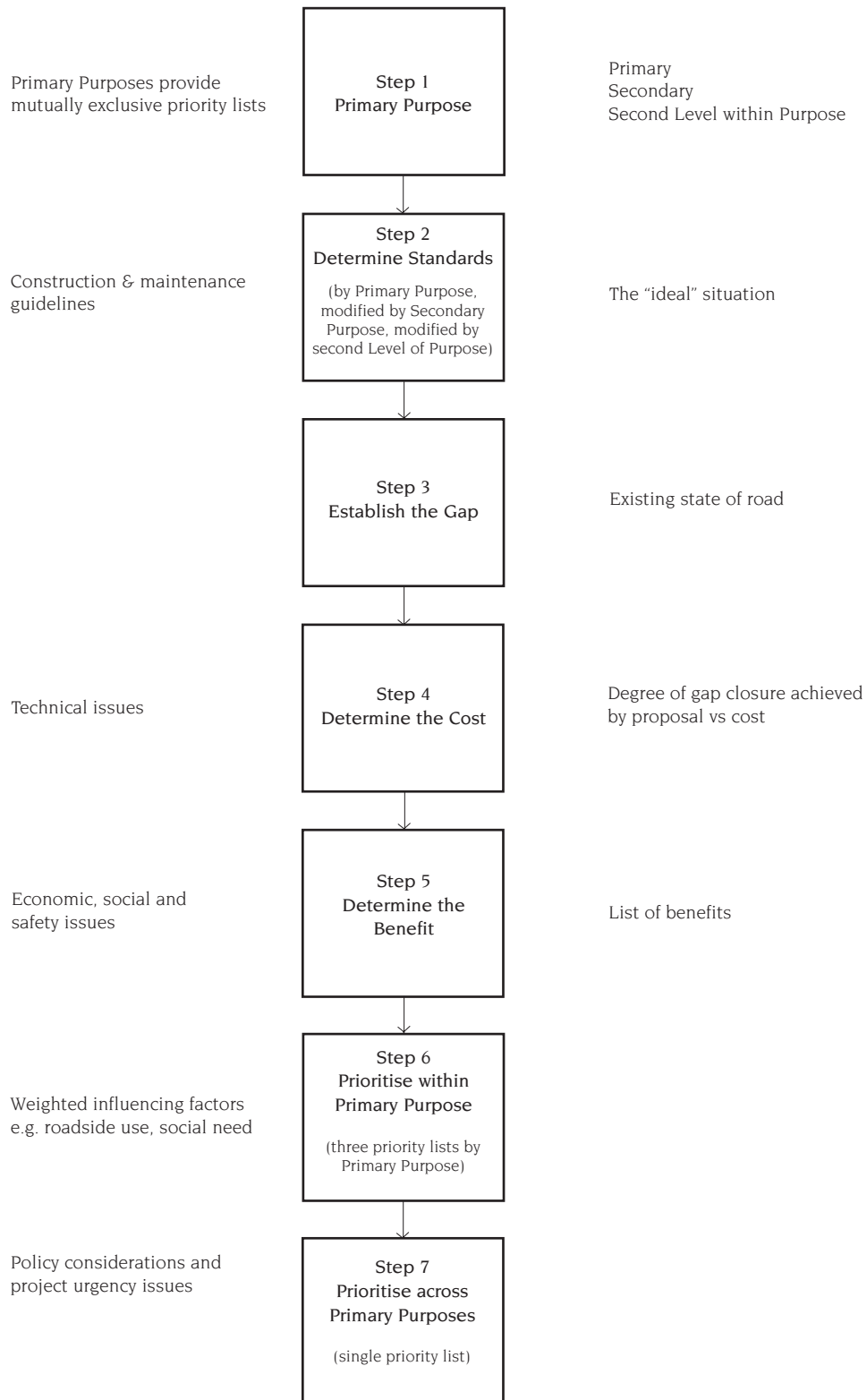
- *Provides for community development and equitable access to community facilities, whilst minimising the impact of heavy vehicles on the community.*

### 7.2 Analysis Process

The Analysis Process shown in Figure 1 below was developed as a framework for the assessment and prioritising of particular road proposals. The flow chart shows the key steps required in assessing an individual road proposal, ranging from determination of the primary purpose of the road through to establishment of its priority against other road proposals.

# GUIDELINES DEVELOPMENT (Cont.)

**Figure 1 The Analysis Process**



## GUIDELINES DEVELOPMENT (Cont.)

A brief description of each step in the analysis process follows. Subsequent sections expand the description of each step and discuss underlying requirements:

### *Step 1 - Define Purpose*

- The term “primary purpose” has been proposed so as to incorporate the breadth of strategic activities and to address the range of varying design standards that will apply to different road proposals.
- It is intended that, for each of the primary purpose areas, a mutually exclusive priority list will be established.
- In addition to the primary purpose, each road may have one or two secondary purposes, that add weight to the importance of the road.
- Moreover, there may be one or more secondary levels of purpose, which will further affect “fit for purpose” standards.

### *Step 2 - Determine Standards*

- For each primary purpose, and as further modified by the secondary level of purpose, a particular “fit for purpose” standard can be established. “Fit for purpose” can be defined as providing *minimum acceptable design/ construction standards* for the situation (i.e. a road has a specific purpose and is then built/maintained to a standard to enable it to be fit for purpose).

### *Step 3 - Establish the Gap*

- By comparing the existing road standard against the defined “fit for purpose” standard, it is possible to determine the “gap”. The “gap” is therefore defined as the improvement in standard required to upgrade a particular road from its current standard to a standard that is fit for purpose.

### *Step 4 - Determine the Cost*

- Once the gap is determined, it is possible to estimate the cost of improvements required to bring the particular road up to a standard which is fit for purpose. This “Cost to Close the Gap” is best equated to the cost of the proposed upgrade (as supplied in grants applications), as it is not practical to arbitrarily apply automated cost estimation techniques to estimate the cost to close the gap. *However, using “Cost of Upgrade” as an approximation for “Cost to Close the Gap” assumes that the upgrade proposal brings the road to a fit for purpose standard. This may not always be the case.*

### *Step 4A - Determine the Extent to which the Gap is Closed*

- An assessment needs to be made of the extent to which any gap (between the current standard and the fit for purpose standard of a road) is closed by an upgrade proposal.

## GUIDELINES DEVELOPMENT (Cont.)

### Step 5 - Determine the Benefit

- To assess the benefit of a particular proposal, consideration needs to be given to a range of influencing factors that define what benefits can be achieved by the proposal. The most important of these factors is the road's "significance", as defined within relevant council, regional and state transport strategies.

### Step 6 - Prioritise within Primary Purpose

- By weighting the various influencing factors identified in Step 5, an initial prioritised list of proposals can be obtained for each of the three primary purpose categories. This initial ranking by "weighted benefit" provides a general overview of the relative benefit of various proposals, but does not take into account the number of road users and other industry or community groups which benefit from the proposal, nor the individual cost of the proposal.
- By combining the weighted benefit with a measure of the road use (namely traffic volume), divided by road length and proposed cost, it is possible to come up with a second prioritised list. This list of "weighted benefit cost scores" will then indicate which proposals provide greatest "value for money" in terms of maximising benefits to the greatest number of users per km of road upgraded per dollar of cost.
- Note that whilst it is technically possible for the "weighted benefit cost score" list to be used to compare road upgrade proposals across the state, it is not considered advisable to do so. The influence of "traffic volume" and "cost per km" factors vary considerably across LGA Regions, and even across councils within regions. The weighted benefit cost score therefore is best used as a tool for differentiating road upgrade proposals that otherwise show similar "weighted benefits". This could be applied within individual LGA Regions and/or across (or even within) individual councils

### Step 7 - Prioritise Across Primary Purposes

- To determine priorities between each of the primary purpose areas, policy and project urgency considerations will need to be applied. It is envisaged that the LRAC will undertake this step manually, using the three "priority within purpose" lists based on weighted benefits, as generated in Step 6.

## GUIDELINES DEVELOPMENT (Cont.)

### 7.3 Development of Purpose

#### 7.3.1 Primary Purpose

In assessing and developing the primary purpose categories, outcomes from the consultation process and research findings were considered.

In each of the regional transport strategies developed to date, and as part of the selection process for candidate roads for Special Local Roads Grants for the 2001/2002 financial year, councils and regions are considering how to develop an appropriate framework that can cover the breadth of road purposes, but be specific enough in enabling a sound level of prioritising to occur.

The South East Transport Strategy Report addressed this issue and its findings are contained in that report.

As part of the development of the Southern and Hills Local Government 2010 Transport Plan, a Local Government Research and Development Scheme project was initiated to document the process and key learning outcomes for use by other local government regions and councils. In that report, Strategic Framework and Evaluation Criteria were proposed. Whilst the report, and other work undertaken to date, goes part way to defining a “fit for purpose” approach to grant applications, and there is some consistency in approaches, we have endeavoured to build on the previous work to develop a more consistent framework and evaluation process.

In addition to the above local government initiatives, Transport SA has, in its draft Regional Road Transport Strategy (not publicly released), developed a number of Role and Function Guidelines that are similar to those proposed in the regional reports and are also closely aligned to those proposed below.

Initially, four primary purpose categories were defined. However, after further consultation with the Consultative Committee and validation through the database development phase, this was reduced to three. These categories, and their associated descriptions, are:

#### FREIGHT

- *Facilitates industry development by linking key industries to major transport routes and contributes to efficient movement of large volumes of heavy freight vehicles.*

#### TOURISM

- *Provides access to tourism sites and locations, and enables people to view scenic attractions in a safe and enjoyable manner.*

#### SOCIAL

- *Provides for community development and equitable access to community facilities, whilst minimising the impact of heavy vehicles on the community.*

## GUIDELINES DEVELOPMENT (Cont.)

The fourth purpose category that had been proposed was that of *Regional Significance*. This purpose was originally designed to cover roads of strategic importance both within and external to the council or region. Specifically, these roads would be either an inter-council link within a region or would be an across region link as part of a state wide strategic route. On further analysis of this proposition, it was concluded that regional significance was more a major influencing factor, rather than a defined “purpose” that would impact on a specific road’s design standards. Hence, it has been addressed under influencing factors (as discussed later in this section).

Based upon the above definitions, the eleven roads selected by the Consultative Committee for evaluation have been grouped under their primary purpose, namely:

### FREIGHT

- Wyatt Road
- Dublin Road
- Gomersal Road
- Pallamana Road
- Nangkita Road

### TOURISM

- Davenport Creek Road
- Gawler Ranges Road
- Caves Hynam Road

### SOCIAL

- Norwood Parade
- Hawthorndene Drive
- Schell Road

### 7.3.2 Secondary Purpose

Whilst a particular road proposal may have one primary purpose, say FREIGHT, it may well have a secondary purpose, such as providing for a SOCIAL purpose by linking communities within the regional area. This factor was taken into account in the development of the database, both in determining an appropriate “fit for purpose” standard for the road and to enable roads with multiple purposes to be weighted accordingly when determining benefits.

## GUIDELINES DEVELOPMENT (Cont.)

### 7.3.3 Second Level within Purpose

Following the determination of key primary purpose categories, it became clear that there is a second level within each purpose that will impact on design standards. For example, the use of B-Doubles will require a higher standard with respect to road geometry than normal commercial vehicles.

Through a number of review processes, a set of second levels within each purpose category, which involve a number of specific design standards, has been developed. It is important to note that there is some overlap between these second levels of purpose and their associated primary purpose categories (e.g. "Commercial" appears in the "Freight" category of primary purpose, while "Commercial / Bus" appears in both the "Tourism" and "Social" categories).

The proposed second levels for each of the primary purpose categories are as follows:

#### FREIGHT

- *Commercial*
- *B-Double*
- *Road Train*
- *Overmass / Overdimension*

#### TOURISM

- *4 Wheel Drive*
- *General Passenger*
- *Commercial / Bus*
- *Bicycle Route*

#### SOCIAL

- *General Passenger*
- *Commercial / Bus*
- *Bicycle Route*

## GUIDELINES DEVELOPMENT (Cont.)

### 7.4 Determination of “Fit for Purpose” Standards

The focus of this step has been the development of a *planning tool*, which looks at a broad range of minimum performance standards that, collectively, create a basis for quantitatively assessing whether a particular road is “fit for purpose”. It is *not an engineering tool* for use in designing new or upgraded roads, because it cannot reasonably address the many qualitative considerations and detailed site investigations necessary to fully define all requirements for safe and efficient operation of a particular road.

The proposed set of standards listed in this section have been settled on after an extensive, though not necessarily exhaustive, literature search of available state, federal and some overseas road/traffic design standards. A list of references related to design standards, uncovered as part of this exercise, is included as Appendix D1. For each proposed standard, the reference adopted has been the latest available material (including some still in a draft stage) from, in order of priority -

- Transport SA,
- Local Government Association of SA,
- Austroads,
- Australian Road Research Board, and
- Other Sources.

Before considering which standards to apply, it was first necessary to recognise that road/traffic design standards vary considerably between “metropolitan” and “rural” situations. However, the term “metropolitan” can often mean just the Adelaide region, whereas many regional cities and towns in South Australia also contain roads for which a metropolitan standard of road/traffic design should apply. Thus, the terms “built up area” and “non built up area” are used in this report, rather than metropolitan and rural. These terms are then consistent with the extensive work already carried out by the Local Government Grants Commission in defining all local government administered roads within South Australia as being in “built up” or “non built up” areas.

In addition to knowledge of any particular road’s primary purpose, second level within purpose, and whether or not the road is in a built up area, details of various traffic parameters are required before appropriate standards can be determined. The critical parameters are:

- Traffic volume (in AADT - Average Annual Daily Traffic),
- Heavy vehicle loading (expressed in “Equivalent Standard Axles” i.e. ESA’s),
- Presence of parking/cyclists (built up areas only), and
- Speed environment.

## GUIDELINES DEVELOPMENT (Cont.)

Having gathered together all of the above information, it was originally thought that road/traffic design standards would provide clear guidance on whether the road should be surfaced or unsurfaced, based upon available “purpose” and “traffic” data. Surprisingly, no such guidance was uncovered during the literature search. It has therefore been necessary to include surface type (i.e. simply “surfaced” vs “unsurfaced”) as a further initial parameter which is to be decided before standards can be applied.

The choice of “surfaced” vs “unsurfaced” is not, however, completely unrestricted. Common sense, and engineering judgement, has been used to apply some restrictions, such as:

- only “Category A - Formed and Sheeted” unsurfaced roads (as defined in the LGA's Unsurfaced Roads Manual) should be permitted as an option in built up areas;
- only “Category A - Formed and Sheeted” unsurfaced roads should be permitted as an option for roads in non built up areas with “freight” as the primary purpose; and
- only “Category D - Tracks” unsurfaced roads should be permitted as an option for roads with “tourism” as the primary purpose and “4WD” as the second level within that purpose.

Once all of the above factors had been considered, it was then possible to select appropriate standards for defining whether a road is fit for its purpose. These standards have been grouped under four fundamental headings, namely:

### *Speed Environment*

Design speed is a key standard which applies in both “built up” and “non built up” areas, collectively reflecting such fundamental parameters as vertical profile, horizontal geometry and site distance, all leading to a particular safe travel speed.

In built up areas, the average flow speed (both in off-peak conditions and in peak hour) reflects the degree of congestion in the road segment, collectively reflecting the capacity of the cross-section layout (through lanes vs mixed through/turning lanes), capacity of intersections and number of access points onto the road.

### *Dimensions*

Carriageway width (general) is a measure of the overall width of the road surface required to safely handle the type and volume of traffic. Carriageway width (bridges) provides an added measure of the minimum clearance requirement for points of restricted access (and high construction cost) where shoulders may not be cost effective to provide.

Lane width is a measure of “through lane” requirements, particularly as they apply to multi-laned roads. Lane width is highly dependent on traffic volumes, and the presence of a high percentage of heavy vehicles, such as on freight routes. In built up areas, allowing room for on-street parking and/or cyclists can add up to 2.1 metres to the recommended width of the kerbside lane on a freight route, where at least one through lane is required. (Bicycle and freight movements are incompatible. Consideration should be given to providing for cycling movements on the adjacent road network or with off-road facilities, where this is not possible, the width above applies.)

## GUIDELINES DEVELOPMENT (Cont.)

In non built up areas, shoulder width is also a key dimension, reflecting the need to allow vehicles room for pulling off of the main carriageway (such as due to a breakdown), or to recover in the event of accidentally running off the main carriageway. The standard for shoulder width increases significantly with increase in traffic volume. Whilst for normal circumstances shoulders do not need to be sealed, designated cycle routes require between one and three metres of sealed shoulder (depending on the speed environment) in addition to normal sealed carriageway requirements. Sealed shoulders can also be worthwhile on some sections of road to reduce the risk of run-off road crashes.

Height clearance is a major consideration for freight routes, and also where buses (commuter or tourist) use the route.

### *Geometry*

Whilst basic geometric considerations are covered by “design speed” under the speed environment heading, special consideration needs to be given to horizontal curve radius (particularly in hilly areas where isolated curves can be very tight) due to the problems of heavy vehicle tracking (corner cutting) creating a significant safety risk for on-coming vehicles.

Vertical grade is also a key consideration, particularly for freight routes, because of the high safety risks associated with the large uphill speed differential between commercial vehicles and cars, and the potential for loss of control (including break failure) on steep downhill grades. (Similarly for routes used by vehicles towing caravans.)

In built up areas, critical to the movement of large vehicles (freight and, occasionally, buses) is intersection turning radius, while roundabout lane width and roundabout radius are also two major considerations for safe movement of commercial vehicles and buses.

### *Strength / Durability*

Traditionally, pavement strength has not been directly specified, but has been reflected in design pavement depths chosen after site investigation of sub-soil conditions, knowledge about the available sub-base and/or base course material strengths and traffic loading predictions have been taken into account. Such a methodology is very site specific. As a more practical alternative, this report specifies pavement deflection as an indicator of overall pavement strength.

Whilst suitable for surfaced roads, pavement deflection is not a suitable indicator of pavement strength for unsurfaced roads. As an alternative, road quality categories (defined in the Local Government Association of SA's “Managing Unsealed Roads in South Australia” publication) are proposed. These categories range from a graded track (Category D) through to a fully formed and engineered road (Category A).

Individual bridge/culvert mass limits are a second important strength related design consideration. Often, the overall route classification may be down-graded due to one or two isolated bridges having a lower capacity and being unable to be bypassed.

## GUIDELINES DEVELOPMENT (Cont.)

Surface roughness has been included as a measure of strength related performance of a road pavement as it ages. Although some examples of high roughness counts reflect initial poor construction standards, it is generally more likely that high roughness is a sign of a deteriorating pavement which manifests itself in general deformation, rutting and high levels of pavement defects. High roughness of a road surface also has a potential economic cost to vehicles using the road, particularly heavy vehicles, in terms of extra wear and tear on the vehicle and possible damage to the load.

A spreadsheet is shown in Appendix D2 which lists, as columns, the above 17 standards and then establishes individual “fit for purpose” levels for each relevant standard against each combination of primary purpose, second level within purpose, built environment and surface type. Not all standards apply to each purpose/category combination. In addition to the actual standards, the spreadsheet identifies where traffic parameters influence the standard. The spreadsheet also lists relevant references, highlighting the source of information upon which the selected standard has been based.

### 7.5 Establishment of the Gap

The 17 individual standards discussed in the previous section collectively define the “fit for purpose” standard of a particular road. These same parameters, *from a planning viewpoint*, provide the basis for defining the current state of a road. Note that, apart from measuring pavement deflection and surface roughness, no other pavement condition or seal condition measurements, or maintenance standards, are suggested. This is because the methodology in this report is focussed upon the ability of a road to safely and efficiently meet its purpose, *not* what physical condition the road is in, unless that physical condition has reached such a state of disrepair that it directly impacts upon the road’s ability to meet its purpose.

In order to establish the gap between current condition of the road and its “fit for purpose” standard, councils will need to supply data on relevant traffic parameters and on the current standard of the road. Traffic parameters required are the traffic volume and heavy vehicle loading, along with (for built up areas only) the presence of parking/cyclists and (for unsurfaced roads) the general speed environment.. Note that traffic parameters should be supplied for the conditions expected within a two to five year timeframe, not current conditions, since the reason for many roads requiring an upgrade is the expected increase in traffic loading resulting from planned developments, not just current traffic loads.

By comparing “fit for purpose” standards with current standards, the gap in the ability of the road to meet its purpose is established.

## GUIDELINES DEVELOPMENT (Cont.)

### 7.6 Determination of the Cost to Close the Gap

The gap between current and fit for purpose standards represents an economic cost in terms of the inability of individual roads within the road network to meet suitable standards for safe and efficient operation in line with their defined purpose. However, quantifying that cost requires an understanding of the individual situation for each road, since the gap in standard may be caused by many varying factors. It is therefore proposed that the cost to close the gap be derived from individual council estimates of the road upgrade proposals as contained in grant applications, rather than some holistic formula which attempts to put a broad dollar value on the gap using arbitrary (non site specific) parameters.

Before a cost to close the gap can be adequately defined using this method, any proposed upgrading of the road (and its associated cost) must be tested against the fit for purpose standards. This is because it cannot automatically be assumed that a particular proposal will close all aspects of the gap in standards. Councils will therefore be required to define the standards achieved by the proposed upgrade, using the same (up to) 17 standards defined above, and also provide their estimate of the percentage of the gap which is closed by the upgrade proposal.

Once the above information is supplied, a modifying factor can be applied to the upgrade's proposed cost, to obtain a closer approximation of the total cost to close the gap. The proposed modifying factor is:

$$\text{Cost to Close Gap} = \text{Upgrade Cost} / \% \text{ of Gap Closed}$$

As an example, a proposed upgrade which only closes 80% of the identified gap in standard would result in the "cost to close gap" being 25% greater than the upgrade cost.

This method for determining the cost to close any gap in standards is clearly an approximation, which cannot ultimately replace a detailed assessment of costs on a site specific basis. However, it will be a valuable planning tool for the purpose of assessing and prioritising road grant applications, where it is clearly impractical to perform a detailed independent analysis of the cost to close the gap in standards for every proposal submitted.

### 7.7 Determination of Factors Influencing Benefits

The relative potential benefits of any proposed road upgrade are derived from a series of "benefit influencing factors". These influencing factors, in turn, impact on the priority of each proposal. In this project, the influencing factors associated with the road proposals selected by the Consultative Committee have been taken into account, along with other research documentation provided.

Influencing factors have been categorised into six key areas. Each key area has been weighted according to its relative importance in determining the overall benefit of road upgrade proposals. In the case of the "Economic" area, further individual weightings have been applied to the three sub-areas of road user benefits, community benefits and road owner benefits. Within each area (or sub-area in the case of the "Economic" area), influencing factors have been given equal importance in determining the percentage of that area (or sub-area) weighting which should be applied for any given road upgrade proposal.

## GUIDELINES DEVELOPMENT (Cont.)

The key areas, sub-areas and specific influencing factors are as follows:

### **SECONDARY PURPOSE (10%)**

*Does the road offer?*

- One secondary purpose (e.g. freight, tourism or social) in addition to the primary purpose
- Two secondary purposes (e.g. freight, tourism or social) in addition to the primary purpose

### **REGIONAL SIGNIFICANCE (25%)**

*Does the road have?*

- Community significance (i.e. part of a formal council transport strategy)
- Regional significance (i.e. part of a regional transport strategy)
- State significance (i.e. links in with a state freight or tourism strategy)

### **ECONOMIC (20%)**

*Does the road proposal provide a?*

Road user benefit (10%), such as:

- Reduce delays and operating costs for heavy vehicles
- Provide direct access to major industrial developments, freight generators and specific facilities such as grain silos, wineries, processing plants, etc
- Facilitate a higher classification of freight movements (e.g. commercial to B-double)
- Facilitate direct access for intermodal transport operations
  - Rail
  - Sea
  - Air
- Assist export of products by improving quality (market condition) and reducing impacts of dust, etc
- Provide direct access to new industrial precincts

## GUIDELINES DEVELOPMENT (Cont.)

Community benefit (5%), such as:

- Benefit regional employment and sustain communities
- Assist attraction of economic investment to region

Road owner benefit (5%), such as:

- Reduce the road maintenance effort

### **ACCESS (15%)**

*Does the road proposal?*

- Reduce traffic congestion
- Link areas of particular land uses to strategic routes
- Provide a higher standard alternative route
- Complement the existing arterial road network
- Provide improved access to key population centres
- Ensure communities are not isolated by flooding
- Act as a collector road for local traffic and for heavy traffic
- Provide all weather access
- Provide access to other types of transport as a passenger intermodal connector
  - Bus
  - Rail
  - Air

## GUIDELINES DEVELOPMENT (Cont.)

### SAFETY (20%)

*Does the road proposal?*

- Reduce conflicts between tourist, freight and commuter traffic
- Contribute to safer travel and reduced accidents
- Provide safe overtaking opportunities and reduce frustration and fatigue
- Reduce exposure to travel risk
- Provide access for school buses
- Provide access for emergency services
- Remove traffic from city/town areas
- Reduce road roughness and potential dust hazards
- Reduce the impact of roadside hazards such as culverts and overhanging trees

### ENVIRONMENTAL (10%)

*Does the road proposal?*

- Reduce environmental pollution
  - Air
  - Noise
  - Water
- Minimise impact of heavy vehicles on local community
- Reduce reliance on road transport and encourage other forms of transport
- Incorporate revegetation or bushcare activities or reduce the impact of another corridor on wildlife.

## GUIDELINES DEVELOPMENT (Cont.)

### 7.8 Prioritisation Within Primary Purpose

Following determination of the factors influencing benefits and their relative weightings, as outlined in the previous section, each of the eleven roads selected by the Consultative Committee for evaluation were assessed against the methodology. This process proved difficult, because information related to specific benefits offered by each of the proposals was often difficult to elicit from the word pictures supplied in the road grant application documentation. Future applications, which follow a pre-defined format for defining benefits, will be easier to assess. For the purpose of this evaluation process, assumptions about benefits have been made where not specifically identified in the documentation supplied.

The resultant "weighted benefit" scores (all out of 100) for the eleven road grant applications, with roads grouped under their primary purpose and ranked in order of highest priority, were:

#### Freight

- Gomersal Road – 83
- Dublin Road – 71
- Pallamana Road – 69
- Wyatt Road – 67
- Nangkita Road – 59

#### Tourism

- Davenport Creek Road – 72
- Gawler Ranges Road – 67
- Caves Hynam Road – 67

#### Social

- Hawthorndene Drive – 47
- Schell Road – 46
- Norwood Parade – 45

As previously stated, this initial ranking by "weighted benefit" provides a general overview of the relative merits of various proposals, with maximum priority given to those proposals with regional and/or state significance that have the most individual benefits. The ranking does not take into account the number of road users and other industry or community groups which benefit from the proposal, nor the individual cost of the proposal. However, the results reasonably accurately reflect the current evaluation process applied by LRAC. It is therefore recommended that the "weighted benefit within primary purpose" priority lists be used as the main criteria for ranking of road upgrade proposals.

## GUIDELINES DEVELOPMENT (Cont.)

In order to differentiate proposals that show much the same weighted benefit score, it is proposed that the above weighted benefit score also be expanded as follows:

- (1) Multiply the weighted benefit score (wb) by the traffic volume (tv) using the route (in AADT). This applies the individual benefits of the proposal to each user of the route, to provide a "total road user benefit" score. At this point, the formula will clearly be biased towards more highly trafficked roads, which is not unreasonable. Note that broader benefits to the economy and/or community are not specifically included, having already been covered in the original weighted benefit score.
- (2) Divide the total road user benefit score by the "cost to close gap / road length (rl) to be upgraded (in km)". This will effectively "normalise" the total road user benefit score on a "per \$ per km" basis, so that lower cost proposals, or those where a relatively long length of road is being upgraded, will have their benefit score elevated.

Noting that the "cost to close gap" has previously been defined as being equal to "upgrade cost (uc) / % of gap closed (gc)", then the components of the formula described above can be brought together as follows:

$$\text{weighted benefit/cost score} = \text{wb} \times \text{tv} \times \text{rl} \times \text{gc} / \text{uc}$$

Using the above "weighted benefit/cost score", new priority lists within primary purpose can be generated. These will indicate which proposals offer the greatest "value for money" on a "road user benefit per \$ per km" basis. However, as previously stated, it is important at this stage to only apply the weighted benefit/cost score as a means of differentiating proposals within individual LGA Regions, or across (or within) individual councils. Other factors still need to be considered for inclusion before such a score could be unilaterally applied in establishing state wide priority lists.

An example of comparing roads within a region can be made between Dublin Road and Gomersal Road. The weighted benefit/cost score for each of these roads is:

- Dublin Road – 207
- Gomersal Road – 174

This result reverses the previous ranking (which had Gomersal Road ahead of Dublin Road). Whilst the predicted traffic volumes are similar for both roads, the cost per km to upgrade Gomersal Road is about 50% higher than that for Dublin Road. Thus, in this example (and on the basis of data supplied with the respective submissions) Dublin Road arguably presents a better "value for money" proposal than Gomersal Road.

## GUIDELINES DEVELOPMENT (Cont.)

### 7.9 Prioritisation Across Primary Purposes

Feedback from discussions at Consultative Committee meetings, and in interviews with various Councils and LGA Regions, leaves little doubt that no formal methodology for comparing road upgrade proposals across primary purposes can be recommended at this stage.

Inspection of the three lists of weighted benefit score by primary purpose, as shown in the previous section, reveals that if such lists were combined, proposals with "Freight" as the primary purpose would (in the main, but not exclusively) be ranked higher than "Tourism", with "Social" a poor third.

Such an "across primary purposes" ranking might be used by LRAC as a guide in decision making. However, it is imperative that policy influences, which might dictate the spread of funding across the three primary purpose categories, are also taken into account. Thus if, when considering the eleven sample road upgrade proposals, a policy decision to spend a minimum of \$500,000 on a "social" purpose might result in Schell Road being funded ahead of Pallamana Road, even though the weighted benefit score easily favours Pallamana Road.

Similarly, urgency issues may need to be factored into the final decision making process. A particular proposal may need to be implemented within a one to three year time frame in order to gain maximum benefit (e.g. supporting economic development in the region). Such considerations are best handled directly by the LRAC, without attempting to formalise the process through the database.

# 8

## DEVELOPMENT OF PROTOTYPE DATABASE

### 8.1 Overview

The objective of this phase of the project was to design, develop and test the prototype of a proposed roads infrastructure database which can, in its final version, be used to store and manipulate data and be accessed by all relevant stakeholders.

In outline, the main activities conducted were:

- An electronic copy of the MapInfo based road length database, as developed for the South Australian Grants Commission, was obtained (with permission from the Grants Commission) to use as the basis for all data that would subsequently be held in the prototype roads infrastructure database and, eventually, in the full version of the roads infrastructure database. This course of action builds on the extensive effort undertaken to date by the Grants Commission in developing and maintaining a comprehensive spatial definition of the South Australian road network.
- Using “Paramap” asset management software, as developed by HDS Australia Pty Ltd, data from the road length database was used to establish an initial roads infrastructure database. Non-spatial data such as road name, council area, road category and road segment length were some of the data items transferred from the road length database.
- Additional non-spatial data fields were defined, including data associated with road inventory, condition, traffic and economic information. Specific data items selected for inclusion in the database were based upon the information needs of the “guidelines development process” discussed in Section 7. Forms were developed, which mirrored the guidelines development process, to allow for data to be entered into the database for each road segment under consideration. These forms were:
  - Purpose / Category
  - Traffic Factors
  - Standards - Current
  - Standards - Proposed
  - Influencing Factors (several forms)
- An initial procedure was developed within the database in which information entered via the “purpose / category” and “traffic factors” forms can be combined with a “fit for purpose” standards spreadsheet (refer Appendix D) to automatically select the most appropriate “fit for purpose” standards for each road segment under consideration. Information entered via the “existing standards” form can then be compared with the “fit for purpose” standard calculated by the database to determine any “gap” in standards. Information entered via the “proposed standards” form, including estimated cost of the proposed upgrade and estimated percentage of gap closed, can then be included to gain a full picture of the existing gap in standards and its degree of closure resulting from the proposal.
- A second procedure was developed in which a “weighted benefit” for each proposal can be automatically determined using the overall methodology and individual weightings described previously in Section 7.8. Based upon that score, three initial prioritised lists of proposals (within primary purpose) can be established.

## DEVELOPMENT OF PROTOTYPE DATABASE (Cont.)

- The second procedure mentioned above also enables the weighted benefit to be converted into a “weighted benefit/cost score” using the formula shown in Section 7.8. As previously discussed in Section 7.8, this then allows for the establishment of revised prioritised lists of proposals within LGA Regions and across or within individual councils. Such lists allow for comparison of road upgrade proposals which otherwise have a very similar weighted benefit.
- While not considered to be an integral step in achieving any final single ranking of all proposals, it is possible for LRAC to extend the concept of listing the weighted benefit across all three primary purposes. This last step is intended to be an interactive process in which members of LRAC can use the database to conduct “sensitivity analyses” of their decision making processes, by trying different weightings associated with the remaining “urgency” and “policy” considerations included in the prioritisation process. It is not intended that the procedure for “prioritisation across purpose” will produce a definitive final ranking of all proposals - merely aid LRAC members in their final consideration of proposals.

In addition to development of the prototype database as described above, consideration was also given to issues associated with resourcing the entry of information, ongoing maintenance and other related matters associated with any final version of the database (i.e. if Stage 2 of the project proceeds).

In considering data source issues, it is imperative that a single source of key data (namely road centreline information) covering the spatial definition of South Australia’s road network is established. There are currently two officially published government sources of road centreline data. One resides with the Department for Environment and Heritage (DEH), as part of the digital cadastral database (DCDB), while the other resides with Transport SA and is an upgraded version of the DCDB base data. Grants Commission data, as used in this project, constitutes a third source of road centreline data. Following several discussions with the Executive Officer SA Grants Commission on this matter, the project team has prepared a number of recommendations, which are detailed in Section 9.

### **8.2 Data Management Issues**

#### **8.2.1 Data Structure**

The road length database established by the SA Grants Commission, and supplied as the basis for development of the prototype roads infrastructure database, comprised over 160,000 individual road segments. These segments were defined both spatially (i.e. their shape) and non-spatially (i.e. attributes associated with each road segment). In addition, a number of layers of supporting information were also contained within the database, or have been separately incorporated into the prototype roads infrastructure database. These include the state boundary, local government authority boundaries and names, and principal town locations and names. Together these three sets of information, namely road segment spatial definitions, road segment attributes and layer spatial definitions, comprise the overall data structure for the proposed roads infrastructure database. Page 1 of Appendix E2 depicts the entry screen of the prototype roads infrastructure database developed using this data model. Page 2 of Appendix E2 shows greater detail on road segment information and other layers forming the basis of the database.

## DEVELOPMENT OF PROTOTYPE DATABASE (Cont.)

### 8.2.2 Data Storage Requirements

The spatial definition of each of the 160,000+ road segments varies in complexity depending upon the length and shape of individual segments. Overall, the five MapInfo files, which hold details of the spatial definition of road segments, are collectively over 13MB in size. In addition, a further 2MB of other MapInfo files hold spatial definitions for the various layers of supporting information.

In addition to its spatial definition, eleven attributes were also originally associated with each road segment in the road length database. Under the prototype roads infrastructure database, the number of attributes has increased to 106. This means that if provision for all road segment information is made at the outset, the main attribute database will contain around 17 million fields of information, resulting in a file of at least 100MB in size. If photographic and/or video images are also stored, the demand for storage space increases dramatically.

Alternatively, initial data could be restricted to about 20 fields of basic information for each road segment, including that which was originally supplied in the road length database, along with road primary purpose and secondary purpose(s). Subsequent data could be added, as required, for each road upgrade proposal, since it is neither feasible nor necessary to enter detailed information on all road segments in the state at the outset. This would contain the size of the initial roads infrastructure database to just over 2 million fields of information, but ultimately it would still need to accommodate much larger data requirements.

Whilst physical storage of 120MB+ of information (much more with images) presents little difficulty using today's computing technology, the time required to undertake detailed searches through, and processing of, over 17 million fields of information is a far more challenging problem. This will need to be carefully considered when developing the final version of the roads infrastructure database.

### 8.2.3 Analysis of Initially Supplied Data

Having established the data structure, including spatial definition of all road segments, the first step in developing the prototype roads infrastructure database was to analyse data supplied by the SA Grants Commission in its road length database. Examples of a "banding enquiry" which creates a map showing the various road categories defined by the Grants Commission, and statistically summarises the percentage of road length in each category, are included in Appendix E2 on Pages 3 and 4. Note that in these and other reports produced by the prototype database, all lengths are in metres.

Details of the primary purpose for each sample road segment examined in this project were entered in the prototype database. From this, a further type of data analysis can be made, where maps of the road network by primary purpose can be produced. An example of this is depicted on Pages 5 and 6 of Appendix E2. It shows a limited set of results for a primary purpose of "Freight", as only two sample roads have data matching this requirement in the area shown in the prototype database. However, the concept of this type of enquiry, and its potential, is clear.

## DEVELOPMENT OF PROTOTYPE DATABASE (Cont.)

### 8.2.4 Data Input for Road Upgrade Proposals

The final data management issue, which was addressed before data modelling commenced, involved the input of information related to each road upgrade proposal. This data was of two fundamental types, namely:

- various information about the existing road and its surrounding environment, used to determine the “fit for purpose” standard of the road, and
- detailed information on the proposed road upgrade, including cost and benefits, used to assess the relative merits of each proposal to each other.

The input of both sets of data closely reflected the draft “guidelines for councils” produced to form part of a revised road grant application process (refer Section 7 of this report and also Volume 2).

Prior to entry of data related to any specific road segment, each segment was located using a special text/location enquiry as shown on Pages 7 and 8 of Appendix E2 (for Wyatt Road). Examples of information entered about the existing road and its surrounding environment are shown on Pages 9 to 11, with a sample of a linked image included on Page 12.

At this point, initial data modelling to determine the fit for purpose standard was undertaken (see next section) and associated examples of the results are shown on Pages 13 and 14 of Appendix E2.

Following running of the fit for purpose modelling procedure, further data was then entered related to the proposed road upgrade, as shown on Pages 15 to 20 of Appendix E2.

### 8.3 Modelling Processes and Test Results

Two principal modelling processes have been incorporated into the prototype road infrastructure database, namely:

- determination of “fit for purpose” standard, and
- determination of weighted benefit and weighted benefit / cost scores.

The effect and role of both of these modelling processes in assisting the LRAC to determine appropriate grant funding priorities has been extensively discussed in Section 7. Discussion in this section will therefore be limited to a brief explanation, including examples, of how the concepts were incorporated into the prototype database.

#### 8.3.1 Determination of Fit for Purpose Standard

Contained within the prototype database is a program that uses purpose/category, built environmental and traffic factor attributes, obtained for each road segment in turn, then matches that data to the relevant line of the “fit for purpose” standards spreadsheet shown in Appendix D. For each of the sample roads considered, the program extracted the relevant fit for purpose standards from the spreadsheet and returned that information into the relevant attribute fields for the road segment, before moving on to the next road segment in the database.

## DEVELOPMENT OF PROTOTYPE DATABASE (Cont.)

If the program did not detect any information for a particular segment, it returned an “undefined” result in the “fit for purpose status” field. If the program detected a combination of purpose/category, built environment and traffic factors which did not exist in the fit for purpose standards spreadsheet, it automatically returned an “infeasible” result in the “fit for purpose status” field.

An example result of the outcome from this fit for purpose modelling process, applicable to Wyatt Road, is shown on Page 13 of Appendix E2.

After completion of the fit for purpose modelling process, it was then possible to compare current standards with fit for purpose standards, thereby establishing the extent of any “gap”. An example of this outcome is shown, again for Wyatt Road, on Page 14 of Appendix E2.

### 8.3.2 *Determination of Weighted Benefit and Weighted Benefit / Cost Scores*

A second program was developed within the prototype database which automatically calculated the weighted benefit and the weighted benefit / cost score, using the formulae contained in Section 7.8 of this report and based upon the individual data entered for each road upgrade proposal. Results obtained from running this program were returned as “calculated field” attributes for each road segment.

Once the weighted benefit had been determined, it was then possible to create an enquiry which, for each primary purpose, identified all road segments matching that purpose and listed them in decreasing order of weighted benefit. In this way, the three weighted benefit priority lists (by primary purpose) were obtained. An example of the form of the enquiry is shown on Page 21 of Appendix E2, while the resulting list, for “Freight”, is shown on Page 22.

Additional lists, showing the relative ranking of road segments within specific council areas, were also examined, using the weighted benefit / cost score as a special differentiation tool. Page 23 of Appendix E2 shows one such result, comparing Dublin Road with Gomersal Road.

Overall, the prototype roads infrastructure database was developed to both examine data management issues for such a large database and to demonstrate how the data modelling process could be successfully implemented. Both outcomes were satisfactorily achieved.

# 9

## SUMMARY OF RECOMMENDATIONS

The following recommendations are proposed in line with the terms of reference for this consultancy. The recommendations are summarised below in two key areas:

### 9.1 Guidelines

It is recommended that:

1. The new guidelines as outlined in Section 7 of this report and in Volume 2, be adopted on a trial basis by the Local Roads Advisory Committee (LRAC), for the evaluation and prioritisation of road application proposals during the 2002 funding process, and be evaluated at the conclusion of the trial process.
2. The definitions of “primary purpose”, “secondary purpose” and “second level within purpose” as specified in Sections 7.3.1 to 7.3.3 of this report be adopted.
3. The standards as specified in Appendix D of this report be adopted for use as a planning tool in assessing whether a road is “fit for purpose”.
4. The estimated cost to close the gap between the existing and proposed state for a particular road proposal be provided by councils as part of the application process.
5. The factors used for assessing the benefits of a particular proposal be as outlined in Section 7.7 and that a “weighted benefit” or be determined for each primary purpose category to develop a priority list of candidate projects.
6. A “weighted benefit/cost score” as outlined in Section 7.8 be used as a means of differentiating proposals within individual LGA Regions, or across (or within) individual councils. (Other factors still need to be considered for inclusion before such a score could be unilaterally applied in establishing statewide priority lists.)
7. Note that no formal methodology for comparing road upgrade proposals across primary purposes is recommended at this stage.

### 9.2 Database

It is recommended that :

1. The structure of the prototype database be adopted for use during the trial of the new guidelines.
2. The prototype database be used by the LRAC to support data collection and prioritising of road proposals in the 2002 round of funding, as a stand alone personal computer based system.
3. The Stage 2 development of a full database should follow a formal review of the 2002 trial.
4. The Stage 2 full database should remain under the control of the South Australian Grants Commission for the entry and management of data to be held in the system.

## SUMMARY OF RECOMMENDATIONS (Cont.)

5. Dissemination of information contained in the Stage 2 database, to councils and regional associations, should be undertaken by the Department of Environment & Heritage, using mechanisms currently being put in place to disseminate information associated with the existing road length database.
6. The final data structures for the Stage 2 full database should be based on the prototype modified by the outcomes from the 2002 trial and be in line with the draft functional specification outlined in Volume 3.
7. The Stage 2 full database will need to be registered within the State Government's spatial data directory as an official repository of information on the South Australian road network.

