CHRISTCHURCH
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RETAILING EFFECTS ON TRANSPORT

Variation 86 - Retail Distribution

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Executive Summary

This report relates to the philosophy of a centres based or dispersed based approach to retailing and the affect this philosophy will most likely have on transportation.

A centres based approach to retailing groups retailers together similar to a high street, a mall or district centre. A dispersed based approach is akin to a laissez faire approach, where retailing is almost unrestricted throughout the fabric of a city.

The Christchurch City Council is the local authority for Christchurch, New Zealand. Christchurch has a population of about 350,000 people and the city is planned and managed using the Christchurch City Plan. The City Plan is a planning document containing the objectives, policies and rules for the city and describes why the city plans to grow in a certain manner and how it will achieve that growth.

During the development of the City Plan, the Christchurch City Council adopted a less restrictive approach to retailing in a number of the industrial land use zones in the city. The result was an expansion of large format (often referred to as big box or bulk retail) retailing in those areas and a creep of retailers away from the central city. To limit the negative effects of this dispersed based retailing the Christchurch City Council developed a variation to the City Plan titled Variation 86 – Retail Distribution. The variation intended to return the city to a centres based approach, restrict retailing in the industrial zones and create a new zone titled Business Retail Park to provide for large format stores.

As part of the process to make the variation operative, the Christchurch City Council requested Abley Transportation Engineers to test the variation and its effects on transportation. This report describes that assessment and the subsequent discussion and conclusions.

Overall it is the opinion of Abley Transportation Engineers that the variation is more aligned with current transportation policies and the effects of introducing the variation are overall positive from a transportation perspective.

The results provide other cites in New Zealand with conclusive evidence that the control of retailing is very prudent. The analysis also provides cities abroad with a real world example of implemented policy and the effects that unrestricted retailing can present.

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Tables and Figures

1 INTRODUCTION

1.1 Abley Transportation Engineers Limited (ATEL – previously Steve Abley Transportation Engineering) was asked by the Christchurch City Council ("the Council"), New Zealand, to examine and present an analysis regarding the Christchurch City Plan Variation 86 – Retail Distribution ("the Variation"). The Variation is based around the concept of a 'centres' rather than a dispersed approach to retailing. The analysis tested the effects the Variation would create for transport.

1.2 The information contained in this report was presented at a Council Hearing in support of the Variation in April 2006 and because of a number of appeals, presented to the Environment Court in November 2007. The court has made a judgement that the Variation supports the objectives and policies of the Christchurch City Council City Plan and hence the Variation was upheld.

1.3 This report is structured as follows:

- Background information
  - a brief history related to the transport aspects of retailing in Christchurch Business 3 (B3), Business 3B (B3B) and Business 4 (B4) zones;
- Policy:
  - a discussion on New Zealand, Canterbury and Christchurch's integrated transport and land use planning strategy, objectives and policies, including;
- Analysis
  - a study of the effects of introducing the Variation
- Discussion
  - an overview of the transport effects of implementing (Scenario 1) or not implementing (Scenario 2) Variation 86
- Conclusion

1.4 This report includes various tables and figures that further explain or describe some of the issues regarding the Variation. A number of technical appendices are also attached to this report. This report is highly technical and is considered the first of its kind where the concept of centres based retailing has been tested explicitly for transportation affects.

1.5 A number of quotations are taken from other references. Typically these are noted in the text and all quotations are *"italicised"*. Important or especially relevant sections of quotations are **bold**.

2 BACKGROUND

2.1 The Christchurch road network has been planned over the past 30 to 40 years in conjunction with other land use planning. This is to attempt to take into account their impacts upon each other.

2.2 The retailing and associated service industries have historically been encouraged to locate either in the central city area or at major nodes on the transport network. This provides for some efficiency in transport by concentrating land use to minimise trips. These areas are now the Business 1 (B1), Business 2 (B2) and Central City zones in the Christchurch City Plan (City Plan) and total about 317 hectares of land.

2.3 Within the City Plan, as notified, there was a 'centres-based approach' which restricted retailing in the industrial zones. The City Plan did this by limiting retailing to 20% of the available floor space of the activity, and provided for a list of retailing activities in the B3, B3B and B4 zones that were listed in the Proposed City Plan, Volume 3, Part 3 Business Zones, Appendix 2. The activities in Appendix 2 included 31 retail activities that range from 'Aluminium products' to activities such as 'Swimming pool, spa pool and sauna sales'. The B3B and B4 zones total 614 hectares of land and B3, 220 hectares of land.

2.4 In the notified plan the anticipated results for the B3B and B4 zones and any subsequent application of these zones, were based on the effects of 'light industrial' land uses. The permitted retail activities allowed in Appendix 2 were considered to be acceptable for a number of reasons including traffic generation. Other retail activities were not permitted as of right within these zones and would require resource consent with appropriate levels of assessment, consideration and possible mitigation.

2.5 After hearing the various submissions, Council adopted a less restrictive approach to retailing in the B3B and B4 zones of the City. The amended provisions allowed relatively unrestricted retailing in the B3B and B4 zones. The limited list of retailing activities remained applied to the B3 zone. Very simplistically the area available for retailing within Christchurch could have tripled.

2.6 The effect of removing the original restrictions has raised a number of concerns regarding the potential impacts on the transport system that may not have been fully realised during the deliberations and decision-making of the City Plan hearing process. This is because retail is one of the highest traffic generating activities of any land use, both in terms of the number of trips that can be associated with retail activity and the intensity of traffic it can generate. Consequently the decision to relax constraints and controls on retail activity in the B3B and B4 zones is of particular relevance to the transportation system.

2.7 **The Variation promotes a return to the earlier 'centres-based approach'** and includes a slightly modified list of retail activities and services appropriate to the B3 zone and imposes a number of rules to control retail activity in the B3B and B4 zones. **It also creates a new land use zone titled Business Retail Park (BRP) that provides, in a number of cases, for the larger format retailing that had started to locate to the B3 and B4 zones.**

3 TRANSPORT AND LAND USE PLANNING POLICY

Introduction

3.1 A city's transport system should be designed around short and long term land use needs and also take into account the changing structure and growth options for a city. The transport system should provide for the different requirements of all modes of transport, including the particular needs of goods vehicles, private motor vehicles, walking, cycling and public transport.

3.2 The fundamental basis of the transport objectives and policies in the City Plan, as well as the New Zealand Transport Strategy (NZTS) 2002, Canterbury Regional Policy Statement (RPS) 1998, Canterbury Regional Policy Statement Chapter 12A (RPS12A)(Plan Change 1) 2007 and Canterbury Regional Land Transport Strategy (RLTS) 2005 is that, **whilst travel is necessary for a successful society and provides many benefits, it can also create a number of adverse effects** e.g. noise, emissions and crashes. Therefore the objectives and policies in the City Plan seek to *"retain a high level of accessibility for people and goods to all parts of the City to allow the City to function and develop without unnecessary restraints being imposed, while not compromising the safety of the transport network."*[1].

3.3 These statutory plans provide policies that seek to achieve these objectives through a number of different approaches. Two key thrusts are:

- to promote travel by more environmentally friendly modes such as walking and cycling, and
- to reduce trip lengths and trip times through integrated land use planning and network efficiency, including public transport.

3.4 It is also acknowledged within the City Plan that *"it is unavoidable in striving to achieve the basic concepts of this objective that conflicts will occur. These may necessitate trade-offs between each part of the objective to achieve an acceptable balance"*[2]. This is a common theme. The NZTS states *"Achieving environmental sustainability will require reorientation of transport policy and individual and business transport decisions over time. While progress has been made, more is required"*[3].

3.5 Consequently, **the City Plan provides for the continued movement of people and goods while seeking to not compromise the concept of sustainability and accessibility**. The Variation is an example of integrating the City Plan's transport objectives and policies with the land use policies and other sections of the City Plan. The Variation attempts to reconcile the potential impacts of retail activity both as a high traffic generator on the transport system and with the broader policies on business centres throughout the City.

3.6 A summary of the NZTS, RLTS, RPS, RPS12A and City Plan objectives and policies that have particular relevance to the matters considered in the Variation are included in **Appendix A**.

Policy Related to the Promotion of Sustainable Transport Modes

3.7 The NZTS, RLTS, RPS and RPS12A all contain objectives and policies of a very similar nature and all promote sustainable travel. The City Plan also contains a number of objectives and policies promoting sustainable modes of travel and

[1] Christchurch City Plan, Principal Transport Objective, Vol. 2 Section 7

[2] Christchurch City Plan Explanation of Principal Transport Objective, Vol. 2 Section 7

[3] NZTS Objective: Ensuring Environmental Sustainability – Introduction, Para 4, Page 43

specifically supports walking and cycling. This is because sustainable forms of transport have the potential, if well utilised, to ease congestion, reduce crashes and also reduce pollution and energy use.

3.8 Walking and cycling also provides travel opportunities for those in the community without access to or who choose not to use a motor car. **The distribution and design of land use activities, including retail activities, can provide significant support for walking and cycling, and assist towards achieving the various objectives and policies regarding sustainability.**

3.9 A brief list of the key objectives and policies in the City Plan regarding sustainable transport is included in **Table 3.1**. A brief list of key objectives and policies in the RLTS regarding sustainable transport is included in **Table 3.2**. These tables give a flavour of the direction adopted by Canterbury and Christchurch regarding sustainable transport.

Table 3.1 City Plan Objectives and Policy Related to Sustainable Transport Modes

Objective or Policy	Notation
Objective 2.3	*"Improvement of the standards of air quality over the City, influenced by the location and nature of land use activities."*
Policy 2.3.1	*"To promote reduced air emissions from transport through a strategy of consolidating the urban form, which also provides for the ability to retain a viable public transport system and promotes lessening dependence on motor vehicle use."*
Objective 3.1	*"Energy Conservation"*
Policy 3.1.4	*"To encourage energy efficiency in transportation"*
Objective 6.1	*"To accommodate urban growth with a primary emphasis on consolidation."*
Objective 6.2	*"Patterns of land use that promote and reinforce a close proximity and good accessibility between living, business and other employment areas."*
Policy 7.1.5	*"To encourage change in the transport system towards sustainability"*
Policy 7.2.7	*"To provide a high standard of access for people to, from and within the central city."*
Objective 7.3	*"Recognition of the public transport needs of people throughout the City and provision for meeting those needs."*
Policy 7.3.3	*"To plan and develop an efficient pattern of public transport routes and associated terminus facilities which best serve the public's needs."*
Objective	*"Provision for the safe movement of cyclists and actively*

Objective or Policy	Notation
7.4	*encouraging cycling as a means of transport"*
Policy 7.4.5	*"To continue to develop a clearly identified cycle network throughout the City by:* *a) providing safe, convenient cycle routes for school children;* *b) using the secondary road network and using and creating vehicle free routes where possible;* *c) making special provision for cycle commuters on some arterial roads to allow direct access to the central city; and* *d) selecting cycle routes and enhancing additional routes to increase the safety and pleasantness of the network"*
Objective 7.5	*"The safe movement of pedestrians in a pleasant environment."*
Policy 7.5.1	*"To improve and develop pedestrian facilities throughout the City."*
Policy 7.5.4	*"To reduce the conflict between vehicles and pedestrians throughout the City by providing pedestrian facilities."*
Policy 10.4.1	*"To integrate new roading resulting from subdivision and/or development with the existing roading network in an efficient manner which reflects expected levels of traffic generation, and safe, efficient and convenient management of vehicles, including public transport, pedestrians and cyclists."*

Table 3.2: RLTS Policy Related to Sustainable Transport Modes

Objective or Policy	Notation
Policy 1.1	*"Support greater use of walking, ensuring the guiding principles for walking are applied."*
Policy 1.2	*"Support greater use of cycling, ensuring the guiding principles for cycling are applied."*
Policy 1.3	*"Support greater use of public passenger transport"*
Policy 3.1	*"Undertake travel behaviour change programmes, and education and promotion measures to reduce the use of private motor vehicles, especially in areas of traffic congestion."*
Policy 4.1	*"Promote the location of housing, jobs, shopping, leisure, education and community facilities and services to support sustainable transport choices and reduce the need to travel, especially by private motor vehicle."*
Policy 4.2	*"Design and programme developments and related infrastructure to support sustainable transport choices, improve interchange between modes and to reduce the need to travel, especially by private motor vehicle."*

3.10 There are many contributing factors to achieve these objectives and policies. These include providing appropriate infrastructure, networks, promotions, safety, co-operation between providers and of course, integrated land use planning. For example, walking relies significantly on shorter journey distances, so pedestrians need their origins and destinations to be close together with a safe and pleasant route between them. To achieve this on a city wide basis means seeking higher densities of these origins and destinations in closer proximity, often expressed through higher density living zones focussed around suburban nodes with various community facilities and services, including retail outlets.

3.11 With regard to cycling, safety is a key issue and the provision of a safer cycling environment is a significant mechanism to support increased cycling. A safer environment includes minimising the potential conflicts that cyclists may have with motor vehicles, particularly larger vehicles including goods vehicles. This leads to a desire to minimise the need for cyclists to cycle in areas with large vehicles or fast moving traffic, or where a desire to cycle in such areas is acknowledged, ensuring that the road environment for cyclists is as safe as possible.

3.12 Public passenger transport operates most efficiently by being able to move comparatively large numbers of people between relatively few points. It is a very effective and efficient means of travel when operating well. As the origins and destinations become increasingly dispersed, the size of the vehicle required to efficiently service the demand becomes smaller, until taxis are the most effective form of public transport, although there is also the consequent loss of efficiencies of larger size vehicles. Given that residential properties, which are well dispersed across the city, are usually at one end or the other of a bus journey, the bus system needs the other end of the journey to be relatively close to a bus route or terminus. A highly dispersed set of trip origins and/or destinations compromises the effectiveness of public transport systems.

Policy Related To Reducing Trip Length and/or Trip Times

3.13 The NZTS, RLTS, RPS and RPS12A all contain objectives and **policies of a very similar nature which are directed at minimising or reducing trip lengths and/or trip times**. These policies cover issues related to urban expansion, distribution of activities within the urban area, supporting the central city and suburban nodes, minimising conflicts between, and integrating, land use and the transport system, and management and development of the road network based on the fundamental concept of a road hierarchy. The concept and basis of a road hierarchy will be discussed in detail later in this report.

3.14 A brief list of key objectives and policies in the City Plan regarding reduced trip lengths and trip times is included in **Table 3.3**. A brief list of key objectives and policies in the RLTS regarding reduced trip lengths and trip times is included in **Table 3.4**. These tables give a flavour of the direction adopted by Canterbury and Christchurch regarding reduced trip lengths and trip times.

Table 3.3 City Plan Objectives and Policy Related to Reduced Trip Lengths or Times

Objective or Policy	Notation
Principal Transport Objective	*"…The pattern and density of urban development can have an influence on transport demands. A compact city with increased densities around focal points can reduce the need for and length of trips by private motor vehicles. …"*
Policy 6.1	*"To accommodate urban growth with a primary emphasis on consolidation", with the comment in the explanation that "Urban consolidation will assist in achieving a reduction in private car-borne trips. Trip lengths can be shortened by locating housing close to employment, schools and business areas."*
Policy 6.2	*"Patterns of land use that promote and reinforce a close proximity and good accessibility between living, business and other employment areas." with the comment in the explanation that … This reasoning does not just apply to home based trips, because by maintaining a reasonably compact city, trip generation from other origins can also be influenced towards achieving a more sustainable form of personal mobility in the long term."*
Policy 6.2.2	*"To encourage a continuing distribution of compact suburban centres that provide for the needs of the City and its communities in a manner that minimises adverse effects on the transport network and the amenities of living environments. with the comment in the explanation that This policy seeks to encourage a reduction in travel demand by private vehicles through encouraging a distribution of shopping centres that are conveniently located throughout the city."*
Policy 7.2.1	*"To continue to plan, build, maintain, and manage the operation of the roads in Christchurch as a hierarchical network comprised of roads of different classifications, and to recognise the different functions and roles of roads and their environmental impacts within those classifications."*
Policy 7.2.2	*"To protect the function of the road network and the environment of adjacent land uses from the adverse effects of high traffic generators." with the comment in the explanation that …Important in this respect is protection from queuing and manoeuvring vehicles through the control of access to and from high traffic generating activities."*
Policy 7.2.5	*"To control the establishment of land use activities to achieve compatibility with the roads they front by avoiding, remedying or mitigating the effects which each has on the other. with the comment in the explanation that … Safety, efficiency and accessibility are paramount when planning transport in the City. The siting of appropriate land uses alongside the appropriate elements of the network will result in benefits of less accidents and greater efficiency. …"*

Table 3.4 RLTS Policy Related to Reduced Trip Lengths or Trip Times

Objective or Policy	Notation
Policy 4.1	*"Promote the location of housing, jobs, shopping, leisure, education and community facilities and services to support sustainable transport choices and reduce the need to travel, especially by private motor vehicle." Preamble states that "The location of different land uses affects both how often we travel and our means of travel. Appropriate location of employment, shops, housing, leisure and services can reduce the need to travel, support greater use if sustainable modes, provide improved access and other economic, social and environmental benefits. …"*

Other Policies and Measures

3.15 There are no quick fixes or silver bullets for addressing the growing adverse effects of traffic in Christchurch. Achieving the desired results for the transport system requires an integrated package of measures. Some of these measures are identified in a variety of Regional Council and City transport strategy documents, both statutory such as the RPS and the City Council Annual Plan, and non-statutory documents such as the:

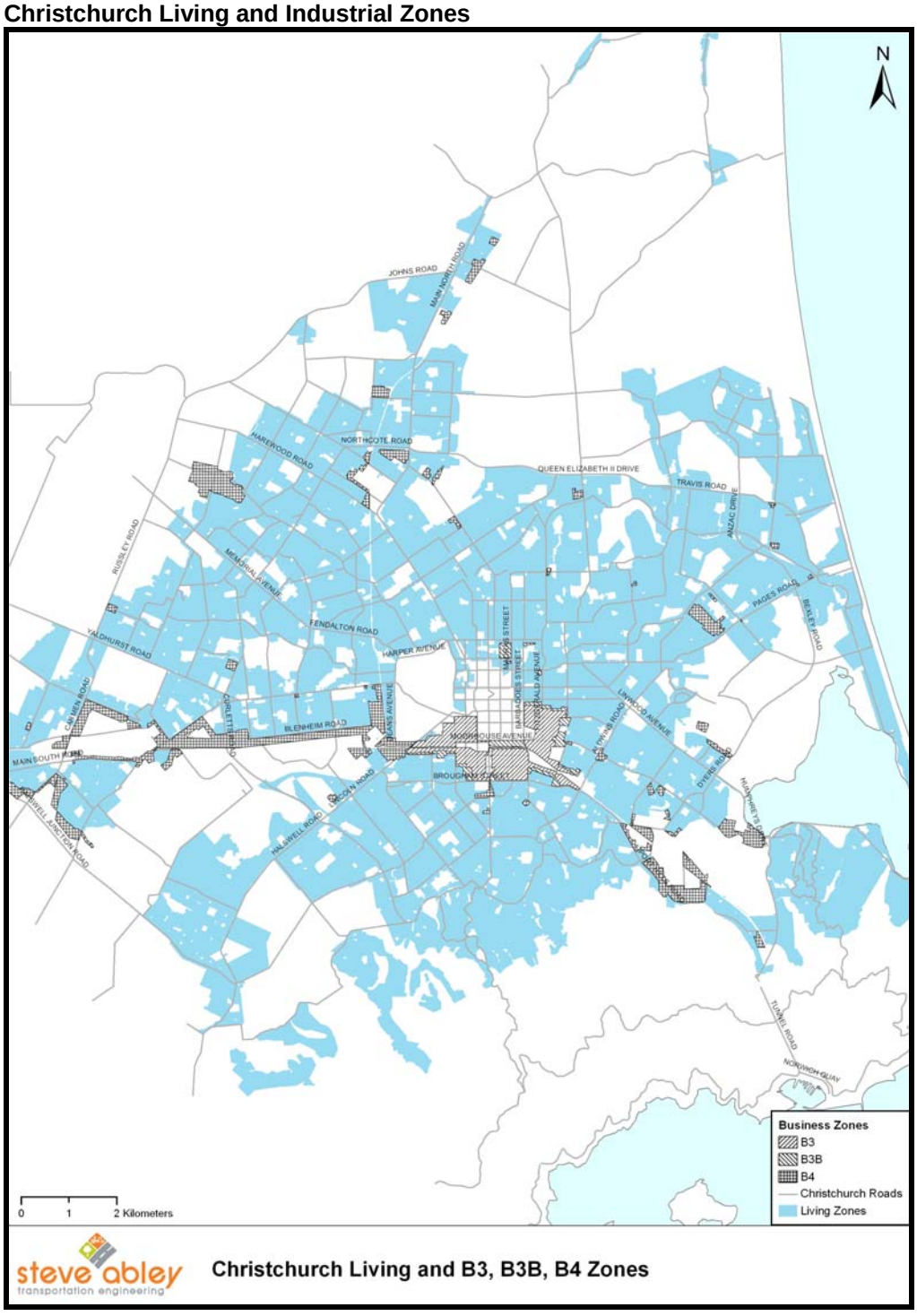
- Metropolitan Christchurch Transport Statement – Dec 2003
- Christchurch Road Safety Strategy – August 2004
- Parking Strategy for the Garden City – 2003
- Joint Christchurch City Council and ECan Public Passenger Transport Strategy - 2003
- Regional Passenger Transport Plan – 2006
- Christchurch Cycling Strategy – July 2004
- Pedestrian Strategy for Christchurch City – Feb 2001

3.16 These documents also seek to achieve the desired underlying direction of development of the city's transport system, which is reflected in the City Plan objectives and policies. These are not currently fully addressed by the rules in the City Plan, such as on street car park hierarchy, but include policies and initiatives related to education and promotion, travel demand management and travel pricing.

Retailing and Transport Policy

3.17 A review of B3, B3B and B4 locations where retailing could occur is shown in **Figure 3.1**. This suggests that these retailing locations i.e. B3B and B4 are not likely to be as close as possible to the homes of most customers. In fact, on average for the whole of Christchurch a residential lot is only 550m from the nearest B1 or B2 zoned land, compared to 1,150m to the nearest B3, B3B or B4 land or 1,158m to the nearest B3B or B4 land.

Figure 3.1 Christchurch Living and Industrial Zones



3.18 If a retail shop in these areas is a greater distance from the home and/or office of its customer, then it is likely to be even more car dependent than other key retail centres that are located, for example, at a suburban node or in the central city. Even if they are closer, if these locations are not supportive of alternative travel choices e.g. walking, cycling or public transport, then the only viable access is by motor vehicle. This potential increasing reliance upon car based travel to meet the retail needs of the community is at odds with the objectives and policies in the City Plan.

3.19 There are clear benefits to the transport system of locating high demand visitor attracting activities, such as retailing, carefully throughout the fabric of the city's urban area. These activities should be placed in such a manner as to minimise as

far as possible the mobility reliance upon car based travel, and to facilitate as best as possible accessibility to these activities by more sustainable modes. This means locating retailing principally where it can be accessed by walking or cycling, and secondly where it can be well serviced by public transport. Whilst some retailing in business-industrial areas can usefully service the local employment base, it is not likely to be as convenient for non-car based access for other potential customers which these activities would wish to attract.

3.20 Two alternative views might be:

- that dispersed retail activity takes advantage of car-based travel that would occur anyway. That is, it spreads the localised adverse effects more thinly across a wider network and may reduce or mitigate the impact of the concentrated retail activity at nodes that would otherwise occur, or
- that it is a given that shopping undertaken at larger stores, such as supermarkets and variety stores, requires the use of a private car, as large quantities of goods are typically purchased and these are difficult to carry when walking or cycling.

3.21 In both cases this overlooks the benefits of shorter trips and increasing the proportion of walking and cycling trips when provision is made for these other non car based modes. One only has to reflect on the increasing number and sophistication of express lanes at supermarkets for small quantity purchases, and the number of passengers on "The Shuttle" in the central city taking bags of groceries from the south city supermarkets to north city accommodation. Additionally at some larger stores the retailer arranges delivery of the goods or the customer may collect the goods at a central distribution centre.

3.22 It also ignores that where car-based travel is undertaken to a 'centres based' retail activity it tends to result in one vehicle trip to a shopping centre and then multiple walking trips within the shopping centre to other retail activities. This is significantly different to a 'dispersed' retail activity where it tends to result in one vehicle trip to the retail activity and then another vehicle trip to another dispersed retail activity.

3.23 Additionally highly dispersed retail activity complicates the management of heavy vehicles, and potentially increases the number of heavy vehicles required to service these activities. Furthermore, the increase in vehicles on the network then hinders the promotion of more sustainable transport modes and results in increasing reliance on the private motor vehicle – a spiral of dependence then occurs that further limits the viability of more sustainable modes of transport. This point will be discussed further later in this report.

3.24 In the transport policy context, the rationalisation of retail activities locating in the former industrial zones is essential to achieving the City's transportation objectives. **When undertaking the management of the distribution and location of retailing, it is therefore appropriate to give careful consideration both to the effects <u>on</u> the transport network as well as the effects <u>of</u> the transport network.**

4 ANALYSIS

Trip Generation - Retail vs. Industrial Activity

4.1 Prior to the Variation there were a number of retail activities that might establish in the B3, B3B and B4 zones virtually as of right, and these would have had very different traffic generation characteristics than originally envisaged for these light industrial zones. It is therefore important to consider the different traffic generation characteristics of these activities.

4.2 It will be appreciated that for different retail land uses e.g. service stations, garden centres, dairies, hire depots etc there is a wide range of potential trip generation rates. This is because for a particular site the activity is dependent upon its location, the specific style of activity and the activity level at the specific establishment.

4.3 An analysis comparing the range of vehicle trip generation and parking demand rates for different activities for peak hours has been undertaken. The New Zealand Trips and Parking Database Bureau (NZTPDB) have been analysed. Database version June 2006 to July 2007, which includes 505 traffic surveys. For reference, the NZTPDB is the organisation that was gifted the intellectual property from research undertaken for Transfund (now Land Transport New Zealand) that resulted in Transfund Research Report Nos. 209 and 210 that were both published in 2001. Report 209 is the technical analysis and Report 210 includes New Zealand traffic surveys that are contained in an expanded NZTPDB Database. The vehicle trip generation peak hour rates for a range of activities, including retail and industrial activities is presented in **Figure 4.1** and the parking demand rates in **Figure 4.2**.

Figure 4.1 Vehicle Trip Generation

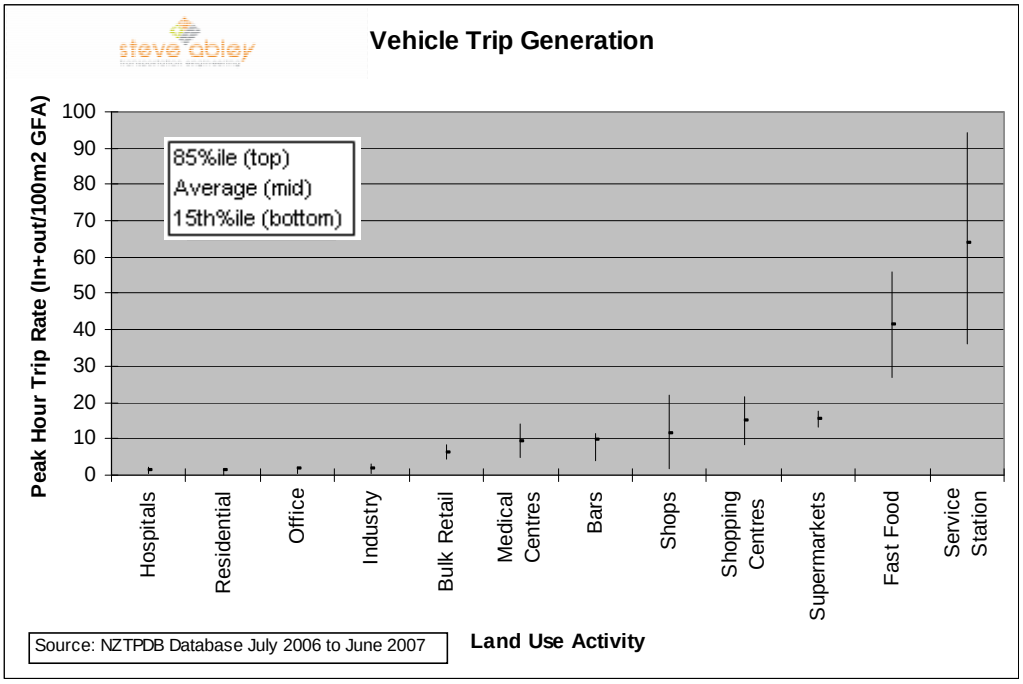
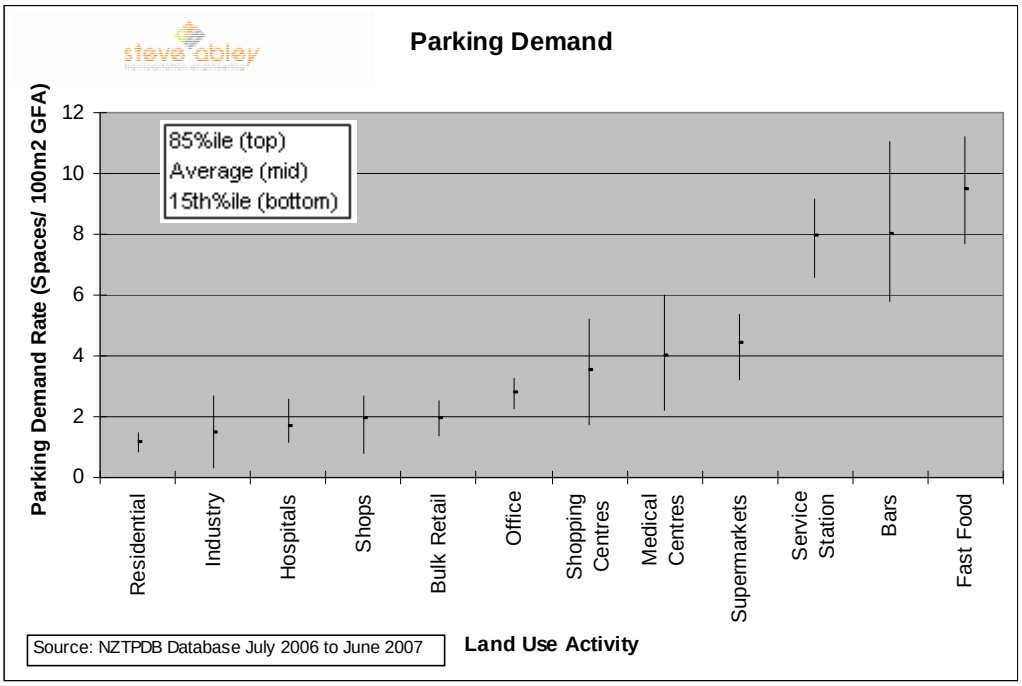


Figure 4.2 Parking Demand



4.4 In terms of vehicle trip generation per hour, there is significant variation in the vehicle trip generation characteristics of retail land uses. The most intensive retail activities in terms of trip generation tend to be service stations and fast food outlets. Service station vehicle trip generation varies greatly from about 38 to 95 vehicle trips per peak hour per 100m^2 gross floor area (GFA) and fast food outlets vehicle trip generation varies greatly from about 28 to 56 vehicle trips per peak hour per 100m^2 GFA. These particular activities tend to locate on major roads and consequently have higher activity levels in the peak traffic congestion hours. Nevertheless they tend to have limited impact beyond the site because they are less likely to attract 'primary' classified trips and rather attract 'by-pass' trips, where visiting the activity is not the motorist's sole purpose. Consequently access provisions and queuing is of most concern at these locations.

4.5 Other retail activities such as those included in the category 'stand alone shops' (shops) include premises such as bottle shops, stationers, diaries, haberdashery and furniture stores and vary from about 2 to 22 vehicle trips per hour per 100m^2 GFA. These are examples of retail activities that could have located as of right in the B3B and B4 zones prior to the Variation. These activities tend to attract more primary i.e. main trip purpose, and secondary i.e. diverted trips, and hence their effects on the wider network are likely to be greater than activities that principally attract 'by pass' trips.

4.6 The level of traffic generation for retail activities permitted pre-variation needs to be considered against the expected vehicle trip generation rates for now permitted activities i.e. retail vs. industrial activities as shown in Figure 2.1. It shows:

- industrial trip rates are significantly lower than retail activities at about 2 vehicle trips per hour,
- there is variability in industrial trip rates although these are significantly less volatile than retail trip rates,
- industrial car park demand, as like industrial trip rates, is significantly lower than retail activities.

4.7 Retailing activities represent not only high vehicle trip generating activities but also a great variety of trip generation rates. Even the lower generation rates noted for

retail are at the higher end of the generation rates of light industrial-business activities. The increase over and above normal light industrial activities for retail activities are in the order of 4 to 10 times the number of trips per day per site.

4.8 **The City Plan recognises the significant variability that can occur from a specific activity, through the parking threshold in a high traffic generator rule.** The high traffic generator rule included in the City Plan states that; if the activity *"…generates more than 250 vehicle trips per day and/or provides more than 25 parking spaces…"*[4], then the proposed activity becomes a 'restricted discretionary' activity. At this point, a specific assessment of the site's actual parking demand and effects is undertaken in more detail. As mentioned earlier, retailing affects not only access provisions but also has the potential to affect safety and capacity on the wider transport network e.g. at nearby traffic signals. **Before adoption of the Variation, discretion was limited to access only, and the impacts on the wider network were not able to be considered. The rule as been amended in the Variation to take into account wider impacts but only for B3B and B4 zones at this stage.**

4.9 Therefore, in providing for a more liberal approach of retailing in the Business zones the City Plan commissioners do not appear to have fully realised the potential impacts on the transport system.

Trip Efficiency - Large vs. Small Shopping Centres

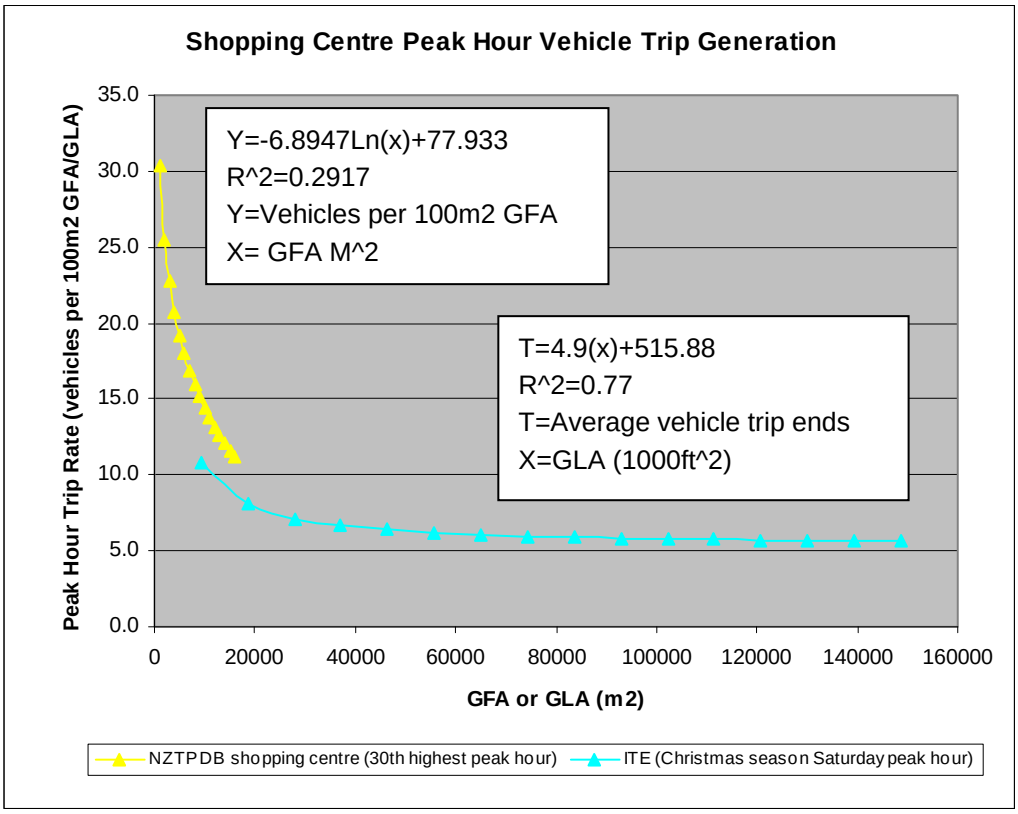
4.10 The current City Plan recognises that as the general size of retail activities and commercial service developments increase, so the parking requirement rates and trip generation rates reduce in relation to floor space. This is important because a wider distribution of 'smaller centres' is expected to generate greater land requirements for car parking and network effects than a smaller number of 'larger centres'.

4.11 Transfund Research Report 209 (Report 209)(NZ), Institution of Transportation Engineers Trip Generation Report 7th Edition (ITE)(USA), and the Trip Rate Information Computer System (TRICS)(UK) all show that a stand-alone retail store generates more activity than a similar store would generate as part of a larger store, retail park, district centre, mall or shopping centre. This is a common occurrence where there is a greater sharing of parking for multi shop visits and as discussed earlier, is principally due where a person shopping in a centre will visit more than one store from a single parking space. Larger stores generally also have lower activity levels per square metre of floor space than smaller stores, for example a small floor space dairy vs. a large floor space supermarket.

4.12 To quantify this trend, an analysis based on a best fit regression line similar to that shown in Report 209 Figure 4.1 has been undertaken. 27 New Zealand Shopping Centres were surveyed and this line shows that as the floor area of the Shopping Centre increased, the 30th highest peak hour trip generation rate per 100m^2 GFA decreased. This regression line has been combined with the regression equation in the ITE Trip Generation Shopping Centre land use for a Christmas Season Saturday peak hour trip generation rate per 100m^2 Gross Leasable Area (GLA) that included 10 Shopping Centre surveys. The results are shown in **Figure 4.3** and the shape and size of the respective curves are very similar. Given that the general size of Shopping Centres in the USA is larger than NZ and the difference between the rating measurements of GFA and GLA, the trip generation values are in fact remarkably similar.

[4] Christchurch City Plan, Volume 3, Part 13, Rule 13.2.3.8

Figure 4.3 Shopping Centre Trip Generation by Store Size



4.13 Extending this analysis and comparing the relative quantum of vehicle trips between shopping centre sizes, using the NZ regression equation it was calculated that:

- a small shopping centre of less than 4,000m^2 i.e. an average 2,000m^2 would generate about 511 trips in the peak hour,
- a medium shopping centre between 4,000m^2 and 10,000m^2 i.e. an average 7,000m^2 would generate about 1,182 trips in the peak hour,
- a large shopping centre greater than 10,000m^2 i.e. an average Christchurch District Centre of about 22,000m^2 would generate about 1,979 trips in the peak hour.

4.14 This further assumes that as the size of the shopping centre increases the trip rate reduces to a natural asymptote of about 5 peak hour vehicle trips per 100m^2 GFA. This indicates that small centres generate about 2.3 times the number of trips in the peak hour than a medium sized shopping centre and about 3.9 times the number of trips in the peak hour than a large sized shopping centre, for the same total floor area.

4.15 City Council staff have previously undertaken an analysis on the survey data contained within TRICS that indicated the ratio between trip generation rates for centres smaller than 10,000m^2 GFA vs. centres larger than 10,000m^2 GFA, is approximately 2.2. Using the same analysis technique but using the NZ regression equation for peak hour trip rates and a 5,000m^2 shopping centre vs. a 55,000m^2 shopping centre results in a ratio of 1.7.

4.16 Additionally, research undertaken by Traffic Design Group in Auckland presented at the earlier Hearing for a survey undertaken at the Westgate Shopping Centre that had a 28,000m^2 GLA, suggested that individual stand-alone retail stores have an efficiency ratio of between 1.4 and 2.2. This figure is in line with the analysis of 1.7 and also very similar to the figure used by the North Shore City Council

(NSCC) of 1.79 for retail stores greater than 10,000 m². This figure is included in the NSCC 'Development Contributions Policy' that was adopted by NSCC in December 2004.

4.17 To provide a local perspective, the Riccarton District Centre has approximately 70,000m^2 GFA retail. If this was split into its respective components, and assuming 70 small stores of 1,000m^2 GFA each, these could produce more than 10 times the number of vehicle trips that Riccarton District Centre currently produces. On a Christchurch scale, the median size of a district centre is about 6,300m^2 which is about the size of Woolston, Addington or Halswell District Centres; if all the district centres were separated into their respective small scale components then vehicle trips to retail activities over the whole of Christchurch could increase by about a factor of about 3.5.

Wider Road Vehicle Network – Scenario Testing

4.18 Given the potential increase in retail trips with the dispersed based approach, a strategic analysis has been conducted using the Christchurch Transport Study (CTS) Traffic Model. The CTS model covers the whole of Christchurch as well as significant outlying settlements. It plays a significant role in the identification of transport planning issues and has been a staple tool of the City's transport planning staff since 1995. A fuller description of how the model functions is included in Appendix B.

4.19 As previously indicated there are large variations between the traffic generating characteristics of alternative land uses. This variability poses problems in trying to present a simple, single answer in terms of modelling the potential traffic impact of alternative patterns of retail activity. However, in order to present an indication of the potential effects, the CTS traffic model to represent two alternative land-use development scenarios for the year 2026 has been used. The model year of 2026 was selected because there has been a significant amount of work undertaken to develop a 2026 land use scenario as part of the Urban Development Strategy (UDS). In terms of transport, master planning for changing land uses and activity some 20 or even 40 years hence is common, although it is acknowledged that as those forward projections extend, there is less confidence in their exact values other than trends and scale of relative effects.

4.20 The CTS model reflects global averages for the generation, distribution and assignment stages for an average weekday. Despite the necessity for aggregated assumptions within the CTS model it still provides macro and strategic guidance on some of the quantitative effects between implementing, and not implementing the Variation. The modelling was undertaken by an external consultant who was the CTS model custodian from 2000 to 2005 and who was responsible for the last major model update to 2001 census data when employed by the Council.

4.21 The two scenarios are based on the same level of economic activity represented within the CTS model as full time and part time retail jobs i.e. retail jobs between Scenario 1 and Scenario 2 are the same; it is simply their distribution that has changed. **Scenario 1 is based on the distribution of economic activity as per the UDS that includes the Variation; Scenario 2 is based on a redistribution of economic activity without the Variation**. In summary:

- Scenario 1 (S1) represents the anticipated scale and pattern of vehicular movement that would follow if development proceeded according to the UDS and with implementation of the Variation. In short, this relates to the 'centres-based approach'.

- Scenario 2 (S2) represents the anticipated scale and pattern of vehicular movement that would follow if development proceeded as per the UDS but

without implementation of the Variation. In short, this relates to a 'dispersed based approach' of retail activity to additional locations throughout the B3, B3B and B4 zones.

4.22 The development of a land use activity associated with Scenario 2 requires an understanding as to why developers choose certain sites for development, selection of sites that might convert to retail, and understanding how competitive the B3, B3B and B4 zones might be in attracting customers compared to existing retail areas. The distribution of vehicle trips is an integral component of the CTS model and Scenario 2 has an adjusted pattern of activity because of the changes of the location of full time and part time retail jobs that reflect what might happen if the Variation is not implemented. An explanation regarding the methodology for the development of Scenario 2 land use is included in **Appendix C**.

4.23 A number of figures that describe the scenarios have been prepared:

Figure 4.4 The likelihood of various B3, B3B and B4 sites converting to retail.

Figure 4.5 Scenario 1 and 2 – 2026 Part time retail jobs by CTS traffic zone

Figure 4.6 Scenario 1 and 2 – 2026 Full time retail jobs by CTS traffic zone

Figure 4.7 The change in distribution of total retail jobs between Scenario 1 and Scenario 2

Figure 4.7a Scenario 1 and 2 – The proportion of total retail jobs in each land use zone

Figure 4.4 Christchurch B3, B3B and B4 Likelihood of Retail

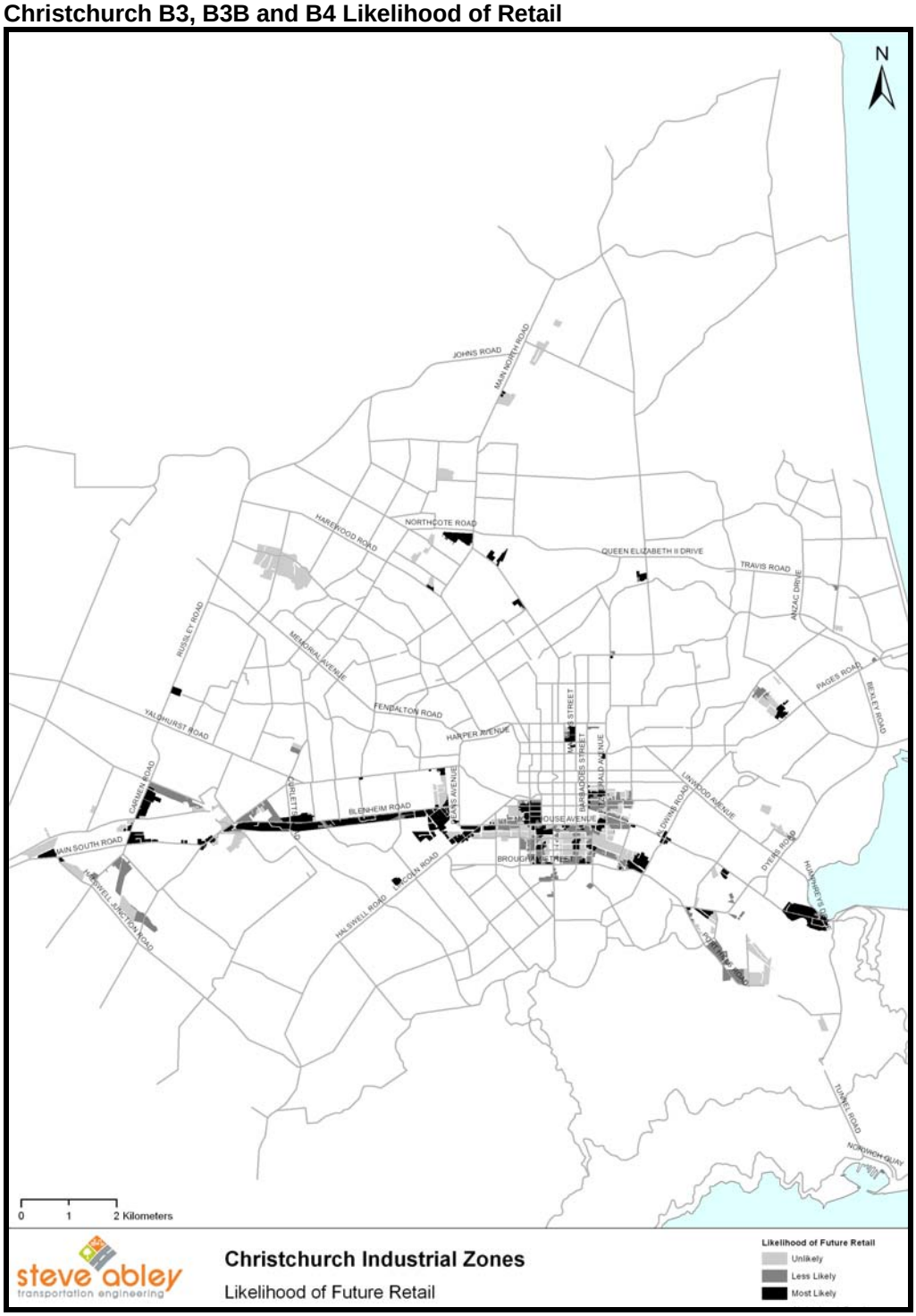


Figure 4.5 2026 Part Time Retail Jobs S1 and S2

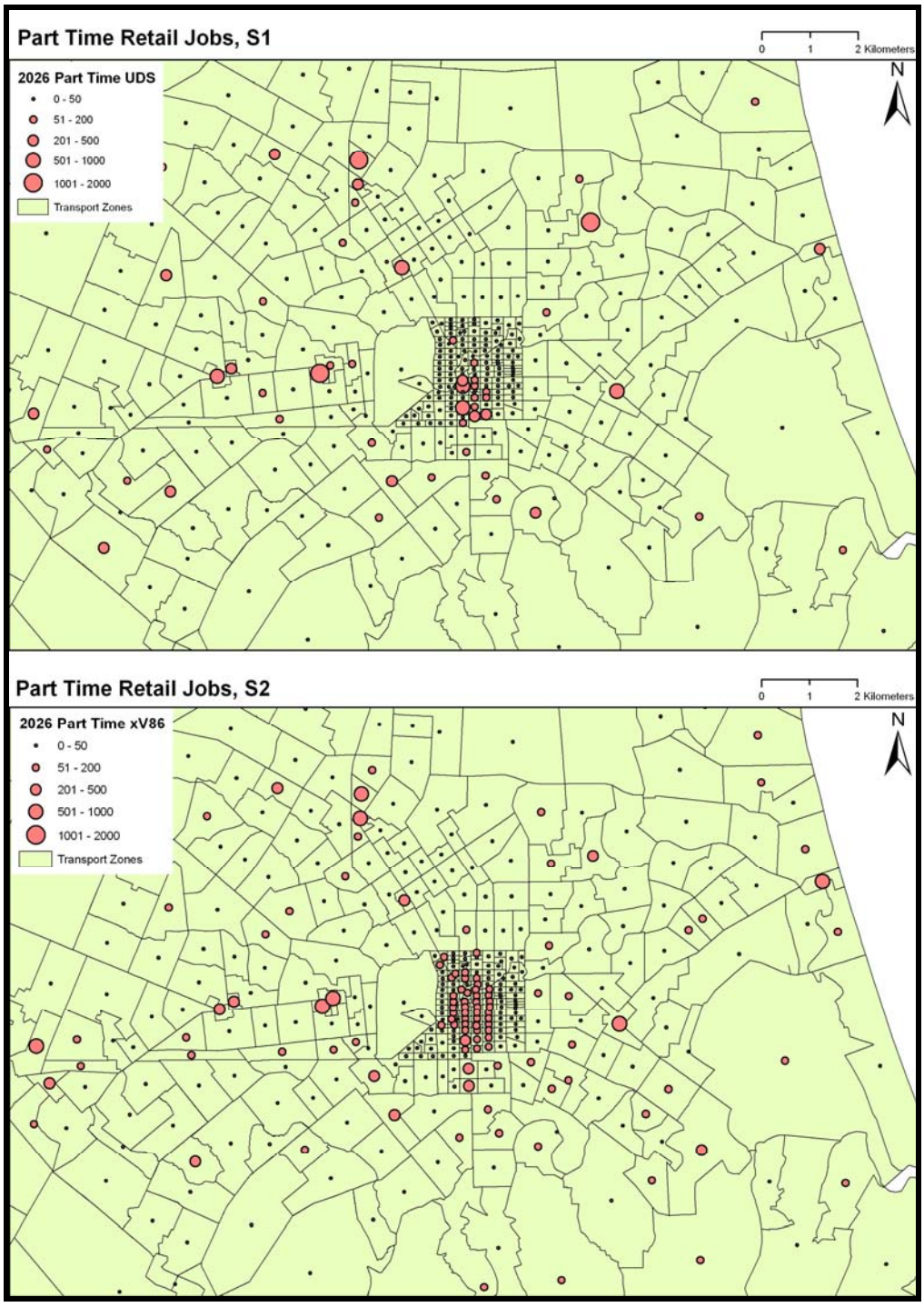
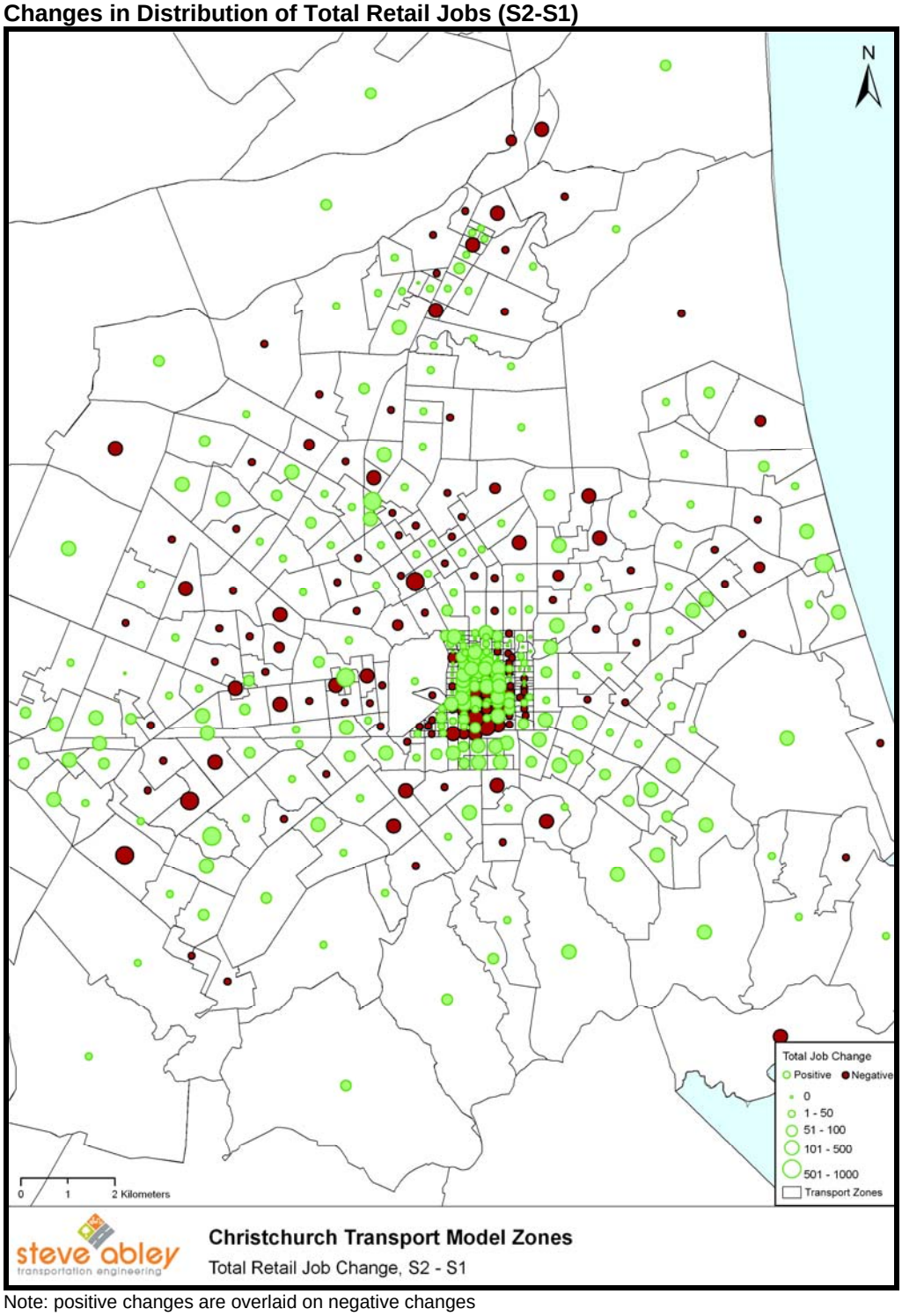


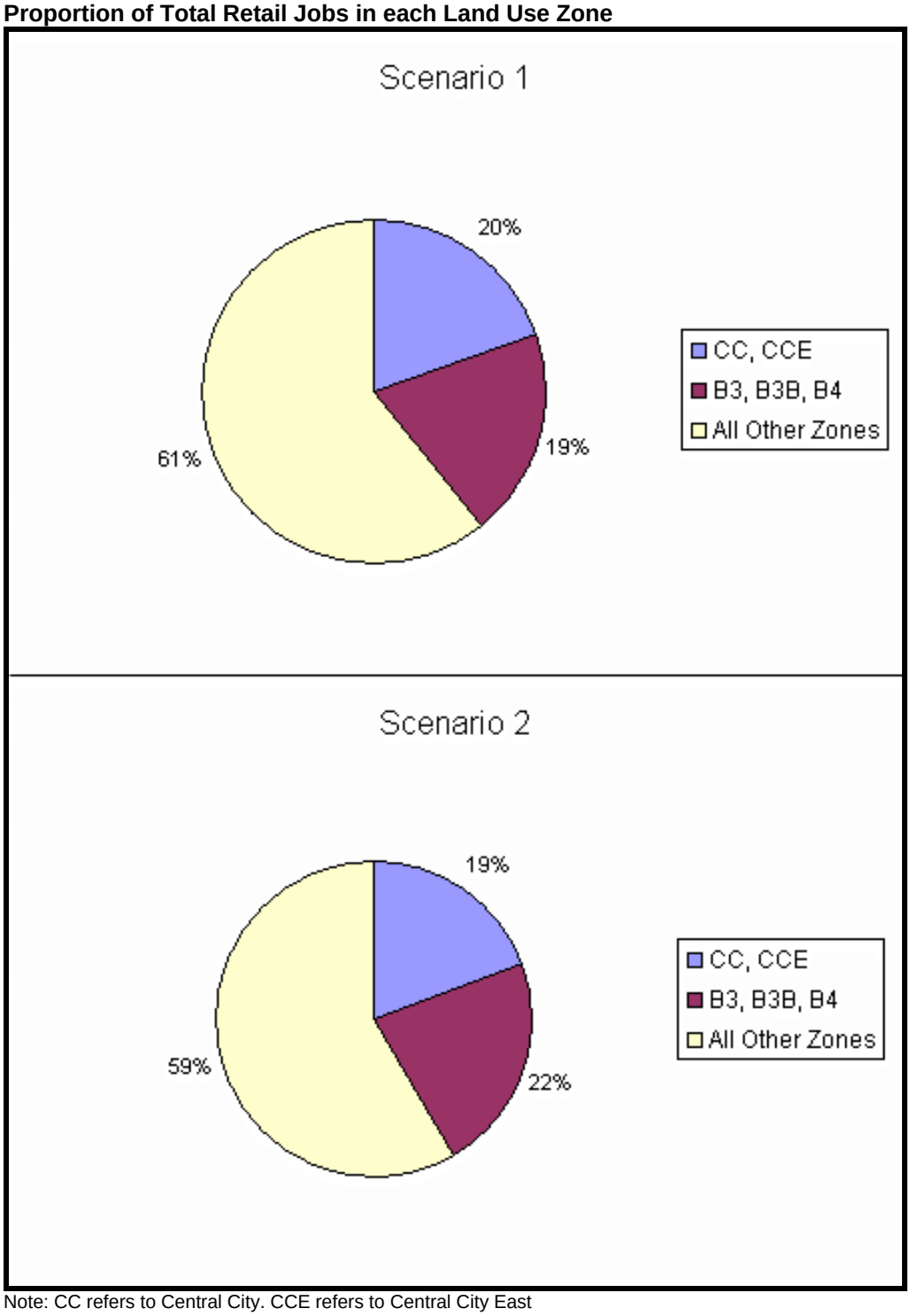
Figure 4.6 2026 Full Time Retail Jobs S1 and S2

Figure 4.7 Changes in Distribution of Total Retail Jobs (S2-S1)



Note: positive changes are overlaid on negative changes

Figure 4.7a Proportion of Total Retail Jobs in each Land Use Zone



Note: CC refers to Central City. CCE refers to Central City East

4.24 The vehicular shopping activity for Scenario 2 is the same as for Scenario 1. As explained earlier the research shows that dispersed shopping activities would lead to smaller-scale developments and hence more vehicle trips. The exact increase in retail trips between Scenario 2 and Scenario 1 is however difficult to quantify because the CTS model does not include specific trip rates at specific locations or the size of a specific development. **Therefore the number of vehicle trips has been kept the same between Scenario 1 and Scenario 2, this is a conservative approach.** The CTS model does not use trip rates based on a particular activity; rather it creates vehicle trips based on eight categories specific to a 'purpose'. These are listed in **Table 4.1**.

Table 4.1 CTS Trip Purposes

Trip Type	Example
Home-based Work trips(HBW)	home to work
Home-based Shopping trips (HBS)	home to dairy
Home-based Social/Recreational trips (HSR)	home to restaurant
Home-based Other trips (HBO)	home to refuse station
Non-home-based trips (NHB)	work to dairy
Light goods vehicle trips (LGV)	courier delivery
Heavy goods vehicle trips (HGV)	moving house trip
External trips (EXT)	visitor from Timaru

4.25 Retail shopping trips are included in two trip purposes, these include approximately one third of all of the 'home based shopping trips' (HBS) and two thirds of the 'non home based' trips (NHB). Not all of the 'home based shopping trips' or 'non home based' trips are retail shopping trips because a trip to a hairdresser, although being a shopping trip is not a retail trip that would be affected by the Variation. NHB trips are a particularly important component of the CTS model because they make up approximately 30% of all private vehicle trips.

4.26 The 2026 road network includes many planned and designated projects such as the Southern Arterial and Northern Arterial, the full list of network improvements included in the CTS model are included in **Appendix D**. The road network to which each of the scenarios is assigned is the same and is the base network developed to support Scenario 1. In practical terms it is likely that the road network for Scenario 2 would be slightly different to Scenario 1. This is because the pattern of activity under Scenario 2 would probably require different infrastructure measures to mitigate the different local changes in traffic flows, such as intersection or road capacity improvements.

4.27 However, it should be noted that this is a strategic modelling exercise, the purpose of which is to illustrate the potential difference between scenarios. Comparison is made easier by fixing at least one element i.e. the road network. Nevertheless Scenario 2 does include some mitigation such as automatically adjusted signal timings to suit the forecast changes in traffic flows.

4.28 A summary of key statistics from the traffic modelling analysis is presented in **Table 4.2**.

Table 4.2 Results of CTS Traffic Model All Day Traffic

Model Name		Base	S1	S2	Change	Percent	Effect
Model Year		2005	2026	2026	(S2)-(S1)	Change	
Whole Network							
Total Trips	(veh trips/day)	1,375,700	1,722,400	1,722,600	200	0.01%	
Total Vehicle Kilometers	(km/day)	9,360,000	12,550,000	12,830,000	280,000	2.2%	Negative
Total Vehicle Minutes	(min/day)	16,410,000	21,080,000	21,030,000	(50,000)	(0.2%)	Positive
Mean Network Speed	(km/hr)	34	36	37	1.0	2.8%	Positive
Mean Trip Length	(km)	6.8	7.3	7.4	0.1	1.4%	
Mean Trip Time	(mins)	11.9	12.2	12.2	- 0.0	(0.2%)	
Total Intersection Delay	(mins)	4,100,000	5,300,000	5,000,000	(300,000)	(5.7%)	Positive
Intersection Delay per Vehicle	(secs)	17	18	17	- 1	(5.6%)	
Cost on Links	($/day)	$1,700,000	$2,200,000	$2,300,000	$100,000	4.5%	Negative
Cost of Intersections	($/day)	$ 48,000	$ 62,000	$ 58,000	($4,000)	(6.5%)	Positive
Cost of Speed Changes	($/day)	$ 133,000	$ 158,000	$ 159,000	$1,000	0.6%	
Total Vehicle Operating Cost	($/day)	$1,850,000	$2,460,000	$2,510,000	$50,000	2.0%	Negative
Total Occupant Time Cost	($/day)	$4,450,000	$5,720,000	$5,700,000	($20,000)	(0.3%)	Positive
Total Cost	($/day)	$6,303,000	$8,178,000	$8,211,000	$33,000	0.4%	Negative
Total Cost	($m/yr)	$ 2,301	$ 2,985	$ 2,997	$12	0.4%	
Noise	(pascal^2 hrs/day)	95	141	144	3	2.1%	Negative
Carbon Monoxide	(CO Tonnes/day)	146	188	187	(1)	(0.5%)	Positive
Carbon Dioxide	(CO2 Tonnes/day)	2,670	3,490	3,510	20	0.6%	Negative
Lead	(kg/day)	440	570	580	10	1.8%	Negative
Fuel	(x 1000L/day)	1,120	1,460	1,480	20	1.4%	Negative
Trips Within Originating Zone							
Total Trips	(num)	94,000	141,700	134,400	(7,300)	(5.2%)	Negative
Total Vehicle Kilometers	(km/day)	39,700	64,400	67,700	3,300	5.1%	Negative
Total Vehicle Minutes	(min/day)	146,000	229,000	230,000	1,000	0.4%	Negative
Mean Trip Length	(km)	0.40	0.45	0.50	0.05	11.1%	
Mean Trip Time	(min)	1.6	1.6	1.7	0.1	6.3%	
Trips External of Originating Zone							
Total Trips	(num)	1,281,700	1,580,700	1,588,200	7,500	0.5%	Negative
Total Vehicle Kilometers	(km/day)	9,319,300	12,482,200	12,763,100	280,900	2.3%	Negative
Total Vehicle Minutes	(min/day)	16,261,000	20,850,000	20,798,000	(52,000)	(0.2%)	Positive
Mean Trip Length	(km)	7.25	7.90	8.05	0.2	1.9%	
Mean Trip Time	(min)	12.7	13.2	13.1	(0.1)	(0.8%)	

Notes: (1) Figures in brackets represent negative values.
(2) Some figures have been rounded for presentation purposes.

4.29 There is a convergence tolerance in the strategic modelling of about 0.5% difference in vehicle kilometres and vehicle distance between successive iterations. Rather than the significance of the specific values, it is of more importance that the differences between scenarios are in sync with each other. The strategic modelling shows that Scenario 2 would overall have a negative impact compared to Scenario 1; this is typically because trip lengths increase. Although the total transport network cost increase is small in percentage terms, it still equates to $12 million New Zealand dollars a year and environmental effects such as noise and carbon dioxide increase. That said, Scenario 2 does have some benefits such as intersection delays decreasing, which has also reduced carbon monoxide emissions and increased average network speeds, but on the whole, Scenario 2 has more negative effects than Scenario 1.

4.30 Additionally, Scenario 2 increases trip lengths for both short and long distance trips but it is most concerning that where a trip originates and terminates within the same traffic zone, these trips have increased in length. These 'short distance' trips are targeted for mode change to sustainable transport modes and as discussed earlier, increasing trip distance does not promote sustainable transport.

4.31 It is also important to note that the strategic modelling is exceptionally conservative in that the number of trips between Scenario 1 and Scenario 2 has assumed to be fixed and equal, therefore it understates potential effects. In practice, and as discussed earlier, Scenario 2 is expected to produce more trips

than Scenario 1 because of the dispersed nature of the retailing activities allowed in the B3, B3B and B4 zones. Worse still is that the effect of additional network trips is not directly proportional to the increase in travel. For example, if overall network trips in Scenario 2 increased by 3%, which is a realistic increase for the dispersed retail activities included in Scenario 2, all the environmental effects, including carbon monoxide that had previously reduced between Scenario 1 and Scenario 2, all increase by about 4%. Overall the adverse environmental effects are proportionally worse as vehicle trips increase.

4.32 Below are a number of prepared figures that describe the output from the modelling including the changes between the scenarios for comparison:

Figure 4.8 Scenario 1 and 2 - All day vehicle trips by CTS traffic zone

Figure 4.8a The change in distribution of vehicle trips between Scenario 1 and Scenario 2

Figure 4.8b Scenario 1 and 2 – The proportion of total vehicle trips in each land use zone

Figure 4.9 The change in all day traffic flow between Scenario 1 and Scenario 2

4.33 The changes intuitively follow the potential future developments and thus give some measure of confidence that the modelling approach, whilst necessarily broad-brush and strategic, is nonetheless indicative of potential outcomes. When these statistics are translated to specific examples, it can be seen that there are expected increases in traffic volumes on arterial roads that are already under some stress. A selection of various traffic flow locations is shown in **Table 4.3**. All of the selected roads are classified major arterial roads apart from Ferry Road, which is a minor arterial road.

Table 4.3 Sample Traffic Flows Scenario 1 vs. Scenario 2

Model Name		Base	S1	S2	Change	Percent
Model Year		2005	2026	2026	S2-S1	Change
Road Name						
Blenheim Road - between Middleton Road and Wharenui Road	(veh/day)	37,000	33,500	34,500	1,000	3.7%
Carmen Road - between Waterloo Road and Yaldhurst Road	(veh/day)	23,000	33,500	36,500	3,000	9.3%
Ferry Road - between Dyers Road and Humphreys Drive	(veh/day)	29,500	34,500	37,500	2,500	7.8%
Dyers Road - between Pages Road and Breezes Road	(veh/day)	6,500	8,000	9,500	1,500	18.9%
Moorhouse Ave - between Selwyn Street and Montreal Street	(veh/day)	59,000	67,000	62,500	(4,500)	(7.0%)
Main North Road - between Belfast Road and Main North Road	(veh/day)	39,500	26,000	26,000	(0)	(0.7%)

4.34 It is acknowledged that even though total vehicle trips remain the same, there will be some localised decrease in traffic flows at certain locations. Most obviously this will be the central city where retail jobs have decreased the most within the smallest area. Moorhouse Avenue at the western end is one example of a localised decrease, however at the eastern end of Moorhouse Avenue traffic flows are predicted to increase. Whilst in some ways this may be seen as beneficial from the point of view of traffic congestion at a specific location, overall traffic effects have increased. In any case, it is likely to be in conflict with efficiencies in terms of encouraging public transport and other planning objectives. It would also negate recent works to manage traffic within the central city better including the recent introduction of Variable Message Signs to better manage parking circulation, provide travel information and promote travel options.

4.35 It is also very important to reemphasise that the CTS model is, at present, a vehicle-driver only model. Modal splits i.e. the proportion of person trips conducted by car, bus, cycle, car passenger and walk, is conducted implicitly at

the trip generation stage and is effectively 'fixed'. Therefore **the current model is not responsive to policy changes in terms of affecting different modes. In this case the model is likely to underestimate the additional attractiveness of car-based travel when comparing Scenario 2 to Scenario** 1, i.e. Scenario 2 will discourage walking and cycling trips and this is not reflected in the modelling.

Figure 4.8 2026 All Day Vehicle Trips S1 and S2

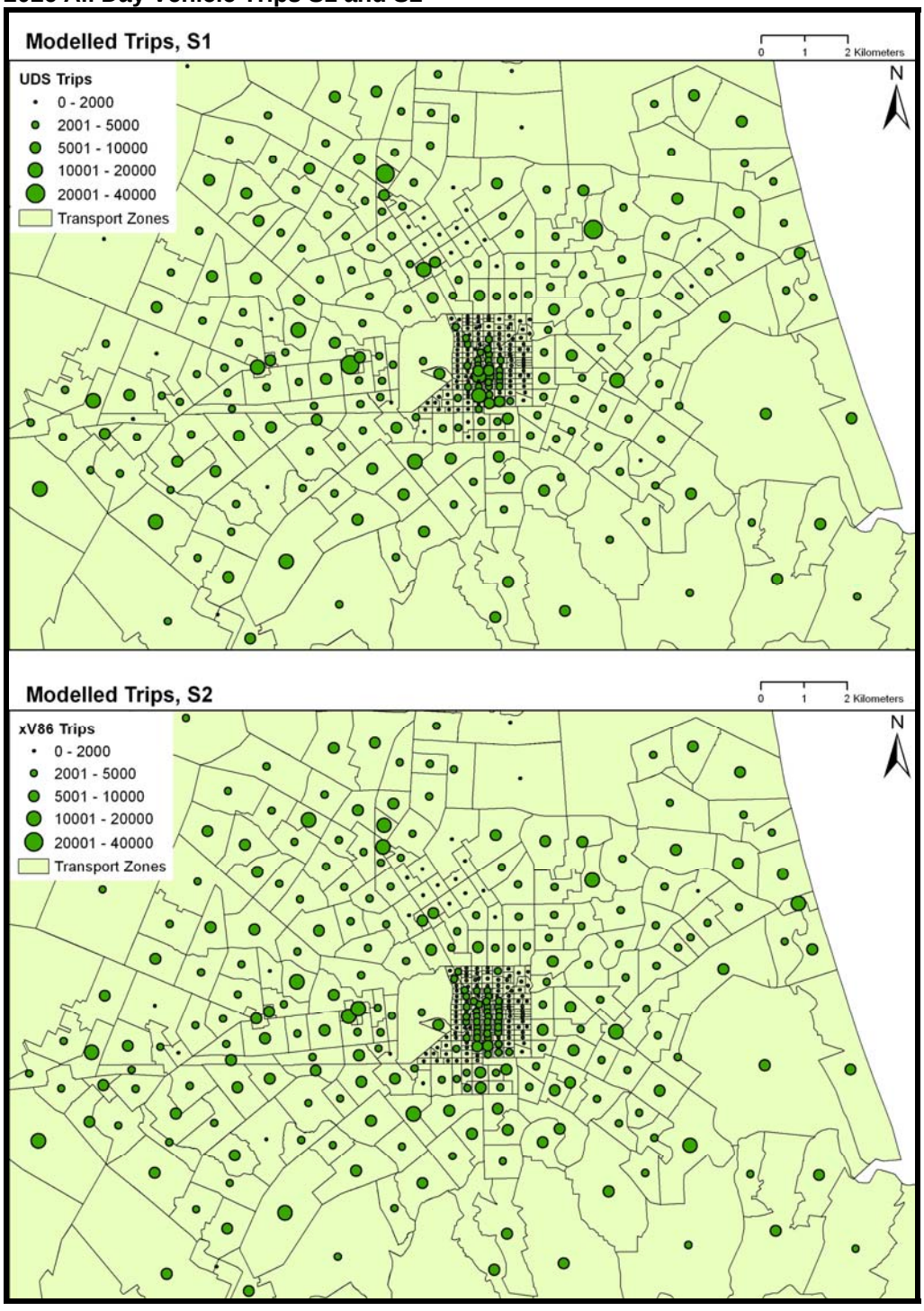
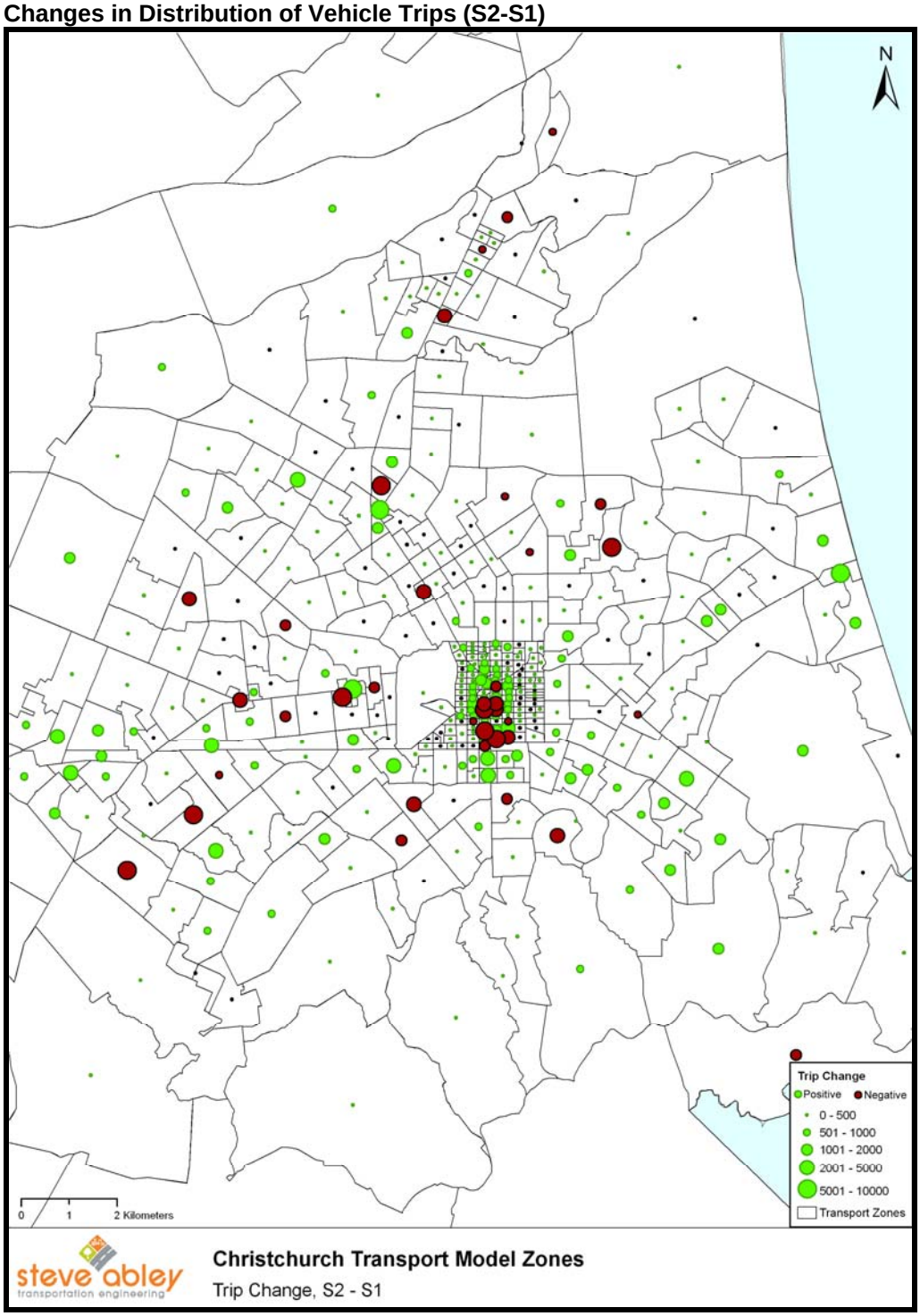
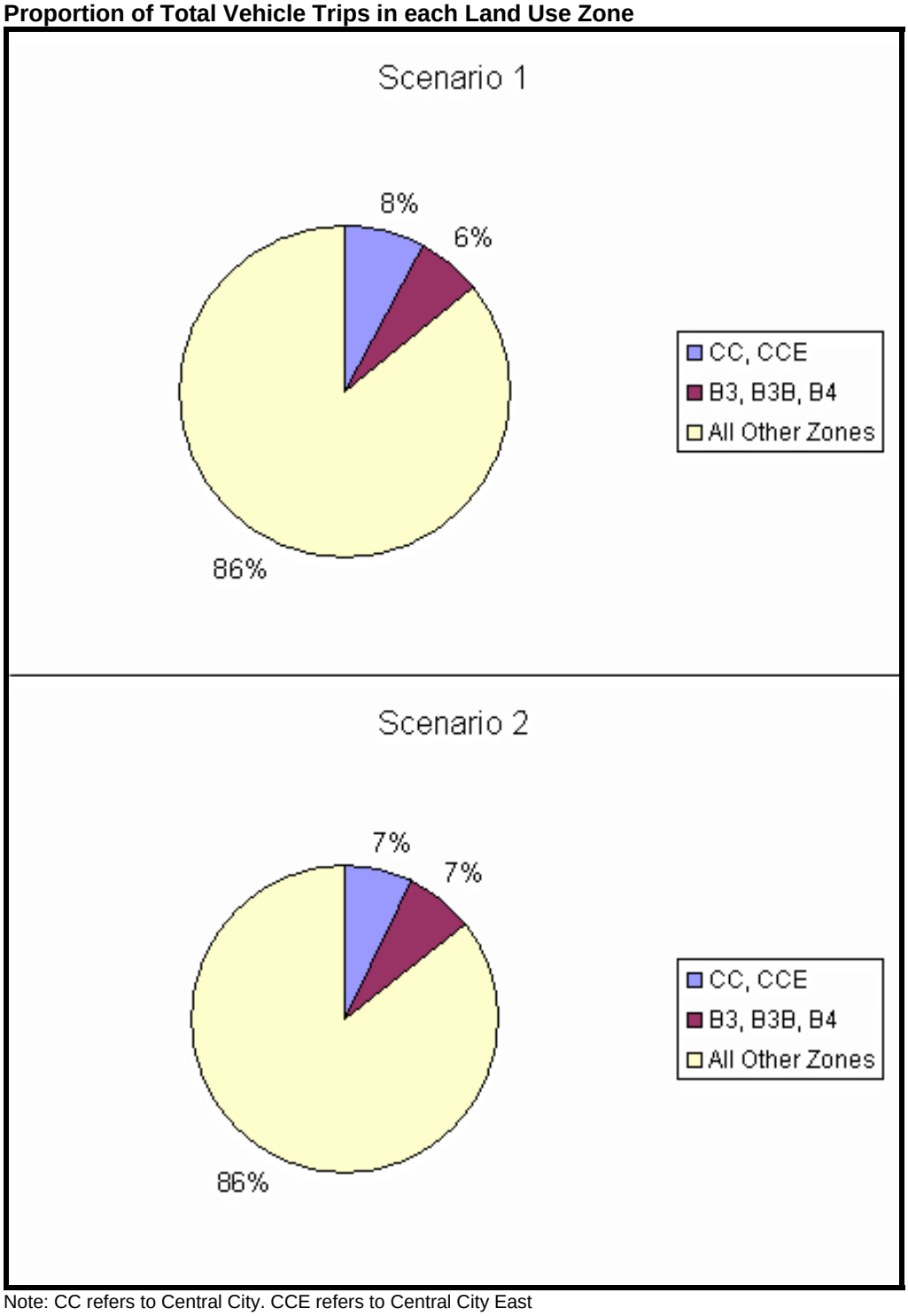


Figure 4.8a Changes in Distribution of Vehicle Trips (S2-S1)



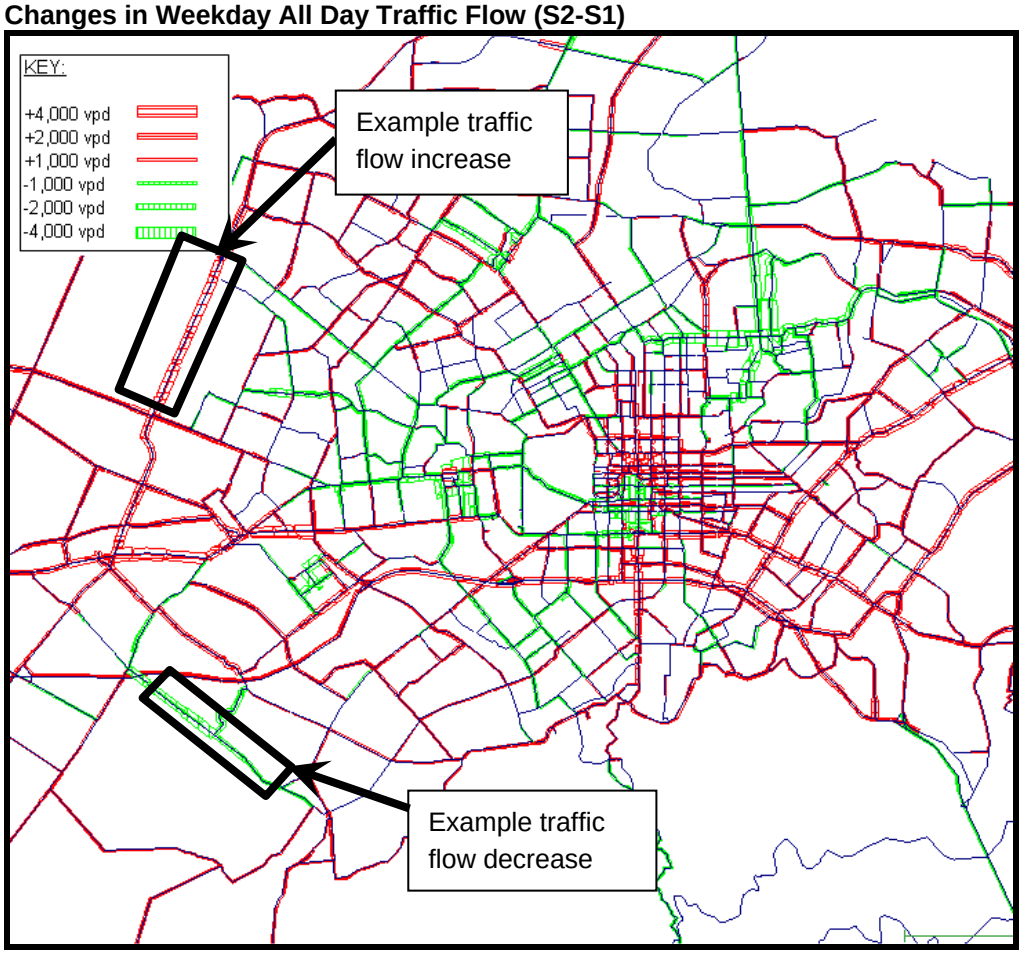
Note: negative changes are overlaid on positive changes

Figure 4.8b Proportion of Total Vehicle Trips in each Land Use Zone



Note: CC refers to Central City. CCE refers to Central City East

Figure 4.9 Changes in Weekday All Day Traffic Flow (S2-S1)



Note: vpd is vehicles per day

Road Hierarchy

4.36 A road network is provided for the movement of road users. The functional hierarchy of roads stems from the need to reconcile the roads' function of providing for the efficient movement of vehicles with those of other transport modes. It is strongly influenced by the idea that any vehicle travelling between a particular origin and destination should intrude as little as possible into the neighbourhoods and living areas that it has to pass through on its journey. It is for this reason the roads in Christchurch, as elsewhere, are classified for different purposes i.e. movement or access, and the effects of traffic are minimised on roads that do not have a high movement function.

4.37 Outside the central city area and major shopping centres retail activities tend to locate, and prefer frontages, onto arterial roads where the greatest degree of exposure of their goods and services to the passing public can be gained. This hypothesis was tested scientifically and is considered true as shown in Appendix C. Associated with the location of retail activities on arterial roads is the pressure to also allow various signage for each site and expectations of on-street parking and access. Therefore, **retail activity produces many impacts on fronting and adjacent roads, most of which are adverse and are not supportive of the road hierarchy.**

4.38 Roads are classified in Volume 3 Part 8 of the City Plan and specifically referenced in Volume 3 Part 8 Appendix 3. The classification of roads forms the basis of the road hierarchy that is a key planning tool to achieve the objectives and policies related to transport in the City Plan. As noted in the City Plan, it is explained that *"the hierarchical network provides for the efficient and safe*

movement of people and goods, while reducing the conflicts which arise between traffic requirements and the environment of surrounding areas."[5] and also *"The efficiency and safety of the road network, particularly arterial roads, requires minimising conflicts between various road users. Important in this respect is protection from queuing and manoeuvring vehicles through the control of access to and from high traffic generating activities"*[6]. It is important to recognise the key role that arterial roads play in supporting the efficiency and effectiveness of the road hierarchy. Equally it is important to consider the impacts on these roads from retailing activities.

4.39 Volume 3 Part 13 of the City Plan covers in some detail rules that relate to matters such as parking, manoeuvring spaces, site access and crossing standards, and a group of assessment matters for resource consents. A general introduction notes that *"To control the proliferation and siting of property access there are rules which limit the number of access points, length and distance from intersections for each site, reflecting the roads planned function in the roading hierarchy. The standards give some protection to the efficiency and safety of the road by controlling where traffic can enter or leave a property. … High traffic generators require particular controls due to the adverse effects these activities may have on the frontage road. Generally, the more vehicle movements an activity generates, the bigger the potential is for accidents* [crashes] *to occur and congestion created. This is particularly true on arterial roads where vehicle numbers and speeds will be higher than on other roads in the hierarchy"*[7].

4.40 The lineal length of B3, B3B and B4 zones fronting the major arterial and minor arterial roads based on the road hierarchy map in Volume 3, Part 8 of the City Plan are listed in **Appendix E**. This is shown for major arterial roads in **Figure 4.10** and minor arterial roads **Figure 4.11**. There are 45.6 lineal kilometres of arterial road frontage occupied by these zones. These frontages lie on either side of 35.9 kilometres of arterial road. Of that total 24.9 kilometres are major arterial roads and of these 2.8 kilometres are Limited Access Roads[8]. About 44 key intersections i.e. major arterial to major arterial or major arterial to minor arterial, are within these zones.

4.41 All of the roads listed in Appendix E, and in particular Blenheim Road, have lengthy frontage to the B3, B3B and B4 zones. Whilst the City Plan standards anticipate access control as being appropriate on arterial and collector roads, some lengths of these roads are also controlled as Limited Access Roads. It is the potential extent of the effects of particular retail activities, in association with existing activities, located in the zones along those major arterial road frontages which are of most concern.

4.42 These B3, B3B and B4 zones are closely associated with several major arterial roads. Indeed retailing in these zones has already occurred with the Supa Centa in Belfast, Tower Junction, Countdown in Colombo Street and the Sloan site in Ferrymead and to a substantial extent along the length of Blenheim Road. These sites have required significant time and resource spent on planning and implementing solutions for the necessary access arrangements and associated on street traffic management for each development. Furthermore if these arterial roads become less efficient then some of their traffic will off load onto collector and local roads.

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[5] Christchurch City Plan Volume 2, Section 7.2.1

[6] Christchurch City Plan Volume 2, Section 7.2.4

[7] Christchurch City Plan Volume 3, Part 13, Section 13.1, 1.0 'Statement', paragraph 3.

[8] Section 346 of the Local Government Act; Christchurch City Plan, Volume 3, Part 8, Appendix 5

4.43 In addition to the arterial road system, collector and local roads also play an important role in the road network's operation. Collector roads are basically intended for local traffic and shorter trips close to their property destinations. They are also used as bus routes. As pointed out in the City Plan for Collector Roads, *"Their traffic movement function must be balanced against the significant property access function which they provide"*[9]. Local roads are intended to provide primarily local property access. Within collector and local roads there is greater emphasis on landscape, living streets, social and environmental balance and usage.

4.44 There are many collector and local roads that pass from suburban residential or industrial locations to link with arterial roads for example Matipo Street (Collector) linkage with Riccarton Road and Blenheim Road, Ilam Rd (Collector) linkage with Riccarton Road, and Craven Street (Local) linkage with Main South Road. There will be occasions where, superficially at least, it might be more desirable to gain access to a retailing activity from a 'side street', a collector or local road, so as to protect the arterial road system.

4.45 However, this could also be of such impact to the collector or local road character and use that the proposal should be declined or appropriately conditioned. **The 'pros' of not accessing directly from the arterial can be offset from the 'con' that side road demand is increased.** For example demand on the side road might be such to create safety concerns and require mitigation through the use of traffic signals. The traffic signals then adversely affect the performance of the arterial road.

[9] Christchurch City Plan, Volume 2, Section 7, 7.2.1 'Policy Hierarchy of roads', bullet point 3.

Figure 4.10 Major Arterial Roads with B3, B3B or B4 frontage

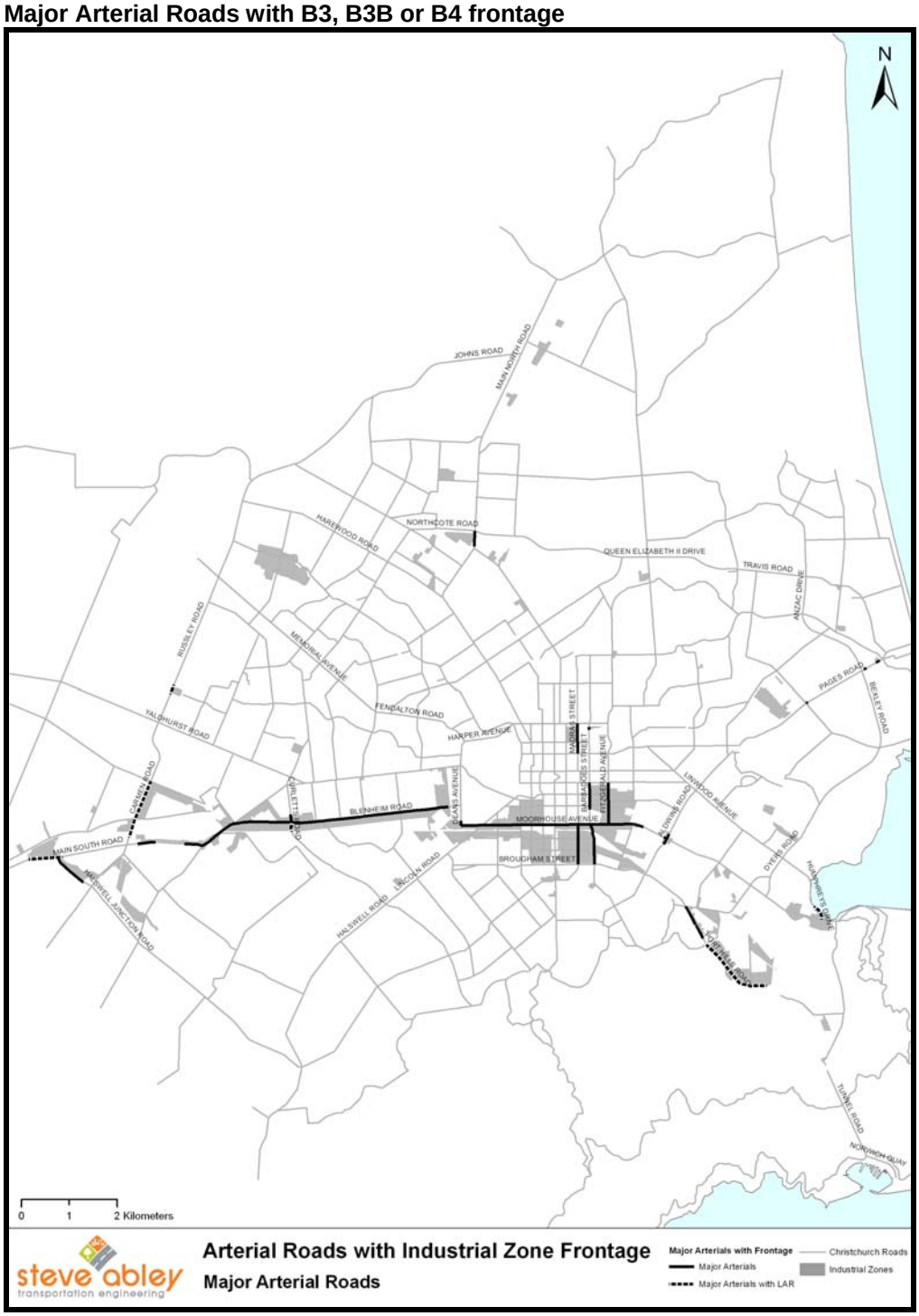
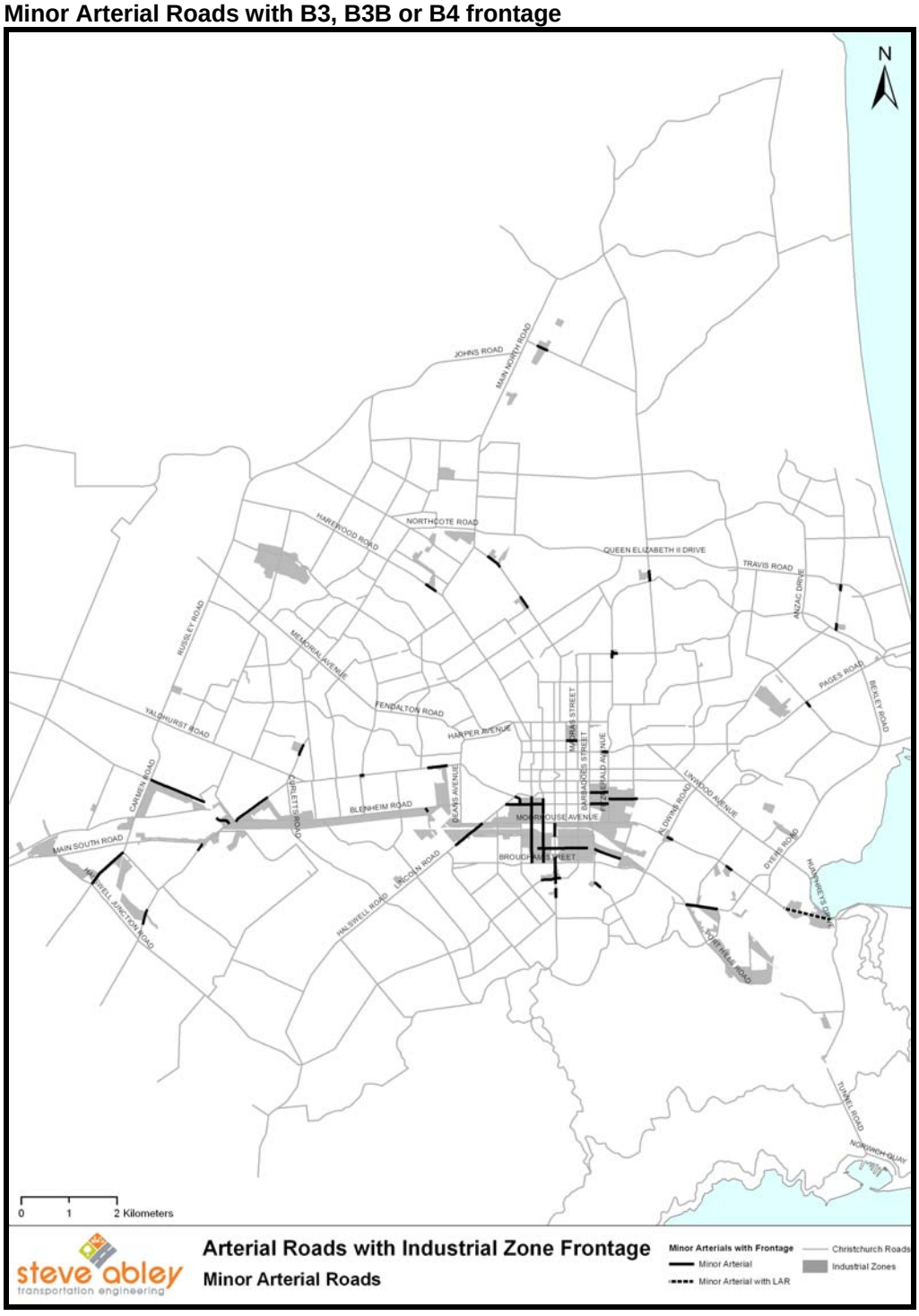


Figure 4.11 Minor Arterial Roads with B3, B3B or B4 frontage



Local Network

4.46 The effects of the higher traffic generation from retailing on the local network can be from the direct effects of access or from the cumulative effects of the increase in traffic generation and movement. Aside from the potential proximity of high-generating activities near critical road intersections, there are two other important potential impacts on frontage roads created by an increase in high generating land uses such as retail activities.

- The first is the increase in the number of vehicles turning on and off the road delaying other vehicles and increasing the potential for crashes.
- The second is the increase in the number of busy accesses caused by small individual businesses.

4.47 Both of these effects have the potential to reduce the efficiency, safety and therefore level of service of the frontage road. Where the frontage road is an arterial road, a change permitting retailing from adjoining sites could have a major effect on the function of the road in carrying traffic efficiently and safely. Where the frontage road may carry a high number of cyclists and pedestrians, a large number of busy accesses will impact on the safety and confidence of these users.

4.48 Two examples regarding the potential impacts might be looked at. Firstly, on Ferry Road at Ferrymead (a Minor Arterial Road), there is already a lot of retail development in this area that is affecting the efficiency of the arterial road. On the south side of this road, a lack of off street parking, particularly convenient parking, has led to customer parking occurring on street. This is generating conflicts with turning vehicles. It is also important to note there is a large amount of consented but not yet built development in the Ferrymead area, so the affects are expected to be more than what is experienced today.

4.49 Secondly, there is Blenheim Road and Main South Road (being Major Arterial roads and a State Highway west of Curletts Road). The main function of major arterial roads is *'to cater especially for longer trips and generally link to other arterial roads and collector roads. They will be constructed and managed to minimise their local access function.'*[10] This area is currently developing at a very fast pace with recent development including Blenheim Square, which includes a selection of 'convenience' retail outlets including a bakery, grocer and liquor outlet.

4.50 It is interesting to note that traffic growth on Blenheim Road west of Matipo Street between 1999 and 2007 (inclusive) increased 1.7%, 3.7% and 4.8% per annum for a weekday, Saturday and Sunday respectively. This traffic growth is comparable to the traffic decline on Riccarton Road west of Matipo Street that was -2.4%, -1.2% and -0.8% per annum for the same period and respective days.

4.51 Initially it could be considered that the traffic growth on Blenheim Road may be due to the increased size of settlements west of the city at Prebbleton, Rolleston, and to a lesser extent at Lincoln. The majority of the Blenheim Road traffic growth for a weekday (1.7%) would therefore be able to be attributed to household growth within these areas. However, it would be unlikely that the traffic growth measured on Blenheim Road for a Saturday (3.7%) or Sunday (4.8%) is attributable to such household growth only. A more considered rationale would be that this growth is due to increased retailing occurring on Blenheim Road.

4.52 Blenheim Square is also worthy of specific comparison given it is a recent development, consists of smaller shops, but together combine to form a number of the typical activities that might be found in a supermarket. Access to Blenheim

[10] Christchurch City Plan, Volume 2, Section 7, 7.2.1 'Policy Hierarchy of roads', bullet point 1.

Square is primarily car based, it can be accessed by other modes but these are awkward, given Blenheim Road is a dual lane carriageway and there are no specific on street facilities that might encourage more sustainable transport modes given the arterial nature of the adjacent road. It also has a limited residential catchment, the number of normally resident people noted as being within a 200m catchment (buffer) of Blenheim Square at the 2006 Census being about 280. This is significantly less than the same buffer around the B1 shops that include a dairy, takeaway, bakery and hairdresser at the other end of Wharenui Road at the intersection with Riccarton Road, where there were 403 people at the 2006 Census based on the same 200m catchment.

4.53 Additionally, although access via public transport to Blenhiem Square is possible, the closest bus stop westbound is about 240 metres away and necessitates crossing Akron Drive, or 76 meters if travelling eastbound and requires crossing Blenheim Road, which for some people would mean crossing at the nearby intersection at Wharenui Road and would increase this distance to 190 metres. In terms of a public transport accessibility index[11], the Blenheim Square interpeak weekday score is 3.82 and is slightly better than the likes of Tower Junction, Supa Centa and Chappie Place, but significantly lower than the likes of Riccarton, Shirley, Northlands or Sydenham that score about 7. As a direct comparison, the B1 shops at the other end of Wharenui Road have a public transport score of 6.76 or almost twice that of Blenheim Square. Additionally, because of the single carriageway of Riccarton and Wharenui Roads they are easier to cross.

4.54 The impacts of development on the B3, B3B and B4 zones have been able to be partially mitigated at a local level, for example the entrance to Blenheim Square, Ferrymead or the Supa Centa, through restricted access and exit movements via an entry and/or exit only lane. On a larger scale they have been partially mitigated through the installation of traffic signal access such as Tower Junction on Whiteleigh Avenue (Minor Arterial) or Chappie Place on Main South Road (Major Arterial). Although in such cases the benefits of providing a safer access to accommodate and mitigate those adverse consequences, are somewhat offset by added delays to bypass traffic that is unrelated to the specific activity i.e. these developments have not fully internalised their transport 'costs'. Unfortunately the transportation impact for these sites has only been assessed on confined individual access issues rather than on wider network issues – the 'big picture' has been blurred, if viewed at all. Consequently matters such as integration of walking and cycling facilities have only been included at a very site specific level and not at the level included in the Variation.

4.55 **The potential exists without the Variation for retailing along the full length of Blenheim Road on its southern side unless a greater control is enabled over the types of activity that can establish as-of-right.** As can be seen from Scenario 2, the allowance for full retailing along Blenheim Road has the potential to increase traffic along this major arterial road, as well as reduce capacity with more vehicles accessing sites to or from more access points. **The Variation enables greater consideration of the effects of development and the appropriate location of higher traffic generators.**

4.56 Additionally the current methods of control via the access rule are limited in that they do not take into account cumulative effects of development. Blenheim Road and to a lesser extent Ferry Road, are good, or rather bad examples, **where development has affected the transport network cumulatively and more than what was probably expected when developments have been assessed on an individual basis** during each of the respective resource consent applications.

[11] Public Transport Accessibility Levels - Transport for London. A higher score better.

5 DISCUSSION

5.1 Overall the NZTS, RPS, RPS12A, RLTS and City Plan have a range of very similar objectives and policies and specifically **the City Plan seeks *"An efficient, safe and sustainable transport system in the City which provides for ease of accessibility for people and goods"*[12] and the Transport System needs to *"…avoid, remedy or mitigate adverse environmental impacts"*[13]**. In essence, these documents all support use of sustainable transport modes rather than the private motor vehicle, and integrating land use and transport. Integrating land use and transport involves support for strengthening the central city and suburban nodes as a means of reducing trip lengths, trip times and improving network efficiency including the use of public transport.

5.2 Allowing significant retail activity in industrial areas rather than the central city or suburban centres has the potential to result in adverse traffic impacts on the transport system and road network. This has been demonstrated through this review and the indicative traffic modelling. **The conservative nature of the modelling gives one confidence that the general scale and especially the direction of effects are clear. A dispersed retailing environment produces effects that overall, have greater adverse impacts when compared to a centres based approach.**

5.3 One of these adverse effects is the result of shoppers needing to travel further to get to the shops. As a consequence, some people who would have walked or cycled to the shops would instead choose to use their private motor vehicle. This would disperse shopping options and increase the number of vehicles on the road network, which in turn would then require shoppers to travel in areas with more vehicles. This would further discourage walking and cycling and increase energy use and air pollution. This is the spiral of dependence that has been referred to earlier in this report.

5.4 Additionally the transport hierarchy would be compromised and the efficiency and function of the road network degraded. This would appear to be contrary to City Plan policy "*To protect the function of the road network and the environment of adjacent land uses"*[14] and *"To control the establishment of land use activities to achieve compatibility with the roads they front by avoiding, remedying or mitigating the effects which each has on the other"*[15]. **The end result is less sustainable in terms of transport planning and does not support the significant amount of transportation policy that embraces a sustainable transport philosophy.**

5.5 While it is difficult to anticipate with precision the traffic effects that could establish in the B3, B3B and B4 zones without the Variation, the analysis shows that **there will be adverse effects from not implementing a greater measure of control.** The objective and policy provisions contained in the Variation will achieve an improved level of control and will enable, from a transportation perspective, a greater and more detailed assessment of the impacts of any developments which do come forward in these and other zones. Such an approach is consistent with the various document listed in Appendix A including the Regional Land Transport Strategy and City Plan.

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[12] Christchurch City Plan, Volume 2, Section 7, Transport Objective

[13] Christchurch City Plan, Volume 2, Transport Objective Explanation

[14] Christchurch City Plan, Volume 2, Section 7, Objective 7.2, Policy 7.2.2

[15] Christchurch City Plan, Volume 2, Section 7, Objective 7.2, Policy 7.2.5

6 CONCLUSION

6.1 The analysis of transportation policy generally appears to complement and reinforce the land use and other planning issues which have been considered in establishing a framework for retail activity in the city and defining the retail activities appropriate to the B3, B3B and B4 zones.

6.2 The amendments proposed through the Variation have been framed within the broad policy context and better reflect the transport objectives and policies included in the City Plan. They still permit a large range of retail uses in the industrial zones but provide some opportunities to address any related adverse traffic effects.

6.3 Consequently **it is the conclusion of Abley Transportation Engineers Limited that the Variation is more aligned with current policies and the effects of introducing the Variation are overall, positive from a transportation effects perspective**.

CHRISTCHURCH
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RETAILING EFFECTS ON TRANSPORT

Appendix A

abley
transportation engineers

NEW ZEALAND TRANSPORT STRATEGY
Extracts relevant to the Variation

Vision and Principles

Vision:
By 2010 New Zealand will have an affordable, integrated, safe, responsive and sustainable transport system.

Four Principles:

Sustainability
Integration
Safety
Responsiveness

Approach:

Forward-looking
Collaborative
Accountable, and
Evidence Based

Future Challenges

In a rapidly changing society, transport will continue to play a major role in improving access to social and economic opportunities. However, much of our transport development, especially the growth of the motor vehicle, has also brought a wide range of health and environmental problems. The negative impacts of transport include noise, transport-related wastes, greenhouse gases, local air emissions, and contaminated water runoff.

The negative social and environmental impacts of transport must be reduced. In land transport, the government is determined to see that the transport system supports access and environmental outcomes through improving public transport, reducing congestion, improving safety for all, supporting alternatives to travel (such as teleworking and local provision of services), and providing infrastructure for walking and cycling. Barriers to mobility will need to reduce. Improving the energy efficiency of our transport system, and implementing emissions-related initiatives, are an important part of the government's commitment to reducing greenhouse gases.

Change is Needed

Advances are continually being made in the transport sector, many of which directly contribute to the vision set out in this Strategy. However, there is still some way to go before we achieve our vision.

Our investment in transport needs to focus on the long-term needs of New Zealand…

We must ensure that transport supports social interaction and wellbeing, especially for those who are most vulnerable in society or for those who are mobility impaired…

As we continue to develop economically and socially, we must ensure that transport does not place ever-growing pressure on the environment. This will require the use of more energy efficient and less environmentally harmful approaches to providing transport. Technology and alternatives to transport will need to play a role in achieving this….

Objective: Assisting Economic Development

The transport system is a complex infrastructure and operating system that plays a crucial role in the economic development of New Zealand. New Zealand's economic development relies on a coherent, affordable, efficient and effective transport system to improve the flow of people, goods and services both within New Zealand and to and from other parts of the world.

…Land transport investment needs to focus on safety, reducing severe congestion, supporting passenger transport, walking and cycling, and supporting regional economic development…

Transport policy will also recognise the economic significance of shorter journeys and the role of communications technology. The integration of walking and cycling and public transport services has an important role to play in creating the quality urban environment that together with telecommunications and investment will allow
clusters of businesses to develop and prosper.

…All modes of transport will need to be taken into account. The outcomes need to contribute to the government's social, economic and environmental goals. To help make decisions that are economically, socially and environmentally sustainable we will need to improve our understanding of the relationship, in the New Zealand context, between economic development and transport.

Looking beyond these more urgent measures, this Strategy recognises the increasing international experience showing that the transport sector cannot endlessly build its way out of all its problems, or rely solely on developments such as energy efficient vehicles. More effective management of the existing transport system and investment is becoming as important as new investment. Effective management means taking a broader view with all social, economic and environmental costs and benefits considered and taken into account when making transport decisions.

In our current transport system, decisions by commercial operators and private individuals usually appear to offer substantial benefits. However, these decisions nearly always impose some additional costs on people or systems outside the direct financial responsibility of the person or organisation making the decision….

Objective: Assisting Safety and Personal Security

All forms of transport expose people to safety and security risks….

…

As will be reflected in Road Safety to 2010, pedestrians and cyclists must also be safe. The government has a role in ensuring safety for all transport users, especially in the road corridor. The success of Road Safety to 2010, and the New Zealand Transport Strategy, requires that the safety needs of vulnerable users be taken into account in making a wide range of transport decisions, including in

policy, planning and investment decisions. In particular, the needs of the aged and children need to
be considered.

Many short journeys made today by car could be replaced by walking or cycling where the necessary safety improvements have been made. Public transport could also offer improved safety and security…

Objective: Improving Access and Mobility

…Lack of access can reduce individual or community ability to participate in activities. Transport choice is important in allowing New Zealanders to take advantage of social and economic opportunities.

Providing choice need not be about long journeys or moving around our cities. Ending isolation for the elderly, supporting the independent movement of children within their communities, providing access to medical services, education and employment all depend in part on people being able to access services and opportunities locally, and to interact and move within communities. Transport systems must meet these needs and allow people to exercise a full range of transport choices.

…Transport in all its forms is such an integral part of every community that it is sometimes easy to forget that a system that exists to link people together can also be a barrier to movement and community interaction. Communities where people walk and interact in streets tend to be healthier.

New Zealanders who are disabled or are unable, for age or other reasons, to use a car or access other transport services are some of the people for whom our transport system, and the layout and attitudes of our communities, can all too easily become a major impediment to mobility. High traffic volumes and transport noise and emissions can disrupt social cohesion and indirectly undermine mobility by breaking down social networks.

…

Providing improved pedestrian facilities is an important factor in increasing access to services, especially to local services such as shops or medical centres. The government has already increased its investment in walking and cycling….

Objective: Protecting and Promoting Public Health

…

The negative health impacts of transport can come from a wide range of areas including emissions, contaminants, noise and accidents. These impacts can affect both physical and mental wellbeing. High volumes of traffic can restrict people's sense of mobility and their ability to interact in public spaces. This in turn increases stress and isolation.

…

Some individuals find that transport negatively affects their ability to participate in society and their community and thus presents them with a broader set of physical and mental health challenges.
Noise from motor vehicles in urban areas can have an impact on community health

and wellbeing.

…

Solving the impact of transport on health will require more than regulation, improved infrastructure design and new technologies. We must also consider whether or not the use of alternative modes of transport could offer better health outcomes. Substantial health benefits would be achieved if even a small proportion of the under two kilometre trips currently made by car were made by active health modes such as walking or cycling. These benefits would come from increased physical activity, reduced emissions, less noise and less water pollution.

…safe and well-designed facilities for walking and cycling need to be available to support … changes. The government has set aside additional funding in the National Land Transport Fund for walking and cycling initiatives and infrastructure. Work is also well underway on a strategy for walking and cycling. This strategy will help to provide guidance for policy makers, road managers and communities.

Objective: Ensuring Environmental Sustainability

…

Achieving environmental sustainability will require the reorientation of transport policy and individual and business transport decisions over time. While progress has been made, more is required.

…

The government has already approved the National Energy Efficiency and Conservation Strategy, which has set a range of energy efficiency targets for the national economy. It has also set out specific goals for transport energy reduction and efficiency improvements. These include:

- reducing the need for travel
- improving the energy performance of the transport fleet
- improving traffic flow
- reducing fuel consumption
- increasing the use of low energy transport options
- developing more efficient urban forms and systems.

In a sector of such complexity [Transport], forward planning of the transport system will need to be closely integrated with the need to ensure environmental sustainability goals are addressed….

CANTERBURY REGIONAL POLICY STATEMENT 1998
Extracts relevant to the Variation

Section 12: Settlement and the Built Environment

12.3 Methods (page 204)

District plan provisions

Responsibility for the control of subdivision of land and the control of any actual or potential effects of the use, development, or protection of land for the purpose of avoiding, remedying or mitigating adverse effects on natural and physical resources and for the avoidance or mitigation of natural hazards is vested in territorial councils (section 31 (b) and (c), RM Act).

District/city councils in the preparation, variation, change or review of district plans, through the exercise of their functions should:

(a) consider promoting settlement and transport patterns and built environments that result in increasingly effective and efficient use of resources particularly energy, reduce the rate of the use of non-renewable energy sources, minimise emissions into the atmosphere, and incorporate energy efficient approaches into building orientation, form and design.

Section 13: Air (Extracts)

Policy 2: Promote measures that reduce emissions from the use of carbon based fuels (page 209)

Explanation

…

The principal sources of air pollution are from solid fuel combustion for domestic heating, fossil fuel combustion for commercial heating and industrial purposes, and motor vehicle exhaust emissions.

…

Emissions from motor vehicle exhaust systems include carbon monoxide, carbon dioxide, oxides of nitrogen, lead compounds, hydrocarbons, sulphur dioxide, suspended particulate and products of incomplete combustion. Motor vehicles are a major source of carbon monoxide and an increasing source of suspended particulate in ambient air in Christchurch.

Policy 9: Promote measures to reduce emissions, or mitigate the effects of carbon dioxide from the use of carbon based fuels (page 215)

Explanation

When carbon based fuels are burnt they emit carbon dioxide into the atmosphere. Major sources of carbon dioxide in Canterbury include motor vehicle exhaust emissions, burning of coal for domestic heating and in industrial boilers, and landfill gas. Carbon dioxide is one gas that may be contributing to an enhanced greenhouse effect.

13.3 Methods (page 219)

2. District plan provisions

District/city councils in the preparation, variation, change or review of district plans, through the exercise of their functions, should consider:

(c) encouraging patterns and forms of urban settlement and infrastructure which decrease production of motor vehicle emissions and decrease demand for transport.

Section 15: Transport (Extracts)

Policy 1: Protect Canterbury's existing transport infrastructure and land transport corridors necessary for future strategic transport requirements by avoiding, remedying, or mitigating the adverse effects of the use, development or protection of land and associated natural and physical resources on the transport infrastructure. (page 233)

Explanation

The existing strategic transport infrastructure is a physical resource which enables essential transport services to meet present and future regional, inter-regional and national transport needs. This infrastructure needs protection from adverse effects which undermine its ability to safely and efficiently enable those services to be provided. Community needs are changing and will continue to change with population growth. Therefore existing transport infrastructure and land transport corridors within which future expansion of infrastructure can be accommodated, need to be safeguarded.

Principal Reasons

A wide and long-term framework of protection is needed to ensure that the present and future physical transport infrastructure operates safely and efficiently.

Policy 2: Promote the use of transport modes which have low adverse environmental effects (pages 234-235)

Explanation

Cycling, walking, public passenger transport, sea transport and rail as a passenger and freight mode generally have low adverse effects on the environment relative to motor cars and trucks.

Policy 3: Promote changes in movement patterns, travel habits and the location of activities, which achieve a safe, efficient and cost-effective use of the transport infrastructure and reduce the demand for transport. (Page 235)

Explanation

By promoting safe, efficient and cost-effective use of the transport infrastructure and reducing the demand for transport, the adverse environmental, economic and community effects may be reduced. The demand for resources such as energy, and for new physical structures will be similarly reduced, or their uses made more efficient.

The demand for transport may be reduced by a wide range of means including:

(1) controlling the use, development and protection of land, such as the containment of urban areas
(2) encouraging increased use of more energy efficient transport modes
(3) increasing public awareness on environmental issues and transport options
(4) promoting or facilitating increased substitution by telecommunications, for example, "telecommuting".

The demand for transport can be reduced by promoting an urban layout that decreases distances between homes, sources of employment, shops and other frequent destinations, reducing energy demand and emissions. Similarly the effectiveness and efficiency of the most environmentally desirable modes can be facilitated by ensuring the right preconditions are built in. For example, by planning residential areas so that they are located within convenient walking distance of trunk routes where a fast, frequent public transport service can operate, or by providing cycle lanes.

People have an important role to play as individuals. Any steps that people can take to minimise the use of their own cars, for example, by car pooling, and actions by local authorities to encourage this will help reduce the demand for transport and assist energy conservation and reduce exhaust emissions.

26 June 1998

Canterbury Regional Policy Statement Proposed Change No 1 Extracts relevant to the Variation

Policy Related to Sustainable Transport Modes

Policy 2: Intensification (page 10)

(d) Christchurch City Council will recognise and provide for central city intensification which underpins and supports the role of the Central Business District within the Greater Christchurch sub-region.

(e) Christchurch City Council will in identifying areas for intensification recognise and provide for the protection of heritage values and areas of special amenity.

Explanation

Providing for intensification in and around key activity centres will help ensure good access to commercial, community and recreational facilities and to public transport.

Policy 5: Key Activity Centres and Commercial Activities (page 13)

b) Territorial authorities shall manage the development of the Key Activity Centres to:

…

- support the development of the principal public transport and cycling networks and the ability to change transport modes, and
- encourage pedestrian access to and within these centres.
- provision for a range of areas of residential densities and lot sizes, with higher residential densities located within walking distance of Key Activity Centres and commercial centres,…
- effective and efficient use of existing and new infrastructure networks.

Explanation

The more significant commercial centres are a key component of the settlement pattern as they are an existing resource that provides a logical focus for areas of intensive residential development. Integrating urban development in this way assists in reducing car travel, increases the efficient use of resources, and strengthens existing communities. As such their development, usability and viability are important to successfully implementing the Greater Christchurch Urban Development Strategy. Commercial development in other areas can reduce the ability of the centres to fulfil these functions, and such development should therefore be avoided.

Policy 7: Development Form and Design (Page 16)

Development of Activities in Greenfields, Intensification Areas, and Key Activity Centres should give effect to urban design best practice. The principles of the Urban Design Protocol (Ministry for the Environment, 2005) shall be observed when preparing or assessing any urban development and the following matters shall be provided for:

- good safe connectivity within the area, and to surrounding areas, by a variety of transport modes, including motor vehicles, cycling, pedestrian

and public transport, and provision for easy and safe transfer between modes of transport,
- location within walkable distance to, community, social and commercial facilities,
- provision for effective, efficient and attractive walk and cycleways, preferably integrated with open space and stormwater detention areas, within, across and linking beyond the area,…

Explanation

Good urban design will increase the success of urban areas in Greater Christchurch. It will benefit both economic performance of Greater Christchurch and the quality of life of its residents. In particular the factors listed will:

- reduce travel times, fuel usage and dependence on the private car,
- provide for a high standard of physical amenities,
- avoid adverse effects on other areas such as flooding, traffic congestion and degraded water , and
- protect important features of the natural environment

The Urban Design Protocol contains many principles to enhance the sustainability and quality of urban environments. It is important that good urban design is achieved consistently across all parts of Greater Christchurch.

Policy Related to Reduced Trip Lengths and or Trip Times

Objective 1: Urban Consolidation (page 5)

Urban Development in Greater Christchurch shall be managed to achieve consolidation of existing urban areas and to avoid unsustainable expansion outside existing urban areas in order to achieve:

- Higher density living environments, particularly in inner Christchurch, in and around key activity centres, and in new greenfields subdivision areas
- Reinforcement of the role of the Christchurch Central Business District within the Greater Christchurch sub-region
- Greenfields development on the periphery of Christchurch City, and surrounding towns at a rate which enables the efficient provision and use of network infrastructure
- Initiatives by the Christchurch City Council to promote intensification within Christchurch City
- A move towards sustainable and self-sufficient growth of the towns of Rangiora, Kaiapoi, Woodend, Lincoln, Rolleston and Prebbleton
- Growth in rural-residential households restricted to no more than 5% of the growth of residential households

Policies 1- 8, 11, 14.

Explanation

Consolidation of existing urban settlements is the form of development most likely to minimize the adverse effects of travel for work, business and recreation, minimise the costs of new infrastructure and avoid adverse effects of development on sensitive landscapes, natural features and areas of high amenity. Greater intensification within Christchurch City will reduce the need for expansion of peripheral areas.

Objective 5: Key Activity Centres (Page 7)

Recognise, provide for and sustain the community's physical resource investment in key centres of business and service activity that are highly accessible and constitute nodes on the strategic transport corridors shown on Map 1.

Policies 3, 4, 5, 7, 8.

Explanation

It is important to recognise that existing centres provide a strong basis of support for more intensified residential living and provide a basis for the successful planning of public transport.

Objective 7: Integration of Transport Infrastructure and Land Use (Page 7)

Transport infrastructure is integrated with development and settlement patterns to reduce network congestion, reduce dependency on private motor vehicles, reduce emission of contaminants to air and energy use, promote the use of active transport modes and facilitate the movement of goods and provision of services in Greater Christchurch.

Policies 1-11, 14

Explanation

Land use patterns that are integrated with transport infrastructure minimise energy use through network optimisation, operation and maintenance. Development that is not well integrated with transport infrastructure can result in increased car dependency, higher energy use and greater traffic volumes.

Policy 2: Intensification (Page 10)

(b)…Intensification should be encouraged in and close to the Key Activity Centres identified in Policy 5 and suitable industrial "brownfields" sites.

(d) Christchurch City Council will recognise and provide for central city intensification which underpins and supports the role of the Central Business District within the Greater Christchurch sub-region.

(e) Christchurch City Council will in identifying areas for intensification recognise and provide for the protection of heritage values and areas of special amenity.

Explanation

...

Intensification will also minimise the adverse effects of travel for work, business and recreation, minimise the costs of new infrastructure, and avoid the adverse effects of development on sensitive landscapes, natural features and areas of high amenity.

Policy 3: Business land (Page 11)

Territorial authorities shall provide for business activities in a manner which;

- Promotes the redevelopment and better utilisation of existing business land, and provides sufficient other land for expansion,
- Reinforces Key activity Centres, and
- Encourages self-sufficiency of employment and business activities.

Explanation

The provision of adequate land for future business activities is a key challenge for successful growth management. Locating appropriate business land close to existing and future residential development helps achieve a greater range of travel options as well as reducing energy usage. Business land location is also important for the forward planning of the transportation network.

Policy 5: Key Activity Centres and Commercial Activities (Page 13)

a) The following centres shown on Map 1 constitute the Key Activity Centres within Greater Christchurch:

- Central City
- Papanui/Northlands
- Shirley
- Linwood
- Riccarton
- Halswell
- Barrington
- Hornby
- Kaiapoi
- Rangiora
- Woodend/Pegasus
- Lincoln
- Rolleston

b) Territorial authorities shall manage the development of the Key Activity Centres to:

- provide for the facilities and services necessary to support the planned community, and
- encourage economic and business activity and interaction, and
- broaden the mix of uses appropriate to the centre, including high density residential provision within and adjoining the Key Activity Centre, and
- provide major centres for the community,….

Explanation

The more significant commercial centres are a key component of the settlement pattern as they are an existing resource that provides a logical focus for areas of intensive residential development. Integrating urban development in this way assists in reducing car travel, increases the efficient use of resources, and strengthens existing communities. As such their development, usability and viability are important to successfully implementing the Greater Christchurch Urban Development Strategy. Commercial development in other areas can

reduce the ability of the centres to fulfil these functions, and such development should therefore be avoided.

Policy 9: Transport Effectiveness (Page 19)

(a) Development of Greenfield Development Areas, Intensification Areas and Key Activity Centres, shall avoid overloading existing transport network infrastructure, particularly strategic roads, and avoid detracting from the primary through-traffic function of state highways and arterial roads;

(b) The Canterbury Regional Council, territorial authorities and transport infrastructure providers shall ensure that the land transport networks within Greater Christchurch provide for the safe, sustainable, integrated movement of goods and people both within the sub-region, and to and from locations outside the sub-region.

28 July 2007

CANTERBURY REGIONAL LAND TRANSPORT STRATEGY
Extracts Relevant to the Variation

KRA.1 – Alternative Modes

Future Needs

A core component of the strategy is to increase the proportion of trips made by walking, cycling and public transport. …
The desired increase in trips by alternative modes is intended to replace private motor vehicle trips where their use is not necessary. An example of this is very short trips or along routes where public passenger transport is available, or could be made by more appropriate means (e.g. cheaper, less damaging to the environment). … The reasons for encouraging alternative modes include freeing up road space for trips where vehicle use is most appropriate, to reduce the adverse effects of private motor vehicle use and maintaining a choice between modes.

Policy 1.1 Support greater use of walking, ensuring the guiding principles for walking are applied.

Methods

1.1.1 Locate new developments so that these ensure walking is a convenient and attractive means of access.
1.1.2 Ensure the design and access arrangements of developments and infrastructure improvements make walking a convenient and attractive means of access.

Policy 1.2 Support greater use of cycling, ensuring the guiding principles for cycling are applied.

Methods

Ensure that new developments are located so that they support cycling as a means of access.
Provide for cycling through supportive land-use planning, demand management policies and associated promotional policies.

Policy 1.3 Support greater use of public transport

Methods

1.3.3 New developments and infrastructure improvements should be located so that they facilitate ease of access to passenger transport services.
1.3.2 Provide for passenger transport use through supportive land-use planning.

KRA 2 – Roads: Safety, environment and Infrastructure

Policy 2.3 Support the maintenance and development of the region's strategic road network.

Methods

2.3.1 Protect the functions of the strategic transport network through corridor or access management plans
2.3.3 Develop and maintain the region's strategic road network to provide for the safe, sustainable and efficient movement of people and freight.

Policy 2.4 Support the maintenance and enhancement of non-strategic local roads.

Methods

2.4.1 Ensure the status of a non-strategic local road is consistent with its function and reflects surrounding land uses and vice versa.
2.4.2 Maintain or enhance the non-strategic local road network to standards consistent with its function.
2.4.3 Provide local roads that are safe and pleasant for all users and reflect the needs and aspirations of the communities in which they exist.

KRA 3 – Demand Management

Policy 3.1 Undertake travel behaviour change programmes, and education and promotion measures to reduce the use of private motor vehicles, especially in areas of traffic congestion.

Methods

3.1.2 Encourage more efficient motor vehicle use through improved logistics and programmes that increase vehicle occupancy or reduce the demand for travel.

KRA 4 – Land Use

Policy 4.1 Promote the location of housing, jobs, shopping, leisure, education and community facilities and services to support sustainable transport choices and reduce the need to travel, especially by private motor vehicle.

Methods

4.1.1 Focus major attractors of private travel demand in city and town centres or near areas of high accessibility such as alongside bus routes of high frequency and/or near public transport interchanges.
4.1.2 Promote day-to-day facilities in local centres, so that they are accessible by walking and cycling and public passenger transport.

Policy 4.2 Design and programme developments and related infrastructure to support sustainable transport choices, improve interchange between modes and to reduce the need to travel, especially by private motor vehicle.

Methods

4.2.3 Promote the design of new developments with higher density residential and/or mixed-use developments close to main urban transport routes, in and around city and suburban centres and town centres.

4.2.4 Provide appropriate access and priority for pedestrians, cyclists and public passenger transport in, through and between town centres, suburban centres, local neighbourhoods and new subdivisions.

Policy 4.3 Ensure that land-use, transportation planning and transport provision are supportive and priorities closely linked.

Methods

4.3.2 Protect the function of strategic transport infrastructure from other land-use activities through city and district plan provisions.

March 2005

CHRISTCHURCH CITY PLAN
Extracts Relevant to the Variation

Volume 2: The Statement of Objectives Policies and Methods

Section 2 – Natural Environment

Objective: Air

2.3 Improvement of the standards of air quality over the City, influenced by the location and nature of land use activities.

Policy: Transport Emissions

2.3.1 To promote reduced air emissions from transport through a strategy of consolidating the urban form, which also provides for the ability to retain a viable public transport system and promotes lessening dependence on motor vehicle use.

Explanation and reasons:
The Council has little control over the generation of demand for private vehicle transport, but can ensure that the overall pattern of urban development that takes place within the City enables options for reduced dependence on motor vehicle transport to still be viable in the future.

The Plan contains objectives and policies elsewhere to promote the strategy of urban consolidation and is selective in increasing urban densities close to the central city and around some suburban focal points (shown on Urban Growth Strategy' map, Volume 2, Section 6). It is expected that these policies will be one of a number of strategies, both within and outside the City Plan, which will enable a potential reduction in vehicle emissions and travel distances as one means of reducing air pollution from a major source, that being motorised transport.

Section 3 – Energy

Objective: Energy Conservation

3.1 The efficient use of energy, in both supply and consumption, whilst promoting the development of alternative renewable energy sources.

Policy: Energy Conservation

3.1.4 To encourage energy efficiency in transportation.

Explanation and reasons:
… The form of the City is one means of influencing energy saving, in particular through transportation patterns and the relationship of activities one to another. …

Such an urban form assists in reducing use of the private motor vehicle and minimising the length of journey, by ensuring people have ready access to servicing their day to day needs. Furthermore, alternative forms of transport such as cycling and walking became more attractive due to the proximity of employment, shops and services, and of public transport routes for longer trips.

Section 6 – Urban Growth

Objective: Urban consolidation

6.1 To accommodate urban growth with a primary emphasis on consolidation.

Reasons

…

Urban consolidation will assist in achieving a reduction in private car-borne trips. Trip lengths can be shortened by locating housing close to employment, schools and business areas. Other modes of transport are assisted by ensuring that safe and convenient pedestrian and cycling links are provided in new neighbourhoods, and through increasing population densities to support public transport.

Objective: Business activity and urban growth

6.2 Patterns of land use that promote and reinforce a close proximity and good accessibility between living, business and other employment areas.

…

The way in which social, business and cultural activities are distributed within Christchurch has a major influence on travel demand and energy consumption. While it is unrealistic to expect all people to use facilities or obtain employment nearest to their homes, particularly in a flexible labour market, there are good reasons why the opportunities should at least be made available. These include:

- Enabling people with limited private transport to have convenient access to shops and other facilities;
- Enabling people to have a choice as to whether they use a car, walk or cycle, or use public transport; and
- Enabling those who do rely on car travel, to be able to reduce trip lengths to access services, recreation and employment.

This reasoning does not just apply to home based trips, because by maintaining a reasonably compact city, trip generation from other origins can also be influenced towards achieving a more sustainable form of personal mobility in the long term.

Policy: Central City

6.2.1 To promote the central city as the principal focus for commercial, administration, employment, cultural and tourism activities.

Explanation and reasons:

… (The central city) is literally the centre of Christchurch and the converging point of the city's radial road network. The central city is therefore the most accessible part of the city for most people, and the logical focus of public transport. Because reducing transport demand is an important long term aim of the Plan, the continuing existence of the central city as a socially economically and environmentally attractive area, is important in achieving the purpose of the Act in the context of the physical resources of the City.

Policy: Suburban centres

6.2.2 To encourage a continuing distribution of compact suburban centres that provide for the needs of the City and its communities in a manner that minimises adverse effects on the transport network and the amenities of living environments.

Explanation and reasons:
This policy seeks to encourage a reduction in travel demand by private vehicles through encouraging a distribution of shopping centres that are conveniently located throughout the city. Some of the larger shopping centres will serve as "consolidation focal points", a key component of the urban growth strategy, and are therefore complemented by medium density housing in close proximity (refer to Policy 6.1.1(a) and the 'Urban Growth Strategy' map, Volume 2, Section 6).

… The expansion of existing centres, or the creation of new ones, should occur in locations and on routes that … are serviced by public transport, and where the level of demand on the road network can be accommodated.

… Particular district centres have a role as consolidation focal points for adjoining residential development at higher densities, and generally provide accessible facilities that can be reached by different transport modes, entailing relatively short journeys.

Section 7 Transport

Overall Transport objective

An efficient, safe and sustainable transport system in the City which provides for ease of accessibility for people and goods.

Objective: A sustainable transport system

7.1 A safe, efficient and sustainable transport system.

Reasons:
The impacts of the transport system can be many and far ranging if care is not taken to avoid, remedy or mitigate the adverse effects which may be produced. There are not only the direct effects of traffic such as vibration, fumes and noise, but also the indirect effects of loss of privacy, loss of land for other users, separation of neighbourhood areas, accident damage and injury, and the costs of congestion and lack of accessibility. …

Policies: Minimising adverse effects

7.1.1 To remedy, mitigate or avoid the adverse effects of the use of the transport system.

7.1.2 To promote integration of transport and land use planning.

7.1.3 To promote integration of the planning, management, and operation of all elements of the transport system.

7.1.4 To make efficient use of the transport system, particularly its infrastructure.

7.1.5 To encourage change in the transport system towards sustainability.

Explanation and reasons:
Alternatives to the private motor car, such as bicycles, public transport and walking, can be promoted by the Council through education, parking policies and construction of pedestrian and cycle facilities. If these alternative modes of transport and measures can be successfully promoted, it may lead to some containment of the growth in use of the private motor car in the medium term.

…

In addition, the number and length of vehicle trips can be reduced through a variety of city growth and land use options, and other traffic demand management measures. Increasing densities towards the central city and around

community consolidation focal points (shown on Urban Growth Strategy' map, Volume 2, Section 6) in the suburbs can reduce dependency on car use. Other forms of transport become more attractive due to the close vicinity to employment areas, shopping and services and public transport routes for longer trips.

Policy: Integrated Sustainable Transport Strategy

7.1.6 To develop a long term integrated strategy for transport.

Explanation and reasons:

A long term strategy would cover longer time frames than the ten-year life of the current City Plan. It should determine long-term directions and assist in the understanding of the City Plan transport sections by providing a setting for the integrated development of the transport system towards being more sustainable. Such a strategy would be developed with other appropriate agencies and stakeholders as well as by the City Council and the people of Christchurch. This strategy would allow Christchurch to plan for its transportation future, just as the Master Transportation Study of the 1960's enabled Christchurch to develop its transport system over the past thirty years.

Objective: Road Network

7.2 An efficient and effective road network that allows the City to function and develop with minimal conflict between land uses, traffic and people.

Reasons:

The transportation of nearly all goods and people within the City is undertaken by vehicles using the road network. This situation is unlikely to change significantly in the medium term, although cycling, public transport and rail may play an increasingly important role as current fossil fuel sources decline or become more costly. It is therefore important to plan the road network in conjunction with surrounding land uses to provide accessibility to all parts of the City, while minimising any conflicts, such as those created by strip development of commercial land uses along arterial roads. In this way the objective provides for the economic development of the City in conjunction with a high level of mobility for residents and visitors.

The planning of the network needs to take into account the finite characteristics of natural and physical resources. An example of this is the use of traffic management to increase existing road capacities, rather than taking more land to construct a new link. This will not always be an appropriate option however, as the adverse effects of restricting a road within its existing width may well be greater than the effects of obtaining extra land for widening, or constructing a new road.

Policy: Hierarchy of roads.

7.2.1. To continue to plan, build, maintain, and manage the operation of the roads in Christchurch as a hierarchical network comprised of roads of different classifications, and to recognise the different functions and roles of roads and their environmental impacts within those classifications.

Explanation and reasons:

For over 25 years the City has adopted, and continued to develop, a hierarchy of roads. Each road is generally classified with respect to its planned traffic function and the surrounding land uses. The highest classified roads (major arterials) provide for the greatest level of movement with a minimum access function, while

local roads provide for very little through movement, but have a major access function. In this way the hierarchical network provides for the efficient and safe movement of people and goods, while reducing the conflicts which arise between traffic requirements and the environment of surrounding areas. The function of each road classification in the hierarchy is as follows:

- **Major Arterial Roads**

Major arterial roads are the dominant elements of the roading network connecting the major localities of the region, both within and beyond the main urban area, and link to the most important external localities. Some major arterials, particularly some State Highways, serve an important by-pass function within the City, directing traffic through the district to areas beyond. Major arterial roads cater especially for longer trips and generally link to other arterial roads and collector roads. They will be constructed and managed to minimise their local access function.

- **Minor Arterial Roads**

Minor arterial roads provide the connections between major arterial roads and inter-connect the major rural, suburban, commercial and industrial areas. They may also define the boundaries of neighbourhood areas, along with major arterial roads. Generally, these roads cater for trips of intermediate length. They will generally connect to other minor and major arterial roads and to collector roads. Some of these roads are essential routes to more remote parts of the region and to recreation facilities, such as ski-fields and parks.
…

Continued roading improvements on arterial roads will eventually provide continuity of travel with roads of similar function having similar design and access controls. Arterial roads also have a key role in terms of defining communities.

Policy: Planning the network

7.2.2 To protect the function of the road network and the environment of adjacent land uses from the adverse effects of high traffic generators.

Explanation and reasons:

The efficiency and safety of the road network, particularly arterial roads, requires minimising conflicts between various road users. Important in this respect is protection from queuing and manoeuvring vehicles through the control of access to and from high traffic generating activities. These may be in the form of individual land uses, or a grouping of activities such as a suburban shopping centre.

Policy: Land use control

7.2.5 To control the establishment of land use activities to achieve compatibility with the roads they front by avoiding, remedying or mitigating the effects which each has on the other.

Explanation and reasons:

The purpose of controls on the types of land uses which may develop alongside various elements of the road network is twofold.

The safety and efficiency of the road can be adversely affected by parking, access and pedestrian activity associated with a particular activity. Safety, efficiency and accessibility are paramount when planning transport in the City. The siting of appropriate land uses alongside the appropriate elements of the network will result in benefits of less accidents and greater efficiency. …

… The function of arterial roads is to carry large volumes of vehicles, particularly heavy vehicles, between major localities. It must therefore be expected that the potential effects upon activities alongside these roads will be greater than for those alongside local roads, where by comparison traffic volumes are low. For example, strip development along major roading links is not desirable and any development on these links will be encouraged to be clustered - a grouping of activities sharing a minimum number of accesses to this part of the roading system.

Policy: Central city access

7.2.7 To provide a high standard of access for people to, from and within the central city.

Explanation and reasons:

The central city is the area of the City where the concentration of activity and people is greatest. It is the Council's intention that access to the central city will be as free as practicable for all forms of public transport, business vehicles and private transport for short-term visitors. This requires a road network of high standard both leading into the central city, and also within it for ease of internal movement. A highly convenient passenger transport interchange is to be provided which promotes bus patronage to the central city, notably by commuters.

Access to the central city of Christchurch is relatively easy and convenient compared to most other New Zealand cities. This is a strength to be retained and will assist the central city to survive and thrive because of the ability for people to readily travel to it and move around within it. Access to the central city by visitors, shoppers and business people must be to a high standard to ensure that the commercial and community activities found in the central city are supported and serviced without undue constraint or disadvantage. This is especially important when considering the existence of conveniently located and comprehensively designed suburban centres. Excellent access and facilities for cycles and public transport is essential for promoting more efficient use of energy, lessening peak congestion, and reducing pressure on valuable and limited car parking.

Given the specific focus of this policy it is also reflected in the Business section of the Plan.

Environmental results anticipated

An efficient and effective road network allowing the City to function and develop with minimal conflict between land uses, traffic and people is anticipated to produce the following outcomes:

- Improved road safety generally throughout the City.
- Minimisation of growth in the use of non-renewable energy sources in transport.
- Improved visual amenity and accessibility city-wide.
- Enhanced viability of the central city as an area that is easily accessed, and within which people can move around as freely as possible.
- A reduction in conflicts between land uses and road functions.

Implementation

Objective 7.2 and associated policies will be implemented through a number of methods including the following:

District Plan

- The identification and development of a hierarchical network of roads for the City, classifying roads with respect to their planned traffic function and the surrounding land uses.
- Identification of a Special Purpose (Road) Zone providing for road travel and transportation, and the range of activities that customarily take place on roads. …

Objective: Public Transport

7.3 Recognition of the public transport needs of people throughout the City and provision for meeting those needs.

Reasons:

Alternative forms of transport to the private motor vehicle include walking, cycling and public transport.

It is necessary, and desirable, to provide for the differing requirements of these alternatives and ensure their efficiency and safety on the roading network.

Public transport provides a means of transport which has the potential, if fully utilised, to ease congestion, reduce accidents and also reduce pollution and energy usage. … Public transport also provides good access to the central city, itself an important and significant resource.

Policy: Planning

7.3.3 To plan and develop an efficient pattern of public transport routes and associated terminus facilities which best serve the public's needs.

Explanation and reasons:

An efficient pattern of routes is an important facet of the operation of a public transport system, which can provide accessibility at an affordable level. The accessibility of the route to passengers must be weighed against the journey time of more direct routes between centres of activity.

Objective: Cyclists

7.4 Provision for the safe movement of cyclists and actively encouraging cycling as a means of transport.

Reasons:

Cycling is a non polluting, energy efficient form of transport which makes little demand on road space. With the flat topography in Christchurch it can make an attractive alternative to the private motor car thereby helping to reduce congestion and the associated adverse environmental effects. …

The accident rate for cyclists per kilometre travelled is significantly higher than that for motor vehicles, and the cyclist is much more vulnerable to injury than motorists.

Policy: Network development

7.4.5 To continue to develop a clearly identified cycle network throughout the City by:

(a) providing safe, convenient cycle routes for school children;

(b) using the secondary road network and using and creating vehicle free routes where possible;

(c) making special provision for cycle commuters on some arterial roads to allow direct access to the central city; and
(d) selecting cycle routes and enhancing additional routes to increase the safety and pleasantness of the network

Explanation and reasons:
The cycle network in Christchurch needs to take account of the differing needs of the cyclists in the City as it is developed. …

The development of a comprehensive cycle network provides all cyclists with the opportunity to enjoy a safe and pleasant route and may serve to increase the numbers cycling within the City.

Objective: Pedestrians
7.5 The safe movement of pedestrians in a pleasant environment.

Reasons:
Walking forms some portion of virtually every trip that involves other methods of transport. People will be encouraged to walk, rather than using motorised transport, if they are provided with a safe, pleasant and convenient pedestrian environment. … Roads which carry a high number of vehicles at high speeds can be disconcerting for pedestrians and care is needed in designing for adequate, safe crossing points.

Policy: Facilities
7.5.1 To improve and develop pedestrian facilities throughout the City.

Explanation and reasons:
… Since walking is a form of transport which does not pollute and does not use fossil fuel resources, it should be encouraged by providing a high standard of pedestrian facilities. …

Improvement and development of pedestrian facilities throughout the City will assist in easing traffic congestion by encouraging walking as a preferred alternative to the use of motor vehicles for shorter trips and encourage the use of public transport for longer trips.

Policy: Safety
7.5.4 To reduce the conflict between vehicles and pedestrians throughout the City by providing pedestrian facilities.

Explanation and reasons:
Many roads in the City are becoming increasingly busy and therefore more difficult and dangerous to cross. This is particularly so for those people, such as some elderly, who may not be very mobile. Facilities which assist their ability to cross roads and other areas of high vehicle movement in greater safety are therefore required. … The use of such management measures will seek to increase pedestrian safety and convenience, particularly near schools and other community facilities and on busy and multi-laned roads.

Section 9 – Community Facilities and Identity

Objective: Local Community Facilities
9.1 Provision for accessible community facilities to meet educational, spiritual, health and other local needs.

Policy: Location

9.1.1 To provide for local community facilities to locate within living areas of the City, but particularly in close proximity to suburban centre or on arterial roads.

Explanation and reasons:

…

Such provision is especially important for the elderly, children or those without access to cars, as public transport serves many of these centres. The scale of such facilities however, is controlled through provisions in the Plan where the level of traffic generation is significant and could adversely affect the efficient and safe functioning of arterial roads.

Section 10 – Subdivision and Development

Objective: Anticipated land uses

10.4 Before new certificates of title are issued for land that has been subdivided, or land use development proceeds, the effects of the anticipated land use activities for which the subdivision or development is undertaken shall be taken into account, and the necessary supporting framework of services and contributions shall be provided.

Policy: Roading and access

10.4.1 To integrate new roading resulting from subdivision and/or development with the existing roading network in an efficient manner which reflects expected levels of traffic generation, and safe, efficient and convenient management of vehicles, including public transport, pedestrians and cyclists.

10.4.2 To require safe and effective vehicular access where practicable, to properties in subdivisional and/or land use developments.

Explanation and reasons:

Access to nearly all properties for goods and people is undertaken by vehicles using the road network. It is therefore important to plan the network in conjunction with surrounding land use activities so as to provide accessibility to all parts of the City, while minimising any conflicts between different land use activities, and providing for development by ensuring an efficient traffic system is provided for a mobile population.

14 November 2005

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RETAILING EFFECTS ON TRANSPORT

Appendix B

abley
transportation engineers

CHRISTCHURCH TRANSPORT STUDY (CTS) TRAFFIC MODEL

i) Historical Background

The CTS model has been developed jointly by the model owners Christchurch City Council, the Regional Council (Environment Canterbury) and Transit New Zealand. It is based around the TRACKS software suite and data originally collected from household surveys in 1990/1991. The CTS model has evolved since it's creation in the early 1990's, and since that time has been used extensively as a tool for strategic transport planning in the Christchurch area. The model was essentially re-built from scratch during 1995-1996, although this still used 1991 as a base year. That version of the model (used as a base for all subsequent versions) was tested and found to adequately back-predict conditions in 1981 and 1986[1]. The Model was also subsequently updated and re-calibrated to a 1996 rather than 1991 base[2]. Inputs provided to the model ensure that it will project the future traffic situation with appropriate accuracy for a given demographic input.

The CTS model last had a major upgrade during April 2000[3], this upgrade being conducted on behalf of the model owners by consultants Gabites Porter. The most significant element of this update was an improved representation of intersection delay.

The land-use scenarios presented in this report have been analysed by application with the latest general release of the CTS model (January 2005 version)

ii) Extent of the Model

The study area of the CTS model includes not only the whole of Christchurch City, but also parts of Waimakariri, Selwyn and Banks Peninsula Districts. About 10% of the Study Area, in terms of population and household numbers, lies outside the boundaries of the Christchurch City area. The area in these outlying districts is of predominantly rural land-use, but includes significant settlements such as Rangiora and Kaiapoi to the north, Lincoln to the south-west and Lyttelton in the south-east. Potentially significant growth areas, such as Rolleston, are also included within the Study Area.

It is important to recognise that the CTS Model, as with any transport model, is a simplified representation of reality, as it is unrealistic to attempt to model the complex behavioural trip-making decisions of each and every individual within a study area of this size. The study area for the CTS model is divided into approximately 559 smaller areas termed 'traffic zones', for which an aggregated pattern of trip-making is established. Each traffic zone is typically smaller than a Census Area Unit and consists of a number of Census mesh blocks.

1 "Christchurch Transportation Study: Revised Vehicle Driver Model Calibration and Validation Report – November 1996 (CCC)".

2 "Christchurch Transportation Study Traffic Model Update to 1996 Census Data – April 1999 (CCC)".

3 "Christchurch Transportation Study Traffic Model Update Technical Supplement – April 2000 (Gabites Porter)".

iii) How does the Model work?

a) Trip Generation

The level of traffic activity (demand) in each zone is estimated using a 'trip generation' sub-model. This trip generation sub-model takes account of the scale and distribution of land-use activities through demographic inputs for each traffic zone (such as household and job numbers in various categories). The calibrated relationships applied to this input data mean that the sub-model can be used to produce past, present or future predictions of vehicle driver trip generation, depending on the land-use and vehicle availability data provided as inputs.

The trip generation sub-model has separate methodologies for the estimation of demand for private trips, trips for the commercial carriage of goods and for trips external to the study area. The model is formulated to represent only vehicle-driver trips. In other words a fixed level of modal-split is implicitly conducted at the same stage as trip generation.

The majority of trip generation is due to private trip-making. The estimation of this in the model is based on the finding that the number of (vehicle-driver) productions may be related, at a household level, to the life-cycle category of the household and the availability of cars to that household. 8 life-cycle categories are represented in the model, each being defined by the personal characteristics of the occupants of the household and their relationship to each other. 4 categories of car-availability are represented for each of the household categories. Knowledge (or predictions of) the numbers of households in each of these categories, aggregated by zone, thus allows prediction of private trip productions throughout the Study Area. Use of the proportions of trips made for different purposes (by household category) allows their different spatial relationships to be accounted for in a trip distribution sub-model. 5 private-trip purposes are represented, along with 2 commercial purposes (LGV and HGV trips) and the external trips.

The likely level of attractions (and productions for the 2 commercial purposes) to each zone is related to demographic characteristics, such as employment by industry type as well as, for some purposes, the number of households.

b) Trip Distribution

The distribution (or pattern) of trips throughout the study area is related to the scale of productions at the origin, attractions at the destination and the disutility of a trip relative to one made to other zones. This disutility is measured as a perceived composite of the cost of the time and distance of the potential trip. Put another way, the number of trips between two areas (zones) is proportional to the amount of land use activity in each area and inversely proportional to the cost of travel (time/distance). This process is achieved by application of what is known as a 'gravity model'.

The pattern of 'external' trips (trips with at least one end outside the study area) is established separately, being based on survey results and adjusted for future years depending on observed growth levels where the roads cross the study area boundary. These trips form a very minor element (about 2%) of total trip-making within the study area.
Each pattern of demand by trip purpose is then combined. Minor adjustments are made to these trip purpose 'matrices' in order to maintain consistency

between the 24 hour model and models that represent shorter time periods (eg morning and evening peaks).

c) Trip Assignment

Vehicle trip demand is then loaded onto a network that represents available road supply. This traffic demand arranges itself on the routes available in the network to minimise the cost of travel between the desired origins and destinations. The loading is done in small increments so that assigned volumes and the resulting speeds and delays reflect the build up of traffic.

It will be apparent that to establish the distribution of trips (pattern of demand), the 'cost' of travel between alternative origins and destinations is required. This cost in the form of travel time and distance is however partially dependent on the pattern of demand and partially dependent on the level of supply as represented by the capacity of the road network. Thus there is a requirement for 'feedback' between the trip distribution and trip assignment stages, with iterations of this feedback loop continuing until costs used for distribution and formulation of a travel pattern are consistent with those produced by assignment of that particular pattern.

iv) Model Outputs

Output from the model provides information that can be used to assess the results of the run, or compare and contrast the resulting differences between two or more runs with different input parameters. The differences may be in terms of land-use assumptions or network representation, or a combination of the two.

The potential output from the model includes:

- Volumes of traffic and delays on each link/turning movement
- Total Vehicle Time
- Total Vehicle Distance
- Accident Costs
- Cost of Travel (Total Cost, Operating Cost, Time Cost, Cost/Trip)
- CO2 and CO emissions
- Road distance within each Level of Service (LOS) category

v) Accuracy of the Model

It is important to recognise that the CTS Model, like any transport model, is a simplified representation of reality, as it is unrealistic to attempt to model the complex behavioural trip-making decisions of each and every individual within a study area.

The base model (for 1996) has been shown to replicate observed conditions in that year to an acceptable degree. The accuracy of the model as a forecasting tool is of course particularly dependent upon the accuracy of the demographic inputs, with the other major determinant being an accurate representation of supply in the form of the road network capacity.

Accurately *known* demographic data is only available for past years, and the model has been proven to replicate observed patterns of use through a process of 'back-projection' to 1981 and 1986. It has also been demonstrated that the forward-forecasting ability of an earlier generation of the model (the 'TSWG'

version) was also reliable over a period of approaching 20 years (for given demographic forecasts).

It is fair to acknowledge that some concern exists about the quality and age of the *original* data on which the current CTS Model is *partially* based, although it has been updated to reflect current car-availability and the consequential trip-making characteristics etc. The City Council and Regional Council jointly engaged independent consultants Sinclair Knight Merz to conduct a review of future modelling needs in Christchurch. It is notable that this firm is retained by Transfund New Zealand to offer modelling advice to this national body. To quote from their report[4]:

"There are precedents for models being based on data 15 years old, and we are unaware of any universal standard requiring models to be updated on a 10 year basis (although this has been the practise in some cities). A stronger case for early data collection would rest on there having been major changes in travel patterns in the intervening period since the last surveys. While traffic levels have certainly increased in Christchurch, and there have been land-use developments, it is not suggested that these have led to a substantially different city layout or significant changes in the patterns of travel. The implication is that a minor model update for 2001 using mainly traffic volume information, as was done for 1996, should provide a sufficiently reliable basis for continued model use in the short term. It therefore appears that there is not a strong case for incurring the substantial expenditure in a major data collection exercise and major developments in the scope of the model. It is recognised that an alternative date for additional surveys would be 2006, coinciding with the census at that time and, in our view, this appears to be the most sensible plan."

In short, the advice from these independent consultants was that the current model (with minor updating) *would* adequately serve the requirements of the owners until 2006. A new transport model has recently been commissioned that is due for delivery in late 2008 that will be validated against March 2006 census data.

[4] "Review of Modelling Needs for Canterbury Regional Council and Christchurch City Council, Final Report" July 2000, (Sinclair Knight Merz).

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RETAILING EFFECTS ON TRANSPORT

Appendix C

LAND USE AND RETAIL JOB DISTRIBUTION
Scenario 2 Land Use Development

Introduction

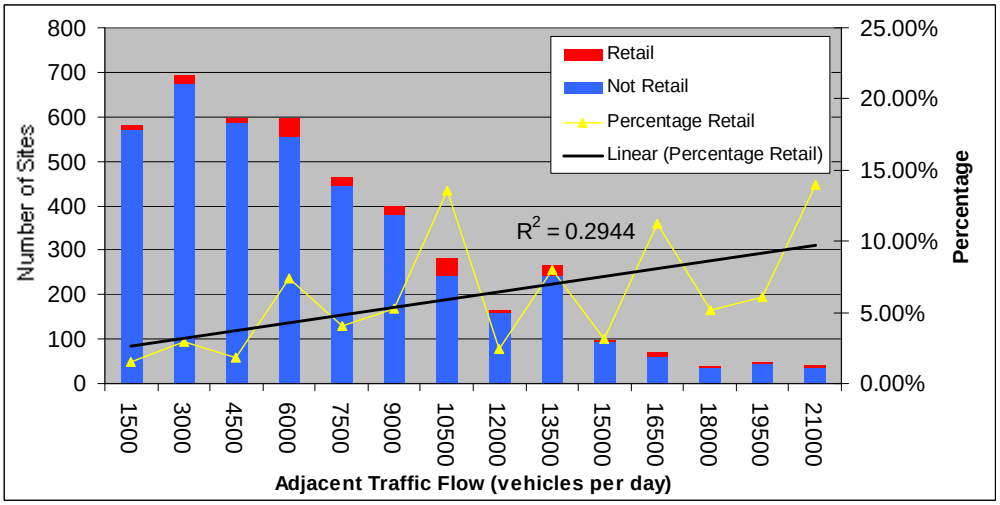
Hypothesis: "Retail activities tend to locate, and prefer frontages, onto arterial roads where the greatest degree of exposure of their goods and services to the passing public can be gained".

The methodology included in this appendix was used to test the hypothesis.

Developer Site Preference

Adjacent traffic volumes for each B3, B3B and B4 lot were recorded from the CTS 2001 modelled traffic flows. There were compared against the number of lots that contained retail in each B3, B3B and B4 zones that was identified through the Christchurch City Council retail survey that was undertaken in June 2006. **Figure C1** shows a positive relationship between traffic volume and a higher percentage of lots with retail activity as traffic volume increases.

Figure C1 B3, B3B + B4 Sites Operating as Retail



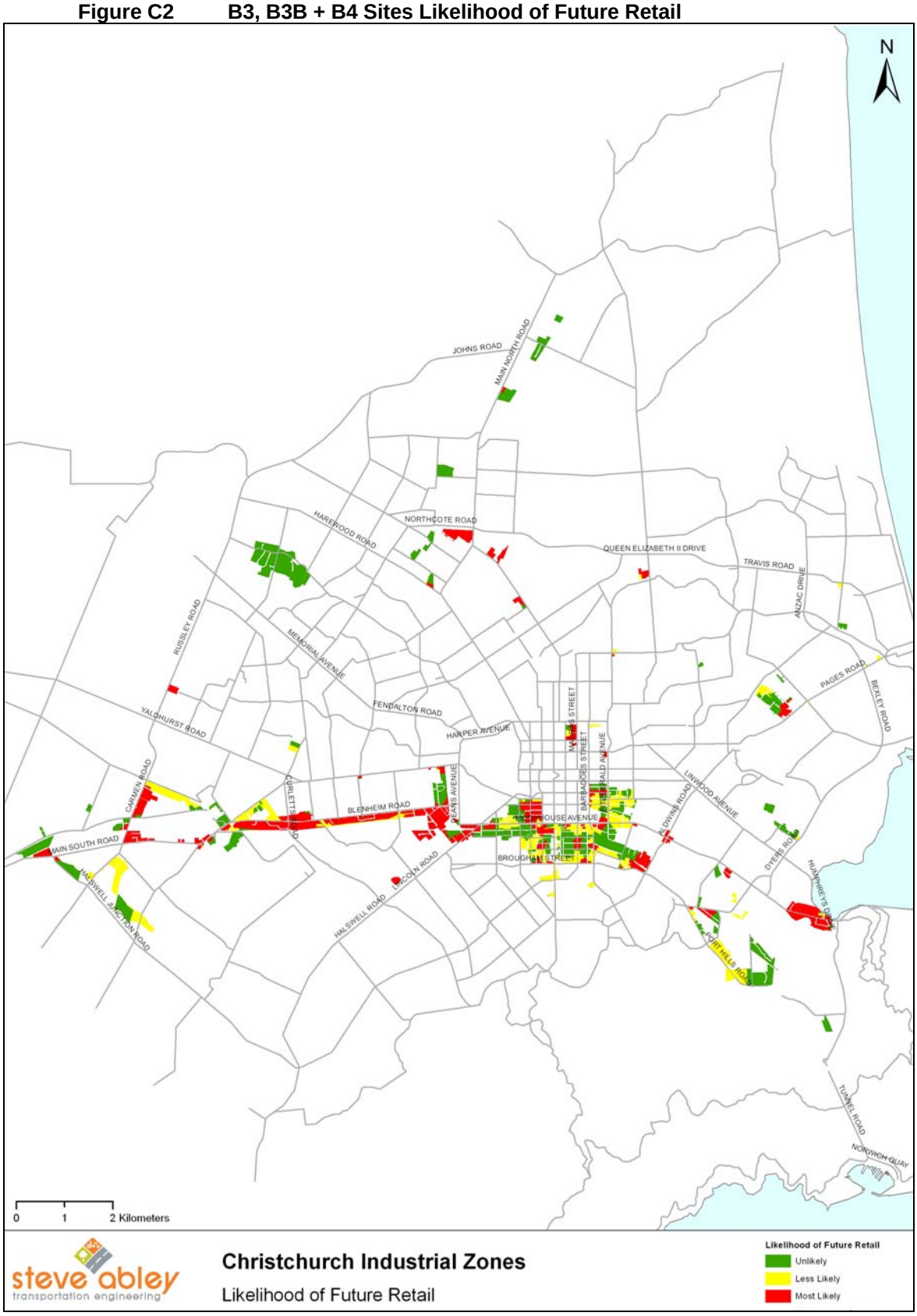
Source: CCC CTS Transport Model 2001, CCC Retail Survey June 2006.

The linear regression line that shows the percentage of retail lots in each traffic flow category is positive and supports the hypothesises.

Likelihood of Specific Industrial Sites Converting to Retail

Given that future retail sites are more likely to be located on roads with higher traffic flows, a model has been developed where B3, B3B and B4 industrial lots have been given a score of their likelihood of developing into retail. The scores are adjacent traffic flows. Scores are only assigned to lots that are not currently operating as retail. The lots with higher scores are predicted as more likely to develop into retail, and sites with lower score less likely to develop into retail. The lots were divided into three board categories of unlikely, less likely and most likely to convert to retail sites. There are approximately the same number of lots in each category. A map of the model output is shown in **Figure C2**.

Figure C2 B3, B3B + B4 Sites Likelihood of Future Retail



Attractiveness of Future Retail Sites

The increase in full time and part time retail jobs from 2006 to 2026 in Scenario 1 was redistributed using a weighted combination of likelihood of retail development, plot ratio, 2006 job density and the proportion of land use zone area within each transport zone. Only the B3, B3B and B4 lots identified as most likely to convert to retail were allowed to compete for retail jobs with the B2, CC, CCE, and BRP areas. These lots were prefixed with 'h' and this denotes their higher likelihood of including retail.

Figure C3 shows the job total retail job distribution predictions from the two models. The total number of jobs has not changed, only the distribution of jobs.

Figure C3 Total Retail Job Predictions, Scenario 1 and Scenario 2

Key to Job Changes

Increase in Jobs

Decrease in Jobs

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RETAILING EFFECTS ON TRANSPORT

Appendix D

CTS NETWORK IMPROVEMENTS INCLUDED IN 2026 SCENARIO 1 AND SCENARIO 2

Network Upgrade	Base 2006	S1 2026	S2 2026
Blenheim Rd Deviation	N	Y	Y
Ferrymead Bridge Upgrade (+Main Rd 3 laning)	N	Y	Y
Ferry/Humphreys Signals	N	Y	Y
Main South/Shands Signal Upgrade	N	Y	Y
Deans Ave/Riccarton Signals	N	Y	Y
Prestons/Marshland Rbt upgrade (2 lanes)	N	Y	Y
Pound Road/ Yaldhurst Signals	N	Y	Y
Northern Arterial (Limited Access)	N	Y	Y
Cranford St 4 Laning (Berwick-McFaddens)	N	Y	Y
Western Belfast Bypass	N	Y	Y
Hills Road Extension	N	Y	Y
Hills Rd 4 Laning (North Avon - Aylesford)	N	Y	Y
Northcote Rd 4 Laning (Main Nth-Sawyers Arms) + Sayers Arms Signals	N	Y	Y
Marshlands / QEII signals	N	Y	Y
QEII Dr/Travis Rd 4 Laning	N	Y	Y
SH1 Airport Grade Seperation (associated with 4 laning)	N	Y	Y
Gardiners Rd Left in/out (Johns 4laning)	N	Y	Y
Carmen Rd 4 Laning (Railway S Waterloo-Yaldhurst)	N	Y	Y
Johns/Russley 4 Laning (Harewood-Yaldhurst)	N	Y	Y
Johns/Russley 4 Laning (Harewood-Groynes/WBB)	N	Y	Y
McLeans Diversion to Sayers Arms	N	Y	Y
Main South/Barters signals	N	Y	Y
Yaldhurst Road 4 Laning (Racecourse to Russley) + Sigs at Racecourse	N	Y	Y
Main Sth Rd 4 Laning (Halswell Jct-Parker) + Hallswell Jct Signals	N	Y	Y
Southern Arterial + Extension	N	Y	Y
Nash Rd Extension (through to Wigram)	N	Y	Y
Dunbars/Halswell/Milnes Signals	N	Y	Y
Milnes Rd Extension	N	Y	Y
Aidenfiled / Hendersons / Halswell Rd Signals	N	Y	Y
Halswell Road 4 Laning (Curletts Road to Dunbars Road)	N	Y	Y
Rolleston SH1 Interchange (Weedons Rd)	N	Y	Y
SH1 4 Laning (Southern Ext to Rolleston)	N	Y	Y
Buckleys Rd 4 Laning (Cuffs-Breezes)	N	N	N
Ferry Rd 4 Laning (Wilsons-Aldwins) (designation)	N	Y	Y
Moorhouse 4 Laning (Wilsons to Falsegrave)	N	Y	Y
Frankleigh/Lyttelton Signals	N	Y	Y
Woodham/Kerrs Signals	N	Y	Y
Sparks/Hoonhay Signals	N	Y	Y
Glandovey/Idris Signals	N	Y	Y
Main Rd/Mt Pleasant Rbt	N	N	Y
Sockburn Signals	N	N	Y

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RETAILING EFFECTS ON TRANSPORT

Appendix E

ZONE FRONTAGE AND ARTERIAL ROAD LENGTHS
Business B3, B4 and B3B Zones and Arterial Roads

1. Major Arterial Roads

ROAD	SECTION	LENGTH	SIDE ADJOINING B3, B3B OR B4
Barbadoes Street (one-way)	Cashel to Ferry	0.7 kms	E + W
Blenheim Road	Railway to Sockburn	4.5 kms	S
Blenheim Road	Railway to Picton	0.3 kms	N
Blenheim Road	Hansons to Main South	1.2 kms	N
Brougham Street	Montreal to Waltham	1.3 kms	N
Brougham Street (LAR)	Wilsons to Ensors	0.6 kms	N
Carmen Road (LAR)	Waterloo to Buchanans	0.9 kms	E
Carmen Road (LAR)	Waterloo to Railway	0.3 kms	W
Curletts Road (LAR)	Railway to Blenheim	0.3 kms	E + W
Dyers Road (LAR)	North of Maces	0.1 kms	W
Fitzgerald Avenue	Moorhouse to Cashel	0.7 kms	E + W
Gasson Street	Brougham to Moorhouse	0.8 kms	E + W
Main North Road	Near Radcliffe Road	0.3 kms	E
Main North Road	Near Northcote Road	0.2 kms	W
Main South Road	Blenheim to Springs	0.7 kms	N + S
Main South Road	Springs to Carmen	1.5 kms	N
Main South Road	Halswell Jn to Foremans	0.6 kms	N
Main South Road	Halswell Jn to Foremans	0.7 kms	S
Moorhouse Avenue	Deans to Wilsons	3.5 kms	S
Moorhouse Avenue	Hagley to Durham	1.0 kms	N
Moorhouse Avenue	Iversen to Wilsons	0.8 kms	N
Opawa Road	Garlands to Ribbonwood	0.7 kms	N
Port Hills Road (LAR)	Curries to Tunnel Road	1.7 kms	N
Waltham Road	Moorhouse to Shakespeare	0.7 kms	E
Waltham Road	Moorhouse to Brougham	0.8 kms	W

Major Arterial Frontage Total (both sides) = **28.1 kms**
Total Length of Major Arterial = **24.9 kms**

Note 1 - (LAR) are Limited Access Roads or Proposed LAR

2. Minor Arterial Roads

ROAD	SECTION	LENGTH	SIDE ADJOINING B3, B3B OR B4
Durham Street (one-way)	Tuam to Moorhouse	0.5 kms	W
Durham Street (one-way)	Moorhouse to Brougham	0.8 kms	E + W
Ferry Road (LAR)	Charlesworth to Humphreys	1.0 km	N + S
Garlands Road	Opawa to Tanner	0.8 kms	S
Harewood Road	West of Railway	0.2 kms	N
Lichfield Street (one-way)	Barbadoes to Fitzgerald	0.4 kms	N + S
Main South Road	Watts to Blenheim	0.5 kms	S
Montreal Street (two-way)	Brougham to Moorhouse	0.8 kms	E + W
Montreal Street (one-way)	Moorhouse to Tuam	0.5 kms	E + W
Opawa Road	Wilsons to Brougham	0.2 kms	N + S
Shakespeare Road	Waltham to Wilson	0.6 kms	N
Shakespeare Road	Waltham to Defoe	0.1 kms	S
Shands Road	Amyes to Halswell Junction	0.7 kms	S
Shands Road	Skerten to HalswellJunction	0.2 kms	N
St Asaph Street (one-way)	Fitzgerald to Babadoes	0.4 kms	N + S
St Asaph Street (one-way)	Durham to Hagley	0.7 kms	N + S
Tuam Street	Fitzgerald to Stanmore	0.6 kms	N + S
Whiteleigh Ave	Leamington to Blenheim	0.6 kms	E
Whiteleigh Ave	Leamington to Blenheim	0.3 kms	W
Wordsworth Street	Waltham to Durham	1.1 kms	N + S

Minor Arterial Frontages Total (both sides) **17.5 kms**
Total Length Minor Arterial **11.0 kms**

Total Arterial Frontages (both sides) **45.6 kms**
Total Length Arterial Roads **35.9 kms**

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