

# Review of Proposed Post-Quake Bus Network

Environment Canterbury

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## Report

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August 2012



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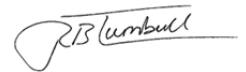
## Report Quality Assurance Statement

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# 1. Executive Summary

Traffic Design Group (TDG) was commissioned by Environment Canterbury (ECan) to assess its proposed new Christchurch bus network for its fit to post 2011 earthquake employment needs of the city.

The new bus network has been designed on a 'hub and spoke' system; a set of core routes connecting CBD and suburban interchanges with connector and link services feeding the interchanges.

Our assessment of the fit of the network to employment travel needs has used two approaches. Firstly, we have assessed the delivery of the network to meeting the overall travel demands (all travel purposes irrespective of mode) as estimated by the Christchurch Transportation Model (CTM), which includes the post-2011 quake land use.

Secondly, we have looked at the key employment zones in Christchurch, post the 2011 quake, and assessed the delivery of the proposed bus network against the geographic location of each zone.

Our assessment using the CTM looked at the "very high" and "high" transport demands generated by the model to assess the fit of the proposed network. We classified 'Very High' demand as journeys between sectors greater than 20,000 persons per weekday (irrespective of mode or travel purpose). 'High' demand was classified as being between 10,000 and 20,000 journeys.

Most 'Very High' transport demand patterns would be met by the proposed PT network. Where there was some area of concern was accommodating direct journeys between Middleton / Hoon Hay and Riccarton / Ilam where only The Orbiter provided a service.

The majority of 'High' transport demands would be met by direct services but the following journeys between sectors would not be met:

- Somerfield / Sydenham and Riccarton / Ilam
- Halswell and Riccarton / Ilam
- Tai Tapu and Riccarton / Ilam

Journeys between these sectors would require a transfer at one of the main interchanges.

An assessment made of proposed bus services to zones of high employment (those with greater than 3,000 employees) identified that the majority of zones were reasonably well catered for but Wigram and Middleton were not. We also observed that very high employment in the Sir William Pickering Drive / Roydvale Ave zone might justify a review of infrastructure and core route provision to the area.

However, although this was an assessment of employment related travel, delivery of the bus network needs to be assessed on total travel demand and therefore the outputs of the CTM may be more valuable in assessing the overall needs of the network, rather than considering employment based needs in isolation.

## 2. Background

Environment Canterbury (ECan) has developed a plan to reshape the Christchurch bus network to meet the transport demands of the city post the major September 2010 and catastrophic February 2011 earthquakes.

As a result of changes to travel patterns the previous concentration of bus services to the central city is no longer required, nor is it economically justifiable. To reduce costs and improve efficiency the network is to be reconfigured into a hub and spoke design. This will see the reestablishment of not only a strong CBD interchange, but also create suburban interchanges where services will meet and allow easy transfer.

Whereas previously most services used to travel to and through the CBD, the new network is proposed to reduce the number of services to and through the CBD to four core routes and three non-core routes. Other routes will feed the suburban interchanges allowing transfer onto the core routes or onto other circulating routes as may be required, for instance the Orbiter.

The changes are being phased into operation with Stage 1 already implemented, timed to meet the opening of the new temporary Central City Interchange known as 'Central Station.' At this time new routes to locations where pre-earthquake CBD employment has now migrated to were established. Central Station and the route changes started in October 2011.

Stage 2A saw the service frequency of six poor performing routes reduced in June 2012 as part of an efficiency drive to improve financial outcomes for ECan and its funding partner NZTA.

The next proposed change, which is referred to as Stage 2B, involves new interchanges for north-south movements. These interchanges will be primarily located at shopping destinations, being Northlands Mall in the north, with three in the south at Sydenham, Barrington and Princess Margaret Hospital. The current north-south bus routes will be modified and feed these new interchange hubs, with a new service (Route number 1) linking some of the hubs. Public consultation on these changes began on June 30 and ran for five weeks. Following the consultation, Stage 2B is planned for implementation in October 2012. The process of developing timetables for Stage 2B is underway, although in the interim, scheduled frequencies were available for this project's analysis.

Stage 3 involves new interchange hubs and route modifications focusing on east-west travel. Implementation is expected in 2014-2015 and will be refined following the assessment of the implementation of Stage 2B. Stage 3 will see interchanges developed at Riccarton, Eastgate, The Palms, Church Corner and Hornby. See Appendix A for a schematic of the route plan.

This review provides ECan with an assessment of the ability of Stage 2B and Stage 3 to serve the new employment hubs in the west and south-west of the City, which have significantly increased since the closure of the City Centre.

## 3. Review Process

The review comprised of a three step process to provide the necessary assessment to ECan.

### 3.1 Assess Land Use Change

This task required a review to summarise the key employment areas post-quake, utilising the land use datasets developed under the instruction of the Urban Development Strategy (UDS) partners and comment on changes from pre-quake areas.

### 3.2 Apply the Christchurch Transportation Model (CTM)

For this task we input the estimate of 2011 land use, which included population and employment by geographic area, into the strategic transportation planning tool for Greater Christchurch, referred to as the Christchurch Transportation Model (CTM). This produced an estimate of 2011 travel patterns for an average weekday in units of persons. Model estimates of mode of travel were not considered in this assessment – the demands quoted in this report are in units of total daily person journeys. The review considered this output in conjunction with the new north-south routes to ascertain whether the major travel movements were being catered for.

### 3.3 Qualitative Review

We undertook two steps in the qualitative review of CTM data.

#### 3.3.1 Total Traffic Demands

Utilising the outputs of the CTM with the updated land use, we undertook a qualitative review of the proposed bus network changes considering total travel demands by sector. These demands would include not only employment related trips but also, study, recreational and school journeys.

#### 3.3.2 New Employment Zones

Again using outputs of the CTM, we looked specifically at employment zones and compared these against the proposed bus network. This step looked only at the bus services to be provided to each zone, not the relative travel demand to that zone from other zones.

## 4. Land Use Change

### 4.1 Context

Prior to the 2010/11 earthquakes, land use (defined as population, households and employment) in Christchurch was collated from the 2006 Census and based on these observations, estimated for the future years of 2016, 2026 and 2041. With the devastation following the February 2011 quakes, dramatic changes in existing land use have occurred. As a result and to facilitate planning, the Urban Development Strategy partners commissioned the development of new 2011 estimates of land use and revised forecasts for 2016, 2026, and 2041.

Without any observations and in the absence of a National Census, four estimates of 2011 post-quake land use were produced. These sets are referred to as Rapid, Quick, Moderate and Slow. The differences in 2011 between the sets relate to the total reduction in population and not the spatial allocation. The differences between the sets increase in forecast years.

The “Rapid” set has been adopted for this analysis, as recommended for planning purposes by the UDS partners.

A pre-quake 2011 estimate of land use was also produced to facilitate comparisons.

### 4.2 Change in Land Use

The most significant changes in total employment by model zone are shown in the following table. Employment estimates are provided for 2011 post quake, and an estimate of the likely employment immediately prior to the February 2011 quake.

Zone Description (CTM Zone Number)	Employment 2011 (Pre Quake Estimate)	Employment 2011 (Post Quake Estimate)	Change from Quake
Sir William Pickering Drive / Roydvale Ave (Z288)	3520	7745	4225
Middleton – Birmingham Drive (Z220)	3268	5982	2714
Addington (Z183)	2076	4152	2076
Airport (Z284)	3806	5691	1885
Addington (Z348)	1040	2074	1034
Papanui – Northlands Mall (Z303)	2138	3097	959
City Centre (Z81)	2142	1071	-1071
City Centre (Z75)	1357	0	-1357
City Centre (Z73)	3103	1524	-1578
City Centre (Z60)	1635	0	-1635
City Centre (Z56)	2018	0	-2018
City Centre (Z57)	2506	325	-2180
City Centre (Z62)	2919	661	-2258
City Centre (Z58)	2658	0	-2658
City Centre (Z61)	3387	0	-3387

**Table 1: Changes in Employment from Quakes**

The significant reductions, as would be expected, are all in the City Centre. The main increases in employment are in Sir William Pickering Drive, Middleton (Birmingham Drive), Addington, the Airport, and Papanui in the vicinity of Northlands Mall.



## 5. Travel Demands

Previous to the February 2011 earthquake the Christchurch bus network was primarily orientated to provide travel to CBD based employment.

To assess travel demands post the 2011 quake the Christchurch Transportation Model (CTM) was applied using UDS agreed changes to land use. For this review we undertook an assessment of travel volumes between the 25 geographic sectors the model is divided into. Each sector is given a number and is described in the following table.

SECTOR IDENTIFIERS	
Number	Description
1	Rangiora
2	Mandeville North
3	Kaiapoi
4	Airport / McLeans Island
5	Bottle Lake / Brooklands
6	Northwood / Northcote
7	Redwood / Belfast
8	Parkland / Waimairi Beach
9	Bishopdale
10	St Albans / Merivale
11	Shirley / Burwood / Aranui
12	New Brighton / South New Brighton
13	Riccarton / Ilam
14	CBD
15	Phillipstown
16	Bromley / Woolston
17	Rolleston
18	Halswell
19	Middleton / Hoon Hay
20	Somerfield / Sydenham
21	Tai Tapu
22	Lyttelton
23	Cashmere Hills
24	Governors Bay / Diamond Harbour
25	Sumner / Mount Pleasant

**Table 2: Sector Identifier Descriptions**

It is noted that the highest number of journeys are typically contained within each sector, for instance sector 13 had an estimated 79,000 person journeys undertaken internally on an average weekday (by any mode of travel). Internal sector travel has not been considered in this assessment of the bus network.

## 5.1 Very High Travel Demands

Figure 1 below shows the 25 geographic sectors with Very High traffic demands between sectors highlighted by a large green line.

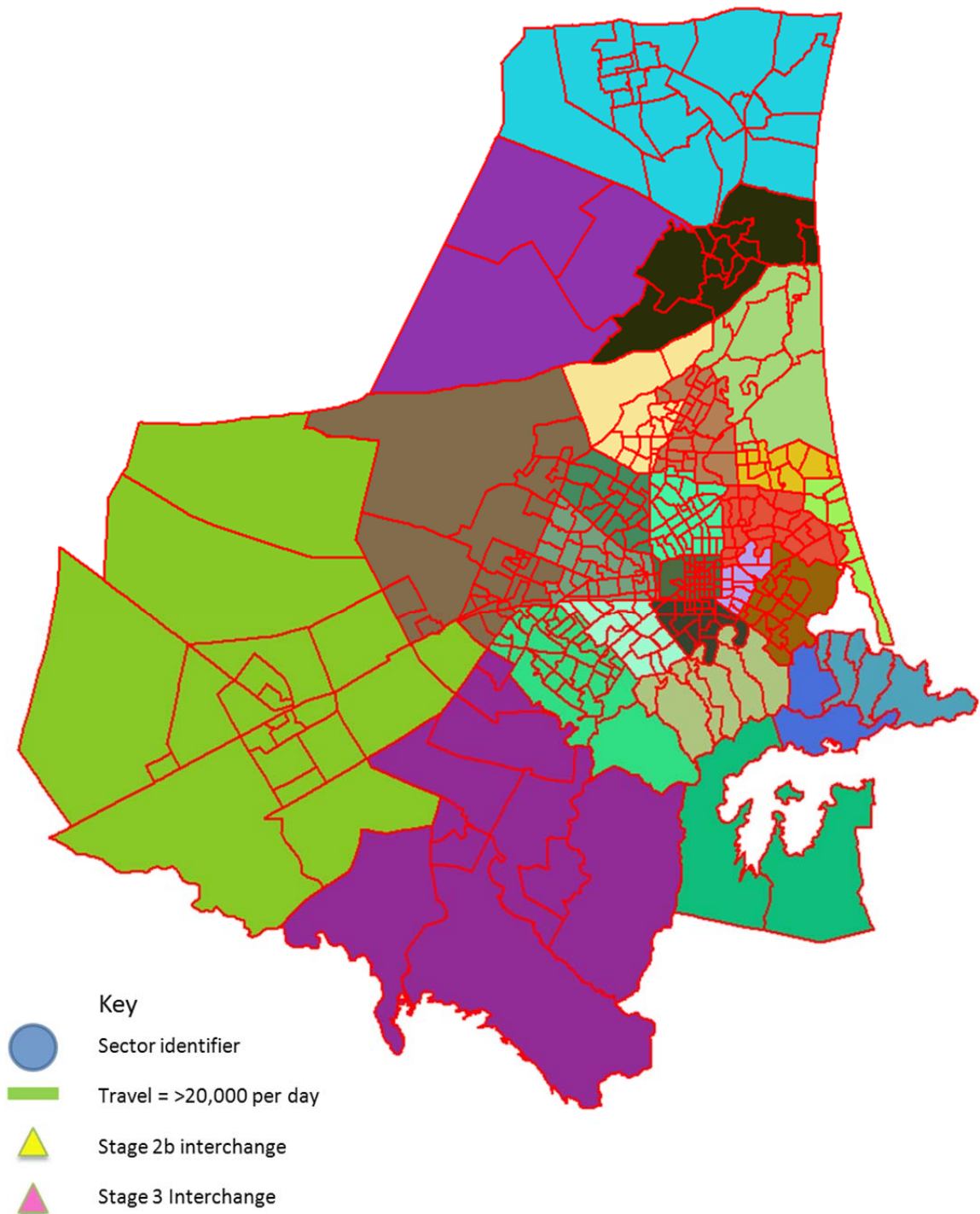


Figure 1: All Mode Person Travel between Sectors 20,000+

### 5.1.1 Demand Assessment

Very high inter-sector demands in Christchurch are noted between:

- Sectors 9 and 13, Bishopdale and Riccarton / Ilam
- Sectors 10 and 13, St Albans / Merivale and Riccarton / Ilam
- Sectors 11 and 13, Shirley / Burwood / Aranui and Riccarton / Ilam
- Sectors 19 and 13, Middleton / Hoon Hay and Riccarton / Ilam

These high transport demands centred on Sector 13 are likely to be partly due to the location of the University within this sector as well as the Westfield Mall at Riccarton.

### 5.1.2 Fit to Proposed Bus Network

Table 3 below identifies the proposed bus network routes that are aligned with the 'Very High' travel demand between CTM sectors in Christchurch.

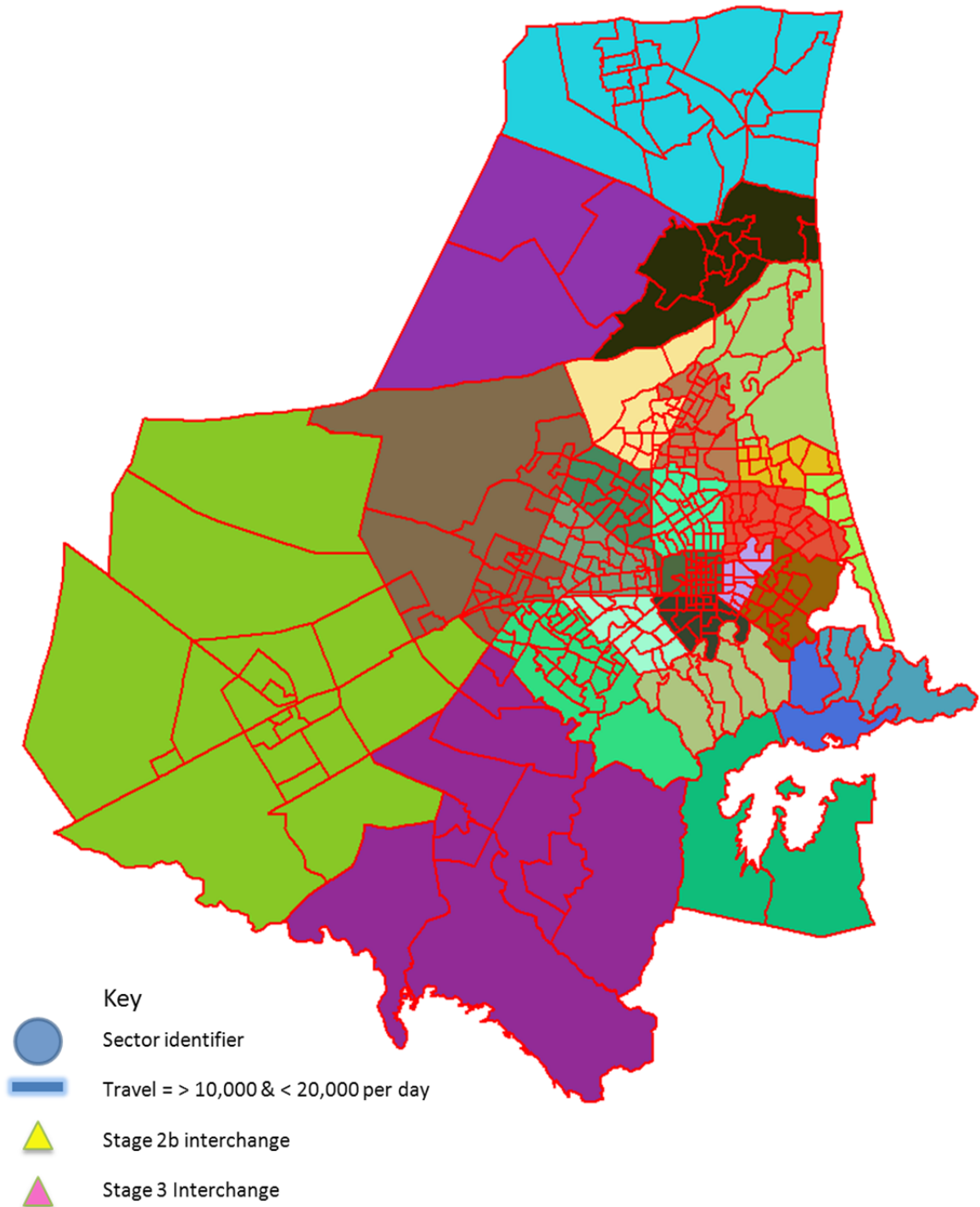
Travel between	Descriptions	Direct Routes
Sectors 9 and 13	Bishopdale and Riccarton / Ilam	Routes E4, N5,109, 120 and the Orbiter
Sectors 10 and 13	St Albans / Merivale and Riccarton / Ilam	Route E4 and the Orbiter
Sectors 11 and 13	Shirley / Burwood / Aranui and Riccarton / Ilam	Route E4 and the Orbiter
Sectors 19 and 13	Middleton / Hoon Hay and Riccarton / Ilam	Orbiter

**Table 3: Very High Demand Bus Network Fit**

The highest transport demand corridors in Christchurch appear to be mostly catered for by direct routes on the proposed network with direct travel between Sector 19 and 13 limited to the Orbiter, thus other journeys (that do not suit use of the Orbiter between these sectors) will be more likely to require a transfer.

## 5.2 High Travel Demands

Figure 2 below shows the 25 geographic sectors with High traffic demands between sectors highlighted by a large blue line.



**Figure 2: All Mode Person Travel between sectors > 10,000 & < 20,000**

## 5.2.1 Demand Assessment

High inter-sector demands in Christchurch are between

- Sectors 9 and 10, Bishopdale and St Albans / Merivale
- Sectors 10 and 11, St Albans / Merivale and Shirley / Burwood / Aranui
- Sectors 10 and 14, St Albans / Merivale and CBD
- Sectors 14 and 20, CBD and Somerfield/Sydenham
- Sectors 20 and 23, Somerfield/Sydenham and Cashmere Hills
- Sectors 20 and 13, Somerfield/Sydenham and Riccarton / Ilam
- Sectors 14 and 13, CBD and Riccarton / Ilam
- Sectors 18 and 13, Halswell and Riccarton / Ilam
- Sectors 21 and 13, Tai Tapu and Riccarton / Ilam

## 5.2.2 Fit to Proposed Bus Network

Table 4 below identifies the proposed bus network routes that are aligned with the 'High' travel demand between CTM sectors in Christchurch.

Travel Between	Descriptions	Direct Routes
Sectors 9 and 10	Bishopdale and St Albans / Merivale	Orbiter
Sectors 10 and 11	St Albans / Merivale and Shirley / Burwood / Aranui	Routes 132, E4 and The Orbiter
Sectors 10 and 14	St Albans / Merivale and CBD	Route 132, 28 & 1
Sectors 14 and 20	CBD and Somerfield / Sydenham	Route 1 and 28
Sectors 20 and 23	Somerfield / Sydenham and Cashmere Hills	Route 17 and 115
Sectors 20 and 13	Somerfield / Sydenham and Riccarton / Ilam	Indirect, requires transfer
Sectors 14 and 13	CBD and Riccarton / Ilam	Route 3
Sectors 18 and 13	Halswell and Riccarton / Ilam	Indirect, requires transfer
Sectors 21 and 13	Tai Tapu and Riccarton / Ilam	Indirect, requires transfer

**Table 4: High Demand Bus Network Fit**

These high transport demands associated with the University campus at Ilam and employment in St Albans / Merivale, CBD and Somerfield / Sydenham are likely to be driving these patterns.

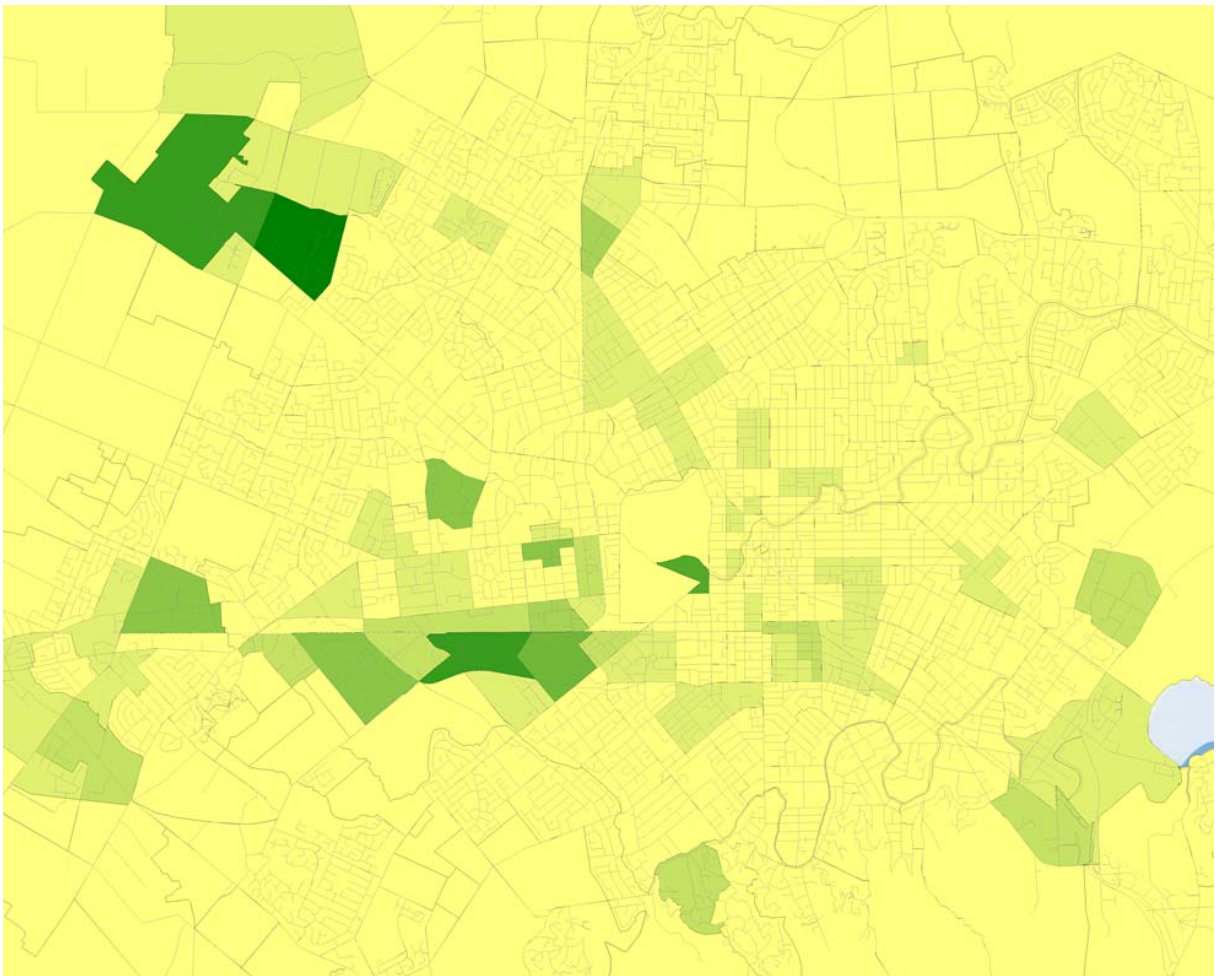
Whilst the majority of these high transport demand corridors in Christchurch appear to be directly catered for by the proposed network, others will require a transfer, most often at the CBD or at Riccarton.

## 6. Key Employment Zones

This second step of the assessment uses the updated employment allocated to model zones (a finer definition than sectors) to consider the geographic location of key zones (employment greater than 3,000 per zone) to the proposed bus network and its interchanges.

Figure 3 below shows employment by zone, with the shade of green representing the intensity, with the darkest shading indicated the highest employment.

The Roydvale area shows the highest density of employment centred on Sir William Pickering Drive. The other key areas of employment include the Airport, Middleton, the University, North Hornby, Islington, Wigram, Addington, Riccarton, Papanui and Christchurch Hospital.



**Figure 3: Employment Post 2011 Quake**

For reference, Figure 4 overleaf shows employment by zone for Greater Christchurch. The darker shading indicates model zones with higher employment, while the red lines show the boundaries of the 25 model sectors. Note that the shading is the same within each model zone and does not show individual businesses or sub-areas of high employment. As an example, there is a large shaded zone in the south but the employment in this model zone relates primarily to Lincoln University, located in the north east of that zone.

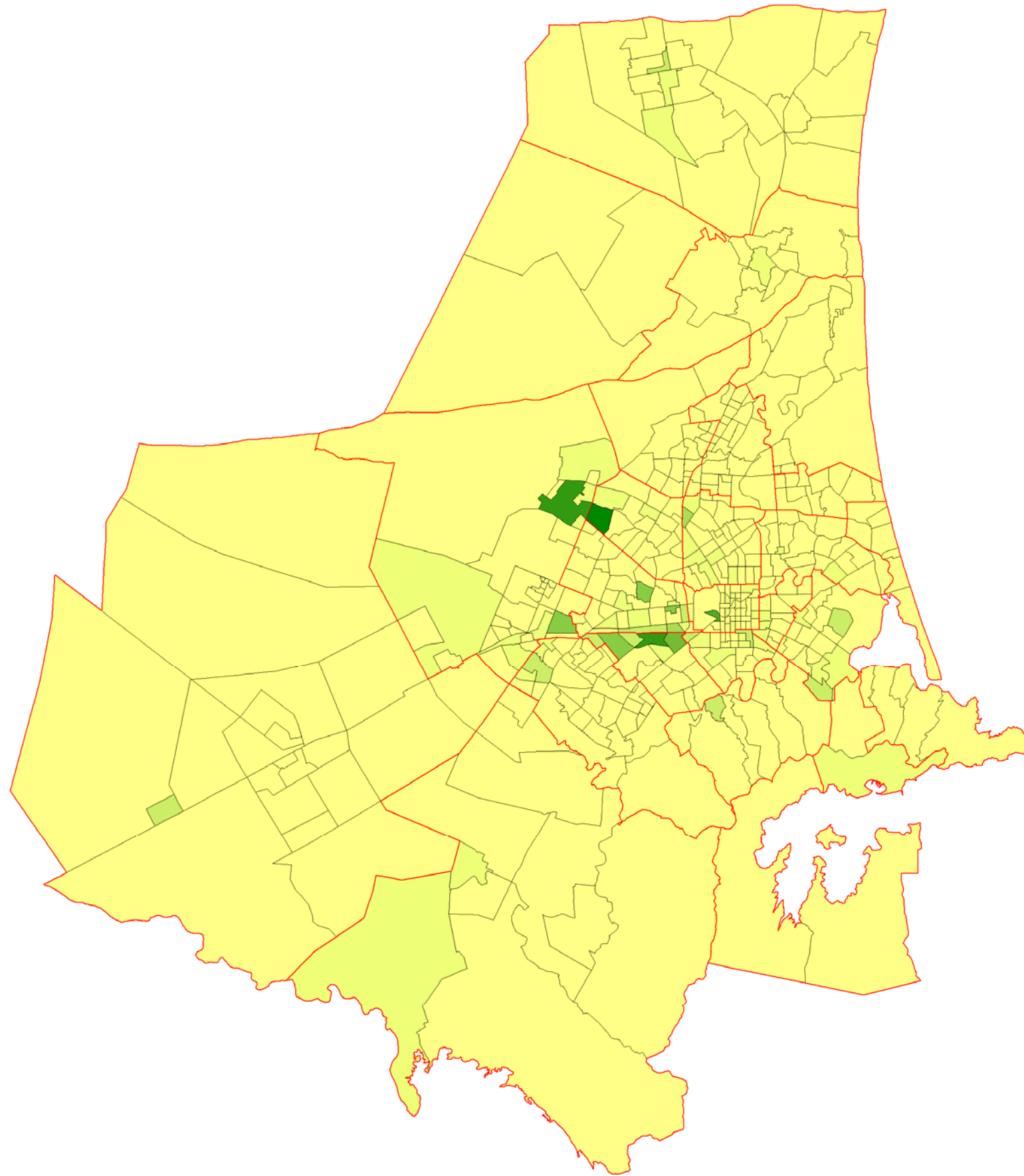


Figure 4: Employment Post 2011 Quake by CTM Model Zone

## 6.1 Fit to Proposed Bus Network

Looking specifically at the proposed network and its provision of services to key employment zones (defined as greater than 3,000 employees per zone) the assessment undertaken is reported in the following tables.

EMPLOYMENT ZONE ASSESSMENT					
Zone description (CTM zone number)	Employment of zone	Access to core services	Access to connector services	Proximity of major interchange	Assessment of access to PT network
Sir William Pickering Drive / Roydvale Ave (Z288)	7745	Medium	Very good	Poor	Medium
Airport (Z284)	5691	Good	Medium	Poor	Medium
North Hornby (Z242)	3824	Medium	Medium	Medium	Medium
Wigram (Z222)	3592	Poor	Medium	Poor	Poor
Middleton (Z220)	5980	Poor	Good	Poor	Medium
Addington (Z183)	4152	Good	Medium	Poor	Medium
Riccarton (Z256)	3309	Very good	Very good	Very good	Very Good
University (Z272)	3125	Good	Very good	Medium	Good
Hospital (Z66)	4821	Good	Good	Medium	Good

**Table 5: Employment Zone Assessment**

The basis of the assessment was as follows:

Rating	Access to core services	Access to connector services	Proximity of major interchange
Poor	No services in close proximity	No services in close proximity	No interchange in proximity
Medium	1 service in close proximity	1 service in close proximity	Interchange walkable
Good	1 service within immediate proximity	1 service within immediate proximity	Interchange within close proximity
Very Good	2 or more services within immediate proximity	2 or more services within immediate proximity	Interchange within immediate proximity

**Table 6: Employment Zone Assessment Criteria**

We conclude that the Wigram zone does not appear to be well served by public transport, considering its employment density. The Middleton zone is served by one connector service and a peak only service so given its high employment density it might not be adequately serviced. We also observe that the Sir William Pickering Drive / Roydvale Ave employment zone is well served by connector services but is not a location of a major interchange and could benefit from a connection to a core service.



## 7. Recommendations for Further Investigation

Considering the outcomes of the land use change and key employment zone assessment, we recommend the following investigation of network changes be made.

### 7.1 Middleton / Hoon Hay to Riccarton / Ilam

Given the observed CTM model travel demand between these two sectors and the significant employment density in Middleton, additional direct service could be added. This could be in the form of:

- **Extension of Route W6 north from its current proposed Riccarton terminus**, perhaps making it a through route with N5 and 109 (which would have the benefit of providing a direct connection between the two most intense employment zones in Christchurch); and/or
- **Conversion of the peak only Middleton service to an all-day service** (low frequency). Offset departures with W6 to create a 15 minute service to/from Riccarton interchange along Birmingham Drive.

### 7.2 Roydvale Ave Interchange & Route 3 Diversion

The connection of multiple services (121, N5, 109 & 120) at Roydvale Ave and the nearness of a core route within proximity to a significant employment zone in Christchurch creates a good PT integration opportunity through:

- **Creation of a purpose built interchange** at this site for workers to walk to for multiple service access; and
- **Diversion of Route 3 via the new interchange** to allow access to a frequent service from this zone to Riccarton / Ilam (a high travel demand zone to zone need) and to the Riccarton Interchange and beyond.

### 7.3 Bishopdale to St Albans / Merivale

The Orbiter goes some way to meeting the Bishopdale to St Albans / Merivale travel demand but it could be further catered to through the conversion of Route 132 (low frequency) to a Peak Frequency and through routing it with 109.

### 7.4 Somerfield / Sydenham to Riccarton / Ilam

There is good access utilising core services, with one transfer required, to meet the high travel demand between Somerfield/Sydenham and Riccarton / Ilam. To improve the accessibility between these two zones would require a direct service, but maybe only in the peaks.

### 7.5 Halswell to Riccarton / Ilam

We have identified that there is a poor level of service supplied to the Wigram area, and a high level of demand from Halswell to Riccarton / Ilam. A service enabling this connection would be worth considering:

- A peak only or low frequency service from Halswell to the Roydvale employment area via the Church Corner Interchange, Ilam Road and Memorial Ave.

- An extension of Route 120 south to provide connections to Addington and Barrington.

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# Appendix A

## New Network Concept: Greater Christchurch

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New network concept: Greater Christchurch (source: Draft Regional Public Transport Plan 2012)

