report

Hutt Corridor Study Stage 1

■ report

Hutt Corridor Study Stage 1

Prepared for
Wellington Regional Council

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1 Introduction

The document outlines the strategic approach that will be used by Wellington Regional Council (WRC) to develop a Hutt Corridor Plan, as part of the Region's wider transport strategies. The Hutt Corridor Plan Study is the second corridor study to be undertaken in the Wellington Region. It has been commissioned by the Regional Land Transport Committee. This corridor links Wairarapa, Hutt Valley, Porirua, Kapiti and Wellington City. This is a multi-modal corridor with highways, major local roads, rail and bus services playing a major role in daily travel patterns.

1.1 Purpose and Objectives

The purpose of the study is to identify present and future transport needs and deficiencies in the corridor. Solutions will be developed that address those needs and deficiencies. These solutions will need to provide enhanced accessibility and economic development, safety and sustainability and also recognise the impacts that development of one part of the network will have on the other parts. These solutions will be constrained by being affordable and economically efficient.

There are a number of projects at various stages of development for this corridor. This study will bring together both these planned projects and other conceptual schemes to determine the optimum multi-modal package of projects and measures to address the transport needs and deficiencies of the corridor.

The objectives that have guided the development of the Hutt Corridor Plan are those of the Regional Land Transport Strategy. These are:

- Maintain and improve accessibility and economic development;
- Improve road safety;
- Maintain and improve economic efficiency;
- Maintain and improve affordability;
- Promote sustainability; and
- Provide a balance between passenger transport and roading networks.

1.2 Scope

This study considers travel in the corridor between Te Marua and the State Highway 1/State Highway 2 Ngauranga merge. Links from the Hutt Corridor to the existing SH1, the proposed Transmission Gully route and Porirua central were also investigated. The implications of proposals in the corridor on other parts of the network have been identified.

The study is multi-modal. This means that road, rail, bus, ferry, pedestrian and cycling strategies and impacts need also to be considered. Additionally, the movement of freight is an important issue in the Hutt Corridor. It is recognised that in some parts of the

corridor, there is competition for space and that initiatives in one mode of transport will have implications for other modes.

1.3 Current Needs and Issues

The following issues are identified in the Regional Land Transport Strategy for travel in the Hutt Corridor:

- Low population growth in the Hutt Valley;
- Continued employment in Wellington CBD of people living outside of Wellington City ;
- Slow down in manufacturing regionally;
- Peak period road congestion;
- Inadequate peak frequency levels of passenger rail in the Hutt;
- Increase in freight movements across the Hutt Valley, particularly rail in the Hutt;
- Increase in freight movements across the Hutt Valley, particularly near or in residential areas;
- Increase in journeys for recreation and shopping ;
- Poor local access in and out of the Hutt Valley;
- Lack of direct passenger rail access to the Lower Hutt central area; and
- Growing need for improved roads to meet increases in tourism.

The regional Land Transport Strategy identifies the following needs and issues for links between the Hutt Valley and Porirua:

- Low or declining population growth in Porirua and the Hutt Valley;
- Continuing regional employment in Wellington CDB;
- Growth of Tourism in the region;
- Increase in recreation and shopping journeys; and
- Lack of a direct road link between Lower Hutt central and Porirua central.

In addition to the above there are a number of other issues that include:

- Lack of an effective gateway to the Hutt CBD (road and rail)
- Poor connection to service the Gracefield-Seaview industrial area;
- Poor pedestrian and cycling connections to Wellington City;
- Restricted access in a disaster;
- Providing for the local access needs of communities along the highway; and
- Poor accident record of the highway with local intersections.

1.4 Background and Previous Studies

The report "Strategy Scenarios Options for Hutt City", prepared by Opus International for Hutt City Council and Wellington Regional Council looked at four scenarios for growth in the Hutt Valley. The four scenarios were:

1. Status Quo
2. Focus on Seaview Industrial
3. Focus on Retail
4. Focus on IT, Communication and Media

The report concluded that it is likely that the Wellington CBD will continue to shrink and job opportunities be lost. This will affect the significant number of commuters, estimated to be 12 thousand in 1996, who live in Hutt and work in Wellington. The implications are that the Hutt will need to promote and assist the creation of jobs in Hutt for many of those people.

1.5 Report Structure

The remainder of this report is structured as follows:

Section 2	Describes the study approach in terms of the Transport model, performance indicators, and the role of the Technical Group;
Section 3	Describes the transport scenarios tested;
Section 4	Details the methodology for Stage 1 and Stage 2 analysis;
Section 5	Summaries the results from the scenarios tested;
Section 6	Provides a description of the issues identified for each option tested; and
Section 7	Summaries Stage 1 and details the tasks for Stage 2.

2 Study Approach

2.1 Transportation Model

The improvement options have been analysed using the current Wellington Transport Strategic (WTS) Model for the forecast horizon year of 2016.

2.2 Technical Group

This study was directed by a Technical group made up of officers from Wellington Regional Council, Transfund New Zealand, Transit New Zealand, Hutt City Council, Upper Hutt City Council, Masterton District Council, Porirua City Council and Wellington City Council. The technical group is chaired by Tony Brennand from the Wellington Regional Council.

The technical group is responsible for overseeing the technical work of the study. This includes ensuring that the study is based on sound processes and information. A report will be prepared for the Regional Land Transport Committee based on the outcomes and recommendation of the Stage 2 report.

The technical group will support the Wellington Regional Council in ensuring that the members of the Regional Land Transport Committee have the information they require to consider the findings of this study.

2.3 Performance Indicators

The analysis will identify a set of projects that address current and future needs and issues. This set of projects will be evaluated against the objectives of the Regional Land Transport Strategy.

Performance indicators for each objective have been developed from model outputs as follows:

- Accessibility
  - Total auto and transit travel time and distance
  - Average vehicle and passenger network speeds
  - Auto travel time to the Airport from different origin points
- Affordability
  - Strategic revenue in terms of tolls, passenger fares and parking charges
- Economic Evaluation
  - Cross Valley Link road user benefits
  - Porirua – Hutt Link road user benefits
  - Non link road user benefits

  - Region wide user benefits
- Sustainability
  - Environment in terms for CO2 and CO generation
  - Fuel Consumption
  - Total Accident Cost (Calculated by accident rate for each class of road.)
- General Statistics
  - Total number of motor vehicle trips
  - Total number of passenger trips
  - Total number of slow trips
  - Total number of PT trips
  - Average motor vehicle trip length
  - Cost of congestion (Transfund PEM formula)
  - Volume / Capacity ratios on key routes

These indicators were assessed for each option via comparison against a base scenario. The base and option scenarios are described in the following chapter.

3 Transport Scenarios

A large number of improvement options exist. Outlined below are the improvements included in each option. A graphical description of each option is provided in Appendix A full description of the coding assumptions made for each option, by period, for the EMME/2 modelling is shown in Appendix B. The transport packages tested have been split into 3 broad categories:

1. State Highway 2 upgrade options;
2. Passenger Transport service upgrades ; and
3. Porirua – Hutt link options.

3.1 Base

The Base option year 2016 includes the following projects:

- State Highway 2 Dowse to Petone Upgrade;
- SH1 Ngauranga to Aotea Quay Tidal Flow Lane;
- CBD Bus Lane Schemes;
- Mana to Pukerua Bay 4 Laning;
- Kapiti Link Road;
- Inner City Bypass; and
- Transmission Gully Motorway (untolled).

3.2 State Highway 2 Upgrade Options

3.2.1 H1 – Minor capacity improvement

Option H1 involves the following improvements:

- Removing accesses on SH2; and
- Upgrading Silverstream Bridge.

3.2.2 H2 – Capacity upgrades at key locations

Option H2 includes the following improvements:

- Hutt Expressway High Occupancy Toll (HOT) Lane
- Melling Grade Separated Interchange
- Silverstream Bridge Upgrade to 4 lanes

3.2.3 H3 – Major capacity upgrade through the corridor

Option H3 includes the following improvements:

- Hutt Expressway Tidal Flow Lane (Petone – Ngauranga);
- Full Grade Separation at:
  - Melling
  - Belmont
  - Silverstream
  - Moonshine Road
  - Gibbons Street
  - Totara Park Road
- Realignment of Petone Curve;
- Whakatiki Street access to SH2 closed; and
- Silverstream Bridge Upgrade to 4 lanes.

3.3 Passenger Transport Options

3.3.1 P1

Option P1 includes the following improvements:

- Hutt Expressway High Occupancy Vehicle (HOV) Bus only lane (Petone – Ngauranga)
- New Bus & Ferry Services & Routes between Hutt & Porirua

3.3.2 P2

Option P2 is the first of the rail options and includes the following improvements:

- Increased frequency and speed of rail services; and
- New bus service between Hutt & Porirua.

3.3.3 P3

Option P3 is the second of the rail options and includes the following improvements:

- Melling Loop Light Rapid Transit (LRT);
- Stokes Valley LRT;
- New stations at Timberlea & Cruickshank Road;
- Hutt Valley Heavy Rail Services; and
- Wairarapa Services.

3.3.4 P4

Option P4 includes all P3 improvements plus the following improvements:

- Rail speeds increased;
- Bus services between Hutt & Porirua;
- Hutt Expressway HOV Bus only lane;
- Wainuiomata Superbus network; and
- Eastbourne Ferry Service doubled.

3.4 Porirua – Hutt Road Link Options

3.4.1 X1

Option X1 includes the following improvements:

- Petone – Grenada Link Road; and
- Esplanade Upgrade.

3.4.2 X2

Option X2 includes the following improvements:

- Melling – Porirua Link Road; and
- Cross Valley Link:
  - Whites Line Road to Wakefield Bridge;
  - 4 lane road from Randwick Road to Dowse SH2.

3.4.3 X3

Option X3 includes the following improvements:

- Melling – Porirua Link Road;
- Melling Grade Separation; and
- Randwick – Melling Link around the Lower Hutt CBD

3.4.4 X4

Option X4 includes the following improvements:

- Belmont – Porirua Link Road;
- Randwick – Cambridge Terrace – Belmont Link.

3.4.5 X6

Option X6 includes the following improvements:

- SH58 Four Laning.

3.4.6 X7

Option X7 includes the following improvements:

- Akatarawa Road Upgrade.

Each of these transport packages were analysed as outline in the following chapter.

4 Methodology

The base year and time periods for the evaluation of the options are the 2016 AM peak 2-hour and Inter peak 7-hour models.

The "Base" network is defined as that network that includes all the projects on the Western corridor and Wellington identified in the Regional Land Transport Strategy. On the Hutt Corridor and links to State Highway 1 only committed projects are included.

The process for determining the preferred Hutt Corridor improvement package or packages is as outlined below. It is important to note that this report only covers steps 1 to 2.

Stage 1

1. Run the "Base" network and report all the required performance Indicators;
2. Run each of the State Highway, Hutt to Porirua and public transport packages independently and report all the performance indicators;

Stage 2

3. Refine each of the independent, State Highway, Hutt to Porirua and public transport packages by deleting poor performing elements or by adding appropriate new elements. This process will require a critical examination of the performance indicators including flows on routes and services and the shape of the sectorial origin – destination matrices by mode. The effectiveness of the respective elements can be determined by comparing these above outputs with the Base outputs;
4. Re-model and evaluate each of the independent refined packages in a planning balance sheet using the Base network as a datum;
5. Repeat the Cross Valley link option using the Hutt City Sub-regional model. This would involve working with Bill Barclay (Hutt City Traffic Model operator) to determine the modelling methodology to be used, as there are some significant interface issues to be resolved between the regional and sub-regional models;
6. Based on the Hutt model outputs, evaluate the preferred Hutt to Porirua packages with and without the Transmission Gully project on a planning balance sheet as above. This step is undertaken to understand the major impacts of not having Transmission Gully on package performance;
7. Run composite packages of highway options permutated against preferred Hutt – Porirua link(s). Check each composite package as above to see if refinements are warranted;
8. Evaluate each composite package and report in a planning balance sheet. Select the most promising composite packages and other packages to straddle a range of performances against the respective objectives;

9. Run a further level of composite packages using the selected packages in (6) above permutated against public transport packages. Check each composite package to see if any refinements in the composite packages are warranted. Evaluate and report each composite package in a planning balance sheet;

10. Select a preferred package or packages;

11. The above steps (1) to (10) are to be comprehensively documented in Stage 2 giving a full account of the performance indicators and planning balance sheets for each of the packages including the sensitivity tests. The rationale for package refinements and selection of preferred packages is to be recorded. Prepare the draft Stage 2 report;

10. Discuss Stage 2 report in a mini-workshop with WRC staff and finalise the draft Stage 2 report;

11. Meet with the Technical Group to discuss the draft Stage 2 report; and

12. Finalise Stage 2 report.

5 Results

This is a strategic investigation, and as such, detailed design of proposals has not been undertaken. The investigation is to focus on packages of proposals rather than individual projects.

5.1 Performance Indicators

The results of the performance indicator tests are detailed in the following Tables in Appendix C:

- Table 5.1 -AM peak results
- Table 5.2 – AM peak results as % difference compared to the Base
- Table 5.3 – AM peak results as actual difference compared to the Base
- Table 5.4 - Interpeak results
- Table 5.5 – Interpeak results as % difference compared to the Base
- Table 5.6 – Interpeak results as actual difference compared to the Base

5.1.1 Benefit Cost Ratio Indicators

BCR indicators have been assessed as follows:

- The indicative benefits of each option have been calculated used the AM 2 hour and Interpeak 7-hour models.
- The Weekday daily benefits have been calculated as 2 times the AM peak plus 1.7 times the Interpeak periods modelled.
- The Weekend benefits have been calculated as 4 times the Interpeak benefits.
- The Annual benefits have been calculated as 240 weekdays and 60 weekend benefits.
- The 25 year benefits were calculated using a uniform series present worth factor of 9.524, which equates to 25 years from time zero. Time zero is assumed to be 2016, the year modelled. Because we are only using one model year of 2016 there is no growth assumed in the benefits calculation.

The Benefit Cost Ratio for each option are presented in Table 5.7 of Appendix D.

6 Description of Issues

This section provides a preliminary description of the issues identified from the stage 1 strategic modelling for each option tested.

6.1 State Highway 2 Upgrade Options

6.1.1 Option H1

Option H1 consisted of closing a number of minor accesses to State Highway 2 (SH2) around Upper Hutt and widening the Silverstream bridge.

The evaluation of this option shows that there are benefits to SH 2 traffic due to the closure of the minor SH2 accesses around Upper Hutt and the subsequent reduced flows on the State Highway. However, the modelling showed that this would lead to:

- Local traffic having to travel further and slower than using SH2. This results in negative benefits due to localised trip lengths increasing as local traffic re-routes to find new access points. It is noted that some junction closures are proposed primarily for accident savings. These local accident savings are not reflected in the accident saving performance indicator. A detailed examination of the change in severity of accident and accident reduction is required if this Option is to be taken forward.
- The Wellington Strategic model shows a small shift in origins trips to northern zones to gain the benefits from the State Highway 2 closed accesses.

A summary of the key performance indicators is provided in Table 6.1. In addition, Table 6.2 provides a comparison of the vehicle and passenger transport flow through the Petone to Ngauranga corridor.

Table 6.1

Summary of Key AM Peak Indicator for Option H1

Key Indicator	*Base*	*Option H1*	*Percentage Difference*
Total Motor Vehicle Travel Time (hrs)	29678	29705	0.1
Total Passenger Travel Time (hrs)	10939	10938	-0.01
Travel Time from Upper Hutt to Airport (hrs)	51.9	54.5	5.0
Estimated Costs		$12.5M	
BCR		-2.8	
Total Number of Vehicle Trips	141026	140994	-0.02
Total number of Passenger Transport Trips	49921	49943	-0.04
Cost of Congestion	78825	78119	-0.9

Table 6.1 shows that due to the additional traffic on the local roads within Upper Hutt caused by the access closures on SH2, travel time to the Wellington Airport from Upper Hutt railway station would increase by 5%.

Table 6.2

AM 2-Hour Peak Southbound Trip Distribution through Petone – Ngauranga Corridor

Mode	*Base*	*Option H1*	*Percentage Difference*
State Highway 2 (vehicles)	8075	8076	0.01
Bus	144	144	0.0
Train	6200	6181	-0.3

Table 6.2 shows very little changes in traffic flow between Petone and Ngauranga.

In summary the strategic evaluation of this option would suggest that closure of minor SH 2 junction improves highway efficiency, but causes disbenefits on the local roads. To evaluate this option further would require a more detailed assessment of local network effects and potential accidents savings.

6.1.2 Option H2

This option is based on an optional tolling scenario for the Hutt Expressway High Occupancy Toll (HOT) Lane and grade separation of the Melling link intersection with SH 2.

It has been identified that the benefits of Grade Separated Interchanges are not modelled well by the current WTS model, as the model does not explicitly model delays at intersection. Therefore, the modelling of grade separated interchanges generates negative benefits as traffic is modelled to travel slower and slightly further when entering and exiting the State Highway through a grade separate intersection than a single node intersection. It is recommended that as part of the Stage 2 work major intersection bottlenecks in the corridor will be more accurately modelled.

A summary of the key performance indicators is provided in Table 6.3. In addition, Table 6.4 provides a comparison of the vehicle and passenger transport flow through the Petone to Ngauranga corridor.

Table 6.3

Summary of Key AM Peak Indicator for Option H2

Key Indicator	*Base*	*Option H2*	*Percentage Difference*
Total Motor Vehicle Travel Time (hrs)	29678	29530	-1.5
Travel Time from Upper Hutt to Airport (hrs)	51.9	46.3	-10.8
Total Passenger Travel Time (hrs)	10939	10784	-1.4
Estimated Cost		$66.5M	
BCR (AM benefits only)		0.2	
Total Number of Vehicle Trips	141026	141618	0.4
Total number of Passenger Transport Trips	49921	49274	-1.3
Cost of Congestion	78825	74574	-5.4

Table 6.3 shows that the travel time between Upper Hutt railway station and the Wellington Airport is 11% faster with the HOT lane and the cost of congestion over the regional network has reduced by 5%. Taking account of the AM benefits only gives an indicative Benefits Cost Ratio (BCR) of 0.2 for this option.

Table 6.4

AM 2-Hour Peak Southbound Trip Distribution through Petone – Ngauranga Corridor

Mode	*Base*	*Option H2*	*Percentage Difference*
State Highway 2 (Vehicles)	8075	7439	16
HOT Lane (Vehicles)		1907	
Bus (Passengers)	114	519	260
Train (Passengers)	6200	5429	-12

Table 6.4 shows that the HOT lane increases vehicle flow between Petone and Ngauranga by 16% with train passenger flow reducing by 12%. The increased number of bus services and bus speed between Petone and Ngauranga has encouraged a 260% increase in bus passengers.

It is our recommendation that the HOT lane should be modelled separately in Stage 2 to allow direct comparison of the benefit of this capacity improvement between Petone and Ngauranga with that for the Tidal Flow lane and Bus only HOV lane options.

6.1.3 Option H3

This option involves the construction of six new grade separated interchanges. The modelling problem as described in section 6.1.2 above results in significant negative benefits. Key intersection delays need to be incorporated in the base, so more realistic benefits of grade separations are generated by the WTS model. It is proposed that this will be investigated in Stage 2.

A summary of the key performance indicators is provided in Table 6.5. In addition, Table 6.6 provides a comparison of the vehicle and passenger transport flow through the Petone to Ngauranga corridor.

Table 6.5

Summary of Key AM Peak Indicator for Option H3

Key Indicator	*Base*	*Option H3*	*Percentage Difference*
Total Motor Vehicle Travel Time (hrs)	29678	29572	-0.4
Travel Time from Upper Hutt to Airport (hrs)	51.9	40.8	-21.7
Total Passenger Travel Time (hrs)	10939	10465	-4.3
Estimated Cost		$212.2M	
BCR		0.2	

Key Indicator	Base	Option H3	Percentage Difference
Total Number of Vehicle Trips	141026	142517	1.1
Total number of Passenger Transport Trips	49921	48490	-2.9
Cost of Congestion	78825	72065	-8.6

This option reduces the travel time between Wellington Airport and Upper Hutt by 22%. The travel time reduction could be significantly higher with appropriate modelling of grade separate interchanges.

It is our opinion that the results of the incorrect modelling of the grade separated interchanges has disguised the benefits of the Tidal Flow lane. It is therefore our recommendation that Tidal Flow lane option should be modelled separately in Stage 2 to compare the benefit of this capacity improvement between Petone and Ngauranga with the HOT lane and HOV Bus only lane options.

Table 6.6

AM 2-Hour Peak Southbound Trip Distribution through Petone – Ngauranga Corridor

Mode	Base	Option H3	Percentage Difference
State Highway 2 (Vehicles)	8075	10794	34
Bus	144	385	167
Train	6200	4849	-22

The model shows that the Tidal Flow lane option would attract train passengers into cars. This option would have a significant impact on parking and congestion within Wellington CBD.

6.2 Passenger Transport options

6.2.1 Option P1

This option consists of a HOV Bus only lane and improved bus and ferry services.

The model predicts that the new ferry services between Petone and Taranaki Wharf, and Seaview and Taranaki Wharf have little impact on improving the attractiveness of ferries as an alternative mode to the car travelling to the Wellington CBD. This may be because of the improved bus service from Wainuiomata to Wellington. It is recommended that this new ferry service option be dropped.

The additional Hayward Bus service encourages a fairly small number of passengers (150 over 2 hours) between Hutt and Porirua. Most of the benefit of this service seems to come from passengers travelling from Whitby and East Porirua to Porirua. It is recommended

that this bus service option be investigated further to determine how best to deliver and package this service as part of the Stage 2 analysis.

A summary of the key performance indicators is provided in Table 6.7. In addition, Table 6.8 provides a comparison of the vehicle and passenger transport flows through the Petone to Ngauranga corridor.

Table 6.7

Summary of Key AM Peak Indicator for Option P1

Key Indicator	*Base*	*Option P1*	*Percentage Difference*
Total Motor Vehicle Travel Time (hrs)	29678	29147	-1.8
Travel Time from Upper Hutt to Airport (hrs)	51.9	50.3	-3.1
Total Passenger Travel Time (hrs)	10939	12582	15.0
Estimated Cost		$39.4M	
BCR (AM benefits only)		0.6	
Total Number of Vehicle Trips	141026	140343	-0.5
Total number of Passenger Transport Trips	49921	51110	2.4
Cost of Congestion	78825	74845	-5.1

The BCR of this option using only the modelled AM peak period benefits is 0.6.

Table 6.8

AM 2-Hour Peak Southbound Trip Distribution through Petone – Ngauranga Corridor

Mode	*Base*	*Option P1*	*Percentage Difference*
State Highway 2 (Vehicles)	8075	7966	-1
Bus (Passengers)	144	3059 (HOV Lane)	2024
Train (Passengers)	6200	4231	-32

The modelling shows that the HOV Bus only lane has little effect on attaching motorist from cars with the increase in bus patronage coming from rail. It is recommended that this option be further investigated in Stage 2 to determine what would be required to improved the attractiveness of the HOV Bus only lane to motorists in the AM peak period and compare it against the Tidal Flow and HOT lane options for the Petone to Hgauranga corridor. As part of this investigation the new bus services will be investigated separately to determine which provide significant benefits to be incorporated as part a passenger transport package.

6.2.2 Option P2

This option is increases rail speeds by 10% and doubles the service frequencies for current rail services.

A summary of the key performance indicators is provided in Table 6.9. In addition, Table 6.10 provides a comparison of the vehicle and passenger transport flows through the Petone to Ngauranga corridor.

Table 6.9

Summary of Key AM Peak Indicator for Option P2

Key Indicator	*Base*	*Option P2*	*Percentage Difference*
Total Motor Vehicle Travel Time (hrs)	29678	29305	-1.4
Travel Time from Upper Hutt to Airport (hrs)	51.9	50.7	-2.3
Total Passenger Travel Time (hrs)	10939	11148	1.9
Estimated Cost		$6,5M	
BCR		7.1	
Total Number of Vehicle Trips	141026	140199	-0.6
Total number of Passenger Transport Trips	49921	51204	2.6
Cost of Congestion	78825	76380	-3.1

Over the regional road network the cost of congestion is reduced by 3.1% with this option, which compares to 5.4% with the HOT lane, 8.6% with the Tidal Flow lane and 5.1% with the HOV Bus only lane.

Table 6.10

AM 2-Hour Peak Southbound Trip Distribution through Petone – Ngauranga Corridor

Mode	*Base*	*Option P2*	*Percentage Difference*
Private Vehicles	8075	8005	-1
Bus	144	160	11
Train	6200	6729	9

This option shows that modal shift is sensitive to frequency. Vehicle volumes on SH2 from Petone to Ngauranga only change by 70 vehicles, but rail passengers through this corridor have increased by 500 over the two hour AM peak period. This option is expected to produce $46 million in road user benefits and have an indicative BCR of 7.1.

This Option of improving frequency and speed of rail should be investigated further in Stage 2 as part of a package of improvements. WRC believed that this option is achievable using the existing infrastructure.

6.2.3 Option P3

The construction of the Melling Loop LRT with 20 minutes headways shows little benefit. It is proposed to test this option with a 10-minute headway and isolate the LRT benefits. Booz Allen Hamilton (BAH) / Sinclair Knight Merz (SKM)'s evaluation of the Melling Loop

LRT identified this option as beneficial with 10 minute headways as part of the Stage 2 analysis.

The opening of the Timberlea and Cruickshank stations and extension of services to Timberlea provide significant increase in Rail patronage and respective benefits. These improvements should be investigated further in Stage 2.

The Stokes Valley LRT is not promising with 20-minute headways. This option will be tested with 10-minute headways to determine its viability as part of the Stage 2 analysis.

The modelling of the improved Wairarapa rail services provides little road user benefits. However, it is recommended that this option be investigated further in Stage 2 to determine if this current model is appropriate to test the benefits of an improved Wairarapa rail service.

A summary of the key performance indicators is provided in Table 6.11. In addition, Table 6.12 provides a comparison of the vehicle and passenger transport flows through the Petone to Ngauranga corridor.

Table 6.11

Summary of Key AM Peak Indicator for Option P3

Key Indicator	*Base*	*Option P3*	*Percentage Difference*
Total Motor Vehicle Travel Time (hrs)	29678	29561	-0.4
Travel Time from Upper Hutt to Airport (hrs)	51.9	51.4	-0.9
Total Passenger Travel Time (hrs)	10939	11148	-1.9
Estimated Cost		$32.6M	
BCR		0.6	
Total Number of Vehicle Trips	141026	140720	-0.2
Total number of Passenger Transport Trips	49921	50487	1.3
Cost of Congestion	78825	78111	-0.9

This option has little effect on any of the performance indicators.

Table 6.12

AM 2-Hour Peak Southbound Trip Distribution through Petone – Ngauranga Corridor

Mode	*Base*	*Option P3*	*Percentage Difference*
Private Vehicles	8075	8056	-0.2
Bus	144	137	-5.0
Train	6200	6515	5.0

The new rail station at Timberlea and Cruickshank station and extension of services to Timberlea contributed mostly to the 5% increase in rail patronage.

6.2.4 Option P4

Option P4 includes Options P1 and P3 and provides benefits approximately equal to the sum of P1 and P3 benefits. This seems to be because the additional Melling Loop LRT, Stokes Valley LRT and Eastbourne ferry services provide very little benefits.

The Wainuiomata to Wellington bus service with 20-minute headways seems to have a very positive impact by encouraging 400 additional passengers in the 2 hour AM peak period. This service improvement is the main contributor to the increase in bus passengers between Petone and Ngaurauga. This improved bus service option should be investigated in Stage 2 as part of the passenger transport improvement package.

The doubling of the Eastbourne Ferry services attracted 50 additional passengers in the 2 hour AM peak period. This is equivalent to 34 passengers using the additional ferry. Due to low attractiveness of this service improvement compared to the improved Wainuiomata bus services it is our recommendation that this ferry improvement does not warrant further investigation.

A summary of the key performance indicators is provided in Table 6.13. In addition, Table 6.14 provides a comparison of the vehicle and passenger transport flow through the Petone to Ngauranga corridor.

Table 6.13

Summary of Key AM Peak Indicators for Option P4

Key Indicator	*Base*	*Option P4*	*Percentage Difference*
Total Motor Vehicle Travel Time (hrs)	29678	29078	-2.0
Travel Time from Upper Hutt to Airport (hrs)	51.9	49.9	-3.8
Total Passenger Travel Time (hrs)	10939	11697	-6.9
Estimated Cost		$60.4M	
BCR		1.1	
Total Number of Vehicle Trips	141026	140159	-0.6
Total number of Passenger Transport Trips	49921	51406	3.0
Cost of Congestion	78825	74502	-5.5

This option does have a reasonable impact on the above performance indicators with the cost of congestion reducing by 5.5% even though the travel time between Upper Hutt and Wellington Airport does not decrease significantly.

Table 6.14

AM 2-Hour Peak Southbound Trip Distribution through Petone – Ngauranga Corridor

Mode	*Base*	*Option P4*	*Percentage Difference*
State Highway 2 (Vehicles)	8075	7945	-2
Bus	144	2682	1762
Train	6200	4725	-24

The Hutt Expressway Bus lane results in a drop of 24% in rail passengers between Petone and Ngauranga, but the improved Bus services results in an increase of 1760% of passengers using buses. However, only 2% of vehicles were attracted off the state highway between Petone and Ngauranga into buses.

It is recommended that components of this option identified above be further investigated in Stage 2.

6.3 Hutt to Porirua Link Options

Table 6.15 provides a comparison of key link flows on SH1, SH58 and the link road plus the indicative benefits of each option.

Table 6.15

Hutt to Porirua Link Option Comparison

Option	*Description*	*AM 2-Hour Peak Vehicle Flows*			*Indicative Benefits*	Cost $M	Benefits Cost Ratio
		SH1 **Petone – Ngauranga**	*SH58*	*Hutt to Porirua Link Road*			
X1	Grenada – Petone & Esplanade Upgrade	-1,600	-1,440	7,780	$148.0M	67	2.2
X2	Porirua – Melling & Cross Valley Link	-560	-2,190	6,500	$155.1M	125	1.2
X3	Porirua – Melling & Randwick – Melling Link	-660	-2,280	6,700	$150.8M	170	0.9
X4	Porirua – Belmont & Randwick / Cambridge / Belmont Link	-540	-3,340	7,590	$136.4M	155	0.9
X6	SH58 Four Laning	-40	-219	-	$8.2M	10	0.9
X7	Akatarawa	-10	-105	218	$3.6M	10	0.4

Under Option X1 the Porirua Link attracts more traffic than it diverts from the Petone to Ngauranga section of SH2 and SH58, due to trip redistribution (Induced traffic). The evaluation has identified that the Hutt – Porirua link plus the Hutt local road network improvements provide more benefits than the sum of separate benefits for the two road

improvements. Option X1 attracts the greatest number of vehicles but generates fewer benefits than Option X2. Option X2, X3 and X4 draw more traffic off SH58 than SH1. The modelling of Option X4 with a link from Belmont to Porirua shows that it is a more attractive link than SH58.

Option X2 benefits are the highest as they provide greater travel timesavings, but the link flows are lower than on Option X1. Therefore Option X1 is more accessible, but route shortening for this option is less than that in Option X2.

Option X2 provides more benefits than option X3 and X4 at less cost. This would seem to be due to the cross valley alignment. It is recommended that the X2 Cross Valley alignment of White Line East Road to Wakefield Bridge and 4 laning from Randwick Road to Dowse SH2 interchange be further investigated as part of Stage 2.

It is believed that coding of the Options X1, X2, X3 and X4 may have been modelled with higher than expected travel speeds and shorter than expected link lengths. As a sensitivity test it was proposed to reduce the free flow speed by 10kph and increase the Porirua to Hutt Link distance by 20%. Table 6.16 provides a comparison of indicative benefits for this sensitivity test with the increased alignment and reduced operating speed for each option. Calculation of these benefits is shown in Appendix E along with changes in the performance indictors.

Table 6.22

Sensitivity Test Benefits and BCR

	Option X1	***Option X2***	***Option X3***	***Option X4***
Original Benefits $M	148.0	155.1	150.8	136.4
Modified Benefits $M	110.5	120.0	105.2	78.9
Original BCR	2.2	1.2	0.9	0.9
Modified BCR	1.6	1.0	0.8	0.5

Reducing the free flow speed by 10kph and increasing the Porirua to Hutt Link distance by 20% decreases Option X1 benefits by 25%. For Option X3 and X4 this sensitivity test reduces the indicative benefits by 23% and 30% respectively.

As the benefits of Option X3 and X4 are potentially significantly less than Option X2 from this preliminary evaluation it is recommended that only Option X1 and X2 be evaluated further using the Hutt City Model to more accurately determine the local benefits and network and capacity effects. In addition, further work should be undertaken to determine a realistic length and operating speed for the Option X1 and X2 Hutt – Porirua links.

6.3.1 Regional Economic Effects of a Hutt – Porirua Link

The Technical Group were interested in the potential economic effects of the X1 and X2 Options. The model does not directly predict economic activity, however the generation and attractions of person trips were used as a proxy measure of economic activity. The

total passenger trip matrices of each option were compared to the base matrix and the plots are provided in Appendix F.

Option X1 would seem to redistribute AM peak period origin trips (in green) from the Wellington CBD, Newlands, Johnsonville and to a lesser extent Hutt City and Porirua CBD's to Churton Park, Porirua East, Hutt city and to a lesser extent Upper Hutt (in red).

For Option X2 AM peak period destination trips to the Wellington CBD, Johnsonville, Newlands, Petone, Seaview and Hutt City CBD (in green) would increase and destination trips to Wainuiomata, Eastbourne, Eastern and Northern Hutt City suburbs and to a lesser extent Upper Hutt would reduce.

For Option X2 the effects are similar to Option X1 during the AM peak period, but with a greater increase in origin trips from Tawa, East Porirua, Waitangirua, Eastern and Northern Hutt City. For destination trips again the results are similar to Option X1, but with increased trips to Porirua and Hutt City CBD's.

In the inter-peak, which would be dominated by business trips, origin and destination trips increase around Petone and Johnsonville for Option X1, but Option X2 origin and destination trips increase both around Petone and the Hutt City CBD. These increases for Option X1 seem to come from the Wellington CBD, Porirua, northern and eastern Hutt City, and lesser extent Upper Hutt. For Option X2 the increase is a redistribution from Wellington CBD, Johnsonville, Porirua and Wainuiomata.

The modelling shows that neither of these options for a Porirua – Hutt Link have any economic improvement for the Upper Hutt (as measured through changes inn trip generation / attraction).

6.4 Sensitivity Tests

The following sensitivity tests have been undertaken:

- Base model with no Transmission Gully;
- Base and Option H3 with no tidal flow lane between Ngauranga and Aotea Quay
- Option H2, P1a, P2, X1 and X3 with no Transmission Gully;
- Option X1 and X2 with no Hutt to Porirua Link; and
- Option X1 and X2 with no cross valley link upgrade.

Table 5.10 and 5.11 in Appendix G show the performance indicators for the AM and Inter peak respectively.

For Options H2 and P1a there are slightly more regional benefits without Transmission Gully than with. However, for Option X1 the regional benefits rose by 17% without Transmission Gully, as Transmission Gully project would share some benefits with Option X1.

The tests on Options X1 and X2 show that the Hutt - Porirua Link provided 97% of the benefits of the combined link and the cross-valley route option model separately. As a combined project the regional benefits increase a further 18% and 7% respectively than the combined separate link and cross-valley project benefits.

Therefore it can be concluded that the cross valley link improvement is essential to the Porirua to Hutt link being successful.

From the Option H3 test without a tidal flow lane from Ngauranga to Aotea Quay it was found that regional benefits dropped by 29%. It is our opinion that the bottleneck benefits of this improvement may not be modelled correctly in the WTS model and this should be investigated further in Stage 2. In reality there should be very little benefits as the SH2 AM peak bottleneck would have just moved from Petone to Ngauranga.

7 Recommendations and Proposed Stage 2 Work

This section outlines what should be investigated further as part of Stage 2.

7.1 SH2 Intersection Closures

The closure of junctions north of Lower Hutt, as modelled in Option H1, improves highway efficiency, but causes disbenefits on local roads. To evaluate this option further the actual accident savings should be calculated before recommending further modelling.

7.2 Major Intersection Delays

It is recommended that an alternative method of modelling major intersection delays be investigated to better reflect the benefits of grade separating these intersections. This would allow a recommendation to be made on the proposed intersection upgrades and Silverstream Bridge upgrade.

7.3 Petone to Ngauranga

It is recommended that the Hutt Expressway HOT lane, Tidal Flow Lane, HOV Bus only lane be evaluated separately to allow a comparative assessment of the effects of each option and to determine what road capacity is needed between Petone and Ngauranga and in what form it should be provided.

7.4 Hutt to Porirua Link

It is recommended that Option X6 (SH58 Four Laning) should be part of the Base model. In addition, the Wellington Transport Strategic Model is not suited to determining the benefits of four laning this section of State Highway. Option X7 (Akatarawa Road Upgrade) is a stand alone project that should be investigated further by Upper Hutt City Council as a local road improvement.

Option X1 and X2 Hutt to Porirua Link alignments should be investigated further in Stage 2. In addition, the economic effects of this link should also be investigated further through an Economist.

7.5 Cross Valley Improvements

The Esplanade upgrade as part of Option X1 and Option X2 Cross Valley alignment of White Line Road to Wakefield Bridge and 4 laning from Randwick Road to Dowse SH2 interchange should be evaluated using the Hutt City Model.

It is our recommendation that Options X3 and X4 should not be evaluated further as the initial strategic tests show that Option X2 provides greater cross valley benefits than these alternative options.

7.6 Passenger Transport Improvements

Further testing of the Melling Loop and Stokes Valley LRT systems using a headway of 10 minutes should be undertaken before any recommendation on these options is made.

The new stations at Timberlea and Cruickshank Road plus the new service to Timberlea provide very good benefits and should be evaluated further as part of the passenger transport strategy.

The Wainuiomata Superbus network showed promising benefits and should be evaluated further a part a passenger transport package. In addition, the other bus service improvements from Upper Hutt, Stokes Valley and the Western Hills will be investigated further to determine which should be incorporated as part of a passenger transport package.

The option of increasing rail speeds and increasing rail frequency should be investigated further as part of a package of passenger transport improvement.

The Hayward Bus services encourage a small number of passengers between Hutt and Porirua. Most of the benefit of this service seems to come from passengers travelling from Whitby and East Porirua in to Porirua. It is recommended that this bus service option be investigated further to determine how best to deliver and package this service as part of the Stage 2 analysis.

The modelling of the improved Wairarapa rail services provides little road user benefits. However, it is recommended that this option be investigated further in Stage 2 to determine if this current model is appropriate to capture the full benefits of an improved Wairarapa rail service.

The new ferry services between Petone and Taranaki Wharf, and Seaview and Taranaki Wharf are predicted to have little impact on improving the attractiveness of ferry as an alternative mode to using the car to travel to Wellington CBD. It is recommended that this new ferry service option be dropped.

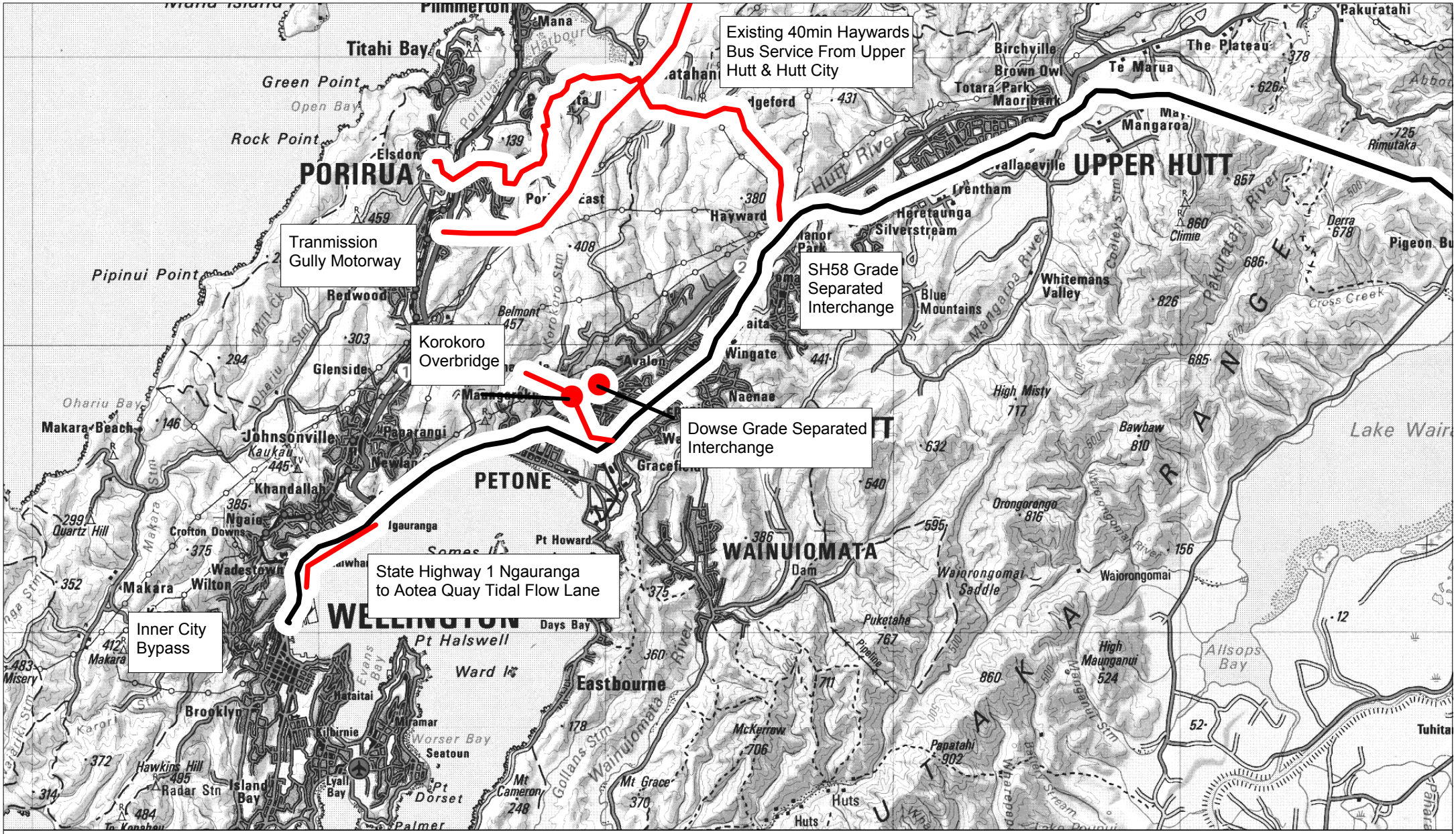
The doubling of the Eastbourne Ferry services attracted few additional passengers and it is our recommendation that this ferry improvement does not warrant further investigation.

Report Prepared By: Stephen Hewett *Signed* ……..

Report Reviewed By: Andrew Murray *Signed* ……..

- Appendix A

Graphical Description of each option



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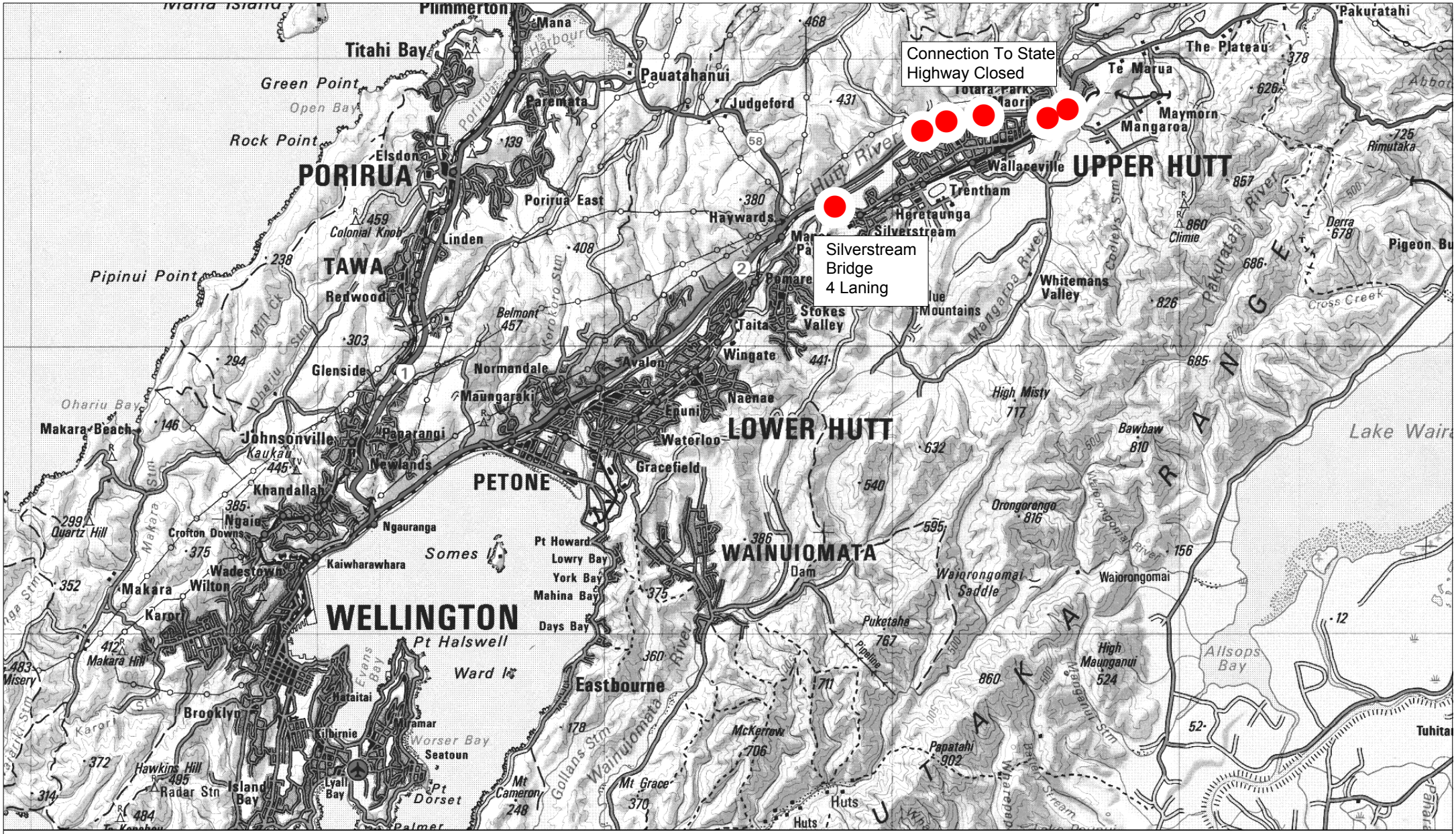
Base Network Improvements



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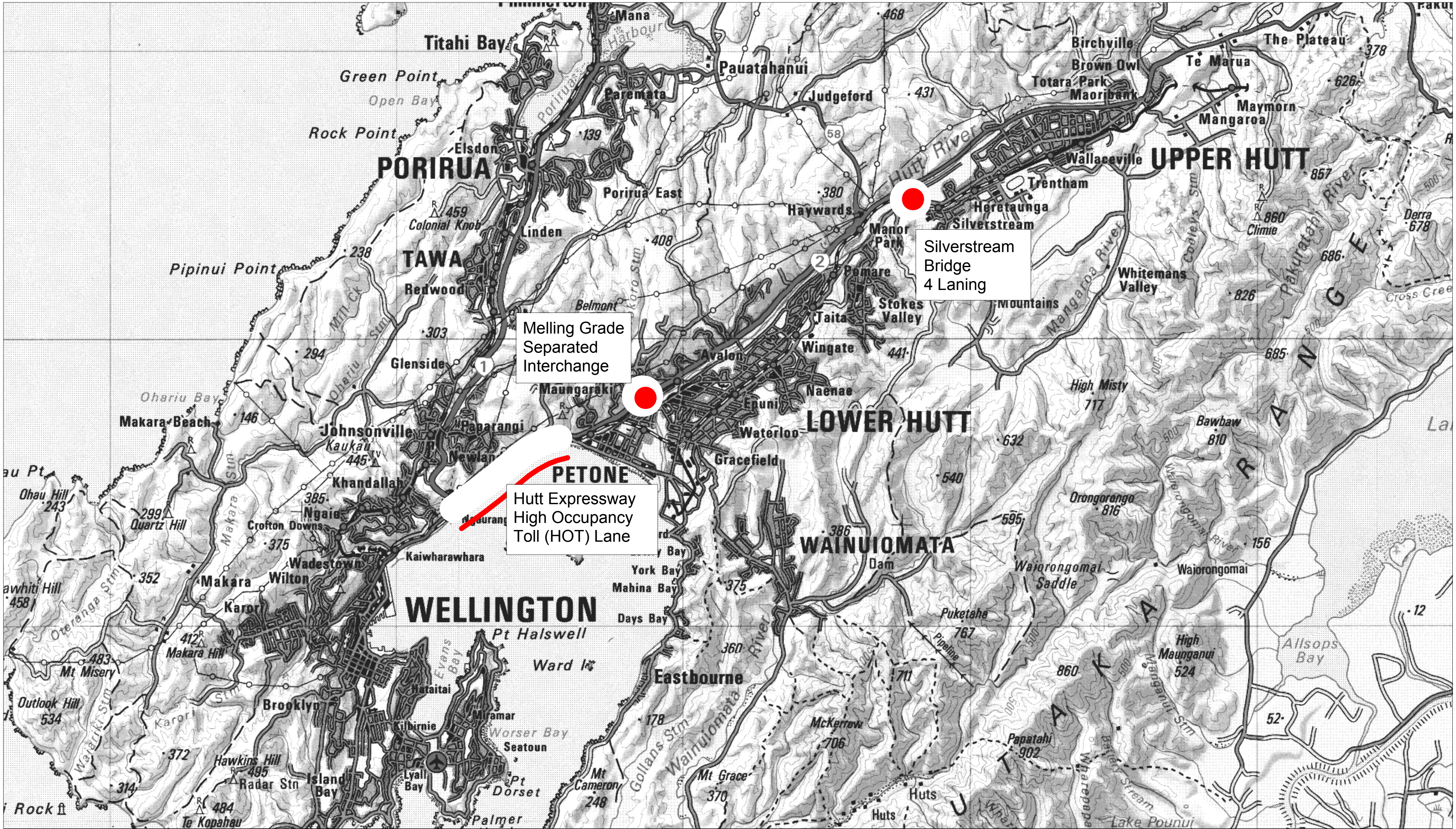
State Highway 2 Option H1



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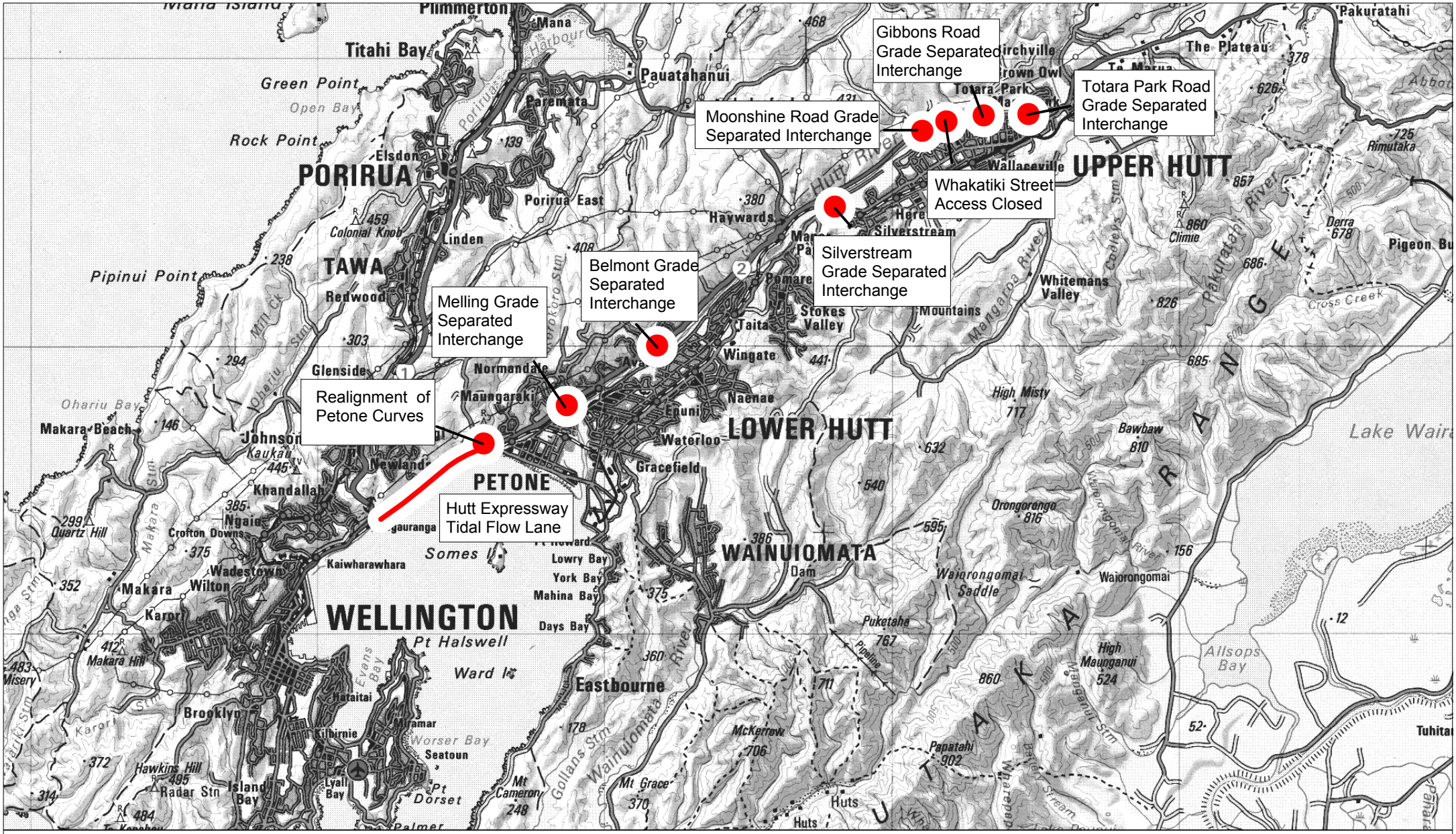

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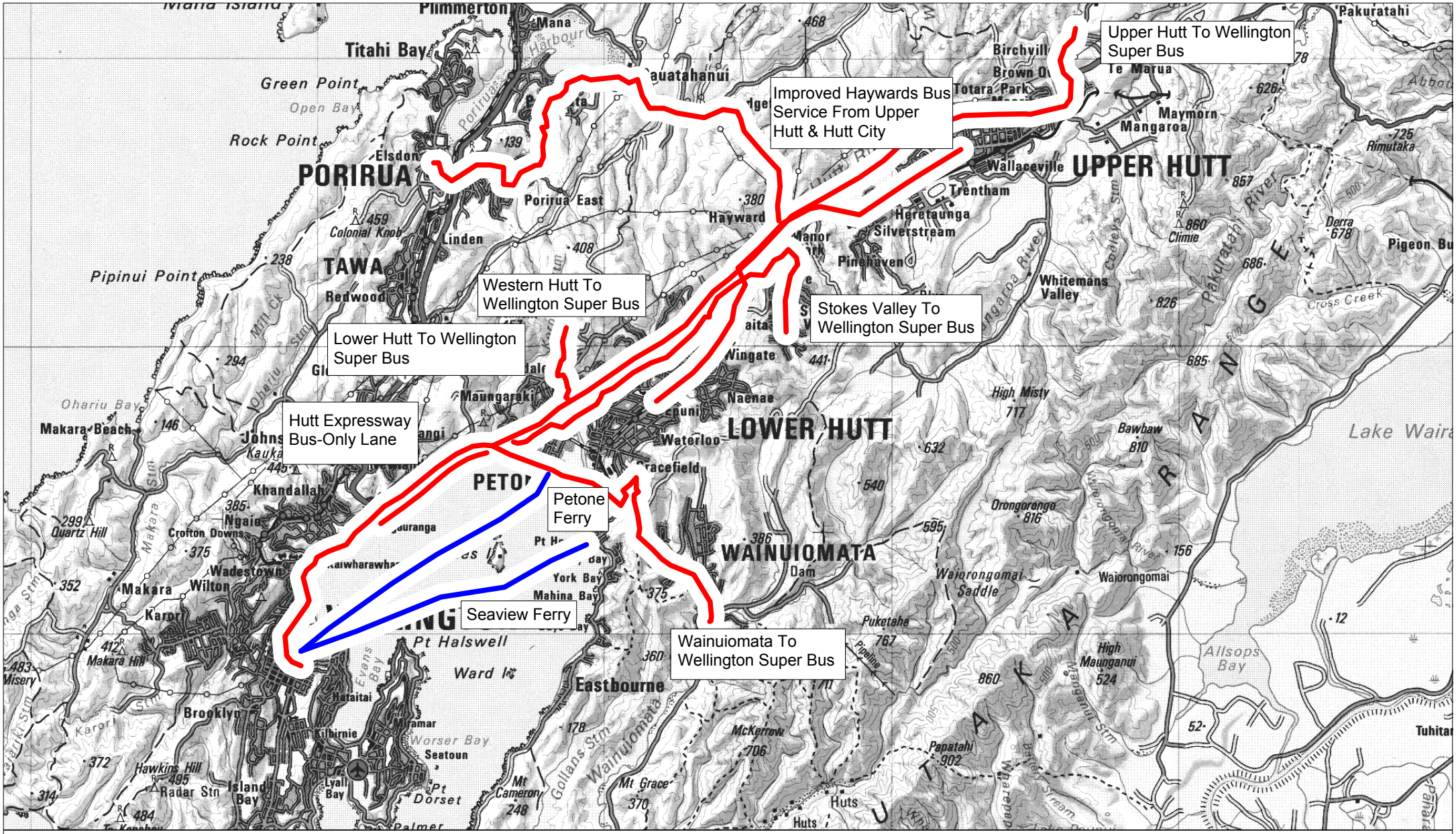

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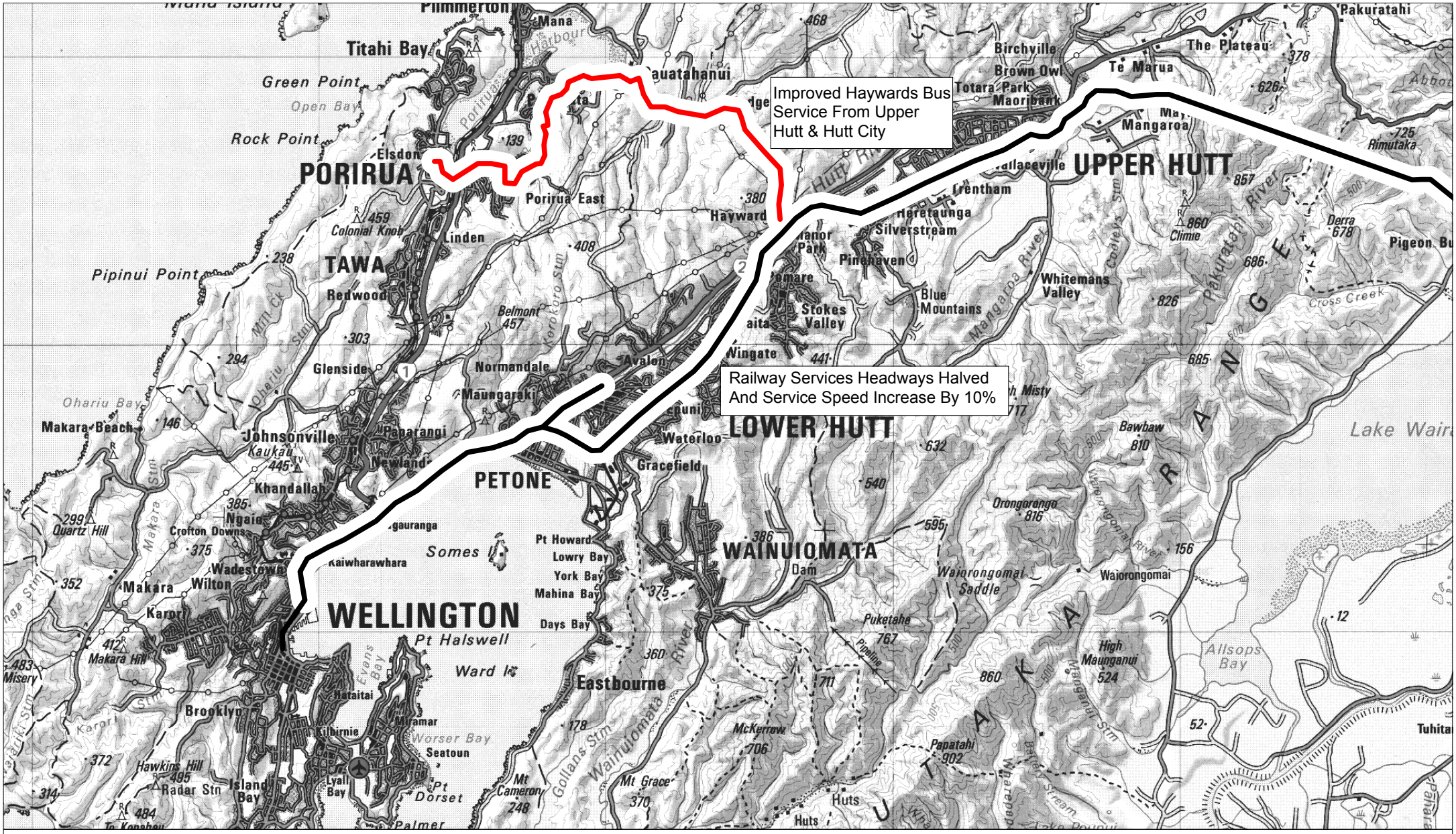
Passenger Transport Options P1



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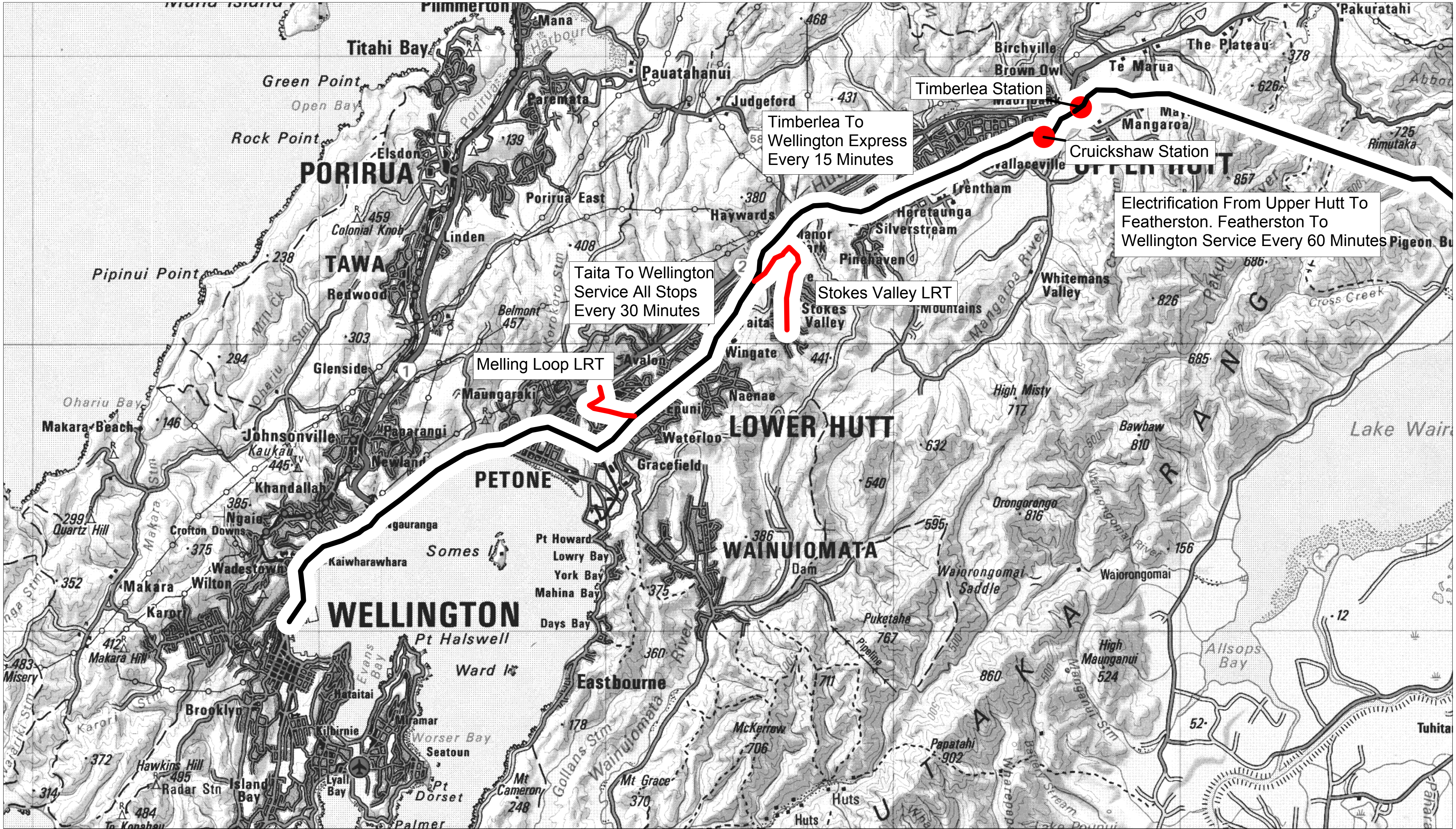

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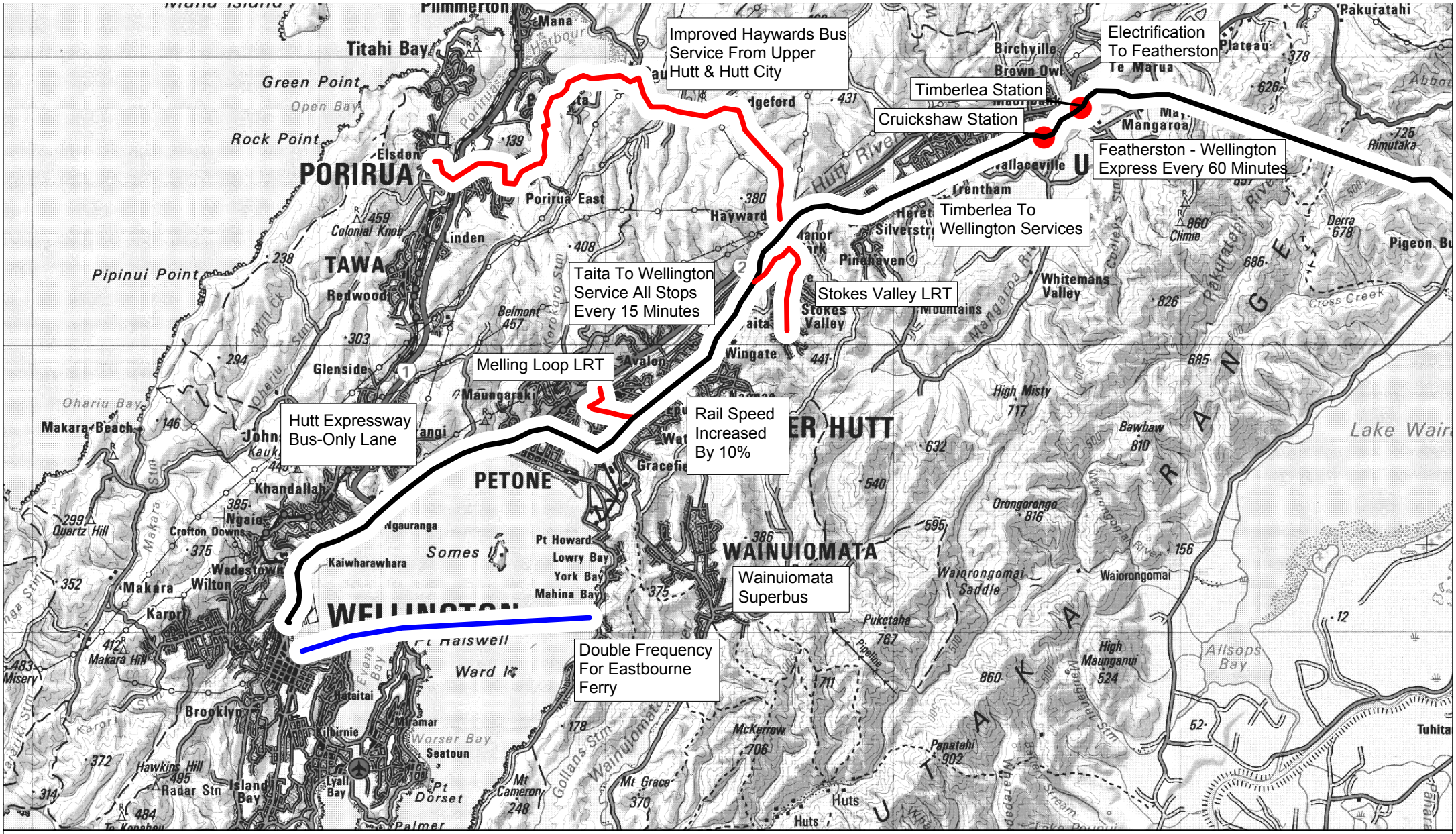

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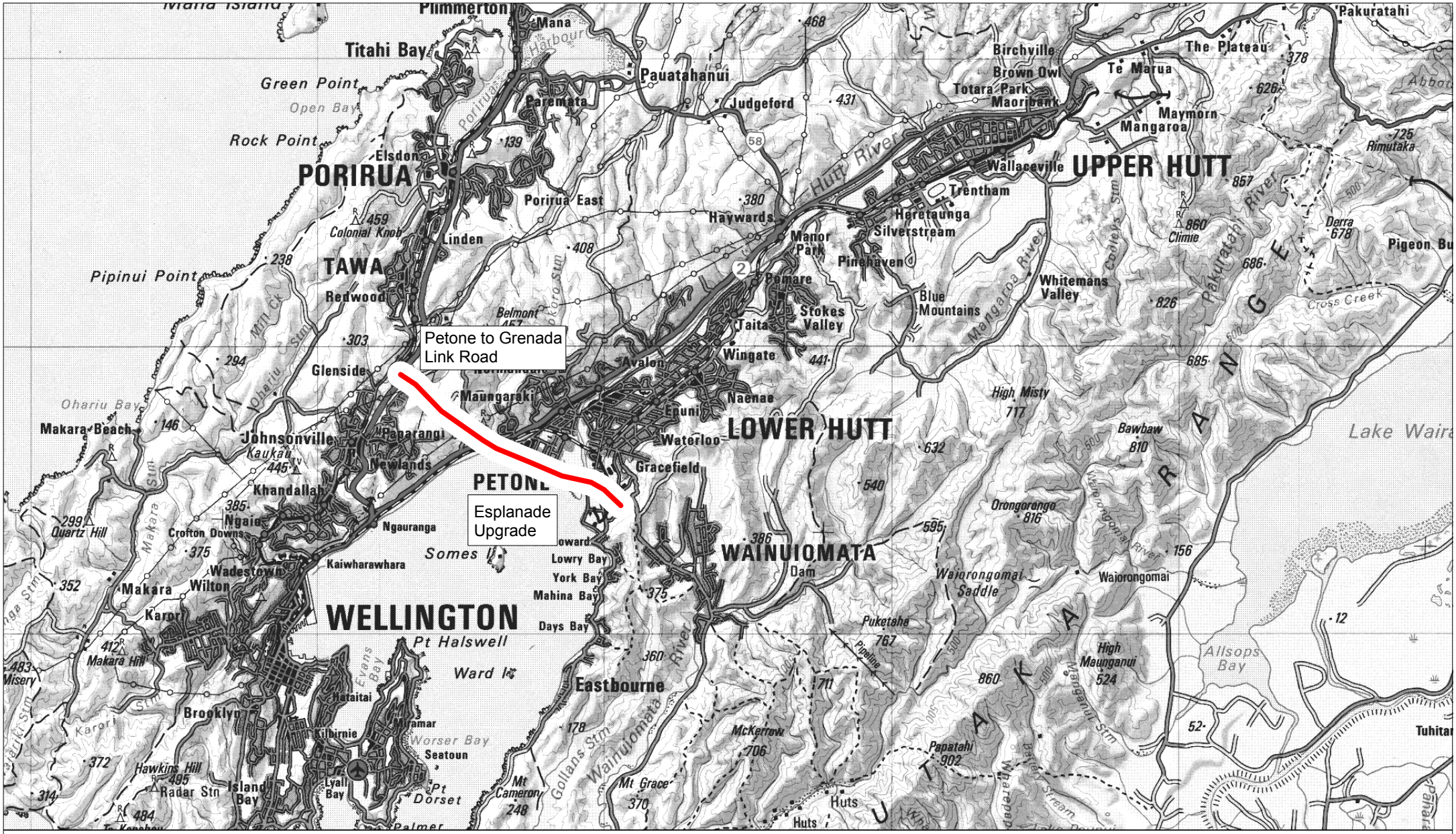

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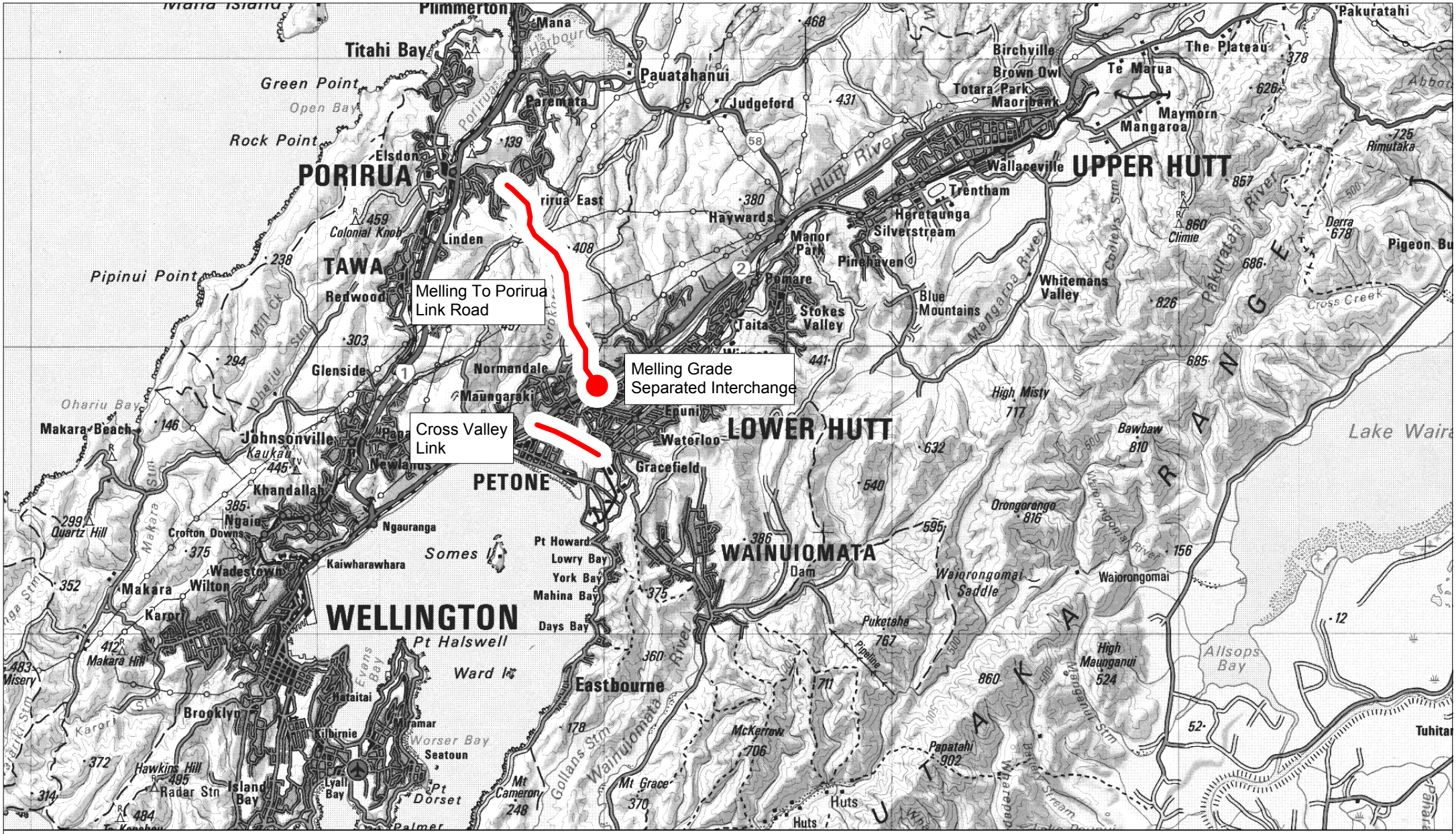
Porirua - Hutt Road Link-Option X1



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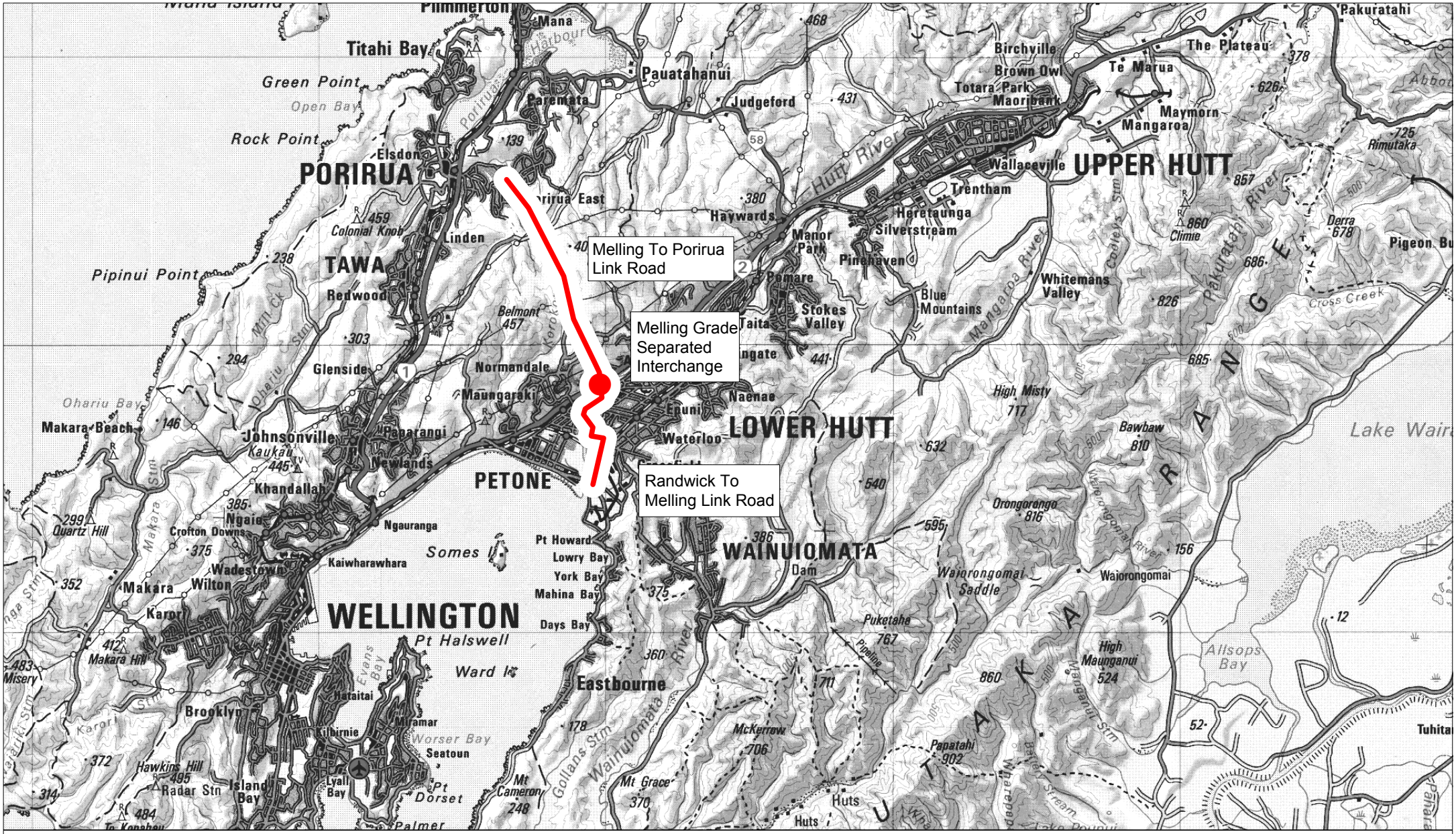
Porirua - Hutt Road Link-Option X2



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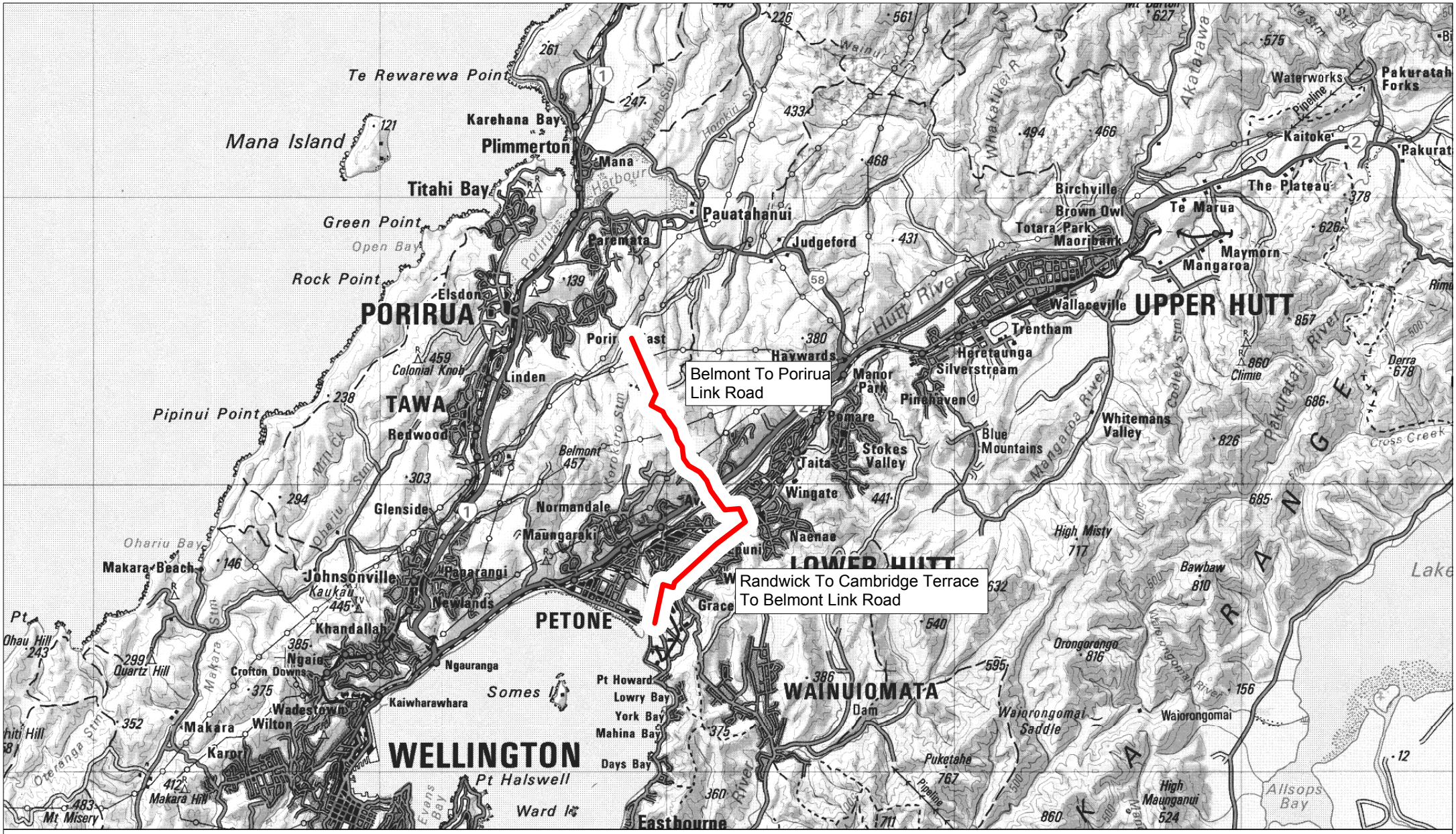
Porirua - Hutt Road Link-Option X3



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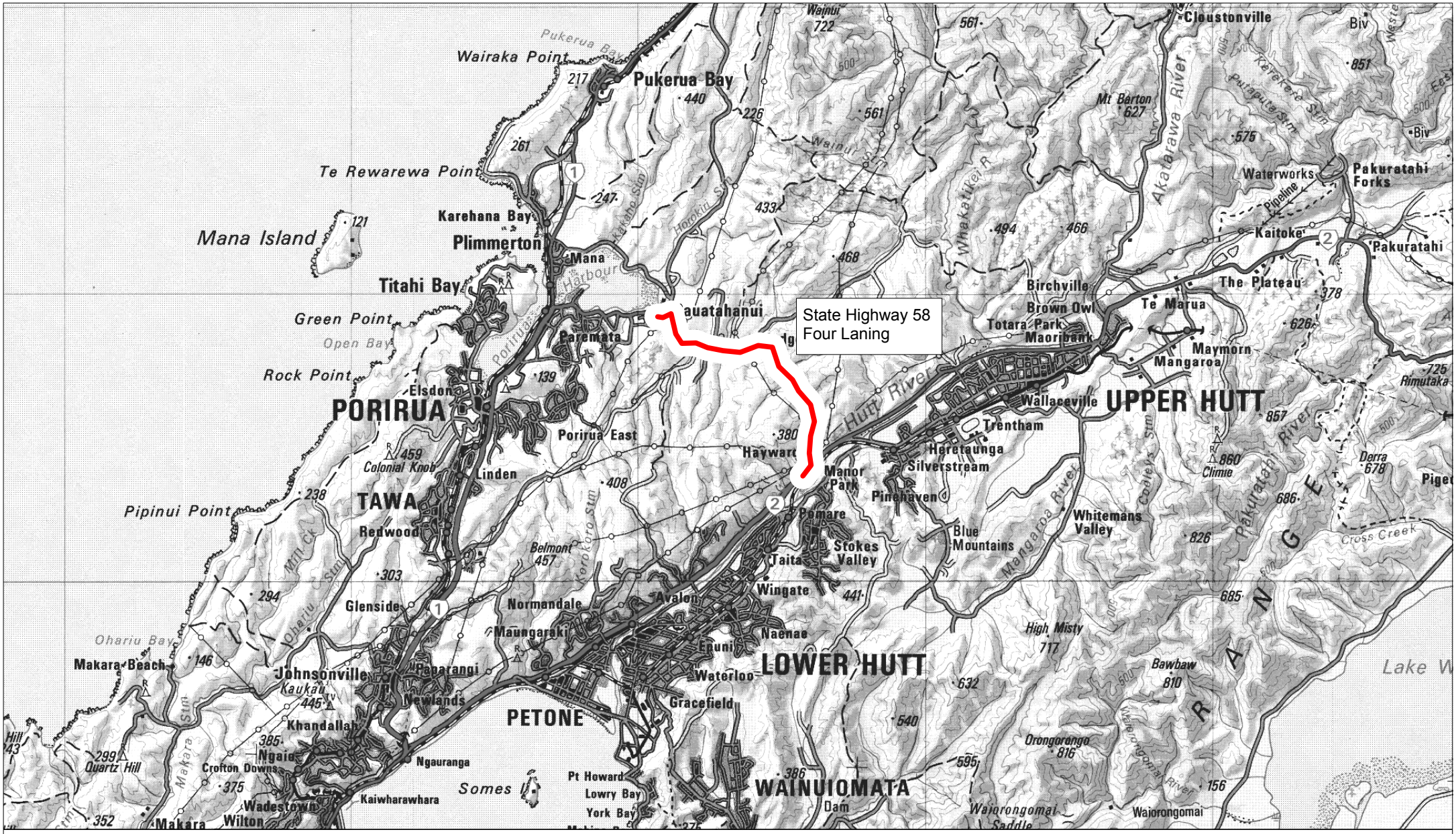

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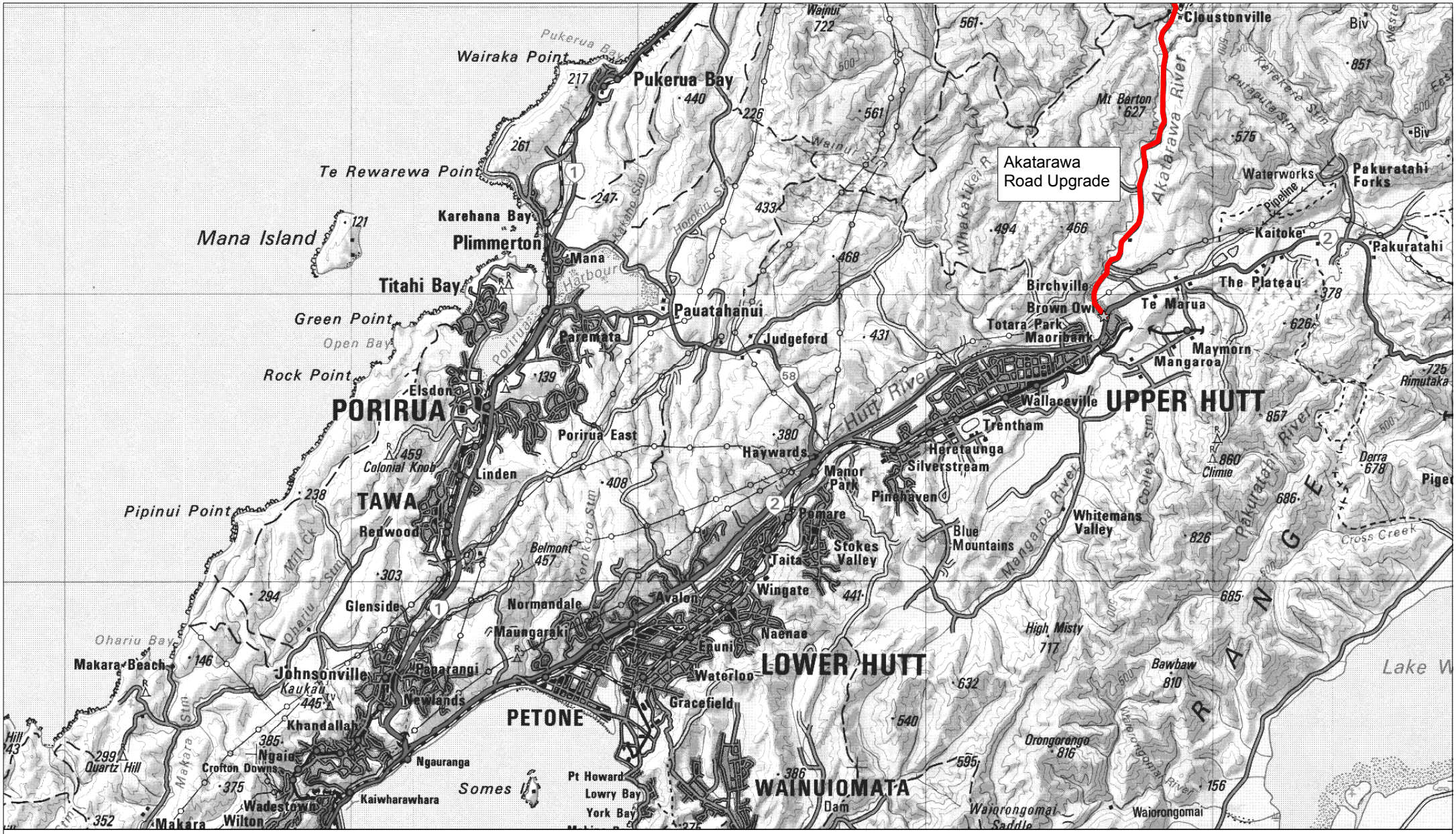

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Porirua - Hutt Road Link-Option X7

▪ Appendix B

EMME/2 modelling Assumptions made for each option

Hutt Corridor Study – Option Coding for EMME/2 Modelling

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
Base (aka 51)	**AM 30001 IP 30002**	Updated Street Network	Uses updated street network from CBD Corridor Study including: • Revised number of lanes on some links • Revised modes on some links.	base_netmods.211
		Updated Turns	Uses updated turns file from CBD Corridor Study.	base_turnmods.231
		Updated Transit Lines	Uses updated transit line files from CBD Corridor Study. Lines updated to 12-Feb-2001.	base_ampt.221 base_ippt.221
		Korokoro Dowse Grade Separation	**Junction** / **Physical Action** / **Model Action** Korokoro / Partial grade separation / Remodel Junction Dowse Drive / Full grade separation / Remodel Junction SH58 / Full grade separation / Improved vdf Programming note: Turn Table needs to be expanded to 400 turns.	base_dowse.211 base_korokoro.211 base_dowseturn.231 base_ haywardsh2.211
		SH1 Ngauranga to Aotea Quay Tidal Flow	• 4 lanes inbound from Ngauranga merge to Aotea Quay off ramp • 2 lanes outbound from Aotea Quay on ramp to Ngauranga diverge • Assumed that this arrangement continues during interpeak (whether extra lane operates inbound or outbound during interpeak is not critical)	base_aoteatidal.211
		CBD Bus Lane Schemes	Five schemes operating in the AM peak only: • Hutt Rd approaching Kaiwharawhara Rd • Kaiwharawhara Rd approaching Hutt Rd • Hutt Rd approaching Sar St near the start of Tinakori Rd • Adelaide Rd approaching the Basin Reserve • Chaytor St approaching Birdwood St.	base_BusLanes.211

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
		Bus Services Along Bus Lanes	Buses given a travel time based on free flow speed rather than the prevailing auto speed.	base_hov_ampt.221
		Cablecar Line	Walk links connect cablecar line to streets.	base_cabcar.211
		Railway Station Walk Links	Walk link added between Wellington Railway Station and its forecourt (where the City Circular bus services departs from). With new canopies increasing the attractiveness of walk trips from Wellington Station, there may be a case for reducing the travel cost of those walk trips to reflect that increased attractiveness.	base_RailWalk.211
		Electrification to Waikanae	4 services/hr in AM peak between Waikanae and Plimmerton. 5 services/hr in AM peak between Plimmerton and Porirua. 7 services/hr in AM peak between Porirua and Wellington (4 are express). 2 services/hr in interpeak between Waikanae and Wellington.	base_Waik_am.221 base_Waik_ip.221
		Raumati Station	Near Poplar Avenue.	base_RaumStat.211
		Lindale Station	Near Awatea Avenue.	base_LindStat.211
		Existing Haywards Bus Service	Buses via SH58 (Haywards Hill) from Porirua to Upper Hutt only (effectively 3 buses during 0700-0900, hence 40 minute headway)	TO BE INCLUDED IN UPDATED TRANSIT LINES FILE

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
		Mana Extension	4 Laning between Plimmerton and Pukerua Bay. Note: Mana Esplanade is 2 lanes only, because the 2016 Base assumes that the Transmission Gully Motorway is in place.	base_ManaExtn.211
		Kapiti Link Road (Stage 1)	New link between Paraparaumu North and Waikanae (i.e between Raumati Rd and Te Moana Rd).	base_LinkRd1.211
		Inner City Bypass (Stage II)	• Terrace tunnel southbound connected to Vivian St • Vivian St becomes eastbound only from Willis St to Cambridge Terrace • Buckle St extended through Arthur St • New link from Arthur St to Terrace tunnel (westbound only) • Ghuznee St becomes two way, with one lane in each direction • Southbound link from Terrace tunnel to Ghuznee St closed • Minor changes have been made to transit lines cross ICBP	base_icbp.211 base_icbp_ampt.221 base_icbp_ippt.221
		Transmission Gully Motorway	4-lane motorway from Mackays Crossing to Kenepuru with the following features: • grade-separated crossing of railway, south of Mackays Xing • connection to Paekakariki via 1-lane on and off ramps in both directions • connection with SH58 (capacity increased from fd=6 to fd=3) • connection to Whitby (1 lane each way) • connection to Cannons Creek (1 lane each way) • connection to current motorway at Kenepuru • grade-separated interchange at Kenepuru has a link to Kenepuru Drive (1 lane each way) • An AM peak toll of 4.5 minutes is modelled over the northern and southern sections of Transmission Gully (i.e 9 minutes over the full route). The corresponding interpeak toll is 0.5 minutes	base_transgul.211
		Ngauranga Gorge ATMS	• No improvement in capacity is modelled • Transit representative advises that it is too early to say whether ATMS will result in higher capacity	Not modelled

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
H1 (aka 52)	**AM 41001 IP 41002**	Hutt Expressway ATMS	• No improvement in capacity is modelled • Transit representative advises that it is too early to say whether ATMS will result in higher capacity • The ATMS would be between Melling and Ngauranga.	Not modelled
		Minor Junction Upgrades	**Junction** / **Physical Action** / **Model Action** Ngauranga / None / None Petone / None / None Korokoro / Partial grade separation / As per Base Dowse Drive / Full grade separation / As per Base Melling / Intersection upgrade / None Belmont / None / None SH58 / Full grade separation / As per Base Silverstream / None / None Moonshine Road / Close access / Remove access Whakatiki Street / Close access / Remove access Gibbons Street / Close access / Remove access Totara Park Road / None / None Fergusson Drive / Close access / Remove access Moeraki Road / Close access / Remove access Akatarawa / None / None	h1_jct.211
		Associated Public Transport Changes	The closure of the Fergusson Drive access to SH2 at Maoribank affects the following bus routes: • Route 12 – Plateau(re-routed via Totara Park Road) • Route 13 – Timberlea (re-routed via added link representing Oregon Drive or Hillside Drive between Fergusson Drive and Norana Road).	h1_ampt.221 h1_ippt.221
		Silverstream Bridge Upgrade	Capacity increased across Silverstream Bridge (the capacity increase from 1000 to 1530 pcu/lane/hr applies to Fergusson Drive between SH2 and Field Street). **Note:** Silverstream Bridge is 2 lanes only in the Base 2016, and remains as 2 lanes in the option (but with a higher lane capacity).	h1_silverstream.211

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
H2_8 (aka 53)	**AM 42001 IP 42002**	Hutt Expressway HOT Lane	• Extra inbound lane provided and operated as a high-occupancy-tolled (HOT) lane for the full distance from Petone interchange to Ngauranga merge • The toll is set by iterative model runs so that the V/C ratio in the general purpose lanes is >0.9 and the V/C ratio in the HOT lane is in the range 0.6 to 0.7 **(The optimum toll is 8 minutes)** • The existing 2 inbound lanes remain as general-purpose lanes • The existing two general-purpose lanes in the opposite direction (towards Petone) are unaffected • Public Transport is coded via the general-purpose lanes with a travel-time function that is independent of auto travel times (hence this simulates public transport using an uncongested HOT lane without having to pay a toll).	h2_petone_hot.211 h2_hot_ampt.221 h2_hot_ippt.221
		Medium-level Junction Upgrades	**Junction** / **Physical Action** / **Model Action** Ngauranga / None / None Petone / None / None Korokoro / Partial grade separation / As per Base Dowse Drive / Full grade separation / As per Base Melling / Full grade separation / Remodel Junction Belmont / Intersection upgrade / None SH58 / Full grade separation / As per Base Silverstream / Intersection upgrade / None Moonshine Road / Intersection upgrade / None Whakatiki Street / Intersection upgrade / None Gibbons Street / Intersection upgrade / None Totara Park Road / Intersection upgrade / None Fergusson Drive / Intersection upgrade / None Moeraki Road / Intersection upgrade / None Akatarawa / Intersection upgrade / None	h2_melling.211 h2_melling_turn.231 h2_melling_ampt.221 h2_melling_ippt.221
		Silverstream Bridge Upgrade	Capacity increased across Silverstream Bridge (the capacity increase from 1000 to 1530 pcu/lane/hr applies to Fergusson Drive between SH2 and Field Street). See “Note” under H1.	h1_silverstream.211

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
H3 (aka 54)	**AM 43001 IP 43002**	Hutt Expressway Tidal Flow	• Extra lane provided and operated as a tidal flow lane • 3 lanes inbound from Petone I/C to Ngauranga merge • 2 lanes outbound from Ngauranga diverge to Petone I/C • Assumed that this arrangement continues during interpeak (whether extra lane operates inbound or outbound during interpeak is not critical)	h3_petone_tidal.211
		Major Junction Upgrades between Petone and Silverstream	**Junction** / **Physical Action** / **Model Action** Ngauranga / None / None Petone / Curve realignment / Higher Capacity Korokoro / Partial grade separation / As per Base Dowse Drive / Full grade separation / As per Base Melling / Full grade separation / As per H2 Belmont / Full grade separation / Higher Capacity SH58 / Full grade separation / As per Base Silverstream / Full grade separation / Higher Capacity The capacity of SH2 between Petone and Silverstream is increased from 1700 pcu/lane/h to 2340 pcu/lane/h to represent full grade separation. This upgrade assumes the curve at Petone is realigned to match the speed environment of the whole route.	h3_lower_jct.211 h2_melling.211 h2_melling_turn.231 h2_melling_ampt.221 h2_melling_ippt.221

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
		Major Junction Upgrades between Silverstream and Akatarawa Road	**Junction** / **Physical Action** / **Model Action** Moonshine Road / Full grade separation / Higher Capacity Whakatiki Street / Close access / Remove access Gibbons Street / Full grade separation / Higher Capacity Totara Park Road / Full grade separation / Higher Capacity Fergusson Drive / Intersection upgrade / None Moeraki Road / Intersection upgrade / None Akatarawa / Intersection upgrade / None **Note (1):** Full grade separation of all three of the Moonshine, Whakatiki and Gibbons junctions is almost certainly not warranted. Furthermore, the junctions are probably too close together to allow satisfactory merge lengths between the on and off ramps. Hence, because the Whakatiki junction has the lowest flows in the base model, it has been closed for this option. **Note (2):** Full grade separation of the Fergusson, Moeraki and Akatarawa intersections is probably not feasible because of phyiscal constraints and existing land use. Hence, short of a bypass being built, the likely maximum alteration to these intersections is an intersection upgrade.	h3_upper_jct.211
		Silverstream Bridge Upgrade	Capacity increased across Silverstream Bridge (the capacity increase from 1000 to 1530 pcu/lane/hr applies to Fergusson Drive between SH2 and Field Street). **Note:** Silverstream Bridge is 2 lanes only in the Base 2016, and remains as 2 lanes in the option (but with a higher lane capacity).	h1_silverstream.211

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
P1 (aka 55)	**AM 60101**	Hutt Expressway Bus Lane	• Extra inbound lane provided and operated as a high-occupancy-vehicle (HOV) lane for the full distance from Petone interchange to Ngauranga merge • There are still 2 general-purpose lanes in each direction • Bus lane may be configured to operate outbound in PM peak	h2_petone_hot.211
		Bus Lane Services	All inbound bus services along Hutt Expressway to travel via bus lane	p1_hov_ampt.221
		Superbus Network	Superbus services, running at 20 minute headways during AM peak only, between Wellington and: Upper Hutt / Stokes Valley / Wainuiomata Lower Hutt / Western Hills	p1_superbus.221
		Haywards Bus Service	Buses via SH58 (Haywards Hill) between Porirua and: - Lower Hutt (30 minute headways) - Upper Hutt (30 minute headways)	p1_porirua_hutt_ ampt.221
		New Ferry Routes	New ferry routes between: - Petone Wharf and Taranaki Street Terminal - Seaview and Taranaki Street Terminal	p1_ferry.211
		New Ferry Services	New ferry services running at 60 minute headways between: - Petone Wharf and Taranaki Street Terminal - Seaview and Taranaki Street Terminal	p1_ferrynew.221
	IP 60102	Hutt Expressway Bus Lane	See AM above	h2_petone_hot.211
		Bus Lane Services	See AM above	p1_hov_ippt.221
		Haywards Bus Service	Buses via SH58 (Haywards Hill) between Porirua and: - Lower Hutt (60 minute headways) - Upper Hutt (60 minute headways)	p1_porirua_hutt_ ippt.221
		New Ferry Routes	See AM above	p1_ferry.211
		New Ferry Services	See AM above	p1_ferrynew.221

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
P2 (aka 56)	**AM 60201**	Haywards Bus Service	Buses via SH58 (Haywards Hill) between Porirua and: - Lower Hutt (30 minute headways) - Upper Hutt (30 minute headways)	p2_porirua_hutt_ ampt.221
		Rail Frequency Doubled	Headway is halved on the following lines: melwel Melling-Wellington maswel Masterton-Wellington taiwel Taita-Wellington uhwela Upper Hutt-Wellington uhwelx Upper Hutt-Wellington Express welmas Wellington-Masterton welmel Wellington-Melling weltai Wellington-Taita weltax Wellington-Taita Express weluha Wellington-Upper Hutt weluhx Wellington-Upper Hutt Express	uses modline function
		Rail Speed Increased	Rail speeds increased by 10% on the same eleven lines as above.	Travel time function changed from ttf=11 to 12
	IP 60202	Haywards Bus Service	Buses via SH58 (Haywards Hill) between Porirua and: - Lower Hutt (60 minute headways) - Upper Hutt (60 minute headways)	p2_porirua_hutt_ ippt.221
		Rail Frequency Doubled	Headway is halved on the following lines: maswel Masterton-Wellington uhwela Upper Hutt-Wellington welmas Wellington-Masterton weluha Wellington-Upper Hutt	uses modline function
		Rail Speed Increased	Rail speeds increased by 10% on the same four lines as above.	Travel time function changed from ttf=11 to 12

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
P3 (aka 57)	**AM 60301**	Melling Loop LRT Line	Line from Waterloo Interchange to Melling via Queensgate	p3_melling.211
		Melling Loop LRT Services	Wellington-Melling-Waterloo-Wellington (20 minute headway) Wellington-Waterloo-Melling-Wellington (20 minute headway)	p3_melling_ampt.221
		Stokes Valley LRT	Line from Pomare into Stokes Valley	p3_stokes.211
		Stokes Valley LRT Services	Wellington-Melling-Waterloo-Stokes Valley (20 minute headway) Stokes Valley-Waterloo-Melling-Wellington (20 minute headway)	p3_stokes_ampt.221
		New Stations at Timberlea and Cruickshank Rd	2 new stations on Hutt Valley Line north of Upper Hutt Station	p3_timber.211
		Hutt Valley Heavy-Rail Services	Timberlea-Wellington Express (15 minute headway) Taita-Wellington All Stops (30 minute headway) Wellington-Timberlea Express (15 minute headway) Wellington-Taita All Stops (30 minute headway)	p3_timber_ampt.221
		Electrification to Featherston	Electrification extended from Upper Hutt to Featherston	See below
		Wairarapa Services	Featherston-Wellington Express (60 minute headway) Wellington-Featherston Express (60 minute headway) Masterton trains continue as at present	p3_featherston_ ampt.221
	IP 60302	Melling Loop LRT Line	Line from Waterloo Interchange to Melling via Queensgate	p3_melling.211
		Melling Loop LRT Services	Wellington-Melling-Waterloo-Wellington (30 minute headway) Wellington-Waterloo-Melling-Wellington (30 minute headway)	p3_melling_ippt.221
		Stokes Valley LRT	Line from Pomare into Stokes Valley	p3_stokes.211
		Stokes Valley LRT Services	Wellington-Melling-Waterloo-Stokes Valley (30 minute headway) Stokes Valley-Waterloo-Melling-Wellington (30 minute headway)	p3_stokes_ippt.221
		New Stations at Timberlea and Cruickshank Rd	2 new stations on Hutt Valley Line north of Upper Hutt Station	p3_timber.211
		Hutt Valley Heavy-Rail Services	Timberlea-Wellington All Stops (30 minute headway) Wellington-Timberlea All Stops (30 minute headway)	p3_timber_ippt.221
		Electrification to Featherston	Electrification extended from Upper Hutt to Featherston	See below
		Wairarapa Services	Featherston-Wellington Express (60 minute headway) Wellington-Featherston Express (60 minute headway) Masterton trains continue as at present	p3_featherston_ ippt.221

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
P4 (aka 58)	**AM 60401**	Melling Loop LRT Line	Line from Waterloo Interchange to Melling via Queensgate	p4_melling.211
		Melling Loop LRT Services	Wellington-Melling-Waterloo-Wellington (20 minute headway) Wellington-Waterloo-Melling-Wellington (20 minute headway) Note: There are no heavy-rail services on the Melling Line	p4_melling_ampt.221
		Stokes Valley LRT	Line from Pomare into Stokes Valley	p4_stokes.211
		Stokes Valley LRT Services	Wellington-Melling-Waterloo-Stokes Valley (20 minute headway) Stokes Valley-Waterloo-Melling-Wellington (20 minute headway)	p4_stokes_ampt.221
		New Stations at Timberlea and Cruickshank Rd	2 new stations on Hutt Valley Line north of Upper Hutt Station	p4_timber.211
		Hutt Valley Heavy-Rail Services	Timberlea-Wellington Express (15 minute headway) Taita-Wellington All Stops (15 minute headway) Wellington-Timberlea Express (15 minute headway) Wellington-Taita All Stops (15 minute headway)	p4_timber_ampt.221
		Electrification to Featherston	Electrification extended from Upper Hutt to Timberlea	See below
		Wairarapa Services	Featherston-Wellington Express (60 minute headway) Wellington-Featherston Express (60 minute headway) Masterton trains continue as at present	p4_featherston_ ampt.221
		Rail Speeds Increased	Rail speeds increased by 10% on the following lines: maswel Masterton-Wellington (existing) welmas Wellington-Masterton (exisitng) taiwel Taita-Wellington (existing) weltai Wellington-Taita (existing) timwel Timberlea-Wellington Express (new) weltim Wellington-Timberlea Express (new) Note: Speeds for LRT services are also 10% faster than base heavy-rail speeds.	Travel time function changed from ttf=11 to 12
		Haywards Bus Service	Buses via SH58 (Haywards Hill) between Porirua and: - Lower Hutt (30 minute headways) - Upper Hutt (30 minute headways)	p4_porirua_hutt_ ampt.221

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
		Hutt Expressway Bus Lane	• Extra inbound lane provided and operated as a high-occupancy-vehicle (HOV) lane for the full distance from Petone interchange to Ngauranga merge • There are still 2 general-purpose lanes in each direction • Bus lane may be configured to operate outbound in PM peak	p4_buslane.211 p4_hov_ampt.221
		Wainuiomata Superbus	Superbus service, running at 20 minute headways during AM peak only, between Wellington and Wainuiomata.	p4_superbus_ ampt.221
		Ferry Frequency Doubled for Eastbourne ferry	Headway is halved for the following services: ferrin Days Bay-Queens Wharf Ferry ferrou Queens Wharf-Days Bay Ferry	uses modline function
	IP 60402	Melling Loop LRT Line	See AM above	p4_melling.211
		Melling Loop LRT Services	Wellington-Melling-Waterloo-Wellington (60 minute headway) Wellington-Waterloo-Melling-Wellington (60 minute headway) Note: There are no heavy-rail services on the Melling Line	p4_melling_ippt.221
		Stokes Valley LRT	See AM above	p4_stokes.211
		Stokes Valley LRT Services	Wellington-Melling-Waterloo-Stokes Valley (60 minute headway) Stokes Valley-Waterloo-Melling-Wellington (60 minute headway)	p4_stokes_ippt.221
		New Stations at Timberlea and Cruickshank Rd	2 new stations on Hutt Valley Line north of Upper Hutt Station	p4_timber.211
		Hutt Valley Heavy-Rail Services	Timberlea-Wellington All Stops (30 minute headway) Wellington-Timberlea All Stops (30 minute headway)	p4_timber_ippt.221
		Electrification to Featherston	Electrification extended from Upper Hutt to Timberlea	See below
		Wairarapa Services	Featherston-Wellington Express (60 minute headway) Wellington-Featherston Express (60 minute headway) Masterton trains continue as at present	p4_featherston_ ippt.221
		Haywards Bus Service	Buses via SH58 (Haywards Hill) between Porirua and: - Lower Hutt (60 minute headways) - Upper Hutt (60 minute headways)	p4_porirua_hutt_ ippt.221

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
		Hutt Expressway Bus Lane	• Extra inbound lane provided and operated as a high-occupancy-vehicle (HOV) lane for the full distance from Petone interchange to Ngauranga merge • There are still 2 general-purpose lanes in each direction • Bus lane may be configured to operate outbound in PM peak	p4_buslane.211 p4_hov_ippt.221
		Rail Speeds Increased	Rail speeds increased by 10% on the following lines: maswel Masterton-Wellington (existing) welmas Wellington-Masterton (exisitng) timwel Timberlea-Wellington Express (new) weltim Wellington-Timberlea Express (new) Note: Speeds for LRT services are also 10% faster than base heavy-rail speeds.	Travel time function changed from ttf=11 to 12
		Ferry Frequency Doubled for Eastbourne ferry	Headway is halved for the following services: ferrin Days Bay-Queens Wharf Ferry ferrou Queens Wharf-Days Bay Ferry	uses modline function

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
X1 (aka 59)	**AM 80011 IP 80012**	Petone-Grenada Link Road	• 4-lane road from Cornish Street (Petone) to Westchester Drive / Churton Park Interchange (Grenada) • 80 km/h speed limit (steep grade similar to Ngauranga Gorge) • Volume delay function is fd6 (1400 pcu/lane/hr). Not fd3 because of steep grade • All movements full grade separation at Petone • Assumed there are traffic signals at the tops of the on ramps (hence 50 km/h speed environment)	x1_petone_ grenada.211
		Esplanade Upgrade	• 4-lane road from Randwick Rd to Petone Interchange • 70 km/h speed limit • Volume delay function remains as fd3 (but now over 4 lanes) • Limited access along Esplanade • Access from Cuba St closed • Duplicated Waione St Bridge	x1_esplanade.211
X2 (aka 60)	**AM 80021 IP 80022**	Melling-Porirua Link Road	4-lane road from Melling Bridge to Transmission Gully route.	x2_melling_tgully.211
		Cross-Valley Link (Korokoro Dowse)	• 4-lane road from Randwick Rd to SH2 Dowse Interchange • New bridge across Hutt River between Whites Line West and Wakefield St	x2_cross_valley.211 x2_dowse_ampt.221 x2_dowse_ippt.221

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
X3 (aka 61)	**AM 80031 IP 80032**	Melling-Porirua Link Road	4-lane road from Melling Bridge to Transmission Gully route.	x3_melling_tgully.211
		Melling Grade Separation	Full grade separation at Melling Interchange	x3_melling.211 x3_melling_turn.231 x3_melling_ampt.221 x3_melling_ippt.211
		Randwick-Melling Link	• 4-lane road from Randwick Rd to Melling Bridge • New 4-lane link around Lower Hutt CBD (over Riverside carpark) • 4 lane Melling Bridge	x3_randwick_ melling.211
X4 (aka 62)	**AM 80041 IP 80042**	Belmont-Porirua Link Road	4-lane road from Kennedy Good Bridge to Transmission Gully.	x4_kgb_tgully.211
		Randwick-Cambridge Terrace-Belmont Link	• 4-lane road from Randwick Rd to Kennedy Good Bridge via Cambridge Terrace and Daysh St • Remodelled junction where Daysh St ovberbridge currently crosses Cambridge Terrace	x4_randwick_kgb.211
X5	**Not modelled**	SH58 Four Laning	SH58 upgraded to four lanes from Manor Park to Judgeford	Not modelled
		Judgeford-Warspite Avenue Link	2-lane arterial road connecting Warspite Avenue (near Niagara Street) to SH58 **Note: X5 is not modelled now that Transmission Gully is included in the base**	Not modelled
X6 (aka 64)	**AM 80061 IP 80062**	SH58 Four Laning	• SH58 upgraded to four lanes from Manor Park to Paremata • 80 km/h speed limit • Volume delay function is fd3 (1530 pcu/lane/hr)	x6_sh58_4lane.211
X7 (aka 65)	**AM 80071 IP 80072**	Akatarawa Road upgrade	Akatarawa Road upgraded from SH2 through to SH1 with: • minimum 70 km/h curves • minimum 3.5 metre width lanes.	x7_aka70.211

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
H3P1	**AM 53101 IP 53102**	See H3 and P1 above	**NOTE:** This is an example combination selected by BAH for their original modelling. It will almost certainly be superseded.	
H3P2	**AM 53201 IP 53202**	See H3 and P2 above	**NOTE:** This is an example combination selected by BAH for their original modelling. It will almost certainly be superseded.	
H3P3	**AM 53301 IP 53302**	See H3 and P3 above	**NOTE:** This is an example combination selected by BAH for their original modelling. It will almost certainly be superseded.	
H3X1	**AM 93011 IP 93012**	See H3 and X1 above	**NOTE:** This is an example combination selected by BAH for their original modelling. It will almost certainly be superseded. H3 with: • Petone-Grenada Link Road • Esplanade Upgrade.	
H3X4	**AM 93041 IP 93042**	See H3 and X4 above	**NOTE:** This is an example combination selected by BAH for their original modelling. It will almost certainly be superseded. H3 with: • Belmont-Porirua Link Road • Randwick-Cambridge Terrace-Belmont Link.	
H3P3X1	**AM 93311 IP 93312**	See H3, P3 and X1 above	**NOTE:** This is an example combination selected by BAH for their original modelling. It will almost certainly be superseded. H3 with: • P3 • Petone-Grenada Link Road • Esplanade Upgrade.	

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
Base No TG No ICBP	**AM 30003 IP 30004**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
H1 No TG No ICBP	**AM 41003 IP 41004**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
H2 No TG No ICBP	**AM 42003 IP 42004**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
H3 No TG No ICBP	**AM 43003 IP 43004**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
P1 No TG No ICBP	**AM 60103 IP 60104**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
P2 No TG No ICBP	**AM 60203 IP 60204**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
P3 No TG No ICBP	**AM 60303 IP 60304**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
P4 No TG No ICBP	**AM 60403 IP 60404**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	

Option	Period / Scenario	Inclusions	Description and Assumptions	Filename / Modification
X1 No TG No ICBP	**AM 80013 IP 80014**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
X2 No TG No ICBP	**AM 80023 IP 80024**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
X3 No TG No ICBP	**AM 80033 IP 80034**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
X4 No TG No ICBP	**AM 80043 IP 80044**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
X5 No TG No ICBP	**AM 80053 IP 80054**		**EXTRA SPECIAL NOTE:** Option X5 becomes a possible option if Transmission Gully is taken it. Hence it may be necessary to model X5 at the sensitivity testing stage.	
X6 No TG No ICBP	**AM 80063 IP 80064**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	
X7 No TG No ICBP	**AM 80073 IP 80074**		**NOTE:** A sensitivity test of each option will be conducted with Transmission Gully and the Inner City Bypass taken out. Only the promising options may undergo this sensitivity test.	

▪ Appendix C

Performance indicator test results for each option

INDICATOR	Table 5.1 - AM Results (Note: Values are for the period 0700 to 0900)													
	Base	H1	H2	H3	P1	P2	P3	P4	X1	X2	X3	X4	X6	X7
ACCESSIBILITY														
Auto														
Total motor vehicle travel time (hrs)	29678	29705	29530	29572	29147	29305	29561	29024	29793	29786	29556	29804	29591	29694
Total motor vehicle travel distance ('000km)	1487	1486	1507	1546	1480	1481	1485	1478	1518	1511	1514	1514	1490	1488
Average vehicle network speed (km/hr)	50.1	50.0	51.0	52.3	50.8	50.5	50.2	50.9	50.9	50.7	51.2	50.8	50.3	50.1
Total auto trips spread from the peak	189	164	11	-286	63	110	151	51	-78	-16	-60	-24	178	177
Total vehicle hours below service level D	8435	8248	8629	8021	8253	8184	8356	8203	8712	8511	8281	8157	8386	8431
Auto Travel times to Airport (mins):														
CBD	9.9	9.9	9.9	10.0	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Port	12.4	12.4	12.5	12.6	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Johnsonville to Airport	25.3	25.3	25.3	25.5	25.0	25.0	25.2	24.8	24.1	24.9	24.7	25.1	25.1	25.3
Porirua to Airport	32.4	32.5	32.3	32.1	31.9	32.0	32.3	31.7	33.5	31.9	31.6	32.5	32.3	32.5
Plimerton to Airport	38.8	38.9	38.6	38.4	38.2	38.3	38.7	38.1	39.9	38.3	38.1	38.9	38.7	38.9
Paraparaumu to Airport	54.2	54.3	54.0	53.8	53.7	53.8	54.1	53.5	55.2	53.8	53.5	54.3	54.1	54.2
West External to Airport	72.8	72.8	72.6	72.3	72.2	72.3	72.7	72.1	73.7	72.3	72.0	72.9	72.7	72.7
Lower Hutt to Airport	38.7	38.7	33.1	29.9	37.1	37.6	38.4	36.8	35.7	38.4	37.5	37.0	38.5	38.7
Upper Hutt to Airport	51.9	54.5	46.3	40.6	50.3	50.7	51.4	49.8	49.0	51.2	50.3	50.4	51.7	51.9
East External to Airport	117.8	115.5	112.3	105.8	116.2	116.6	117.3	115.7	114.9	117.2	116.3	116.4	117.7	117.8
Transit														
Total passenger travel time (hrs)	12125	12124	11901	11521	12582	12425	12406	12787	11958	11891	11952	11978	12124	12115
Total passenger travel distance ('000km)	426	426	412	399	452	449	438	462	417	413	417	417	426	425
Average passenger network speed (km/hr)	38.9	38.9	38.2	38.1	39.1	40.3	39.3	39.5	38.6	38.4	38.5	38.5	38.9	38.9
AFFORDABILITY														
Strategy Revenue ($)														
Toll	0	0	2087	0	0	0	0	0	0	0	0	0	0	0
Fare	75627	75590	74465	72155	82238	79360	76797	82363	74955	74174	74639	74736	75661	75575
Parking	114432	114460	116549	119633	112530	112981	113925	112069	115908	115612	115242	115379	114374	114478
Total	190060	190050	193101	191787	194768	192341	190722	194433	190863	189787	189881	190115	190035	190053
ECONOMIC EVALUATION														
Cross-valley-link-road user benefits	0	-175	3315	5809	4170	2458	1526	5293	9289	6272	5680	4542	51	80
Porirua-Hutt-link-road user benefits	0	-136	120	239	148	185	34	176	2985	5580	5863	5966	357	272
Non-link-road user benefits	0	-1139	3487	7855	5782	5951	2306	7355	2406	1399	2540	1920	375	165
Region-wide user benefits	0	-1450	6921	13902	10100	8594	3866	12824	14680	13251	14083	12428	783	517
SUSTAINABILITY														
Environment														
CO2 Emmissions (Tonnes)	379.1	379.0	382.5	387.6	375.1	376.0	378.1	374.0	385.8	383.9	382.7	384.5	378.9	379.4
CO Emmissions (Tonnes)	15.4	15.4	15.4	15.4	15.2	15.2	15.4	15.1	15.5	15.5	15.4	15.5	15.4	15.4
Fuel														
Fuel Consumption (Litres)	151654	151599	153006	155026	150034	150412	151257	149605	154339	153546	153062	153802	151566	151745
Safety														
Total Accident Cost ($)	45099	44643	45698	43313	44889	44894	45036	44810	46836	47397	47474	47470	45228	45138
General Statistics														
Total Number of motor vehicle trips	141026	140994	141618	142517	140343	140199	140720	140011	141985	142011	141920	141869	141050	141054
Total Number of passenger trips	50306	50289	50659	50977	50020	50026	50195	49916	50608	50602	50562	50564	50321	50318
Total Number of slow trips	47498	47547	47405	47287	47285	47217	47357	47164	47204	47315	47245	47248	47476	47486
Total Number of PT trips	49921	49943	49274	48490	51110	51204	50487	51625	49298	49130	49385	49376	49922	49908
Average motor vehicle trip length (km)	10.5	10.5	10.6	10.9	10.5	10.6	10.6	10.6	10.7	10.6	10.7	10.7	10.6	10.5
Cost of Congestion ($)	78825	78119	74574	72065	74845	76380	78111	74236	75111	76745	73818	75784	78297	78745
V/C Ratios														
Melling Bridge (WB)	0.77	0.76	0.00	0.00	0.76	0.75	0.77	0.76	0.75	0.87	0.00	0.82	0.78	0.77
SH2 South of SH58 (SB)	0.60	0.59	0.62	0.70	0.60	0.59	0.60	0.60	0.57	0.47	0.47	0.54	0.60	0.60
Kenn Good Bridge (WB)	0.85	0.85	0.91	1.04	0.85	0.85	0.86	0.85	0.81	0.95	0.89	0.68	0.85	0.85
Randwick Rd (SB)	0.76	0.76	0.76	0.74	0.76	0.75	0.75	0.76	0.90	0.71	0.38	0.36	0.76	0.76
Petone Esplanade (WB)	0.81	0.81	0.89	0.84	0.79	0.79	0.80	0.79	0.68	0.70	0.79	0.79	0.81	0.81
Hutt Rd South of Wakefield (SB)	0.49	0.49	0.53	0.53	0.51	0.50	0.49	0.51	0.68	0.43	0.42	0.46	0.49	0.49
SH2 Petone - Ngauranga (SB)	1.19	1.19	1.09	1.06	1.17	1.18	1.18	1.17	1.12	1.17	1.16	1.16	1.19	1.19
SH1 Ngauranga - Aotea Quay (SB)	0.81	0.81	0.85	0.90	0.80	0.81	0.81	0.80	0.82	0.83	0.82	0.82	0.81	0.81
SH1 Aotea Quay - Ngauranga (NB)	0.75	0.75	0.77	0.79	0.77	0.77	0.76	0.78	0.76	0.75	0.75	0.75	0.75	0.75

INDICATOR	Table 5.2 - AM Results - % Difference													
	Base	H1	H2	H3	P1b	P2	P3	P4	X1	X2	X3	X4	X6	X7
ACCESSIBILITY														
Auto														
Total motor vehicle travel time (hrs)	29678	0.09%	-0.50%	-0.36%	-1.79%	-1.26%	-0.39%	-2.20%	0.39%	0.36%	-0.41%	0.42%	-0.29%	0.05%
Total motor vehicle travel distance ('000km)	1487	-0.11%	1.32%	3.97%	-0.48%	-0.46%	-0.16%	-0.66%	2.04%	1.58%	1.77%	1.76%	0.16%	0.03%
Average vehicle network speed (km/hr)	50.1	-0.21%	1.83%	4.34%	1.33%	0.80%	0.23%	1.58%	1.64%	1.21%	2.19%	1.33%	0.46%	-0.02%
Total auto trips spread from the peak	189	-12.93%	-93.96%	-251.56%	-66.77%	-41.71%	-20.19%	-72.97%	-141.55%	-108.32%	-131.85%	-112.88%	-5.78%	-6.25%
Total vehicle hours below service level D	8435	-2.23%	2.29%	-4.91%	-2.16%	-2.98%	-0.94%	-2.76%	3.28%	0.89%	-1.83%	-3.30%	-0.58%	-0.06%
Auto Travel times to Airport (mins):														
CBD	10	-0.19%	0.34%	1.10%	-0.16%	-0.12%	-0.02%	-0.06%	0.19%	0.14%	-0.06%	0.23%	-0.06%	-0.09%
Port	12	-0.16%	0.48%	1.78%	-0.32%	-0.16%	-0.08%	-0.16%	0.32%	0.16%	0.00%	0.32%	-0.08%	-0.08%
Johnsonville to Airport	25	0.12%	0.20%	0.79%	-1.11%	-0.95%	-0.16%	-1.62%	-4.48%	-1.50%	-2.26%	-0.55%	-0.44%	0.16%
Porirua to Airport	32	0.19%	-0.56%	-1.17%	-1.73%	-1.48%	-0.28%	-2.19%	3.21%	-1.67%	-2.47%	0.19%	-0.31%	0.15%
Plimerton to Airport	39	0.15%	-0.54%	-1.13%	-1.49%	-1.29%	-0.26%	-1.88%	2.65%	-1.34%	-1.98%	0.28%	-0.28%	0.10%
Paraparaumu to Airport	54	0.11%	-0.39%	-0.85%	-1.05%	-0.90%	-0.18%	-1.33%	1.75%	-0.88%	-1.40%	0.17%	-0.18%	-0.11%
West External to Airport	73	0.08%	-0.29%	-0.63%	-0.80%	-0.67%	-0.14%	-0.99%	1.29%	-0.66%	-1.04%	0.12%	-0.14%	-0.12%
Lower Hutt to Airport	39	0.08%	-14.28%	-22.61%	-4.01%	-2.72%	-0.78%	-4.86%	-7.63%	-0.70%	-2.98%	-4.22%	-0.52%	0.18%
Upper Hutt to Airport	52	5.05%	-10.76%	-21.71%	-3.08%	-2.31%	-0.87%	-3.97%	-5.57%	-1.25%	-3.01%	-2.85%	-0.33%	-0.02%
East External to Airport	118	-1.95%	-4.67%	-10.19%	-1.36%	-1.02%	-0.42%	-1.78%	-2.46%	-0.51%	-1.27%	-1.19%	-0.08%	0.00%
Transit														
Total passenger travel time (hrs)	12125	-0.01%	-1.85%	-4.98%	3.77%	2.47%	2.31%	5.46%	-1.38%	-1.93%	-1.43%	-1.21%	-0.01%	-0.08%
Total passenger travel distance ('000km)	426	-0.02%	-3.19%	-6.39%	6.18%	5.40%	2.84%	8.45%	-1.97%	-3.12%	-2.18%	-2.04%	0.02%	-0.14%
Average passenger network speed (km/hr)	39	-0.01%	-1.80%	-2.15%	0.39%	3.43%	0.91%	1.57%	-0.78%	-1.47%	-0.97%	-1.01%	0.05%	-0.08%
AFFORDABILITY														
Strategy Revenue ($)														
Toll	0													
Fare	75627	-0.05%	-1.54%	-4.59%	8.74%	4.94%	1.55%	8.91%	-0.89%	-1.92%	-1.31%	-1.18%	0.04%	-0.07%
Parking	114432	0.02%	1.85%	4.54%	-1.66%	-1.27%	-0.44%	-2.06%	1.29%	1.03%	0.71%	0.83%	-0.05%	0.04%
Total	190060	-0.01%	1.60%	0.91%	2.48%	1.20%	0.35%	2.30%	0.42%	-0.14%	-0.09%	0.03%	-0.01%	0.00%
ECONOMIC EVALUATION														
Cross-valley-link-road user benefits	0													
Porirua-Hutt-link-road user benefits	0													
Non-link-road user benefits	0													
Region-wide user benefits	0													
SUSTAINABILITY														
Environment														
CO2 Emmissions (Tonnes)	379	-0.04%	0.89%	2.22%	-1.07%	-0.82%	-0.26%	-1.35%	1.77%	1.25%	0.93%	1.42%	-0.06%	0.06%
CO Emmissions (Tonnes)	15	0.08%	-0.39%	-0.14%	-1.75%	-1.21%	-0.38%	-2.14%	0.52%	0.43%	-0.29%	0.51%	-0.28%	0.05%
Fuel														
Fuel Consumption (Litres)	151654	-0.04%	0.89%	2.22%	-1.07%	-0.82%	-0.26%	-1.35%	1.77%	1.25%	0.93%	1.42%	-0.06%	0.06%
Safety														
Total Accident Cost ($)	45099	-1.01%	1.33%	-3.96%	-0.47%	-0.46%	-0.14%	-0.64%	3.85%	5.09%	5.27%	5.26%	0.28%	0.09%
General Statistics														
Total Number of motor vehicle trips	141026	-0.02%	0.42%	1.06%	-0.48%	-0.59%	-0.22%	-0.72%	0.68%	0.70%	0.63%	0.60%	0.02%	0.02%
Total Number of passenger trips	50306	-0.03%	0.70%	1.33%	-0.57%	-0.56%	-0.22%	-0.78%	0.60%	0.59%	0.51%	0.51%	0.03%	0.02%
Total Number of slow trips	47498	0.10%	-0.20%	-0.44%	-0.45%	-0.59%	-0.30%	-0.70%	-0.62%	-0.39%	-0.53%	-0.53%	-0.05%	-0.03%
Total Number of PT trips	49921	0.04%	-1.30%	-2.87%	2.38%	2.57%	1.13%	3.41%	-1.25%	-1.58%	-1.07%	-1.09%	0.00%	-0.03%
Average motor vehicle trip length (km)	10.5	-0.09%	0.90%	2.88%	0.00%	0.12%	0.06%	0.06%	1.35%	0.88%	1.13%	1.16%	0.14%	0.01%
Cost of Congestion ($)	78825	-0.90%	-5.39%	-8.58%	-5.05%	-3.10%	-0.91%	-5.82%	-4.71%	-2.64%	-6.35%	-3.86%	-0.67%	-0.10%
V/C Ratios														
Melling Bridge (WB)	1	-1.13%	-100.00%	-100.00%	-0.62%	-2.05%	-0.43%	-1.45%	-2.85%	13.44%	-100.00%	6.20%	1.03%	0.25%
SH2 South of SH58 (SB)	1	-1.04%	3.65%	16.07%	-0.52%	-1.09%	-0.93%	-0.90%	-5.69%	-21.94%	-21.60%	-10.87%	0.71%	0.28%
Kenn Good Bridge (WB)	1	-0.54%	6.76%	22.01%	-0.96%	-0.32%	0.43%	-0.77%	-4.92%	11.66%	4.47%	-20.09%	-0.32%	-0.17%
Randwick Rd (SB)	1	-0.07%	0.09%	-2.54%	-0.55%	-1.59%	-0.74%	-0.63%	18.68%	-6.15%	-49.65%	-52.94%	0.19%	0.04%
Petone Esplanade (WB)	1	-0.06%	9.91%	3.46%	-2.09%	-1.58%	-0.58%	-2.42%	-15.74%	-13.69%	-2.22%	-2.57%	-0.15%	-0.04%
Hutt Rd South of Wakefield (SB)	0	0.19%	7.74%	7.01%	3.26%	1.59%	0.70%	3.57%	39.17%	-13.23%	-14.28%	-5.55%	-0.24%	-0.01%
SH2 Petone - Ngauranga (SB)	1	0.02%	-7.88%	-10.88%	-1.35%	-0.87%	-0.24%	-1.61%	-5.81%	-1.67%	-2.18%	-2.28%	-0.20%	0.02%
SH1 Ngauranga - Aotea Quay (SB)	1	-0.03%	4.80%	11.01%	-1.24%	-0.84%	-0.20%	-1.33%	1.30%	1.66%	1.44%	1.16%	0.00%	0.00%
SH1 Aotea Quay - Ngauranga (NB)	1	-0.10%	2.87%	5.51%	2.74%	1.81%	0.72%	3.18%	1.05%	-0.58%	-0.90%	-0.33%	0.06%	0.00%

INDICATOR	Table 5.3 - AM Results - Actual Difference													
	Base	H1	H2	H3	P1	P2	P3	P4	X1	X2	X3	X4	X6	X7
ACCESSIBILITY														
Auto														
Total motor vehicle travel time (hrs)	29678	27	-148	-106	-531	-373	-117	-654	115	108	-122	126	-87	16
Total motor vehicle travel distance ('000km)	1487	-2	20	59	-7	-7	-2	-10	30	24	26	26	2	1
Average vehicle network speed (km/hr)	50.1	-0.1	0.9	2.2	0.7	0.4	0.1	0.8	0.8	0.6	1.1	0.7	0.2	0.0
Total auto trips spread from the peak	189	-24	-177	-475	-126	-79	-38	-138	-267	-204	-249	-213	-11	-12
Total vehicle hours below service level D	8435	-188	193	-414	-182	-251	-80	-233	277	75	-154	-278	-49	-5
Auto Travel times to Airport (mins):														
CBD	10	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Port	12	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Johnsonville to Airport	25	0.0	0.1	0.2	-0.3	-0.2	0.0	-0.4	-1.1	-0.4	-0.6	-0.1	-0.1	0.0
Porirua to Airport	32	0.1	-0.2	-0.4	-0.6	-0.5	-0.1	-0.7	1.0	-0.5	-0.8	0.1	-0.1	0.0
Plimerton to Airport	39	0.1	-0.2	-0.4	-0.6	-0.5	-0.1	-0.7	1.0	-0.5	-0.8	0.1	-0.1	0.0
Paraparaumu to Airport	54	0.1	-0.2	-0.5	-0.6	-0.5	-0.1	-0.7	0.9	-0.5	-0.8	0.1	-0.1	-0.1
West External to Airport	73	0.1	-0.2	-0.5	-0.6	-0.5	-0.1	-0.7	0.9	-0.5	-0.8	0.1	-0.1	-0.1
Lower Hutt to Airport	39	0.0	-5.5	-8.7	-1.6	-1.1	-0.3	-1.9	-3.0	-0.3	-1.2	-1.6	-0.2	0.1
Upper Hutt to Airport	52	2.6	-5.6	-11.3	-1.6	-1.2	-0.4	-2.1	-2.9	-0.6	-1.6	-1.5	-0.2	0.0
East External to Airport	118	-2.3	-5.5	-12.0	-1.6	-1.2	-0.5	-2.1	-2.9	-0.6	-1.5	-1.4	-0.1	0.0
Transit														
Total passenger travel time (hrs)	12125	-2	-224	-604	457	300	280	662	-167	-235	-173	-147	-1	-10
Total passenger travel distance ('000km)	426	0	-14	-27	26	23	12	36	-8	-13	-9	-9	0	-1
Average passenger network speed (km/hr)	38.9	0.0	-0.7	-0.8	0.2	1.3	0.4	0.6	-0.3	-0.6	-0.4	-0.4	0.0	0.0
AFFORDABILITY														
Strategy Revenue ($)														
Toll	0	0	2087	0	0	0	0	0	0	0	0	0	0	0
Fare	75627	-37	-1162	-3473	6610	3733	1170	6736	-673	-1453	-988	-891	34	-52
Parking	114432	27	2117	5200	-1902	-1451	-508	-2363	1476	1180	810	947	-58	45
Total	190060	-10	3041	1727	4708	2281	662	4373	804	-273	-178	55	-25	-7
ECONOMIC EVALUATION														
Cross-valley-link-road user benefits	0	-175	3315	5809	4170	2458	1526	5293	9289	6272	5680	4542	51	80
Porirua-Hutt-link-road user benefits	0	-136	120	239	148	185	34	176	2985	5580	5863	5966	357	272
Non-link-road user benefits	0	-1139	3487	7855	5782	5951	2306	7355	2406	1399	2540	1920	375	165
Region-wide user benefits	0	-1450	6921	13902	10100	8594	3866	12824	14680	13251	14083	12428	783	517
SUSTAINABILITY														
Environment														
CO2 Emmissions (Tonnes)	379	0	3	8	-4	-3	-1	-5	7	5	4	5	0	0
CO Emmissions (Tonnes)	15	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel														
Fuel Consumption (Litres)	151654	-55	1352	3372	-1619	-1242	-397	-2049	2685	1892	1408	2148	-88	91
Safety														
Total Accident Cost ($)	45099	-456	599	-1786	-210	-206	-63	-290	1737	2297	2375	2371	128	39
General Statistics														
Total Number of motor vehicle trips	141026	0 -32	592	1491	-683	-827	-306	-1015	959	985	894	843	24	28
Total Number of passenger trips	50306	0 -17	353	671	-286	-280	-111	-390	302	296	256	258	15	12
Total Number of slow trips	47498	0 49	-93	-211	-213	-281	-141	-334	-294	-183	-253	-250	-22	-12
Total Number of PT trips	49921	0 22	-647	-1431	1189	1283	566	1704	-623	-791	-536	-545	1	-13
Average motor vehicle trip length (km)	10.55	-0.01	0.10	0.30	0.00	0.01	0.01	0.01	0.14	0.09	0.12	0.12	0.02	0.00
Cost of Congestion ($)	78825	-706	-4250	-6760	-3980	-2444	-714	-4589	-3714	-2080	-5006	-3041	-528	-80
V/C Ratios														
Melling Bridge (WB)	0.8	-0.01	-0.77	-0.77	0.00	-0.02	0.00	-0.01	-0.02	0.10	-0.77	0.05	0.01	0.00
SH2 South of SH58 (SB)	0.6	-0.01	0.02	0.10	0.00	-0.01	-0.01	-0.01	-0.03	-0.13	-0.13	-0.07	0.00	0.00
Kenn Good Bridge (WB)	0.9	0.00	0.06	0.19	-0.01	0.00	0.00	-0.01	-0.04	0.10	0.04	-0.17	0.00	0.00
Randwick Rd (SB)	0.8	0.00	0.00	-0.02	0.00	-0.01	-0.01	0.00	0.14	-0.05	-0.38	-0.40	0.00	0.00
Petone Esplanade (WB)	0.8	0.00	0.08	0.03	-0.02	-0.01	0.00	-0.02	-0.13	-0.11	-0.02	-0.02	0.00	0.00
Hutt Rd South of Wakefield (SB)	0.5	0.00	0.04	0.03	0.02	0.01	0.00	0.02	0.19	-0.07	-0.07	-0.03	0.00	0.00
SH2 Petone - Ngauranga (SB)	1.2	0.00	-0.09	-0.13	-0.02	-0.01	0.00	-0.02	-0.07	-0.02	-0.03	-0.03	0.00	0.00
SH1 Ngauranga - Aotea Quay (SB)	0.8	0.00	0.04	0.09	-0.01	-0.01	0.00	-0.01	0.01	0.01	0.01	0.01	0.00	0.00
SH1 Aotea Quay - Ngauranga (NB)	0.8	0.00	0.02	0.04	0.02	0.01	0.01	0.02	0.01	0.00	-0.01	0.00	0.00	0.00

Table 5.4 - IP Results (Note: Values are for the period 0900 to 1600)

INDICATOR	Base	H1	H2	H3	P1	P2	P3	P4	X1	X2	X3	X4	X6	X7
ACCESSIBILITY														
Auto														
Total motor vehicle travel time (hrs)	55305	55475	55828	56066	55402	55340	55358	55385	56034	56019	56093	56152	55296	55271
Total motor vehicle travel distance ('000km)	3664	3655	3687	3721	3671	3668	3668	3671	3733	3724	3728	3725	3670	3658
Average vehicle network speed (km/hr)	66.3	65.9	66.0	66.4	66.3	66.3	66.3	66.3	66.6	66.5	66.5	66.3	66.4	66.2
Total auto trips spread from the peak	194	172	14	-282	71	119	168	55	-65	-8	-69	-6	180	187
Total vehicle hours below service level D	208	212	180	250	216	214	207	211	202	232	87	248	214	205
Auto Travel times to Airport (mins):														
CBD	8.3	8.3	8.3	8.2	8.3	8.3	8.3	8.3	8.3	8.3	8.2	8.3	8.3	8.3
Port	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Johnsonville to Airport	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.5	15.6	15.5	15.6	15.6	15.6
Porirua to Airport	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Plimerton to Airport	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1	27.1
Paraparaumu to Airport	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	41.9	42.0	42.0	41.9
West External to Airport	61.6	61.6	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.7	61.6	61.7	61.6	61.6
Lower Hutt to Airport	18.6	18.5	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6
Upper Hutt to Airport	28.5	32.5	28.5	28.9	28.5	28.6	28.5	28.6	28.5	28.5	28.5	28.5	28.5	28.5
East External to Airport	94.6	94.5	94.6	94.4	94.6	94.6	94.6	94.7	94.6	94.6	94.6	94.6	94.6	94.6
Transit														
Total passenger travel time (hrs)	6408	6291	6264	6332	6379	6407	6596	6613	6283	6270	6327	6409	6410	6407
Total passenger travel distance ('000km)	218	213	212	215	219	221	221	225	212	210	212	217	218	218
Average passenger network speed (km/hr)	36.7	36.3	36.4	36.4	36.9	37.1	36.2	36.6	36.3	36.0	36.1	36.5	36.7	36.6
AFFORDABILITY														
Strategy Revenue ($)														
Toll	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fare	45163	44501	44150	44692	45822	46143	45813	46571	44515	44310	44827	45091	45171	45157
Parking	203023	203213	203736	203722	203160	202794	202935	202751	203437	203402	203158	203163	203056	203053
Total	248186	247714	247885	248414	248983	248937	248747	249323	247952	247712	247985	248253	248226	248210
ECONOMIC EVALUATION														
Cross-valley-link-road user benefits	0	-1329	-704	-1165	-520	-250	313	-369	7899	6896	4573	2625	-59	-22
Porirua-Hutt-link-road user benefits	0	-560	59	23	1692	1695	32	1762	3846	6996	7368	7048	778	371
Non-link-road user benefits	0	-2802	-903	-1727	-469	-342	-222	134	1354	1419	2062	3217	99	-78
Region-wide user benefits	0	-4691	-1547	-2869	703	1103	123	1527	13099	15311	14003	12890	818	271
SUSTAINABILITY														
Environment														
CO2 Emmissions (Tonnes)	826.9	827.1	834.6	838.6	828.5	827.6	827.7	828.3	841.1	838.8	840.1	840.0	827.4	826.0
CO Emmissions (Tonnes)	29.1	29.2	29.4	29.5	29.2	29.2	29.2	29.2	29.5	29.5	29.6	29.6	29.1	29.1
Fuel														
Fuel Consumption (Litres)	330757	330854	333833	335455	331380	331052	331084	331320	336427	335502	336021	336013	330950	330404
Safety														
Total Accident Cost ($)	103421	102064	104342	96834	103681	103596	103567	103680	107540	108433	108613	108667	103604	103204
General Statistics														
Total Number of motor vehicle trips	364670	364564	365096	364920	364073	363800	364533	363761	366042	366105	366012	365837	364737	364692
Total Number of passenger trips	81505	81483	81721	81835	81564	81552	81554	81575	81991	81955	81936	81883	81525	81523
Total Number of slow trips	128779	129050	128283	127759	128417	128455	128633	128304	127220	127436	127300	127479	128705	128742
Total Number of PT trips	38032	37833	37626	37691	38236	38361	38115	38429	37512	37460	37617	37731	38015	38024
Average motor vehicle trip length (km)	10.0	10.0	10.1	10.2	10.1	10.1	10.1	10.1	10.2	10.2	10.2	10.2	10.1	10.0
Cost of Congestion ($)	10185	10253	11454	12274	10784	10587	10405	10704	9242	10791	9402	10659	10378	10092
V/C Ratios														
Melling Bridge (WB)	0.67	0.66	0.00	0.00	0.67	0.67	0.67	0.67	0.69	0.80	0.00	0.78	0.67	0.67
SH2 South of SH58 (SB)	0.28	0.27	0.28	0.29	0.28	0.28	0.28	0.28	0.26	0.25	0.23	0.25	0.28	0.28
Kenn Good Bridge (WB)	0.55	0.55	0.59	0.59	0.55	0.55	0.55	0.55	0.58	0.57	0.58	0.36	0.55	0.55
Randwick Rd (SB)	0.44	0.44	0.44	0.43	0.44	0.44	0.44	0.44	0.43	0.42	0.18	0.17	0.44	0.44
Petone Esplanade (WB)	0.31	0.31	0.33	0.32	0.31	0.30	0.31	0.31	0.27	0.20	0.27	0.28	0.31	0.31
Hutt Rd South of Wakefield (SB)	0.27	0.27	0.31	0.29	0.28	0.28	0.27	0.28	0.38	0.28	0.26	0.28	0.27	0.28
SH2 Petone - Ngauranga (SB)	0.62	0.62	0.44	0.48	0.64	0.63	0.62	0.64	0.56	0.60	0.60	0.60	0.62	0.62
SH1 Ngauranga - Aotea Quay (SB)	0.35	0.35	0.36	0.36	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
SH1 Aotea Quay - Ngauranga (NB)	0.87	0.87	0.88	0.90	0.87	0.87	0.87	0.88	0.87	0.87	0.87	0.87	0.87	0.87

INDICATOR	Table 5.5 - IP Results - % Difference													
	Base	H1	H2	H3	P1	P2	P3	P4	X1	X2	X3	X4	X6	X7
ACCESSIBILITY														
Auto														
Total motor vehicle travel time (hrs)	55305	0.31%	0.95%	1.38%	0.18%	0.06%	0.10%	0.14%	1.32%	1.29%	1.42%	1.53%	-0.02%	-0.06%
Total motor vehicle travel distance ('000km)	3664	-0.24%	0.62%	1.54%	0.19%	0.10%	0.10%	0.17%	1.88%	1.64%	1.74%	1.65%	0.15%	-0.18%
Average vehicle network speed (km/hr)	66.3	-0.55%	-0.32%	0.16%	0.01%	0.04%	0.01%	0.03%	0.55%	0.35%	0.31%	0.12%	0.17%	-0.12%
Total auto trips spread from the peak	194	-11.21%	-92.66%	-245.63%	-63.31%	-38.55%	-13.13%	-71.42%	-133.59%	-104.03%	-135.76%	-103.15%	-7.24%	-3.41%
Total vehicle hours below service level D	208	1.56%	-13.60%	19.98%	3.84%	2.46%	-0.59%	1.05%	-2.85%	11.30%	-58.41%	19.11%	2.58%	-1.47%
Auto Travel times to Airport (mins):														
CBD	8	0.00%	0.08%	-0.11%	-0.08%	0.16%	0.15%	0.15%	0.08%	0.01%	-0.15%	-0.01%	0.04%	0.15%
Port	10	0.00%	0.10%	-0.10%	-0.10%	0.10%	0.10%	0.10%	0.10%	0.00%	-0.10%	0.00%	0.00%	0.10%
Johnsonville to Airport	16	0.00%	0.32%	0.26%	0.13%	0.19%	0.06%	0.19%	-0.45%	0.06%	-0.19%	0.00%	0.00%	0.00%
Porirua to Airport	21	-0.05%	0.19%	0.14%	0.05%	0.09%	0.00%	0.14%	0.19%	0.09%	-0.05%	0.05%	-0.05%	0.00%
Plimerton to Airport	27	-0.04%	0.15%	0.07%	0.04%	0.07%	0.00%	0.11%	0.11%	-0.04%	-0.15%	-0.04%	0.00%	0.00%
Paraparaumu to Airport	42	-0.02%	0.10%	0.07%	0.02%	0.05%	0.00%	0.07%	0.07%	0.02%	-0.05%	0.00%	-0.02%	-0.05%
West External to Airport	62	-0.02%	0.06%	0.05%	0.03%	0.05%	0.02%	0.06%	0.06%	0.02%	-0.02%	0.02%	0.00%	-0.15%
Lower Hutt to Airport	19	-0.05%	0.49%	0.38%	0.16%	0.16%	0.05%	0.27%	0.16%	0.16%	0.49%	0.05%	0.00%	0.00%
Upper Hutt to Airport	29	13.85%	-0.07%	1.26%	0.11%	0.14%	0.04%	0.18%	0.11%	0.00%	-0.18%	0.00%	0.00%	-0.04%
East External to Airport	95	-0.10%	-0.02%	-0.22%	0.02%	0.03%	0.01%	0.04%	0.03%	-0.01%	-0.05%	0.00%	0.00%	-0.02%
Transit														
Total passenger travel time (hrs)	6408	-1.83%	-2.25%	-1.19%	-0.46%	-0.02%	2.92%	3.19%	-1.96%	-2.16%	-1.27%	0.01%	0.03%	-0.02%
Total passenger travel distance ('000km)	218	-2.43%	-3.02%	-1.56%	0.32%	1.24%	1.33%	2.93%	-2.75%	-3.57%	-2.66%	-0.55%	0.05%	-0.05%
Average passenger network speed (km/hr)	37	-0.88%	-0.84%	-0.58%	0.55%	1.08%	-1.24%	-0.04%	-1.04%	-1.69%	-1.67%	-0.49%	0.02%	-0.03%
AFFORDABILITY														
Strategy Revenue ($)														
Toll	0													
Fare	45163	-1.47%	-2.24%	-1.04%	1.46%	2.17%	1.44%	3.12%	-1.44%	-1.89%	-0.75%	-0.16%	0.02%	-0.01%
Parking	203023	0.09%	0.35%	0.34%	0.07%	-0.11%	-0.04%	-0.13%	0.20%	0.19%	0.07%	0.07%	0.02%	0.02%
Total	248186	-0.19%	-0.12%	0.09%	0.32%	0.30%	0.23%	0.46%	-0.09%	-0.19%	-0.08%	0.03%	0.02%	0.01%
ECONOMIC EVALUATION														
Cross-valley-link-road user benefits	0	0												
Porirua-Hutt-link-road user benefits	0	0												
Non-link-road user benefits	0	0												
Region-wide user benefits	0	0												
SUSTAINABILITY														
Environment														
CO2 Emmissions (Tonnes)	827	0.03%	0.93%	1.42%	0.19%	0.09%	0.10%	0.17%	1.71%	1.43%	1.59%	1.59%	0.06%	-0.11%
CO Emmissions (Tonnes)	29	0.30%	0.96%	1.38%	0.20%	0.08%	0.10%	0.17%	1.33%	1.34%	1.46%	1.54%	0.00%	-0.07%
Fuel														
Fuel Consumption (Litres)	330757	0.03%	0.93%	1.42%	0.19%	0.09%	0.10%	0.17%	1.71%	1.43%	1.59%	1.59%	0.06%	-0.11%
Safety														
Total Accident Cost ($)	103421	-1.31%	0.89%	-6.37%	0.25%	0.17%	0.14%	0.25%	3.98%	4.85%	5.02%	5.07%	0.18%	-0.21%
General Statistics														
Total Number of motor vehicle trips	364670	-0.03%	0.12%	0.07%	-0.16%	-0.24%	-0.04%	-0.25%	0.38%	0.39%	0.37%	0.32%	0.02%	0.01%
Total Number of passenger trips	81505	-0.03%	0.27%	0.40%	0.07%	0.06%	0.06%	0.09%	0.60%	0.55%	0.53%	0.46%	0.02%	0.02%
Total Number of slow trips	128779	0.21%	-0.39%	-0.79%	-0.28%	-0.25%	-0.11%	-0.37%	-1.21%	-1.04%	-1.15%	-1.01%	-0.06%	-0.03%
Total Number of PT trips	38032	-0.52%	-1.07%	-0.90%	0.54%	0.87%	0.22%	1.04%	-1.37%	-1.50%	-1.09%	-0.79%	-0.04%	-0.02%
Average motor vehicle trip length (km)	10.0	-0.21%	0.50%	1.47%	0.35%	0.34%	0.14%	0.42%	1.50%	1.24%	1.37%	1.33%	0.13%	-0.18%
Cost of Congestion ($)	10185	0.66%	12.46%	20.51%	5.88%	3.95%	2.16%	5.10%	-9.26%	5.95%	-7.69%	4.66%	1.89%	-0.92%
V/C Ratios														
Melling Bridge (WB)	0.7	-1.29%	-100.00%	-100.00%	0.48%	0.28%	0.30%	0.46%	2.66%	19.85%	-100.00%	16.02%	0.39%	0.08%
SH2 South of SH58 (SB)	0.3	-3.29%	1.96%	5.68%	0.57%	0.49%	0.51%	0.46%	-4.34%	-10.77%	-16.62%	-10.23%	0.53%	-0.10%
Kenn Good Bridge (WB)	0.5	-0.35%	8.11%	8.68%	0.55%	0.57%	0.48%	0.56%	5.99%	5.08%	6.72%	-33.34%	0.38%	0.15%
Randwick Rd (SB)	0.4	-0.26%	-0.92%	-2.54%	-0.56%	-0.55%	-0.10%	-0.76%	-1.75%	-4.33%	-59.26%	-60.98%	-0.06%	-0.02%
Petone Esplanade (WB)	0.3	-0.96%	6.50%	4.46%	-0.92%	-1.69%	-1.28%	-0.83%	-12.20%	-35.24%	-12.51%	-10.51%	-0.68%	-1.18%
Hutt Rd South of Wakefield (SB)	0.3	-1.63%	13.61%	7.80%	3.45%	2.80%	0.38%	3.87%	41.83%	2.84%	-4.61%	2.28%	0.69%	2.52%
SH2 Petone - Ngauranga (SB)	0.6	0.19%	-28.52%	-22.88%	2.60%	1.79%	0.74%	2.81%	-10.28%	-2.92%	-3.86%	-3.00%	0.39%	-0.01%
SH1 Ngauranga - Aotea Quay (SB)	0.3	0.12%	3.27%	5.31%	1.44%	0.99%	0.37%	1.50%	1.56%	0.81%	0.34%	0.59%	0.11%	0.03%
SH1 Aotea Quay - Ngauranga (NB)	0.9	-0.01%	2.14%	3.56%	0.96%	0.78%	0.37%	1.16%	0.92%	0.43%	0.13%	0.38%	0.07%	0.03%

INDICATOR	Table 5.6 - IP Results - Actual Difference													
	Base	H1	H2	H3	P1	P2	P3	P4	X1	X2	X3	X4	X6	X7
ACCESSIBILITY														
Auto														
Total motor vehicle travel time (hrs)	55305	170	523	761	97	35	53	80	729	714	788	847	-9	-34
Total motor vehicle travel distance ('000km)	3664	-9	23	56	7	4	4	6	69	60	64	61	6	-7
Average vehicle network speed (km/hr)	66.3	-0.4	-0.2	0.1	0.0	0.0	0.0	0.0	0.4	0.2	0.2	0.1	0.1	-0.1
Total auto trips spread from the peak	194	-22	-179	-475	-123	-75	-25	-138	-259	-201	-263	-200	-14	-7
Total vehicle hours below service level D	208	3	-28	42	8	5	-1	2	-6	24	-122	40	5	-3
Auto Travel times to Airport (mins):														
CBD	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Port	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Johnsonville to Airport	15.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
Porirua to Airport	21.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plimerton to Airport	27.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Paraparaumu to Airport	42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West External to Airport	61.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Lower Hutt to Airport	18.6	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Upper Hutt to Airport	28.5	4.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
East External to Airport	94.6	-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transit														
Total passenger travel time (hrs)	6408	-117.417	-144.32324	-76.04736	-29.60595	-1.32763	187.2437	204.3506	-125.3096	-138.4619	-81.53955	0.72705	1.8291	-1.2817
Total passenger travel distance ('000km)	218	-5.3	-6.6	-3.4	0.7	2.7	2.9	6.4	-6	-7.8	-5.8	-1.2	0.1	-0.1
Average passenger network speed (km/hr)	37	-0.32267	-0.307529	-0.2136242	0.2006076	0.3945033	-0.455067	-0.013348	-0.382088	-0.61835	-0.610467	-0.179556	0.006328	-0.0125
AFFORDABILITY														
Strategy Revenue ($)														
Toll	0													
Fare	45163	-662	-1014	-471	659	980	649	1407.82	-649	-854	-337	-73	7	-7
Parking	203023	190	713	699	138	-229	-88	-271.594	414	379	136	140	33	31
Total	248186	-472	-301	228	796	750	561	1136.226	-234	-475	-201	67	40	24
ECONOMIC EVALUATION														
Cross-valley-link-road user benefits	0	0 -1329	-704	-1165	-520	-250	313	-369	7899	6896	4573	2625	-59	-22
Porirua-Hutt-link-road user benefits	0	0 -560	59	23	1692	1695	32	1762	3846	6996	7368	7048	778	371
Non-link-road user benefits	0	0 -2802	-903	-1727	-469	-342	-222	134	1354	1419	2062	3217	99	-78
Region-wide user benefits	0	0 -4691	-1547	-2869	703	1103	123	1527	13099	15311	14003	12890	818	271
SUSTAINABILITY														
Environment														
CO2 Emmissions (Tonnes)	827	0	8	12	2	1	1	1	14	12	13	13	0	-1
CO Emmissions (Tonnes)	29	0	0	0	0	0	0	0	0	0	0	0	0	0
Fuel														
Fuel Consumption (Litres)	330757	97	3076	4698	623	294	326	563	5669	4744	5263	5256	193	-354
Safety														
Total Accident Cost ($)	103421	-1357	921	-6587	260	175	146	258	4119	5012	5192	5246	183	-217
General Statistics														
Total Number of motor vehicle trips	364670	-106	426	250	-597	-870	-137	-909	1372	1435	1342	1167	67	22
Total Number of passenger trips	81505	-22	216	330	59	47	49	70	486	450	431	378	20	18
Total Number of slow trips	128779	271	-496	-1020	-362	-324	-146	-475	-1559	-1343	-1479	-1300	-74	-37
Total Number of PT trips	38032	-199	-406	-341	204	329	83	397	-520	-572	-415	-301	-17	-8
Average motor vehicle trip length (km)	10	-0.02	0.05	0.15	0.04	0.03	0.01	0.04	0.15	0.13	0.14	0.13	0.01	-0.02
Cost of Congestion ($)	10185	67.6191	1269.0742	2089.2265	599.0986	402.1406	219.6562	519.1748	-943.4365	606.3203	-783	474	193	-93
V/C Ratios														
Melling Bridge (WB)	1	-0.01	-0.67	-0.67	0.00	0.00	0.00	0.00	0.02	0.13	-0.67	0.11	0.00	0.00
SH2 South of SH58 (SB)	0	-0.01	0.01	0.02	0.00	0.00	0.00	0.00	-0.01	-0.03	-0.05	-0.03	0.00	0.00
Kenn Good Bridge (WB)	1	0.00	0.04	0.05	0.00	0.00	0.00	0.00	0.03	0.03	0.04	-0.18	0.00	0.00
Randwick Rd (SB)	0	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.26	-0.27	0.00	0.00
Petone Esplanade (WB)	0	0.00	0.02	0.01	0.00	-0.01	0.00	0.00	-0.04	-0.11	-0.04	-0.03	0.00	0.00
Hutt Rd South of Wakefield (SB)	0	0.00	0.04	0.02	0.01	0.01	0.00	0.01	0.11	0.01	-0.01	0.01	0.00	0.01
SH2 Petone - Ngauranga (SB)	1	0.00	-0.18	-0.14	0.02	0.01	0.00	0.02	-0.06	-0.02	-0.02	-0.02	0.00	0.00
SH1 Ngauranga - Aotea Quay (SB)	0	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
SH1 Aotea Quay - Ngauranga (NB)	1	0.00	0.02	0.03	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00

▪ Appendix D

Rough Order of Cost, Indicative Benefits and BCRs for each option

Table 5.7 Hutt Corridor - Benefit Cost Calculations (over 25 year evaluation period)

	Base	H1	H2	H2 (AM only)	H3	P1	P1 (AM only)	P2	P3	P4	X1	X2	X3	X4	X6	X7
Benefits																
AM Peak 2 hour User Benefits ($)	$0	-$1,450	$6,921	$6,921	$13,902	$10,100	$10,100	$8,594	$3,866	$12,824	$14,680	$13,251	$14,083	$12,428	$783	$517
Interpeak 7 hour User Benefits ($)	$0	-$4,691	-$1,547	$0	-$2,869	$703	$0	$1,103	$123	$1,527	$13,099	$15,311	$14,003	$12,890	$818	$271
Weekday Daily benefits	$0	-$10,874.10	$11,211	$6,921	$22,927	$21,394.59	$10,100.00	$19,063	$7,941	$28,243.90	$51,628	$52,531	$51,971	$46,769	$2,957	$1,495
Weekend benefits	$0	-$18,764.00	-$6,190	$0	-$11,476	$2,810.80	$0.00	$4,412	$492	$6,108	$52,396	$61,244	$56,012	$51,560	$3,271	$1,085
Annual benefits	$0	-$3,735,624	$2,319,365	$1,661,040	$4,813,913	$5,303,350	$2,424,000	$4,839,864	$1,935,319	$7,145,016	$15,534,552	$16,282,008	$15,833,784	$14,318,160	$905,870	$423,818
25 Year benefits (Discounted 10%)	**$0**	**-$35,578,083**	**$22,089,630**	**$15,819,745**	**$45,847,706**	**$50,509,102**	**$23,086,176**	**$46,094,865**	**$18,431,980**	**$68,049,132**	**$147,951,073**	**$155,069,844**	**$150,800,959**	**$136,366,156**	**$8,627,510**	**$4,036,446**
Costs																
Korokoro Dowse Grade Seperation	$37,000,000															
SH1 ATMS		$5,000,000														
Minor Junction Upgrades (Removing Access)		$500,000														
Minor Junction Upgrades (Signals))			$1,500,000	$1,500,000												
Melling Full Separation			$45,000,000	$45,000,000	$45,000,000	$750,000	$750,000						$45,000,000			
Silverstream Bridge Upgrade		$7,000,000	$7,000,000	$7,000,000	$7,000,000											
SH2 HOT Lane			$13,000,000	$13,000,000												
Petone Curves Realignment					$25,000,000											
Belmont full Grade Separation					$14,000,000											
Silverstream Full Grade Separation					$20,000,000											
Moonshine Full Grade Separation					$12,000,000											
Gibbons Full Grade Separation					$20,000,000											
Totara Park Full grade Separation					$25,000,000											
River Road Upgrade					$15,000,000											
Major Junction Upgrades (Signal+extra lanes)					$1,200,000											
SH2 Tidal 5th Lane					$28,000,000											
Hutt Expressway Buslane						$13,000,000	$13,000,000			$13,000,000						
Petone-Grenada											$45,000,000					
Esplanade Upgrade											$22,000,000					
Cross Valley Link												$45,000,000				
Melling-Porirua												$80,000,000	$80,000,000			
Randwick Melling													$45,000,000			
Belmont-Porirua														$80,000,000		
Randwick -Cambridge-KGB														$75,000,000		
Melling Loop LRT Line									$12,000,000	$12,000,000						
SH58															$10,000,000	
Akatarawa Road																$10,000,000
Tolling Facilities																
New Station at Timberlea									$2,000,000	$2,000,000						
New Station at Cruickshank									$2,000,000	$2,000,000						
New Buses						$8,250,000	$8,250,000	$750,000		$6,750,000						
New Bus Services						$61,112	$61,112	$17,838		$54,240						
New Trains								$5,500,000	$5,500,000	$3,000,000						
New Tains Services								$61,877	$126,051	$126,051						
New Ferry						$5,000,000	$5,000,000			$10,000,000						
Superbus						$11,993,573	$11,993,573									
Haywards bus						$150,000	$150,000	$150,000		$150,000						
Ferry Service						$150,000	$150,000			$300,000						
Stokes Valley LRT									$6,000,000	$6,000,000						
Electrification extened to Featherson									$5,000,000	$5,000,000						
Rail Hutt - Porirua																
Capital Costs Undiscounted		**$12,500,000**	**$66,500,000**	**$66,500,000**	**$212,200,000**	**$39,354,685**	**$39,354,685**	**$6,479,715**	**$32,626,051**	**$60,380,291**	**$67,000,000**	**$125,000,000**	**$170,000,000**	**$155,000,000**	**$10,000,000**	**$10,000,000**
BCR	**N/A**	**-2.8**	**0.3**	**0.2**	**0.2**	**1.3**	**0.6**	**7.1**	**0.6**	**1.1**	**2.2**	**1.2**	**0.9**	**0.9**	**0.9**	**0.4**

▪ Appendix E

Porirua to Hutt Link sensitivity test Performance Indicator and BCR Results

Table 5.9 Hutt Corridor - Benefit Cost Calculations Sensitivity Test (over 25 year evaluation period)

	Base	X1	X1S4	X2	X2S3	X3	X3S2	X4	X4S1
Benefits									
AM Peak 2 hour User Benefits ($)	$0	$14,680	$11,184	$13,251	$11,547	$14,083	$10,169	$12,428	$8,154
Interpeak 7 hour User Benefits ($)	$0	$13,099	$9,623	$15,311	$10,890	$14,003	$9,512	$12,890	$6,752
Weekday Daily benefits	$0	$51,628.30	$38,727.10	$52,531	$41,607.00	$51,971	$36,508.40	$46,769	$27,786.40
Weekend benefits	$0	$52,396	$38,492	$61,244	$43,560	$56,012	$38,048	$51,560	$27,008
Annual benefits	$0	$15,534,552	$11,604,024	$16,282,008	$12,599,280	$15,833,784	$11,044,896	$14,318,160	$8,289,216
25 Year benefits (Discounted 10%)	**$0**	**$147,951,073**	**$110,516,725**	**$155,069,844**	**$119,995,543**	**$150,800,959**	**$105,191,590**	**$136,366,156**	**$78,946,493**
Costs									
Korokoro Dowse Grade Seperation	$37,000,000								
SH1 ATMS									
Minor Junction Upgrades (Removing Access)									
Minor Junction Upgrades (Signals))									
Full Interchange									
Silverstream Bridge Upgrade									
SH2 HOT Lane									
Half Interchange									
Major Junction Upgrades (Signals+Extral Lanes)									
SH2 Tidal 5th Lane									
Hutt Expressway Buslane									
Petone-Grenada		$45,000,000	$45,000,000						
Esplanade Upgrade		$22,000,000	$22,000,000						
Cross Valley Link				$45,000,000	$45,000,000				
Melling-Porirua				$80,000,000	$80,000,000	$80,000,000	$80,000,000		
Randwick Melling						$45,000,000	$45,000,000		
Belmont-Porirua								$80,000,000	$80,000,000
Randwick -Cambridge-KGB								$75,000,000	$75,000,000
Melling Loop LRT Line									
SH58									
Akatarawa Road									
Tolling Facilities									
New Station at Timberlea									
New Station at Cruickshank									
New Buses									
New Bus Services									
New Trains									
New Tains Services									
New Ferry									
Superbus									
Haywards bus									
Ferry Service									
Stokes Valley LRT									
Electrification extened to Featherson									
Rail Hutt - Porirua									
25 Year Costs		**$67,000,000**	**$67,000,000**	**$125,000,000**	**$125,000,000**	**$125,000,000**	**$125,000,000**	**$155,000,000**	**$155,000,000**
BCR	**N/A**	**2.2**	**1.6**	**1.2**	**1.0**	**1.2**	**0.8**	**0.9**	**0.5**

Table 5.10 AM Peak - Sensitivity Test

INDICATOR	Base	BaseS1	X1	X1S1	X1S2	X1S3	X1S4	X2	X2S1	X2S2	X2S3	X3	X3S1	X3S2	X4	X4S1
ACCESSIBILITY																
Auto		No TG		No Pentone Link	No Espl Upgrade	No TG	+20% dist, 70km/h		No Melling Link	No Cross Link	+20% dist, 70km/h		No TG	+20% dist, 70km/h		+20% dist, 70km/h
Total motor vehicle travel time (hrs)	29676	30142	29793	29689	29972	30288	29845	29786	29683	29789	29762	29556	30182	29757	29804	29787
Total motor vehicle travel distance ('000km)	1487	1426	1518	1489	1512	1472	1518	1511	1486	1510	1507	1514	1483	1512	1514	1509
Average vehicle network speed (km/hr)	50.1	47.3	50.9	50.1	50.4	48.6	50.9	50.7	50.1	50.7	50.6	51.2	48.1	50.8	50.8	50.7
		0														
Total auto trips spread from the peak	189	502	-78	217	-30	167	-44	-16	219	-13	6	-60	278	-30	-24	9
Total vehicle hours below service level D	8435	9596	8712	8632	8692	9950	8672	8511	8642	8279	8457	8281	9219	8401	8157	8426
Auto Travel times to Airport (mins):																
CBD	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
Port	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Johnsonville to Airport	25.3	24.6	24.1	25.3	24.0	23.8	24.3	24.9	25.3	24.9	25.0	24.7	24.1	24.9	25.1	25.0
Porirua to Airport	32.4	33.7	33.5	32.6	33.1	34.6	33.1	31.9	32.5	31.8	32.0	31.6	32.9	31.8	32.5	32.1
Plimerton to Airport	38.8	50.8	39.9	38.9	39.5	51.0	39.5	38.3	38.9	38.3	38.4	38.1	49.7	38.2	38.9	38.5
Paraparaumu to Airport	54.2	72.9	55.2	54.4	54.8	73.0	54.9	53.8	54.4	53.7	53.9	53.5	71.8	53.7	54.3	53.9
West External to Airport	72.8	91.4	73.7	72.9	73.3	91.4	73.4	72.3	72.9	72.2	72.4	72.0	90.3	72.2	72.9	72.4
Lower Hutt to Airport	38.7	39.6	35.7	39.0	36.3	35.5	36.2	38.4	39.4	37.6	38.5	37.5	38.5	38.4	37.0	37.9
Upper Hutt to Airport	51.9	52.7	49.0	52.2	49.6	48.8	49.5	51.2	52.6	50.3	51.3	50.3	51.6	51.2	50.4	51.2
East External to Airport	117.8	118.6	114.9	118.1	115.5	114.8	115.5	117.2	118.5	116.2	117.3	116.3	117.4	117.1	116.4	117.2
Transit																
Total passenger travel time (hrs)	10939	11405	10806	10950	10832	11213	10796	10755	10911	10819	10812	10805	11383	10770	10825	10807
Total passenger travel distance ('000km)	426	459	417	426	418	448	417	413	422	417	417	417	450	416	417	417
Average passenger network speed (km/hr)	38.9	40.2	38.6	38.9	38.6	39.9	38.6	38.4	38.7	38.5	38.5	38.5	39.9	38.6	38.5	38.6
AFFORDABILITY																
Strategy Revenue ($)																
Toll	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fare	75627	78748	74955	75762	74971	77557	74680	74174	75319	74709	74778	74639	77513	74247	74736	74541
Parking	114432	112701	115908	114593	115874	114884	115938	115612	114709	115440	115247	115242	113665	115501	115379	115338
Total	190060	191448	190863	190355	190846	192441	190618	189787	190028	190149	190024	189881	191178	189748	190115	189880
ECONOMIC EVALUATION																
Cross-valley-link-road user benefits			9289 63%	693 222%	6657 55%	8923 59%	7501	6272 47%	1847 521%	3857 33%	5658	5680 40%	4936 39%	4433	4542 37%	3083
Porirua-Hutt-link-road user benefits			2985 20%	7 2%	2746 23%	3555 21%	2506	5580 42%	27 7%	5516 47%	4115	5863 42%	5701 45%	4325	5965 48%	4146
Non-link-road user benefits			2405 16%	-388	2613 22%	3451 20%	1177	1399 11%	-1599	2385 20%	1774	2540 18%	2142 17%	1411	1920 15%	925
Region-wide user benefits			14680	312	12017	16929	11184	13251	374	11769	11547	14083	12779	10169	12428	8154
SUSTAINABILITY																
Environment																
CO2 Emmissions (Tonnes)	379	374	385	379	386	383	386	384	379	383	383	383	379	384	385	383
CO Emmissions (Tonnes)	15	16	16	15	16	16	16	16	15	16	15	15	16	15	16	16
Fuel												0	0			
Fuel Consumption (Litres)	151654	149449	154339	151617	154541	153268	154467	153546	151747	153393	153212	153062	151416	153521	153602	153379
Safety												0	0			
Total Accident Cost ($)	45099	46441	46836	45280	46453	46606	45601	47397	45240	47167	46706	47474	46162	47007	47470	46592
General Statistics																
Total Number of motor vehicle trips	141026	140138	141985	141009	141835	141334	141995	142011	141138	141799	141727	141520	141034	141523	141889	141805
Total Number of passenger trips	50306	49821	50608	50320	50555	50241	50634	50602	50354	50531	50506	50562	50086	50589	50584	50558
Total Number of slow trips	47498	47571	47204	47464	47257	47325	47251	47315	47534	47284	47331	47245	47432	47312	47248	47333
Total Number of PT trips	49921	50754	49298	49536	49383	49909	49170	49130	49701	49430	49452	49386	50171	49236	49376	49305
Average motor vehicle trip length (km)	10.5	10.2	10.7	10.6	10.7	10.4	10.7	10.6	10.5	10.7	10.6	10.7	10.3	10.7	10.7	10.6
Cost of Congestion ($)	79825	86959	75111	79587	76781	83565	75393	76745	79117	76938	76602	73818	84462	75255	75784	76152
V/C Ratios																
Melling Bridge (WB)	0.8	0.7	0.7	0.8	0.8	0.7	0.8	0.9	0.7	0.9	0.8	0.0	0.0	0.0	0.8	0.8
SH2 South of SH58 (SB)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.6
Kenn Good Bridge (WB)	0.9	0.8	0.8	0.8	0.9	0.8	0.8	1.0	0.8	1.0	0.9	0.9	0.8	0.9	0.7	0.7
Randwick Rd (SB)	0.8	0.8	0.9	0.8	0.7	0.9	0.9	0.7	0.7	0.8	0.7	0.4	0.4	0.4	0.4	0.4
Petone Esplanade (WB)	0.8	0.8	0.7	0.5	1.0	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.8	0.8	0.8
Hutt Rd South of Wakefield (SB)	0.5	0.5	0.7	0.5	0.7	0.7	0.6	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.5	0.5
SH2 Petone - Ngauranga (SB)	1.2	1.2	1.1	1.2	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
SH1 Ngauranga - Aotea Quay (SB)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
SH1 Aotea Quay - Ngauranga (NB)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.8	0.8	0.8

Table 5.11 Inter Peak - Sensitivity Test

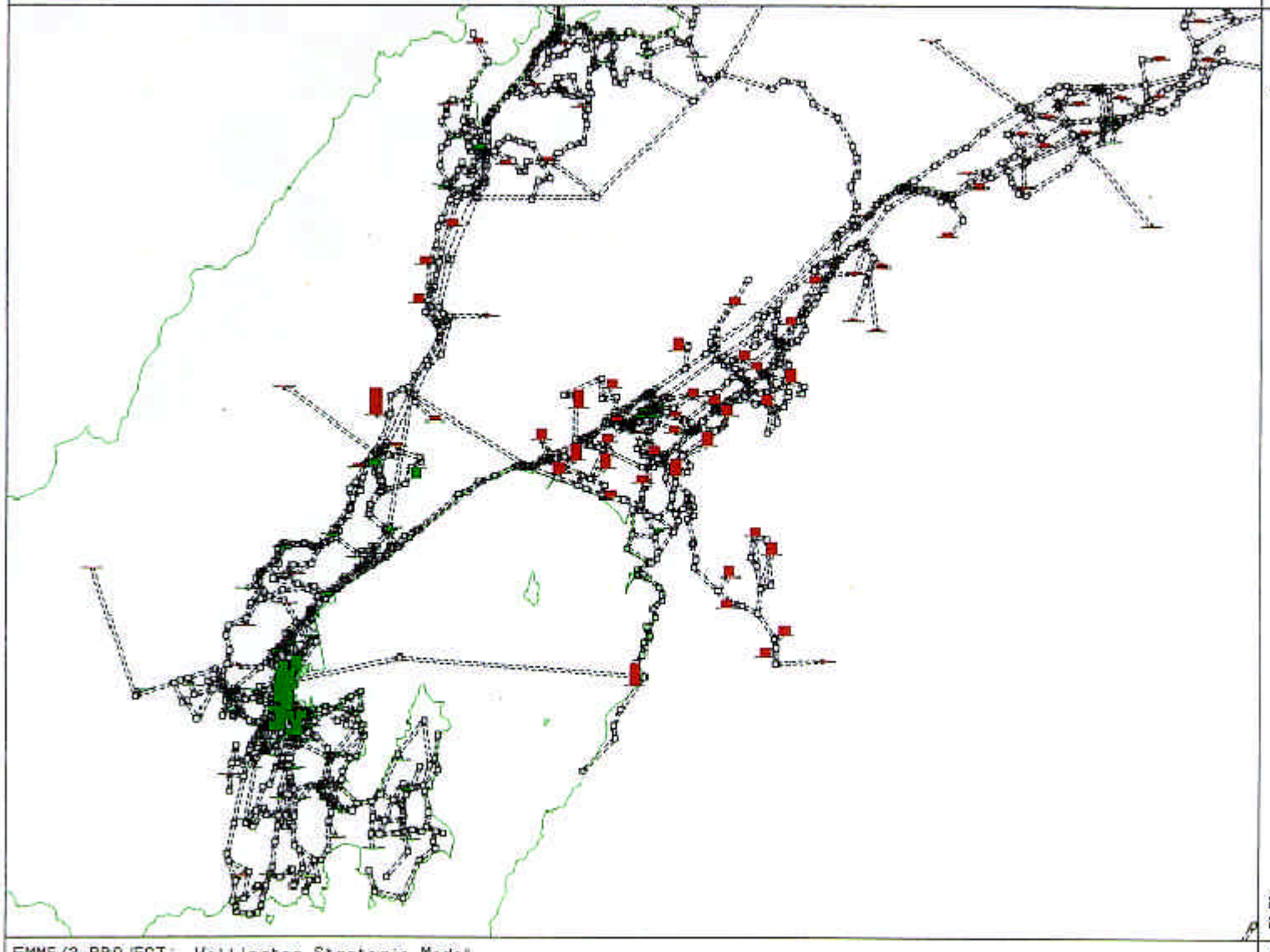
INDICATOR	Base	BaseS1	X1	X1S1	X1S2	X1S3	X1S4	X2	X2S1	X2S2	X2S3	X3	X3S1	X3S2	X4	X4S1
ACCESSIBILITY																
Auto		No TG		No Pentone Link	No Espl Upgrade	No TG	+20% dist, 70km/h		No Melling Link	No Cross Link	+20% dist, 70km/h		No TG	+20% dist, 70km/h		+20% dist, 70km/h
Total motor vehicle travel time (hrs)	55305	55904	56034	54872	55841	56754	56093	56019	54920	55808	56042	56093	56832	56095	56152	56087
Total motor vehicle travel distance ('000km)	3664	3619	3733	3654	3698	3702	3731	3724	3649	3699	3717	3728	3676	3717	3725	3712
Average vehicle network speed (km/hr)	66.3	64.7	66.6	66.6	66.2	65.2	66.5	66.5	66.4	66.3	66.3	66.5	64.7	66.3	66.3	66.2
							0				0			0		0
Total auto trips spread from the peak	194	513	-65	226	-11	178	-49	-8	223	-7	29	-69	282	-36	-6	13
Total vehicle hours below service level D	208	195	202	195	232	196	199	232	188	262	225	87	84	83	248	246
Auto Travel times to Airport (mins):													0			
CBD	8.3	8.2	8.3	8.2	8.3	8.3	8.3	8.3	8.2	8.2	8.3	8.2	8.2	8.3	8.3	8.3
Port	10.5	10.4	10.5	10.5	10.5	10.5	10.5	10.5	10.4	10.4	10.5	10.5	10.5	10.5	10.5	10.5
Johnsonville to Airport	15.6	15.5	15.5	15.5	15.4	15.5	15.5	15.6	15.5	15.5	15.6	15.5	15.5	15.6	15.6	15.6
Porirua to Airport	21.3	23.9	21.2	21.3	21.3	24.0	21.3	21.3	21.3	21.3	21.3	21.3	23.9	21.3	21.3	21.3
Plimerton to Airport	27.1	27.5	27.1	27.1	27.1	27.8	27.1	27.1	27.1	27.0	27.1	27.1	27.8	27.1	27.1	27.1
Paraparaumu to Airport	42.0	44.9	42.0	41.9	41.9	45.2	42.0	42.0	41.9	41.9	42.0	41.9	45.2	42.0	42.0	42.0
West External to Airport	61.6	64.6	61.7	61.6	61.6	64.9	61.7	61.7	61.6	61.6	61.7	61.6	64.9	61.7	61.7	61.6
Lower Hutt to Airport	18.6	18.5	18.6	18.5	18.5	18.6	18.6	18.6	18.5	18.5	18.6	18.6	18.6	18.7	18.6	18.6
Upper Hutt to Airport	28.5	28.5	28.5	28.5	28.5	28.5	28.6	28.5	28.5	28.4	28.5	28.5	28.5	28.5	28.5	28.5
East External to Airport	94.6	94.6	94.6	94.6	94.6	94.6	94.7	94.6	94.6	94.5	94.6	94.6	94.6	94.6	94.6	94.6
Transit																
Total passenger travel time (hrs)	5952	5856	5849	6675	6894	5986	5856	5837	6671	6674	5849	5892	5804	5901	5946	5853
Total passenger travel distance ('000km)	218	213	212	250	248	219	213	210	248	248	211	212	213	213	217	212
Average passenger network speed (km/hr)	36.7	36.3	36.3	37.4	37.2	36.7	36.3	36.0	37.3	37.1	36.1	36.1	36.1	36.1	36.5	36.2
AFFORDABILITY																
Strategy Revenue ($)																
Toll	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fare	45163	44479	44519	51947	52046	45349	44556	44316	51880	51846	44390	44827	44898	44902	45091	44417
Parking	203023	203190	203437	200758	200666	203369	203592	203402	200826	200497	203541	203156	203253	203253	203163	203353
Total	248186	247669	247952	252705	252709	248718	248148	247718	252707	252343	247931	247985	248152	248155	248253	247770
ECONOMIC EVALUATION																
Cross-valley-link-road user benefits		No TG	7899 60%	4358 22%	8668 29%	7961 52%	5890	6896 45%	6232 29%	6154 20%	5519	4573 33%	4080 31%	3152	2625 20%	1257
Porirua-Hutt-link-road user benefits			3846 29%	3265 17%	7100 24%	4386 29%	2950	6998 46%	3350 16%	10436 34%	4820	7368 53%	8718 67%	5045	7048 55%	4263
Non-link-road user benefits			1354 10%	11882 61%	14032 47%	2909 19%	784	1419 9%	11902 55%	13985 46%	551	2062 15%	290 2%	1315	3217 25%	1232
Region-wide user benefits			13099	19504	29801	15251	9623	15311	21488	30577	10890	14003	13088	9512	12890	6752
SUSTAINABILITY																
Environment																
CO2 Emmissions (Tonnes)	827	822	841	822	836	844	841	838	822	834	838	840	841	839	840	838
CO Emmissions (Tonnes)	28	29	30	29	29	30	30	30	29	29	30	30	30	30	30	30
Fuel																
Fuel Consumption (Litres)	330757	331329	336427	328977	334367	337673	336481	335502	328945	333622	335341	336021	335414	335736	336013	335275
Safety																
Total Accident Cost ($)	103421	113816	107540	103266	106060	117646	106785	108433	103068	107427	106971	108612	116823	107197	108667	106761
General Statistics																
Total Number of motor vehicle trips	364670	364758	366042	363122	364054	365886	365859	366105	363075	364105	365842	366012	365961	365700	365837	365595
Total Number of passenger trips	81505	81302	81991	80936	81232	81726	81936	81955	80911	81240	81881	81936	81627	81852	81863	81827
Total Number of slow trips	128779	129435	127220	127764	126522	127614	127391	127436	127876	126611	127694	127300	128022	127569	127479	127892
Total Number of PT trips	38032	37918	37512	41251	41006	37873	37567	37460	41204	40960	37536	37617	37769	37701	37731	37573
Average motor vehicle trip length (km)	10.0	9.9	10.2	10.1	10.2	10.1	10.2	10.2	10.0	10.2	10.2	10.2	10.0	10.2	10.2	10.2
Cost of Congestion ($)	22693	22693	22693	44236	44236	22693	22693	22693	44236	44236	22693	22693	22693	22693	22693	22693
V/C Ratios																
Melling Bridge (WB)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.8	0.8
SH2 South of SH58 (SB)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.3
Kenn Good Bridge (WB)	0.5	0.5	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.3
Randwick Rd (SB)	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.2	0.2	0.2	0.2	0.2
Petone Esplanade (WB)	0.3	0.3	0.3	0.2	0.4	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3
Hutt Rd South of Wakefield (SB)	0.3	0.3	0.4	0.3	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SH2 Petone - Ngauranga (SB)	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
SH1 Ngauranga - Aotea Quay (SB)	0.3	0.3	0.4	0.3	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SH1 Aotea Quay - Ngauranga (NB)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

- Appendix F

Economic Effects of the Hutt – Porirua Link

PLOT MATRIX: MF121 :DIFFAM

TOTAL FOR ORIGIN



emme/2

PLOT MATRIX:
mf121 :diffam
LINKS.
all

SCALE 2.5

250
200
150
100
50
0
-50

WINDOW 8:
2550465/-------
2588256/-------

EMME/2 PROJECT: Wellington Strategic Model
SCENARIO 80011: Hutt_X1 pm 16 59 am
MATRIX mf121: diffam Difference between base and x1 am

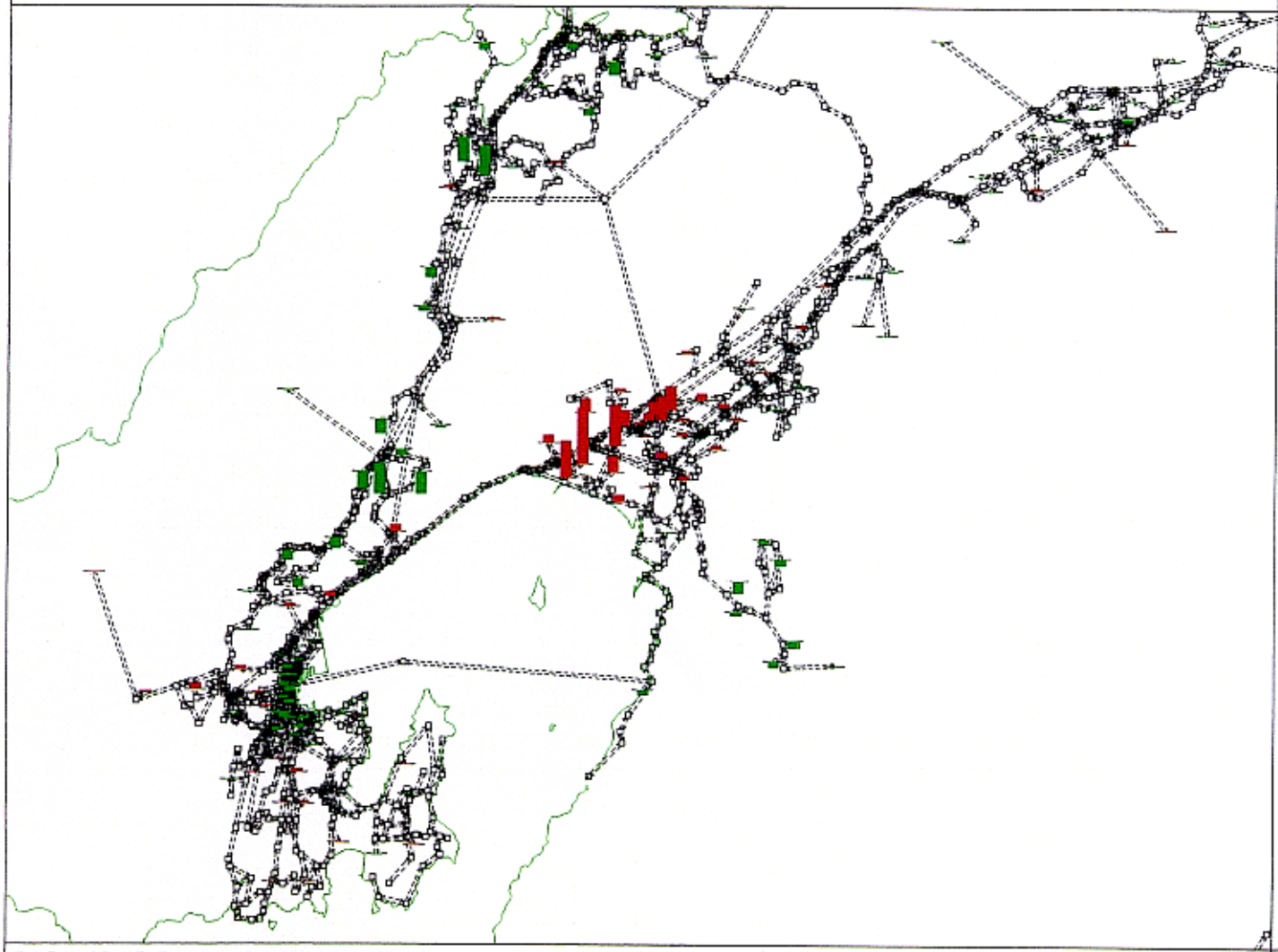
Wellington Regional Council

02-03-24 09:50
MODULE: 3 13
BCHF.....myl

PLOT MATRIX: MF124:DIFFIP

TOTFL FOR ORIGIN

emme/2



PLOT MATRIX:
mf124:diffip
LINKS:
all

SCALE: 2.5

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200
150
100
50
0
-50

WINDOW B:
2650465/xxxxxxx
2688256/xxxxxxx

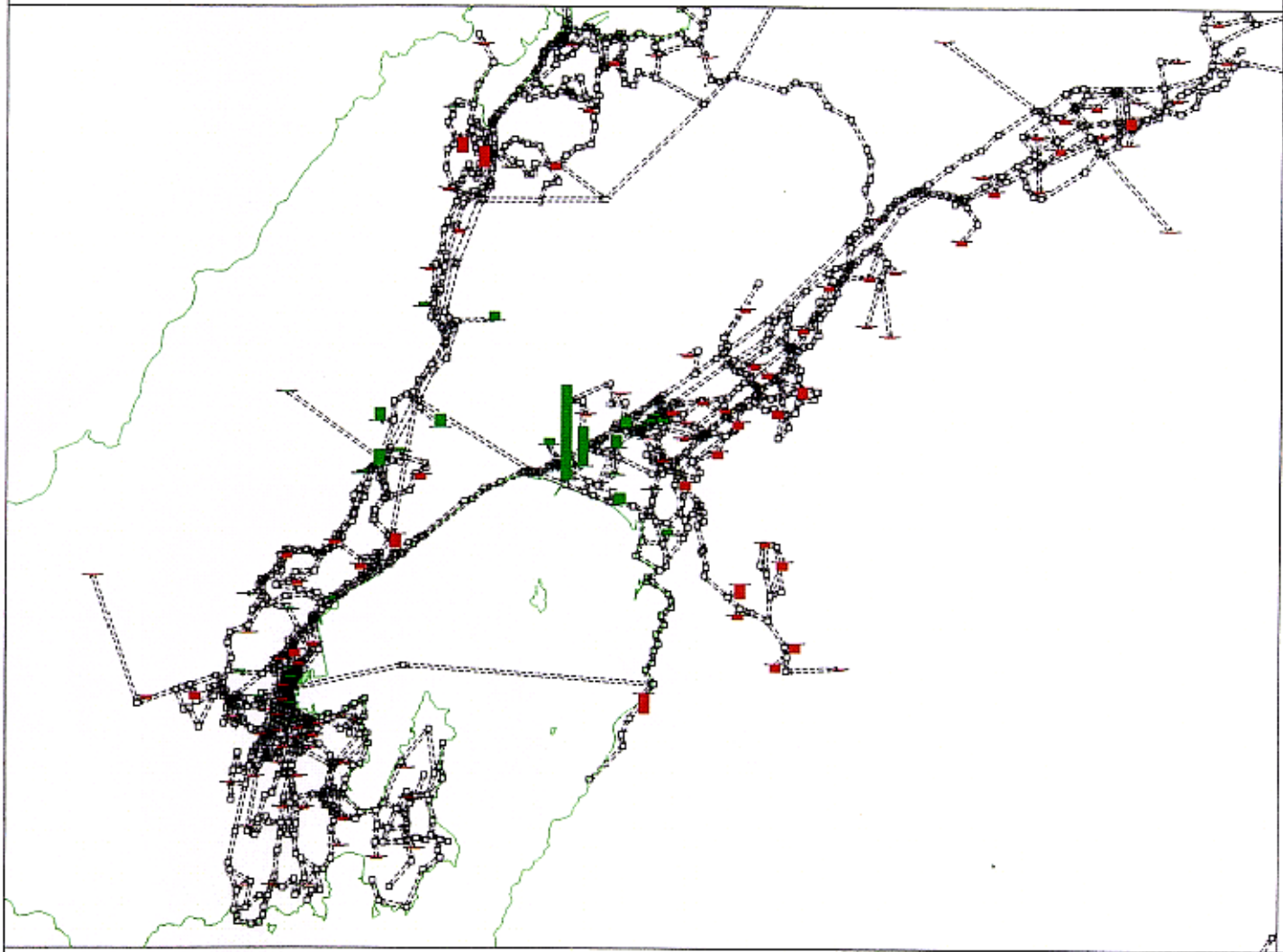
EMME/2 PROJECT: Wellington Strategic Model
SCENARIO 80022: Hutt_X2 me 16 60 ip
MATRIX mf124: diffip Difference between base and x2 ip

Wellington Regional Council

02-03-24 09:50
MODULE: 3.13
BCHF.....myl

PLOT MATRIX: MF122:DIFFIP

TOTAL FOR DESTINATION



PLOT MATRIX:
mf122:diffip
LINKS:
all

SCALE: 2.5

250
200
150
100
50
0
-50

WINDOW B:
2650465/xxxxxxx
2688256/xxxxxxx

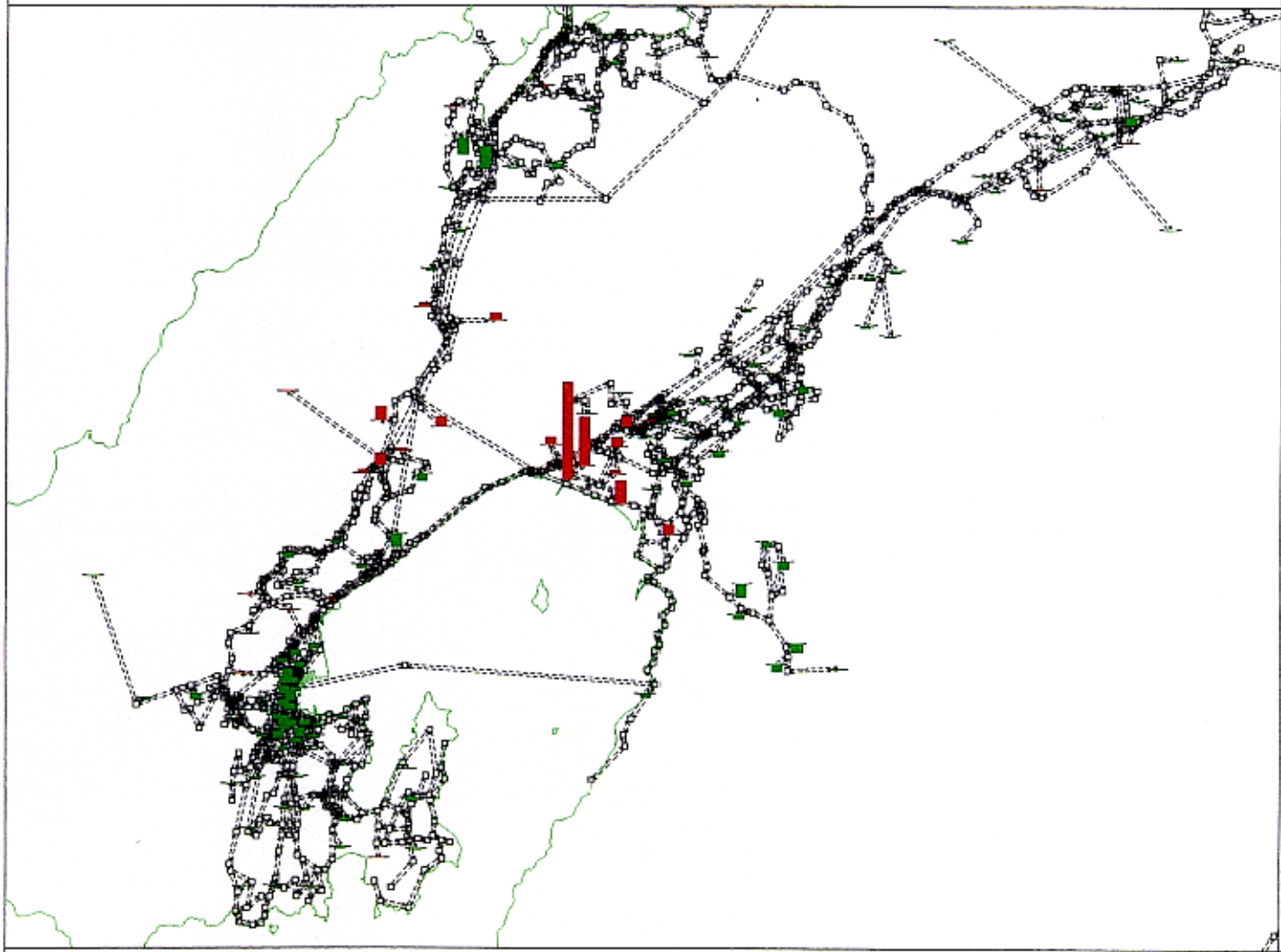
EMME/2 PROJECT: Wellington Strategic Model
SCENARIO 80012: Hutt_X1 ma 16 59 ip
MATRIX mf122: diffip Difference between base and x1 ip

Wellington Regional Council

02-03-24 09:50
MODULE: 3.13
BCHF.....myl

PLOT MATRIX: MF122:DIFFIP

TOTAL FOR ORIGIN



emme/2

PLOT MATRIX:
mf122:diffip
LINKS:
all

SCALE: 2.5

250
200
150
100
50
0
-50

WINDOW B:
2550465/*******
2568256/*******

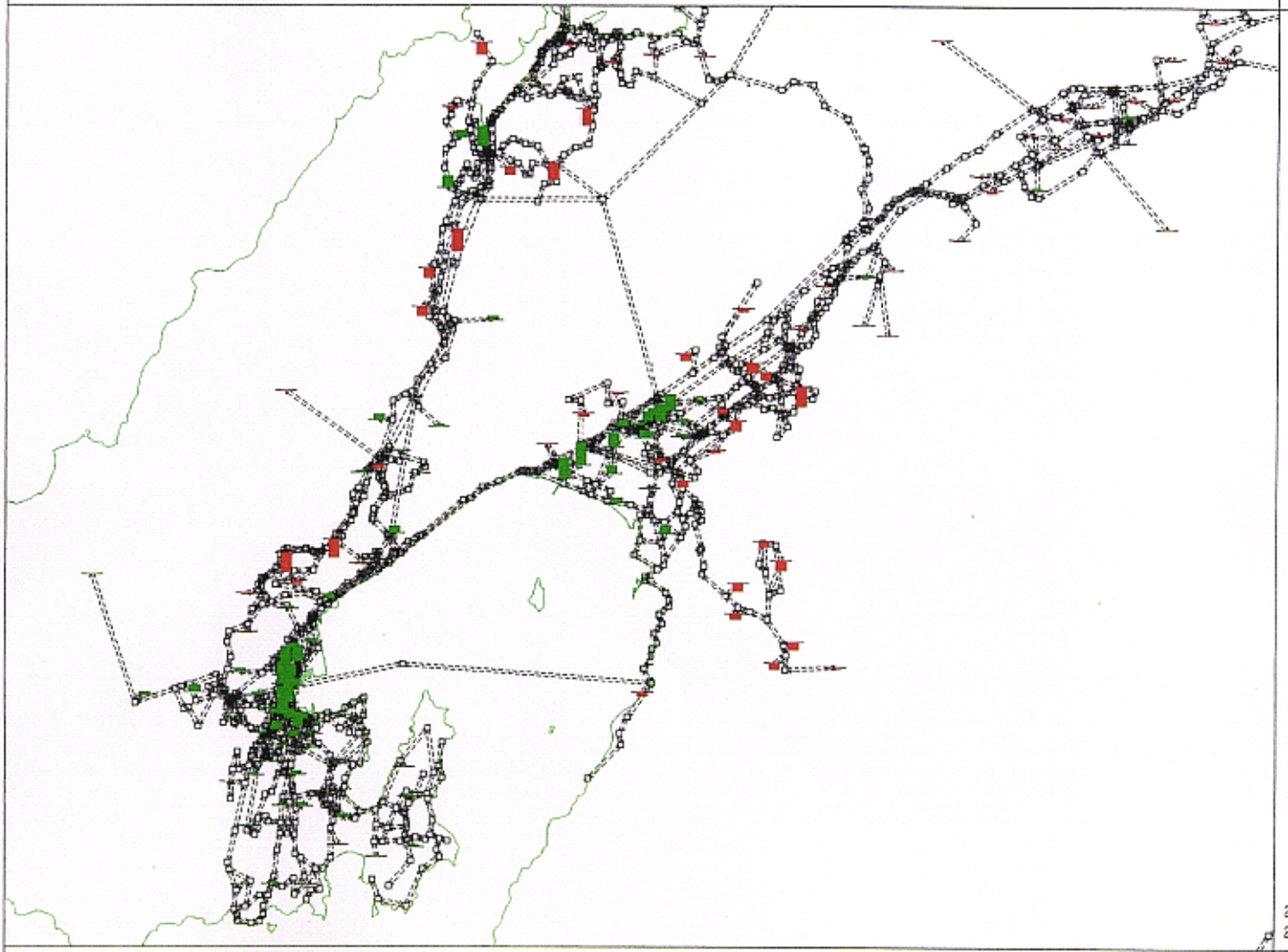
EMME/2 PROJECT: Wellington Strategic Model
SCENARIO 80012: Hutt_X1 me 16 59 ip
MATRIX mf122: diffip Difference between base and x1 ip

Wellington Regional Council

02-03-24 09:50
MODULE: 3.13
BCHF.....myl

PLOT MATRIX: MF123:DIFFAM

TOTAL FOR DESTINATION



PLOT MATRIX:
mf123:diffam
LINKS:
all

SCALE: 2.5

250
200
150
100
50
0
-50

WINDOW B:
2650465/*******
2688256/*******

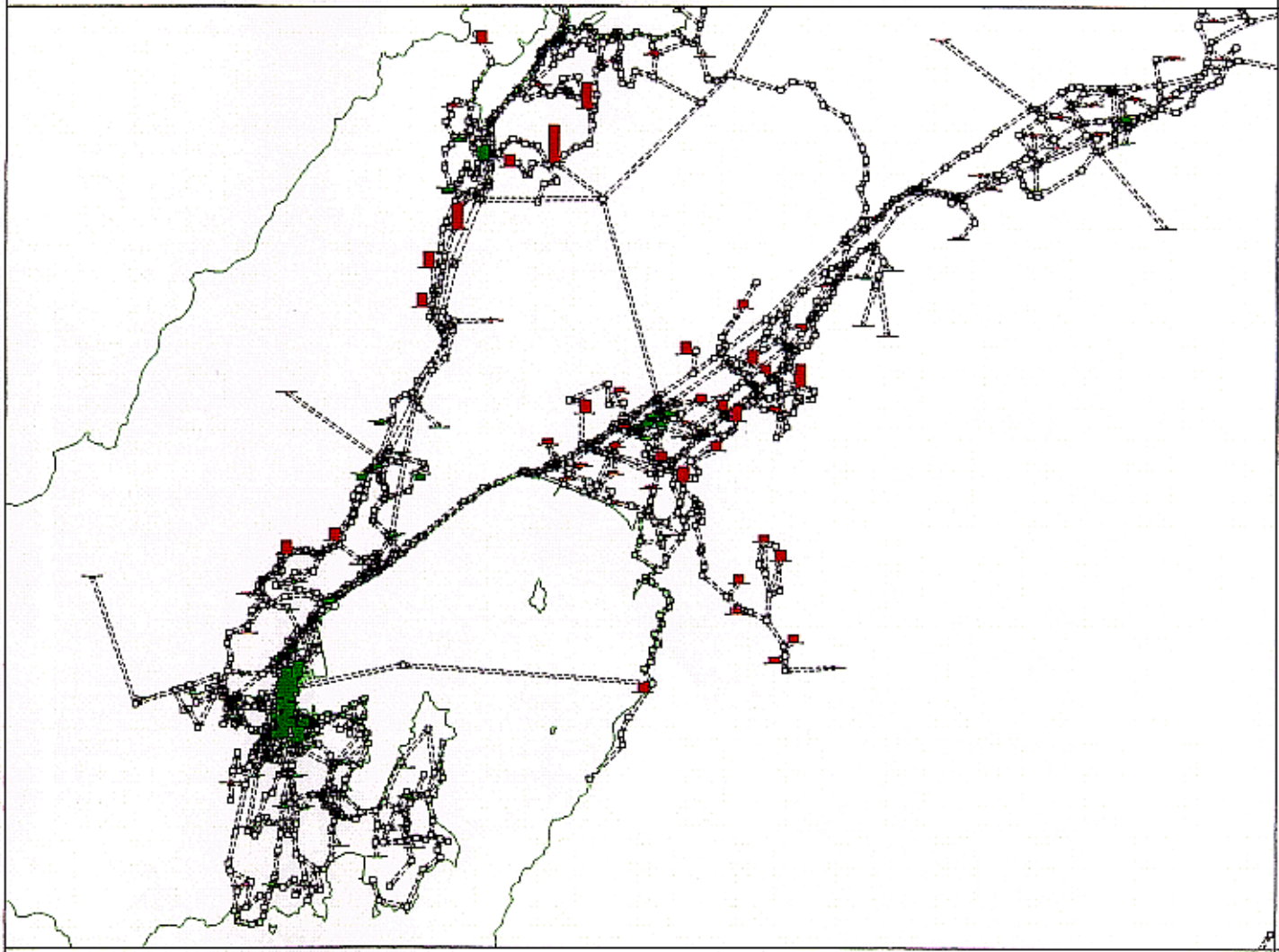
EMME/2 PROJECT: Wellington Strategic Modal
SCENARIO 80021: Hutt_X2 me 16 60 am
MATRIX mf123: diffam Difference between base and x2 am

Wellington Regional Council

02-03-24 09:50
MODULE: 3.13
ECHF.....myl

PLOT MATRIX: MF123:DIFFAM

TOTAL FOR ORIGIN



PLOT MATRIX:
mf123:diffam
LINKS:
all

SCALE: 2.5

250
200
150
100
50
0
-50

WINDOW 8:
2650465/******
2688256/******

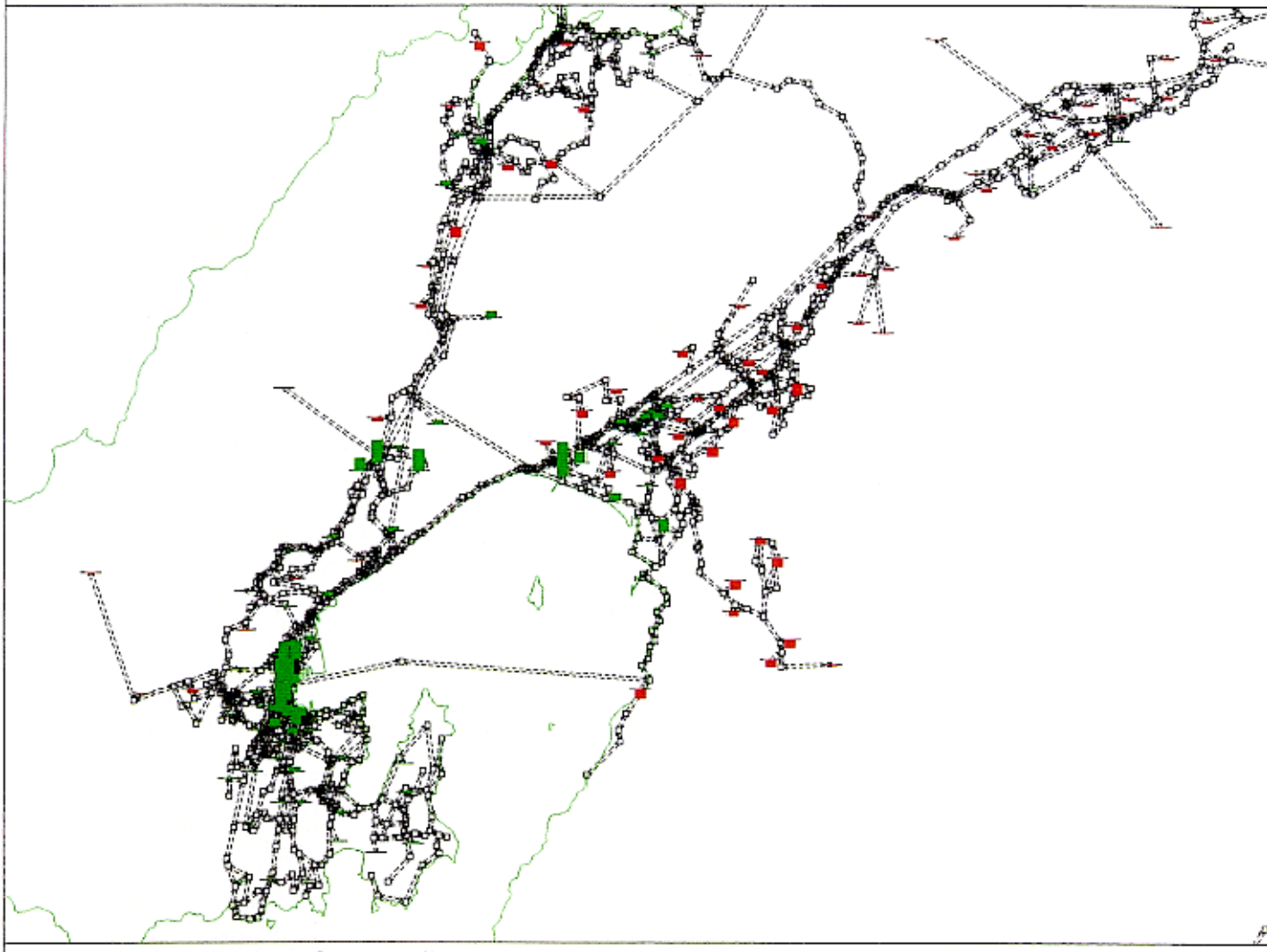
EMME/2 PROJECT: Wellington Strategic Model
SCENARIO 80021: Hutt_X2 me 16 60 am
MATRIX mf123: diffam Difference between base and x2 am

Wellington Regional Council

02-03-24 09:50
MODULE: 3 13
BCHF.....myl

PLOT MATRIX: MF121:DIFFAM

TOTAL FOR DESTINATION



PLOT MATRIX:
mf121:diffam

LINKS:
all

SCALE: 2.5

250
200
150
100
50
0
-50

WINDOW B:
2650465/*******
2688256/*******

EMME/2 PROJECT: Wellington Strategic Model
SCENARIO 80011: Hutt_X1 mo 16 59 am
MATRIX mf121: diffam Difference between base and x1 am

Wellington Regional Council

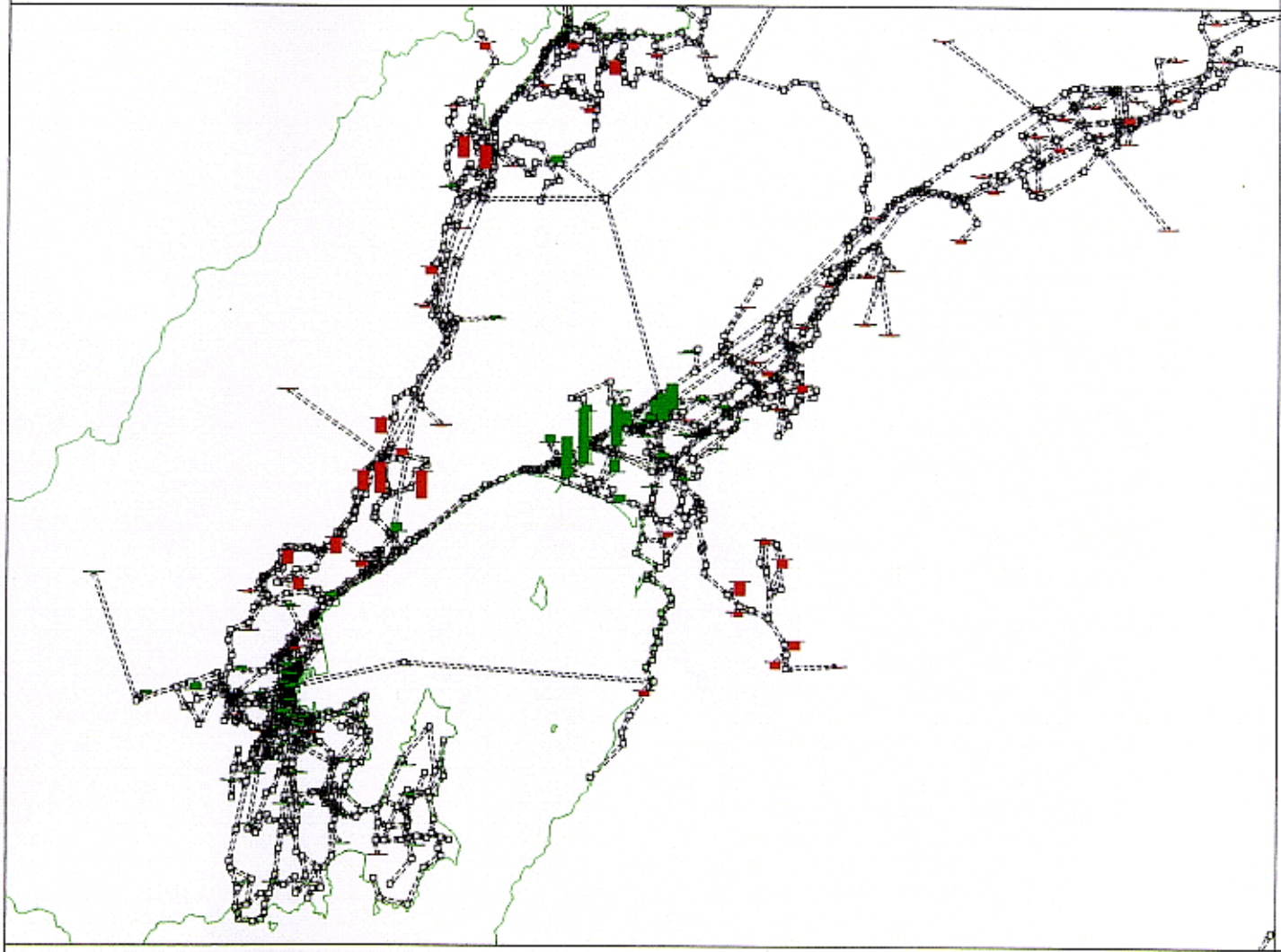
02-03-24 09:50
MODULE: 3.13
BCHF.....myl

PLOT MATRIX: MF124:DIFFIP

TOTAL FOR DESTINATION

emme/2

PLOT MATRIX:
mf124:diffip
LINKS:
all



SCALE: 2.5

250
200
150
100
50
0
-50

WINDOW 8:
2650465/******
2688256/******

EMME/2 PROJECT: Wellington Strategic Model
SCENARIO 80022: Hutt_X2 me 16 60 ip
MATRIX mf124: diffip Difference between base and x2 ip

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02-03-24 09:50
MODULE: 3.13
BCHF.....myl

▪ Appendix G

Performance Indicator Comparison form other Sensitivity

Table 5.10 AM Peak - Sensitivity Test

INDICATOR	Base	BaseS1	BaseS2	H2_8	H28S1	H3	H3S1	P1	P1S1	P2	P2S1
ACCESSIBILITY											
Auto		No TG	No Tidal Flow		No TG		No Tidal Flow		No TG		No TG
Total motor vehicle travel time (hrs)	29678	30142	29754	29530	29941	29572	29750	29662	30115	29305	29712
Total motor vehicle travel distance ('000km)	1487	1426	1482	1507	1449	1546	1529	1516	1458	1481	1419
Average vehicle network speed (km/hr)	50.1	47.3	49.8	51.0	48.4	52.3	51.4	51.1	48.4	50.5	47.8
		0									
Total auto trips spread from the peak	189	502	250	11	323	-286	-90	-117	200	110	442
Total vehicle hours below service level D	8435	9596	8924	8629	9684	8021	9096	8901	10051	8184	9543
Auto Travel times to Airport (mins):											
CBD	9.9	9.9	9.9	9.9	9.9	10.0	9.9	9.9	9.9	9.9	9.8
Port	12.4	12.4	12.3	12.5	12.4	12.6	12.5	12.5	12.5	12.4	12.3
Johnsonville to Airport	25.3	24.6	26.1	25.3	24.7	25.5	27.3	25.3	24.7	25.0	24.3
Porirua to Airport	32.4	33.7	33.1	32.3	33.7	32.1	33.7	32.0	33.6	32.0	33.3
Plimerton to Airport	38.8	50.8	39.5	38.6	50.5	38.4	40.0	38.3	50.2	38.3	50.2
Paraparaumu to Airport	54.2	72.9	54.9	54.0	72.5	53.8	55.4	53.7	72.3	53.8	72.5
West External to Airport	72.8	91.4	73.5	72.6	91.0	72.3	74.0	72.2	90.8	72.3	90.9
Lower Hutt to Airport	38.7	39.6	39.6	33.1	33.3	29.9	32.3	32.2	32.5	37.6	38.2
Upper Hutt to Airport	51.9	52.7	52.8	46.3	46.3	40.6	43.0	45.7	45.9	50.7	51.2
East External to Airport	117.8	118.6	118.7	112.3	112.3	105.8	108.1	111.7	111.8	116.6	117.1
Transit											
Total passenger travel time (hrs)	10939	11405	11042	10784	11238	10465	10728	10723	11183	11148	11621
Total passenger travel distance ('000km)	426	459	430	412	446	399	411	413	447	449	483
Average passenger network speed (km/hr)	38.9	40.2	39.0	38.2	39.7	38.1	38.3	38.6	40.0	40.3	41.5
AFFORDABILITY											
Strategy Revenue ($)											
Toll	0	0	0	2087	2303	0	0	0	0	0	0
Fare	75627	78746	76224	74465	77483	72155	73699	75338	78429	79360	82601
Parking	114432	112701	113497	116549	114954	119633	117161	117691	116040	112981	111110
Total	190060	191448	189721	193101	194740	191787	190860	193029	194469	192341	193712
ECONOMIC EVALUATION											
Cross-valley-link-road user benefits				3315 48%	3270 47%	5755 42%	4937 50%	4566 36%	4433 35%	2405 28%	2182 27%
Porirua-Hutt-link-road user benefits				120 2%	223 3%	241 2%	264 3%	271 2%	420 3%	188 2%	187 2%
Non-link-road user benefits				3487 50%	3440 50%	7759 56%	4615 47%	7808 62%	7927 62%	5855 69%	5690 71%
Region-wide user benefits				6921	6933	13754	9816	12644	12779	8447	8059
SUSTAINABILITY											
Environment											
CO2 Emmissions (Tonnes)	379	374	380	383	378	388	387	385	380	376	370
CO Emmissions (Tonnes)	15	16	15	15	16	15		15	16	15	15
Fuel							0				
Fuel Consumption (Litres)	151654	149449	152135	153006	151018	155026	154727	153910	152100	150412	148154
Safety											
Total Accident Cost ($)	45099	46441	44912	45698	47099	43313	42822	46050	47480	44894	46253
General Statistics											
Total Number of motor vehicle trips	141026	140138	140798	141618	140765	142517	141912	141673	140802	140199	139257
Total Number of passenger trips	50306	49821	50203	50659	50205	50977	50704	50593	50122	50026	49526
Total Number of slow trips	47498	47671	47536	47405	47570	47287	47368	47281	47449	47217	47383
Total Number of PT trips	49921	50754	50150	49274	50056	48490	49089	49453	50266	51204	52097
Average motor vehicle trip length (km)	10.5	10.2	10.5	10.6	10.3	10.9	10.8	10.7	10.4	10.6	10.2
Cost of Congestion ($)	78825	88969	78613	74574	83374	72065	73441	76984	85768	76380	85847
V/C Ratios							0				
Melling Bridge (WB)	0.8	0.7	0.8	0.0	0.0	0.0		0.8	0.8	0.8	0.7
SH2 South of SH58 (SB)	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.6
Kenn Good Bridge (WB)	0.9	0.8	0.9	0.9	0.9	1.0	1.0	0.8	0.8	0.9	0.8
Randwick Rd (SB)	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.7	0.7
Petone Esplanade (WB)	0.8	0.8	0.8	0.9	0.9	0.8	0.8	0.9	1.0	0.8	0.8
Hutt Rd South of Wakefield (SB)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5
SH2 Petone - Ngauranga (SB)	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.2	1.2 >0.9
SH1 Ngauranga - Aotea Quay (SB)	0.8	0.8	1.0	0.9	0.8	0.9	1.1	0.9	0.9	0.8	0.8
SH1 Aotea Quay - Ngauranga (NB)	0.8	0.8	0.5	0.8	0.8	0.8	0.5	0.8	0.8	0.8	0.8

Table 5.11 Inter Peak - Sensitivity Test

INDICATOR	Base	BaseS1	BaseS2	H2_8	H28S1	H3	H3S1	P1	P1S1	P2	P2S1
ACCESSIBILITY											
Auto		No TG	No Tidal F		No TG		No Tidal Flow		No TG		No TG
Total motor vehicle travel time (hrs)	55305	55904	55214	55828	56427	56066	55771	55869	56441	55340	55870
Total motor vehicle travel distance ('000km)	3664	3619	3667	3687	3647	3721	3714	3690	3650	3668	3618
Average vehicle network speed (km/hr)	66.3	64.7	66.4	66.0	64.6	66.4	66.6	66.1	64.7	66.3	64.7
Total auto trips spread from the peak	194	513	271	14	327	-282	-92	-110	207	119	448
Total vehicle hours below service level D	208	195	212	180	175	250	191	281	288	214	210
Auto Travel times to Airport (mins):											
CBD	8.3	8.2	8.3	8.3	8.2	8.2	8.3	8.3	8.3	8.3	8.3
Port	10.5	10.4	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Johnsonville to Airport	15.6	15.5	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Porirua to Airport	21.3	23.9	21.3	21.3	23.9	21.3	21.3	21.3	23.9	21.3	23.9
Plimerton to Airport	27.1	27.5	27.1	27.1	27.6	27.1	27.1	27.1	27.6	27.1	27.6
Paraparaumu to Airport	42.0	44.9	42.0	42.0	45.0	42.0	42.0	42.0	45.0	42.0	45.0
West External to Airport	61.6	64.6	61.7	61.7	64.7	61.7	61.7	61.7	64.7	61.7	64.7
Lower Hutt to Airport	18.6	18.5	18.6	18.6	18.6	18.6	18.6	18.6	18.5	18.6	18.6
Upper Hutt to Airport	28.5	28.5	28.5	28.5	28.5	28.9	28.9	28.5	28.5	28.6	28.5
East External to Airport	94.6	94.6	94.6	94.6	94.6	94.4	94.4	94.6	94.6	94.6	94.6
Transit											
Total passenger travel time (hrs)	5952	5856	5844	5821	5827	5893	5871	5927	5927	5961	6056
Total passenger travel distance ('000km)	218	213	212	212	212	215	214	218	218	221	226
Average passenger network speed (km/hr)	36.7	36.3	36.3	36.4	36.4	36.4	36.4	36.8	36.8	37.1	37.4
AFFORDABILITY											
Strategy Revenue ($)											
Toll	0	0	0	0	0	0	0	0	0	0	0
Fare	45163	44475	44400	44150	44187	44692	44562	45729	45723	46143	46815
Parking	203023	203190	203131	203736	203755	203722	203409	203481	203458	202794	202539
Total	248186	247665	247532	247885	247942	248414	247971	249210	249181	248937	249354
ECONOMIC EVALUATION											
Cross-valley-link-road user benefits		No TG	No Tidal Flow	-704	-538	-1162	-649	-98	126	-248	466
Porirua-Hutt-link-road user benefits				59 -4%	524 -168%	23 -1%	300 -39%	1972 127%	2439 86%	1694 149%	2095 52%
Non-link-road user benefits				-903	-299	-1693	-430	-320	285 10%	-307	1487 37%
Region-wide user benefits				-1547	-313	-2832	-779	1553	2850	1140	4048
SUSTAINABILITY											
Environment											
CO2 Emmissions (Tonnes)	827	828	826	835	836	839	835	835	836	828	828
CO Emmissions (Tonnes)	29	29	29	29	30	30	29	29	30	29	29
Fuel											
Fuel Consumption (Litres)	330757	331329	330438	333833	334369	335455	334169	334099	334542	331052	331111
Safety											
Total Accident Cost ($)	103421	113816	103522	104342	114714	96834	96641	104775	115080	103596	113759
General Statistics											
Total Number of motor vehicle trips	364670	364759	364888	365096	365050	364920	365043	364400	364352	363800	363598
Total Number of passenger trips	81505	81302	81551	81721	81457	81835	81781	81674	81404	81552	81236
Total Number of slow trips	128779	129435	128906	128283	128909	127759	128056	127942	128600	128455	129059
Total Number of PT trips	38032	37919	37784	37626	37753	37691	37695	38144	38271	38361	38736
Average motor vehicle trip length (km)	10.0	9.9	10.0	10.1	10.0	10.2	10.2	10.1	10.0	10.1	9.9
Cost of Congestion ($)	22693	22693	22693	22693	22693	22693	22693	22693	22693	23681	23681
V/C Ratios											
Melling Bridge (WB)	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7
SH2 South of SH58 (SB)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Kenn Good Bridge (WB)	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5
Randwick Rd (SB)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Petone Esplanade (WB)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Hutt Rd South of Wakefield (SB)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SH2 Petone - Ngauranga (SB)	0.6	0.6	0.6	0.4	0.5	0.5	0.5	0.5	0.4	0.6	0.6
SH1 Ngauranga - Aotea Quay (SB)	0.3	0.3	0.5	0.4	0.4	0.4	0.5	0.4	0.4	0.3	0.3
SH1 Aotea Quay - Ngauranga (NB)	0.9	0.9	0.6	0.9	0.9	0.9	0.6	0.9	0.9	0.9	0.9