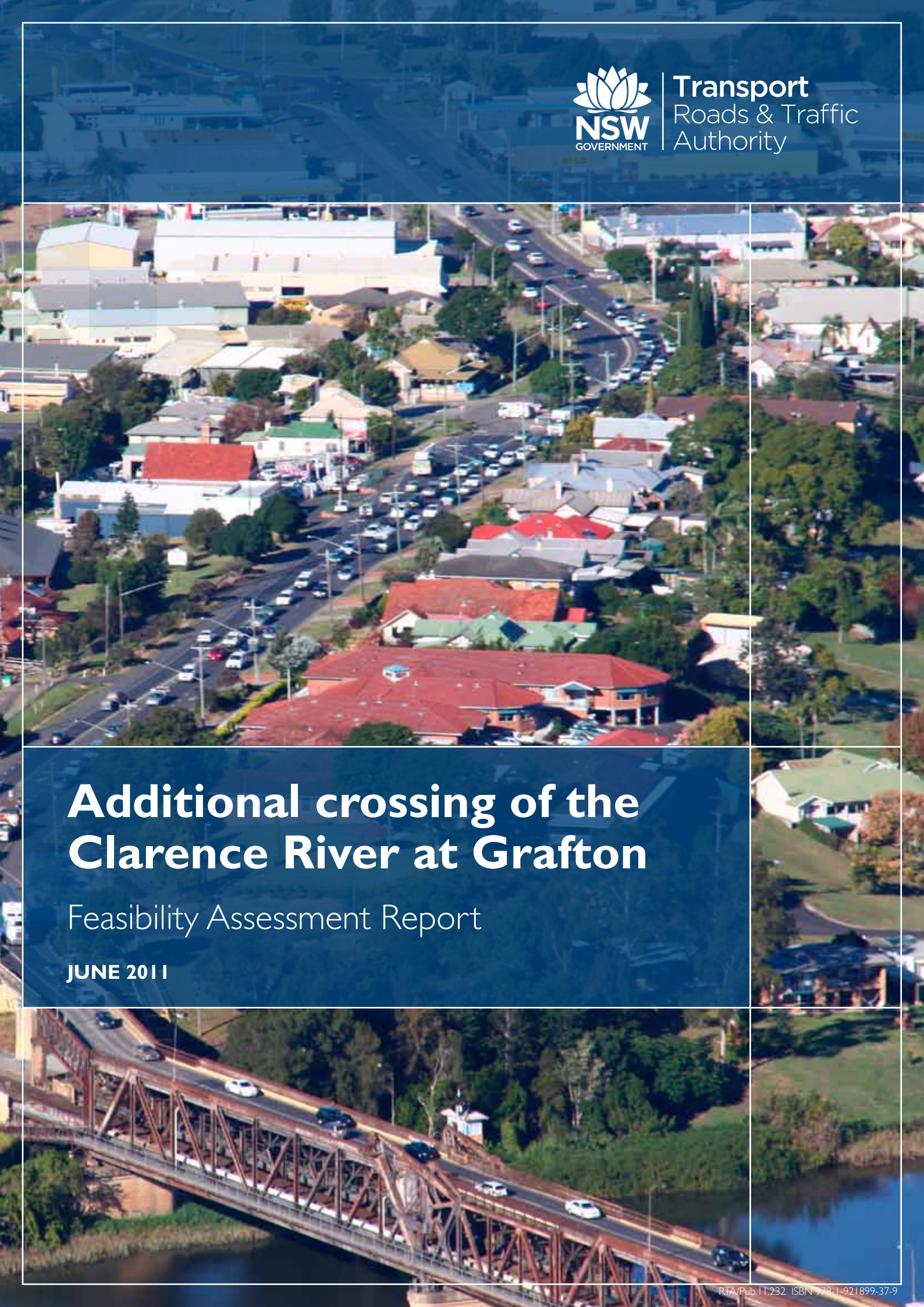

NSW GOVERNMENT
Transport
Roads & Traffic
Authority

Additional crossing of the Clarence River at Grafton

Feasibility Assessment Report

JUNE 2011

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Transport Roads & Traffic Authority

Main Road 83 Summerland Way Additional Crossing of the Clarence River at Grafton

Feasibility Assessment Report

June 2011

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1 Contents

Appendices

2 About this report

2.1 Introduction and background

The NSW Roads and Traffic Authority (RTA) is currently undertaking planning to identify a preferred location for an additional crossing of the Clarence River at Grafton.

In December 2010, a community update described a revised consultation process for this project. The community update displayed 13 preliminary route options for an additional crossing of the Clarence River at Grafton and included a community postal survey regarding the additional crossing.

437 responses to the postal survey were received between 6 December 2010 and 8 March 2011. Of the 437 responses received, 70 respondents suggested new locations for the additional crossing. A number of the suggestions were identical or similar and based on this feedback, 28 new route suggestions were identified. The addition of these 28 community suggestions brought the total number of suggestions and preliminary options for an additional crossing location to 41. We call these 41 suggestions.

Due to the significant number of crossing locations suggested by the community, the RTA has developed a process to identify a recommended preferred option from the 41suggestions. This process is discussed further in Sections 3 and 4 of this report.

The initial phase of this process is to assess the feasibility of the 41 suggestions. It is important that the options taken forward for more investigation satisfy basic requirements and have no clear and significant environmental impact. As such, the RTA project team held a workshop on 14 April 2011, to identify feasible options for further consideration. The results of this workshop are outlined in this report.

Strategic high-level cost estimates have been prepared to understand the comparative costs implications for the suggestions. The strategic cost estimates were prepared for comparative purposes only and were not considered in this phase of the investigations.

2.2 Purpose of this report

This report documents the process and results of the feasibility assessment of the 41 suggestions.

The report will:

- Describe the 41 suggestions.
- Describe the methods used for assessing the feasibility of these suggestions.
- Document the process to identify those suggestions that are not feasible.
- Identify the preliminary route options to be taken forward for further investigation.
- Document the comparative strategic cost estimate for each of the 41 suggestions.
- Identify the next steps in the identification of a preferred location for an additional crossing of the Clarence River, Grafton.

2.3 Project purpose and objectives

The purpose of the project is:

To identify an additional crossing of the Clarence River at Grafton to address short-term and long-term transport needs.

The key objectives of the project are to:

- Enhance road safety for all road users over the length of the project.
- Improve traffic efficiency between and within Grafton and South Grafton.
- Support regional and local economic development.
- Involve all stakeholders and consider their interests.
- Provide value for money.
- Minimise impact on the environment.

To assist in achieving these key objectives, supporting objectives are being developed in consultation with the community. The adopted supporting objectives will be identified in future reports.

3 41 suggestions

The 41 suggestions assessed at the Feasibility Workshop on 14 April 2011 included the 13 preliminary options A to M from the December 2010 community update and the additional 28 community suggestions received. The 41 suggestions are presented in **Figure 1** and also **Appendix A – Grafton options and community suggestions**. For ease of reference, the 28 community suggestions have been numbered consecutively from 1 to 28, starting at the most upstream locality, heading in a downstream direction. (NB: The suggestion numbered 28 was identified after the close of feedback and therefore does not appear in this sequence).

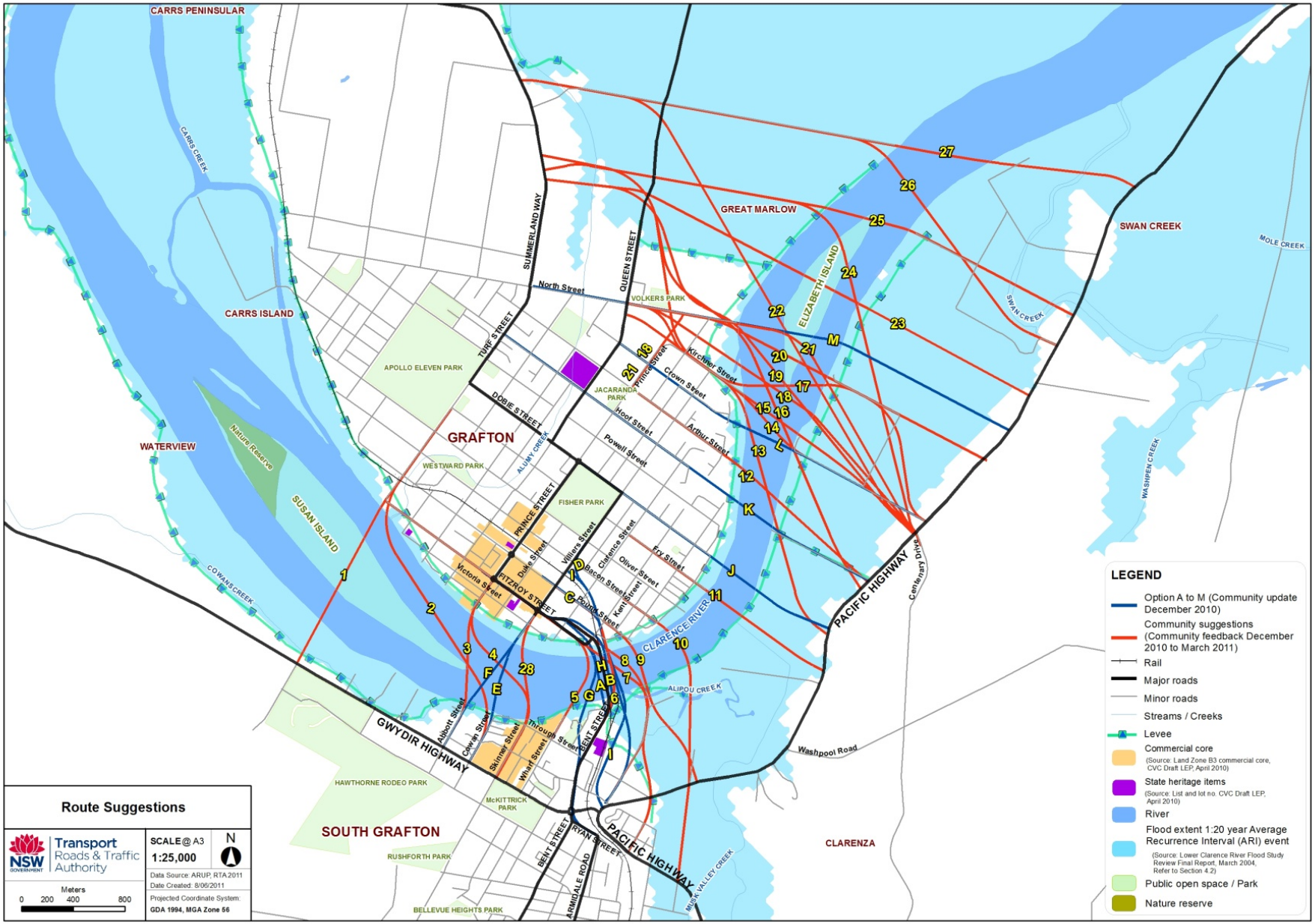


Figure 1 – 41 suggestions for an additional crossing of the Clarence River at Grafton.

4 Methods for short-listing suggestions

The RTA identified three potential methods for short-listing the 41 suggestions. The three methods were presented to the community at a forum held at the Grafton Community Centre on Thursday 3 March 2011. Community feedback was requested on the three short-listing methods at this forum, and via the project website.

4.1 Potential short-listing methodologies

The three methods considered for the short-listing of suggestions were:

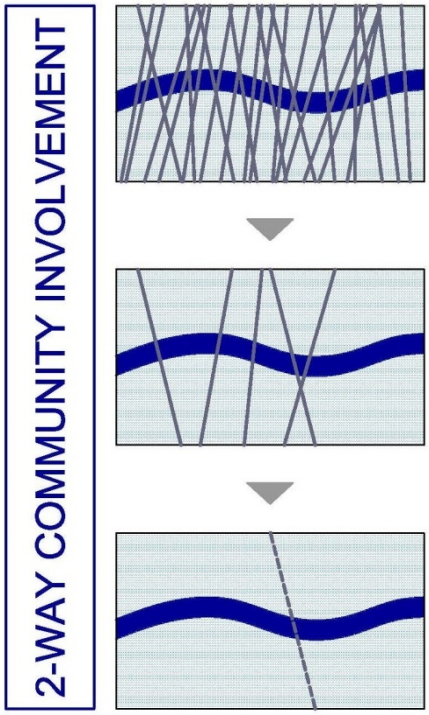
- Method 1 – Assess all 41 suggestions in detail, identify a short-list of options, then identify a recommended preferred option.
- Method 2 – Group suggestions into corridors, identify the best option(s) within each corridor, then identify a recommended preferred option.
- Method 3 – Group suggestions into corridors, identify a preferred corridor and identify the best option within the preferred corridor.

These methods are explained in more detail below.

Method 1

Method 1 comprises the following steps:

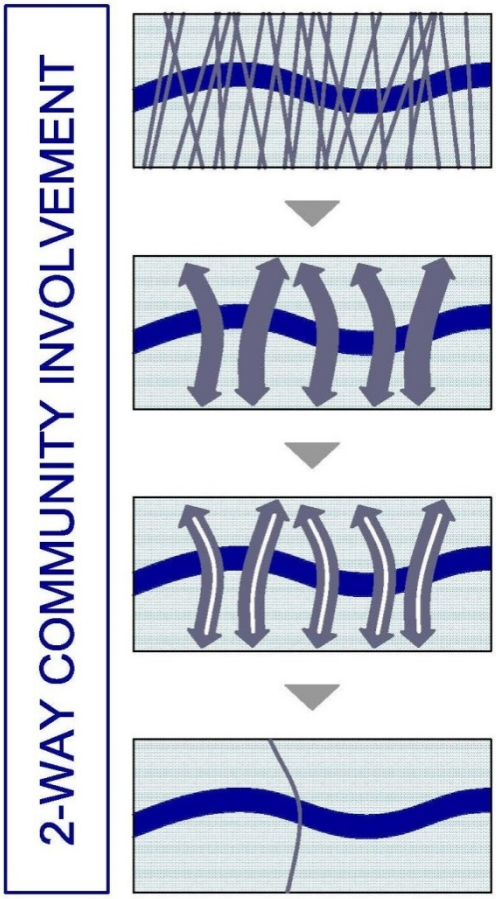
- Identify all suggestions. Undertake detailed engineering and environmental studies and site investigations on these.
- Identify a short list of the best route options based on technical investigations and community input.
- Identify a recommended option from the short list of route options based on further technical investigations, community input and a Value Management Workshop for community review.
- Finalise the preferred option



Method 2

Method 2 comprises the following steps:

- Identify all suggestions.



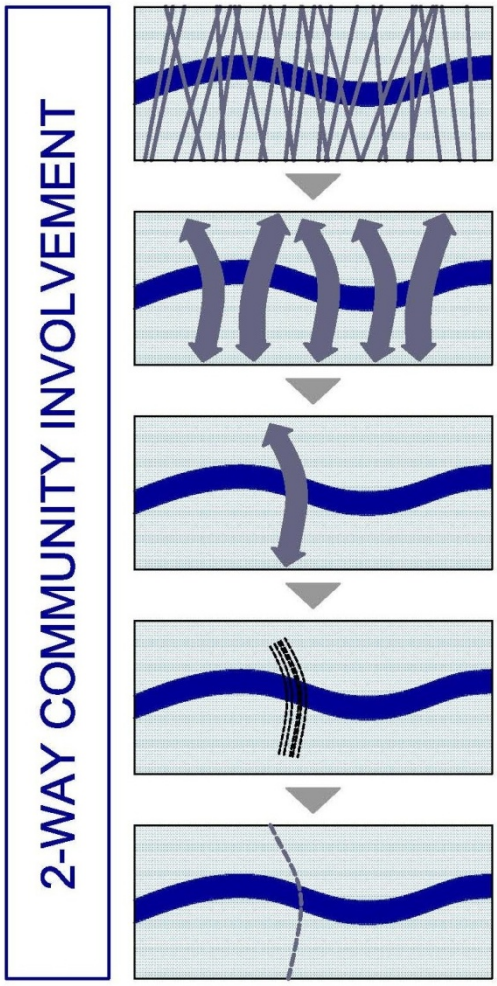
- Group the suggestions into strategic corridors. Assess the feasibility of these suggestions against key engineering and environmental considerations. Identify the suggestions that are not feasible, based on their obvious environmental and engineering impacts.
- Identify the best route option(s) within each of the strategic corridors based on technical investigations and community input.
- Identify a recommended option from the best route option(s) within each corridor based on further technical investigations, community input and a Value Management Workshop for community review.

- Finalise the preferred option

Method 3

Method 3 comprises the following steps:

- Identify all suggestions.
- Group suggestions into strategic corridors and assess feasibility against key engineering and environmental considerations.
- Identify a preferred corridor.
- Identify the best route option(s) within the preferred corridor based on technical investigations and community input.
- Identify a recommended option from the route options within the preferred corridor based on further technical investigations, community input and a Value Management Workshop for community review.
- Finalise the preferred option



4.2 Preferred short-listing method

In response to community consultation and requests for feedback, no preference was expressed by the community for a preferred short-listing method.

Method 2 was announced at the community forum held at the Grafton Community Centre on Wednesday 16 March 2011 as the preferred methodology to be followed to identify a recommended preferred location for an additional crossing. Feedback from the community forum on 3 March 2011 about information that will assist in evaluating suggestions will be used during the short-listing process.

5 Feasibility assessment

This section documents the feasibility assessment of the 41 suggestions for an additional crossing of the Clarence River at Grafton that was undertaken at the workshop held on 14 April 2011.

5.1 Identification of strategic corridors

The area covered by the suggestions was divided into five corridors, which represent the strategic desire lines across the Clarence River that were identified by the project team. The location and description of these corridors is presented below.

Corridor 1

Corridor 1 comprises the suggestions upstream of the existing bridge, connecting the Gwydir Highway at South Grafton approximately between Skinner Street and Hay Street to the Grafton central business district between Villiers Street and Turf Street. Corridor 1 includes the eastern portion of Susan Island.

Preliminary options E and F and community suggestions 1, 2, 3, 4 and 28 are located within this corridor. The locations of these suggestions are shown in **Figure 2** and can also be found in **Appendix B – Route suggestions shown in strategic corridors.**

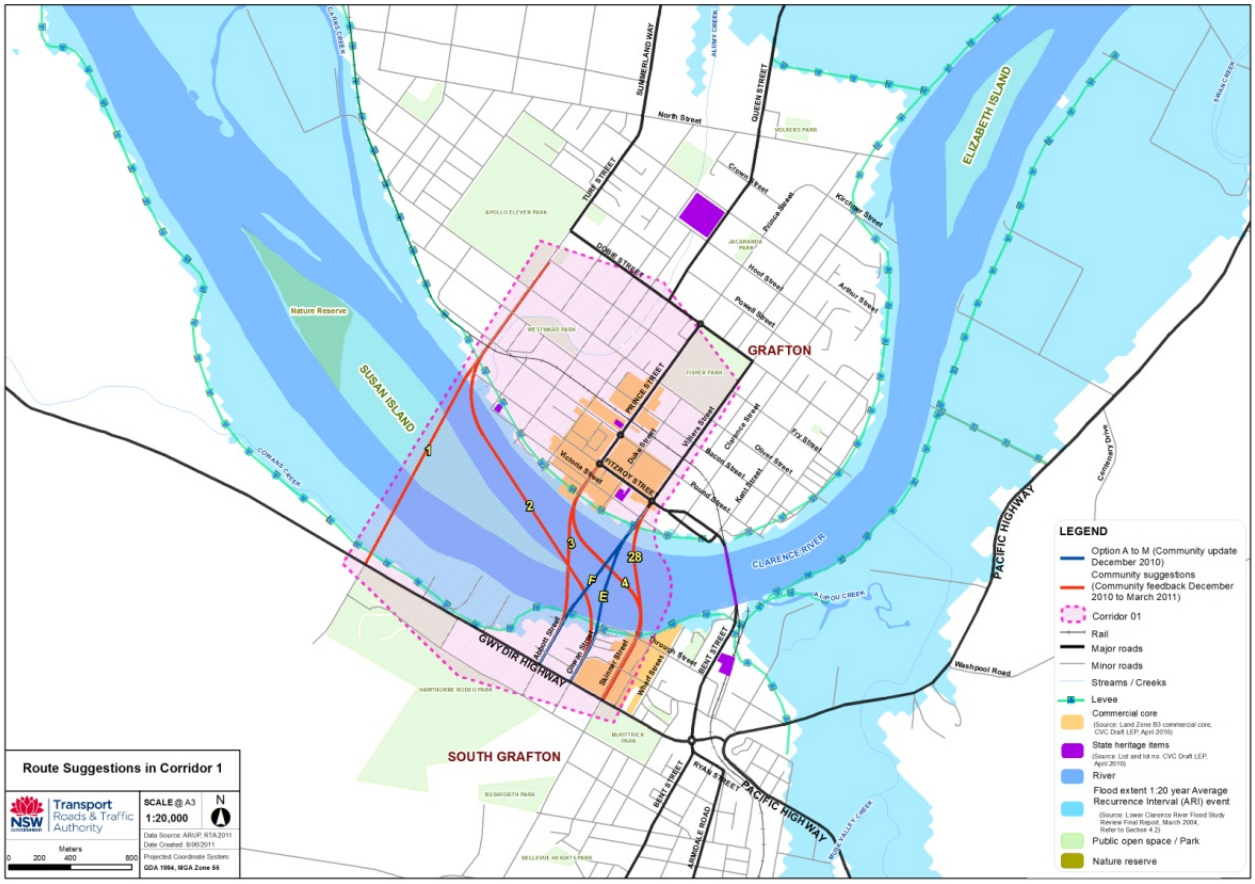


Figure 2 – Strategic corridor 1.

Corridor 2

Corridor 2 comprises suggestions in the vicinity of the existing bridge, connecting the Pacific and Gwydir highways between Alipou Creek and Wharf Street in South Grafton to the Grafton central business district between Victoria Street and Oliver Street.

Preliminary options A, B, C, D, G, H and I and community suggestions 5, 6, 7, 8, 9 and 10 are located within Corridor 2. Also, the existing river crossing is located within this corridor. The locations of these suggestions are shown in **Figure 3** and can also be found in **Appendix B**.

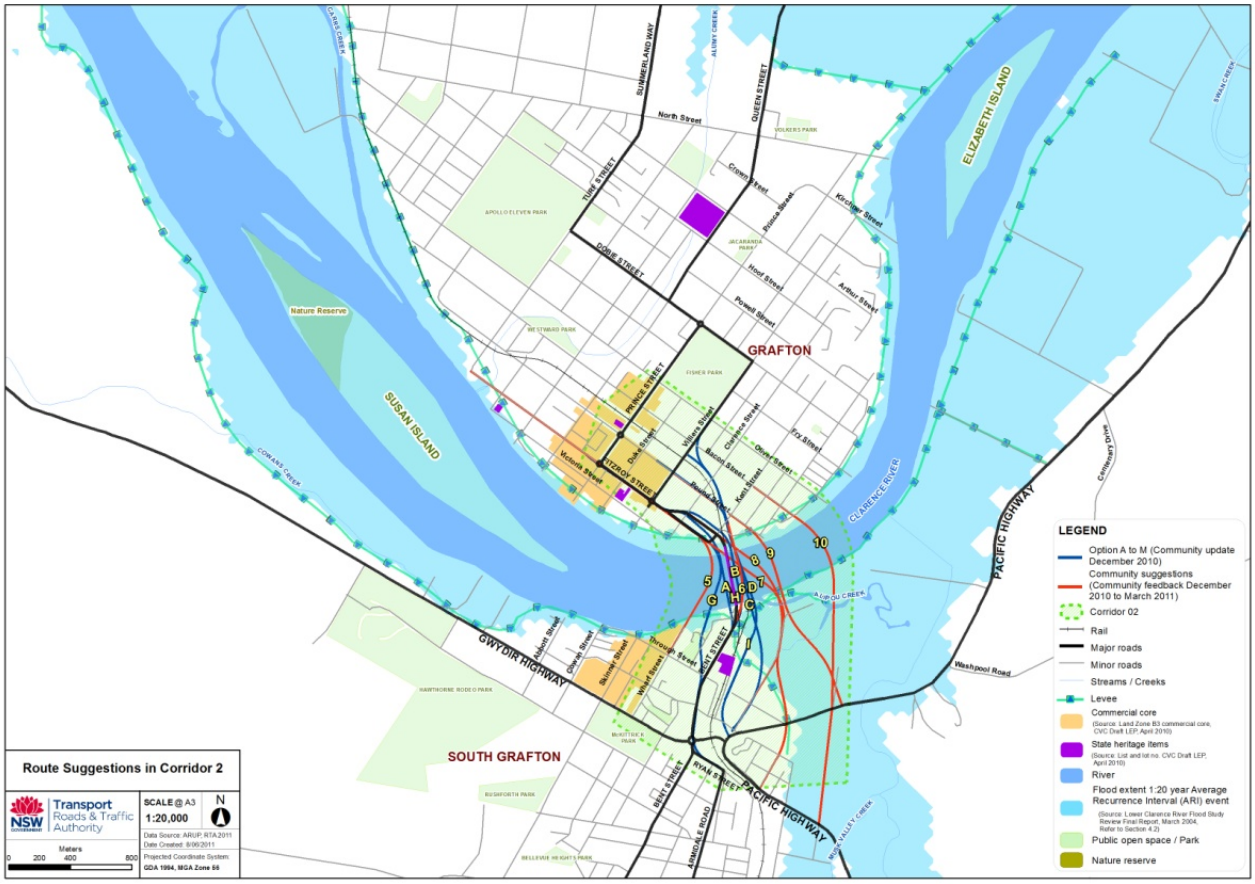


Figure 3 – Strategic corridor 2.

Corridor 3

Corridor 3 is located downstream of the existing bridge and upstream of Elizabeth Island, connecting the Pacific Highway east of South Grafton to the area north of the Grafton central business district (south of North Street). It runs approximately between Meona Lane and Alipou Creek in the south and between Oliver Street and Kirchner Street in Grafton.

Preliminary options J, K and L and community suggestions 11 and 12 are located within this corridor. The locations of these suggestions are shown in **Figure 4** and can also be found in **Appendix B**.

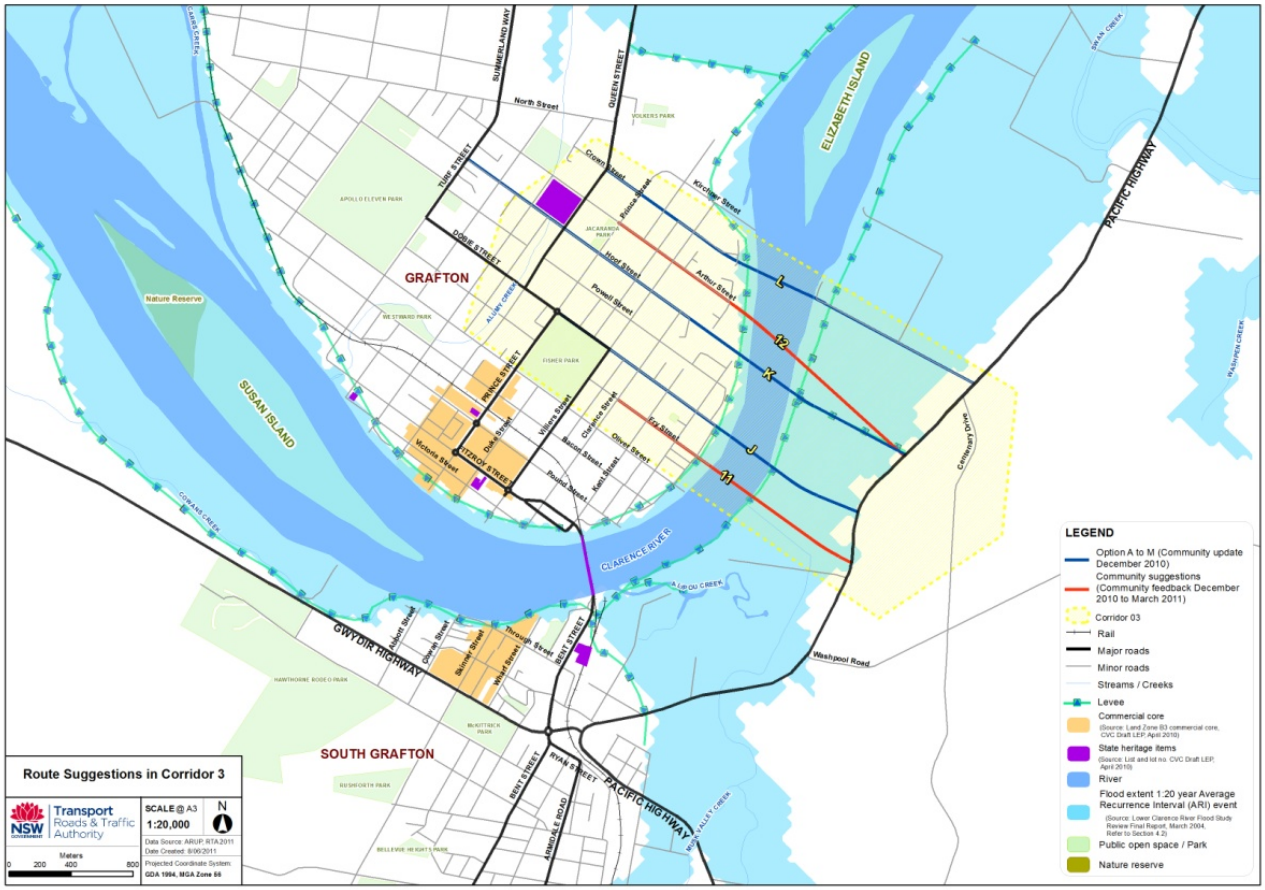


Figure 4 – Strategic corridor 3.

Corridor 4

Corridor 4 contains suggestions downstream of the existing bridge, connecting the Pacific Highway east of South Grafton to North Street in Grafton. Corridor 4 includes the southern portion of Elizabeth Island and contains preliminary option M and community suggestions 13, 14, 17, 18, 20 and 21. The locations of these suggestions are shown in **Figure 5** and can also be found in **Appendix B**.

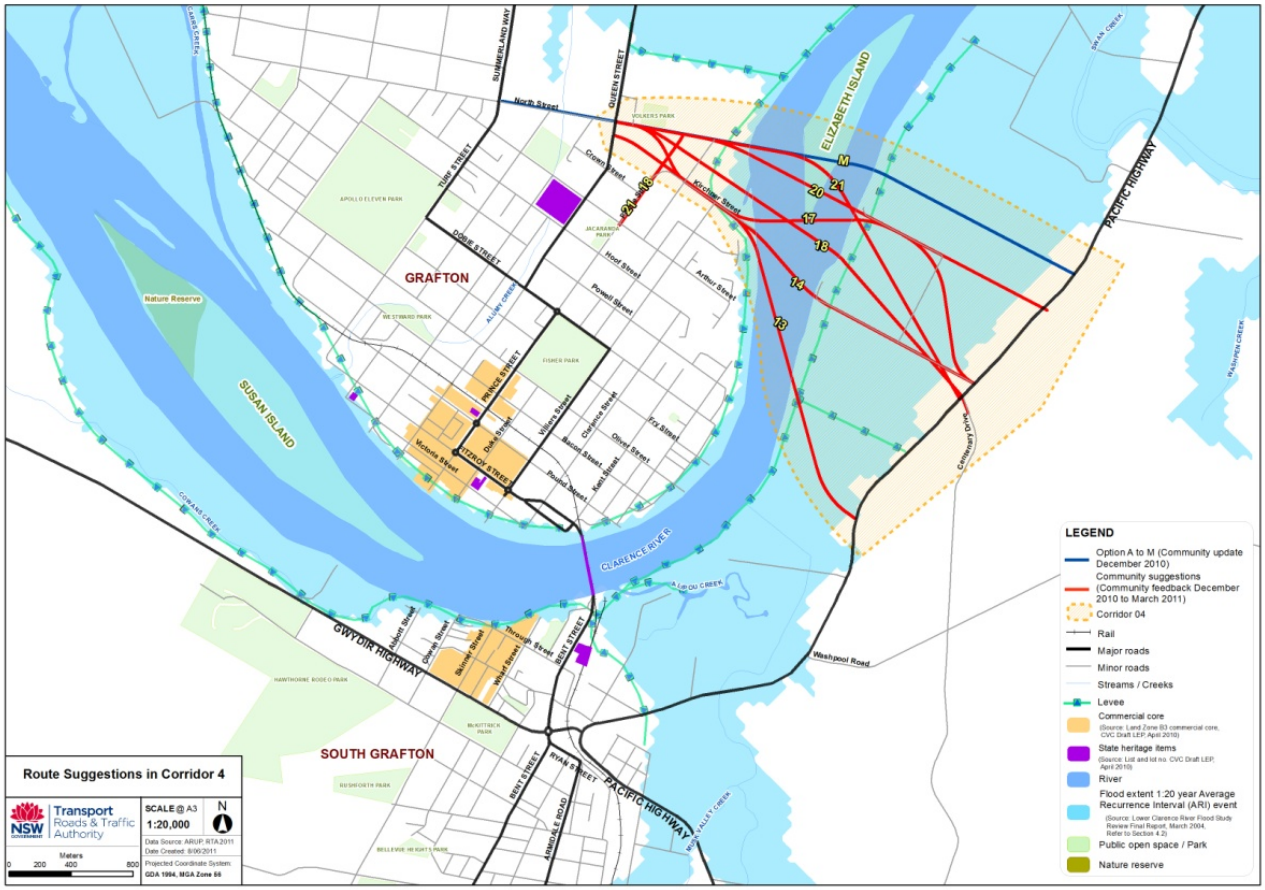


Figure 5 – Strategic corridor 4.

Corridor 5

Corridor 5 contains suggestions connecting the Pacific Highway east of South Grafton and the Summerland Way, north of North Street in Grafton. It is the furthest corridor downstream of the existing bridge and includes Elizabeth Island. Community suggestions 15, 16, 19, 22, 23, 24, 25, 26 and 27 are located within this corridor. The location of these suggestions are shown in Figure 6 and can also be found in Appendix B.

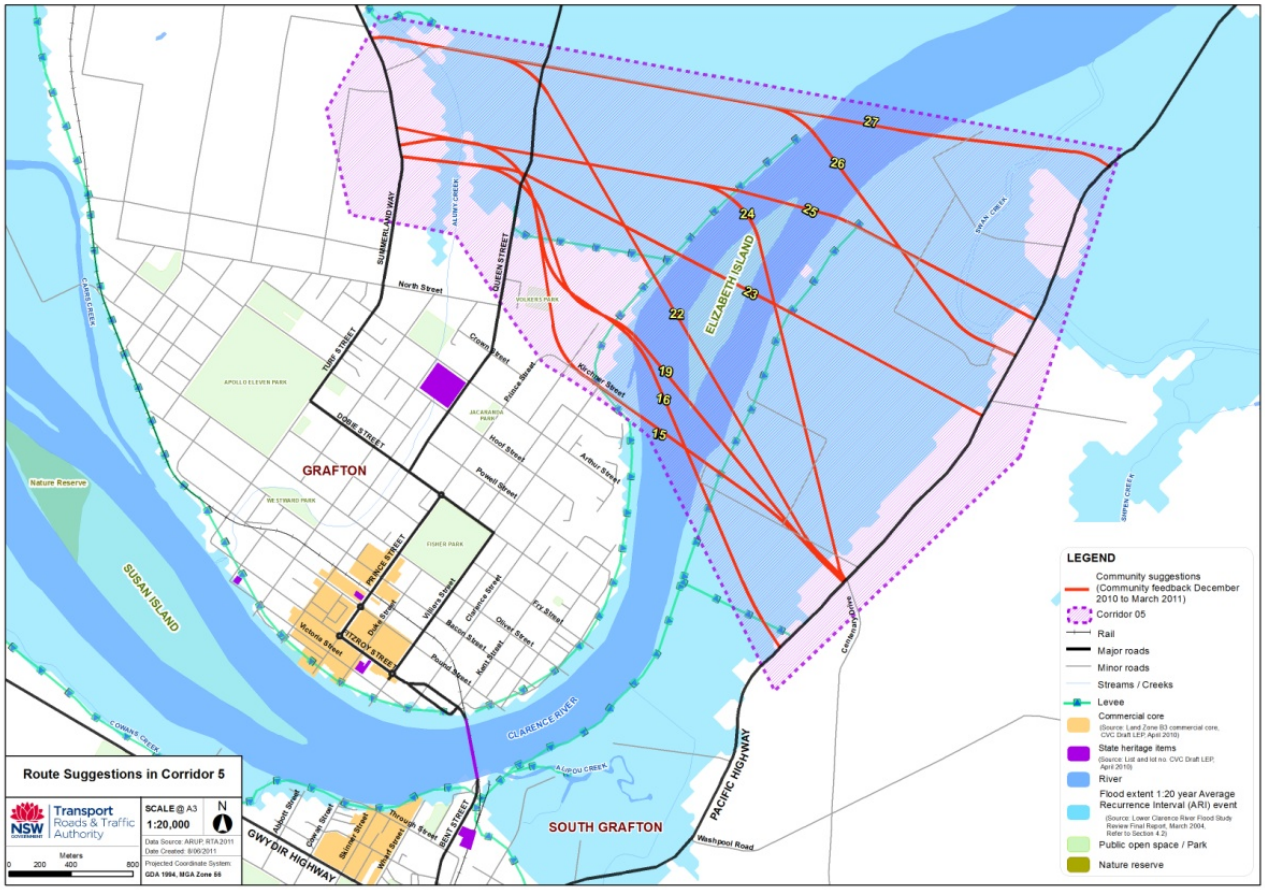


Figure 6 – Strategic corridor 5.

5.2 Feasibility assessment considerations

The purpose of the feasibility assessment was to identify any suggestions that were not feasible due to significant constraints and therefore did not warrant further, more detailed consideration. The feasibility assessment was undertaken using the following considerations:

- Engineering and constructability issues
- Land use and land use zoning impacts
- Aboriginal heritage impacts
- Impacts on native plants and animals
- Flooding impacts.

Cost of suggestions was not considered as part of the feasibility assessment.

The feasibility assessment considerations are discussed in detail below.

Engineering and constructability issues

The project team assessed the ability to construct each suggestion from an engineering and constructability perspective. Potential engineering design and construction constraints that make an option not feasible were examined. These include:

- A highly skewed bridge or viaduct structure (i.e. the angle of bridge crossing, relative to the river, is greater than approximately 30°). This scenario leads to structural complications and potential navigational and flooding impacts.
- Constructability complications for bridge structures due to the geometry of the structure (small radius curves and combinations of curves and straights).
- Difficulties of compliance with current design standards due to constraints (e.g. travel lanes and shoulder widths may not meet current standards where existing infrastructure is used, road geometry may not meet current standards without impacting on key heritage items).

Land use and land use zoning impacts

Potential impacts on key infrastructure elements were considered, such as the existing bridge and the Grafton sewage treatment works. Potential impacts on the key commercial street precincts of Grafton (Prince Street) and South Grafton (Skinner Street), which are not considered suitable for through traffic, were also considered.

Aboriginal heritage impacts

Known Aboriginal heritage on Susan Island was considered. It is acknowledged that other areas of Aboriginal cultural significance occur in the Grafton and South Grafton area, however additional consultation with local Aboriginal communities will be required before potential implications for any of the proposals can be determined.

Impacts on native plants and animals

Potential impacts on the known sensitive ecology on Susan Island such as the major black flying fox (*Pteropus alecto*) and grey-headed flying fox (*Pteropus poliocephalus*) colonies were considered as part of the feasibility assessment.

Flooding impacts

The project team considered, in general terms, the potential impact of each suggestion on flood prone areas in Grafton and South Grafton.

Based on flood modelling results documented in the *Lower Clarence River Flood Study Review Final Report* (March 2004), sections of the Grafton flood levee start to overtop during the 1:20 year Average Recurrence Interval (ARI) flood. Due to the flood risk associated with the overtopping of the Grafton levees, this ARI event represents a critical design flood event for Grafton. Within this Feasibility Assessment Report a number of the figures use the 1:20 ARI flood to indicate the approximate extent of flooding for the given event in the vicinity of Grafton. Future investigations into the likely flooding impacts of preliminary route options will assess a range of floods, including floods larger (less frequent) than the 1:20 ARI flood.

5.3 Feasibility assessment workshop

The purpose of the feasibility assessment workshop was to identify any of the 41 suggestions that were not feasible due to significant constraints and therefore did not warrant further, more detailed consideration. Each of the 41 suggestions located within the five corridors were assessed using the considerations described in Section 5.2 above. The workshop was attended by key project team members from the RTA and Arup Pty Ltd.

The following sections discuss the outcomes of the feasibility assessment within each strategic corridor. The individual feasibility assessment summary sheets showing each of the 41 suggestions are contained within Appendix C – Feasibility assessment summary sheets. The feasibility assessment report card compiled at the workshop is shown in Appendix D - Feasibility assessment workshop outcomes.

Corridor 1 feasibility assessment

The assessment of the suggestions contained within Corridor 1 found that:

- Community suggestion 1 would have significant impacts on the Aboriginal heritage and ecological values of Susan Island.
- Community suggestions 2 and 4 would require a highly skewed bridge leading to structural complications and potential navigational and flooding impacts. These suggestions were also found to have significant constructability complications due to the geometry of the structure (small radius curves and combinations of curves and straights).
- Community suggestions 3 and 4 would add unacceptable traffic volumes along Prince Street, which is the key commercial precinct for Grafton.
- Community suggestions 4 and 28 would add unacceptable traffic volumes along Skinner Street, which is the key commercial precinct for South Grafton.

The assessment concluded that community suggestions 1, 2, 3, 4 and 28 were considered not feasible and did not merit further consideration. Preliminary options E and F are considered feasible and are recommended for further engineering and environmental investigations.

The assessment findings are summarised in Table 1.

Table 1 – Corridor 1 suggestions assessment summary.

Suggestion	Engineering and constructability impacts	Land use and land use zoning impacts	Aboriginal heritage impacts	Impacts on native plants and animals	Flooding impacts	Conclusion of feasibility assessment
1			✕	✕		Does not merit further consideration
2	✕				✕	Does not merit further consideration
3		✕				Does not merit further consideration
4	✕	✕			✕	Does not merit further consideration
28		✕				Does not merit further consideration
E						Suitable for further assessment
F						Suitable for further assessment

✕ Indicates unacceptable impact.

Corridor 2 feasibility assessment

The assessment of the suggestions contained within Corridor 2 found that:

- Preliminary option G was found to have significant constructability complications due to the geometry of the structure (small radius curves and combinations of curves and straights).
- Preliminary option H includes traffic lanes on the lower deck of the existing bridge which would not comply with current road design engineering standards for clearance and lane widths.
- Community suggestion 7 would have infrastructure conflicts with the existing Grafton Bridge. There is likely to be significant difficulties of compliance with current design standards due to the grade required to cross over the existing bridge.

The assessment concluded that preliminary options G and H and community suggestion 7 were considered not feasible and did not merit further consideration. The remaining suggestions are considered feasible and are recommended for further engineering and environmental investigations.

The assessment findings are summarised in Table 2.

Table 2 – Corridor 2 suggestions assessment summary.

Suggestions	Engineering and constructability impacts	Land use and land use zoning impacts	Aboriginal heritage impacts	Impacts on native plants and animals	Flooding impacts	Conclusion of feasibility assessment
A						Suitable for further assessment
B						Suitable for further assessment
C						Suitable for further assessment
D						Suitable for further assessment
G	✕					Does not merit further consideration
H	✕					Does not merit further consideration
I						Suitable for further assessment
5						Suitable for further assessment
6						Suitable for further assessment
7	✕	✕				Does not merit further consideration
8						Suitable for further assessment
9						Suitable for further assessment
10						Suitable for further assessment

✕ Indicates unacceptable impact.

Corridor 3 feasibility assessment

The assessment of the suggestions contained within Corridor 3 found that all suggestions contained in Corridor 3 are feasible. Thus preliminary options J, K and L and community suggestions 11 and 12 are recommended for further engineering and environmental investigations.

The assessment findings are summarised in Table 3.

Table 3 – Corridor 3 suggestions assessment summary.

Suggestion	Engineering and constructability impacts	Land use and land use zoning impacts	Aboriginal heritage impacts	Impacts on native plants and animals	Flooding impacts	Conclusion of feasibility assessment
J						Suitable for further assessment
K						Suitable for further assessment
L						Suitable for further assessment
11						Suitable for further assessment
12						Suitable for further assessment

Corridor 4 feasibility assessment

The assessment of the suggestions contained within Corridor 4 found that:

- Community suggestion 13 would require a highly skewed bridge leading to structural complications and potential navigational and flooding impacts.
- Community suggestion 17 would require a highly skewed viaduct structure leading to potential flooding impacts. This suggestion was also found to have significant constructability complications due to the geometry of the structure (small radius curves and combinations of curves and straights).
- Community suggestion 18 would cross the Grafton sewage treatment works, representing a significant conflict with existing major infrastructure.

The feasibility workshop also noted that:

- In the future, community suggestions 14, 20 and 21 and preliminary option M could be extended through to the Summerland Way along an alignment similar to that of community suggestion 15 between North Street and the Summerland Way to the north of North Street.
- As proposed, community suggestion 21 would require a highly skewed viaduct leading to structural complications and potential flooding impacts. However, the design and/or alignment of the suggestion could be refined to reduce the potential structural complications and flooding impacts.

Thus, community suggestions 13, 17 and 18 were considered not feasible and did not merit further consideration. Preliminary option M and community suggestions 14, 20 and 21 are considered feasible and are recommended for further engineering and environmental investigations.

The assessment findings are summarised in Table 4.

Table 4 – Corridor 4 suggestions assessment summary.

Suggestion	Engineering and constructability impacts	Land use and land use zoning impacts	Aboriginal heritage impacts	Impacts on native plants and animals	Flooding impacts	Conclusion of feasibility assessment
M						Suitable for further assessment
13	✕				✕	Does not merit further consideration
14						Suitable for further assessment
17	✕				✕	Does not merit further consideration
18	✕	✕				Does not merit further consideration
20						Suitable for further assessment
21						Suitable for further assessment

✕ Indicates unacceptable impact.

Corridor 5 feasibility assessment

The assessment of the suggestions contained within Corridor 5 found that:

- Community suggestions 16, 19, 22, 24 and 27 would require a highly skewed bridge and/or viaduct leading to structural complications and potential navigational and flooding impacts. Community suggestion 16 was also found to have significant constructability complications due to the geometry of the structure (small radius curves and combinations of curves and straights).
- Community suggestions 19 and 22 require a significant length of bridge over the river, which could lead to potential navigational and flooding impacts.

The feasibility workshop also noted that:

- Community suggestion 25 required a significant skew for the bridge over the Clarence River, a long crossing of the floodplain with potential resultant constructability and flooding impacts and two crossings of Swan Creek.
- Community suggestions 23 and 26 required a long crossing of the floodplain with potential resultant constructability and flooding impacts.

Thus, community suggestions 16, 19, 22, 24 and 27 were considered not feasible and did not merit further consideration. Community suggestions 15, 23, 25 and 26 are considered feasible and are recommended for further engineering and environmental investigations. The assessment findings are summarised in **Table 5**.

Table 5 – Corridor 5 suggestions assessment summary.

Suggestion	Engineering and constructability impacts	Land use and land use zoning impacts	Aboriginal heritage impacts	Impacts on native plants and animals	Flooding impacts	Conclusion of feasibility assessment
15						Suitable for further assessment
16	✕				✕	Does not merit further consideration
19	✕				✕	Does not merit further consideration
22	✕				✕	Does not merit further consideration
23						Suitable for further assessment
24	✕				✕	Does not merit further consideration
25						Suitable for further assessment
26						Suitable for further assessment
27	✕				✕	Does not merit further consideration

✕ Indicates unacceptable impact.

5.4 Preliminary route options for further consideration

The workshop recommended 25 preliminary route options for further engineering and environmental studies to inform the ongoing process of the identification of a preferred location for an additional crossing of the Clarence River at Grafton. A map of these preliminary route options is presented in **Figure 7** and **Appendix D**.

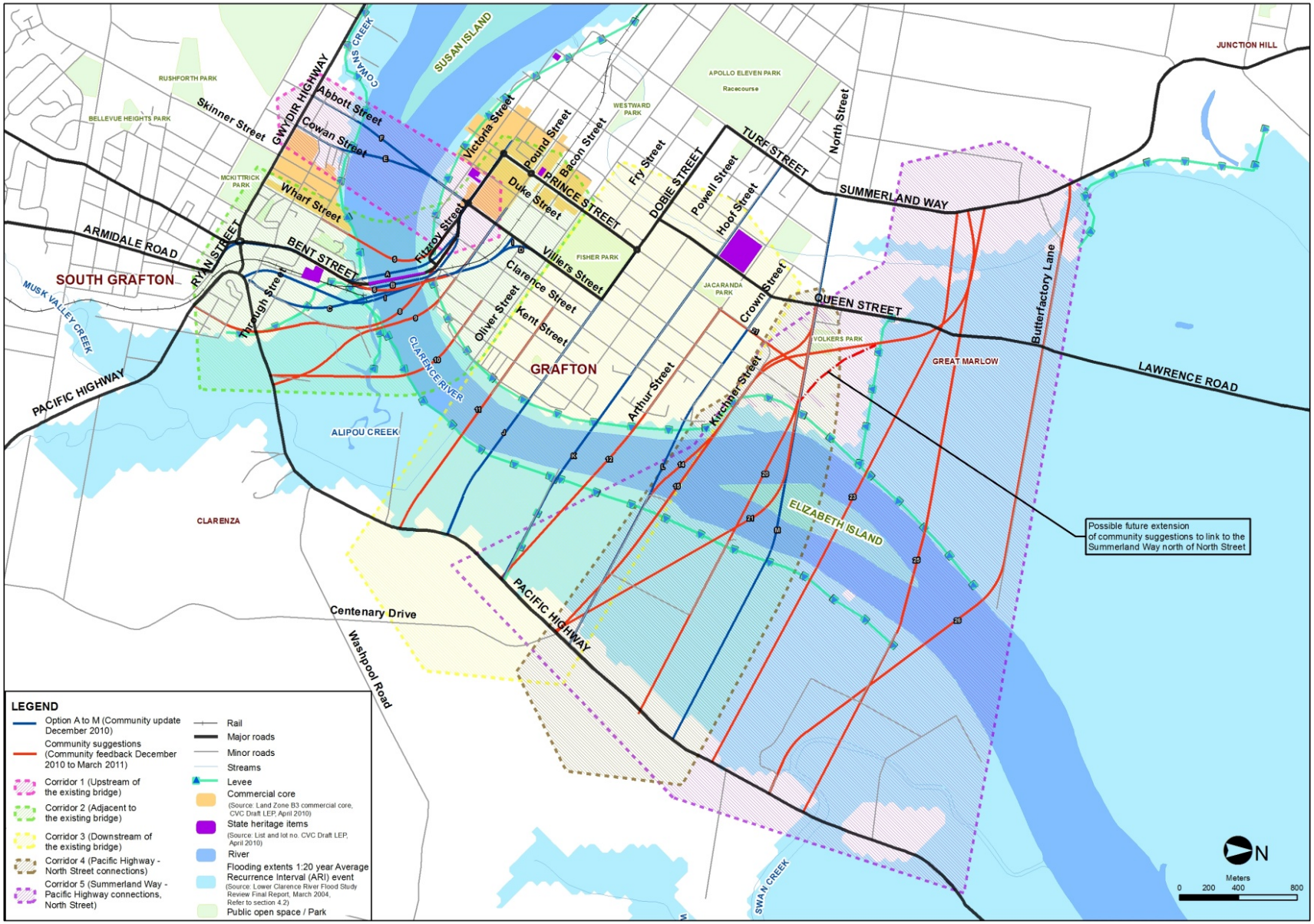


Figure 7 – 25 feasible preliminary route options for further consideration.

6 Strategic cost estimates

Strategic high-level cost estimates have been prepared to understand the comparative costs implications for each suggestion. The comparative strategic cost estimates are summarised in

Table 6.

Table 6 – Comparative strategic cost estimates of 41 suggestions.

	Suggestion	Strategic Cost Estimate ($Millions) ($2011)
Corridor 1	1	$280
	2	$510
	3	$210
	4	$270
	28	$180
	E	$130
	F	$140
Corridor 2	5	$180
	6	$180
	7	$220
	8	$170
	9	$250
	10	$250
	A	$160
	B	$180
	C	$210
	D	$240
	G	$180
	H	$190
	I	$200
Corridor 3	11	$230
	12	$350
	J	$200
	K	$260
	L	$280

Corridor 4	13	$450
	14	$370
	17	$400
	18	$390
	20	$430
	21	$480
	M	$380
Corridor 5	15	$370
	16	$430
	19	$410
	22	$450
	23	$420
	24	$500
	25	$440
	26	$440
	27	$440

Note: Strategic cost estimates are in $2011 to enable comparison of each of the 41 suggestions. Actual costs may vary from these strategic estimates due to a range of factors including the outcomes of further investigations, changes to the extent (or scope) of the project, design refinements and timing of construction.

The comparative strategic cost estimates broadly include:

- Concept development costs
- Detailed design and documentation costs
- Property acquisition costs
- Utility adjustment costs
- Infrastructure construction costs
- Handover costs
- Contingency.

The strategic cost estimates include contingencies consistent with the RTA's estimating guidelines and assume the following key points:

- For preliminary options A, C, D, E, F, H, I, J, K, L and community suggestions 1, 10, 11, 12, 15, 20, 22, 25 and 27, it is assumed that the main river crossing bridge superstructure could be incrementally launched.
- For preliminary options B, G, M and community suggestions 5, 6, 7, 8, 9, 13, 14, 16, 17, 18, 19, 21, 23, 24 and 26, it is assumed that the main river crossing bridge superstructure could be incrementally launched if the alignment is refined.
- For community suggestions 2, 4 and 28, it is assumed that the bridge alignment is not suitable for an incrementally launched superstructure.

- For community suggestion 3 it is assumed that the bridge alignment is not suitable for an incrementally launched superstructure without impacting on Susan Island.
- Costs have been rounded to the nearest 10 million dollars.

The strategic cost estimates are based on preliminary strategic designs developed by the project team.

The strategic cost estimates were prepared for comparative purposes only. All estimates are based on similar estimating rates for similar activities.

The comparative strategic cost estimates were not used in the feasibility assessment.

The comparative strategic cost estimate for each suggestion is shown in Appendix E – Comparative Strategic Cost Estimates.

Designs and cost estimates for the feasible preliminary route options will be refined based on the outcomes of further investigations.

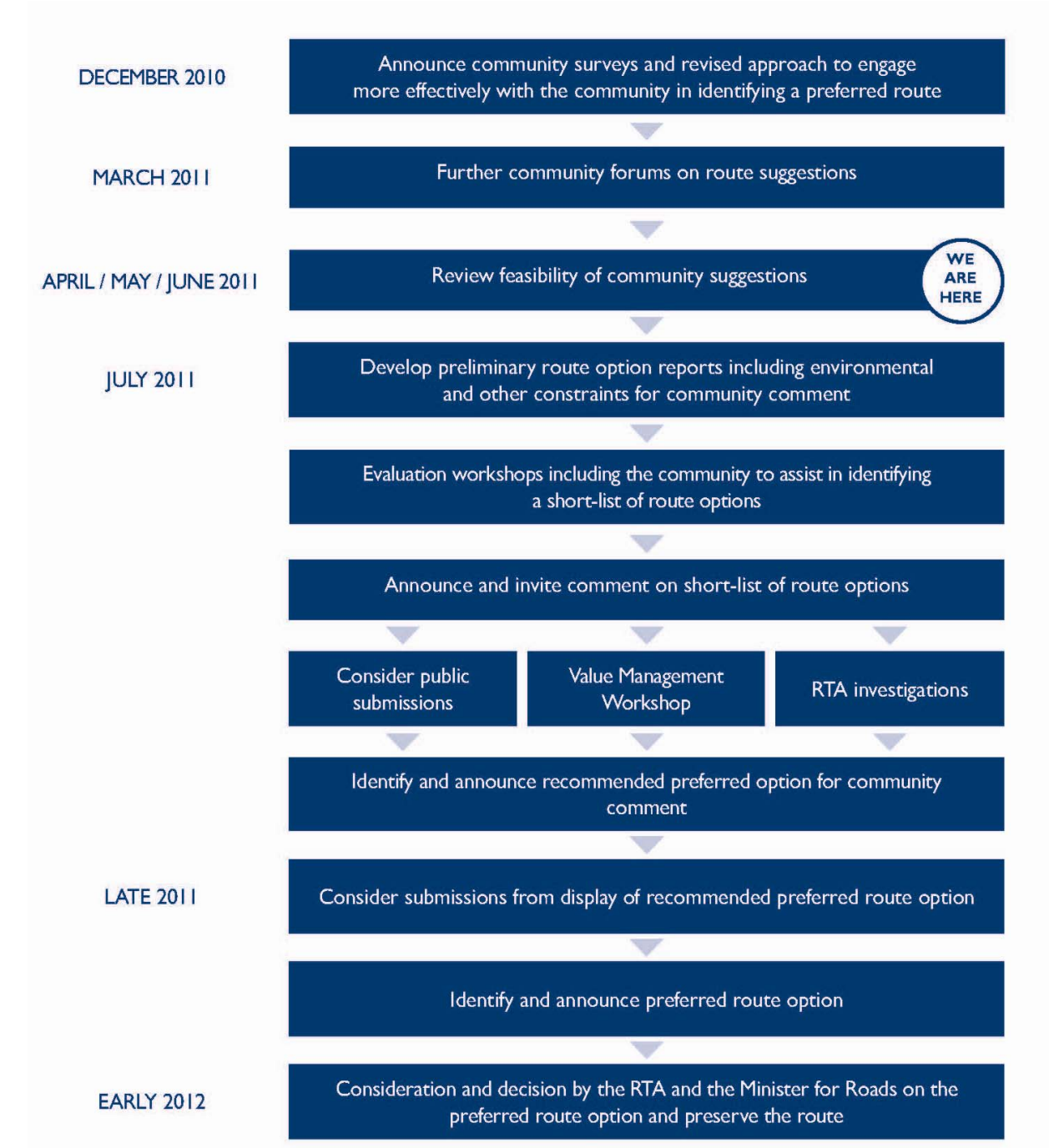
7 What happens next?

7.1 Process to identify a recommended preferred location

Background papers discussing the issues to be considered when identifying a preferred location for an additional crossing of the Clarence River at Grafton are being finalised. The papers will form part of a Preliminary Route Options Report which is expected to be released in July 2011.

Following the release of the Preliminary Route Options Report, community evaluation workshops will be held to facilitate input into the short-listing of route options.

The process to then identify a preferred location for an additional crossing is shown in the flow chart below.

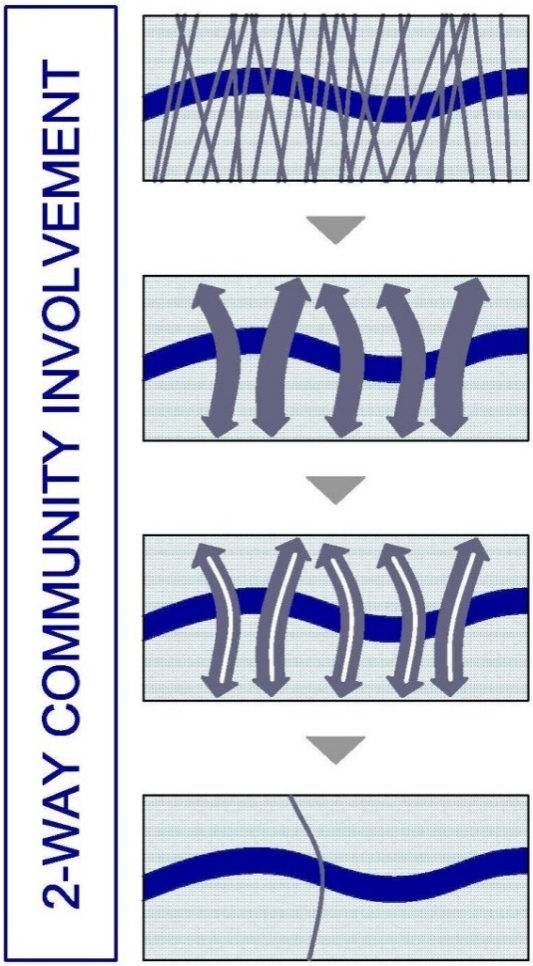


7.2 Short-listing method

The method outlined below (Method 2) has been adopted for the short-listing of the 41 suggestions and the identification of a recommended preferred option:

Method 2 comprises the following steps:

- Identify all suggestions.
- Group the suggestions into strategic corridors. Assess the feasibility of these suggestions against key engineering and environmental considerations. Identify the suggestions that are not feasible, based on their obvious environmental and engineering impacts.
- Identify the best route option(s) within each of the strategic corridors based on technical investigations and community input.
- Identify a recommended option from the route option(s) within each corridor based on further technical investigations, community input and a Value Management Workshop for community review.
- Finalise the preferred option



Appendix A

Route suggestions

Appendix B

Route suggestions shown in strategic corridors

Appendix C

Feasibility assessment summary sheets

Appendix D

Feasibility assessment workshop outcomes

Appendix E

Comparative strategic cost estimates