



# **Kingseat Wider Area Review**

Transport Assessment

January 2024

**flow**

TRANSPORTATION SPECIALISTS



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## SUMMARY OF OUR ASSESSMENT

Recent land use applications within Kingseat and Karaka North have suggested that the density of residential developments in these areas is greater than previously anticipated. As a result, the transport planning carried out to date in this area of south Auckland may not accurately reflect future demands of this growing community. While the immediate transport network about these developments will likely have sufficient road capacity, the wider transport network effects are not clear.

Flow Transportation Specialists (Flow) has looked at the development proposals of each area and compared these to the previously forecast land use projections. We have also used Auckland Transport's Southern Sector SATURN Model (the S3M) to assess the wider transport network and to provide some commentary on the predicted effects of this residential growth.

Our analysis has found that in Karaka North

- ◆ actual land use growth has not been accounted for in the regional land use projections, being some 900 households light
- ◆ as a result, we estimate that the currently anticipated development will result in up to 400 more vehicle trips to/from/within Karaka North than what has been included in the 2038 S3M traffic model to date. The increase is in the order of 170%.

And in Kingseat

- ◆ land use is fairly consistent with the regional projections (2,430 projected households in 2048 vs 2,585 households proposed), with this being higher than the original Kingseat ITA which projected 1,835 households
- ◆ nonetheless, we estimate that the currently anticipated development will result in up to 700 more vehicle trips to/from/within Kingseat than what has been included in the 2038 S3M traffic model to date. The increase is up to 85%.

We have added the extra development vehicle trips to the S3M traffic model, to identify what effects these vehicle trips are predicted to have on the transport network. We anticipate the following outcomes in 2038

- ◆ increases in peak period traffic volumes on Linwood Road of up to 300 vehicles per hour, per direction. Increases are also predicted on other routes, such as Glenbrook Road/Karaka Road
- ◆ increased pressure on both Papakura and Drury interchanges
- ◆ the S3M predicts that, even without the anticipated development, sections of Linwood Road and Hingaia Road would operate with congested conditions during peak periods, with both eastbound morning peak and westbound evening peak traffic flows at practical capacity. With the additional land use development now expected, we anticipate that this congestion would worsen during the commuter peak periods. We have not assessed interpeak period, where we expect capacity to exist about the network
- ◆ during the morning peak period, traffic demands on SH1 at the northbound on-ramp merges, and at the northbound on-ramp meters is predicted to exceed capacity. We expect that queuing from

the northbound on-ramps will extend back to both Hingaia Road and Beach Road, affecting the operation of both roads. With the additional land use development now expected, we anticipate that these queues would worsen. We're unable to conclude however whether these queues would affect east-west through traffic on this corridor, or affect other upstream intersections, noting that Waka Kotahi have the ability to manage and moderate this traffic through the meter signals

- ◆ during the evening peak period, there is no significant impacts predicted as a result of the currently anticipated land use development. This is because upstream capacity constraints, such as at Manukau, are expected to limit the flow of traffic to Papakura, limiting the local effects of increased car travel to Kingseat and Karaka North
- ◆ In conclusion, we consider that the currently anticipated land use development will increase the level of morning peak period traffic on both Linwood Road and Hingaia Road, and increase pressure on Papakura interchange. The effects of this increase in traffic have not previously been fully considered, through for example the Supporting Growth programme of work. The implication of this could be varied, as the traffic network only has so much capacity. As such, should traffic demands increase, this may encourage changes in people's travel behaviour about the wider Franklin area. For example, shifting to public transport where routes exist, travelling to park and ride sites (if constructed) or altering the time in which people travel.

Demands for private car travel on the Linwood Road/Hingaia Road corridor are predicted to exceed capacity in the future, as will demand for travel through Papakura interchange. This is to be expected through growth anticipated about the wider South Auckland area. Waka Kotahi will continue their role of managing demand on the motorway network through ramp metering, and prioritising high productivity vehicles through T2/truck lanes at Papakura interchange. However there is little ability to increase the capacity of the general traffic network in this area, so residents living in Kingseat and Karaka North, as well as catchments further west will instead need to be given better choices to 'opt out' of peak period congestion. Options would include

- ◆ Travel Demand Management measures that reduce the need for travel
- ◆ a land use development pattern that provides local destinations, such as local schools, shops and community facilities within Kingseat
- ◆ significantly improved public transport offering, relative to the existing peak direction bus service on Linwood Road. This may include
  - more frequent bus services to Waiuku and Papakura
  - new bus services such as to Drury, and to proposed new train stations at Drury West and Paerata
  - interventions to make the proposed new train stations at Drury West and Paerata more attractive. We understand that these stations will include park and ride facilities that may well attract commutes from Kingseat and Karaka North
- ◆ interventions to prioritise high productivity vehicles, such as transit lanes on Hingaia Road

- ◆ we note that active travel is unlikely to be a realistic option from either Kingseat or Karaka North, due to the distances involved (a minimum of 6 km to the rail network, and 15 km from Kingseat to Papakura) and the high speed, rural roads involved.

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## 1 WHAT THIS REPORT INCLUDES

Auckland Council is working closely with Auckland Transport to understand the cumulative effects of ongoing land use developments about the Kingseat and Karaka North areas. Based on land use applications, the density of residential developments is above that previously anticipated by land use and transport planning carried out to date. While the immediate transport network about these developments will likely have sufficient road capacity, the wider transport network effects are not clear.

Flow Transportation Specialists (Flow) has looked at the development proposals of each area and have used the Auckland Transport SATURN traffic model for the southern area to assess the wider transport network and therefore provide some commentary on the predicted effects.

This report summarises the following

- ◆ Overview of the development areas
- ◆ Overview of the current transport environment
- ◆ Assumptions included in the Auckland Transport Southern Sector SATURN model (the S3M), covering land use and transport infrastructure
- ◆ Predicted network impacts associated with higher density development.

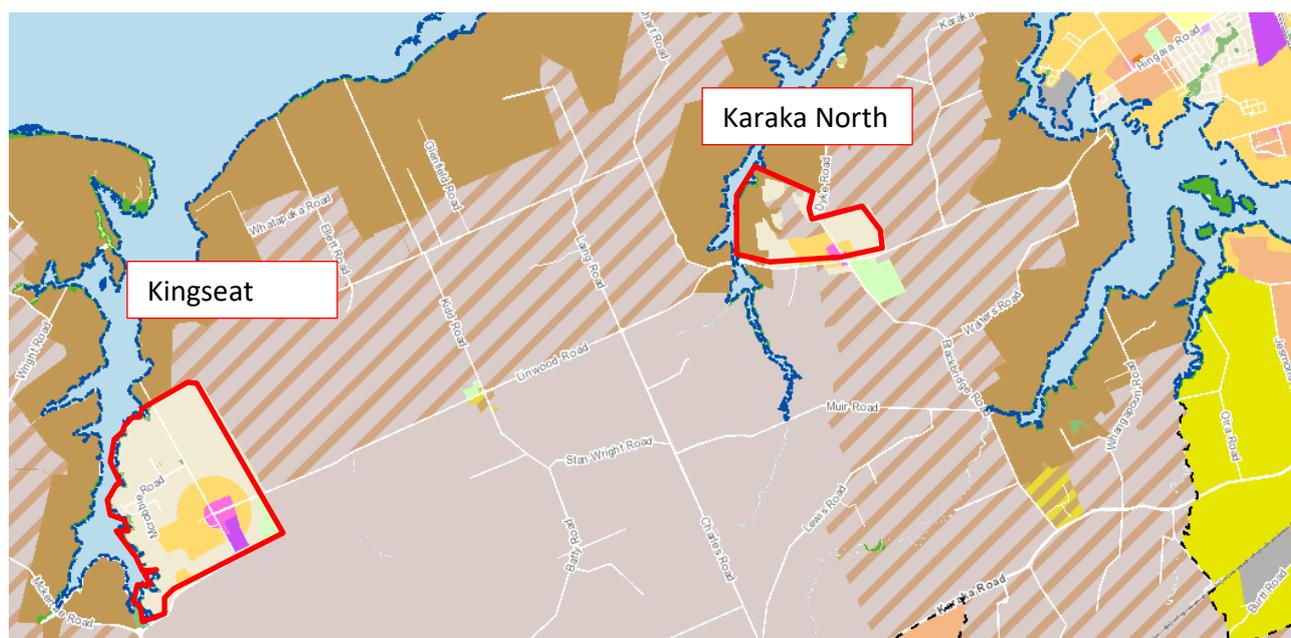
## 2 DEVELOPMENT AREA OVERVIEW

This report focusses on two development areas, being Kingseat and Karaka North, as shown in Figure 1. Both of these areas rely on Linwood Road and Hingaia Road to access the wider transport network, with each area expected to have a high reliance on private vehicle travel due to the lack of frequent public transport services. While a bus route operates along Linwood Road (connecting Waiuku with Papakura Train Station), the service is limited to peak direction only during the commuter peak periods.

We have obtained traffic flow predictions from assessments completed for each area. Flow has been responsible for updating the land use projections for Kingseat, where resource consent applications for two large development sites has allowed for the Precinct projections to be reconsidered. The supporting traffic assessment report for Karaka North provides a summary of the expected housing density about the Linwood Road, Dyke Road area. The reports that have helped inform this assessment and the anticipated trip generation for each area include

- ◆ Kingseat Structure Plan Transport Assessment, prepared by Wes Edwards Consulting in 2010
- ◆ Residential and Commercial Subdivision, 833 Kingseat Road, Kingseat. Transportation Assessment Report prepared by Commute Transportation Consultants, dated 3 August 2018
- ◆ Residential Subdivision, 9 McRobbie Road, Kingseat. Transportation Assessment Report prepared by Commute Transportation Consultants, dated 2 March 2018
- ◆ 9 McRobbie Road Proposed Development, Traffic Assessment Review prepared by WSP|Opus dated 17 April 2019, reference OAS 2019-035MR
- ◆ Residential Development Masterplan, 348 Linwood Road, Karaka North. Integrated Transport Assessment prepared by Commute Transportation Consultants, dated 5 November 2020. This report also includes information for 34 and 38b Dyke Road and 304 Linwood Road developments.

**Figure 1: Development areas directly considered in this report**



## 3 EXISTING TRANSPORT ENVIRONMENT

### 3.1 Road safety

We have assessed the crash records from 2016 to 2021 as recorded within the Waka Kotahi NZTA Crash Analysis System (CAS). We have assessed

- ◆ Linwood Road between Kingseat Road and Hingaia Stream bridge, and
- ◆ Hingaia Road, between Hingaia Stream Bridge and the SH1 Papakura Interchange.

The summary of each road section is set out below.

#### Linwood Road

The locations of each recorded crash, injury severity level (non-injury, minor, serious and fatal) and other factors such as crash year, weather conditions and road conditions have been considered.

- ◆ A total of 64 crashes were recorded: 37 non-injury, 21 minor injury, 3 serious injury and 3 fatal crashes
- ◆ A large number of crashes occurred on the corridor (80%), with the remaining occurring at intersections (20%)
- ◆ The most common crash types are
  - 18 crashes are loss of control on straight sections of road
  - 17 crashes are loss of control when cornering
  - 6 crashes were head on
- ◆ The 6 serious or fatal crashes were generally head on crashes or cornering crashes.

With such a large number of crashes relating to loss of control and cornering, we suspect that the recent speed limit change along this corridor will help reduce the number of crashes.

#### Hingaia Road

A total of 29 crashes were recorded including

- ◆ 14 minor injury and 10 non-injury crashes
- ◆ 5 serious injury crashes that are different movements
- ◆ A number of incidents are attributed to rear end crashes

At intersections on Hingaia Road the following crashes were recorded

- ◆ 11 crashes including 10 non-injury and 1 minor injury crash occurred at the intersection with the Papakura off ramp (northbound)
- ◆ 8 crashes including 2 non-injury, 5 minor injury and 1 serious injury crash at the Hinau Road/Harbourside Drive intersection
- ◆ 5 incidents at the intersection with Pararekau Road
- ◆ 2 serious crashes at the intersection of Papaka Road and Kuhanui Drive.

### 3.2 Public transport

As noted earlier, there is only one bus route (395) passing through Linwood Road, connecting Waiuku, Kingseat and Karaka North to the Papakura train station.

Two services operate during the morning peak, travelling from Waiuku through to Papakura (via Linwood Road), with two services operating during the evening peak, travelling from Papakura to Waiuku (via Linwood Road). This bus route, while serving morning and evening peak commuters is far from ideal for people to rely on to carry out their day to day needs.

We understand that a school bus service for Rosehill College used to travel along Linwood Road, collecting students as far as Clarks Beach, but this service has recently been stopped.

### 3.3 Existing traffic conditions

The latest traffic volume data about the immediate roading network has been obtained from Auckland Transport<sup>1</sup> and the reports referenced earlier. The average two-way daily traffic volume measured in vehicles per day (vpd) and peak hour volumes in vehicles per hour (vph) are summarised in Table 1.

**Table 1: Traffic volume data (two-way)**

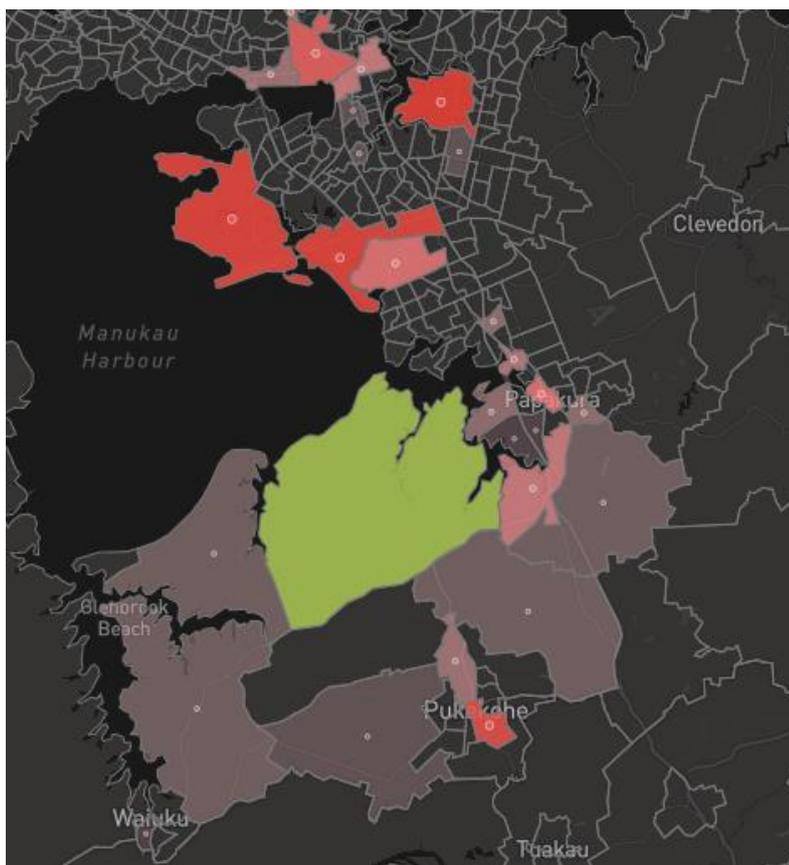
Road	Location	Count Date	Average Daily Traffic (vpd)	Peak Hour Volume (vph)
Linwood Road	Speed restriction east of Kingseat village	6/02/2019	6,085	700
Linwood Road	Linwood Road/Dyke Road intersection	24/10/2019	8,450	845
Kingseat Road	Speed restriction west of Kingseat village	7/02/2018	5,570	670
Hingaia Road	Between Bridgeview Road and Kuhanui Road	28/03/2019	16,385	1,600

### 3.4 Travel patterns

The Waka Commuter app highlights the destinations of those leaving the Kingseat and Karaka North area for employment. Statistics suggest 71% of the workers travel by car, with 21% working from home. Based on the density of the destinations, the direction of travel is heavily weighted to the north, via Linwood Road, Hingaia Road and the Southern Motorway, with access at the Papakura Interchange.

<sup>1</sup> Auckland Transport Open GIS Data, available online <https://data-atgis.opendata.arcgis.com/datasets/average-daily-traffic-counts?geometry=174.779%2C-37.132%2C174.825%2C-37.120>

Figure 2: Travel to Work Map – Kingseat/Karaka North

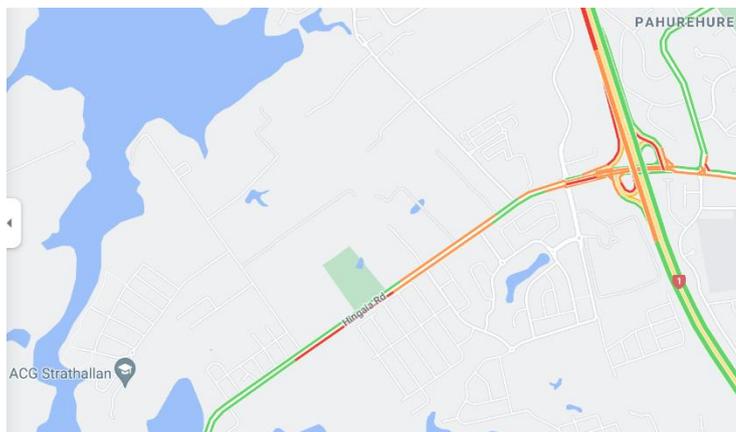


### 3.5 Current corridor operation

Currently, the performance of Linwood Road and Hingaia Road during the commuter peak periods is generally acceptable, with minimal queues associated with commuter traffic. We consider this is partly due to the corridor experiencing very different peak periods. That is commuters wishing to travel into the city from the wider Franklin area do so early, which generally reduces the level of conflict with the school peak periods.

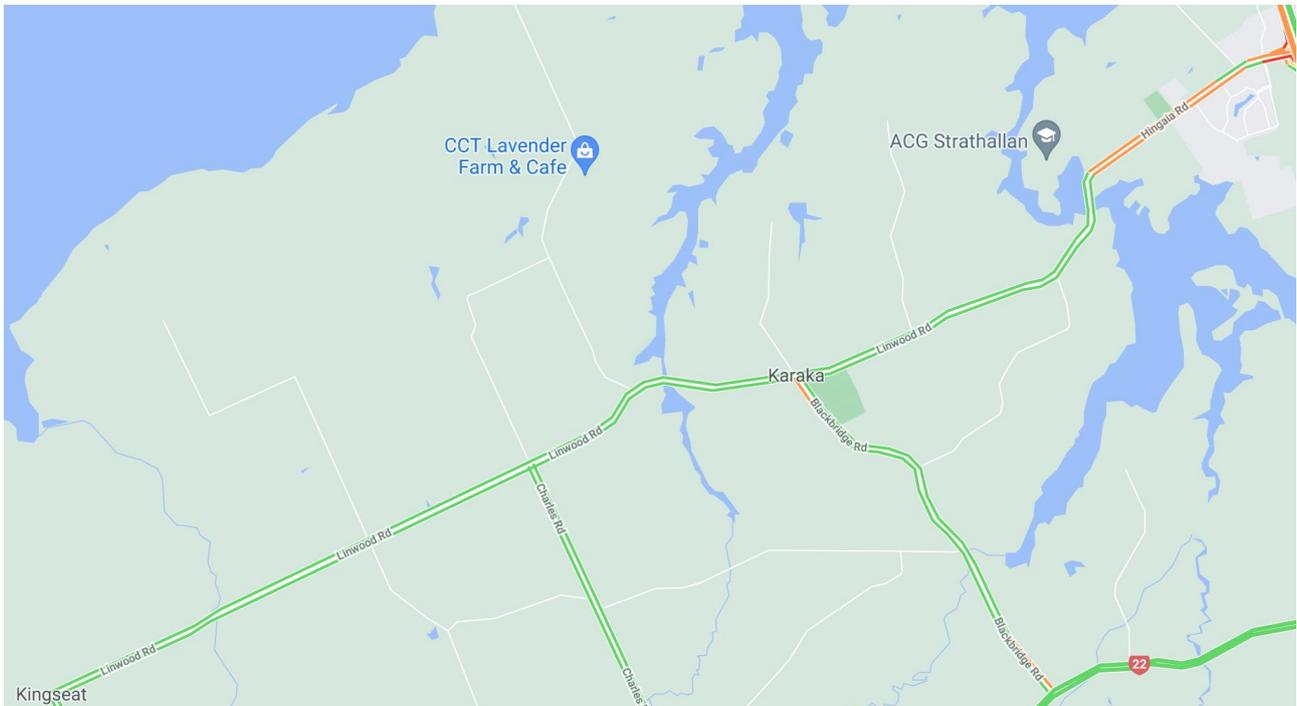
In recent years congestion has occurred along Hingaia Road as a result of congestion spilling back from the SH1 Papakura Interchange or as a result of road works on Hingaia Road. With roadworks about the corridor being completed, the performance of the corridor has improved.

Congestion however remains about the school pick up and drop off periods (8:00am and 3:00pm), particularly about Oakland Road where right turn queues form on Hingaia Road as parents drop their children off or pick their children up from ACG Strathallan School. When this occurs, traffic wishing to travel west slows and tends to use the metal shoulder to pass right turning traffic.



Outside of the school peak period however the corridor generally operates satisfactorily. To summarise how the current corridor operates, we have referred to Google Maps which sets out the typical traffic conditions observed during a typical day. The figure below reflects the corridor performance at 8:00am, where some congestion is observed about Oakland Road and about the traffic signals for traffic heading towards the Southern Motorway.

**Figure 3: Linwood Road Performance – AM Peak**



## 4 ANTICIPATED DEVELOPMENT

### 4.1 Kingseat

As set out in the Auckland Unitary Plan (AUP), the Kingseat Precinct is some 300 hectares in size. The Precinct projects a population in the order of 5,000 people, with this being based on some 1,835 dwellings (2.7 people per dwelling) as assessed in the Kingseat ITA. We note that

- ◆ the number of people per dwelling in the Karaka/Kingseat area as of the last census is 3.0, higher than the 2.7 assumed in the original assessment
- ◆ that the Precinct is established, and hence, is not up for challenge – unless of course Discretionary Resource Consents are lodged.

We have reviewed the supporting documents provided by Auckland Council for the Kingseat area. The original Kingseat Structure Plan includes the assumptions set out in Table 2.

**Table 2: Original Kingseat Structure Plan Transport Assessment land use assumptions and peak hour traffic**

	2021	2031	2051
<b>Population</b>	1,470	2,890	4,950
<b>Households</b>	525	1,050	1,835
<b>Peak Hour Traffic (AM)</b>	430	780	1,300

We note that the 9 McRobbie Road and 833 Kingseat Road development sit at the higher end of the density scale, with these two sites (as currently applied for) set to deliver

- ◆ 880 dwellings, accounting for approximately 50% of the original household numbers anticipated for the whole Precinct
- ◆ approximately 2,600 people or 53% of the anticipated population for the whole Precinct, and
- ◆ close to 60% of the total traffic estimated in 2010 for the whole Precinct.

This suggests that development intensity being applied for is greater than that originally anticipated. We understand that the 9 McRobbie Road development has applied for a Discretionary resource consent with lot sizes less than the 325 m<sup>2</sup> minimum allowed for in the AUP. As such, the intensity and scale of development for this particular site increases anticipated demand, if consented.

While this is the case for the 9 McRobbie Road site, the level of growth beyond that intended for the remaining land located within Sub-Precinct B and Sub-Precinct C will largely depend on whether future resource consents lodged abide by the Precinct Provisions or continue to push for higher density.

833 Kingseat Road also includes 17 superlots which allows for further development beyond that assessed in the supporting traffic assessment which also leads to an increase in dwellings, population and therefore traffic generation. Based on the above numbers, the scale of development within the Precinct suggests dwelling numbers, population and traffic generation (and therefore mitigation) beyond that originally anticipated.

Bringing the various sources together, we have summarised the following in Table 3

- ◆ Anticipated dwelling yields set out in the AUP (Kingseat Village Precinct I418)
- ◆ Anticipated land use set out in Auckland’s Regional land use projections (Scenario I11v5)
- ◆ Predicted land use (estimated by Flow) based on AUP permitted activity provisions being applied across the Kingseat Precinct
- ◆ Predicted land use based on developer applications, with the higher density trends being applied across the Kingseat Village residential zones.

**Table 3: Kingseat Precinct Land Use Assumptions**

Development Type	I418 – Yield Assumption (Precinct Plan 11)		Scenario i11v5 land use projections		Predicted Yields - Flow Analysis Full Build – AUP Permitted		Predicted Yields - Flow Analysis Full Build – Application Trend	
Housing – Single House Zone	1,940 dwellings	1,940 dwellings	630 dwellings (2028 – 30%)	2,430 dwellings	1,630 dwellings 450 m <sup>2</sup> lots	2,590 dwellings	1,815 dwellings 400 m <sup>2</sup> lots	2,785 dwellings
Mixed Housing Suburban			1,560 dwellings (2038 – 65%)		750 dwellings 325 m <sup>2</sup> lots		760 dwellings 320 m <sup>2</sup> lots	
Large Lot – Sub Precinct G			2,430 dwellings (2048 – 100%)		210 dwellings 2,500 m <sup>2</sup> lots		210 dwellings 2,500 m <sup>2</sup> lots	
Centre Activities - Commercial	Not Defined		290 jobs (2028)		63,500 m <sup>2</sup> GFA		63,500 m <sup>2</sup> GFA	
Industrial – Sub Precinct E			565 jobs (2038) 825 jobs (2048)		36,000 m <sup>2</sup> GFA		36,000 m <sup>2</sup> GFA	

The vehicle trip impacts of these differences are discussed further below, focussing on the scenario i11v5 projections and the predicted yields and demands assessed by Flow.

## 4.2 Karaka North (Dyke Road)

Similar to the Kingseat area, we have assessed the Karaka North/Dyke Road development, comparing the projections included in the Regional land use (Scenario i11v5) forecasts and that presented in documents supporting the developments.

**Table 4: Karaka North/Dyke Road Land Use Assumptions**

Development Type	Scenario I11v5 land use projections		Transport Assessment Report/AT input	
Residential Lots – Dyke Road	160 dwellings	160 dwellings (2048 – 100%)	202 dwellings	1,052 dwellings
Residential Lots – 348 Linwood Rd			598 dwellings	
Superlots – 348 Linwood Rd			252 dwellings	

**Table 4: Karaka North/Dyke Road Land Use Assumptions**

Development Type	Scenario I11v5 land use projections	Transport Assessment Report/AT input
Commercial Centre – 348 Linwood Rd	180 jobs (2028)	9,000 m <sup>2</sup> GFA
	190 jobs (2038)	
Community Facility – 348 Linwood Rd	200 jobs (2048)	350 m <sup>2</sup> GFA

A substantial amount of growth is projected in the Dyke Road area. This is discussed further below. Based on the 2018 census, (NZ Stats 7009721, 7009613) there are some 95 dwellings within the Karaka North/Dyke Road catchment, suggesting that only a small amount of growth is anticipated within the Regional land use forecast for this area.

### 4.3 Western Franklin development areas

Other growth areas near Kingseat include

- ◆ Clarks Beach
- ◆ Glenbrook
- ◆ Patumahoe.

We have not included detailed analysis of these areas within our report, however we note that the S3M (discussed in Section 6) includes traffic demands from these areas (based on regional land use assumptions). The S3M sources traffic demands from the regional Macro Simulation Model (MSM) which includes growth according to Council’s Scenario I11.5 land use.

We have summarised the growth included for these areas below, as sourced from Scenario I11.5.

**Table 5: Western Franklin growth areas about Kingseat – Scenario I11.5 land use**

	<b>2028</b>	<b>2038</b>	<b>2048</b>
<b>Patumahoe (MSM 584)</b>	Households – 625 Population – 1,800 Employment - 500	Households – 800 Population – 2,200 Employment - 500	Households – 970 Population – 2,575 Employment - 515
<b>Waiau Pā (588)</b>	Households – 400 Population – 1,050 Employment - 250	Households – 450 Population – 1,150 Employment - 285	Households – 500 Population – 1,200 Employment - 310
<b>Clarks Beach (589)</b>	Households – 750 Population – 1,900 Employment - 380	Households – 740 Population – 1,790 Employment - 380	Households – 730 Population – 1,700 Employment - 385
<b>Glenbrook (590)</b>	Households – 2,100 Population – 5,715 Employment – 1,460	Households – 2,600 Population – 6,770 Employment – 1,430	Households – 2,960 Population – 7,430 Employment – 1,420

Based on the above, some 1,350 additional houses are projected to the west of Kingseat. The traffic demands associated with this wider growth is captured in the S3M, through the trips carried through from the regional transport model.

## 5 FUTURE TRANSPORT ENVIRONMENT

Several transport programmes and projects exist about the South. While most do not directly relate to the Linwood Road or Hingaia Road corridors, several interventions will impact on how people about the wider South Auckland/Franklin area travel through Linwood Road and Hingaia Road.

The interventions being planned and delivered will assist motorists in several ways, either through providing safer and more efficient routes or alternative travel options. Set out below are the projects which in our view will benefit the study corridor in some shape or form.

### 5.1 Waka Kotahi SH22 /SH1 Drury to Paerata

This Waka Kotahi project<sup>2</sup> focuses on improving the safety of SH22 between the SH1/Drury interchange and the Paerata township. Key elements of this project include

- ◆ Placing a roundabout at the SH22/Glenbrook Road intersection, which includes a direct connection into Paerata. These works are underway in 2021
- ◆ Intersection safety improvements, such as at the SH22/Great South Road intersection
- ◆ Removing the unsafe passing lanes fronting the Pukekohe Golf Course
- ◆ Installing turn around locations, making it safer for people to turn around, including installing right turn bays
- ◆ Reviewing the speed limit

The Glenbrook Road/SH22 intersection has been a significant safety concern. The safety risk of this intersection encourages drivers to travel via Kingseat and Linwood Road to avoid having to use the intersection. When upgraded, this may assist in diverting drivers back to using SH22 and Glenbrook Road.

### 5.2 Waka Kotahi New Zealand Upgrade Programme (NZUP)

The New Zealand Upgrade Programme includes projects that will provide more travel choices, help people to get where they are going safely and grow the economy. The South Auckland Package includes some \$2.7 billion worth of investment in new train stations and invest in Drury transport upgrades that help support the release of housing.

Some of the interventions about the South being delivered by the New Zealand Upgrade Programme over the next 5 years may benefit Linwood Road and Hingaia Road. For example, projects being delivered by the New Zealand Upgrade Programme (NZUP) may attract motorists passing through the corridor from the wider catchment onto public transport, with NZUP delivering

- ◆ Electrification of the main trunk rail line between Papakura and Pukekohe

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<sup>2</sup> <https://www.nzta.govt.nz/projects/sh22-sh1-drury-to-paerata/>

- ◆ New train stations at Paerata and Drury West, with each train station including park and ride facilities
- ◆ Improvements to State Highway 1 between Papakura Interchange and Drury Interchange, with the motorway being widened from two lanes to three lanes in each direction.

Planning processes are already underway, where it is understood that the rail electrification, Paerata, Drury West and Drury Central Rail Stations are set to be delivered within 5 years (by late 2025). Construction has already started for the State Highway widening.

### 5.3 Te Tupu Ngātahi Supporting Growth Programme

The future transport network about the southern area is being assessed through the Te Tupu Ngātahi Supporting Growth programme. The programme is investigating and planning the transport services and infrastructure needed to support Auckland's future urban growth areas over the next 30 years.

The 'Indicative Strategic Transport Network', dated July 2019 includes safety improvements being the focus for the Hingaia Road and Linwood Road corridors. The major growth areas and transport interventions associated with the Supporting Growth Programme however sit to the east and south of the study area, as shown in Figure 4.

We note that the Supporting Growth Programme about the South is focussed at this time on planning the future transport interventions, protecting/seeking the designation for key corridors and acquiring land. To date the programme is focussed about the Drury and Opaheke Structure Plan areas and excludes western settlements, including Kingseat, Glenbrook, Clarks Beach, and Patumahoe.

Figure 4: Supporting Growth Indicative Strategic Transport Network - SOUTH



## 6 WIDER AREA ASSESSMENT

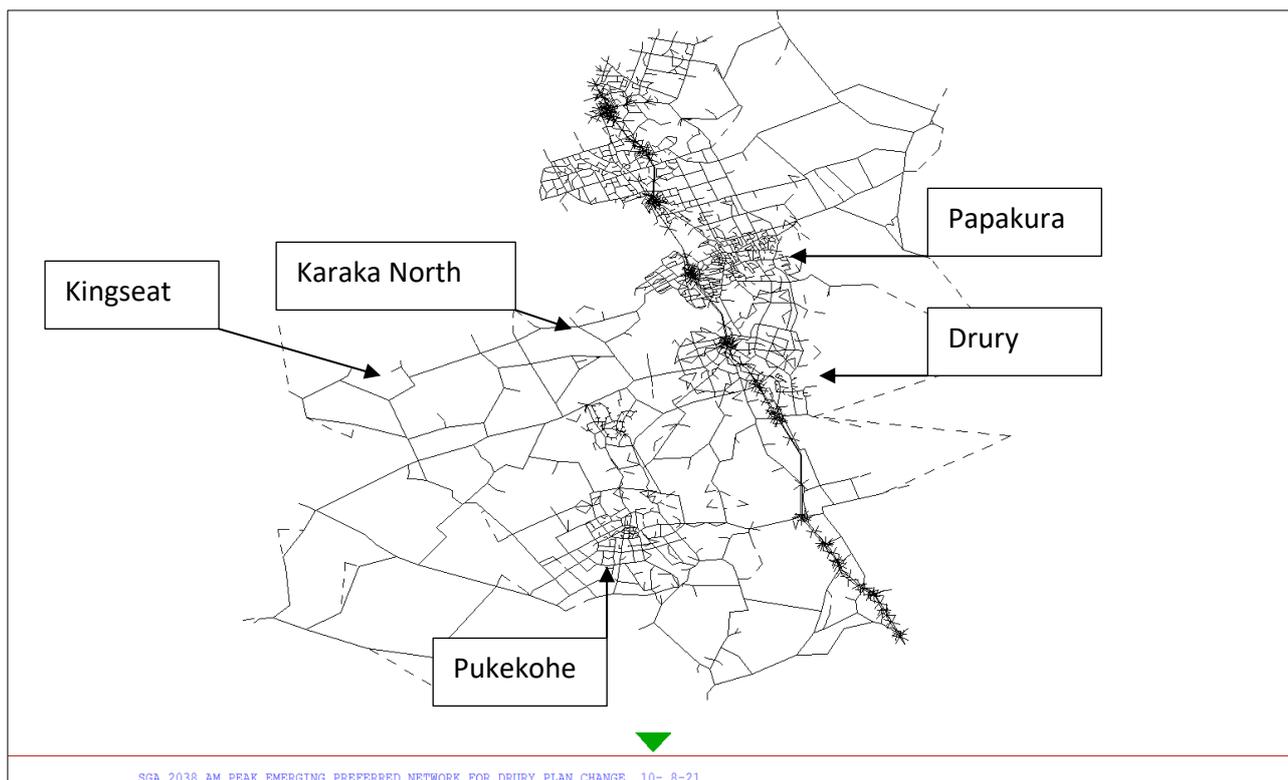
The assessment of the Kingseat development and Karaka North development has used the Auckland Transport SATURN traffic model to predict the performance of the wider area in the future. This section

- ◆ Provides an overview of the SATURN traffic model used to assess the predicted effects
- ◆ Sets out the land use assumptions included in the default land use projections for the study area
- ◆ Summarises the amendments made to the forecast assumptions to account for development within Kingseat and Karaka North not anticipated by the default land use projections.

### 6.1 Auckland Transport Saturn Traffic Model

Auckland Transport owns and maintains the Southern Sector SATURN Traffic Model (S3M). The S3M encompasses a large portion of the south Auckland region, particularly the Papakura and Franklin districts. The model is frequently used to inform transport related projects at a mesoscopic level. The extent of the S3M is shown in Figure 5.

Figure 5: Extent of the Southern Sector SATURN Traffic Model (S3M)



The underlying land uses included in the S3M are simulated by the Auckland Strategic Planning model (ASP) and the Macro Strategic Model (MSM) to produce land use scenario i11v5. This scenario is developed and updated by the Auckland Forecasting Centre (AFC), informed by Auckland Council and Waka Kotahi NZ Transport Agency. While the S3M model does not include settlements such as Glenbrook and Clarks Beach within the model boundaries, traffic demands from these settlements are reflected in the S3M model via outputs taken from the MSM model.

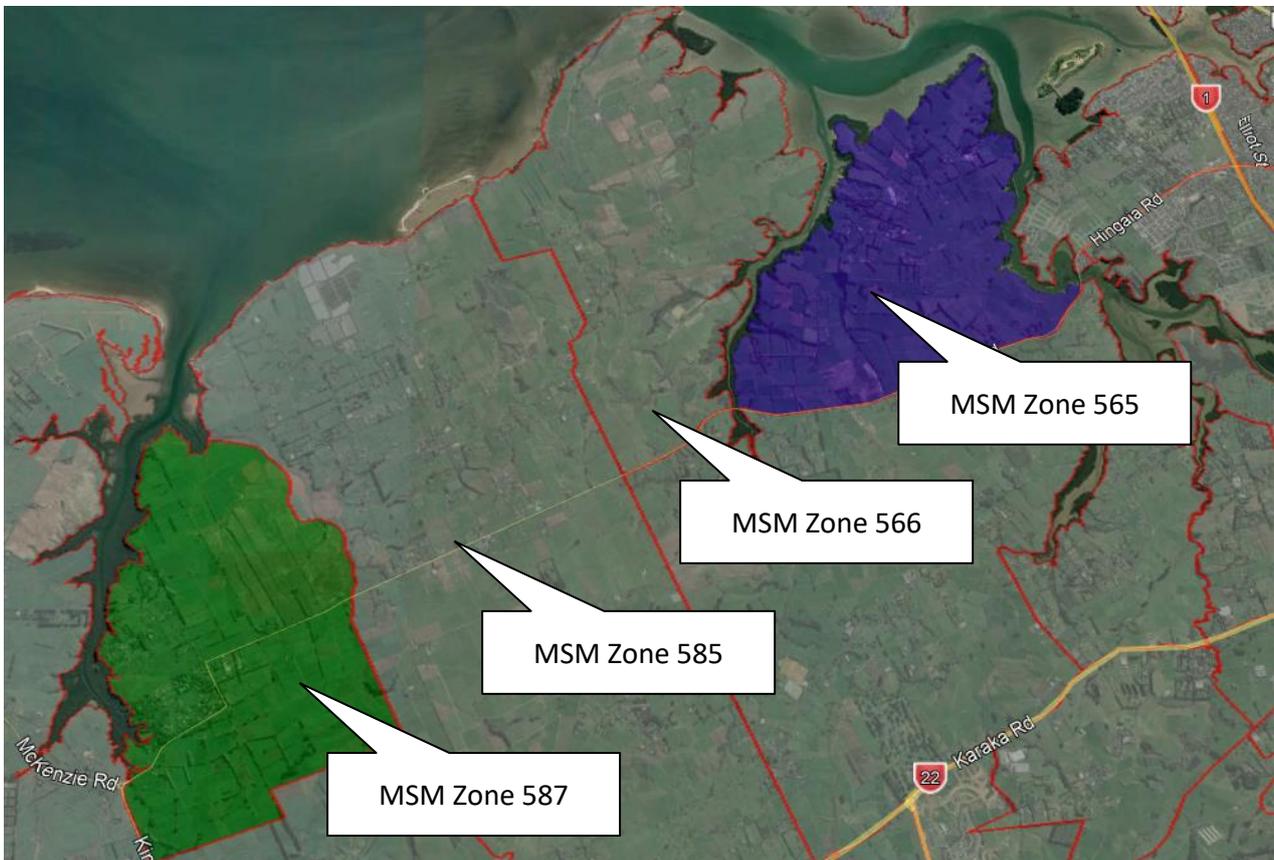
While AFC have recently released scenario i11v6 land use, the SATURN traffic model being used by Supporting Growth to assess future projects about the south continues to use i11v5 land use. As such, we have continued to rely on i11v5 land use as the basis for this assessment.

## 6.2 Scenario i11v5 land use and trip generation

As introduced above, we have assessed the underlying projections included in the Regional land use (Scenario i11v5) to appreciate how different the forecast projections are to that assessed in the respective development traffic assessment reports.

The land use zones relevant to the study area are illustrated in Figure 6, with Kingseat shown in green and Karaka North shown in purple. Our analysis also includes the zones in between to ensure the regional land use has not assigned projected growth within these adjacent zones.

Figure 6: Kingseat and Karaka North development areas



We have focussed on 2028, 2038 and 2048 forecasts, as this aligns with the traffic model forecasts being used by Auckland Transport.

The table below summarises the

- ◆ projected households for each zone
- ◆ the anticipated yields for each 10 year period (2028, 2038 and 2048+) and
- ◆ the anticipated dwellings long term as assessed in the respective development reports.

**Table 6: Scenario i11v5 Land Use Assumptions**

Area (MSM Zone)	2028 Households (i11v5) Short Term	2038 Households (i11v5) Medium Term	2048 Households (i11v5) Long Term	Private Development Buildout
Karaka North (565)	145	155	160	1,050
Karaka North (566)	85	150	210	N/A
Kingseat (585)	320	405	485	N/A
Kingseat (587)	630 (25%)	1,560 (65%)	2,430 (100%)	2,585

Based on the above analysis

- ♦ growth at Karaka North has not been accounted for in the regional land use projections, being some 900 households light
- ♦ the anticipated households at Kingseat is fairly consistent with the analysis completed by Flow (2,430 households vs 2,585 households), with this being higher than the original Kingseat ITA which projected 1,835 households
- ♦ no substantial growth has been projected for the zones that sit adjacent to the zones being focussed on for this assessment. While growth is anticipated, we consider this to be minor in scale and in keeping with natural growth
- ♦ growth to the west of the Kingseat area, for areas such as Glenbrook, Patumahoe, Clarks Beach and Waiau Pā is summarised in Table 5 above.

With household projections being light in Karaka North (MSM Zone 565) and consistent for Kingseat (MSM Zone 587), we have turned our attention to the number of vehicle trips predicted for each area in 2038 and the full build (long term) forecasts. We have not assessed 2028, as the level of development is light, at some 25% of the full build scenario.

**Table 7: Vehicle Trip Generation (2038 and Full Build)**

Area	2038 AT Model Hourly Vehicle Trips Medium Term	Development Hourly Vehicle Trips Medium Term	2048 Households (i11v5) Long Term	Private Development Buildout
Karaka North (565)				
AM Peak (Hourly)	215	580 (+365)	230	895 (+665)
PM Peak (Hourly)	195	580 (+385)	210	895 (+685)
Kingseat (587)				
AM Peak (Hourly)	865	1,380 (+515)	1,605	1,985 (+380)
PM Peak (Hourly)	830	1,545 (+715)	1,520	2,235 (+715)

When considering the number of vehicle trips assumed in the Auckland Transport SATURN model

- ♦ Karaka North vehicle trips are at least 365 vehicles per hour light in 2038 (170% different), with this increasing to up to 665 vehicles per hour in 2048+ (290% different)

- ◆ While Kingseat household projections were fairly consistent, the differences in predicted hourly vehicle trips is substantially different for 2038 (up to 715 trips, or 85% different) while 2048+ projections are between 380 trips (25%, AM) to 715 trips (50%, PM) different.

With the 2048 forecast being some way in the future, we have focused on the 2038 forecast to determine the effect caused by the increase in anticipated vehicle trips. For Kingseat, this essentially brings the anticipated vehicle trips predicted in Auckland Transport’s 2048 model forward to 2038.

### 6.3 2038 SATURN Model Infrastructure Assumptions

The forecast SATURN traffic models include future infrastructure being assessed through the Supporting Growth and New Zealand Upgrade Programmes. We have outlined the infrastructure improvements included in the traffic model (relevant to this assessment) and outlined how these alter from today’s network layout.

**Table 8: Infrastructure changes about study area**

Location	Current Layout	2038 SATURN Model Layout
Hingaia Road/Oakland Road intersection	Priority Give Way – 3 arms	Signalised – 4 arms
SH1 Papakura Interchange	Southbound on ramp loop	Southbound on ramp loop plus conventional ramp (removing right turn movement)
SH1 Papakura to Drury	Two lanes per direction	Three lanes per direction
SH22 / Glenbrook Road intersection	Priority Give Way – 3 arms	Roundabout – 4 arms
SH22 Drury West development	Priority intersections	Upgraded roundabouts and Traffic Signals
Pukekohe Expressway	N/A	Four lane expressway connecting at Drury South Interchange

## 7 TRANSPORT ASSESSMENT

To assess the impacts of additional traffic, we have increased the level of traffic included in the 2038 SATURN traffic model to the values set out in Table 7. The trip distribution of each zone remains unchanged.

To appreciate the impacts the increase in traffic has about the study area and the surrounding network, a series of outputs and plots have been extracted from the traffic model, with each being interpreted. The outputs or plots extracted include

- ◆ Summary of predicted volumes on Linwood Road and Hingaia Road, comparing these to today's volumes. We note that these plots include growth about the wider Franklin area, and as such, growth is not isolated to Kingseat and Karaka North development
- ◆ Peak hour (AM and PM) difference plots – showing the difference in predicted traffic volumes about the immediate network (Linwood Road and Hingaia Road) and the wider transport network
- ◆ Volume over Capacity (congestion) plots (where V/C is greater than 75% for each scenario – indicating where congestion on the network is predicted to occur based on the hourly peak traffic volume
- ◆ Wider network plots indicating intersections where delays/hotspots are predicted to increase

Through these plots, the impacts of the projected growth which is over and above that currently captured within Auckland Transport's SATURN traffic model will be better understood.

### 7.1 Predicted traffic volumes

Figure 7 to Figure 10 on the following pages present the predicted 2038 morning and peak hour traffic volumes on Linwood Road and the surrounding area. The plots show these peak hour traffic volumes for

- ◆ the default, I11v5 land use forecasts
- ◆ the currently anticipated land use development

Higher resolution plots are included in Appendix A.

By way of summary

- ◆ in the peak direction (eastbound in the morning, westbound in the evening), traffic volumes of 950 to 1,400 vehicles per hour are predicted on Linwood Road in the default, I11v5 land use scenario
- ◆ with the level of land use development now anticipated, higher traffic volumes of 1,050 to 1,600 vehicles per hour are predicted

This level of traffic is generally at the upper end of what a single lane, rural road can support.

Figure 7: 2038 am peak hour forecast traffic volumes – I11v5 land use

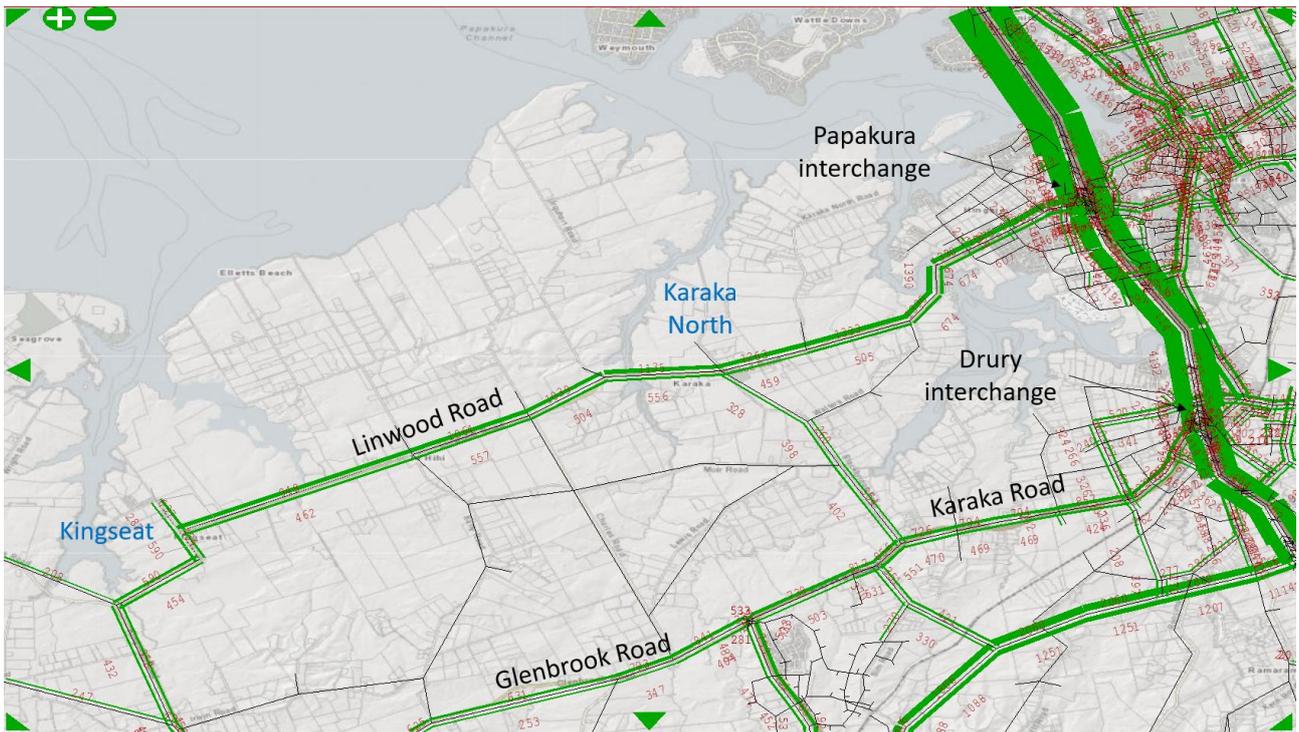


Figure 8: 2038 am peak hour forecast traffic volumes – anticipated land use

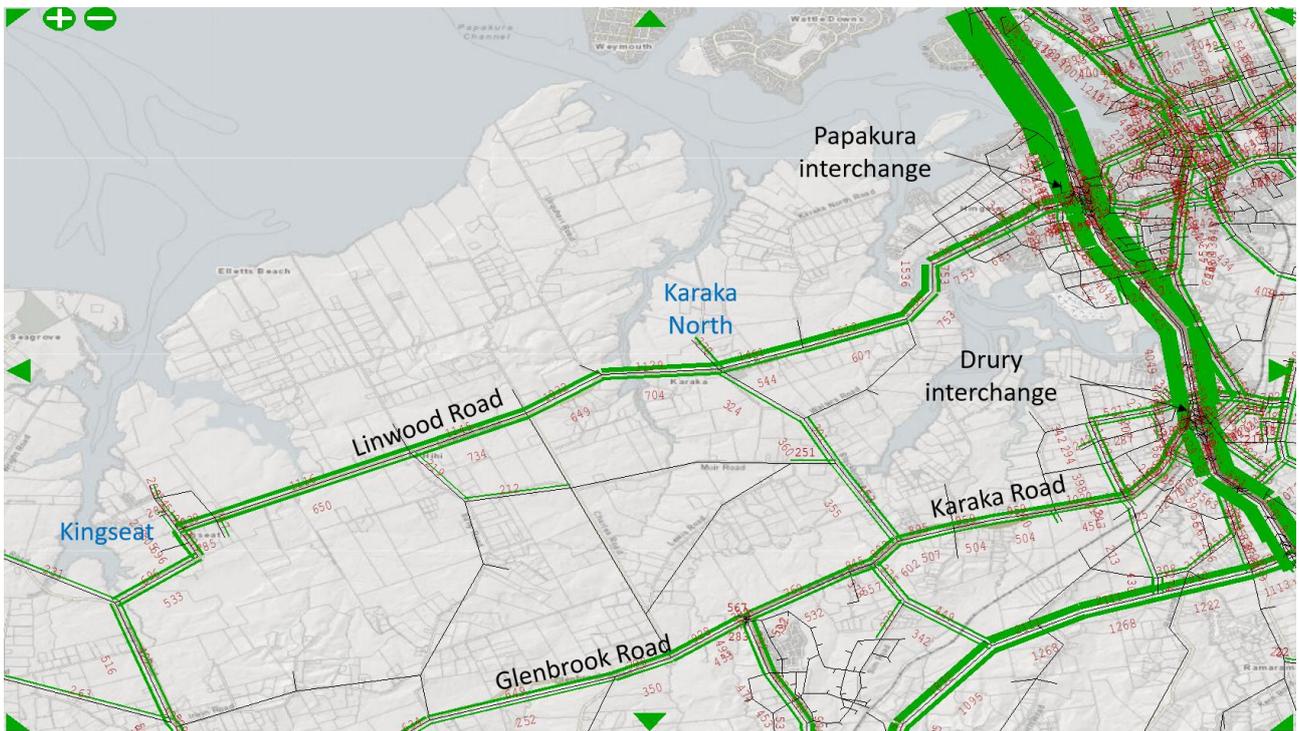


Figure 9: 2038 pm peak hour forecast traffic volumes – I11v5 land use

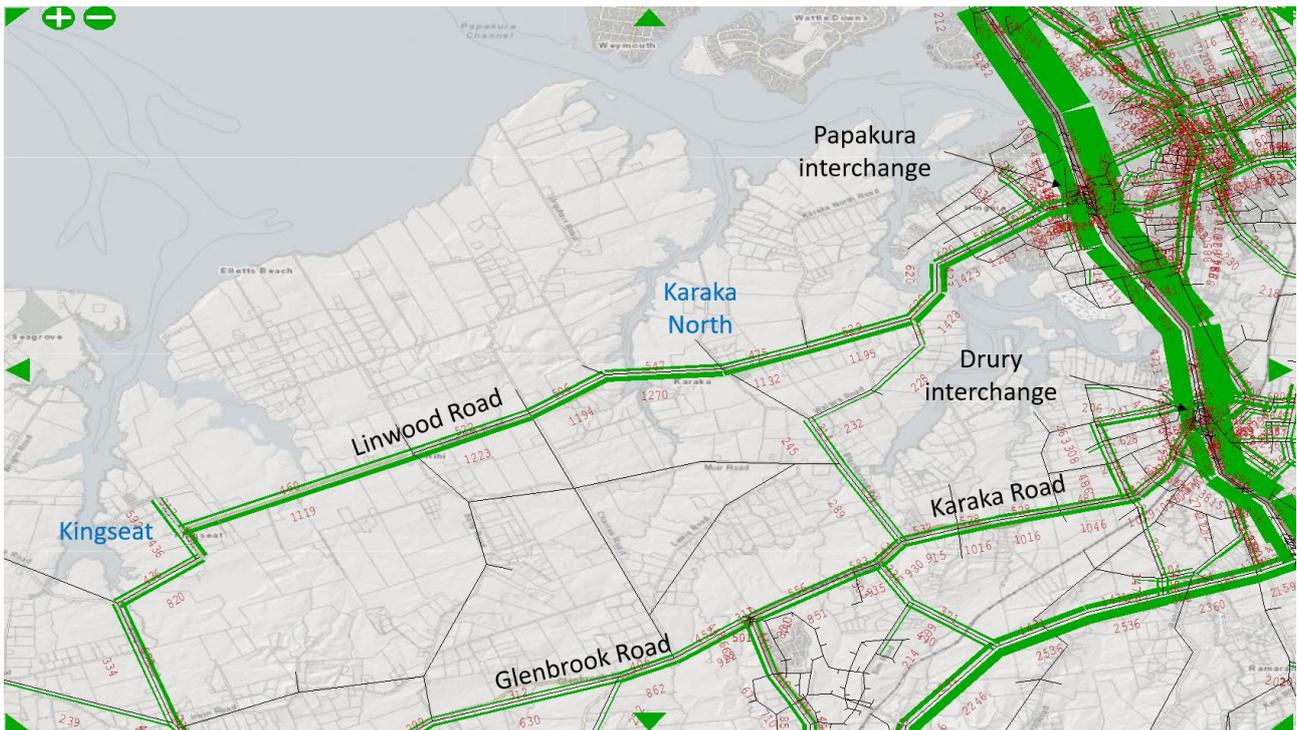
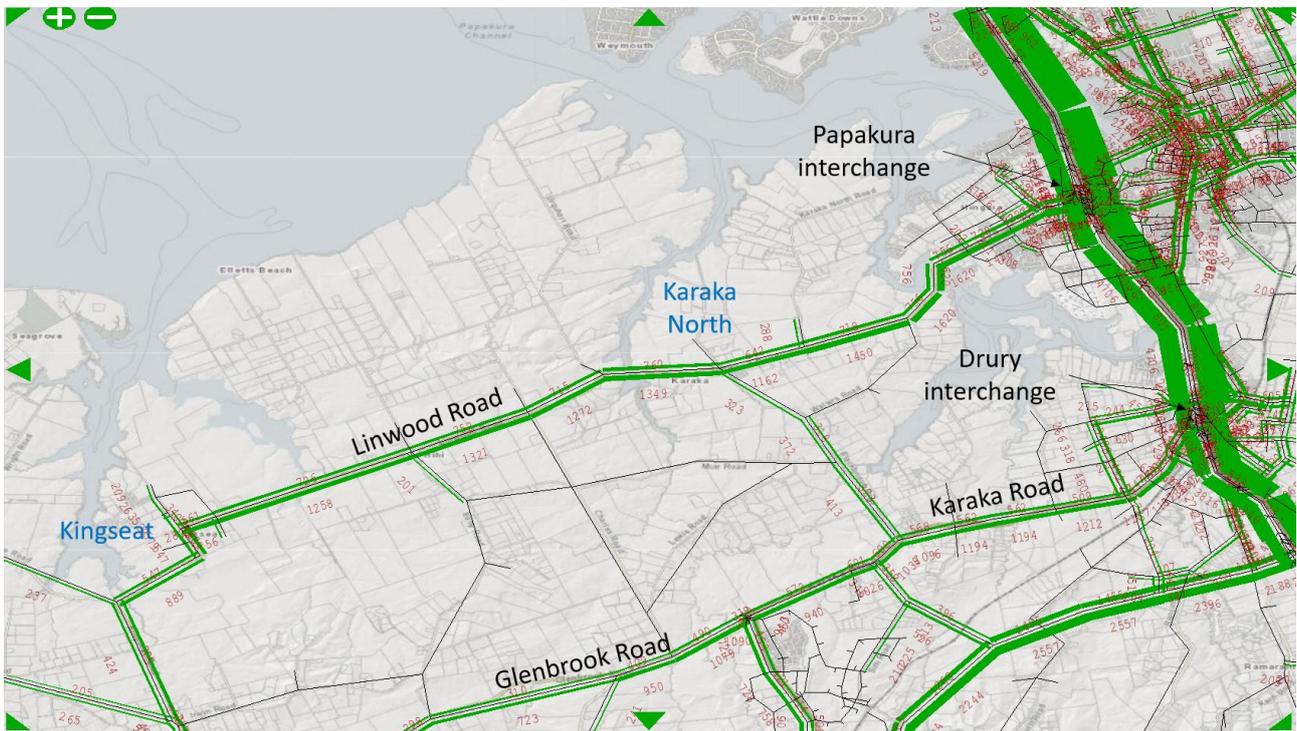


Figure 10: 2038 pm peak hour forecast traffic volumes – anticipated land use



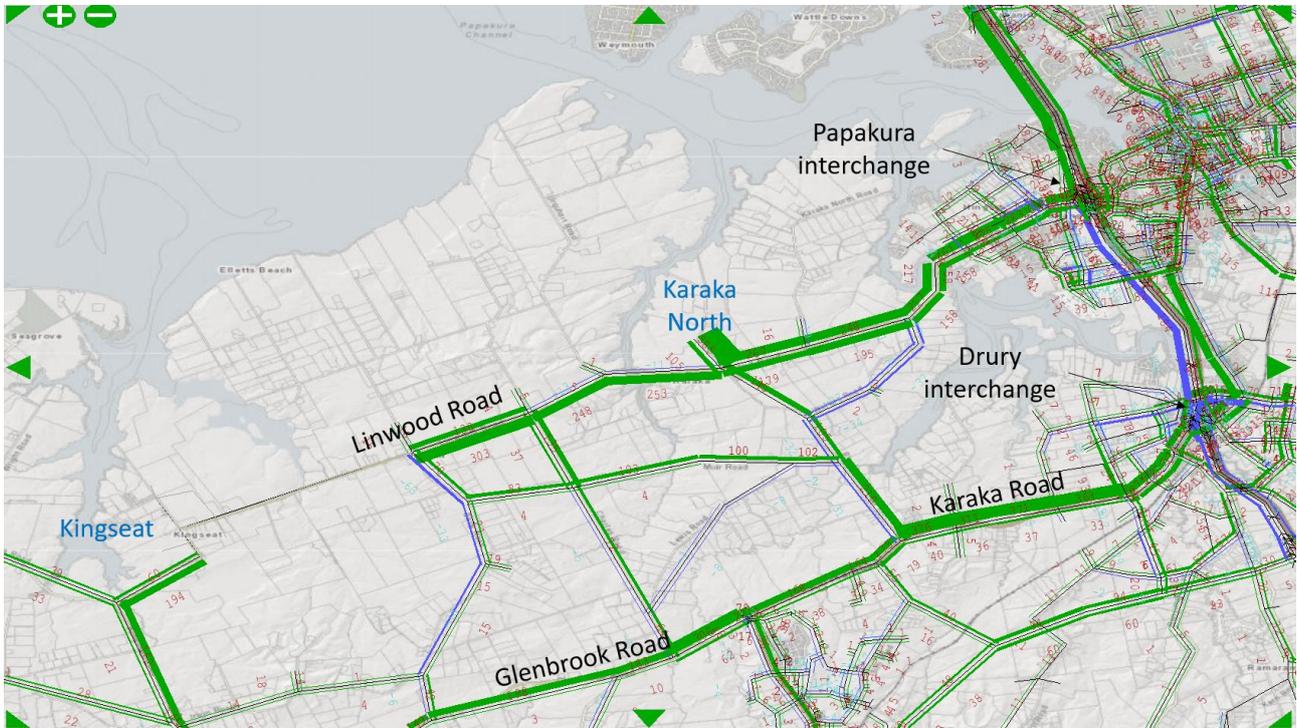
## 7.2 Traffic volume difference plots

Figure 11 and Figure 12 below show the differences in predicted traffic flows, when comparing the two land use forecasts. In latter plots, traffic volumes that are higher in the anticipated land use scenario are presented as green bands, while traffic volumes that are higher in the I11v5 scenario are shown as blue

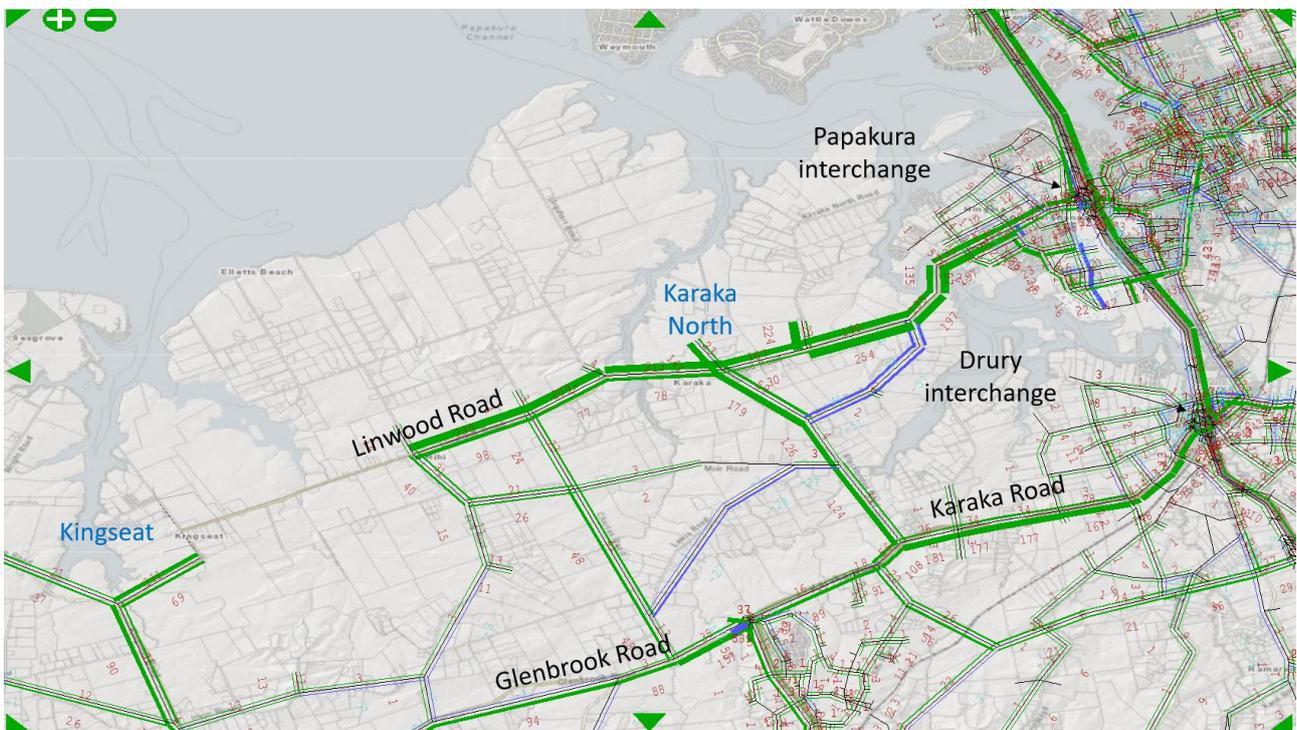
bands. The latter generally occurs where increased traffic under the anticipated land use scenario is predicted to result in increased congestion, pushing some traffic onto alternative routes.

Higher resolution plots are included in Appendix A.

**Figure 11: 2038 am peak hour forecast traffic volume difference – I11v5 vs anticipated land use**



**Figure 12: 2038 pm peak hour forecast traffic volume difference – I11v5 vs anticipated land use**



During peak hours, increases in traffic on Linwood Road of up to 300 vehicles per hour per direction are predicted. Increases are also predicted on Glenbrook Road and Karaka Road (the current SH22) of up to 400 vehicles per hour per direction.

### 7.3 Volume over capacity (Congestion) plots

Figure 13 to Figure 16 below show volume over capacity plots for each peak hour and each forecast scenario. Volume over capacity ratios are a measure of traffic flows on each link, relative to the capacity on that link. Volume over capacity ratios above 100% represent links where demand for travel exceeds the theoretical capacity, resulting in queuing and congestion. These links are **shown black** in the below plots.

In practice however, links tend to reach congested conditions at around 85% of their theoretical capacity. Links predicted to operate at between 85% and 100% of capacity are **shown red** in the below plots. Links nearing this, at 70% to 85% capacity, are shown **orange**.

Higher resolution plots are included in Appendix A.

Figure 13: 2038 am peak hour forecast volume to capacity plot – I11v5 land use

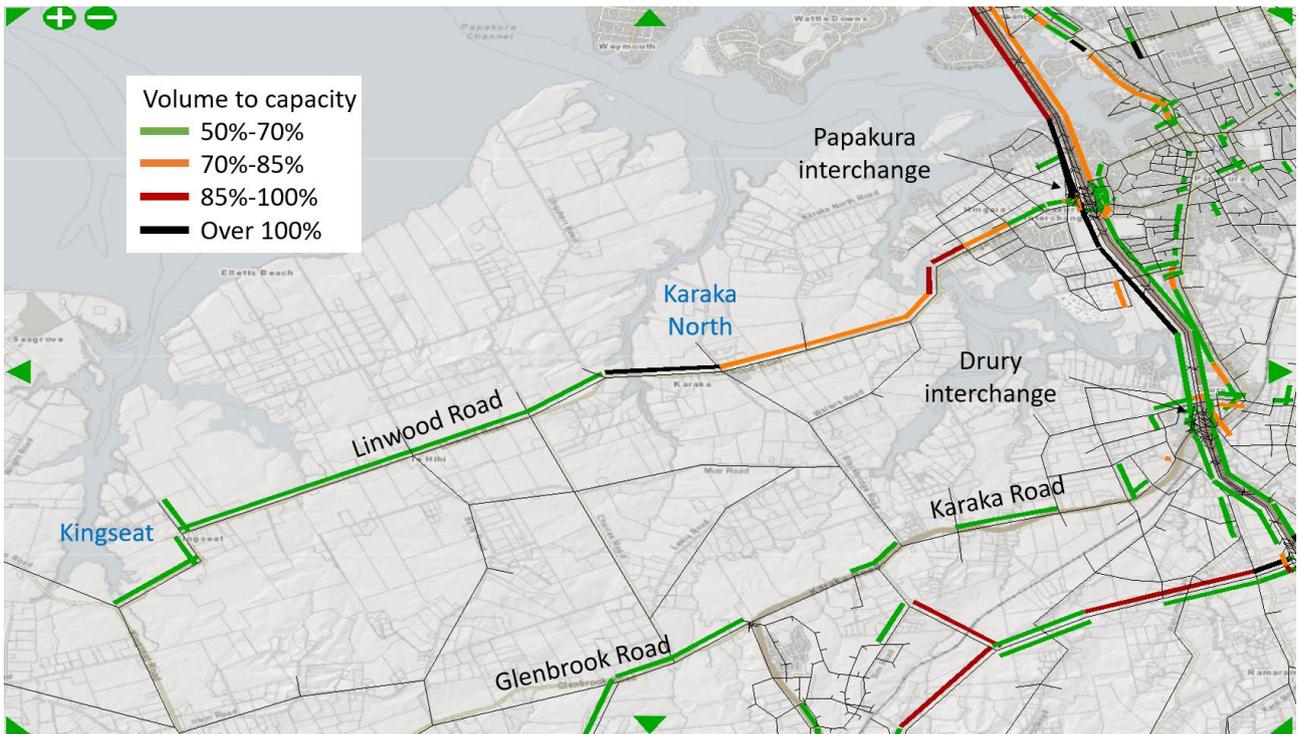


Figure 14: 2038 am peak hour forecast volume to capacity plot – anticipated land use

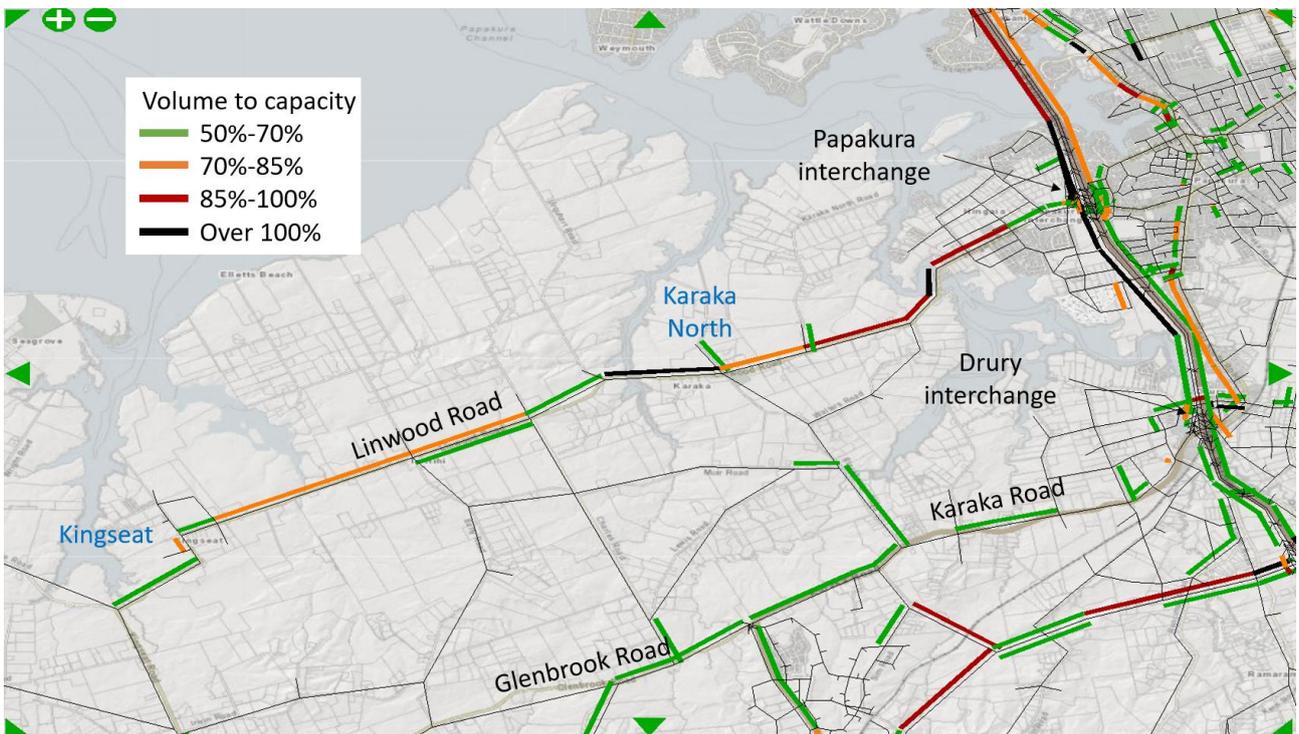


Figure 15: 2038 pm peak hour forecast volume to capacity plot – I11v5 land use

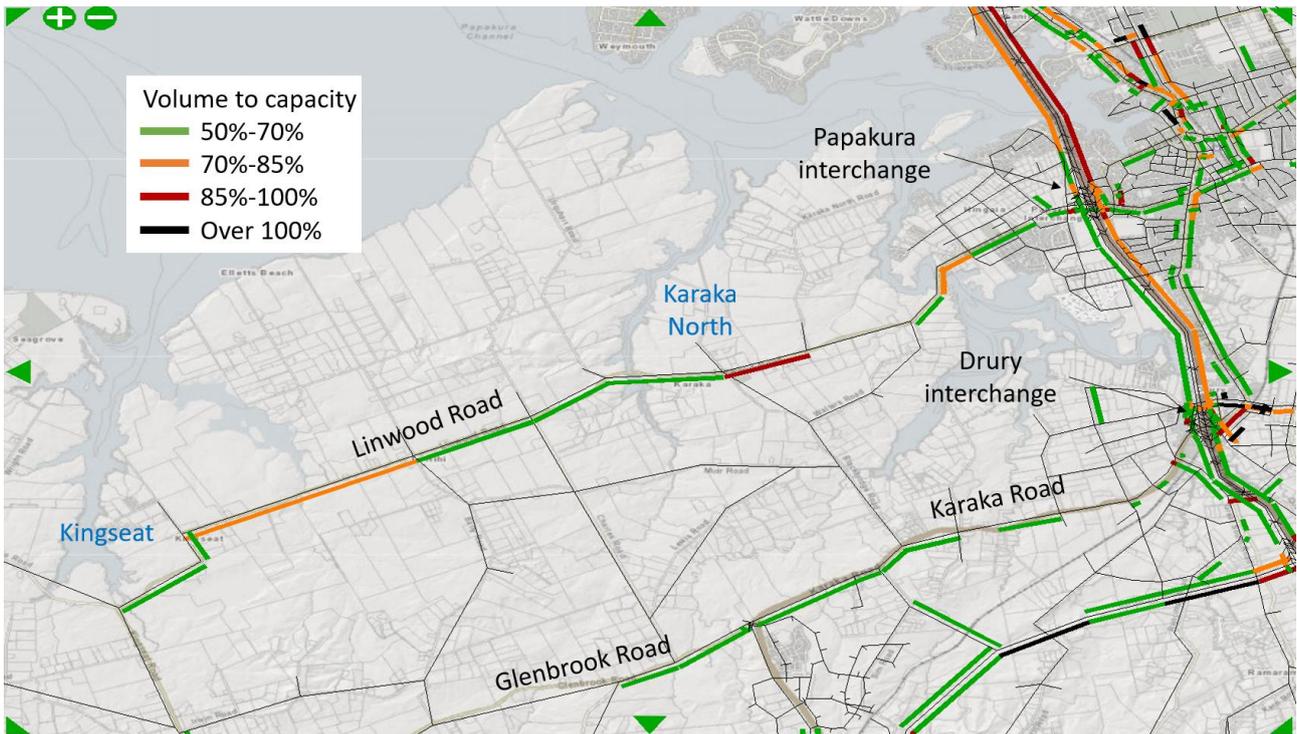
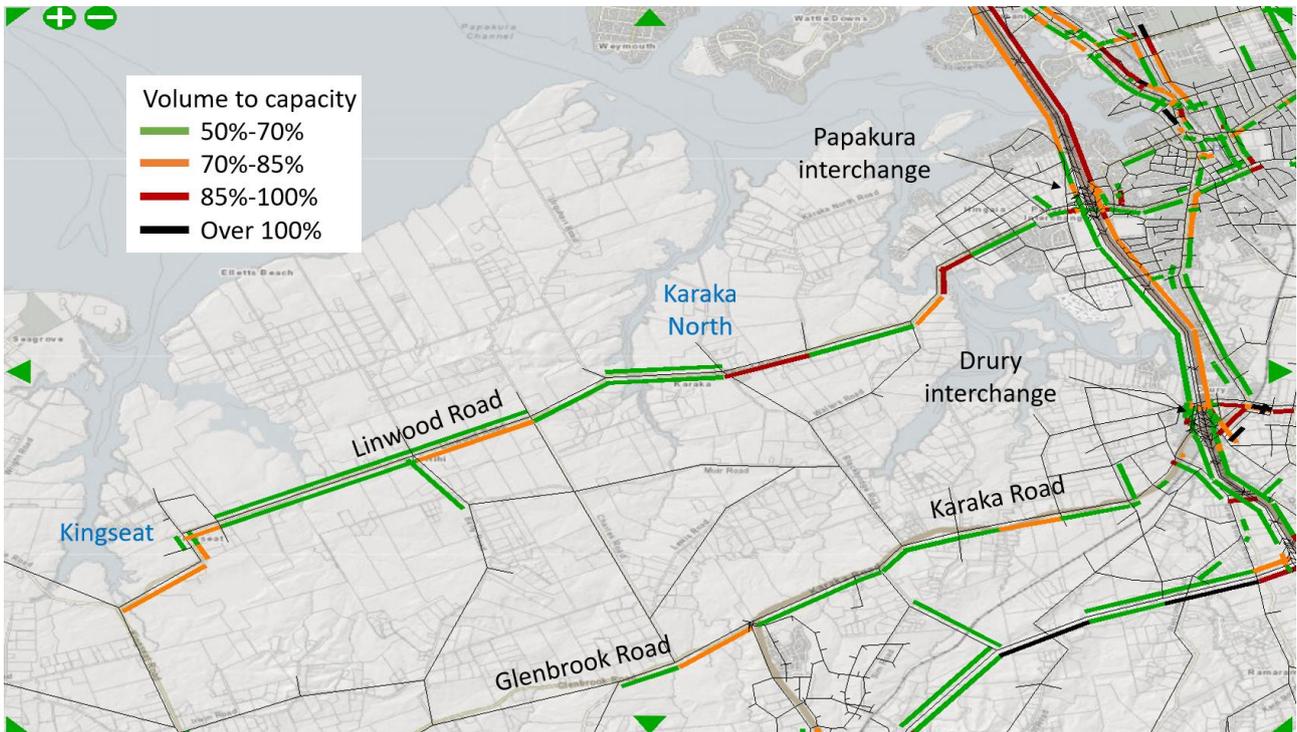


Figure 16: 2038 pm peak hour forecast volume to capacity plot – anticipated land use



With the default, I11v5 land use scenario, Linwood Road is predicted to operate with congested conditions eastbound, during the morning peak on the approach to Blackbridge Road, and then again across the Hingaia Bridge and into Hingaia. The additional development now anticipated is predicted to exacerbate this congestion.

In the evening peak, westbound congestion is predicted on several sections of Linwood Road, including at Hingaia Bridge. The additional land use now anticipated is predicted to exacerbate this, and to cause westbound congestion on Karaka Road.

## 7.4 Delay plots

Figure 17 to Figure 20 below show delay plots for each peak hour and each forecast scenario. The plots show the predicted delays at modelled intersections, focusing on the intersections around Papakura interchange. Predicted delays are colour coded to show:

- ♦ intersection delays under 35 seconds in **green** (Level of Service A to C, which generally represents uncongested conditions)
- ♦ intersection delays between 35 and 55 seconds in **orange** (Level of Service D, which generally conditions approach congested)
- ♦ intersection delays between 55 and 80 seconds in **red** (Level of Service E, which generally represents congested conditions)
- ♦ intersection delays over 80 seconds in **black** (Level of Service F, which generally represents very congested conditions)

Higher resolution plots are included in Appendix A.

Figure 17: 2038 am peak hour forecast delay plot – I11v5 land use

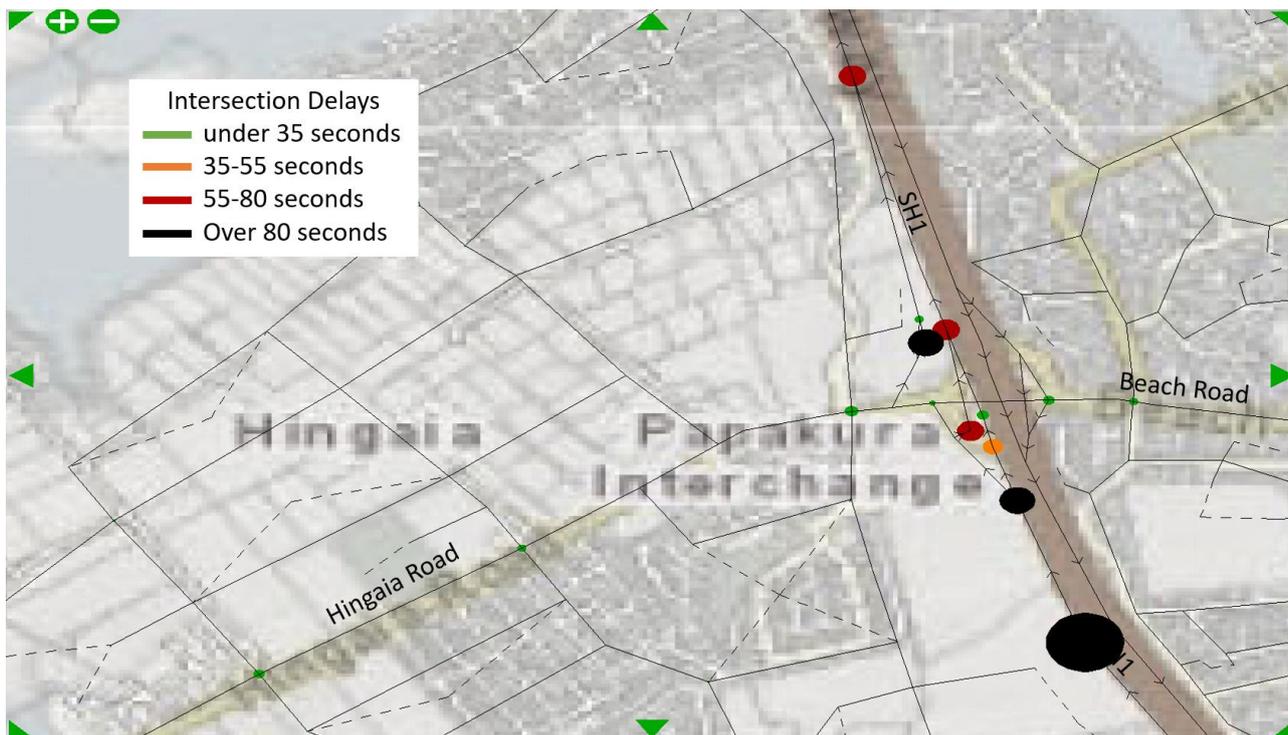
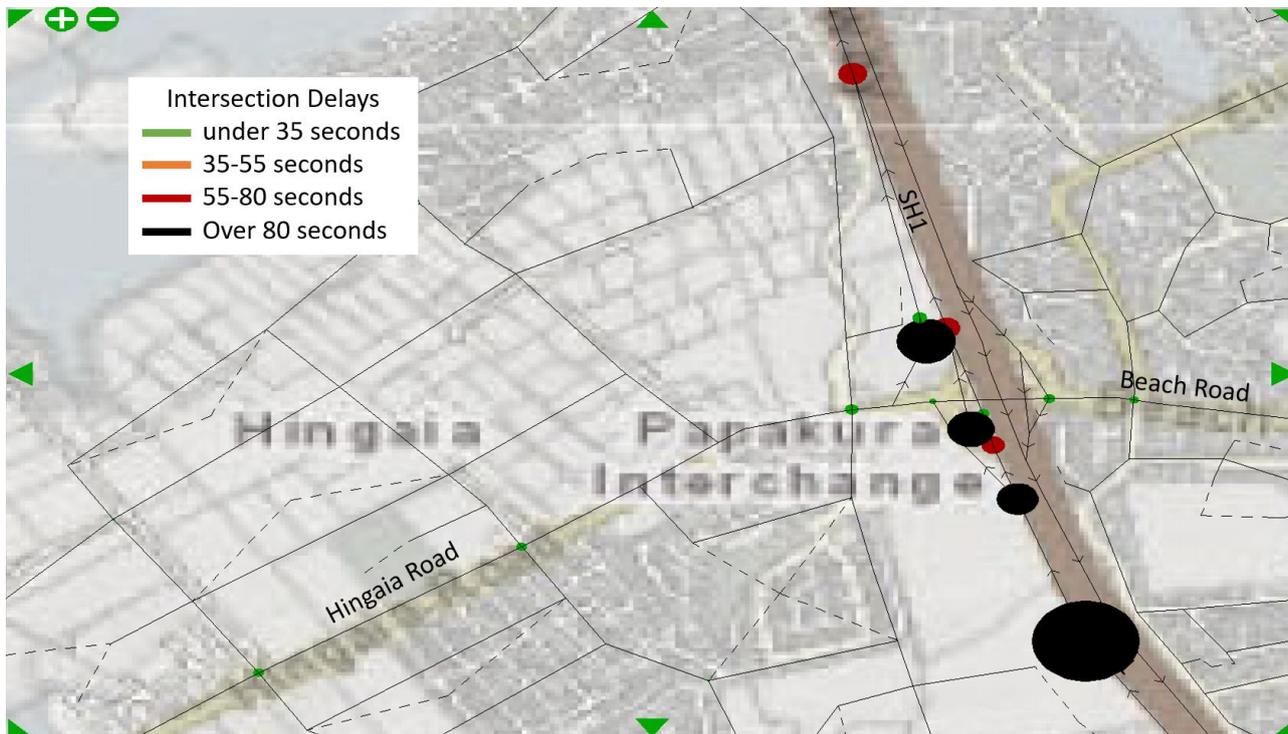


Figure 18: 2038 am peak hour forecast delay plot – anticipated land use



During the morning peak hour, and with the default i11v5 land use scenario, northbound delays are predicted on SH1, and at the SH1 northbound on-ramp meters and on-ramp merges. With the additional land use now anticipated, these delays are predicted to increase.

No significant delays are predicted at the Beach Road intersections within or adjacent to the Papakura Interchange. In practice however, queues extending back from the northbound on-ramps will likely

extend back to Beach Road during peak times, blocking some approach lanes to these intersections and causing larger delays than those shown in Figure 17 and Figure 18. These queues and delays may affect traffic on both Beach Road and Hingaia Road, however we are unable to provide any more certainty due to the limitations of the model. However it is clear that the increased land use now anticipated will exacerbate these delays, and increase the risk of further effects.

Figure 19: 2038 pm peak hour forecast delay plot – I11v5 land use

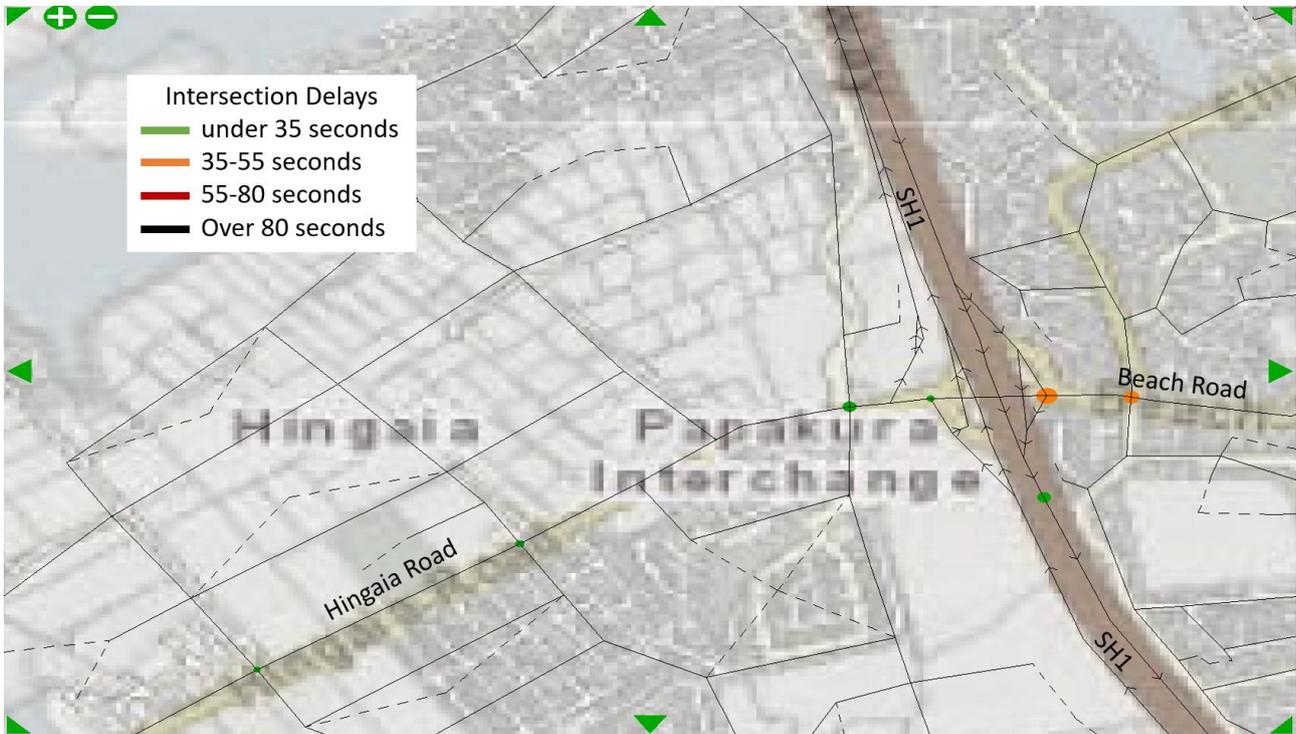
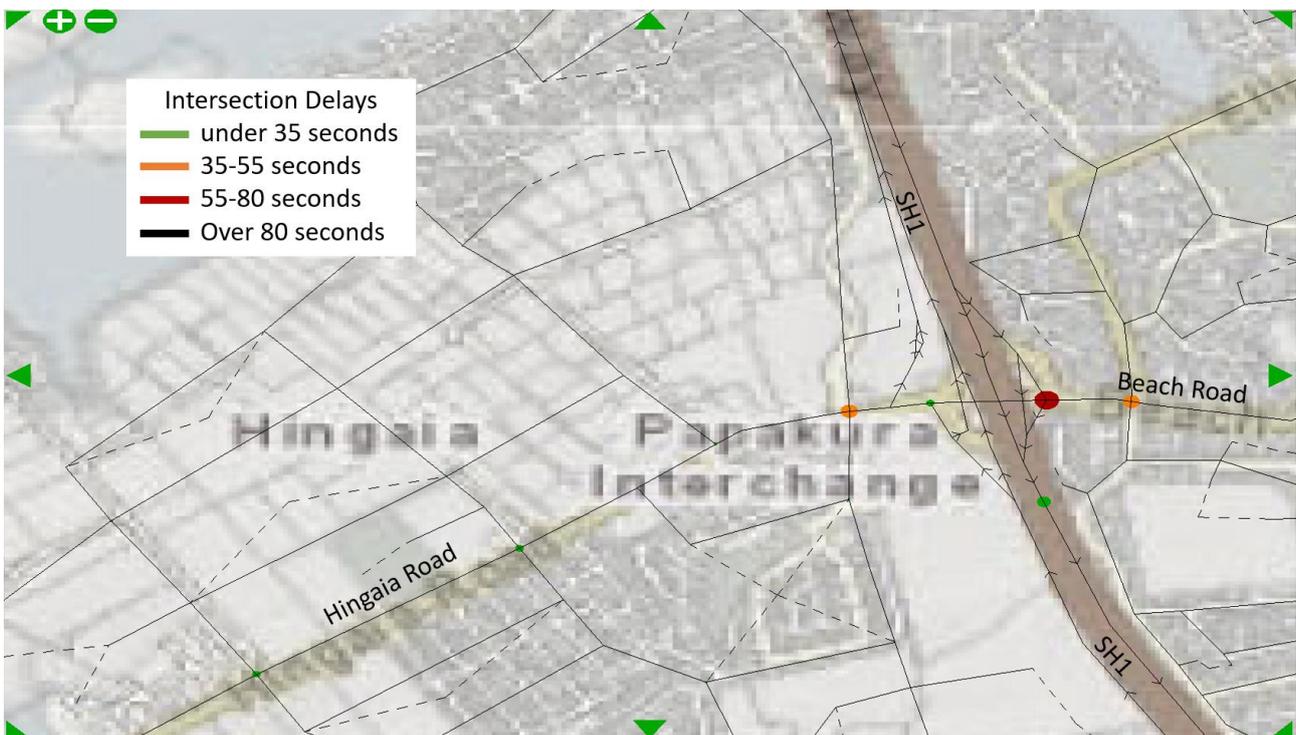


Figure 20: 2038 pm peak hour forecast delay plot – anticipated land use



During the evening peak hour, and with the default i11v5 land use scenario, only relatively modest delays are predicted at the intersection of the southbound off-ramp and Beach Road. With the additional land use now anticipated, these delays are predicted to increase, but not significantly so.

## 8 AUCKLAND TRANSPORT FEEDBACK

Feedback received from Auckland Transport<sup>3</sup>, and our responses, are provided in Appendix B. In summary we consider that matters raised by Auckland Transport have been addressed in Revision B of this report.

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<sup>3</sup> Email from [Liam.Burkhardt@at.govt.nz](mailto:Liam.Burkhardt@at.govt.nz), Subject: RE: Kingseat and Karaka North Wider Assessment, sent Friday, 8 October 2021 2:53 pm

## 9 CONCLUSIONS

We have reviewed the development proposals within the wider Kingseat area and compared these to the land use forecasts used to develop Auckland Transport's SATURN traffic model for the southern area (the S3M). Our comparison has found that

In Karaka North

- ◆ actual land use growth has not been accounted for in the regional land use projections, being some 900 households light
- ◆ as a result, we estimate that the currently anticipated development will result in up to 400 more vehicle trips to/from/within Karaka North than what has been included in the 2038 S3M traffic model to date. The increase is in the order of 170%.

And in Kingseat

- ◆ land use is fairly consistent with the regional projections (2,430 projected households in 2048 vs 2,585 households proposed), with this being higher than the original Kingseat ITA which projected 1,835 households
- ◆ nonetheless, we estimate that the currently anticipated development will result in up to 700 more vehicle trips to/from/within Kingseat than what has been included in the 2038 S3M traffic model to date. The increase is up to 85%.

We have added the extra development vehicle trips to the S3M traffic model, to identify what effects these vehicle trips are predicted to have on the transport network. We anticipate the following outcomes in 2038

- ◆ increases in peak period traffic volumes on Linwood Road of up to 300 vehicles per hour, per direction. Increases are also predicted on other routes, such as Glenbrook Road/Karaka Road
- ◆ increased pressure on both Papakura and Drury interchanges
- ◆ the S3M predicts that, even without the anticipated development, sections of Linwood Road and Hingaia Road would operate with congested conditions during peak periods, with both eastbound morning peak and westbound evening peak traffic flows at practical capacity. With the additional land use development now expected, we anticipate that this congestion would worsen during the commuter peak periods. We have not assessed interpeak period, where we expect capacity to exist about the network
- ◆ during the morning peak period, traffic demands on SH1 at the northbound on-ramp merges, and at the northbound on-ramp meters is predicted to exceed capacity. We expect that queuing from the northbound on-ramps will extend back to both Hingaia Road and Beach Road, affecting the operation of both roads. With the additional land use development now expected, we anticipate that these queues would worsen. We're unable to conclude however whether these queues would affect east-west through traffic on this corridor, or affect other upstream intersections, noting that Waka Kotahi have the ability to manage and moderate this traffic through the meter signals

- ◆ during the evening peak period, there is no significant impacts predicted as a result of the currently anticipated land use development. This is because upstream capacity constraints, such as at Manukau, are expected to limit the flow of traffic to Papakura, limiting the local effects of increased car travel to Kingseat and Karaka North

In conclusion, we consider that the currently anticipated land use development will increase the level of morning peak period traffic on both Linwood Road and Hingaia Road, and increase pressure on Papakura interchange. The effects of this increase in traffic have not previously been fully considered, through for example the Supporting Growth programme of work. The implication of this could be varied, as the traffic network only has so much capacity. As such, should traffic demands increase, this may encourage changes in people's travel behaviour about the wider Franklin area. For example, shifting to public transport where routes exist, travelling to park and ride sites, altering the time in which people travel.

Demands for private car travel on the Linwood Road/Hingaia Road corridor are predicted to exceed capacity in the future, as will demand for travel through Papakura interchange. This is to be expected through growth anticipated about the wider South Auckland area. Waka Kotahi will continue their role of managing demand on the motorway network through ramp metering, and prioritising high productivity vehicles through T2/truck lanes at Papakura interchange. However there is little ability to increase the capacity of the general traffic network in this area, so residents living in Kingseat and Karaka North, as well as catchments further west will instead need to be given better choices to 'opt out' of peak period congestion. Options would include

- ◆ Travel Demand Management measures that reduce the need for travel
- ◆ a land use development pattern that provides local destinations, such as local schools, shops and community facilities within Kingseat
- ◆ significantly improved public transport offering, relative to the existing peak direction bus service on Linwood Road. This may include
  - more frequent bus services to Waiuku and Papakura
  - new bus services such as to Drury, and to proposed new train stations at Drury West and Paerata
  - interventions to make the proposed new train stations at Drury West and Paerata more attractive. We understand that these stations will include park and ride facilities that may well attract commutes from Kingseat and Karaka North
- ◆ interventions to prioritise high productivity vehicles, such as transit lanes on Hingaia Road
- ◆ we note that active travel is unlikely to be a realistic option from either Kingseat or Karaka North, due to the distances involved (a minimum of 6 km to the rail network, and 15 km from Kingseat to Papakura) and the high speed, rural roads involved.

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## APPENDIX A

## SATURN plots

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Figure 21: 2038 am peak hour forecast traffic volumes – I11v5 land use

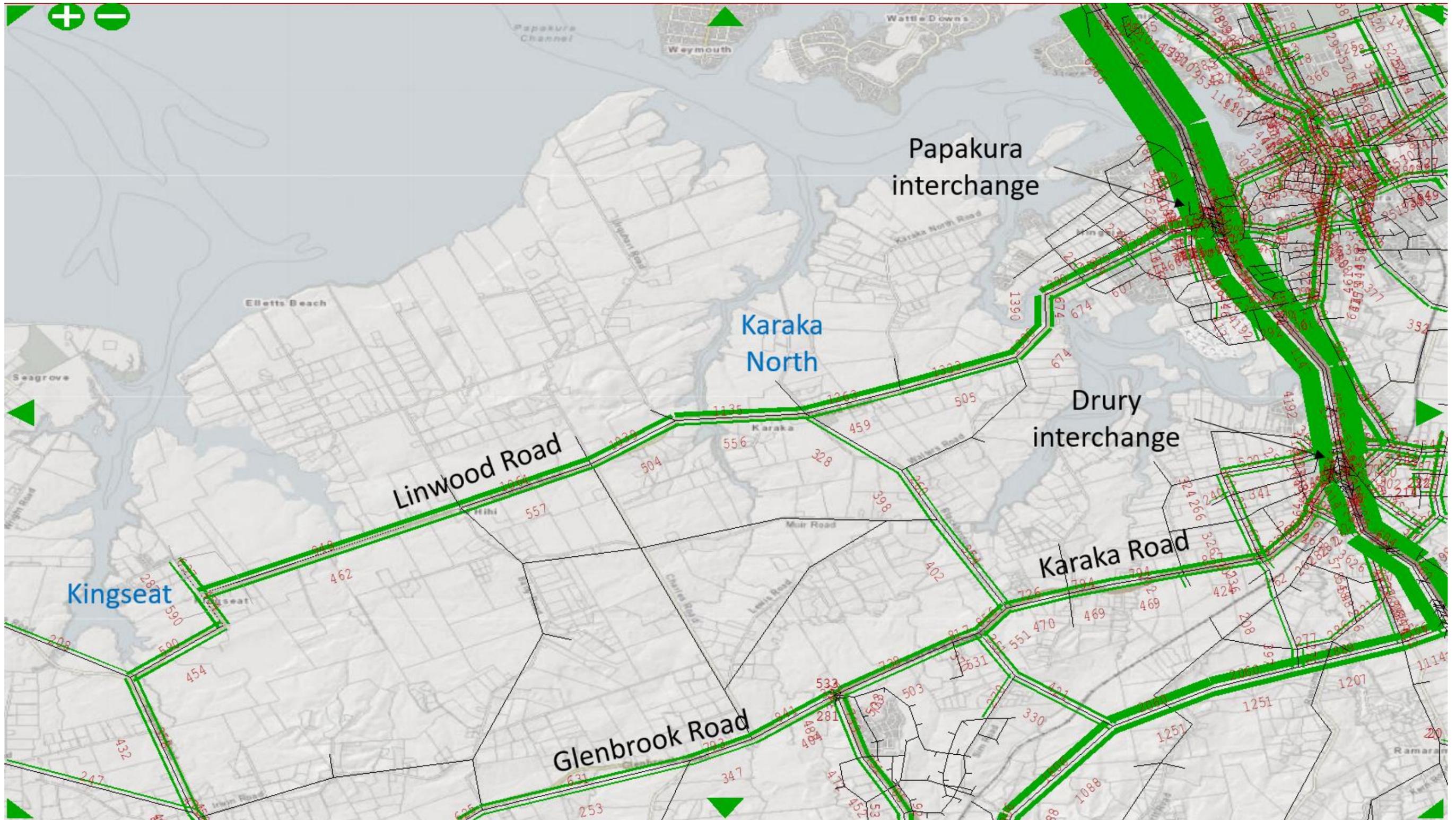


Figure 22: 2038 am peak hour forecast traffic volumes – anticipated land use

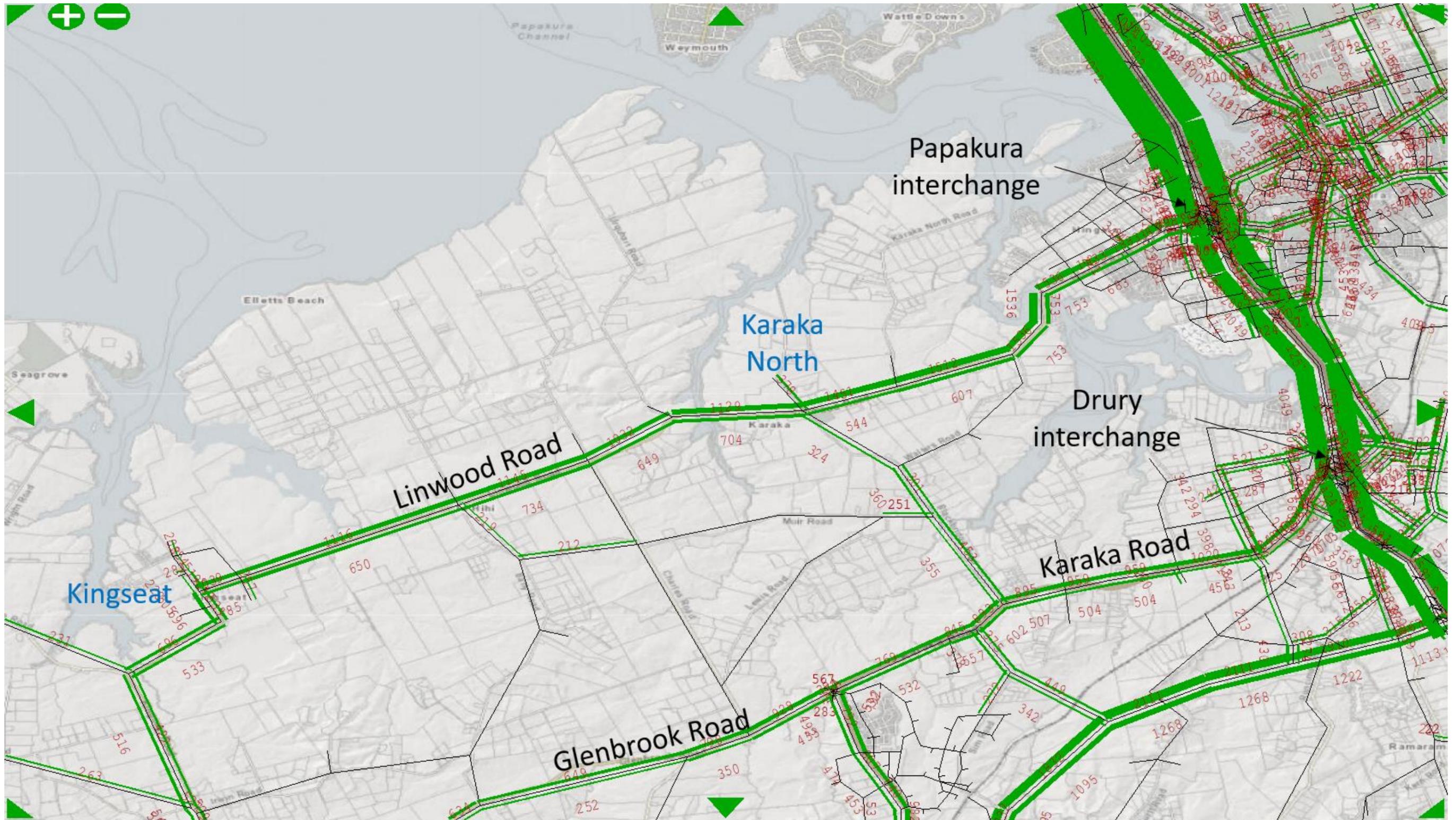


Figure 23: 2038 am peak hour forecast traffic volume difference – I11v5 vs anticipated land use

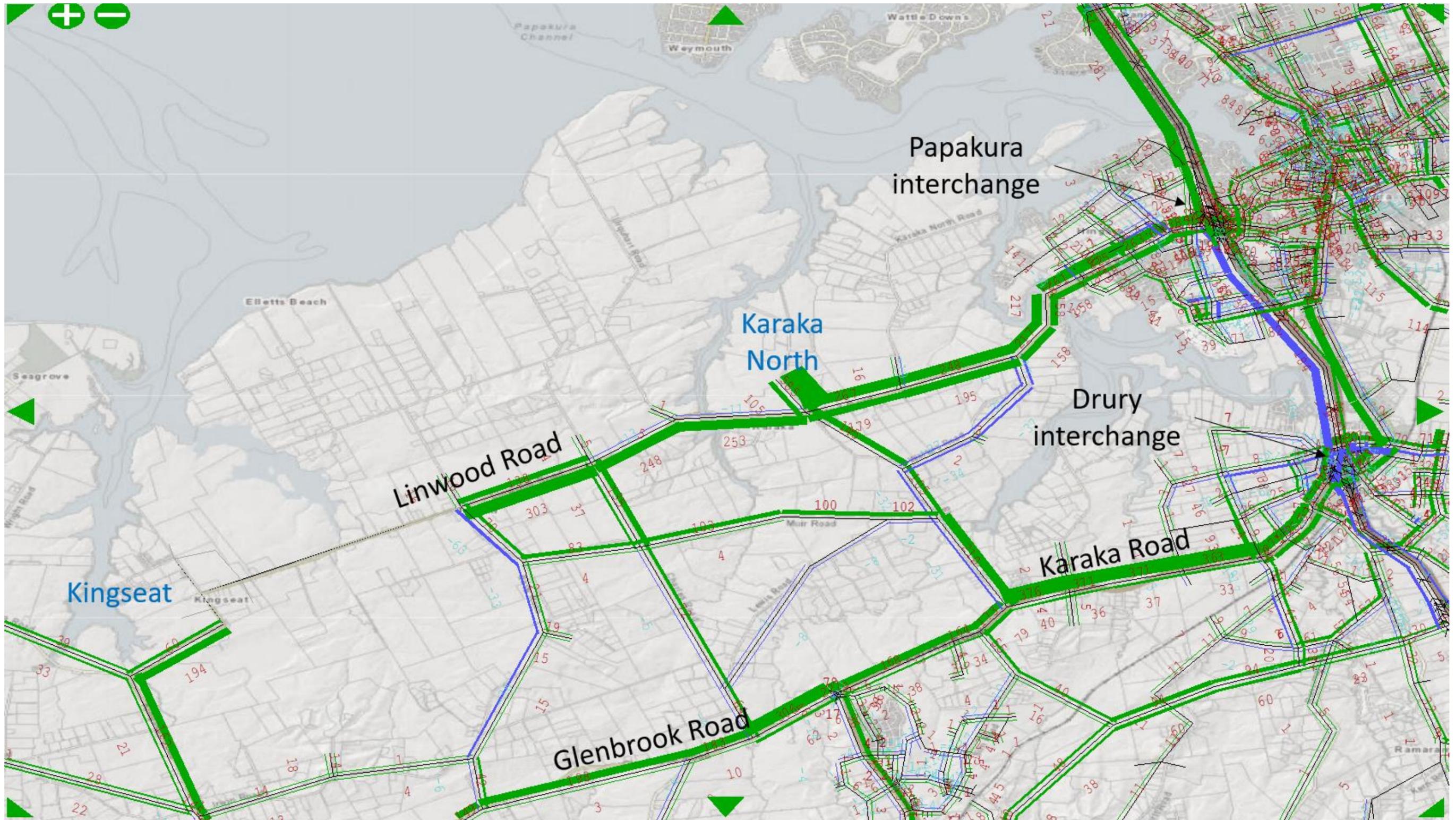


Figure 24: 2038 pm peak hour forecast traffic volumes – I11v5 land use

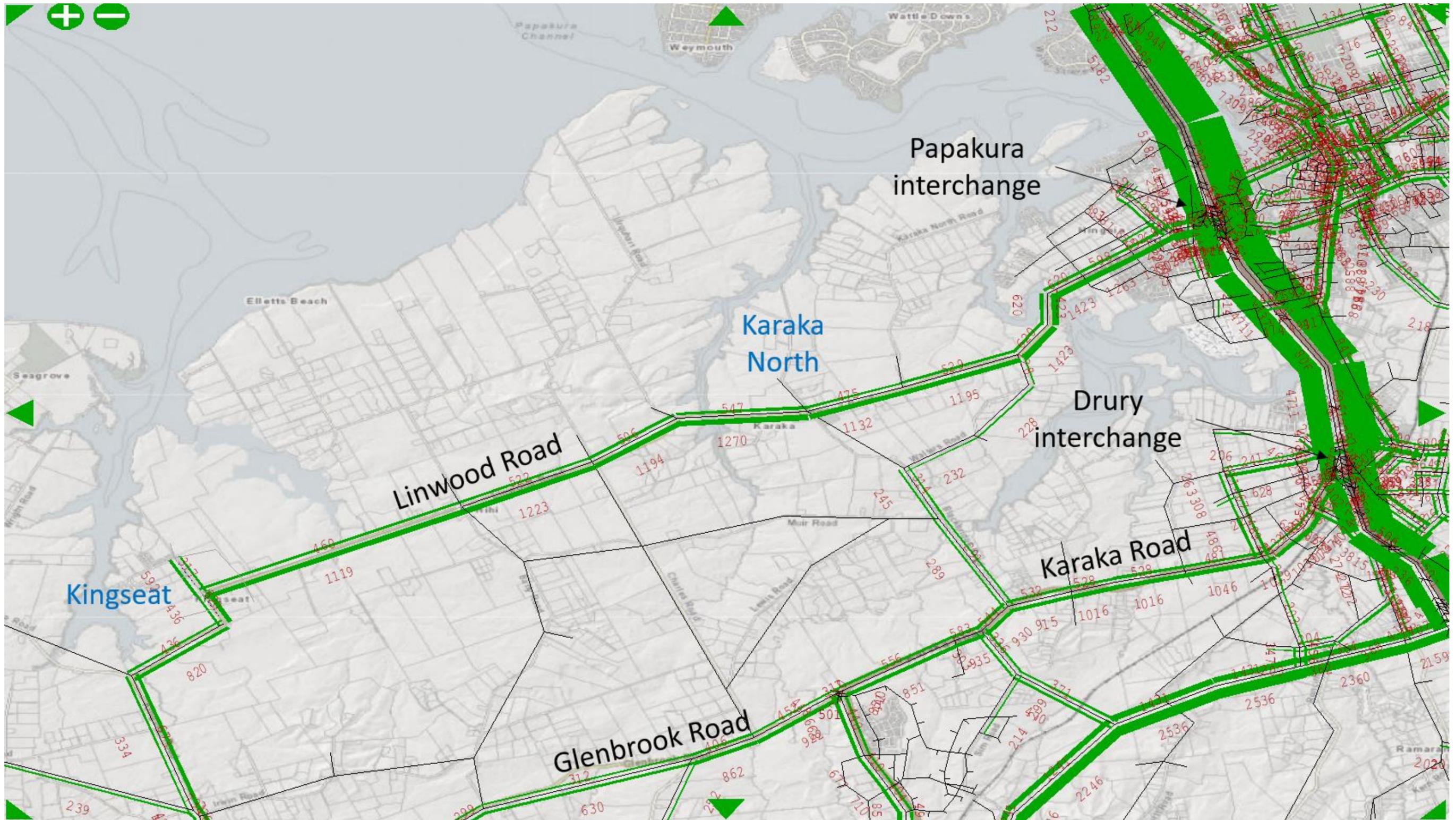


Figure 25: 2038 pm peak hour forecast traffic volumes – anticipated land use

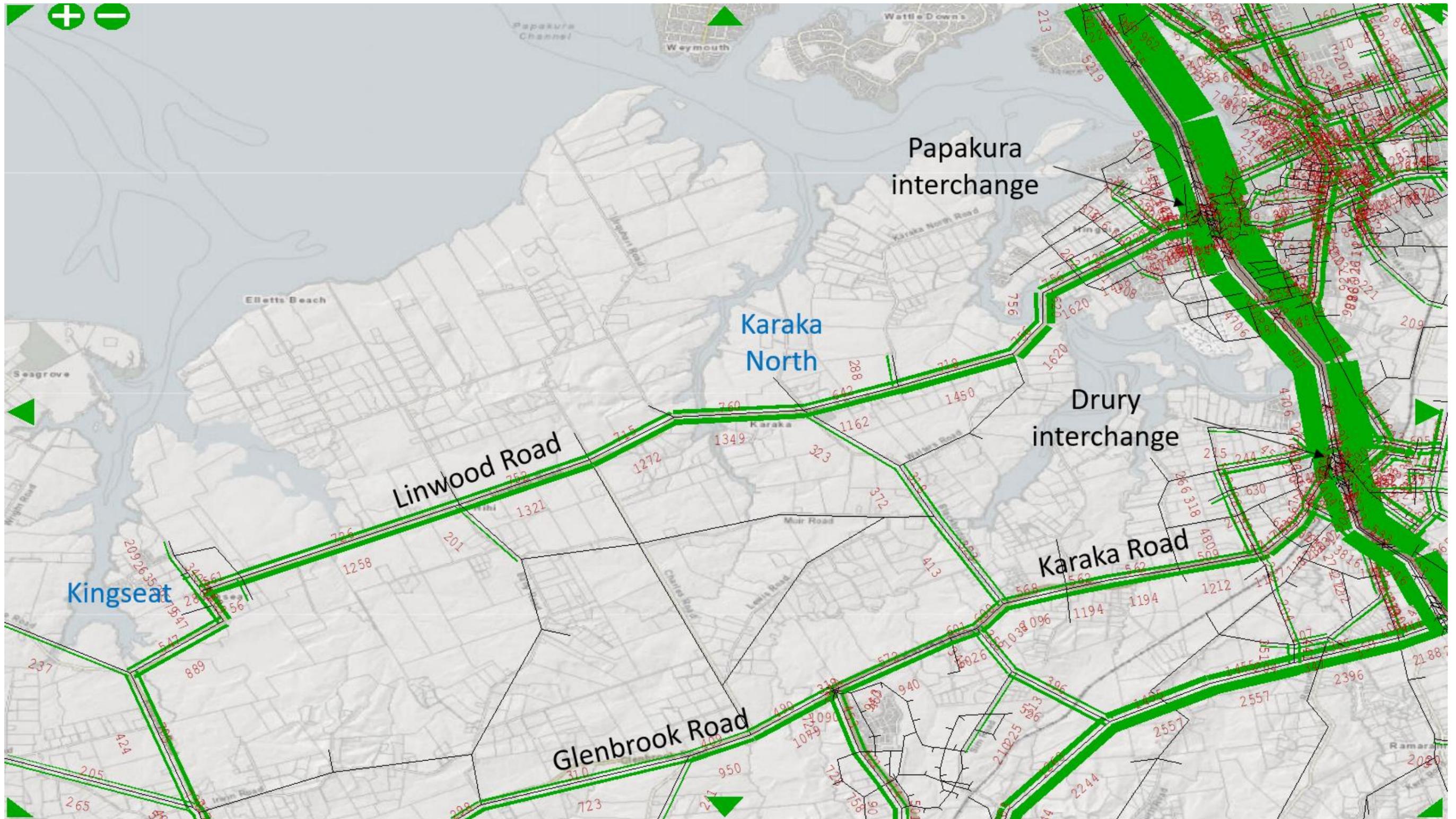


Figure 26: 2038 pm peak hour forecast traffic volume difference – I11v5 vs anticipated land use

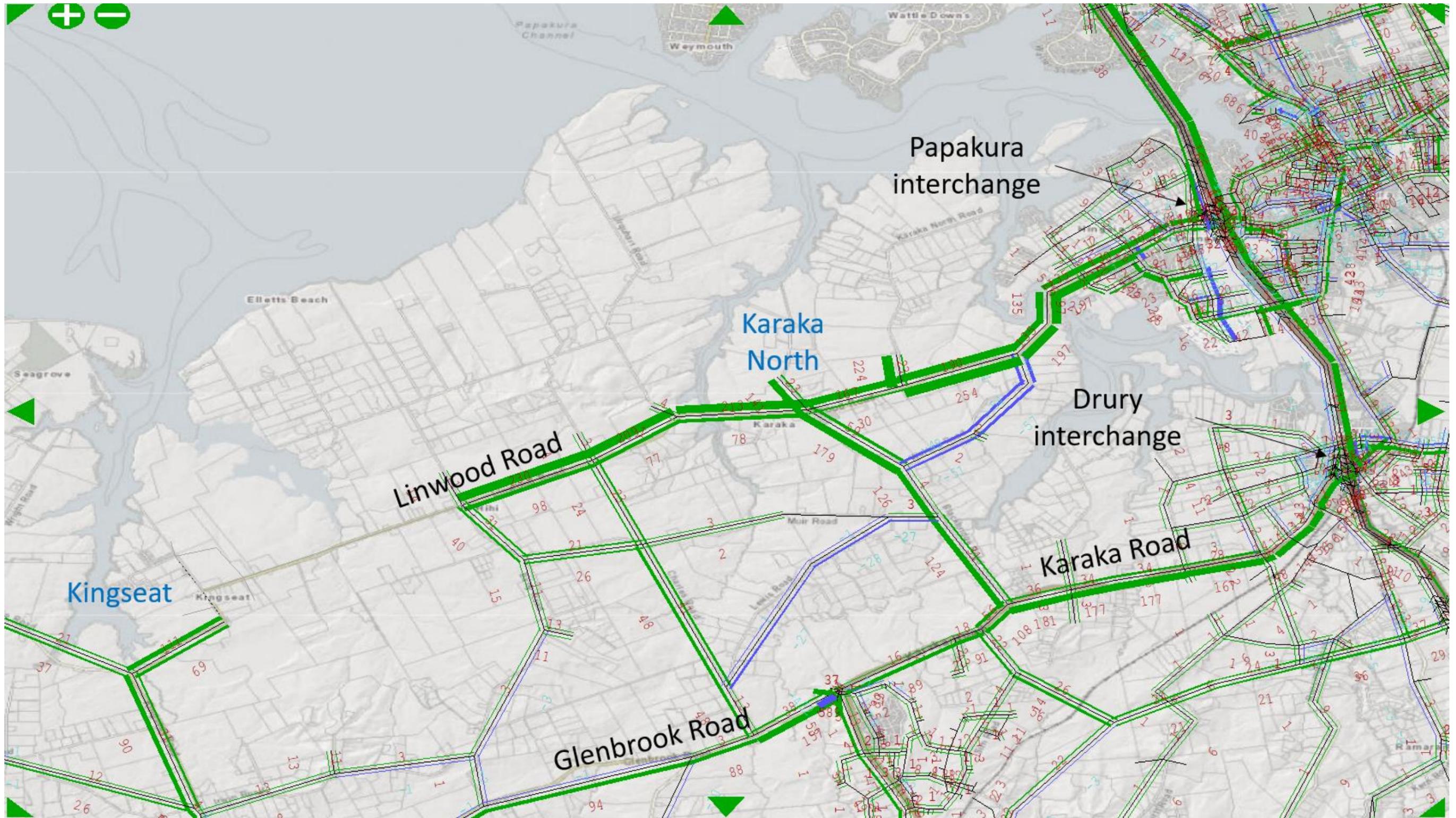


Figure 27: 2038 am peak hour forecast volume to capacity plot – I11v5 land use

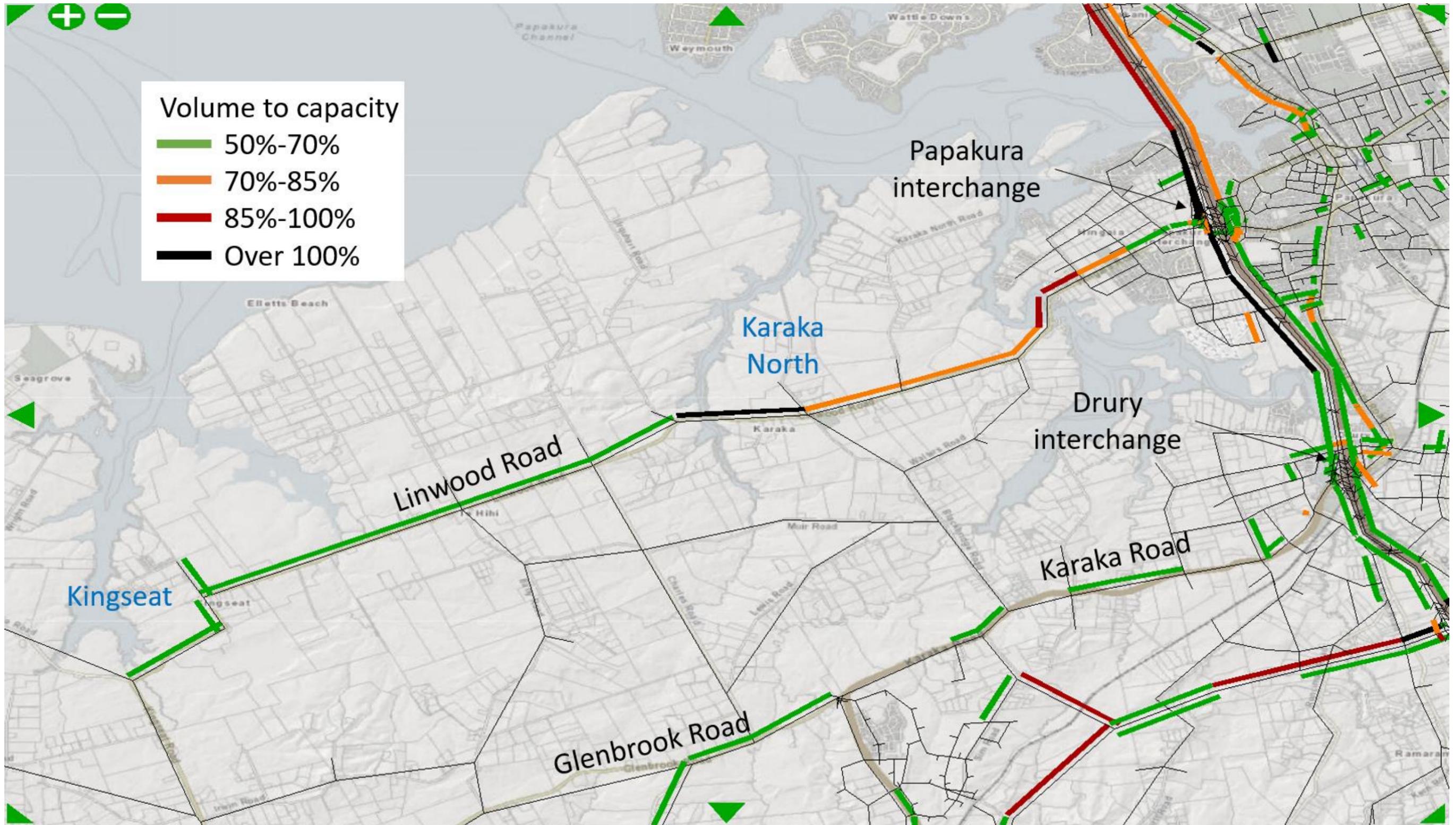


Figure 28: 2038 am peak hour forecast volume to capacity plot – anticipated land use

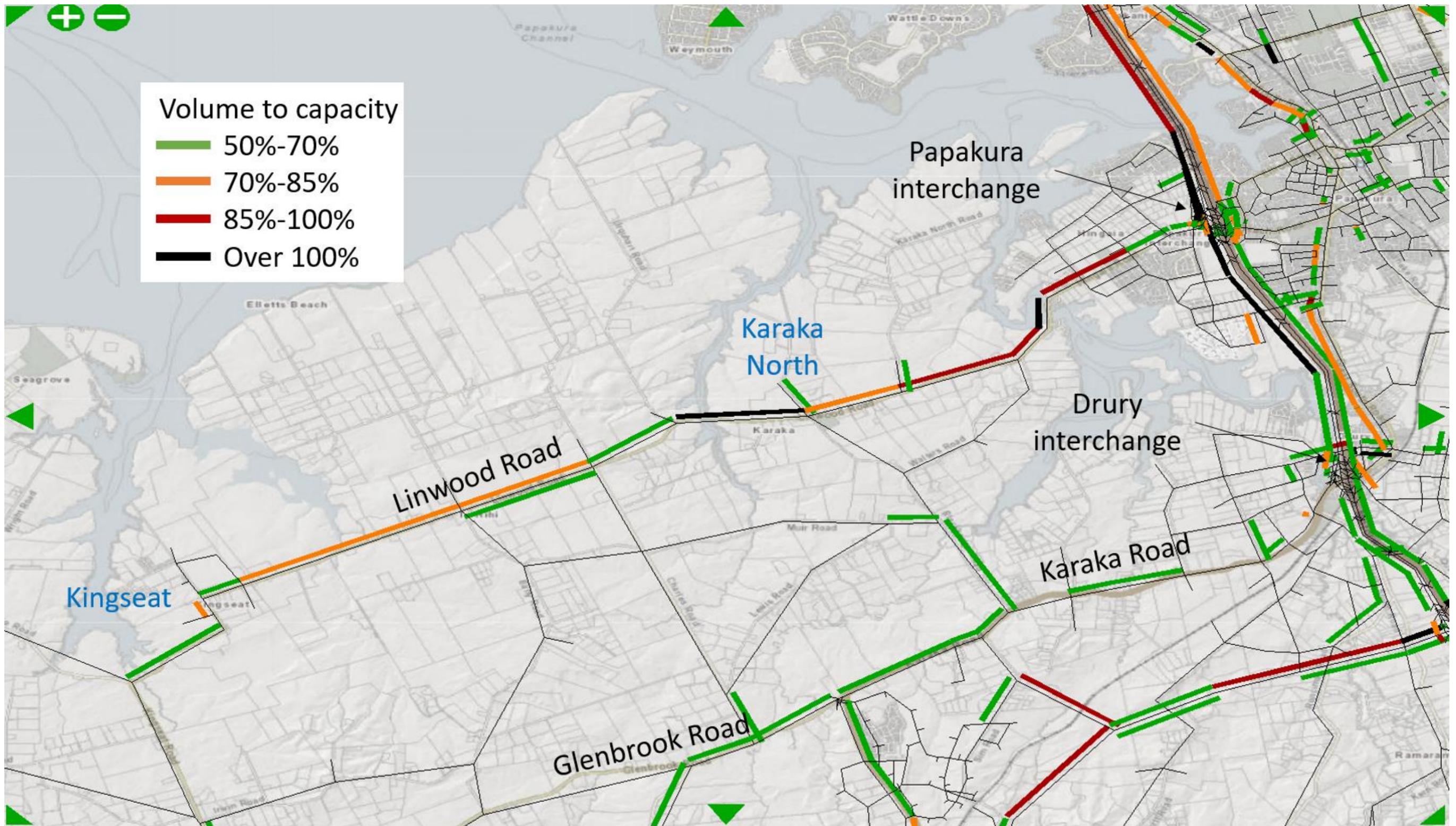


Figure 29: 2038 pm peak hour forecast volume to capacity plot – I11v5 land use

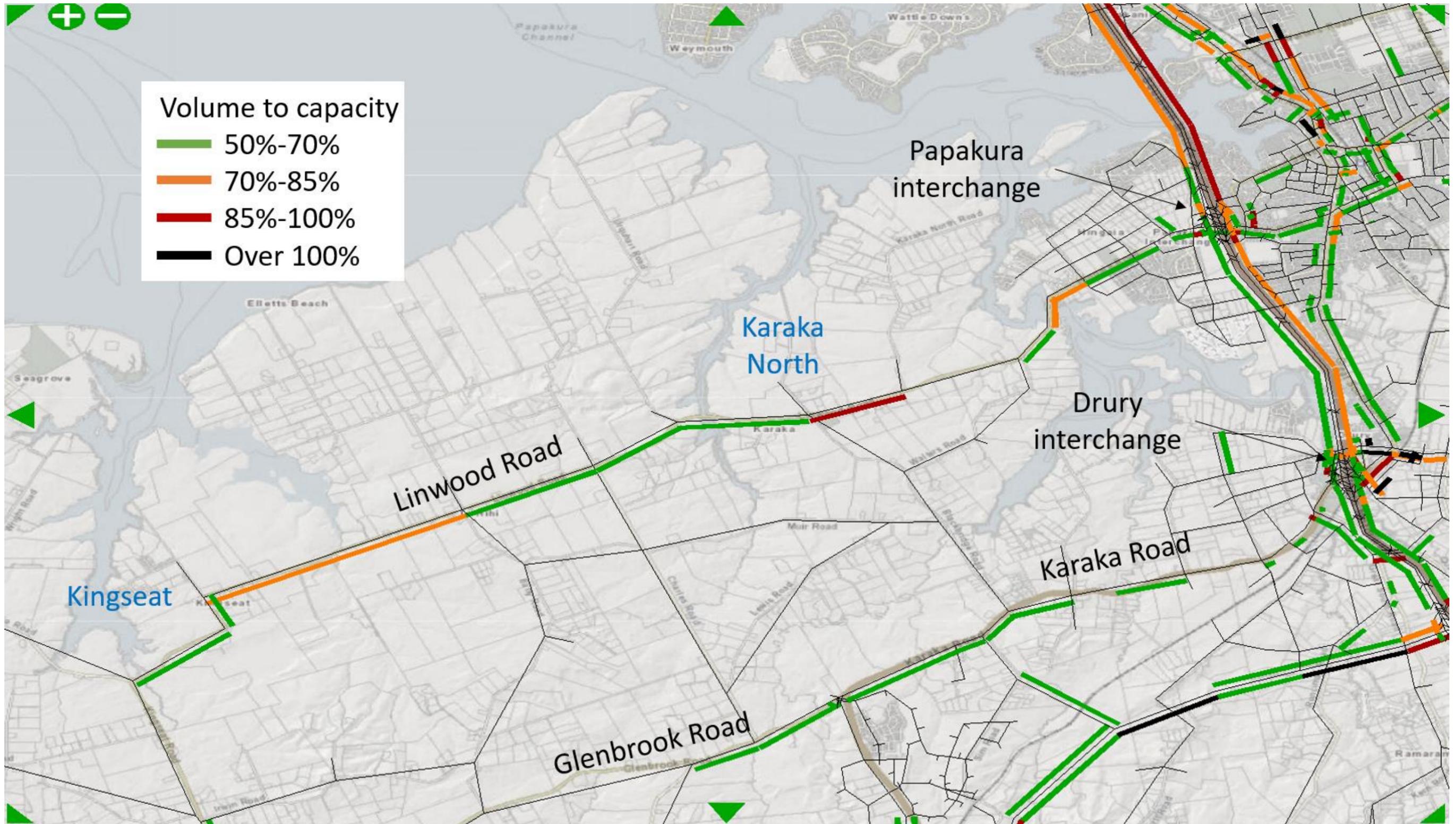




Figure 31: 2038 am peak hour forecast delay plot – I11v5 land use

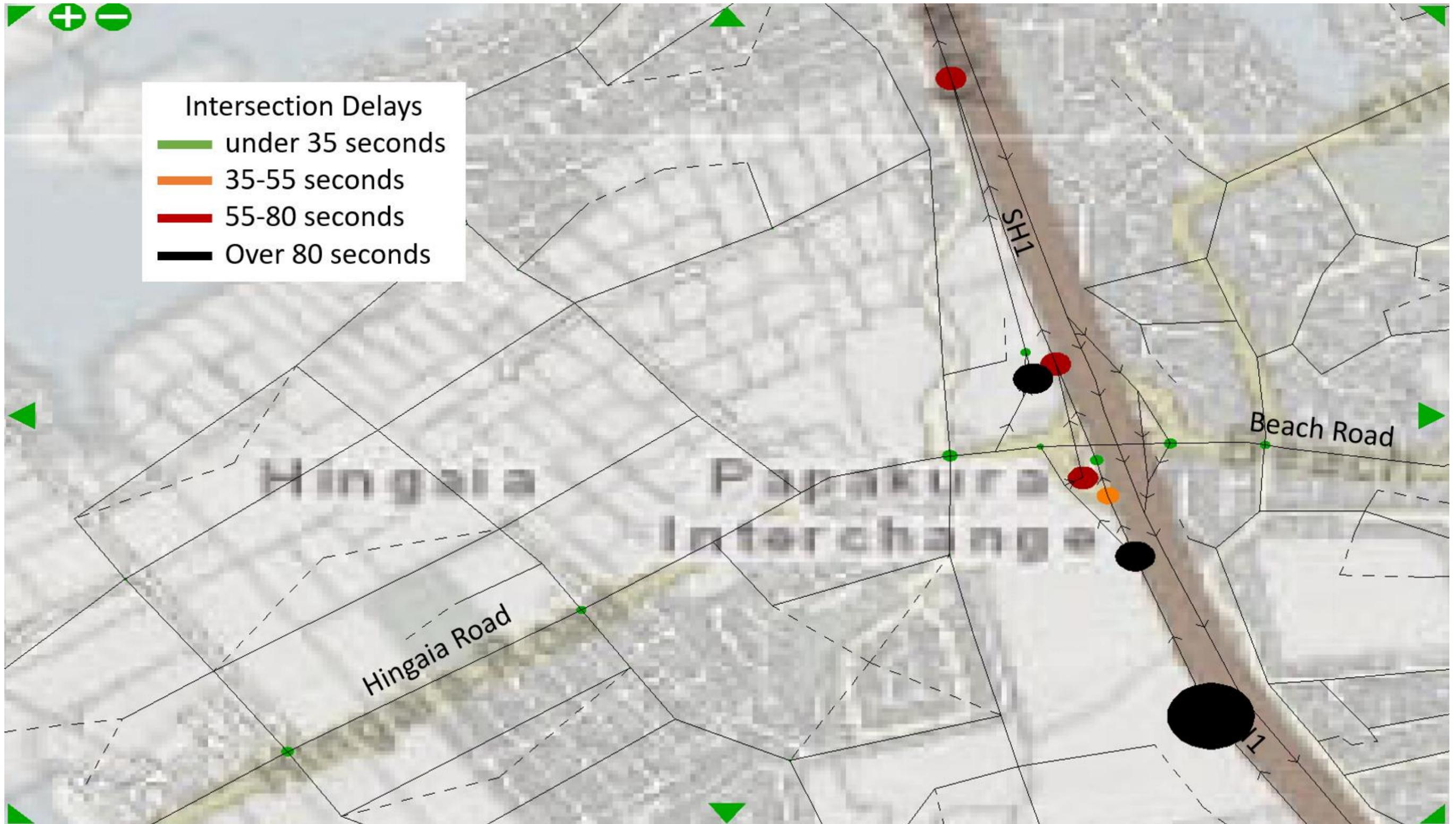


Figure 32: 2038 am peak hour forecast delay plot – anticipated land use

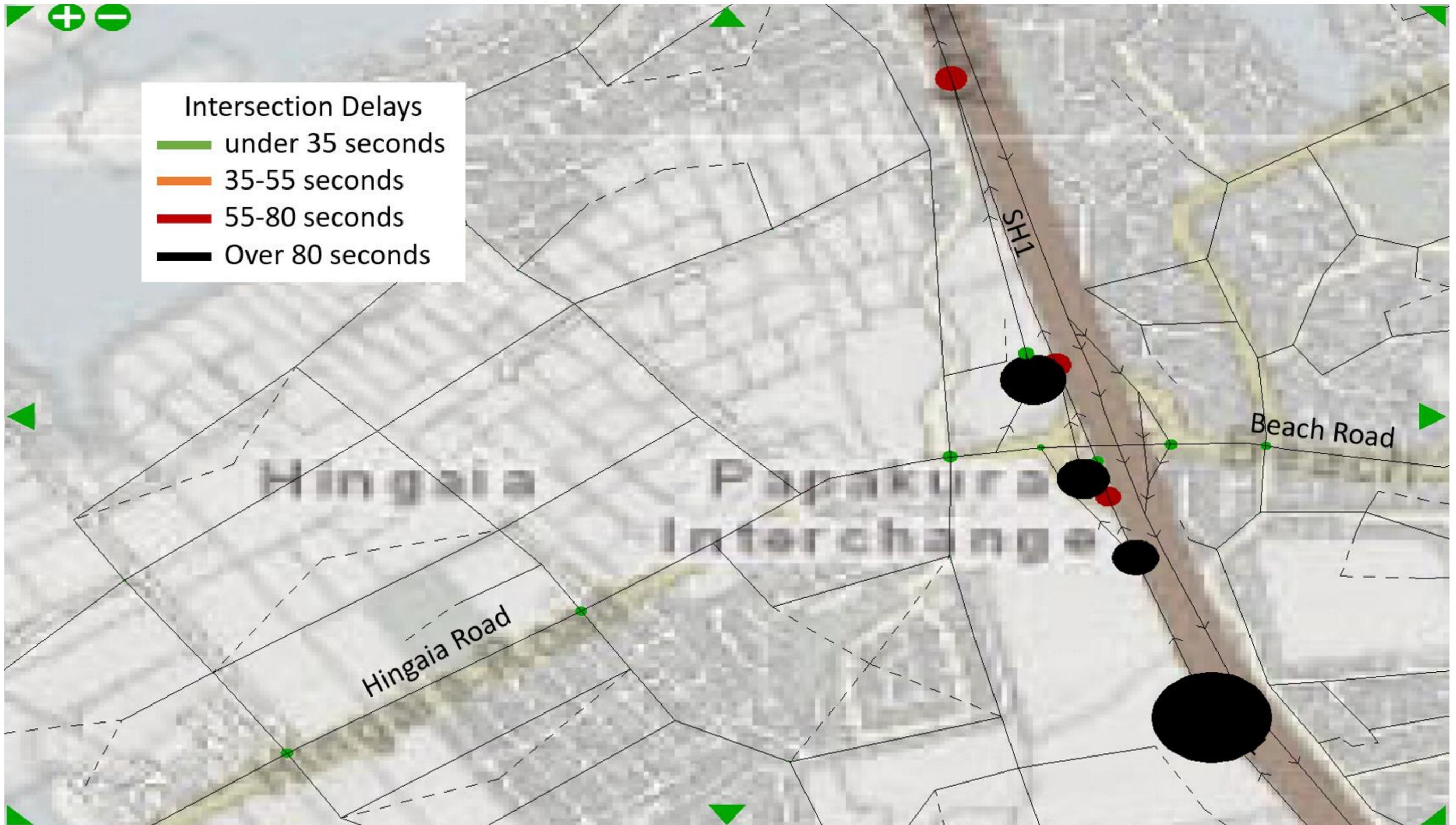


Figure 33: 2038 pm peak hour forecast delay plot – I11v5 land use

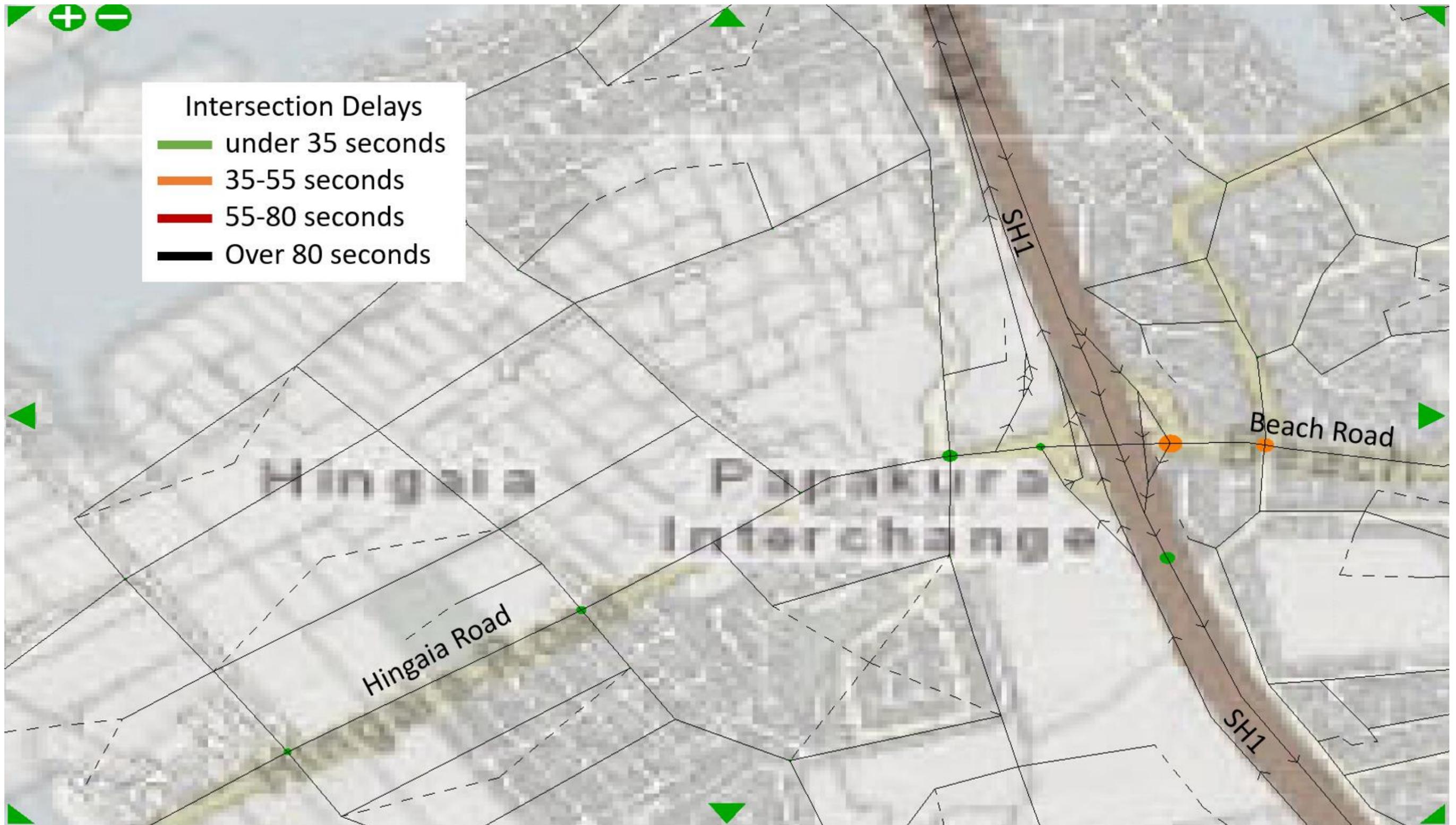
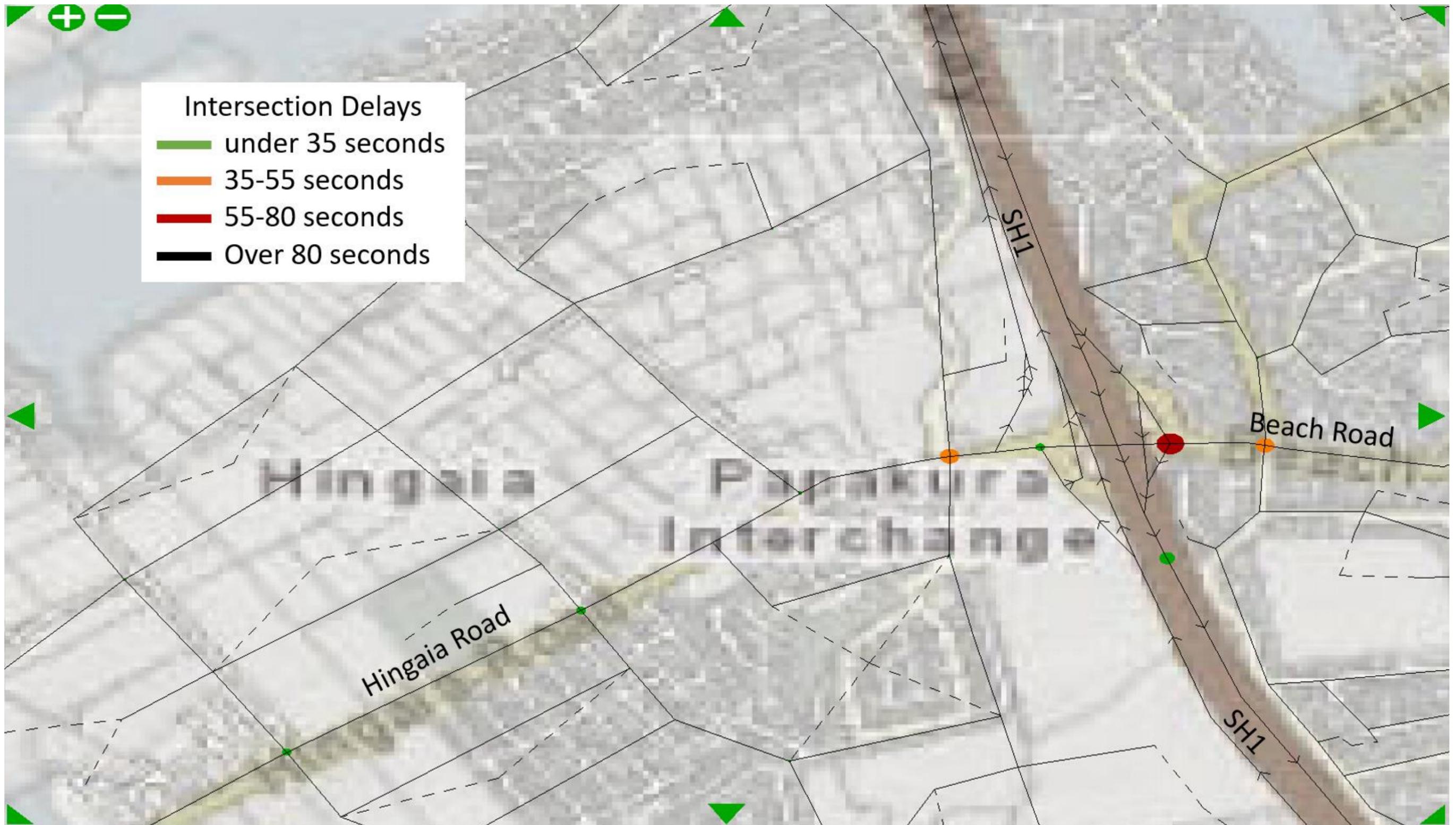


Figure 34: 2038 pm peak hour forecast delay plot – anticipated land use



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## **APPENDIX B**

## **Auckland Transport feedback**

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**Table 9: Auckland Transport feedback and Flow responses**

AT question	Flow response
<p>Implications of S3M residential underestimation on wider parallel analyses e.g. Drury Structure Plan ITA. It is noted that the assessment suggests that – <i>The effects of this increasing congestion have not previously been fully considered, through for example the Supporting Growth programme of work</i></p>	<p>We recommend that our review is passed on to Te Tupu Ngātahi   Supporting Growth for their consideration as part of their planning/implementation of transport aspects of the Drury Opāheke and Pukekohe – Paerata Structure Plans.</p>
<p>The Statement of Works (brief) issued by Council includes consideration of – <i>regional land use projections are continually being updating. Of note is the Special Housing Areas of Glenbrook Beach and Clarks Beach did not exist at the time of establishing or assessing the Precinct and as such, traffic volumes passing through the Precinct have likely increased.</i> The extent of the S3M does not cover these south-western coastal settlements and emerging growth areas such as Patumahoe? The demands from these areas should be factored into the assessment. Note AT’s earlier inputs into brief included – <i>Identifying any issues or gaps in terms of the ‘external’ network requirements to service the Kingseat redevelopment precinct in light of the land use development and urbanisation occurring in the wider sub-regional catchment (i.e. Drury, Pukekohe, Paerata, Patumahoe</i></p>	<p>We confirm that the south-western coastal settlements and other Franklin growth areas are not directly referred to in our assessment. However, the S3M model includes traffic resulting from future anticipated land uses in these areas, as an output from the MSM model. Therefore these areas are represented in our assessment. We have added Section 4.3 and additional text to Section 6.1 to address this matter for clarity. Should AT have queries about the inputs into the S3M model, we recommend that these are discussed with Te Tupu Ngātahi   Supporting Growth.</p>
<p>Figure 1: Extent of the Southern Sector SATURN Traffic Model (S3M) – extent of S3M does not appear to be shown</p>	<p>Figure 1 was mislabelled. This has been corrected to refer to the two development areas that are directly considered in this report.</p>
<p>5.3 Te Tupu Ngātahi Supporting Growth Programme – need to note that the SGA programme excludes coastal settlements, etc west of Kingseat</p>	<p>Section 5.3 has been updated.</p>
<p>6.2 Scenario i11v5 land use and trip generation – need to extend to include MSM zones to the west and factor these demand into high level assessment e.g. demand over and above S3M</p>	<p>The S3M model includes traffic resulting from future anticipated land uses in these areas. Should AT have queries about the inputs into the S3M model, we recommend that these are discussed with Te Tupu Ngātahi   Supporting Growth.</p>
<p>7 Transport assessment notes that ‘plots include growth about the wider Franklin area, and as such, growth is not isolated to Kingseat and Karaka North development’. Assume this wider area is based on Figure 5: Extent of the Southern Sector SATURN Traffic Model (S3M). Can the 2028 plots be included</p>	<p>The plots are outputs from the S3M model (which includes MSM land use assumptions), plus additional traffic from Kingseat and Karaka North as discussed in Section 4. Therefore, these plots represent traffic from the wider Franklin area (not development within the S3M model boundary).</p>

	2028 plots cannot be provided without additional coding.
7.1 Predicted traffic volumes - Confirm if SGA modelling is also uses the default, I11v5 land use forecasts	There are several versions of i11.5, our report is based the Te Tupu Ngātahi   Supporting Growth version of i11.5.
Figure 13: 2038 am peak hour forecast volume to capacity plot – I11v5 land use & Figure 14: 2038 am peak hour forecast volume to capacity plot – anticipated land use. Query why the VC drops to green on the final eastbound approach link to the Papakura I/C if the southern motorway mainline is +100% and the links to the immediate west are 70-100%? Are trips diverting prior to I/C approach, if so where are they being diverted	<p>This is because Hingaia Road is multi lane in this section. The two lane bridge west of Hingaia acts as a bottle neck, limiting the number of vehicles along the multi lane section of Hingaia Road, hence the volume to capacity ratio for this section is reported as more favourable.</p> <p>Diversion of traffic is occurring, mainly to Karaka Road, refer to Figure 11 and Figure 12 for traffic volume difference plots. These figures show some traffic diverting to Karaka Road and Drury Interchange as a result of the additional development within Kingseat and Karaka North.</p>
8 Conclusions – Notes that – ‘there is little ability to increase the capacity of the general traffic network in this area, so residents living in Kingseat and Karaka North will instead need to be given better choices to ‘opt out’ of peak period congestion’. Would this also apply to a greater extent to the areas of coastal development further west (e.g. Clarks Beach, Waiuku, etc	We agree that this conclusion applies to other settlement areas with Franklin.