Brownlie Land Proposed Plan Change

Traffic Modelling Assessment

August 2025

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TRANSPORTATION SPECIALISTS

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EXECUTIVE SUMMARY

Flow Transportation Specialists Limited has been commissioned by Kiwi Fresh Orange Company Limited to assess the impact of the Proposed Plan Change located between Waipapa and Kerikeri.

We have been commissioned to provide an independent assessment of the traffic impacts on the road network using the Far North District Council's Kerikeri Transport Model.

Traffic Engineering and Management Limited (TEAM) has undertaken an Integrated Transport Assessment (ITA) for the proposed Plan Change which has been used to inform the land use and trip generation assumptions.

Kerikeri Transport Model

We developed a base model and forecast model of the Kerikeri and Waipapa area using the Aimsun micro-simulation modelling package. The forecast model represents a 10-year forecast land use and traffic demand scenario based on the Council's Proposed District Plan (PDP) and a 'Do Minimum' road network[1].

The forecast land use is based on Council's PDP. This is supported by Council's Section 32 reports with regard to the potential residential, commercial and industrial demand.

Forecast land-use and forecast scenarios

The Proposed Plan Change seeks a rezoning of the site to allow predominantly a combination of residential, commercial, industrial land uses. The proposed rezoning would provide a total of circa 112ha of land for the proposed land uses. We have been supplied a summary of the forecast development yield (gross floor area, m^2) for the Proposed Plan Change by TEAM. Table E1 summarises the land-use scenario for the Proposed Plan change.

Table E1: Summary of forecast Proposed Plan Change development yield (m^2)

Activity	'10-year scenario' 50% development	'20-year scenario' 100% development
Retail	6,875	13,750
Commercial service	1,625	3,250
Office	1,500	3,000
Hotel	4,750	9,500
Recreation	2,500	5,000
Industrial	7,500	15,000
Total Retail/Commercial/Industrial	**24,750**	**49,500**
Residential	1,600 dwellings	2,440 dwellings

[1] Network changes over the 2022 situation include only the link road between Mill Road and Hall Road.

When compared to the forecast PDP, we note that the Proposed Plan change development would provide a significant proportion of the forecast 10-year demand for industrial land/retail/commercial development in the Kerikeri/Waipapa area, and would significantly exceed the current predicted demand for residential housing (1,830 dwellings vs 860 dwellings) in the medium term.

We have assumed that the Proposed Plan Change development replaces the forecast PDP growth, ie the forecast demand remains the same, but the location of future development is altered. In the case of residential households, the Plan Change 10 year scenario predicts demand of at least 1,600 dwellings in the Kerikeri/Waipapa area, and this will occur within the Plan Change area. We have also accounted for an additional 250 dwellings in the wider area, predominantly immediately north or south of Kerikeri CBD.

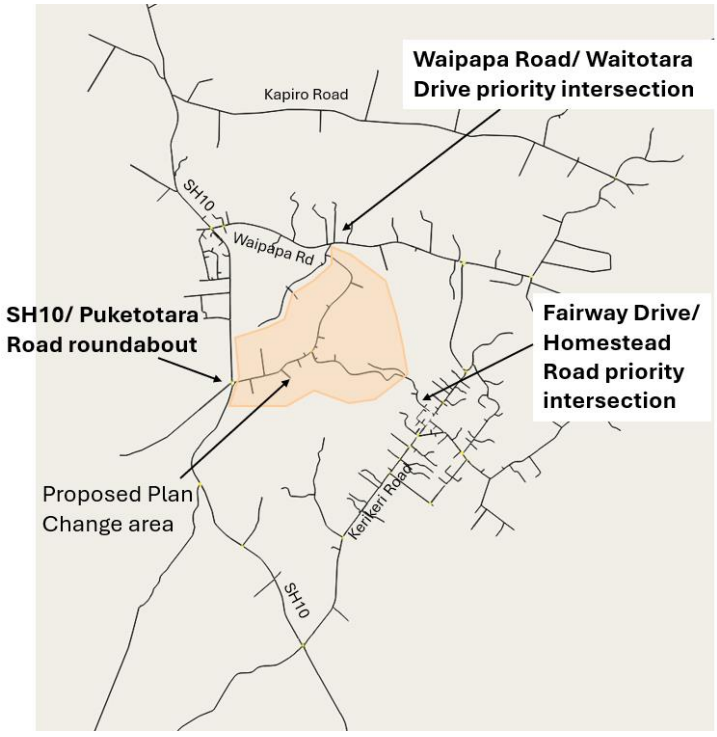
Proposed Plan Change access points

The Plan Change area is likely to have 3 access points to the existing road network being:

1. SH10/Puketotara Road intersection (new roundabout)
2. Waipapa Road/Waitotara Drive intersection (existing priority control)
3. Fairway Drive connecting to the Fairway Drive/Homestead Road intersection (existing priority control at the southern end of Fairway Drive).

These access points are indicated in Figure E1.

Figure E1: Kerikeri Transport Model extent and Proposed Plan Change area with proposed access points to the existing road network



We have also undertaken an assessment of the Plan Change without the Fairway Drive access, ie with no link through the golf course.

Future network changes (for the 10 year scenario) within the Kerikeri Transport model area include only the link road between Mill Road and Hall Road. We are aware of the Kerikeri CBD Bypass, which is in the planning stages. At this stage, this is not a committed project within the next 10 years.

We have assessed the following scenarios for the Proposed Plan Change.

- Proposed Plan Change '10 year scenario', 50% development, 3 access points
- Proposed Plan Change '10 year scenario', 50% development, 2 access points
- Proposed Plan Change '20 year scenario', 100% development, 3 access points, without Kerikeri CBD bypass
- Proposed Plan Change '20 year scenario', 100% development, 3 access points, with Kerikeri CBD bypass.

The 10 year scenarios have been compared against the PDP 10 year scenario for the typical weekday morning (AM) and evening (PM) commuter periods.

Proposed Plan Change - 10 year scenario assessment

Overall, the forecast traffic growth in the modelled area, for the 10 year model scenario, is similar when comparing the PDP and Proposed Plan Change. The total retail/commercial/industrial development is the same within the modelled area, but the new development located in different areas. While the total number of households in the Proposed Brownlie Plan change scenario (10 year forecast) is higher, the predicted trip rate for the Plan Change area is lower with a high level of internalisation of trips to the area.

The following points are noted for the peak hour periods with regard to the Proposed Plan change 10 year scenario assessment.

- When compared to the PDP scenario, driver behaviour is likely to be altered due to the Plan Change development, with predicted reductions in traffic volumes on Kerikeri Road, Waipapa Road and the Heritage Bypass in both peak hours
- Peak traffic flows on Kerikeri Road are predicted to reduce by approximately 10% in both directions when compared to the PDP scenario (both peak periods). Waipapa Road is predicted to decrease by some 5 to 10%, and Heritage Bypass is predicted to decrease by 12-14% in the PM peak and up to 20% in one direction in the AM peak
- Similar changes are expected on SH10 (north of Kerikeri Road) with a reduction of approximately 15% in both peak periods
- These changes are due to the change in the location of predicted growth in the next 10 years. Development in the PDP scenario is predicted within Kerikeri CBD (commercial/retail), Waipapa (industrial) and spread through the region for residential development (with large areas south of the Kerikeri CBD)

- The Proposed Plan Change concentrates development of residential, commercial, retail and industrial in the area between Waipapa and Kerikeri CBD, and assumes a large proportion of traffic is internalised to the development area. The development location generally is predicted to reduce trips around the network, ie between Waipapa and Kerikeri, and replaces them with trips between the development and Waipapa or Kerikeri, or internal to the Plan Change area
- With the Plan Change 10 year scenario, the SH10/Puketotara Road and Waipapa Road/Waitotara Drive intersections are predicted to operate with limited delays in the peak hours, being a Level of Service (LOS) A or B
- Vehicle queues at the SH10 access (new roundabout) and Waipapa Road access points are also predicted to be relatively short
- The intersection of Fairway Drive and Homestead Road is likely to operate with some delays. During the morning peak hour, the LOS on the Fairway Drive approach is predicted to be a LOS D in the AM peak hour and LOS F in the PM peak hour
- The AM peak hour is predicted to operate adequately with some delay and relatively short queues. However, the PM peak will likely experience queues of up to 200 to 250 m on the Fairway Drive approach. This is as a result of increased traffic volumes through the intersection that are travelling to and from the Plan Change area, and also an increase traffic flows through the Kerikeri CBD in the future.

Proposed Plan Change – without Fairway Drive access point

We have assessed a scenario with proposed access points on SH10 and Waipapa Road only, and no access for development traffic via Fairway Drive, ie two access points to the external road network only.

The following points are noted for the peak hour periods with regard to the Proposed Plan change 10 year scenario assessment:

- The scenario assessment, with the Fairway Drive access, predicts high numbers of drivers travelling directly into Kerikeri CBD through a give way controlled intersection of Fairway Drive and Homestead Road. The scenario without the Fairway Drive access requires drivers to find alternative routes to Kerikeri CBD, ie via Waipapa Road and Kerikeri Road
- Despite removing access via Fairway Drive, SH10/Puketotara Road and Waipapa Road/Waitotara Drive intersections are both predicted to operate with a LOS A or B in both peak hours, ie limited delays in a 10 year scenario (50% of proposed development)
- SH10/Kerikeri Road intersection is predicted to operate with a LOS C and LOS B in the AM and PM peak hours. This is slightly worse than the scenario with the Fairway Drive link due to more drivers travelling via SH10 and Kerikeri Road. However, this is still considered an acceptable level of service
- The total traffic travelling through the SH10/Kerikeri Road roundabout is also still likely to be lower than the PDP scenario. This is due to the shift associated with the Plan Change, ie households would be closer to Waipapa and a large number of trips internalised to the Plan Change area development between households and retail/commercial/industrial development

- However, without the Fairway Drive access, there is a predicted increase in traffic through the roundabout, predominantly on the SH10 south approach. This leads to a LOS F southbound on SH10, ie the conflicting movements, and longer queues in the PM peak hour
- Vehicle queues are predicted to be up to some 200 to 300 m long southbound on SH10. This is similar to the PDP scenario, albeit the SH10 southbound approach is predicted to operate with a LOS E. The overall LOS for the intersection is still the same, with a LOS D predicted.

Full build-out of Plan change area

We have assessed a scenario with full potential development of the Plan Change area, which could occur within a 20 year time frame. Two network scenarios have been assessed, being with and without the Kerikeri CBD bypass

- Significant delays are predicted at the Fairway Drive/Homestead Road intersection during the PM peak hour with a full build out scenario and without any further road network changes. A LOS F and queues in excess of 500m are provided along Fairway Drive
- With the Kerikeri Bypass in place, the key constraint in the full build out of the Plan Change area is removed. Significant delays are still likely at the SH10/Waipapa Road intersection, however this would be a similar situation to a 20 year forecast without full development of the Plan Change
- The assessment indicates that if a 20 year scenario with full development of the Plan Change area eventuates, then further changes to the network are required to accommodate the predicted traffic volumes
- We understand that the precinct provisions for the Plan Change may require an assessment of traffic effects beyond a 50% build out of the Plan Change area. This enables the traffic effects to be considered in the future when there is more certainty with regard to the CBD bypass and future development in the region.

CONTENTS

APPENDICES

1 INTRODUCTION

Flow Transportation Specialists Limited (Flow) has been commissioned by Kiwi Fresh Orange Company Limited to assess the impact of the Proposed Plan Change located between Waipapa and Kerikeri.

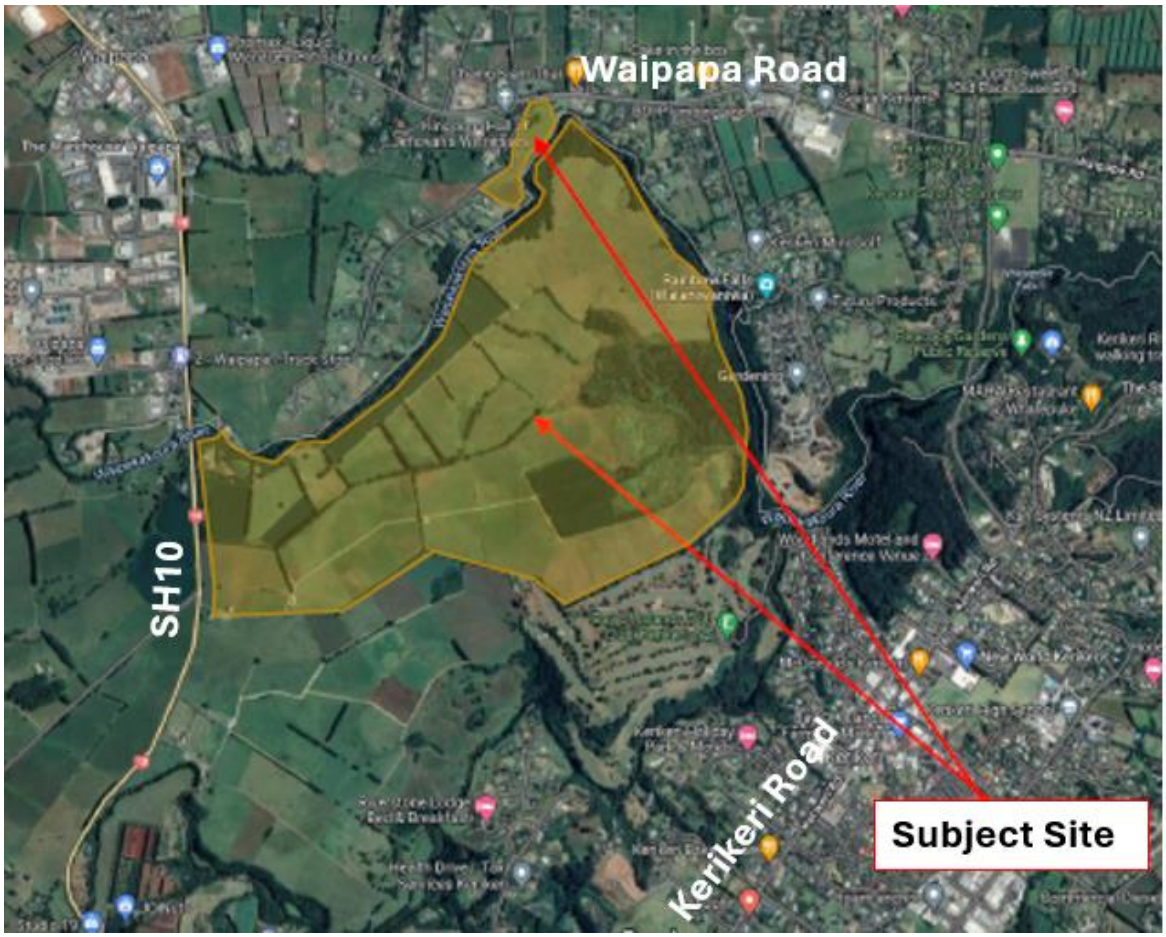
We have been commissioned to provide an independent assessment of the traffic impacts on the road network using the Far North District Council's (Council) Kerikeri Transport Model.

TEAM has undertaken an Integrated Transport Assessment (ITA) for the proposed Plan Change. This notes that the submission seeks a rezoning of the subject site's 197ha area to allow a combination of residential, commercial, industrial, community and educational land uses, with these being supported by a comprehensive and connected network of main public roads and off-road pedestrian and cycle paths.

2 SITE LOCATION

Figure 1 indicates the location of the Proposed Plan Change area in relation to the surrounding road network. As described in TEAM's ITA, the area is currently zoned Rural Production under the Operative and Proposed District Plan (PDP).

Figure 1: Proposed Plan Change location



3 KERIKERI TRANSPORT MODEL BACKGROUND

Flow was commissioned by Council to develop a traffic model for the Kerikeri and Waipapa area. The purpose of this traffic model is to provide Council with a forecasting tool that will inform transport investment. The modelling tool also provides a useful tool for Council to understand the impacts of private land use development proposals.

We developed a base model and forecast model of the Kerikeri and Waipapa area in the Aimsun micro-simulation modelling package.

- The base model reflects the existing travel behaviour about Kerikeri and Waipapa and includes existing traffic demands and land use activities (year 2022). The Kerikeri Transport Model considers typical weekday morning and evening commuter periods, as confirmed with Council. Weekends and holiday periods are not specifically modelled
- Traffic survey information was collected for the model build, including origin-destination survey information using number plate recognition cameras
- The forecast model represents a 10-year forecast land use and traffic demand scenario based on the Council's Proposed District Plan (PDP) and a 'Do Minimum' road network[2]
- The forecast land use is based on Council's Proposed District Plan. This is supported by Council's Section 32 reports with regard to the potential residential, commercial and industrial demand
- The forecast traffic model used gravity model theory to forecast traffic based on future land use changes.

The Kerikeri Transport Model has been peer reviewed and declared fit for purpose, being a forecasting tool that will inform a transport investment PBC. The peer review followed the New Zealand Modelling User Group (NZMUGS) Peer Review Guidelines (2019), with the AIMSUN model and supporting report supplied to the peer reviewer.

The base and forecast model development process is covered in full in the supporting reports[3]. We have outlined the forecast model development and how this relates to assessment of the Proposed Plan Change, in Appendix A, with some key points summarised below.

4 PDP LAND USE SUMMARY

4.1 Population and residential households

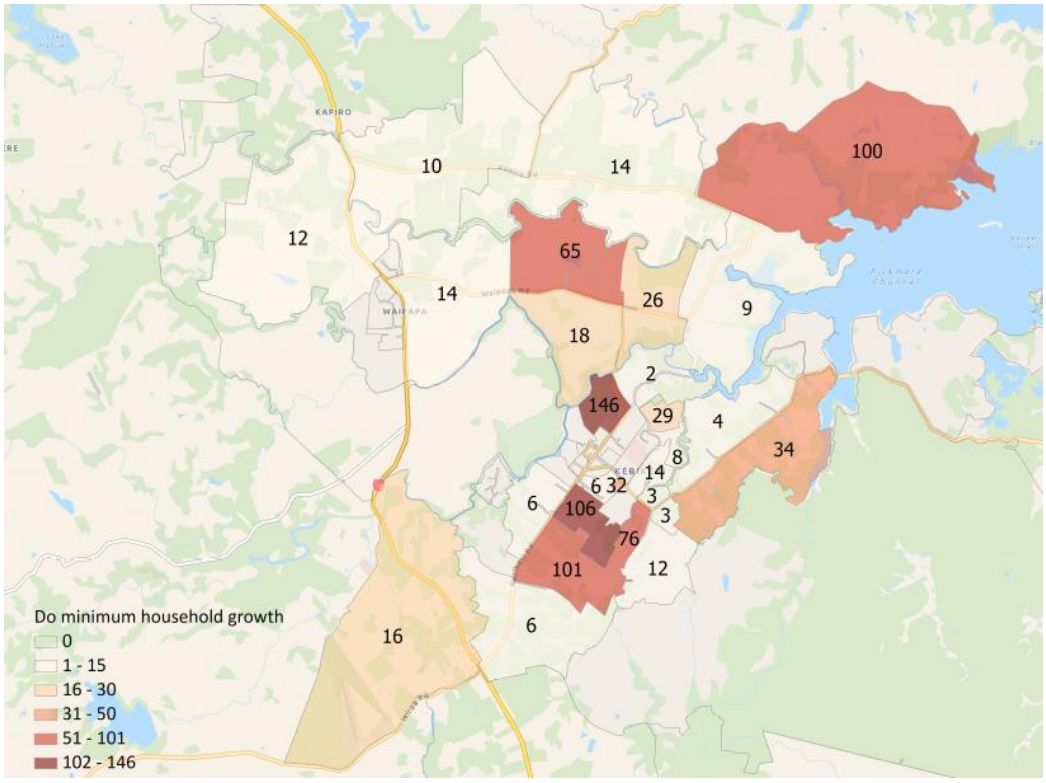
In order to meet the population forecasts for the Kerikeri area, some 730 households (medium growth) or 855 households (high growth) are anticipated over the next 10 years. Council's analysis of the latent capacity for the PDP shows what type of sites are available and how many are available within the Kerikeri area, in particular the 4 Kerikeri census (Statistical Area 2/SA2) areas.

[2] Network changes over the 2022 situation include only the link road between Mill Road and Hall Road.
[3] Refer to the base model development report (R1C240515_Kerikeri Transport model development report_update.pdf) and the forecast model development report (R2C2300313 Kerikeri Transport Model Forecast model report.pdf)

Based on the conclusions of the latent capacity assessment, there are plenty of available sites within the PDP zoning with limited or likely development potential. The Council report states that the four SA2 areas can accommodate all of the projected development over the next 10 years (medium term) under both the medium and high growth scenarios with an excess of 100% headroom.

The Council analysis outlines the potential population and household forecasts. The high growth scenario requires approximately 860 households to meet the population growth as presented in Figure 2.

Figure 2: Development potential (households within traffic model zones) – High growth scenario with existing consented or likely consented development (total of 860 residential sites)



4.2 Commercial and industrial zoned land

The economic model developed by BERL for Council estimated the additional commercial and industrial zoned land needed to meet demand over the next 30 years for the Far North and in particular the Kerikeri/Waipapa area.

The following points are noted within Council's Section 32 report with regard to the re-zoning of commercial and industrial land:

- 14 ha of commercial and 11 ha of industrial development are required in the next 10 years to meet demand, with this being considered in the proposed zoning
- There is a level of rezoning proposed for Kerikeri and Waipapa in the PDP, which is largely focused around extending the industrial areas in Waipapa, while also having areas of Mixed Use.

5 SUMMARY OF ASSESSMENT OF A 10-YEAR LAND-USE (PDP) AND TRAFFIC FORECAST WITH A DO MINIMUM ROAD NETWORK

The Kerikeri Transport Model predicts moderate congestion in isolated locations in the 10 year forecast, ie the medium term, based on Council's predicted land-use development growth, using Council's 'high growth scenario'.

During both peak hours, there are additional delays predicted within the town centre one-way system in the medium term scenario. However, congestion occurs for a short period of time, being between 8:45 am and 9:00 am during the morning peak, and 5:00 pm and 5:15 pm during the evening peak.

However, the town centre's one-way system would approach capacity in the evening peak hour if traffic volumes were to increase over that predicted, due to it operating with one lane in a single direction. A further increase in traffic may lead to significant vehicle queues around the inner town centre block. With only 1 lane available there is no way to bypass queues. The one-way system therefore provides little resilience beyond the traffic 10-year forecast land-use and associated traffic volumes.

There are some isolated areas of congestion (LOS E and LOS F) within the forecast network, and PDP land use scenario, in both the morning and evening peak hours. However, these are for relatively short periods. The notable locations are:

- Cobham Road/Hone Heke Road (both peak hours on Hone Heke Road approach), and
- SH10/Waipapa Road roundabout (both peak hours, predominantly on the SH10 southbound approach).

Improving intersection capacity would help alleviate delays in the short to medium term and we understand there may be a potential change of the Cobham Road/Hone Heke Road to a roundabout controlled intersection and investigations are underway for a Kerikeri CBD bypass.

6 FORECAST LAND-USE – PDP VS PROPOSED PLAN CHANGE

6.1 Proposed District Plan

Table 1 summarises the forecast land use changes for the Kerikeri Aimsun model area. This is the forecast land use represented in the PDP medium term (10-year forecast) as outlined in Flow's forecast modelling report.

Table 1: Summary of forecast land use changes for Kerikeri Transport Model (2032)

Activity	Proposed District Plan Medium term (10-year) forecast
TOTAL new households	860
TOTAL new industry (m^2)	38,500
TOTAL new retail/commercial (m^2)	49,250

6.2 Proposed Plan Change

The Plan Change area is currently zoned Rural Production. The Proposed Plan Change seeks a rezoning of the site to allow predominantly a combination of residential, commercial, industrial land uses. The proposed rezoning would provide a total of circa 112ha of land for the proposed land uses. The proposed zone structure is shown in Figure 3.

Figure 3: Proposed Plan Change zones

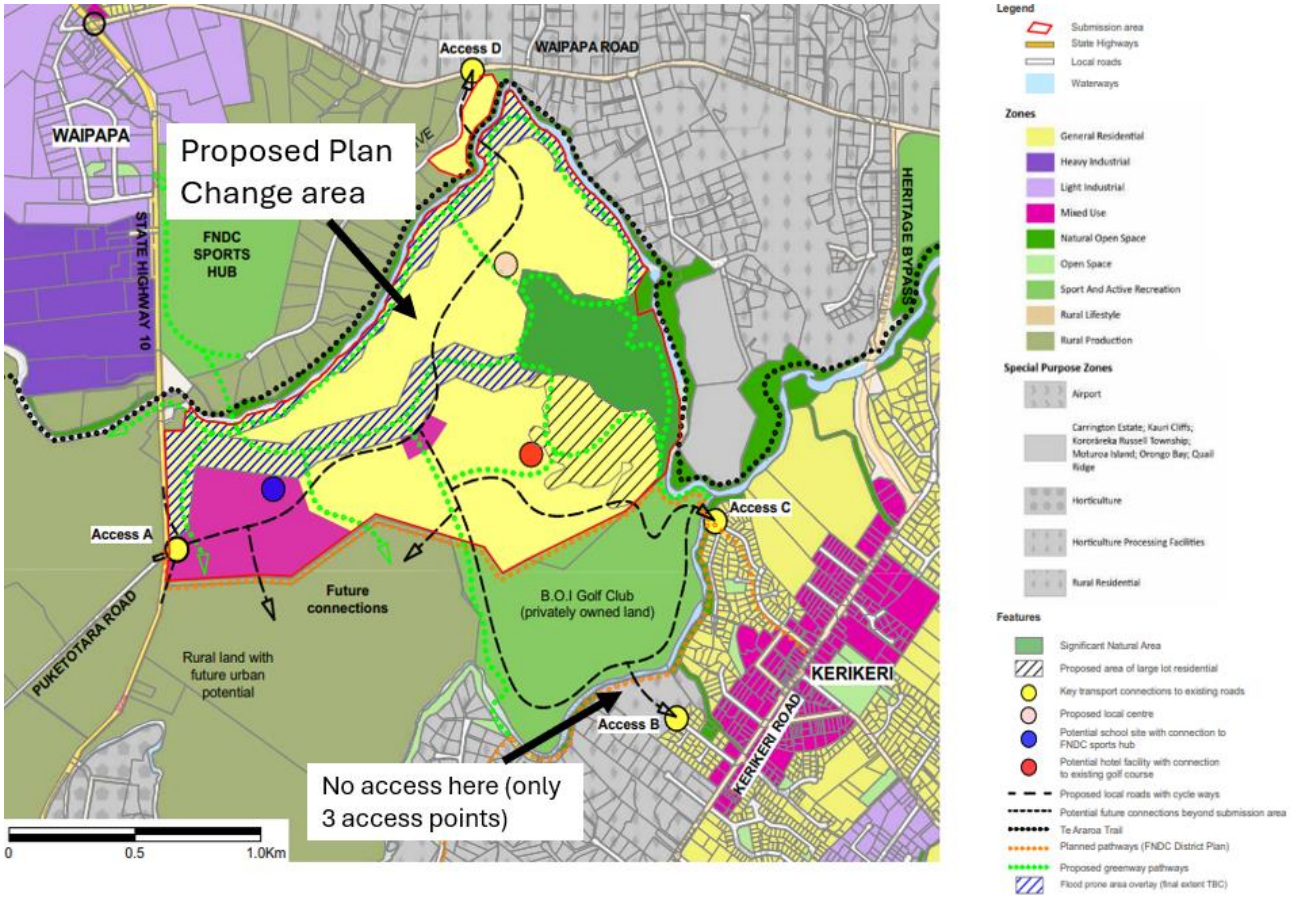


Figure 3 indicates an area of Mixed Use adjacent to SH10 and a local centre in the middle of the Plan Change area. The remainder of the area is predominantly zoned general residential.

We have been supplied a summary of the forecast development for the Proposed Plan Change area by TEAM, and this is summarised in Table 2.

Table 2: Summary of forecast Proposed Plan Change development yield (m^2)

Activity	'10-year scenario' 50% development	'20-year scenario' 100% development
Retail	6,875	13,750
Commercial service	1,625	3,250
Office	1,500	3,000
Hotel	4,750	9,500
Recreation	2,500	5,000
Industrial	7,500	15,000
Total Retail/Commercial/Industrial	**24,750**	**49,500**
Residential	1,600 dwellings	2,440 dwellings

When compared to the forecast PDP, we note that the Proposed Plan change development would provide a significant proportion of the forecast 10-year demand for industrial land/retail/commercial development in the Kerikeri/Waipapa area, and would significantly exceed the current predicted demand for residential housing (1,830 dwellings vs 860 dwellings) in the medium term.

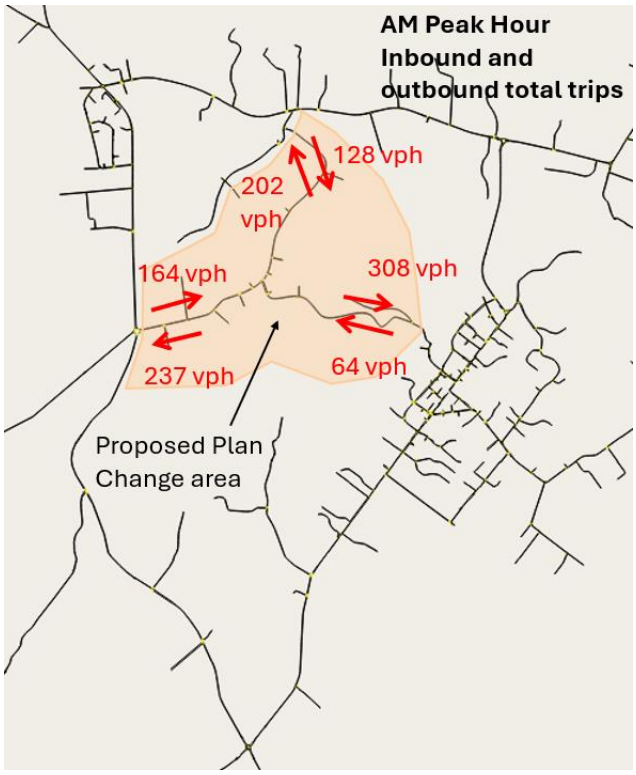
We have assumed that the Proposed Plan Change development replaces the forecast PDP growth, ie the forecast demand remains the same, but the location of future development is altered. In the case of residential households, the Plan Change 10 year scenario predicts demand of at least 1,600 dwellings in the Kerikeri/Waipapa area, and this will occur within the Plan Change area. We have also accounted for an additional 250 dwellings in the wider area, predominantly immediately north or south of Kerikeri CBD.

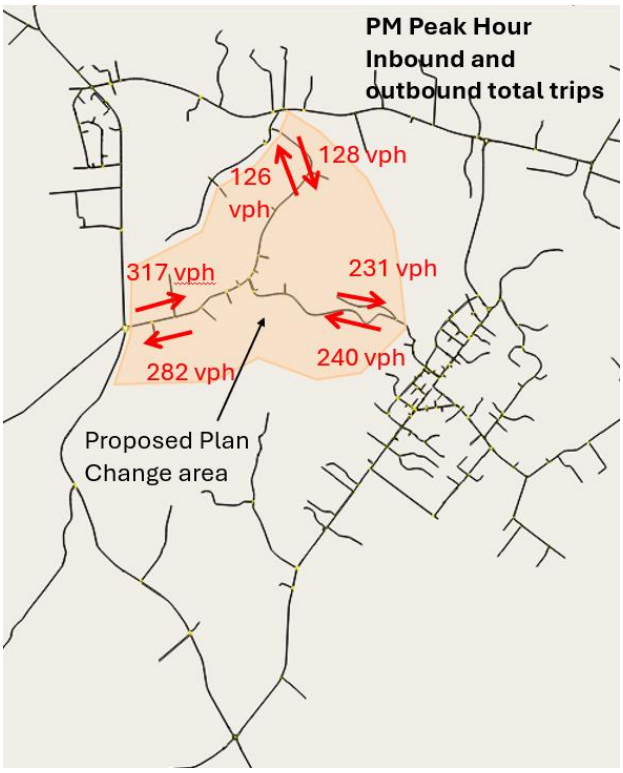
6.3 Trip generation – Proposed Plan Change

TEAM has provided the predicted trip generation for the Plan Change. This is contained in Appendix B for the 2 forecast scenarios based on the land use contained in Table 2. We have used this in the model development process, which is described in the following sections.

Figure 4 presents the total inbound and outbound trips to and from the Plan Change area (10 year scenario). Note this includes some through-routing trips as indicated in Figure 6, within Section 11.2.

Figure 4: Predicted total inbound and outbound trips to and from the Plan Change area – 10 year scenario (note this includes some through-routing trips as indicated in Figure 6, within Section 11.2)





7 TRAFFIC MODEL DEVELOPMENT – PROPOSED PLAN CHANGE

The forecast Kerikeri Traffic Model uses gravity model theory to forecast traffic based on future land use changes. The following sections outline how this has been applied to the Proposed Plan Change.

7.1 Kerikeri Transport Model – gravity model process

The following process has been used to develop the forecast traffic demands for the Proposed Plan Change

1. We have calculated new development zone totals using the trip rate assessment (supplied by TEAM)
2. We have developed an 'attraction' based gravity model and applied adjustment factors where applicable
3. We applied this process to the post-matrix estimation and forecast demands. We calculated the differences between these two matrices and applied this growth to the post-matrix estimation base year matrix.

This is the peer reviewed modelling process and uses the calibrated/validated base model.

We have applied the same process for the Proposed Plan Change.

We have assumed that the total land-use demand changes, as predicted through the PDP process over the next 10 years, will remain approximately the same, just redistributed (with exception of residential dwellings, which will be exceeded). The above process will alter the potential location of residential, retail, industrial uses.

7.2 Background traffic growth

We have considered the historic traffic count information and applied a 2% growth rate for external zones to/from SH10. This is a relatively conservative approach, noting that the majority of growth is generated internal to the model area by additional development rather than through traffic on the state highway.

We do note that the required commercial and industrial development will service the wider district, not just the Kerikeri region (ie not just the modelled area). This is somewhat accounted for by the background traffic growth on SH10.

7.3 Trips external to the Kerikeri-Waipapa area

For the forecast scenarios, we have considered that the proportion of external trips may reduce as more households and commercial/retail areas are developed within the Kerikeri/Waipapa area (ie there is a higher proportion of trips internal to the modelled area).

External zones are currently excluded from the gravity model, and it is assumed the same proportion of trips travel external to the area. For the forecast demand development, we have reduced the proportion of trips external to the model area by 30% to account for more internalisation of trips within the Waipapa and Kerikeri area as the areas grow. An internalisation trip rate reduction of 30% is considered typical within a large multi-land-use development area.

The total number of trips that travel out of the region (external to the model network) will still increase, but the proportion of the new trips external to the Kerikeri/Waipapa area will decrease as there is more development within the area, leading to more internalised trips. These trips still appear within the model network in the Kerikeri/Waipapa area.

8 COMMITTED NETWORK CHANGES – DO MINIMUM ROAD NETWORK

Future network changes (10 year scenario) within the Kerikeri Transport model area include only the link road between Mill Road and Hall Road.

We are aware of a potential new roundabout at the intersection of Kerikeri Inlet Road and Hone Heke Road, however, no funding has been committed. As such, the intersection upgrade has not been included in the Do Minimum forecast model.

We are aware of the Kerikeri CBD Bypass, which is in the planning stages. At this stage this is not a committed project within the next 10 years.

We are not aware of any other significant network changes being constructed in the area that will have a material impact on the analysis of the transport network.

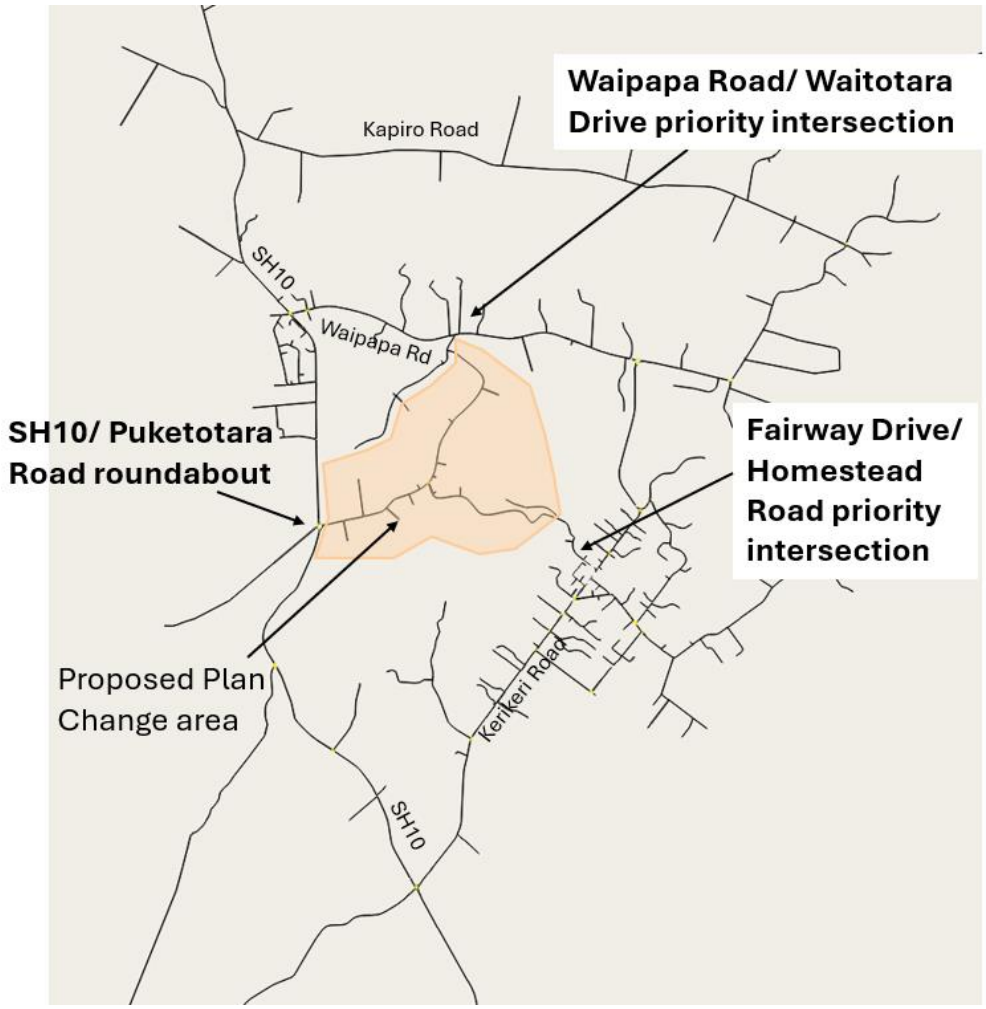
9 PROPOSED PLAN CHANGE ACCESS POINTS

The Plan Change area is likely to have 3 access points to the existing road network being:

4. SH10/Puketotara Road intersection (new roundabout)
5. Waipapa Road/Waitotara Drive intersection (existing priority control)
6. Fairway Drive connecting to the Fairway Drive/Homestead Road intersection (existing priority control at the southern end of Fairway Drive)

These are indicated in Figure 5 within the modelled road network. The principal roads within the Plan Change area have been included in the model. The local road network is not specifically modelled as the effect on the wider road network is the key concern.

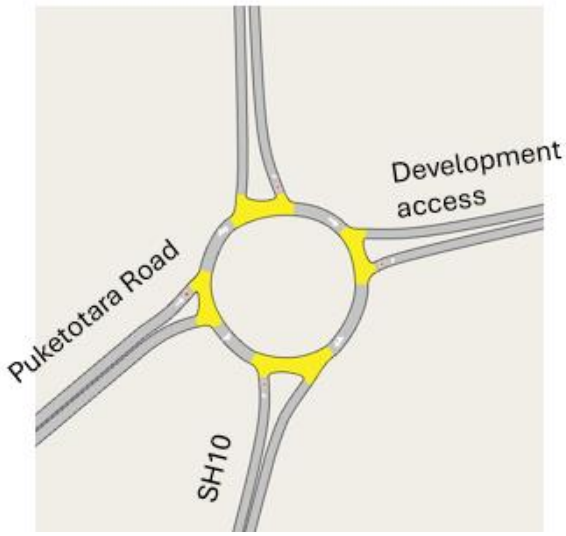
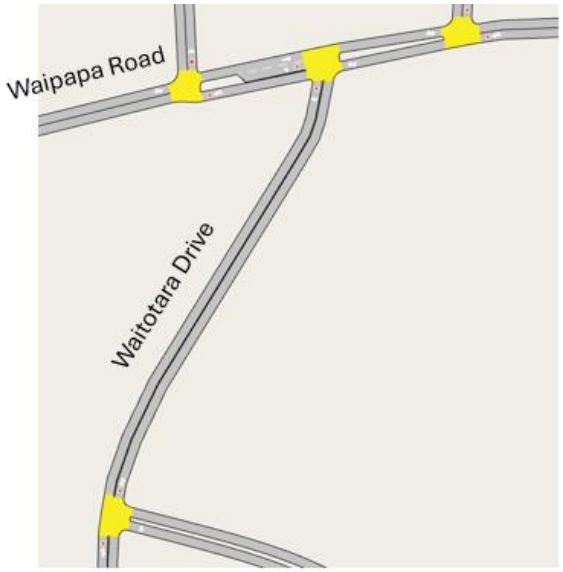
Figure 5: Kerikeri Transport Model extent and Proposed Plan Change area with proposed access points to the existing road network



We have also undertaken an assessment of the Plan Change without the Fairway Drive access, ie with no link through the golf course.

Table 3 below presents the modelled layout at the 3 proposed access points.

Table 3: Proposed Plan Change – modelled road layout at potential access points

Puketotara Road/SH10 RBT	Waitotara Drive/Waipapa Road (with right turn bay)
	
Fairway Drive/Homestead Road	
	

10 FORECAST OPERATIONAL ASSESSMENT

We have assessed the following scenarios for the Proposed Plan Change:

- Proposed Plan Change '10 year scenario', 50% development, 3 access points
- Proposed Plan Change '10 year scenario', 50% development, 2 access points
- Proposed Plan Change '20 year scenario', 100% development, 3 access points, without Kerikeri CBD bypass
- Proposed Plan Change '20 year scenario', 100% development, 3 access points, with Kerikeri CBD bypass.

The 10 year scenarios have been compared against the PDP 10 year scenario.

11 PROPOSED PLAN CHANGE - 10 YEAR SCENARIO ASSESSMENT

We have presented the predicted traffic operation of the forecast scenarios using the following transport metrics:

- travel times
- traffic flows
- intersection performance, and
- vehicle queues.

11.1 Traffic flow changes

We have compared the predicted traffic flows within the model area to understand the effects of development within the Plan Change area. Table 4 and Table 5 provide a summary of the key roads in the modelled area and the predicted changes in traffic volumes between the forecast PDP scenario and the Plan Change development (10 year forecast).

Appendix C presents a full summary of the modelled traffic volumes.

Table 4: Traffic flows comparison of key roads PDP 10 year scenario and forecast 10 year development (3 access points) traffic flows: morning peak

Location	Direction	AM peak hour		
		PDP	10 Years Brownlie	Difference
Kerikeri Road	Northbound	940	866	-8%
(south of Hall Road)	Southbound	660	590	-11%
Heritage Bypass	Northbound	750	598	-20%
(b/w Kerikeri Rd & Waipapa Rd)	Southbound	990	980	-1%
Waipapa Road	Westbound	570	544	-5%
(east of SH10)	Eastbound	590	546	-7%
SH10	Northbound	550	530	-4%
(north of Waipapa Rd roundabout)	Southbound	700	705	1%
SH10	Northbound	880	835	-5%
(south of Kerikeri Rd roundabout)	Southbound	580	566	-2%
SH10	Northbound	690	565	-18%
(north of Kerikeri Rd roundabout)	Southbound	520	432	-17%
Hone Heke Road	Northbound	680	623	-8%
(at Cobham Rd)	Southbound	360	340	-6%

Table 5: Traffic flows comparison of key roads PDP 10 year scenario and forecast 10 year development (3 access points) traffic flows: evening peak

Location	Direction	PM peak hour		
		PDP	10 Years Brownlie	Difference
Kerikeri Road (south of Hall Road)	Northbound	780	680	-13%
	Southbound	800	715	-11%
Heritage Bypass (b/w Kerikeri Rd & Waipapa Rd)	Northbound	890	784	-12%
	Southbound	890	770	-14%
Waipapa Road (east of SH10)	Westbound	570	521	-9%
	Eastbound	630	607	-4%
SH10 (north of Waipapa Rd roundabout)	Northbound	810	829	2%
	Southbound	640	653	2%
SH10 (south of Kerikeri Rd roundabout)	Northbound	650	657	1%
	Southbound	760	779	2%
SH10 (north of Kerikeri Rd roundabout)	Northbound	580	492	-15%
	Southbound	620	548	-12%
Hone Heke Road (at Cobham Rd)	Northbound	510	481	-6%
	Southbound	450	310	-31%

The following points are noted:

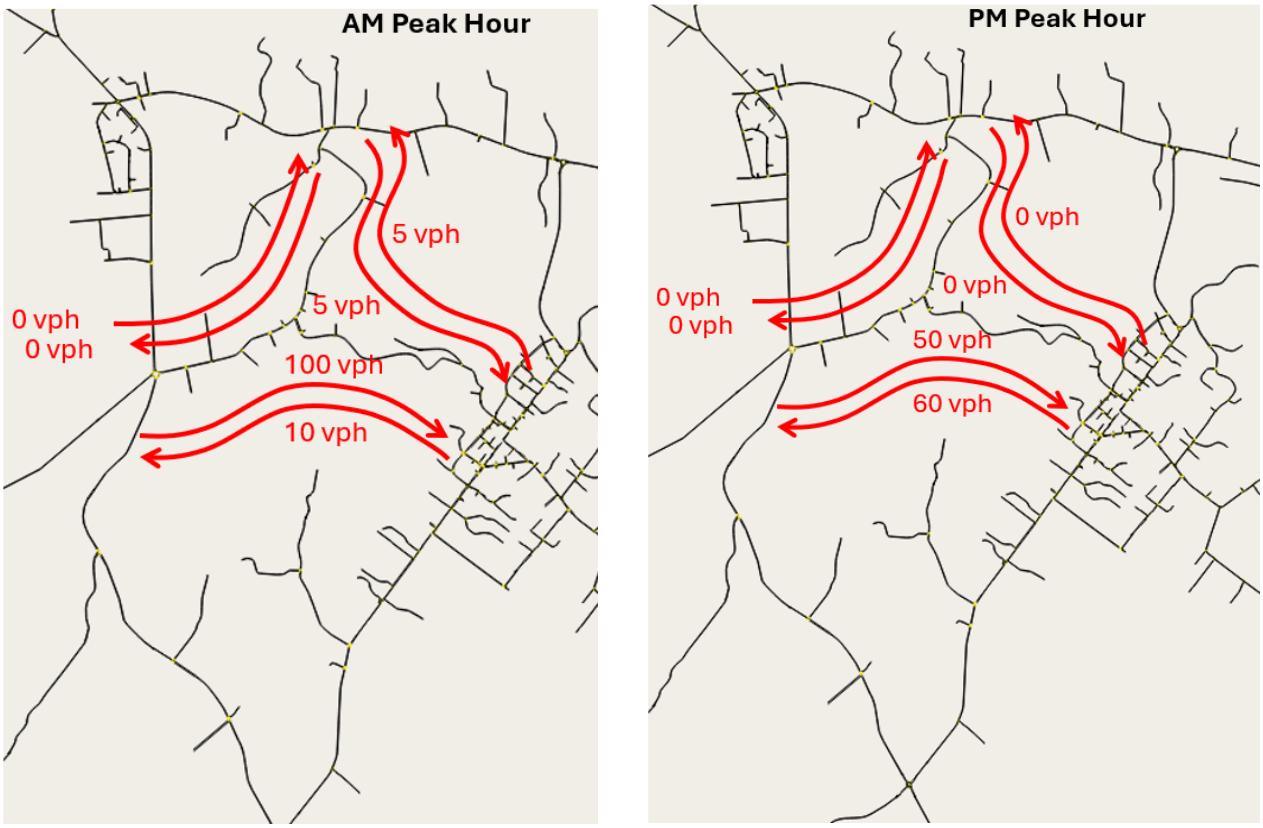
- Traffic flows in the modelled area (considering all roads) are predicted to increase by approximately 20 to 30%, or around 3% growth per year, over the 10-year forecast period. This is similar to the traffic growth associated with the PDP land use
- When compared to the PDP scenario, driver behaviour is likely to be altered due to the Plan Change development, with predicted reductions in traffic volumes on Kerikeri Road, Waipapa Road and the Heritage Bypass in both peak hours
- Peak traffic flows on Kerikeri Road are predicted to reduce by approximately 10% in both directions when compared to the PDP scenario (both peak periods). Waipapa Road is predicted to decrease by some 5 to 10%, and Heritage Bypass is predicted to decrease by 12-14% in the PM peak and up to 20% in one direction in the AM peak
- Similar changes are expected on SH10 (north of Kerikeri Road) with a reduction of approximately 15% in both peak periods
- These changes are due to the change in the location of predicted growth in the next 10 years. Development in the PDP scenario is predicted within Kerikeri CBD (commercial/retail), Waipapa (industrial) and spread through the region for residential development (with large areas south of the Kerikeri CBD)
- The Proposed Plan Change concentrates development of residential, commercial, retail and industrial in the area between Waipapa and Kerikeri CBD, and assumes a large proportion of traffic is internalised to the development area. The development location generally is predicted to reduce trips around the network, ie between Waipapa and Kerikeri, and replaces them with trips between the development and Waipapa or Kerikeri, or internal to the Plan Change area.

11.2 Through routing traffic

We have extracted traffic volumes from the model to understand the number of drivers using the development purely as a shortcut or through-route.

Figure 6 presents the modelled through-route volumes for the AM and PM peak hours.

Figure 6: Traffic volumes predicted to travel through the Plan Change area (10 year scenario) - vehicles per hour (vph)



Of the traffic travelling eastbound through the Plan Change area, ie 100 vph and 50 vph in the AM and PM peak hours respectively, the majority (approximately 80% in the AM and 50% in the PM peak hours) come from the south or west, and the remainder come from Waipapa.

Whilst the distance from Waipapa to Kerikeri CBD, via the Plan Change area, is shorter than travelling via SH10-Kerikeri Road or Waipapa Road-Heritage Bypass, there are a number of key factors that influence the relatively low internal traffic volumes, including:

- The internal road network will likely be a low-speed environment, with a likely speed limit of 50kph on the central collector road
- The relatively steep grades of some development roads will also affect vehicle speeds
- A high degree of activity along the street network near SH10, ie the commercial/retail zone, will reduce the likelihood of drivers cutting through the development area. Drivers will likely prefer to use other higher speed roads, eg SH10, with less chance of being slowed down
- The development road network is not intended to be part of the strategic road network, ie it is not an alternative to SH10 or Waipapa Road to access the CBD.

The above considerations are reflected in the model and result in relatively low volumes of through-routing traffic as shown Figure 6.

11.3 Modelled vehicle queues

The following figures present a 'snapshot' of vehicle queues within the study area. The coloured dots represent individual vehicles, and the different colours represent the following:

- LOS A and B, represented by **green** vehicles (travelling greater than 70% of the speed limit)
- LOS C to E, represented by **orange** vehicles (travelling between 30% and 70% of the speed limit)
- LOS F, represented by **red** represents vehicles (travelling less than 30% of the speed limit)

We note that the figures are a single 'snapshot' of the vehicle queues during the 2.5 hour peak period. The queues are constantly changing, but the figures give an indication of the worst case during the peak period, with congestion levels fluctuating for the remainder of the modelled period.

Figure 7 presents a snapshot of Plan Change 10 year scenario during the AM peak 8:30am (left) and PM peak 5:00pm (right).

Figure 7: Snapshot of vehicle queues Plan Change development (10 year scenario) – AM peak 8:30am (left) and PM peak 5:00pm (right)

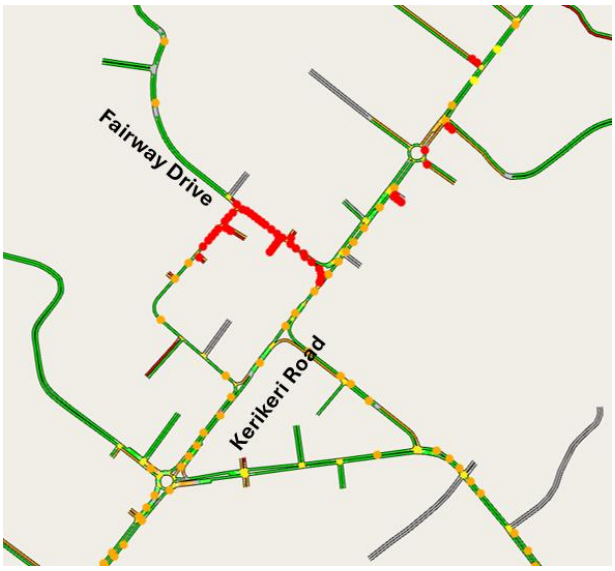
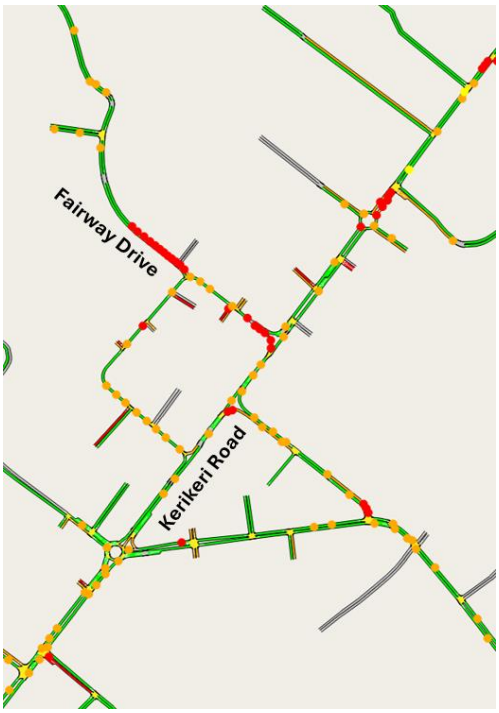
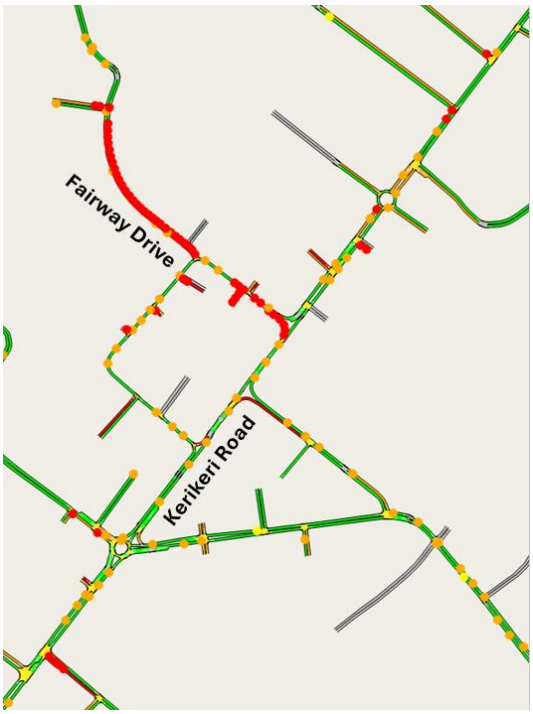
The figures indicate some areas of delay, being:

- Fairway Drive/Homestead Road, predominantly during the PM peak hour
- SH10/Waipapa Road roundabout during both peak hours.

The access points on SH10 and Waipapa Road are not predicted to have any significant vehicle queuing in the 10 year Plan Change scenario.

The predicted worst queues/congestion on each approach to the key intersections have been compared between the PDP scenario and 10 year development scenario.

Table 6: Snapshot of vehicle queues at intersections - Plan Change development (10 year scenario)

Fairway Drive/Homestead Road PDP scenario	
AM peak hour	**PM peak hour**
	
Fairway Drive/Homestead Road With Plan Change development (10 year scenario)	
AM peak hour	**PM peak hour**
	

The figures indicate some areas of delay, being Fairway Drive/Homestead Road, in the 10 year Plan Change scenario. The PDP scenario does indicate delays and queues through the Kerikeri CBD in the PM peak, albeit in a different location given the land use differences between the 2 scenarios.

The following section provides further assessment of the key intersections and predicted delays.

11.4 Level of service

Level of Service (LOS) is a qualitative performance measure representing the quality of service. It is a measure of delay at an intersection and a typical measure of intersection performance for vehicles. In general, there are six levels of service, designated A to F, with:

- LOS A representing the best operating condition and service quality from the users' perspective (i.e. free-flow), and
- LOS F representing the worst operating condition and service quality (i.e. forced or breakdown flow or having reached a point that most users would consider unsatisfactory).

Table 7 presents the predicted LOS at the proposed access points.

Table 7: Plan Change 10 year scenario - AM and PM peak hour (3 access points)

	AM Peak Hour					PM Peak Hour			
Intersection	Int. LOS	Approach	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS	Int. LOS	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS
SH10/Puketotara Road	B	State Highway 10 South S	616	12	B	B	543	15	B
		Puketotara Road West W	116	16	B		122	12	B
		State Highway 10 North N	531	10	B		725	10	B
		Puketotara Road East E	164	7	A		282	13	B
Waipapa Road/Waitotara Drive	A	Waitotara Drive S	218	8	A	A	161	8	A
		Waipapa Road West W	547	1	A		608	1	A
		Waipapa Road East E	544	1	A		527	1	A
Fairway Drive/Homestead Road	B	Homestead Road S	655	6	A	C	924	3	A
		Fairway Drive N	330	41	D		317	84	F

The following points are noted with the Plan Change 10 year scenario in the morning and evening peak hours:

- SH10/Puketotara Road and Waipapa Road/Waitotara Drive intersection are predicted to operate with limited delays in the peak hours, being a LOS A or B

- Vehicle queues at the SH10 access and Waipapa Road access points are also predicted to be relatively short
- The right turn demand from Waipapa Road to Waitotara Drive is some 40 vph and 75 vph in the AM and PM peak hours, with queues generally no more than 2 vehicles. A short right turn bay can therefore accommodate the 10 year forecast demand
- The intersection of Fairway Drive and Homestead Road is likely to operate with some delays. During the morning peak hour, the LOS on the Fairway Drive approach is predicted to be a LOS D in the AM peak hour and LOS F in the PM peak hour
- The AM peak hour operates adequately with some delay and relatively short queues. However, the PM peak will likely experience queues of up to 200 to 250 m on the Fairway Drive approach. This is as a result of increased traffic volumes through the intersection that are travelling to and from the Plan Change area, and also an increase traffic flows through the Kerikeri CBD in the future
- We note that the period of congestion in the peak hours is a relatively short period of some 15 to 20 minutes.

12 TRAVEL TIME COMPARISON

Travel times for 3 key corridors have been assessed in both directions, being

- SH10 between Kerikeri Road and Kapiro Road
- Kerikeri Road between SH10 and Waipapa Road/Heritage Bypass
- Waipapa Road between SH10 and Heritage Bypass

Figure 8 shows the modelled travel time routes.

Figure 8: Journey time routes

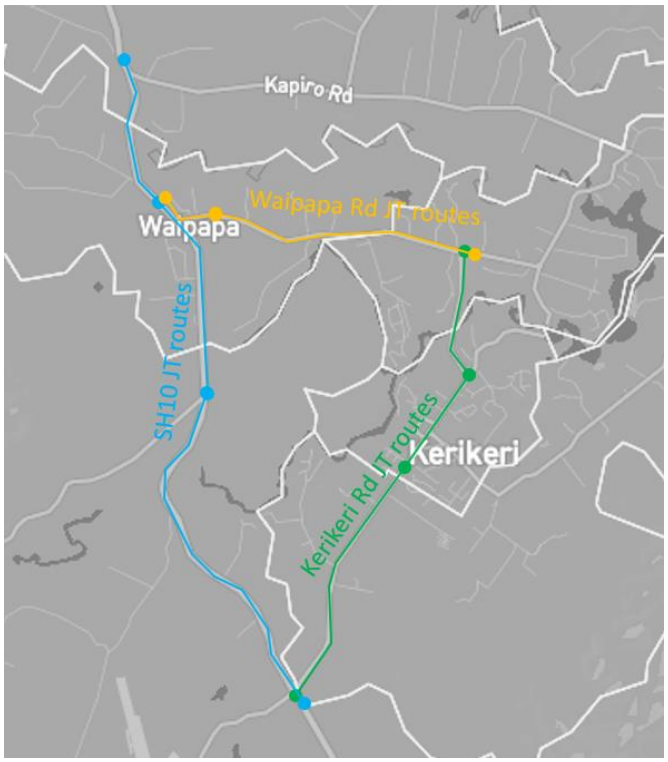


Table 8 presents a comparison of travel times between the PDP forecast and the Plan Change 10 year forecast.

Table 8: Travel time comparison

Route	Direction	PDP		Plan Change '10 year' scenario		Difference (seconds)	
		AM	PM	AM	PM	AM	PM
SH10	Northbound	07:12	07:14	07:19	07:29	7	15
	Southbound	07:23	07:55	07:27	07:52	4	-3
Kerikeri Road	Northbound	08:35	08:45	08:30	08:20	-5	-25
	Southbound	07:49	07:49	07:45	08:00	-4	12
Waipapa Road	Eastbound	04:05	04:34	04:02	04:21	-3	-13
	Westbound	04:27	04:39	04:18	04:26	-9	-13

Travel times within the modelled area are unlikely to change significantly with 50% of the Plan Change development in place (10 year scenario), when compared to the PDP scenario. All changes in travel times are predicted to be either an increase or a decrease of less than half a minute.

A predicted increase in travel time on SH10 is due to the geometric delay of a new roundabout, but is somewhat offset by a reduction in traffic volumes on SH10 near Kerikeri Road (as discussed previously in Section 11.1).

13 PROPOSED PLAN CHANGE – WITHOUT FAIRWAY DRIVE ACCESS POINT

We have assessed a scenario with proposed access points on SH10 and Waipapa Road only, and no access for development traffic via Fairway Drive, ie two access points to the external road network only.

Table 9 presents the predicted LOS at the proposed access points on SH10 and Waipapa Road. This also shows the Fairway Drive/Homestead Road intersection, which does not serve as a development access point in this test.

Table 9: Brownlie development 10 year scenario with SH10 and Waipapa Road access points only - AM and PM peak hour

			AM Peak Hour			PM Peak Hour		
Intersection	Int. LOS	Approach	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS	Int. LOS	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS
SH10/Puketotara Road	B	State Highway 10 South S	596	13	B	B	599	13	B
		Puketotara Road West W	113	17	B		115	16	B
		State Highway 10 North N	512	9	A		734	10	B
		Puketotara Road East E	219	8	A		283	14	B
Waipapa Road/Waitotara Drive	A	Waitotara Drive S	350	16	B	A	259	18	B
		Waipapa Road West W	567	1	A		637	2	A
		Waipapa Road East E	585	1	A		672	1	A
Fairway Drive/Homestead Road	A	Homestead Road S	687	4	A	A	799	2	A
		Fairway Drive N	80	9	A		157	11	B

The following points are noted:

- Fairway Drive does not serve as an access road for the Plan Change area, and therefore the Fairway Drive/Homestead Road intersection is predicted to operate with a LOS A in both peak hours
- Despite removing access via Fairway Drive, SH10/Puketotara Road and Waipapa Road/Waitotara Drive intersections are both predicted to operate with a LOS A or B in both peak hours, ie limited delays

The scenario assessment, with the Fairway Drive access, predicts high numbers of drivers travelling directly into Kerikeri CBD through a give way controlled intersection of Fairway Drive and Homestead Road. The scenario, without the Fairway Drive access, requires drivers to find alternative routes to Kerikeri CBD, ie via Waipapa Road and Kerikeri Road.

To understand the effect on the wider road network, we have presented the predicted LOS in Table 9. Full details of the LOS for each intersection are contained in Appendix D.

Based on the LOS outputs for the wider network, the following points are noted for the scenario without the Fairway Drive access point.

SH10/Kerikeri Road intersection

- SH10/Kerikeri Road intersection is predicted to operate with a LOS C and LOS B in the AM and PM peak hours. This is slightly worse than the scenario with the Fairway Drive link, due to more drivers travelling via SH10 and Kerikeri Road. However, this is still considered an acceptable level of service

- The total traffic travelling through the SH10/Kerikeri Road roundabout is also still likely to be lower than the PDP scenario. This is due to the shift associated with the Plan Change, ie households would be closer to Waipapa and a large number of trips internalised to the Plan Change area development between households and retail/commercial/industrial development.

SH10/Waipapa Road intersection

- SH10/Waipapa Road intersection is predicted to operate with a LOS B and LOS D in the AM and PM peak hours without the Fairway Drive access point. This is still considered an acceptable level of delay
- However, without the Fairway Drive access, there is a predicted increase in traffic through the roundabout, predominantly on the SH10 south approach. This leads to a LOS F southbound on SH10 and longer queues in the PM peak hour
- Vehicle queues are predicted to be up to some 200 m long southbound on SH10. This is similar to the PDP scenario, albeit the SH10 southbound approach is predicted to operate with a LOS E. The overall LOS for the intersection is still the same, with a LOS D predicted.

The majority of other intersections are predicted to operate with a LOS A or B without the Fairway Drive access point in place.

Table 10 presents a comparison of travel times between the PDP forecast and the Plan Change 10 year scenario without the Fairway Drive access.

Table 10: Travel time comparison

Route	Direction	Proposed District Plan 10 year scenario		Brownlie development 10 year scenario without Fairway Dr link		Difference (seconds)	
		AM	PM	AM	PM	AM	PM
SH10	Northbound	07:12	07:14	07:22	07:28	10	14
	Southbound	07:23	07:55	07:56	08:43	33	47
Kerikeri Road	Northbound	08:35	08:45	08:28	08:25	-7	-20
	Southbound	07:49	07:49	07:57	07:51	8	2
Waipapa Road	Eastbound	04:05	04:34	04:03	04:34	-1	0
	Westbound	04:27	04:39	04:28	04:36	0	-3

The results in Table 10 indicate the following.

- There is an increase in travel time southbound on SH10 of some 30 to 45 seconds (7 to 10%) in the peak hours when compared to the PDP scenario. This is due to the geometric delay of a new roundabout and also increased traffic volumes
- Travel times on Waipapa Road and Kerikeri Road are generally predicted to see relatively small changes in travel time.

The assessment indicates that 50% of the full Plan Change development, with 2 proposed access points and the existing road network, can operate without significant delays.

14 FULL BUILD-OUT OF PLAN CHANGE AREA

We have assessed a scenario with full potential development of the Plan Change area, which could occur within a 20 year time frame.

Two network scenarios have been assessed, being with and without the Kerikeri CBD bypass.

We have presented the predicted traffic operation of the forecast scenarios using vehicle queues and intersection performance (Level of Service). Appendix E presents a full summary of the modelled traffic volumes.

14.1 Modelled vehicle queues

The following figures present a 'snapshot' of vehicle queues within the study area. The coloured dots represent individual vehicles, and the different colours representing different levels of congestion as outlined in Section 11.3 previously.

The figures present 20 year scenario with (Figure 9) and without (Figure 10) the Kerikeri CBD bypass.

Figure 9: Snapshot of vehicle queues Plan Change (20 year scenario) *without* Kerikeri CBD bypass – AM peak 8:30am (left) and PM peak 5:00pm (right)

Figure 9 indicates some areas of delay *without* the Kerikeri Bypass, being

- Significant delay at the Fairway Drive/Homestead Road intersection during the PM peak hour
- SH10/Waipapa Road roundabout during both peak hours
- SH10/Puketotara Road roundabout.

The extent of the modelled delays is further quantified in the following section.

Figure 10: Snapshot of vehicle queues Plan Change (20 year scenario) *with* Kerikeri CBD bypass – AM peak 8:30am (left) and PM peak 5:00pm (right)

Figure 10 indicates that the key constraint in the full build out of the Plan Change area is removed when the Kerikeri Bypass is in place. Significant delays are still likely at the SH10/Waipapa Road intersection, however this would be a similar situation to a 20 year forecast without full development of the Plan Change.

The following section further illustrates the predicted delay at the 3 access points for the Plan Change.

14.2 Level of Service

Table 11 and Table 12 present the predicted LOS at the proposed access points to the Plan Change area.

- Table 11 presents the LOS without the Kerikeri CBD bypass
- Table 12 presents the LOS with the Kerikeri CBD bypass.

Table 11: Plan Change 20 year scenario *without* Kerikeri CBD bypass - AM and PM peak hour (3 access points to Plan Change area)

			AM Peak Hour			PM Peak Hour		
Intersection	Int. LOS	Approach	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS	Int. LOS	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS
SH10/Puketotara Road	B	State Highway 10 South S	689	18	B	B	653	22	C
		Puketotara Road West W	114	40	D		140	25	C
		State Highway 10 North N	600	14	B		764	13	B
		Puketotara Road East E	268	9	A		417	16	B
Waipapa Road/Waitotara Drive	A	Waitotara Drive S	282	12	B	A	277	12	B
		Waipapa Road West W	551	2	A		647	2	A
		Waipapa Road East E	644	1	A		563	1	A
Fairway Drive/Homestead Road	E	Homestead Road S	743	13	B	E	1113	13	B
		Fairway Drive N	400	133	F		317	241	F

Table 12: Plan Change 20 year scenario *with* Kerikeri CBD bypass - AM and PM peak hour (3 access points to Plan Change area)

			AM Peak Hour			PM Peak Hour			
Intersection	Int. LOS	Approach	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS	Int. LOS	Approach Flow (veh)	Approach Average Delay (s/veh)	Approach LOS
Puketotara Road/SH10 RBT	B	State Highway 10 South S	638	15	B	B	535	26	C
		Puketotara Road West W	108	29	C		143	22	C
		State Highway 10 North N	550	12	B		752	12	B
		Puketotara Road East E	239	8	A		320	12	B
Waitotara Drive/Waipapa Road	A	Waitotara Drive S	281	12	B	A	258	10	B
		Waipapa Road West W	556	2	A		624	2	A
		Waipapa Road East E	636	1	A		549	1	A
Fairway Drive/Homestead Road	A	Homestead South S	565	3	A	C	805	17	B
		Fairway West W	511	17	B		475	55	E
		Augusta Place North N	1048	8	A		899	6	A
		Fairway East E	149	7	A		364	8	A

The modelled scenario with full Plan Change development in place is predicted to lead to extensive delays (LOS F) and long queues on Fairway Drive (in excess of 500m). This may not eventuate, as the Kerikeri CBD bypass may be in place in the future.

With the CBD bypass in place, there is a roundabout control at the intersection of Fairway Drive and Kerikeri Road. Our assessment indicates that this can accommodate the forecast Plan Change traffic from Fairway Drive.

Further to this, this scenario is a 20 year land use forecast. Whilst we have accounted for development in the wider area, the nature and extent of this is somewhat uncertain given the 20 year timeframe.

The assessment indicates that if a 20 year scenario with full development of the Plan Change area eventuates, then further changes to the network are required to accommodate the predicted traffic volumes.

We understand that the precinct provisions for the Plan Change may require an assessment of traffic effects beyond a 50% build out of the Plan Change area. This enables the traffic effects to be considered in the future when there is more certainty with regard to the CBD bypass and future development in the region.

15 SUMMARY

We have assessed the potential traffic effects of the Proposed Plan Change (10 year scenario / 50% of development yield) and 20 year scenario with full development of the Plan Change area.

Overall, the forecast traffic growth in the modelled area, for the 10 year model scenario, is similar when comparing the PDP and Proposed Plan Change. The total retail/commercial/industrial development is the same within the modelled area, but located in different areas. While the total number of households in the Proposed Brownlie Plan change scenario (10 year forecast) is higher, the predicted trip rate for the Plan Change area is lower with a high level of internalisation of trips to the area.

When compared to the PDP scenario, driver behaviour is likely to be altered due to the Plan Change development, with predicted reductions in traffic volumes on Kerikeri Road, Waipapa Road and the Heritage Bypass in both peak commuter hours.

These changes are due to the change in the location of predicted growth in the next 10 years. Development in the PDP scenario is predicted within Kerikeri CBD (commercial/retail), Waipapa (industrial) and spread through the region for residential development (with large areas south of the Kerikeri CBD). While the Proposed Plan Change concentrates development of residential, commercial, retail and industrial in the area between Waipapa and Kerikeri CBD, and assumes a large proportion of traffic is internalised to the development area. The development location generally is predicted to reduce trips around the network, ie between Waipapa and Kerikeri, and replaces them with trips between the development and Waipapa or Kerikeri, or internal to the Plan Change area.

With the Plan Change 10 year scenario access points to the existing road network, ie the SH10/Puketotara Road and Waipapa Road/Waitotara Drive intersections, are predicted to operate with limited delays in the peak hours, while the third access point via Fairway Drive, which connects to the Fairway Drive/Homestead Road intersection, is likely to operate with some delays. The AM peak hour operates adequately with limited delay and relatively short queues. However, the PM peak will likely experience queues of up to 200 to 250 m on the Fairway Drive approach.

We have also assessed a scenario without an access route via Fairway Drive, and with proposed access points on SH10 and Waipapa Road only. Despite removing access via Fairway Drive, SH10/Puketotara Road and Waipapa Road/Waitotara Drive intersections are both predicted to operate with a LOS A or B in both peak hours, ie limited delays in a 10 year scenario (50% of proposed development).

The assessment indicates that if a 20 year scenario with full development of the Plan Change area eventuates, then further changes to the network are required to accommodate the predicted traffic volumes.

We understand that the precinct provisions for the Plan Change may require an assessment of traffic effects beyond a 50% build out of the Plan Change area. This enables the traffic effects to be considered in the future when there is more certainty with regard to the CBD bypass and future development in the region.

APPENDIX A Forecast PDP Land Use

PDP Land Use Summary

Proposed District Plan Population Growth Summary

The Kerikeri-Waipapa area is expected to continue accommodating the majority of the Far North District Council's growth over the next 50 years. We note that

- the Kerikeri-Waipapa structure plan area currently accommodates some 19% of the Far North's population
- this is projected to grow to 25% by 2073, as growth in the area outpaces the district overall
- population (residential) growth is projected to be concentrated in the urban area, particularly Kerikeri Central and Kerikeri South, and to a lesser extent Riverview and Waipapa
- analysis undertaken by, or for Council provides estimates of the commercial and industrial land required to meet forecast demand
- a large portion of business (employment) land zoning is rolled over from the Operative District Plan (ODP), with the main area of rezoning occurring at Waipapa, to meet the demand for additional business land in the Kerikeri / Waipapa area.

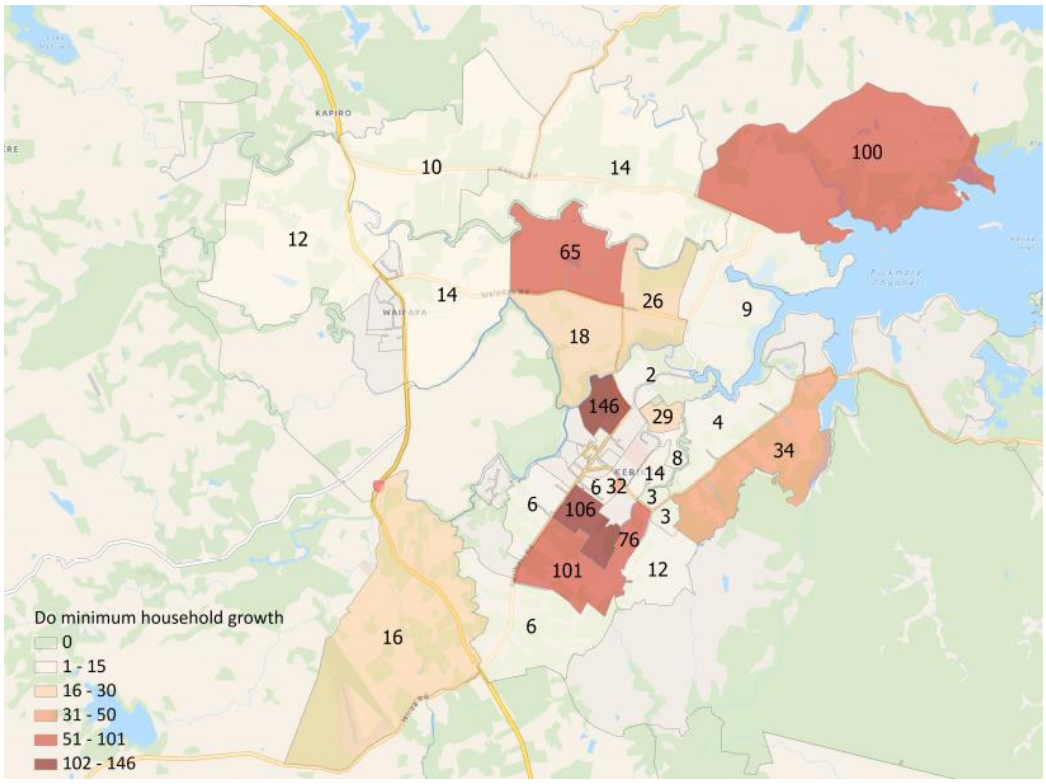
Population and residential households

In order to meet the population forecasts for the Kerikeri area, some 730 households (medium growth) or 855 households (high growth) is anticipated over the next 10 years. Council's analysis of the latent capacity for the PDP shows what type of sites are available and how many are available within the Kerikeri area, in particular the 4 Kerikeri census (Statistical Area 2/SA2) areas.

Based on the conclusions of the latent capacity assessment, there are plenty of available sites within the PDP zoning with limited or likely development potential. The Council report states that the four SA2 areas can accommodate all of the projected development over the next 10 years (medium term) under both the medium and high growth scenarios with an excess of 100% headroom.

The Council analysis outlines the potential population and household forecasts. The high growth scenario requires approximately 860 households to meet the population growth as presented in Figure 11.

Figure 11: Development potential (households within traffic model zones) – High growth scenario (total of 860 residential sites)



Commercial and industrial zoned land

The economic model developed by BERL for Council estimated the additional commercial and industrial zoned land needed to meet demand over the next 30 years for the Far North and in particular the Kerikeri/Waipapa area.

A large portion of business land zoning is rolled over from the ODP, with the main area of rezoning occurring at Waipapa. Table 13 presents the additional commercial and industrial land zoning needed in the short, medium and long term.

Table 13: 10-year forecast requirements for industrial and commercial development

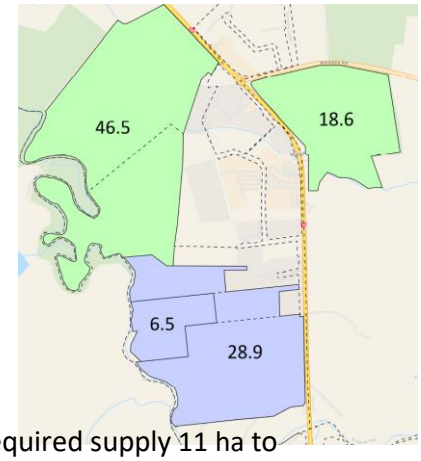
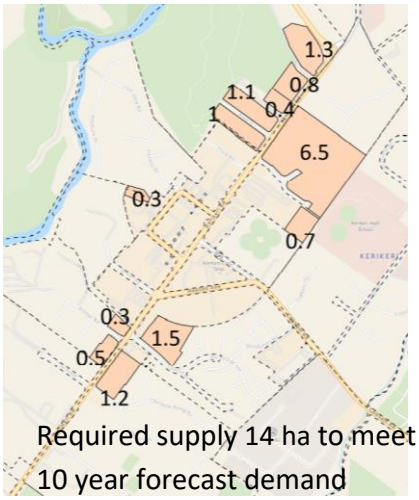
Land-use zone	Area	Short term (5 years) (ha)	Medium term (10 years) (ha)	Long term (30 years) (ha)
Commercial	Kerikeri / Waipapa	9	14	14
Industrial		11	11	11

The following points are noted within Council's Section 32 report with regard to the re-zoning of commercial and industrial land

- the economic model covers the Far North District. Kerikeri/Waipapa displays the highest demand for additional land for both industrial and commercial uses
- 14 ha of commercial and 11 ha of industrial development is required in the next 10 years to meet demand, with this being considered in the proposed zoning, as shown in Table 14

- there is a level of rezoning proposed for Kerikeri and Waipapa in the PDP, which is largely focused around extending the industrial areas in Waipapa, while also having areas of Mixed Use
- There will be 16 ha of new commercial land zoned in Kerikeri under the PDP, with no additional in Waipapa. This will meet the estimated future *additional* demand of 14 ha
- There will be 101 ha of newly zoned industrial land (light and heavy industrial) in Waipapa under the PDP. This will easily meet the estimated future *additional* demand of 11 ha.

Table 14: New commercial and industrial zones within the PDP

Proposed District Plan (PDP) **Additional commercial and industrial zoned areas (ha)**	
Waipapa	Kerikeri town centre
 Required supply 11 ha to meet 10 year forecast demand	 Required supply 14 ha to meet 10 year forecast demand
	

APPENDIX B Trip generation

Table 15: Proposed Plan Change – 10 year scenario, 50% of development potential

Use		Area	Units
Mixed use - Commercial and Employment Ce	Retail	2500	sqm
	Superma	1250	sqm
	LFR	2500	sqm
	Commercial service	1250	sqm
	Office	1250	sqm
	Light industry	7500	sqm
	Resident	2500	sqm
	Accommodation	1000	
	Recreation & health	2500	sqm
Mixed use - Local centre	Retail	375	sqm
	Commercial service	375	sqm
	Office	250	sqm
Hotel		50	units
Local centre		250	sqm
Dwellings		1600	dwellings

speciality retail
medium sized
medium sized

Consistancy check between updated numbers and Flow numbers for Model

Use	Area	Units	
Retail	6875	Sqm	
Commercial service	1625	Sqm	
Office	1500	Sqm	
Hotel	50	units	95sqm
Recreation	2500	Sqm	
Industrial	7500	Sqm	
Residential	1600	dwellings	

no discounting of passby for residential
recognising passby here

AM generation - updated numbers		Area	Gntn rate	Distribution Inbound	Outbound	Overall total trips Inbound	Outbound	Percentage split Internal trips	External trips	No of internal trips/hour ontained within the zoned are Inbound	Outbound	No of external trips/hour into out of zoned area Inbound	Outbound
Mixed use -													
Commercial and	Retail	2500	0.04	60%	40%	48	32	50%	50%	24	16	24	16
	Supermarket	1250	0	50%	50%	0	0	50%	50%	0	0	0	0
	LFR	2500	0	50%	50%	0	0	50%	50%	0	0	0	0
	Commercial service	1250	0	35%	65%	0	0	50%	50%	0	0	0	0
	Office	1250	0.02	80%	20%	20	5	50%	50%	10	3	10	3
	Light industry	7500	0.015	80%	20%	90	23	50%	50%	45	11	45	11
	Residential	2500	0.5	35%	65%	6	12	20%	80%	1	2	5	9.2857143
	Accommodation	1000	0.5	35%	65%	3	5	20%	80%	1	1	2	3.7142857
	Recreation & health	2500	0.01	70%	30%	14	6	50%	50%	7	3	7	3
Mixed use - Local centre	Retail	375	0.2	60%	40%	36	24	50%	50%	18	12	18	12
	Commercial service	375	0.02	35%	65%	3	5	50%	50%	1	2	1	2
	Office	250	0.02	80%	20%	4	1	50%	50%	2	1	2	1
Hotel	(rooms)	50	0.1	60%	40%	3	2	30%	70%	1	1	2	1
Local centre		250	0.04	50%	50%	4	4	85%	15%	3	3	1	1
Residential - 10 years		1600	0.5	35%	65%	280	520	20%	80%	56	104	224	416
TOTAL													
with Residential 20 years										169	159	341	479
							equiv veh trips/min			2.8	2.6	5.7	8.0

no discounting of passby for residential
recognising passby here

PM generation - updated numbers		Area	Gntn rate	Distribution Inbound	Outbound	Overall total trips Inbound	Outbound	Percentage split Internal trips	External trips	No of internal trips/hour ontained within the zoned are Inbound	Outbound	No of external trips into out of zoned area Inbound	Outbound
Mixed use -													
Commercial and	Retail	2500	0.2	50%	50%	200	200	50%	50%	100	100	100	100
	Supermarket	1250	0.0371	50%	50%	19	19	50%	50%	9	9	9	9
	LFR	2500	0.0371	50%	50%	37	37	50%	50%	19	19	19	19
	Commercial service	1250	0.015	35%	65%	7	12	50%	50%	3	6	3	6
	Office	1250	0.02	35%	65%	9	16	50%	50%	4	8	4	8
	Light industry	7500	0.015	20%	80%	23	90	50%	50%	11	45	11	45
	Residential	2500	0.5	60%	40%	11	7	20%	80%	2	1	9	6
	Accommodation	1000	0.5	60%	40%	4	3	20%	80%	1	1	3	2
	Recreation & health	2500	0.02	35%	65%	14	26	50%	50%	7	13	7	13
Mixed use - Local centre	Retail	375	0.2	50%	50%	30	30	50%	50%	15	15	15	15
	Commercial service	375	0.015	35%	65%	2	4	50%	50%	1	2	1	2
	Office	250	0.02	35%	65%	2	3	50%	50%	1	2	1	2
Hotel	(rooms)	50	0.5	60%	40%	15	10	30%	70%	5	3	11	7
Local centre		250	0.2	50%	50%	20	20	85%	15%	17	17	3	3
Residential - 10 years		1600	0.5	60%	40%	480	320	20%	80%	96	64	384	256
TOTAL													
with Residential 10 Years										291	304	580	492
							equiv veh trips/min			4.9	5.1	9.7	8.2

Table 16: Proposed Plan Change – 10 year scenario, 50% of development potential

Use		Area	Units
Mixed use - Commercial and Employment Ce	Retail	5000	sqm
	Superma	2500	sqm
	LFR	5000	sqm
	Commercial service	2500	sqm
	Office	2500	sqm
	Light industry	15000	sqm
	Resident	5000	sqm
	Accommodation	2000	
	Recreation & health	5000	sqm
Mixed use - Local centre	Retail	750	sqm
	Commercial service	750	sqm
	Office	500	sqm
Hotel		100	units
Local centre		500	sqm
Dwellings		2440	dwellings

speciality retail
medium sized
medium sized

Consistancy check between updated numbers and Flow numbers for Model

Use	Area	Units	
Retail	13750	Sqm	
Commercial service	3250	Sqm	
Office	3000	Sqm	
Hotel	100	units	95sqm
Recreation	5000	Sqm	
Industrial	15000	Sqm	
Residential	2440	dwellings	

no discounting of passby for residential recognising passby here

AM generation - updated numbers		Area	Gntn rate	Distribution Inbound	Outbound	Overall total trips Inbound	Outbound	Percentage split Internal trips	External trips	No of internal trips/hour ontained within the zoned are Inbound	Outbound	No of external trips/hour into out of zoned area Inbound	Outbound
Mixed use - Commercial and	Retail	5000	0.04	60%	40%	96	64	50%	50%	48	32	48	32
	Supermarket	2500	0	50%	50%	0	0	50%	50%	0	0	0	0
	LFR	5000	0	50%	50%	0	0	50%	50%	0	0	0	0
	Commercial service	2500	0	35%	65%	0	0	50%	50%	0	0	0	0
	Office	2500	0.02	80%	20%	40	10	50%	50%	20	5	20	5
	Light industry	15000	0.015	80%	20%	180	45	50%	50%	90	23	90	23
	Residential	5000	0.5	35%	65%	13	23	20%	80%	3	5	10	19
	Accommodation	2000	0.5	35%	65%	5	9	20%	80%	1	2	4	7
	Recreation & health	5000	0.01	70%	30%	28	12	50%	50%	14	6	14	6
Mixed use - Local centre	Retail	750	0.2	60%	40%	72	48	50%	50%	36	24	36	24
	Commercial service	750	0.02	35%	65%	5	10	50%	50%	3	5	3	5
	Office	500	0.02	80%	20%	8	2	50%	50%	4	1	4	1
Hotel	(rooms)	100	0.1	60%	40%	6	4	30%	70%	2	1	4	3
Local centre		500	0.04	50%	50%	8	8	85%	15%	7	7	1	1
Residential - 20 years		2440	0.5	35%	65%	427	793	20%	80%	85	159	342	634
TOTAL													
with Residential 20 years										312	268	576	760
							equiv veh trips/min			5.2	4.5	9.6	12.7

no discounting of passby for residential recognising passby here

PM generation - updated numbers		Area	Gntn rate	Distribution Inbound	Outbound	Overall total trips Inbound	Outbound	Percentage split Internal trips	External trips	No of internal trips/hour ontained within the zoned are Inbound	Outbound	No of external trips into out of zoned area Inbound	Outbound
Mixed use - Commercial and	Retail	5000	0.2	50%	50%	400	400	50%	50%	200	200	200	200
	Supermarket	2500	0.0371	50%	50%	37	37	50%	50%	19	19	19	19
	LFR	5000	0.0371	50%	50%	74	74	50%	50%	37	37	37	37
	Commercial service	2500	0.015	35%	65%	13	24	50%	50%	7	12	7	12
	Office	2500	0.02	35%	65%	18	33	50%	50%	9	16	9	16
	Light industry	15000	0.015	20%	80%	45	180	50%	50%	23	90	23	90
	Residential	5000	0.5	60%	40%	21	14	20%	80%	4	3	17	11
	Accommodation	2000	0.5	60%	40%	9	6	20%	80%	2	1	7	5
	Recreation & health	5000	0.02	35%	65%	28	52	50%	50%	14	26	14	26
Mixed use - Local centre	Retail	750	0.2	50%	50%	60	60	50%	50%	30	30	30	30
	Commercial service	750	0.015	35%	65%	4	7	50%	50%	2	4	2	4
	Office	500	0.02	35%	65%	4	7	50%	50%	2	3	2	3
Hotel	(rooms)	100	0.5	60%	40%	30	20	30%	70%	9	6	21	14
Local centre		500	0.2	50%	50%	40	40	85%	15%	34	34	6	6
Residential - 20 years		2440	0.5	60%	40%	732	488	20%	80%	146	98	586	390
TOTAL													
with Residential 20 Years										537	579	978	863
							equiv veh trips/min			8.9	9.6	16.3	14.4

APPENDIX C Forecast Traffic Volumes

Figure 12: Comparison of forecast PDP and Brownlie Development (10 year scenario) traffic flows (vehicles) – Morning peak hour (8 to 9 am)

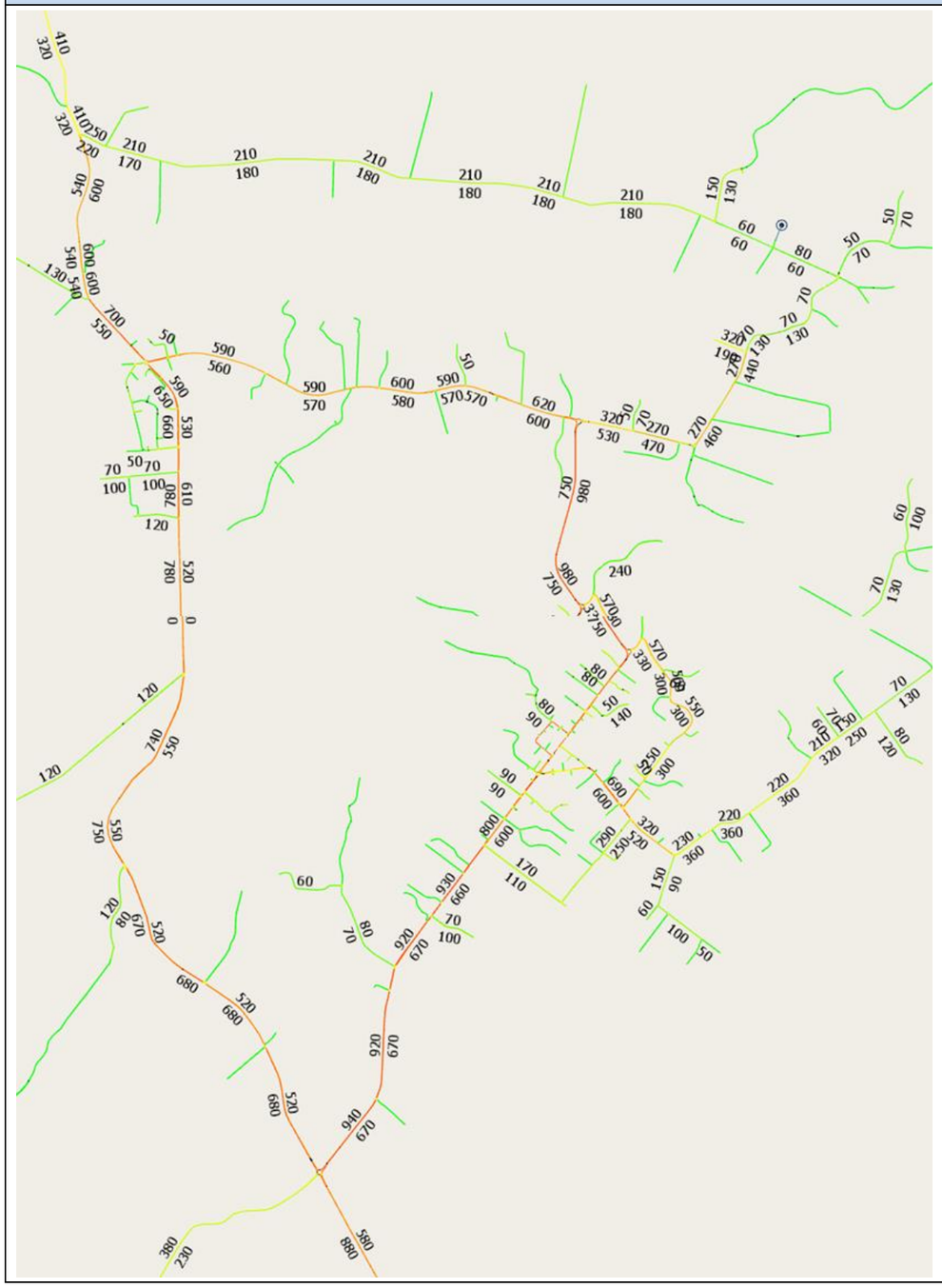
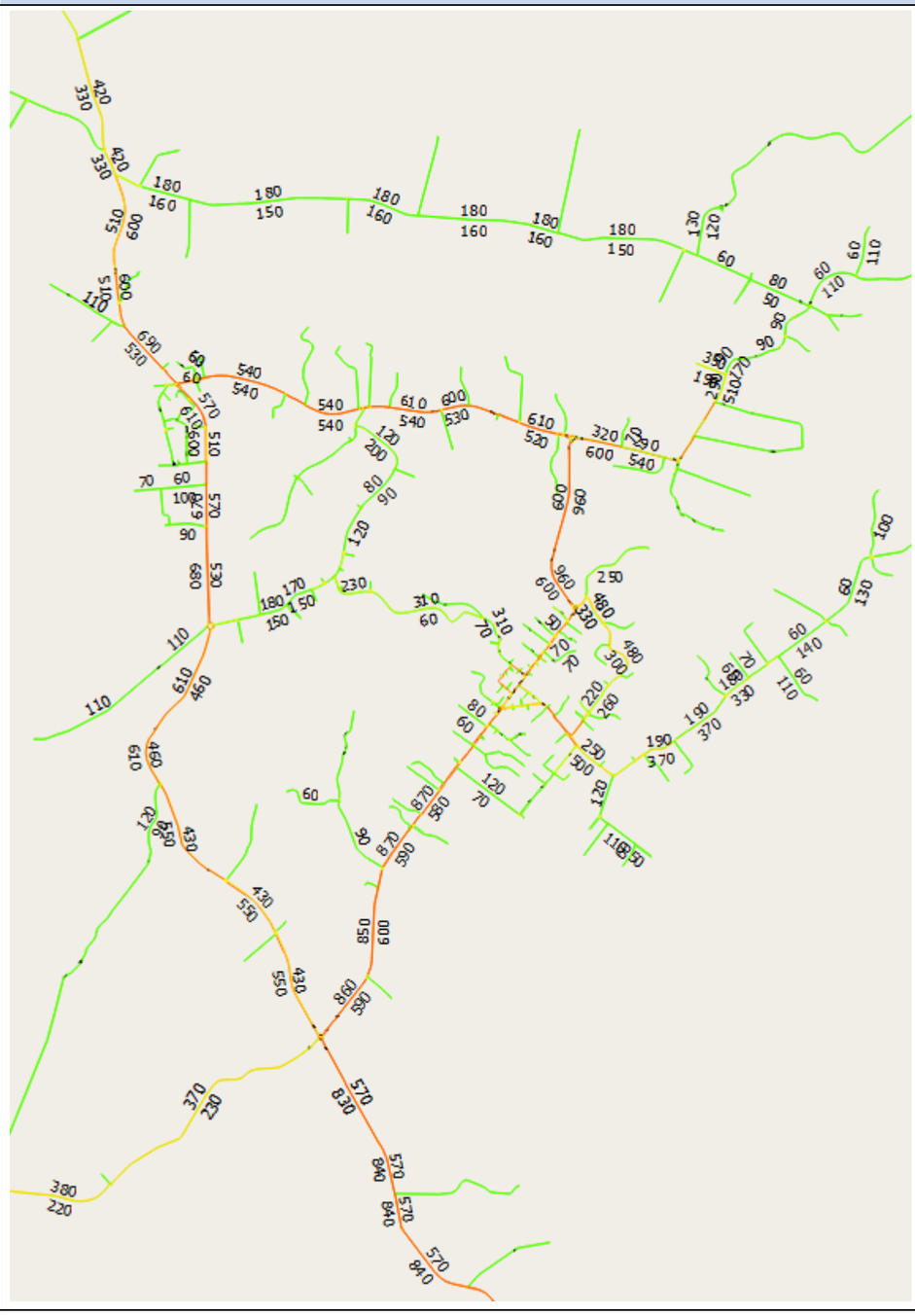
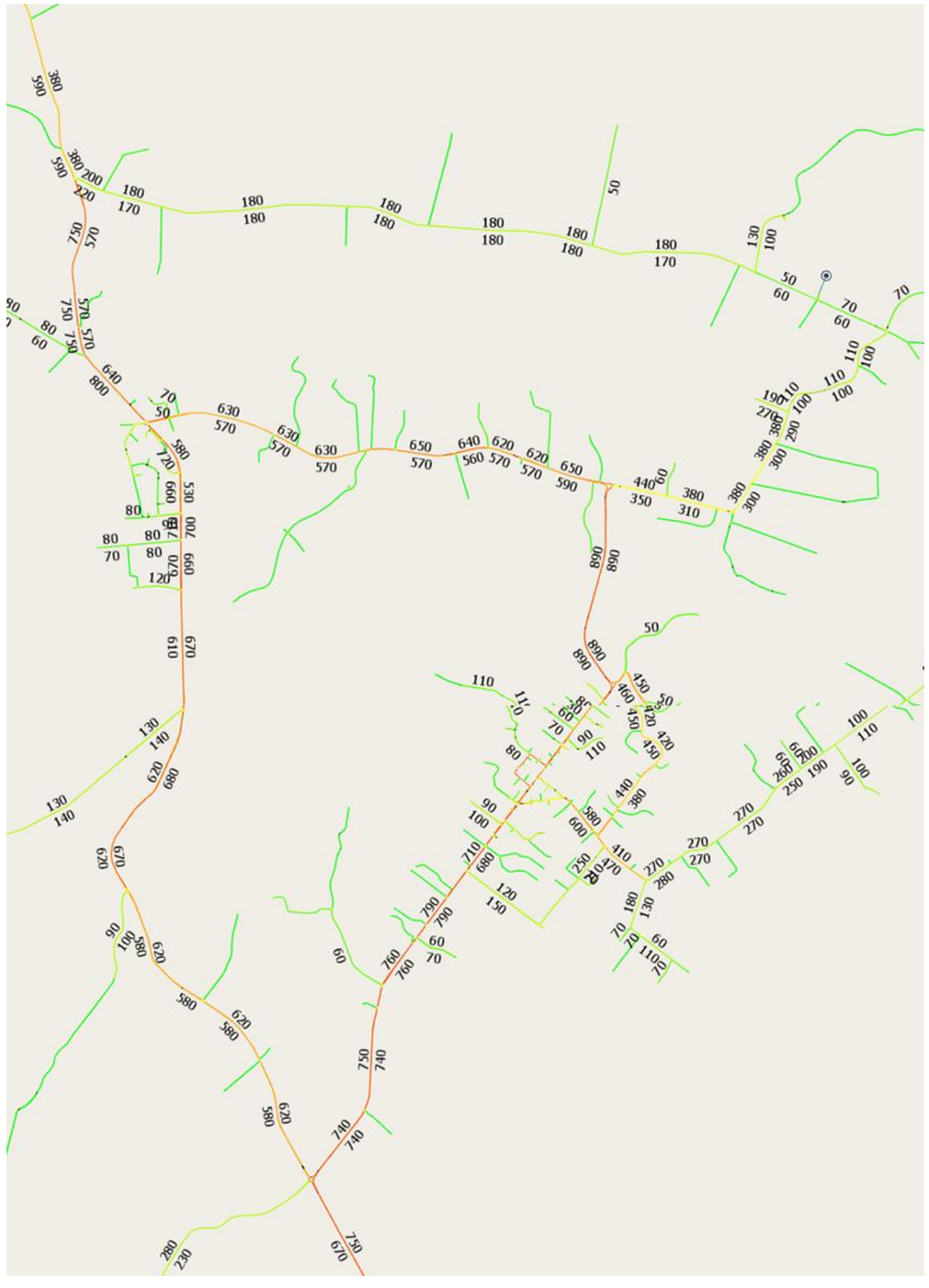
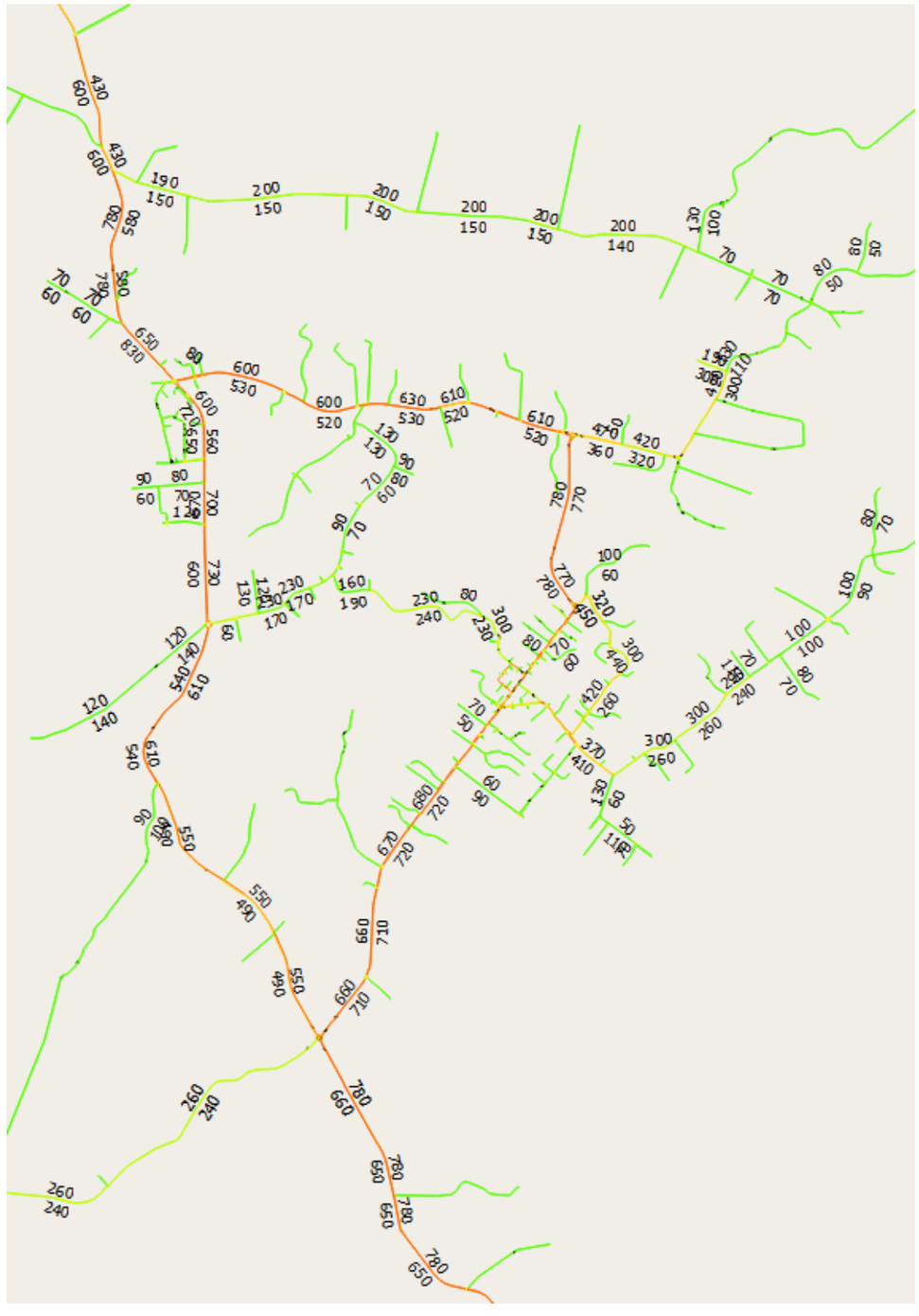
Forecast PDP traffic flows	Brownlie Development traffic flows – 10 year forecast
	

Figure 13: Comparison of forecast PDP and Brownlie Development (10 year scenario) traffic flows (vehicles) – Evening peak hour (4:30 pm to 5:30 pm)

Forecast PDP traffic flows	Brownlie Development traffic flows – 10 year forecast
	

APPENDIX D Level of Service – Key intersections in the wider network

Table 17: Level of Service – AM peak hour

Level of Service PDP scenario									Brownlie 10 year_Three access points								Brownlie 10 year_Two access points							
		Int.				Approach				Int.				Approach				Int.				Approach		
	Intersection	Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS
1	SH 10-Kerikeri Rd-Wiroa Rd	2435	35	D	SH10 N	523	32	C		2223	16	B	SH10 N	431	19	B		2308	23	C	SH10 N	503	47	D
					Kerikeri Rd E	663	6	A					Kerikeri Rd E	597	5	A					Kerikeri Rd E	602	5	A
					SH10 S	876	25	C					SH10 S	834	19	B					SH10 S	830	18	B
					Wiroa Rd W	380	110	F					Wiroa Rd W	361	27	C					Wiroa Rd W	373	31	C
2	SH 10-Waipapa Rd	1942	13	B	SH10 N	701	11	B		1824	11	B	SH10 N	706	11	B		1867	12	B	SH10 N	699	12	B
					Waipapa Rd E	515	19	B					Waipapa Rd E	495	15	B					Waipapa Rd E	497	16	B
					SH10 S	631	9	A					SH10 S	584	8	A					SH10 S	613	9	A
					Waipapa Loop Rd W	78	17	B					Waipapa Loop Rd W	39	12	B					Waipapa Loop Rd W	58	18	B
4	Waipapa Rd-Heritage Bypass	1900	8	A	Waipapa Rd E	531	11	B		1824	7	A	Waipapa Rd E	600	11	B		2008	15	B	Waipapa Rd E	588	35	D
					Twin Coast Discovery Hwy S	750	6	A					Twin Coast Discovery Hwy S	597	6	A					Twin Coast Discovery Hwy S	641	6	A
					Waipapa Rd W	621	6	A					Waipapa Rd W	627	5	A					Waipapa Rd W	779	7	A
5	Kerikeri Rd-Heritage Bypass	1591	7	A	Kerikeri Rd N	107	11	B		1536	6	A	Kerikeri Rd N	167	12	B		1719	8	A	Kerikeri Rd N	164	24	C
					Kerikeri Rd S	517	4	A					Kerikeri Rd S	397	3	A					Kerikeri Rd S	404	4	A
					Twin Coast Discovery Hwy W	979	7	A					Twin Coast Discovery Hwy W	972	6	A					Twin Coast Discovery Hwy W	1151	7	A
9	Kerikeri Rd-Hobson Ave-Butler Rd	1646	4	A	Kerikeri Rd N	474	7	A		1669	4	A	Kerikeri Rd N	439	6	A		1662	4	A	Kerikeri Rd N	423	5	A
					Hobson Ave E	325	3	A					Hobson Ave E	284	4	A					Hobson Ave E	286	3	A
					Kerikeri Rd S	848	3	A					Kerikeri Rd S	844	3	A					Kerikeri Rd S	851	3	A
					Bulter Rd W	111	6	A					Bulter Rd W	102	6	A					Bulter Rd W	102	6	A

Table 18: Level of Service – PM peak hour

Level of Service PDP scenario									Brownlie 10 year_Three access points									Brownlie 10 year_Two access points								
		Int.				Approach				Int.				Approach				Int.				Approach				
Intersection		Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS	Approach	Flow (veh)	Average Delay (s/veh)	LOS		
1	SH 10-Kerikeri Rd-Wiroa Rd	2304	13	B	SH10 N	618	20	C		2165	13	B	SH10 N	547	20	C		2302	15	B	SH10 N	603	24	C		
					Kerikeri Rd E	748	7	A					Kerikeri Rd E	704	8	A					Kerikeri Rd E	792	9	A		
					SH10 S	654	14	B					SH10 S	657	13	B					SH10 S	653	15	B		
					Wiroa Rd W	284	15	B					Wiroa Rd W	257	14	B					Wiroa Rd W	254	15	B		
2	SH 10-Waipapa Rd	2092	42	D	SH10 N	642	50	E		2004	32	C	SH10 N	653	35	D		2037	46	D	SH10 N	641	76	F		
					Waipapa Rd E	567	36	D					Waipapa Rd E	484	27	C					Waipapa Rd E	494	30	C		
					SH10 S	699	17	B					SH10 S	686	16	B					SH10 S	720	17	B		
					Waipapa Loop Rd W	184	127	F					Waipapa Loop Rd W	181	92	F					Waipapa Loop Rd W	182	99	F		
4	Waipapa Rd-Heritage Bypass	1903	8	A	Waipapa Rd E	362	10	B		1750	6	A	Waipapa Rd E	354	7	A		2053	8	A	Waipapa Rd E	376	11	B		
					Twin Coast Discovery Hwy S	888	6	A					Twin Coast Discovery Hwy S	783	6	A					Twin Coast Discovery	933	7	A		
					Waipapa Rd W	653	8	A					Waipapa Rd W	613	6	A					Waipapa Rd W	744	8	A		
5	Kerikeri Rd-Heritage Bypass	1506	6	A	Kerikeri Rd N	16	9	A		1386	5	A	Kerikeri Rd N	37	10	B		1619	6	A	Kerikeri Rd N	34	15	B		
					Kerikeri Rd S	600	6	A					Kerikeri Rd S	579	4	A					Kerikeri Rd S	663	6	A		
					Twin Coast Discovery Hwy W	890	6	A					Twin Coast Discovery Hwy W	770	5	A					Twin Coast Discovery	922	6	A		
9	Kerikeri Rd-Hobson Ave-Butler Rd	1786	5	A	Kerikeri Rd N	497	4	A		1673	6	A	Kerikeri Rd N	495	9	A		1712	6	A	Kerikeri Rd N	489	7	A		
					Hobson Ave E	333	4	A					Hobson Ave E	217	4	A					Hobson Ave E	220	6	A		
					Kerikeri Rd S	708	4	A					Kerikeri Rd S	732	4	A					Kerikeri Rd S	745	4	A		
					Bulter Rd W	248	7	A					Bulter Rd W	229	8	A					Bulter Rd W	258	11	B		

APPENDIX E Without Fairway Drive access

Figure 14: Brownlie Development traffic flows (vehicles) – 10 year forecast without Fairway Drive access

Brownlie Development traffic flows – 10 year forecast without Fairway Drive access	
Morning peak hour (8 to 9 am)	**Evening peak hour (4:30 pm to 5:30 pm)**