

Waitemata Harbour Crossing Study

PHASE 1: SUMMARY REPORT OPTION SHORT LISTING

November 2007





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1. Executive Summary

Organisations responsible for planning transport infrastructure around the Auckland Harbour (the Project Partners) decided to undertake the Waitemata Harbour Crossing Study, to identify the preferred location for an additional harbour crossing. Issues associated with the Wynyard Quarter Plan Change prompted the need to this matter to be given some urgency.

The study objective was:

“To identify the preferred option for delivering integrated, safe, responsive and sustainable cross-harbour travel between North Shore and the Isthmus to facilitate the future growth and development of the Auckland Region.”

This report describes Phase 1 of the Waitemata Harbour Crossing Study, which involved development of a long list of possible options for a new harbour crossing and a subsequent assessment to determine a short list. The short listed options will be refined and assessed in greater detail in Phase 2 of the study, which will identify a preferred option for the new crossing.

Given the policy background for New Zealand transportation projects, an LTMA themed evaluation framework was developed, which will also form the basis of the Phase 2 evaluation framework. Key aspects of the Phase 1 evaluation framework are as follows:

- Economic Development and Regional Growth – covering consistency with the Regional Growth Strategy and economic growth;
- Connectivity – addressing connections between transport networks, functional principles and flexibility;
- Environmental – sustainability issues and the key environmental criteria such effects on natural and built environments;
- Social & Community – measures of social severance and displacement of communities; and
- Affordability – relating to cost only at this stage

The first key task in Phase1 was development of a long list of feasible options for the crossing. Four methods of generating options were used, as follows:

- Analysis of ways to connect transport networks
- Options identified in previous studies
- Opportunities generated by new technologies and operational options
- Independent expert review



All options were developed recognising the potential future use of the existing Auckland Harbour Bridge. The study identified 159 possible options for a new harbour crossing (plus a “do-nothing” option of no new crossing), with tunnels or bridges joining the same points considered to be two separate options. In addition, options were generated with intermediate connection points where possible; for example routes connecting Esmonde Road to SH16 (Port and Westbound) at Central Motorway Junction (CMJ) have possible connections at Onewa and Wynyard.

Once the option long list was agreed, options were evaluated to produce a short list. This was carried out in two steps using the evaluation framework in each case. The first step was an initial sieve carried out on the options that were a single new crossing either for combined PT and general traffic or for general traffic only. The initial sieve focussed on the positive aspects of the options, namely economic development, regional growth and connectivity criteria, from which a reduced list of options was derived. Therefore, to be considered further, options had to score higher than the no new crossing option.

In the second step of the evaluation, the reduced option list was reassessed using a more refined assessment system and considering both positive and negative aspects of options. This gave a short list of single-crossing options.

A two-crossing option was then developed by combining a PT alone option and a general traffic alone option, using the best option for each function. The two-crossing option and the best PT alone option were compared against the short list of single-crossing options to decide on the final short list.

Operational options, such as ferries, did not reach the short list as they did not satisfy the project objectives as effectively as other options. However, it is recognised that measures to optimise use of existing infrastructure and improve ferry services are likely to be implemented prior to a new harbour crossing.

The evaluation process concluded with a short list of options on three alignments, although the question of whether the crossing would be a bridge or a tunnel had not been settled. Accordingly further work was undertaken to look at the following aspects of a bridge crossing:

- Ports of Auckland operations and navigation rules
- Suburban rail requirements

Discussions with Ports of Auckland about operational requirements of the port established that a bridge between the existing Auckland Harbour Bridge and Wynyard would need an air draught no less than that of the existing bridge (43.5 metres). Any bridge between Wynyard and Captain Cook Wharf would need an air draught of at least 62m plus clearance (for cruise ships). Any bridge



between Captain Cook Wharf and the open sea would need an air draught of 80m plus appropriate clearance.

These constraints would render a bridge impractical from Princess Wharf eastwards, as the gradients that could be used are such that the approaches would be too long to achieve the necessary height. Therefore a bridge option for Esmonde to Grafton was dismissed.

Hence, the conclusions of Phase 1 of this study are that the short list of options for the Waitemata Harbour Crossing is as listed below. These options should be further evaluated during Phase 2 of the study:

Option 1: Esmonde to Britomart

- Passenger transport (only) in a new tunnel or on a new bridge between Esmonde and Britomart, with possible connections at Onewa and Wynyard.
- General traffic on the existing Auckland Harbour Bridge
- Walking and cycling on either a new bridge or the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)

Option 2 Esmonde to Britomart & SH16

- Passenger transport in either a new tunnel or new bridge across the harbour, with tunnels to landside connections between Esmonde and Britomart. Possible connections at Onewa and Wynyard.
- General traffic in either a new tunnel, or new bridge (as well as on the existing bridge), with tunnels to landside connections between Esmonde and SH16 at either Wellington Street (Port and Westbound) or Newton (Westbound only). Possible connections at Onewa and Wynyard.
- Walking and cycling on either a new bridge or the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)

Option 3 Esmonde to Britomart & Grafton




- Passenger transport in a new tunnel between Esmonde and Britomart. Possible connection at Onewa.
- General traffic in a new tunnel between Esmonde and Grafton (as well as on the existing bridge) with possible connection at Onewa.
- Walking and cycling on the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)



A plan showing each of these options is included as Figure 1 overleaf.

While options have been described in terms of particular connection points to the transport network, a key aspect of Phase 2 will be to determine the optimal connection configuration to each part of the network in that vicinity.

LEGEND

-  COMBINED PT AND GENERAL TRAFFIC
-  PT ONLY
-  GENERAL TRAFFIC ONLY



WAITEMATA HARBOUR CROSSING STUDY
 OPTION SHORT LIST - FIGURE 1



2. Study Purpose and Process

2.1 Study Purpose

Prompted by the need to contribute to decisions about the Wynyard Quarter Plan Change notified by Auckland City Council, organisations responsible for planning transport infrastructure around the Auckland Harbour decided to undertake the Waitemata Harbour Crossing Study.

The study purpose is to determine the preferred location and form of future crossing infrastructure required to ensure an appropriate level of accessibility is maintained for cross-harbour travel between the North Shore and the Isthmus, and to facilitate planned future growth and development of the region. The five partner organisations (Partners) responsible for this initiative are:

- Auckland Regional Council (ARC),
- Transit New Zealand,
- Auckland Regional Transport Authority (ARTA),
- Auckland City Council (ACC) and
- North Shore City Council (NSCC).

The Partners' objective in pursuing the Waitemata Harbour Crossing Study is:

“To identify the preferred option for delivering integrated, safe, responsive and sustainable cross-harbour travel between North Shore and the Isthmus to facilitate the future growth and development of the Auckland Region.”

The Partners appointed an Implementation Executive (IE) to manage the project, comprising officers from each member organisation. A Project Director was also appointed to support the IE. In October 2007, a consultant team of Sinclair Knight Merz (SKM), Connell Wagner and Zomac Planning, with other specialists, was appointed to carry out the study.

2.2 Study Process

The study is being undertaken in two phases; the first phase involved identification of all feasible options for the new harbour crossing (working in combination with the existing Auckland Harbour Bridge). These options were then evaluated to produce a short list of options which would be developed and evaluated in more detail in the second phase of the study. This report describes Phase 1 of this study, concluding with recommendations about short listed options which will be assessed further in Phase 2.



The study process in Phase 1 involved an Inception Meeting, followed by 2 workshops with members of the IE and consultant team. The purpose of each session was as follows:

- Inception Meeting: knowledge and appreciation of project objectives, goals and functional principles
- Workshop 1; develop option long list and evaluation framework
- Workshop 2; review option evaluation and agree option short list

Due to time constraints, the Partners set the timeframe of phase 1 of the study to be completed within 6 weeks. To achieve this deadline, it has been necessary to draw on the significant amount of previous work related to the next harbour crossing. This information is summarised in Appendix A and has been further augmented by specialist inputs from the consultant team.

3. Project Objectives and Functional Principles

At the outset, the Partners determined that the project objectives would be as follows:

“Together, the Auckland Harbour Bridge (AHB), new crossing and connections will:

- *To facilitate development in an environmentally and socially sustainable manner and to encourage alignment with the strategic land use objectives of the Auckland Regional Growth Strategy;*
- *Provide a more resilient network and reduce the risks arising from accidents or structural failure associated with concentrating a high proportion of cross-harbour capacity on a single route;*
- *Provide a connection between the rapid transit networks on the North Shore and Auckland Isthmus, which as far as possible provides for future options for all types of passenger transport in the Auckland Region*
- *Provide accessibility for all modes, including commercial and general traffic, passenger and rapid transport, walking and cycling*
- *Improve cross-harbour accessibility and reduce the barrier effect of the Waitemata Harbour;*
- *Avoid, to the extent reasonable in the circumstances, adverse effects on the environment (including any adverse safety, social, community and ecological impacts) associated with the provision of the new crossing and any associated works;*

In pursuing these objectives the Project will be developed:

- *In accordance with the Land Transport Management Act.*
- *In accordance with the goals and shifts identified in the Auckland Sustainability Framework*
- *In accordance with the goals, objectives and policies of the Auckland Regional Land Transport Strategy*
- *In a manner that contributes to the implementation of regional strategies and policies.”*

Further work was carried out by the IE, to provide guidance about how the objectives and policy background would influence the project. A series of functional principles were derived, which are summarised below:

- Future improvements to connectivity between the North Shore and the CBD will be provided predominantly by public transport and cross harbour passenger transport improvements will be given first priority.



- Future cross harbour connectivity will include sufficient general traffic lanes linking the North Shore and greater Auckland region to best meet wider regional connectivity needs and will be given second priority.
- Additional connectivity between the North Shore and the CBD by way of general traffic lanes would be advantageous and will be given third priority.
- Transport network robustness (ability to cope with change, e.g. removal and replacement of the AHB clip on lanes) is important
- Operational flexibility is also important

An important aspect of these principles is that they are prioritised, giving additional guidance about the type of outcomes desired. At Workshop 1, it was agreed to expand the list of functional principles to include:

- Walking and cycling shall be provided for on either the new and/or existing harbour crossing.

Additional explanatory information around each of these principles was developed. The full list of functional principles and explanatory text is included in Appendix B.

The objectives and functional principles were used to develop the option long list and the evaluation framework described in the next sections of this report.



4. Phase 1 Evaluation Framework

At the outset, it was clear that a transparent, robust evaluation framework would be needed to make rational and defensible decisions about a recommended option for the Waitemata Harbour Crossing. Due to the short time frame of Phase 1, the goal was to use attributes that would meaningfully differentiate between options using available reliable information, while being relatively simple to use and based upon widely accepted and tested evaluation methodologies.

Given the policy background for New Zealand transportation projects, an LTMA themed framework was developed, which will also form the basis of the Phase 2 evaluation framework. Key aspects of the Phase 1 evaluation framework are as follows:

- Economic Development and Regional Growth – covering consistency with the Regional Growth Strategy and economic growth;
- Connectivity – addressing connections between transport networks, functional principles and flexibility;
- Environmental – sustainability issues and the key environmental criteria such effects on natural and built environments;
- Social & Community – measures of social severance and displacement of communities; and
- Affordability – relating to cost only at this stage

Within each aspect, criteria were developed as a means of assessing each. The full framework, together with comments on considerations and measures used in the evaluation are shown in table 1 overleaf. Application of the framework and the scoring system used in this phase of the study are discussed in Section 6 of this report.



Categories and Criteria	Considerations and Measures	Sources	LTMA, NZTS
Economic Development & Regional Growth			
World class city status	Extent to which the option contributes to world class city status; assessment of overall quality and ease of getting around the region provided by the option		Economic development
Growth strategy (RGS)	Extent to which the option is consistent with the RGS; that is provides and improves connectivity to RGS intensification areas (positive effect) and to non-RGS areas (negative effect); travel costs to/between RGS areas	ART Model for travel costs	Economic development
Economic growth policy (AREDS)	Extent to which the option contributes to AREDS; that is provides and improves access to areas of economic and employment importance; travel costs to/between economic areas and employment areas; effects on Port operations	ART Model for travel costs	Economic development
Connectivity			
PT connectivity to CBD	Extent to which option improves PT connectivity to CBD; new crossings with PT to CBD improve connectivity over existing bridge; PT trips across harbour to CBD	ART Model 1997	Accessibility and mobility
Wider regional connectivity	Extent to which the option improves wider network connectivity; average vehicle speed: region and across harbour; linkage with other strategic network	ART Model 1997	Accessibility and mobility
Providing for all modes, including walking/cycling	Cross-harbour rail capability; walk/cycle provision		Accessibility and mobility; Safety and Security



Categories and Criteria	Considerations and Measures	Sources	LTMA, NZTS
Network resilience (existing crossing)	Extent to which the option adds to the resilience of the network; ability of network to operate if existing bridge failed		Economic development; access and mobility
Network flexibility	Ability to fit with existing and other possible future infrastructure		Accessibility and mobility
Environmental Sustainability & Urban Form			
Sustainability framework (ASF)	Environmental only; extent to which the option minimises private vehicle travel (vkt)	Expert view, ART Model 1997	Environmental sustainability
Natural environmental effects	Extent and significance of effects on coastal environment, emissions, ecological areas, heritage	Expert view, 1997 Study	Environmental sustainability
Built environmental effects	Extent and significance of land take, number of properties affected and specific areas; negative and positive (opportunities)	Expert view, 1997 Study	Environmental sustainability
Social & Community			
Trips by PT and active modes	Extent to which the option encourages trips by PT trips and active modes; PT trips across harbour (to CBD); walk/cycle provision	ART Model 1997	Public health
Social effects	Extent and significance in terms of severance and displacement of communities	Expert view, 1997 Study	Environmental sustainability
Affordability			
Cost	Consideration of broad-order construction costs		Expert view, 1997 Study

■ **Table 1: Phase 1 Evaluation Framework**



5. Option Long List Development

The first key task in Phase 1 was development of a long list of feasible options for the Waitemata Harbour Crossing. Careful consideration was given to how to go about this task, to ensure that a comprehensive assessment of all possibilities for future crossings was made. Four methods of generating options were used, as follows:

- How to connect transport networks
- Options identified in previous studies
- Opportunities generated by new technologies and operational options
- Independent expert review

These methods and options generated by them are described below. All options were developed, recognising the current and potential future use and operation of the existing Auckland Harbour Bridge.

5.1 Connecting Networks

A key aspect of the functional principles was network connectivity. Therefore, the passenger transport and strategic / regional roading networks were examined to explore logical ways they could be connected.

As an initial step the main transport corridors were identified for PT and roading respectively. Given the planning horizon of this project, it was important to use the planned future networks, taking account of planned improvements by ARTA, Transit and the City Councils. From this assessment, possible connection points were identified on either side of the harbour as follows:

PT: North Shore

- Esmonde (for North Shore Busway)
- Highbury, Onewa, Takapuna,

PT: City

Britomart, CBD central (on CBD rail loop), Wynyard

Roads: North Shore

- Glenfield Road, Esmonde Road, Onewa Road, Lake Road, Bayswater, Stanley Point



Roads: City Side

- Te Atatu, Waterview, Meola Rd, Waterview, Newton, Westhaven, Wynyard, Vic Park, Grafton, Resolution Point, Tamaki Drive, Orakei Point.

A series of PT and roading options were then developed, connecting each possible combination of points. The following assumptions were made:

- No new infrastructure would cross the existing AHB / SH1 corridor
- All landside infrastructure would be in tunnel; i.e. no new surface corridors.

5.2 Previous Studies and Options

Extensive work had been carried out previously on harbour crossing options. The 1997 ARC study examined nearly 40 options, each of which was included in the option long list.

In addition to formal studies commissioned by ARC and Transit a number of proposals have previously been developed from a range of sources, for example, replacing the existing AHB with a new bridge, and links to Bayswater. These were also included in the option long list.

5.3 New Technologies and Operational Options

Increased transport capacity could be satisfied by several methods, not all of which involve new fixed infrastructure. New technologies are continually emerging, and the study team have examined which of these could possibly meet the project objectives. In addition, options which utilised the existing harbour bridge but in a different manner were also considered.

The final list of new technologies and operational options was as follows:

- Additional passenger ferry services
- New ferry services for vehicles, using roll-on, roll-off vessels
- Sky cabs
- Mono rail
- In vehicle guidance systems (which provide greater capacity by reducing headways between vehicles)
- Adding extra deck space to the existing bridge
- A one way pair system, i.e. building a new connection for travel in one direction and modifying the existing crossing for the contra-direction.

No other technologies or operational changes to the network were considered to meet the project objectives.



5.4 Independent Expert Review

In addition to the work on option development by the study team, an independent review was undertaken by Peter Prince, Transport Planning Manager for SKM in New South Wales. Based on experience of planning major strategic transport infrastructure overseas, this review concluded:

- A long term view for infrastructure planning was necessary
- Regional growth may accelerate beyond current estimates, therefore new infrastructure needed to be planned with a high degree of flexibility
- Given current trends, future proofing passenger transport options for the introduction of suburban rail linking the North Shore and the CBD was essential.
- Private sector participation in the implementation of infrastructure at this scale is increasingly important overseas; although funding is not a key issue at this stage of the study, the final choice of a preferred option should consider the extent to which it would lend itself to private sector involvement.

No other specific options which the study team had identified emerged from this independent review.

5.5 Option Long List

Combining the outputs of the work described above generated 159 possible options for a new harbour crossing (excluding the “do-nothing” option of no new crossing). Tunnel or bridges joining the same points were considered to be two options. In addition, options were generated where intermediate connection points were possible; for example routes connecting Esmonde Road to SH16 have possible connections at Onewa and Wynyard, taking the possible combination of options around this route from two (either a bridge or a tunnel) to 10.

A naming convention for all options was developed, based on the point of origin on the North Shore. Extra names were developed for passenger transport only and operational options. The general naming convention adopted was as follows:



Options	Option Code
Glenfield – Te Atatu	a1 – a2
Glenfield – Waterview	b1 – b6
Glenfield – Western Springs	c1-c2
Glenfield – Newton	d1 – d4
Esmonde - Waterview	e1 – e15
Esmonde – Western Springs	f1 – f5
Esmonde – SH16 @ Newton	g1 – g25
Esmonde – SH16 @CMJ	h1- h10
Esmonde – Grafton	i1 – i8
Esmonde – AMETI	j1 – j24
Esmonde – Resolution Point	k1- k5
Lake – Grafton	l1 – l2
Lake – AMETI	m1 – m6
Lake – Resolution Point	n1 – n2
Operational Options	o1 – o7
PT only	p1 – p20
Others	q1 – q16

■ **Table 2: Option Long List Summary**

The full option long list is included in Appendix C.



6. Option Long List Evaluation

6.1 Overall Process

Once the option long list was agreed with the IE, the long list of options was evaluated in order to reduce it to the short list. This was carried out in two steps using the evaluation framework in each case.

The first step was an initial sieve carried out on the options that were a single new crossing either for combined PT and general traffic or for general traffic only. The initial sieve focussed on the positive aspects of the options from which a reduced list of options was derived. Therefore, to be considered further, options had to score higher than the no new crossing option.

In the second step of the evaluation, the reduced list of options was reassessed using a more refined assessment system and considering both positive and negative aspects. This gave a short list of single-crossing options.

A two-crossing option was then developed by combining a PT alone option and a general traffic alone option. For this the long list of PT options was assessed and the highest scoring one identified. The general traffic options which would not include an exclusive PT component, that is, those that did not provide PT access to the CBD, were identified and assessed. This was chosen to combine with the highest scoring PT option.

The two-crossing option and the best PT alone option were compared against the short list of single-crossing options to decide on the final short list.

At each step an assessment was made using each criteria based on the considerations and measures listed in the framework, and then these were summarised into an overall score for each major evaluation framework aspect.

6.2 Initial Sieve Analysis

The initial sieve analysis of the options was undertaken using the evaluation framework and a five point scoring system, as illustrated in Table 3. This system used scores ranging from + + for strong positive effects to - - for strong negative effects. Zero (0) was considered as the option having no effects compared with no new crossing.



Initial Sieve Score	Attribute
++	Strong positive effects
+	Small/moderate positive effects
0	Neutral with respect to no new crossing
-	Small/moderate negative effects
--	Strong negative effects

■ **Table 3: Initial Sieve Scoring System**

The initial sieve concentrated on retaining options which scored highly for positive attributes rather than rejecting options due to adverse effects. The “positive” attributes were taken to be the two aspects of the evaluation framework, as follows:

- Economic Development and Regional Growth, and
- Connectivity

Those options with the highest overall scores (++) for these aspects were identified as well as those that scored highest for some criteria within each aspect. The full initial sieve analysis is included in Appendix D.

Particular aspects that differentiated between options included:

PT Access to the CBD and Rail Compatibility:

- Options that provided improved access to the CBD by way of an new exclusive PT right of way scored higher than those that did not, that is, those that relied on use of the existing bridge.
- PT on the existing bridge would preclude suburban rail, due to gradients on the structure.
- Of the new PT crossings, those that accessed the CBD from the west were considered better than those that accessed from the east, because:
 - Wynyard Quarter is an important consideration for PT as it is the significant growth area on the Auckland side of the harbour and requires a high PT service to realise its potential,
 - Options that bring PT to the east of Queen Street require buses to back track to the west of the CBD, to serve the higher level of demand on this side of the City (including the planned Wynyard Quarter development) **OR** services would be required on both the new crossing and the existing bridge. This suggests any options to the east of Queen Street need to be carefully considered with regards to PT effects and whether PT would remain on the existing bridge.



This effectively removed from further consideration PT options that:

- connected on the south side of the harbour west of the existing bridge, that is, to Te Atatu, Rosebank, Waterview, Pt Chevalier, Meola, Western Springs, SH16 at Newton (and not the CBD), and
- the operational type options.

Consistency with RGS:

- Options that connected Regional Growth Strategy intensification areas scored higher than those that did not. In this regard, connections with Bayswater/Stanley Point were considered a negative attribute as were those in the Lake Road corridor, as the Devonport Peninsula is not an identified growth area in the RGS.
- This effectively removed Lake Road options from further consideration.

Wider Network Connectivity and Resilience for General Traffic:

- Options that did not provide for wider network connectivity and resilience for general traffic by way of connections to the existing or planned future strategic network scored lower than those that did.
- This effectively removed from further consideration the operational options and those that only terminated at the edges of the harbour and hence provided little, if any, regional connectivity (Onewa, Westhaven, Wynyard, Queens, Tamaki).

Operational options, such as ferries, did not reach the short list as they did not satisfy the project objectives as effectively as other options. However, it is recognised that measures to optimise use of existing infrastructure and improve ferry services are likely to be implemented prior to construction of a new harbour crossing

The initial sieve analysis identified 39 separate options for the next step in the evaluation; the finer sieve analysis. These options were all located within the following corridors:

- Esmonde – SH16 (westbound only) at Newton
- Esmonde – SH16 (Port and westbound) at CMJ
- Esmonde – Grafton
- Esmonde – AMETI
- Esmonde – Resolution Point (Tamaki Drive, in the vicinity of Parnell Baths)



6.3 Finer Sieve Analysis

The finer sieve analysis expanded the scale of scoring to allow a more detailed assessment and finer differentiation between the remaining options. A seven point scoring system was adopted for this process, as shown in Table 4.

Finer Sieve Score	Attribute
+++	Strong positive effects
++	Moderate positive effects
+	Small positive effects
0	Neutral with respect to no new crossing
-	Small negative effects
--	Moderate negative effects
---	Strong negative effects

■ **Table 4: Finer Sieve Scoring System**

As outlined in Section 6.1, in addition to testing the 39 separate options which emerged from the initial sieve analysis, a dual-crossing option was generated by combining the best PT only plus the best general traffic only option. This combination was tested against single crossing options, together with a PT only option (operating in combination with the existing Harbour Crossing).

The results of the finer sieve analysis on the PT plus general traffic single-crossing options with respect to the evaluation framework are described in the following sections.



6.3.1 Economic Development and Regional Growth

Key aspects of the economic growth assessment were as follows and the results of the evaluation are given in Table 5 below:

Attribute	Assessment
World Class City	All single-crossing options have been scored the same at this stage
Growth Strategy	Connecting to Bayswater/Stanley Point is a negative as the Devonport Peninsula is not an identified growth area in the RGS A connection at Onewa is a positive due to the PT connectivity provided for the area west of SH1 Connecting at Wynyard is better than connecting east of the CBD, and Resolution Point provides the lowest level of PT accessibility Linking with AMETI is a positive as this provides access to growth areas in this corridor (e.g. Glen Innes and Panmure)
AREDS	Providing wider regional connectivity is more positive than just a CBD connection Options to Grafton/AMETI are scored lower than those to SH16 CMJ /Newton due to the impact on the Port and lower CBD connectivity Resolution Point is scored the lowest due to the lowest CBD connectivity and no regional connectivity

	Esmonde - Newton										Esmonde - CMJ (SH16 & Port)					Esmonde - Grafton								Esmonde - AMETI						Esmonde - Resolution Point									
	g11	g12	g13	g14	g15	g21	g22	g23	g24	g25	h6	h7	h8	h9	h10	i1	i2	i3	i4	i5	i6	i7	i8	j9	j10	j11	j12	j13	j14	j15	j16	j17	j18	j19	j20	j21	j22	j23	j24
Economic Development & Regional Growth																																							
World class city status	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Growth strategy (RGS)	++	++	+++	+++	+++	++	++	+++	+++	+++	++	++	+++	+++	+++	++	++	++	++	++	+	+	+	+	+	++	++	++	+	+	+	+	+	+	+	+	+	+	+
Economic growth policy (AREDS)	+++	+++	+++	+++	+++	++	++	++	++	++	+++	+++	+++	+++	+++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	+	+	+	+	+	+	+	+

■ Table 5: Finer Sieve – Results of Economic Development Evaluation



6.3.2 Connectivity

Key aspects of the connectivity assessment were as follows and the results of the evaluation are given in Table 6 below:

Attribute	Assessment
PT Connectivity to CBD	Connecting to the west of the CBD is better than East, as CBD development will be focused to west of CBD, and does not mean back-tracking from the crossing to Britomart. A connection at Onewa is a positive due to the PT connectivity provided to areas west of SH1
Wider Regional Connectivity	Linking with AMETI provides the best wider connectivity and to the CBD only (Resolution Point) the least; the other options (to SH16 CMJ, Newton, Grafton) are between these two extremes.
Providing for all modes	Connecting at Wynyard best location for active modes (less distance across the harbour) and rail compatibility; Resolution Point is the worst location of the options A bridge better than a tunnel for active modes; with a new tunnel crossing the existing bridge would be utilised for active modes
Network Resilience	Connecting at Grafton provides the best network resilience as it links to both the Southern and the North-Western Motorways Connecting to the CBD only provides the least resilience, and the other options (to VPT, Newton, AMETI) are in-between
Network Flexibility	Linking to AMETI gives the best network flexibility as it creates a new transport corridor Connecting to the CBD only is no better than the existing situation, and to SH16 at CMJ /Newton is slightly better The eastern options (Grafton, Resolution Point) create the opportunity to extend to AMETI

	Esmonde - Newton								Esmonde - CMJ (SH16 & Port)					Esmonde - Grafton						Esmonde - AMETI						Esmonde - Resolution Point													
	g11	g12	g13	g14	g15	g21	g22	g23	g24	g25	h6	h7	h8	h9	h10	i1	i2	i3	i4	i5	i6	i7	i8	j9	j10	j11	j12	j13	j14	j15	j16	j17	j18	j19	j20	j21	j22	j23	j24
Connectivity																																							
PT connectivity to CBD	++	++	+++	+++	+++	++	++	+++	+++	+++	++	++	+++	+++	+++	+	+	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Wider regional connectivity	++	++	++	++	++	+	+	+	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	+++	+++	+++	+++	+++	+++	+++	+++	+	+	+	+	+	+	+	+
Providing for all modes, including walking/cycling	++	+++	++	++	+++	++	+++	++	++	+++	++	+++	++	++	+++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	+	+	+	+	+	+	+	+
Network resilience (existing crossing)	++	++	++	++	++	+	+	+	+	+	++	++	++	++	++	+++	+++	+++	+++	+++	+++	+++	+++	++	++	++	++	++	++	++	++	+	+	+	+	+	+	+	+
Network flexibility	+	+	+	+	+	0	0	0	0	0	+	+	+	+	+	++	++	++	++	++	++	++	++	+++	+++	+++	+++	+++	+++	+++	+++	++	++	++	++	++	++	++	++

Table 6: Finer Sieve – Results of Connectivity Evaluation



6.3.3 Environment Sustainability and Urban Form

Key aspects of the environmental assessment were as follows and the results of the evaluation are given in Table 7 below:

Attribute	Assessment
Sustainability Framework	A connection to the CBD only was assessed as neutral in terms of minimising vehicle travel, and the other options are negative, with those linking to AMETI the worst
Natural environmental effects	Bridge and tunnel options are considered same at this stage Routes through middle of Shoal Bay are assessed as having the most adverse impacts, while routes adjacent to SH1 (Esmonde/Onewa) have the least impact The crossing length was also considered, and those options to Resolution Point and AMETI have greater environmental effects
Built Environmental effects	A bridge through Bayswater / Stanley Point has the most impact, and options to Resolution Point have the least impact The remaining options are assessed as in-between these extremes

	Esmonde - Newton										Esmonde - CMJ (SH16 & Port)					Esmonde - Grafton								Esmonde - AMETI								Esmonde - Resolution Point							
	g11	g12	g13	g14	g15	g21	g22	g23	g24	g25	h6	h7	h8	h9	h10	i1	i2	i3	i4	i5	i6	i7	i8	j9	j10	j11	j12	j13	j14	j15	j16	j17	j18	j19	j20	j21	j22	j23	j24
Environmental Sustainability & Urban Form																																							
Sustainability framework (ASF)	-	-	-	-	-	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Natural environmental effects	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Built environmental effects	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

■ Table 7: Finer Sieve –Results of Environmental Sustainability and Urban Form Evaluation



6.3.4 Social and Community

Key aspects of the social and community assessment were as follows and the results of the evaluation are given in Table 8 below:

Attribute	Assessment
Trips by PT and Active modes	A new bridge is better than a tunnel for active modes; for the latter the existing bridge would be utilised Connecting at Wynyard to the west of the CBD is better than options to the east
Social Effects	Connections at Bayswater / Stanley Point have a high level of severance and displacement Connecting at Resolution Point creates significant severance at Tamaki Drive; the options linking with AMETI were assessed as similar to Resolution Point

	Esmonde - Newton										Esmonde - CMJ (SH16 & Port)					Esmonde - Grafton								Esmonde - AMETI								Esmonde - Resolution Point							
	g11	g12	g13	g14	g15	g21	g22	g23	g24	g25	h6	h7	h8	h9	h10	i1	i2	i3	i4	i5	i6	i7	i8	j9	j10	j11	j12	j13	j14	j15	j16	j17	j18	j19	j20	j21	j22	j23	j24
Social & Community																																							
Trips by PT and active modes	++	+++	+++	+++	+++	++	+++	+++	+++	+++	++	+++	+++	+++	+++	++	++	++	++	++	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Social effects	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Table 8: Finer Sieve – Results of Social and Community Evaluation



6.3.5 Affordability

Key aspects of the affordability assessment were as follows and the results of the evaluation are given in Table 9 below:

Attribute	Assessment
Cost	<p>A rough order measure of the option costs is based on the length the options and consideration of tunnel vs. bridge</p> <p>Tunnel is more costly than bridge</p> <p>The options linking with AMET1 have the highest cost (longest length)</p> <p>A bridge to Wynyard would have the lowest cost</p> <p>The other options (to SH16 CMJ Newton, Grafton) would have costs in-between</p>

	Esmonde - Newton										Esmonde - CMJ (SH16 & Port)					Esmonde - Grafton								Esmonde - AMET1								Esmonde - Resolution Point							
	g11	g12	g13	g14	g15	g21	g22	g23	g24	g25	h6	h7	h8	h9	h10	i1	i2	i3	i4	i5	i6	i7	i8	j9	j10	j11	j12	j13	j14	j15	j16	j17	j18	j19	j20	j21	j22	j23	j24
Affordability																																							
Cost	--	--	--	--	--	--	-	--	--	-	--	-	--	--	-	--	-	--	--	-	--	--	-	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--

■ **Table 9: Finer Sieve – Results of Affordability Evaluation**



6.3.6 Summary of Evaluating Single-Crossing PT and General Traffic Options

The evaluation summary is shown in Table 10 overleaf. From the evaluation of the single-crossing options:

- Those terminating at Resolution Point score lower under Economic Development and Regional Growth and Connectivity.
- Those terminating at Wynyard score lower under Connectivity due to low connectivity to the wider network.
- Those that connect to Bayswater / Stanley Point score lower under Economic Development and Regional Growth due to inconsistency with the RGS and also have significant adverse effects under Environmental Sustainability and Social and Community.
- Those that are routed through the middle of Shoal Bay score low under Environmental Sustainability due to the greatest adverse natural environmental effects
- Those that link with AMETI have significant adverse natural environmental effects (Environmental Sustainability) and have the highest costs (Affordability).

The options that scored lowest with the above attributes have been eliminated from further consideration, leaving options with the highest levels of economic development, regional growth and connectivity effects and the lower adverse environmental, social and community impacts.

These, which would be the short list of options, are between Esmonde and:

- SH16 at CMJ (Port and westbound) with PT to Wynyard
- SH16 Newton (westbound only) with PT to Wynyard
- Grafton

Table 10 overleaf shows the summary of the evaluation with the eliminated options.



6.3.7 PT Only and Dual Crossing Options

The PT options were evaluated as standalone crossings under the first sieve scoring system, which showed that:

- They all have similar levels of positive attributes (Economic Development and Regional Growth, and Connectivity),
- Those from Highbury (Glenfield Road), Devonport (Lake Road) and through Bayswater have higher adverse social effects
- Those from Highbury (Glenfield Road) and Devonport (Lake Road) have higher costs

Eliminating these options from further consideration leaves the options between Esmonde and Britomart/Mid-Town via Wynyard.

Options which would cater for general traffic only were assessed in terms of their wider network connectivity. From the initial sieve evaluation three options were considered for combining with the best PT alone option:

- Glenfield – Waterview
- Esmonde – Waterview
- Esmonde – AMETI

All were considered as direct links in tunnel with no intermediate connection points. They were evaluated as having similar connectivity but the Esmonde-Waterview option was chosen as this had slightly lower environmental effects than the other two.

This general traffic option and the PT alone option were then assessed as a dual-crossing option (refer Table 2) and compared with the single-crossing options. This showed that the dual-crossing option had similar positive attributes to the single-crossing options (listed in the summary above), but had much higher adverse environmental effects and very high costs. Given this, the dual-crossing option has been eliminated from further consideration.

The PT alone option, though, has reasonable positive effects, and the least environmental effects and the lowest cost (refer Table 2). Hence, this option was included in the short list of options to be taken into Phase 2 of the Study.



	Taka - Britomart (Via Onewa alignment)			PT Only
	PT	Road (E1)	Combined	
Economic Development & Regional Growth				
World class city status	+	+	++	+
Growth strategy (RGS)	+++	+	++	+++
Economic growth policy (AREDS)	+++	++	+++	+++
Connectivity				
PT connectivity to CBD	+++	0	+++	+++
Wider regional connectivity	0	+++	+++	0
Providing for all modes, including walking/cycling	++	+	++	++
Network resilience (existing crossing)	+	+	++	+
Network flexibility	0	++	++	0
Environmental Sustainability & Urban Form				
Sustainability framework (ASF)	+	--	0	+
Natural environmental effects	-	--	---	-
Built environmental effects	--	-	---	--
Social & Community				
Trips by PT and active modes	++	0	+	++
Social effects	-	-	--	-
Affordability				
Cost	-	---	---	-
Summary				
Economic Development & Regional Growth	++	+	++	++
Connectivity	+	+	++	+
Environmental Sustainability & Urban Form	-	--	--	-
Social & Community	0	-	-	0
Affordability	-	---	---	-

■ **Table 12: PT and Dual-Crossing Options - Evaluation Results**

6.4 Workshop Discussions

Two workshops were held during Phase 1 of the study, attended by members of the IE and the partner organisations, the Project Director and leading members of the consultant study team. Presentations were made by the consultant study team at both workshops; the first workshop focused on development of the evaluation framework and the option long list and the second on the option shortlist. Breakout groups then tested key assumptions and issues raised during the presentation, followed by group discussion to reach agreement on the key issues.

Key takeouts and issues which arose at the workshops were as follows:

- Concern was raised about interpretation of “World Class City” and the contribution that a new harbour crossing would make to this goal. It was agreed that it could be highly subjective, so the consultant team took the emphasis of this to be on quality transport networks. As noted previously, all options evaluated in the finer sieve analysis were scored equally on this attribute.
- Although there was some concern that similar factors arose in a number of evaluation framework attributes (for example PT usage), it was agreed that the measure associated with



several attributes could be the same. This did not necessarily force the outcome to any one particular conclusion.

- While affordability will be a concern for the project, it was agreed that for this phase of the study, cost would be the only attribute used to differentiate between different options under this criterion. Concern over different opportunities for funding (for example tolling) will be part of Phase 2
- It was agreed that there was no basis for carrying out a “weighted” analysis of the evaluation framework; the criteria was sufficient in themselves to carry out a transparent assessment of the options.
- With regard to the Grafton option, it was agreed that this option could be configured to allow a possible future connection to AMETI, with a possible link in the vicinity of Stanley Street.
- Overall, the workshops concluded that on the basis of the presentations and discussions held, the outcomes in relation to the evaluation framework, option long list and recommended short list were sound.

6.5 Subsequent Review of Bridging Options

At the second workshop, the IE asked the consultant team if it would be possible to determine if the bridge options for any of the recommended short listed options would be suitable, given the scoring that had been used in the finer sieve analysis. Accordingly further work was undertaken to look at the following aspects of bridge crossings:

- Ports of Auckland operations and navigation rules
- Suburban rail requirements

A meeting was held with PoA to discuss their current and future operations. The following points emerged:

- Ships are expected to arrive in the near future at the Fergusson Container terminal with 55m air draught. There are occasional specialised cargo ships, having an air draught of some 75m. PoA would require at least 80m air draught between Fergusson and Bledisloe container terminals.
- Any bridge to the north of Wynyard would need an air draught no less than that of the existing harbour bridge (43.5 metres). Any bridge between Wynyard and Captain Cook Wharf would need an air draught of at least 62m plus clearance (for cruise ships). Any bridge between Captain Cook Wharf and the open sea would need an air draught of 80m plus appropriate clearance.



It is possible that the strategic nature of a new harbour crossing would be such that these operational constraints could be challenged. However, the Port is also a key strategic asset. Therefore, for the purposes of assessing the effect of an option on the Port, these requirements have been accepted.

Further work then took place to examine what the impact would be on bridge options, from the standpoint of gradients that could be adopted in their design. The existing Harbour Bridge has gradients of 5% - this was then taken to be the maximum gradient for general traffic. However, suburban rail is not really able to fulfil its task with gradients in excess of 2.5% and has a maximum gradient of 3%.

Taking these factors together lead to the following conclusions:

- The requirement for an 80metre air draught around the Bledisloe Wharf area effectively discounts any practical basis for a bridge option connecting to Grafton, irrespective of the transport mode (general traffic or PT).
- Of the remaining bridge options, only the route through Wynyard remains. In this location, i.e. between the existing Harbour Bridge and Princess Wharf, a minimum height of at least the existing bridge (43.5 metres) would be required. This would prevent suburban rail, but not buses.

Tunnels are more expensive than bridges to construct and maintain. Therefore, based on the conclusions above, it was considered bridge options for the Esmonde to Britomart and SH16 (CMJ and Newton) routes should be included in the option short list for further evaluation in Phase 2 of the study.



7. Option Short List Recommendations

On the basis of the findings of Phase 1 of this study, it is recommended that the following are adopted for the short list of options for the Waitemata Harbour Crossing, and should be further evaluated during Phase 2 of this study:

Option 1: Esmonde to Britomart

- Passenger transport (only) in a new tunnel or on a new bridge between Esmonde and Britomart, with possible connections at Onewa and Wynyard.
- General traffic on the existing Auckland Harbour Bridge
- Walking and cycling on either a new bridge or the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)

Option 2 Esmonde to Britomart & SH16

- Passenger transport in either a new tunnel or new bridge across the harbour, with tunnels to landside connections between Esmonde and Britomart. Possible connections at Onewa and Wynyard.
- General traffic in either a new tunnel, or new bridge (as well as on the existing bridge), with tunnels to landside connections between Esmonde and SH16 at either Wellington Street (Port and Westbound) or Newton (Westbound only). Possible connections at Onewa and Wynyard.
- Walking and cycling on either a new bridge or the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)


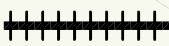

Option 3 Esmonde to Britomart & Grafton

- Passenger transport in a new tunnel between Esmonde and Britomart. Possible connection at Onewa.
- General traffic in a new tunnel between Esmonde and Grafton (as well as on the existing bridge) with possible connection at Onewa.
- Walking and cycling on the existing Auckland Harbour Bridge (with appropriate modifications to the existing bridge.)



The Option Shortlist is shown on Figure 1 overleaf. It should be noted that while options have been described in terms of particular connection points to the existing transport network, a key aspect of Phase 2 will be to determine the optimal connection configuration to each part of the network in that vicinity.

LEGEND

-  COMBINED PT AND GENERAL TRAFFIC
-  PT ONLY
-  GENERAL TRAFFIC ONLY



WAITEMATA HARBOUR CROSSING STUDY
OPTION SHORT LIST - FIGURE 1



Appendix A Reference Material



Previous studies and reports have been used as reference material during this study. These are listed below:

- 1988 Waitemata Harbour Crossing Study
- 1997 Waitemata Harbour Crossing Study
- 2002 Construction Feasibility Study
- 2007 Transit Reports (SKM and others) (Draft only)
- 2007 Shortlisting Report 2007 (Paling Assessment)



Appendix B Functional Principles



Functionality Principles

The following principles are to be used for assessing the performance of new crossing options. The existing Auckland Harbour Bridge and any new crossing are to be considered together and planned to operate in a complimentary manner. Assessment of the performance of crossing options is to relate to the joint performance of the AHB and the new crossing.

1. Future improvements to connectivity between the North Shore and the CBD will be provided predominantly by public transport and cross harbour passenger transport improvements will be given first priority.

Access to the CBD is currently provided by a mixture of public transport (rail, bus, and ferry), road, cycling and walking. Road access to the CBD is available through a limited number of entry points from both the motorway network and the regional arterial road network. The ability of the CBD to accommodate additional road traffic is limited, both by the capacity of the road network within the CBD and the availability of parking. Auckland City has recognised this, and has policies around the maximum number of vehicles it expects the road network to be able to accommodate.

Current investment in rail service improvements and electrification and in the Northern Busway will add significant capacity that will increase the accessibility of the CBD and which is in line with regional strategies of improved sustainability and reduced reliance on private motor vehicles.

In planning for the future of the CBD, substantive improvements in connectivity will therefore be provided through improvements to the public transport network rather than through increased road capacity.

Public transport improvements could include improvements to the frequency and quality of existing services, as well as new and improved facilities. Examples of planned improvements include development of Britomart as a through facility (rather than a terminal), and development of an inner city rail loop. Future connectivity from the North Shore is expected to be compatible with and complementary to these plans.

2. Future cross harbour connectivity will include sufficient general traffic lanes linking the North Shore and greater Auckland region to best meet wider regional connectivity needs and will be given second priority

Despite planned improvements in public transport connectivity, it will not be convenient or practical in terms of cost and trip duration to travel from all North Shore origins to all locations to the south – even during peak periods when public transport services are at their most prevalent. These trips, and those where the use of private vehicles is still a first choice, are expected to remain a sizeable proportion of total cross harbour trips. Other trips, such as freight movements and commercial journeys can only be made by road.



Limited spare capacity on the strategic and regional arterial networks on both sides of the Harbour, together with the need to move towards a more sustainable transport system, mean it will be neither practical nor desirable to provide sufficient cross harbour road capacity to match demand. Any additional connectivity should therefore be provided to the best practicable standard, that is, in balance with the remainder of the Auckland road network, and in a cost effective manner.

3. Additional connectivity between the North Shore and the CBD by way of general traffic lanes would be advantageous and will be given third priority.

Given the above two functionality objectives, it should be noted that additional connectivity to the CBD by way of general traffic lanes would be advantageous. Such connectivity would be for the purpose of improving the robustness of the road network, as opposed to significantly increasing the capacity of the road network into the CBD.

4. Transport network robustness (ability to cope with change e.g. removal and replacement of the AHB clip on lanes) is important

The connectivity between the northern part of the region and the central and southern parts of the region is currently primarily through a single direct crossing location (recognising that SH18 provides an alternate route of significantly greater distance and with limited spare capacity). As such, any event (sudden or planned) which removes capacity from the crossing will have a dramatic negative effect on cross harbour movement.

Climate change is expected to increase the long term risk of disruption to the network.

The ability of options to improve the robustness of both the road and public transport networks is considered very important, and will go a considerable way to reducing the connectivity risk which currently exists through being dependent upon a single direct crossing location.

5. Operational flexibility is also important.

This study will examine options that will address forecast future scenarios. Given the uncertainty around the future, it is considered important that options have operational flexibility.

Examples of desirable flexibility include the ability to cater for changing total demands, as well as demand patterns. For example, if public transport demand exceeds that for which buses can service, then the ability to convert to rail becomes critical. Similarly, if growth in the CBD (or other centres) is different to that forecast, the ability to adjust connectivity accordingly would be a significant advantage.



Appendix C Option Long List

		Connectivity	Origin	Land	Harb		Land	Destination	Previous	Comments
					Inter 1	our				
1	a1	a Glenfield-Te Atatu	Glenfield	T	x	T	x	Te Atatu	Yes	
2	a2		Glenfield	T	x	S	x	Te Atatu	Yes	
3	b1	b Glenfield-Waterview	Glenfield	T	x	T	x	Waterview	Yes	
4	b2		Glenfield	T	x	S	x	Waterview	Yes	
5	b3		Glenfield	T	x	T	Meola	Waterview	Yes	
6	b4		Glenfield	T	x	S	Meola	Waterview	Yes	
7	b5		Glenfield	T	x	T	x	Meola	Yes	
8	b6		Glenfield	T	x	S	x	Meola	Yes	
9	c1	c Glenfield-WSprings	Glenfield	T	x	T	x	WSprings	Yes	
10	c2		Glenfield	T	x	S	x	WSprings	Yes	
11	d1	d Glenfield-Newton	Glenfield	T	x	T	x	Newton	No	
12	d2		Glenfield	T	x	S	x	Newton	No	
13	d3		Glenfield	T	x	T	Westhavn	Newton	No	
14	d4		Glenfield	T	x	S	Westhavn	Newton	No	
15	e1	e Esmonde-Waterview	Esmonde	x	x	T	x	Waterview	No	
16	e2		Esmonde	x	x	S	x	Waterview	No	
17	e3		Esmonde	T	Onewa	T	x	Waterview	No	
18	e4		Esmonde	S	Onewa	T	x	Waterview	No	
19	e5		Esmonde	S	Onewa	S	x	Waterview	No	
20	e6		Esmonde	x	x	T	Meola	Waterview	Yes	
21	e7		Esmonde	x	x	S	Meola	Waterview	Yes	
22	e8		Esmonde	T	Onewa	T	Meola	Waterview	No	
23	e9		Esmonde	S	Onewa	T	Meola	Waterview	No	
24	e10		Esmonde	S	Onewa	S	Meola	Waterview	No	
25	e11		Esmonde	x	x	T	x	Meola	Yes	
26	e12		Esmonde	x	x	S	x	Meola	Yes	
27	e13		Esmonde	T	Onewa	T	x	Meola	No	
28	e14		Esmonde	S	Onewa	T	x	Meola	No	
29	e15		Esmonde	S	Onewa	S	x	Meola	No	
30	f1	f Esmonde-WSprings	Esmonde	x	x	T	x	WSprings	Yes	
31	f2		Esmonde	x	x	S	x	WSprings	Yes	
32	f3		Esmonde	T	Onewa	T	x	WSprings	No	
33	f4		Esmonde	S	Onewa	T	x	WSprings	No	
34	f5		Esmonde	S	Onewa	S	x	WSprings	No	
35	g1	g Esmonde-Newton	Esmonde	x	x	T	x	Newton	No	
36	g2		Esmonde	x	x	S	x	Newton	No	
37	g3		Esmonde	T	Onewa	T	x	Newton	No	
38	g4		Esmonde	S	Onewa	T	x	Newton	No	
39	g5		Esmonde	S	Onewa	S	x	Newton	No	
40	g6		Esmonde	x	x	T	Westhavn	Newton	No	
41	g7		Esmonde	x	x	S	Westhavn	Newton	No	
42	g8		Esmonde	T	Onewa	T	Westhavn	Newton	No	
43	g9		Esmonde	S	Onewa	T	Westhavn	Newton	No	
44	g10		Esmonde	S	Onewa	S	Westhavn	Newton	No	
45	g11		Esmonde	x	x	T	Wynyard	Newton	No	
46	g12		Esmonde	x	x	S	Wynyard	Newton	No	
47	g13		Esmonde	T	Onewa	T	Wynyard	Newton	No	
48	g14		Esmonde	S	Onewa	T	Wynyard	Newton	No	
49	g15		Esmonde	S	Onewa	S	Wynyard	Newton	No	
50	g16		Esmonde	x	x	T	x	Westhavn	Yes	
51	g17		Esmonde	x	x	S	x	Westhavn	Yes	
52	g18		Esmonde	T	Onewa	T	x	Westhavn	No	
53	g19		Esmonde	S	Onewa	T	x	Westhavn	No	
54	g20		Esmonde	S	Onewa	S	x	Westhavn	No	
55	g21		Esmonde	x	x	T	x	Wynyard	No	
56	g22		Esmonde	x	x	S	x	Wynyard	No	
57	g23		Esmonde	T	Onewa	T	x	Wynyard	No	
58	g24		Esmonde	S	Onewa	T	x	Wynyard	No	
59	g25		Esmonde	S	Onewa	S	x	Wynyard	No	
60	h1	h Esmonde-VPT	Esmonde	x	x	T	x	VPT	No	
61	h2		Esmonde	x	x	S	x	VPT	Yes	
62	h3		Esmonde	T	Onewa	T	x	VPT	No	
63	h4		Esmonde	S	Onewa	T	x	VPT	No	
64	h5		Esmonde	S	Onewa	S	x	VPT	No	
65	h6		Esmonde	x	x	T	Wynyard	VPT	No	
66	h7		Esmonde	x	x	S	Wynyard	VPT	No	
67	h8		Esmonde	T	Onewa	T	Wynyard	VPT	No	
68	h9		Esmonde	S	Onewa	T	Wynyard	VPT	No	
69	h10		Esmonde	S	Onewa	S	Wynyard	VPT	No	

	<u>Connectivity</u>	<u>Origin</u>	<u>Land</u>	<u>Inter 1</u>	<u>Harb</u>		<u>Land</u>	<u>Destination</u>	<u>Previous</u>	<u>Comments</u>
					<u>our</u>	<u>Inter 2</u>			<u>Option ?</u>	
70	i1	i Esmonde-Grafton	Esmonde	x	x	T	x	T	Grafton	No
71	i2		Esmonde	x	x	S	x	T	Grafton	No
72	i3		Esmonde	T	Onewa	T	x	T	Grafton	No
73	i4		Esmonde	S	Onewa	T	x	T	Grafton	No
74	i5		Esmonde	S	Onewa	S	x	T	Grafton	No
75	i6		Esmonde	T	B/SP	T	x	T	Grafton	No
76	i7		Esmonde	S	B/SP	T	x	T	Grafton	No
77	i8		Esmonde	S	B/SP	S	x	T	Grafton	No
78	j1	j Esmonde-AMETI	Esmonde	x	x	T	x	T	AMETI	No
79	j2		Esmonde	x	x	S	x	T	AMETI	No
80	j3		Esmonde	T	Onewa	T	x	T	AMETI	No
81	j4		Esmonde	S	Onewa	T	x	T	AMETI	No
82	j5		Esmonde	S	Onewa	S	x	T	AMETI	No
83	j6		Esmonde	T	B/SP	T	x	T	AMETI	No
84	j7		Esmonde	S	B/SP	T	x	T	AMETI	No
85	j8		Esmonde	S	B/SP	S	x	T	AMETI	No
86	j9		Esmonde	x	x	T	PR/O	T	AMETI	No
87	j10		Esmonde	x	x	S	PR/O	T	AMETI	No
88	j11		Esmonde	T	Onewa	T	PR/O	T	AMETI	No
89	j12		Esmonde	S	Onewa	T	PR/O	T	AMETI	No
90	j13		Esmonde	S	Onewa	S	PR/O	T	AMETI	No
91	j14		Esmonde	T	B/SP	T	PR/O	T	AMETI	No
92	j15		Esmonde	S	B/SP	T	PR/O	T	AMETI	Yes
93	j16		Esmonde	S	B/SP	S	PR/O	T	AMETI	Yes
94	j17		Esmonde	x	x	T	x	x	Pt Res	No
95	j18		Esmonde	x	x	S	x	x	Pt Res	No
96	j19		Esmonde	T	Onewa	T	x	x	Pt Res	No
97	j20		Esmonde	S	Onewa	T	x	x	Pt Res	No
98	j21		Esmonde	S	Onewa	S	x	x	Pt Res	No
99	j22		Esmonde	T	B/SP	T	x	x	Pt Res	No
100	j23		Esmonde	S	B/SP	T	x	x	Pt Res	Yes
101	j24		Esmonde	S	B/SP	S	x	x	Pt Res	Yes
102	k1	k Esmonde-Tamaki	Esmonde	x	x	T	x	x	Tamaki	No
103	k2		Esmonde	x	x	S	x	x	Tamaki	No
104	k3		Esmonde	T	B/SP	T	x	x	Tamaki	No
105	k4		Esmonde	S	B/SP	T	x	x	Tamaki	Yes
106	k5		Esmonde	S	B/SP	S	x	x	Tamaki	Yes
107	l1	l Lake-Grafton	Lake	x	x	T	x	x	Grafton	No
108	l2		Lake	x	x	S	x	x	Grafton	No
109	m1	m Lake-AMETI	Lake	x	x	T	x	x	AMETI	Yes
110	m2		Lake	x	x	S	x	x	AMETI	Yes
111	m3		Lake	x	x	T	PR/O	T	AMETI	Yes
112	m4		Lake	x	x	S	PR/O	T	AMETI	Yes
113	m5		Lake	x	x	T	x	x	Pt Res	Yes
114	m6		Lake	x	x	S	x	x	Pt Res	Yes
115	n1	n Lake-Tamaki	Lake	x	x	T	x	x	Tamaki	Yes
116	n2		Lake	x	x	S	x	x	Tamaki	Yes

Connectivity	Origin	Land	Inter 1	Harb Inter		Land	Destination	Previous Option ?	Comments
				our	2				
Operational Options									
117 o1	Ferries Only							No	
118 o2	Sky Cab							No	
119 o3	Mono rail							No	
120 o4	Car Guidance							No	
121 o5	Double Deck Existing							No	
122 o6	Roll on Roll off Ferries							No	
123 o7	One Way Pairs							No	
PT Only									
124 p1	Glenfield - Britomart	Glenfield	x	x	Rail	x	x	Britomart	No
125 p2		Glenfield	x	x	Bus	x	x	Britomart	No
126 p3		Glenfield	x		Britomart Rail	x	x	Mid Town	No
127 p4		Glenfield	x		Britomart Bus	x	x	Mid Town	No
128 p5	Onewa - Britomart	Onewa	x	x	Rail	x	x	Britomart	No
129 p6		Onewa	x	x	Bus	x	x	Britomart	No
130 p7		Onewa	x		Britomart Rail	x	x	Mid Town	No
131 p8		Onewa	x		Britomart Bus	x	x	Mid Town	No
132 p9	Esmonde - Britomart	Esmonde	x	x	Rail	x	x	Britomart	No
133 p10		Esmonde	x	x	Bus	x	x	Britomart	No
134 p11		Esmonde	x		Britomart Rail	x	x	Mid Town	No
135 p12		Esmonde	x		Britomart Bus	x	x	Mid Town	No
136 p13	Takapuna - Britomart	Takapuna	x	x	Rail	x	x	Britomart	No
137 p14		Takapuna	x	x	Bus	x	x	Britomart	No
138 p15		Takapuna	x		Britomart Rail	x	x	Mid Town	No
139 p16		Takapuna	x		Britomart Bus	x	x	Mid Town	No
140 p17	Lake - Britomart	Lake	x	x	Rail	x	x	Britomart	No
141 p18		Lake	x	x	Bus	x	x	Britomart	No
142 p19		Lake	x		Britomart Rail	x	x	Mid Town	No
143 p20		Lake	x		Britomart Bus	x	x	Mid Town	No
Others									
144 q1	Onewa - Bayswater - W	Onewa	x	Bayswater	T	x	x	Wynyard	No
145 q2		Onewa	x	Bayswater	B	x	x	Wynyard	No
146 q3	Glenfield to Rosebank	Glenfield	x		T	x	x	Rosebank	No
147 q4		Glenfield	x		B	x	x	Rosebank	No
148 q5	Onewa - Bayswater - Q	Onewa	x	Bayswater	T	x	x	Queens Wharf	No
149 q6		Onewa	x	Bayswater	B	x	x	Queens Wharf	No
150 q7		Onewa	x	Bayswater	T	x	x	Queens Wharf	No
151 q8		Onewa	x	Bayswater	B	x	x	Queens Wharf	No
152 q9	Onewa - Westhaven	Onewa	x	x	B	x	x	Westhaven	No
153 q10	Onewa - Grafton	Onewa	x	x	T	x	x	Grafton	No
154 q11	Glenfield - Pt Chev	Glenfield	x	x	B	x	x	Pt Chev	Yes
155 q12		Glenfield	x	x	T	x	x	Pt Chev	Yes
156 q13	Glenfield - Westhaven	Glenfield	x	x	B	x	x	Westhaven	Yes
157 q14		Glenfield	x	x	T	x	x	Westhaven	Yes
158 q15	Esmonde - Bayswater -	Esmonde	x	Bayswater	T	x	x	Wynyard	
159 q16		Esmonde	x	Bayswater	B	x	x	Wynyard	



Appendix D Initial Sieve Analysis

Evaluation Framework and Evaluation
9/11/2007

	Glenfield-Te Atatu		Glenfield-Rosebank		Glenfield - Pt Cheeseman		Glenfield-Waterview						Glenfield-WSprings		Glenfield-Newton				Glenfield-Westhaven		Onewa-Wai	Onewa-BW-Wynyard		Onewa-BW-Queens				Onewa-Grange	
	a1	a2	q3	q4	q11	q12	b1	b2	b3	b4	b5	b6	c1	c2	d1	d2	d3	d4	q13	q14	q9	q1	q2	q5	q6	q7	q8	q10	
Economic Development & Regional Growth																													
World class city status	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	0	+	+	+	+	+	+	+	
Growth strategy (RGS)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	
Economic growth policy (AREDS)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	++	++	++	++	++	++	+	
Connectivity																													
PT connectivity to CBD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	+	++	++	++	++	++	++	+	
Wider regional connectivity	+	+	+	+	+	+	++	++	++	++	+	+	++	++	++	++	++	++	0	0	0	+	+	0	0	0	0	++	
Providing for all modes, including walking/cycling	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	++	++	++	++	++	++	+
Network resilience (existing crossing)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	
Network flexibility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	+	+	++		
Environmental Sustainability & Urban Form																													
Sustainability framework (ASF)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	
Natural environmental effects	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Built environmental effects	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	-	-	-	-	
Social & Community																													
Trips by PT and active modes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	+	+	+	0	++	++	++	++	++	++	+	
Social effects	-	-	-	-	--	--	-	-	--	--	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Affordability																													
Cost	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	-	-	-	--	

Glenfield propoerlge cheame as a1 b5 b6 egiional connecti Social Impacts Meola worse Similar to b1 Similar to b1 g21 with Bayswater RGS issue same as q1

Summary	Glenfield-Te Atatu		Glenfield-Rosebank		Glenfield - Pt Cheeseman		Glenfield-Waterview						Glenfield-WSprings		Glenfield-Newton				Glenfield-Westhaven		Onewa-Wai	Onewa-BW-Wynyard		Onewa-BW-Queens				Onewa-Grange
Economic Development & Regional Growth	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+
Connectivity	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+
Environmental Sustainability & Urban Form	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	-	-	-	0	
Social & Community	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	0	0	0	0	0	0	0
Affordability	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	-	-	-	--

Surrounding network capability ?

For first sieve of combined PT and roading options consider benefits in the first instance (first two aspects), not just the summary, but the individual criteria within each

This gives:

- Esmonde - Newton via Wynyard g11-g15
- Esmonde - VPT via Wynyard h6-h10
- Esmonde - Grafton i1-i8
- Esmonde - AMETI j9-j16
- Esmonde - Resolution Point j17-j24

This is 39 options as defined

PT only and separate PT and roading options to be considered in the 2nd sieve to the short list

p18	p19	p20
+	+	+
+	+	+
+	+	+
+	+	+
0	0	0
+	++	+
+	+	+
0	0	0
+	+	+
--	--	--
--	--	--
+	+	+
--	--	--
--	--	--

+	+	+
+	+	+
-	-	-
-	-	-
--	--	--