



Porirua Transport Model Stage 2

Future Do Minimum Model
Development

January 2024

flow

TRANSPORTATION SPECIALISTS



TRANSPORTATION SPECIALISTS

Project: Porirua Transport Model Stage 2
Title: Future Do Minimum Model Development
Document Reference: P:\GWRC\008 Porirua Stage 2 Aimsun\4.0 Reporting\R2B240119
PTM Stage 2 Future DM development report.docx
Prepared by: Neha Sharma, Qing Li
Project Manager: Ian Clark
Reviewed by: Ian Clark

Revisions:

Date	Status	Reference	Approved by	Initials
23 November 2023	Draft	R2A231122	Ian Clark	IC
19 January 2024	Update to address Peer Review comments	R2B240119	Qing Li	QL

The drawings, information and data recorded in this document (the information) are the property of Flow Transportation Specialists Ltd. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Flow Transportation Specialists Ltd. Flow Transportation Specialists Ltd makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

EXECUTIVE SUMMARY

An Aimsun hybrid model has been developed to cover the transport network within Porirua area. The model has been developed using the traffic data collected after the opening of the Transmission Gully (TG) project and the traffic demand predictions obtained from the Wellington Transport Strategic Model (WTSM). The forecast model has been developed to represent a 2033 forecast year for the morning peak, interpeak and evening peak periods.

The 2033 Do Minimum model assumes the existing transport network within Porirua, with its demands being informed by the traffic growth predicted by WTSM between 2023 and 2033. We note that in general, the model reflects the anticipated traffic growth associated with the regional model predictions, with notable population growth/demand increases predicted in the following areas:

- ◆ Linden/Tawa
- ◆ Kenepuru
- ◆ Cannons Creek
- ◆ Ascot Park
- ◆ Plimmerton
- ◆ City centre

The above traffic growth seems plausible from a traditional transport planning point of view i.e. traffic demands for private vehicles will keep increasing with the anticipated land use growth. However, we note this increase appears to conflict with Te hau mārohi ki anamata Aotearoa New Zealand's Emissions Reduction Plan (the ERP), and with any subsequent Wellington regional vehicle kilometres travelled (VKT) reduction plan. As such, it should be emphasised that the 2033 Do Minimum model currently represents a scenario where traffic growth trend has been allowed to continue without interventions (beyond the default assumptions in the regional transport model, which includes limited railway investments).

When taking the modelled outcomes at face value however, we note that increased traffic congestion is predicted on the road network surrounding Porirua City. The following locations have been highlighted in the 2033 Do Minimum model:

- ◆ SH1 and Main Road in the morning peak, southbound direction
- ◆ Kenepuru Link Road westbound in the morning peak
- ◆ SH59 Southbound off ramp at the SH59/Mungavin Avenue interchange, in both morning and evening peak
- ◆ Westbound/southbound traffic on The Ramp in the morning peak and eastbound/northbound in the evening peak
- ◆ Titahi Bay Road eastbound in the evening peak
- ◆ Local roads within and surrounding city centre are generally predicted with higher delays and queues in the evening peak, due to increased demands.

Given the input assumptions and growth in traffic volumes, these outcomes are considered plausible.

CONTENTS

1	INTRODUCTION	1
1.1	2023 Base Model.....	1
1.2	2033 Forecast Model – Future Do Minimum.....	1
2	DO MINIMUM NETWORK	1
3	DO MINIMUM FORECAST DEMAND.....	1
3.1	Regional Model Land Use Forecast.....	2
3.2	2033 Forecast Demand Process.....	2
3.3	Demand Growth Summary.....	3
3.3.1	Area Wide Growth	3
3.3.2	Sector Growth	4
4	2033 DO MINIMUM MODEL OBSERVATIONS	6
4.1	Screenline Volume Changes.....	6
4.2	Flow Difference Plots	7
4.3	Route Travel Times.....	11
4.4	Network Travel Times	13
5	ADDITIONAL MODEL CHECKS.....	15
6	SUMMARY	16

APPENDICES

- APPENDIX A SCREENLINE FLOW COMPARISONS
- APPENDIX B ROUTE TRAVEL TIME COMPARISON

1 INTRODUCTION

This report provides a summary of the forecast model development completed for the Porirua Transport Model (PTM), Stage 2. Previously, a forecast 2031 model (Stage 1) was developed by Wellington Transport Analytics Unit (WTAU) based on traffic data obtained prior to the opening of the SH1 Transmission Gully (TG) project. The Stage 1 model has since been recalibrated and revalidated based on the traffic patterns observed in later 2022 (post TG) and it has been updated to reflect the most recent Wellington Transport Strategic Model (WTSM) forecast demands. The Stage 2 forecast model represents year 2033, aligning with the WTSM forecast year.

1.1 2023 Base Model

Prior to the development of the 2033 forecast model, a 'Base' model was developed to represent existing traffic conditions about Porirua. It was noted in the PTM Stage 1 that the traffic count data used to inform the base model development was collected both before and after the TG opening and flows may have been affected by the TG opening. As such, additional traffic data has been collected in November 2023 to assist the recalibration and revalidation of PTM base model.

In addition, the demand matrices of the Stage 2 PTM model have also been updated using a cordon of the most recent WTSM 2023 model. The base model has been peer reviewed and it has been used as a basis for the development of the forecast 2033 model.

1.2 2033 Forecast Model – Future Do Minimum

The Future Do Minimum scenario represents the transport and land use network as it is expected to operate in the future model year of 2033. Demands have been derived from the WTSM model runs for this future year.

2 DO MINIMUM NETWORK

The Stage 2 forecast model assumes the same network as the Stage 2 base model. Traffic signal timings at signalised intersections have been adjusted to accommodate the predicted future demands.

We note that while the transport network has been assumed to be consistent between 2023 and 2033 in the PTM area, network changes in other parts of the wider network may have impacts on the traffic volumes travelling through the modelled area (between external zones). We understand that the following projects have been assumed in the 2033 WTSM model:

- ◆ Lower North Island Rail Integrated Mobility (LNIRIM) project – limited rail investment
- ◆ Riverlink

3 DO MINIMUM FORECAST DEMAND

The forecast PTM model demands have been informed by the regional Wellington Transport Strategy Model (WTSM). As a result, the forecasts represent the effects of any land use changes at a macro level.

The predicted traffic growth between the 2023 and 2033 WTSM model has been applied to the base year Aimsun demands to obtain 2033 forecast demands for PTM.

3.1 Regional Model Land Use Forecast

The WTSM model contains some 128 zones in the area surrounding Porirua. These zones have been further split into 187 zones in PTM. In order to simplify the analysis, the PTM zones have been grouped into 13 urban and rural districts/sectors, as listed below:

- ◆ Porirua City Centre
- ◆ Titahi Bay
- ◆ Kenepuru
- ◆ Linden and Tawa
- ◆ Cannons Creek
- ◆ Aotea, Papakōwhai and Ascot Park
- ◆ Waitangirua
- ◆ Whitby North and Paremata South
- ◆ Whitby South
- ◆ Paremata North, Camborne and Plimmerton (Mana)
- ◆ Pukerua Bay
- ◆ Paekākāriki Hill and Pāuatahanui
- ◆ SH58 East / Judgeford

Figure 1: Land Use Sectors

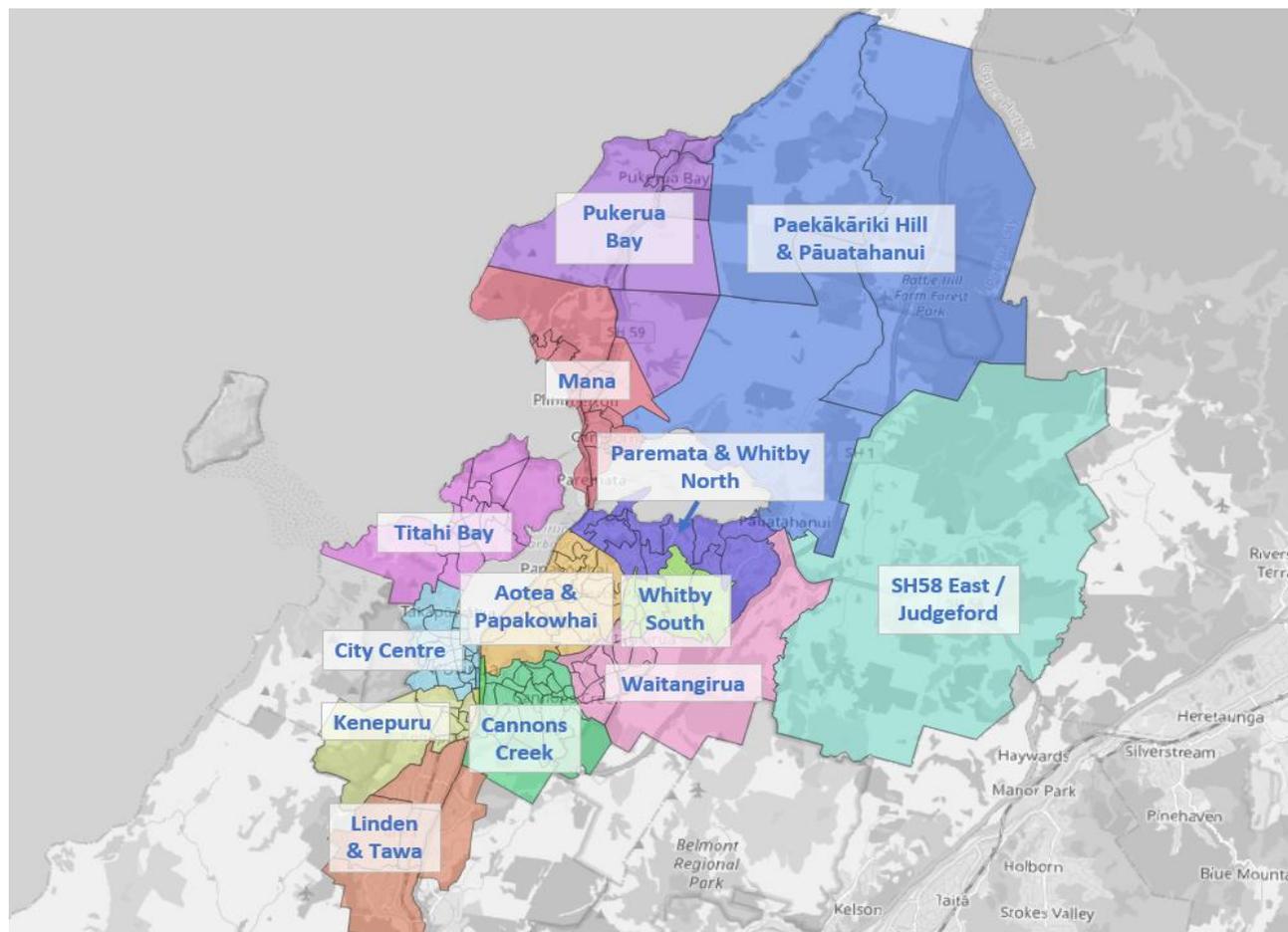


Table 1 below documents the household and employment forecast for each individual sector above:

Table 1: Predicted Households and Employment in Porirua¹

Location	WTSM Forecast				Growth	
	2023		2033		2023 to 2033	
	Household	Employment	Household	Employment	Household	Employment
Porirua City Centre	880	7,300	1,090	7,650	+210	+360
Titahi Bay	3,280	1,420	3,480	1,440	+ 210	+20
Kenepuru	300	2,910	760	3,000	+ 460	+90
Linden and Tawa	5,150	3,360	6,390	3,460	+1,240	+100
Cannons Creek	2,720	1,290	3,200	1,380	+ 470	+80
Aotea, Papakōwhai and Ascot Park	2,880	2,140	3,610	1,990	+730	-150
Waitangirua	1,740	690	2,270	650	+530	-40
Whitby North & Paremata South	3,480	1,510	3,700	1,560	+220	+50
Whitby South	1,360	1,050	1,490	1,040	+130	-10
Mana	2,020	2,090	2,490	2,110	+470	+20
Pukerua Bay	740	350	820	360	+80	+10
Paekākāriki Hill and Pāuatahanui	410	720	610	770	+200	+60
Judgeford	170	90	240	110	+70	+20
Total	25,140	24,940	30,150	25,530	+5,020 (+20%)	+600 (+2%)

The above table indicates the level of growth forecast for Porirua. An additional 5,000 households are anticipated between 2023 and 2033, representing a 20% increase. Much of this growth is forecast for Linden/Tawa, Cannons Creek, Kenepuru, Waitangirua and Ascot Park.

In terms of employment growth, approximately 600 new jobs are forecast from 2023 to 2033, representing a marginal 2% increase.

3.2 2033 Forecast Demand Process

Changes in forecast demands (between 2023 and 2033) have been derived from the WTSM model. In general, the following process has been used to create the PTM 2033 demands:

¹ The household and employment forecasts have been rounded to the nearest 10 units, for clarity.

- ◆ The predicted traffic growth during the morning peak, inter peak and evening peak periods has been calculated using the WTSM cordon demands (3 hours for each peak) between 2023 and 2033, for light and heavy vehicles separately
- ◆ The differences in the 3-hour WTSM demands have been factored up to 4 hours based on the calibrated base model profiles defined for each OD pair in the model (light and heavy). The factors used are consistent with the 3-hour to 4-hour factors developed during the base model development stage. These factors have been derived based on the profiles assigned to each OD for light and heavy vehicles respectively. The factors used for each profile have been provided in Appendix A of this report.
- ◆ The 4-hour traffic growth has then been added to the calibrated base traffic demands based on the disaggregation process established for the base model
- ◆ We note that a small number of ODs are predicted to have negative values after the above process. These values have been set to zero. An alternative method has also been investigated, where the demands with the negative values will be informed by the percentage decreases between 2023 and 2033. We note that the differences between the two methods are very modest for the 2033 Do Minimum scenario.

In addition to the above, we have been informed that the forecast 2033 WTSM zone has included an additional zone to represent the Plimmerton Farms development. This zone was not originally included in the 2023 base demands therefore we have assumed that it will have a similar profile/trip distribution pattern to the zone that is close to the development (PTM zone 11931).

3.3 Demand Growth Summary

3.3.1 Area Wide Growth

Based on the forecast demand process discussed above, Table 2 overleaf provides the predicted total traffic volume changes for the zones in PTM area. A comparison of the WTSM and PTM predicted volume changes for cars and trucks is also provided in Appendix A of this report.

Table 2: Predicted Total Traffic Demand Changes in Porirua²

Location	Total Households	WTSM Trips (3 hours)			PTM Trips (4 hours)		
		AM	IP	PM	AM	IP	PM
2023	25,140	60,500	64,000	81,500	87,400	92,000	117,400
2033	30,150	67,400	70,200	90,800	96,600	100,300	129,300
Total Growth	+5,020	+6,900	+6,200	+9,300	+9,200	+8,300	+11,900
Percentage Growth	20%	11.4%	9.6%	11.4%	10.5%	9.0%	10.1%
Annual Percentage Growth	2%	1.1%	1.0%	1.1%	1.1%	0.9%	1.0%
2023 Trips per HH		2.1	2.3	2.9	3.1	3.3	4.2
2033 Trips per HH		2.0	2.1	2.7	2.9	3.0	3.9

The following points are noted:

- ◆ The traffic growth reported for PTM is generally in line with the WTSM predictions, indicating that the demand process has been applied correctly
- ◆ The predicted percentage traffic growth in PTM is slightly lower than that predicted by WTSM, possibly due to the base demand calibration applied to the 2023 demands
- ◆ The trips per household predicted in 2033 are slightly lower (by approximately 10%) than the 2023 levels, indicating that WTSM is predicting reduced private vehicle use in the long term.

3.3.2 Sector Growth

Table 3 below provides a comparison of the anticipated land use and traffic demand growth between 2023 and 2033, at a sector level. We note the following points from the comparisons:

- ◆ High residential growth is predicted for the Linden/Tawa area. Significant traffic growth is therefore predicted in these areas
- ◆ Additional household/traffic growth is also predicted in the areas of Kenepuru, Cannons Creek, Ascot Park and Plimmerton (Mana) between 2023 and 2033. These changes are in line with the future developments anticipated in the area
- ◆ We note that high traffic growth is predicted in the city centre area in the inter peak and PM peak periods, but not in the AM peak. This broadly fits the traffic generation patterns observed in the central business areas
- ◆ The demand increases between each sector (provided in Appendix A) reflect similar trends discussed above. It is noted that some minor trip reductions have been predicted between the Porirua City Centre area and external State Highway zones in both morning and evening peak.

² The traffic demands have been rounded to the nearest 100 trips, Traffic demands associated with external and Park and Ride zones have been omitted from this table for clarity.

These are likely to be associated with the rail improvements assumed in the 2033 WTSM, which predicts additional Park and Ride trips in the Porirua area

- While the predicted traffic growth seems plausible from a traditional transport planning point of view i.e. traffic demands for private vehicles will keep increasing with the anticipated land use growth. However, we note this projected increase appears to conflict with Te hau mārohi ki anamata Aotearoa New Zealand’s Emissions Reduction Plan (the ERP), and with any subsequent Wellington regional vehicle kilometres travelled (VKT) reduction plan. The Ministry of Transport’s Decarbonising Transport Action Plan Cabinet Paper for example, sets a draft 2035 Wellington regional VKT reduction target of -16%, relative to a 2019 benchmark.

Table 3: Predicted Sector Land Use/Demand Changes³

Location	Forecast Land Use Growth		WTSM Growth (3 hours)			PTM Growth (4 hours)		
	Household	Employment	AM	IP	PM	AM	IP	PM
Porirua City Centre	+210	+360	+100	+1,470	+1,590	+270	+1,960	+2,160
Titahi Bay	+ 210	+20	+310	+200	+370	+380	+310	+470
Kenepuru	+ 460	+90	+780	+590	+820	+990	+800	+1,040
Linden and Tawa	+1,240	+100	+1,530	+1,020	+1,950	+1,980	+1,360	+2,360
Cannons Creek	+ 470	+80	+530	+560	+820	+580	+540	+790
Aotea, Papakōwhai and Ascot Park	+730	-150	+770	+650	+970	+960	+860	+1,190
Waitangirua	+530	-40	+450	+270	+500	+550	+360	+620
Whitby North & Paremata South	+220	+50	+520	+260	+460	+780	+340	+590
Whitby South	+130	-10	+20	-50	-20	+160	+40	+100
Mana	+470	+20	+750	+330	+580	+960	+480	+770
Pukerua Bay	+80	+10	+110	+180	+240	+350	+480	+650
Paekākāriki Hill and Pāuatahanui	+200	+60	+960	+600	+920	+1,220	+780	+1,130
Judgeford	+70	+20	+70	+90	+120	+20	+20	+30
Total Porirua Area	+5,020 (+20%)	+600 (+2%)	+6,890	+6,170	+9,330	+9,180	+8,320	+11,880

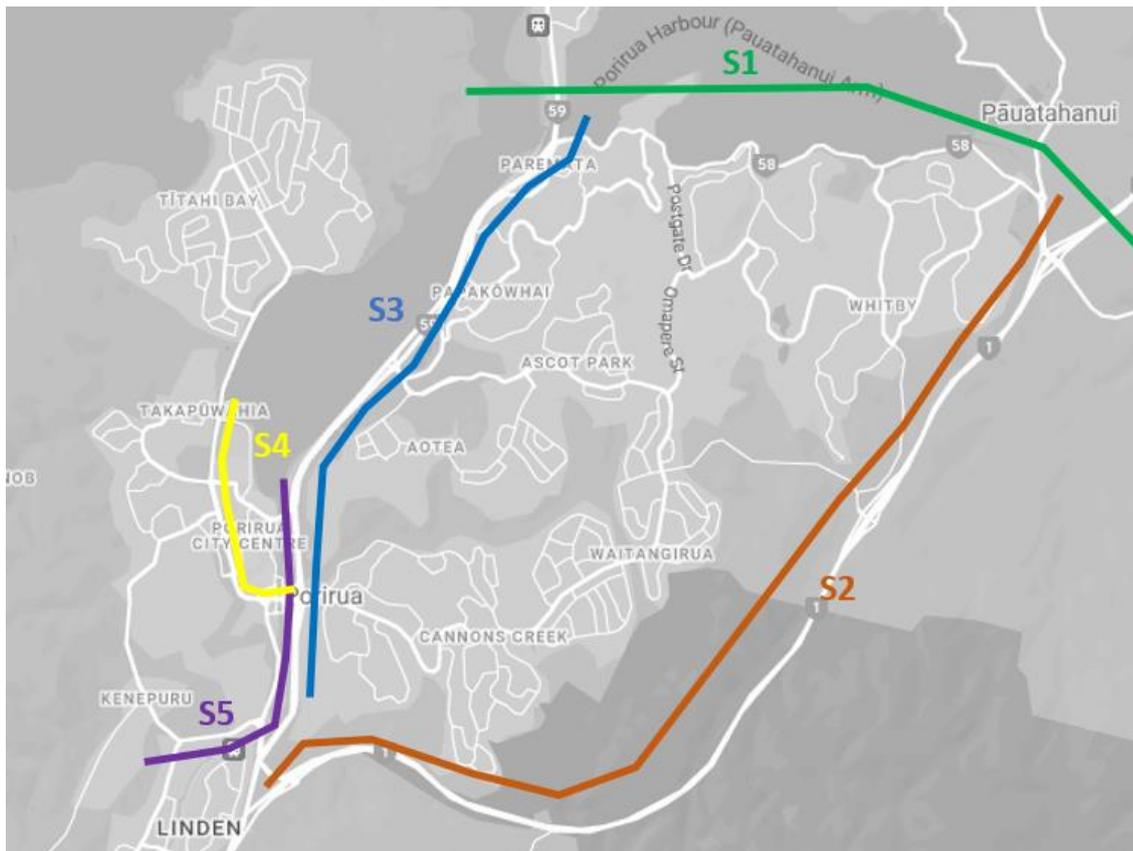
³ The household, employment and demands forecasts have been rounded to the nearest 10 units/trips. Traffic demands associated with external and Park and Ride zones have been omitted from this table.

4 2033 DO MINIMUM MODEL OBSERVATIONS

4.1 Screenline Volume Changes

To understand the traffic volume changes on the traffic network, we have looked at the traffic volumes reported through 5 screenlines in the Porirua area. Figure 2 overleaf illustrates the location of the screenlines and the full screenline analysis is provided in Appendix A of this report.

Figure 2: Screenline Locations



The following observations have been made from the screenline comparisons:

Screenline 1 – North of SH58

- ◆ Volume increases of 15 – 20% are predicted on Transmission Gully in all three modelled periods
- ◆ The traffic volumes on SH59 (Mana Esplanade) are also predicted to increase by some 10 – 17%
- ◆ Paekākāriki Hill Road volumes are predicted to remain similar to 2023 levels

Screenline 2 – Eastern Suburbs, eastern boundary

- ◆ Some 200 to 300 additional vehicles (4 hours) are predicted on SH58 west of Joseph Banks Drive, in the eastbound direction in the morning peak, and in the westbound direction in the PM peak
- ◆ Increases of 200 – 300 vehicles (4 hours, two-way) are also predicted on Waitangirua Link Road and Kenepuru Link Road in all three modelled periods

Screenline 3 – Eastern Suburbs, western boundary

- ◆ Traffic demands on Whitford Brown Avenue east of SH59 intersection are predicted to increase by some 600 – 800 (or 10% – 15%, 4 hours, two-way) in all three modelled periods
- ◆ A similar magnitude of increase has also been predicted on Mungavin Avenue east of the SH59 interchange
- ◆ Traffic volumes along Paremata Crescent are predicted to remain similar

Screenline 4 – City Centre, east/north of Titahi Bay Road

- ◆ Increases of 8 to 13% are predicted in the total volumes of traffic travelling into and out of city centre, from/to Titahi Bay Road
- ◆ It is noted that high traffic demand increases are predicted on Wi Neera Drive (400 – 700 vehicles, 4 hours), Lyttleton Avenue (250 – 400 vehicles, 4 hours) and Walton Leight Avenue (400 - 650 vehicles, 4 hours)
- ◆ The demands along Semple Street and Hagley Avenue are predicted to remain similar between 2023 and 2033

Screenline 5 – Porirua City/Kenepuru Eastern boundary

- ◆ High volume increases (950 vehicles in 4 hours) are predicted on Raiha Street in the morning peak hour, particularly in the southbound direction. This is likely associated with the significant queuing predicted on SH1 in the southbound direction during the morning peak period
- ◆ Traffic demands on The Ramp are also predicted to increase (600 vehicles in 4 hours) in the morning peak towards the city centre area
- ◆ Total traffic demands along Titahi Bay Road east of SH58 interchange are also predicted to increase by some 600 – 1,700 vehicles (4 hours), which are considered significant.

In general, the total volumes across each of the screenlines above are predicted to experience increases of 10% to 20%, depending on their locations. This is considered reasonable given the land use change and therefore the increases in demands discussed in Section 3 above.

4.2 Flow Difference Plots

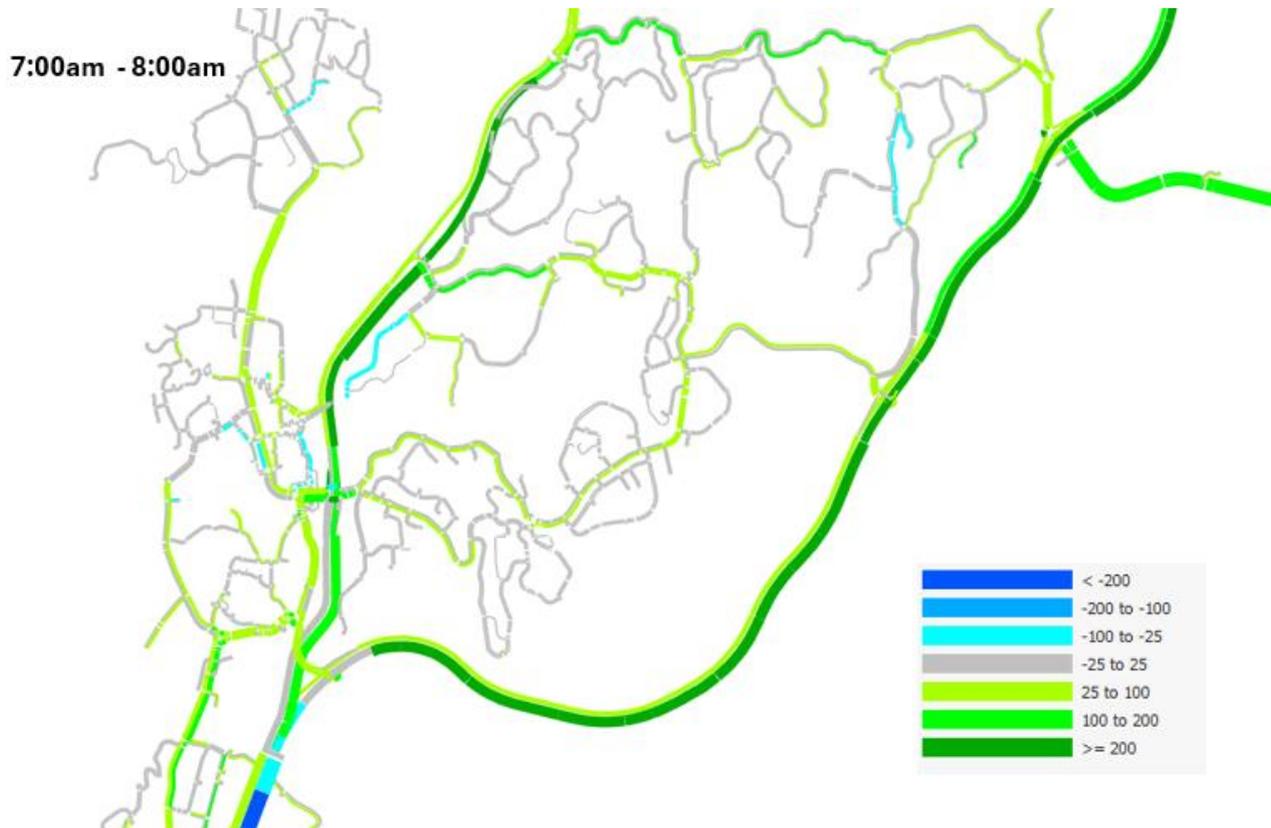
Table 4 to Table 6 show the predicted hourly flow differences between the 2023 and 2033 models for the morning peak (7 – 9 am), inter peak (11 am – 1 pm) and evening peak (4 – 6 pm). The Green bandwidths below represent the road links which are predicted to experience increased traffic volumes while the Blue bandwidths indicate decreases. We note the following from the different plots:

- ◆ In the morning peak between 7 and 8 am, traffic volume increases are predicted on the vast majority of the road network, particularly along SH59 between the Paremata and Mungavin interchange and SH1 along Transmission Gully. These are generally expected as they are the major arterial links within the Porirua area
- ◆ We note that the 2033 model appears to predict reduced volumes of SH1 southbound traffic near the Transmission Gully merge point, between 7 and 9 am. This seems counter-intuitive, as the SH1 demands towards Wellington are predicted to increase between 2023 and 2033. A closer

look indicates that this reduction is associated with the downstream queues blocking back from Grenada interchange, which results in a reduction of the throughput along the congested sections (where congestion was not observed in 2023). We note that volume increases are still predicted to the upstream sections north of the congested area

- ◆ The inter peak 2033 model shows moderate increases within the network, where the state highways are predicted to experience higher growth compared to the local road network
- ◆ In the evening peak, high demand increases are predicted along both SH1 and SH59, and along the local arterial roads such as Titahi Bay Road and Parumoana Street. This is predicted to contribute to evening peak congestion along these corridors.

Table 4: Flow Difference Plot - Morning Peak



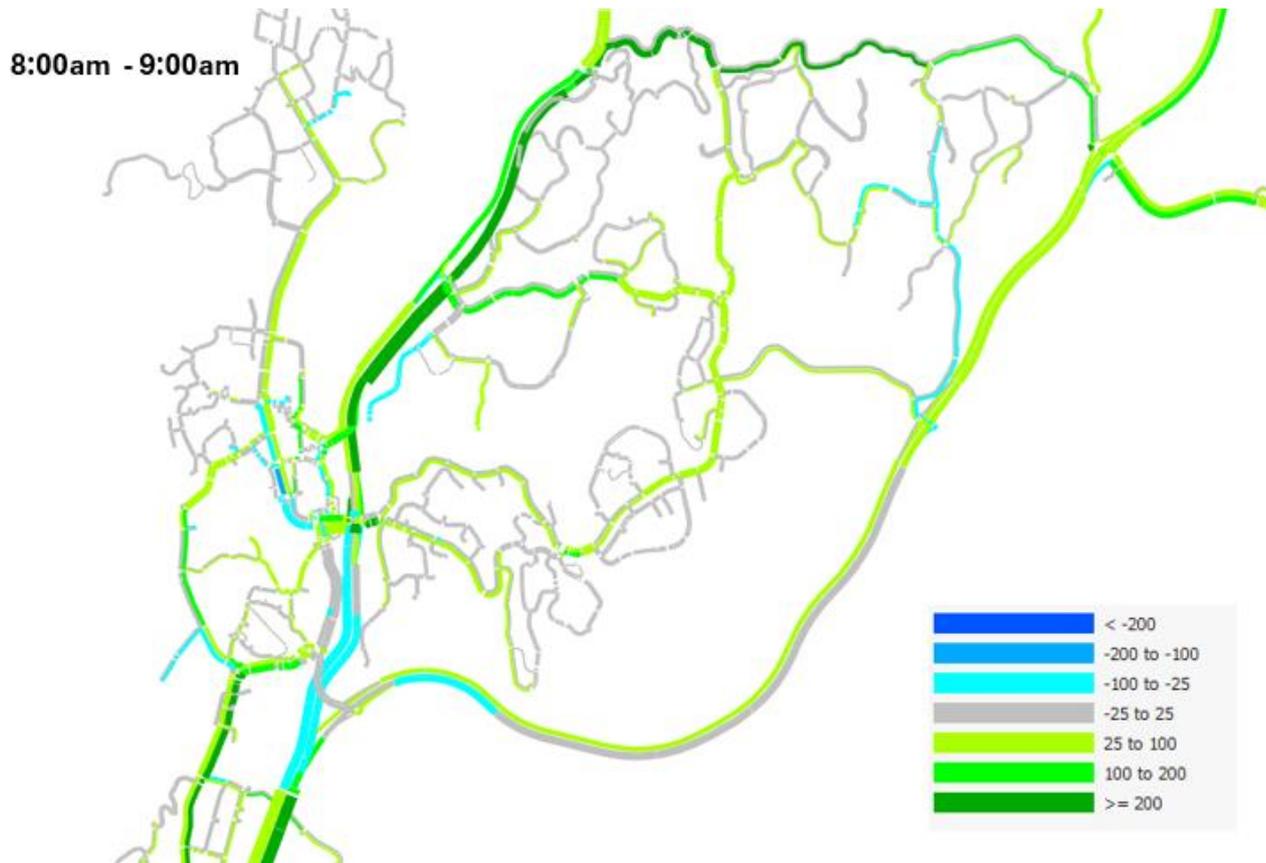
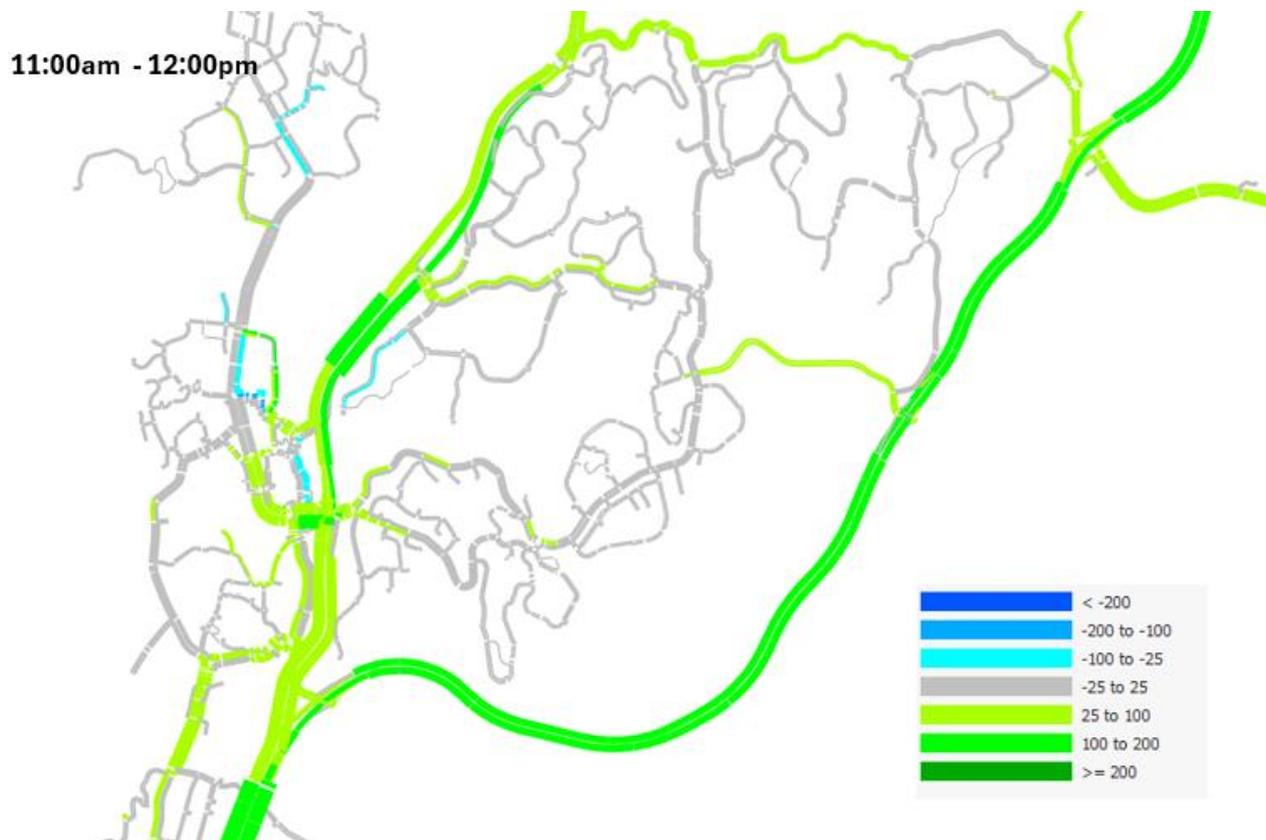


Table 5: Flow Difference Plot - Inter Peak

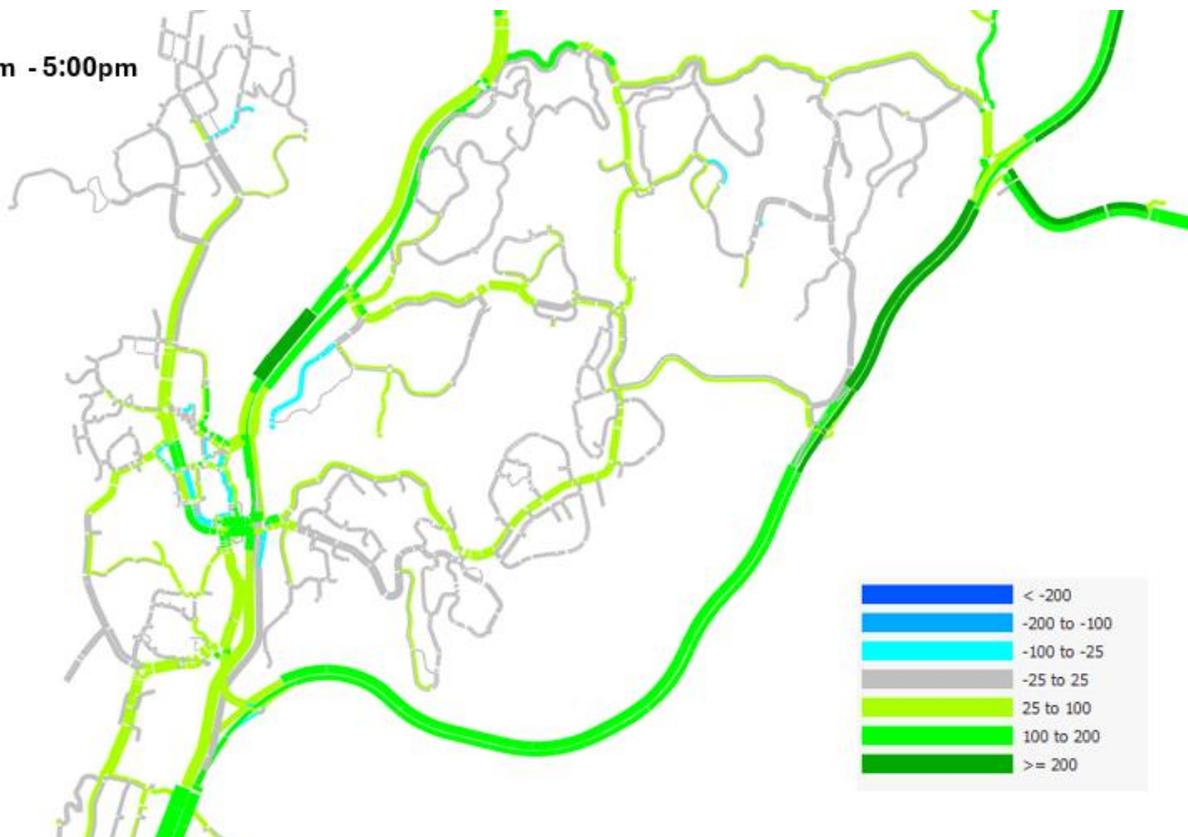


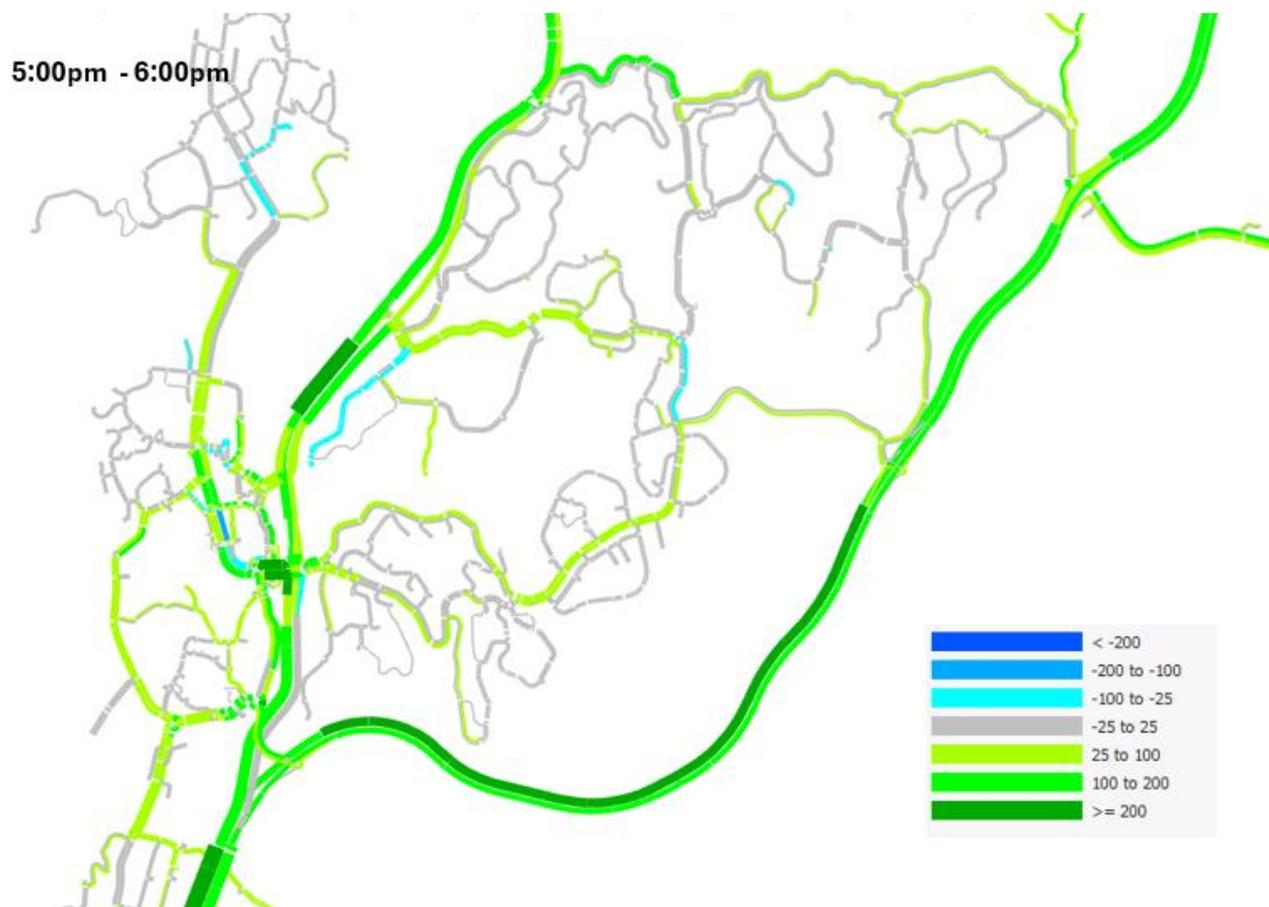
12:00pm - 1:00pm



Table 6: Flow Difference Plot – Evening Peak

4:00pm - 5:00pm

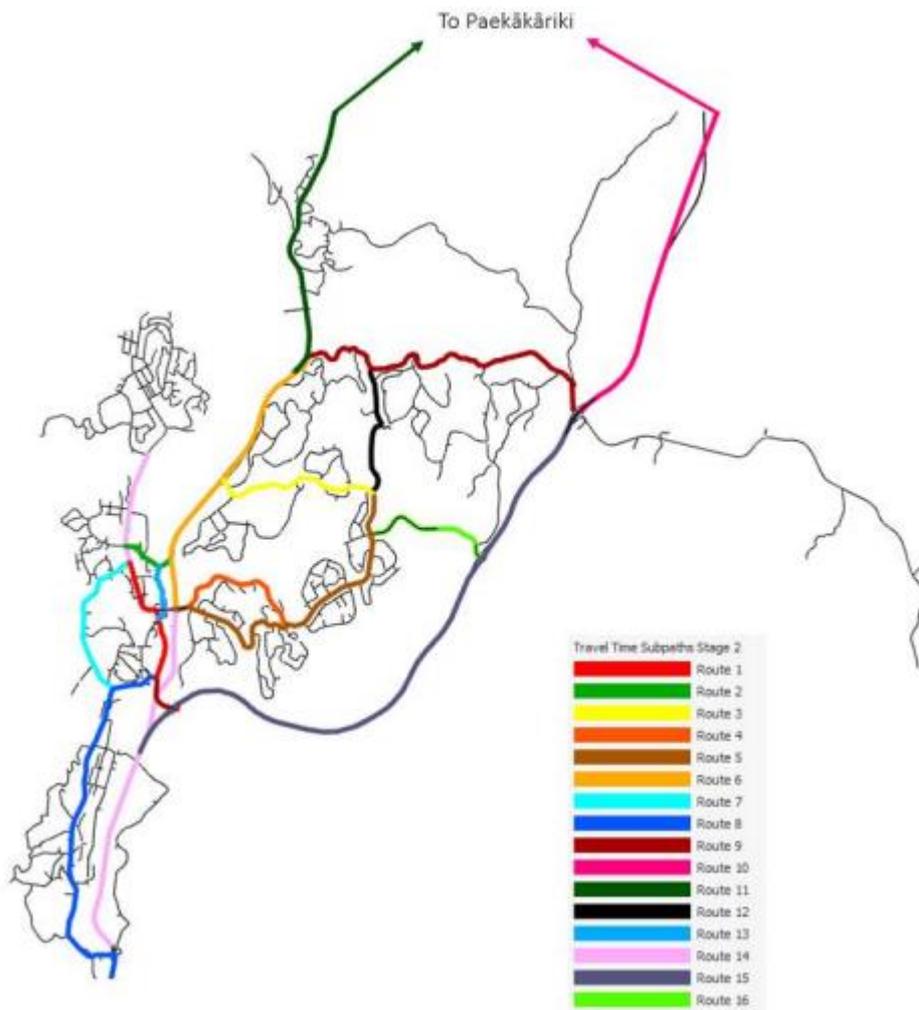




4.3 Route Travel Times

The travel time routes considered are shown in Figure 3 overleaf. Table B1 in Appendix B also provides a comparison of the travel time data between the Stage 2 base model (2023) and the Stage 2 forecast do minimum model (2033) for the following routes, during the morning peak (8 – 9 am), inter peak (12 – 1 pm) and evening peak (5 – 6 pm) hour.

Figure 3: Travel Time Routes



The following points have been noted from the route travel time comparisons:

- ◆ In general, travel time increases are predicted in all three modelled periods. The level of increases, however, are predicted to be very modest in the inter peak hour, with the vast majority of the travel time routes experiencing increases of 5% or less
- ◆ In the morning peak, significant increases are predicted for southbound traffic heading towards Wellington City from Porirua city centre, along both SH1 (Route 14, increased by 11 mins) and Main Road (Route 8, increased by 12 minutes). The queues are predicted to extend back beyond the Kenepuru Link Drive interchange shortly after 8 am. This is predicted to result in increases to the travel times between Porirua city centre and SH1 (Route 1 southbound by 7 minutes)
- ◆ Increases of travel times are also predicted along routes travelling towards Porirua city centre/Kenepuru area in the morning peak, from Kenepuru Link Road (Route 1 westbound, increased by 13 minutes) and Paremata (Route 6, by 4 minutes). These increases are considered plausible given the anticipated increased demands associated with land use change in Kenepuru and the city centre

- ◆ The evening peak model also predicts high increases in travel times between Paremata and Mungavin interchange (Route 6, by 7 minutes) and between Semple Street and SH59 north (Route 2, by 4 minutes)
- ◆ The model also predicts that eastbound delays on Titahi Bay Road will increase by some 3 - 4 minutes in the evening peak, due to the increased traffic demands predicted in 2033.

Overall, the 2033 morning peak model shows the most substantial increases in travel times, compared to 2023.

4.4 Network Travel Times

Figure 4 to Figure 6 show the network travel times for the forecast model across the three modelled periods. The morning peak shows the most substantial increase in network travel time, at 13% (increase from the 2023 base year model). The afternoon peak shows an increase of 6% in travel time between years 2023 and 2033, while the inter peak shows negligible changes. The following points are noted:

- ◆ The morning peak shows a steep increase in travel time from 7:15 am. This could be a result of the SH1 southbound lanes reaching capacity north of Grenada Interchange. These sections are predicted to experience significant queuing throughout the morning peak period. However, it is observed that these queues are predicted to dissipate during the 9 am – 10 am period
- ◆ In the evening peak, increased travel times are reported after the ‘traditional’ peak hour (5 – 6 pm), however the total travel time is predicted to ‘cool off’ after 6:30 pm
- ◆ In both morning and evening peak periods, the model is predicting longer ‘peak periods’ compared to the profile observed in 2023, indicating that queues in the network will take longer to dissipate.

Figure 4: Network Travel Time - Morning Peak

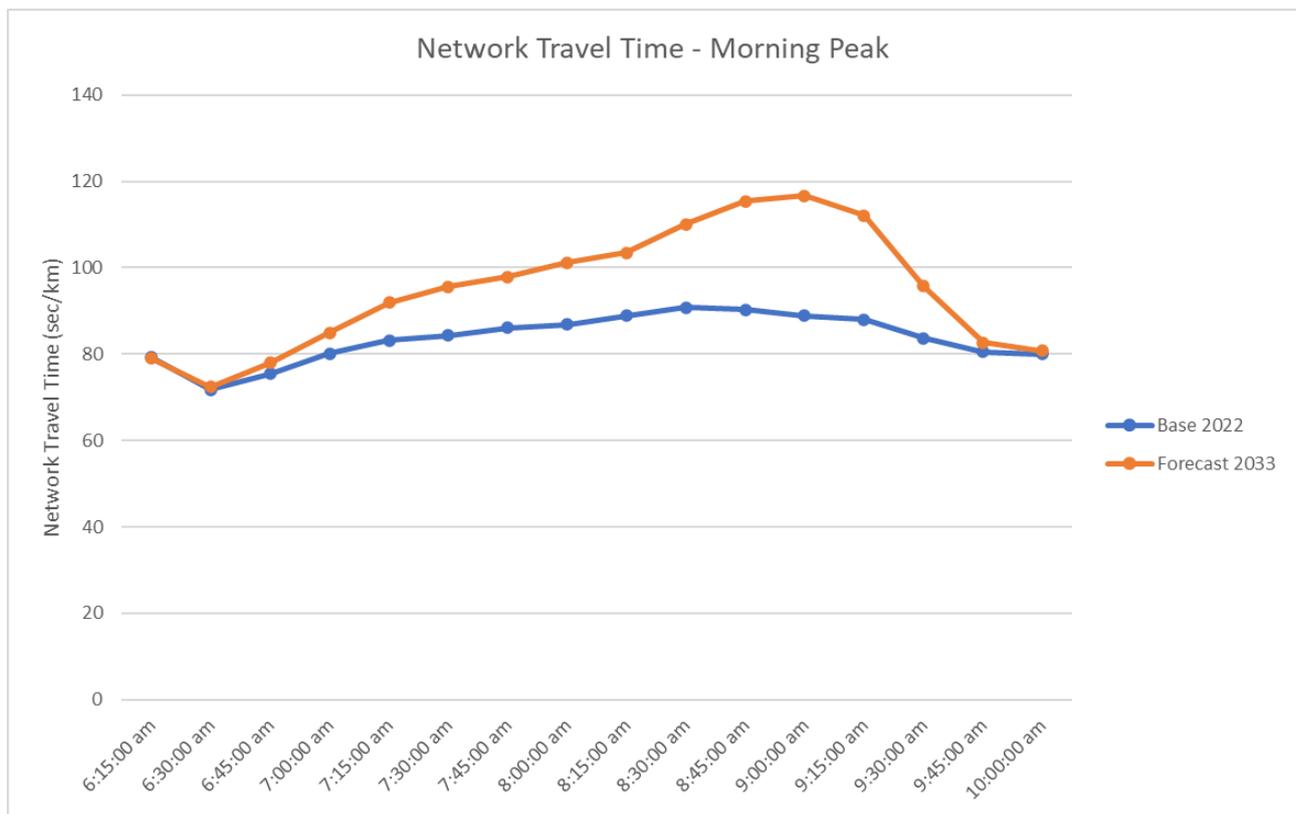


Figure 5: Network Travel Time - Inter Peak

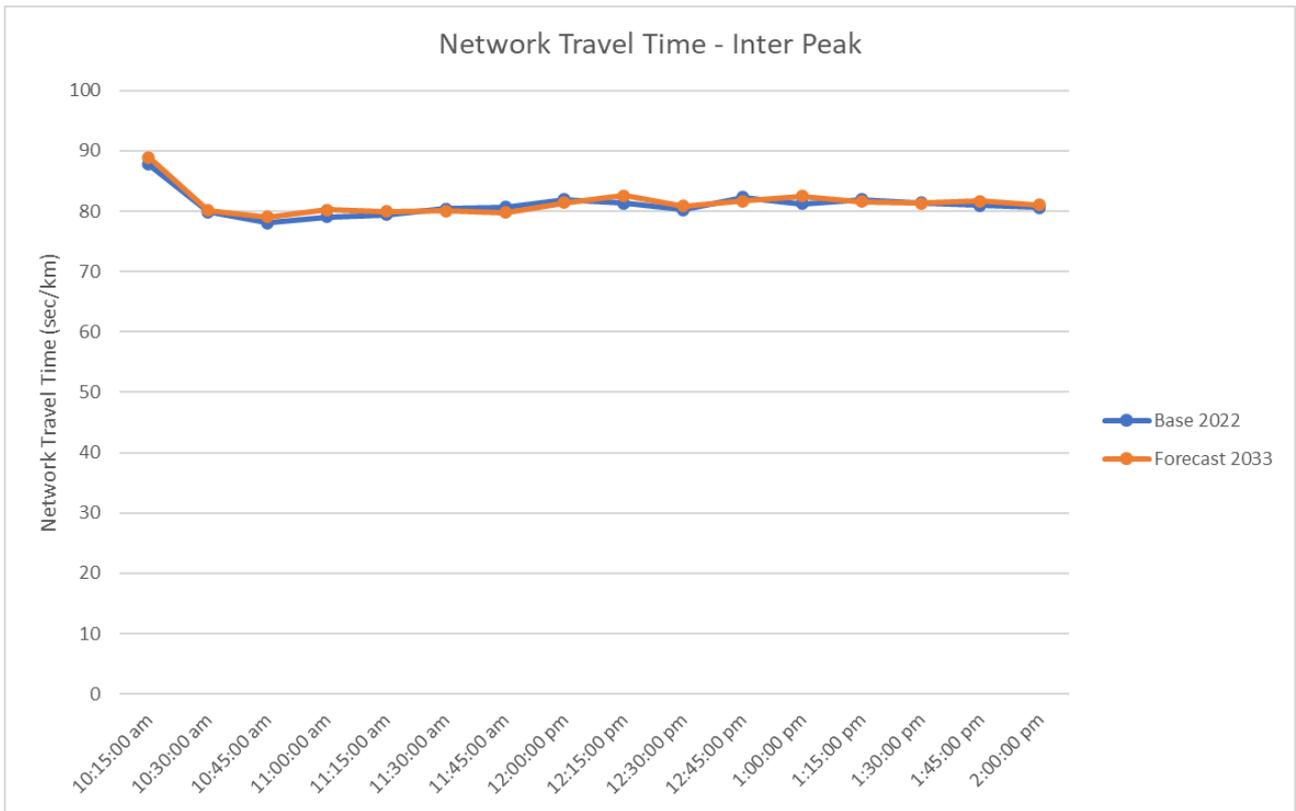
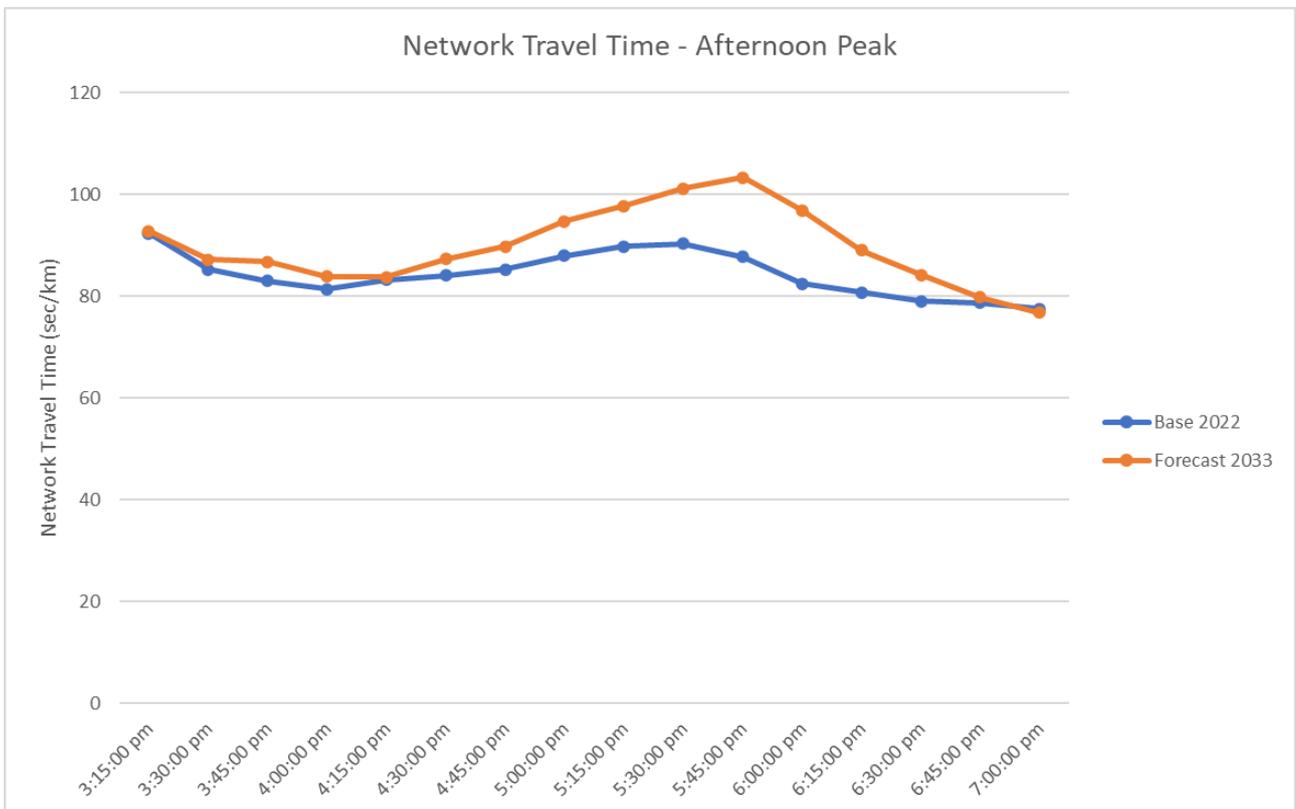


Figure 6: Network Travel Time - Afternoon Peak



5 ADDITIONAL MODEL CHECKS

In addition to the above model outputs, we have carried out a ‘health’ check to the future 2033 models. This includes the following statistics:

- ◆ Model run time – this is the time required for the model to process a specific scenario. The PTM model utilises Stochastic Route Choices (SRC) which are based on random variables. As such, multiple model runs (replications) are generally required and their outputs should be averaged to inform the scenario assessment
- ◆ Network residual queues – this is the number of vehicles waiting to enter the network at the end of the modelled period. It is generally expected that the vast majority of the assigned traffic demands should be able to enter the network
- ◆ Total missed turns – this reflects the number of vehicles which are forced to change their routes due to downstream constraints/queues

Table 7: PTM health check

	2023 Base Model			2033 Do Minimum		
	AM	IP	PM	AM	IP	PM
Model run time (5 replications)	16 mins	13 mins	20 mins	24 mins	20 mins	25 mins
Network residual queues (vehicles per replication)	15	240	5	5	210	5
Average missed turns (per application)	235	175	190	310	240	270

The above table indicates that:

- ◆ Increased model run time has been reported for each peak between 2023 and 2033, for the morning and evening peak models in particular. This is generally expected with the increased traffic demands/level of congestion observed in the future Do Minimum scenarios. It is noted that for future models, an average run time of 5 minutes are generally expected for each replication
- ◆ The average network residual queues have remained consistent between the 2023 and 2033 scenarios
- ◆ The number of missed turns reported for each peak period have increased slightly between 2023 and 2033 replications. However, they are considered very modest compared to the level of growth predicted in the model.

6 SUMMARY

An Aimsun hybrid model has been developed to cover the transport network within Porirua area. The model has been developed using traffic data collected after the opening of the Transmission Gully (TG) project and the traffic demand predictions have been obtained from the Wellington Transport Strategic Model (WTSM). The forecast model has been developed to represent a 2033 forecast year for the morning peak, interpeak and evening peak periods.

The 2033 Do minimum model assumes the existing transport network within Porirua, with demands being informed by the traffic growth predicted by WTSM between 2023 and 2033. We note that in general, the model reflects anticipated traffic growth associated with the regional model predictions, with notable population growth/demand increases predicted in the following areas:

- ◆ Linden/Tawa
- ◆ Kenepuru
- ◆ Cannons Creek
- ◆ Ascot Park
- ◆ Plimmerton
- ◆ City centre

The above traffic growth seems plausible from a traditional transport planning point of view i.e. traffic demands for private vehicles will keep increasing with the anticipated land use growth. However, we note this increase appears to conflict with Te hau mārohi ki anamata Aotearoa New Zealand's Emissions Reduction Plan (the ERP), and with any subsequent Wellington regional vehicle kilometres travelled (VKT) reduction plan. As such, it should be emphasised that the 2033 Do Minimum model currently represents a scenario where traffic growth trend has been allowed to continue without interventions (beyond the default assumptions in the regional transport model, which includes limited railway investments).

When taking the modelled outcomes at face value however, we note that increased traffic congestion is predicted on the road network surrounding Porirua City. The following locations have been highlighted in the 2033 Do Minimum model:

- ◆ SH1 and Main Road in the morning peak, southbound direction
- ◆ SH59 Southbound off ramp at the SH59/Mungavin Avenue interchange, in both morning and evening peak
- ◆ Westbound/southbound traffic on The Ramp in the morning peak and eastbound/northbound in the evening peak
- ◆ Kenepuru Link Road westbound in the morning peak
- ◆ Titahi Bay Road eastbound in the evening peak
- ◆ Local roads within city centre are generally predicted with higher delays and queues in the evening peak, due to increased demands.

Given the input assumptions and growth in traffic volumes, these outcomes are considered plausible.



APPENDIX A Forecast Demand Development



3 hour to 4 hour Factors:

Profile	Description	Area/Direction informed	Light Vehicle Factors			Heavy Vehicle Factors		
			AM	IP	PM	AM	IP	PM
Profile 1	Titahi Bay Road - between SH1 and Kenepuru Drive eastbound	Porirua CBD to All	1.22	1.26	1.23	1.22	1.23	1.14
Profile 2	Titahi Bay Road - North of Te Hiko St	Porirua North to All	1.23	1.33	1.26	1.40	1.43	1.09
Profile 3	Kenepuru Link south of Kenepuru Dr	Kenepuru to All	1.25	1.29	1.14	1.41	1.39	1.12
Profile 4	Main Road - Lincoln Ave to Surrey St	Linden/Tawa to All	1.21	1.32	1.21	1.31	1.30	1.20
Profile 5	MUNGAVIN AVENUE - BETWEEN CHAMPION STREET TO GEAR TERRACE	Mungavin to All	1.21	1.30	1.27	1.30	1.34	1.18
Profile 6	Whitford Brown Avenue - Between Width Change To Okowai Road - June 2021	Aotea/Papakowhai to All	1.16	1.30	1.25	1.23	1.36	1.24
Profile 7	WARSPITE AVENUE - BETWEEN FANTAME STREET TO WAIHORA CRESCENT	Waitangirua to All	1.17	1.31	1.27	1.33	1.39	1.21
Profile 8	SH58 West of Joeseeph Banks + East of Paremata RAB	Paremata/south of SH59 to All	1.17	1.30	1.23	1.17	1.31	1.25
Profile 9	Discovery Dr west of James Cook Dr	Whitby to All	1.11	1.32	1.23	1.36	1.16	1.08
Profile 10	TMS 0590018 Mana Esplanade	Mana to All	1.18	1.30	1.24	1.33	1.28	1.26
Profile 11	SH59_Pukerua Beach Road_Intersection	Pukerua Bay to All	1.18	1.32	1.19	1.29	1.28	1.23
Profile 12	PAEKAKARIKI HILL ROAD - BETWEEN CENTRE OF SPEED HUMP TO GRAYS ROAD - N	Paekakariki Hill/Pauatahanui to All	1.14	1.31	1.21	1.19	1.38	1.13
Profile 13	TG north of SH58	TG North to All	1.29	1.37	1.32	1.29	1.37	1.34
Profile 14	PAUATAHANUI EAST - Telemetry Si	Judgeford/SH58 to All	1.51	1.29	1.10	1.42	1.32	1.16
Profile 15	TMS - Grenada Interchange NB	SH1 south to All	1.18	1.28	1.22	1.18	1.28	1.23
Profile 16	Park n Ride Trips	Park n Ride Trips from (AM) and to (PM) All	1.33	1.33	1.13	1.33	1.33	1.14
Profile 17	SH1 east of Pukerua Beach Rd	Pukerua Beach to All	1.23	1.41	1.22	1.32	1.40	1.20
Profile 18	TMS - Grenada Interchange SB	All to SH1 south	1.38	1.34	1.22	1.38	1.34	1.24
Profile 19	Titahi Bay Road - between SH1 and Kenepuru Drive westbound	All to Porirua CBD	1.12	1.31	1.25	1.18	1.32	1.14
Profile 20	Okowai Road - Between Whitford Brown Av To Frances Brown Av - Nov 2022	School Trips to/from All (AM peak only)	1.11			1.08		

Predicted Traffic Volume Changes –WTSM and PTM Matrix Totals

Table A1: Predicted Total Traffic Demand Changes – All Trips

Years	WTSM Trips (3 hours)			PTM Trips (4 hours)		
	AM	IP	PM	AM	IP	PM
2023	43,532	41,928	55,014	62,290	60,243	79,191
2033	48,866	45,880	61,540	69,607	65,688	87,568
Total Growth	5,334	3,952	6,526	7,317	5,445	8,377
Percentage Growth	12%	9%	12%	12%	9%	11%
Annual Percentage Growth	1.1%	0.9%	1.1%	1.1%	0.8%	1.0%

Table A1: Predicted Total Traffic Demand Changes - Cars

Years	WTSM Trips (3 hours)			PTM Trips (4 hours)		
	AM	IP	PM	AM	IP	PM
2023	41,643	40,143	53,480	58,916	57,037	76,053
2033	46,633	43,771	59,727	65,737	62,018	84,053
Total Growth	4,990	3,629	6,248	6,821	4,981	8,000
Percentage Growth	12%	9%	12%	12%	9%	11%
Annual Percentage Growth	1.1%	0.8%	1.1%	1.1%	0.8%	1.0%

Table A2: Predicted Total Traffic Demand Changes - Trucks

Years	WTSM Trips (3 hours)			PTM Trips (4 hours)		
	AM	IP	PM	AM	IP	PM
2023	1,890	1,785	1,535	3,374	3,207	3,138
2033	2,234	2,109	1,813	3,870	3,670	3,515
Total Growth	344	323	278	496	463	377
Percentage Growth	18%	18%	18%	15%	14%	12%
Annual Percentage Growth	1.7%	1.6%	1.6%	1.3%	1.3%	1.1%

Predicted Growth By Sectors – AM Peak

	Prorirual City Centre	Titahi Bay	Kenepuru	Linden & Tawa	Cannons Creek	Aotea, Papakowhai & Ascot Park	Waitangiru a	Whitby North & Paremata South	Whitby South	Mana	Pukerua Bay	Paekakariki Hill & Pauatahanui	Judgeford	SH1 & SH59 North	SH1 South & Grenada/Gl enside	SH58 East	Park and Ride		Total
Prorirual City Centre	-69	1	2	-1	4	6	2	6	-2	0	46	17	0	0	-96	7	62		-15
Titahi Bay	-3	16	15	9	-4	-4	-2	3	-2	3	12	16	0	0	78	3	137		277
Kenepuru	128	19	35	87	18	25	9	13	6	14	9	9	0	12	177	16	97		674
Linden & Tawa	44	7	51	353	5	10	1	8	0	6	7	17	0	14	457	10	407		1397
Cannons Creek	54	5	23	18	30	8	17	11	7	10	5	19	0	8	97	17	139		469
Aotea, Papakowhai & Ascot Park	68	9	30	23	11	65	16	28	23	24	17	36	0	5	191	28	194		770
Waitangirua	35	4	14	10	19	19	29	19	16	10	2	18	0	10	61	31	136		433
Whitby North & Paremata South	9	1	14	7	2	4	3	20	10	14	11	55	1	-5	118	10	292		565
Whitby South	-11	-3	1	-4	-2	-4	-1	-1	-4	-4	1	12	0	-2	15	-3	106		95
Mana	-9	-3	4	-9	-3	-15	-3	-7	-10	-29	42	89	0	0	32	7	162		248
Pukerua Bay	19	13	8	2	-2	-5	-2	1	-3	19	3	67	0	0	33	2	63		218
Paekakariki Hill & Pauatahanui	68	12	21	26	11	26	8	29	11	77	30	13	0	5	142	35	133		648
Judgeford	1	0	0	0	0	0	0	1	1	0	0	0	0	0	2	1	2		11
SH1 & SH59 North	17	2	20	16	6	5	7	19	3	0	0	20	0	0	520	165	1		801
SH1 South & Grenada/Glenside	-34	14	38	29	9	31	4	29	6	19	16	34	1	185	-57	1	0		326
SH58 East	-30	4	36	15	11	14	25	34	4	14	3	51	1	169	49	-1	0		400
Park and Ride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Total	289	99	312	579	116	187	114	213	65	177	205	474	5	401	1820	329	1931		7317

Predicted Growth By Sectors – Inter Peak

	Prorirual City Centre	Titahi Bay	Kenepuru	Linden & Tawa	Cannons Creek	Aotea, Papakowhai & Ascot Park	Waitangirua	Whitby North & Paremata South	Whitby South	Mana	Pukerua Bay	Paekakariki Hill & Pauatahanui	Judgeford	SH1 & SH59 North	SH1 South & Grenada/Glenside	SH58 East	Park and Ride	Total
Prorirual City Centre	169	43	91	77	80	122	45	46	12	25	108	58	2	0	-14	15	12	893
Titahi Bay	58	19	15	0	2	4	2	-1	-2	-5	24	12	0	0	11	2	14	155
Kenepuru	118	16	33	51	22	26	9	12	3	9	15	13	0	16	50	15	5	414
Linden & Tawa	111	1	52	370	4	12	-1	-1	-4	-5	8	18	0	19	54	10	26	674
Cannons Creek	101	4	23	4	30	16	20	8	5	3	9	13	0	9	23	10	15	294
Aotea, Papakowhai & Ascot Park	133	3	23	6	14	57	18	13	13	13	29	27	1	5	58	20	18	452
Waitangirua	49	1	8	-2	18	15	21	9	6	-1	3	10	1	7	3	17	16	181
Whitby North & Paremata South	49	-1	10	0	5	9	10	3	-3	-17	8	29	1	-13	43	24	21	179
Whitby South	9	-4	1	-7	1	3	4	-9	5	-17	4	8	1	-6	-6	-2	8	-6
Mana	22	-5	7	-5	0	-1	0	-16	-14	-72	59	67	1	0	1	7	11	61
Pukerua Bay	70	26	7	3	2	6	2	4	1	25	-18	30	0	0	28	3	9	197
Paekakariki Hill & Pauatahanui	65	11	13	16	12	24	10	28	10	64	20	-5	0	12	57	37	9	385
Judgeford	2	0	0	0	0	1	0	1	1	1	0	0	0	0	1	1	0	10
SH1 & SH59 North	-1	0	18	18	8	12	9	-9	-3	0	0	5	0	0	264	171	0	492
SH1 South & Grenada/Glenside	109	39	77	148	42	94	19	61	18	27	39	57	2	266	-131	0	0	868
SH58 East	3	0	6	3	2	5	9	11	-4	-4	1	16	1	148	0	0	0	195
Park and Ride	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1067	151	384	681	244	406	176	162	44	47	310	359	11	464	443	330	165	5445

Predicted Growth By Sectors – PM Peak

	Prorirual City Centre	Titahi Bay	Kenepuru	Linden & Tawa	Cannons Creek	Aotea, Papakowhai & Ascot Park	Waitangirua	Whitby North & Paremata South	Whitby South	Mana	Pukerua Bay	Paekakariki Hill & Pauatahanui	Judgeford	SH1 & SH59 North	SH1 South & Grenada/Glenside	SH58 East	Park and Ride	Total
Prorirual City Centre	139	51	162	187	133	201	83	81	19	32	216	106	2	0	-53	29	0	1389
Titahi Bay	50	30	18	12	6	10	5	1	-2	-6	47	14	0	0	3	7	0	195
Kenepuru	81	13	38	67	23	32	11	13	1	7	31	20	1	21	14	34	0	406
Linden & Tawa	64	1	71	545	5	18	2	1	-5	-8	2	22	0	21	-2	28	0	767
Cannons Creek	87	2	27	12	40	21	29	9	4	0	12	15	0	9	6	21	0	293
Aotea, Papakowhai & Ascot Park	108	-3	26	12	13	71	22	6	5	3	21	32	1	6	27	30	0	379
Waitangirua	37	-1	8	-1	21	18	28	7	3	-4	3	10	1	8	2	23	0	163
Whitby North & Paremata South	37	-1	11	4	8	17	15	4	-9	-23	8	30	1	-4	30	31	0	160
Whitby South	6	-4	2	-3	4	15	11	-2	4	-20	2	10	2	-4	-5	0	0	20
Mana	15	-5	11	2	4	10	4	-13	-17	-82	68	98	1	0	-5	18	0	107
Pukerua Bay	74	24	8	5	3	15	3	6	2	21	-47	29	0	0	30	4	0	176
Paekakariki Hill & Pauatahanui	52	14	11	17	16	32	15	42	11	83	44	-4	1	18	43	46	0	439
Judgeford	1	0	0	0	0	1	0	1	1	1	0	1	0	0	1	1	0	10
SH1 & SH59 North	-20	-18	14	19	8	-2	7	-42	-14	0	0	-3	0	0	345	251	0	544
SH1 South & Grenada/Glenside	32	72	154	399	98	178	62	118	33	45	43	111	3	456	-117	16	0	1702
SH58 East	-4	-1	13	7	10	25	43	30	-5	-5	4	46	1	190	1	0	0	354
Park and Ride	10	101	63	307	108	148	115	163	49	61	58	96	2	-9	0	0	0	1272
Total	768	275	637	1591	501	809	455	426	81	106	512	632	16	713	319	539	0	8377

APPENDIX B

Screenline Flow Comparisons

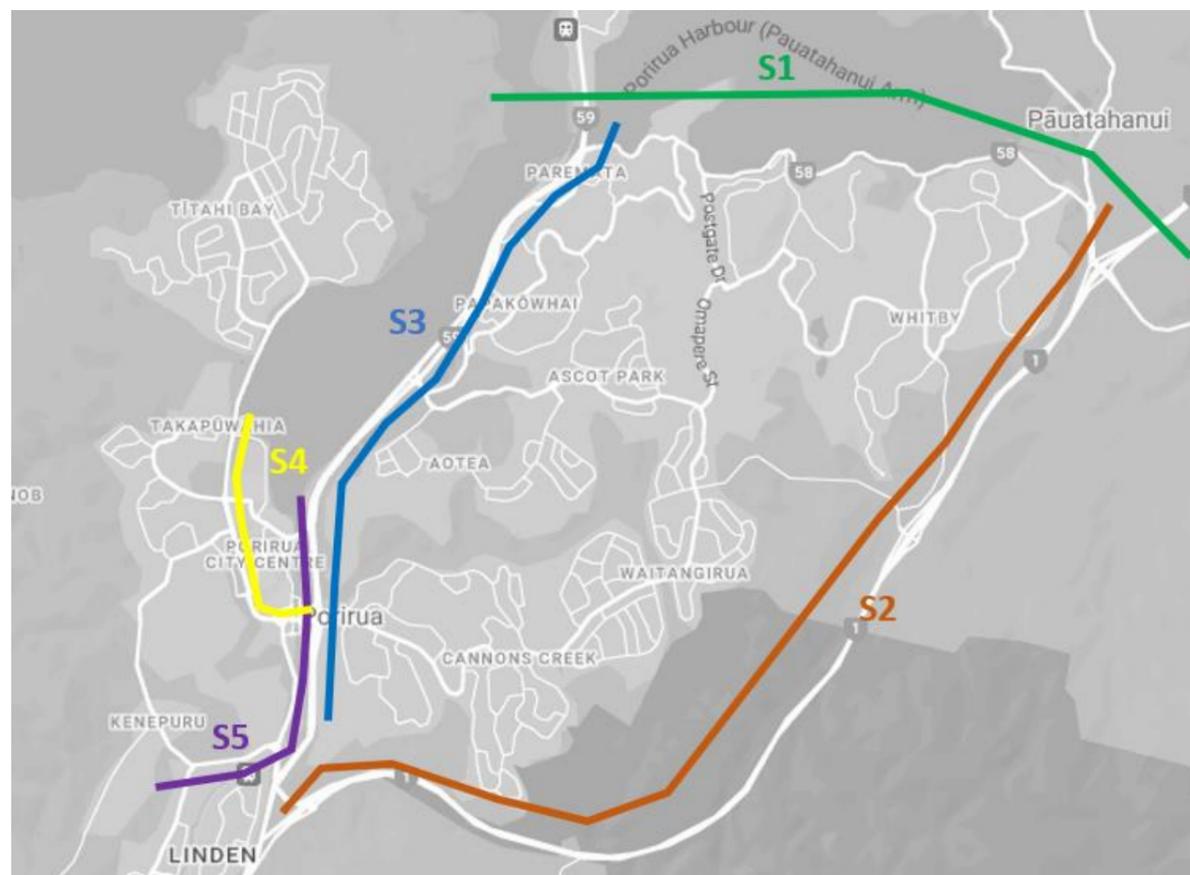


Table A1: Screenline volume comparisons

Screenline 1 - North of SH58	AM Peak 6 am -10 am				Inter Peak 10 am - 2 pm				PM Peak 3 pm - 7 pm			
	2,022	2,033	Diff	Diff%	2,022	2,033	Diff	Diff%	2,022	2,033	Diff	Diff%
Mana Esplanade Dec	1,697	1,994	297	17%	2,783	3,182	399	14%	4,461	5,021	561	13%
Paekakariki Hill Road - Between Centre Of Speed Hump To Grays Road - Nov 2022 Northbound	583	684	100	17%	362	585	223	62%	408	695	286	70%
Transmission Gully North of SH58 - NB	2,323	2,702	379	16%	2,713	3,212	499	18%	4,545	5,235	690	15%
Total Northbound	4,603	5,379	776	17%	5,857	6,979	1,121	19%	9,414	10,951	1,537	16%
Mana Esplanade Inc	3,310	3,628	318	10%	2,236	2,538	302	13%	2,514	2,828	314	12%
Paekakariki Hill Road - Between Centre Of Speed Hump To Grays Road - Nov 2022 Southbound	951	913	-38	-4%	768	747	-21	-3%	1,379	1,345	-34	-2%
Transmission Gully North of SH58 - SB	4,118	4,837	719	17%	2,853	3,336	483	17%	2,877	3,437	561	19%
Total Southbound	8,380	9,378	998	12%	5,857	6,621	764	13%	6,770	7,610	841	12%
Screenline 2 - Eastern Suburbs Eastern Boundary												
	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%
SH58 West of Joseph Banks Drive - Inc	915	1,236	321	35%	548	646	98	18%	1,054	1,041	-12	-1%
Joseph Banks Drive - Between End Of Old Urban To State Highway No 58 - Nov 2022 Southbound	205	236	32	16%	267	297	30	11%	645	682	38	6%
Te Ara Kapehu - Between Waitangirua Link Road To James Cook Drive Rab - Nov 2022 Northbound	317	362	45	14%	444	493	49	11%	1,083	1,151	68	6%
Waitangirua Link Road - Between Warspite Avenue To Sh 1 - Nov 2022 Westbound	723	850	128	18%	474	574	101	21%	983	1,172	189	19%
Kenepuru Link Road Kenepuru Drive Roundabout - Kenepuru Link Road S NB	1,885	1,920	35	2%	892	958	67	7%	918	1,060	142	15%
Total Westbound	4,044	4,604	560	14%	2,624	2,968	344	13%	4,682	5,107	425	9%
SH58 West of Joseph Banks Drive - Dec	1,032	1,056	24	2%	661	751	90	14%	988	1,161	173	18%
Joseph Banks Drive - Between End Of Old Urban To State Highway No 58 - Nov 2022 Northbound	583	651	68	12%	293	332	39	13%	362	402	40	11%
Te Ara Kapehu - Between Waitangirua Link Road To James Cook Drive Rab - Nov 2022 Southbound	1,247	1,231	-16	-1%	479	499	20	4%	627	642	15	2%
Waitangirua Link Road - Between Warspite Avenue To Sh 1 - Nov 2022 Eastbound	992	1,109	117	12%	433	543	109	25%	658	731	73	11%
Kenepuru Link Road Kenepuru Drive Roundabout - Kenepuru Link Road S SB	1,111	1,274	163	15%	1,399	1,609	211	15%	2,348	2,637	289	12%
Total Eastbound	4,965	5,321	356	7%	3,265	3,734	469	14%	4,984	5,573	589	12%
Screenline 3 - Eastern Suburbs Western Boundary												
	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%
Paremata Crescent - Between Station Road To Paremata Road Slip Lane - Nov 2022 Northbound	800	826	26	3%	576	598	22	4%	872	893	21	2%
Papakowhai Road Whitford Brown Avenue Intersection - Whitford Brown Avenue N NB	3,832	4,490	658	17%	2,680	2,941	262	10%	3,145	3,411	266	8%
Mungavin Avenue Titahi Bay Road Motorway Roundabout - Mangavin Ave E WB	2,342	2,420	78	3%	2,933	3,176	243	8%	4,399	5,151	752	17%
Total Westbound	6,974	7,736	762	11%	6,188	6,715	527	9%	8,416	9,455	1,039	12%
Paremata Crescent - Between Station Road To Paremata Road Slip Lane - Nov 2022 Southbound	591	595	4	1%	445	442	-3	-1%	810	879	69	9%
Papakowhai Road Whitford Brown Avenue Intersection - Whitford Brown Avenue N SB	2,196	2,238	42	2%	2,297	2,623	325	14%	4,174	4,735	561	13%
Mungavin Avenue Titahi Bay Road Motorway Roundabout - Mangavin Ave E EB	3,921	4,545	625	16%	2,786	3,061	275	10%	3,316	3,630	314	9%
Total Eastbound	6,708	7,379	671	10%	5,529	6,126	598	11%	8,300	9,244	944	11%
Screenline 4 City Centre West												
	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%
Titahi Bay Road Wi Neera Drive Intersection - Wi Neera Drive E WB	263	260	-3	-1%	458	587	129	28%	709	974	265	37%
Titahi Bay Road Semple Street Roundabout - Semple Street E WB	1,302	1,419	118	9%	2,149	2,170	21	1%	2,867	2,851	-16	-1%
Lytelton Avenue Titahi Bay Road Intersection - Lytelton Avenue E WB	613	704	91	15%	906	1,073	167	18%	1,243	1,420	177	14%
Titahi Bay Road Hagley Street Roundabout - Hagley Street E WB	291	165	-125	-43%	1,188	1,175	-12	-1%	1,033	1,252	219	21%
Titahi Bay Road Kenepuru Drive Walton Leigh Avenue Roundabout - Walton Leigh Ave N SB	902	764	-138	-15%	1,995	2,033	38	2%	2,026	2,540	514	25%
Lytelton Avenue Walton Leigh Avenue Roundabout - Lytelton Avenue S SB	668	843	175	26%	848	874	26	3%	681	880	200	29%
Total Westbound	4,039	4,156	118	3%	7,543	7,912	369	5%	8,559	9,917	1,359	16%
Titahi Bay Road Wi Neera Drive Intersection - Wi Neera Drive E EB	833	911	78	9%	483	1,049	566	117%	895	1,009	113	13%
Titahi Bay Road Semple Street Roundabout - Semple Street E EB	1,213	1,161	-51	-4%	1,825	1,416	-408	-22%	1,883	1,949	66	4%
Lytelton Avenue Titahi Bay Road Intersection - Lytelton Avenue E EB	395	576	181	46%	924	1,137	213	23%	1,106	1,301	195	18%
Titahi Bay Road Hagley Street Roundabout - Hagley Street E EB	362	632	271	75%	1,337	1,347	10	1%	785	970	185	24%
Titahi Bay Road Kenepuru Drive Walton Leigh Avenue Roundabout - Walton Leigh Ave N NB	1,601	1,756	155	10%	2,281	2,696	415	18%	2,098	2,210	113	5%
Lytelton Avenue Walton Leigh Avenue Roundabout - Lytelton Avenue S NB	777	781	4	0%	941	988	47	5%	1,051	1,097	47	4%
Total Eastbound	5,181	5,818	638	12%	7,790	8,633	842	11%	7,817	8,535	718	9%
Screenline 5 City Centre East/Kenepuru												
	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%	Observed	Modelled	Diff	Diff%
Parumoana Street The Ramp Roundabout - The Ramp EB	1,612	1,765	153	9%	3,021	3,358	337	11%	4,393	4,695	302	7%
Mungavin Avenue Titahi Bay Road Motorway Roundabout - Titahi Bay Rd W EB	3,341	3,738	397	12%	4,767	5,120	353	7%	5,656	6,517	861	15%
Kenepuru Link Road Kenepuru Drive Roundabout - Kenepuru Link Road S SB	1,111	1,274	163	15%	1,399	1,609	211	15%	2,348	2,637	289	12%
Raiha Street Kenepuru Drive Roundabout - Raiha Street W SB	2,958	3,621	663	22%	2,595	2,691	95	4%	2,351	2,656	305	13%
Total Northbound	9,022	10,398	1,377	15%	11,782	12,778	996	8%	14,749	16,506	1,756	12%
Parumoana Street The Ramp Roundabout - The Ramp WB	3,049	3,651	602	20%	2,379	2,504	125	5%	2,840	3,011	171	6%
Mungavin Avenue Titahi Bay Road Motorway Roundabout - Titahi Bay Rd W WB	5,743	5,944	201	4%	5,710	6,414	704	12%	5,761	6,609	848	15%
Kenepuru Link Road Kenepuru Drive Roundabout - Kenepuru Link Road S NB	1,885	1,920	35	2%	892	958	67	7%	918	1,060	142	15%
Raiha Street Kenepuru Drive Roundabout - Raiha Street W NB	2,248	2,536	288	13%	2,556	2,875	319	12%	2,985	3,188	203	7%
Total Southbound	12,925	14,051	1,126	9%	11,537	12,752	1,215	11%	12,504	13,867	1,364	11%

APPENDIX C Route Travel Time Comparison

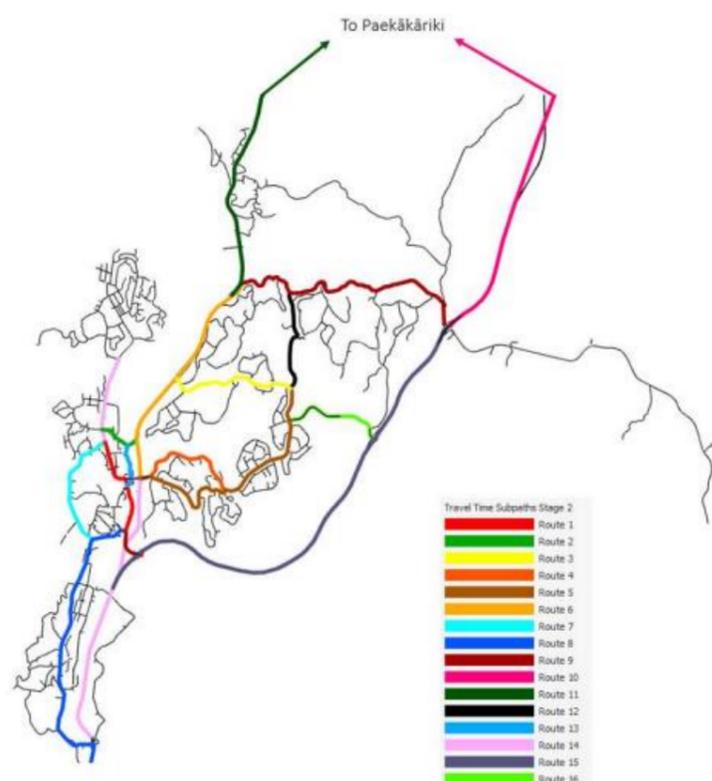


Table B1: Route travel time comparisons

Route	Description	AM Peak Hour 08:00 - 09:00				IP Peak Hour (12:00 - 13:00)				PM Peak Hour (17:00 - 18:00)			
		2022 (mins)	2033 (mins)	Absolute Difference (min)	Percentage Difference	2022 (mins)	2033 (mins)	Absolute Difference (min)	Percentage Difference	2022 (mins)	2033 (mins)	Absolute Difference (min)	Percentage Difference
Route 1	Prosser Street to SH1 via Kenepuru Drive	5.7	12.3	6.5	114%	5.7	6.3	0.6	11%	6.2	10.6	4.4	71%
	SH1 SB offramp to Prosser Street via Kenepuru Drive	6.1	18.8	12.7	207%	5.2	5.4	0.2	4%	5.5	6.5	1.0	18%
Route 2	Titahi Bay Rd to SH59 via Semple St	2.3	2.3	0.0	0%	2.2	2.3	0.1	4%	3.4	6.8	3.4	103%
	SH59 to Titahi Bay Rd via Semple St	2.8	2.8	0.1	2%	2.6	2.7	0.1	2%	2.9	3.6	0.7	26%
Route 3	Omapere Street to Whitford Brown Avenue	3.8	3.9	0.0	1%	3.7	3.8	0.0	0%	3.8	3.8	0.0	0%
	Whitford Brown Avenue to Omapere Street	4.2	4.3	0.1	2%	4.1	4.1	0.0	1%	4.3	4.4	0.0	1%
Route 4	Champion Street at Warspite Avenue to Champion Street at Mungavin	3.1	3.0	-0.1	-2%	3.0	3.0	0.0	0%	3.2	3.1	-0.1	-2%
	Champion Street at Mungavin to Champion Street at Warspite Avenue	3.4	3.6	0.2	6%	3.2	3.2	0.0	1%	3.5	3.6	0.1	3%
Route 5	Waitangirua Link Rd to Mungavin Ave via Mungavin Ave	7.2	7.6	0.4	6%	6.9	6.9	0.0	0%	7.0	7.0	0.0	-1%
	Mungavin Ave to Waitangirua Link Rd via Mungavin Ave	7.8	7.5	-0.3	-4%	7.2	7.1	-0.1	-1%	7.3	7.5	0.2	2%
Route 6	SH58 to Titahi Bay Rd via SH59	5.0	8.5	3.5	69%	4.3	4.6	0.3	6%	4.9	11.8	6.9	141%
	Titahi Bay Rd to SH58 via SH59	3.6	3.6	0.0	1%	3.5	3.5	0.0	1%	3.7	3.7	0.1	2%
Route 7	Prosser Street to Main Rd via Raiha St	4.0	4.6	0.6	14%	3.9	3.9	0.0	0%	3.9	4.0	0.1	2%
	Main Rd to Prosser Street via Raiha St	4.2	4.2	-0.1	-2%	4.0	4.0	0.0	-1%	4.1	4.4	0.3	7%
Route 8	Kenepuru Dr/Kenepuru Link roundabout to SH1 via Main Rd	10.7	22.2	11.5	108%	10.4	10.4	0.1	1%	10.3	10.4	0.1	1%
	SH1 to Kenepuru Dr/Kenepuru Link roundabout via Main Rd	9.7	10.3	0.6	7%	9.2	9.2	0.1	1%	9.3	9.3	0.1	1%
Route 9	SH1 to SH59 via SH58	5.7	6.4	0.7	12%	5.6	5.6	0.0	0%	5.8	5.7	0.0	0%
	SH59 to SH1 via SH58	6.3	6.6	0.3	6%	6.2	6.2	0.0	0%	6.3	6.3	0.1	1%
Route 10	Paekakariki to SH58	10.1	10.2	0.2	2%	10.1	10.2	0.1	1%	10.0	10.0	0.0	0%
	SH58 to Paekakariki	10.1	10.2	0.1	1%	10.1	10.1	-0.1	-1%	10.4	10.5	0.1	1%
Route 11	Paekakariki to SH58 via SH59	12.6	12.8	0.2	2%	12.5	12.7	0.2	2%	12.9	13.2	0.2	2%
	SH58 to Paekakariki via SH59	12.4	12.6	0.2	2%	12.5	12.7	0.2	1%	14.5	13.8	-0.7	-5%
Route 12	SH58 to Warspite Ave via Omapere St	3.0	3.0	0.0	0%	2.9	2.9	0.0	0%	3.0	2.9	0.0	-1%
	Warspite Ave to SH58 via Omapere St	3.1	4.1	1.0	32%	2.9	2.9	0.0	0%	3.0	3.0	0.0	-1%
Route 13	Parumoana St to Kenepuru Dr via Lyttelton Ave	2.2	2.0	-0.2	-11%	1.8	1.8	0.0	0%	1.9	4.0	2.1	109%
	Kenepuru Dr to Parumoana St via Lyttelton Ave	2.3	2.5	0.2	8%	2.3	2.3	0.0	1%	3.2	5.5	2.3	71%
Route 14	Te Pene Ave to Takapu Rd via Titahi Bay Rd-SH1	10.8	21.4	10.6	98%	9.1	9.6	0.5	5%	10.5	13.8	3.3	32%
	Takapu Rd to Te Pene Ave via Titahi Bay Rd-SH1	9.2	10.1	0.9	10%	8.8	8.8	0.1	1%	9.4	9.4	0.0	0%
Route 15	SH58 to SH59 via SH1	5.9	16.7	10.7	180%	5.9	5.9	0.1	1%	5.9	5.9	0.0	0%
	SH59 to SH58 via SH1	6.4	6.4	0.0	0%	6.3	6.3	0.0	0%	6.4	6.4	0.0	0%
Route 16	Warspite Ave to TG via Waitangirua Link Rd	2.0	2.0	0.0	0%	1.9	1.9	0.0	0%	2.1	2.1	0.0	1%
	TG to Warspite Ave via Waitangirua Link Rd	2.6	2.8	0.2	7%	2.5	2.6	0.1	3%	2.6	2.7	0.1	4%