Additional Crossing of the Clarence River

Feasibility Study Report

February 2003






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Executive Summary

In May 2002 a public meeting was held regarding an additional crossing of the Clarence River. Following that meeting the State Government allocated $100,000 to a feasibility study for an additional crossing of the Clarence River in the vicinity of Grafton. The feasibility study commenced in July 2002 and is the subject of this report.

The primary objective of this study was to identify feasible locations for a second crossing of the Clarence River, taking into consideration community needs, traffic and the environment. The feasibility study focused on these three areas for investigation.

Community Involvement

The RTA implemented a large-scale, high profile community consultation program, which considered the views and opinions of the wider Clarence Valley community. A Community Involvement Plan was developed, which was intended to involve the overall community in the identification of relevant issues to be considered during the development of the strategic options.

The community consultation was divided into four categories to allow a broad coverage of the community. The consultation categories are listed below:

1. *Community Focus Group*
2. *Invitations to Comment*
3. *Community Questionnaire*
4. *Media*

The community consultation undertaken for this project has exceeded the typical level of consultation undertaken for a feasibility study. The RTA sought to gain as a wide a perspective as possible whilst ensuring that the feasibility study process was open and guided, as much as possible, by community expectations.

Traffic Analysis

The following tasks formed the main part of the traffic investigations.

- A review of existing data and collection of additional traffic data available from Grafton City Council, RTA Grafton, traffic survey information, consultant reports and traffic studies for major developments. Additional vehicle occupancy surveys and vehicle travel time surveys were undertaken.
- Consideration of urban population growth in the Grafton locality and nearby centres.
- Consideration of future traffic growth and needs up to 35 years.
- Formulation of a traffic analysis model that takes into consideration safety, travel time, road user costs and ferry replacement costs at Lawrence and Ulmarra.
- Use of the traffic model to analyse the strategic locations.
- A benefit cost analysis on the basis of the results of the traffic analysis model and cost estimates for the strategic locations.

The traffic issues considered as part of the traffic analysis were:

- Delays on the existing Grafton Bridge
- Capacity of the roadway
- Capacity of intersections
- Heavy vehicles
- Emergency vehicles
- Public Transport
- Road Safety
- Through traffic needs versus local traffic needs

Environmental Investigations

The purpose of the environmental investigations was to identify the environmental issues that would need to be considered when investigating strategic locations for an additional crossing.

The feasibility study was limited in scope to a review of existing reports and information. State of the Environment Reports for Grafton, Copmanhurst, Pristine Waters and Maclean Councils were reviewed. Local Councils, the National Parks and Wildlife Service and the Department of Land and Water Conservation were contacted and relevant ecological and natural resource studies were sourced and reviewed.

From the State of the Environment Reports, it was noted that eighteen (18) threatened fauna species and one (1) threatened flora species are known to occur in the Grafton City Local Government Area. More than Five Hundred (500) species of fauna are known to occur in Pristine Waters Shire, with Seventy-Seven (77) of those being threatened. Also, seventy four (74) threatened flora species are known to occur within Pristine Waters Shire.

Susan Island was identified to be the site of greatest ecological value within the study area. On the upstream end of Susan Island is Susan Island Nature Reserve. The remainder of the island is currently being considered for incorporation into the Nature Reserve. The Reserve currently protects a small remnant of the subtropical rainforest that first attracted Europeans to the Clarence Valley in search of timber. In the warmer months, the remaining rainforest provides a roost for thousands of Flying Foxes.

The rainforest on Susan Island comprises part of the vegetation community known as "Lowland Rainforest on Floodplain in the North Coast Bioregion". The rainforest on Susan Island comprises key habitat for the Grey-headed Flying Fox, a vulnerable species. The Susan Island colony is the largest maternity colony in NSW, with numbers reaching up to 200,000 at certain times of the year.

Nine (9) Aboriginal objects and Aboriginal places have been recorded in or around Grafton. This includes a bora/ceremonial site at Susan Island.

Potential noise impacts on the community were considered for the strategic locations. The impact of an additional crossing on the residential and business districts with respect to noise

is potentially high. The feasibility study did not undertake any specific noise monitoring of strategic locations. Property impacts would also be potentially high, particularly for strategic locations in the vicinity of residential areas.

The heritage item that is most immediately obvious within the study area is the Clarence River Bridge, connecting Grafton to South Grafton. The bridge, which was completed in 1932, is historically significant for a number of reasons, and has important aesthetic and social significance related to its landmark qualities and its recognisable part of the community's identity. The bridge is an item of State heritage significance.

Strategic Locations

The strategic locations investigated were divided into the following study areas:

1. Upstream of the existing bridge including Susan Island
2. At the existing bridge
3. Downstream of the existing bridge including Elizabeth Island
4. Ulmarra
5. Cowper
6. Lawrence

The strategic options that can be considered feasible locations were those that met the objectives of the project. Those that did not meet the objectives were considered further and rejected if they did not provide a significant benefit.

The most feasible location appears to be in the vicinity of the existing bridge. However, although this location is feasible an additional crossing would still have significant impacts on the community such as traffic, social, noise and aesthetics. If the project were to proceed to the Development Phase, ie, selection of a preferred location, more detailed studies would be required. This would include more specific traffic analysis and noise monitoring in this locality. It would also require continuation of close consultation with the community to determine the social impact of an additional crossing.

The locations upstream and downstream of the existing bridge also appear feasible as they meet all the objectives of the project with the exception of economic comparisons of the benefits to cost. These options have a number of adverse impacts particularly social and environmental impacts and traffic noise. However, they do have a number of benefits as detailed in this report. If the project were to proceed to the Development Phase these locations would need to be considered as part of the selection of a preferred location to validate the findings of the Feasibility Study. Further detailed traffic analysis, noise monitoring, environmental investigations and community consultation would be required to determine the viability of an additional crossing in these locations.

The locations at Ulmarra, Cowper and Lawrence do not meet a number of objectives of the project and would not contribute greatly to reducing congestion or providing a significant improvement to safety at the existing Grafton bridge. Therefore, an additional crossing at these locations does not appear feasible as it does not meet the objectives of this project.

Glossary

DLWC – Department of Land and Water Conservation
EPA – Environment Protection Authority
LGA – Local Government Area
SOE – State of the Environment Report. Published by Local Councils
TSC Act – Threatened Species Conservation Act, 1995
Terrestrial Ecology – Plants and animals that exist on land
Aquatic Ecology – Plants and animals that exist in water
Vehicle Occupancy Survey – A count of the number of occupants in each vehicle in a certain period
Linear Growth Rate – A term to describe the growth of traffic each year at a constant rate.
Hydrology Investigations– Analysis of the existing flooding information for the Clarence River within the study area
Indigenous Heritage – Aboriginal heritage which has cultural and spiritual significance.
Non-Indigenous Heritage – Non-aboriginal items of heritage significance (usually of European origin).
Geotechnical Investigations – Investigation of the types of materials in the ground that will impact on the construction of an additional crossing.
Socio-Economic Considerations – The impact an additional crossing will have on future planning and land use.

1 Introduction and Background

1.1 Introduction

This report deals with the identification of feasible locations for an additional crossing of the Clarence River.

The existing Clarence River Bridge.

1.2 Background

Approval was given in 1915 for the design and construction of a bridge over the Clarence River (with a moveable span for river navigation clearance) to carry a railway and a footway. In 1922, when design was well advanced, the Minister for Works requested the design to include vehicular traffic in addition to the railway and pedestrian traffic. The new bridge was opened to traffic in 1932.

Grafton City Council initiated correspondence regarding a second bridge in 1960 with investigations commencing in the early 1970's. In 1977 the Department of Main Roads (DMR) advised that a new bridge location had been adopted linking Fitzroy Street Grafton to Bent Street, South Grafton. Survey and geotechnical investigations were then undertaken. In 1985 the DMR advised that the new bridge was a long-range proposal.

In 1999 the RTA examined a number of upgrading options for the existing bridge. They were;

1. Do Nothing
2. Minor alterations to the kerbs at the 'kinks'
3. Remove the 'kinks'
4. Construct one lane on the existing rail bridge on the lower deck
5. Provide two additional travel lanes at the existing rail or road bridge.
6. Upgrade southern approach lanes from the Through Street roundabout

7. Upgrade the northern approach lanes from the Villiers Street roundabout.

Construction on the northern and southern approaches to the existing bridge was undertaken in 2000 and 2001. This was a cost-effective short term solution to improve the road capacity at the approaches and reduce the queuing at the Villiers Street and Through Street roundabouts.

In 2001 a group of business people formed a committee to campaign for a new bridge at Grafton. In May 2002 a public meeting was held regarding a second crossing of the Clarence River. Following this meeting the State Government allocated $100,000 to a feasibility study for a second crossing of the Clarence River at Grafton. The feasibility study commenced in July 2002 and is the subject of this report.

1.3 Purpose

The purpose of the feasibility study is to:

1. Identify broad strategic locations between Seelands and Maclean for an additional crossing of the Clarence River;
2. Determine the traffic, community, environment and engineering impacts for each of the strategic locations; and.
3. Identify the broad strategic locations that are feasible for an additional crossing.

The feasibility study can be used as a basis for decision making on whether the project can proceed to the next phase of investigations. The feasibility report is to be made available to the community for public comment. Technical information relating to the main report is included in the Appendices. A Glossary of Terms is provided in the front of this document to describe the technical terms used throughout the report.

1.4 Limitations

- The feasibility study focuses on broad strategic locations and does not recommend a specific site for an additional crossing. That would be considered in the next phase if the project proceeds.
- The report does not investigate the upgrade of the existing bridge.

1.5 Objectives

The primary objective of the project is;

- To identify feasible locations for a second crossing of the Clarence River that considers environmental, traffic and community needs.

The supporting objectives of the project are to:

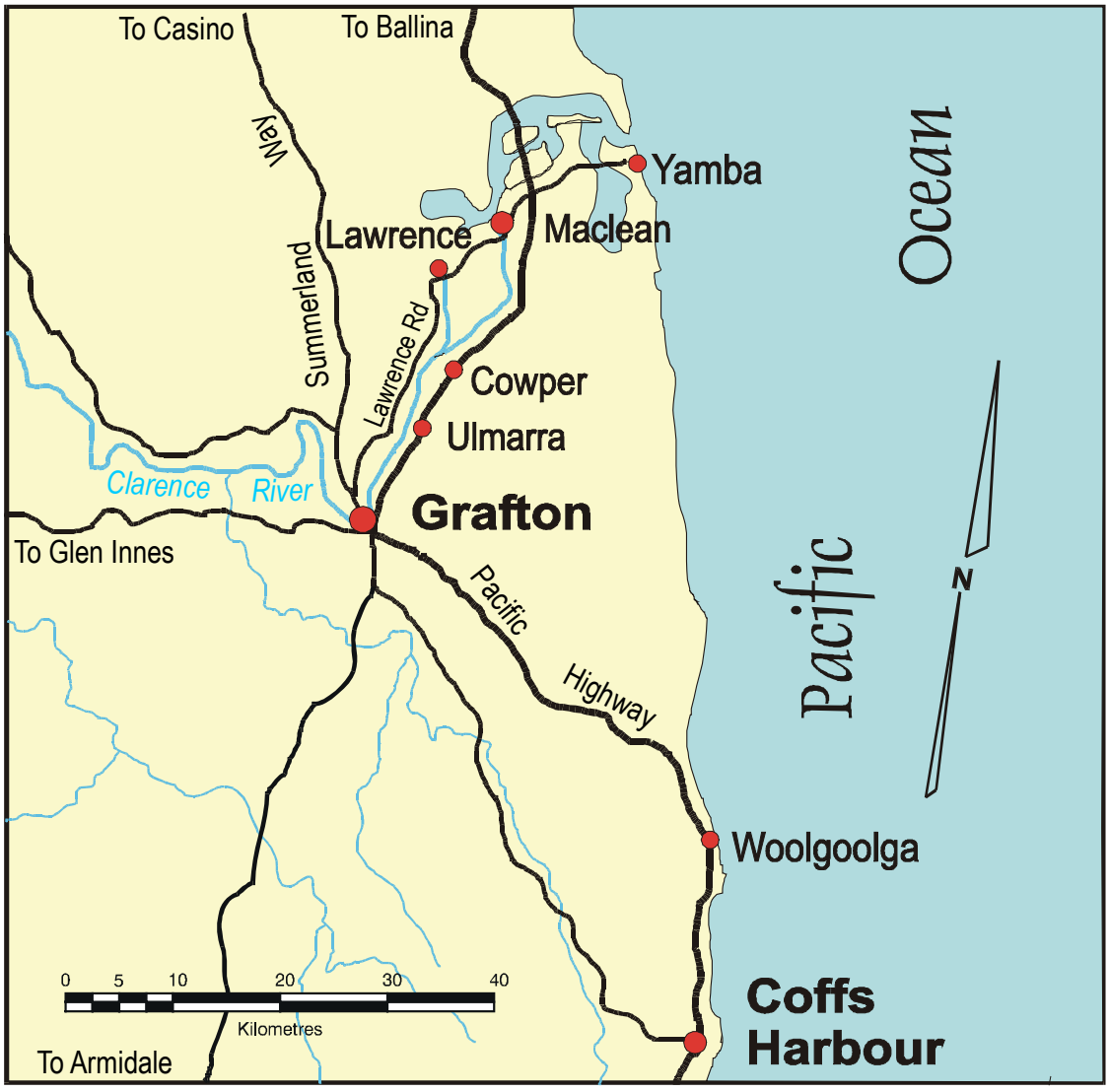
- Identify the environmental, traffic and community impacts on potential crossings;
- Identify locations that minimise the impact on the environment;
- To reduce the delays on the existing bridge by consideration of the long term traffic growth and development in the study area;
- Consider the needs of the State and local road network for the potential crossings;
- Determine the potential return on investment of potential crossings with the return to be twice the investment.

1.6 Scope

The scope of the work required to identify feasible locations is:

- Provide ground information using current aerial photography;
- Identify environmental, community, traffic and engineering information that could potentially impact on feasible locations;
- Implement a community consultation program to allow the community to have input to the project;
- Source current traffic information and predict traffic patterns into the future;
- Identify feasible locations for an additional crossing with consideration of the information collected;
- Confirm feasible locations.

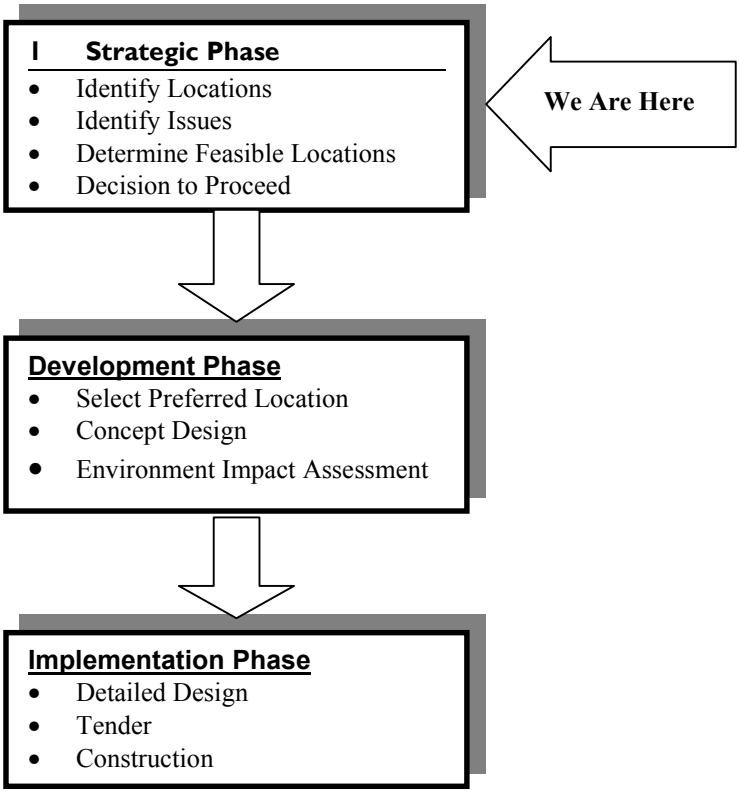
The study area for investigations includes the Clarence River from Seelands to Maclean. Long term planning issues such as the future road network and settlement patterns are considered over this area. More detailed investigations are confined to the Grafton area.



Project Study Area

1.7 Broad Strategy of the Feasibility Study

The feasibility study is in the strategic phase of the project. The following chart outlines the project phases.



The Strategic Phase is a funnelling and filtering exercise, directing a range of possible locations for a second crossing into a narrower range of locations, with those that clearly fail to meet the project objectives eliminated. Therefore, the feasible locations will only be those that meet the project objectives. The project cannot formally proceed into the next phase, ie the Development Phase, until the feasibility study has been completed. The project will also not proceed into the next phase if there are no feasible locations identified.

During the Strategic Phase the range of possible locations is examined and potential issues identified. The main issues identified will come from three major areas, ie community consultation, traffic analysis and environmental overview. The RTA has focused the investigations on these three areas and they are detailed in the following sections of the feasibility study.

2 Community Involvement

2.1 Introduction

This section of the report deals with the community involvement for the feasibility study.

2.2 Community Involvement Strategy

During project initiation meetings organised by the RTA, the need was identified for strong community involvement and ownership to be developed. A Community Involvement Plan was developed to involve the overall community in the identification of relevant issues to be considered during the development of potential crossings.

The community consultation was divided into four categories to allow a broad coverage of the community. The consultation categories are listed below:

1. *Community Focus Group*
2. *Invitations to Comment*
3. *Community Questionnaire*
4. *Media*

Details of the consultation from each of the categories are outlined in the following sections.

2.2.1 Community Focus Group

To ensure that the expectations and needs of the community were thoroughly considered, a Community Focus Group was formed. This Group consisted of representatives from key business groups and Councils in the Clarence Valley. From this group, the RTA was able to develop a clear understanding of the issues and needs of the community when considering the feasibility of the second river crossing.

Representatives were invited to participate in a series of community focus group meetings. The first meeting was held on 6 August 2002 to introduce the members to the project and to the aims and objectives of the study. The invited members of the Focus Group were:

Group	***Representatives***
State Member for Clarence	*Terry Flanagan & David Bancroft*
Copmanhurst Shire Council	*George Cowan*
Maclean Shire Council	*Ian Dinham*
South Grafton Traders Association	*Kel Kearns*
Grafton City Council	*Col Harbidge & Tony Smith*
Pristine Waters Shire Council	*Kerry Lloyd and Cecil Hyde*
Grafton Chamber of Commerce	*Ron Bell*
South Grafton Progress Association	*Laurie Marchant & Tony Wade*

Each member was requested to develop an action plan on how they would consult with the members from within their respective groups. These action plans were implemented and the results were tabled at the second focus group meeting held in Grafton on 26 September 2002. A third focus group meeting was held on 5 December 2002. The third meeting expanded

upon further feedback presented by each group and provided participants with an overview of the feasible options.

A summary of the issues identified by the Community Focus Group is included in Section 1 of ***Appendix A***.

2.2.2 Invitations to Comment

The second category of community consultation was an invitation to comment. The invitations were sent to the following agencies and community groups who had a key interest in the project.

Government Agencies

All relevant NSW government agencies were contacted inviting them to provide input to the feasibility study. Following is a list of the agencies consulted:

NSW Agriculture	*Planning NSW*
NSW Fisheries	*NSW Waterways Authority*
NSW National Parks and Wildlife Service (NPWS)	*NSW Department of Land and Water Conservation (DLWC)*
NSW Department of Transport	*NSW Department of Education*
Rail Infrastructure Corporation (RIC)	*Richmond (Valley) River Shire Council*
Kyogle Council	*NSW Police (Grafton)*
NSW Environment Protection Authority (EPA)	*NSW State Forests*

Community Groups and Associations

Community Groups and Associations provide a formalised voice for members of the public. Groups and Associations that were considered to have a key interest in an additional crossing of the Clarence River were invited to comment on the feasibility study. These groups were:

Local Tourism Board	*Bicycle NSW*
National Roads and Motorists Association (NRMA)	*Summerland Way Promotion Committee*
Senior Citizens Association	

Note: Grafton Chamber of Commerce and South Grafton Progress Association were not invited to comment via letter as they were involved in the Community Focus Group.

Business Community / Transport Industry

Members of the business community that were identified as being directly impacted by delays on the existing bridge were invited to comment on the feasibility study from the perspective of business impacts of an additional crossing. The businesses were all transport based where the bridge would be used in the operation of their business. Invitations were sent to the following businesses:

Grafton Radio Taxis Co-Operative Ltd	*Singhs Bus Service*
King Bros. International Travel	*Blunts Bus Service*
Lawrence Bus Service	*Caseys Coaches*
Herb Blanchard Haulage Pty Ltd	*PW Foster Transport.*
Cromack & Tranter	*GK McLennan Transport*
Munns Haulage	*Noremac Transport*
Blanchard Haulage	*Cameron Bros Carrying Co*
Austins Bus Service	

Emergency Services

Emergency Services were invited to comment with respect to the impacts that a second crossing may have on emergency response times. The following Services were invited to comment:

NSW Fire Brigade	*NSW Ambulance Service, Northern Division*
State Emergency Services	*Grafton Base Hospital*
NSW Police (Grafton)	

Responses

The following groups and agencies responded to the invitation to comment:

Lawrence Bus Service	*NSW Fisheries*
Kyogle Council	*Richmond Valley Council*
DLWC	*EPA*
Planning NSW	*Rail Infrastructure Corporation*
NSW Agriculture	*Transport NSW*
Northern Rivers Area Health Service	*Grafton Radio Taxis*
Bicycle NSW	*NSW Police (Grafton)*
NRMA	*NSW NPWS*
Grafton City Council	*NSW Waterways*
Christopher Hallam and Associates P/L on behalf of Grafton Shoppingworld	

Those parties that responded identified the following issues as important when considering an additional crossing:

Community and Environmental Impacts:

• Access for emergency services	• Consider community impacts on

	selection of feasible crossings
• Consultation with landowners and stakeholders during planning	• Traffic Delays including abnormal conditions such as bushfires or Pacific Highway accidents
• Impacts on emergency services with delays on the existing bridge	• Minimise impacts on flora, fauna and aquatics
• Consideration of hydrological impacts	• Geotechnical considerations and soils
• Access – between business areas and future community growth areas	• Industry and agriculture
• Social impacts	• Utilities and infrastructure

Existing Bridge:

• Access to existing bridge	• Consideration of cyclists
• Delays to emergency Services	• Flooding impacts
• Modification of existing bridge	• Future planning
• High traffic volumes	• Traffic delays

New Bridge:

• Heritage impacts	• Location
• Planning	• Impacts on property
• Utilities and infrastructure	

Section 2 of ***Appendix A*** provides details of the specific issues raised.

2.2.3 Community Questionnaire

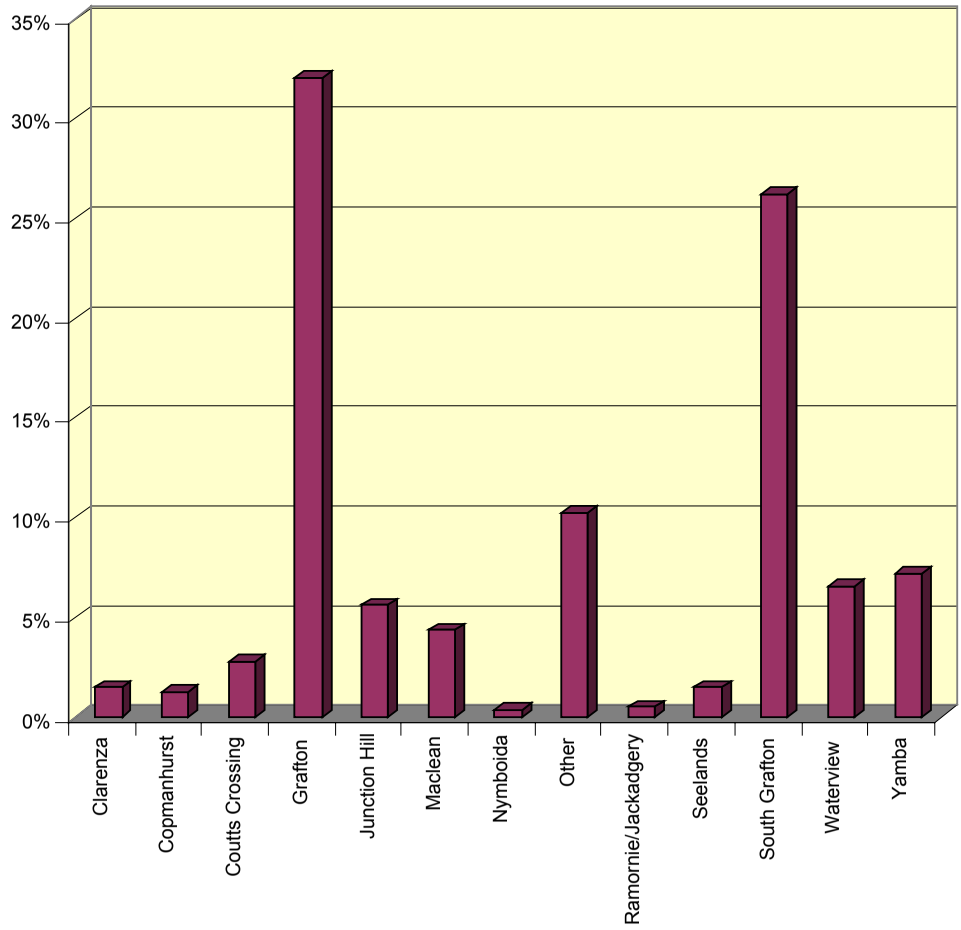
In addition to the formulation of the focus group and the invitations to comment sent to the key groups, a community questionnaire was developed and widely distributed in August 2002 to seek feedback from Clarence Valley residents. The questionnaire was intended to give each member of the Clarence Valley community an opportunity to comment on the Feasibility Study and provide input regarding the issues to be considered.

Background information was also obtained from those who responded to the questionnaire regarding their age, the form of transport used to cross the existing bridge and the frequency of trips across the existing bridge. Responses to the questionnaire were received up to and including the 28th August 2002. Over 1900 questionnaires were received and the results are shown in the following graphs

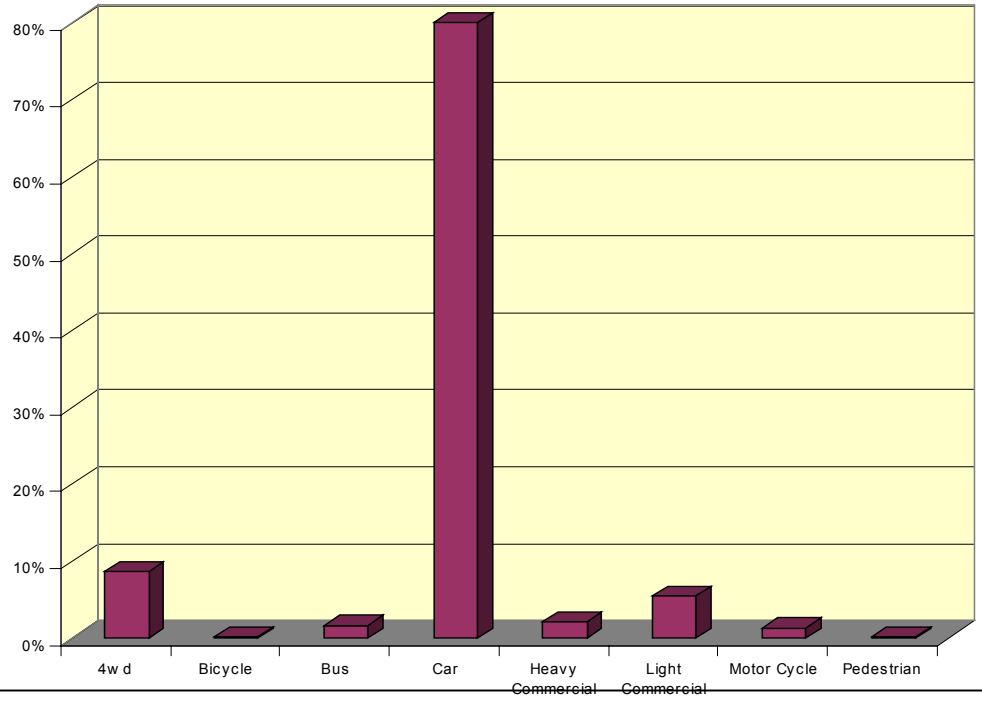
The age groups of people responding were;

- 44% from the 46 to 65 age group
- 22% over 65
- 25% between 26 and 45 years of age

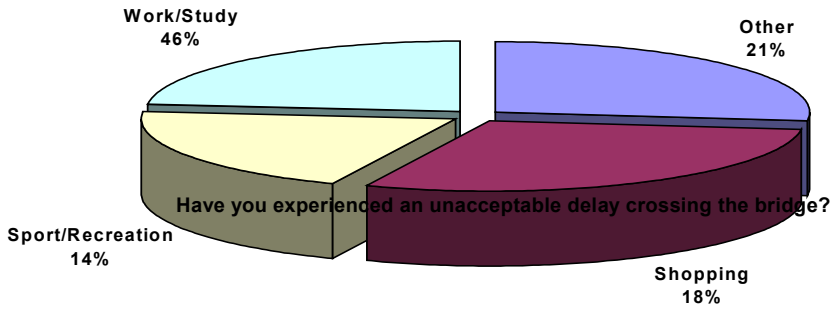
In what general area do you live?



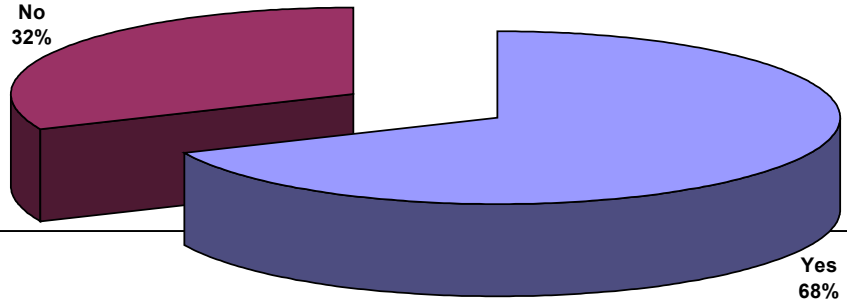
How do you travel across the bridge?

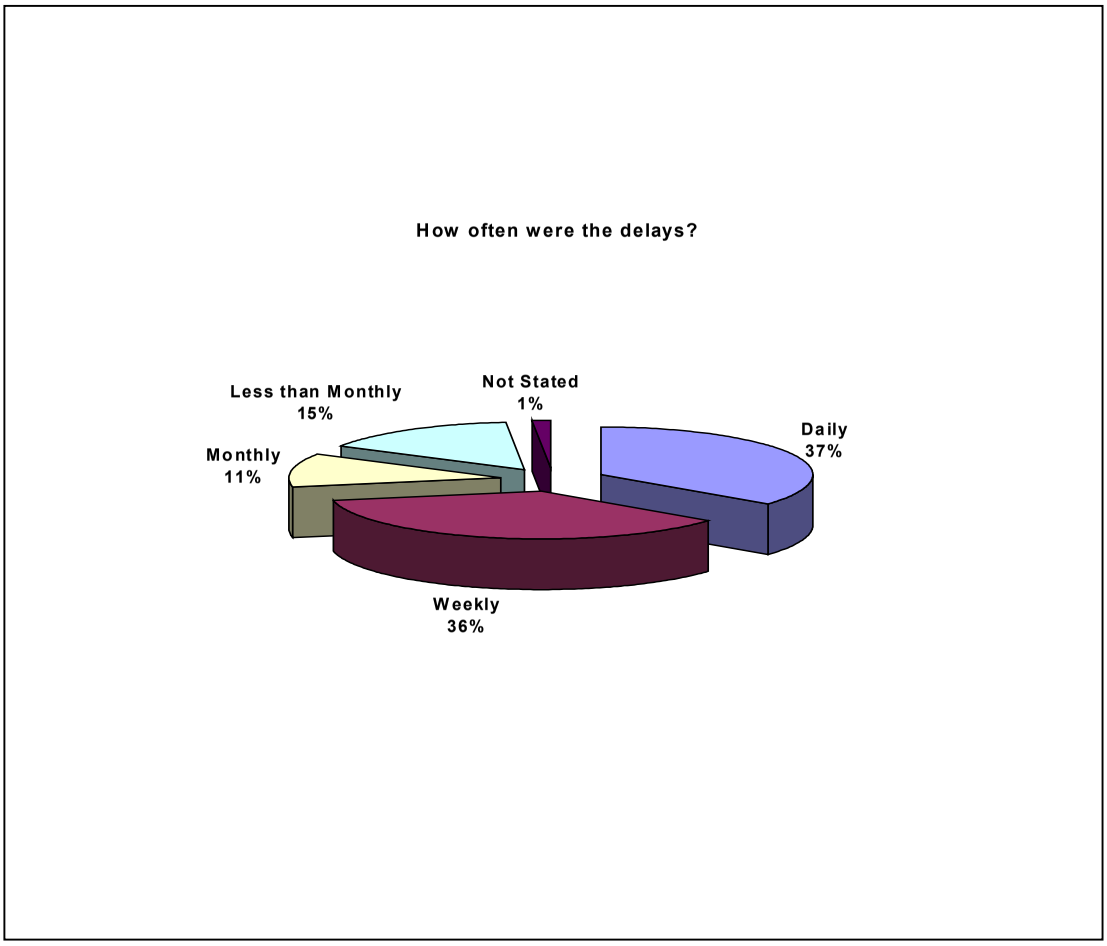


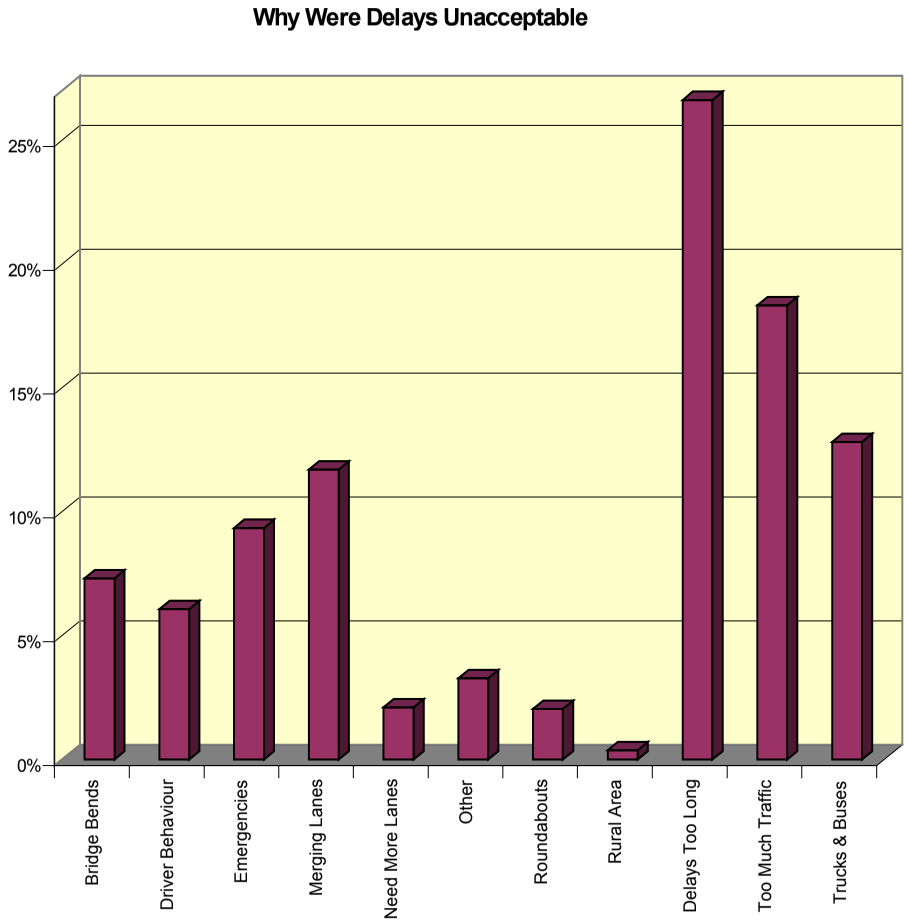
For what purpose do you travel across the bridge?



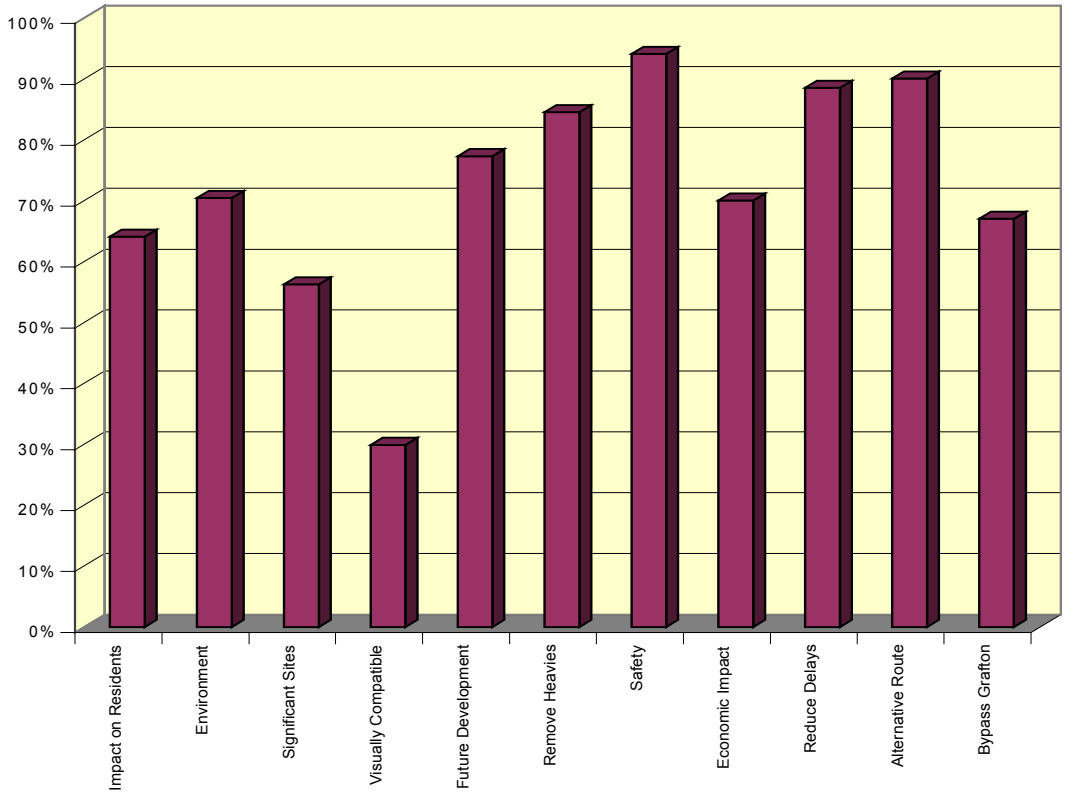
Have you experienced an unacceptable delay crossing the bridge?



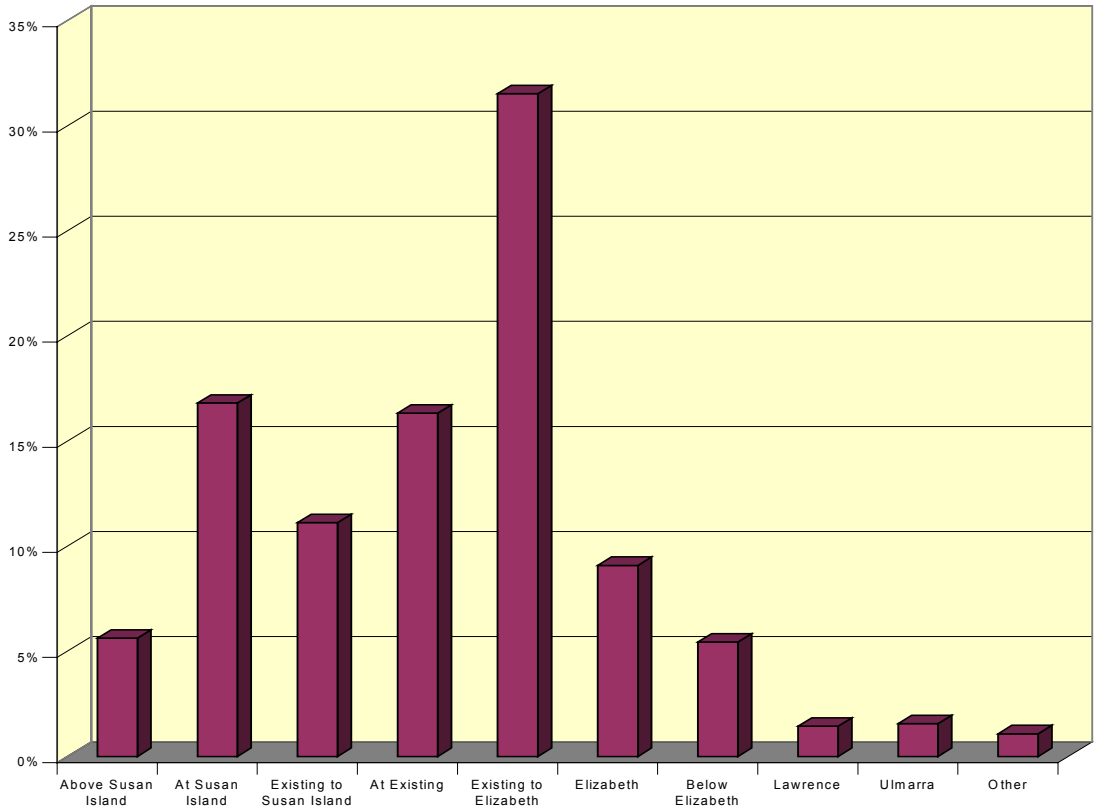

How often were the delays?
Less than Monthly
15%
Not Stated
1%
Daily
37%
Monthly
11%
Weekly
36%


Why Were Delays Unacceptable
25%
20%
15%
10%
5%
0%
Bridge Bends
Driver Behaviour
Emergencies
Merging Lanes
Need More Lanes
Other
Roundabouts
Rural Area
Delays Too Long
Too Much Traffic
Trucks & Buses

What issues are important when planning an additional crossing?



If an additional crossing is feasible where do you think it should be located?



2.2.4 Media

Newsletters

Three newsletters were released to the community to provide an update on the feasibility study as it progressed. The first newsletter was released shortly after the commencement of the project, in July 2002. A second newsletter was released immediately after the second Community Focus Group meeting in September 2002 and a third newsletter was released with the completion of the feasibility report in December 2002.

Media Releases

Four media releases were placed in the Grafton *Daily Examiner* to also provide an update of the feasibility study. The first was issued shortly after commencement of the project, in early July 2002. The second and third were issued immediately after the Community Focus Group meetings held in August and September 2002. A fourth was released with the completion of the feasibility study in December 2002.

2.2.5 Display of the Feasibility report

The Feasibility Report was placed on public display from 7th December 2002 to 3rd February 2003. The report was available for viewing at the RTA Regional Office and RTA Motor Registry, Grafton and the offices of Clarence Valley Councils. The Report was also made available on the RTA's website.

Fifteen submissions were received and were included in Appendix A, Community Consultation Specific Issues Raised. The Feasibility Report was finalised and again made available to the community on 20th February 2003.

2.3 Summary

The community of the Clarence Valley has been debating and discussing the issue of an additional crossing of the Clarence River, in the vicinity of Grafton, for many years. Therefore, the RTA implemented an extensive program of community consultation, which has taken into consideration the views and opinions of the wider Clarence Valley community.

The community consultation undertaken for this project has exceeded the typical level of consultation undertaken for a feasibility study. The RTA sought to gain as a wide a perspective as possible, whilst ensuring that the feasibility study process is open and guided, as much as possible, by community expectations.

3 Traffic Analysis

3.1 Introduction

This section of the report deals with the analysis of the existing and future traffic conditions of the existing Grafton bridge as part of the feasibility study.

3.2 Traffic Analysis Strategy

The traffic study focuses on analysis of the existing traffic conditions and future traffic impacts on the strategic locations for an additional crossing of the Clarence River. The analysis has been carried out with consideration of traffic flows for existing and future conditions for strategic locations. It should be noted that the traffic analysis for the feasibility study is a strategic assessment only.

Photo 1 Traffic flow at Through Street roundabout

The following tasks formed the main part of the traffic investigations:

- A review of existing data and collection of additional traffic data available from Grafton City Council, RTA Grafton, traffic survey information, consultant reports and traffic studies for major developments. Additional vehicle occupancy surveys and vehicle travel time surveys were undertaken.
- Consideration of urban population growth in the Grafton locality and nearby centres.
- Consideration of future traffic growth and needs up to 35 years.
- Formulation of a traffic analysis model that takes into consideration safety, travel time, road user costs and ferry replacement costs at Lawrence and Ulmarra.
- Use of the traffic model to analyse the strategic locations.

- A benefit cost analysis on the basis of the results of the traffic analysis model and cost estimates for the strategic locations.

A more detailed description of the traffic analysis strategy is shown in Section 1 of ***Appendix B.***

The traffic issues to be considered as part of the traffic analysis are;

- Delays on the existing Grafton Bridge.
- Capacity of the roadway.
- Capacity of intersections.
- Heavy vehicles.
- Emergency vehicles.
- Public Transport – buses.
- Road Safety.
- Through traffic needs versus local traffic needs.

3.3 Traffic Data

This section details the traffic data collected for input into the traffic analysis model.

3.3.1 Traffic Volumes

The 2001 Annual Average Daily Traffic (AADT) of Grafton bridge is 24,340 vehicles per day. (total northbound and southbound).

The average weekday traffic volumes (Monday to Friday) are:

Northbound	12,530
Southbound	12,470
Total	**25,000**

The highest recorded daily volumes were on Thursday 20/12/01:

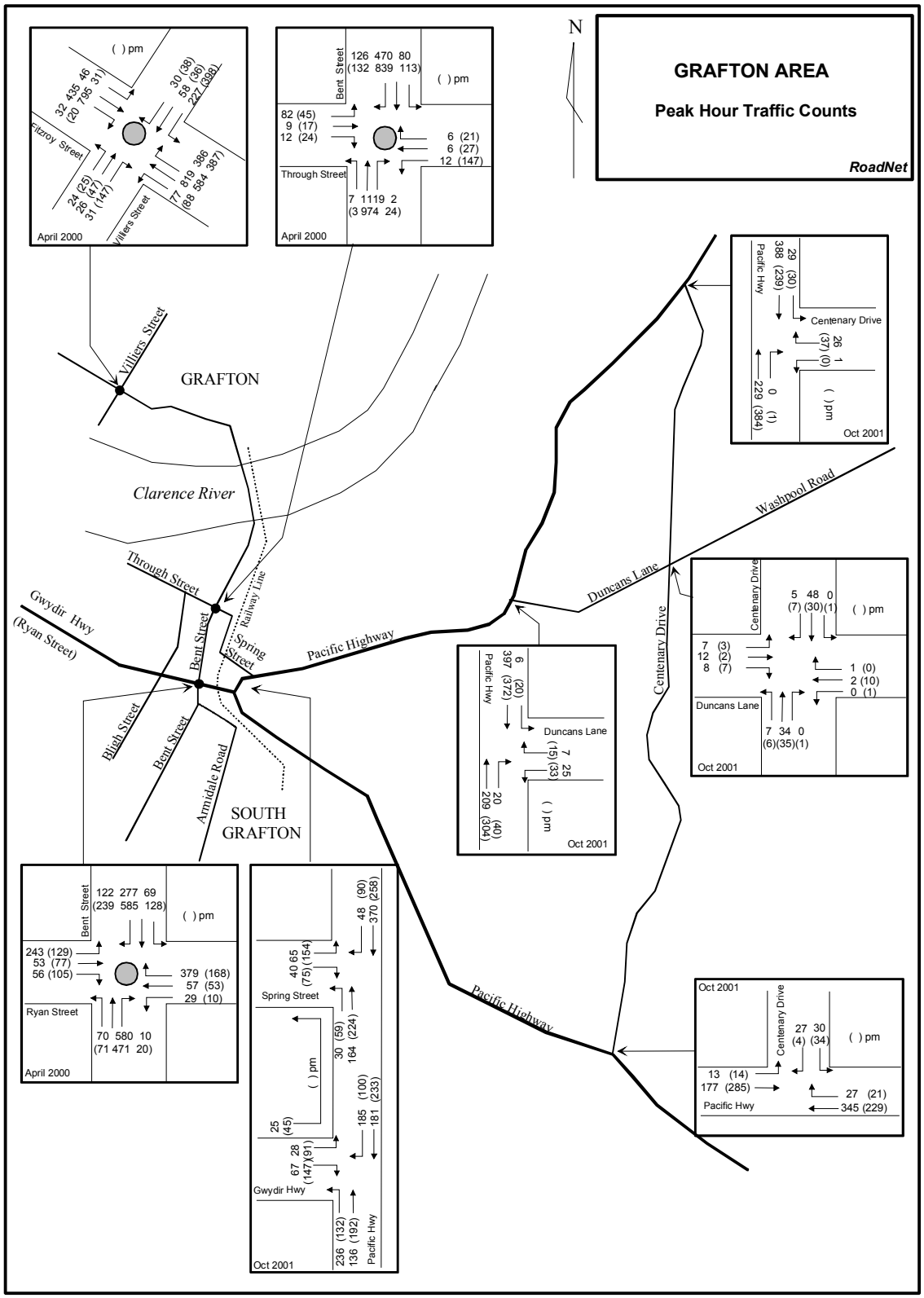
Northbound	14,900
Southbound	14,900
Total	**29,800**

This higher than average volume was due to the diversion of Pacific Highway traffic onto the Summerland Way as a result of bush fires north of Grafton.

Peak hour traffic counts were taken at a number of sites in the locality. A summary of these counts is shown on Figure 1.

Figure 1 Peak Hour Traffic Counts

Note: The numbers in brackets indicate pm peak volumes and the numbers without brackets are am peak volumes.



3.3.2 Traffic Composition

An important part of the traffic analysis is to determine the types of vehicles that make up the total volume of traffic crossing the existing bridge.

Previous surveys carried out (SKM 1999) showed that heavy vehicles accounted for between 4% to 6% of the total vehicles depending upon the period of the day. (Heavy vehicles are defined as those that are greater than 4.5 tonnes). The vehicle occupancy survey carried out in July 2002 showed the following data in regard to the number of heavy vehicles during peak periods on the bridge

8:00 to 9:00am

Northbound - 41 trucks and 32 buses
Southbound - 48 trucks and 32 buses

3:00 to 5:00pm

Northbound - 88 trucks and 28 buses
Southbound - 76 trucks and 43 buses

Trucks and buses on the survey day accounted for 6% of total traffic.

3.3.3 Vehicle Occupancy

A vehicle occupancy survey was carried out on the bridge for the morning and afternoon peak periods in July 2002 to determine the average number of passengers in vehicles, including buses. This survey counted all vehicles and occupants. The survey showed that the average car occupancy is:

Table 1 Vehicle Occupancy

Period / Direction	Average occupancy per vehicle	Percent of cars with driver only
AM Peak Northbound	1.46	67%
AM Peak Southbound	1.34	74%
PM Peak Northbound	1.61	60%
PM Peak Southbound	1.56	61%
Combined	1.53	63%

This is consistent with the figure of 1.6 persons per vehicle used in the RTA Economic Analysis Manual for assessment of rural travel in NSW.

3.3.4 Travel Times

The following travel times in Table 2 have been recorded for various traffic periods of the day for the section of Bent Street between the Gwydir Highway and Villiers Street, a distance of 1.9 km.

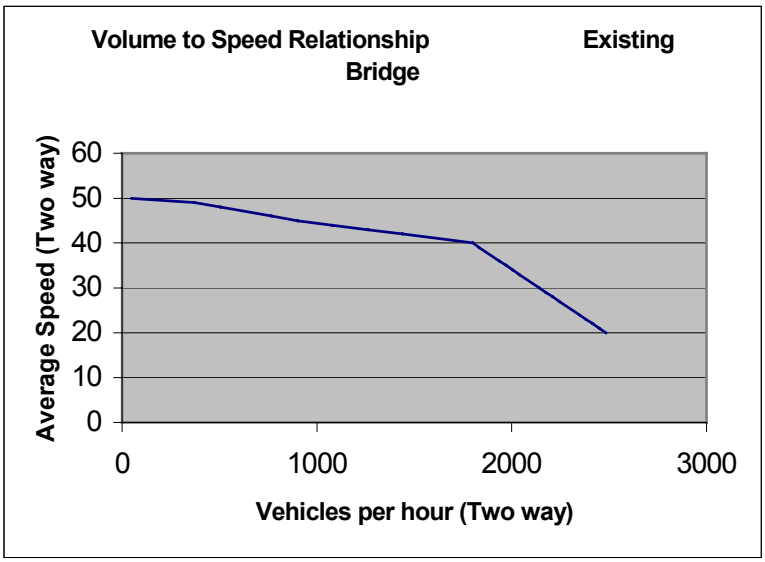
In high traffic periods one direction of travel is delayed considerably more than the other.

Table 2 Travel Times

Period	NORTHBOUND	SOUTHBOUND
am peak	7 min 30 secs	3 min 00 secs
pm peak	2 min 55 secs	5 min 00 secs
Business	2 min 50 secs	2 min 50 secs
Offpeak	2 min 30 secs	2 min 30 secs
Night	2 min 15 secs	2 min 15 secs

The following chart shows the volume to speed relationship for two way flow on the bridge obtained from travel time surveys conducted at various times of the day including am and pm peak hour conditions.

Figure 2 Volume to Speed Relationship on Existing Bridge



The graph shows that as the traffic volumes increase on the existing bridge the average speed is reduced.

3.3.5 Delays

When a road is operating at or near its maximum capacity it eventually reaches a state of unstable equilibrium where high volumes can pass along the road but any small disturbance, such as stopping for heavy vehicles at the existing kinks, can sometimes cause a collapse of equilibrium. When this occurs, queuing and delays result.

These unstable flow conditions will become more frequent and extend over longer periods as traffic volumes increase on the Grafton bridge.

3.3.6 Road Capacity

The capacity of the road is when the number of vehicles reaches a volume that causes major delay problems. The road capacity at Grafton bridge and approaches has been determined by factors such as the volume of opposing traffic flow, the number of large vehicles, lane width, adjacent development and the alignment of the road as detailed below.

3.3.6.1 Capacity in 2001

The road / bridge has a practical lane capacity when one way volumes reach 1400 vehicles per hour (vph) (or 350 vehicles for 15 a minute period). This has been determined from actual traffic counts where traffic approaching the Grafton bridge slows and queuing occurs when the one way volume exceeds 1400 vehicles per hour. This has been further confirmed by comparing other two lane bridges in NSW that have similar conditions to the Grafton bridge.

Under the existing traffic conditions at Grafton bridge a traffic flow in one direction of up to 1400 vph can be achieved. Typical volumes in the morning peak hour are between 1300 and 1400.

The counts indicate that the morning peak is more concentrated with the intensity peaking at around 8.15 am and continuing to 9.00 am.

Recent intersection counts (July 2002) show that between 8:00 and 9:00am a total of 1450 vph, including heavy vehicles, approach the bridge from the south. If the absolute one way capacity of the bridge is 1400 then there is resultant queuing of vehicles that cannot fit across the bridge. In addition, any slight interruptions to traffic flow or increased traffic arriving at the bridge would see this queue extend back to Gwydir Highway.

In 2001 the morning and afternoon peak period totals 2.5 hours per day, comprising 45 minutes in the morning (8:15 – 9:00) and 1 hour 45 mins in the afternoon (3:30 – 5:15).

3.3.6.2 Capacity in 2011

The morning and afternoon peak periods will get longer as traffic volumes increase on the Grafton bridge.

By the year 2011 the morning and afternoon peak period may extend to 3 hours per day and the intensity currently experienced in the morning peak between 8.15 am to 9:00am may be common for the 3 hour morning and afternoon period. In other words, by 2011 traffic flows for the whole period (3 hours) may approach that of the current ¼ hour peaks. This will mean a higher probability of collapse of flow equilibrium with the resultant delays.

3.3.6.3 Capacity in 2021

By year 2021 the morning and afternoon peak period may extend to 4.5 hours and to 9 hours by year 2031. These peak periods are when volumes would reach the maximum road/bridge capacity of 1400 vph one way. In practice, this 9 hour peak period in 2031 will not be reached as operational problems would occur well before the 9 hour period is reached.

3.3.6.4 Intersection Capacity

This traffic study assumes that existing intersections will be able to accommodate traffic that would be redirected to the additional crossings being investigated and that there is scope to upgrade these intersections as part of any additional crossing option.

Key intersections were modelled (SKM Study 1999) in regard to the option of duplication of the existing bridge. Practical capacity would occur at these two lane circulating roundabouts at a Degree of Saturation of about 0.85 at which point queuing would occur. The results of the then existing conditions are shown in Table 3:

Table 3

Intersection	Degree of Saturation A	Average Delay (secs)
Bent Street / Through Street	0.67 pm	4.5
Fitzroy Street / Villiers Street	0.79 am	7.6

A *Degree of saturation for an intersection ranges from close to zero for very low traffic flows up to 1 for saturated flow or capacity. Any degree of saturation greater than 1 indicates conditions in which long queues of vehicles build up at an intersection over an extended period of time*

The SKM Report concluded that these sites would continue to operate satisfactorily if the existing bridge were to be duplicated. Although the report was completed in 1999 this analysis would still be relevant because traffic conditions have not varied to any great extent since.

3.3.7 Population and Traffic Growth

Population figures for the Clarence Valley provided by Planning NSW show an increase in population from 46,555 in 1996 to 60,290 in 2016. This equates to a linear growth rate of 1.5%. The growth rate over the past five years between the 1996 census and 2001 census figures is 1.03%. The more conservative rate of 1% linear growth is adopted for this traffic study.

3.3.8 Proposed Developments

3.3.8.1 New Shopping Centre at South Grafton

A supermarket and specialty shops development has been completed in December 2002 on the corner of Bent Street and Spring Street, South Grafton. The traffic impacts report (TTM Consulting 2000) for the complex stated that it is likely to generate 424 trips during peak hour and 3940 daily trips.

The location and type of development may cause it to have an impact on traffic flow on Grafton Bridge. Accordingly, an assessment of the likely traffic patterns has been carried out using the above figures. It is estimated that the development may reduce travel on the Grafton Bridge in the order of 170 trips during peak hour and 1600 daily trips. This assumes that 80% of customers would come from the South Grafton area; 50% of trips would be combined trips (shopping with work, school, recreation or business); and some South Grafton residents may use the new store but still cross the bridge to shop in Grafton.

3.3.8.2 New Development at Clarenza

The Clarenza area has been identified in the Clarence Valley Urban Development Strategy as a prime area for urban growth for Grafton. New residential subdivision and three schools are currently proposed for the Clarenza area. Urban development at Clarenza is likely to increase traffic flow on the Grafton Bridge.

The traffic impact report (RoadNet 2001) for the relocation of Catherine McAuley College to the Clarenza area took account of all future urban development of the locality over the next 30 years. That included the development of other schools (St Andrews and the Cathedral School). The report stated that the Clarenza area is likely to generate 800 trips during peak hour and 4633 daily trips. It assumed that 90% would travel to and from Grafton with 65% to North Grafton and 35% to the South Grafton area. This means that an additional 470 trips during peak hour in 30 years time would be generated.

As the school development is proposed within the next 10 years so it is appropriate to assess traffic flows for that time, year 2011. The daily additional traffic is estimated as 1500 with the main impact being between 8:00-9:00am and 3:00-4:00pm because of school traffic. Estimated peak hour increases are shown in Table 4:

Table 4

	Southbound	**Northbound**	**Total Increase**
am peak	100 vehicles/hour	130 vehicles/hour	230 vehicles/hour
pm peak	130 vehicles/hour	100 vehicles/hour	230 vehicles/hour

The actual number of bus movements on the Grafton Bridge should not significantly change due to the current mix of students from both sides of the River attending private schools.

3.3.8.3 Summary of Proposed Developments

Peak hour traffic flow is the critical issue on the Grafton Bridge. Accordingly, this aspect is examined to show the combined impacts of the major developments that could affect traffic flow on the bridge.

The new shopping Centre at South Grafton is likely to reduce peak hour travel by 170 vehicles per hour by the end of year 2002 when the complex will be open.

The increase of 230vph from Clarenza development is generally equivalent to a 1% linear growth rate over 10 years on the existing peak hour volume of 1,400vph.

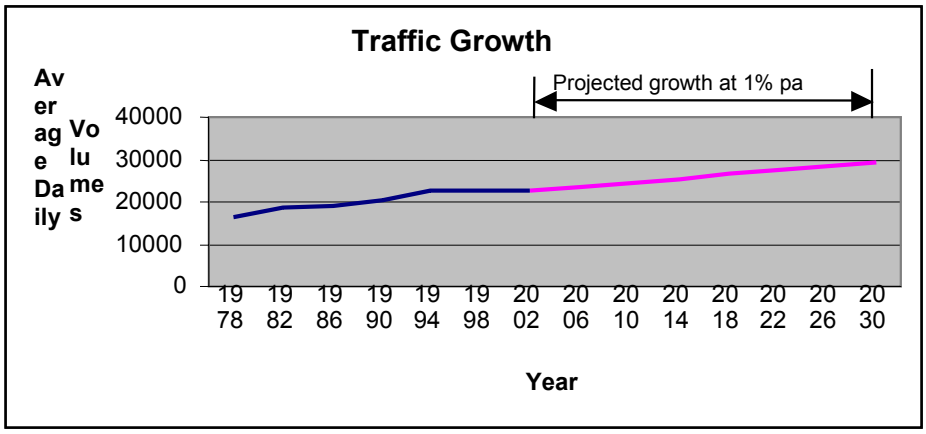
The net change in traffic volumes on Grafton Bridge in 10 years time from these developments is an additional 60 vehicles per hour.

Traffic growth from other areas would still need to be taken into account and hence the adoption of a 1% growth rate for planning purposes is considered reasonable under the circumstances.

3.3.9 Traffic Growth

Figure 3 shows historical traffic volumes on the Grafton Bridge as well as a projection for the next 30 years based on a 1% traffic growth rate.

Figure 3 Traffic Growth



3.3.10 Origin and Destination

To carry out the traffic analysis it is necessary to define where the traffic that uses the existing bridge is coming from. Table 5 shows the percentage of traffic originating from selected areas from 2001 to 2031. These percentages are predicted to change slightly over time with changes to the pattern of urban development such as the Clarenza area.

Table 5 Origin of Traffic Using the Existing Grafton Bridge

TRAFFIC FROM:	2001	2011	2021	2031
Cowper	15%	16%	16%	16%
Clarenza	5%	8%	12%	14%
Pacific Highway South	10%	10%	10%	10%
South Grafton	50%	47%	44%	43%
Gwydir Highway	15%	14%	13%	12%
Through	5%	5%	5%	5%
TOTAL	100%	100%	100%	100%
TRAFFIC FROM:				
CBD	75%	75%	75%	75%
Grafton East	10%	10%	10%	10%
Grafton West	15%	15%	15%	15%
TOTAL	100%	100%	100%	100%
TOTAL VOLUMES				
Cowper	3651	4285	4675	5062
Clarenza	1217	2143	3506	4430
Pacific Highway South	2434	2678	2922	3164
South Grafton	12170	12588	12857	13605
Gwydir Highway	3651	3750	3799	3797
Through	1217	1339	1461	1582
Daily traffic (1% growth)	24340	26784	29220	31640

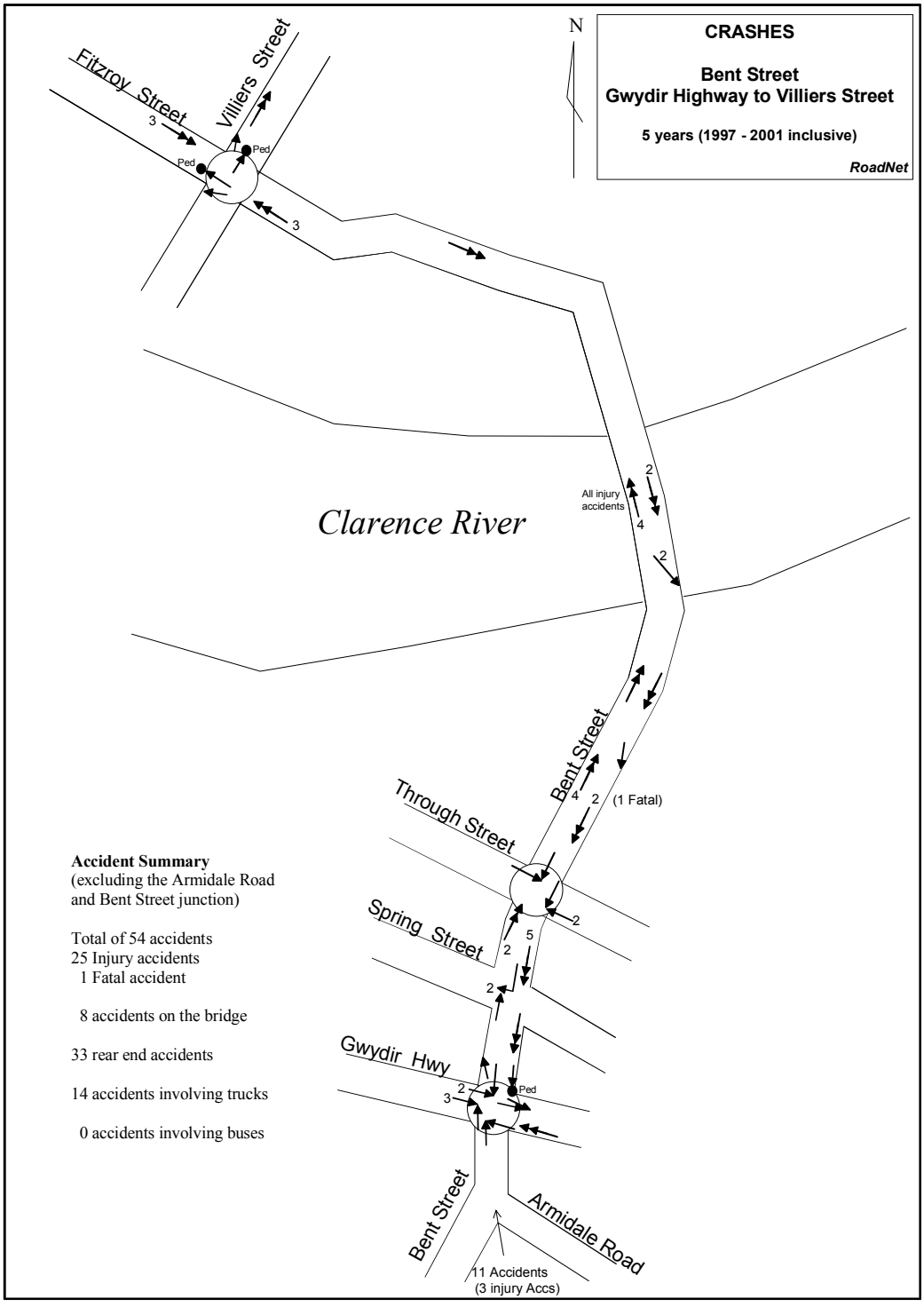
Note that the percentage of traffic crossing the bridge originating from Clarenza is predicted to increase from 5% to 14% (1,217 vehicles per day to 4,430 vehicles per day) over the next thirty years as the development in this area takes place.

3.4 Crash Analysis

Figure 4 below shows a plot of tow away or injury accidents sourced from the RTA's crash database for the 5 year period from 1997 to 2001 inclusive.

The diagram shows that there have been only 8 recorded accidents on the Grafton bridge. There may be many minor incidences but these are not included in the database

Figure 4 – Crash Diagram



The impacts of the traffic analysis on the strategic locations are included in Section 6.

4 Environmental Overview

4.1 Introduction

The purpose of this section of the report is to identify the environmental issues that will need to be considered when investigating strategic locations for an additional crossing.

The Clarence Valley is situated in an area of high biodiversity. It contains an overlap of both temperate and tropical species, with some species reaching their northern or southern limits. Therefore, the Valley supports a large number of threatened species and unique natural values. Its physical resource base and its social and cultural character also contribute to its potential wealth. Any new crossing of the Clarence River would have an impact upon natural, social and cultural values of the Clarence Valley, and these values must be considered in detail in the environmental assessment stage.

Photo 2 Wildlife on the Clarence River

4.2 Strategy

The feasibility study was limited in scope to a review of existing reports and information. State of Environment reports for Grafton, Copmanhurst, Pristine Waters and Maclean Councils were reviewed. Councils, NPWS and DLWC were contacted and relevant ecological and natural resource studies were sourced and reviewed.

Relevant information was extracted and incorporated into this report.

4.3 Ecologically Sustainable Development

The NSW Government is committed to the principles of ecologically sustainable development (ESD). The most relevant reference in terms of preparing a large-scale environmental impact assessment is found in Schedule 2 of the *Environmental Planning and Assessment* (EP&A) *Regulation 2000*. According to Schedule 2, ESD is based on the following four interrelated principles:

1. ***The Precautionary Principle***. Namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
2. ***Intergenerational Equity***. Namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.
3. ***Conservation of Biological Diversity and Ecological Integrity***. This should be a fundamental consideration throughout all aspects of environmental impact assessment.
4. ***Improved Valuation, Pricing and Incentive Mechanisms***. Namely, that environmental factors should be included in the valuation of assets and services.

The RTA seeks to ensure that all road proposals are consistent with the principles of ESD and that environmental impact assessments provide sufficient and unambiguous scientific information to assess the performance of Proposals against ESD principles. Any consideration of a new crossing over the Clarence River would need to take into account the above principles.

4.4 Terrestrial Ecology Considerations

Proposed Urban Development Areas

Grafton City Council provided two recently completed ecological assessments to the RTA in September 2002. Although the assessments were specific to two proposed development sites, they provide further evidence that the Clarence Valley supports a high population of threatened species, and that any development proposal would need to thoroughly consider potential impacts on terrestrial ecology. Nine threatened fauna species were recorded from the Clarenza urban investigation area (Clancy, GP and VA, 2001). One threatened fauna species was recorded from the proposed site of the St Andrews Christian Community School at Clarenza (Kendall and Kendall, 2001). No threatened flora species were recorded in those areas, however a number of 'significant' flora species were recorded.

State of the Environment Reporting

The *Grafton City Council State of the Environment Report* listed 18 threatened fauna species and 1 threatened flora species known to occur in the Grafton City Local Government Area. The *Pristine Waters State of the Environment Report* indicates that more than 500 species of fauna are known to occur in Pristine Waters Shire, with 77 of those being threatened. 74 threatened flora species are known to occur within Pristine Waters Shire. The high number of threatened flora and fauna species within Pristine Waters Shire is indicative of the large proportion of National Parks and State Forests, in comparison to Grafton City Local Government Area. From a review of existing information, within the study area, Susan Island was identified to be of the greatest ecological value. Susan Island is examined below in more detail.

Susan Island

Susan Island lies in the Clarence River, immediately upstream of the existing Grafton bridge. On the upstream end of Susan Island is Susan Island Nature Reserve. The remainder of the island is currently being considered for incorporation into the Nature Reserve (Jeffries, A. NPWS, pers. comm). The Reserve currently protects a small remnant of the subtropical

rainforest that first attracted Europeans to the Clarence Valley in search of timber. In the warmer months, the remaining rainforest provides a roost for thousands of flying foxes.

Photo 3 View across the Clarence River to Susan Island

Ecological Significance:

- The rainforest on Susan Island comprises part of the vegetation community known as "Lowland Rainforest on Floodplain in the North Coast Bioregion". This is a threatened ecological community, as listed on Schedule 1, Part 3, of the *Threatened Species Conservation* (TSC) *Act* 1995.
- The rainforest on Susan Island comprises key habitat for the Grey-headed Flying Fox, a Vulnerable species as listed on Schedule 2 of the TSC Act. The Susan Island colony is the largest maternity colony in NSW, with numbers reaching up to 200,000 at certain times of the year. It is thought that only 400,000 individual Grey-headed Flying Foxes remain in Australia (Grafton City Council SOE, 2000/01).
- The NPWS also notes that the threatened Black Flying Fox and the Little Red Flying Fox also stop over occasionally in the rainforest on Susan Island (Grafton City Council SOE, 2000/01).

Constraints

Any additional crossing in the Clarence River should take precautions to prevent disturbance to Susan Island.

4.5 Aquatic Ecology / Water Quality / Hydrology Considerations

The aquatic environment of the study area is of course dominated by the Clarence River and its tributaries. The Clarence River is classified as "Inland Waters" at Grafton.

Landuse practices within a catchment impact on ground and surface water quality and the Clarence catchment is already under pressure associated with domestic on-site sewage disposal, non point source pollution related to agriculture, water pollution and general urban impacts. The EPA imposes effluent quantum and quality standards and specifies performance monitoring criteria as part of the licence conditions for point source discharges. The

information provided below is a snapshot of some of the pressures that the Clarence River already faces.

Photo 4 View downstream from Grafton bridge

Grafton City Council Recreational Sites Water Monitoring Program

During 2000/01 the Grafton Sailing Club was the only monitoring site in the area that failed to meet the ANZECC 1992 Guidelines for faecal coliforms (Grafton City SOE Report, 2000/01). Existing Water Quality Pressures in the Clarence Valley (as cited in the 2000/01 Grafton City Council State of Environment Report):

a. Surface Water (on-site sewage management and septic systems).
b. Stormwater Drains.
c. Reticulated Water. The SOE states that raw water quality issues have arisen in periods of low flow in the Nymboida River, including occasional problems with colour, turbidity and iron content.
d. Algal Blooms and bacteriological contamination.

River Fish Species

The Eastern Freshwater Cod (*Maccullochella ikei*), a threatened fish species, is known to have occurred only throughout the Richmond River catchment. A draft recovery plan has been prepared for the species and efforts such as stocking of the species are being undertaken to re-establish the species within its former range. NSW Fisheries policy requires that terrestrial areas adjoining freshwater, estuarine or coastal habitats be carefully managed in order to minimise land use impacts on aquatic habitats. NSW Fisheries advises that as a precautionary approach, foreshore buffer zones at least 50m wide may need to be established and maintained with their natural features and vegetation preserved. In any assessment, there would need to be consideration of how damage to fish habitats such as instream macrophytes would be minimised.

Flooding

The maximum recorded flood by the (then) Clarence River County Council was 7.8mm in 1890. The existing levee system consists of rock concrete and soil embankments. North Grafton is protected from floods below 8.25m. South Grafton is now protected from floods by the flood levee constructed in 1996.

Photo 5 View across the Clarence River to Susan Island

Constraints

The construction of an additional crossing in the Clarence River has the potential to impact on water quality. Erosion and sedimentation are the two potentially greatest impacts, whilst the potential for spillage of fuels and chemicals into the river during both construction and operation is also a risk. In the operational phase, water quality impacts could arise from discharge of untreated road runoff onto the Clarence River. The potential for water quality impacts would be generally proportional to the length and width of any additional crossing. Risks to water quality would not dictate the location of any additional crossing, as impacts are likely to be similar anywhere within the strategic study area.

4.6 Air Quality

During 2000/01, the EPA licenced 9 atmospheric discharges from scheduled premises around Grafton. The majority of air pollution complaints received by Grafton City Council however relate to backyard burning (Grafton City Council SOE, 2000/01).

Constraints

The risks to air quality from any additional crossing would be most likely to occur during the construction phase, from machinery and construction equipment. In the longer term, an additional crossing would be likely to improve local air quality, as traffic congestion would decrease during peak hours. The risks to air quality would not largely dictate the location of any additional crossing, as risks are likely to be similar anywhere within the strategic study area. However, impacts are likely to be greater if construction takes place close to areas of high occupancy such as schools, shopping centres or residences. The downstream side of the existing bridge is currently less developed than the upstream side, particularly in South Grafton.

4.7 Waste

The Grafton Regional Landfill commenced operations in September 1998 (Grafton City Council SOE, 2000/01). The landfill site is located at 704 Armidale Road, South Grafton. The site has a predicted life in excess of 50 years. The following statistics highlighting the sources of waste are relevant to 2000/01 (Grafton City Council SOE report):

- Domestic: 59.3%.
- Commercial / Industrial: 23.7%.
- Building / Demolition: 1.8%.
- Transfer Stations: 9.3%.
- Other: 5.9%.

Constraints

The impact of waste production would not largely dictate the location of any additional crossing, as risks are likely to be similar anywhere within the strategic study area. However, there would be secondary impacts such as truck routes to waste disposal facilities that would need to be considered during the environmental impact assessment stage. A route would need to be chosen that would have least impact on local roads and residences.

4.8 Noise

Noise impacts of road projects on the community are considered in the planning stages of projects. The impact of an additional crossing on the residential and business districts with respect to noise is potentially high. The feasibility study has not undertaken any specific noise monitoring of strategic locations. This will be undertaken if the project proceeds into the development phase.

Constraints

Impacts of noise on strategic locations that connect to residential areas will be significant. The cost of reducing noise for residents in these locations has been included in the development of strategic estimates.

4.9 Geotechnical Considerations

The study area is underlain by the Grafton Formation [1:250 000 Geological Series Sheet (SH56-6)] that is known to consist of Sandstone, Siltstone, Claystone and Minor Coal. The Clarence River Floodplain stretches to a maximum width of approximately 7km within the study area. The deep layered alluvial soils vary in texture with distance from the river. Close to the bank, brown-black silty loams overlay dark brown acid silty soils. On the old ridges and terraces associated with the migrating river channel, silty clay loams overlay silty organic clay of medium to low plasticity. On the flat floodplains low plasticity clays, (with fine sand) overlay heavy plastic clays. The Grafton Formation exposed at South Grafton is a weathered clayey siltstone. These red-brown heavy inorganic clays have a moderate to very high plasticity and the potential for mass movement. Historical logs show that the riverbed consists of horizontally bedded, fine grained, hard, grey sandstone of the Grafton Formation overlain by alluvial deposits of sand, gravel and sandy clay. Dunlop's 1981 report identifies the floodplain alluvial soils have problems related to settlement, providing a poor subgrade for construction, as well as necessitating the haulage of higher class materials from outside of Grafton. These factors would need to be taken into account during any route selection study.

Acid Sulphate Soils

Reference to the 1:25 000 Acid Sulphate Soil Map for Grafton indicates that the investigation area contains areas of both low and high probability of occurrence of acid sulphate soil materials. The areas of high probability are predominantly to the northeast of Grafton. The urban areas of Grafton and South Grafton are located within areas of low probability of occurrence, although thin strips of land surrounding creeks in the area as well as Susan Island are reported to be high probability areas. The bottom sediments of the Clarence River from west of Susan Island to the eastern extent of the study area also carry a high probability of occurrence. An Acid Sulphate Soil Risk Map is contained in ***Appendix C***.

Constraints

The geotechnical constraints associated with a second bridge crossing over the Clarence River are expected to be those typically encountered during bridge construction. There may be the potential for soft soils at depth, particularly on the eastern side of the study area. This is not expected to be a major constraint, but may add time to construction and/or increase costs. There is also the possibility that Potential Acid Sulphate Soils (PASS) will be present along the selected route. As long as construction practices do not expose the PASS, they are not expected to pose a problem. Corrosion resistant foundations for the bridge may be advisable.

4.10 Contaminated Sites

Within Grafton City LGA, the 2000/2001 SOE indicates that there is no comprehensive register of contaminated land held by Grafton City Council. There are however ten identified cattle dip sites within Grafton City, and nine closed landfill sites. The EPA's contaminated sites register indicates that within approximately a 5km radius of the Grafton CBD, there are 49 known contaminated sites. The Vere Street Tip site and the disused South Grafton Saleyards dip site on Abbott Street, are the closest known sites; between approximately 2 and 3km west of the existing bridge.

Constraints

The selection of any feasible route should seek to avoid contaminated sites wherever possible. The disturbance of contaminated sites presents a risk to the environment, and can be a financial burden through the cost of remediation.

4.11 Indigenous Heritage Considerations

A search of the NPWS Aboriginal Heritage Information Management System (AHIMS) has shown that 9 Aboriginal objects and Aboriginal places have been recorded in or around Grafton. It should be noted that AHIMS only includes information on Aboriginal objects and places that have been provided to NPWS. Large areas of NSW have not been the subject of systematic survey or recording of Aboriginal History. Those areas may contain Aboriginal objects and other heritage values that are not recorded on AHIMS.

All Aboriginal places and objects are protected under the *National Parks and Wildlife Act* (NPW Act) 1974, and it is an offence to destroy, damage or deface them without the prior consent of the NPWS Director-General.

Within 10 km of the existing Grafton Bridge, the following sites are known from AHIMS:

Site Name	Site Type
Southampton	Scarred tree
CH-G 47	Open camp site
CH-G 48	Open camp site
Susan Island	Bora / ceremonial
Goorie Park	Scarred tree
Grafton	Carved tree
South Grafton Bora Ground; Pacific Highway	Bora / ceremonial
Swan Creek Burial; Grafton	Burial/s
Ulmarra & Southgate	Burial/s

Constraints

Any proposed new crossing should aim to avoid Aboriginal objects and places. The Ngerrie Local Aboriginal Land Council requested that no new bridge be considered in the vicinity of Susan Island as this is a very significant site for the local Aboriginal people.

4.12 Non-indigenous Heritage Considerations

The following heritage items were identified within the study area as being of relevance to constraining an additional crossing:

Grafton City LEP

A large number of commercial buildings and private residences are listed on this LEP. Those items that may be of relevance to an additional crossing include:

- Clarence River bridge.
- Species of tree within the genera *Brachychiton*, *Ficus* or *Jacaranda* located in any road reserve and being more than 3m in height.

No items of relevance to an additional crossing of the Clarence River, in the vicinity of Grafton, were identified within the Copmanhurst or Pristine Waters Shires.

State Heritage Register

- Clarence River bridge

Register of the National Estate

- Grafton Conservation Area (approximately 400ha), comprising an area upstream of the existing bridge on both sides of the Clarence River.

Australian Heritage Commission

- Grafton Conservation Area.
- Clarence River bridge.

State Rail Authority Section 170 Register

- Clarence River bridge

RTA Section 170 Register

- Clarence River bridge

North Coast REP

- Clarence River bridge
- The Hull of "SS Induna", bank of Clarence River, west of Grafton Road and rail Bridge.

Constraints

The most immediately obvious heritage item within the study area is the Clarence River Bridge, connecting Grafton to South Grafton. The bridge, which was completed in 1932, is an important landmark in the region and was the subject of a Conservation Management Plan (Connell Wagner, 1996) undertaken on behalf of Rail Access Corporation (RAC). That report identified that the bridge is historically significant for a number of reasons, and has important aesthetic and social significance related to its landmark qualities and its recognisable part of the community's identity. The Plan identified that the bridge is an item of State heritage significance. The construction of any additional crossing of the Clarence River should seek to avoid impact upon any heritage item if there are feasible alternatives.

Photo 6 View of existing bridge from Grafton

4.13 Socio-economic Considerations

Planning and Landuse Considerations

Grafton is the economic and transport hub of the Clarence Valley, with road links to Sydney, Brisbane, Casino and Glen Innes by way of the Pacific Highway, the Gwydir Highway and the Summerland Way. Connection between these arterial roads is dependent upon the Grafton Bridge. Funding has been made available to upgrade the Summerland Way between Grafton and the Queensland border. Intensified use of this road would increase pressure on the existing Grafton Bridge.

In planning for a major infrastructure project such as a bridge crossing of the Clarence River, consideration must be given to planning and landuse into the future so that the best social and economic benefits may be achieved. There has been no shortage of strategic planning

documents prepared for the North Coast and Northern Rivers areas. In a physical context, the Clarence River catchment has a total area of 22,182 square kilometres. The Clarence River and its tributaries have set the scene for a range of settlement, agricultural and economic patterns within the Valley.

The City of Grafton is the largest centre and acts as the major service centre for the sub-region, containing approximately 54% of the population of the Valley (DUAP, 1999). The areas of land designated a particular zone are indicative of landuse patterns. In 2001 the largest percentage of land (68.8%) was Non-Urban (ie (1a, 1d, 1e). By comparison, Commercial Zonings make up only 1.1% of land within Grafton City. This ratio represents a relatively high level of urbanisation compared to most non-metropolitan local government areas and is indicative of the small amount of Grafton's functional hinterland that is within the Grafton City local government boundary.

Section 3 of ***Appendix A*** provides a summary of planning documents that were reviewed and considered as part of this Feasibility Study, to assist in identifying constraints to a future crossing of the Clarence.

Constraints
Any additional crossing of the Clarence river should target potential future growth areas such as Junction Hill and Clarenza. The investigations should also consider the property impacts of additional crossings particularly in the vicinity of the residential areas.

Landscape and Visual Considerations
A visual / landscape study determines the short and long term impacts that would occur in relation to the effect of a proposed activity on its surroundings. Adverse impacts can occur, for example, as a result of earthworks or vegetation clearance, the alignment of a road that is unsympathetic with the surrounding landscape, or the use of materials that detract from the adjoining urban fabric. Aspects that would need to be considered for any proposed additional crossing in the vicinity of Grafton would include:

- Destruction or obscuring of existing views for residents and motorists.
- Creation of unattractive additions to the landscape that detract from the existing aesthetic quality or scenic character. In particular, consideration would need to be given to maintaining the character of the area associated with the existing bridge.
- Alignment and design features, including details such as materials to be used.

A visual / landscape study should be undertaken by a landscape architect or urban designer experienced in visual impact assessment for road and bridge projects.
A description of the visual impact of a proposed activity requires an assessment of the scenic quality and value of the area. Generally three levels of scenic quality and value may be identified:

1. High – Areas with visually prominent features of landform, land cover, waterform or built elements. These may include escarpments, elevated ridgelines, visually significant stands of vegetation, geological formations, river, parks, buildings, city skyline or streetscape. Views from an elevated position are also usually of high scenic value.
2. Moderate – Areas with landform or built features that tend to be common throughout the region and are not outstanding in visual quality.
3. Low – areas with features of minimal diversity or variety.

Constraints
Both the upstream and downstream areas are considered to be of relatively high scenic value, with the areas closer to the city being generally more moderate (although some areas could be considered to be high), and the areas further upstream and downstream being generally high.

During preliminary field inspections for this study, it was noted that generally, an additional crossing on the upstream side of the river would be more visible from public viewing areas on both sides of the river. A downstream structure would be visible from residences on the northern bank of the river, however there are fewer potential viewing places downstream compared to the upstream situation.

Photo 7 View of existing bridge from South Grafton

Navigational Considerations

The Waterways Authority, North Coast Region, provided information to the RTA, for this study, on the navigational considerations for an additional crossing of the Clarence in the vicinity of Grafton. The Authority's policy on bridge clearance heights for the North Coast states that the Clarence is considered to be a major river downstream of Grafton and a medium river upstream of Grafton. The Authority notes that the Clarence River is the largest river on the east coast of NSW. In the past, Grafton was a Port of Entry for foreign vessels and was regularly used by ocean-going ships with drafts up to 5m. The Authority suggests that even in past times, Grafton was the practical limit of navigation.

Today, the Clarence River is home to the Port of Yamba in its lower reaches and is regularly used by commercial shipping. The largest ship to have used the port in recent times was the Otava (119m overall length). The lower and middle reaches of the river are frequented by large cruisers and yachts to 30m in length and the occasional 'Superyacht' to 60m. A 30m yacht would typically have a mast of approximately 35m high, depending upon the vessel's rig. The Authority notes that it is difficult to know what the usage patterns of the river will be over the next 100 years, however it can be seen that the river has been and currently is, used by vessels of a considerable size.

Constraints

The underbridge clearance height and width of the navigational span of all bridges on the Clarence River are of considerable significance to any additional crossing, as an inadequate clearance height may have a negative impact on the local economy.

In relation to the width of the navigational span, it is generally considered that an adequate span-width to allow for vessels to safely navigate would be a width between pylons of 60m, or two spans of 35m each, situated over the deepest part of the river.

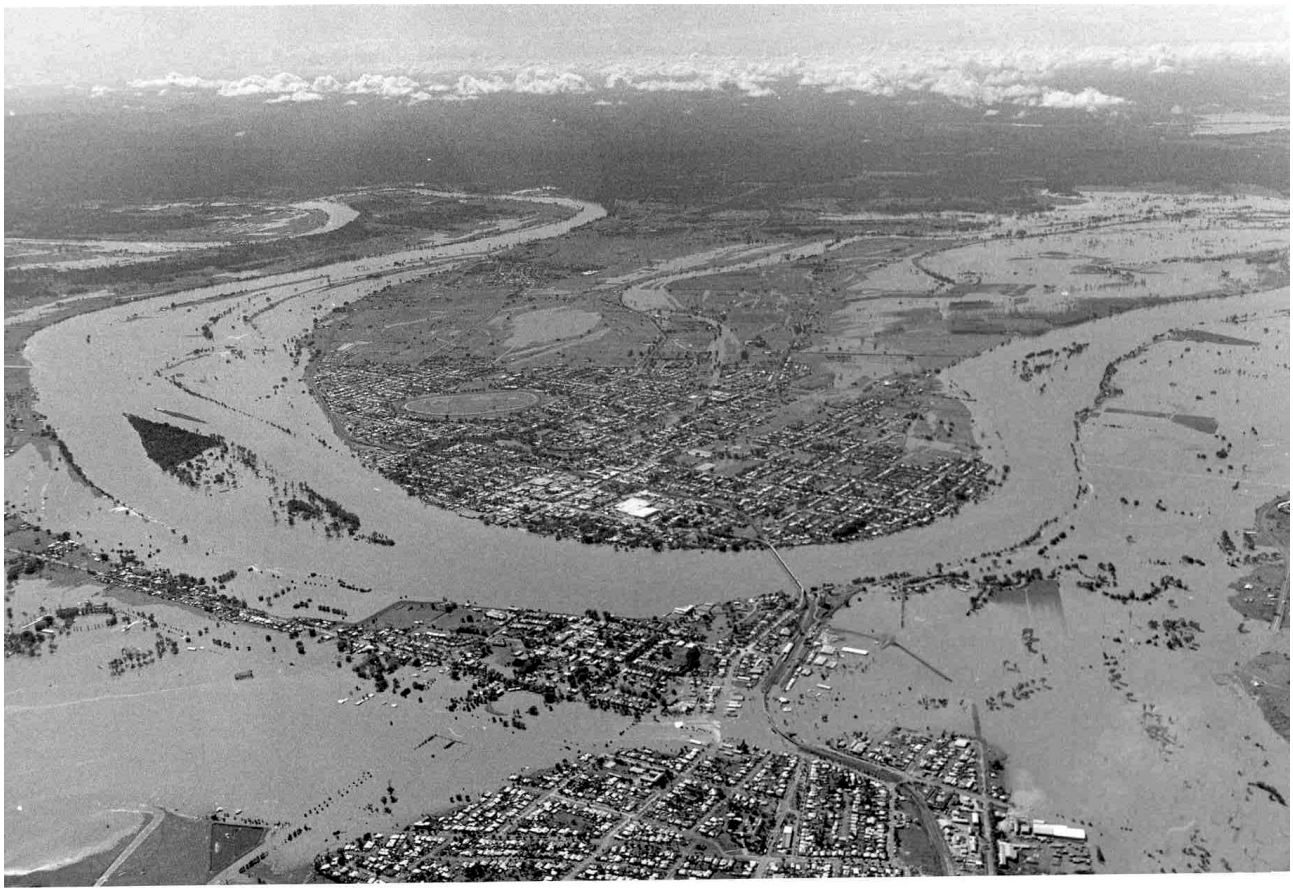


Photo 8 Clarence River at Grafton during the 1996 flood. Courtesy of *The Daily Examiner*.

5 Strategic Options

5.1 Introduction

This section provides an assessment of feasible sites for a second crossing of the Clarence River.

The study area for investigations extends from Seelands to Maclean, with detailed focus on the Grafton area, Ulmarra, Cowper and Lawrence. The options have been broadly grouped into a range of study areas, identified in Figure 5. The community, environment and traffic information collected was then used as part of the analysis of the strategic locations.

5.2 Scope

The scope of the work required to identify strategic locations is to:

- Provide ground data for constraints mapping, including ground information and current aerial photography.
- Identify feasible locations for an additional crossing with consideration to the information collected.
- Group locations into a range of study areas.
- Provide a range of strategic designs and estimates for the study areas.

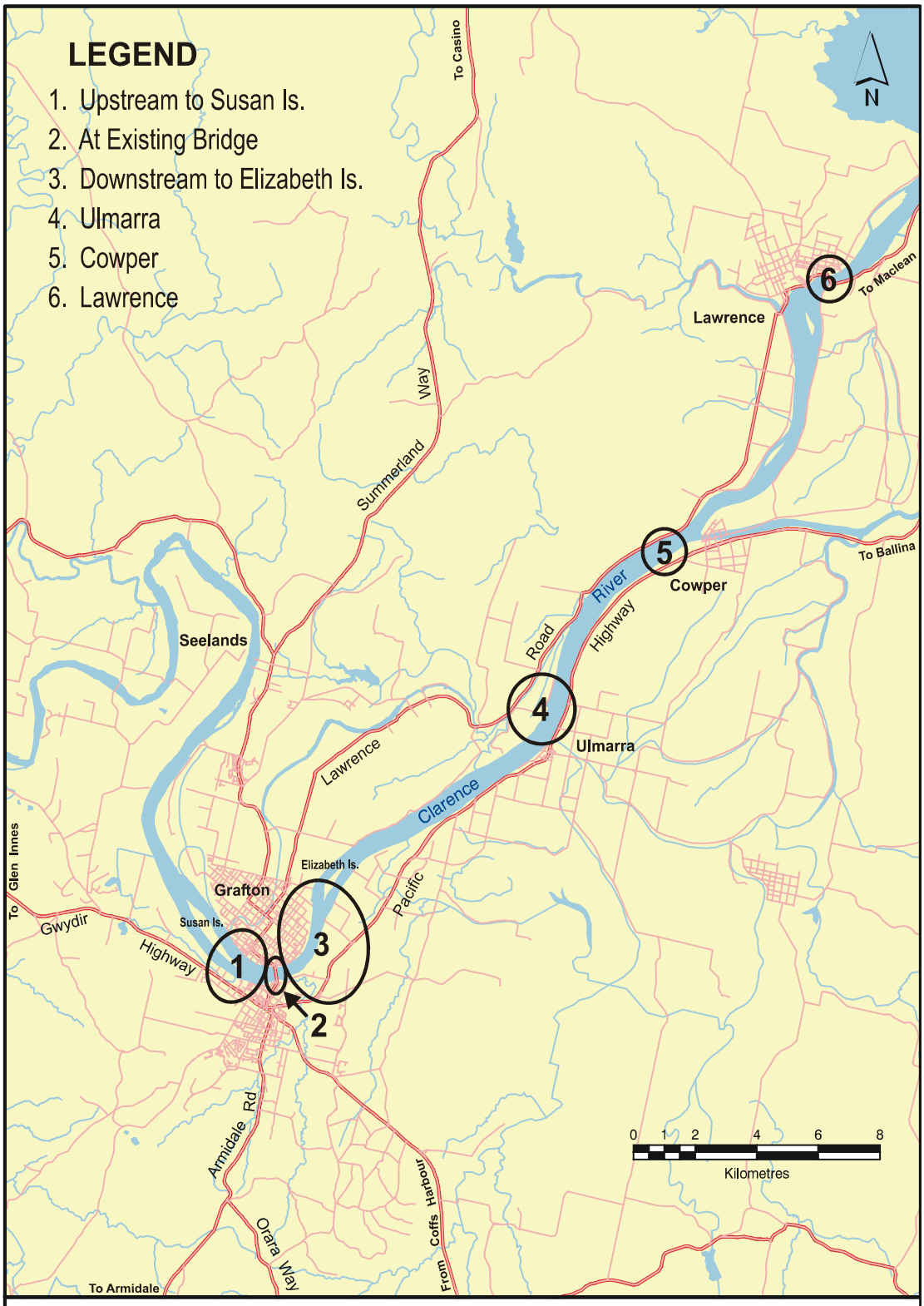
5.3 Strategic Option Strategy

The initial stage of identifying locations involved collecting existing data from various sources. This included aerial photography, ground data, flooding data, major public utility locations and property information. Following the identification of strategic locations, additional traffic, environment and community information was considered.

Most of the data was available for the Grafton area, which included September 2000 aerial photography and one metre contours. Options downstream from Elizabeth Island were investigated using 1:25000 scale mapping.

The options investigated were divided into the following study areas:

1. Upstream of the existing bridge including Susan Island
2. At the existing bridge
3. Downstream of the existing bridge including Elizabeth Island
4. Ulmarra
5. Cowper
6. Lawrence



ADDITIONAL CROSSING OF CLARENCE RIVER - FEASIBILITY STUDY

STUDY SITES

The do nothing option was not considered as the purpose of this report was to identify the broad strategic locations that are feasible for an additional crossing. Section 3.3.6, Road Capacity, describes the impact of traffic increases on the capacity of the existing bridge up until 2031. The condition of the existing bridge is structurally sound and the RTA has been implementing a regular maintenance programme.

An assessment of these sites was carried out based on engineering principles, environmental assessment including flooding, property and social impacts, major utility disturbance and economic analysis.

The community consultation feedback also raised the option of a tunnel crossing. Tunnels are usually considered in areas such as major cities where property density and values are high, making underground options potentially viable. There is also the environmental impact such as ventilation of the tunnel to consider. This option therefore was not considered in this study.

5.4 Traffic Analysis

The traffic analysis, described in detail in ***Appendix B***, is developed by inputting the traffic data collected (detailed in Section 3) into a computer program. The program then compares strategic options by considering improvements in safety, travel times, road user costs and ferry replacement for each strategic location. The difference in cost per trip between the existing traffic at the Grafton bridge and each strategic location was calculated. Traffic growth was considered over a 35 year period.

5.4.1 Assumptions

A number of assumptions were made prior to analysing the future traffic patterns. They are;

- Traffic will increase on a conservative 1% linear rate on year 2001 traffic volumes.
- This growth rate takes account of the increase in traffic from the new shopping centre at South Grafton and proposed development at Clarenza, South Grafton, Junction Hill and areas to the north and south that are serviced by Grafton.
- 1,400 vehicles per hour is the maximum one way flow rate on the bridge.
- Motorists will generally take the most direct or shortest path. Some allowance has been made for slightly longer trips in order to avoid congestion and minimise travel times.
- Intersections will be designed and upgraded to operate safely and efficiently.
- The Summerland Way / Pacific Highway route comprises 5% of total traffic using the bridge. (An origin and destination survey conducted by the RTA in 1974 also showed that 5% of traffic on the bridge used the Summerland Way north of Junction Hill.)
- Existing behaviour will continue such as car occupancy, level of public transport, peak traffic demand etc.
- The downstream option may encourage an increased use of Centenary Drive. No additional traffic has been assigned to Centenary Drive for these options. It is assumed that traffic will stay on the existing highway.

5.5 Options Considered

Following are details of the options considered for an additional crossing of the Clarence River. Traffic figures quoted are based on predicted traffic growth over the next five years.

5.5.1 Location 1 - Upstream of Existing Bridge

This option covers the strategic location for a crossing of the Clarence River from the existing Grafton bridge upstream to and including Susan Island.

Assumptions:

The assumptions made when investigating this option are listed below.

- The option would commence at a location in Ryan Street, South Grafton and include the bridge approaches, a new bridge, and upgrade of the existing local streets to connect to the existing Summerland Way in Grafton.
- An Environmental Impact Study (EIS) would be required for a crossing in this location.
- New bridge to include 2 travel lanes (one lane in each direction) and pedestrian/cycleway.
- Bridge clearance for navigation will be equal to or better than the existing bridge.
- A roundabout would be required at the southern connection to Ryan Street.
- Approaches to be above RL. 6.5 (assumed for minor flooding).
- All fill is to be imported for the bridge approaches.

Impacts:

On the upstream end of Susan Island is Susan Island Nature Reserve containing a remnant of subtropical rainforest. The remainder of the island is currently being considered for incorporation into the Nature Reserve. Susan Island is also a site of significant indigenous heritage value. Crossings at Susan Island would need to take precautions to prevent disturbance to Susan Island.

An additional crossing in this locality would continue to connect the business districts of Grafton and South Grafton. This would impact on the volumes of traffic to and from these areas and the receiving roads would need to be upgraded to cater for the additional traffic. It would also attract heavy vehicles to the business district of Grafton and South Grafton. With the additional traffic would be the increased traffic noise and this would need to be considered in detail in future assessments.

Property impacts would be minor depending on the location. The crossing would be above the 1 in 100 year flood level and would be up to 750 metres in length.

An additional crossing would attract 7,500 vehicles from the existing bridge with 18,300 vehicles still using the existing bridge. This option would attract traffic travelling to and from the areas west of Grafton such as Waterview and Rushforth Road. Cost of an additional crossing in this locality is in the range of $35M to $40M.

Options further upstream to Seelands were not investigated in detail as the benefits of providing an additional crossing upstream diminish as the distance increases from the existing Grafton bridge.

Over 25% of the community responded in the questionnaire to favouring this locality for an additional crossing of the Clarence River.

5.5.2 Location 2 - At the Existing Bridge

This option covers the strategic location for a crossing of the Clarence River in the vicinity of the existing Grafton bridge.

Assumptions:

The assumptions made when investigating this option are listed below.

- Construction would be limited to a new bridge and immediate approaches.
- An EIS would be required for a crossing at this location.
- New bridge to provide two travel lanes in one direction.
- Existing bridge will be retained as two travel lanes in one direction.
- Bridge clearance for navigation would be equal to or better than the existing bridge.
- Existing bridge can be closed to improve the 'kinks'.
- Bent Street to be upgraded to four lanes from Through Street to start of work.
- All fill to be imported for approaches.

Impacts:

An additional crossing within the vicinity of the existing bridge would continue to give direct access between the business communities of Grafton and South Grafton. It would also utilise the existing Summerland Way. The recent upgrade works on the approaches at Craig Street and Bent Street could still be utilised in the works thereby reducing the amount of approach road construction. This would also minimise the affects on public utilities.

This option would not remove the heavy vehicles from the existing bridge which makes up 5% of the total volume of traffic and contributes to delays at the kinks. However, traffic could be temporarily diverted to a two-way flow on the new bridge in order to close the existing bridge for work to be carried out to improve the bends.

Property impacts would be minor to medium depending on the location. The crossing would be above the 1 in 100 year flood level and would be between 500 and 700 metres in length.

An additional crossing would not require a pedestrian/cycleway as the existing bridge has adequate facilities for pedestrians and cyclists.

An additional crossing would take 50% of the traffic off the existing bridge as each crossing would be two lane one way. 12,800 vehicles per day would be using the existing bridge and the additional crossing. Current volumes on the existing bridge are 24,340.

On the basis of current and future development patterns the closer the additional crossing is to the existing bridge the greater the volume of traffic is attracted to a new crossing and therefore becomes more economically viable.

Cost of an additional crossing at this locality is in the range of $40M to $45M.

Over 15% of the community responded to the questionnaire to favouring this locality for an additional crossing of the Clarence River.

5.5.3 Location 3 - Downstream of Existing Bridge

This option covers the strategic location for a crossing of the Clarence River from the existing Grafton bridge downstream to and including Elizabeth Island.

Assumptions:

The assumptions made when investigating this option are listed below.

- The work would commence at a location at the Pacific Highway and include the bridge approaches, new bridge and upgrade of the existing road network in Grafton to the Summerland Way.
- An EIS would be required for crossings at this location.
- New bridge to include 2 travel lanes (one lane in each direction) and pedestrian/cycleway.
- Bridge clearance for navigation is equal to or better than the existing bridge.
- A T-junction with the Pacific Highway, which would include a detailed arrangement, with separate right and left turn storage lanes.
- Approaches to be above RL. 6.5 (assumed for minor Flooding).
- All fill will be imported for approaches.

Impacts:

A crossing in this locality would have a medium effect on properties on the southern approaches as lengths of the existing road reserves could be used. These approaches would also impact on the flooding in the area as it is outside the levee wall that protects Grafton and South Grafton.

Locations closer to the existing bridge would be able to provide access from the proposed Clarenza development to Grafton. It would also link the residential areas in Grafton directly to the Pacific Highway. The length of the potential crossings would be similar to the existing bridge with a length of approximately 400 to 750 metres.

These crossings will have a high social and property impact by potentially bringing traffic into residential streets on the northern side of the crossing. A percentage of this traffic would be heavy vehicles using the route as part of the Summerland Way.

This location would attract 5,800 to 7,600 vehicles per day and would require major roadworks on the approach roads in Grafton to connect to the Summerland Way. This crossing would reduce the traffic volumes on the existing bridge to between 17,900 to 19,700 vehicles per day.

The impacts of noise from increased traffic volumes on local residents would be high. The impact of the increase of traffic volumes and road traffic noise would need detailed studies in any future investigations.

The crossing would have a high impact on public utilities on the northern residential streets. Telstra, electricity, water and sewer would need to be relocated. It may also impact on the existing trees in residential streets.

Cost for an additional crossing in this locality is from $45M to $70M.

Over 45% of the responses to the questionnaire favoured this locality for an additional crossing of the Clarence River.

5.5.4 Location 4 - Ulmarra

This option covers the strategic location for a crossing of the Clarence River at the existing ferry crossing at Ulmarra.

Assumptions:

The assumptions made when investigating this option are listed below.

- The work would commence at the Pacific Highway with a flyover interchange to provide the height over the Pacific Highway for bridge clearance.
- A T-junction would be provided at Lawrence Road.
- An EIS would be required for this option.
- New bridge to include 2 travel lanes (one lane in each direction) and pedestrian/cycleway.
- Bridge clearance for navigation equal to or better than the existing Grafton bridge.
- New approaches to be above minor flooding levels.
- All fill to be imported for approaches.

Impacts:

Minor property acquisition would be required to accommodate the approach to an additional crossing. The southern approach to the bridge would have to provide adequate height over the Pacific Highway. An 800 metre bridge would be required and the existing ferry crossing would be eliminated.

This option may also attract Pacific Highway traffic that would normally have travelled through Grafton and north on the Summerland Way. However, the northern connection of the Grafton to Lawrence Road to the Summerland Way is unsealed with substandard alignment and would need major upgrade works.

An additional crossing would attract 1,900 vehicles per day with the existing Grafton bridge volumes at 23,600 vehicles per day (2006 figures) thereby reducing the traffic volumes on the Grafton bridge by a small percentage.

Cost for an additional crossing at this location is $40M.

Approximately 2% of the responses to the questionnaire favoured this locality for an additional crossing of the Clarence River.

5.5.5 Location 5 - Cowper

This option covers the strategic location for a crossing of the Clarence River at Cowper.

Assumptions:

The assumptions made when investigating this option are listed below.

- The work would commence at the Pacific Highway with a T-junction.
- A fly over interchange at Lawrence Road to provide the height for bridge clearance.
- An EIS would be required for this location.
- New bridge to include 2 travel lanes (one lane in each direction) and pedestrian/cycleway.
- Bridge clearance for navigation equal to or better than existing.
- New approaches to be above minor flooding levels.

Impacts:

Minor property acquisition would be required. A bridge length of 500 metres is required.

An additional crossing would attract 1,400 vehicles per day and the existing Grafton bridge would be 24,200 vehicles per day thereby reducing the traffic volumes on the existing bridge by only a small percentage.

Cost for an additional crossing at this location is $30M.

Approximately 2% of the responses to the questionnaire favoured this locality for an additional crossing of the Clarence River.

5.5.6 Location 6 - Lawrence

This option covers the strategic location for a crossing of the Clarence River at the existing ferry crossing at Lawrence.

Assumptions:

The assumptions made when investigating this option are listed below.

- The work would commence at the Pacific Highway with a flyover interchange to provide the height for bridge clearance.
- An EIS would be required for this option.
- New bridge to include 2 travel lanes (one lane in each direction) and pedestrian/cycleway.
- Bridge clearance for navigation equal to or better than existing.
- New approaches to be above minor flooding levels.

Impacts:

Minor property acquisition would be required. A bridge length of 380 metres is required and removal of the existing Lawrence Ferry.

An additional crossing would attract 600 vehicles per day and the existing Grafton bridge would be 25,000 vehicles per day thereby reducing the traffic volumes on the existing bridge by only a negligible percentage.

As with the Ulmarra option this option may also attract Pacific Highway traffic that would normally have travelled through Grafton and north on the Summerland Way. However, the northern connection of the Grafton to Lawrence Road to the Summerland Way is unsealed and substandard alignment and would need major upgrade works.

Cost for an additional crossing at this location is $20M.

Approximately 2% of the responses to the questionnaire favoured this locality for an additional crossing of the Clarence River.

Table 2 in ***Appendix B*** details the volumes of traffic that will be redirected to each of the strategic crossings in the years 2006 and 2036.

5.6 Safety Comparisons of Options

The following table shows the comparison of options in terms of safety performance over 35 years.

Table 7 – Safety Comparison of Options

Option	Predicted number of accidents	Accident Savings
Existing bridge	32	
Duplication upstream	29	3
Duplication at existing	22	10
Duplication downstream	30	2
Duplication at Ulmarra, Cowper & Lawrence	29	3

The table compares the predicted traffic accidents on the existing bridge with the predicted traffic accidents by duplicating the existing bridge at the various locations. It can be seen that the duplication of the existing bridge has the highest accident savings.

The accidents forming the basis of the analysis are those of a serious nature, that is tow away or injury accident. Minor bumps that would occur on the bridge and on the approaches are not included in the data.

5.7 Economic Analysis

5.7.1 General

The objective of economic appraisal is to analyse costs and benefits of the strategic options. It shows which of the options is the most viable and effective. Specifically, whether the benefits of a project exceed its costs.

The RTA uses economic appraisal results as a tool for analysing, ranking and funding road and bridge projects. Cost Benefit Analysis (CBA) is an economic-based approach that considers the merits of a project from the viewpoint of the community at large rather than that of the organisation responsible for the project.

For an additional crossing bridge to be competitive with other worthwhile projects throughout NSW it must be shown that benefits exceed the cost of investment. This is normally demonstrated by estimating future costs and future benefits and translating them into current day dollars to give a benefit cost ratio (BCR). A BCR of greater than 2 is usually needed before investing public funds. Projects with a higher BCR would usually be ranked ahead of projects with a lower BCR.

Table 7 shows the costs of each of the options.

Table 7 Costs of Strategic Options

Option	1	2	3	4	5	6
Description	**Upstream of existing**	**At existing bridge**	**Downstream from existing.**	**New bridge D/S at Ulmarra**	**New bridge D/S at Cowper**	**New bridge D/S at Lawrence**
Strategic Estimate of Cost - $M (RTA)	35 to 40	40 to 45	45 to 70	40	30	20

Table 8 shows the benefits of each of the options.

Table 8 Benefit Cost Ratios

Option	1	2	3	4	5	6
Description	**Upstream of existing**	**At existing bridge**	**Downstream from existing.**	**New bridge D/S at Ulmarra**	**New bridge D/S at Cowper**	**New bridge D/S at Lawrence**
Benefit Cost Ratio (BCR)	1.6 to 1.8	1.9 to 2.2	0.9 to 1.6	0.7	0.7	0.5

5.8 Feasible Options

The strategic options that can be considered feasible locations will be those that meet the objectives of the project. Those that do not meet these objectives will further considered and rejected if they do not provide a significant benefit.

The following analysis has been undertaken on the strategic options.

Option	1	2	3	4	5	6
Location	**Upstream of existing bridge**	**At the existing bridge**	**Downstream of existing bridge**	**At Ulmarra**	**At Cowper**	**At Lawrence**
To reduce the delays at the existing Grafton bridge	3	5	3	X	X	X
Considers the needs of the State road network	1	2	3	1	1	1
Considers the needs of the local road network	3	5	2	X	X	X
Minimise the impacts on the environment	2	3	2	3	3	3
Return on investment of BCR greater than two	X	2	X	X	X	X

X = Doesn't meet the objective
1 = Marginal effect
2 = Average effect
3 = Effective
4 = Very effective
5 = Highly effective

The table does not rank options however the numbering allows an overview on the degree with which the options meet the project objectives.

From the table the option of an additional crossing at the existing bridge meets all the objectives of the project and is the location that appears most feasible for an additional crossing. The options upstream and downstream meet the objectives of the project with the exception of a return on investment of greater than two. The locations at Ulmarra, Cowper and Lawrence do not meet three of the objectives.

5.9 Conclusion

The most feasible location appears to be in the vicinity of the existing bridge. The main advantage of this option is that it maximises the reduction of delays on the existing bridge by transferring fifty per cent of the traffic onto an additional crossing. However, even though this location is feasible any additional crossing is likely to have potentially significant impacts on the community such as traffic, social, noise and aesthetics. If the project were to proceed to the Development Phase, ie, selection of a preferred location, more detailed studies would be required. This would include more specific traffic analysis and noise monitoring in this locality. It would also require continuation of the close consultation with the community to determine the social impact of an additional crossing.

The locations upstream and downstream of the existing bridge also appear to be feasible as they meet all the objectives of the project with the exception of economic comparisons of the benefits to cost. These options have a number of adverse impacts particularly social and

environmental impacts and traffic noise. However, they do have a number of benefits as detailed in this study report. If the project were to proceed to the Development Phase these locations would need to be considered as part of the selection of a preferred location to validate the findings of the Feasibility Study. Further detailed traffic analysis, noise monitoring, environmental investigations and community consultation would be required to determine the viability of an additional crossing in these locations.

The locations at Ulmarra, Cowper and Lawrence do not meet a number of objectives of the project and would not contribute greatly to reducing congestion or provide a significant improvement to safety at the existing Grafton bridge. Therefore, an additional crossing at these locations is not feasible with respect to this project.

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Appendix A
Community Consultation
Specific Issues Raised

1. Community Focus Group Responses

1.1 Summary of presentations made by the Community Representatives at the first Community Focus Group Meeting held on 6 August 2002.

Ian Dinham – Maclean Shire Council

- Supports additional crossing as it may move trucks off the Pacific Highway onto the Summerland Way.
- How will the funding of the bridge impact upon other local projects e.g. Oyster Channel Bridge at Yamba & bridge to replace ferry at Lawrence.
- How will it impact on other Pacific Highway projects e.g. Ulmarra Bypass
- MSC's support for the additional crossing is subject to the provision that it does not have a detrimental effect on the funding for these other projects.

George Cowan – Copmanhurst Shire Council

- Long-term goal is to upgrade the Summerland Way. The existing bridge has restrictions.
- Council supports additional crossing as the existing bridge impacts on traffic flow on Summerland Way.
- No preference for location at the moment.
- Urban planning to be considered. Refer to the Clarence Valley Settlement Strategy (CVSS) document.
- Consider the impact on timber industry. There are timber mills to the north of Junction Hill and the majority of truck movements are sourced from the south.
- Needs of Junction Hill to be taken into account. Proposed Council planning includes a bypass of Junction Hill.

Col Harbidge – Grafton City Council

- CVSS says 95% bridge traffic flow is local. Council is doing its own study to verify this data and this information will be made available to the CFG.
- Delays of traffic are during peak hour on workdays, not school holidays.
- Emergency vehicles and location of emergency services should be considered.
- Letters and general discussions are received from the community.
- 68% of vehicles are single occupants in peak hour – strategic options to address this and the CFG to consider it.
- Can Feasibility Study look at strategies to address this issue i.e. ferry across to the Victoria Street business area.
- Concerned that additional crossing away from Grafton will not address emergency vehicles & 95% of local traffic.
- Has not considered location options – probably assumed in Grafton area, as location elsewhere may not address the traffic needs.
- Diversion of traffic from Pacific Highway to Summerland Way – need to consider this in options.
- Promote Summerland Way – as it brings business to Grafton.
- Height of bridge to be above flood level – flood proofing as much as possible.
- More issues to be raised by Council as part of the consultation process.

Ron Bell – Grafton Chamber of Commerce

- Original concept is for an additional bridge in Grafton to alleviate traffic congestion etc.
- Additional crossing outside of Grafton probably will not address problems.

- Chamber of Commerce survey (for Grafton & South Grafton members) in November 2001 (not an accurate methodology) identified a number of major issues including a better bridge.
- No opinion about location except not too far away from the existing location.
- Chamber of Commerce has sought and received support from other councils.
- CFG to maintain and develop decision that considers future planning needs.
- If there is an additional bridge, will the government maintain the two road crossings or close one down.
- Pleased with RTA's approach.

Kel Kearns – South Grafton Business Association

- Personal view at this stage.
- Support previous comments (by Col Harbidge & Ron Bell).
- Seems to be a re-energising in South Grafton business area.
- Needs to be an additional crossing that serves the Grafton community and Summerland Way.

Laurie Marchant – South Grafton Residents Progress Association

- Originally involved in the flood levee project.
- Need a two stage approach
- Initially consider ways to ease traffic issues with low expense options.
- At a longer-term stage need an additional crossing that will ease the traffic congestion.
- Appropriate cost / benefit analysis should be used to justify another crossing or otherwise it could be an expensive bridge for little return.
- Northern Rivers Regional Strategy & CVSS – critical of them as they are too restricting of business development.
- Hope the Feasibility Study may provide data to help further developments.
- Difficult to accurately plan over long time frames.
- Development opportunities in South Grafton to be considered due to the levee.
- Need to consider traffic movements at schools.
- Supports additional crossing if the Feasibility Study results indicate the long-term need.

SUMMARY OF AGREED ISSUES

- Unanimous agreement for an additional crossing.
- Agreement to the RTA process for the Feasibility Study.
- Study should consider the Summerland Way.
- Feasibility Study to take into account future vehicle usage, heavy vehicles, planning and land use.
- Consider future settlement strategies.
- Study to address reducing delays that currently exist.
- Consider obstructions that may occur to interrupt emergency vehicles.
- Funding for this project should not be taken from other projects.

1.2 Following is the Community Focus Group participants' responses to the meeting held on 26 September 2002.

Ron Bell – Chamber of Commerce

1. Chamber Survey

A survey conducted by the chamber of retailers and professional located in the Grafton CBD resulted in the following observations:

- 61% of respondents thought safety issues outweighed delays as a reason for a new Grafton Bridge.
- 53% agreed the present Grafton Bridge has a detrimental effect on trade, business and commerce in the Clarence Valley.
- 78% agreed that a new bridge if located near or adjacent to the present structure would be of benefit to business and commerce in the city of Grafton.
- 11% thought the construction of a new rail bridge and the conversion of the present bridge into an upper/lower roadway would be beneficial to the city.
- Respondents when asked to list a 'preferred site'

  - ➢ 55% Adjacent to the present Grafton Bridge site
  - ➢ 33% Turf Street to the Gwydir Highway
  - ➢ 5% Dobie Street to Clarenza
  - ➢ 7% Other sites

- Respondents were asked to list issues to be considered, which they thought to be of high importance for any potential site.

  - ➢ 75% protection of the present environment
  - ➢ 20% disruption of residential areas through relocation and/or increased traffic noise
  - ➢ other issues – through traffic/reducing dealys/increase business.

2. Sub Focus Groups

There wasn't enough time to organise this. However, this could happen within the next month.

3. 2GF/FM 104.7 Websites

The project has been noted on the Home Page of both station websites advising those interested to go to their local council. Links to all Clarence Valley Councils are available from the station websites.

4. Promotion of Questionnaire

A free schedule of advertising was broadcast on 2GF and FM 104.7 over a two week period promoting the questionnaire being in the Daily Examiner and on the Council websites. (Value approximately $3,000).

5. Other matters

A number of suggested sites have been presented to me by interested people. I will make these available at the next CFG meeting. If you require them before then, please contact me.

Kel Kearns – South Grafton Traders Association

South Grafton Traders has had limited responses. Need to get responses from businesses.

Laurie Marchant – South Grafton Progress Association

Subsequent to the meeting of 6th August, the feasibility study into the additional crossing of the Clarence River near Grafton has been discussed with a number of individuals and three main groups.

It was interesting to note that most appeared to be aware of the study and had sighted the Questionnaire. There was one segment that claimed they had not seen the Questionnaire. This letter group was located in the Housing Estate Area in the Rushforth Road / Bimble Avenue South Grafton area.

I have summarised the comment received as follows:

1. There was agreement with the proposed approach to the study and overall there were no aspects considered to have been overlooked. Several comments were made relative to the possible problems in the securing of adequate foundations.
2. There was approximately 50% support for a new bridge at this time. 50% considered that planning should take place now but doubted an immediate need.
3. The reasons for requiring an additional crossing were for reasons of security and the need to get the heavy trucks out of the city area.
4. Less than 10% indicated that they had been disadvantaged when using the current crossing.
5. The disadvantaged claimed being the need to have to stop and give way to larger vehicles.
6. Less than 5% claimed that they had been penalised financially by or when using the current crossing. Some claimed payment for appointments they were late in attending.
7. the preferred location for an additional crossing was indicated as 25% upstream and 75% downstream of Grafton City. there was no support for an additional crossing into the Grafton City area. There was comment by a very small number that further consideration should be given to the possible widening of the current structure by clip-ons.
8. When considering how prepared people were to pay some form of contribution towards the cost of the additional crossing the consensus appeared to be an objection to the payment of any form of **additional rates** but a willingness to pay a toll on vehicles using the facility. One group claimed that there should be no demand for additional payments as they already paid through their petrol and registration charges. In considering the priority for funding of the additional crossing relative to other public infrastructure projects it was virtually unanimous that the top priority was for spending on Health, Education and Aged Care facilities, with the additional crossing **at this time** having a lower priority. An exception was one group that wanted all such projects to proceed together and was very cynical of political decisions that would be made irrespective of what the community might say.

Ian Dinham – Maclean Shire Council

Information sent out to a large range of groups.

- Responses were directed to the RTA.

- Good response received from the Lower River area as shown in the responses for the questionnaire.

Tony Smith – Grafton City Council

110 surveys / 50 responded.

- Result were focused on
  - ➢ Safety
  - ➢ Trade
  - ➢ Near the present structure
  - ➢ A new rail bridge

- There was some delay with questionnaire being placed on Grafton City Council website.

- A number of private submissions received and given to RTA.
- Peter Black handed around response from the Mayor asking if anybody required copies – no copies requested.

George Cowan – Copmanhurst Council

Minutes to Council – happy with agreed issues.

- Questionnaire placed on public website – responses forward directly to RTA.
- Distribution of questionnaire at Council front counter.

Cecil Hyde – Pristine Waters Council

Discussion with Councilors indicated interest in having additional crossing away from Grafton.

David Bancroft – Representing Member to Clarence

One response received from Lawrence Bus Service.

2. Specific Community Issues Raised

	Representation No
Community Impacts	
Access	
Increased traffic directly past the Hospital would be undesirable, particularly heavy vehicles due to the impacts upon visitors in particular the elderly.	11
It would be of benefit to patient care if the second bridge had easy access from the Pacific Highway to Grafton Base Hospital. A proposed Bridge across Susan Island would provide such access. It would also provide a quick alternate route to the major referral hospital in Lismore via easy access to Summerland Way.	11
Emergency Services	
Concerns are raised about the ability of emergency services to cross the bridge during times of congestion.	12
Other	
Turf Street becomes Summerland Way north of Dobie Street although most heavy vehicles use Oliver Street to drive into the CBD of Grafton. This existing route passes Grafton High School and Public School which is undesirable. The new bridge linking with Turf Street would increase heavy vehicle traffic between Oliver Street and Pound Street which would cause noise issues for homes located on the western side. The eastern side has Grafton Swimming Complex and See Park. Existing heavy vehicle traffic uses a similar route so there would be little inconvenience for people using that area. The eastern side of See Park are predominantly used so little inconvenience would be experienced.	14
The Community Update has not given enough consideration to the health and noise impacts of a new bridge next to the existing structure.	
Planning	
Appropriate negotiation should be undertaken with affected landholders.	9
The local community and businesses are considered a very important stakeholder group from which information as to the necessity, possible location, concerns and benefits of such a proposal should be sought.	9
There has been no consideration of the layout of Grafton and the importance of rail infrastructure in the City. Location No 2 does not relieve the problem of heavy vehicles driving under the viaducts.	29
Traffic Delays	
The main reason for traffic slowing down on the bridge is the corners/bends at either end of the bridge. Heavy vehicles have to slow while vehicles travelling in the opposite direction have to stop in order for them to negotiate the bends. If the traffic did not have slow then there would be very little delay at most time of the day.	14
During peak hours the bridge does not have the capacity to handle the volume of traffic using it.	14
Traffic lights on either side of the bends in the bridge would be more effective. The RTA could look at a programme promoting people walking or riding their bikes to work. Two other factors that will lessen vehicle numbers are the new South Grafton Shopping Centre and the new Catholic School moving to South Grafton. The delays currently experienced do not justify the spending of $40 million. Removal of heavy vehicles by a location outside the populated area would have a less effect on the town landscape.	20
A further crossing of the Grafton Bridge is not necessary as delays occur over a limited time. These delays would occur regardless of whether a new crossing existed. Note that projected traffic growth of 1% pa is assumed. Figure 3 Traffic Growth shows that from 1994 to 2002 there has been no traffic growth. Opening of the shopping centre and relocation of the schools to South Grafton will reduce traffic.	27

	Representation No
Quantitative traffic figures do not consider the stopping and starting of traffic at the bends of the bridge. The study needs to measure the impact of starting and stopping on the traffic flows	33

Cumulative Impacts

Emergency Services

From an emergency services point of view delays experienced on both the existing bridge and at the ferries mean a new bridge is a necessity.	1

Traffic Delays

The Christmas/New Year bushfires and recent highway accidents have demonstrated the need for an additional river crossing in the Lower Clarence with up to 2 and 3 hour delays being experienced.	1

Ecological Impacts

Ecologically Sustainable Development

Appropriate site remediation and weed control would need to be implemented.	9

Flora, Fauna and Aquatics

Assessment of the proposed development should investigate via an eight-part test whether a species impact statement is necessary for threatened fish species. There should also be an indication of whether the Proposal conflicts or could impact upon actions to be undertaken in the draft recovery plan. The Eastern Freshwater Cod (threatened species) is known to have occurred throughout the Richmond River catchment. The draft recovery plan for the Eastern Freshwater Cod was included as an attachment.	2
There should be consideration of how damage to fish habitats such as instream macrophytes will be minimised and of opportunities for compensatory habitat.	2
Buffer zones may need to be fenced or marked by signs and the width may need to be increased to 100 metres where they are adjacent to ecologically sensitive areas.	2
Approvals may be required for activities that block the free passage of fish.	2
Terrestrial areas adjoining freshwater, estuarine or coastal habitats are required to be carefully managed in order to minimise land use impacts on aquatic habitats. Foreshore buffer zones at least 50 metres wide should be established and maintained, with their natural features and vegetation preserved.	2
NSW Fisheries minimum information requirements for environmental assessment was also included as an attachment and it was requested that the proponent address these requirements in the environmental studies.	2
Approvals may be required for dredging and reclamation activities.	2
Environmental studies are required to examine and demonstrate how impacts on aquatic diversity can be addressed to ensure compliance with habitat provisions in the *Fisheries Management Act* 1994 and NSW Fisheries policies that underpin them.	2
5 No license is required for clearing of native vegetation under the Native Vegetation Conservation Act within a road reserve. However, a license may be required for clearing of any vegetation in category 'b' State Protected Land, which is land either within 20m of the bank of a defined watercourse or within the watercourse when clearing is outside an existing road reserve.	

	Representation No
Opposed to the use of either Susan or Elizabeth Islands for a second crossing. Should be preserved under the NPW Act for protection	34
The RTA is exempt from needing to obtain a Rivers and Foreshores Improvement Act permit although any works involving excavations carried out within 40m of the high bank of the river but should comply with the intent of the Act.	5
Should a bridge cross one of the islands in the Clarence River there would be potential for serious biodiversity impacts from unlimited pedestrian access as well as fauna impacts from dogs and cats etc. Any consideration of an island crossing would need to look at the potential impacts from these factors.	5
It is recommended that a search of the NPWS Wildlife Atlas be undertaken for flora and fauna records. If significant species or their potential habitat have been recorded in the study area it is recommended that detailed surveys be undetaken to determine the extent of populations and potential impacts on these species or their habitats.	19
The study area includes Susan Island, the upstream third of which is protected as Susan Island Nature Reserve. This Nature Reserve includes the Grey-headed Flying-fox, and bridge works should avoid Susan Island, and a half-kilometre radius, to protect the roost site and access routes.	19
Unanimously opposed to a crossing on either Elizabeth or Susan Island which comprise of endangered ecological communities and at least 10 threatened fauna species. Susan Island is especially significant to the Aboriginal women of the area.	32
The rainforest on Susan Island is already under threat and should be avoided. Construction in the vicinity of the new bridge would reduce this impact.	33
Geotech and Soils	
Works on the floodplain and within the bed of the river will need to be assessed for potential Acid Sulfate Soils impacts.	5
Consideration should be given to management of soil erosion so as to minimise impacts on downstream water quality.	9
Hydrological Impacts	
Assessment of any potential impacts on the riverbank stability should be made.	5
A large floodplain adjoins the Clarence River and depending on the proposed location, the approach works (particularly if outside the existing flood levy) may have significant impacts on flood flows. The effect of any new bridge on possible flooding impacts would need to be investigated.	5
Economic Impacts	
Access	
Reduction in travel times between North Grafton and the Lower Clarence would provide an important link between the established business centre and the growth areas and would be an economic advantage to both areas.	1
Industry and Agriculture	
The suggested diversions would provide for growth of the local sugar cane industry. It was pointed out that growth of the industry is currently hampered by poor access to the north side of the river.	1
Social Issues	
Delays on the existing bridge add to the cost of passenger transport, and the inability of meeting pre booked taxi commitments.	12

	Representation No
Utilities and Infrastructure	
The suggested diversions would make the Bluff Point and Ulmarra-Southgate ferries unnecessary providing significant ongoing savings to annual running costs and negating future upgrade costs that may be required.	1
Existing Bridge	
Access	
Another issue is that the existing bridge is very narrow, with some bends on the bridge making it difficult for large trucks to negotiate the bends without scraping the kerb and having to cross the on-coming traffic lane. This causes further delays as the on-coming traffic needs to stop to allow these trucks to make these turns. There is quite heavy usage of trucks on the existing bridge as northbound trucks often cross from the Pacific Highway on the coast to travel through Grafton and inland along the Summerland Way to Casino and then up through the gate-way to Queensland, or to Lismore or west to Tenterfield. These routes are also used for return trips.	15
Cyclists	
It is understood that there is a good quality cycling facility on the existing bridge.	13
Emergency Services	
Collisions on the existing bridge can bring traffic to a standstill. This can make it very difficult to reach the scene in order to assist. Such incidents can also create enormous backlogs of traffic with no convenient alternative crossing of the river being available.	14
The main concern regarding the existing bridge is the poor response time to incidents on the south side of Grafton Bridge. Most of the time there is little opportunity to overtake when undertaking a response. The same situation also occurs for Police crossing south to north to undertake a response although this occurs less frequently.	14
Access for other emergency service vehicles such as ambulance, fire brigade, police etc. would be of concern.	15
Hydrological Impacts	
Reports have been made of scouring to the bridge structure when levies have concentrated flood water past pylons. This is of concern to the rail operators.	10
A bridge constructed adjacent to the existing would potentially damage the existing bridge and would affect water flows.	20
Location	
The current bridge is strategically located close to where the Pacific highway approaches the town, close to where the Gwydir Highway joins the Pacific Highway and also close to where the road from Armidale enters the area. The current bridge location is thus in approximately the most appropriate area. The Summerland Way also starts in Grafton, with the bridge connecting the major arterial routes to the west, south and east to the route to the north. This is not to say that the exact location of the current bridge is the only location for additional capacity. A new crossing immediately east or west of the current bridge might be feasible. However to make the most of the existing road infrastructure, including the existing bridge and the approach roads, it would make economic sense to utilise as many of the existing roads and facilities as possible.	16
Grafton is disadvantaged in two ways. It is a divided city and it is difficult to get the full benefit of the businesses on both sides. Bypassing Grafton with a bridge would reduce it's importance. The only viable solution would be an improvement of the existing bridge or a bridge near by.	26
Noise levels would need to be considered if an adjacent site was chosen.	20

	Representation No
Strong support for an additional crossing either at the existing bridge or immediately downstream. The do nothing option is most unsatisfactory. The Government should provide sufficient funding to allow the project to proceed to the development phase.	28
A new crossing is not needed for the 25,500 vehicles that cross each day. A new crossing is needed for the heavy vehicles that cross the bridge as well as emergency vehicles. A new crossing would be of great importance for to the development of the infrastructure of the region. The Grafton bridge is inadequate as a modern road bridge and older members of the community fear driving across the bridge.	29
Do not consider any upstream crossing of the Clarence River to be appropriate due to environmental, cultural and economic reasons.	30
Endorses strategic locations 1,2 and 3 for further investigation by the RTA. Preference is for Location 2 or at the existing bridge. Locations 4,5 and 6 did not address the increasing traffic numbers using the existing bridge. An additional crossing in the vicinity of the existing bridge will have enormous social, commercial, tourism and economic benefits for the town and the Northern Rivers. Strongly urges the RTA to proceed to the Development Phase.	31
The impact of a downstream crossing linking Centenary Drive to the Summerland Way would be greater than the projected figures would suggest. Locating a second crossing adjacent or or upstream to the existing crossing will concentrate all traffic through the town centre. It would also impact on the houses in the vicinity of the bridge and on the approaches. There are areas downstream towards Elizabeth Island which remain relatively undeveloped and a second crossing here would have minimum impact on housing.	33

Other

The existing bridge was not designed to take the weight of the traffic that is currently using it. Many people have expressed concern at the amount of movement of the bridge whilst they are stationary and heavy vehicles are crossing.	14
Outside these peak periods the traffic flows quite well except in cases of motor vehicle accidents or breakdowns.	15

Planning

Long term utilisation and maintenance of the existing bridge	9
Unless the bridge is considered unsafe to maintain in its current operation, it will presumably continue to play a role in providing access across the Clarence River.	16

Suggested Modifications

Suggested investigation of the possible addition of an extra road lane beside the existing rail line on the Grafton Bridge.	1
Modifications to the road deck of the present Grafton Bridge including widening, particularly at the bends, would greatly improve traffic flow.	1
If a pylon were placed on the inside of the bends to support the widening of the bridge and subsequent straightening of the corners there would be very few delays. The pylons would go into the ground and not the river and this would be a fairly simple engineering task done at comparatively little expense. It is suggested that this solution should be attempted immediately rather than waiting for a second bridge.	14

Traffic Delays

The volume of traffic using the bridge during peak hours causes delays of up to ten - twenty minutes.	12
The main issue of concern is the delay time of driving over the existing bridge during daily peak travel times in the morning and afternoon. NRMA road service patrols report experiencing delays whilst driving over the bridge during these times.	15

Representation No

You will be aware from your own knowledge of the town and the results of your Questionnaire survey that many motorists currently suffer significant delays when using the current Clarence River bridge to access the town. The delays are particularly noticeable in commuter peak periods.	16

Traffic Volumes

Reduction of through traffic over the Grafton Bridge would improve local travel times. The reduction could be achieved by the two suggested diversions.

Traffic times were collected and submitted in a spreadsheet. Average travel times were 2 to 2.5 minutes less than figures quoted in the Feasibility Report. Any future options should consider modifications to the existing bridge. Difficult to see how Option 1 is less costly than Option 2. The issue of providing a better level of service does not justify a new crossing. The "Do Nothing" option should consider locating a second ambulance station to South Grafton. The money for an additional crossing could be diverted from a new crossing to subsidise or fully fund a traffic reduction scheme. Alternatives should consider changing commuter's behaviour to travel outside peak periods.	23
The impact of a new section of road south of Tweed Heads is an example of the effect of upgrade road infrastructure on traffic. It would be hard to imagine that a similar impact would not occur with a second crossing and would feed increased traffic through the city.	33

New Bridge

Heritage Impacts

A preliminary evaluation of potential Aboriginal cultural heritage in the study area revealed several sites or objects, which may be significant constraints. Each route option would need to be separately surveyed.	19
A search of the NPWS AHIMS database is recommended along with consultation with the local Aboriginal community.	
A bridge adjacent to the current bridge would significantly impact on the cultural/heritage significance of the current bridge. Visual obstruction would impact the heritage and visual value of the bridge. The southern and northern approaches contain numerous houses of heritage significance. A new bridge is not needed adjacent to the existing structure and the impact on heritage and cultural values makes it unsuitable as a site.	20

Location

Two problems arise on the north side of the bridge created by using the Turf Street option are that the railway line has to be crossed and that the Boral concrete site may have to be relocated. Solutions would be to lift the railway crossing via a bridge so that the road traffic does not have to be set at a different grade and it may be possible for the new road bridge to be constructed over the top of the Boral Concrete Site. A roundabout would be necessary at the intersection of Turf Street and Pound Street.	14
For the Turf Street Proposal Ryan Street would need to be extended on the south bank to link with the new bridge. A roundabout would need to be constructed at the intersection of Ryan and Hay Street. It is suggested that all heavy vehicles be required to use this route. Vehicles travelling west from the Gwydir Highway would turn left while those approaching from the south would travel west on Ryan Street to Hay Street. This would result in an increase in Heavy Vehicle Traffic on Ryan Street that is considered acceptable due to the improvement in quality of life that would result for the people of Grafton.	14
It is suggested that a new bridge be placed linking Turf Street from the north and Ryan Street from the south. This would enable two short spans with a join on Susan Island rather than one long span that would be required for a bridge adjacent to the existing structure.	14
A new bridge immediately upstream of the existing bridge may be the easiest option but it is not the best. It would mean that all heavy vehicle transport crossing the river would still go through the heart of town.	14

Representation No

A bridge immediately upstream of the existing bridge would use the existing road infrastructure. This option would create two lanes from Ryan and Bent Street roundabout to	14

the Grafton CBD. Bent Street would have to be widened to two lanes to ease traffic flow between the bridge and Through Street. Changes required at either end of the bridge should not be too expensive.	
The easiest position to place a second bridge would be alongside the existing bridge on the up river / western side	14
Other issues for the planning of an additional crossing is selecting a suitable site and the impact on residents due to changed traffic routes, protecting the environment and sites of significance, future urban development around Grafton, the removal of heavy traffic from the main thoroughfare, improved safety etc. In addition to considering an additional crossing, I'm sure the RTA will also consider the feasibility of all options including widening the existing bridge. We are after the best possible outcomes for our members and the community.	15
A crossing location substantially northeast of the current location might have some benefit for southbound drivers on the Pacific Highway wishing to enter Grafton, but little benefit for drivers approaching from the Pacific Highway. A crossing location substantially north-east of the current location might have some benefit for southbound drivers on the Pacific Highway wishing to enter Grafton, but little benefit for drivers approaching from the Pacific Highway South. Such a location would need a cross-link to the Summerland Way, involving additional expenditure.	16
While we have not undertaken an origin/destination survey ourselves, we feel that it is likely that if a second bridge was constructed to the north-east of the current bridge, the current bridge would still attract most of the current flows with only a minor diversion to the new bridge.	
The second location issue we mentioned is traffic origins and destinations. Crossing location away from the current position is considered, the RTA would need to undertake an origin/destination survey of current users of the bridge. We would estimate that the vast majority of drivers using the current bridge have origins or destinations within Grafton township, with only a relatively minor number proceeding along the Summerland Way towards Casino. It is not as if the bridge formed part of the Pacific Highway, with substantial regional through traffic.	16
The choice of the location of where additional River crossing capacity is provided needs to take into account a number of issues, in particular location in context of major road Network, traffic origins and destinations, and local land use.	16
Question the No 1 location joining the business areas of Grafton and South Grafton. In 5, 10 or 20 years Grafton would want another bridge to bypass the town centres. The No 2 location in the vicinity of the existing bridge is the best site.	21

Other

If the second crossing were located downstream of Elizabeth Island but upstream of Maclean, the Authority would require a minimum clearance of 12 metres.	18
The underbridge clearance height and width of the navigational span of all bridges on the Clarence River are of considerable significance to the Authority as a clearance height that is too low may have a negative impact on local economy.	18
Recommended minimum navigational span width is 60m, or two spans at 35m each situated over the deepest part of the channel. It is recommended that spans outside of the navigation channel be a minimum of 12 metres.	
Recommended minimum clearance if the second crossing was located in the vicinity of the existing bridge is 9.1 metres. Alternatively an opening span could be provided.	

Representation No

Planning

Support for a second crossing of the Clarence River at Grafton with the main objective of relieving local traffic congestion and Council urges that the Study progress to the	17

development phase.

Supports the findings of the Feasibility Study Report. The RTA is requested to include in the Feasibility Report the structural adequacy of the existing bridge and an assessment of the 'do nothing' option. Also to finalise the Report as soon as possible. RTA be requested to proceed to the Development Phase for strategic locations 1, 2 and 3. 25

Development of Grafton has focused on the northern side of the bridge. Upon completion of the levee the development on the south side has been rapid. The South Grafton CBD is a prime area for retail development. As commercial functions return to the south side there will be a decrease in traffic crossing the river. 33

Property Issues

The Turf St to Ryan St crossing would cause very little inconvenience to existing landowners. Turf Street becomes Summerland Way north of Dobie Street although most heavy vehicles use Oliver Street to drive into the CBD of Grafton. 14

Utilities and Infrastructure

The Authority would require the installation of lights and reflectors on the bridge pylons, and possibly some navigation aids on the approaches, to ensure the safety of navigation; the maintenance of a safe navigation channel during construction; and appropriate lighting of the existing bridge during demolition, should that occur. 18

Other

Access

The problem with a new bridge is that it still means that all Summerland Way traffic and all Grafton - Lower Clarence traffic must travel through Grafton and South Grafton. 1

Planning

NPWS has expressed an interest in both islands within the Clarence River, which are currently managed by Crown Reserve Trusts. 5

As land below the high water level and the islands within the Clarence River are Crown Land the RTA would be required to acquire the land around any piers/supports within the river or on Elizabeth or Susan Islands under the Just Terms Compensation Act. 5

Most of the public comment in regards to a solution lies in discussion of the whereabouts of a second river crossing. This is' jumping the gun' as no attempt has been made to improve the current situation on the existing bridge. 14

We have undertaken various studies on the traffic and parking situation in Grafton and are currently preparing a report on the proposed extensions to Grafton Shoppingworld. While our practise is not based in Grafton, we have become familiar with the traffic conditions in the town through our studies. 16

Strategic Planning

Access

Diversion of the Summerland Way would provide direct access from the Summerland Way to the Lower Clarence growth areas and the Pacific Highway. 1

Representation No

Substantial funding is still required to complete upgrading work on the Summerland Way including works required at Wiangaree Bridge, the section of road form Burnett Creek to the Mt Lindsay Highway junction and intersections at Edenville Road, Collins Creek Road, Toonumbah Forest Road and Findon Creek Road. While the provision of a second crossing of the Clarence River at Grafton is supported, it is ranked at a lower priority than the ongoing maintenance and upgrading of the Summerland Way. 3

The Summerland Way (designated as a Road of National Importance) is promoted as an alternative route to the Pacific Highway and as an essential transport corridor for the ongoing development of the Upper Clarence and Richmond Valleys.	3
A second bridge crossing of the Clarence, combined with the current upgrading program for the Summerland Way, would obviously have an impact on traffic movements on the Summerland Way and through Casino which at this time would be deemed as beneficial.	4
Consider the travel routes between proposed bridge sites and strategic public infrastructure such as the new transit centre and Country Link railway station. Good forward planning to ensure separate pathways for walkers, joggers prams, cyclists, scooters etc. Due consideration should be given to these factors prior to making a decision.	22

Cyclists

Any second crossing should improve the existing improvised river crossing for cyclists and enhance security for pedestrians. Transport NSW has received representations about muggers preying upon pedestrians in mid-bridge.	10
It is expected, as part of RTA policy, that any new crossing of the river would include safe and accessible bicycle facilities.	13

Ecologically Sustainable Development

Attention is drawn to the EPBC Act 2000. If any species requiring consideration under this legislation may be affected by the proposal, for example migratory shorebirds	19
protected under international treaties, approval for the development may also be required from Environment Australia.	

Hydrological Impacts

Impacts on the agricultural lands on the floodplains around Grafton would be an issue.	9
Any study of crossing locations would also need to consider flooding issues and the locations of levee banks.	16

Industry and Agriculture

Consideration should be given to appropriate provision of any new farm infrastructure and access roads that may be required including access for agricultural machinery in the event of severance of a property.	9

Location

The second bridge should divert heavy vehicle traffic away from the existing bridge and the Grafton CBD, with the possible exception of buses.	14
The third location issue relates to the land use in Grafton. Grafton is split into South Grafton and Grafton itself, with the river being the barrier. The pattern of land use has followed from the current bridge location, with South Grafton fanning out below the bridge. Residents and businesses in South Grafton retain strong links with facilities in Grafton north of the river. Hence there is a strong demand for travel in about the location of the existing bridge. A second river crossing substantially further away would provide little benefit for travel between South Grafton and Grafton.	16

	Representation No
Should the RTA proceed with the construction of an additional crossing of the Clarence River, the location of that crossing is critical to maximising the benefits and usage of the facility and at the same time spend construction funds efficiently. On our assessment of the situation, and without the benefit of detailed survey results, it would appear that a crossing close to the current bridge would be most appropriate.	16

Other

Should the new bridge include a rail it would be required to accommodate double stack containers. This issue may require investigation of including rail in a new structure.	10
Being allowed to have input on any such development in the future would be appreciated.	13
With the sealing of the gravel section of road on the Armidale Road nearing completion and a new two lane bridge being constructed in Coramba on the Orara Way it is expected that there will be an increase in heavy vehicle traffic approaching Grafton from that direction. A roundabout at the intersection of Armidale Road and the Orara Way could be combined with a new road across to Rushforth Road. A new section of road could also be constructed from Rushforth Road to Ryan Street. This new section of road from Orara Way to Ryan Street would act as a link road would take a lot of traffic, especially heavy vehicle traffic, out of the Grafton traffic flow.	14
Of particular interest are areas of significance for native vegetation, with particular reference to the value of habitat for threatened species, population or ecological communities and their habitats, or regionally significant species and vegetation associations, including Rare or Threatened Australian Plants; areas of potential significance for native fauna with particular reference to the value of habitat for threatened species, populations or ecological communities, or regionally significant species; areas of archaeological potential and Aboriginal heritage values as identified by the Aboriginal community and sites registered on the NPWS Aboriginal Sites Register; and areas of NPWS estate.	19

Planning

It is expected that the scope of the feasibility study would conform to relevant components of the DUAP EIS Guideline - *Roads and Related Facilities* (September 1996). As a minimum the scope of the feasibility study should address Table 3 of the document *Matters to be Considered in Initial Site Assessment within Section 4 Route or Site selection procedures*.	6
Reference was made to the investigation of a city transport strategy by Grafton City Council, which addresses a range of transport issues including public transport, cycling and innovative ways to increase mobility while maximising efficient use of existing resources.	7
Specific Strategies relevant to the Grafton Bridge include: *Junction Hill* Future development of the Junction Hill village may dilute development pressures which impact upon the Grafton Bridge.	7
Specific strategies relevant to the Grafton Bridge include: *Grafton and South Grafton* Urban infill and limited peripheral development; Higher densities closer to Grafton and South Grafton CBDs; Good cycle and pedestrian access to Grafton and South Grafton CBDs; Sensitive revitalisation of the South Grafton CBD including provision of a quality supermarket to reduce pressure on the existing bridge; when Grafton's land supply is exhausted around 2005, villages at Clarenza and Junction Hill will provide settlement opportunities to the north and south of Grafton.	7
It was suggested that the Clarence Valley Settlement Strategy be considered in undertaking the feasibility study.	7

Representation No

Specific strategies relevant to the Grafton Bridge include: *Clarenza* A new village at Clarenza will aim for self reliance in local services rather than functioning as a dormitory suburb; Clarenza will be linked to Grafton by bicycle track, safe road access and by a public transport system which is responsive to the residents needs; Future development of Clarenza has the potential to increase local pressure on the Grafton Bridge and Bent Street however this could be alleviated by providing local services, good public transport, car pooling, safe cycle access and the promotion of	7

commercial and community services in the South Grafton CBD.

Any future additional crossing should consider the strategic intent and therefore the most strategic location of a second crossing. In addition, local flooding patterns may be a significant factor as to the location, cost and impacts of a second bridge. 9

Suggested Modifications

Suggested diversion of the Pacific Highway bypassing Ulmarra and South Grafton completely reducing north-south travelling times. Suggested Route by-pass from Tyndale - Cowper to Halfway Creek. 1

Suggested diversion of Summerland Way through Lawrence directly onto the Pacific Highway at Cowper via a bridge over the Clarence from Lower Southgate 1

Traffic Delays

The suggested diversions would provide greatly improved travel times for local and through traffic from Lawrence-Southgate to the Lower Clarence. 1

Traffic Volumes

While we have no traffic count data for the weekday commuter peak periods, as part of our assessment of the traffic implications of the proposed expansion of Shoppingworld, we have undertaken traffic counts during the retail peak times. Traffic counts undertaken on 19.02.99 in the period 11:00am to 2:00pm found peak flows at the intersection of Fitzroy and Villiers Street in the period 12:00pm - 1:00pm, when the northbound flow was 850 veh/hr and the southbound flow was just over 900veh/hr. For non-commuter peak periods these are substantial flows, suggesting that the need for additional bridge capacity could be justified over the whole day and not just for the peak periods. For reference, a one-way interrupted traffic flow of 900 veh/hr in one lane is equivalent to a level of service D. While traffic lanes on bridges have less side friction than in an urban area, it is still a high level of flow where any interference due to vehicles breaking down can have substantial implications. 16

3. Summary of Planning Documents Reviewed

The North Coast Regional Environmental Plan (REP)

The REP is mainly concerned with stating specific planning objectives and plan making by local government. The REP highlights that the provision of services such as transport networks are all necessary parts of urban and rural communities and are expensive to provide, therefore where possible, use should first be made of existing services. Proposed new services need to be carefully considered.

The Northern Rivers Regional Strategy Overview

This Overview recommends a vision for the future of the region. The Overview recommends a vision for the future of the region based upon a set of sustainability principles. Based upon those principles, the Overview suggests a schematic structure plan for how the Northern Rivers Region, including the Grafton and South Grafton area, may look in 2016.

The North Coast Urban Planning Strategy

This Strategy was developed in 1995 to provide a vision for the future settlement of the North Coast, including the Clarence Valley. The vision's objectives are to manage the expected population growth in the region efficiently and sustainably. The strategy adopted a settlement pattern based upon a hierarchy of centres within a sub-regional context, nominating sub-regional centres and major district centres. Grafton and South Grafton were nominated as a sub-regional centre.

Rural Settlement Guidelines

In 1995 the State Government adopted the Guidelines to provide a model by which rural residential living areas can be designed and located so as to integrate with the existing natural and cultural environment. Local Councils wishing to plan for rural residential development must do so in a manner consistent with the Guidelines.

The Clarence Valley Settlement Strategy

The Clarence Valley Settlement Strategy (DUAP, 1999) is a sub-regional planning project which forms part of the Northern Rivers Regional Strategy. The strategy was integral in contributing to identifying areas of potential future growth, so that constraints to an additional crossing of the Clarence could be identified.

The Clarence Valley landscape has a basic hierarchical pattern of cities, towns, villages and rural areas. The following settlement hierarchy is outlined in The Clarence Valley Settlement Strategy (DUAP 1999). The strategy outlines a hierarchy that builds on that pattern to maintain social and economic viability while preserving natural landscape values. The dot points under each sub-heading list the agreed outcomes to be achieved by implementation of the strategy. Adoption of the settlement strategy would have implications in terms of what road network infrastructure would be required in the future.

1. The sub-regional centre of Grafton and South Grafton:

- Grafton may reach a population of approximately 18,350 around 2016 (The Grafton Local Government Area contained 17395 residents based on June 2001 census of population and housing).
- Grafton will continue to function as a sub-regional centre, providing a focus for services to the Clarence Valley community and sub-regional educational, health, community and recreational services, and providing outreach services to smaller centres.
- Grafton will provide a primary focus for major commercial activity.
- Grafton will continue to be the sub-regional administrative centre for the State Government.

- Resident's access to services will be optimised by higher densities being encouraged closer to the CBDs.
- Grafton and South Grafton's character and heritage significance will be maintained.
- Grafton and South Grafton will be linked by improved public transport access to higher order services in other sub-regional centres.
- The town of South Grafton will aim to provide enhanced commercial / retail services to settlements south of the Clarence River as well as accommodating industrial development.
- Grafton and South Grafton will aim to provide good cycle and pedestrian access to CBDs.

Urban infill and minor peripheral extensions to Grafton's urban area have the potential to contribute to public transport viability, optimisation of access to services and utilisation of existing infrastructure. The strategy indicates that the planned revitalisation of the South Grafton CBD would reduce pressure on the bridge and provide a more efficient service to valley residents living south of the Clarence River. The population data in the Strategy indicates that, including Maclean Shire, the population south of the Clarence River in 1996 was 32432 and is predicted to reach 44,398 by 2016. In contrast, the population north of the Clarence River was 14123 in 1996 and is predicted to be 15892 by 2016.

Grafton City as the Clarence Valley's administrative centre provides essential community services to the sub-region, including schools, large shopping centres and hospitals. As the need for higher order services arises, residents of outlying areas are required to travel to Grafton. Accessibility to Grafton-based services for residents living outside Grafton is limited by a lack of public transport. Grafton is the focus of employment in the area. At least 30 organisations in Grafton employ 20 or more people.

The desired future character for South Grafton is outlined in the Strategy as being a reinvigorated town with the re-establishment of a strong commercial centre (including the provision of a relatively large supermarket), whilst providing a high level of residential and recreational amenity. The Strategy highlights that any further commercial development in South Grafton should only be in the area bounded by Ryan Street, Bent Street, Cowan Street and the Clarence River.

2. *The towns of Maclean and Yamba:*

- Maclean and Yamba may reach 2016 populations of 5000 and 6500 people respectively (The Maclean Local Government Area contained 17062 residents based on June 2001 census of population and housing).
- Yamba will continue to be an important residential and tourist centre and provide a river port capable of servicing maritime transport.
- Maclean will continue to act as a major district centre, helping to serve the lower Clarence community with secondary levels of sub-regional services.
- Maclean will continue to be the central town of Maclean Shire and maintain its strong physical and cultural identity.
- Residents' access to services will be optimised by higher densities being encouraged closer to the CBDs.
- The existing heritage values, access to open space and high quality landscaping will be maintained.
- Maclean and Yamba will aim to provide good cycle and pedestrian access to CBDs.

3. *Villages comprising expansion of the existing village of Junction Hill, a new village at Clarenza, and village-type development incorporated into existing rural residential settlement at Waterview Heights:*

- All of the above villages will be located within 10 kilometres of Grafton.
- All will each support populations of between 1200 and 2000 by 2016.
- Waterview heights will have an identified population capacity based on the utilisation of existing zoned land.

- Junction Hill and Clarenza may be suitable for long term growth beyond 2016.
- All will aim for a strong identity and self-reliance in terms of local services.
- Junction Hill will accommodate significant industrial development.
- All will aim to provide for local shops, community open space and a community building clustered in a central area, with new development located and designed for good pedestrian access to the central area.
- All will be linked to Grafton by bicycle track, safe road access and a public transport system.
- All will be provided with reticulated water and sewerage.
- All will aim to provide local services and community identity to rural residential and rural catchments.
- All will provide for a range of housing types, including centralised higher density housing.

The Strategy identifies that the major outlying areas for future expansion are Junction Hill and Clarenza. These are discussed in more detail below:

Junction Hill: The objective for Junction Hill is to consolidate the existing zoned area into a self-reliant village. Junction Hill has the potential to function as a major village, providing the benefits of local services to its residents while maintaining access to Grafton for higher order services. Junction Hill has a large supply of available land that can be released in stages to take up extra demand. In terms of road infrastructure, the route of the Summerland Way currently dissects Junction Hill and is important to the future amenity of the village. Minor light and commercial industrial opportunities catering for local needs are encouraged. Future rural residential development is proposed to be focussed in defined enclaves with a clear physical, social and servicing link to Junction Hill. A large quarry area is located to the north of the village between Coaldale Road and the Summerland Way, with the Summerland Way being the haulage route. As part of a 50 year plan, Copmanhurst Shire Council intends to expand Junction Hill to the north

Clarenza: The Strategy notes that the position of this village in the 2016 settlement hierarchy is subject to transport and access implications. The Strategy notes that 500 dwellings would generate approximately 4495 vehicle trips per day, and that this would be concentrated on the Pacific Highway from Duncans Lane. Reliance on the Highway for access to Clarenza would have implications for the safety and efficiency of the Highway. The Strategy identifies that the development of Clarenza, and other areas south of the Clarence River, would increase local pressure on the bridge and Bent Street and notes that 95% of traffic using the bridge is local, rather than associated with the Summerland Way. The Strategy notes that the 94ha area west of Centenary Drive has a potential to house approximately 1500 people, with current growth rates indicating that this would be utilised by 2012. After that time, an area east of Centenary Drive, to accommodate up to 900 people would be required as a stage to 2016. The Strategy states that Grafton City Council intends to implement measures to protect future residential potential.

4. *Small river villages at Copmanhurst, Coutts Crossing, Glenreagh, Ulmarra, Lawrence, Baryulgil, Nymboida, Jackadgery, Dundurrabin, Tyringham, Hernani, Swan Creek, Eatonville, Tucabia, Cowper, Chatsworth Island, Ilarwill, Asby, Harwood and Woombah:*

- All will have populations of between 130 and 730 by 2016.
- All will provide local services and community identity.
- All will be unlikely to attract major new services.
- All will aim to enhance community facilities to increase self-reliance and reduce the need to travel.
- All will support populations large enough to maintain existing services and be able to grow to an upper population limit based upon potential impacts of expansion.
- All will seek opportunities for public transport options.

- All will be likely to continue to have a rural focus.
- All will aim to minimise access to existing community infrastructure by locating and orienting new development close to the existing central village area.
- All will aim to preserve special village character.
- All will aim to fulfill any potential for low key tourism.

5. *Closer rural settlement areas near Coutts Crossing, Copmanhurst, Junction Hill, Nymboida, Glenreagh, Ashby, Woombah, Gulmarrad and Waterview Heights:*

- All will build on existing rural residential cluster areas, but will exclude environmentally and culturally sensitive areas.
- All will contribute to catchment management.
- All will encourage subdivision designs that provide elements of rural lifestyle.
- All will be separated from rural land uses.
- All will be closely linked by physical, servicing and social catchment to a village or town which provides community services.
- All will link into existing local or sub-regional services without pressure, or provide for self-reliance.
- All will establish services to suit the location and scale of development.
- All will aim for effective environmental, social and cultural management.
- All will provide the option of Community Titles subdivisions.
- All will encourage energy and water conservation.
- All will be located where the cost and impact of infrastructure can be minimised.
- None will encroach on land identified for future urban development.
- All will protect the safety and efficiency of arterial roads.
- All will reduce bushfire risks.
- All will be able to grow towards identified population capacities.
- All will aim to provide for demand for various lot sizes / styles.
- All will aim to identify and enhance distinctive rural character.

6. *Dispersed residential settlement at Halfway Creek, Kungala, Lanitza, Whiporie, Ewingar, Seelands, Coaldale, Braunstone, Blaxlands Flat Kangaroo Creek and Pillar Valley and other dispersed agricultural populations:*

- All will generally not be further encouraged for residential settlement.
- All will comprise scattered existing populations.
- All will rely on distant villages for local services.
- All will be related to purposeful agricultural production or responsible land management.

Appendix B
Traffic Analysis Data

1. Detailed Traffic Analysis Strategy.

The assessment of strategic locations has been carried out by distributing traffic across the different road networks. A spreadsheet traffic model of the locality was developed to assist in the calculations. The model takes account of factors such as safety performance, travel times, road user costs and ferry replacement. The difference in cost per trip between the existing traffic conditions and the new arrangement for each option was calculated. Traffic growth was considered over the 35 year analysis period.

The outputs from the model provide data that are used in benefit cost analysis. The analysis contained in this study essentially provides a ratio of benefits over costs. The analysis process and summary of results are discussed in detail in this report.

This traffic study has been prepared using the considerable existing traffic data collected over many years. This includes background data available from Grafton City Council, RTA Northern Regional Office relating to the bridge, traffic survey information, consultant reports and traffic studies within the local area for major developments.

Additional intersection traffic counts and vehicle occupancy surveys were conducted to update existing data. Travel time surveys were carried out during various traffic periods to gain a measure of all traffic conditions for use in the traffic model. A traffic model has been formulated using the Microsoft Excel spreadsheet program. It is a strategic assessment that quantifies the differences in traffic performance between the existing bridge and the strategic locations.

The model is essentially constructed in the following way. Daily traffic counts based on 15 minute intervals were used to determine traffic periods for a typical day. Four periods were established Peak, Business, Offpeak and Night. Travel times were measured and a speed / flow algorithm calculated for the existing bridge and approaches. The speed / flow algorithm was applied to the various bridge options considered. In addition, it provided a basis for assessing peak flow capacity, which means that peak traffic periods will become longer to provide for future increases in traffic.

Growth in traffic has been calculated on the conservative basis of 1% linear. Intersection traffic counts were used to determine traffic patterns and general origin and destinations. The intersections on the Gwydir Highway at Pacific Highway and at Bent Street and intersection along Bent Street provided a reasonably reliable pattern of arrivals especially in the morning peak hour.

The Grafton area was divided into zones and a central point identified in each. It was assumed that all traffic travelling between zones passed through these central points. From the above mentioned intersection counts the percentage of total traffic flow entering Grafton was identified. These percentages were further divided and apportioned to various zones.

Changes in traffic conditions were calculated for each 5 year period up to 35 years. Costs (from RTA Economic Analysis Manual, year 2002 costs) were applied to these traffic conditions and aggregated over a 35 year time period. The costs include travel time and road user costs (fuel, wear and tear etc). Accident costs were added separately.

An economic analysis was carried out on the outputs from the traffic model. Both construction costs and accrued benefits were discounted back to current day dollars to provide a benefit cost ratio. These factors were examined using various discount rates for sensitivity purposes.

Accidents for the period 1997 to 2001 inclusive were plotted onto a map of the locality and analysed to determine trends. Accident savings were predicted for each bridge option examined. These savings were included in the benefit cost analysis.
The downstream options at Ulmarra and Lawrence involved replacement of existing car ferries. The savings in operation costs and savings in travel times for long distance users (to Grafton) were included in the economic analysis.

2. Detailed Origin Predictions

The following table shows the volume of traffic using the Grafton bridge originating from distinct areas over 5 year periods from 2001 to 2031.

Table 1

	ORIGIN AND DESTINATION							
Originating From:	Variation of source with time							
	2001	2006	2011	2016	2021	2026	2031	2036
Cowper	15.0%	15.5%	16.0%	16.0%	16.0%	16.0%	16.0%	16.0%
Clarenza	5.0%	6.5%	8.0%	10.0%	12.0%	13.0%	14.0%	15.0%
Pac Hwy South	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
South Grafton	50.0%	48.5%	47.0%	45.5%	44.0%	43.5%	43.0%	42.5%
Gwydir Highway	15.0%	14.5%	14.0%	13.5%	13.0%	12.5%	12.0%	11.5%
Through	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Volumes								
Cowper	3651	3965	4285	4477	4675	4870	5062	5254
Clarenza	1217	1663	2143	2798	3506	3957	4430	4926
Pac Hwy South	2434	2558	2678	2798	2922	3044	3164	3284
South Grafton	12170	12406	12588	12731	12857	13241	13605	13957
Gwydir Highway	3651	3709	3750	3777	3799	3805	3797	3777
Through	1217	1279	1339	1399	1461	1522	1582	1642
Daily traffic (1% growth)	24340	25580	26784	27980	29220	30440	31640	32840
Originating From:								
CBD	75%	75%	75%	75%	75%	75%	75%	75%
Grafton East	10%	10%	10%	10%	10%	10%	10%	10%
Grafton West	15%	15%	15%	15%	15%	15%	15%	15%

3. Traffic Redirection to Strategic Locations

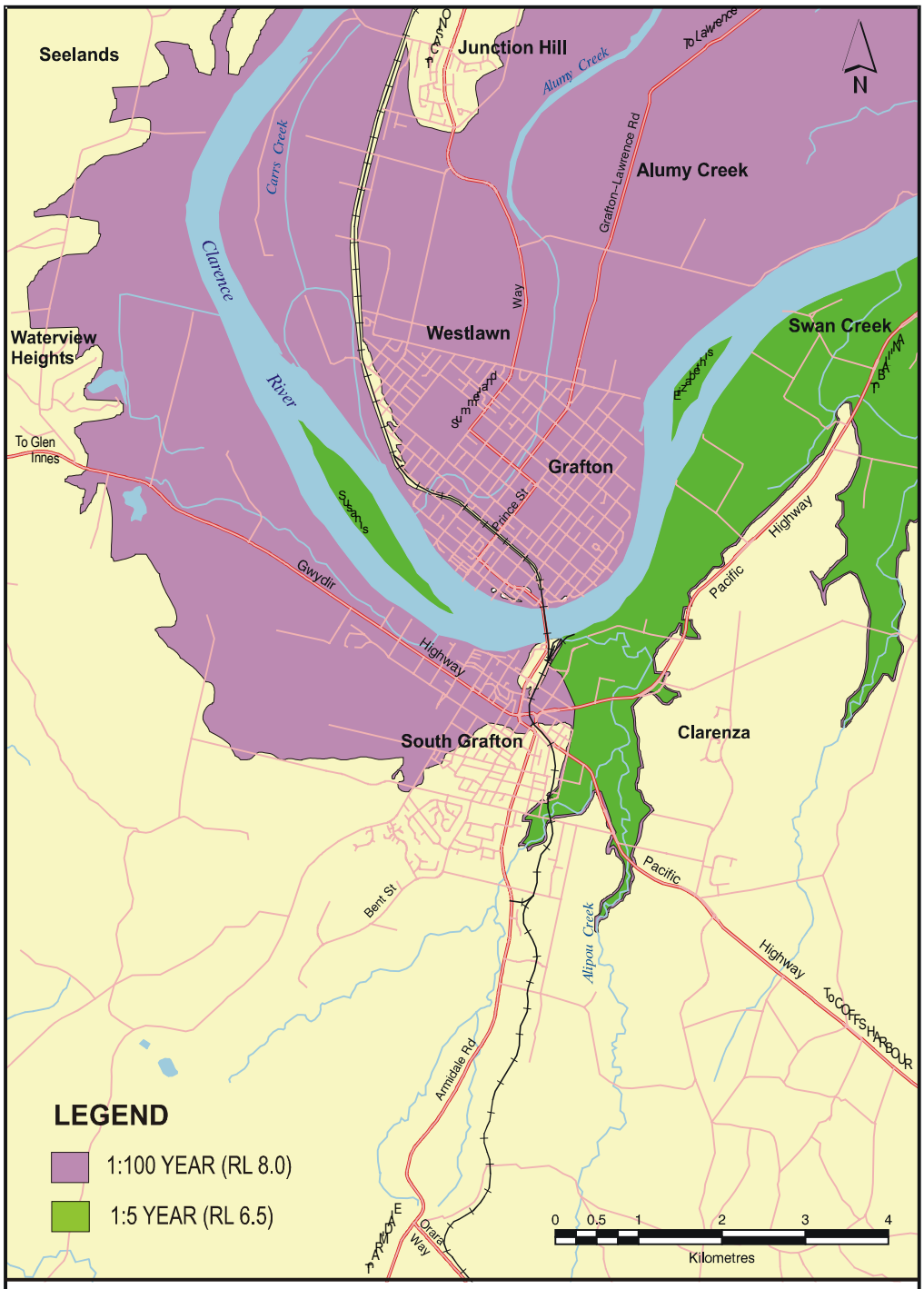
The following table shows traffic volumes that would be directed to the existing and each strategic location for the year 2006 and for the year 2036. The existing bridge currently carries 24,340.

Table 2

		Peak Hour Volume		Daily Volume	
Year 2006		Existing Bridge	New Bridge	Existing Bridge	New Bridge
Option	Existing	2300		25600	
1	Upstream of Existing Bridge	1646	654	18300	7500
2	At Existing Bridge	1150	1150	12800	12800
3	Downstream of Existing Bridge	1613	687	18500	7100
4	Ulmarra	2121	179	23600	1900
5	Cowper	2175	125	24190	1390
6	Lawrence	2247	53	24990	590

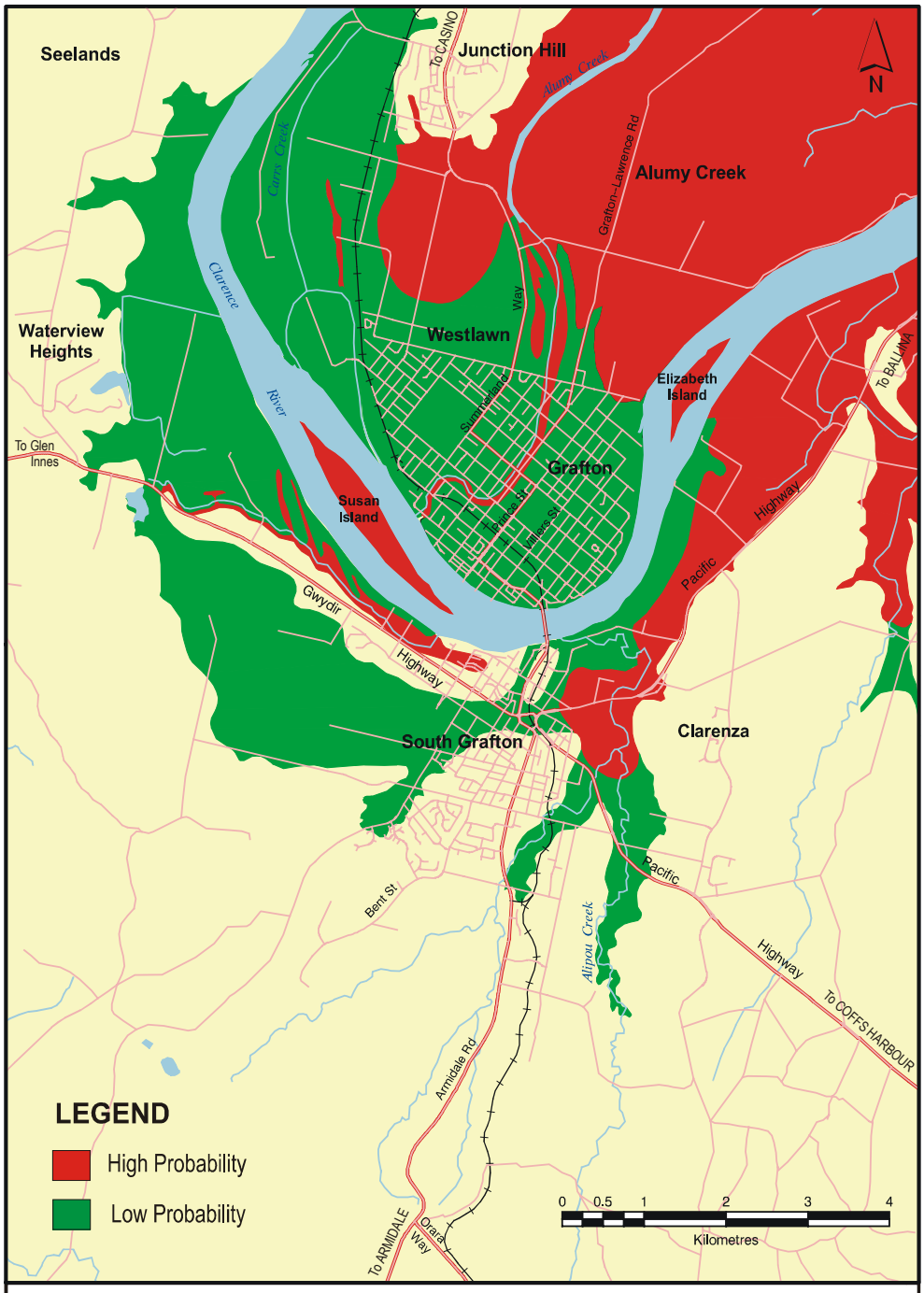
Year 2036	Existing	2400		32840	
1	Upstream of Existing Bridge	1771	629	24235	8605
2	At Existing Bridge	1200	1200	16420	16420
3	Downstream of Existing Bridge	1507	893	22000	10840
4	Ulmarra	2208	192	30213	2627
5	Cowper	2266	134	31006	1834
6	Lawrence	2342	58	32046	794

Appendix C
Constraints Map



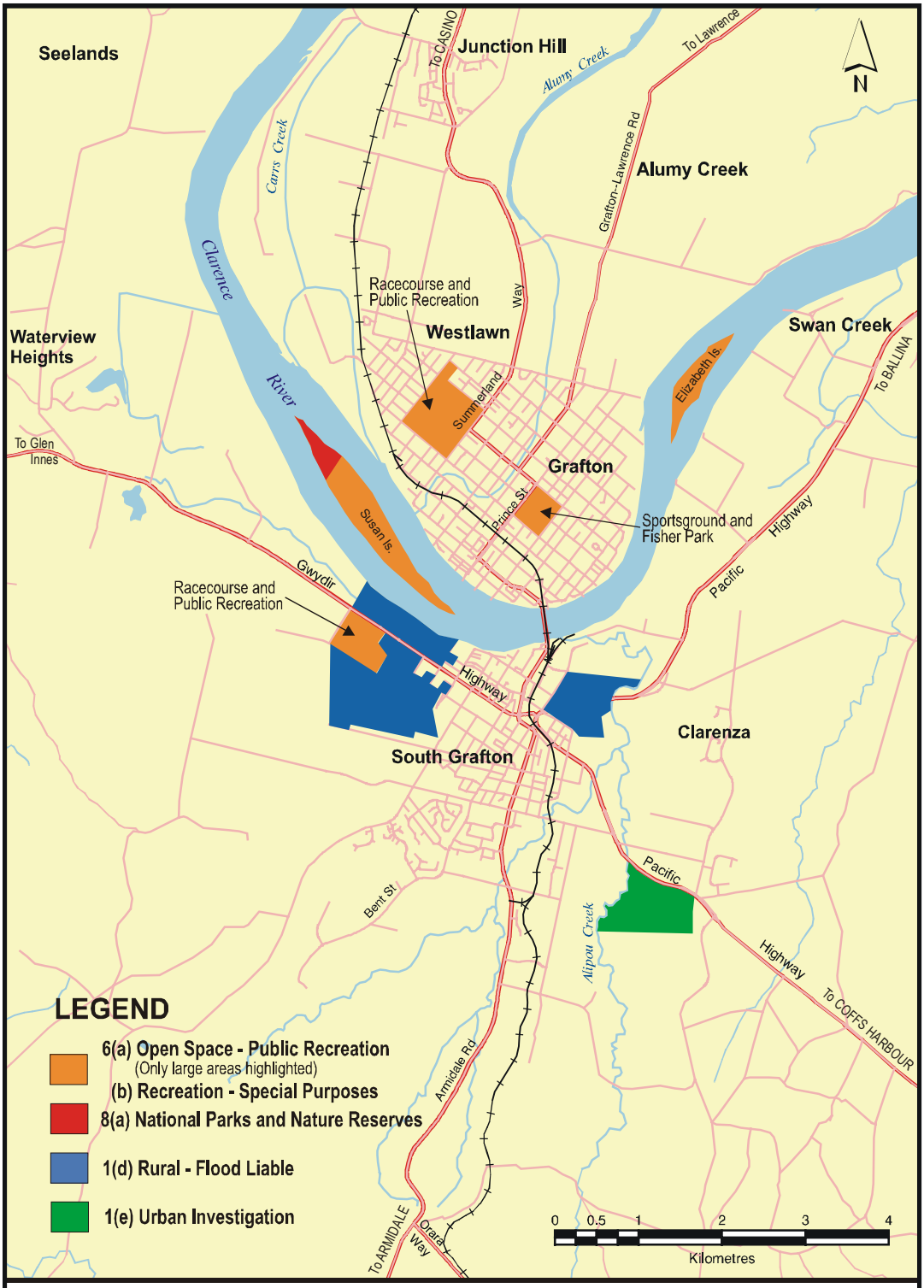
ADDITIONAL CROSSING OF CLARENCE RIVER - FEASIBILITY STUDY

FLOODING IMPACTS



ADDITIONAL CROSSING OF CLARENCE RIVER - FEASIBILITY STUDY

ACID SULPHATE SOILS



ADDITIONAL CROSSING OF CLARENCE RIVER - FEASIBILITY STUDY

ENVIRONMENTAL CONSTRAINTS