



Additional crossing of the Clarence River, Grafton – Route Options Development Report: peer review of traffic and the strategic models, and best practice community consultation

Never Stand Still



INSTITUTE OF
ENVIRONMENTAL
STUDIES

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For:
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Services**

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APPENDIX I: Proposal for Additional Bridge Crossing of the Clarence River at Grafton - Peer Review of Traffic and Transport and Best Practice Community Consultation

APPENDIX II: Extracts of comments from the 16 pages report and supporting evidence provided by Ms L. Cairns of the Grafton Concerned Citizens Group in October 2012; “Consultation process – second bridge and new freight route for Grafton”

Executive Summary

The New South Wales Roads and Maritime Services (RMS) was formed in 2010 with responsibilities for some of the core functions of the previous Roads and Traffic Authority (RTA). A challenge for the new authority in the area of transport planning is the continuous improvement in its community engagement program, especially given the contemporary context of increasing use of social media, the opportunities offered by developments in information technologies and the widespread uptake in Australia of access to the internet. To this end, in September, 2012, the New South Wales Roads and Maritime Services (RMS) provided a research grant to the Institute of Environmental Studies, UNSW, to report on methodologies for world's best practice in community consultation and engagement, and to apply the principles to a case study.

The research design includes extensive literature review of Australian and world best practices of stakeholder participation, review of the RMS Community Involvement and Communications Resource Manual for Staff, review of project documents for the case study available at the dedicated project website (e.g. community liaison plan; postal and telephonic surveys, community updating, etc); listening to community concerns at workshops; and reading informal and formal submissions.

International and national best practice of community engagement stresses on the need to replace the 'tool-kit' approach to participation (e.g. IAP2's toolbox, etc) that emphasises selection of relevant tools (e.g. focus group, forum, surveys, etc) with an approach that views community participation as a process. Eight criteria of best practice for community engagement are identified as follows:

1. Stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning
2. Where relevant, stakeholder participation should be considered as early as possible and throughout the process
3. Relevant stakeholders need to be analysed and represented systematically
4. Clear objectives for the participatory process need to be agreed among stakeholders at the outset
5. Methods should be selected and tailored to the decision making context, considering the objectives, type of participants and appropriate level of engagement
6. Highly skilled facilitation is essential
7. Local and scientific knowledge should be integrated
8. Participation needs to be institutionalised.

The case study of an additional bridge crossing of the Clarence River at Grafton shows that the project team approach to community involvement and communication fulfilled the RMS policy, in regards to information gathering, consultation, community involvement and partnering with the public in the development of alternatives and the identification of the preferred solution. Furthermore, the research results show that most community involvement outcomes sought by the RMS policy have been achieved in the case study. Additional participatory techniques for improved consultation and collaboration (e.g. participatory mapping, scenario analysis) may be considered by RMS in the future to foster co-decisions - that is, the cooperation with stakeholders towards an agreement for solution and implementation of the preferred option. Consultation techniques are project and scale specific and therefore the RMS needs to allocate appropriate amount of resources to each individual project.

1. Introduction

The New South Wales Roads and Maritime Services (RMS) was formed in 2010 with responsibilities for some of the core functions of the previous Roads and Traffic Authority (RTA). A challenge for the new authority in the area of transport planning is the continuous improvement in its community engagement program, especially given the contemporary context of increasing use of social media and the opportunities offered by developments in information technologies and the widespread uptake in Australia of access to the internet. In September, 2012, the New South Wales Roads and Maritime Services (RMS) provided a research grant to the Institute of Environmental Studies, UNSW, to report on methodologies for world's best practice in community consultation and engagement. Our broad research interest is to establish the sustainable development of infrastructure and social inclusion. By independently and critically assessing this Grafton community engagement program against world's best practice, we aim to identify organisational improvements necessary, if any, and to recommend any capacity building programs for RMS, if so required.

Part of this research included a case study in community consultation by RMS on one of its road planning projects - a proposal for an additional road bridge crossing of the Clarence River at Grafton, New South Wales. Although there has been a long history of ideas for an additional river crossing, and several earlier investigations, our case study of the processes of community engagement starts at the point where RMS has narrowed down options from an extensive list to six routes proposed for an additional bridge crossing of the Clarence River at Grafton. The earlier history of community consultations on a bridge crossing are beyond the scope of this research. Our case study finishes at the Value Management Workshop (23 and 24 October, 2012) held in Grafton when a preferred route was recommended for further, detailed, technical investigation. Throughout this process some representatives of the community have raised concerns about the traffic studies undertaken by RMS and its consultants so an Appendix to this report considers traffic issues in more detail.

2. Methodology

The Main Road 83 Summerland Way additional Crossing of the Clarence River at Grafton: route options development plan sets out to 'involve all stakeholders and consider their interests' as one of the project objectives, with the specific objective of 'integrating input from the community into the development of the project through the implementation of a comprehensive programme of community consultation and participation'. This allowed us to include a detailed case study of community participation in our research project.

The research design includes extensive literature review of Australian and world best practices of stakeholder participation, review of the RMS Community Involvement and Communications Resource Manual for Staff, review of project documents available at the dedicated project website (e.g. community liaison plan; postal and telephonic surveys, community updates, etc)¹. The case study was further informed by:

- Listening to community concerns as arose in two community forums (18 September and 9 October, 2012);

¹ http://www.rta.nsw.gov.au/roadprojects/projects/north_eastern_region/grafton_bridge/index.html

- Attending the local radio station on 10 October, 2012 when a morning program (9 – 10am) was devoted to the additional crossing of the Clarence River at Grafton and speaking on this program (which also invited listener phone-in questions to the panel);
- Reading the formal submissions by the community on the six route options (117 submissions plus a few annexes) that identified specific issues raised on the RMS traffic studies;
- Reading of an informal submission to the consultants by the Grafton Concerned Citizens Group.
- Interviewing community members, and
- Participating (as observers only) at the Value Management Workshop.

Furthermore, part of this research includes an independent peer review (see Annex I) of the published reports on traffic assessment of the route options for an additional crossing of the Clarence River at Grafton (also available on the RMS project website). The peer review was commissioned by Senior Management of RMS to ensure that the traffic assessment undertaken for the project is thorough and robust and is suitable for the specific purpose of informing stakeholders on the selection of the preferred route from among the six options presented. A resource paper summarising the outcomes of the peer review was prepared (see Appendix I) for the Value Management Workshop (23-24 October 2012). In its preparation, it was informed by discussions with the transport consultants engaged by the RMS - Arup Consultants and GTA Consultants – and the Pre-sales Consultant of the Quadstone Paramics Software that has been applied in the traffic studies. The peer review report was made available to participants at the Value Management Workshop on 23 and 24 October 2012, to form an opinion on whether the traffic studies undertaken so far are adequate for the purpose of assessing the advantages and disadvantages of each alternative route options.

In outlining our methodology it is important to clarify the scope of this peer review of traffic. The focus is on the practical methods of the traffic studies, and whether the work undertaken by the consultants to RMS is adequate for the purposes of providing adequate information to decision makers on each of the six route options. The Appendix does not make any recommendations on the preferred route. Furthermore, the Appendix does not form a view on the detailed traffic management devices (for example, intersection control with either roundabouts and traffic signals) associated with each option (the reviewers have established independently that the traffic consultants have the local knowledge of local traffic conditions to have formulated the necessary package of traffic management schemes to support each route option.) It is important for any members of the community who may read this report to note that once a preferred route has been identified then it is standard transport planning practice for further, more detailed, investigations to be undertaken by RMS and these will probably include additional traffic studies, traffic forecasts and a recommendations on preferred traffic management devices and detailed engineering plans for alignment of the bridge crossing.

3. Results

The findings from analysing the community involvement process for the 'Additional crossing of the Clarence River at Grafton' project, using the methodology described in the previous section, are summarised hereafter.

3.1 Assessing project community engagement against the RMS Community Involvement and Communications Resource Manual for Staff.

The goal and objectives set for the 'Additional crossing of the Clarence River at Grafton' are in agreement the RMS policy statement on community involvement and communications. Specific actions and tools adopted by the project consultants and the RMS to address the objectives are:

- a) Development of a community liaison plan, summarising its purpose, key stages in the consultation process, including identification of key stakeholders and likely critical issues, and a summary of communication activities and tools for data gathering (p. 15 Community Liaison plan); and
- b) Development of a dedicated website with easy access to latest documents, surveys and video of community consultations; a video of the traffic simulations on each of the six route options, graphic visual display of route options, and outcomes of community discussion evenings, evaluation workshops, staffed and static displays, outputs of community surveys and community update brochures.

The RMS Community Involvement policy points to "*Ensuring that the outcomes of community and stakeholder involvement are integrated into decisions that may impact on communities and other stakeholders*" (Management responsibilities, RMS Community involvement policy). Most community involvement outcomes sought by the RMS policy have been achieved (see Table 1). Activities listed under the community involvement section of the dedicated project website², and Appendix B of the Community Liaison Plan, plus the consultants' interviews with different stakeholders and community participants show that techniques and activities were mostly focused on 'information giving', information seeking, information sharing and in voicing preferences for a route option; and to a lesser extent in participatory decision making.

Table 1: Expected outcomes from community involvement processes as defined in the RMS Community Involvement and Communications Resource Manual for Staff.

| Outcome | Evidence from tools and activities of the Main Road 83 Summerland Way additional Crossing of the Clarence River at Grafton |
|------------|---|
| Efficiency | Strong evidence of information sharing, consultation and involvement in developing solutions that consider community expectations; evidence is needed at forthcoming meetings to show how issues raised by the community have been addressed; if they have not been addressed, why |

²

http://www.rta.nsw.gov.au/roadprojects/projects/north_eastern_region/grafton_bridge/community_involvement.html

| | |
|-------------------------|--|
| | not. |
| Equity | <p>Range of tools was available to ensure involvement of the community at all levels (including minority groups)³. The <u>final report needs to clearly state</u> how different views expressed by the community were taken into consideration in the decision making, to circumvent potential comments on the use of 'black box' approaches to decision making, and prevent perceptions of lack of transparency in the processes applied for selecting a preferred option (see Appendix II for a list of comments by community members in this regard).</p> <p>RMS may consider improving equity in the future by ensuring that Value management workshop type of activities ensure a gender and youth quota, when number of participants is limited; for instance the VM workshop October 23-24 2012 lacked youth representation and gender balance from stakeholders and community participants.</p> |
| Accountability | <p>The forthcoming report on 'issues raised in community submissions' needs to reflect how differences of opinion were managed; this is not evident in Chapter 3 of the report.</p> <p>RMS may consider providing open and regular updates to stakeholders through other media than its dedicated project website; including changes in pre-established timeframes. One concern expressed by some citizens of Grafton was the irregular frequency of public forums and meetings, the lack of information on extension dates granted to submissions, the inability to respect established timeframes, and the inability to respond to questions raised by citizens within the time periods pre-established by RMS (see Appendix II).</p> |
| Effective Participation | <p>Several community actions were set for citizens to contribute in an informed way and to raise concerns on route options. The report could be clearer in showing 'how' the community advice influenced the final decision⁴.</p> |
| Diverse representation | <p>The Project Team made a clear identification of those with a 'stake' in this project; meetings with key and individual stakeholders (see. Pg 15 Community liaison plan).</p> |
| Cost-effectiveness | <p>The combination of postal, telephone, face to face meetings, website development and displays appears as cost-effective. RMS may consider alternative ways of public engagement with the youth, through the use of social media (facebook, sms, twitter).</p> <p>It is important consultants and/or RMS staff engaged in the preparation of community surveys follow the guidelines established in the RMS</p> |

³ www.rta.nsw.gov.au/roadprojects/projects/north_eastern_region/.../community_involvement.html

⁴ The IAP2 spectrum of public participation identifies increasing levels of public participation and impact ranging from passive involvement (information sharing) to active engagement (consultation, involvement and 'partnering with the public'....including the development of alternatives and the identification of the preferred solution'.

| | |
|--|---|
| | <p>Community Involvement and Communications Resource Manual for Staff. For instance, the postal survey of the Grafton project provided open questions, when the Manual (pp.45) advises '<i>It is best to use closed-ended questions. Avoid double-barrelled questions (where only one answer is requested for a combination of questions), and questions that respondents cannot answer accurately</i>'.</p> <p>The consultation process for the selection of a preferred project output option (e.g. route) should not drag over time, to avoid consultation fatigue and increasing project costs.</p> |
|--|---|

3.2 Criteria for best practice of community engagement

A well-informed public can contribute meaningful input to transport infrastructure decisions through a broad array of involvement opportunities at all stages of decisionmaking (US Department of Transportation, 2007). In a review of over 158 papers, Reed (2008) highlights that by taking local interests and concerns into account at an early stage of project development, it may be possible to inform project design with a variety of ideas and perspectives, and in this way increase the likelihood that local needs and priorities are successfully met. Nevertheless, he warns that consultation fatigue may develop as stakeholders are increasingly asked to take part in participatory processes that are not always well run. Furthermore, in some instances, participants perceive that their involvement gains them little reward, or capacity to influence decisions that affect them. Follow-through to demonstrate that decision-makers seriously considered public input during the process is therefore seen as an indicator of effective public involvement (US Department of Transportation, 2007).

Reid (2008) further states that the quality of a decision is strongly dependant on the quality of the process that leads to it, and establishes 8 criteria of best practice for community engagement pursuing enhanced quality of the final decisions. The paper warns on the need to replace the 'tool-kit' approach to participation (e.g. IAP2's toolbox, etc) that emphasises selection of relevant tools (e.g. focus group, forum, surveys, etc) with an approach that views community participation as a process.

Criteria identified in Reed (2008), and in similar studies cited in the Bibliography at the end of this report, are briefly described hereafter, and the Grafton process of community involvement is assessed against these criteria in Table 2.

Criteria #1: Stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning.

This means:

- i. Ensuring that participants: a) have the power to really influence decision; and b) have the technical capability to engage effectively in the process. The former requires that limitations in negotiations within the process need to be identified and flagged early in the participatory process to avoid frustrations and potential conflict; the latter may require *education and assistance techniques*, which result

in an accurate full public understanding of transport issues⁵ for a meaningful engagement in decision making.

- ii. Addressing power inequalities within groups, and other differences such as age, gender, and background. Mutual respect needs to exist between stakeholders and facilitators, as well as recognition of the stakeholders' voluntary time contribution to the process.
- iii. Guiding philosophy emphasising that participation is a two-way learning between participants. This includes learning between participants who may have very different knowledge and perspectives, and between stakeholders and Agency representatives (e.g researchers, consultants).

Criteria #2: where relevant, stakeholder participation should be considered as early as possible and throughout the process.

Participation should be considered right from the outset (concept development and planning), through implementation, to monitoring and evaluation of outcomes. Usually, stakeholders get involved in decision making at the implementation phase of the project cycle, and lesser in earlier project identification and preparation phases.

Criteria #3: relevant stakeholders need to be analysed and represented systematically

- a) Stakeholder analysis is needed to represent those relevant to the decision-making process (ie. What aspects of a social and natural system will be affected by a decision?, who (individuals or groups) are affected?)
- b) Appropriate techniques of stakeholder analysis (relevance of stakeholder, relationships between stakeholders) need to be applied to identify and characterise stakeholders.

Criteria #4: clear objectives for the participatory process need to be agreed among stakeholders at the outset.

- a) Clearly defined purpose and objectives for initiating a public dialogue on transport issues, including a definition of goals towards which the group will be working;
- b) Rather than seeking consensus, participatory processes should adopt the 'shared adversity principle', ie. Trade-offs are inherent to the decision making. If project goals are developed through dialogue, with trade-offs between participants where necessary, the outcomes are more likely to be more relevant to stakeholders needs and priorities, motivating their ongoing, active, engagement;
- c) Clear objectives determine the appropriate level of engagement⁶, who should be engaged, and how best to engage them⁷.

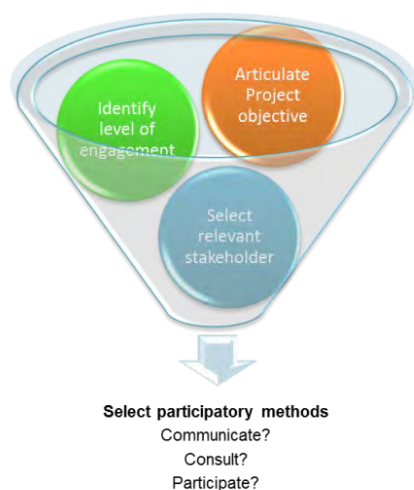
⁵ Eg. RMS could bring 'expert witnesses' to public forum to present different arguments, so that citizens and stakeholders involved in the final selection of preferences have a clear understanding of technical issues (e.g. noise level, pollution measures, what does it mean?); bring experts in specific areas that can explain and interpret in layman language the meaning of technical data collected as part of the process.

- d) Notification procedures that effectively target affected groups.

Criteria #5: Methods should be selected and tailored to the decision-making context, considering the objectives, type of participants and appropriate level of engagement.

The level of engagement pursued is a major factor determining the methods that are likely to be most relevant (Figure 1).

A wide range of methods can be used to communicate (e.g. information dissemination via leaflets, fact sheets, mass media, hotline, static displays, public meetings), consult (e.g. consultation documents, opinion polls and referendums, focus groups and surveys) or participate (e.g. citizen's jury, consensus conferences, task-forces and public meetings with voting, e-participation⁸) with stakeholders.



Methods need also be adapted to the decision-making context, including socio-cultural and environmental factors. Furthermore, participatory methods may change depending on whether the objective is to engage in the process or to evaluate outcomes (e.g. preferred route options).

Criteria #6: Highly skilled facilitation is essential

The outcome of a participatory process is far more sensitive to the manner in which it is conducted than the tools that are used. A successful facilitator needs to be perceived as impartial, open to multiple perspectives, and approachable. They need to be capable of maintaining group dynamics, handling dominating or offensive individuals, re-evaluate entrenched positions.

Criteria #7: Local and scientific knowledge should be integrated

Scientific information and analysis is essential in participatory processes. However, it needs to be balanced to avoid biased decisions. Tapping local knowledge (e.g. for instance, through participatory approaches) more complete information can lead to more robust solutions to transport problems. Scientific knowledge is explicit, systematised, decontextualized and widely transferable (e.g. 'know-why'), which is in contrast to the "know-how" of local knowledge.

⁶ This is important in the context of the policy statement of RMS. Do we inform, consult and involve the community to ensure concerns are reflected in the alternatives developed? Or do we 'partner' with stakeholders to incorporate advice and recommendations in the decision-making process.

⁷ This is relevant for sectors of the society, such as the youth, which require different types of engagement, as compared to mature-age citizens.

⁸ Use of Mobile Technology for Citizen E-Participation, including wireless voting pads.

Criteria #8: Participation needs to be institutionalised.


The long-term success of participatory approaches may depend on institutionally embedding stakeholders' participation. Many of the limitations experienced in participatory processes have their roots in the organisational cultures of those who sponsor or participate in them. For instance, although non-negotiable positions are also the result of regulatory constraints, they may simply be the result of pre-determined positions decided at higher levels within the organisation prior to the participation in the process, that participants do not feel able to negotiate (Reed, 2008).

Issues identified as working against effective participation include:




- a) Lack of information and appropriate induction into the project, and expectations from citizens' participation;
- b) One-way communication process (information running only from proponents to citizens);
- c) In many cases, participative processes do not go beyond consultation (e.g. missing the actual community involvement as partners in decision making).
- d) Individuals and communities tend to become engaged only if the issue affects them directly ("not in my backyard", or the "Locally Unwanted Land Use" effects); the effects of space, place, locality and proximity are therefore key factors in determining public interest in decision-making problems.





Hereafter we compare the community involvement *process* of the 'Additional crossing of the Clarence river at Grafton' against international best practices of community involvement (Table 2); the community involvement *procedures* established as part of the 'additional crossing of the Clarence river at Grafton' are matched against the eight criteria of best practice for community engagement identified in the international literature.

Table 2: Grafton process assessed against criteria of best practice of community involvement.

| Criteria | Achievement | Observations |
|--|---|--|
| #1: Empowerment, equity, trust and learning | Frequent  | <p>Open call for nomination of representatives of different route alternatives for the VM workshop; system of equal representation of stakeholder groups established. Information made available through website, clearly labelled, easy access and navigation; RMS staff available in consultations.</p> <p>Similar <i>processes</i> in the future could be improved by:</p> <ul style="list-style-type: none"> • pre-determining quota to ensure youth and gender representation in the consultation processes; • Ensuring stakeholders participating in the selection of final preferences have the technical capability to engage effectively in the process; the RMS provided clear access to all information and survey data, however some stakeholders complained of difficulty (likely due to lack of technical background) to make sense of data collected, and lack of time to read and understand⁹ the materials made available for the Community and stakeholder evaluation workshop, and the Value Management Workshop; • Establish mechanisms to 'educate' the stakeholders in the interpretation of survey data and their meaning so that value-added submissions are provided to the RMS in consultation phases, and the chances of interest-groups to influence the population on particular options are minimised; likewise, understanding of technical data and surveys increases trust in the findings and proposals put forward; • Avoid time lags in the consultation process throughout the project; • If the project experiences changes in management, convey community meetings to advise such changes and introduce the new team. |
| #2: Early inclusion of stakeholders in the process | Frequent | <p>The community liaison plan and website highlight the states and modes of community involvement throughout the process. There has been a clear plan for information giving, information seeking, and information sharing (e.g. public displays, information forum, radio talks). Evidence gathered from different information sources confirms the process of community engagement has improved significantly after August 2010, though it is crucial stakeholders be involved in early project preparation phases, and be informed the way in which their points of view and opinions were considered in the process of decision making, and 'how' and 'why' additional options were developed by</p> |

⁹ Comment from Grafton concerned citizens ..."3 volumes of report released on the 10th September 2012 with 1400 pages of technical information to be read and understood in one week".

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| |  | <p>RMS and included in the final short list of 6 route options</p> <p>Chapter 3, Table 52, exemplifies community concerns regarding the process, and the way in which alternative route options were selected “concerned that a single community consultation meeting to discuss the large number of options put forward by RTA... [25], that one of the 5 short-listed routes have now been selected for further investigation was not one of the originals”.</p> <p>One group of citizens manifested lack of community involvement in the design of the community survey undertaken in the period December 2010-February 2011 (see Appendix II).</p> |
| #3: Stakeholder analysis and representation | Frequent  | <p>The team actively sought the involvement of relevant stakeholders, through calls for nomination and identification of relevant stakeholders including those most affected by a particular option (Who holds a stake in this process?); the process of equal representation was applied to ensure the views of minority groups were incorporated.</p> <p>Furthermore, the project team actively sought feedback of community services providers such as Grafton Fire Station, South Grafton Fire Station and the Grafton Ambulance Service. As previously stated, youth representation and gender balance should be ensured as part of the stakeholder representation. Likewise, concerns were raised regarding the lack of involvement of people living outside the town (Chapter 3, Table 52, Volume 1: Main Report).</p> |
| #4: Clear objectives for the participation process | Frequent  | <p>The Community Liaison Plan responds to the objective of developing solutions that consider community expectations for the project. Future community engagements should convey that RMS participatory processes require trade-offs for selecting final preferences, rather than seeking consensus. Early understanding of this situations could be particularly useful in negotiation and conflict resolutions with citizen groups; by making it clear that consensus on a preferred option would be very difficult to be attained, and rather trade-offs would be necessary from all involved stakeholders to achieve a final outcome –best preferred option- from a social, economic, functional, environmental and financial perspective. Clear objectives for the participation process also reduce the amount of citizens’ frustration with the cost and time involved in the process (see Appendix II with some comments received in regards to the latter).</p> |
| #5: Methods of engagement tailored to the decision making context | Almost always | <p>A wide range of techniques, namely community updates, newsletters brochures, exhibitions, staffed and unstaffed displays, telephone surveys, request for public submissions, public meetings, telephone information line, community information evenings and afternoons were available since August 2010. In summary, the methods of engagement catered for a wide range of population ages and occupations; with alternative ways of engaging more proactively youth in the future being the only point that might need to be considered. Furthermore, RMS resourced visualisations of the future options to facilitate understanding of the available route options.</p> |

| | | |
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| |  | In future processes the RMS may need to ensure the presence of staff knowledgeable of the project area and methods applied at the staffed displays and public meetings; also ensuring that direct answers to citizens questions are provided, and in case answers can't be given, a follow up and response is provided to citizens afterwards. |
| #6: Skilled facilitation | Very Frequent  | Workshops had independent, qualified facilitators. It is suggested facilitators contracted by RMS for workshops aimed at citizens selecting preferred route options convey in a clear manner the principles of multi-criteria decision making, particularly how to weight different variables at stake for the final selection of a preferred route option. |
| #7: Integration of local and scientific knowledge | Very Frequent  | Community surveys were undertaken to identify preliminary options; The December 2010 community update identified 13 preliminary options, including the additional 9 options suggested by the community since the announcement of four preliminary route options in February 2010. RMS assessed a total of 41 suggested locations for their feasibility. RMS examined a total of 117 written submissions with comments related to the six route options from which a preferred one should be selected at the value management workshop. Stakeholders concerns regarding appropriate methods and techniques applied for local data gathering (e.g. traffic volume, noise levels, pollution, etc) should be clearly explained (in a layman language) to avoid wrong perceptions regarding the quality of the data gathered for the project, and to ensure citizens that local knowledge has been appropriately considered in the project design. |
| #8: Participation is institutionalised | Almost always  | RMS has institutionalised participation through its clear policy on 'community participation and involvement' and the development of a resource manual on community involvement and communications. |

In summary, the project team approach to community involvement and communication fulfilled the RMS policy, in regards to information gathering, consultation, community involvement and partnering with the public in the development of alternatives and the identification of the preferred solution. Additional participatory techniques for improved *consultation and collaboration* (e.g. participatory mapping, scenario analysis, consensus conferences, as illustrated in table 3) may be considered by RMS in the future to foster co-decision, that is, the cooperation with stakeholders towards an agreement for solution and implementation of the preferred option.

Table 3: Some participatory techniques with their degree of involvement. Modified from Luyet et al (2012)

| Participation Technique | Information | Consultation | Collaboration | Co-decision | Empowerment |
|--|-------------|--------------|---------------|-------------|-------------|
| Newsletter | X | | | | |
| Reports | X | | | | |
| Presentations, Public hearings | X | X | X | | |
| Internet Webpage | X | X | | | |
| Interviews, questionnaires and surveys | X | X | X | | |
| Field visit and interactions | X | X | X | | |
| Workshop | | X | X | X | X |
| Participatory mapping | | | X | X | X |
| Focus group | | | X | X | X |
| Citizen jury | | X | X | X | X |
| Geospatial / decision support system | X | X | X | X | |
| Cognitive map | X | X | X | | |
| Multi-criteria analysis | | | X | X | |
| Scenario Analysis | | | X | X | X |
| Consensus conference | | | X | X | X |

4. Recommendations

We suggest there are areas of continuing professional development for RMS staff in relation to community involvement. The analysis of the Grafton project community involvement process suggest Senior Management of the RMS may consider strengthening technical staff capacity in the following areas:

- a) Methods and techniques for ranking/selection of preferred options in the context of multi-criteria/multi-objective decision making. Although the 'know-how' of these techniques and their implementation can be outsourced to consultants, it is important RMS staff be aware of the variety of techniques and methods available for selecting preferred options in the context of multiple criteria (e.g. environmental, social, functional, economic) and/or objectives. This enables better quality control of the method proposed by the consultant, and ensures the final decision making undertaken in collaboration with local stakeholders and community participants be fair and sound¹⁰.
- b) Methods and tools for stakeholder selection (stakeholder analysis techniques to ensure relevant, inclusive stakeholder representation).
- c) Public/community participation techniques (although this part of the project can be outsourced, staff should be aware of the latest techniques for quality control of consultant proposals). Charette, 21st Century town meetings, e-participation techniques, social networks or a combination thereof may be needed for appropriate engagement of diverse groups.
- d) Techniques to manage social acceptance of projects
- e) Technology aided-participative methods (including visual, the use of geographic information systems, scenario visualisation), for staff awareness of the latest technological developments that could be built into the project bidding documentation for consultants. Recent research (Gonzalez *et al.*, 2008) suggest that combining technology with more conventional ways of gathering, evaluating and presenting data are seen as offering a solution to the need to promote the integration of public perceptions in environmental assessment procedures. Participatory GIS¹¹ techniques are a recent example to incorporate community views in the planning and decision-making process.
- f) Stakeholder management and community consultation software to record interactions with stakeholders, analysing data, and evaluating community engagement processes that are part of RMS projects. Software packages such as Darzin would enable the implementation of an evaluation framework of the community consultation undertaken under criteria of integrity, inclusion, deliberation, influence, capacity, and transparency of the process, following the United Nations Brisbane declaration.

¹⁰ Consultants observed the Grafton the VM-workshop could have had a clearer guidance to the participants in the way in which the relative importance between environmental, socio-economic and functional criteria were integrated and weighted for the selection of the final route option. Techniques such as the Analytical Hierarchy Process could have been used.

¹¹ The inclusion of GIS as a tool for public participation enhances opportunities to: identify spatial aspects that had not been considered; clearly and effectively communicate potential problems and results through spatial analysis; improve understanding of the effects of alternatives (options/scenarios) by visualising them; involve the public; modify perceptions of a problem.

5. Acknowledgments

The authors thank those residents of Grafton and other stakeholders who contributed to the two community workshops and the value management workshop, the residents who made formal submissions to the NSW Roads and Maritime Services and provided us with material for this research project. As we have included some quotes in an appendix from the Concerned Citizens of Grafton Group we make special mention of their submission to us. The project staff of the RMS and their consultants answered our many questions, and commissioned some additional work, for which we are grateful. Finally, the authors take sole responsibility for the interpretation of the materials on which this study is based.

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APPENDIX I: Proposal for Additional Bridge Crossing of the Clarence River at Grafton - Peer Review of Traffic and Transport and Best Practice Community Consultation

Commercial-in-Confidence

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Executive Summary

1. Traffic studies are but one component of a decision-making process that provides information to stakeholders to assist them in the selection of a preferred route from a short-listed set of route options. Therefore, this Peer Review is confined to the traffic studies undertaken by consultants for the NSW Roads and Maritime Services on a proposal for a bridge to cross the Clarence River at Grafton.
2. Good policies, programs and project can only emerge after a careful consideration of options, including the “do-nothing” case. This is the case with investigations into a route location for an additional river crossing at Grafton where a number of plausible alternatives have been narrowed to a short list of six.
3. It is noted that the majority of community opinion views that the "do-nothing" case is untenable and another crossing is needed. Options such as implementing travel demand management will not avoid the need for another bridge.
4. The traffic studies undertaken conform to the broad steps in the land-use and transport planning process, initially formulated in the mid-1950s in the USA and later spreading throughout the developed and developing world that included Australia from the early 1960s onwards.
5. Today, leading edge international practice in traffic studies includes the use of computer-based software, including the application of micro-simulation models, greater visualisation of the results and a wider range of factors in project appraisal covering social, economic and environmental considerations. The traffic studies undertaken as part of the assessment of the six route options for an additional bridge in Grafton can be categorised as good industry practice.
6. The planning horizon adopted is appropriate because beyond that time, the land use forecast of population that are inputs to the traffic model become highly speculative.
7. Good practice always entails a balance between the resources allocated to a study and the level of accuracy of the results to reach robust conclusions as data collection is an expensive exercise. A variety of traffic surveys completed in different locations and at different times have informed this study.
8. Guidelines on data collection are available on websites. The consultants followed UK guidelines on data collection and model validation.
9. The purpose of all models used is to make estimates of future traffic for the basis of deciding on the best alternative from the options considered. In conclusion, the information base and modelling exercises undertaken by the consultants to RMS are more than adequate for the purposes of informing the selection of the preferred route bearing in mind all options are evaluated with one common set of traffic assumptions.
10. In accordance with standard practice, further traffic studies should be undertaken on the preferred option after it has been selected.

INTRODUCTION

In September, 2012, the New South Wales Roads and Maritime Services (RMS) provided a research grant to the Institute of Environmental Studies, UNSW, to report on methodologies for world's best practice in community consultation and engagement. Part of this research included a case study of the work by RMS on the six route options proposed for an additional bridge crossing of the Clarence River at Grafton and the Value Management Workshop (23 and 24 October, 2012) to recommend a preferred route for further, detailed, investigation. Our research interest is to establish the sustainable development of infrastructure and social inclusion. By independently and critically assessing this Grafton community engagement program against world's best practice, we aim to identify any organisational improvements necessary, if any, and to recommend any capacity building programs for RMS, if so required.

Part of this research includes an independent peer review of the published reports on traffic assessment of the route options for an additional crossing of the Clarence River at Grafton (also available on the RMS project website). The research design also includes: listening to community concerns on the traffic studies undertaken as arose in:

- Listening to community concerns on the traffic studies undertaken as arose in two community forums (18 September and 9 October, 2012);
- Attendance at the local radio station on 10 October, 2012 when a morning program (9 – 10am) was devoted to the additional crossing of the Clarence River at Grafton and listener phone-in invited and
- Reading the formal submissions by the community on the six route options (115 submissions plus a few annexes) to identify specific issues raised on the RMS traffic studies.

This resource paper for the Value Management Workshop is informed by discussions with the transport consultants engaged by the RMS - Arup Consultants and GTA Consultants – and the Pre-sales Consultant of the Quadstone Paramics Software that has been applied in the traffic studies.

This peer review has been commissioned by senior management of RMS to ensure that the traffic assessment undertaken for the project is thorough and robust and is suitable for the purposes of informing the selection of the preferred route.

The peer review report is proposed to be made available to members of the community. Participants at the Value Management Workshop on 23 and 24 October 2012 may wish to consult the peer review report to form an opinion on whether the traffic studies undertaken so far are adequate for the purpose of assessing the advantages and disadvantages of each alternative route options. Project managers from within the NSW Roads and Maritime Services may find this peer review useful when working on similar investigations.

It is important to clarify the scope of the research undertaken. The focus is on the methodology of the traffic studies and whether the work undertaken by the consultants to RMS is adequate for the purposes of providing adequate information to decision makers on the six route options. The research does not make any recommendations on the preferred route. Furthermore, the research does not form a view on the detailed traffic management devices (for example, intersection control with either roundabouts and traffic signals)

associated with each option (The reviewers have established independently that the traffic consultants have the local knowledge of local traffic conditions to have formulated the necessary package of traffic management schemes to support each route option.) Once a preferred route has been identified then further, more detailed, investigations will be commissioned by RMS and these will include additional traffic studies.

METHODOLOGY

The independent review of the traffic studies undertaken in the planning of route options for a bridge crossing the Clarence River at Grafton is based primarily on a critical assessment of the work undertaken by the GTA Consultants, namely.

“Additional Crossing of the Clarence River at Grafton: Preliminary Route Options Report – Part Two, Volume 2 Technical Paper – Strategic Traffic Assessment” (November 2011).

“Main Road 83 Summerland Way: Additional Crossing of the Clarence River, Grafton - Route Options Development Report, Technical Paper Traffic Assignment” (September 2012).

“Main Road 83 Summerland Way: Additional Crossing of the Clarence River, Grafton - Route Options Design Report, Micro-simulation Calibration and Validation Report.” (September 2012)

Issues that arose in the clarity of reporting on technical matters were identified by the reviewers and discussed with the traffic consultants, Arup and GTA. Additional work was undertaken by the consultants: some of this is incorporated into this report, either in the text or as appendices. Following presentations by the study team at the first community forum, it was the view of one of the reviewers that better visualisations of the results from the micro-simulation traffic model were required for greater community understanding. The RMS project manager allocated resources to do this and the RMS and Arup consultants produced appropriate visualisations. A sub-set of these visualisations was shown at the second community forum. The full set of visualisations of the results from the micro-simulation traffic model is also available for viewing on the RMS project website.

The methodology also included attendance at two community forums and listening to concerns on traffic and transport raised by attendees. The closing date for public submissions on the route options was 12 October 2012, when 115 individual submissions were received. Each submission was examined with the aim of extracting traffic and transport issues of relevance to this peer review.

INTRODUCTION TO THE TRAFFIC MODEL USED

Any model of a system is designed for a purpose and the model used in the traffic studies of route options in Grafton is fit for purpose. In the context of this review a model is “a representation of something else and is designed for a specific purpose” (Black, 1981, p. 27). The traffic models considered here are designed to represent existing traffic conditions on the road network. They are then used to test future scenarios of road planning and traffic management options with each route option being assessed with the *identical set of assumptions*. The model will permit a relative evaluation of options to be undertaken.

Micro-simulation traffic models capture the interactions of real world road traffic through a series of complex algorithms describing car following, lane changing, gap acceptance and spatial collision detection. Micro-simulation traffic models have, in recent years, become accepted as useful tools amongst road and transport authorities to analyse and identify solutions for traffic and transport planning (AUSTROADS, 2006). The synergy between information technologies and traffic engineering has enabled a new generation of micro-simulation models now available for road and transport managers to analyse complex traffic operations.

As of November 2005, AUSTROADS (2006, p. 43) identified the following list of micro-simulation packages available from various countries. In particular, the choice reflects the level of support both in development and usage. AIMSUN by Traffic Simulation Systems (<http://www.aimsun.com>), PARAMICS (<http://www.paramics.com>) by Quadstone and SIAS, and VISSIM (<http://www.ptvag.com/traffic/vissim.htm>) by PTV are commercial products with technical support in both Australia and New Zealand and other in countries such as the USA and Great Britain. In Australia, they are used by most AUSTROADS Member agencies.

PARAMICS has emerged as the preferred micro-simulation traffic model by the Roads and Maritime Services (New South Wales, Roads and Traffic Authority, 2009). The RTA has had a long history of using and developing micro simulation traffic models, e.g. INSECTS and SCATSIM since the 1980s. In the Grafton Additional Bridge Across the Clarence River Study, Quadstone Paramics (PARAllel MICroscopic Simulation) referred to in the GTA reports as “Q-Paramics” (“the model”) is a microscopic traffic and pedestrian simulation software used to design transport infrastructure allowing operational assessment for current and future year traffic conditions. The Paramics software is designed to handle scenarios as wide-ranging as a single intersection through to a congested freeway or the modelling of an entire city’s traffic system. It has been applied in over 80 countries world-wide by thousands of customers including commercial consultants, cutting edge transportation researchers and state-funded Government agencies (<http://www.paramics-online.com/index.php>, accessed 11 September, 2012).

The reviewers are not users of any kind of commercially-available software packages that are commonly applied in the general field of traffic and transport but they are sufficiently familiar with the underpinning theories on which a whole family of strategic planning and traffic models are based. However, they downloaded the demonstration software from the Quadstone Paramics website, and received a kind offer from the Pre-Sales Consultant, Lenny Winsel (O: +44.131.240.3108 | M: +44.7808.640.727; Lenny.Winsel@pb.com) to answer any technical questions. Professor Black spoke to Mr Winsel in Sydney on the evening of 10 October, 2012 and understood that Quadstone had developed visualisation modules specifically for community consultation in the USA.

INSTITUTIONAL GUIDELINES

One way to assess independently the technical work of consultants is to follow guidelines issued by various agencies. For example, AUSTRROADS (2006, pp. 45 - 46) assist road and transport authorities in the preparation of a brief specifying the requirements of a micro-simulation traffic project, such as the topic of this review, either as an internally sourced study within the authority or as a contractual study out-sourced to a consultant. The materials in this report emphasise a need to: provide a problem statement; state reasons why the modelling is required; state the context of the study and background information; provide a list of specific aims and outcomes from the study; and provide a brief description of study area.

The study scope should: specify the parts of a network to be simulated (i.e. the spatial domain of analysis); specify the time periods of analysis – a.m. peak, p.m. peak, business peak, or period of incidence; and specify vehicle types, and whether public transport, pedestrians or cyclists are part of the study. The brief should also list the options to be analysed, and the combinations of the options to be tested.

Traffic demand data provided by the client should: state whether an origin-destination (OD) matrix is available for the study, and whether the preparation of a demand matrix is part of the project; determine whether a time profile of the matrix is necessary to address the project objective and what profile should be used; if traffic flow and turning proportions at each node are used to represent traffic demand, discuss the adequacy of this approach relative to the use of an OD matrix and if an OD matrix is available from a four-step transport planning suite, discuss the need for manual fine-tuning of the demand for the study area.

Calibration of the model is necessary for the local situation and this includes: specifying the traffic volumes on screen lines selected for flow or demand calibration; specifying the output performance metrics selected for calibration, e.g. travel times, delays, and queue lengths; providing the list of parameters that will be used in getting the right demand and performance metrics and specifying the level of accuracy proposed for calibration.

ASSESSMENT OF GTA TRAFFIC ASSESSMENT REPORT

Based on the above considerations, focus is now turned to the report “Main Road 83 Summerland Way: Additional Crossing of the Clarence River, Grafton - Route Options Development Report, Technical Paper Traffic Assignment” (September 2012).

1. Problem Statement

The existing bridge across the River Clarence at Grafton was opened in 1932 and correspondence about an additional bridge crossing can be traced back to 1960. Previous studies that have investigated this problem were reviewed by the GTA consultants (pp. 1 – 6).

2. Study Objectives

The study objectives are clearly stated: “...to assess the existing and future traffic conditions in the Grafton area and to inform investigations into the identification of a preferred location for an additional crossing of the Clarence River. The objectives of this study are to undertake an assessment of the six short-listed options and understand their performance in terms of the operation of the road network.”

3. Micro-simulation Approach

The consultants justify the use of a micro-simulation model because the existing road network is “already over-saturated or a proposed scheme [i.e. the bridge] is likely to over-saturate the study network.” (p. 7). This choice of modelling approach is appropriate to the local situation. Paramics, along with other micro-simulation software, is simply one of the decision support tools used to predict future travel patterns as a result of a design proposal, new development, traffic growth, and, in this case, a new bridge with associated intersection treatments and traffic management changes.

4. Study Methodology

The study methodology and the micro-simulation model development are clearly described without unnecessary use of jargon in sections 2 and 3 (pp. 7 – 17). Noting the points mentioned in the previous section on guidelines these sections: show spatial coverage of the model - a map of the study area (Figure 2.2, p. 9) and its model representation as a network (Figure 3.1, p. 12); the temporal extent in the model – AM peak period (6.30 – 10.30) and PM peak period (2.30 – 7); sources of data (p.10); the articulation of guidelines on model calibration and validation (based on international best practice expressed in the “UK Design Manual for Roads and Bridges - Traffic Appraisal in Urban Areas”) are set out in Table 3.1, p. 13); the modelling assumptions for the Grafton specific situation (Appendix, p. 6) and the outputs from the model in terms of general network statistics (p.16).

There are two activities to use observed datasets - such as vehicular traffic counts, video recordings or origin-destination (OD) surveys. One activity is used to generate an OD matrix, the other is used to calibrate/validate traffic against modelled results. In practice, these observed datasets should only be used once, either to generate an OD matrix or to calibrate/validate the model. A different set of observed datasets should be used to carry out the other activity, and, indeed, this was the case with this traffic modelling exercise.

The community forums of 18 September and 9 October drew attention to some of the perceived deficiencies of data collected during various traffic studies of Grafton. Whilst the traffic consultants verbally addressed the concerns the reviewers felt it prudent to ask for a written explanation based on all previous traffic studies undertaken over recent years in Grafton. Therefore, we recommended to the RMS Project Manager that “the traffic consultants extract from all relevant reports: a description of the various methodologies of the traffic surveys and counts (including how problems – according to the community - with the 2010 counters at Villiers and Summerland Highway – were addressed); interpretation of any differences between these data and their validity for the purpose of the various modelling exercises”.

The traffic consultants reviewed their data sources and produced a consolidated report which is attached as Appendix A. The attachment documents the road, location, survey period, survey days, and survey method for all the traffic count data used in both the strategic and micro-simulation modelling. Over 68 different sites around Grafton have been used throughout the project, with several of the sites being on the major roads within the region. Using traffic counts and OD survey as an input to traffic models has been a long-standing debate, and this as noted by Mr Larry Winsel of Quadsone-Paramics, the developers of the micro-simulation software. The following guidelines address data collection issues as model input (Table 1). Weighing the evidence presented on data collection for the purposes of evaluating route options, it is concluded that the consultants have followed standard practice with the design and conduct of traffic surveys and that the traffic studies are therefore fit for purpose.

Table 1: Selected Guidelines on Use of Micro-simulation Models

| | |
|--|---|
| Federal Highway Administration (FHWA) – Traffic Analysis Toolbox: | http://ops.fhwa.dot.gov/trafficanalysisistools/tat_vo13/index.htm |
| <i>Highway Capacity Manual (HCM), chapters 6 and 7</i> | http://books.trbbookstore.org/hcm10.aspx |
| <i>Design Manual for Roads and Bridges validation criteria</i> | http://www.dft.gov.uk/ha/standards/dmrb |
| <i>Austroads - The use and application of microsimulation traffic models</i> | https://www.onlinepublications.austroads.com.au/items/AP-R286-06 |
| <i>The Roads and Traffic Authority of New South Wales - Microsimulation Modelling manual</i> | http://www.rta.nsw.gov.au/doingbusinesswithus/downloads/technicalmanuals/paramicsmanual_i.pdf |
| <i>Transport for London (TfL) - Traffic Modelling Guidelines</i> | http://www.tfl.gov.uk/assets/downloads/businessandpartners/traffic-modelling-guidelines.pdf |
| <i>Wisconsin Department of Transport (WisDOT) Microsimulation Guidelines</i> | http://www.wisdot.info/microsimulation |

(Source: Lenny Winsel, pers. com.)

MICRO-SIMULATION MODEL APPLICATION

The purpose of calibrating a model to base-year traffic conditions is to provide a plausible basis for the assessment of six different route options. It is the relative performance of each alternative that becomes important, and the matter of absolute accuracy in traffic forecasts

becomes a lesser issue of importance. When applying the model to the base year network, the consultants confirm that the validation criteria specified from best practice have been achieved (Section 3.3.3, pp. 14 – 16).

The six route options are described in terms of their location and associated traffic engineering treatments (Table 6.1, p. 26) that forms the basis of the six networks tested by the consultants. Morning and evening peak traffic is evaluated for each network for 2011 (base year), 2019, 2029, 2039 and 2049. Future traffic levels are inputs to the micro-simulation model (see Figure 2.1, p. 8) from a “strategic model” that is reviewed independently in the next section (as noted above it is the relative performance of each option not its absolute level of future traffic forecasted).

STRATEGIC TRAFFIC ASSESSMENT

“Additional Crossing of the Clarence River at Grafton: Preliminary Route Options Report – Part Two, Volume 2 Technical Paper – Strategic Traffic Assessment” (November 2011) is a report on the traffic assessment of the preliminary route options. Assessment is informed by the strategic transport model (applying the CUBE-TRIPS software), where,

“Future year population forecasts were used to estimate the future year travel behaviour and how certain trips would respond to the each of the preliminary route options” (p.6).

The model works from a 2012 base year (see micro-simulation model above) and then assigns vehicular traffic to the road networks (existing network plus any traffic engineering modifications plus each of the route options) for the morning peak two-hours (7am – 9am) for the years 2019, 2029, 2039 and 2049. The first step with this model calibration is to take as model inputs the survey origin and destination matrix between all zone pairs in the study area and the road traffic counts and apply the “matrix estimator tool within TRIPS.” (p. 24). A comparison of model estimates and traffic link counts (Fig. 3.3, p. 25) illustrated an adequately calibrated model.

However, there is no clear technical description as to how this was undertaken. That “matrix estimation is a well established technique.” (p.24) fails to overcome criticism of the “black box” approach that forms the basis of some community criticism. The calibration and validation (section 3.6) blandly states “When the model results match the existing traffic flows within the specified range, the model is validated and therefore suitable for use as the base to prepare models for future conditions” (p. 24). Therefore, we have asked the traffic consultants to provide a clearer explanation for the community, and this is attached as Appendix B. This explanation is adequate.

In the application of this model to future year traffic estimates, the consultants set out several key assumptions (Section 4.1, p. 28). In particular, they note from Australian Bureau of Statistics data the decline in persons per household but infill housing for Junction Hill, Waterview Heights and Clarenza will offset these reductions to give a net population increase from 18,800 in 2011 to 30,300 in 2049 at a rate of 1.1 per cent per annum (Table, 4.1, p.30). These population growth forecasts (different for each design year) were allocated to each zone in the study area. In broad outline zonal traffic was assumed to have the same growth rates as population for the various design years.

Technically, this approach is a “growth factor method”, commonly applied in US transport studies in the 1940s and 1950s, which is useful for short-term traffic forecasting but questionable when there may be long-term land use changes (see, Blunden and Black (1984, pp.35 – 37)). The strategic model therefore estimates a larger version of the current traffic patterns in 30 years’ time. Furthermore, there are some unexplained characteristics of traffic growth in Table 4.1 that require explanation from the consultants. The current per capita rate of traffic in the morning peak two hours is 1.11 trips (2011) rising to 1.17 in 2019 (before the bridge opens?) then 1.26 in 2029 (with induced traffic), to 1.28 in 2039 and 1.26 in 2049. In further discussion with the consultants, they satisfactorily explained the assumptions in terms of initially the capacity of the present bridge constrains the growth of

traffic using the bridge but after a second crossing additional traffic is induced as with the experience of traffic growth across water barriers with additional road capacity.

In reviewing the documentation and presence at the first community forum, this led us to recommend that better visualisation of the existing traffic and traffic forecasts would be helpful to the community, especially the origin-destination desire lines from the six options. Such a representation of traffic may shed light as to whether a bridge location close to or further from the existing bridge is required. One way to demonstrate this is to calculate the road network route factor for all traffic crossing the Clarence River – existing and projected for all route options. The route factor of a road link between a single origin-destination pair is a long established measure of the inherent efficiency of the link (Blunden and Black, 1984, pp. 141 – 144). The route factor is calculated by dividing the actual distance travelled from origin-destination over the road network by the direct distance (“as the crow flies”) from the origin-destination. Obviously, the route factor can be calculated for all O-D pairs across the Clarence River and a mean value for the route factor calculated. Additionally, the route factor derived for each option can be weighted by the amount of traffic on each desire line.

The consultants undertook this additional work and the results are given in Table 2. For the current road geometry the route factor for the 2011 road network for origin-destination traffic crossing the Clarence River is 1.34, The closer the route factor is to unity the more efficient the layout of the road network to cater for all traffic movements. The equivalent route factor calculations were made for the year 2019 with the forecast origin-destination desire lines across the river and the six route options, E, A, C, 11, 14 and 15. Options A and E result in the lowest network route factor of 1.38, whereas options 14 and 15 result in the highest of network route options of 1.6.

Table 2. Route Factors for Existing Grafton Road Network and Six Options for a Second Bridge

| Estimated Route Factor | | | | |
|------------------------|--------|---------------|---------------|--------|
| Year | Option | Network Route | Straight Line | Factor |
| 2011 | 2011 | 4.12 | 3.07 | 1.34 |
| 2019 | E | 4.35 | 3.15 | 1.38 |
| | A | 4.34 | 3.15 | 1.38 |
| | C | 4.45 | 3.15 | 1.41 |
| | 11 | 4.45 | 3.15 | 1.41 |
| | 14 | 5.05 | 3.15 | 1.60 |
| | 15 | 5.09 | 3.15 | 1.61 |

(Source: Arup Consultants, pers. com.)

COMMUNITY CONCERNS ON TRAFFIC STUDIES

The community was asked to comment on the six route options and they were invited to identify the strengths and weaknesses of option each by a closing date of 12 October 2012. One hundred and fifteen submissions were reviewed. Amongst these three raised concerns about the traffic studies. Comments and questions were raised at the two community forums. These questions were answered satisfactorily by the RMS project team and consultants at each forum - in the opinion of the reviewers. However, there are some matters that require additional comment and they are included below:

1. One submission suggested that an area that should be considered in more detail during investigations of the preferred route option is the long-term growth plans for the Grafton region. The traffic forecasts are derived from the population projections and development areas identified by the NSW Department of Planning and Infrastructure in its Mid-North Coast Strategy, and by subsequent work undertaken by the Clarence Valley Council (see: Chapter 4.5 of the Preliminary Route Options Report, January, 2012; and Chapter 4 of the "Additional Crossing of the Clarence River at Grafton: Preliminary Route Options Report – Part Two, Volume 2 Technical Paper – Strategic Traffic Assessment, November, 2011).
2. An opinion has been expressed that the traffic studies are seriously "flawed". The issue of the adequacy of the traffic modelling for the purposes of route comparison has been addressed by this report, including additional work of the consultants.
3. Community members have asked why the traffic projections go only 30 years into the future after an assumed second crossing is operational in 2019. This is a typical forecast horizon in road planning whether undertaken by the public or private sectors. Modelling of traffic requires exogenous inputs of the future spatial distribution of population, employment and other economic activity but there long-term forecast accuracy is highly questionable. For example, a back-casting approach to the accuracy of traffic forecasts on the Sydney-Newcastle Toll Road found the traffic model was robustly accurate given the actual populations along the route as inputs but that the land use forecasts used in 1960 turned out to be highly inaccurate (Brewer and Black, 1992).
4. One submission makes a detailed and well-documented case for travel demand management as an option to an additional bridge crossing. There is no doubt in the minds of the reviewers that the local council should undertake immediately studies transport studies of Grafton that have objectives broad goals of economic, social and environmental sustainability. One of the strategies to consider and evaluate is travel demand management as a component of "green transport plans". The additional bridge is unlikely to be constructed before 2019 and therefore there are network improvements and management options that can be considered in the interim.

COMMENTS ON TRAFFIC STUDIES AND THE PREFERRED ROUTE

The desired outcome of the Value Management Workshop is for the participants to recommend a preferred route from the six options presented as input into the selection of the preferred route.

Additional technical studies on that preferred road would be undertaken after it has been selected as part of an environmental impact assessment. Traffic studies would be part of these further investigations. The traffic models subject to this review can be applied and the traffic management to support the preferred option can be further refined and modelled.

However, it would be prudent to check the robustness of conclusions as to the location of the preferred bridge by applying a strategic land use and transport model. Such strategic models are commonly used to make long-term traffic forecasts from future land use scenarios. No additional data collection is recommended to the consultants because synthetic calibration parameters (parameters based on experience in other places) could be used in the model for the morning peak hour model. This approach was adopted in the Voorhees methodology (Voorhees and Associates, 1967) that recommended the Y-Plan for Canberra. This has continued to guide the development of the national capital. The US Transportation Research Record (1998) contains travel estimation techniques for urban planning, including calibration parameters for study areas of populations of different size. However, if Census of Population and Housing Journey-to-Work Tabulations are available for small areas in the Grafton region, then it is recommended that a trip distribution model be calibrated for the journey to work.

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The reviewers have no conflict of interest in undertaking this review of traffic studies as part of a broader research and development project for the NSW Roads and Maritime Services. One of the reviewers (John Black, Emeritus Professor of Transport Engineering) has experience of strategic land use and transport planning, traffic studies and community engagement. We thank the New South Wales Roads and Maritime Services project staff in Grafton for inviting us to join various meetings and for the introduction to community stakeholders. ID Planning provided us with a CD containing the public submissions. The traffic consultants, Gerard Cavanagh (Arup) and Reece Humphreys (GTA consultants) were responsive to our comments on the traffic studies. Lenny Winsel (Quadstone-Paramics) was responsive to our queries and provided us with some helpful information.

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APPENDIX A – CONSULTANTS' DESCRIPTION OF DATA

Introduction

Arup was engaged by Road and Maritime Services to undertake the route selection study for a second road crossing of the Clarence River in the vicinity of Grafton. Observed traffic data and travel patterns were an important element of the route selection analysis. Arup engaged GTA Consulting as a specialist advisor to undertake traffic modelling to support the route selection. The traffic modelling relied on observed traffic data including origin-destination surveys, traffic counts, and travel times.

Community members have raised concerns that the traffic count data used to inform the modelling has discrepancies and is generally unsuitable for the purpose intended as the days counted were not representative of an average weekday and the origin-destination data was collected on a peak day.

The purpose of this note is to detail all the traffic count data used in the modelling and route selection analysis and show that it is suitable for the purpose intended.

Background

A strategic TRIPS traffic model was validated to AM peak 2011 average traffic conditions using three sources:

- A previous traffic model developed for an earlier phase of the project
- OD survey documented in the Heavy vehicle Survey report conducted on Thursday 19 August 2010
- Traffic count data collected between 2006 and 2011.

The TRIPS model was used in the preliminary route selection phase of the project.

A Paramics micro-simulation model was validated in December 2011 for the AM peak and PM peak periods and relied on:

- Outputs from the TRIPS strategic traffic model
- OD surveys as above and undertaken on Wednesday 11 March 2009.
- Traffic data collected in 2010 and 2011.

The Paramics micro-simulation model was used in the route selection phase of the project.

Traffic Count Data

The attached table documents the road, location, survey period, survey days, and survey method for all the traffic count data used in both the strategic and micro-simulation modelling. Over 68 sites around Grafton have been used to throughout the project, with the sites being on the key roads within the region:

- Pacific Highway

- Armidale Road
- Bent Street
- Fitzroy Street
- Dobie Street
- Gwydir Highway
- Pound Street
- Prince Street
- Summerland Way
- Villiers Street, and
- Many others.

A range of different survey methods were used:

- Tube count – which collects 24 hour data over an extended period and provides counts for different vehicles types. The tube count method was extensively used in Grafton for the reasons mentioned, duration, vehicle type, week or two weeks of data.
- Intersection counts – are typically manual counts and are used to collect data for localised validation of traffic behaviour. The intersection count data was predominantly collected during the AM and PM peak periods and has informed the validation of both models but more particularly the micro-simulation modelling.
- Video traffic counts – were used to collect turning movement data at key intersections. They are a more cost effective method of data collection than manual turning movement counts and provide the same data as manual traffic counts.
- OD surveys – video technology was used to record vehicle number plates which are then matched with video survey records at other sites to determine the origin/ destination of travellers in the system. Due to issues with legibility of number plates during the night time hours the OD surveys were conducted over 5am to 7pm time frame. The OD surveys were supported by tube counts as discussed earlier.

Table 1 - Traffic Count Data - Strategic Modelling

| Year | Sites Surveyed | Survey Type | | |
|-------|----------------|-------------|--------------|----------------------|
| | | Tube | Intersection | Origin – Destination |
| 2006 | 4 | 4 | - | - |
| 2007 | 14 | - | 14 | - |
| 2008 | 4 | 4 | - | |
| 2009 | 30 | 10 | 14 | 6 |
| 2010 | 34 | 26 | - | 8 |
| 2011 | 56 | 54 | 2 | - |
| Total | 142 | 98 | 30 | 14 |

The OD surveys conducted on Wednesday March 11 2009 and Thursday March 20 2010 show similar travel patterns. An argument raised is that the inclusion of Junction Hill and Clarenza as internal trips distorts internal to external and external to external traffic. The OD survey captures a likely trip origin and a likely trip destination. In the case of a trip from Junction Hill to Clarenza this could be considered external to external or internal to internal depending on boundary definitions. In the Heavy Vehicle Study Junction Hill and Clarenza were considered internal for the purposes of reporting the findings. This was simply a reporting method and does not change travel behaviour. When developing a traffic model the origin and destination are recorded and the model determines the best route as such is not aware that a trip could be considered internal to internal or external to external. Therefore options that provides the best route between the origin and destination will be preferred whether this is via a down river bridge or an up river bridge.

Table 2 - Traffic Count Data Microsimulation Modelling

| Year | Sites Surveyed | Survey Type | |
|------|----------------|------------------|--------------|
| | | Turning Movement | Video Survey |
| 2007 | 7 | 7 | - |
| 2009 | 4 | 4 | - |
| 2011 | 5 | - | 5 |

The key intersections surveyed for validation of the Paramics model include intersections in the town centre and in south Grafton. The days of the week surveyed included Tuesday, Wednesday, Thursday and Friday. The micro-simulation modelling also included the counts collected and used in the strategic modelling discussed earlier.

Summary

The intent of this note is to show the data used for the traffic modelling and analysis conducted for the study is appropriate. The concern was raised that the OD surveys were conducted on a peak day and as such did not represent average traffic conditions. The 2010 OD survey was conducted on a Thursday which coincided with above average traffic conditions. The modelling did not rely solely on this survey. The survey informed the development of a "prior" trip matrix and the observed travel patterns were adjusted using a matrix estimation approach and the traffic data outlined in Attachment 1. The traffic data in Attachment 1 is summarised in Table 1 above. Traffic counts were conducted over different periods of the year and included a range of differing techniques. It is considered that any distortions resulting from the OD survey are mitigated by the range of traffic counts, the majority of which were conducted over a week or two week period.

Arup/ GTA have made best use of the data collected during this study. The area covered by the traffic counts is comprehensive and the extent of data available exceeds that used for most studies.

Summerland Way Route Selection - Microsimulation Data Summary

| No. | Intersection | Approach | Movement | 7am-8am | 8am-9am | 3pm-4pm | 4pm-5pm | No. of Survey Days | Survey Date | Year | Survey Days | Survey Period | Method |
|-----|-------------------------------|----------|----------|---------|---------|---------|---------|--------------------|-------------|---------|------------------|------------------|------------------------|
| 1 | Dobie Street and Turf Street | North | Through | 182 | 373 | 240 | 191 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Left | 113 | 184 | 180 | 154 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | East | Right | 101 | 158 | 209 | 187 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Left | 5 | 16 | 24 | 15 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | South | Right | 4 | 10 | 13 | 19 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 90 | 167 | 290 | 282 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| 2 | Bent Street and Spring Street | South | Left | 12 | 24 | 37 | 37 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 629 | 1181 | 724 | 724 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | East | Left | 37 | 90 | 120 | 120 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Left | 88 | 105 | 115 | 115 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | North | Through | 329 | 506 | 942 | 942 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Left | 21 | 48 | 47 | 47 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| 3 | Gwydir Highway and Bligh | South | Left | 11 | 45 | 22 | 22 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 8 | 20 | 8 | 8 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 4 | 19 | 9 | 9 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Left | 8 | 11 | 20 | 20 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 119 | 233 | 361 | 361 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 10 | 32 | 19 | 19 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | North | Left | 23 | 42 | 89 | 89 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 12 | 25 | 32 | 32 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 13 | 11 | 43 | 43 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Left | 14 | 39 | 26 | 26 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 224 | 329 | 278 | 278 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 13 | 26 | 18 | 18 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| 4 | Ryan St and Pacific | East | Through | 221 | 264 | 284 | 284 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 65 | 100 | 85 | 85 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | North | Left | 46 | 75 | 61 | 61 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 16 | 45 | 28 | 28 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | West | Left | 29 | 59 | 47 | 47 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 178 | 220 | 369 | 369 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| 5 | Pacific Highway and | South | Left | 24 | 52 | 39 | 39 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 55 | 95 | 75 | 75 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | East | Left | 31 | 42 | 47 | 47 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 299 | 332 | 309 | 309 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | North | Through | 185 | 246 | 411 | 411 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 42 | 83 | 53 | 53 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| 6 | Pacific Highway and Spring | East | Through | 159 | 433 | 237 | 237 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 141 | 108 | 88 | 88 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | North | Left | 96 | 171 | 169 | 169 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 33 | 70 | 89 | 89 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | West | Left | 118 | 146 | 124 | 124 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 159 | 227 | 248 | 248 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| 7 | Pacific Highway and Gwydir | South | Left | 173 | 223 | 164 | 164 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 189 | 229 | 231 | 231 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | North | Through | 128 | 213 | 254 | 254 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 82 | 302 | 80 | 80 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | West | Left | 97 | 152 | 130 | 130 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 98 | 113 | 202 | 202 | 2 | 15-16 Nov | 2007 | Thursday-Friday | 7am-10am,4pm-7pm | Turning Movement Count |
| 8 | Prince Street and Dobie | South | Left | 58 | 92 | 166 | 147 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 45 | 65 | 129 | 154 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 22 | 23 | 39 | 47 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Left | 2 | 7 | 5 | 11 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | Through | 113 | 147 | 173 | 154 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey | |
| | | | Right | 47 | 144 | 95 | 97 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | North | Left | 8 | 10 | 14 | 11 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 81 | 153 | 116 | 127 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 6 | 6 | 9 | 6 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Left | 37 | 56 | 41 | 49 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | Through | 110 | 161 | 137 | 124 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey | |
| | | | Right | 2 | 5 | 18 | 18 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| 9 | Queen Street and Dobie | South | Left | 10 | 17 | 24 | 23 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 41 | 68 | 90 | 90 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 12 | 11 | 23 | 17 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Left | 3 | 11 | 13 | 12 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | Through | 118 | 237 | 212 | 194 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey | |
| | | | Right | 17 | 25 | 14 | 15 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| 2 | | North | Left | 29 | 43 | 46 | 47 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 62 | 137 | 111 | 99 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | Right | 2 | 20 | 13 | 9 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey | |
| | | | Left | 15 | 14 | 21 | 12 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |

| | | | | | | | | | | | | | |
|----|-----------------------------|-------|---------|-----|------|-----|-----|---|--------|------|-----------|------------------|------------------------|
| | | | Through | 111 | 186 | 224 | 214 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 48 | 54 | 65 | 53 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| 10 | Bent Street and Through | South | Left | 13 | 17 | 44 | 41 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 714 | 1176 | 829 | 687 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 7 | 9 | 33 | 19 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | West | Left | 93 | 195 | 139 | 145 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 3 | 6 | 11 | 11 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 4 | 7 | 10 | 22 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | North | Left | 71 | 111 | 163 | 176 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 472 | 702 | 881 | 971 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 80 | 158 | 255 | 237 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | East | Left | 4 | 16 | 18 | 16 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Through | 9 | 7 | 14 | 19 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| | | | Right | 149 | 52 | 205 | 144 | 1 | 8-Nov | 2011 | Tuesday | 7am-10am,3pm-6pm | Video Survey |
| 11 | Gwydir Highway and Bent | South | Left | 27 | 61 | N/A | 68 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 363 | 392 | N/A | 463 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 27 | 18 | N/A | 37 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | West | Left | 139 | 165 | N/A | 133 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 75 | 91 | N/A | 115 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 61 | 57 | N/A | 124 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | North | Left | 79 | 72 | N/A | 150 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 227 | 367 | N/A | 559 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 63 | 144 | N/A | 255 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | East | Left | 25 | 22 | N/A | 37 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Through | 46 | 39 | N/A | 81 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| | | | Right | 171 | 385 | N/A | 176 | 1 | 15-Nov | 2007 | Thursday | 7am-10am,4pm-7pm | Turning Movement Count |
| 12 | Fitzroy Street and Villiers | South | Left | 3 | 15 | 16 | 9 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 5 | 17 | 23 | 23 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 2 | 25 | 52 | 77 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | West | Left | 18 | 40 | 65 | 52 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 219 | 275 | 517 | 559 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 10 | 9 | 17 | 21 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | North | Left | 179 | 282 | 362 | 367 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 15 | 37 | 33 | 23 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 13 | 40 | 23 | 26 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | East | Left | 74 | 149 | 93 | 77 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 389 | 722 | 584 | 530 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 403 | 608 | 535 | 403 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| 13 | Villiers Street and Pound | South | Left | 108 | 268 | 243 | 153 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 294 | 279 | 293 | 244 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 36 | 64 | 31 | 33 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | West | Left | 4 | 16 | 57 | 52 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 24 | 85 | 143 | 171 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 17 | 87 | 161 | 195 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | North | Left | 30 | 63 | 88 | 76 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 109 | 287 | 251 | 262 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 9 | 44 | 47 | 53 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | East | Left | 9 | 17 | 22 | 22 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 43 | 71 | 63 | 81 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 8 | 9 | 10 | 7 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| 14 | Fitzroy Street and Prince | South | Left | 37 | 70 | 76 | 74 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 43 | 91 | 123 | 125 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 29 | 29 | 100 | 67 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | West | Left | 8 | 24 | 41 | 66 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 104 | 177 | 228 | 246 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 29 | 80 | 36 | 47 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | North | Left | 114 | 127 | 165 | 197 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 79 | 137 | 72 | 109 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 34 | 69 | 32 | 42 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | East | Left | 52 | 93 | 92 | 93 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 158 | 323 | 252 | 216 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 100 | 123 | 145 | 158 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| 15 | Prince Street and Pound | South | Left | 20 | 60 | 91 | 92 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 117 | 162 | 203 | 218 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 7 | 27 | 25 | 45 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | West | Left | 15 | 53 | 106 | 84 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 81 | 207 | 234 | 212 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 90 | 117 | 101 | 102 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | North | Left | 32 | 85 | 127 | 109 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 130 | 201 | 202 | 184 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 28 | 67 | 44 | 44 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | East | Left | 37 | 74 | 98 | 72 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Through | 79 | 211 | 190 | 191 | 1 | 11-Mar | 2009 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |
| | | | Right | 29 | 56 | 112 | 93 | 1 | 11-Mar | 200 | Wednesday | 7am-10am,3pm-6pm | Turning Movement Count |

N/A - Count not available in nominated time period

Grafton Survey Data Summary

| No. | Road Name | Location | Direction | 2Hrs | No. of Survey | Survey Date | Survey Day | Survey Period | Method | Year |
|-----|--------------------|--|------------|------|---------------|-------------------------|---------------------|---------------|---------------|------|
| 1 | Armidale Road | South of Brickworks Lane | Northbound | 489 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 2 | Armidale Road | South of Brickworks Lane | Southbound | 177 | 5 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 3 | Armidale Road | North of Cambridge Street | Northbound | 642 | 1 day | 19/08/2010 | Thursday | 5am - 7pm | ODSurvey | 2010 |
| 4 | Armidale Road | North of Cambridge Street | Southbound | 404 | 1 day | 19/08/2010 | Thursday | 5am - 7pm | ODSurvey | 2010 |
| 5 | Armidale Road | South of Jubilee Avenue | Northbound | 620 | 5 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 6 | Armidale Road | South of Jubilee Avenue | Southbound | 411 | 5 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 7 | Armidale Road | North of Brickworks Lane | Northbound | 497 | 1 day | 19/08/2010 | Thursday | 5am - 7pm | ODSurvey | 2010 |
| 8 | Armidale Road | North of Brickworks Lane | Southbound | 171 | 1 day | 19/08/2010 | Thursday | 5am - 7pm | ODSurvey | 2010 |
| 9 | Arthur Street | Between Queen Street and Mary Street | Eastbound | 254 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 10 | Arthur Street | Between Queen Street and Mary Street | Westbound | 169 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 11 | Bacon Street | Between WoodwaRoad Street and Clarence | Westbound | 43 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 12 | Bent Street | Bent Street/ Spring Street Intersection | Southbound | 1063 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 13 | Bent Street | Bent Street/ Spring Street Intersection | Northbound | 1697 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 14 | Bent Street | Bent Street/ Gwydir Highway Intersection | Southbound | 952 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 15 | Bent Street | Bent Street/ Gwydir Highway Intersection | Northbound | 888 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 16 | Bent Street | South of Vere Street | Northbound | 665 | 1 day | 12/03/2009 | Thursday | 7am - 6pm | Tube Count | 2009 |
| 17 | Bent Street | South of Vere Street | Southbound | 339 | 1 day | 12/03/2009 | Thursday | 7am - 6pm | Tube Count | 2009 |
| 18 | Bligh Street | Bligh Street/ Gwydir Highway Intersection | Southbound | 102 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 19 | Bligh Street | Bligh Street/ Gwydir Highway Intersection | Northbound | 696 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 20 | Breimba Street | Between Fry Street and Dobie Street | Northbound | 31 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 21 | Breimba Street | Between Fry Street and Dobie Street | Southbound | 41 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 22 | Bridge | Northern Approach | Southbound | 2309 | 5 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 5am-12pm | Tube Count | 2010 |
| 23 | Bridge | Southern Approach | Northbound | 1448 | 5 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 5am-12pm | Tube Count | 2010 |
| 24 | Butterfactory Lane | Between Richmond Road and Lawrence Road | Eastbound | 16 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 25 | Butterfactory Lane | Between Lawrence Road and Great Marlow | Eastbound | 5 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 26 | Butterfactory Lane | Between Richmond Road and Lawrence Road | Westbound | 19 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 27 | Butterfactory Lane | Between Lawrence Road and Great Marlow | Westbound | 16 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 28 | Centenary Drive | North of Helens Drive | Northbound | 62 | 1 day | 16/07/2009 | Thursday | 12am - 12am | Tube Count | 2009 |
| 29 | Centenary Drive | North of Helens Drive | Southbound | 61 | 1 day | 16/07/2009 | Thursday | 12am - 12am | Tube Count | 2009 |
| 30 | Centenary Drive | Between Pacific Highway and Pacific Highway | Northbound | 56 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 31 | Centenary Drive | Between Pacific Highway and Pacific Highway | Southbound | 83 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 32 | Clarence Street | Between Fry Street and Dobie Street | Northbound | 27 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 33 | Clarence Street | Between Fry Street and Dobie Street | Southbound | 90 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 34 | Cranworth Street | Between Dobie Street and Fry Street | Northbound | 124 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 35 | Cranworth Street | Between Dobie Street and Fry Street | Southbound | 252 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 36 | Dobie Street | Between Kent Street and Clarence Street | Eastbound | 58 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 37 | Dobie Street | Between Queen Street and bowtell Avenue | Eastbound | 369 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 38 | Dobie Street | Between Kent Street and Clarence Street | Westbound | 129 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 39 | Dobie Street | Between Queen Street and bowtell Avenue | Westbound | 309 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 40 | Fitzroy Street | Fitzroy Street/ Villiers Street Intersection | Westbound | 2345 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 41 | Fitzroy Street | Fitzroy Street/ Villiers Street Intersection | Eastbound | 571 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 42 | Fitzroy Street | Fitzroy Street/ Prince Street Intersection | Eastbound | 849 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 43 | Fitzroy Street | Fitzroy Street/ Prince Street Intersection | Westbound | 422 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 44 | Gwydir Highway | Gwydir Highway/ Bent Street Intersection | Westbound | 688 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 45 | Gwydir Highway | Gwydir Highway/ Bent Street Intersection | Eastbound | 588 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 46 | Gwydir Highway | Gwydir Highway/Bligh Street Intersection | Westbound | 453 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 47 | Gwydir Highway | Gwydir Highway/ Pacific Highway Intersection | Eastbound | 415 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 48 | Gwydir Highway | East of Hay Street | Eastbound | 626 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 49 | Gwydir Highway | East of Hay Street | Westbound | 189 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 50 | Gwydir Highway | Between Cowan Street and Abbot Street | Eastbound | 672 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 51 | Gwydir Highway | Between Cowan Street and Abbot Street | Westbound | 241 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 52 | Hoof Street | East of Prince Street | Westbound | 52 | 1 day | 3/07/2008 | Thursday | 12am - 12am | Tube Count | 2008 |
| 53 | Hoof Street | East of Prince Street | Eastbound | 40 | 1 day | 3/07/2008 | Thursday | 12am - 12am | Tube Count | 2008 |
| 54 | Hoof Street | Between Villiers Street and Chapman Street | Eastbound | 41 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 55 | Hoof Street | Between Villiers Street and Chapman Street | Westbound | 47 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 56 | Lawrence Road | North of North Street | Southbound | 272 | 1 day | 12/03/2009 | Thursday | 7am - 6pm | Tube Count | 2009 |
| 57 | Lawrence Road | North of North Street | Northbound | 104 | 1 day | 12/03/2009 | Thursday | 7am - 6pm | Tube Count | 2009 |
| 58 | Lawrence Road | Between North of Experimental Farm Lane | Northbound | 54 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 59 | Lawrence Road | Between North of Experimental Farm Lane | Southbound | 194 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 60 | Lawrence Road | North of Butterfactory Lane | Southbound | 207 | 1 day | 19/08/2010 | Thursday | 5am - 7pm | ODSurvey | 2010 |
| 61 | Lawrence Road | North of Butterfactory Lane | Northbound | 102 | 1 day | 19/08/2010 | Thursday | 5am - 7pm | ODSurvey | 2010 |
| 62 | North Street | WeStreet of Cassia Street | Westbound | 57 | 1 day | 30/10/2008 | Thursday | 12am - 12am | Tube Count | 2008 |
| 63 | North Street | WeStreet of Cassia Street | Eastbound | 100 | 1 day | 30/10/2008 | Thursday | 12am - 12am | Tube Count | 2008 |
| 64 | North Street | Between Mary Street and Queen Street | Eastbound | 154 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 65 | North Street | Between Cranworth and Milton Street | Eastbound | 136 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 66 | North Street | Between Mary Street and Queen Street | Westbound | 154 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 67 | North Street | Between Cranworth and Milton Street | Westbound | 65 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 68 | Oliver Street | East of Cransworth Street | Westbound | 85 | 1 day | 12/02/2009 | Thursday | 12am - 12am | Tube Count | 2009 |
| 69 | Oliver Street | East of Cransworth Street | Eastbound | 126 | 1 day | 12/02/2009 | Thursday | 12am - 12am | Tube Count | 2009 |
| 70 | Pacific Highway | South of Centenary Drive | Northbound | 735 | 1 day | 19/08/2010 | Thursday | 5am-7pm | ODSurvey | 2010 |
| 71 | Pacific Highway | South of Centenary Drive | Southbound | 413 | 1 day | 19/08/2010 | Thursday | 5am-7pm | ODSurvey | 2010 |
| 72 | Pacific Highway | Pacific Highway/ Gwydir Highway Intersection | Northbound | 680 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 73 | Pacific Highway | Pacific Highway/ Gwydir Highway Intersection | Southbound | 883 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 74 | Pacific Highway | North of Centenary Drive | Southbound | 678 | 1 day | 12/03/2009 | Thursday | 7am - 6pm | Tube Count | 2009 |
| 75 | Pacific Highway | North of Centenary Drive | Northbound | 447 | 1 day | 12/03/2009 | Thursday | 7am - 6pm | Tube Count | 2009 |
| 76 | Pacific Highway | East of Heber Street | Northbound | 620 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 77 | Pacific Highway | East of Heber Street | Southbound | 415 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 78 | Pacific Highway | Pacific Highway/ Duncans Lane Intersection | Northbound | 330 | 1 day | 22/06/2006 | Thursday | 12am - 12am | Tube Count | 2006 |
| 79 | Pacific Highway | Pacific Highway/ Duncans Lane Intersection | Southbound | 553 | 1 day | 22/06/2006 | Thursday | 12am - 12am | Tube Count | 2006 |
| 80 | Pacific Highway | North of Centenary Drive | Northbound | 487 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 81 | Pacific Highway | North of Centenary Drive | Southbound | 743 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 82 | Pacific Highway | South of Lillypool Road | Northbound | 681 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |

| | | | | | | | | | | |
|-----|-----------------|---|------------|-----|---------|-------------------------|---------------------|-------------|---------------|------|
| 83 | Pacific Highway | North of Four Mile Road | Southbound | 423 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 84 | Pacific Highway | East of Viaduct Road | Northbound | 723 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 85 | Pacific Highway | East of Viaduct Road | Southbound | 325 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 86 | Pound Street | Pound Street/ Prince Street Intersection | Westbound | 486 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 87 | Pound Street | Pound Street/ Prince Street Intersection | Eastbound | 563 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 88 | Pound Street | North of Alice Street | Northbound | 375 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 89 | Pound Street | North of Alice Street | Southbound | 796 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 90 | Pound Street | Between Clarence Street and Kent Street | Eastbound | 51 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 91 | Pound Street | Between Clarence Street and Kent Street | Westbound | 151 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 92 | Powell Street | Between Turf Street and Cranworth Street | Eastbound | 80 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 93 | Powell Street | Between Turf Street and Cranworth Street | Westbound | 68 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 94 | Prince Street | Prince Street/ Pound Street Intersection | Northbound | 393 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 95 | Prince Street | Prince Street/ Pound Street Intersection | Southbound | 543 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 96 | Prince Street | Prince Street/ Fitzroy Street Intersection | Northbound | 299 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 97 | Prince Street | Prince Street/ Fitzroy Street Intersection | Southbound | 560 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 98 | Prince Street | North of Oliver Street | Northbound | 389 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 99 | Prince Street | North of Oliver Street | Southbound | 556 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 100 | Queen Street | Between Ford Street and North Street | Northbound | 206 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 101 | Queen Street | Between Arthurs Street and Crown Street | Northbound | 293 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 102 | Queen Street | Between Ford Street and North Street | Southbound | 359 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 103 | Queen Street | Between Arthurs Street and Crown Street | Southbound | 448 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 104 | Skinner Street | South of Gwydir Highway | Northbound | 310 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 105 | Skinner Street | South of Gwydir Highway | Southbound | 201 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 106 | Spring Street | Spring Street/ Bent Street Intersection | Westbound | 200 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 107 | Spring Street | Spring Street/ Bent Street Intersection | Eastbound | 102 | 1 day | 15/11/2007 | Thursday | 7am-10am, | Intersection | 2007 |
| 108 | Spring Street | Between Wharf Street and New Street | Eastbound | 106 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 109 | Spring Street | Between Wharf Street and New Street | Westbound | 87 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 110 | Summerland Way | South of Clarence Way | Northbound | 137 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 111 | Summerland Way | South of Clarence Way | Southbound | 268 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 112 | Summerland Way | North of Butterfactory Lane | Northbound | 285 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 113 | Summerland Way | North of Butterfactory Lane | Southbound | 629 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 114 | Summerland Way | North of Butterfactory Lane | Northbound | 318 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 115 | Summerland Way | North of Butterfactory Lane | Southbound | 764 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 116 | Turf Street | Between Dobie Street and Powell Street | Northbound | 446 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 117 | Turf Street | Between Dobie Street and Powell Street | Southbound | 708 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 118 | Victoria Street | Between Villier Street and Clarence Street | Eastbound | 33 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 119 | Victoria Street | Between Villier Street and Clarence Street | Westbound | 85 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 120 | Villiers Street | Villiers Street/ Fitzroy Street Intersection | Northbound | 67 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 121 | Villiers Street | Villiers Street / Fitzroy Street Intersection | Southbound | 566 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 122 | Villiers Street | Between Fitzroy Street and Pound Street | Northbound | 955 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Video Traffic | 2011 |
| 123 | Villiers Street | Pound Street/ Villiers Street Intersection | Westbound | 157 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 124 | Villiers Street | Between Pound Street and Bacon Street | Northbound | 567 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Video Traffic | 2011 |
| 125 | Villiers Street | Pound Street/ Villiers Street Intersection | Eastbound | 294 | 1 day | 11/03/2009 | Wednesday | 7am-10am, | Video Traffic | 2009 |
| 126 | Villiers Street | North of Oliver Street | Northbound | 517 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 127 | Villiers Street | North of Oliver Street | Southbound | 647 | 6 days | 19/08/2010 - 26/08/2010 | Thursday - Thursday | 12am - 12am | Tube Count | 2010 |
| 128 | Villiers Street | etween Powell Street and Hoof Street | Northbound | 298 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 129 | Villiers Street | Between Powell Street and Hoof Street | Southbound | 379 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 130 | Villiers Street | Between Pound Street and Bacon Street | Southbound | 666 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 131 | Villiers Street | Between Fitzroy Street and Pound Street | Southbound | 634 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 132 | Washpool Road | East of Centenary Drive | Westbound | 67 | 1 day | 9/11/2006 | Thursday | 12am - 12am | Tube Count | 2006 |
| 133 | Washpool Road | East of Centenary Drive | Eastbound | 27 | 1 day | 9/11/2006 | Thursday | 12am - 12am | Tube Count | 2006 |
| 134 | Wharf Street | Between Through Street and Spring Street | Northbound | 97 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 135 | Wharf Street | Between Spring Street and Lawrence Lane | Northbound | 77 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |
| 136 | Wharf Street | Between Through Street and Spring Street | Southbound | 77 | 10 days | 20/06/2011 - 3/07/2011 | Monday - Sunday | 12am - 11pm | Tube Count | 2011 |

APPENDIX B - DESCRIPTION OF MATRIX ESTIMATION METHOD

Estimating the Origin – destination matrix for the 2011 existing condition model was undertaken using the TRIPS “Matrix Estimator” module. The TRIPS estimation module is a computationally intensive process that performs a set of iterative calculations that will determine statistically the most likely matrix for the set of input data values provided. In this case, the input values are the count data for the network.

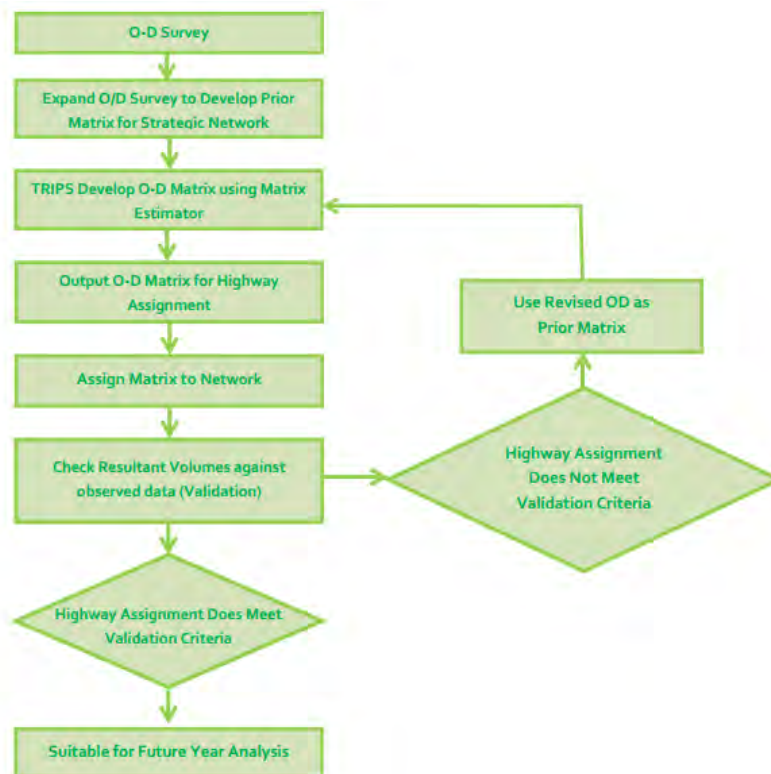
The “Matrix estimator” requires a starting (or prior) matrix in order to perform the process. In this case, the starting matrix was determined from the origin and destination survey complete in August 2010.

Once the TRIPS “Matrix Estimation” process is complete, an origin destination matrix is produced which is then input into the network in the form of a “highway assignment”. The model is processed, and the resultant volumes are checked against observed data to determine if it satisfactorily meets a predetermined validation criterion.

If the resultant outputs do not meet the validation criteria, the O-D matrix is re used as a prior matrix for a second iteration using the TRIPS “Matrix Estimation” module. This process is completed until the validation criteria is satisfied.

The following chart details the Matrix Estimation process used for this project.

Figure 1: Matrix Estimation Methodology



Date: 1st October 2012

APPENDIX II: Extracts of comments from the 16 pages report and supporting evidence provided by Ms L. Cairns of the Grafton Concerned Citizens Group in October 2012; “Consultation process – second bridge and new freight route for Grafton”

The consultants interpret some of these comments are relevant in the context of the eight criteria of best practice for community involvement described in the main report.

....lack of continuitywith the number of managers and project managers (about 8) running the process. When the process was moved from the responsibility of the Regional Office to the PHO in October 2010 it was about 5 months until the new project team held an open public forum, on 3 March 2011. It was 5 months until the new project team personally introduced themselves to the community at an open forum....(pg 2)

“The postal survey questions were ambiguous and open ended (no in accordance with the RMS Community Involvement and Consultation PolicyThe community voted unanimously at the August 2010 workshop to help formulate the questions for the survey” (pg 3).

“Lack of responding to emails and correspondence and not responding within the RMS guarantee of timeframe of 15 business days....[automatically generated email outlining RMS timeframe], showing delay in responding” (pg 5)

“Springing things on the community without prior warning and expecting an immediate decision, such as the methodology for short listing options (see attachment T1 and T2). Three methodologies were provided without prior warning, for the first time to the community at the forum on date 16 March 2011. A decision was immediately required. See RMS website video dated 16 March 2011 afternoon at 1 hr 42 mins. Only those attending were aware of RMS decision on methodology chosen for short listing. And this was not advertised to the wider community”. (pg 6)

“Due to the anomalies in the October Report our Group met with the RMS to outline our concerns. One such concern was the accuracy of the data collected for comparison between the options such as the noise sensitive receivers. Corridor 3 showed Dobie Street with almost double the potential of noise sensitive receivers with doubling of traffic (see attachment Z1 -this report has been removed from the RMS website). The RMS produced a map and explanation of the data. Following discussions and despite requests the RMS refused to provide this explanation or maps to the public (see attachment Z2)”. (pg 8)

.....”the community was given insufficient notice, only:

- *7 days notice of the open public forum on 18 September 2012 (see attachment DD1). RMS had discussions with and notified Professor John Black to attend the forum and gave him notification on 6 September, more than the community received (see attachment DD2). Not*

in accordance with the RMS Community Involvement and Consultation Policy- see attachment DD3.

- *7 days notice to read and comprehend some 1,400 pages of technical papers (RMS Route Options Development Report Volumes 1, 2 and 3);*
- *3 days notice of a briefing session for selected groups to provide a presentation at the public forum (see attachment DD4);*
- *4 days notice for each invited group to then formulate a presentation to provide at the public forum (see attachment DD4);*
- *The comment period and nomination period (10 September to 10 October) for the value management workshop was held during the September/October 2012 school holiday period (holiday period 21 September to 8 October). Minister Duncan Gay had previously promised this would not occur, has had happened with the postal survey held over the December 2010 and January 2011 holiday and Christmas period.” (pg 9)*

“...The people of Grafton City are worn down and have lost interest given the lengthy and dislocated timeframe over the past 3 years since December 2009” (pg 12)

....”All community surveys, some 6 surveys, since 2003 have shown that the community responding wants a bridge on the outskirts of town. Even the telephone, postal and business surveys in 2010/2011 since the process was the responsibility of the Pacific Highway Office, show that those responding want the second bridge and new freight route located on the outskirts of town. And now two in town options have been chosen to go forward, C and E - and the community has been misled. How can residents of Grafton have faith and confidence in the process? (pg 12).

“Ensure sufficient notice is provided to the community for all forums with the community” (pg 14)

“Widely advertise for input in relation to the community's needs for consultation and provide topics the community wants at forums”; (pg 14)

“Avoid using confusing, ambiguous and open ended questions in surveys” (pg 14).

“Ensure that any extension of a submission or survey period is widely advertised” (pg 15)

“Provide thorough explanations and information of technical questions at public forums” (pg 15).