Transport Assessment

Curtis Street Plan Change

OPUS

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1. Introduction

Opus International Consultants (Opus) have been commissioned by Wellington City Council (the Council) to assess the possible transport effects of a proposed plan change. The plan change would change the permitted use of land at 55-85 Curtis Street (the site) from Open Space B and Residential to Business.

This transport assessment has considered the traffic impacts of the three types of land use that could be included as permitted land use in the proposed plan change:

- industrial,
- bulk retail and / or
- service retail.

The assessment has made account of the different trip generating potential of each possible land-use and determined the effect of each on the safe and efficient operation of the surrounding road network. The assessment has also considered the parking demand likely to be generated by each potential land-use as well as the implications associated with servicing the site.

2. Existing Conditions

2.1 Location

Figure 2.1 shows the location of 55-85 Curtis Street (shaded in red), which is bordered by Old Karori Road to the west, Whitehead Road to the north and Curtis Street to the east. The site is 10,900m² in size and currently has vehicular access from Old Karori Road. Approximately 7,000m² land at its northern end is zoned Open Space B. The southern end comprising 6 land parcels is zoned Outer Residential. Currently the site is unoccupied and generates very little, if any, traffic.

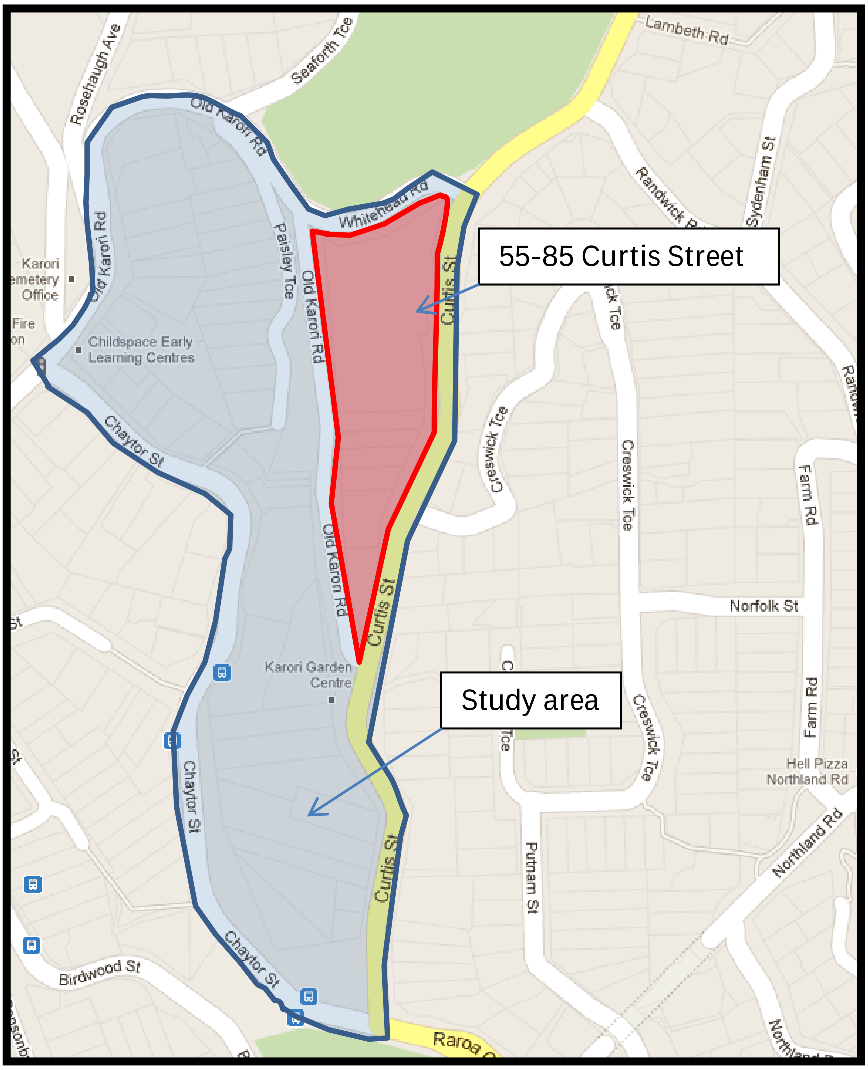


Figure 2.1: Location of 55-85 Curtis Street

Land to the west of the site, adjacent to the old Karori Road is undeveloped hillside, covered in established vegetation. On the eastern side of Curtis Street are a number of residential properties. On-street vehicle parking on some parts of Curtis Street is thought to be associated with these residential properties.

Ian Galloway Park is north of Whitehead Road, with playing fields, a BMX track and skateboard ramp. The park is used for team sports during both the summer and winter seasons. Land to the south of the site was previously used for a garden centre. On 18 April 2011, Wellington City Council granted resource consent for a child care centre where the garden centre had been.

2.2 Study Area

The study area was identified following discussions with Wellington City Council. The agreed study area is shown in Figure 2.1 (in blue) and includes the following intersections between:

- Chaytor Street and Old Karori Road – Signal Controlled Intersection
- Curtis Street and Whitehead Road – Priority T Intersection
- Curtis Street and Old Karori Road – Priority T Intersection
- Curtis Street and Chaytor Street – Priority T Intersection

The study area includes the roads linking these intersections. They were chosen after looking at the expected trip distribution. Each trip to or from the site is expected to pass through one or more of these intersections.

2.3 Road Layout

As shown in Figure 2.2, Curtis Street is defined as a Principal Road in the District Plan, which is defined as: "*a road that provides access to motorways and to arterial roads having a dominant through-traffic function and carrying the major public transport routes*".

At its southern end, Curtis Street connects with Chaytor Street which is also a Principal Road. Both Chaytor and Curtis Streets are commuter routes with associated tidal traffic patterns. Whitehead Road and Old Karori Road are both classified as 'Local Roads': "*roads that provide direct access to properties fronting the road and include both long and short cul-de-sacs*".

Curtis Street

As a Principal Road, Curtis Street predominantly carries through traffic and provides good connections to the wider Wellington roading network. In the vicinity of the site it has a winding and undulating alignment which is typical of suburban roads in this area of Wellington.

The road width in the vicinity of the site is approximately 6.2m which is less than desirable for a Principal Road. A 1.6m wide footpath is provided on the western side only. Sections of the roadside are marked with dashed yellow lines indicating no parking.

Priority is given to through traffic along Curtis Street, with traffic at the tee intersections with Old Karori Road and Whitehead Road being required to give way. A right turn bay is provided for traffic turning right/west from Curtis Street into Whitehead Road. At the tee intersection with Chaytor Street traffic from Curtis Street is required to give way.

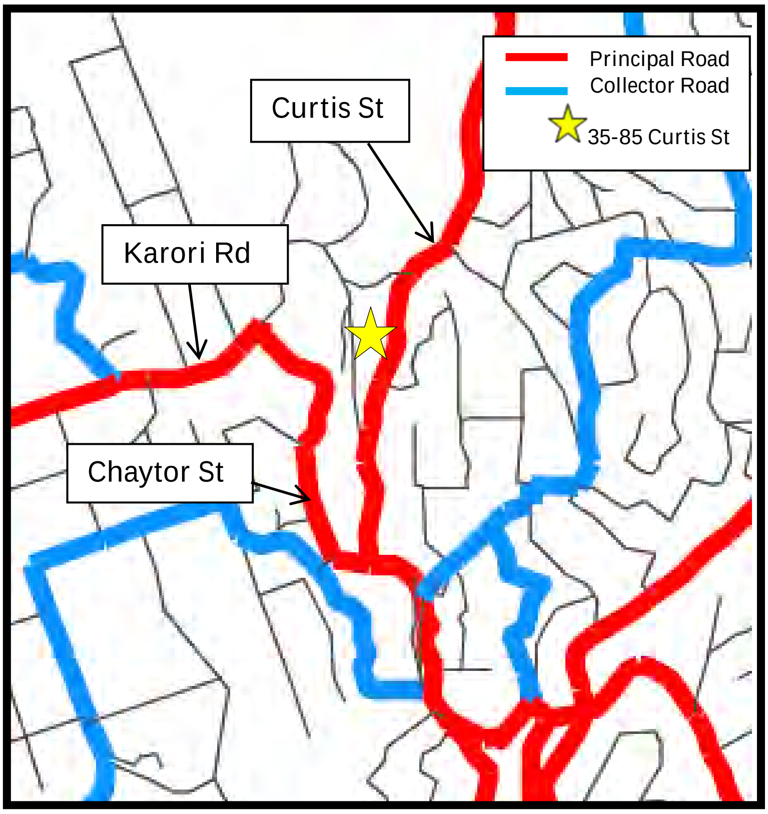


Figure 2.2: Surrounding Road Hierarchy[1]

Old Karori Road

Old Karori Road once connected Curtis Street with Karori Road, providing an alternative to Chaytor Street. In the late 1980s Whitehead Road was formed to provide a more direct route. The southern portion of the road is a short cul-de-sac which provides access to the site. This end of Old Karori Road will also provide access to the new child care centre when it is opened.

A northern portion of the road still exists and connects Whitehead Road with Karori Road. The section of the former road to the west of the site now acts as a walkway connecting the northern and southern portions of Old Karori Road.

Whitehead Road

Whitehead Road connects Curtis Street with the northern portion of Old Karori Road and is classified as a local road in the District Plan road hierarchy. It has a typical road width of 7.2m and a 1.6m wide footpath is provided on the northern side of the road.

Chaytor Street

Chaytor Street is a Principal Road carrying predominantly through traffic between Kelburn, the CBD and Karori. The road width in the vicinity of its intersection with Curtis Street is approximately 8.7m with an eastbound bus lane in addition to two general traffic lanes (one operating in each direction). A turning bay is provided for vehicles turning into and out of Curtis

[1] Source: Wellington City Council District Plan map 33

Street. Priority is given to through traffic along Chaytor Street, with traffic at the tee intersections with Raroa Crescent and Curtis Street being required to give way.

Chaytor Street is flat in the vicinity of Curtis Street; however it does bank steeply to the west as it approaches Karori. A footpath is provided on both sides of Chaytor Street in the vicinity of Curtis Street, with a pedestrian refuge 30m to the west of the intersection with Curtis Street.

2.4 Walking and Cycling Infrastructure

Pedestrian footpaths are provided on the western side of Curtis Street and the northern side of Whitehead Road. There are no specific cycle lanes provided on any nearby roads.

2.5 Public Transport

During Victoria University's Trimesters 1 and 2 (March to October), bus route 47, between Johnsonville and Newtown, operates along Curtis Street. The service runs from approximately 7.40am to 6pm with 10 southbound buses and 9 northbound during this time. The closest stops for travel in both directions are approximately 550m south of the site near the intersection of Chaytor Street, Birdwood Street and Northland Tunnel Road.

Chaytor Street is well served by buses operating between Karori and Wellington city centre with a high frequency service at all times of the day, as shown in Figure 2.3. The nearest bus stops for travel in both directions on these services are on Chaytor Street, just west of the intersection with Curtis Street, approximately 280m south of the site.

Service	Route	Frequency
3	Karori to Wellington to Lyall Bay	Every 10 minutes all day
3S	South Karori to Wellington to Lyall Bay	Every 20 minutes during peak times
3W	West Karori to Wellington to Lyall Bay	Every 15 minutes during peak times
17	Karori to Wellington via University	Every 15 minutes during peak times

Figure 2.3: Bus Services Operating on Chaytor Street

2.6 Summary of Existing Conditions

The site is bordered by Curtis Street which is a principal road. Its function in the Wellington Road hierarchy is to predominantly serve through-traffic. Curtis Street is approximately 6.2m wide in the vicinity of the site is which is less than desirable for a Principal Road. On-street parking on this section of Curtis Street would be unsafe and would cause delays to through traffic.

Nearby intersections are predominantly priority T intersections with right turn bays provided for movements from the major arm. Motorist on the minor arm of the intersection must give way to traffic on the major arm.

3. Crash History

A search of the NZ Transport Agency's Crash Analysis System has been undertaken on the Curtis Street site and surrounding area. The search covers the most recent complete 5 year period, this being between 2007 and 2011. The area covered includes the length of Curtis Street between Whitehead Road and Chaytor Street, inclusive of these two intersections. The location, type and number of crashes are summarised in Table 3.1, with full details available in Appendix A.

A total of 14 crashes were recorded, resulting in four minor injuries but no serious injuries or fatalities. One accident was recorded on Whitehead Road and was due to a moped losing control which resulted in a minor injury.

On Curtis Street three crashes were recorded between Whitehead Road and Chaytor Street:

- One occurred when a truck clipped a parked car;
- One was due to a car losing control; and
- One was caused by a car failing to give way when turning off Curtis Street.

Location	Total Crashes	Injury[2] Crashes	Injury Crashes Per Year	Crash Factors
Whitehead Rd (between Old Karori Rd and Curtis St)	1	1	0.2	Loss of control
Curtis St (between Whitehead Rd and Chaytor St)	3	1	0.2	Loss of control Turning Manoeuvring
Curtis St/Chaytor St Intersection	7	1	0.2	Turning Following too closely
Chaytor St	3	1	0.2	Changing lanes Loss of control

Table 3.1: Crash Analysis

Seven crashes were recorded at the intersection of Curtis and Chaytor Streets with another three on Chaytor Street in close proximity to the intersection:

- Four crashes involved cars turning right from Chaytor Street into Curtis Street being hit by oncoming vehicles travelling east on Chaytor Street. Only one of these crashes resulted in a minor injury;
- One accident involved a vehicle failing to give way when turning right out of Curtis Street and colliding with an eastbound vehicle on Chaytor Street;
- One was a rear-end crash caused by cars following too closely; and
- One crash was caused by a vehicle changing lanes and failing to look behind them.

Another three crashes were recorded on Chaytor Street in close proximity to the intersection:

[2] Injury crashes include minor, serious and fatal crashes. No serious or fatal crashes have been recorded within the study area.

- One occurred when a motorist lost control of their vehicle.
- One was a rear-end crash caused by cars following too closely; and
- One occurred when a motorist changing lanes failed to look behind them colliding with a cyclist and causing minor injuries.

3.1 Typical Crash Rates

The New Zealand Transport Agency's Economic Evaluation Manual (Vol. 1), Section A6.6 provides models for forecasting the typical injury accident rates (annual number of injury crashes). Based on the observed traffic flows, the following typical injury accident rates were forecast:

- Chaytor Street / Curtis Street intersection – 0.37 Injury Crashes per year
- Curtis Street / Whitehead Road intersection – 0.15 Injury Crashes per year

The forecast injury rates for the Chaytor / Curtis Street intersection are higher than those recorded over the last five years. This indicates that the observed crash rate is lower than would typically be expected given the observed traffic flows. No injury crashes have been recorded at the Curtis Street / Whitehead Road intersection.

3.2 Summary of Crash History

This crash history does not reveal any existing safety issues with this section of the Curtis Street. The historic intersection crash rates are also lower that would be typically be expected given the observed traffic flows. The non-injury crashes at the Chaytor Street / Curtis Street intersection provide an indication of the crashes types most likely to occur in future, however there is not currently a crash problem within the study area.

4. Existing Traffic Patterns

4.1 Traffic Counts

Traffic data was collected between Saturday 22 September and Tuesday 25 September 2012. Three types of traffic data was collected:

a. Automatic traffic counts providing continuous traffic flow recording for the period at three locations; and
b. Manual turning counts at three intersections on Saturday 22 and Tuesday 25 September
c. Manual queue length survey at the three intersections on the same survey days.

The location of these counts is shown in Figure 4.1 below.

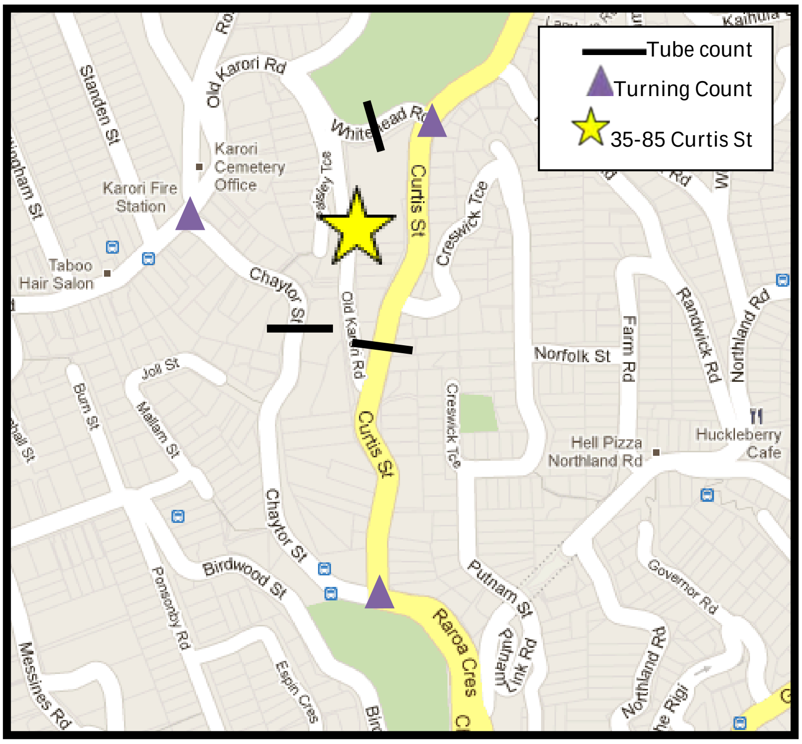


Figure 4.1: Location of September 2012 Traffic Counts

Analysis of the collected count data shows the following:

- Saturday traffic is fairly balanced with similar traffic volumes in each direction at each of the surveyed locations.
- In the Tuesday PM peak, there are higher traffic flows on Chaytor Street northbound towards Karori, than southbound towards Wellington.

The manual count data correlates well with the traffic flows recorded using automatic traffic counters. Figure 4.2 shows a comparison of weekday traffic recorded at the three automatic count sites with the manual counts. Figure 4.3 shows the weekend comparison. Both figures show a good correlation between the data sets and indicate that the manual count surveys corresponded with the peak traffic period and are therefore appropriate data to use for this assessment.

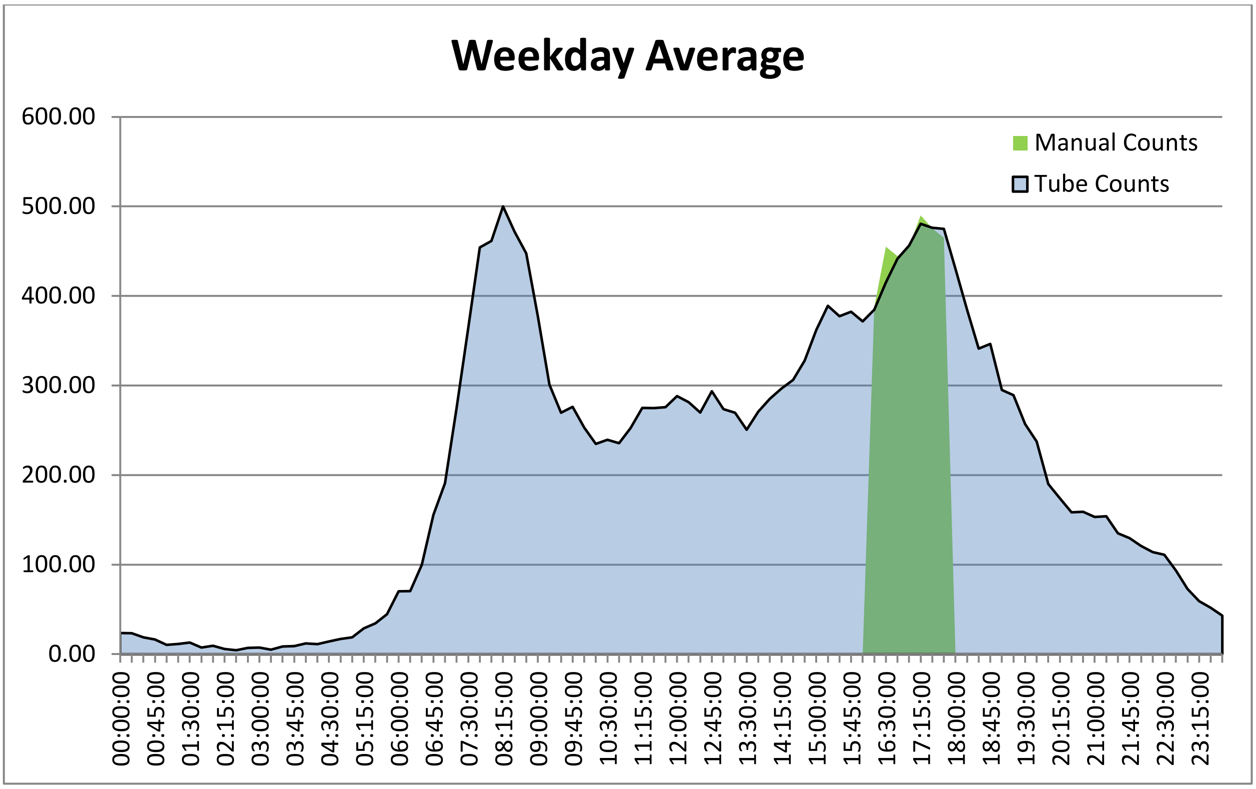


Figure 4.2 Comparison of Manual Count Data to Average Weekday Traffic Profile

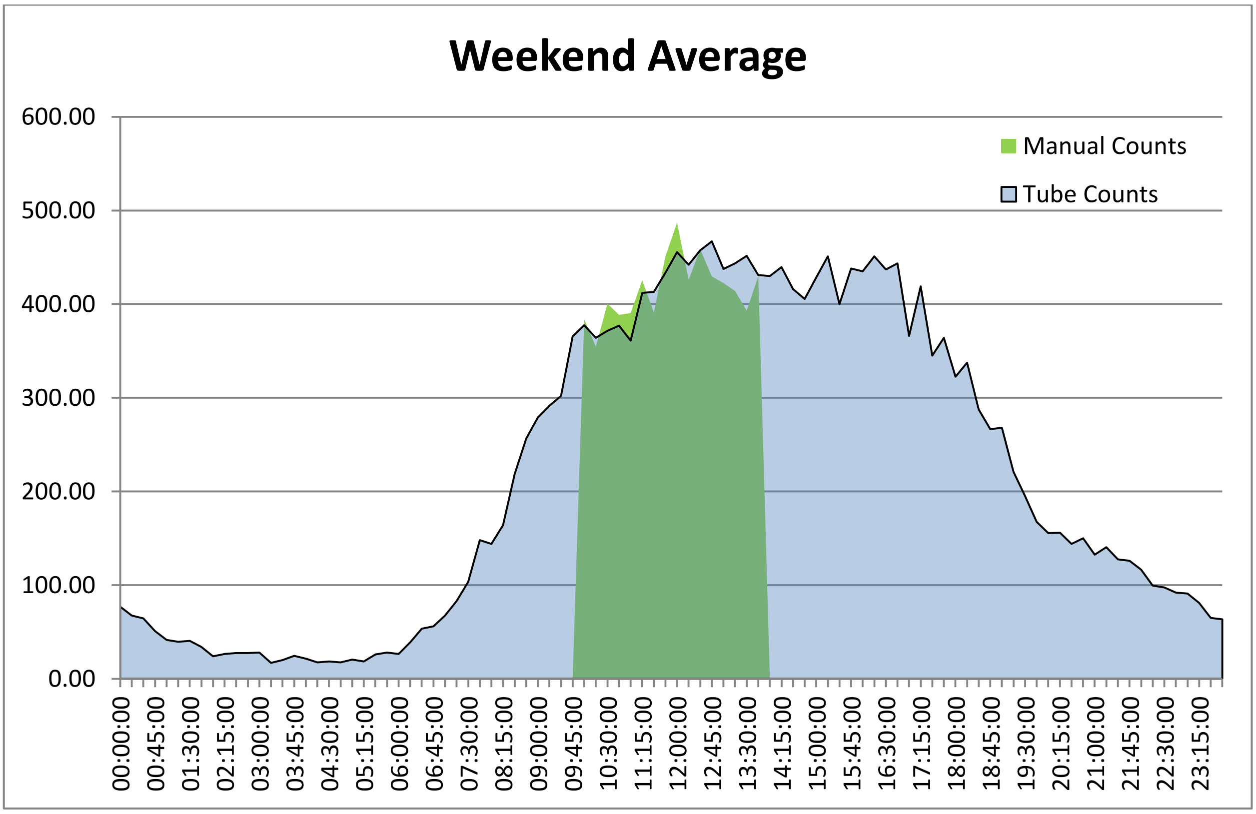


Figure 4.3 Comparison of Manual Count Data to Average Weekend Traffic Profile

A summary of the automatic count data collected between 22 and 25 September 2012 is presented in Table 4.1, below. The traffic flows recorded on Curtis Street are significantly lower than would be expected on a Principal Road.

Location and Direction		Weekday			Weekend	
		AM Peak Hour	PM Peak Hour	Hourly Average (7am – 7pm)	Peak Hour	Hourly Average (7am – 7pm)
Chaytor Street	NB	327	865	477	684	492
	SB	810	405	422	631	515
Whitehead Road	WB	117	215	156	170	128
	EB	110	183	148	154	126
Curtis Street	NB	40	122	70	85	73
	SB	114	94	99	89	80

Table 4.1 Observed Traffic Flows (From Automatic Count 22 – 25 September)

4.2 Traffic Speed

The automatic traffic counters were also used to survey the speed of motorists. The data is summarised in Table 4.2. Examination of vehicle speeds throughout the day found that there was little variation from the values presented in Table 4.2.

The table shows that average and 85%ile speeds at the count sites were lower than the posted speed limit of 50kmph. The speeds recorded on Chaytor Street are lower than expected. This could be due to the proximity of the count site to the sweeping bend.

Location	Weekday Speed (kmph)		Weekend Speed (kmph)		Comments
	Mean	85%ile	Mean	85%ile	
Chaytor Street	41	45	42	45	Vehicle Speeds lower than expected. Likely to be due to location of count site.
Whitehead Road	42	47	42	47	
Curtis Street	51	57	51	57	

Table 4.2 Observed Traffic Speeds (From Automatic Count 22 – 25 September)

The survey found that on average motorists driving on Curtis Street travelled at 51 kmph and 85 per cent of motorists travelled at or below 57kmph during the survey. This corresponds well with a survey undertaken by Wellington City Council staff in June 2011 that found mean speed on Curtis Street 100m north of its intersection with Chaytor Street to be between 41 and 46kmph. 60m north of Lambeth Street the mean speed of motorists on Curtis Street was between 49 and 54kmph.

4.3 Summary of Existing Traffic Patterns

The traffic surveys show that on Curtis Street and Chaytor Street, there are distinct peaks on weekdays in the morning and evening. Traffic flow is tidal with the predominant movement towards the south in the AM and towards the north in the PM. On weekends, traffic flows are more balance with a single peak during the middle of the day. The traffic flow on Curtis Street is significantly lower than would normally be expected for a principal road.

A series of surveys has found that the mean speed of motorists using Curtis Street varies between 41kmph and 54kmph. Adjacent to the site, close to the intersection with Whitehead Road, 85 per cent of vehicles are driven at speeds of 57kmph or less.

5. Trip Generation and Trip Distribution

5.1 Trip Generation

The 2011 New Zealand Trips and Parking Database was used as the basis for forecasting the numbers of trips generated by three different land uses which could be permitted under the proposed plan change:

- Industrial,
- Bulk Retail; and / or
- Service Retail.

The New Zealand Trips and Parking Database is a record of the numbers of trips surveyed at existing land-use throughout the country. The survey records are further classified by location, size and other factors such as time of day.

Each of the three land-uses generates higher trip rates in the weekday evening peak hour than in the morning peak hour. Both the retail land-uses also generate traffic on weekends. Trip rates for these times have therefore been used as the basis of this assessment. These types of land use do not tend to generate high traffic flows coinciding with the AM peak hour.

Industrial

The 'Industry' land use group is considered to cover activities such as manufacturing, storage and contractor land use activities. Only trip rates for suburban settings were selected. Those in rural or town centre locations were excluded as they were not considered relevant to the Curtis Street site. Seven sites in Christchurch, Manukau and Auckland remained after the less relevant sites were excluded.

The mean Gross Floor Area (GFA) of the seven sites is 4245m^2. The average trip generation across the sites in the PM peak is 1.74 vehicles per 100m^2. No trip generation rates were available for weekends as Industrial sites tend to operate on weekdays. Weekend trip generation is therefore lower than on weekdays. More details on the sites are shown in Appendix B.

Bulk Retail

Only sites in suburban settings were included. Those in rural or town centre locations were excluded. More details on the sites used as the basis for the trip generation forecast are shown in Appendix B.

Weekday

There were three bulk retail sites with PM peak hour data trip rates that were considered relevant to the Curtis Street site. The three sites were located in Christchurch and Auckland North Shore. Their mean GFA was 3433m^2 and the surveys were undertaken between 2006 and 2007. The average trip generation across the sites in the PM peak is 5.56 vehicles per 100m^2.

Weekend

Unfortunately not all of the above sites included weekend trip generation data. Trip generation rates were derived from three sites with a mean GFA of 3005m^2. The sites located in suburban locations in Christchurch Waitakere and Auckland were surveyed between 1993 and 2004. The average trip generation across the sites for the PM peak on the weekend is 7.85 vehicles per 100m^2. This is notably higher than the trip rates for the weekday PM peak (5.56 vehicles per 100m^2).

Service Retail

In the New Zealand Trips and Parking Database, "Retail" includes "bar", "restaurant", "fast-food" and "shop" activities. More details on the sites are shown in Appendix B.

Weekday

The PM peak trip generation rate used in this assessment is based on 29 sites from across New Zealand. The surveyed sites had floor area of up to 2000m^2 and were surveyed between 1993 and 2011. The mean trip generation rate for these sites in the PM peak is 9.68 vehicles per 100m^2 GFA.

Weekend

Weekend trip rates were available for fewer sites. The mean was calculated from 16 sites located across New Zealand surveyed between 1993 and 2006. The floor areas for these sites were up to 2690m^2. The mean trip generation rate for the 16 sites is 20.62 vehicles per of 100m^2 GFA which is more than double the rate for weekday PM peak

5.2 Trip Distribution

This section documents assumptions about where trips to and from the site would begin and end. The main assumptions are that:

- in each peak modelled, half the trips would be towards the site and half would be away from the site;
- 30% of trips start or end in parts of Karori, west of the site;
- 45% of trips Northland / Wilton / Wadestown, north of the site; and
- 25% of trips start or end in Kelburn and other locations east of the site.

Our assumed assignment of these trips is shown in Figure 5.1.

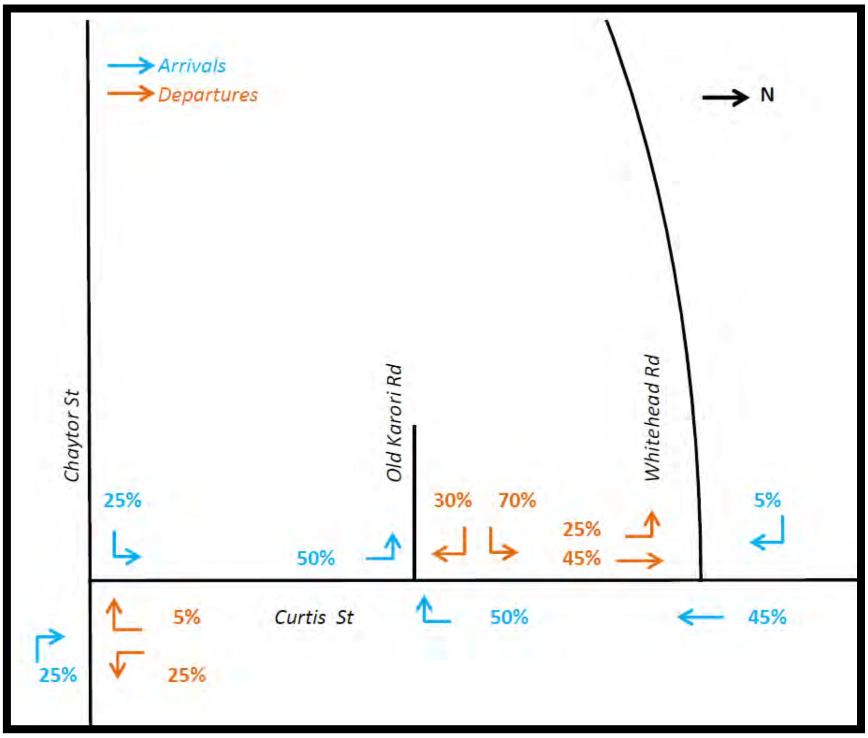


Figure 5.1: Trip Distribution

5.3 Summary of Trip Generation & Trip Distribution

On the basis of similar sites, surveyed elsewhere in New Zealand is has been shown that Service Retail generates the highest number of motorised vehicle trips per 100m^2 GFA. This is shown in Table 5.1. Both retail land-uses are expected to generate more trips on weekends than during the weekday PM peak. Industrial land-use is expected to generate fewer trips on a weekend than on weekdays.

Land-Use	Weekday PM Peak Hour	Weekend Peak Hour
Industrial	1.74	-
Bulk Retail	5.56	7.85
Service Retail	9.68	20.62

Table 5.1 Summary of Trip Generation Rates (Vehicles per 100m^2 GFA)

The preceding sections document the assumptions about where trips to and from the site would start and end. We have assumed that most motorists would choose the easiest route for their journey and would tend to avoid right turns that usually incur more delay than left turns.

6. Assessment of Traffic Effects

6.1 Levels of Service at Intersections

The three intersections nearest the site were modelled using the software package SIDRA INTERSECTION 5.1:

- Chaytor Street and Old Karori Road – Signal Controlled Intersection
- Curtis Street and Whitehead Road – Priority T Intersection
- Curtis Street and Chaytor Street – Priority T Intersection

PM peak hour and Saturday peak hours were determined on the basis of the surveyed count data. PM peak hour and Saturday peak hour traffic volumes were tested within SIDRA models which had been individually calibrated against queue lengths observed during the surveys.

Results are reported in terms of Level of Service (LOS) which is a measure based on the delay experienced at each approach. The LOS definitions used throughout this report are outlined in Table 6.1.

Level of Service	Control delay per vehicle in seconds (d)	
	Signals	Stop and Give way / Yield Signs
A	d ≤ 10	d ≤ 10
B	10 < d ≤ 20	10 < d ≤ 15
C	20 < d ≤ 35	15 < d ≤ 25
D	35 < d ≤ 55	25 < d ≤ 35
E	55 < d ≤ 80	35 < d ≤ 50
F	80 < d	50 < d

Table 6.1 Level of Service definitions

The overall approach has been to:

- determine and assess the performance of the intersections on the days of the traffic surveys (Base Case);
- determine and assess the performance of the intersections for future scenarios including the additional weekday traffic associated with the day care centre and the weekend traffic associated with sports events at Ian Galloway Park (Do Minimum Scenario);
- compare Do Minimum intersection performance against test scenarios where 55-85 Curtis Street is developed for commercial activities (as a starting assuming 4000m² GFA);
- working backwards to determine the development thresholds beyond which traffic effects would need to be mitigated;

6.2 Base Case Performance

The base case represents the performance of the existing intersections with current traffic flows. Base models were built using the surveyed traffic flow data and calibrated against observed queue lengths. Detailed SIDRA outputs for the base case are shown in Appendix C.

Analysis of the base case found that all three intersections currently perform relatively well with LOS of C or better generally being achieved. The following performance issues were identified:

- the Curtis Street approach to Chaytor Street shows a LOS of D in the Saturday model with an associated mean delay of 30 seconds.
- the Old Karori Road approach to the Karori Road / Chaytor Street intersection has a LOS of D with mean delays of 36 seconds.
- the signal controlled Chaytor Street right turn approach to the Karori Road / Chaytor Street intersection shows a LOS of D with delay of 46 seconds in the Saturday model and a LOS of E (57 second mean delay) in the weekday PM peak model.

6.3 Do Minimum

Based on guidance from the New Zealand Transport Agency's (NZTA's) *Integrated Transport Assessment Guidelines – November 2010,* assessment of the do minimum was undertaken for the 2017 forecast year (5 years in the future). Annual traffic growth of 2% was used to derive increased future traffic flows. This growth rate was taken from Table A25 from the *NZTA's Economic Evaluation Manual – January 2010*.

Traffic flows used for the do minimum assessments were also increased to reflect known / committed developments and to better reflect traffic conditions when sporting events occur in Ian Galloway Park.

Weekday traffic projections include traffic generated by the Day Care Centre which has planning consent for land adjacent to the site and accessed from the Old Karori Road. The assumed trip generation, which was taken from the transport assessment supporting the resource consent application, is shown in Appendix D.

Traffic surveys for this assessment were undertaken between the winter and summer sports seasons and therefore do not reflect conditions when the sports fields are being intensively used. Wellington City Council Officers provided count data undertaken during the start of the summer sports season (Saturday 3 December 2011). This was used to increase the flows recorded on Saturday 22 September 2012.

Analysis of the intersection performance for the do minimum scenario showed similar performance to the base case. The analysis found only minimal degradation in intersection performance from the calibrated base models. The exceptions to this are:

- during the Saturday peak hour, the additional traffic associated with use of Ian Galloway Park results in LOS F and mean delays of 98 seconds for the Curtis Street approach to Chaytor Street. The base model showed LOS D with a mean delay of 30 seconds.
- poorer performance is also forecast for the Chaytor Street right turn and Old Karori Road approaches to the Karori / Chaytor / Old Karori Road signal controlled intersection. In the

Saturday do minimum scenarios, both approaches are forecast to operate at LOS E with delays of 69 and 57 seconds respectively.

- on the weekday PM peak, the Curtis Street approach to Chaytor Street is forecast to operate at LOS D with average delay of 35 seconds. The base model showed LOS C for this approach in the weekday PM peak.

Summary of 2017 Do Minimum Scenario

Overall, the three intersections modelled are forecast to perform acceptably for the 2017 do minimum scenario. Emerging issues are associated with the Curtis Street approach to Chaytor Street, particularly on Saturdays when Ian Galloway Park is used for sporting events.

The movements at signal controlled intersection between Chaytor Street, Karori Road and Old Karori Road where poor levels of service are observed are minor movements and relatively lightly trafficked. Further detail is shown in Appendix E.

6.4 Development Scenarios

The additional traffic associated with three possible land-uses has been modelled using the calibrated SIDRA models:

- Industrial,
- Bulk Retail; and / or
- Service Retail.

Trips generated by each potential land use were assigned to the network as described in section 5.2. It was assumed that in each peak hour modelled, half the trips would be to the site and half would be away from the site.

It is possible that any future proposals for use of the site would be a combination of activities. For this assessment, each land-use treated is separately as its own scenario. It was assumed as a starting point, that for each land-use scenario, the site would be developed to a GFA of 4000m². None of the service retail sites surveyed for the New Zealand Trips and Parking database were more than about 2700m² GFA. If service retail is provided at the site, it is likely to compliment another land-use such as bulk retail.

The following sections summarise the findings of the traffic analysis for each potential land-use. The analysis is also summarised in Table 6.2 and Table 6.3.

Curtis Street / Chaytor Street

Analysis of the traffic effects of the three potential land-use scenarios on the Chaytor / Curtis Street intersection concluded that:

- the overall performance of the intersection is not significantly affected by development of the site;
- without mitigation, future development of the site will increase the average delay for motorists approaching Chaytor Street along Curtis Street;
- the additional average delay during the weekday PM peak hour, resulting from industrial use of the site is forecast to be approximately 10 seconds;

- during the weekday PM peak hour, without mitigation, development of the site as bulk retail or service retail would increase delays for the Curtis Street approach from approximately 35 seconds to 103 and 192 seconds respectively (i.e. average delay of 1½ to 3 minutes per motorist);
- during the weekend peak hour, without mitigation, development of the site as bulk retail or service retail is forecast to increase delays for the Curtis Street approach from approximately 97 seconds (1 ½ minutes) to 306 and 678 seconds respectively (i.e. average delay of 5 to 10 minutes per motorist); and
- the effect on traffic using other approaches to the intersection is forecast to be negligible.

Most motorists would be unwilling to wait for 678 seconds (5 to 10 minutes) to turn into an intersection. Without mitigation, it is likely that they would either re-route to avoid the delays or accept unsafe gaps in the conflicting traffic movements.

Without mitigation, motorists travelling towards Kelburn or Wellington CBD may reroute via local roads such as Randwick Road or Creswick Terrace. The route between the site and Upland Road is approximately equal in length. The width of Randwick Road means that of the two routes, travel via Randwick Road would be faster and therefore more appealing.

The delays on the Curtis Street approach to Chaytor Street would need to be mitigated. Mitigation would reduce the likelihood of additional crashes at the intersection and minimise traffic re-routing through residential streets. Alternatively the size of the bulk or service retail could be limited to avoid these effects. Sections 6.5 and 6.6 outline the scope for mitigating this effect and for development thresholds respectively.

Curtis Street / Whitehead Road

Analysis of the traffic effects of the three development scenarios on the Curtis / Whitehead Road intersection concluded that:

- the overall performance of the intersection is not affected by development of the site for Industrial or Bulk Retail purposes during the weekday PM or weekend peak;
- significant average delays of more than 5 minutes (LOS F) are forecast for the Whitehead approach to Curtis Street under Service Retail scenario for the weekend peak hour; and
- although bulk retail use of the site would increase average delays for motorists approaching Curtis Street on Whitehead Road by approximately 10 seconds, the approach would continue to perform with an acceptable LOS C.

Karori Road / Chaytor Street

Analysis of the traffic effects of the three development scenarios on the Curtis / Whitehead Road intersection (see Appendix F) concluded that:

- the overall performance of the intersection is not significantly affected by development of the site for Industrial or Bulk Retail purposes during the weekday PM or weekend peak; and
- average delays during the weekend peak hour for the movement from Karori Road to Chaytor Street are forecast to increase from approximately 13 seconds per motorists (LOS B) to just under 50 seconds (LOS D) as a result of service retail use of the site.

Table 6.2 Intersection Performance: Saturday Peak Hour

Chaytor / Curtis – Saturday Peak		Do Min		Industrial		Bulk Retail		Serviced Retail	
Approach	Lane	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
Chaytor Street (South)	Through	0.0	A	-	-	0.0	A	0.0	A
	Right Turn	11.3	B	-	-	12.2	B	14.8	B
Curtis	Left and Right	97.5	F	-	-	305.9	F	678.7	F
Chaytor Street (North)	Through and Right	0.2	A	-	-	0.5	A	1.0	A

Curtis / Whitehead – Saturday Peak		Do Min		Industrial		Bulk Retail		Serviced Retail	
Approach	Lane	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
Curtis Street (East)	Through	5.0	A	-	-	4.9	A	4.9	A
	Right	9.4	A	-	-	12.1	B	17.4	C
Whitehead Road	Left and Right	10.0	B	-	-	20.3	C	573.5	F
Curtis Street (West)	Through and Left	5.0	A	-	-	5.2	A	5.3	A

Karori / Chaytor / Old Karori – Saturday Peak		Do Min		Industrial		Bulk Retail		Serviced Retail	
Approach	Lane	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
Chaytor Street	Left	9.2	A	-	-	10.3	A	11.6	B
	Right	69.2	E	-	-	69.2	E	69.2	E
Old Karori Road	Through and Left	57.2	E	-	-	61.7	E	85.6	F
Karori Road	Through	10.4	B	-	-	11.3	B	12.2	B
	Right	13.1	B	-	-	19.8	B	47.7	D

Table 6.3 Intersection Performance: Weekday PM Peak Hour

Chaytor / Curtis – Weekday PM		Do Min		Industrial		Bulk Retail		Serviced Retail	
Approach	Lane	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
Chaytor Street (South)	Through	0.0	A	0.0	A	0.0	A	0.0	A
	Right Turn	9.1	A	9.1	A	9.3	A	9.5	A
Curtis Street	Left and Right	34.7	D	45.5	E	102.5	F	192.2	F
Chaytor Street (North)	Through and Right	0.2	A	0.3	A	0.6	A	0.8	A

Curtis / Whitehead – Weekday PM		Do Min		Industrial		Bulk Retail		Serviced Retail	
Approach	Lane	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
Curtis Street (East)	Through	4.9	A	4.9	A	4.9	A	4.9	A
	Right	8.7	A	9.0	A	9.5	A	10.2	B
Whitehead Road	Left and Right	8.3	A	8.7	A	10.2	B	12.5	B
Curtis Street (West)	Through and Left	5.2	A	5.2	A	5.3	A	5.3	A

Karori / Chaytor / Old Karori – Weekday PM		Do Min		Industrial		Bulk Retail		Serviced Retail	
Approach	Lane	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay	LOS
Chaytor Street	Left	10.2	B	10.7	B	12.5	B	14.8	B
	Right	65.4	E	68.2	E	68.2	E	68.2	E
Old Karori Road	Through and Left	54.3	D	55.1	E	56.6	E	58.7	E
Karori Road	Through	10.5	B	10.9	B	11.3	B	11.8	B
	Right	10.7	B	11.8	B	12.2	B	12.6	B

Summary of Development Scenario Intersection Performance

The preceding sections (and tables below) show that development of the site for industrial purposes would not generate sufficient traffic to significantly affect the traffic efficiency of surrounding intersections.

Development of the site for bulk retail purposes is likely to exacerbate existing delays on the Curtis Street approach to Chaytor Street. This effect would be evident during the weekday PM peak and particularly during the Saturday peak hours. Measures to mitigate these effects would be necessary. The following section (6.5) presents the scope for possible mitigation measures.

The traffic effects associated with potential development of the site as GFA 4000m² bulk or service retail are significant and would be difficult, if not impossible to sufficiently mitigate. Other ways to minimise the effect of this land-use would be to limit the size of the development. Possible thresholds, beyond which detailed consideration of the traffic and transportation effects would be required are presented in section 6.6.

6.5 Scope for Mitigation of Traffic Effects

A series of tests were undertaken to determine the potential for mitigating the traffic effects associated with each potential land-use. Engineering investigation and design would be needed to determine the feasibility and cost of these measures. It would be appropriate to determine the feasibility of these options as part of a transport assessment submitted in support of a specific development proposal. The effect of the development scenarios could be mitigated in the following ways:

- limit the size of development; and / or
- minor intersection upgrades allowing for additional approach lanes.

The effect of additional approach lanes was modelled for both the bulk retail and service retail development scenarios for the Curtis Street / Whitehead Road intersection and the Curtis Street / Chaytor Street intersection. Figure 6-1 and Figure 6-2 show the existing intersection arrangement (on the left) and the test arrangements (on the right).

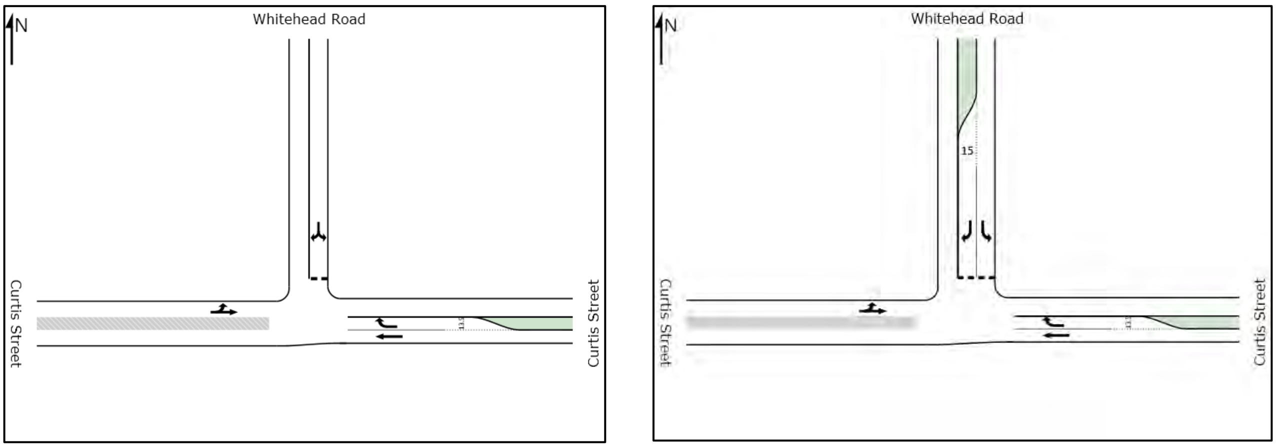


Figure 6-1 Curtis / Whitehead Intersection Mitigation Measures

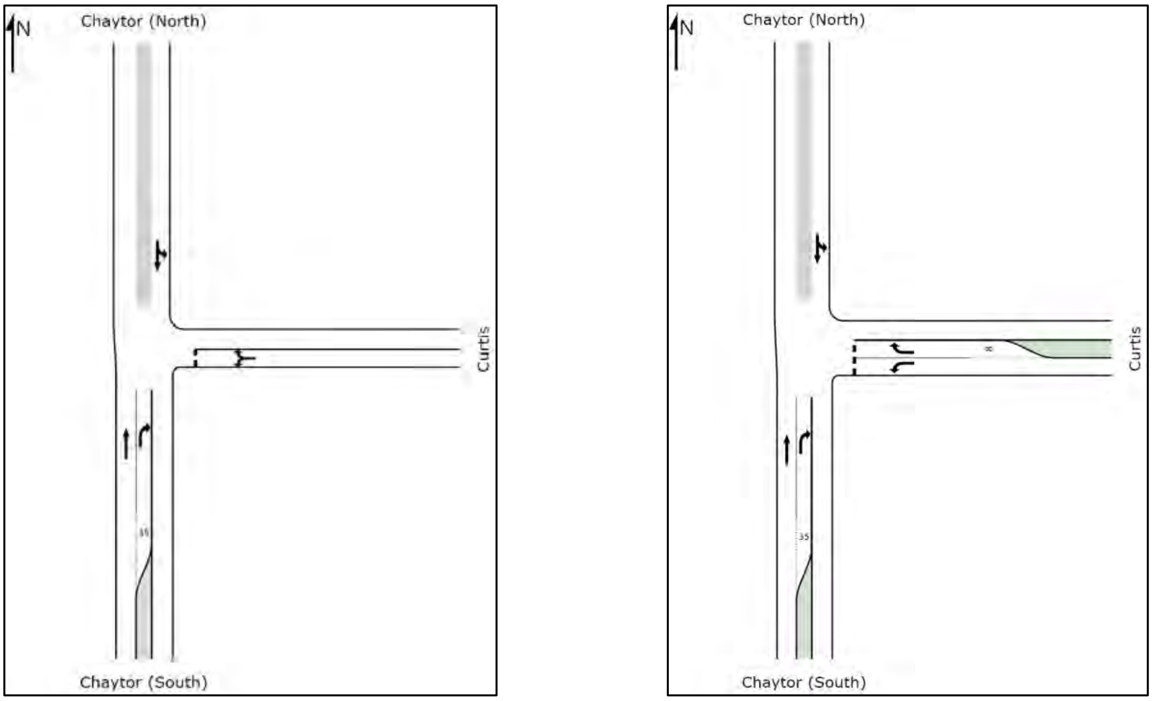


Figure 6-2 Curtis / Chaytor Intersection Mitigation Measures

The changes shown above have been modelled for the Saturday Peak hour only as this was the worst performing time period for each development type. For the service retail test, the development size was also reduced to 3000m^2.

The bulk retail development mitigation test found the following:

- delay on the Curtis Street approach to Chaytor Street reduced from 305.9 seconds (without mitigation) to 67.9 seconds for the right turn and 92.2 seconds for the left turn with mitigation. (The delay for this approach was approximately 35 seconds for the 2017 weekend do minimum.)
- delay on the Whitehead Road approach to Curtis Street reduced slightly from 20.3 seconds to 18.2 for the right turn lane and 19.3 seconds for the left turn lane.

The service retail development mitigation test (including intersection changes and reduced development area) found the following:

- delay on the Curtis Street approach to Chaytor Street reduced from 678.7 seconds to 155.6 seconds for the right turn and 108.2 seconds for the left turn. (The delay for this approach was approximately 35 seconds for the 2017 weekend do minimum.)
- delay on the Whitehead Road approach to Curtis / Whitehead intersection reduced from 573.5 seconds to 94.8 for the right turn lane and 33.2 seconds for the left turn lane.
- Minor delay reduction across all other approaches.

These tests show that it is possible to mitigate the traffic effects of potential bulk retail land-use by introducing changes to nearby intersections. The tests also show that to minimise effects of serviced retail it would be necessary to limit the size of permitted development below the 4000m^2 threshold currently proposed.

6.6 Summary of Traffic Assessment and Potential Development Thresholds

This chapter has shown that:

- the intersection between Curtis Street and Chaytor Street is the most sensitive to additional traffic;
- nearby intersections have less capacity to accommodate additional traffic on weekends than they do in the weekday evening peak hour;
- the additional traffic associated with GFA 4000m² industrial land-use at the site could be accommodated without affecting the efficient operation of nearby intersections;
- the traffic effects associated with GFA 4000m² bulk or service retail activities would need to be mitigated.

Potential Development Thresholds

Development thresholds could be based on the traffic capacity of nearby intersections. The Chaytor Street / Curtis Street intersection is most sensitive to additional traffic. It is therefore appropriate that the performance of this intersection is used to determine potential development thresholds based on traffic efficiency.

On the basis of the trip rates presented in section 5.1 and the traffic distribution presented in section 5.2, we have determined that approximately 100 additional trips can be generated by the site before the performance of the Curtis Street approach to Chaytor Street begins to deteriorate. Table 6.4 shows possible GFA thresholds for alternative activities at the site. Beyond these thresholds, mitigation for traffic effects is likely to be necessary. The numbers in brackets that would be applied on the basis of weekend travel demand.

Potential Land-Use	Trips per 100m² PM Peak (Weekend Peak)	Potential GFA Threshold
Industrial	1.74	5700 m²
Bulk Retail	5.56 (7.85)	1700 m² (1200 m²)
Service Retail	9.68 (20.62)	1000 m² (500 m²)

Table 6.4 Potential GFA Thresholds

By way of comparison, the mean trip generation rate for offices on a weekday peak hour would be 1.71 trips per 100 m² GFA. This is similar to the industrial trip generation rate and would lead to a development threshold of 5800 m².

Activities such as retail or offices often require provision of significant areas of off-street parking. Development thresholds based on other site attributes such as parking supply may therefore be more appropriate for this site. This is discussed in the following chapter.

7. Parking

Narrow lane widths and limited forward visibility mean there is minimal space for on-street parking on Curtis Street. In many parts of Curtis Street, the poor forward visibility and narrow road widths mean that on-street parking would be unsafe. Although wider, Whitehead Road has limited width, relatively low forward visibility and would not be suitable for on-street parking. This means that it would be to avoid negative effects it will be important for parking associated with the development to be safely accommodated. This could be through the provision of adequate off-street parking within the development site.

The southern leg of Old Karori Road provides opportunities for accommodating some on-street parking, particularly during the weekend when the day care is not in use.

7.1 Off-Street Parking

Unless otherwise specified, Wellington City Council's District Plan defines any activity providing more than 70 parking spaces as a high traffic generator and requires a Transport Assessment to be prepared as part of a resource consent application. This chapter examines whether this threshold is appropriate for the proposed rezoning of 55 – 85 Curtis Street.

The 2011 New Zealand Trips and Parking Database was used as the basis for estimating parking demand and appropriate parking provision associated with the potential land-use scenarios defined in section 5.1.

Industrial

The Industrial sites listed in the database have an average GFA of 4245m^2. On average 64 car parking off-street spaces were provided. The mean maximum parking demand listed in the database was 39 vehicles or 62% occupancy. This type of land use would not typically have a high turn-over of parking spaces. Most of the parking spaces would be used by staff, with some allocated for visitors to the site. This land-use is least likely to result in overspill parking on-street. On the basis of the average GFA, it would be necessary to provide one parking space per 100m^2 GFA in order to accommodate the mean maximum parking demand [=100 x (39 / 4245)].

Bulk Retail

No car parking data was available for the sites used to assess the weekday trip rates for bulk retail land use. Two of the three sites used for the weekend trip rates did however have parking data. These two sites have an average GFA of 3,162m^2 and provide 65 car parking spaces. The mean maximum occupancy recorded at these sites was 62 vehicles or 95%.

This type of land use is likely to generate a higher demand for parking on weekends when it attracts a higher number of customers. On the basis of the average GFA, it would be necessary to provide two parking spaces per 100m^2 GFA in order to accommodate the mean maximum parking demand [=100 x (62 / 3162)].

Service Retail

For site surveyed during the week, the number of parking spaces provided for retail activities ranged from 12 to 226, with an average of 77 spaces. Most of the surveyed sites were significantly smaller than the land available at 55 – 85 Curtis Street with GFA of between 50 and 2000m^2. On average 13 spaces per 100m^2 GFA was provided which is the equivalent of 520 off-street car parks for a 4000m^2 site. Weekday peak demand for a 4000m^2 service retail site would be in the order of 280 car parks. Weekend demand was surveyed as 5.5 car parks per 100m^2 GFA which is the equivalent of 220 car parks for a 4000m^2.

Provision of 70 off-street car parks or fewer would therefore hardly be unable to accommodate the expected peak demand associated with the site. Large service retail developments with this number of off-street car parks would therefore result in significant levels of on-street car parking and a serious safety hazard.

A service retail development designed to accommodate peak parking demand of 5.5 spaces per 100m^2 GFA would therefore either provide 220 car parks (i.e. within a multi-story car park) or limit development size.

7.2 Summary of Parking Assessment & Possible Thresholds

This assessment has found that the surrounding road network has little or no ability to safely accommodate on-street parking associated with development of the site. For this location it is important that most, if not all of the parking demand associated with land-use is accommodated within the site.

It is expected that the site can be easily developed for Industrial and Bulk Retail activities without requiring more car parks that the 70 space threshold currently defined in the District Plan. Demand associated with these activities should also be relatively easy to accommodate within the site. Service Retail activities require attract a significantly greater level of parking demand which would be more difficult to accommodate within the site.

Potential Development Thresholds

For 55 – 85 Curtis Street, minimum parking provisions are more appropriate than using the number of car parks as a maximum threshold. Table 7.1 presents the forecast mean maximum parking demand associated with each of the potential land-use activities. It also shows the land area required to accommodate the estimated parking demand (assumes 21m^2 per car park include. aisles). The possible GFA thresholds are derived by assuming that the total land area, including development and parking, does not exceed 6000 m^2.

Land-use	Potential GFA Threshold (sq.m)	Mean Max. Demand (Per 100sq.m)	Forecast Mean Max. Demand (Spaces)	Parking Land Area (sq.m)	Total Land Area (sq.m)
Industrial	4900	1	49	1029	5929
Bulk Retail	4100	2	82	1722	5822
Service Retail	2700	5.5	140	2940	5740
Office	3600	3	108	2268	5868

Table 7.1 Potential Thresholds Based on Parking Provision

If parking effects are to be avoided, developments with the GFA shown in the table need to provide, as a minimum, the mean maximum number of parking spaces. However developments that provide more than the minimum parking requirement may still result in adverse traffic effects. It is therefore appropriate to use the GFA as a threshold and to choose the lower of the values presented in Table 7.1 and Table 6.4, above.

8. Servicing and Access

Servicing and access has been considered from the point of view of the surrounding road network. Internal servicing and access is too dependent on the specific developer proposals to assess at a theoretical or high level.

The topography of the site is likely to limit the locations where new site access would be provided. Figure 7.1 (at the end of this report) shows the gradient of land adjacent to and perpendicular to the site boundary. It provides an indication of where developers are most likely to propose new site access. It shows that gradients of less than 10% (indicated with a green line) are available at three locations along the site boundary:

- from the southern leg of the Old Karori Road;
- from Whitehead Road, west of its intersection with Curtis Street; and
- from Curtis Street, south of its intersection with Whitehead Road.

The Old Karori Road (no exit street) and Whitehead Road have relatively low traffic flows and would be more suitable for new site access. Consideration should also be given to the types of vehicles that would service the site. The District Plan requires consideration of an 8 ton rigid axle truck (i.e. no articulation). Industrial or bulk retail activities at the site is however likely to generate deliveries using articulated semi-trailer vehicles more than 17m in length.

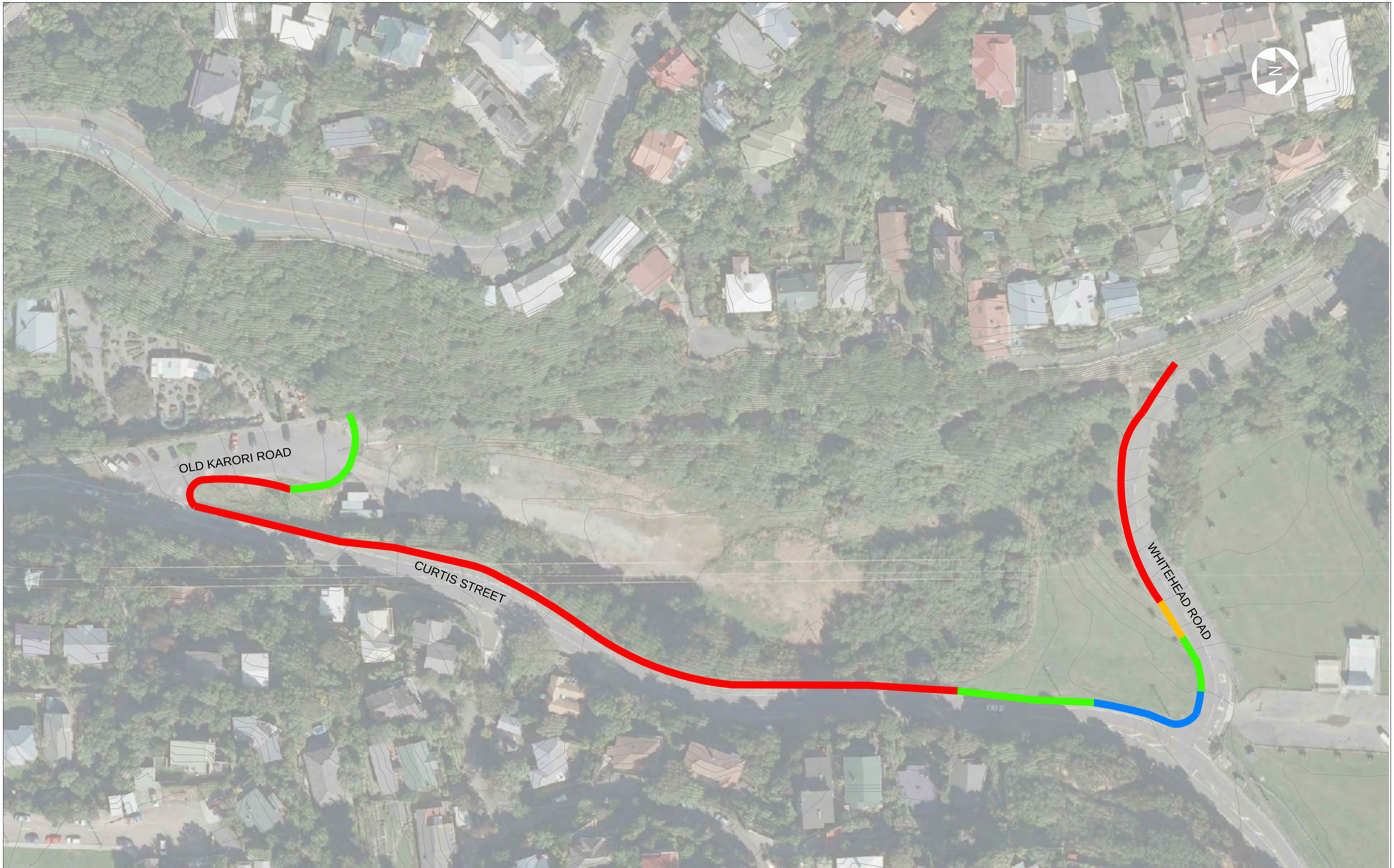
8.1 Tracked Path Analysis

The ability for articulated semi-trailer vehicles to manoeuvre through the existing intersections was assessed using AutoTURN software. That analysis concluded that:

- semi-trailer vehicles could be accommodated at the Curtis Street / Chaytor Street without conflicting with any opposing traffic movements;
- the right turn from Chaytor Street to and Old Karori Road and the left turn for the reverse movement cannot be made by semi-trailer vehicles;
- semi-trailer vehicles could not safely turn left turn out from or right-into the southern leg of Old Karori Road. This would limit movements to / from Old Karori Road and the southern leg of Curtis Street;

Figure 7.2 shows the tracked paths for the 17m semi-trailer vehicles turning from Curtis Street to Whitehead Road. Figure 7.3 shows the tracked paths for turns from Whitehead Road. The figures show that each of these turning movements could result in conflict with opposing traffic movements.

The topography adjacent to the intersection means that improvements could be made to avoid this problem. Easing the southern side of Whitehead Road would be relatively easy. The engineering plant located immediately north of Whitehead Road is likely to increase the costs associated with easing this side of the intersection. This means that it would be more difficult (costly) to mitigate the effects of semi-trailers turning between Whitehead Road and the arm of Curtis Street north of the intersection. It is however possible to reasonably mitigate these effects. Changes to this intersection should also address the poor visibility to and from Curtis Street, north of the intersection.



KEY - SITE ACCESS GRADES

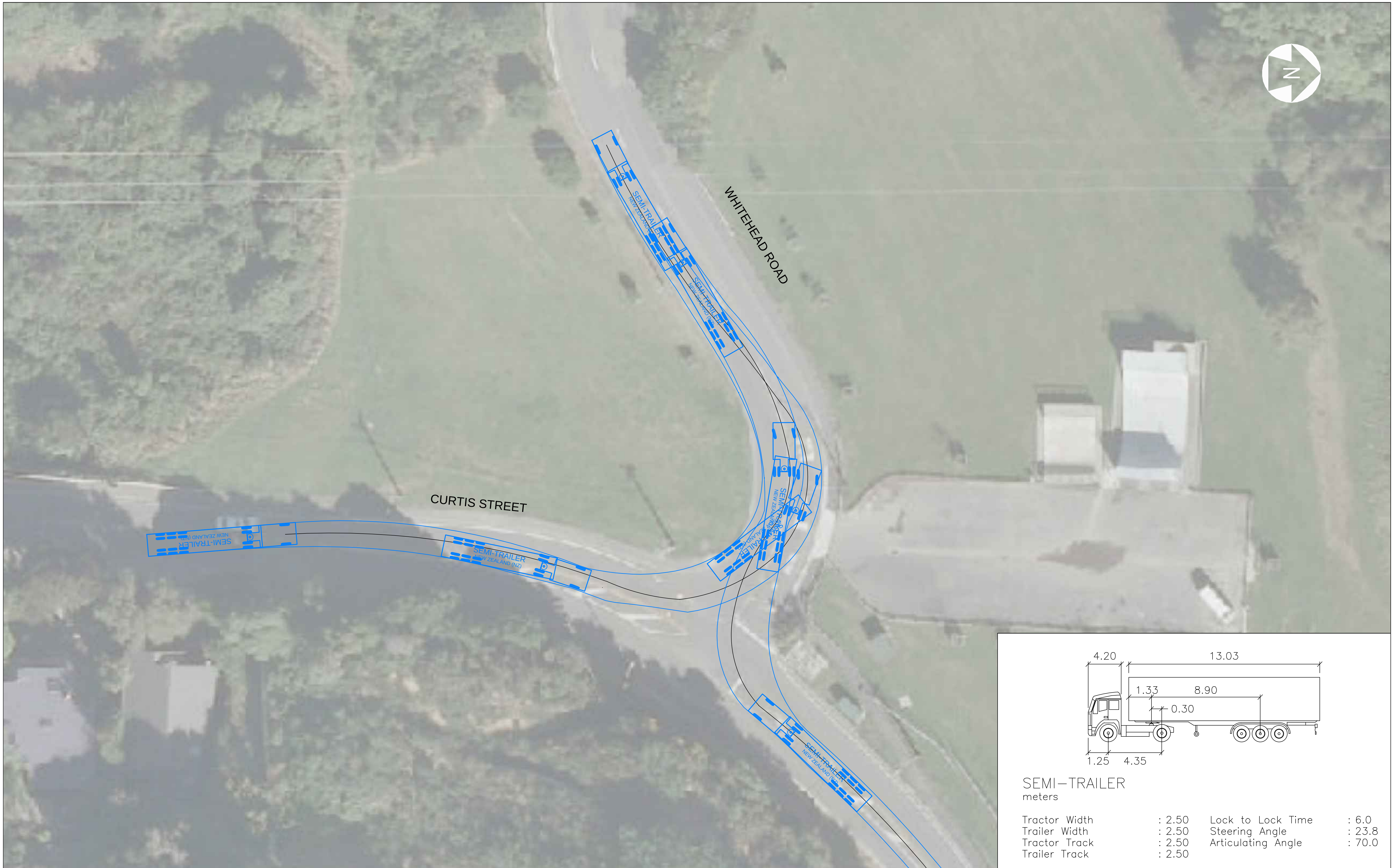
- ACCESS LOCATION WITH GRADE LESS THAN 10%
- ACCESS LOCATION WITH GRADES 10% TO 20%
- ACCESS LOCATION EXCEEDS 20% GRADE
- ACCESS RESTRICTED DUE TO PROXIMITY TO EXISTING JUNCTION

1:500 @ A1
1:1000 @ A3
0 5 10 15 20 25 30 35 40 45 50 m

CURTIS STREET PLAN CHANGE

FIGURE 7.1 - ACCESS CONSTRAINTS MAP

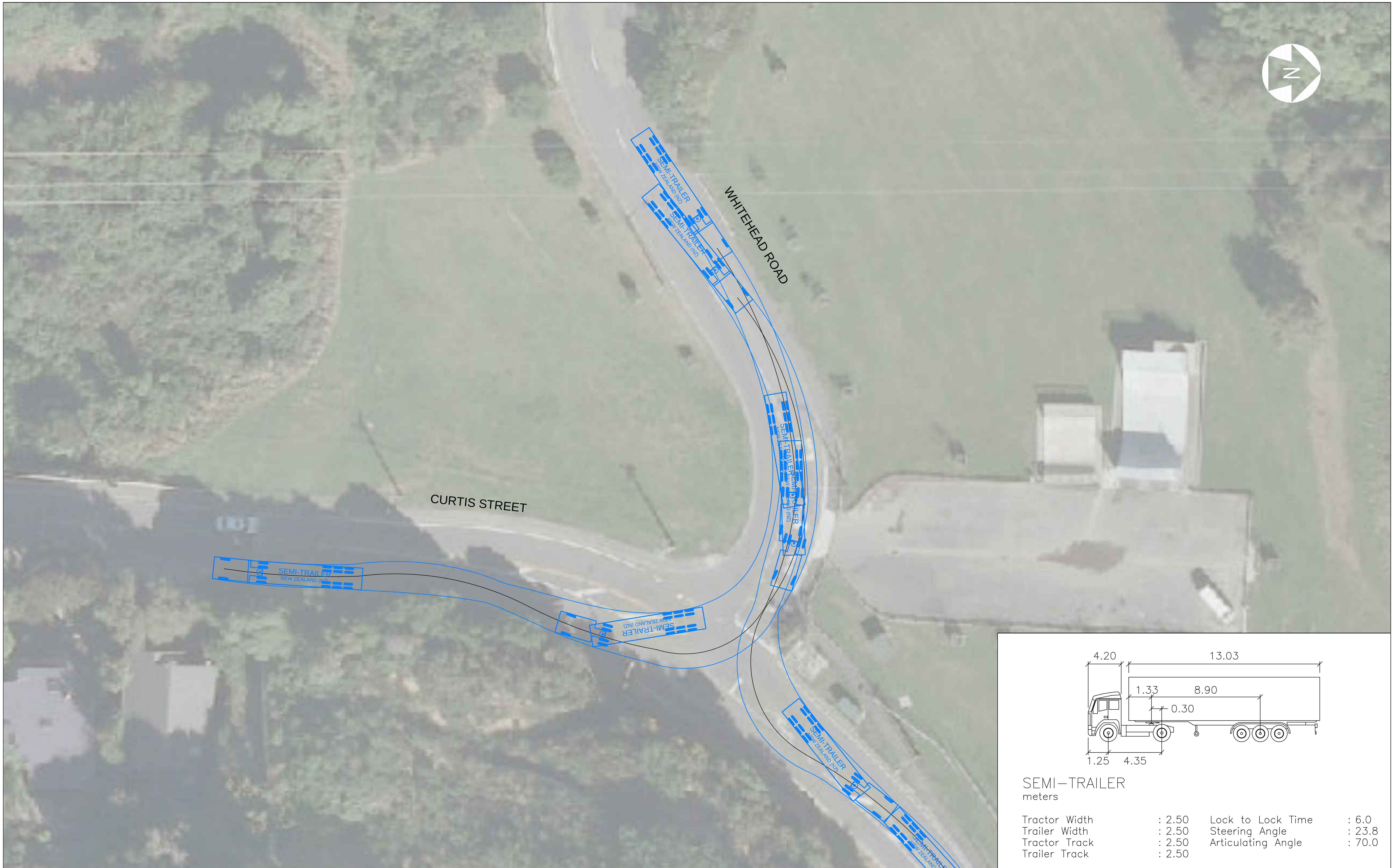
SCALE 1:1,000 (A3)



CURTIS STREET TO WHITEHEAD ROAD
SEMI-TRAILER TRACKING PATHS

FIGURE 7.2

SCALE 1:400 (A3)



WHITEHEAD ROAD TO CURTIS STREET
SEMI-TRAILER TRACKING PATHS

FIGURE 7.3

SCALE 1:400 (A3)

9. Road Safety Effects

Section 2.6 concluded that there was a trend for road traffic crashes involving turning vehicles at the intersection between Curtis Street and Chaytor Street. Section 6.4 showed that the increase in traffic associated with 4000m2 bulk or service retail would, if no mitigation measures are introduced result in significant delays for motorists approaching Chaytor Street on Curtis Street. If un-mitigated, the additional delay, particularly during the weekends peak period is likely to encourage risk-taking which could increase the numbers of crashes at the intersection. It is therefore important from both a traffic efficiency and road safety perspective that mitigation measures are introduced to minimise the delays for motorists on this approach to the intersection. Developments that are smaller than the thresholds presented in section 6.6 would not require mitigation.

It is also important that parking demand associated with the development site is accommodated to avoid on-street parking on surrounding streets. On-street parking would create potential safety hazards for other road users. On-street parking problems are most likely to be associated with service retail land-use.

The previous chapter has shown that some of the vehicles likely to be associated with Industrial or Bulk Retail land-uses would not be able to safely negotiate the surrounding road network without changes to intersections. The intersection between Whitehead Road and Curtis Street is most likely to need changes to accommodate a semi-trailer vehicle. This would however be dependent on the location chosen for new site access.

10. Conclusions and Recommendations

The assessment documented in this report has concluded that effects associated with developing the site for industrial or bulk retail activities can be adequately mitigated through changes to the surrounding infrastructure. The mitigation likely to be required should:

- ensure vehicles needed to service the development can safely manoeuvre through nearby access (e.g. Curtis Street / Whitehead Road intersection and Curtis Street / Old Karori Road intersection);
- mitigate delays at the Curtis Street / Chaytor Street intersection resulting from the development; and
- avoid the incidence of on-street parking associated with the development site.

This assessment has also found that it would not be possible to adequately mitigate the traffic effects associated with developing the site for 4000m^2 of service retail. The intersection delays associated with a service retail development of this size could not be appropriately mitigated without significant changes to nearby intersections which would result in additional environmental effects. The parking demand associated with service retail would also be difficult to safely manage. It is recommended that the amount of land developed as service retail is limited such that it is ancillary to other activities at the site.

10.1 Recommended Development Thresholds

To allow the Wellington City Council to control development of land at 55 – 85 Curtis Street and to understand the transport effects of potential development, it recommended that development thresholds are identified. Proposed developments that exceed these thresholds should be supported by a detailed and robust transportation assessment specific to the proposal.

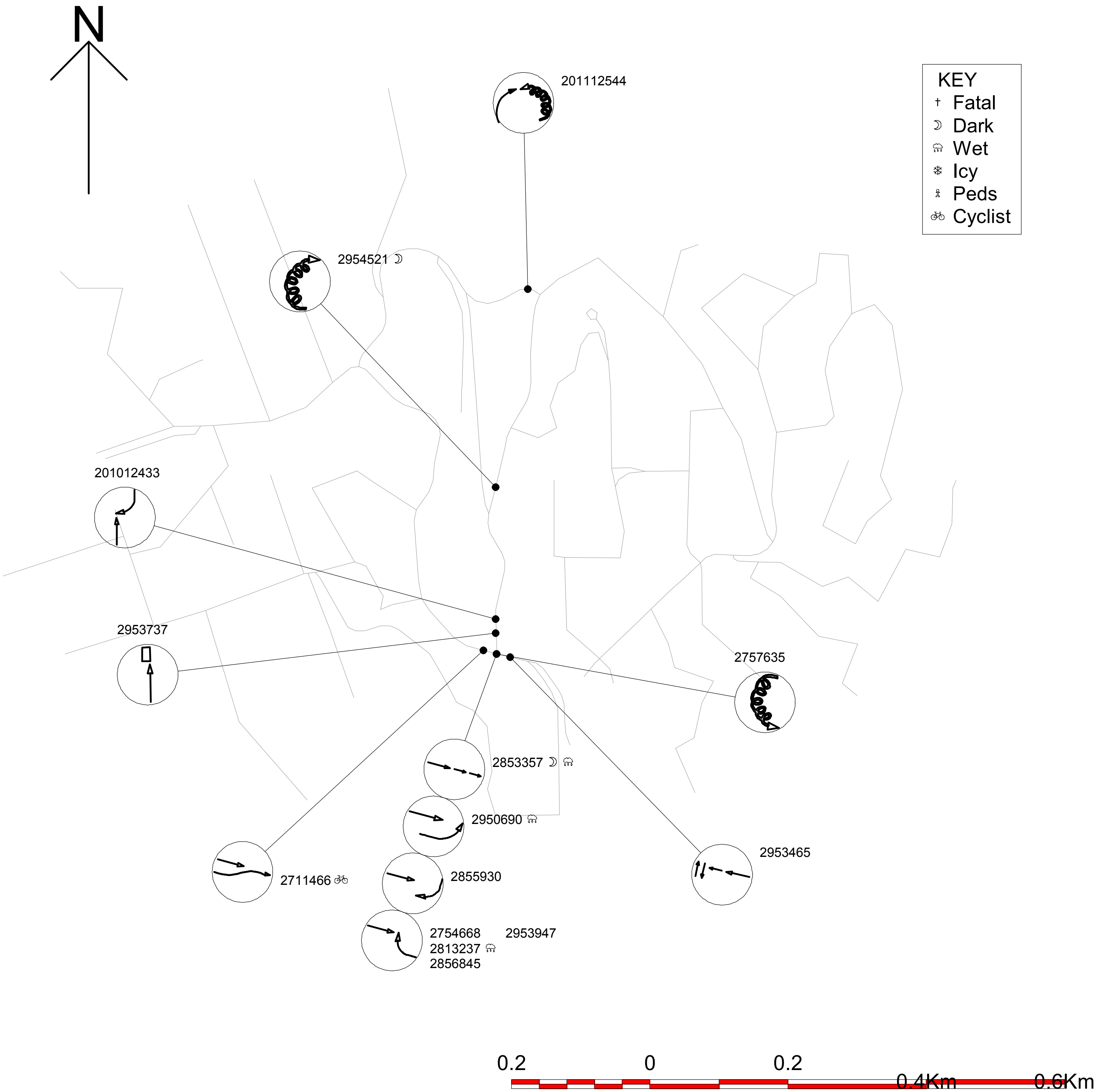
The two main issues this assessment has identified are:

- the effects of additional traffic on the safe and efficient operation of the Curtis Street / Chaytor Street intersection; and
- the potential for on-street parking to cause a safety hazard to users of streets surrounding 55 – 85 Curtis Street.

Thresholds related to traffic generation or parking are therefore appropriate. Potential GFA thresholds were presented in sections 6.6 and 7.2. It is recommended that the lower of these is applied for each potential land-use.

Potential Land-Use	**Potential Traffic Generation GFA Threshold (sq.m)**	**Potential Parking Demand GFA Threshold (sq.m)**	***Recommended GFA Threshold (sq.m)***
Industrial	5700 m^2	4900 m^2	*4900 m^2*
Bulk Retail	1700 m^2 (1200 m^2)	4100 m^2	*1500 m^2*
Service Retail	1000 m^2 (500 m^2)	2700 m^2	*500 m^2*
Office	5800 m^2	3600 m^2	*3600 m^2*

APPENDIX A: Crash History


N
KEY
Fatal
Dark
Wet
Icy
Peds
Cyclist
201112544
2954521
201012433
2953737
2757635
2853357
2950690
2711466
2855930
2953465
2754668
2953947
2813237
2856845
0.2
0
0.2
0.4Km
0.6Km

First Street	Distance D/I/R	Second street or landmark	Crash Number	Date DD/MM/YYYY	Day DDD	Time HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F A T	Tot Inj S E R	Tot Inj M I N
CHAYTOR ST	20S	CURTIS ST	2953465	17/07/2009	Fri	1450	CAR1 NBD on CHAYTOR ST hit rear end of CAR2 stop/slow for cross traffic	CAR1 following too closely	Dry	Overcast	Fine	T Type Junction	Give Way Sign			
CHAYTOR ST	20W	CURTIS ST	2711466	26/02/2007	Mon	0824	CAR1 EBD on CHAYTOR ST changing lanes to left hit CYCLIST2 (Age 57)	CAR1 didnt see/look behind when changing lanes, position or direction	Dry	Overcast	Fine	T Type Junction	Nil			1
CHAYTOR ST	I	CURTIS ST	2813237	01/08/2008	Fri	0745	MOPED2 turning right hit by oncoming CAR1 EBD on CHAYTOR ST	CAR1 overtaking on left	Wet	Bright	Fine	T Type Junction	Give Way Sign			1
CHAYTOR ST	I	CURTIS ST	2853357	12/06/2008	Thu	1650	CAR1 EBD on CHAYTOR ST hit rear end of CAR2 stop/slow for queue	CAR1 following too closely	Wet	Twilight	Mist	T Type Junction	Give Way Sign			
CHAYTOR ST	I	CURTIS ST	2855930	29/10/2008	Wed	1855	CAR1 EBD on CHAYTOR ST hit CAR2 turning right onto CHAYTOR ST from the left, CAR1 hit Cliff Bank	CAR2 failed to give way at give way sign, didnt see/look when required to give way to traffic from another direction	Dry	Bright	Fine	T Type Junction	Give Way Sign			
CHAYTOR ST	I	CURTIS ST	2950690	04/02/2009	Wed	1810	BUS1 EBD on CHAYTOR ST sideswiped by VAN2 turning left	VAN2 didnt see/look behind when changing lanes, position or direction	Wet	Overcast	Light Rain	T Type Junction	Give Way Sign			
CHAYTOR ST	I	CURTIS ST	2757635	30/12/2007	Sun	1900	CAR1 SBD on CURTIS ST lost control turning left, CAR1 hit Cliff Bank	CAR1 suddenly turned left, new driver showed inexperience, interferred with driver	Dry	Bright	Fine	T Type Junction	Give Way Sign			
CHAYTOR ST	I	CURTIS ST	2754668	09/03/2007	Fri	0800	CAR2 turning right hit by oncoming CAR1 EBD on CHAYTOR ST	CAR1 overtaking on left, in bus/transit lane CAR2 failed to give way when turning to non-turning traffic, didnt see/look when visibility obstructed by other vehicles	Dry	Overcast	Fine	T Type Junction	Give Way Sign			
CHAYTOR ST	I	CURTIS ST	2856845	20/11/2008	Thu	0750	VAN2 turning right hit by oncoming CAR1 EBD on CHAYTOR ST	CAR1 in bus/transit lane, didnt see/look when visibility obstructed by other vehicles VAN2 failed to give way when turning to non-turning traffic	Dry	Bright	Fine	T Type Junction	Give Way Sign			
CHAYTOR ST	I	CURTIS ST	2953947	22/07/2009	Wed	0800	CAR2 turning right hit by oncoming CAR1 EBD on CHAYTOR ST	CAR1 in bus/transit lane CAR2 failed to give way when turning to non-turning traffic, didnt see/look when visibility obstructed by other vehicles	Dry	Overcast	Fine	T Type Junction	Give Way Sign			
CURTIS ST	30N	CHAYTOR ST	2953737	03/07/2009	Fri	1030	TRUCK1 NBD on CURTIS ST hit parked veh, TRUCK1 hit Parked Vehicle	TRUCK1 too far left/right	Dry	Bright	Fine	Unknown	Nil			
CURTIS ST	250N	CHAYTOR ST	2954521	21/08/2009	Fri	1908	CAR1 NBD on CURTIS ST lost control turning right, CAR1 hit Kerb on right hand bend	CAR1 lost control avoiding another vehicle CAR2 did not see or look for other party until too late ENV: visibility limited by curve, entering or leaving private house / farm	Dry	Dark	Fine	Driveway	Nil			
CURTIS ST	50W	CHAYTOR ST	201012433	13/07/2010	Tue	1515	CAR2 turning right hit by oncoming MOPED1 WBD on CURTIS ST	CAR2 failed to give way when turning to non-turning traffic, attention diverted by driver dazzled by sun/lights, didnt see/look when required to give way to traffic from another direction ENV: dazzling sun, entering or leaving private house / farm	Dry	Bright	Fine	Driveway	Nil			1
WHITEHEAD ROAD	20E	CURTIS ST	201112544	22/08/2011	Mon	1535	MOPED1 WBD on WHITEHEAD ROAD lost control on curve and hit VAN2 head on	MOPED1 lost control when turning, misjudged speed of own vehicle, new driver showed inexperience	Dry	Overcast	Fine	T Type Junction	Give Way Sign			1

Crash List: JTP Curtis Street (14 crashes)

Total Injury Crashes:	4
Total Non-Injury Crashes:	10
	14

Crash Type	Number	%
Overtaking Crashes:	2	14
Straight Road Lost Control/Head On:	0	0
Bend - Lost Control/Head On:	3	21
Rear End/Obstruction:	3	21
Crossing/Turning:	6	43
Pedestrian Crashes:	0	0
Miscellaneous Crashes:	0	0
TOTAL:	14	100 %

Location	Local road	%	St.Highway	%	Total	%
Urban	14	100	0	0	14	100
Open road	0	0	0	0	0	0
TOTAL:	14	100	0	0	14	100 %

Intersection/Midblock	Number	%
Intersection:	8	57
MidBlock:	6	43
TOTAL:	14	100 %

Environmental Factors	Number	%
Light/Overcast Crashes:	12	86
Dark/Twilight Crashes:	2	14
TOTAL:	14	100 %
Wet/Ice:	3	21
Dry:	11	79
TOTAL:	14	100 %

Day/Period	Number	%
Weekday	13	93
Weekend	1	7
TOTAL:	14	100 %

Vehicles	Number	%
Car	19	86
Van/Ute	3	21
Truck	1	7
Bus	1	7
Motorcycle	3	21
Bicycle	1	7
TOTAL:	28	149 %

Note: Percentages represent the % of crashes in which the vehicle, cause or object appears.

Crash factors (*)	Number	%
Failed Giveway/Stop	5	36
Overtaking	2	14
Incorrect Lane/posn	6	43
Poor handling	2	14
Poor Observation	8	57
Poor judgement	2	14
Road factors	1	7
Weather	1	7
Other	1	7
TOTAL:	28	199 %
Crashes with a:		
Driver factor	25	178 %
Environmental factor	2	14 %

(*) factors are counted once against a crash - ie two fatigued drivers count as one fatigue crash factor.

Note: Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007. This will influence numbers and percentages.

Crashes with objects(s) struck 4 29 %

Object Struck	Number	%
Cliff Bank	2	14
Kerb	1	7
Parked Vehicle	1	7
TOTAL:	4	28 %

Crash Numbers

Year	Fatal	Serious	Minor	Non-Inj
2007	0	0	1	2
2008	0	0	1	3
2009	0	0	0	5
2010	0	0	1	0
2011	0	0	1	0
TOTAL:	0	0	4	10

APPENDIX B: Trip Generation

Site No.	Source of Data	Territorial Local Authority	Suburb or Locality	Activity Name	Land Use Group	Land Use Activity (Primary)	Location Environment	Date of Survey	Time of Survey	Day of Survey	GFA (m^2)	Parking Spaces Provided On-site	MAX ON-SITE PARKING DEMAND	TRIP GENERATION RATES GFA (IN+OUT)		
														AM	PM	DAILY
575	Canterbury University	Christchurch	Middleton	9 Craft Place	Industry	Manufacturing & Commercial	Suburban	14/09/2007	14:20-16:50	Friday	2020	25	19		1.04	
13	ATLA Study	Manukau	East Tamaki	Springs Road Industrial Units	Industry	Manufacturing	Outer Suburban	26/03/1993	0800-1600	Friday	2956	91	112	1.12	6.02	38.94
14	ATLA Study	Manukau	Wiri	South Auckland Mail Centre	Industry	Storage	Outer Suburban	24/06/1992	0800-1600	Wednesday	3550	82	52	3.66	3.04	22.14
561	Canterbury University	Christchurch	Middleton	Hands Road - Stratco Lrd	Industry	Contractor	Suburban	17/09/2007	14:30-16:30	Monday	3160	48	25		0.73	
507	DCS Ltd.	Christchurch	Sockburn	EasyStore	Industry	Storage		28/01/2005	8:00-17:30	Friday	4700	100	8	0.34	0.30	1.74
568	Canterbury University	Christchurch	Middleton	107 Magadala Place	Industry	Storage	Suburban	20/09/2007	14:30-17:30	Thursday	6677	36	19		0.58	
671	Traffic Design Group	Auckland	Penrose	MG Marketing Distribution Centre	Industry	Storage	Outer Suburban	20/09/2007	05:00-18:00	Thursday	6,650			1.17	0.47	0.00
Average											***4245***	***64***	***39***	***1.57***	***1.74***	

Site No.	Territorial Local Authority	Suburb or Locality	Activity Name	Land Use Group	Land Use Activity (Primary)	Date of Survey	Time of Survey	Day of Survey	GFA (m^2)	Parking Spaces Provided On-site	MAX ON-SITE PARKING DEMAND	SURVEYED ARRIVAL/DEPARTURE FLOW PM Peak (vph) at time	TRIP GENERATION RATES GFA (IN+OUT) (vph or vpd/100m2 GFA) AM	PM	DAILY
530	North Shore	Wairau	Harvey Norman	Retail	Bulk	31/07/2007	16:00-18:00	Tuesday	3399	71		16:30-17:30	0.00	3.06	0.00
539	Christchurch	Hornby	The Warehouse / Briscoes Bulk Retail Centre	Retail	Bulk	8/05/2006	16:00-17:30	Monday	3500			16:00 - 17:30	0.00	12.77	0.00
531	North Shore	Wairau	Harvey Norman	Retail	Bulk	1/08/2007	16:00-18:01	Wednesday	3399	71		16:30-17:30	0.00	0.85	0.00
Average									***3433***	***71***			***0.00***	***5.56***	

56	Waitakere	Henderson South	The Warehouse Ltd	Retail	Bulk	24/07/1993	0900-1630	Saturday	2408	73	67		0.00	13.50	100.25
484	Christchurch	Upper Riccarton	Miller's Homeworld	Retail	Shop	24/01/2004	10:00-16:00	Saturday	2690		39	1500-1600	0.00	4.16	0.00
20	Auckland	Onehunga	Grove Mitre 10	Retail	Shop	27/03/1993	0830-1700	Saturday	3916	56	56		2.94	5.90	43.59
Average									***3005***	***65***	***54***		***0.98***	***7.85***	

Site No.	Territorial Local Authority	Activity Name	Land Use	Land Use Activity (Primary)	Date of Survey	Time of Survey	Day of Survey	GFA (m^2)	Parking Spaces Provided On-site	MAX ON-SITE PARKING DEMAND	TRIP GENERATION GFA (IN+OUT) AM	PM	DAILY
66	Christchurch	Cashmere Club, Colombo St	Retail	Bar	19/11/1999	1600-1800	Friday	1400	175	76	0.00	4.14	0.00
131	Christchurch	Bros Kelly's, Centaurus Road shops	Retail	Bar	14/12/2000	1100-1930	Thu	400	29	18	2.00	3.75	24.00
57	Christchurch	Cashmere Club, Colombo St	Retail	Bar	17/11/1994	1630-2030	Thursday	1400	175	69	0.00	4.14	0.00
71	Christchurch	Parklands Tavern	Retail	Bar	15/07/1993	1800-2330	Thursday	1500		89	0.00	7.67	0.00
77	Christchurch	Ferrymead Tavern	Retail	Bar	15/07/1993	1800-2330	Thursday	900		51	0.00	12.33	0.00
80	Marlborough	Redwood Tavern	Retail	Bar	23/02/1995	1600-1900	Thursday	400	130	27	0.00	0.00	0.00
79	North Shore	Glenfield Tavern	Retail	Bar	28/09/1994	1630-1730	Wednesday	1900	120		0.00	10.42	0.00
160	North Shore	Glenfield Tavern	Retail	Bar	28/09/1994	1630-1730	Wednesday	1900	120		0.00	10.42	0.00
480	Christchurch	Subway	Retail	Fast Food	30/05/2008	11:30-13:30	Friday	470	11	10	12.13	0.00	0.00
504	Waitakere	Pumpkin Patch	Retail	Other	6/10/2006	11:00-15:00	Friday	309.4			36.20	28.44	0.00
165	North Shore	Sizzlers Wairau Park	Retail	Restaurant	14/05/1993	1600-1800	Friday	661	89		0.00	9.83	0.00
167	North Shore	Sizzlers Wairau Park	Retail	Restaurant	26/05/1995	1700-2100	Friday	661	89	86	0.00	12.41	0.00
450	North Shore	Pizza Hutt	Retail	Restaurant	18/06/1993	1100-2230	Friday	220	44	21	0.00	18.64	78.64
459	Waitakere	Valentines and The Boats Inn	Retail	Restaurant	22/10/1993	1730-2300	Friday	980	69	60	0.00	3.67	19.59
461	Auckland	Richardsons Tavern	Retail	Restaurant	10/12/1993	1700-2300	Friday	1067	105	73	0.00	17.34	105.25
478	Auckland	Ellerslie Oaks	Retail	Restaurant	4/02/1994	1630-2230	Friday	2010	226	185	0.00	15.52	58.81
503	Manukau	Metro Bar and Grill	Retail	Restaurant	28/01/1994	1630-2230	Friday	372	42	46	0.00	9.41	56.45
464	Auckland	Liquor King	Retail	Shop	7/01/1994	1700-2200	Friday	880	36	23	0.00	23.07	98.18
481	Christchurch	Liquor King	Retail	Shop	13/05/2011	16:00-18:00	Friday	362			0.00	39.50	
546	Tauranga	Video & Barber shop	Retail	shop	30/06/2006	08:00-22:00	Friday	356	12	9	3.37	8.43	53.37
432	Tauranga	Civic Video and a barber	Retail	Shop	26/6/2006-2/7/2006	08:00-22:00	Monday-Sunday	356	12	9	0.00	12.36	0.00
246	Hamilton	Total Furnature	Retail	Shop	16/12/2004	11:00-12:00 2:00-3:00	Thursday	1650			1.21	1.45	0.00
433	Rodney	Benchmark Building Supplies	Retail	Shop	29/04/1993	0800-1700	Thursday	1915	36	14	1.93	0.68	14.62
435	Manukau	Benchmark	Retail	Shop	15/04/1993	0730-1530	Thursday	1243	34	22	4.75	4.91	44.65
484	North Shore	Grove Mitre 10	Retail	Shop	25/03/1993	0830-1700	Thursday	1872	47	43	4.54	5.56	46.63
488	North Shore	Payless Plastics	Retail	Shop	22/04/1993	0830-1700	Thursday	474	27	11	1.90	4.01	31.22
358	Hamilton	Stacks	Retail	Shop	4/08/2004	8:00-9:00 12:00-15:00 16:00-17:00	Wednesday	90			5.56	0.00	0.00
430	Hamilton	Unknown	Retail	Shop	4/08/2004	8:00-9:00 12:00-15:00 16:00-17:00	Wednesday	50			32.00	0.00	0.00
457	Manukau	The New Hub Furniture Shop	Retail	Shop	15/06/1995	0900-1600		4086	70	8	0.00	0.54	3.70
Average								***825***	***77***	***45***	***7.06***	***24.29***	

76	Christchurch	Parklands Tavern	Retail	Bar	17/07/1993	1800-0300	Saturday	1500		92	0.00	10.13	0.00
78	Christchurch	Ferrymead Tavern	Retail	Bar	17/07/1993	1800-0300	Saturday	900		75	0.00	22.33	0.00
458	Auckland	Duke of Wellington	Retail	Bar	9/10/1993	1700-2200	Saturday	1460	161	117	0.00	10.41	61.30
460	North Shore	Georgie Pie	Retail	Fast Food	4/12/1993	0900-1700	Saturday	990	65	61	0.00	17.07	126.46
489	Rodney	KFC Orewa	Retail	Fast Food	20/11/1993	0900-1730	Saturday	230	47	22	0.00	41.74	220.43
491	Auckland	McDonalds	Retail	Fast Food	20/11/1993	0900-1730	Saturday	590	75	57	0.00	39.15	322.20
451	North Shore	KFC Takapuna	Retail	Fast Food	25/06/1995	1000-2230	Sunday	240	24	30	0.00	67.92	394.58
512	Waitakere	Pumpkin Patch	Retail	Other	7/10/2006	11:00-15:00	Saturday	309.4			34.58	33.94	0.00
704	Rodney	Honey Café & Store	Retail	Other	3/09/2005	11:00-13:00	Saturday	350		38	15.43	0.00	0.00
166	North Shore	Sizzlers Wairau Park	Retail	Restaurant	15/05/1993	1000-1300	Saturday	661	89		0.00	6.35	0.00
168	North Shore	Sizzlers Wairau Park	Retail	Restaurant	27/05/1995	1200-1400, 1700-2100	Saturday	661	89	96	0.00	22.24	0.00
245	North Shore	United Video, Mokoia Road	Retail	Shop	2/07/1994	1000-1400, 1430-1900	Saturday	697			24.10	36.15	0.00
251	Christchurch	Miller's Homeworld	Retail	Shop	24/01/2004	10:00-16:00	Saturday	2690		39	0.00	4.16	0.00
434	Auckland	Grove Mitre 10	Retail	Shop	27/03/1993	0830-1700	Saturday	3916	56	56	2.94	5.90	43.59
479	Auckland	Danske Mobler Furniture	Retail	Shop	15/06/1995	0900-1600	Saturday	790	33	17	0.00	0.00	21.65
518	Tauranga	Video & Barber shop	Retail	shop	1/07/2006	08:00-22:00	Saturday	356	12	7	4.78	12.36	77.81
Average								***1021***	***65***	***54***	***5.11***	***20.62***	

APPENDIX C: Base SIDRA Models

LANE SUMMARY

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	979	0	979	2.2	1922	0.510	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	110	110	1.0	1107	0.099	100	8.7	LOS A	0.4	3.0	35	Turn Bay	0.0	0.0
Approach	0	979	110	1089	2.1		0.510		0.9	NA	0.4	3.0				
East: Curtis																
Lane 1	164	0	16	180	1.8	341	0.528	100	20.7	LOS C	2.8	19.6	500	–	0.0	0.0
Approach	164	0	16	180	1.8		0.528		20.7	LOS C	2.8	19.6				
North: Chaytor (North)																
Lane 1	10	470	0	480	4.5	1893	0.254	100	0.1	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	10	470	0	480	4.5		0.254		0.1	NA	0.0	0.0				
Intersection				1749	2.7		0.528		2.7	NA	2.8	19.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	704	0	704	0.8	1940	0.363	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	52	52	0.0	785	0.067	100	10.3	LOS B	0.3	1.8	35	Turn Bay	0.0	0.0
Approach	0	704	52	756	0.7		0.363		0.7	NA	0.3	1.8				
East: Curtis																
Lane 1	130	0	18	148	1.1	242	0.612	100	29.6	LOS D	2.9	20.8	500	–	0.0	0.0
Approach	130	0	18	148	1.1		0.612		29.6	LOS D	2.9	20.8				
North: Chaytor (North)																
Lane 1	18	710	0	728	1.1	1934	0.376	100	0.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	18	710	0	728	1.1		0.376		0.2	NA	0.0	0.0				
Intersection				1632	0.9		0.612		3.1	NA	2.9	20.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: Karori / Chaytor / Old Karori

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 100 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	968	0	0	968	2.2	1243	0.778	100	10.4	LOS B	14.8	105.8	500	–	0.0	0.0
Lane 2	0	0	8	8	0.0	70[1]	0.108	100	56.7	LOS E	0.4	2.6	15	Turn Bay	0.0	0.0
Approach	968	0	8	975	2.2		0.778		10.7	LOS B	14.8	105.8				
East: Old Karori Road																
Lane 1	10	286	0	296	0.0	389	0.761	100	44.0	LOS D	14.5	101.4	500	–	0.0	0.0
Approach	10	286	0	296	0.0		0.761		44.0	LOS D	14.5	101.4				
West: Karori Road																
Lane 1	0	80	0	80	0.0	268[1]	0.300	47[5]	10.6	LOS B	1.8	12.3	28	Turn Bay	0.0	0.0
Lane 2	0	140[0]	499	639	4.5	1008	0.634	100	10.7	LOS B	7.7	55.4	500	–	0.0	0.0
Approach	0	221	499	720	3.1		0.634		10.7	LOS B	7.7	55.4				
Intersection				1991	2.2		0.778		16.0	LOS B	14.8	105.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LANE SUMMARY

Site: Karori / Chaytor / Old Karori

Karori / Chaytor / Old Karori
Signals - Fixed Time Cycle Time = 80 seconds (User-Given Cycle Time)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	779	0	0	779	1.3	1219	0.639	100	9.8	LOS A	8.1	57.5	500	–	0.0	0.0
Lane 2	0	0	12	12	9.1	81 [1]	0.154	100	46.2	LOS D	0.5	3.6	15	Turn Bay	0.0	0.0
Approach	779	0	12	792	1.4		0.639		10.4	LOS B	8.1	57.5				
East: Old Karori Road																
Lane 1	10	252	0	262	2.3	359	0.729	100	36.0	LOS D	10.3	73.8	500	–	0.0	0.0
Approach	10	252	0	262	2.3		0.729		36.0	LOS D	10.3	73.8				
West: Karori Road																
Lane 1	0	183	0	183	1.8	290 [1]	0.631	85 [5]	12.8	LOS B	4.0	28.6	28	Turn Bay	0.0	6.8
Lane 2	0	0	703	703	1.2	944	0.745	100	8.4	LOS A	4.8	33.7	500	–	0.0	0.0
Approach	0	183	703	886	1.3		0.745		9.3	LOS A	4.8	33.7				
Intersection				1940	1.5		0.745		13.3	LOS B	10.3	73.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

SIDRA INTERSECTION

LANE SUMMARY

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	84	0	84	3.1	1911	0.044	100	5.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	320	320	0.0	841[1]	0.380	100	7.9	LOS A	1.2	8.4	14	Turn Bay	0.0	0.0
Approach	0	84	320	404	0.7		0.380		7.3	NA	1.2	8.4				
North: Whitehead Road																
Lane 1	187	0	13	200	0.0	843	0.237	100	7.7	LOS A	1.0	7.3	500	–	0.0	0.0
Approach	187	0	13	200	0.0		0.237		7.7	LOS A	1.0	7.3				
West: Curtis Street																
Lane 1	14	101	0	115	1.0	1925	0.060	100	5.1	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	14	101	0	115	1.0		0.060		5.1	NA	0.0	0.0				
Intersection				719	0.5		0.380		7.1	NA	1.2	8.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

LANE SUMMARY

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	104	0	104	5.2	1886	0.055	100	5.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	180	180	3.6	798[1]	0.225	100	8.1	LOS A	0.6	4.7	14	Turn Bay	0.0	0.0
Approach	0	104	180	283	4.2		0.225		7.0	NA	0.6	4.7				
North: Whitehead Road																
Lane 1	212	0	4	216	1.8	840	0.257	100	7.9	LOS A	1.2	8.2	500	–	0.0	0.0
Approach	212	0	4	216	1.8		0.257		7.9	LOS A	1.2	8.2				
West: Curtis Street																
Lane 1	19	133	0	152	0.0	1938	0.078	100	5.1	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	19	133	0	152	0.0		0.078		5.1	NA	0.0	0.0				
Intersection				651	2.4		0.257		6.8	NA	1.2	8.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

APPENDIX D: Transport Assessment for Childcare Centre

Kindercare Childcare Centre

Karori, Wellington

Transportation Assessment Report

March 2010

Traffic Design Group

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Lower Hutt 5040
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www.tdg.co.nz
New Zealand

10101report.doc

Kindercare Childcare Centre

Karori, Wellington

Transportation Assessment Report Quality Assurance Statement

Prepared by:
Chris Morahan
Traffic Engineer

Reviewed by:
Eliza Sutton
Senior Transportation Engineer

Approved for Issue by:
Richard Galloway
Principal Transportation Engineer

Status: Final Report

Date: 22 March 2010

Table of Contents

1. Introduction

Kindercare Learning Centres Ltd proposes to develop a new childcare facility and regional office in Karori, providing for up to 100 children and a maximum of 24 staff. The proposal includes an on-site carpark, with vehicular access from the lower portion of Old Karori Road.

This report documents an assessment of the transportation and traffic related effects of the proposed childcare centre. In doing so, it first describes the location of the site and the patterns of traffic flows, and road safety of the area. The proposal is then described and compared to the provisions of the Wellington City District Plan. An assessment of the expected trip generation and parking demand is then provided, together with a description of proposed arrangements for parking and access. Particular attention is given to the parking and access arrangements on Old Karori Road, and the manner in which this will operate for residents, staff, parents and children. The opportunities for staff to use alternative modes of transport is then assessed.

The assessment concludes that the development can be accommodated in a safe and efficient manner in this location, and that the parking and access arrangements can be supported accordingly.

2. Location in the Transport Network

Figure 1 shows the location of the site of the proposed childcare centre fronting Old Karori Road. Old Karori Road is a short cul-de-sac which in the past connected to the upper portion of Old Karori Road until Whitehead Road was formed in 1988. Although its primary frontage is onto Old Karori Road the site is technically addressed 31 Curtis Street.

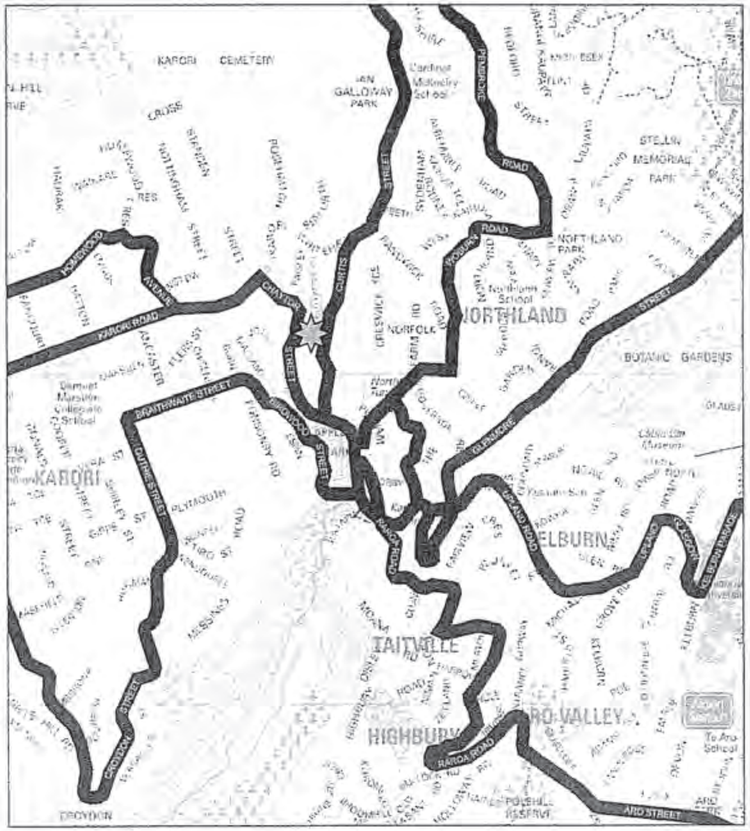
As shown by the road hierarchy details included in Figure 1, Curtis Street is defined as a 'Principal Road' and Old Karori Road as a 'Local Road'. Chaytor Street is also a 'Principal Road'. Curtis Street and Chaytor Road are commuter routes with associated tidal traffic patterns.

Access to Old Karori Road is gained from a give way controlled intersection with Curtis Street. Priority is afforded to through traffic on Curtis Street, in keeping with the roading classification. Sight distance is measured at 95m to the north and 70m to the south.

The Cardinal McKeefry Primary School is situated on Wilton Road 900m north of the site, and Wilton Primary School a further 900m north again.

The site is currently occupied by the Karori Garden Centre, and the proposed childcare centre will replace this commercial activity. The only other activity on Old Karori Road is a WCC compound on a small corner of a discontinued landfill, with vacant land located on the northern portion of the area. Some of the neighbouring residents on both sides of Curtis Street use the Old Karori Road cul-de-sac for parking.

Curtis Street has a footpath on the west side only, which links to the footpath on the west side of Old Karori Road. No buses run along Curtis Street, but Chaytor Street is a main bus route with stops in both directions near the corner of Curtis Street, some 200m from the site.



Motorway
Arterial Road
Principal Road
Golden Mile
Collector Road
Site

Tuesday, 23 March 2010

Kindercare Childcare Centre - Karori Location in Road Network	Traffic Design Group	1 SCALE 1:15 000

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3. Existing Traffic Patterns

The lower portion of Old Karori Road which fronts the site is a 60m long cul-de-sac, fulfilling a purely access related function with a generous provision of on-street parking. Curtis Street is a windy road with restricted sight distances in places. Curtis Street, in the vicinity of Old Karori Road, has one lane in each direction, with no on-street parking. There are steep banks on both sides of the road and a number of residential lots in the immediate area have no vehicular access. As such, some existing residential properties rely on kerbside parking within Old Karori Road. Parking on Old Karori Road is unmarked, but there is space for a total of around 17 vehicles to park along the length of the road.

As an integral part of this assessment, a detailed traffic survey was undertaken to record vehicles through the intersection of Old Karori Road and Curtis Street. Vehicles were recorded from 7:00am to 7:00pm on Tuesday 3 February 2009.

Figure 2 shows the traffic patterns observed throughout the survey period. These demonstrate a strong commuter pattern along Curtis Street, with traffic travelling south into the city in the morning and returning north to the residential suburbs in the evening. Curtis Street traffic flows can be seen to reach a peak between 8:00 and 9:00am, when some 290 vehicles passed through the intersection, of which 220 vehicles were travelling southbound. A slightly lower peak of 270 vehicles per hour (vph) was recorded in the evening between 5:00pm and 6:00pm, with northbound traffic making up 170vph.

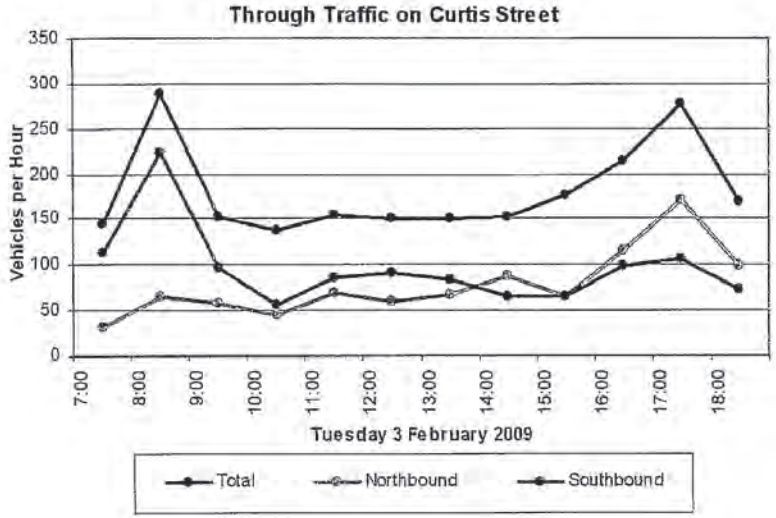
Figure 3 shows the detailed traffic movements during the morning and evening peak hours. As can be seen, Old Karori Road carries just 8vph during the morning peak and 16vph in the evening peak. Weekend flows are understood to be higher due to the presence of the garden centre. However this will be replaced by the Childcare Centre which will have virtually no traffic activity on weekends.

Cyclist movements along Curtis Street were also counted, with a total of 22 cyclists observed in the 12 hour survey period.

The traffic survey also included patterns of vehicles parking on Old Karori Road. The length of stay was recorded, as well as the destination of the occupants after they left the vehicle. It was found that a triangular planter about a third of the way along Old Karori Road acted as a separator, with the seven spaces south of it being generally used by residents and the ten spaces north of it being generally used by Garden Centre customers. Three residents' cars were parked south of the planter through much of the day, rising to seven overnight. The results of this survey, and an assessment of the ability for the road frontage to accommodate the proposed childcare centre's overflow parking demand is detailed further in Chapter 8 of this report.

A further survey was undertaken on Tuesday 16 February 2010 to measure the speeds of vehicles travelling along Curtis Street. A total of 240 vehicles were measured during the two hour period of 11:45am and 1:45pm. The 85th percentile speeds were measured as follows:

- northbound 46km/h
- southbound 51km/h.



Tuesday, 23 March 2010

Kindercare Childcare Centre - Karori

Curtis Street Through-Traffic

Traffic Design Group

2

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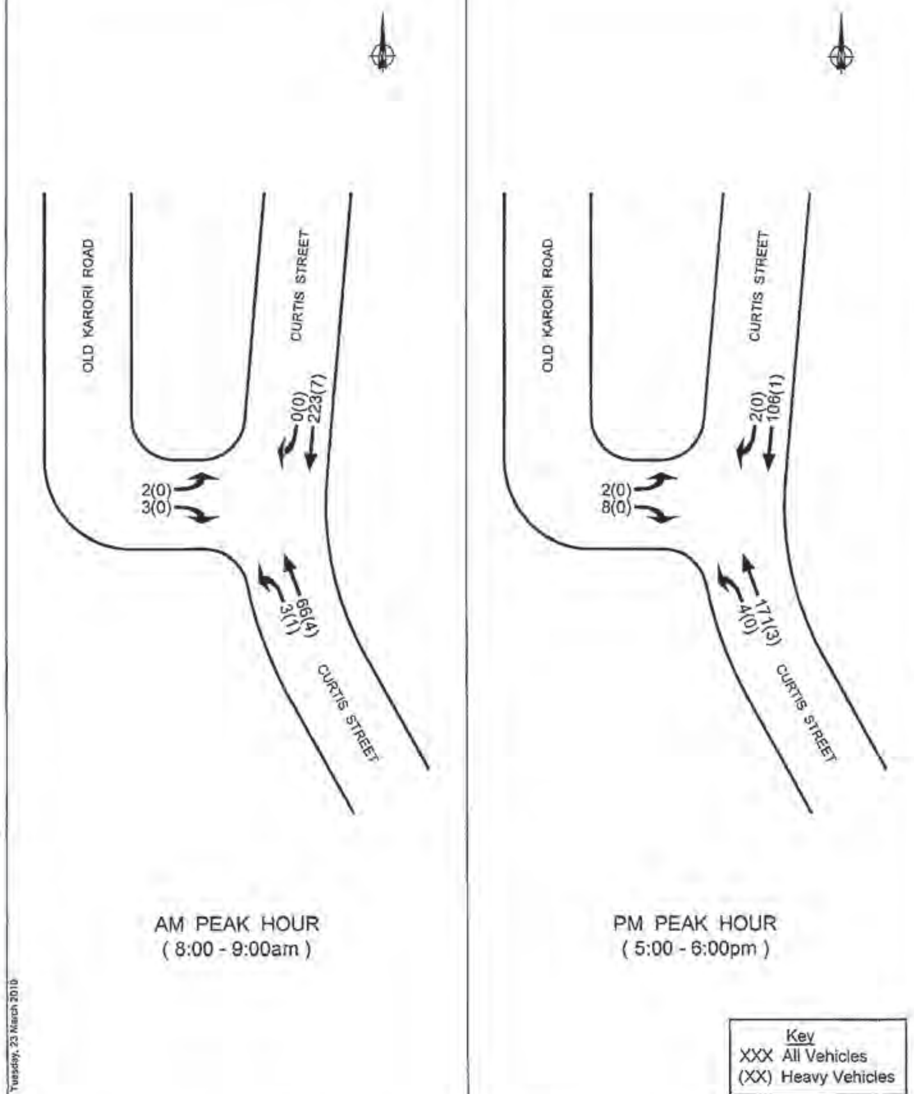

Tuesday, 23 March 2010

Kindercare Childcare Centre - Karori

Peak Period Flows

Traffic Design Group

3

SCALE: NTS

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The Austroads Guide to Road Design (Part 4A) details the Safe Intersection Sight Distances (SISD) for the measured speeds as follows:

	85TH PERCENTILE SPEED	SISD	MEASURED SIGHT DISTANCE
Northbound	46km/h	65m	70m
Southbound	51km/h	74m	95m

Table 1:Required Sight Distances

These values were calculated in accordance with the procedures set in Appendix A.2 of the Guide for the Extended Design Domain. The parameters used were an observation time of 1.5 seconds (Table A6 for T-intersections on roads with up to 4,000vpd), a coefficient of friction of 0.46 (Table 5.3 of Austroads Guide to Road Design Part 3: Geometric Design), and a reaction time of 2.0 seconds (conservative default).

As can be seen from Table 1, the measured sight distances are sufficient to meet the recommendations of the guide, and additionally can be noted as meeting the 40m access sightline requirements of the District Plan).

4. Road Safety

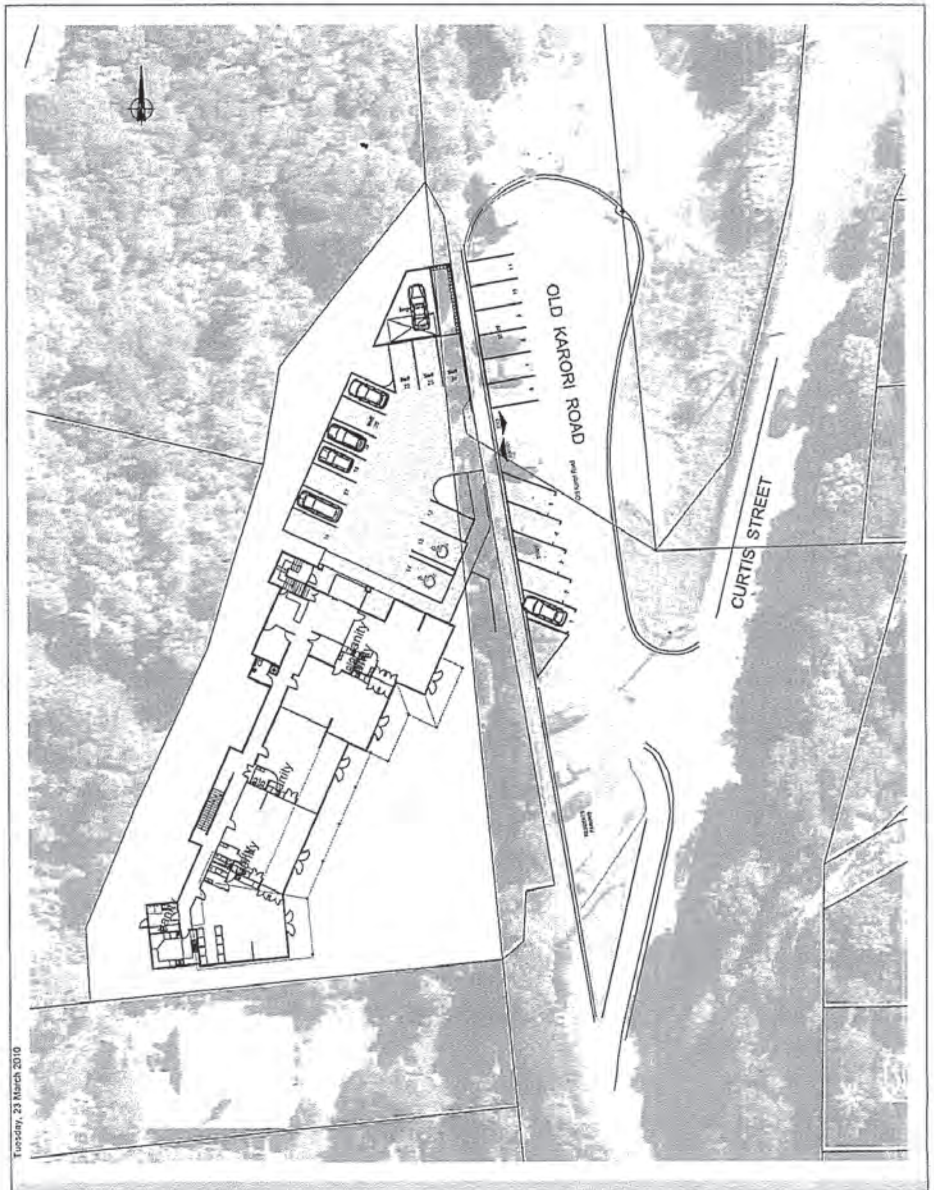
A detailed search of the NZ Transport Agency accident database (CAS) for the complete five year period from 2005 to 2009 found no reported accidents along Old Karori Road, and three on Curtis Street in the length between Chaytor Street and Whitehead Road (excluding the intersections at either end). One occurred at the intersection of Curtis Street and Creswick Terrace, when an unlicensed 15 year old driver pulled out from Creswick Terrace and failed to give way to a vehicle travelling along Curtis Street. Another occurred in 2009 when a vehicle attempting a U-turn was narrowly missed by a vehicle driving straight through, which damaged its tyre on the kerb attempting to avoid the turning vehicle. The third also occurred in 2009 when a parked car had its front right corner scraped by a passing vehicle. No injuries were sustained as a result of any of these accidents.

From these details, it is confirmed that Curtis Street and Old Karori Road are operating with a good level of safety.

5. Proposed Development

Figure 4 shows the proposed layout of the ground floor of the new childcare facility and regional office. The childcare facility will provide non-sessional early childhood services for up to 100 children aged between six months and five years and be staffed by up to 21 staff members during peak times. Another three staff will be required to manage the regional office that will be incorporated into the upper level of the two storey development.

On-site vehicular access will be provided at the northern end of the site to service a 13 space carpark, as well as a single garage intended for staff parking. The remaining staff and parents using private vehicles will park on Old Karori Road and will access the site by a prominent pedestrian entrance adjacent to the carpark.



Kindercare Childcare Centre - Karori

Proposed Development

Traffic Design Group

4

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Although on-street parking is not marked, there is currently sufficient space for up to 17 vehicles to park on Old Karori Road. This proposal presents the ability to formalise the currently available parking and create an additional space by combining the existing two driveways into one, resulting in seven spaces south of the planter and 11 spaces north of the planter.

6. District Plan

The site is zoned 'outer residential' within the provisions of the Wellington City District Plan. In these zones early childhood centres of up to 30 children are considered Controlled Activities. As this centre intends to provide for up to 100 children it needs to be assessed as a Discretionary Activity (Unrestricted). The relevant traffic and transportation assessment criteria for Discretionary Activities are set out in the following Table 2, as well as for the Controlled Activity of an early childhood centre of up to 30 children, which provides useful guidance as to transportation matters that should be considered in the context of this proposal.

Rule	Assessment Criteria	Compliance
5.4.1	**Discretionary Activity (Unrestricted)**	
5.4.1.3	Activities which generate significant vehicular traffic should be directed towards streets with existing high flows	**Complies.** Traffic generation is not significant. All traffic will access the site from a local road with ready access to a Principal Street (Curtis Street).
5.4.1.4	Vehicular traffic should be able to be accommodated without loss of safety or residential amenity or without causing congestion	**Complies.** Generated traffic can be accommodated safely and efficiently as detailed later in this report.
	On-site vehicle parking will be assessed with regard to the number of people employed or occupying the site and the demands of visitors and customers. Reasonable on-site parking should be provided	**Complies.** Reasonable parking is provided on-site for the expected demand and the availability of on-street parking, as detailed later in this report.
5.2.1	**Controlled Activity**	
5.2.1.5	Off-street parking arrangements will be assessed with regard to the number of staff to be employed on the site and visitors. Council seeks to ensure that off-street parking is available for each staff member.	**Does Not Comply** 14 parking spaces are provided on-site for a maximum of 24 staff. Overspill parking will be accommodated within available spare capacity on Old Karori Road.
	Council requires any parking, either on-street or on-site, to be safe for the setting down or picking up of children.	**Complies.** Parking layout including reliance on kerbside parking is safe, as discussed later in this report.
5.2.1.6	Whether the location and design of vehicle access to the site is safe. Council seeks to avoid hazardous situations such as access to and from busy streets or rear sites served by shared access drives. Additionally the proximity of any proposed facility to other activities which generate high number of vehicle movements will be taken into account.	**Complies.** Vehicle access location and design is safe, as discussed later in this report.

Table 2 : District Plan Considerations

In addition, reference has been made to the permitted activity standards for activities in the Residential Zone. The proposal complies with the relevant standards for restricted road access, sight distance, intersection separation, pedestrian visibility, access width and number of accesses. All but two of the parks comply with the District Plan standards for parking dimensions. These two are discussed later in this report.

There is currently a proposed plan change out for consultation, Plan Change 72, which seeks to change the rules and objectives governing this development. The transportation and traffic related parts have been reviewed and are described below.

The most relevant consideration under this proposed Plan Change with respect to this application is that early childcare centres of up to 30 children will be considered as Discretionary Activities (Restricted), rather than controlled activities as existing. Early childhood centres of more than 30 children will remain Discretionary Activities (Unrestricted).

The assessment criteria outlined in Table 2 for Discretionary Activities (Unrestricted) (Rules 5.4.1.3 and 5.4.1.4) are removed in the Plan Change, and instead the application is to be assessed on the relevant policies described in the plan, particularly including Policy 4.2.7.6 which is to "Manage the establishment of early childhood centres in residential areas". This describes matters to consider when assessing all applications for early childhood centres, whether it be for fewer than 30 children or more. The matters to consider are almost identical to the assessment criteria in the current District Plan for childcare centres of fewer than 30 children, as described earlier in Table 1.

Therefore, under Plan Change 72 the application would be a Discretionary Activity (Unrestricted), but would be assessed in regards to the criteria listed under the Controlled Activity heading in Table 1. This includes the guideline of one parking space per staff member. As can be seen, the application is aligned well with the existing District Plan, as well as the proposed Plan, with the exception of the level of provision of on-site parking, which does not comply with the required one space per staff member, as well as two spaces not complying with the standard dimensions. As will be discussed in Section 8, the overspill of parking can be accommodated within the available spare kerbside parking provision on Old Karori Road.

Overall, the application is well aligned with the District Plan objectives and policies and, with the exception of the two parking spaces mentioned earlier, meets all the transportation related assessment criteria for a Discretionary Activity. It also meets all but one of the criteria for the Controlled Activity of a childcare centre, again with respect to the shortfall of on-site parking provision.

7. Trip Generation

Detailed trip generation surveys were undertaken by Traffic Design Group at the established 80-child 15-staff member Kindercare in Kilbirnie in December 2008. From this information, a pro-rated daily traffic generation of some 344 vehicle movements (total of inbound and outbound movements) per day is expected at the proposed new centre. The hourly peak periods are expected to occur from 8:00am to 9:00am and 5:00pm to 6:00pm with peak hourly movements of 66vph and 60vph respectively, in the manner detailed in Table 3.

TIME	VEHICLE MOVEMENTS		
	In	Out	Total
7:00am - 8:00am	35	19	54
8:00am - 9:00am	36	32	68
9:00am - 10:00am	15	19	34
10:00am - 11:00am	4	4	8
11:00am - 12:00pm	3	4	7
12:00pm - 1:00pm	3	3	6
1:00pm - 2:00pm	7	0	7
2:00pm - 3:00pm	15	17	32
3:00pm - 4:00pm	6	7	13
4:00pm - 5:00pm	24	30	54
5:00pm - 6:00pm (PM peak)	24	37	61
TOTAL	172	172	344

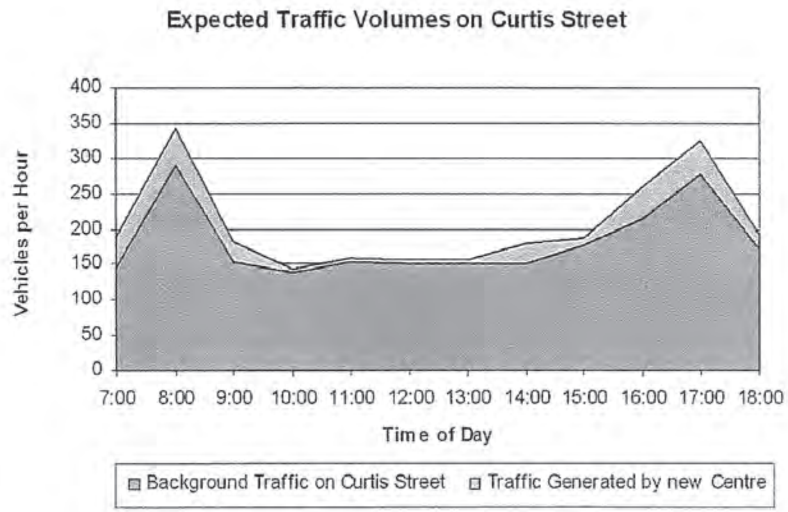
Table 3 : Forecast Vehicle Flows (per hour)

Figure 5 shows the pattern of added traffic demands which can be expected during a typical weekday when the traffic generated by the proposed activity is added to the underlying existing traffic using Curtis Street. Since it is expected that this Centre will cater largely for children of working parents who would be dropped off and picked up as parents travel to and from work, this diagram includes a provision for 20% of the generated traffic to be pass-by trips. That is, these trips would be passing the site regardless of whether or not a childcare centre was established here and will not be additional to the existing volumes.

The additional traffic created by the development represents an increase of 19% to the existing number of vehicle movements along Curtis Street at the busiest morning and afternoon peaks. This results in a combined peak hour volume of around 345 vehicles, still well within the practical capacity of Curtis Street.

Both current and future performance of the Curtis Street/Old Karori Road intersection have been assessed using industry recognised software package SIDRA Intersection. The data obtained indicates the intersection is currently performing very well at a level of service A for all movements and a maximum average delay of 8.5 seconds for vehicles turning right onto Curtis Street from Old Karori Road. With the increased trip generation, future performance predictions indicate that all movements will still operate at level of service A, with the maximum average delay for right turning traffic onto Curtis Street from Old Karori Road increasing slightly to 8.8 seconds. This increase in delay is not expected to be noticeable to the individual user.

Overall, there is an existing low volume of traffic currently using Curtis Street, with sufficient spare capacity to accommodate the additional traffic generated by the childcare centre while still retaining a high level of service for users.



Tuesday 23 March 2010

Kindercare Childcare Centre - Karori

Expected Traffic on Curtis Street

Traffic Design Group

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8. Parking

Old Karori Road is a 60m long cul-de-sac, which currently provides access to the Garden Centre and only one other established activity, being the infrequently accessed WCC compound. The only other users of the street are residents of houses on Curtis Street who have no off-street parking and as such use Old Karori Road as their primary parking area.

A detailed survey of existing parking demands on Old Karori Road was undertaken on Tuesday 3 February 2009 from 7:00am to 7:00pm to determine the level of usage of on-street parking by local residents and others. Vehicles were recorded as they entered the street, and the destination of the occupants after they left their vehicle was noted. It was found that around half of the parked cars observed during the course of the survey time belonged to customers of the Karori Garden Centre, which will be closed as a result of this development. As noted earlier, a maximum of seven residents' cars were parked overnight, prior to 8:00am. These vehicles were predominantly parked in the spaces south of the triangular planter. Two vehicles were recorded temporarily using the street for parking in conjunction with the WCC compound.

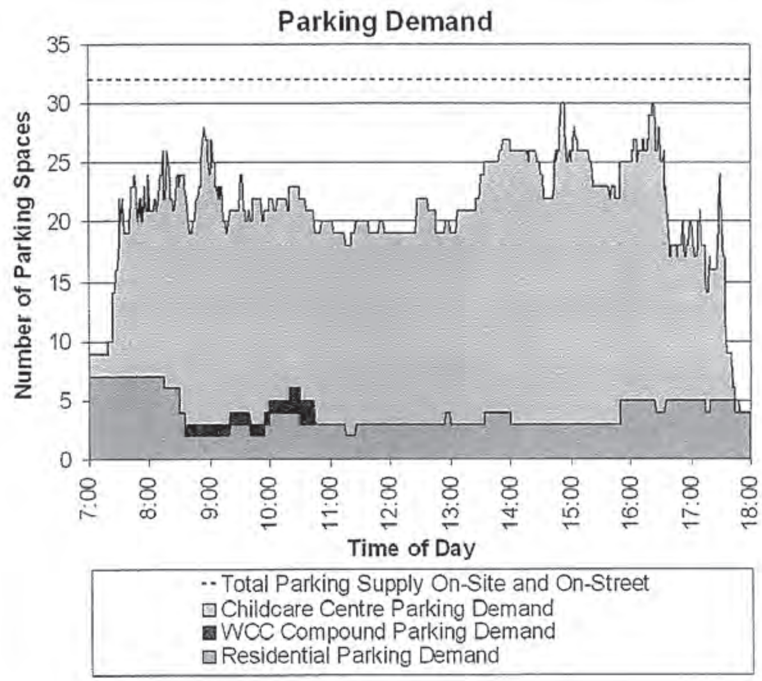
Based on the results from the survey conducted at the Kindercare in Kilbirnie, the expected peak parking demand of the proposal has been assessed as 27 vehicles, occurring at around 3:00pm. This consists of 19 staff vehicles and eight parent vehicles.

Figure 6 shows the surveyed resident and WCC compound parking demand and the forecast Childcare Centre parking demand. As can be seen in the graph, the peak is expected at around 3:00pm and again at 4:30pm, with 30 of its total of 32 parking spaces (off-street and on-site) occupied, meaning the available areas are sufficient o accommodate all of the parking demand in the area.

In general terms, the short visits by parents will keep parking south of the planter, which is most highly valued by residents, available for resident's use during most of the day. To avoid having these occupied by long-stay staff vehicles, it would be appropriate to have a consent condition preventing staff from parking south of the planter. With such a condition in place, residents will mostly be able to return home, and find a vacant parking space south of the planter, as they do now.

It is understood that the Karori Garden Centre currently has approval to use 15 of the on-street parking spaces. If this was to be fully utilised, residents would be able to use only two of the 17 spaces currently available on Old Karori Road. This proposal therefore represents a significant reduction in reliance on kerbside parking.

With the exception of two of the existing on-street spaces, all parking complies with the Wellington City District Plan's Vehicle Parking Standards. The on-site spaces are 2.5m x 5.0m with aisle widths ranging from 7.7m to 9.0m. The on-street spaces north of the planter are either at 90° to the kerb and 2.5m x 5.0m with an 8.2m aisle width at the narrowest point, or 60° to the kerb and 2.6m x 5.2m with 5.0m aisle width. The spaces south of the planter are at 50° to the kerb, and are 2.6m x 5.2m, generally with a 3.5m aisle width. The two spaces nearest Curtis Street however have a narrower aisle of 2.8m due to the footpath kerb behind them obstructing it, but because of the shallow angle these spaces are on they are still accessible by the design vehicle. One of the spaces on-site will be an accessible parking space. The adjacent park will be the same dimensions but not marked as an accessible space, enabling parents with prams or car seats to use this larger space.



Tuesday, 23 March 2010

Kindercare Childcare Centre - Karori Future Parking Demand	Traffic Design Group	6 SCALE NTS

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Overall, the proposed parking arrangements will be sufficient for the expected demand of the childcare centre. 14 spaces will be provided on-site, with a peak of 13 spaces expected to be used on Old Karori Road. Residents will generally be able to continue parking south of the planter, and will still have more parking available to them than they currently use, even during the hours of operation of the childcare centre. Outside these periods, additional parking will be available to accommodate additional residential parking, including the weekend period when the parking demands associated with the existing garden centre are currently at their highest. As such, this proposal represents an improvement to the existing residential parking availability.

9. Alternative Modes of Travel

The Curtis Street site is well placed for staff in particular to be able to choose modes of travel other than the private vehicle. Walking, cycling and public transport are all options for which this location provides a reasonably high level of service, and the layout of the site and its access has been designed with consideration given to such alternatives. A survey of an existing Kindercare Learning Centre in Wellington found that most children travelled by private car and only one of the 14 staff came by public transport. By comparison, the Curtis Street site can be expected to have a higher uptake of alternative modes of transport, for the reasons described below.

The site is within walking distance of a large resident population, being situated between Northland to the east and Karori to the west, presenting good opportunities for staff who live nearby and for parents to walk their children before themselves continuing on by public transport.

The nearest bus stop is on Chaytor Street just west of the intersection with Curtis Street, and a short 250m walk from the site. Four bus services stop here, as detailed in Table 3.

Service Number	Route	Frequency
3	Green Route - Karori to Wellington to Lyall Bay	Every 10 minutes all day
3S	South Karori to Wellington to Lyall Bay	Every 20 minutes - only peak times
3W	West Karori to Wellington to Lyall Bay	Every 15 minutes - only peak times
17	Karori to Wellington via University	Every 15 minutes - only peak times

Table 4 : Bus Services Operating Near the Site

The site is very well serviced by buses from Karori and the city centre with a high frequency service at all times of the day. The presence of bus lanes on Chaytor Street and Glenmore Street make bus travel an attractive option in peak periods, and bus patronage between Karori and the CBD area has a continuing high level of use.

Overall, the site is well placed for walking and public transport. For the reasons described, and while past studies show very limited attraction to taking these travel choices, the particular characteristics and location of this site are such that there is expected to be a higher demand for alternative modes.

Even then, the parking assessment included earlier has been based on the Rongotai example surveyed, and presents a conservative position accordingly.

10. Conclusion

Based on the results of the assessment presented within this report, it is concluded that the development of a new childcare centre on Old Karori Road can be accommodated with little or no adverse affects on the surrounding transport network.

The traffic volumes generated by the centre can be readily absorbed onto Curtis Street, and all the parking demands of staff and parents can be accommodated by the on-site and on-street parking arrangements, without inconveniencing local residents, subject to a consent condition preventing staff from parking south of the planter.

With the on-site design as proposed, and the consent condition as recommended above, the Kindercare Childcare Centre in Karori can be supported from a transportation engineering perspective.

Traffic Design Group Ltd
March 2010

Stephen Havill

From: Chris Morahan [chris.morahan@tdg.co.nz]
Sent: Thursday, 3 June 2010 11:27 a.m.
To: Tim Lainson; Stephen Havill
Cc: Eliza Sutton
Subject: Further information request - SR211394 - 31 Curtis Street

Tim and Stephen,

I met with Brendon Stone yesterday to discuss his concerns raised in the request for more information.

First I noted that the transportation assessment report he had was the one we produced in March, which was based on a different layout, so I gave him our latest report based on the current layout.

He also looked over our draft response to the request for more information, and confirmed that it addressed all his concerns. He suggested a couple of points we could add to it, the first being a mention that the servicing requirements of the Kindercare will be less than the current requirements of the Garden Centre, which currently has trucks coming and going to deliver goods. The second point he thought we could add was a reference to the 15 on-street space allocation that the Garden Centre currently has. We felt this was more of a planning issue and outside the scope of an assessment of effects, so have decided against including reference to it in our letter. Other than these suggestions he felt the letter adequately addressed all his concerns.

The meeting was very productive and I think by the end of it he was a lot more at ease with the proposal and was happy with our section 92 response.

We will finalise our letter and send it to you later today.

Regards,

Chris

-----Original Message-----
From: Chris Morahan
Sent: Monday, 31 May 2010 11:10 a.m.
To: 'Tim Lainson'
Cc: 'Stephen Havill'; Eliza Sutton
Subject: Further information request - SR211394 - 31 Curtis Street

Hi Tim and Stephen,

Here is a draft of our response to the S92 request. Let me know whether or not you would like any changes to it, and I'll finalise it.

Eliza and I were thinking that given Brendan Stone's general questioning of the whole scheme it might be best if we organised a meeting with him, hopefully tomorrow or Wednesday. We could then take in our letter with its plan and talk it through with him, which we think will be enough to ease his mind over the carpark safety. We will go ahead and organise this unless we hear differently from you.

Regards,

Chris

Traffic Design Group

Traffic Design Group Ltd
New Zealand

10101/1
3 June 2010

Tim Lainson
Business Development Manager
Kindercare Learning Centres
60 Greville Road
Pinehill
Albany
Auckland 0632

Dear Sir

Kindercare Curtis Street
Request for Further Information

In response to the Wellington City Council's request of 21 May 2010 for additional information regarding the resource consent application for a childcare centre at 31 Curtis Street, we are pleased to respond to the traffic related matters raised. For ease of reference, the transportation related issues raised by Wellington City Council have been quoted and responded to in turn. These are as follows:

> 4. I note that the plans show a clear indication of parks allocated to staff members within the cul-de-sac. Based on my reading of the previous planning decisions regarding the Karori Garden Centre, dispensation for 15 carparks has been provided, with the understanding that these parks will be accommodated within the cul-de-sac. No provision was made for allocated parking spaces. To have allocated parking spaces within the legal road, an encroachment license will need to be obtained.
>
> Following discussions with the Council's Transport Planner, it is considered inappropriate to specifically allocate/mark carparks for the exclusive use of the staff within the legal road.

By way of clarification, labelling of the on-street carparks with 'staff' was intended to show the spaces which staff would be encouraged to use to ensure the more convenient spaces are available to residents and parents, rather than an intention to officially allocate these parks. All on-street parks would be marked as regular on-street parks, and would be available for any member of the public to use. An encroachment license is therefore not being sought. We note the existing Garden Centre has agreement for up to 15 dedicated kerbside spaces in this vicinity, and the proposed arrangement will result in an improvement to the existing situation in this regard.

> 6. Ms Wood notes that there are some differences in the parking layout between that shown on the planting plan and the ground floor plan. It is assumed that the

ground floor plan takes precedence. Please clarify this and provide updated plans where inaccuracies are shown.

It is noted that since the Transportation Assessment Report was written the plans have been updated, and have several differences to the plans presented in the report. This letter considers the most recent plans lodged with Council, which correspond to the 'Ground Floor' plan representing the appropriate plan to consider.

7. Due to the pedestrian access to the building containing steps, it would be beneficial to provide a pedestrian entrance/footpath to the site beside the vehicle crossing. This would allow caregivers using pushchairs or similar to easily enter the site in a location clear of the vehicle crossing. Accordingly, a 1.5 metre wide pedestrian entrance/footpath should be provided to the site. Ms Wood notes that this would provide a shorter route to the pre-school entrance. The vehicle crossing would need to be located 1.5 metres approximately further north though. Please revise plans with regard to this matter.

A 1.6m wide ramped footpath was incorporated in the plans lodged for proposal, as has been suggested. The different plans lodged with Council may have resulted in some confusion in regard to this, and the attached Figure 1 has accordingly been prepared highlighting the pedestrian routes.

Most pedestrians accessing the site are expected to use the wide steps down from Old Karori Road. Other pedestrians who cannot or do not wish to use the steps are catered for by a 1.6m wide ramped footpath adjacent to the carpark joining the Old Karori Road footpath just south of the vehicle entrance. The grade of this footpath is a gentle 1:40, complying with the New Zealand Standard NZS4121:2001.

8. Please provide clarification regarding the servicing requirements of the site, ie frequency of servicing, and whether there will be sufficient space within the site for this.

Childcare centres do not typically generate any requirements for regular servicing or deliveries by anything other than regular sized cars and vans. Instead, servicing will be carried out by cars and vans in the on-site carpark throughout the day, and are typically managed to avoid peak drop-off and pick-up times. The very occasional delivery of larger items, such as furniture, can be managed to occur during weekend periods when the centre is not operational. This will therefore be an improvement on the current situation, with the Garden Centre currently requiring more frequent deliveries and larger servicing vehicles to adequately service the site.

9. Mr Stone has reviewed the Traffic Report and submitted plans and has concerns regarding the pick-up/drop-off of children. It is noted that the plans do not indicate where this function will occur in a safe and efficient way (all parks are allocated to staff). Mr Stone has concerns with this occurring within the site due to the confined area and number of manoeuvres required to exit - he anticipates there may be an unacceptable level of conflict between pedestrians and vehicles. He

therefore requests that this crucial matter be further addressed.

The safe pick-up/drop-off of children has been thoroughly considered in the design of the carparking and access to the childcare centre. This will occur in both the on-site carpark and the on-street carparks nearest the entrance. During the busiest time around 3:00pm, only around eight of the 27 vehicles parked at the childcare centre are expected to be associated with parents, with the remaining 19 vehicles being staff vehicles. Five spaces are provided for parents in the on-site carpark, as shown in Figure 1, with the remaining three vehicles able to park within the available spare capacity on Old Karori Road.

The parking spaces designated for use by parents in the on-site carpark are extra wide at either 2.7m, or 2.5m with a 1.1m clear zone adjacent to them. This makes it less demanding on drivers manoeuvring in and out of spaces, allowing them to concentrate more on what is happening around them. In the same way, the generous aisle width of 8.6m allows for a greater level of visibility for drivers to be more alert while they are manoeuvring.

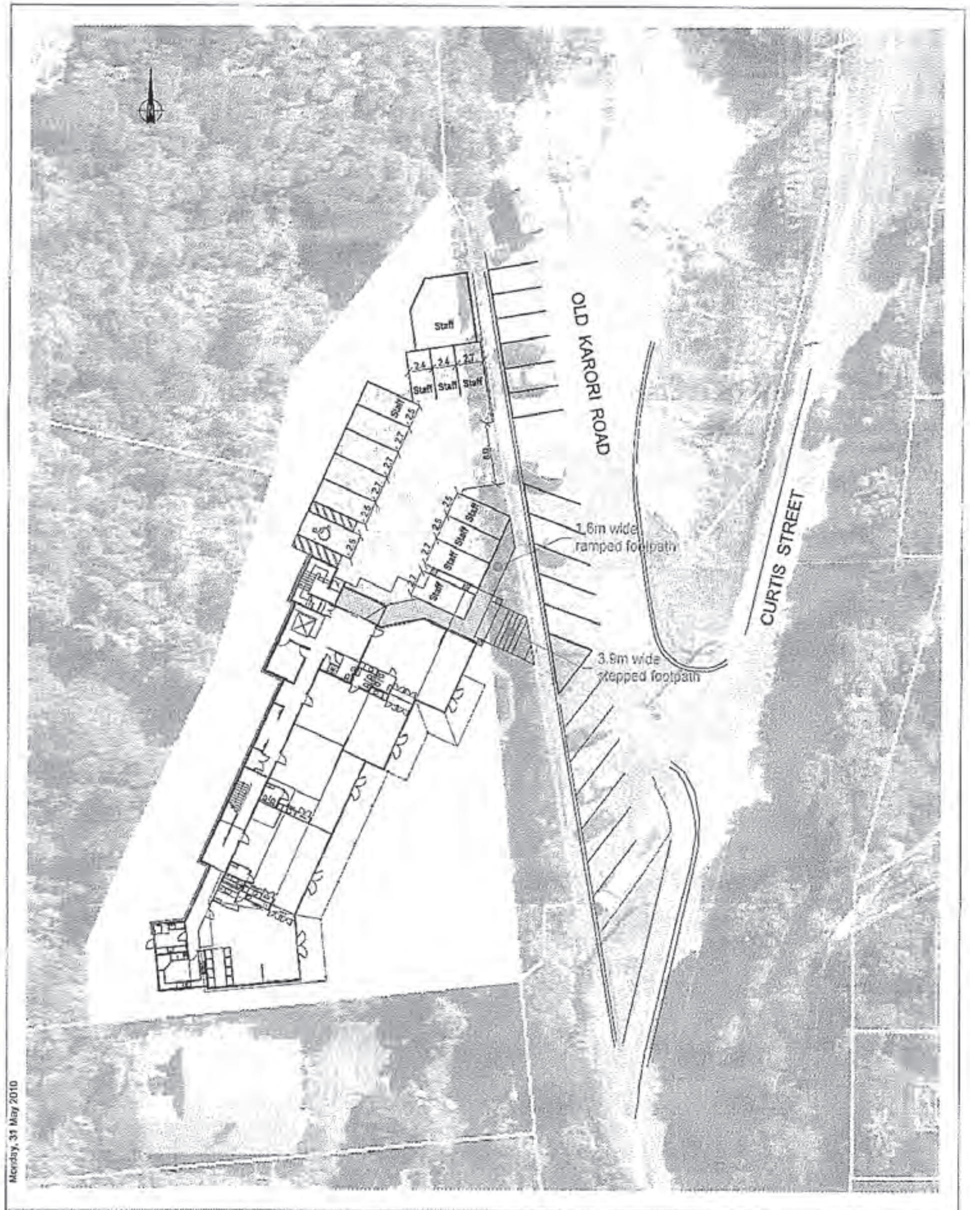
The angle parking on Old Karori Road nearest the entrance is expected to be used by parents as well. While this may not be desirable on a typical road, it is considered a safe solution here due to the nature of Old Karori Road. Being a short cul-de-sac providing access to only the childcare centre and the rarely visited Wellington City Council complex, it has no through traffic, low speeds, and an environment which is more like a carpark than a road. From the angle parking children will disembark onto the footpath and down the main stairs into the childcare centre, with no conflict with any vehicles along the way.

We trust this information clarifies the issues raised and alleviates your concerns, and we will be happy to discuss any aspects further if you wish.

Yours faithfully
Traffic Design Group Ltd

Chris Morahan
Transportation Engineer

Eliza Sutton
Principal Transportation Engineer



Kindercare Childcare Centre - Karori

Proposed Development

Traffic Design Group

1

SCALE 1:500

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APPENDIX E: Do-Minimum SIDRAs

LANE SUMMARY

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	1077	0	1077	2.2	1922	0.560	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	127	127	0.9	1033	0.123	100	9.1	LOS A	0.5	3.7	35	Turn Bay	0.0	0.0
Approach	0	1077	127	1204	2.1		0.560		1.0	NA	0.5	3.7				
East: Curtis																
Lane 1	196	0	20	216	1.5	280	0.772	100	34.7	LOS D	5.5	38.9	500	–	0.0	0.0
Approach	196	0	20	216	1.5		0.772		34.7	LOS D	5.5	38.9				
North: Chaytor (North)																
Lane 1	18	517	0	535	4.4	1892	0.283	100	0.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	18	517	0	535	4.4		0.283		0.2	NA	0.0	0.0				
Intersection				1956	2.7		0.772		4.5	NA	5.5	38.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: Chaytor / Curtis - Do Min

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	775	0	775	0.9	1939	0.400	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	103	103	0.0	696	0.147	100	11.3	LOS B	0.6	4.0	35	Turn Bay	0.0	0.0
Approach	0	775	103	878	0.8		0.400		1.3	NA	0.6	4.0				
East: Curtis																
Lane 1	195	0	20	214	0.8	201	1.067	100	97.5	LOS F	12.9	90.7	500	–	0.0	0.0
Approach	195	0	20	214	0.8		1.067		97.5	LOS F	12.9	90.7				
North: Chaytor (North)																
Lane 1	21	782	0	802	1.1	1933	0.415	100	0.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	21	782	0	802	1.1		0.415		0.2	NA	0.0	0.0				
Intersection				1894	0.9		1.067		11.7	NA	12.9	90.7				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Do Min

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	1065	0	0	1065	2.2	1272	0.837	100	10.2	LOS B	19.1	136.4	500	–	0.0	0.0
Lane 2	0	0	9	9	0.0	60 [1]	0.143	100	65.4	LOS E	0.5	3.4	15	Turn Bay	0.0	0.0
Approach	1065	0	9	1073	2.2		0.837		10.6	LOS B	19.1	136.4				
East: Old Karori Road																
Lane 1	11	315	0	326	0.0	389	0.838	100	54.3	LOS D	19.3	135.2	500	–	0.0	0.0
Approach	11	315	0	326	0.0		0.838		54.3	LOS D	19.3	135.2				
West: Karori Road																
Lane 1	0	76	0	76	0.0	254 [1]	0.300	44 [5]	10.5	LOS B	1.8	12.4	28	Turn Bay	0.0	0.0
Lane 2	0	168 [0]	555	723	4.5	1064	0.680	100	11.5	LOS B	10.7	77.1	500	–	0.0	0.0
Approach	0	244	555	800	3.1		0.680		11.4	LOS B	10.7	77.1				
Intersection				2199	2.2		0.838		17.6	LOS B	19.3	136.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Do Min

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	858	0	0	858	1.3	1288	0.666	100	9.2	LOS A	8.7	61.7	500	–	0.0	0.0
Lane 2	0	0	14	14	8.3	54[1]	0.254	100	69.2	LOS E	0.8	6.1	15	Turn Bay	0.0	0.0
Approach	858	0	14	871	1.4		0.666		10.1	LOS B	8.7	61.7				
East: Old Karori Road																
Lane 1	11	315	0	326	1.9	384	0.847	100	57.2	LOS E	20.3	144.1	500	–	0.0	0.0
Approach	11	315	0	326	1.9		0.847		57.2	LOS E	20.3	144.1				
West: Karori Road																
Lane 1	0	74	0	74	1.3	247[1]	0.300	35[5]	10.4	LOS B	1.8	12.4	28	Turn Bay	0.0	0.0
Lane 2	0	171[0]	774	944	1.2	1104	0.855	100	13.1	LOS B	21.0	148.5	500	–	0.0	0.0
Approach	0	245	774	1019	1.3		0.855		12.9	LOS B	21.0	148.5				
Intersection				2216	1.4		0.855		18.6	LOS B	21.0	148.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

Processed: Friday, 19 October 2012 1:45:51 p.m.
SIDRA INTERSECTION 5.1.12.2089

Project: G:\LocalAuthorities\Wellington City\Proj\5-C2305.00 Curtis Street Plan Change\700 Physical Works\7 Forecast Models\Saturday Models.sip
8000051, OPUS INTERNATIONAL CONSULTANTS, FLOATING

SIDRA INTERSECTION

LANE SUMMARY

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	107	0	107	2.5	1919	0.056	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	351	351	0.0	820[1]	0.428	100	8.7	LOS A	1.7	11.9	14	Turn Bay	0.0	1.3
Approach	0	107	351	458	0.6		0.428		7.8	NA	1.7	11.9				
North: Whitehead Road																
Lane 1	206	0	15	221	0.0	785	0.282	100	8.3	LOS A	1.3	8.8	500	–	0.0	0.0
Approach	206	0	15	221	0.0		0.282		8.3	LOS A	1.3	8.8				
West: Curtis Street																
Lane 1	26	131	0	157	0.8	1924	0.082	100	5.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	26	131	0	157	0.8		0.082		5.2	NA	0.0	0.0				
Intersection				836	0.5		0.428		7.4	NA	1.7	11.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Friday, 19 October 2012 11:13:22 a.m.
SIDRA INTERSECTION 5.1.12.2089

Project: G:\LocalAuthorities\Wellington City\Proj\5-C2305.00 Curtis Street Plan Change\700 Physical Works\7 Forecast Models\Tuesday Models.sip
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LANE SUMMARY

Site: Curtis / WhiteHead - Do Min

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	148	0	148	4.4	1896	0.078	100	5.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	231	231	3.3	729[1]	0.317	100	9.4	LOS A	1.1	7.9	14	Turn Bay	0.0	0.0
Approach	0	148	231	380	3.7		0.317		7.7	NA	1.1	7.9				
North: Whitehead Road																
Lane 1	285	0	4	288	1.3	716	0.403	100	10.0	LOS B	2.4	16.9	500	–	0.0	0.0
Approach	285	0	4	288	1.3		0.403		10.0	LOS B	2.4	16.9				
West: Curtis Street																
Lane 1	21	242	0	264	0.0	1942	0.136	100	5.0	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	21	242	0	264	0.0		0.136		5.0	NA	0.0	0.0				
Intersection				932	1.9		0.403		7.7	NA	2.4	16.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

SIDRA INTERSECTION

APPENDIX F: SIDRA Intersection Outputs for Possible Development Scenarios

LANE SUMMARY

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	1077	0	1077	2.2	1922	0.560	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	137	137	0.8	1019	0.135	100	9.1	LOS A	0.6	4.0	35	Turn Bay	0.0	0.0
Approach	0	1077	137	1214	2.1		0.560		1.0	NA	0.6	4.0				
East: Curtis																
Lane 1	211	0	23	234	1.4	268	0.872	100	45.5	LOS E	7.7	54.8	500	–	0.0	0.0
Approach	211	0	23	234	1.4		0.872		45.5	LOS E	7.7	54.8				
North: Chaytor (North)																
Lane 1	28	517	0	546	4.3	1892	0.288	100	0.3	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	28	517	0	546	4.3		0.288		0.3	NA	0.0	0.0				
Intersection				1994	2.6		0.872		6.1	NA	7.7	54.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Industrial

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	1066	0	0	1066	2.2	1264	0.843	100	10.7	LOS B	21.5	153.3	500	–	0.0	0.0
Lane 2	0	0	9	9	0.0	58[1]	0.149	100	68.2	LOS E	0.5	3.6	15	Turn Bay	0.0	0.0
Approach	1066	0	9	1075	2.2		0.843		11.1	LOS B	21.5	153.3				
East: Old Karori Road																
Lane 1	11	326	0	338	0.0	406	0.832	100	55.1	LOS E	20.6	144.1	500	–	0.0	0.0
Approach	11	326	0	338	0.0		0.832		55.1	LOS E	20.6	144.1				
West: Karori Road																
Lane 1	0	74	0	74	0.0	245[1]	0.300	43[5]	10.9	LOS B	1.8	12.5	28	Turn Bay	0.0	0.0
Lane 2	0	172[0]	565	737	4.4	1065	0.692	100	11.8	LOS B	11.6	83.7	500	–	0.0	0.0
Approach	0	245	565	811	3.1		0.692		11.7	LOS B	11.6	83.7				
Intersection				2223	2.2		0.843		18.3	LOS B	21.5	153.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

LANE SUMMARY

Site: Curtis / WhiteHead - Industrial

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	128	0	128	2.1	1924	0.066	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	351	351	0.0	809[1]	0.434	100	9.0	LOS A	1.8	12.5	14	Turn Bay	0.0	2.8
Approach	0	128	351	479	0.5		0.434		7.9	NA	1.8	12.5				
North: Whitehead Road																
Lane 1	206	0	18	224	0.0	741	0.302	100	8.7	LOS A	1.3	9.4	500	–	0.0	0.0
Approach	206	0	18	224	0.0		0.302		8.7	LOS A	1.3	9.4				
West: Curtis Street																
Lane 1	37	150	0	187	0.6	1923	0.097	100	5.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	37	150	0	187	0.6		0.097		5.2	NA	0.0	0.0				
Intersection				890	0.4		0.434		7.5	NA	1.8	12.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

LANE SUMMARY

Site: Chaytor / Curtis - Service Retail

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	1077	0	1077	2.2	1922	0.560	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	180	180	0.6	961	0.187	100	9.5	LOS A	0.8	5.7	35	Turn Bay	0.0	0.0
Approach	0	1077	180	1257	2.0		0.560		1.4	NA	0.8	5.7				
East: Curtis																
Lane 1	275	0	36	311	1.1	237	1.314	100	192.2	LOS F	32.5	229.5	500	–	0.0	0.0
Approach	275	0	36	311	1.1		1.314		192.2	LOS F	32.5	229.5				
North: Chaytor (North)																
Lane 1	72	517	0	590	4.0	1889	0.312	100	0.8	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	72	517	0	590	4.0		0.312		0.8	NA	0.0	0.0				
Intersection				2157	2.4		1.314		28.7	NA	32.5	229.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: Chaytor / Curtis - Service Retail

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	775	0	775	0.9	1939	0.400	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	219	219	0.0	561	0.389	100	14.8	LOS B	1.9	13.0	35	Turn Bay	0.0	0.0
Approach	0	775	219	994	0.7		0.400		3.3	NA	1.9	13.0				
East: Curtis																
Lane 1	366	0	55	421	0.4	174	2.417	100	678.7	LOS F	86.5	607.9	500	–	0.0	11.1
Approach	366	0	55	421	0.4		2.417		678.7	LOS F	86.5	607.9				
North: Chaytor (North)																
Lane 1	138	782	0	919	1.0	1923	0.478	100	1.0	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	138	782	0	919	1.0		0.478		1.0	NA	0.0	0.0				
Intersection				2334	0.7		2.417		124.1	NA	86.5	607.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: Chaytor / Curtis - Service Retail - Copy

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	775	0	775	0.9	1939	0.400	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	190	190	0.0	594	0.319	100	13.4	LOS B	1.4	10.0	35	Turn Bay	0.0	0.0
Approach	0	775	190	965	0.7		0.400		2.6	NA	1.4	10.0				
East: Curtis																
Lane 1	324	0	0	324	0.5	258	1.256	100	155.6	LOS F	29.0	204.1	500	–	0.0	0.0
Lane 2	0	0	47	47	0.0	53	0.882	100	108.2 [8]	LOS F [8]	2.8 [8]	19.9 [8]	8	Turn Bay	0.0	49.9
Approach	324	0	47	371	0.4		1.256		149.6	LOS F	29.0	204.1				
North: Chaytor (North)																
Lane 1	108	782	0	890	1.0	1925	0.462	100	0.8	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	108	782	0	890	1.0		0.462		0.8	NA	0.0	0.0				
Intersection				2225	0.8		1.256		26.4	NA	29.0	204.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Service Retail

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	1075	0	0	1075	2.2	1234	0.871	100	14.8	LOS B	31.0	221.4	500	–	0.0	0.0
Lane 2	0	0	9	9	0.0	58[1]	0.149	100	68.2	LOS E	0.5	3.6	15	Turn Bay	0.0	0.0
Approach	1075	0	9	1083	2.2		0.871		15.2	LOS B	31.0	221.4				
East: Old Karori Road																
Lane 1	11	375	0	386	0.0	438	0.882	100	58.7	LOS E	24.8	173.6	500	–	0.0	0.0
Approach	11	375	0	386	0.0		0.882		58.7	LOS E	24.8	173.6				
West: Karori Road																
Lane 1	0	71	0	71	0.0	237[1]	0.300	39[5]	11.8	LOS B	1.8	12.5	28	Turn Bay	0.0	0.0
Lane 2	0	183[0]	610	794	4.1	1038	0.765	100	12.6	LOS B	14.5	104.2	500	–	0.0	0.0
Approach	0	255	610	865	2.9		0.765		12.5	LOS B	14.5	104.2				
Intersection				2334	2.1		0.882		21.6	LOS C	31.0	221.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

Processed: Friday, 19 October 2012 12:13:40 p.m.
SIDRA INTERSECTION 5.1.12.2089

Project: G:\LocalAuthorities\Wellington City\Proj\5-C2305.00 Curtis Street Plan Change\700 Physical Works\7 Forecast Models\Tuesday Models.sip
8000051, OPUS INTERNATIONAL CONSULTANTS, FLOATING

SIDRA INTERSECTION

LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Service Retail

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	881	0	0	881	1.3	1227	0.718	100	11.6	LOS B	15.6	110.6	500	–	0.0	0.0
Lane 2	0	0	14	14	8.3	54[1]	0.254	100	69.2	LOS E	0.8	6.1	15	Turn Bay	0.0	0.0
Approach	881	0	14	895	1.4		0.718		12.5	LOS B	15.6	110.6				
East: Old Karori Road																
Lane 1	11	443	0	454	1.4	450	1.007	100	85.6	LOS F	35.6	252.4	500	–	0.0	0.0
Approach	11	443	0	454	1.4		1.007		85.6	LOS F	35.6	252.4				
West: Karori Road																
Lane 1	0	69	0	69	1.2	231[1]	0.300	29[5]	12.2	LOS B	1.8	12.5	28	Turn Bay	0.0	0.0
Lane 2	0	197[0]	884	1081	1.1	1044	1.035	100	47.7	LOS D	82.1	579.9	500	–	0.0	18.4
Approach	0	266	884	1150	1.1		1.035		45.5	LOS D	82.1	579.9				
Intersection				2499	1.3		1.035		41.2	LOS D	82.1	579.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Service Retail

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	875	0	0	875	1.3	1242	0.704	100	11.0	LOS B	13.8	97.4	500	–	0.0	0.0
Lane 2	0	0	14	14	8.3	54[1]	0.254	100	69.2	LOS E	0.8	6.1	15	Turn Bay	0.0	0.0
Approach	875	0	14	888	1.4		0.704		11.9	LOS B	13.8	97.4				
East: Old Karori Road																
Lane 1	11	411	0	422	1.5	434	0.972	100	75.8	LOS E	31.1	220.6	500	–	0.0	0.0
Approach	11	411	0	422	1.5		0.972		75.8	LOS E	31.1	220.6				
West: Karori Road																
Lane 1	0	70	0	70	1.2	234[1]	0.300	30[5]	11.8	LOS B	1.8	12.5	28	Turn Bay	0.0	0.0
Lane 2	0	190[0]	857	1048	1.1	1059	0.989	100	32.7	LOS C	64.2	453.8	500	–	0.0	0.0
Approach	0	261	857	1118	1.1		0.989		31.4	LOS C	64.2	453.8				
Intersection				2428	1.3		0.989		32.2	LOS C	64.2	453.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

Processed: Wednesday, 24 October 2012 1:26:20 p.m.
SIDRA INTERSECTION 5.1.12.2089
Project: G:\LocalAuthorities\Wellington City\Proj\5-C2305.00 Curtis Street Plan Change\700 Physical Works\7 Forecast Models\Saturday Models Testing.sip
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SIDRA INTERSECTION

LANE SUMMARY

Site: Curtis / WhiteHead - Service Retail

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	221	0	221	1.2	1935	0.114	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	351	351	0.0	756[1]	0.464	100	10.2	LOS B	2.2	15.1	14	Turn Bay	0.0	8.4
Approach	0	221	351	572	0.5		0.464		8.2	NA	2.2	15.1				
North: Whitehead Road																
Lane 1	206	0	30	235	0.0	559	0.421	100	12.5	LOS B	2.4	16.5	500	–	0.0	0.0
Approach	206	0	30	235	0.0		0.421		12.5	LOS B	2.4	16.5				
West: Curtis Street																
Lane 1	85	236	0	320	0.4	1920	0.167	100	5.3	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	85	236	0	320	0.4		0.167		5.3	NA	0.0	0.0				
Intersection				1128	0.3		0.464		8.3	NA	2.4	16.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

LANE SUMMARY

Site: Curtis / WhiteHead - Service Retail

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	350	0	350	1.9	1927	0.182	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	231	231	3.3	496	0.467	100	17.4	LOS C	2.4	17.2	14	Turn Bay	0.0	12.7
Approach	0	350	231	582	2.4		0.467		9.9	NA	2.4	17.2				
North: Whitehead Road																
Lane 1	285	0	30	315	1.2	145	2.172	100	573.5	LOS F	61.4	434.4	500	–	0.0	1.0
Approach	285	0	30	315	1.2		2.172		573.5	LOS F	61.4	434.4				
West: Curtis Street																
Lane 1	266	684	0	950	0.0	1923	0.494	100	5.3	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	266	684	0	950	0.0		0.494		5.3	NA	0.0	0.0				
Intersection				1847	1.0		2.172		103.7	NA	61.4	434.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

SIDRA INTERSECTION

LANE SUMMARY

Site: Curtis / WhiteHead - Service Retail - Copy

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	300	0	300	2.2	1923	0.156	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	231	231	3.3	553	0.419	100	15.4	LOS C	2.1	15.3	14	Turn Bay	0.0	8.8
Approach	0	300	231	531	2.6		0.419		9.5	NA	2.1	15.3				
North: Whitehead Road																
Lane 1	285	0	0	285	1.3	260	1.095	100	94.8	LOS F	17.5	124.2	500	–	0.0	0.0
Lane 2	0	0	24	24	0.0	129	0.188	100	33.2	LOS D	0.5	3.8	15	Turn Bay	0.0	0.0
Approach	285	0	24	309	1.2		1.095		90.0	LOS F	17.5	124.2				
West: Curtis Street																
Lane 1	204	575	0	779	0.0	1925	0.405	100	5.3	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	204	575	0	779	0.0		0.405		5.3	NA	0.0	0.0				
Intersection				1619	1.1		1.095		22.8	NA	17.5	124.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	1077	0	1077	2.2	1922	0.560	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	158	158	0.7	991	0.159	100	9.3	LOS A	0.7	4.8	35	Turn Bay	0.0	0.0
Approach	0	1077	158	1235	2.0		0.560		1.2	NA	0.7	4.8				
East: Curtis																
Lane 1	242	0	29	272	1.2	251	1.084	100	102.5	LOS F	17.7	125.3	500	–	0.0	0.0
Approach	242	0	29	272	1.2		1.084		102.5	LOS F	17.7	125.3				
North: Chaytor (North)																
Lane 1	50	517	0	567	4.2	1890	0.300	100	0.6	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	50	517	0	567	4.2		0.300		0.6	NA	0.0	0.0				
Intersection				2074	2.5		1.084		14.3	NA	17.7	125.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: Chaytor / Curtis - Bulk Retail

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	775	0	775	0.9	1939	0.400	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	147	147	0.0	644	0.229	100	12.2	LOS B	0.9	6.5	35	Turn Bay	0.0	0.0
Approach	0	775	147	922	0.7		0.400		1.9	NA	0.9	6.5				
East: Curtis																
Lane 1	259	0	33	293	0.6	185	1.579	100	305.9	LOS F	41.0	288.1	500	–	0.0	0.0
Approach	259	0	33	293	0.6		1.579		305.9	LOS F	41.0	288.1				
North: Chaytor (North)																
Lane 1	65	782	0	847	1.1	1929	0.439	100	0.5	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	65	782	0	847	1.1		0.439		0.5	NA	0.0	0.0				
Intersection				2061	0.8		1.579		44.5	NA	41.0	288.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

LANE SUMMARY

Site: Chaytor / Curtis - Bulk Retail

Chaytor / Curtis
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor (South)																
Lane 1	0	775	0	775	0.9	1939	0.400	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	147	147	0.0	644	0.229	100	12.0	LOS B	0.9	6.5	35	Turn Bay	0.0	0.0
Approach	0	775	147	922	0.7		0.400		1.9	NA	0.9	6.5				
East: Curtis																
Lane 1	259	0	0	259	0.6	258	1.005	100	67.9	LOS F	11.9	83.5	500	–	0.0	0.0
Lane 2	0	0	33	33	0.0	58	0.575	100	92.2	LOS F	1.7	12.2	8	Turn Bay	0.0	19.3
Approach	259	0	33	293	0.6		1.005		70.7	LOS F	11.9	83.5				
North: Chaytor (North)																
Lane 1	65	782	0	847	1.1	1929	0.439	100	0.5	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	65	782	0	847	1.1		0.439		0.5	NA	0.0	0.0				
Intersection				2061	0.8		1.005		11.1	NA	11.9	83.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

Processed: Wednesday, 24 October 2012 1:26:20 p.m.
SIDRA INTERSECTION 5.1.12.2089

Project: G:\LocalAuthorities\Wellington City\Proj\5-C2305.00 Curtis Street Plan Change\700 Physical Works\7 Forecast Models\Saturday Models Testing.sip
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LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Bulk Retail

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Chaytor Street																
Lane 1	1070	0	0	1070	2.2	1249	0.857	100	12.5	LOS B	26.0	185.7	500	–	0.0	0.0
Lane 2	0	0	9	9	0.0	58 [1]	0.149	100	68.2	LOS E	0.5	3.6	15	Turn Bay	0.0	0.0
Approach	1070	0	9	1079	2.2		0.857		12.9	LOS B	26.0	185.7				
East: Old Karori Road																
Lane 1	11	350	0	361	0.0	422	0.857	100	56.6	LOS E	22.5	157.8	500	–	0.0	0.0
Approach	11	350	0	361	0.0		0.857		56.6	LOS E	22.5	157.8				
West: Karori Road																
Lane 1	0	72	0	72	0.0	241 [1]	0.300	41 [5]	11.3	LOS B	1.8	12.5	28	Turn Bay	0.0	0.0
Lane 2	0	178 [0]	587	764	4.2	1052	0.727	100	12.2	LOS B	12.9	92.8	500	–	0.0	0.0
Approach	0	250	587	837	3.0		0.727		12.1	LOS B	12.9	92.8				
Intersection				2277	2.1		0.857		19.8	LOS B	26.0	185.7				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

LANE SUMMARY

Site: Karori / Chaytor / Old Karori - Bulk Retail

Karori / Chaytor / Old Karori
Signals - Fixed Time   Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L	Demand Flows T	Demand Flows R	Total	HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Lane Length	SL Type	Cap. Adj.	Prob. Block.
	veh/h	veh/h	veh/h	veh/h	%	veh/h	v/c	%	sec		veh	m	m		%	%
South: Chaytor Street																
Lane 1	867	0	0	867	1.3	1257	0.689	100	10.3	LOS B	11.9	84.5	500	–	0.0	0.0
Lane 2	0	0	14	14	8.3	54 [1]	0.254	100	69.2	LOS E	0.8	6.1	15	Turn Bay	0.0	0.0
Approach	867	0	14	880	1.4		0.689		11.2	LOS B	11.9	84.5				
East: Old Karori Road																
Lane 1	11	364	0	375	1.6	417	0.899	100	61.7	LOS E	24.7	175.1	500	–	0.0	0.0
Approach	11	364	0	375	1.6		0.899		61.7	LOS E	24.7	175.1				
West: Karori Road																
Lane 1	0	72	0	72	1.3	239 [1]	0.300	32 [5]	11.3	LOS B	1.8	12.5	28	Turn Bay	0.0	0.0
Lane 2	0	181 [0]	816	996	1.2	1074	0.927	100	19.8	LOS B	34.6	244.5	500	–	0.0	0.0
Approach	0	252	816	1068	1.2		0.927		19.2	LOS B	34.6	244.5				
Intersection				2323	1.4		0.927		23.3	LOS C	34.6	244.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program

LANE SUMMARY

Site: Curtis / WhiteHead - Bulk Retail

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows				HV	Cap.	Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Length	SL Type	Cap. Adj.	Prob. Block.
	L	T	R	Total							Vehicles	Distance				
	veh/h	veh/h	veh/h	veh/h	%	veh/h	v/c	%	sec		veh	m	m		%	%
East: Curtis Street																
Lane 1	0	172	0	172	1.5	1931	0.089	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	351	351	0.0	785[1]	0.448	100	9.5	LOS A	2.0	13.8	14	Turn Bay	0.0	5.6
Approach	0	172	351	524	0.5		0.448		8.0	NA	2.0	13.8				
North: Whitehead Road																
Lane 1	206	0	23	228	0.0	655	0.348	100	10.2	LOS B	1.7	12.2	500	–	0.0	0.0
Approach	206	0	23	228	0.0		0.348		10.2	LOS B	1.7	12.2				
West: Curtis Street																
Lane 1	60	190	0	250	0.5	1921	0.130	100	5.3	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	60	190	0	250	0.5		0.130		5.3	NA	0.0	0.0				
Intersection				1002	0.4		0.448		7.8	NA	2.0	13.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

LANE SUMMARY

Site: Curtis / WhiteHead - Bulk Retail

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance																
	Demand Flows										95% Back of Queue					
	L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	225	0	225	2.9	1914	0.118	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	231	231	3.3	617 [1]	0.375	100	12.1	LOS B	1.6	11.4	14	Turn Bay	0.0	0.2
Approach	0	225	231	456	3.1		0.375		8.6	NA	1.6	11.4				
North: Whitehead Road																
Lane 1	285	0	14	299	1.3	442	0.676	100	20.3	LOS C	5.1	35.8	500	–	0.0	0.0
Approach	285	0	14	299	1.3		0.676		20.3	LOS C	5.1	35.8				
West: Curtis Street																
Lane 1	114	411	0	525	0.0	1929	0.272	100	5.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	114	411	0	525	0.0		0.272		5.2	NA	0.0	0.0				
Intersection				1280	1.4		0.676		9.9	NA	5.1	35.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Friday, 19 October 2012 1:45:52 p.m.
SIDRA INTERSECTION 5.1.12.2089

Project: G:\LocalAuthorities\Wellington City\Proj\5-C2305.00 Curtis Street Plan Change\700 Physical Works\7 Forecast Models\Saturday Models.sip
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LANE SUMMARY

Site: Curtis / WhiteHead - Bulk Retail

Curtis / Whitehead Intersection
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	Demand Flows T veh/h	Demand Flows R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
East: Curtis Street																
Lane 1	0	225	0	225	2.9	1914	0.118	100	4.9	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	231	231	3.3	617 [1]	0.375	100	11.9	LOS B	1.6	11.4	14	Turn Bay	0.0	0.2
Approach	0	225	231	456	3.1		0.375		8.5	NA	1.6	11.4				
North: Whitehead Road																
Lane 1	285	0	0	285	1.3	462	0.616	100	18.2	LOS C	4.3	30.2	500	–	0.0	0.0
Lane 2	0	0	14	14	0.0	231	0.061	100	19.3	LOS C	0.2	1.3	15	Turn Bay	0.0	0.0
Approach	285	0	14	299	1.3		0.616		18.2	LOS C	4.3	30.2				
West: Curtis Street																
Lane 1	114	411	0	525	0.0	1929	0.272	100	5.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	114	411	0	525	0.0		0.272		5.2	NA	0.0	0.0				
Intersection				1280	1.4		0.616		9.4	NA	4.3	30.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 24 October 2012 1:26:19 p.m.
SIDRA INTERSECTION 5.1.12.2089

Project: G:\LocalAuthorities\Wellington City\Proj\5-C2305.00 Curtis Street Plan Change\700 Physical Works\7 Forecast Models\Saturday Models Testing.sip
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