Report

Papanui Parallel MCR Scheme Assessment Report - DRAFT

Prepared for Christchurch City Council

Prepared by Beca Ltd / MWH Ltd

5 October 2015

Revision History

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on behalf of	**Beca Ltd / MWH Ltd**		

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1 Executive Summary

MHW and Beca Ltd have been commissioned by Christchurch City Council (CCC) to conduct a Scheme Assessment Report (SAR) on the Bealey Avenue to Rutland Street Reserve section of the "Papanui Parallel" Major Cycleway Route (MCR) as shown in the Figure 1-1 below.

Figure 1-1: Papanui MCR Extents Plan

The Papanui Parallel MCR is part of the development of 13 major cycleways creating a Major Cycle Network as detailed in the Christchurch Transport Strategic Plan (2012 - 2042), with construction of the Papanui scheme scheduled for 2015/16. Further information can be found in Section 4 – Background to the Project.

The scope of this report is based on CCC's **brief** requesting the following work:

- To **review and recommend criteria** used in the Multi Criteria Analysis (MCA) tool used for MCR's

- To carry out a **Route Selection** MCA assessment for the Papanui Parallel MCR, **Southern Section** between Bealey Ave and Rutland Reserve only, with all possible routes
- To complete an assessment of **Route Options** (facility types) using the new MCA criteria, for the **Southern Section**
- A consolidation of previous scheme reports (Beca/MWH) to cover the latest assessment findings and recommendations
- To include the **Northern Section** MCR between Grassmere Street and Sawyers Arms Road information prepared by ViaStrada – refer Appendices S-Z
- To produce Consultation Plans for the next phase.

All reference in this report to ViaStrada's Scheme Assessment for the Northern Section – Grassmere to Sawyers Arms Road - are taken in good faith from the report provided by CCC as shown in **Appendix S-Z**.

1.1 MCR Southern Section

Following a review of possible Criteria to use in the MCA Assessment for Papanui Parallel, 9 **MCA Criteria** were used in this report including:

Four Criteria to represent **Cyclist Level of Service** (objectives established in the CCC Best Practice Design Guide) were proposed as follows:

- **Safety and Comfort** – Assuming the correct facility type is used for each individual street, in the first assessment, any option that was considered high safety risk was rejected. Safer, low risk routes were then evaluated including how comfortable the cyclists would perceive them to be
- **Directness and Coherence** – how close to the "desire line" the route was, the number of turns (directness), and the number of changes in facility types which would affect how obvious the route was to users(coherence)
- **Connectivity** to amenity within the corridor – considered how close the route comes to schools, parks, shops and other cycle attractors/destinations within the corridor. Where routes were remote to amenities consideration to additional connections was made
- **Social Safety and Attractiveness** – balanced the general ambience and environment of the route against security, passive observation and crime prevention through environmental design (CPTED) measures

Three Criteria to represent **Community and Stakeholder Interest** are proposed:

- **Impacts on businesses** – including on-street parking or loading zones, and where access to the business would be affected by, for example, a reduction in passing traffic (and therefore potential for a drop in trade)
- **Impacts on local residents** – including on-street parking effects and access to properties where network changes would influence the ability to enter or exit streets or neighbourhoods
- **Operational and Network effects** – including:
    - Network effects - if the option affects signals operation (capacity and efficiency) or restricts turning movements at intersections and access where road closures were proposed
    - Operational effects – if the option affects rubbish collection or street cleaning.

Two Criteria to represent **Costs and Programme Risks** were chosen as follows:

- **Ease of construction** – whether the option is easy to construct or requires work that may attract more cost risk (e.g. underground services/utility relocations) and the relative cost compared to other options

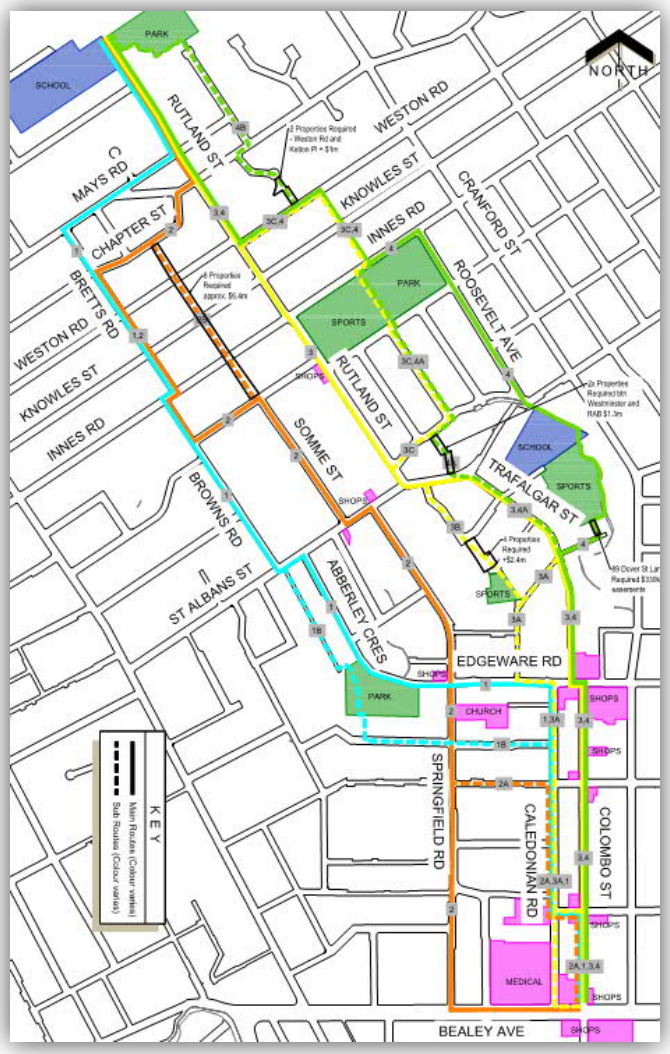
- **Land requirements / easements / other agreements** – whether there are legal or acquisition processes that would influence the timeframe in which a facility could be constructed

The methodology used by the team to complete this SAR is provided in Section 5.

Prior to the **Route Selection Assessment** (for the southern MCR between Bealey Ave and Rutland Reserve only) a route **Corridor** was defined, in agreement with CCC. The corridor was bounded between Bealey Avenue, Papanui Road, Sherbourne / Cranford Street and Rutland Reserve.

The **Route Selection** process identified 4 main "Possible routes" within the corridor. These are referred to in the figure below as Blue, Orange, Yellow and Green. Further alternative sub routes, which could improve directness of each main route should land be purchased or parks be utilised for the MCR, were identified as shown in Figure 1-2 below.

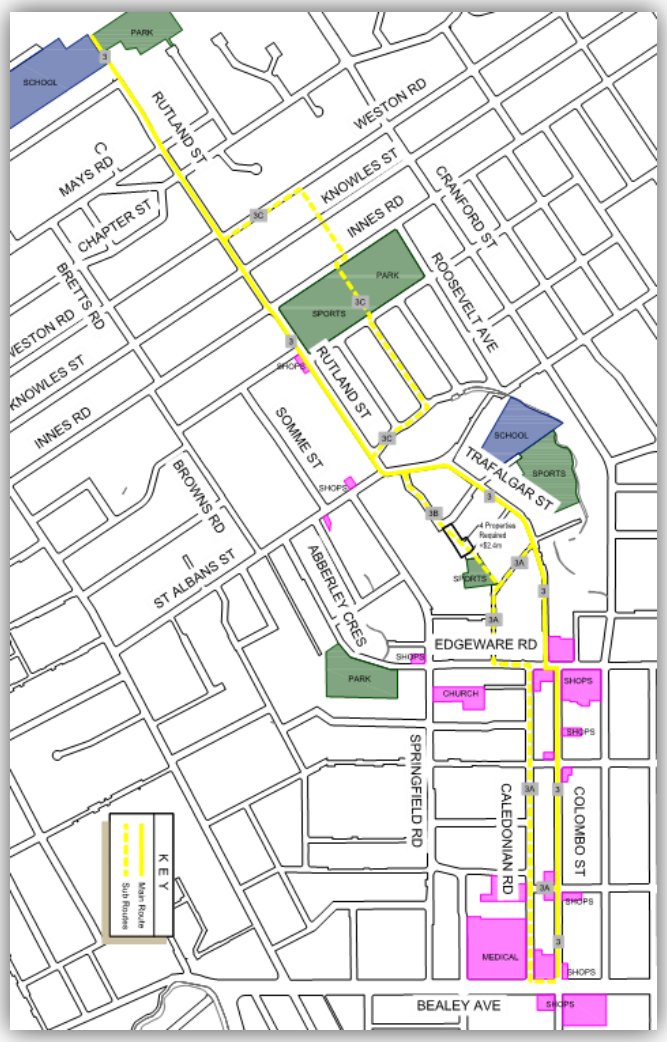
Figure 1-2 Southern Section MCR Possible Routes Plan



The initial "Route Selection" MCA assessment – shown in **Appendix H**) revealed the Yellow Route to be the preferred route as it was the most direct and provided the best link to local amenities. Overall two Yellow Routes were the highest scoring routes, as shown in Figure 1-3 below. The main differences in the two

routes is the sub route avoids the higher trafficked most direct streets (Colombo and Rutland) in an effort to avoids the loss of on street parking and loading zones that a one way separated facility creates. However this is at the expense of directness and as such attracts the risk that the route may not be used as is does not fall on the desire line for cyclists.

Figure 1-3: Southern Section MCR Yellow Routes Plan



- Main Route = Colombo Street – Edgeware Road – Trafalgar Street – St Albans Street – Rutland Street
- Sub route = Colombo - Purchas - Caledonian – Dover – Trafalgar – St Albans – Rutland – Westminster – Gossett – Rugby Park – CCC Right of Way – Weston - Rutland

A second MCA assessment of **Route Options** was carried out to:

- Provide a clear preference between the 2 Yellow routes described in Section 5.6 and
- To determine the preferred options (facility types) along the preferred route

The team thought it likely the preferred route may be a combination of the two Yellow Routes that ranked 1 and 2 in the first MCA assessment. To allow an in depth comparison of sub routes and facility types for the next phase of assessment, the MCR Yellow Route was split into three sections, as follows:

1. Bealey Ave / Colombo Street /Edgeware Road to Trafalgar Street/Dover Street Intersection
2. Trafalgar Street/Dover Street Intersection to St Albans / Rutland St Roundabout
3. Rutland Street between St Albans Street and Rutland Reserve

After the **Route Option** MCA assessment (using initial criteria weightings), the results were as follows:

- Section 1 – Bealey Ave to Trafalgar St / Dover St Intersection – did not reveal a clear favourite between Colombo Street or the alternative route along Caledonian Road. Trafalgar Street is a Greenway with cul de sac immediately north of Dover Street
- Section 2 – Preferred Option is a Greenway along Trafalgar street to Sheppards Place transitioning to a two way separated cycleway along Trafalgar St west side and St Albans St south side
- Section 3 – Preferred Option is a one way separated cycleway along Rutland Street, refer Figure 1-7

Hence **Sensitivity Analysis** was applied to the Section 1 routes (Colombo Street and Caledonian Road) based on the following weighting scenarios.

Scenario	Cycle LOS Criteria - Weighting (%)	Stakeholder Interest Criteria - Weighting (%)	Cost and Programme Risk Criteria – Weighting (%)	Section 1 – Outcome Colombo St v Caledonian Rd
Normal	45	30	25	Colombo
Cycle	80	30	20	Colombo
Stakeholder	60	60	20	Caledonian
Cost / Prog	40	30	40	Colombo
No	40	30	20	Colombo

The result showed Colombo Street to be the preferred Option in 4 of the 5 scenarios. The Colombo Street route is the most direct with good connections to local amenities, however has a greater impact to local business and residents than the Caledonian Road route. The following figures show typical cross sections for the Southern Section Route.

Figure 1-4: Colombo Street Typical Cross Section - One Way Separated Cycleways

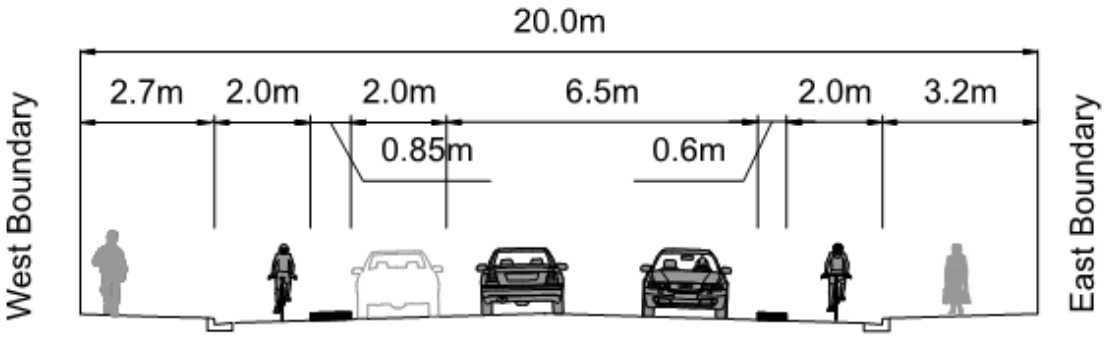


Figure 1-5: Trafalgar Typical Cross Section- Greenway

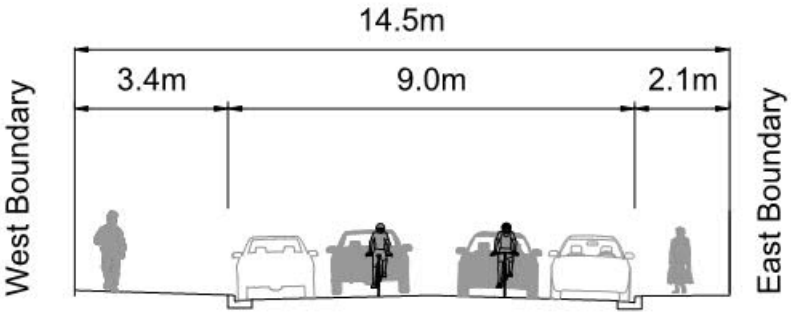


Figure 1-6: St Albans Street Typical Cross Section - Two Way

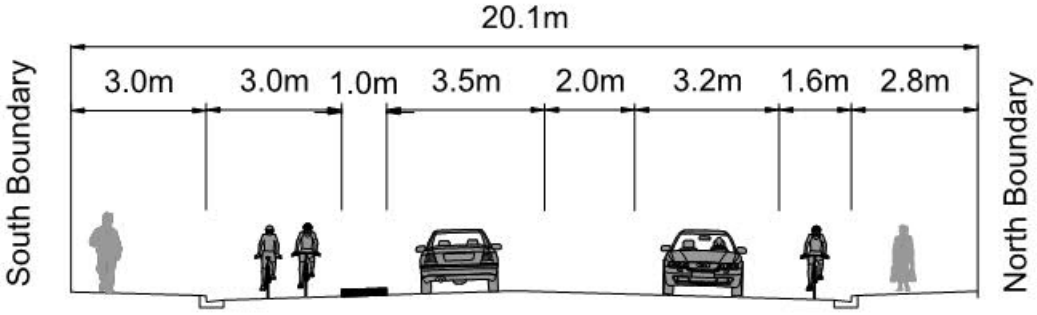
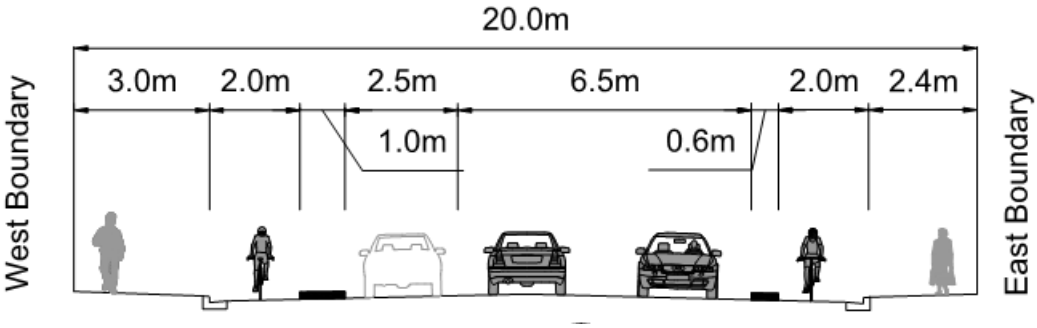


Figure 1-7: Rutland Typical Cross Section - One Way Separated Cycleways



1.2 MCR Northern Section

The Northern Section extents are shown in Figure 1-8 below.

The route is divided into (and assessed using the CCC MCA tool) two sections.

- Section 1 - Grassmere Street and
- Section 2 - Main North Road and Sawyers Arms Road

Section 1 – Grassmere Street

Options have been assessed for the south eastern and north western ends of Grassmere St separately. The south east end extent is Grants Road to 26 Grassmere Street. Options included.

- Option A1 – Greenway along south eastern section of Grassmere Street
- Option A2 – Shared path along south eastern section of Grassmere Street on the Northern Side

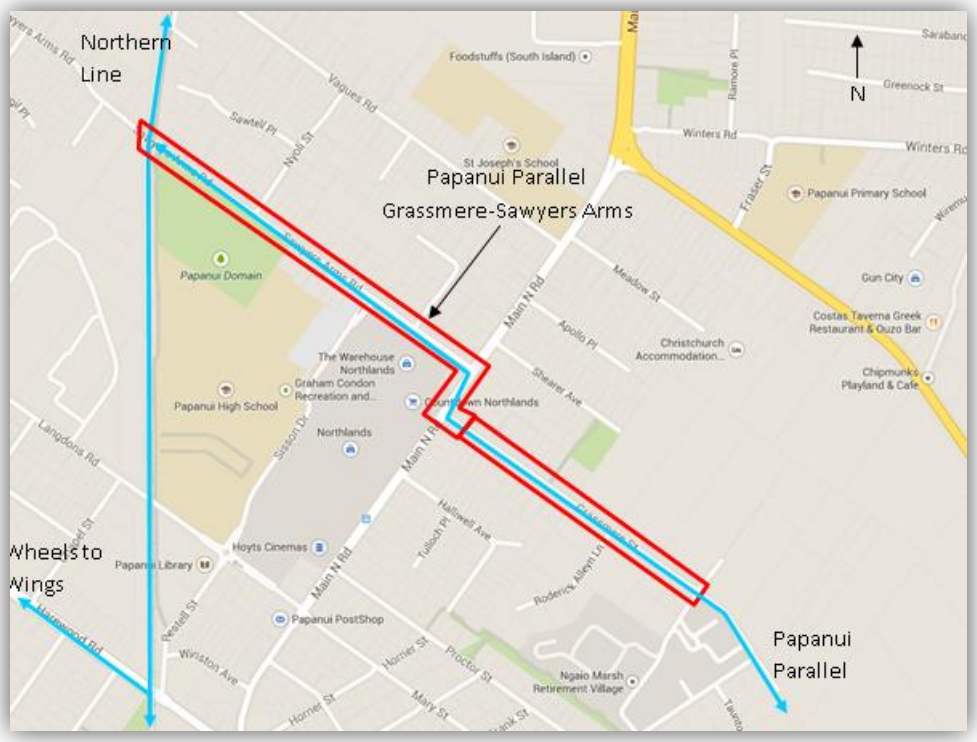
South East Grassmere Street. It is considered that both options could be designed to provide a safe route for cyclists. However, the interventions required to achieve this for Option A1, a greenway, would be more extreme. Due to the rural type environment along the south eastern segment of Grassmere Street the roadway feels very open and is more conducive to a higher speed environment. The environment combined with traffic volumes at the upper limit for a neighbourhood greenway have led to the consideration that a cul-de-sac at this end of Grassmere Street would be beneficial to create an acceptable environment for a greenway. Even if this did occur the necessary low speeds may not be achieved therefore a shared path is considered favourable predominantly on the grounds of comfort.

High traffic speeds on the carriageway directly adjacent to a shared path are still undesirable, however they are less critical than for a greenway. It is considered that a comfortable environment for a shared path can be achieved through the implementation of traffic calming along this section of Grassmere Street.

There are no side streets along the section of Grassmere Street hence there is no significant difference in way finding between the two options. However, a shared path is a more recognisable facility due to continuity from the pathway through the reserve.

The MCA assessment favoured Option A2 – as the best fit to the MCA criteria. However this option requires land acquisition which will be required in the programmed timeframe for the construction of the Papanui parallel MCR works.

Figure 1-8: Northern Section MCR - Route Extent Plan



North West Grassmere Street Options include:

- Option B1 – Greenway along north western section of Grassmere Street
- Option B2 – Two way facility along north western section of Grassmere Street on the Northern Side

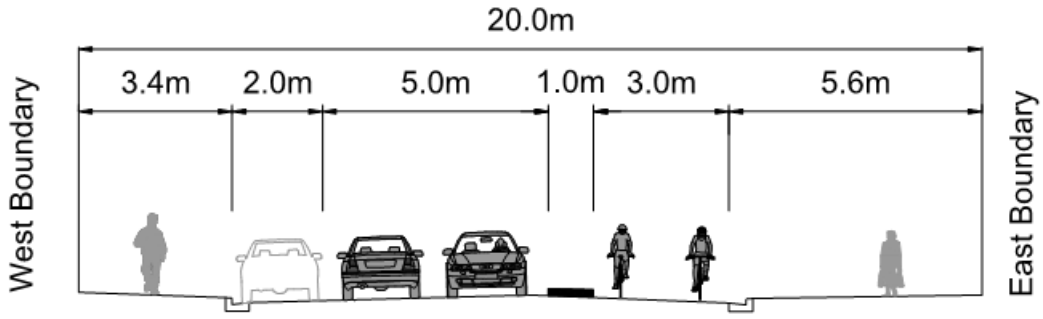
Options B1 and B2 have relatively similar outcomes from the options assessment. However, considering this section of the route in the context of the wider route option B2, a two way facility, is preferred. Option B2 allows a continuous facility along the length of Grassmere Street when combined with a shared path along the south eastern segment. If a greenway was implemented along this segment cyclists would need to enter/exit the traffic part way along Grassmere Street, a complex manoeuvre. There would also be a need for cyclists to enter/exit the traffic again at the Main North Road/Grassmere Street intersection to access the proposed cycle/pedestrian crossing.

It is noted that bi-directional cycle facilities can have safety issues at driveways. It is considered that this can be managed through design. Relatively large off-sets from the boundaries can be achieved and the residential nature of the property accesses means that users will quickly become familiar with the cycleway.

Two options were considered for the two way facility cross section. Both options considered were on the northern side of Grassmere Street to avoid the need for cyclists to cross Grassmere Street at each end of the facility.

Based on the above rationale, the MCA assessment revealed Option B1 (as shown in Figure 1-9) to be the preferred solution.

Figure 1-9: Grassmere Street Typical Cross Section – Two Way facility on east side



Section 2 – Main North Road to Sawyers Arms Road (to KiwiRail main north trunk line crossing)

Five options for the Main North Road sections of the route, from Grassmere Street to Sawyers Arms Road, were presented to the MCR signalised intersection team as part of the investigations into designing signalised intersections on Major Cycle Routes. This section involved the Grassmere Street/Main North Road and Main North Road/Sawyers Arms Road intersections, although most options focused on a crossing point at one of these two intersections with minimal effects on the other.

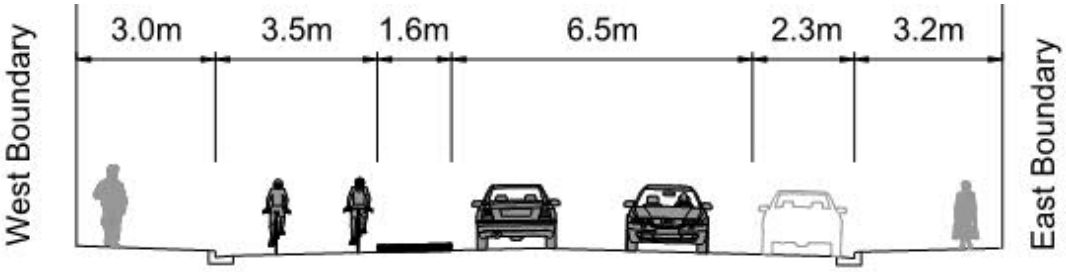
The five options were assessed in the multi-criteria analysis, and have been previously discussed in the report entitled "*MCR signalised intersections – Papanui Parallel Route: Main North Road / Sawyers Arms Road & Sawyers Arms Road / Sisson Drive*" (ViaStrada, 3 November 2014) in **Appendix T** of this report. The options considered were as follows:

- Option 1 – Two way Separated Cycleway on east side of Main North Rd, continuing on north side of Sawyers Arms Road
- Option 2 - Two way Separated Cycleway on west side of Main North Rd with midblock crossing at Grassmere Street, Sawyers Arms Road continues two way cycleway on west side to the main north railway crossing. (refer Figure 1-10)

- Option 3 - Two Way Separated Cycleway with route diversion via Shearer Ave
- Option 4 - Underpass connecting Two Way Separated Cycleway
- Option 5 - Two Way Separated Cycleway from Shearer Ave on north side of Sawyers Arms between Main North and Sissons

The options have been discussed and evaluated by the CCC MCR intersection team and this investigation flows on from their conclusions. The CCC MCR intersections team stated that the preferred option would be Option 2, as this would allow the best level of access to Northlands Mall. There was some concern about the efficiency impacts this could have on the operation of Main North Road and the impact that banning right turns out of Grassmere Street may have on some users.

Figure 1-10: Sawyers Arms Road – Typical Cross Section Two Way Separates Facility



Modelling has been undertaken to quantify these impacts. Modelling was performed for the first three options only, as options 4 and 5 were developed later in the process and CCC considered that it was not necessary to further explore these additional options at this point.

1.3 Chosen Preferred Option

Following the "**Route Option**" Facility Type MCA Assessments and sensitivity analysis, the chosen **Preferred Option** is shown below:

- Colombo Street / Bealey Avenue Intersection (one way signals with full movements)
- Colombo Street – one way separated cycleway on both sides
- Edgeware Village – 2 x signal crossings with shared path on north side of Edgeware
- Trafalgar Street – Greenway between Edgeware Road and Sheppard Place (access to St Albans school) providing a cul-de-sac north of Dover Street east intersection to reduce traffic volumes
- St. Albans Street – two way separated cycleway on south side to signalised intersection with Rutland St
- Rutland Street – one way separated facility on both sides
- Grassmere Street – A shared path between Grants Road and 29 Grassmere street (near entrance to Rutland Reserve)
- Grassmere Street - two way facility, on north side, between Grants Road and Main North Road
- Cross Main North Road at a midblock cycle crossing (with adjacent pedestrian crossing) directly North of Grassmere Street;
  - Note that this incorporates the removal of the bus stop pair currently located outside Countdown, which is consistent with ECan's plans to rationalise the stops provided at the Northlands Super Stop.
- Continue a two way separated MCR along the south side of Sawyers Arms Road.
  - This will require land purchase on the northern corner of the Main North / Sawyers Arms intersection, to accommodate the MCR (see property purchase memo in Appendix X).

- The Sawyers Arms Road MCR required changes to the existing Bus Stop facilities. Bus stops in the pair west of Sisson Drive, will be staggered, with a central flush median to allow following vehicles to overtake a stopped bus (and also provide opportunity to turn into the businesses / sports complexes on the south side of Sawyers Arms Road); The bus stop pair currently located west of Nyoli Street will be removed; and provide a median refuge crossing adjacent to the railway line for users travelling along the Northern Line MCR or transitioning between the Northern Line MCR and the Papanui Parallel MCR

The chosen **preferred option** for each section (shown above) is recommended as they meet the majority of the key cycleway objectives and associated impacts and cost/programme risk criteria.

The key **Design Issues** that were identified during the Scheme Assessment are:

- Providing safety and consistency for cycleways within the context of an existing urban environment
- Ensuring Local Business needs for access and street parking are considered carefully and all effort to retain as much parking as possible is made. It is recommended that existing P5/P30 zones should be maintained where possible to support local businesses
- Ensuring Local Residents interests are met with respect to on street parking and access.
- Ensuring the route along Colombo Street will remain viable for public transport links
- The Colombo Street, Main North and Sawyers Arms Road cycleway routes are influenced by existing bus routes (requiring route facilities which constrain the available cross section)
- Ensuring consistency between adjacent cycleway routes (within the CERA led An Accessible City development and CCC north section of the Papanui Parallel scheme as developed by MWH)
- Ensuring impacts to identified major traffic routes are kept to acceptable limits in consultation with CERA , CCC and CTOC
- Consideration for Land Requirements for the northern MCR proposal on Grassmere Street – between Grants Road and 29 Grassmere Street.
- Consider alterations to Bus Route facilities on Colombo Street and Sawyers Arms Road in discussion with Ecan, to be confirmed at the next phase
- Treatment of side roads where the new MCR is located should be standardised across all MCR's
- Physical separation is important to the safety of cyclists and should be standardised on all MCR's
- Finalising the scheme following consultation comments

The key **Risk** to the project is programme delay due to community objections if the scheme is not sympathetic to local business and residents' concerns. Any objections are likely to delay and increase the cost of implementation of the project. Options that require widening will also attract a higher risk of cost over runs due to the complexity of protection or relocation of underground services and utilities.

A Preliminary **Cost** Estimate for the Preferred Solution is $13,900,000 including P&G, Traffic Management, Design Fees and a 30% contingency.

Previous scheme assessments (on the Papanui Parallel MCR) have been reviewed by an independent **Road Safety Audit** team. However the design has further developed since these audits were undertaken.

Recommendation

That CCC approves the preferred solution with the following decisions and considerations prior to the next stage.

1. That CCC adopt 2m as a desirable minimum setback, in order to maximise the amount of parking for local residents. A key risk to delivery will be to gain local business and residents support for the

project. [For example, the proposal at Colombo Street removes most of the existing on street parking and loading zones which may raise objections during community consultation. (a reduction to 2m allows more on street parking – approx. 48 spaces, compared to 17 spaces for a 5m setback – to support local residents and businesses)]

2. Land acquisition process is initiated early in the next phase

3. That Consultation with key Stakeholders be undertaken to confirm the Preferred Option, including Ecan for proposed changes to Bus Route facilities on Colombo Street and Sawyers Arms Road.

2 Introduction

MWH (NZ) Ltd and Beca Ltd have been commissioned by Christchurch City Council (CCC) to conduct an integrated Scheme Assessment on the Papanui Parallel Major Cycle Route (MCR) from Colombo Street/ Bealey Avenue intersection to the Rutland Reserve at the north end of Rutland Street. The commission requires that this reporting includes the sections of the Papanui Parallel from Rutland Reserve north to the Sawyers Arms Road/Main North Rail line intersection. The development, assessment and reporting for these northern elements were developed under an earlier commission with ViaStrada Ltd, and the contents of their scheme reporting have been included in this reporting in good faith.

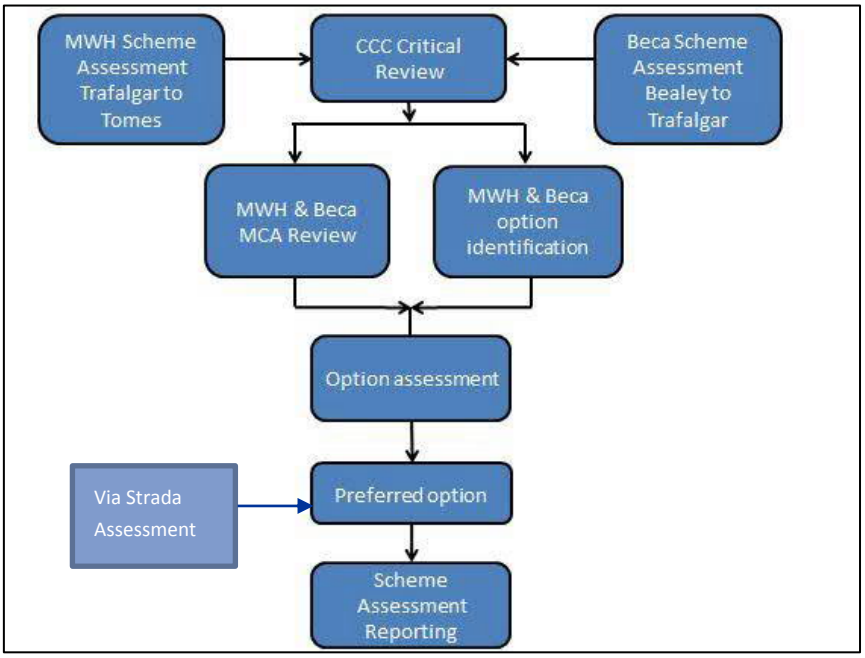
The work on the southern sections (from Bealey Avenue to Rutland Reserve) follows previously completed Scheme Assessment Reports for sections of the Papanui Parallel MCR – Beca from Colombo Bealey to Trafalgar/St Albans; and MWH from Trafalgar St Albans to Rutland Reserve. The two reports delivered recommended configurations for the MCR that had been developed through use of the MCR-accepted multi-criteria analysis tool.

CCC's brief requested the following work:

1. A review of the criteria used in the Multi Criteria Analysis (MCA) tool used for MCR's
2. A route selection assessment for the Papanui Parallel MCR with all possible routes
3. A reassessment of the route options using the new MCA criteria
4. A consolidation of previous scheme reports to cover the latest assessment findings and recommendations

Figure 2-1 describes how this project has been commissioned and shows how the work will progress.

Figure 2-1: Papanui Parallel Scheme Assessment progression



While a review has been undertaken to identify routes from Bealey Avenue to Rutland Reserve, and assess impacts, this report relies heavily on the two scheme assessment reports that precede it. Much of the background work undertaken remains useful and valid.

As the flow chart shows, the MCA and option identification process have been reviewed and updated.

This report:

- States the project objectives (CCC's SAR Part 3)
- Outlines the guidance and design standards to be followed
- Provides background to set the scheme context
- Describes the updated methodology used to identify and assess routes for this investigation; and
- Describes the updates to the MCA criteria;
- Describes the route environs and its characteristics
- (the preceding three bullets are the CCC's SAR Part 2)
- Provides a route description of the possible routes
- Uses an MCA assessment to select the best Cycle Route within the route corridor
- Divides the route into sections to allow facility type option comparison
- Identifies facility type options and decides which are to be assessed using the updated MCA
- Describes the design options that could be applied to the route
- Assesses the selected options using a revised multi-criteria analysis (MCA) tool
- Identifies key issues that will need to be considered prior to selection/implementation
- (the preceding three bullets are the CCC's SAR Part 4)
- Recommends options to be taken through consultation to implementation
- Provides Scheme Stage cost estimates for option comparison
- Provides an overview of key risks and safety in design issues
- (the preceding three bullets are the CCC's SAR Part 5)

3 Project Objectives and Design Requirements

3.1 Project Objectives

Based on the 'need for the project', consideration of the background information, and feedback from the first three scheme assessment reports, the aim and objectives of the project are to:

- Develop a safe; direct; connected and coherent; attractive; and comfortable cycleway that forms part of the Papanui Parallel Major Cycle Route by: full assessment of Bealey Avenue to Rutland Reserve section (must connect at the northern extent to the Rutland Reserve path, and at the southern extent to the Colombo Street cycle facilities south of Bealey Avenue); and adoption of the existing assessment from Rutland Reserve north the Sawyers Arms Road.

- Recognise and respond appropriately to the transport network as detailed in the existing and proposed District Plan. They both show Main North Road as a minor arterial; Rutland Street, St Albans Street, Edgeware Road, Colombo Street and Sawyers Arms Road as collectors for their extent in this corridor; Caledonian Road, Grassmere Street and Trafalgar Street are local roads. Road geometry changes should cater for the appropriate level of demand for this type of road.

- Develop intersection and road geometry treatments that recognise the classification of adjoining and intersecting roads – St Albans Street, Mays Road and McFaddens Roads are Collectors and Innes Road is a Minor Arterial; Bealey Avenue is a Major Arterial. The project must specifically not alter the turning movements that are currently in operation at the Rutland St / Innes Road intersection.

Safety, directness, connectedness and coherence, attractiveness and comfort are objectives that will be used to assess cycleway level of service of the options developed in Section 6. Specifically, this will be a cycleway that:

- Will encourage new users (the interested but concerned category);
- Is suitable for children aged 10 years and over;
- Improves the Level of Service for cyclists so that they are given a high level of priority;
- Includes 'flagship' or innovative design sub-routes, based on best practice examples or best advice on a 'launch and learn' basis, to make a strong statement about cycling in the city;
- Provides an enjoyable experience that will encourage people to start / continue to cycle;
- Creates attractive off-road routes, separated cycle paths and lanes, neighbourhood greenways, easy and safe intersections and crossing points, aligning with the Christchurch City Council's Christchurch Transport Strategic Plan and Cycle Design Guidelines;
- Operates smoothly with continuous/consistent sections of treatments and is coherent to all road users;
- Incorporates use of alternative/innovative products, designs and methodologies to support and compliment cycle facilities to prioritise cycling;
- Has improved connectivity to destinations and other cycleways nearby through targeted measures on adjoining links;
- Reflects the street character, considering local activities, landscaping, urban design, CPTED and universal design principles;
- Implements good cycle signage and markings to ensure high level of service for regulatory, guidance, directional, route signing and information;

- Includes provision of good quality cycle parking facilities at destinations along the route where required.

3.2 Design Requirements

CCC Design Requirements are set out in the Major Cycleways Design Guide – Design Principles Best Practice Guide dated December 2014. This document sets desirable standards for various types of cycleways applicable to various street environments. Included are desirable widths for cycle lanes and shared paths and clear zones /separation adjacent to cycleways – CCC's MCR DPBPG stipulates that desirably a 5 m exclusion zone be applied at access ways for on street parking. General design sub-routes of the scheme shall be in accordance with CCC's Construction Standard Specification (CSS) and Infrastructure Design Standard (IDS) documents.

In situations where a practical design solution may modify or compromise the design standard, this is noted and explained.

4 Background

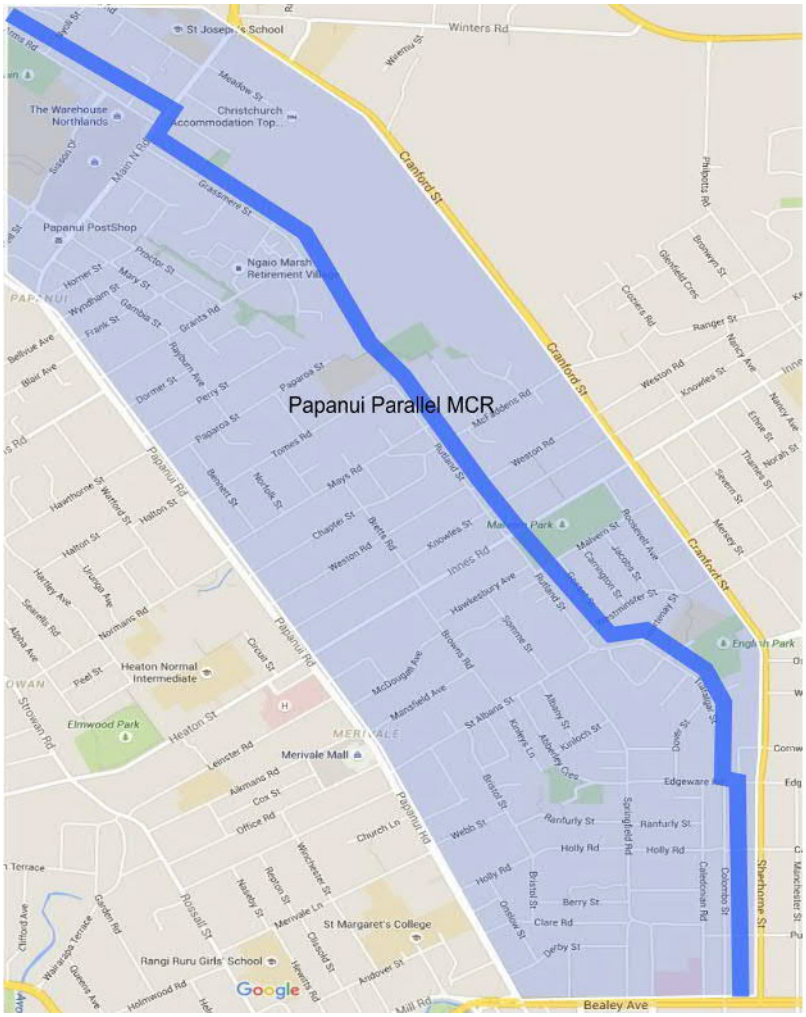
4.1 Papanui Parallel Major Cycle Route (MCR)

The need for the Papanui Parallel MCR capital project has arisen from the Council's commitment to develop high quality cycle facilities throughout the city, as stated in the Project Initiation Brief (PIB).

The brief identified that the Council has a unique opportunity to foster a cycling culture in the city and to develop a connected cycle network following the earthquakes. The need for significantly improved provision for cycling was identified through extensive community consultation following the Christchurch earthquakes. This has led to an accelerated cycle infrastructure programme for 13 major cycleway routes (MCR's) to be constructed over the next 3 to 5 years.

As one of the thirteen MCRs, the aim of this project is to encourage more residents to cycle by targeting the 32 per cent of residents who are seriously thinking about cycling. These potential cyclists have strongly stated that they want to travel separately from motor vehicles and to be able to cross safely at intersections. This route will connect the suburbs of St Albans and Papanui with the Central City.

Figure 4-1: Overview of Papanui Parallel MCR Extent of Works



Papanui Parallel cycleway is part of the development of 13 major cycleways creating a Major Cycle Network as detailed in the Christchurch Transport Strategic Plan (2012 - 2042), with construction of the Papanui scheme scheduled for 2015/16.

The initial route selected prior to the first round of Scheme Assessment Reports followed Colombo Street, Edgeware Road, Trafalgar Street, St Albans Street and Rutland Street, then through Rutland Reserve, Grassmere Street to Main North Road and Sawyers Arms Road.

The full Papanui Parallel route, between Bealey Avenue and the Main North Rail line is approximately 4.6km long when considering the shortest direct route. The section under full reassessment, from Bealey Avenue to Rutland Reserve is approximately 2.7km long when considering a shortest direct route, as illustrated in

Figure 4-1.

With the requirement to review the first round of scheme assessment reports from Bealey Avenue to Rutland Reserve, all sub-routes of the route need to be reconsidered and reassessed, so this SAR starts from the perspective that any route sub-route is a possible component of the recommended option. This assessment process and report has been prepared in accordance with the CCC Cycleway Design Guideline (December 2014) and the Christchurch Transport Strategic Plan (CTSP) and adopts the Safe Systems approach.

Comments have been provided as part of this report on the appropriateness of the route to ensure compliance with the objectives and criteria as set in the CTSP.

The following surveys were carried out within the scheme route for the first round of scheme assessments:

- Pedestrian and cycle movement at the Edgeware Road / Colombo Street
- Pedestrian and cycle movement at the Trafalgar Street / Sheppard Place
- Parking demand on Colombo Street (north of Bealey Avenue) and Trafalgar Street
- Parking demand on Rutland Street and St Albans Street.

Future traffic predictions were assessed using the CCC's Christchurch Assignment and Simulation Traffic (CAST) model for a number of cycle infrastructure/ network impact combinations. Surveys and CAST model information have been used for this assessment.

4.2 Strategic Plans

The following strategic plans provide context to the cycleway scheme development.

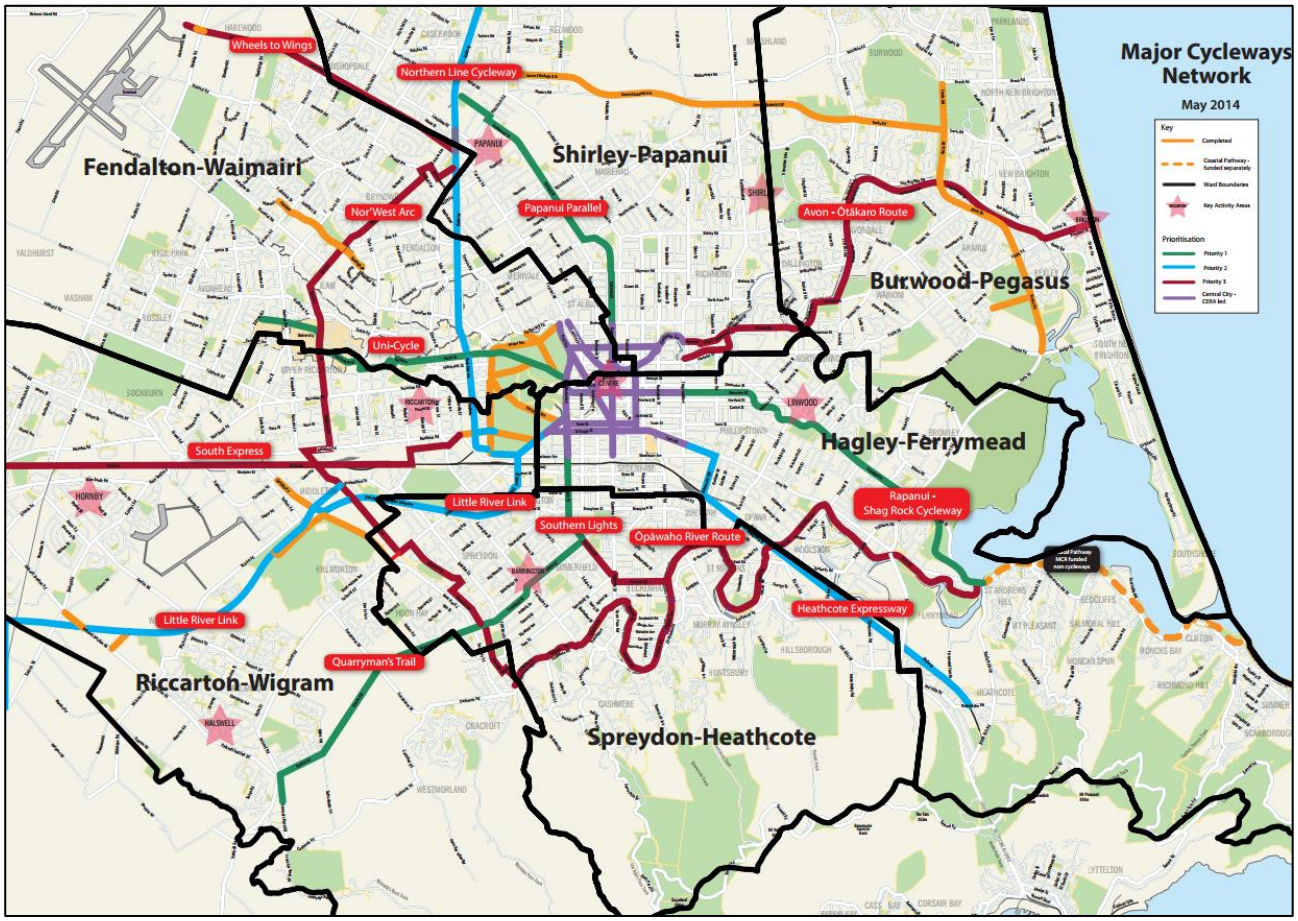
4.2.1 Christchurch Transport Strategic Plan

As part of the earthquake recovery effort CCC engaged with Christchurch residents through the "Share an Idea" campaign which received more than 3,500 cycling related suggestions[1]. These ideas were incorporated into the Christchurch Transport Strategic Plan (2012-2042) (CTSP) which sets out the vision for transport in Christchurch for the next 30 years.

This plan identifies 13 major cycle routes (as shown in Figure 4-2) to encourage the large proportion of people who think they would cycle, or would cycle more, if they felt it was safer.

Figure 4-2: Christchurch Major Cycleways Network Map

[1] http://www.ccc.govt.nz/cityleisure/projectstoimprovechristchurch/transport/cycleways/index.aspx Accessed 20 May 2014



The short term objective of the CTSP is to support the rebuild and recovery of the city and the wider region while balancing the need to achieve long term objectives.

In the medium to long term this will shift to delivering enhancements and changes to all transport networks to provide more attractive and safe transport options for people of all ages and abilities.

Major Cycle Routes should aim to cater for both adults and children (10 years and over). They should provide safe links to popular destinations and key activity centres and offer the highest level of service to cyclists. Some major cycleways will seek to include 'flagship' sub-routes that will make a strong statement about the city's cycle status and will encourage people to take up cycling.

Within the planned 13 cycleways, this report covers the Papanui parallel cycleway, north of Bealey Avenue to St Albans Street, along Colombo Street, Edgeware Road and Trafalgar Street, St Albans Street, Rutland Street, Rutland Reserve, Grassmere Street, Main North Road and Sawyers Arms Road.

4.2.2 Christchurch Central Recovery Plan

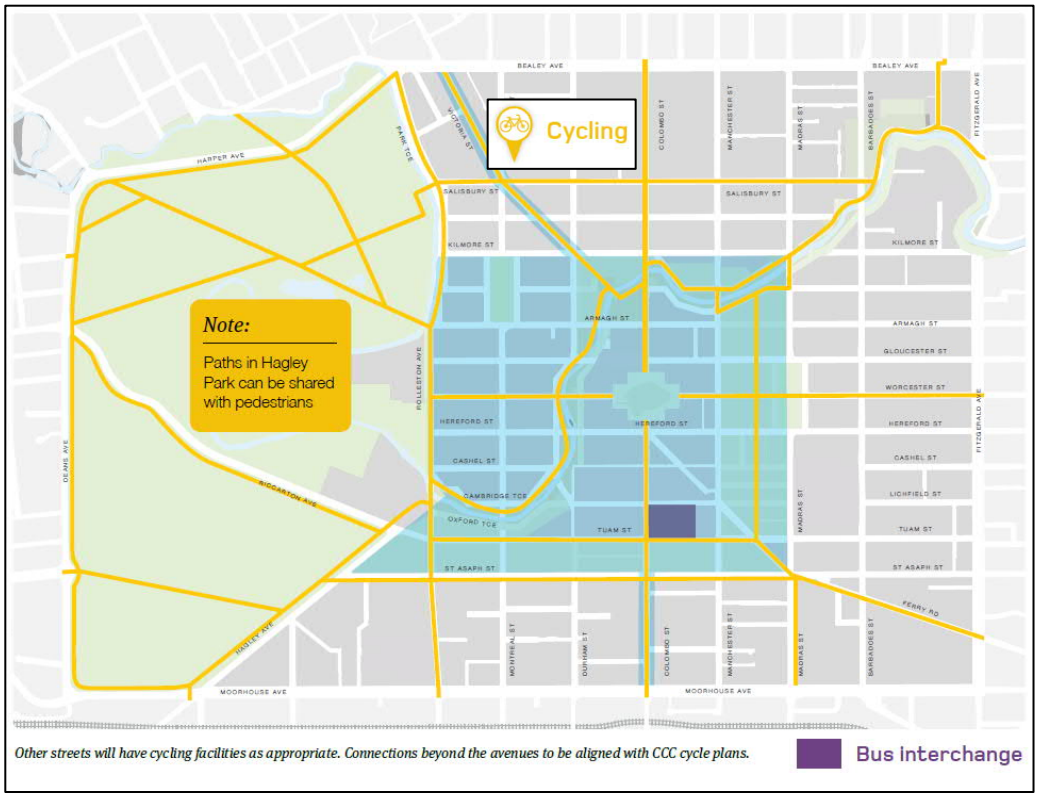
The proposed cycleway adjoins the area defined in The Christchurch Central Recovery Plan (CCRP) which was developed in response to the 2010/2011 Christchurch earthquakes.

The CCRP provides a framework for rebuilding the central city. The transport chapter of the CCRP illustrates the intended transport network for the central city. This shows the proposed central city cycle network, as shown in

Figure 4-3: Proposed Central City Cycling Network

, with a cycleway on Colombo Street through the central city which will connect to the Papanui Parallel Route.

Figure 4-3: Proposed Central City Cycling Network



4.2.3 Edgeware Master Plan

The proposed cycleway route runs through the Edgeware Village for which CCC has developed a master plan as shown in Figure 4-4 . The purpose of this master plan is for the reconstruction and reinvigoration of the Edgeware Village.

Public consultation on the master plan has been completed and incorporated into the proposed master plan. This focuses on the commercial Edgeware shopping centre located on Edgeware Road.

The master plan aims to provide a pedestrian priority environment in the area and encompasses the cycleway on Edgeware Road. To achieve a pedestrian priority environment, footpaths will be widened within the village to reduce the crossing distance for pedestrians.

The existing pedestrian crossings will be retained and additional crossing points proposed with scope to incorporate with the major cycleway.

The speed of traffic entering Edgeware Village will be slowed by providing threshold treatments with speed tables provided on Cornwall Street, Colombo Street and Trafalgar Street. Landscaping and paving

treatments will be provided on Edgeware Road and other approaches to define the Edgeware Village threshold.

Figure 4-4: Edgeware Village Master Plan

Figure (i) – Overall concept plan for the redevelopment of Edgeware Village. The table lists all proposed actions. Those actions that can be shown on a map are indicated on the concept plan.

1a to 1f	**Streetscape and movement improvements** (throughout the village): 1a - Develop a pedestrian priority environment and 'gateways' (entrance points) 1b - Incorporate major cycleway 1c - Reconfigure parking and taxi arrangements 1d - Consolidation of existing bus movements and improved transferability between services 1e - Install amenity planting 1f - Install street furniture, cycle stands and lighting
2	**Access and wayfinding improvements** 2a - Improve crossing points (Sherborne Street and Springfield Road) 2b - Install wayfinding signage
3	**1064 Colombo Street building and carpark improvements** 3a - Promote north-south internal connections 3b - Encourage outdoor courtyard spaces 3c - Improve layout and landscaping of the 1064 Colombo Street carpark
4	**Monitor parking; investigate new off-street carpark if required**
5	**Edgeware Mall enhancements** 5a - Enhance indoor walkway 5b - Redevelop laneway between mall and Domino's building
6	**Hardie & Thomson site redevelopment*** 6a - Hardie & Thomson redevelopment 6b - Alternative mixed use redevelopment
7	**Consider a comprehensive development of the Northern Block**
8	**Consider a reconfigured Brumby's / Peter Timbs redevelopment**
9	**Explore future comprehensive development west of Colombo Street**
10	**Explore future redevelopment and intensification of Edgeware Mall**
11	**Monitor commercial demand and enable expansion / rezoning if required beyond the business zone**
12	**Support development of an Edgeware Village market**
13	**Investigate new Edgeware Village events**
14	**Develop transitional activities / beautification projects**
15	**Improve building signage**
16	**Retain Case Management service**

**NB: The overall concept plan (Figure i) shows a scenario under Action 6a where the existing H&T business is retained. Refer to Action 6b for details regarding alternative mixed use redevelopment possible for this site.*

4.3 City Plan Environment

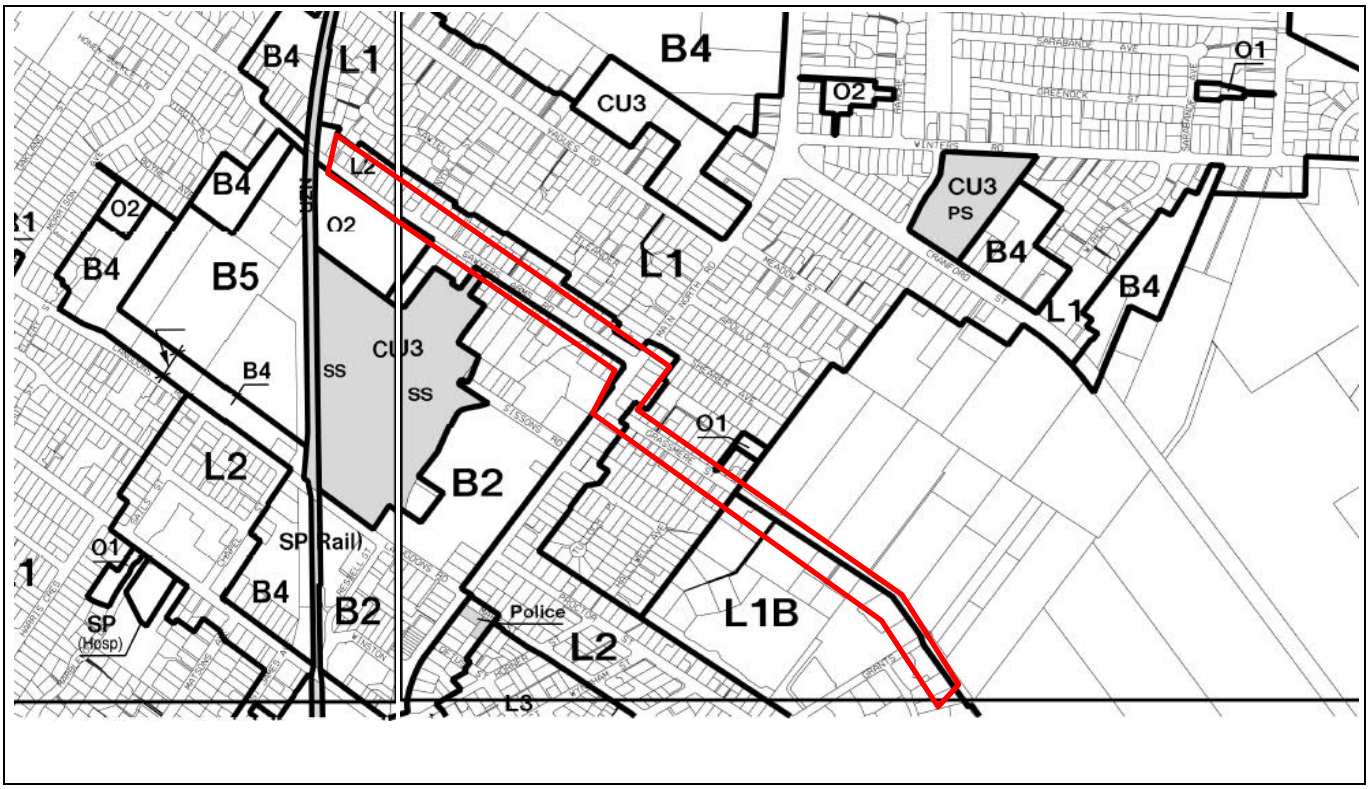
The City Plan zones are shown in Figure 4-5. The land adjacent to the northern sub-routes of the route is predominantly zoned residential L1 – which is generally low density housing. The land is zoned L2 between Innes Road and Edgeware Road, and L3 between Edgeware Road and Bealey Avenue

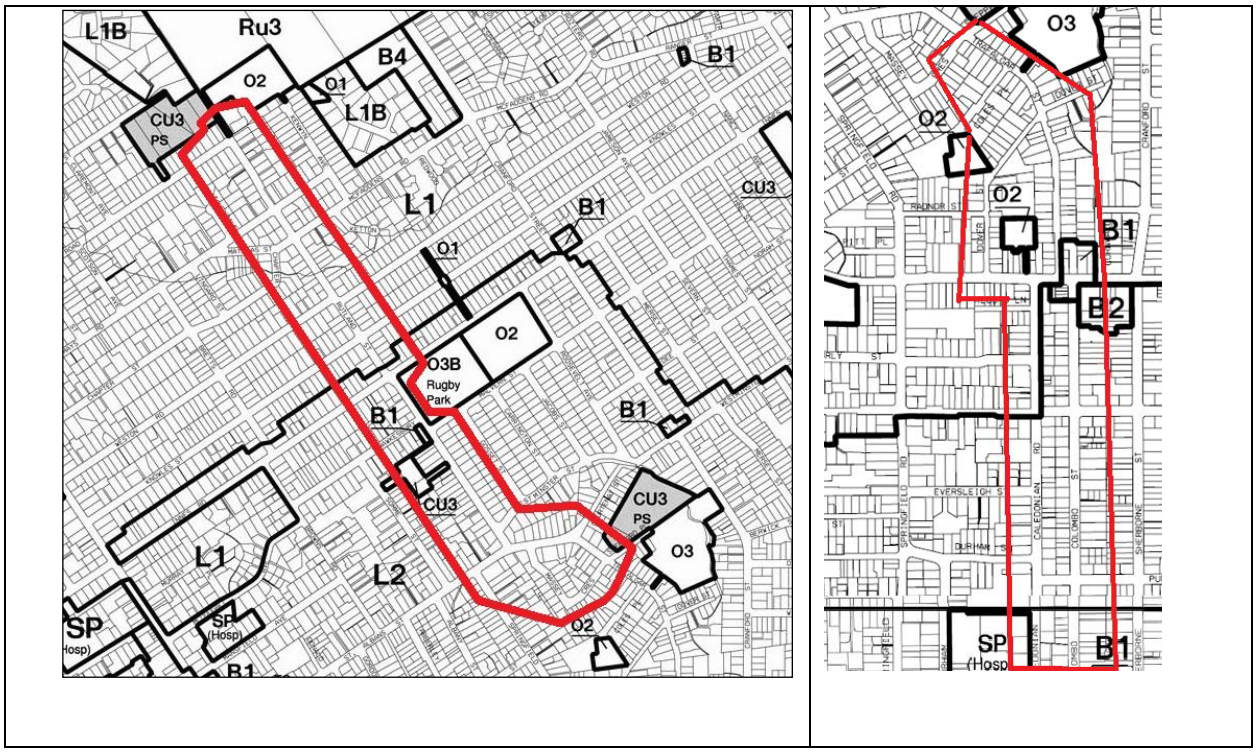
There is a section of Local Business B1 around the shops on Rutland Street immediately south of Hawkesbury Avenue, B1 and B2 Zones around Edgeware Village, and further B1 zoning at Bealey Avenue.

Rugby Park is O3B Open Space (Private Recreation Facilities). Rutland Reserve, zoned Open Space 2, has an access onto the northern end of Rutland Street. English Park is zoned Open Space 3.

Other land uses at the northern end include the three CU3 zoned schools, Paparoa Street School at the northern end of the route, St Albans Catholic School on Innes Road and St Albans School adjacent to Trafalgar Street.

Figure 4-5: City Plan Zonings





The south end of Grassmere Street is surrounded by low density residential activities, and a retirement village. The northwest end Grassmere Street is medium density residential. Section 3 along Main North Road and the south eastern end of Sawyers Arms Road passes the Papanui Key Activity Centre and is predominantly surrounded by business activities. Northlands Mall Shopping Centre is located on the western side of Main North Road and is a major trip attractor. Smaller businesses are located along the south eastern side of Main North Road. Activities on the northern side of Sawyers Arms Road are generally residential. Papanui High School and the Graeme Condon Recreation Centre are key trip attractors located on Sisson Drive just off Sawyers Arms Road.

None of the land zonings directly affect whether an MCR is permitted on the roads or through the parks in the area. However, residential density can influence the number of vehicle movements at an individual property driveway. L1 and L2 are low to medium density while L3 is higher density. While it seems Papanui area will become part of the medium density zone in the District Plan review, it is unlikely to have a large impact on the achievable density in the area. Rutland Street is likely to remain as it is for the foreseeable future.

Caledonian Road has relatively low density housing on its eastern side, but higher density buildings to its west. It would seem unlikely that this would change further, as the property sizes on the eastern side would appear to preclude densification. Colombo Street is similar, but reversed, with higher densities already on its east and lower density housing on the western side.

The Business Zonings all require the provision of on-site car parking for customers and staff, however many of them were developed well in advance of the current planning rules, and were able to rely on on-street parking which continues today . Cycle facilities through these areas are likely to influence the on-street parking provision.

4.3.1 SCIRT Rebuild Programme

The infrastructure rebuild programme includes the following works being carried out by SCIRT in the immediate area of the Cycleway.

Project Number	Description	Programme Status
10535	Rutland Street – Mays to Westminster, wastewater and road repairs	Completed October 2013
10935	Colombo Street Wastewater Upgrade Works	Completed November 2013
10994	Rutland Street – north of Hawkesbury Ave, northwest trunk sewer repairs	Completed February 2015
11052	Edgeware, St. Albans and Strowan Catchment - Waste Water Repairs - effecting Trafalgar Street, Edgeware Road and Colombo Street	Completed May 2014
11053	Edgeware, St. Albans and Strowan Catchment - Roading, Stormwater and Water Supply Repairs - effecting Trafalgar Street, Edgeware Road and Colombo Street	Due to start in June 2015
11068	Rutland Street – Mays to Westminster, wastewater patch repairs only	Due to start in September 2015
11069	Rutland Street – Mays to Westminster, stormwater and water supply repairs	Due to start November 2015
11089	Rutland Street – Tomes to Mays, stormwater, water supply and roading repairs. Wastewater repairs in Rutland Street	Due to start in October 2016
11187	St. Albans Catchment WW Repairs programmed in Caledonian Road and other streets south of Westminster Street.	Due to Start in June 2016

4.4 CCC Major Cycleway Design Guidelines

In 2013 CCC released the “Christchurch Cycle Design Guidelines” with the purpose of influencing the design of new cycle facilities and future reviews of the Christchurch Infrastructure Design Standard (IDS). This document was updated in December 2014 and has been used in the assessment of cycleway options in this report.

The guideline has been developed with the following six criteria in mind:

- Deliver the cycling actions within the CTSP
- Encourage more residents to cycle
- Be specific for the needs of Christchurch

- Be safe, realistic and achievable for Christchurch
- Be based on best practice examples (national and international)
- Adhere to the New Zealand road user rules.

In addition the guideline establishes 5 key objectives of:

- Safety: cycle routes should be safe and be perceived as safe, provide personal security and limit conflict between cyclists and other users.
- Directness: cycle routes should reasonably be direct, based on desire lines and result in few delays door to door. Cycle parking facilities should be in convenient locations.
- Coherence and Connectivity: cycle routes should be continuous and recognisable, link all potential origins and destinations and offer a consistent standard of protection throughout.
- Attractiveness and Social Safety: cycle routes should integrate with and complement their surroundings, enhance public security, look attractive and contribute positively to a pleasant cycling experience.
- Comfort: cycle routes should be smooth, non-slip, well maintained and free of debris, have gentle slopes and be designed to avoid complicated manoeuvres

Further information summarising the key design criteria is provided in Section 4.6

4.5 Safer Journeys

Safer Journeys and the Safe System approach is the government's strategy to guide road safety improvements from 2010 to 2020. The safe system approach works on the principle that it is unacceptable for any road user to be killed or seriously injured if they or any other user makes a mistake. This system is based on the following principles:

- People make mistakes
- People make mistakes and some crashes are inevitable
- People are vulnerable
- The human body can only withstand a limited amount of force before being killed or seriously injured
- We need to share responsibility
- System designers and road users must all share responsibility to create a road system where crashes do not result in users being killed or seriously injured
- We need to strengthen all parts of the system
- We need to improve all aspects of the road safety system (roads and roadside, speeds, vehicles and users) so that if one part fails this will not result in a fatal or serious injury crash

This resulted in the adoption of the safe system approach, which aims to achieve:

- Safe roads and roadsides that are predictable, forgiving of mistakes and encourage safe user behaviour
- Safe speeds that suit the function and level of safety of the road, with road users understanding and complying with speed limits and driving to the conditions
- Safe vehicles that help prevent crashes and protect road users from crash forces that cause death or serious injury

Safe road use, ensuring road users are competent, alter, unimpaired, comply with road rules, choose safer vehicles, take steps to improve safety and demand safety improvements. Safer Journeys has highlighted cycling as an area of medium concern therefore consideration to the safety of cyclists is significant.

The above criteria and objectives have been used to identify options which were assessed using a multi-criteria analysis tool later in this report.

4.6 Design Criteria

The selection of cycleway facility types was based on the road environment, traffic speeds and traffic volumes, as per table 4-3 of the Major Cycleway Design guide – Design Principles Best Practice Guide as shown below in Table 4-1.

Table 4-1: Cycle Facility Selection for Various Link Types (Adapted from Major Cycleways Design Principles & Requirements)

Road Environment	Max. speed of motorized traffic	Traffic volume (vpd)	Cycleway Type
Urban Residential	30 km/h	<1500vpd	Neighbourhood greenway
Urban Residential	50 km/h	1500 – 5000 vpd	Separated 2-way path in each direction or off-road shared path
		>5000vpd	Separated 1-way in each direction
Urban Commercial	30 km/hr	<1500vpd	Neighbourhood greenway
	30 km/hr	>1500vpd	Specific design required and will vary on traffic mix and parking provisions. Not advised for core bus routes or large proportion of HGV's. Target design speed would be 20km/hr if cyclists mixing with traffic to suit speed of a person who rides a bike.
Urban Commercial	50 km/hr	1500vpd	Separated 1-way in each direction.
Collectors and arterials	50 km/h	Irrelevant	Separated 1-way in each direction.
	70 km/h		Separated 1-way in each direction with increased separation over that of 50km/hr.

5 Methodology

Two slightly different methodologies have been used to assess elements of the Papanui Parallel MCR. The northern section (from Rutland Reserve to Sawyers Arms Road) has used an earlier MCR methodology. There was only one route option for this northern section, with different facility types or configuration options within this route. Hence this approach has been effective.

For the southern section (Bealey Avenue to Rutland Reserve), there are both multiple route options (that is different locations for the cycle facilities) and different facility types within the route options. A revised process is required.

This methodology section first describes the assessment approach for the northern section, then the approach for the southern section.

5.1 Rutland Reserve to Sawyers Arms Assessment Methodology

For the **northern section**, the location of the cycle facilities – the route – has been determined. Therefore, the assessment approach for this section has progressed as follows:

5.1.1 Route Sections

The route has been considered in three sections which relate to general environment through which its passes:

- Section 1: Grassmere Street from Rutland Reserve to the Grants Road intersection
- Section 2: Grassmere Street from Grants Road to Main North Road
- Section 3: Main North Road and Sawyers Arms Road.

The existing road environment is described in detail (traffic volumes, pedestrians, crashed, adjoining properties etc), which leads into a consideration of which type of MCR facility is usable or appropriate for the environment.

5.1.2 Facility Options

Facility options are described and how they would operate in the local environment is considered.

5.1.3 Multi-criteria Analysis

Each option type on each section of the route is then subject to a multi-criteria analysis which determines the preferred arrangement. The preferred arrangement is the discussed in further detail to ensure is impacts on the local environment, and vice versa, are understood and addressed.

5.2 Bealey Avenue to Rutland Reserve Methodology.

A key issue to be addressed in the **southern section** of the MCR is that the route that the MCR may take between the two end points is not fixed. It is recognised that the identification of cycle route options is not always clear cut and obvious. As new major cycle routes alter the configuration of the streets through which they traverse, it cannot always be stated that any one location is better suited for an MCR facility than another.

Therefore the initial phase of the assessment for the southern section was to identify and confirm the best route, before considering and assessing the preferred facility type or configuration of that route option.

In consideration of this process, it became clear that the earlier version of the MCA (identified above), had too few assessment criteria to provide a robust and defensible process for route selection as well as configuration selection. The methodology for the southern section therefore progressed as follows:

- The MCR process was updated to be more inclusive of network environment, cost and property effects, as well as cycle levels of service:
- A process was developed to generate a short list of cycle routes (without necessarily considering facility type).
- The updated MCR was used to select a preferred route
- Facility types within that route were then identified and considered in detail.
- The updated MCR was used to test the facility types
- A preferred facility type was identified and then discussed in more detail to ensure its impacts on the local environment, and vice versa, are understood and addressed.

The latter steps parallel the steps for the northern section, once the route has been determined, although an updated MCA is used for the southern.

The remainder of this methodology section describes the development of the updated MCR and the route selection and configuration option processes.

5.3 Updated Criteria used for Cycleway Multi-Criteria Analysis

The multi-criteria tool for the route and facility assessment was developed through feedback to previous assessment review. Criteria were established to represent the range of stake holders involved in an MCR development to ensure a robust and defendable assessment process. Criteria were included that recognised cyclist level of service (based on criteria previously established by CCC in the MCR best practice design guide), and the impact of the cycle facility on the environment through which it passed. Two additional criteria were added that impacted on the MCR programme – cost and timing.

Discussion with CCC gained overall agreement for the criteria as detailed below.

5.3.1 Cycle Levels of Service

The assessment criteria relating to the cycle level of service were reviewed, and reduced to four, as follows:

- Safety and Comfort – in the first assessment, any option that was considered high risk/unsafe was rejected. Safer, low risk routes were then evaluated including how comfortable the cyclists would perceive them to be;
- Directness and Coherence – relates to how close to the “desire line” the route was, the number of turns, and the extent of changes in facility types;
- Connectivity to amenity within the corridor – considered how close the route comes to schools, parks, shops and other cycle attractors/destinations within the corridor; and

- Social Safety and Attractiveness – balanced the general ambience and environment of the route against security, passive observation and crime prevention through environmental design (CPTED) measures.

Criteria for Cyclists 45%						
Safety and Comfort		**Directness and Coherence**		**Connectivity to Amenity within the corridor**		**Social Safety and Attractiveness**

5.3.2 Community and Stakeholder interest

Revised MCA criteria for Community and Stakeholder Interest have been developed following the teams review of key criteria applicable to cycleway implementation. The criteria are:

- Impacts on local residents – including on-street parking effects and access to properties where network changes would influence the ability to enter or exit streets or neighbourhoods.
- Impacts on businesses – including on-street parking or loading zones, and where access to the business would be affected by, for example, a reduction in passing traffic (and therefore drop-in trade).
- Operational and Network effects – including:
    - Network effects - if the option affects signals operation (capacity and efficiency) or restrict turning movements at intersections;
    - Operational effects – if the option affects rubbish collection or street cleaning.

Community/Stakeholder Interests 30%					
Local Business Impact		**Local Resident Impact**		**Operational & Network Impacts**	

5.3.3 Cost and Programme Impact

Two other Criteria have been added that relate to:

- Ease of construction – whether the option is relatively easy to construct or requires major work (and by implication overall costs) or whether property purchase costs are likely to be involved; and
- Land requirements / easements / other agreements – relates specifically to whether there are legal or acquisition processes that would influence the timeframe in which a facility could be constructed (noting costs are part of the previous criteria).

Project Costs and Programme Risks 25%			
Ease of Construction / Cost Premium		**Land Requirements /Easements /Other Agreements**	

5.3.4 MCA Weightings

An initial weighting was applied to the criteria, with Safety and Comfort, and Land Requirements/Easements carrying a 15% weighting and all others 10% based on the following rationale:

- Safety and Comfort – the primary function of these facilities is to provide a safer journey to attract the "interested but concerned" cyclist and

- Land Requirements /easements – which recognised that the need to purchase land or lodge easements will impact on timing and on the overall delivery of the cycle facilities.

After this initial weighting, a sensitivity analysis was applied, with a number of different weightings, to test the results where there was no clear preferred option.

5.4 Southern Section Identification of Possible Routes

Independently from the MCA development, the southern section possible routes were identified first using the following process.

5.4.1 Establish Route Boundaries

The first stage in the route identification process was to define the extent of potential routes by applying a route boundary corridor. That is, determining the area within which all route options must lie, and outside of which the MCR could be considered to fail to function as a cycle corridor. This work was completed as a desktop exercise based on a client agreed area.

5.4.2 Site Visit

The project team visited the site to identify opportunities that were not obvious from maps, aerial photographs, or street views. The visit allowed the team to observe those streets that:

- carry a heavy parking load,
- may be heavily landscaped or
- have mature trees or power poles in the berms;

The visit also identified paths through parks and reserves that are not generally well recorded elsewhere; and noted the context at street level of road crossing opportunities.

5.4.3 Network Details

All streets and pathways within the route corridor had their dimensional details recorded in both map form and spreadsheet. The map recorded:

- Boundary-to-boundary widths;
- Kerb-to-kerb widths;
- Traffic volumes;
- Road designation (arterial, collector, local road).
- Local features, facilities and amenities – churches, schools, shopping areas, parks, trees etc.

The purpose of the spreadsheet was to provide additional information that could not be clearly represented on a plan, such as the parking density, trees and landscape information, and berm width, particularly where the road layout is not symmetrical around the corridor centreline.

Based on the map and spreadsheet information, the map was then used to record what cycle infrastructure could be fitted into the individual road environments. At this stage *routes or connections* were not *considered.* Map line-styles showed what type of facility could be implemented within the existing kerb-to-kerb width without modification, and what could be fitted within the corridor width (boundary-to-boundary) with modification (kerb line changes).

The network detail plan and tables provides an overview of where facilities could be developed within the broader corridor, and to confirm where it is possible to develop a consistent style of facility along any particular chosen route.

The detail plan allowed the creation of a “long list” of possible route options – noting all possibilities for cycle facilities in the area.

5.4.4 Route Identification

Following the details for the network sub-routes and the “long list”, a short list of “possible routes” were developed. Route Selection is not a defined process, but relies on consideration of routes that:

- Offer a sensible, pragmatic alignment between end points;
- Utilise consistent street types generally aligned in the overall route direction;
- Utilise parks, reserves, rights of way and/or other publicly owned land along the general alignment;
- Utilise a combination of the above, and may include private properties that would provide pragmatic links if in public ownership.
- Provide alternatives to the most direct route to ensure possible routes are not rejected without due consideration

A short list of four possible routes- Yellow, Blue, Green and Orange- each having alternatives sub routes (for example if land purchase would provide a more direct route) were identified to be assessed using multi criteria analysis (MCA).
Once the MCA had been developed, and the primary route options identified, the revised MCA was applied to the four colour routes, and their sub-routes, as noted above. This resolved a preferred route alignment (or alignments).

Following on from the Route Selection assessment a preferred route was established. Section 6 describes the route selection process; the application of the MCR the short listed routes, and identifies the preferred route.

5.5 Southern Section Identification of Facility Options and Assessment

For the preferred route, the following process was used to determine the preferred configuration within the preferred route.

5.5.1 Route Sections

The preferred route was split into three sections as follows:

- Bealey Ave / Colombo Street /Edgeware Road to Trafalgar Street/Dover Street Intersection
- Trafalgar Street/Dover Street Intersection to St Albans / Rutland St Roundabout
- Rutland Street between St Albans Street and Rutland Reserve

Using 3 sections allowed a more in depth review of both sub Routes and Options in discrete areas to pin point options that were clearly favoured. This preferred route was described in detail to more fully understand the environment within which the MCR will sit. The description is based on site visits and review of desktop information (aerial maps street view and CCC GIS data). A full description of the route is provided in section 7, giving context to understand the issues that will need consideration during this Scheme Assessment and at the next stage. Much of the route description comes from information from the previous SAR’s

5.5.2 Site Visit

A further site visit was made to review options and how likely each option would fit within the street environment. This exercise reviewed the Yellow Route and its alternative sub routes to confirm option details and any issues that were not already identified. This visit gave the team a picture of how each type of facility would impact each street and allowed preferences to be established where more than one sub route was still being considered.

5.5.3 Option Development

With Issues and the site context understood, more detail was developed for various configurations and facility types, so that they could be more fully and accurately compared. Benefits and impacts of each option have been described, and then the options that merited further assessment were pulled into the MCA and the preferred option configuration evaluated from that.

Very detailed Option plans and discussions are in **Appendix F** – a summary table is contained in Section 8.3 and the MCA results in Section 8. Option Selection review was completed to identify and compare Facility Types (Options) for each route and sub route in each section and is shown in Section 8.4. The rationale for the preferred selected option was made clear.

5.6 Sensitivity Analysis

Where necessary (when a clear winner was not established using the Criteria with standard weightings described in Section 4.2) a sensitivity analysis was used to differentiate between 2 or more sub routes, or to add further justification to the initial findings. This sensitivity analysis looked at the results of the MCA with various weightings to establish further justification for a preferred route. The following scenarios were assessed.

Scenario	Cycle LOS Criteria - Weighting (%)	Stakeholder Interest Criteria - Weighting (%)	Cost and Programme Risk Criteria – Weighting (%)
1 - Normal	45	30	25
2 - Cycle LOS	80	30	20
3 - Stakeholder	40	60	20
4 - Cost/Prog	40	30	40
5 - Unweighted	40	30	20

The results from the sensitivity analysis were scrutinised to ensure they were intuitive. The route (with facility type inferred) that scored top of the most scenarios was confirmed as the Preferred Route and configuration. Each MCA table records the weighting outcomes.

6 Route Selection Assessment

This route selection assessment section is only relevant to the southern section of the Papanui Parallel MCR, as it considered what options exist for various cycle routes between Bealey Avenue and Rutland Reserve. The route for the northern element beyond Rutland Reserve is fixed, and not subject to options.

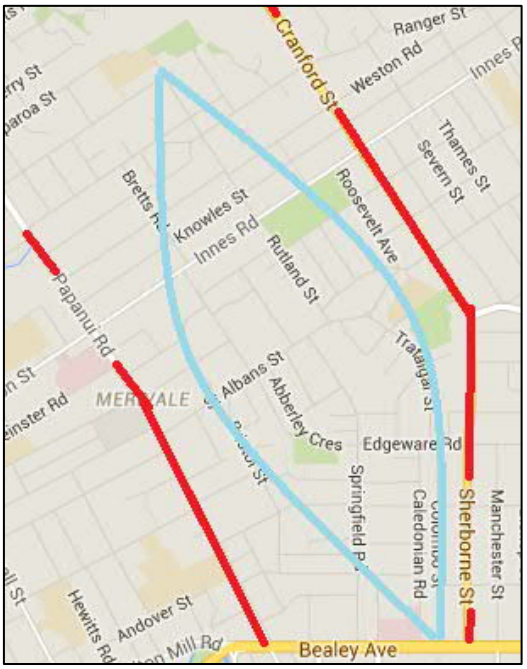
The Route Selection Assessment methodology is detailed in Section 5.4. It high level and does not consider the Facility Options or other issues in as much detail as the Facility Option Assessment in Section 8. An overview of the corridor was established by desktop study and a site visit to inform and intuit possible routes as described below. The Route Selection MCA Assessment table is provided in **Appendix H**.

6.1 Route Corridor

As this investigation is *part* of the Papanui Parallel, its start and finish points are defined – being the intersection of Colombo Street and Bealey Avenue at the south end and Rutland Reserve at Rutland Street to the north.

A route corridor pictured between these two points (see Figure 6-1) falls within the major arterial corridors of Cranford Street – Sherborne Street and Papanui Road. If a cycle route were to progress east or west of these roads (respectively) it would require two crossings (out and back), and would also mark a noticeable departure from the start and end point desire line. Hence Papanui Road and Cranford-Sherborne Streets are considered to be the project area boundaries. Route options outside these boundaries are not considered, however route options *along* the two corridors are assessed in the first round of the MCA for completeness.

Figure 6-1: Route corridor and boundaries



6.2 Site Visit

The project team drove, walked and cycled in over most of the roads and parks within the bounded area, and observed:

- Corridor and kerb-to-kerb widths;
- Berm widths (particularly where they may not be symmetrical around the road centre-line);
- Power pole positions;
- Berm plantings, trees etc;
- Paths in reserves;
- Streams;
- Other public accesses;
- On-street parking (acknowledging this is a snapshot in time, and not necessarily representative of average or maximum demand).

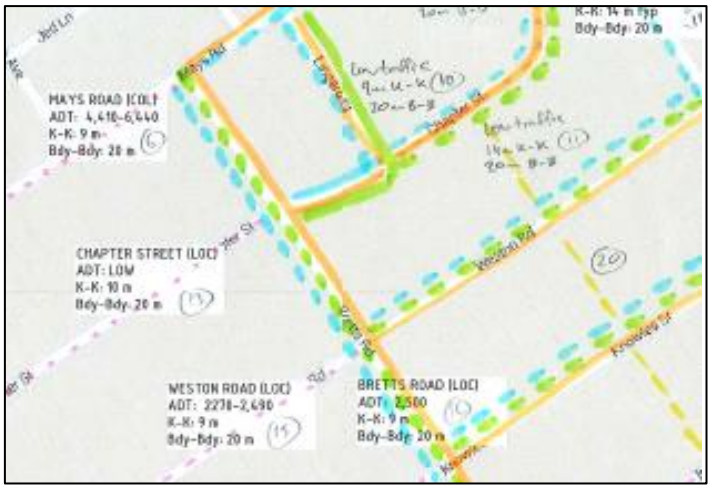
6.3 Network Details

All streets and pathways within the broader route area have had their dimensional details recorded in both map form, and spreadsheet. As indicated from Section 4.1.3, the map records:

- Boundary-to-boundary widths;
- Kerb-to-kerb widths;
- Traffic volumes;
- Road designation (arterial, collector, local road); and
- Local features, facilities and amenities – churches, schools, shopping areas, parks etc – features that are like to act as attractors to cyclists in particular, but may also attract concentrations of pedestrians, and the need for local parking.

The map also shows what cycle infrastructure could be fitted into the road environment, based exclusively on the details provided in the bullets. As an example, Figure 6-2 shows a number of roads with their technical detail labels, and individually coloured – each colour signifies a facility type (such as separated two-directional cycle lanes or separated one-directional cycle lanes), and the line style indicates whether that facility could be implemented without any kerb line changes, or whether kerb line changes are required.

Figure 6-2: Individual Road / Path details



Appendix P shows the series of plans developed for the Papanui Parallel MCR area corridor in 6.1. Each street label in the plan has a unique number with it, which identifies an entry in a spreadsheet (**Appendix Q**). Further details on each street/path have been recorded in the spreadsheet as the example Table 6-1 shows. The purpose of the spreadsheet is to provide additional information that cannot clearly be represented on a plan. In an additional column (not shown below but included in the Appendix), the spreadsheet provides an opportunity to record the ultimate status of the street toward the end of the process, indicating whether it is part of the preferred route option(s) or not, and the rationale behind that decision.

Table 6-1: Additional street details table

Ref	Road (* photo appended)	Section	General notes	Parking	Physical constraints
25	Innes Road*	Opp RoW	Innes Road opposite pedestrian right-of-way (19) and Malvern Park (26), potential location for mid-block crossing for MCR.	Typically low day parking demand, higher demand for sports training/ matches at park	Power underground, lighting columns at boundary.
26	Malvern Park*	Park space	Malvern Park, opportunities for shared path to connect pedestrian right-of-way (19) with streets south of Malvern Street.	None	Large trees 4-6 m from boundary, cricket pavilion, playground.
27	Malvern Street*	All	Unlikely to be a link for the MCR due to directness, however would be a connection to local shops and school. An MCR could cross it.	High parking demand at west end daytime and around sporting fixtures.	Large street trees, power poles behind kerb on south side. Dish channel.
28	Hawkesbury Avenue	All	Unlikely to be a link for the MCR due to directness, unless the property purchase in (20) eventuates. It would be a connection to local shops and school for other routes. An MCR could possibly cross it.	High daytime parking demand on east end, closer to shops and café.	Mostly dish channel, power poles close behind kerb.

The Network Details in both the maps and spreadsheet tables enable scrutiny of individual network sub-routes that could potentially form one of the Papanui Parallel route options – it provides an overview of where facilities could be developed within the broader corridor, and to identify where it is possible to develop a consistent style of facility along any particular chosen route.

This is effectively a “long list” of route options – noting all possibilities for cycle facilities in the area.

6.4 Route Identification

Following the details for the network sub-routes and the “long list”, a short list of route options was developed. **Appendix R** shows the options developed from the network information provided above, and a consideration of a pragmatic alignment between end points. When developing the short list for this project, the option identification rationale proceeded along the following lines:

- **Blue Route**: (labelled route 1). Deliberate effort to capture options further to the west than the previous options. Route uses Caledonian Road to Edgeware Road, then through Abberley Park to Kinleys Lane, St Albans Street crossing to Browns Road, Innes Road crossing, along Bretts Road to Mays Road and Chapter Street. Route Options 1A, 1B and 1C to capture alternative streets and opportunities through parks.

- Sub-route 1A could use either Durham Street north, Eversleigh Street, Ranfurly Street or Holly Road to link Caledonian Road to Springfield Road
- Sub-route 1B uses Ranfurly Street linking Springfield Road to Abberley Park's south access.
- Sub-route 1C uses Abberley Crescent to connect Edgeware Road to St Albans Street.

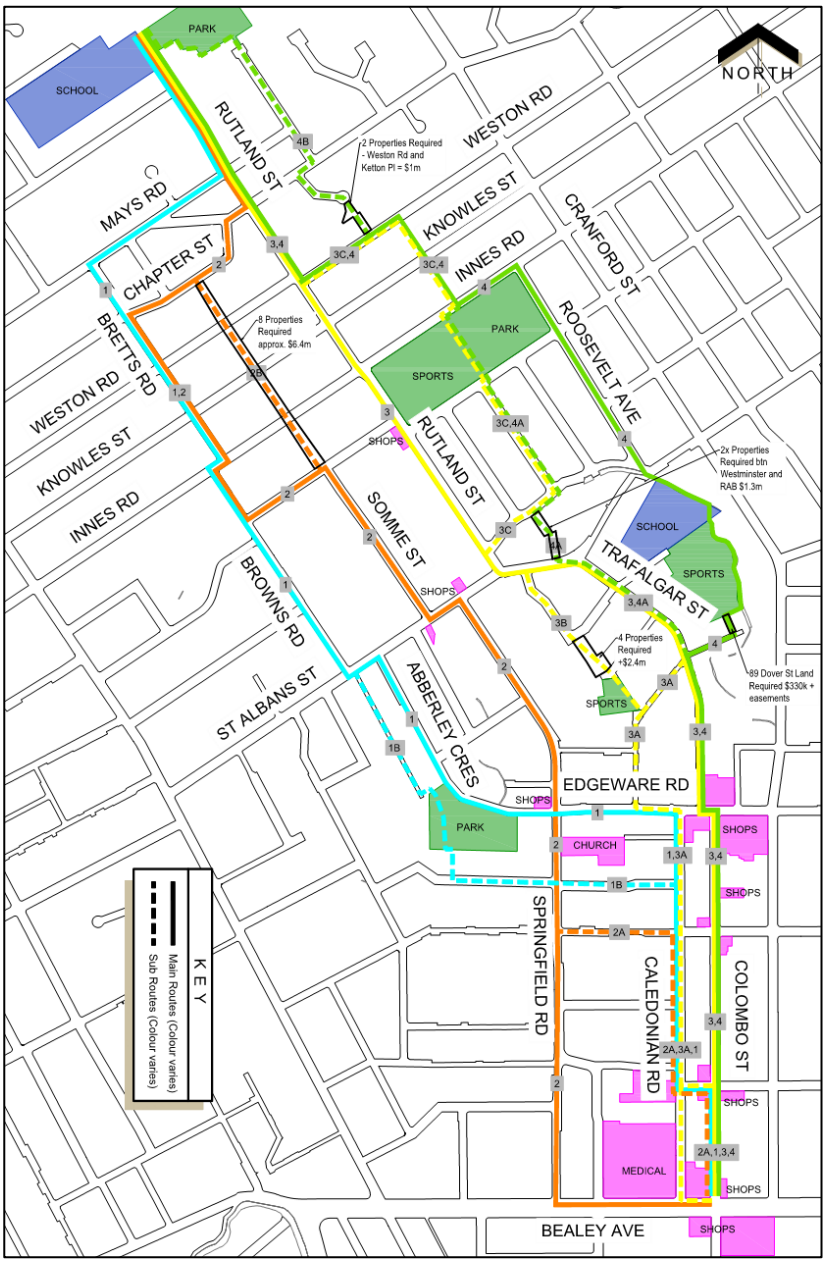
- **Orange Route**: (labelled route 2). Option specifically intended to utilise alternative north-south sub-route not previously considered. Uses Bealey Avenue to Springfield Road, then St Albans Street and Somme Street to Hawkesbury Avenue. It considers a long link of property acquisition crossing Innes Road, Knowles Street, Weston Road and connecting to Chapter Street which links back to Rutland Street. Sub-route 2A avoids property acquisition sections, by using Hawkesbury Avenue to Browns Road, crossing Innes Road to Bretts Road, and joining to Chapter Street.

- **Yellow Route**: (labelled route 3).The most direct available alignment between the two anchor points, and the original route for the initial considerations of the Papanui Parallel facilities. Route is Colombo Street, Trafalgar Street, St Albans Street and Rutland Street. Sub-routes labelled 3A, 3B and 3C are deviations from the route intended to utilise adjacent existing parks and reserves pathways, and/or provide a shorter link between some route sections through property acquisition:
  - Sub-route 3A utilises Purchas Street to link to Caledonian Road and Dover Street, connecting back to Trafalgar at its mid-point approximately.
  - Sub-route 3B is a property acquisition 'short cut' connecting Dover Street to Massey Crescent.
  - Sub-route 3C departs from Rutland at Westminster Street, using Gossett Street, Rugby Park and the right of way from Innes Road to Weston Road, connecting back to Rutland Street at Weston Road.

- **Green Route**: (labelled route 4). Closely parallels route 3, with deviations specifically to encompass park and reserve options that are not part of route 3, and include shorter link options through properties. Main route is Colombo Street, Trafalgar Street, then Dover Street, through the boundaries of English Park and stream reserve adjacent to St Albans School. Then using Roosevelt Avenue, the boundary of Rugby Park, crossing Innes Road then using the previously described right of way. This route considers property acquisition between Weston Road and Ketton Place, to link to Kenwyn Avenue and the eastern-most extension of the Rutland Reserve pathway. Sub-route 4A and 4B provide alternative links.
  - Sub-route 4A follows Trafalgar Street (no deviation at Dover Street) then utilises a property-acquisition link between St Albans Street and Westminster Street, linking through Carrington Street to the Rugby Park paths.
  - Sub-route 4B avoids the Ketton Place property purchase, joining link 3C back to Rutland Street along Weston Road.

Appendix R is duplicated in smaller scale in Figure 6-3 below to illustrate the route options considered.

Figure 6-3: Short list options developed from long list



6.5 Route Selection using MCA Assessment

6.5.1 MCA Criteria

The first round of the MCA evaluated a total of 12 route combinations. The criterion upon which each route has been assessed is explained in more detail in the following tables:

Table 6-2: MCA Criteria for Cyclists

Criteria for Cyclists – Weighting = 45%			
Safety and Comfort	**Directness and Coherence**	**Connectivity to Amenity within the corridor**	**Social Safety and Attractiveness (based on worst feature)**
* Safety for cyclists **GO/ NO GO CRITERIA** Safety along route for other users Relative conflict with other road users • pedestrians; residents; traffic • business access Comfort of users experience • perceptions of risk • noise • CO_2 Possible score between 2 and -2.	* Time and distance to travel * Match to desire lines. * Easy to recognise route * Limited changing of facility types * Few complicated manoeuvres * Few turns. Possible score between 2 and -2.	* Good match to: ***local schools ***shops ***parks ***other public spaces/buildings Possible score between 2 and -2.	* Greenspace routes need open aspect * Consider CPTED for routes off-street * Pleasantness of cycling experience * Lighting where off-road Possible score between 2 and -2.

Table 6-3: Community Stakeholder criteria

Community/Stakeholder Interests – Weighting = 30%		
Local Business Impact	**Local Resident Impact**	**Operational and Network Impacts**
* Impact on local business interests? * Loading Zone loss * Effects on access * Parking spaces lost - is offset possible * Estimated effect on patronage . Score is 0 to -2 as all routes have similar construction issues. Any options with higher impact marked lower.	* Impact on local residents? * Access to properties * Impact on on-street parkings * Impact on journey time if route changes network. Possible score is 0 to -2	* Effect of changes to the network (signals, cul-de-sacs) * Public transport routes affected? * Operation costs for street cleaning, rubbish collection? * Effect on maintenance operations? Possible score is 0 to -2

Table 6-4: MCA Cost and Programme Criteria

Project Costs and Programme Risks – Weighting = 25%	
Ease of Construction	**Land Requirements /Easements /Agreements**
* Increased costs due to: ***Property purchase ***Complicated facilities ***Requires supporting asset replacement (Budget Risk) . Possible score is 0 to -2	* Programme delays due to: ***Land/property acquisition ***Legal processes - consents ***Legal processes - access (Timing Risk) Possible score is 0 to -2

6.5.2 High Level Assumptions and Decisions

A series of high level assumptions and decisions have been made based on the MCR Best Practice Design Guide; on-site observations; practical traffic engineering knowledge, and the reasonable treatment of issues, as evaluated by the project team. The key assumptions and decisions are identified as:

- Where the MCR routes are required to cross a collector or arterial with higher than approximately 6000vpd, traffic signals will be required.
- Single direction separated cycle lanes will require the removal of over 60% [eg. Colombo Street = 90%] of on-street parking.
- Two direction separated cycle lanes will require the removal of between 15 and 60% of on-street parking.
- Unless lengths of park path or right-of-way are included, the cycle routes will traverse approximately the same lengths of residential streets, and are therefore assumed to have similar impacts on residential on-street parking.
- No cul-de-sacs or operational restrictions are considered for any of the route options at this higher level.
- Cyclists would prefer straighter lengths of cycleway as opposed to multiple turns. They would also prefer an overall shorter journey than a longer one, to reach the same destination.
- Cycle facilities will heavily impact on-street parking adjacent to street-side retail businesses.
- Property acquisition for cycle facilities is a time consuming process; property acquisition of multiple properties sufficiently aligned to allow a continuous cycle facility will be *very* time consuming.

Considering these assumptions, the twelve route variations have been assessed through the MCA.

6.5.3 Route MCA Assessment

At this level of assessment, the summarised findings are as per Table 6-5. The full MCA table is provided in **Appendix H**.

Table 6-5: MCA First Iteration summary table

Route Description	Comments on Assessment and Ranking
Blue Route 1/1A: Caledonian Road and/or cross-links to Springfield Road; Edgeware-Abberley – Browns – Bretts – Mays - Rutland	Overall, a poorly functioning cycle facility due to how far west it goes. Would require additional connectivity to local schools. Springfield Road has highest traffic volume of all roads, with some narrower sections, so fit of facilities is not good. **Ranked 4th**
Blue Route 1/1B: Caledonian Road, along Ranfurly, Abberley Park and Kinleys Lane – joins rest of 1.	Similarly poorly functioning due to route departure. Reduced level of cycle service due to CPTED in Abberley Park and Kinleys Lane. **Ranked = 6th**
Orange Route 2: Bealey – Springfield – Somme – property acquisition link – Chapter - Rutland	Very poor function for cycle facilities due to being on busiest roads in bounded area. Route option considered high risk to implementation opportunity, due to requiring 8 residential properties – all aligned - affecting budget and programme majorly. **High Risk Cost & Programme – otherwise Ranked 10th**

Route Description	Comments on Assessment and Ranking
Orange Route 2A/2B: Colombo – Purchas – Caledonian – Holly – Springfield – Somme – Hawkesbury – Brown – Bretts – Mays – Rutland	Also poor for cycle facilities due to Springfield Road, and westerly departure from desire line. Will impose several additional sets of crossing signals on Colombo, Springfield, St Albans. **Ranked 9th**
Yellow Route 3: Colombo St, Edgeware, Trafalgar, St Albans, Rutland St	Most direct of all route options, shortest and best connection to all amenities. Has worst impact on businesses as in front of all shops etc. No property Requirements. **Ranked 2nd**
Yellow Route 3A/3B: Caledonian – Dover – property acquisition link – Massey – Rutland	Almost as direct as route 3 above. Avoids Colombo Street and impact on shops, but not so close to shops and school amenities. The requirement for four properties in a row is a high risk to implementation this option. **High Risk Cost & Programme – otherwise Ranked 3rd**
Yellow Route 3A/3C: Caledonian – Dover – Trafalgar – St Albans – Rutland – Westminster – Gossett – Rugby Park – Right of Way – Weston - Rutland	Best overall cycling environment, but longer with multiple turns, and possible CPTED in park and right of way. Slight miss on amenities but low overall impact on businesses and residents due extent of off road. **Ranked 1st**
Green Route 4: Colombo – Trafalgar – Dover – property acquisition link – English Park – Dudley Creek – Roosevelt – Rugby Park – right of way – property acquisition link – Ketton - Kenwyn	Route with least on road sub-routes, so less residential and business effects, but misses shop amenities and concern about length of CPTED issues with largest deviation to the east. Requires 3 properties which is very high risk for implementation this option for the timeframes involved. **High Risk Cost & Programme – otherwise Ranked 5th**
Green Route 4 and 4A: Colombo – Trafalgar – property acquisition link – Westminster – Carrington – Rugby Park – joins 4 at Innes Road	Generally assessed as the safest of green options with least amount of off-road travel and avoids high volume section of Rutland Street, but some CPTED concerns. Good school and park connections, miss on Rutland shops. Property acquisition makes this high risk to implement, but property link so potentially useful, that opportunity worth retaining for long term plan. **High Risk Cost & Programme – otherwise Ranked = 6th**
Green Route 4 and 4B: Route 4 above to Weston Street then Rutland Street	Good overall route with use of local roads and parks. Has all issues similar to 4, but with only one property sub-route (Dover Street) **High Risk Cost & Programme – otherwise Ranked 8th**
Bealey/ Papanui Road	Longest possible route option. Cycle facilities on Bealey Avenue incompatible with road function and accesses. Poor connectivity to amenities. Will impact all signalised intersection operations. **Ranked 12th**
Bealey Sherborne/ Cranford	Arterial road functions not compatible with cycle facilities. Difficult connections to amenities – second longest route option. **Ranked 11th**

The assessment results revealed the Yellow Route to be the highest scoring route, with the following two sub routes closely ranked:

- Colombo Street – Edgeware Road – Trafalgar Street – St Albans Street – Rutland Street
- Caledonian Road – Edgeware Road – Dover Street – Trafalgar Street – St Albans Street – Rutland Street – Westminster Street – Carrington Street – Rugby Park – right-of-way – Weston Road – Rutland Street.

6.6 Route Selection Outcome and Next Steps

The “Route Selection” MCA assessment revealed a clear preference for the Yellow Route. This route provides the best desire line and connection to local amenities. Refer **Appendix H** for more details. However scores were similar for the main route (as per the previous scheme reports) and minor alternatives described above.

Following the “Route Selection” assessment a “Facilities Options” assessment was carried to using the MCA tool to:

- Provide a clear preference between the 2 routes described in Section 5.6 above and
- To determine the preferred options (facility types) along the preferred route

The team thought it likely the preferred route may be a combination of the 2 Yellow routes that ranked 1 and 2 in the first MCA assessment.

Hence the next phase of assessment the MCR Yellow Route was split into three sections, to allow an in depth comparison of sub routes and facility types, as follows:

1. Bealey Ave / Colombo Street /Edgeware Road to Trafalgar Street/Dover Street Intersection
2. Trafalgar Street/Dover Street Intersection to St Albans / Rutland St Roundabout
3. Rutland Street between St Albans Street and Rutland Reserve

The Route Option MCA (above) is followed by a detailed Route Description (Section 7), a review of Route Issues (Section 8.1) and Factility Option Development (Option 8.2) to identify various route options. Scheme Costs were established for the preferred route and the main alternatives (eg Caledonian Road) to ensure the cost criteria scoring could be confirmed.

7 Route Description

At this point in the scheme assessment, the northern section has a defined route, and the revised MCA and route selection process has determined a preferred route for the southern section. This section develops detailed information about the preferred routes, so that different types of cycle facility can be considered and assessed in the next report section.

This information is presented in two sections. The first section details the information developed for the southern section (Bealey Avenue to Rutland Reserve). The second section considers the northern section, and relies on information provided in the previous scheme assessment report for that section.

7.1 Southern Section

7.1.1 Route Layout

The route is divided into five sections as follows:

- Colombo Street / Bealey Avenue Intersection
- Bealey Avenue to Edgeware Road – via Colombo Street and / or Caledonian Road
- Edgeware Village – the Master Plan Area
- Edgeware Road to St Albans Street - Trafalgar Street
- Trafalgar Street to Rutland Reserve.

7.1.1.1 Bealey Avenue / Colombo Street Intersection

The intersection of Bealey Avenue and Colombo Street is a 4-leg signalised intersection as shown in Figure 7-1.

Figure 7-1: Bealey Avenue / Colombo Street Intersection

Bealey Avenue is classified as a major arterial road, and is one of Christchurch's four avenues that border the Central Business District (CBD). Bealey Avenue generally provides 3 lanes for traffic travelling east and west, with additional turn lanes at intersections. At the intersection with Colombo Street, Bealey Avenue widens to allow for left and right turn lanes in each direction.

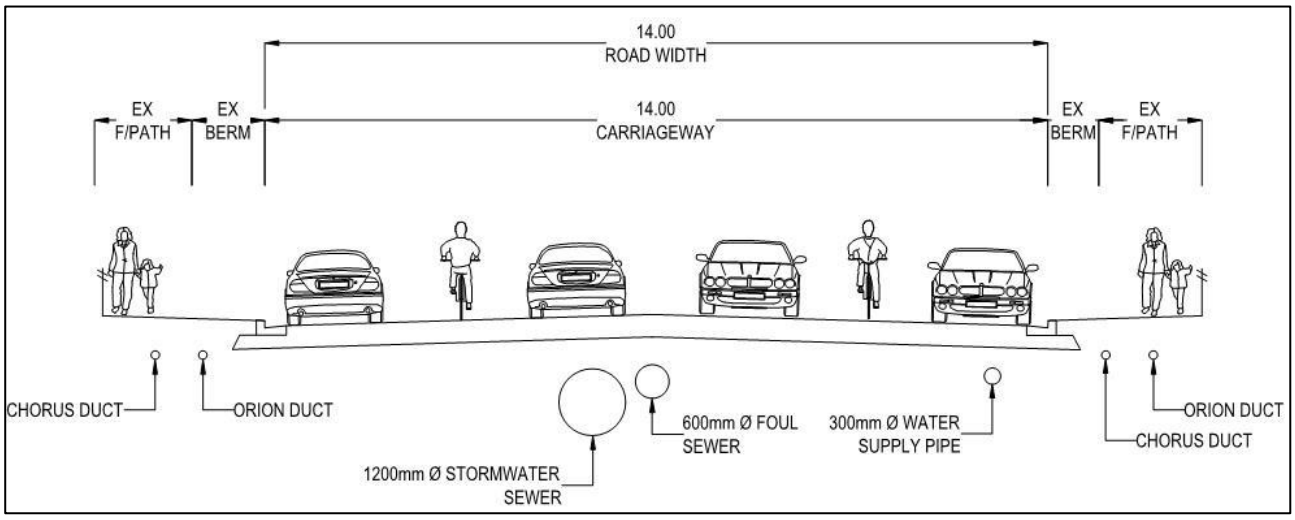
The layout of Colombo Street approaches, both north and south of the intersection, allows for all movements with two lanes provided. All quadrants of the intersection provide footpaths and dedicated pedestrian crossing facilities.

7.1.1.2 Bealey Avenue to Edgeware Road – Colombo Street

Colombo Street is classified as a Collector Road under the Christchurch City Plan and runs from the base of the Port Hills through central Christchurch to Edgeware Road.

North of Bealey Avenue, Colombo Street has a 14m wide carriageway with some short sections narrowing to 12.0m at the intersections of Bealey Avenue, Purchas Street and Canon Street. Colombo Street is a single lane carriageway with street parking on both sides of the road as shown in Figure 7-2.

Figure 7-2: Colombo Street Typical Cross Section



The footpaths, located on both sides of Colombo Street between Bealey Avenue and Edgeware Road, are at least 1.5 m wide. Grassed verges vary in width between 1.0 and 1.5m. Colombo Street is approximately 800m long by 20.1m wide in the study area. A picture showing the layout of Colombo Street is shown in

Figure 7-3.

Figure 7-3: Colombo Street Looking North

Colombo Street, between Bealey Avenue and Edgeware Road, intersects two side streets, Purchas and Canon Street, the latter has had recent threshold treatments to stagger and narrow the side road centreline, and provide additional on-street parking as shown in Figure 7-4 below.

Figure 7-4: Purchas Street and Canon Street

7.1.1.3 Bealey Avenue to Edgeware Road - Caledonian Road

Caledonian Road is classified as a local road under the Christchurch City Plan, and runs north-south from Bealey Avenue to Edgeware Road. It has a corridor width of 20m boundary to boundary, and a carriageway width that varies between 13m and 14m kerb to kerb.

Figure 7-5: Caledonian Road looking south from Edgeware Road

Berm widths are typically 3m on either side. It has deep dish kerb and channel on both sides of the road between Purchas Street and Keoghs Lane. Flat kerb and channel run south of Purchase Street outside the recently developed medical facilities, and north of Keoghs Lane, where kerb line changes have accommodated angle parking against the eastern kerb.

Caledonian Road is left-in/left-out only at Bealey Avenue. The eastern side of the road intersects Purchase and Canon Streets, as per the western side of Colombo Street. The western side of Caledonian Road intersects with Durham Street north, Canon Street, Ranfurly Street and Keoghs Lane.

At its southern end, on the western side is the Southern Cross Hospital and the extension buildings for specialist medical practices. On the eastern side is an access to the Bealey Avenue 24 hour clinic. The remainder of the street is residential with the exception of the Caledonian Hall on its northern end, east side.

7.1.1.4 Edgeware Village Masterplan Area – Edgeware Road

Edgeware Road is classified as a Collector Road under the Christchurch City Plan and runs east-west through the suburb of Edgeware between Hills Road and Springfield Road. Edgeware Road has a carriageway which varies in width between 10 m and 13.5 m particularly around the Edgeware Shopping Centre. There are footpaths with widths of at least 1.5 m on both sides of the road. The section of Edgeware Road being considered as part of the proposed Cycleway is shown in Figure 7-6 below.

There is a zebra crossing located less than 10 m to the east of the Edgeware Road / Colombo Street intersection. Approximately 120 m to the east of the Edgeware Road / Colombo Street intersection is the Edgeware Road / Cranford Street intersection. Cranford Street will connect to the Northern Arterial Extension project which is currently in the preliminary design phase. Cranford Street will form the main connection from the Northern Arterial Motorway to the Christchurch CBD.

While the exact details of changes to Edgware Village proposed in the Master Plan have not been finalised, it is likely to involve increased pedestrian priority and a 30km/h speed zone around the Edgeware Shops.

Figure 7-6: Edgeware Road between Trafalgar Street and Colombo Street

7.1.1.5 Edgeware Village Masterplan Area - Colombo Street / Edgeware Road / Trafalgar Street Intersection

The Colombo Street / Edgeware Road / Trafalgar Street intersection is located 800 metres north of the Colombo Street / Bealey Avenue intersection and is shown in Figure 7-7 below. This intersection is a staggered T-intersection. Colombo Street approaches Edgeware Road from the south with a splitter island and is a stop priority controlled intersection. Trafalgar Street approaches Edgeware Road from the north with a stop priority controlled intersection.

Figure 7-7: Aerial Photo of Colombo Street / Edgeware Road / Trafalgar Street Intersection

7.1.1.6 Edgeware Road to St Albans Street - Trafalgar Street

Trafalgar Street is classified as a Local Road under the Christchurch City Plan and runs from Edgeware Road to St. Albans Street. Trafalgar Street varies in width between 7.0 - 8.4 m with some further narrowing near speed bumps located at 100-120 m intervals. Trafalgar Street has footpaths on both sides of the road with width of at least 1.5 m. The road reserve width varies between 11.5m and 20m.

A Kea crossing is located approximately 70 m south of the Trafalgar Street / St. Alban Street intersection and is operated by nearby St. Albans School. Figure 7-8 shows a typical Trafalgar Street cross section while

Figure 7-9 and Figure 7-10 shows the key intersections at Sheppard Place and Dover Street.

Figure 7-8: Trafalgar Street Looking North Near Coles Place

Figure 7-9: Trafalgar Street – Dover Street Intersection

Figure 7-10: Trafalgar Street – Sheppard Place Intersection and St Albans Street Roundabout

7.1.1.7 Trafalgar Street to Rutland Reserve - Trafalgar Street / St. Albans Street / Courtenay Place Intersection

The Trafalgar Street / St. Albans Street / Courtney Street intersection is a three leg roundabout with a single circulating lane. All approaches are single lane approaches with single lane exits and splitter islands. The central island has a diameter of 15 metres with a circulating lane width of approximately 5 metres. The St. Albans Street approach has a cycle lane which stops 20 metres before the limit line. The St. Albans Street and Courtenay Street exits have cycle lanes starting as traffic exits the roundabout.

Courtenay Street is a collector road. It is a 12 m corridor, with 9 m kerb to kerb. Parking is unrestricted on either side of the road, but the road is not heavily parked on a typical day – a maximum of 6 vehicles were observed (distributed between both sides) at any one time. It has deep dish kerb and channel on both sides east of the roundabout.

7.1.1.8 Trafalgar Street to Rutland Reserve - St Albans Street.

St Albans Street between Rutland Street and Trafalgar Street has a carriageway width of approximately 9.5 m, which allows for painted cycle lanes in both directions. Parking is indented on both sides of the road, as seen in Figure 7-11. Massey Crescent joins the south side of St Albans Street at an uncontrolled intersection with threshold treatment approximately a third of the way along. Corridor width of St Albans Street is 20.1 m, which widens at both roundabout intersections.

Figure 7-11: St Albans Street looking east

Rutland Street joins St Albans Street at a three-leg roundabout which is dimensionally similar to the St Albans/ Courtenay/ Trafalgar intersection.

7.1.1.9 Trafalgar Street to Rutland Reserve – Rutland Street

Rutland Street is a collector road under the Christchurch City Plan, from St Albans Street to McFaddens Road. It is a local road north of McFaddens Road. The Rutland Street corridor is generally 20m wide, however carriageway widths vary between 12m and 14m throughout its length. Footpaths are present on both sides of the road throughout, with crossings across all legs of the Rutland Street/Innes Road signalised intersection and pedestrian islands at the roundabouts of Rutland Street/St Albans Street and Courtenay Street/ St Albans Street/ Trafalgar Street. Cycle lanes are marked at the Rutland Street/Innes Road intersection.

The kerb to kerb width of Rutland Street from the St Albans Street to southern end of the shops at Hawkesbury Avenue is 12m, widening to 14m outside the shops and café. St Albans Catholic School has a vehicle entrance immediately south of the shops, along with the primary pedestrian entrance further south on Rutland Street.

The 14 m kerb to kerb width outside the local shops on Rutland Street, seen in Figure 7-12 makes for a wide road when combined with the no stopping restriction around the opposite intersection with Malvern Street. A P15 parking restriction is in place outside the shops, and cycle parking facilities are provided outside the café. The footpath width outside the shops is 3 m.

Figure 7-12: Rutland Street shopping area

Both Hawkesbury Avenue and Malvern Street are uncontrolled intersections, each with a threshold treatment on the approach to Rutland Street. Also within this section is the uncontrolled intersection with Westminster Street, which has a threshold treatment.

Between Innes Road and Malvern Street/Hawkesbury Avenue, the Rutland Street carriageway width is 12m between kerbs. Development of Rugby Park will remove the green fence in Figure 7-13, replacing it with an open landscaped area and access to a carpark with up to 54 spaces.

Figure 7-13: Rutland Street, looking south of Innes Road

The signalised intersection with Innes Road has dedicated right turn lanes and shared left/through lanes on the Rutland Street approaches, and dedicated lanes for each movement on Innes Road, although cyclists share the left-turn lane on the east-bound approach.

North of Innes Road, Rutland Street continues to vary between 14m and 12m wide. A pedestrian island is located between the off-set legs of the Weston Street intersections. The intersections of Weston, Knowles, Mays, Chapter and McFAddens are all controlled, either by Give Way or Stop. All are crossing intersections.

Between Tomes Road and Mays Road, Rutland Street has a kerb to kerb width of 14 m. The footpaths are immediately behind the kerb. This section also has steep shoulders and paths, with asphalt ramps constructed at many driveways to ease the change in grade between the driveway and the road.

Rutland Street turns into Tomes Road at its northern end with a narrowed 90degree turn. The Rutland Reserve pathway emerges from the reserve at this point.

7.1.2 Public Transport

Currently the number 28 and number 100 bus routes are located within the proposed cycleway routes as shown in Figure 7-14.

Figure 7-14: Bus Routes and Bus Stops in Edgeware / St. Albans Suburbs

The number 28 bus route runs from Papanui to Rapaki and Lyttelton. This bus service utilises Colombo Street from Bealey Avenue to Edgeware Road with four bus stops in each direction. This service runs every 20 minutes from 7am to 9am and every 15 minute from 4:30pm to 6:30pm. Outside these times this bus service runs every 30 minutes for the rest of the day.

The number 100 bus route runs from Halswell to The Palms via Riccarton Mall. This service runs east-west on Edgeware Road. Bus stops are provided for each direction of travel in each direction to the west of Trafalgar Street. This bus service runs every 15 minutes from 7am to 8am and from 3pm to 6pm. Outside of these hour this bus service runs every 30 minutes.

Bus Route 118, finished service on Rutland Street between Mays Road and Hawkesbury Street on 8th December 2014. There are now no bus services using Rutland Street.

7.1.3 Existing Cycle Facilities

There are currently no cycle facilities provided along the roads defined in Section 4.1 above, except at the Bealey Avenue intersection, the Innes Road intersection and the short length of St Albans Street between Rutland Street and Trafalgar Street.

There is currently very little provision for cyclists using the intersection of Bealey Avenue and Colombo Street. Heading south on Colombo Street, an advance Stop box with dedicated cycle lane is provided. The other 3 legs of the intersection provide no formal facilities.

At the Innes Road / Rutland Street intersection, cycle lanes are provided along Innes Road with advanced Stop lines or Stop boxes on their approach. Cycle lanes, 1.5m wide, are provided on St Albans St, adjacent to indented parking on each side of the road.

Figure 7-15: Cycle lanes provided on St Albans Street

7.1.4 Crash History

The full crash history for southern section of the route: Colombo Street (including the Colombo Street / Bealey Avenue intersection); Caledonian Road, Edgeware Road; Trafalgar Street; St Albans Street and Rutland Street covering the extent of the proposed southern section MCR corridor is attached in **Appendix A**.

In the past 10 years (2005 – 2014) there has been one serious and one minor injury crash involving a cyclist on the between Bealey Avenue and St Albans Street route. The serious injury crash occurred at the Colombo Street / Edgeware Road intersection and the minor injury crash occurred at the Colombo Street / Canon Street intersection. Another two minor injury crashes involving cyclists were recorded at the Bealey Avenue / Colombo Street intersection. Three of the four crashes involving a cyclist occurred when cars failed to give way to cyclists which is likely due to the drivers not seeing the cyclists. The other crash involving a cyclist occurred as a result of a car being too far left and striking a cyclist.

In the past 10 years there have been nine crashes on Caledonian Road, none of which involved cyclists or pedestrians.

In the past 5 years (2009 – 2014) there have been two minor injury crashes on St Albans Street and Rutland Street involving cyclists. The first was in 2009, when a 12 year-old travelling straight was hit by a right-turning SUV at the intersection of Rutland Street with Chapter Street. In 2013 a 74 year-old man travelling southbound on Rutland Street was hit by a car turning left out of Westminster Street.

7.1.5 Street Trees

The MCR corridor includes street trees that are listed in the CCC database. Some trees may be affected by the proposed works, where the scheme involves widening the road or includes additional pavements for new cycleways. However the intention throughout will be to protect trees and offset any loss of existing trees with new trees. For street trees plans refer **Appendix N**. There are protected trees along the Bealey Avenue median, and it appears that no protected trees are directly affected by the cycleway corridor.

Several street trees are planted at the northern end of Colombo Street, and a few other young street trees are found in the berms of Trafalgar Street and Rutland Street. Information on the preferred alignment will be provided to the CCC's Arborist with recommendations for the next phase.

7.1.6 Landscaping and Green Space

The two previous scheme assessments have been provided to the CCC's landscape architect and comments taken into account (where applicable) with the final scheme drawings. Relevant information from the two earlier assessments will be carried through into the scheme plans for this updated scheme.

Ultimately, the scheme would seek to promote an attractive route as much as possible with the addition of new trees in existing verges where they are retained, and new low level planted areas around side road changes and other areas..

7.1.7 Local Businesses / Commercial Property

Schools, parks, and local businesses within the cycleway route study area are detailed in Table 7-1 below. Most of the streets in the corridor are largely residential, with some commercial property located around the intersections of Colombo/Bealey, Colombo/Purchas, Colombo/Canon, Edgeware Village, and Rutland/ Hawkesbury.

Table 7-1: Local Businesses along the Route

Business Name	Address	Associated Parking
Bealey – Colombo Intersection		
24 Hr Surgery	931 Colombo St	Off street + P30
Promed Doctors	933 Colombo St	Off street + P30
Pepperberry	919 Colombo St	-
George Anderson & Co	919 Colombo St	Off street
Alliance Francaise de Christchurch	913 Colombo St	
First Avenue Property / Advanced Mortgage Solutions	918 Colombo St	Off Street + P30
The Christchruch Doctors	912 Colombo St	Off Street + P30
The Dispensary	914 Colombo St	Off Street + P30
The Gift Shop	920 Colombo St	-
imagic	Level 1, 920 Colombo St	-

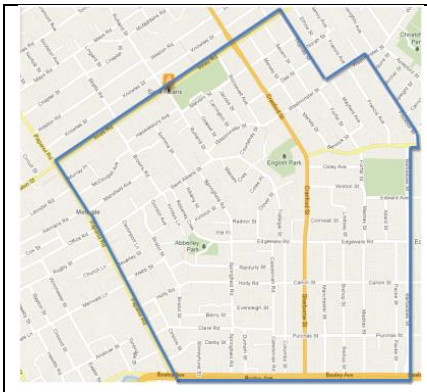
Business Name	Address	Associated Parking
Beauty Therapy	922 Colombo St	-
Do Hairsytling	924 Colombo St	-
Circa	926 Colombo St	-
Colombo Street		
BK Investment Properties Ltd	961 Colombo St	-
Accucentre Ltd	965 Colombo St	Off Street
Pahs Dairy	969 Colombo St	P5
Maxwells Dry Cleaning	1027 Colombo St	P5
Edgeware Dairy		
Edgeware Village		
Super Liquor	1067 Colombo St	P30
Civic Video	1071 Colombo St	P30
Edgeware Takeaways	1073 Colombo St	P30
St Albans Pharmacy	1075 Colombo St	-
Chambers Holdings Ltd	920 – 926 Colomb St	Off street
Alexandra Court Motel	960 Colombo St	Off street
Edgeware Dairy	1022 Colombo St	P5
Bowenz	1040a Colombo St	P30
Takeaways	1040 Colombo St	-
Bailies Bar	1060 Colombo St	Off street
Mitre 10	59 Edgeware Rd	P5
Super Value	61-63 Edgeware Rd	Off street
Peter Timbs Meats Ltd	70a Edgeware Rd	P30
Trafalgar Street		
St Albans Primary School	17 Sheppard Place	Via Sheppard Place
English Park	18 Sheppard Place	Via Sheppard Place
Montessori Pre School	96 Trafalgar St	Off street
Rutland Street		
Reflect Ultrasound	9 Rutland Street	Uncontrolled on street parking
St Albans Catholic School	Somme Street	Access on Rutland Street
Rutland St Fish and Chips	65 Rutland Street	P15
Hansons Too Dairy	67 Rutland Street	P15
Susan Ross Maternity and School	69 Rutland Street	P15

Business Name	Address	Associated Parking
Uniforms		
Loaf Hair and Beauty	71 Rutland Street	P15
Meshino Espresso Café	75 Rutland Street	P15
Rugby Park	Corner Innes Road and Rutland Street	Uncontrolled on street parking
Paparoa St School	Corner of Rutland Street and Tomes Road	Uncontrolled on street parking

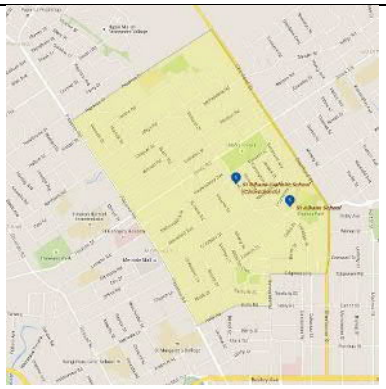
7.1.8 Local Schools Zones

St. Albans School is located towards the northern end of Trafalgar Street. It takes its main access from Sheppard Place which adjoins directly on to Trafalgar Street. The school roll is 523 students (based on the 2013 ERO Report) with the enrolment zone bounded by Innes Road, Papanui Road, Bealey Avenue Barbadoes Street, Flockton Street, Westminster Street and Thames Street (as shown in Figure 7-16).

Figure 7-16: Enrolment Zone for local schools



St Albans School Zone



St Albans Catholic School Zone

Paparoa Street School Zone

St Albans Catholic School has two access points from Rutland Street, south of the western side shops and café. It has a roll of 104 with an enrolment zone bounded by Paparoa Street, Cranford Street, Sherborne Street Edgeware Road, Springfield Road, Holly Road and Papanui Road. Drop-off vehicles tend to park on both Rutland Street and Sommes Road.

Paparoa Street School is located at the north end of Rutland Street, adjacent to Rutland Reserve. It has a roll of 517 and draws its pupils from a zone bounded by Cranford Street, Innes Road, Papanui Road and Main North Road. Drop off vehicles park on Rutland Street and Tomes Road, as well as Paparoa Street.

Overall, the full extent of the cycle corridor is fully covered by primary school zonings, and it will provide direct access to all three of them.

7.1.9 Parks and Reserves

Adjacent to St. Albans School is ASB Football Park (formerly English Park) which is used by Mainland Football that runs soccer leagues in the Canterbury, Marlborough and West Coast Regions. It also acts as a

home ground for the Canterbury Men's and Women's Soccer teams in the New Zealand national soccer league. Two parking lots are provided for English Park with an 81 space car park with access from Cranford Street and 20 space car park taking access from Sheppard Place.

At the intersection of Rutland Street and Innes Road is Rugby Park, which is currently being redeveloped. A fifty space car park has recently developed on site, with an access mid-point between Innes Road and Malvern Street on Rutland Street. Attendees at events typically park along all local roads.

7.1.10 Services

The route corridor contains CCC maintained services as detailed below. Any modifications to kerb lines or footpath and berm areas will need to consider the impact to services which may require protection or relocation which could have a significant effect on construction costs.

- Colombo Street - Wastewater gravity mains and laterals. A 600mm diameter wastewater main centrally located. .
- Colombo Street - Water Supply mains, sub-mains, and laterals. A 300mm diameter water supply main is located in the eastern shoulder.
- Colombo Street (between Bealey and Purchas) - Stormwater gravity mains and manholes/chamber including connections from sumps. A 1200mm diameter stormwater main.
- Caledonian Road - Wastewater gravity mains and laterals. A 225mm diameter earthenware pipe centrally located.
- Caledonian Road – Water supply mains 150mm diameter located to the east of the centreline, in the carriageway berm AC (asbestos)
- Rutland Street - A 900 mm wastewater main runs under Rutland Street from Tomes Road to Hawkesbury Avenue.
- Rutland Street - water mains predominantly AC
- Rutland Street – stormwater piped flow between 38 and 158 Rutland Street, flow is otherwise overland along Rutland Street.
- Rutland Street – A number of culverts cross under Rutland Street, continuing through neighbouring properties as open channels, notably at numbers 145/156 and 184/195 Rutland Street, and 149/151 St Albans Street. The culvert crossing between numbers 145 and 156 has been pushed up following the earthquakes, and has produced quite a hump in the kerb and channel and western shoulder of Rutland Street. Under the current road cross-section this hump would be in a parking area, however following the installation of separated cycle facilities would become either a cycle or traffic lane. No work is programmed to repair this hump in the immediate future.

It needs to be noted that if cycle facilities are to be developed on Caledonian Road, then the existing deep dish kerb and channel will need to be replaced – which may drive the need for reshaping of the road, which could effect the depth of cover of services on that road.

For Services and Utilities plans refer to **Appendix C**

7.1.11 Utilities

The route corridor contains typical utilities as detailed below, the majority of which are located in the berm/footpath area. Any modifications to kerb lines or footpath and berm areas will consider the location of services in establishing construction costs.

- Orion overhead power cables and infrastructure

- Orion underground power cables
- Orion ducts
- Chorus Telecommunication Cables
- Enable fibre optic cables or ducts
- CCC street lighting
- Old gas mains are present throughout the project area.

Updated scheme plans following the preferred option from this assessment will be supplied to Orion for comment to establish scope and costs for relocations. Costs estimates based on the earlier assessments will be included in the scheme cost estimate. Facilities accommodated within the existing kerb lines will minimise relocation costs.

7.1.12 Traffic Volumes

Traffic counts have been conducted by CCC on Colombo Street, Edgeware Road and Trafalgar Street, Caledonian Road, St Albans Street and Rutland Street as part of the ongoing traffic count programme. A number of the counts available have been taken post-quake, but others vary between 2010 (Edgeware Road) and 2007 (Trafalgar Street).

The most recent traffic counts for the proposed route are shown in Table 7-2**.**

The Christchurch Assignment and Simulation Traffic Model (CAST) models the traffic volumes on Christchurch roads based on the relative cost of travel on each link. This model can provide information on the likely traffic volumes in the AM peak, PM peak and average inter peak for future years of 2021 (short-term), 2031 (medium-term) and 2041 (long-term). These volumes can be annualised to give a likely AADT for each period and are shown in Table 7-2 also.

Table 7-2: Current and Likely Future Traffic Volumes on Proposed Route

Road	Most Recent 4-day AADT count (veh/day)	Predicted 5-day 2031 AADT (veh/day)
Colombo Street	4,175 (North of Bealey Ave. on 29/02/2012)	5,150
Edgeware Road	9,450 (East of Sherborne St. on 22/07/2010)	6,300
Caledonian Road	1,236 (north of Colombo on 21/07/2012)	1,500
Trafalgar Street	2,625 (South of St. Albans St on 27/03/2007)	2,700
St Albans Road	3,255 (east of Massey on 23/03/2007)	5,800
Rutland Street	6,725 (south of Innes Rd on 1/08/2008)	10,600

7.1.13 Effect of Northern Arterial Motorway & Northern Arterial Extension

The Northern Arterial Extension, connecting Queen Elizabeth II Drive and the future Northern Arterial to Cranford Street, along with the associated Cranford Street Upgrade, will have an impact on traffic movements around the project area when constructed. Construction is scheduled to begin in 2016-17, and be completed in 2020.

The traffic effects of the Northern Arterial (NArt), Northern Arterial Extension (NAE) and Cranford Street Upgrade (CSU) project on this section of the Papanui Parallel are not fully understood as yet, as the intended configurations are not finally resolved. It is expected that the NArt/NAE/CSU project will significantly increase the number of vehicles using Cranford Street north of Innes Road, some of which will filter through to the streets around the southern end of Rutland Street. The CSU is likely to see Cranford Street from Innes Road north upgraded to four lanes with median separation and turning restrictions to McFaddens Road, Weston Road and Knowles Street, making them left-in/left-out only. This banning of the turn movements will change the distribution of vehicle movements at the intersections of these roads with Rutland Street.

With the southern extent of the NAE/CSU project terminating at Innes Road, investigations into "downstream effects" have concluded that the current downstream network (between Innes Road and Bealey Avenue) is likely to struggle to convey these additional vehicles with an acceptable level of service whilst keeping them on the arterial road network. Improvements and upgrades, including clearways and left-in/left-out restriction on Dee Street and Malvern Street are proposed.

The traffic volumes given in the third column of Table 7-2 above include NArt/NAE/CSU information as it was known in February 2015. A number of changes to plans and programme have changed since then, so some uncertainty remains. However, it is expected that the provision of separated cycleways would provide sufficient protection for cyclists from any increase in traffic volumes as a result of the NArt/NAE/CSU project.

7.1.14 Parking Surveys

7.1.14.1 Survey Methodology

Parking surveys were conducted on 27th May 2014 and 30th May 2014 for the southern section of the route, and during the period 24th to 28th September for St Albans Street and Rutland Street.

For the southern section (Trafalgar to Bealey) an initial survey was done at 8am and between 9:30am and 5pm in 30 minute intervals along the length of the proposed cycleway. The survey involved videotaping a drive along the route and recording if any vehicles had moved or had changed when compared to earlier surveys. The parking demand at the main car park for the Edgeware Village at the corner of Colombo Street and Edgeware Road was also recorded.

Parking surveys were also conducted on Sheppard Place and Trafalgar Street between St. Albans Street and Coles Place on 27th May 2014 and 30th May 2014. These surveys recorded the number of vehicles parked on the surveyed sections in 10 minute intervals from 8:25am to 9:15am and from 2:40pm to 3:30pm. This will assist in assessing the impact of the school on parking demand on Trafalgar Street.

For Rutland Street and St Albans Street, surveys occurred on different days and times, recognising the different neighbourhoods through which the northern streets passed. One-off parking demand surveys occurred during school drop-off time, lunch time, late evening and during the weekend.

Details of the parking provision for each section of the route can be found in Table 7-3: On-Street Parking Capacity along Study Route.

Table 7-3: On-Street Parking Capacity along Study Route

Road	Section	Parking Capacity
Colombo Street	Bealey Avenue – Purchas Street	37

Road	Section	Parking Capacity
	Purchas Street – Canon Street	77
	Canon Street – Edgeware Road	40
	ALL SECTIONS	154
Edgeware Road	Colombo Street – Trafalgar Street	7
Trafalgar Street	Edgeware Road – Dover Street	54
	Dover Street – Coles Place	19
	Coles Place – Sheppard Place	17
	Sheppard Place – St. Albans Street	11
	ALL SECTIONS	101
St Albans Street	Courtenay to Rutland	12
Rutland Street	St Albans to south of shops	49
	South of shops – Hawkesbury	9
	Hawkesbury – Innes	25
	Innes – Knowles	11
	Knowles – Weston	16
	Weston – McFaddens	31
	McFaddens - Mays	15
	Mays – Tomes	32
	ALL SECTIONS	188
Caledonian Road	See footnote[2]	154

7.1.14.2 Parking in Proposed Cycleway Corridor

The results of the parking demand surveys are shown in **Appendix D**. Overall parking demand is currently well below capacity throughout the day except for the areas near commercial developments and near the access points to each of the schools at school start and finish times. Through the residential areas the parking demand stays relatively consistent throughout the day with Colombo Street from Purchas Street to Canon Street experiencing some small variations due to local convenience stores. There is little variation along Rutland Street and St Albans Street between day and night.

Further observation on Saturday morning has shown that parking demand is at a peak at this time in the southern streets, as residents are at home and not at work. Furthermore the east side of Colombo Street within the study area is L3 medium density residential with many apartments which increase the overall demand at peak times.

[2] Note: Caledonian Road has not been surveyed for either parking availability or parking utilisation for this updated scheme assessment. As it runs parallel to Colombo Street, has generally the same residential densities and commercial operations at both the north and south ends, its parking availability is estimated to be the same as Colombo Street.

Colombo Street has two blocks near commercial developments from Bealey Avenue to Purchas Street and from Canon Street to Edgeware Road. From Bealey Avenue to Purchas Street the parking demand peaked near the total parking capacity of the block at 10am and slowly decreased as the day continued with a spike observed on Friday from 2pm to 3pm. In this area there is a medical surgery and vehicle workshop on the western side. While on the eastern side there is a motel and a collection of retail shops with a café.

The commercial development at Edgeware Village appears to have little effect on the level of parking demand on Trafalgar Street. The level of parking demand on the section of Trafalgar Street from Edgeware Road to Dover Street peaked at 5pm on the 27th of May 2014 and 11:30am and 4:30pm on the 30th of May 2014. From 9:30am to 5pm on both days surveyed the parking demand was at least 7 vehicles with fluctuations in parking demand during the day. There is some construction related traffic and parking which could explain some of the variation in parking demand.

The parking demand on Trafalgar Street is affected by St. Albans School from Coles Place to St. Albans Street. The parking demand in this area is relatively consistent throughout the day with the parking demand peaking at 3pm and reverting to the general trend at 3:30pm. The peak parking demand in this area was close to capacity with the section from Coles Place to Sheppard Place at capacity on the 27th of May at 3pm.

The peak parking demand on the Rutland and St Albans Street areas came on a Sunday morning – with parking for church services at the southern end of Rutland Street and on Rutland Street north of Knowles Street.

7.1.14.3 Parking Summary

A summary of the peak parking demand on the proposed cycleway is shown in Table 7-4 In summary the peak observed parking demand on Colombo Street occurs at 12:30pm with a demand of 83 car parks. The car parks at the southern end of Colombo Street tend to be in demand earlier in the day whereas, the car parks near Edgeware Village tend to have their highest demand later in the day when shops are open. On Trafalgar Street the parking demand tends to peak at 3:00pm which indicates that the Primary School is a primary driver for parking demand, especially in the north of Trafalgar Street.

The car parking on St Albans Street does not seem to have a peak, whereas parking on Rutland Streets southern end peaks with Sunday morning church services, and with Paparoa Street School drop off at the northern end.

Table 7-4: Peak Parking Demands on Proposed Cycleway

Road	Section	Parking Capacity	Peak Parking Demand Time	Peak Parking Demand
Colombo Street	Bealey Avenue – Purchas Street	37	10:00am	36
	Purchas Street – Canon Street	77	10:00am, 4:30pm	27
	Canon Street – Edgeware Road	40	5:00pm	36
	ALL SECTIONS	154	12:30pm	83
Edgeware Road	Colombo Street – Trafalgar Street	7	4:30pm	6
Trafalgar Street	Edgeware Road – Dover Street	54	11:30am, 4:30pm	14
	Dover Street – Coles Place	19	3:00pm	11
	Coles Place – Sheppard Place	17	3:00pm	17

Road	Section	Parking Capacity	Peak Parking Demand Time	Peak Parking Demand
	Sheppard Place – St. Albans Street	11	3:00pm	10
	ALL SECTIONS	101	3:00pm	48
St Albans Street	Courtenay to Rutland	12	1.30pm (Sat pm)	6
Rutland Street	St Albans to south of shops	49	10.15am (Sun am)	39
	South of shops – Hawkesbury	9	1.30pm (Sat pm) and 10.15am (Sun am)	8
	Hawkesbury – Innes	25	1.30pm (Sat am)	8
	Innes – Knowles	11	12.30pm (Wed pm)	2
	Knowles – Weston	16	1.30pm (Sat pm)	5
	Weston – McFaddens	31	10.15am (Sun am)	28
	McFaddens - Mays	15	9.15pm (Wed pm)	4
	Mays – Tomes	32	8.30am (Thu am)	19
	ALL SECTIONS	188	10.15am (Sun am)	94
Caledonian Road	Not recorded			

7.1.15 Pedestrian & Cycle Counts

QTP consultants have developed a model to allow prediction of cyclist volumes for each of the Major Cycle Routes being developed. The 2031 daily use estimate for the Papanui Parallel route is 633 cyclists per day.

Pedestrian and cycle counts were conducted around Edgeware Village on the 27th and 30th of May 2014 from 8:30am to 9:30, 11am to 1pm and 4:30pm to 5:30pm. Pedestrians were counted as they crossed Edgeware Road, Trafalgar Street and Colombo Street in the areas shown in Figure 7-17.

Pedestrian and cycle counts were conducted on Trafalgar Street on the 27th and 30th of May 2014 from 8:15am to 9:15am and from 2:30pm to 3:30pm. Pedestrians were counted as they crossed Trafalgar Street and Sheppard Place in the areas shown in Figure 7-18.

Figure 7-17: Edgeware Village Pedestrian Survey Areas

Figure 7-18: Trafalgar Street Pedestrian Survey Areas

7.1.15.1 Edgeware Village

During the periods surveyed there were a total of 898 pedestrians counted on Day 1 and 1007 pedestrians in Day 2. The proportion of pedestrians crossing the road in the various crossing areas is shown in Table 7-5.

Time	Count											
	Colombo St		Trafalgar St		At Edgeware Road Zebra		East of Edgeware Road Zebra		West of Edgeware Road Zebra		Total	
	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14
AM (8:30–9:30)	27%	26%	11%	7%	34%	39%	18%	14%	11%	15%	131	165
IP (11-1)	37%	34%	9%	7%	35%	33%	11%	19%	7%	6%	433	463
PM (4:30-5:30)	31%	31%	10%	4%	43%	46%	6%	10%	11%	9%	334	379

The average hourly pedestrian count during the interpeak period was 217 pedestrians on Day 1 and 232 pedestrians on Day 2. The majority of pedestrians crossing Edgeware Road use the zebra crossing with approximately 70% of pedestrians using the zebra crossing during the PM survey period. Of all pedestrian crossing areas surveyed, the Edgeware Road zebra crossing, and Colombo Street crossing were the most used crossings. It is worth noting that there were a number of pedestrians observed crossing Colombo Street not at the pedestrian crossing facility. These pedestrians were often using the short stay parking outside the Edgeware shops.

Table 7-5: Pedestrians Crossing Location Proportions

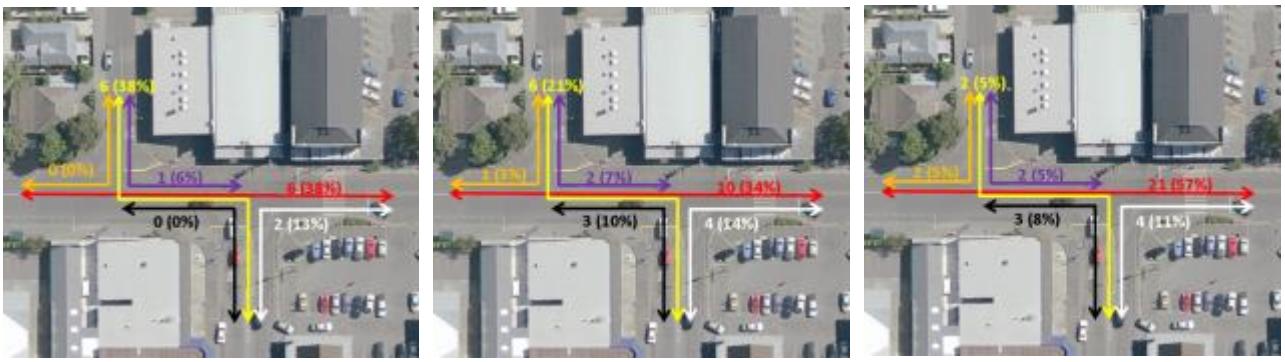
Time	Count											
	Colombo St		Trafalgar St		At Edgeware Road Zebra		East of Edgeware Road Zebra		West of Edgeware Road Zebra		Total	
	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14
AM (8:30–9:30)	27%	26%	11%	7%	34%	39%	18%	14%	11%	15%	131	165
IP (11-1)	37%	34%	9%	7%	35%	33%	11%	19%	7%	6%	433	463
PM (4:30-5:30)	31%	31%	10%	4%	43%	46%	6%	10%	11%	9%	334	379

The proportion of pedestrians using the current zebra crossing on Edgeware Road and Crossing Colombo Street indicate that it is important that any cycleway design retain a pedestrian crossing on Edgeware Road and Colombo Street. Pedestrians crossing Edgeware Road to the east or west of the current zebra crossing would be difficult to capture with a new facility, as the pedestrians are making a conscious decision not to use the facilities provided.

Cyclist Counts

A summary of the count and proportion of cyclists moving through the Edgeware Village are shown in Figure 7-19 with the full results shown in Appendix E. The number of cyclists cycling through Edgeware Village increases as the day progresses with it peaking in the PM period surveyed.

Figure 7-19: Count and Proportion of Cyclist Movements through Edgeware Village



AM Period (8:30am – 9:30am) IP Period (11am – 1pm) PM Period (4:30pm – 5:30pm)

During the AM period and inter-peak period surveyed the proportion of cyclists doing each movement is similar. During these periods the movement with the largest proportion of cyclists is the east to west and west to east movements on Edgeware Road, followed by the Colombo Street to Trafalgar Street and Trafalgar Street to Colombo Street movements. During the PM period surveyed, the east to west and west to

east movements on Edgeware Road have the majority of cycle movements through the Edgeware Village with the other movements having similar volumes.

Table 7-6: Origin of Cyclists Visiting Edgeware Village

Period	Colombo St	Trafalgar St	Edgeware Rd East	Edgeware Rd West
AM Period (8:30am–9:30am)	1	0	0	0
IP Period (11am-1pm)	2	1	0	0
PM Period (4:30pm-5:30pm)	0	0	2	1

7.1.15.2 Trafalgar Street near St. Albans School

Pedestrian Counts

During the periods surveyed there was a total of 371 and 359 pedestrians counted on the 27th and 30th of May respectively. The proportion of pedestrians crossing at the various crossing areas are shown in Table 7-7. At least 90% of all pedestrians crossing Trafalgar Street cross at the existing Kea crossing. During the AM period approximately 70% of pedestrians are considered sensitive pedestrians compared to approximately 55% during the PM period. Sensitive pedestrians, are defined as young children less than 12 years old and the elderly, are more susceptible to injury in a crash and also tend to walk slower than adult pedestrians. Approximately 95% of young children crossing the Trafalgar Street cross at the current Kea crossing during both the AM and PM periods.

Table 7-7: Crossing Location of Pedestrians near St. Albans School

Time	Pedestrian Count											
	Sheppard Place		South of Kea Crossing		At Kea Crossing		North of Kea Crossing		At Roundabout		Total	
	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14	27/5/14	30/5/14
AM (8:15am–9:15am)	20%	12%	7%	3%	74%	81%	0%	0%	0%	4%	152	116
PM (3:30pm-4:30pm)	21%	21%	5%	3%	71%	77%	2%	0%	0%	0%	219	243

The proportion of pedestrians crossing Trafalgar Street at the current Kea crossing indicates that this is a key crossing point for pedestrians, especially school-aged pedestrians. Any cycleway design needs to include this crossing point as it provides a safe place to cross for pedestrians.

Cyclist Counts

During the periods surveyed there were a total of 14 and 15 cyclists counted during the AM and PM periods respectively with the full results shown in **Appendix E**. During the AM period, 57% of the cyclists were

travelling north-south/south-north on Trafalgar Street compared to 53% during the PM period. Five cyclists were observed using Trafalgar Street after turning in or out of Sheppard Place during the AM period compared to six during the PM period. Approximately half of the cyclists observed entering or exiting Sheppard Street were going to or from the south of Trafalgar Street. During the AM period only one cyclist was observed crossing Trafalgar Street using Sheppard Place and Massey Crescent compared to none in the PM period.

7.1.15.3 St Albans Street and Rutland Street

Cycle volume information has been obtained for the intersections of Rutland Street/Innes Road Rutland Street/St Albans Street and Courtenay Street/St Albans Street/Trafalgar Street from the CCC database. The counts were undertaken for a two-hour morning - peak; one hour inter- peak and two hour evening peak, for St Albans Street in 2008 and Rutland Street in 2011. The counts showed very low numbers (typically fewer than 10 cyclists in any one hour count movement for all legs and periods).

The age of the cycle counts makes them of passing interest only for this investigation. The purpose of this investigation is to create a major cycle route that will attract increasing numbers to it. The anticipated future volumes of cyclists on the MCR are anticipated to be 2,440 cyclists per day north of Innes Road, and 2,370 per day south of Innes Road (2031)[3]. The strategic model information is included in **Appendix E.**

7.1.16 Colombo Street / Bealey Avenue Intersection Observations

Site observations of the operation of Colombo Street / Bealey Avenue intersection were conducted on 15 April 2015 and 7 May 2015. Pedestrians crossing Bealey Avenue are required to cross in one movement which was observed taking approximately 25 seconds. The green time for Colombo Street traffic when pedestrians are crossing was approximately 30 seconds. Without the pedestrian demand the green time on Colombo Street was observed to be approximately 10 seconds. When pedestrians are crossing Bealey Avenue it adds extra time to the cycle and increases the time turning traffic is required to wait (although some drivers were observed proceeding when they are required to Give Way to pedestrians).

On-street parking surrounding the intersection appears to be highly utilised by long-stay parking. Due to the high utilisation of parking in the area, patrons of business near the intersection were not observed parking directly outside of the respective business. All businesses on and around the intersection have some off-street parking available, however the businesses on the north-eastern corner (920-926 Colombo Street) are likely to have very limited parking relative to its available floor space.

7.2 Northern Section

This section provides a description of the existing transport environment for the project including an outline of the crash history and the road users. The roads within the study area are all subject to a 50km/hr speed limit area.

7.2.1 Intersections

There are six intersections within the study area:

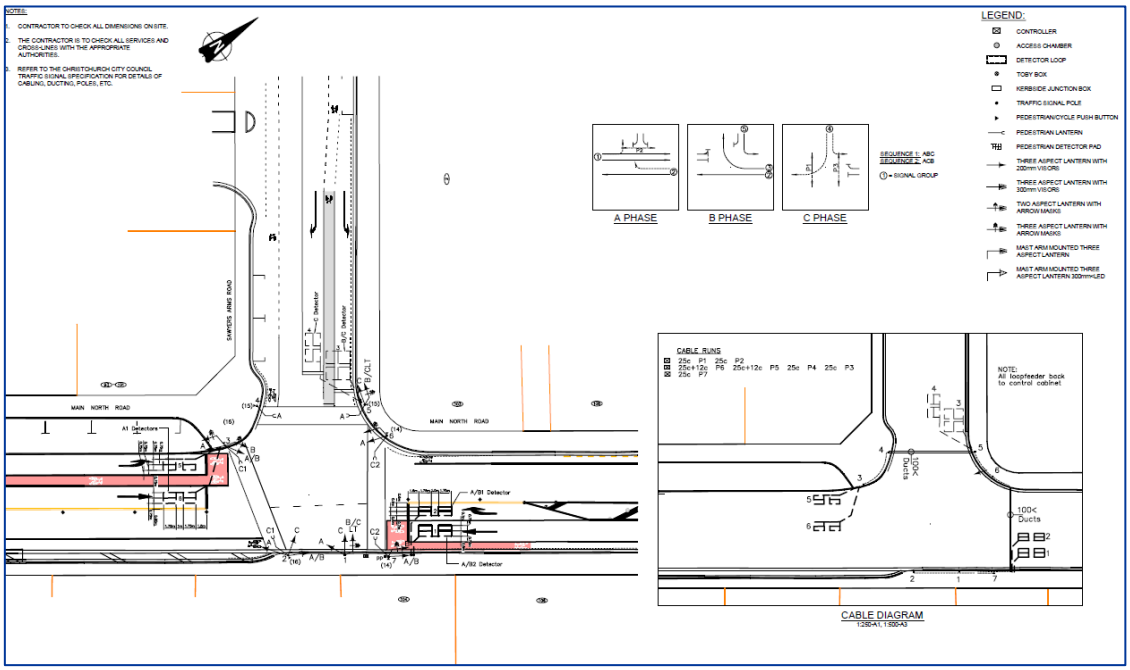
[3] Cycle flow data supplied by CCC “Rutland St Cycle Flows” extracted from Christchurch Strategic Cycle Model (Aug 2014).

- Grassmere Street/Grants Road is an uncontrolled T-intersection where the north western Grassmere Street and Grants Road approaches have priority.
- Grassmere Street/Main North Road is a Give-Way controlled T intersection where Main North Road has priority.
- Main North Road/Sawyers Arms Road is a signalised T-intersection.
- Sawyers Arms Road/Leander Street is an uncontrolled T-intersection where Sawyers Arms Road has priority.
- Sawyers Arms Road/Sisson Drive is a Give-Way controlled T-intersection where Sawyers Arms Road has priority.
- Sawyers Arms Road/Nyoli Street is an uncontrolled T-intersection where Sawyers Arms Road has priority.

The current traffic signals plan for the Main North Road/Sawyers Arms Road intersection is shown in Figure 7-20. The intersection currently has cycle lanes and separate right, through and left lanes as appropriate on each approach.

A more detailed discussion of the intersections is provided in the relevant sections below

Figure 7-20: Current traffic signals plan for Main North/Sawyers Arms Intersection



7.2.2 Grassmere Street traffic environment

Grassmere Street is a local road ('Typical Street' in the CTSP) and therefore has an 'access' function. Grassmere Street has two distinct environments.

The south eastern end is relatively rural in its nature, see Figure 7-21, and incorporates the following:

- Footpath on the southern side only.
- Kerb and channel on the southern side only (except outside 45 Grassmere Street where a short length of kerb exists due to the property boundary being less than 1m from the carriageway).
- Approximately an 8.0-8.3m wide carriageway.

- Grass verge on the northern side of variable width.
- Parking on both sides however on the north side vehicles park on the grass verge.
- Few driveways on both sides. On the southern side, low/open fences are predominant providing good visibility.
- On the northern side, fences are higher and driveways are more abundant/more heavily used.
- There is also an unsealed section of Grassmere Street south of the Grassmere Street/Grants Road intersection, see
- *Figure 7-22.* This is where the cycleway will connect with the remainder of the Papanui Parallel route.

Figure 7-21: South Eastern Segment of Grassmere St

Figure 7-22: Unsealed segment of Grassmere St

The north western section is more developed (see Figure 7-23), and incorporates the following components:

- Footpaths on both sides.
- Parking on both sides (P120 interspersed with unrestricted).
- Kerb and channel on both sides.
- An 11m wide carriageway (3.5m wide traffic lanes).
- Many driveways on both sides.

- Along the length of Grassmere Street there are two bus stops (outside number 41 and number 3) These stops exist solely for the 118 Edgeware/Northlands route that is no longer in service.

There are no existing cycle facilities on Grassmere Street.

Figure 7-23: North Western Segment of Grassmere St

During the site visit it was observed that unrestricted parking at the north western end of Grassmere Street experiences high occupancy rates while P120 spaces are generally underutilised. This can also be seen on aerial photos where some areas more utilised than others, see

Figure 7-24. It is expected that the majority of parking occurring in the unrestricted spaces on Grassmere Street is associated with staff at the Northlands Shopping Centre. Residential properties along Grassmere Street have off-street parking.

Figure 7-24 Parking Restrictions on Grassmere St

7.2.3 Main North Road Traffic Environment

Main North Road is a minor arterial road (with the same classification under the CTSP) and therefore has an important function of distribution of trips.

The traffic environment along Main North Road is as follows:

- Footpaths on both sides.
- Kerb and channel on both sides.
- Carriageway width of 20 -24 metres (depending on presence of indented parking, bus stops etc) along the section of interest.
- Some indented parking is provided between Grassmere Street and Sawyers Arms Road, with various time restrictions.
- Some significant driveways on the east side providing access to doctors surgery and hair dressing salon as well as private residences. These, and other potential hazards to the MCR, are discussed further in Section 9.2.3.1.

There is a major bus stop pair outside Countdown (the function of which is discussed further in Section 10.8.4). Immediately south of the study location on Main North Road is a Super Stop servicing Northlands Mall.

There are existing on-road cycle lanes on both sides of Main North Road along the entire study section.

7.2.4 Sawyers Arms Road Traffic Environment

Sawyers Arms Road is a collector road ('Main Distributor' in the CTSP) and therefore has a function of distribution of trips but also with a significant access function.

The traffic environment along Sawyers Arms Road is as follows:

- Footpaths on both sides.
- Kerb and channel on both sides.
- Carriageway width of approximately 14.0 metres.
- Parking is available on both sides. Parking on the north side has P120 restriction (in some places including the "at all times" clause). Parking is unrestricted on the south side and has been observed to have a high occupancy, presumably due to staff from Northlands Mall.
- Multiple driveways on both sides. These, and other potential hazards to the MCR, are discussed further in Section 9.2.3.1.

There are two bus stop pairs along Sawyers Arms Road (west of Sisson Drive and West of Nyoli Street). These stops are used exclusively for the 108 bus route.

There are existing on-road cycle lanes on both sides of Sawyers Arms Road between Main North Road and Nyoli Street.

7.2.5 Existing Vehicle Flows

Link Counts

Council routinely records link count data at sites throughout the city. The most recent 4-day (Monday-Thursday) average traffic flow profiles are shown in *Error! Reference source not found.*, *Error! Reference source not found.* and Figure 7-27 for Grassmere Street, Main North Road and Sawyers Arms Road

respectively. Available link count data for side roads that connect to the study area are also included in Figure 7-25.

Figure 7-25 Grassmere Street Weekday Traffic Flow Profile (December 2007)

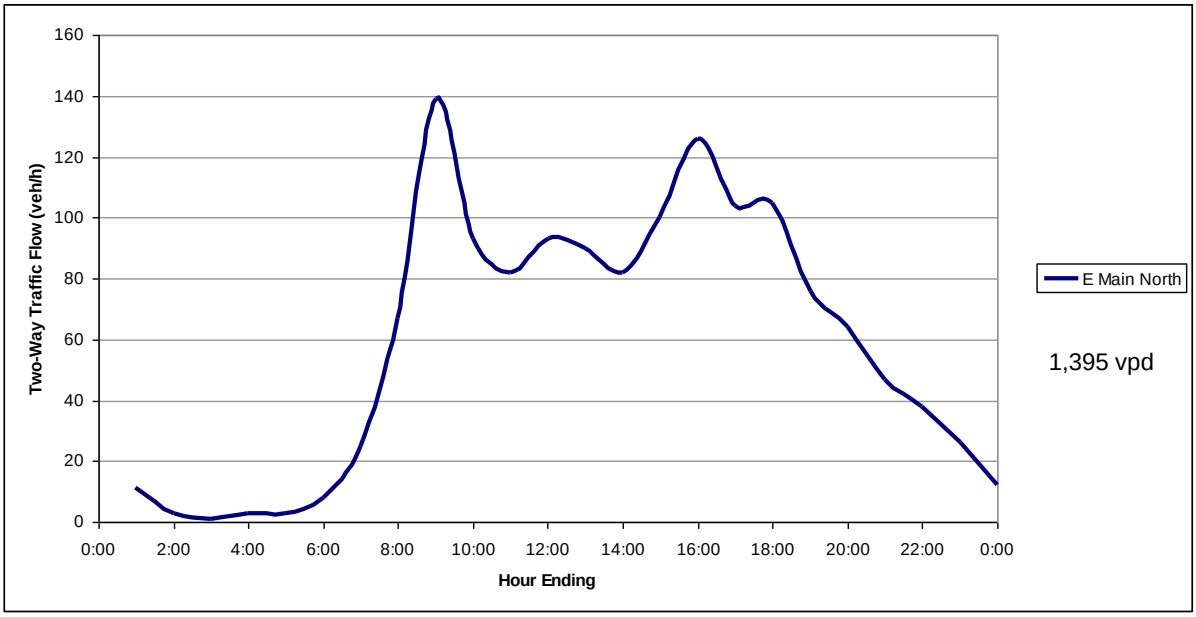


Figure 7-26 Main North Road Weekday Traffic Flow Profile (June 2012)

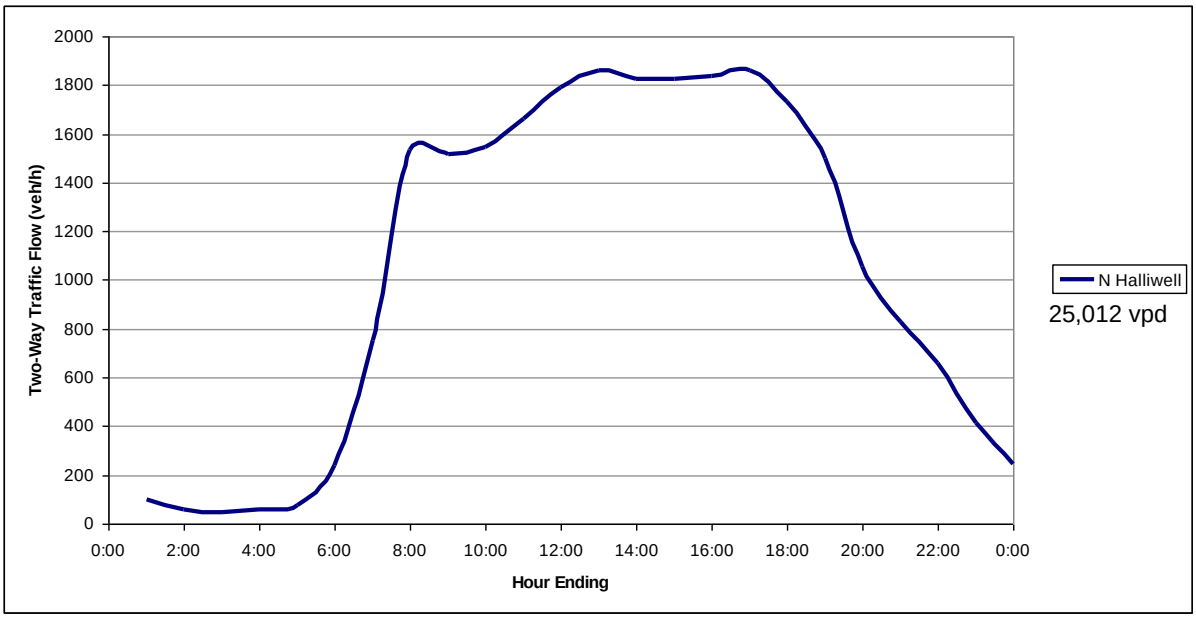


Figure 7-27 Sawyers Arms Road Weekday Traffic Flow Profile (June 2012)

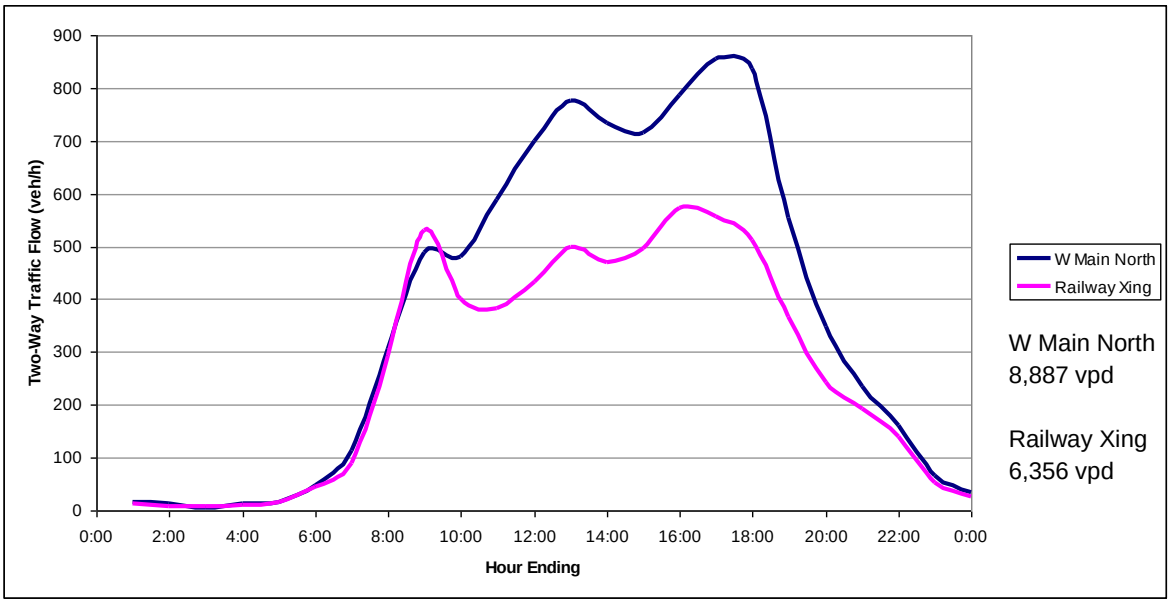


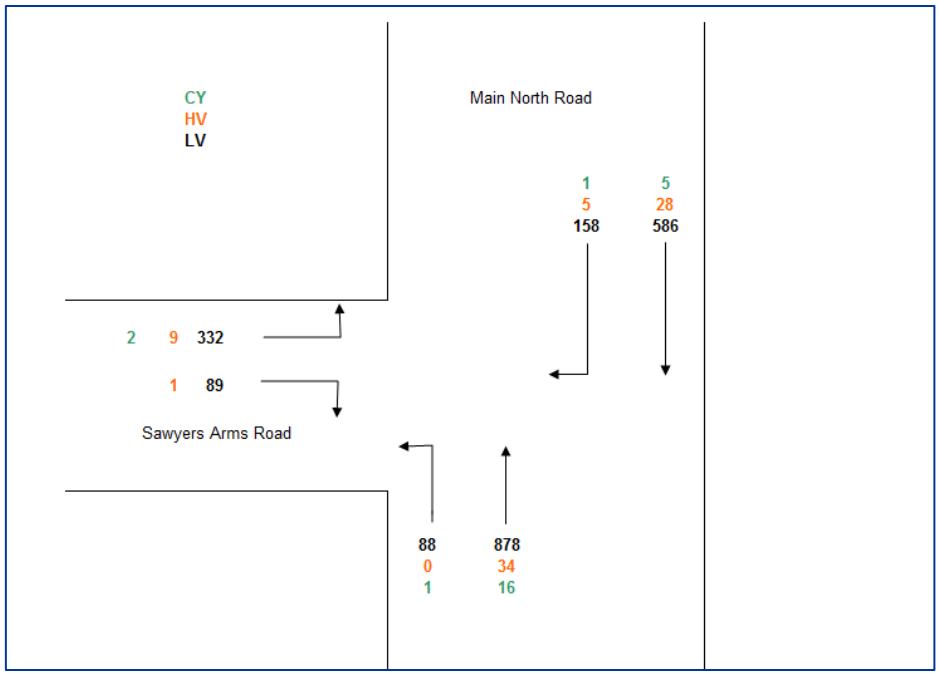
Table 7-8 Link Count Data

Street	Count Year	Morning Peak 8am - 9am	Evening Peak 4pm-5pm	ADT	2031 CAST Volumes (ADT)
Grassmere Street	2007	139	104	1,395	1,269
Main North Road	2012	1,518	1,862	25,012	22,327
Sawyers Arms Road W Main North	2012	489	854	8,887	7838
Sawyers Arms Road at X-ing	2012	531	558	6,356	4,121
Grants Road	2008	71	167	1,542	878
Leander Street	Not Available				
Sisson Drive	2011	152	237	2,465	2,969
Nyoli Street	2004	236	212	2,369	2,458

Intersection Volumes

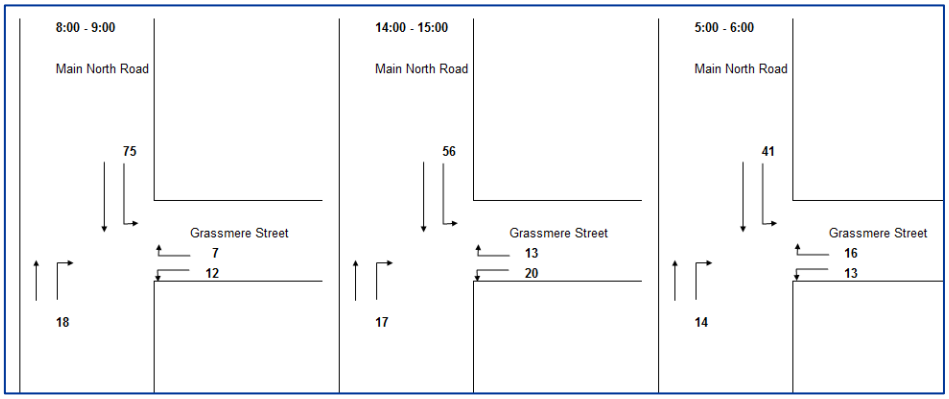
Of all the intersections within the study area, the only intersection that falls within Council's programme of intersection counts is the Main North Road/Sawyers Arms Road intersection. The 4:00pm-5:00pm intersection movements are shown in Figure-7-28.

Figure-7-28 Main North / Sawyers Arms Intersection Weekday Turning Movements 4-5pm (February 2010)



Intersection counts to understand turning movements into and out of Grassmere Street were undertaken as part of this study. The results of the counts are shown in *Figure-7-29*.

Figure-7-29 Main North / Grassmere Intersection Weekday Turning Movements (12 November 2014)



Cycle Volumes

Cycle volumes have been extracted from the Christchurch Strategic Cycle Model (August 2014 version). Anticipated volumes are shown in

Table 7-9 and *Figure 7-33*. Cycle Counts are anticipated to decrease from 2021 to 2031 due to the inclusion of other connections in the network, the most notable being the Northern Line MCR.

Table 7-9 Anticipated Cycle Counts

	2021				2031			
Location	**AM Peak**	**Inter Peak**	**PM Peak**	**Daily**	**AM Peak**	**Inter Peak**	**PM Peak**	**Daily**
Grassmere Street	215	65	195	1270	175	50	145	990
Main North Road	240	75	215	1400	180	60	150	1010
Sawyers Arms Road W Main North	110	40	145	810	105	35	130	730
Sawyers Arms Road Leander-Nyoli	95	40	125	690	90	35	105	610
Sawyers Arms Road Nyoli-Xing	90	35	115	660	80	30	95	570
Sawyers Arms Road W Xing	60	20	50	360	70	20	60	420
Railway N	305	100	315	1960	285	90	280	1770
Railway S	265	85	140	1610	260	85	235	1570

The anticipated directional split of cyclists on the routes within the study area are shown in Figure 7-30 and

Figure 7-31.

Figure 7-30 2031 Directional Split During AM Peak

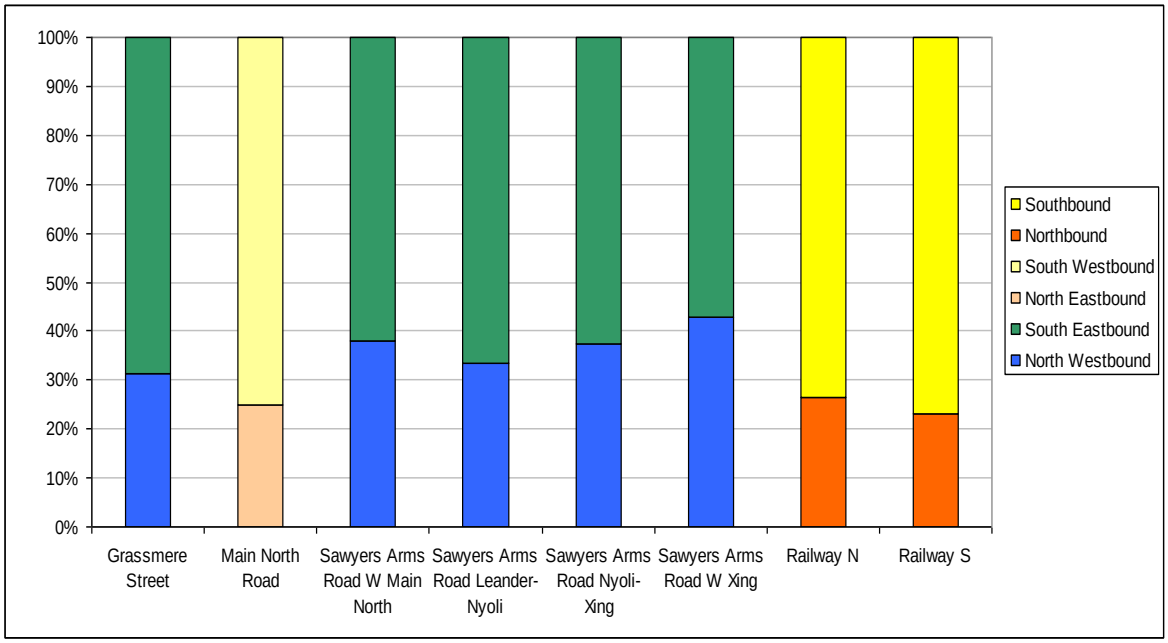
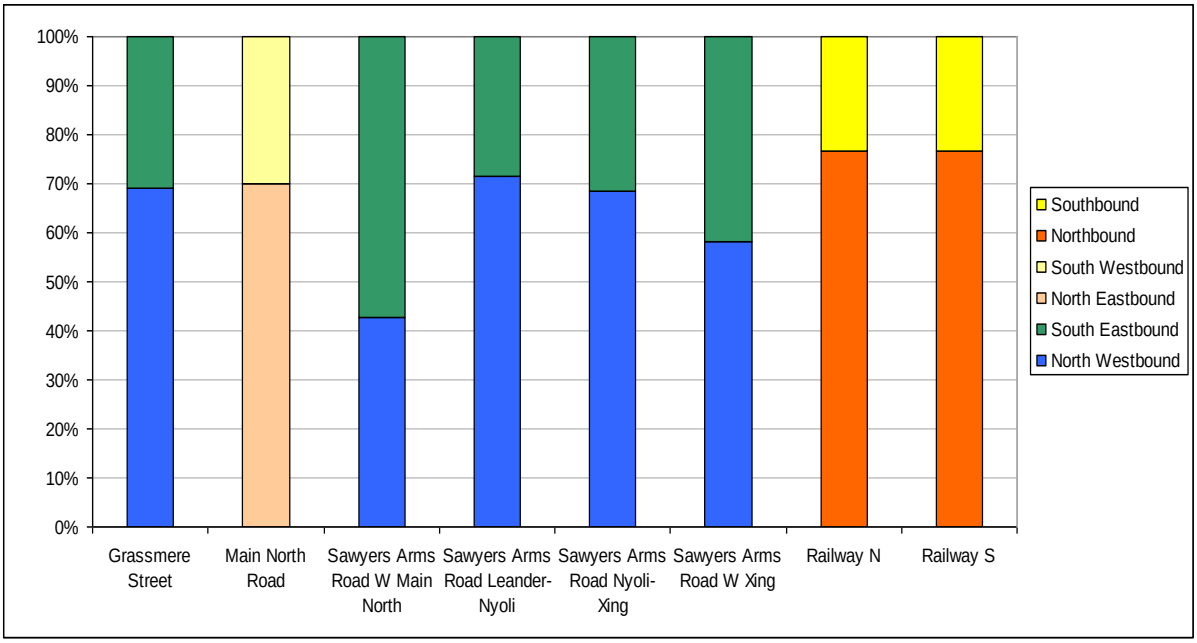


Figure 7-31 2031 Directional Split During PM Peak



Existing Cycle Facilities

Existing cycle facilities in or adjacent to the study area include:

- Cycle lanes and bus lanes on Main North Road,
- Cycle lanes on Sawyers Arms Road,
- A cycle lane on Sisson Drive on the approach to the Sisson Drive/Sawyers Arms Road intersection,
- A shared path on Sisson Drive, and
- A shared path along the railway line.

Grassmere Street has no existing cycle facilities.

The 2006 cyclist volumes along the route, which were used as the base data for the CAST model development and represent the “existing” situation, are shown in

Figure 7-32. The model's predictions for cyclist volumes in 2031 are shown in Figure 7-33.

Figure 7-32: Base (2006) cycle volumes used in cycle model

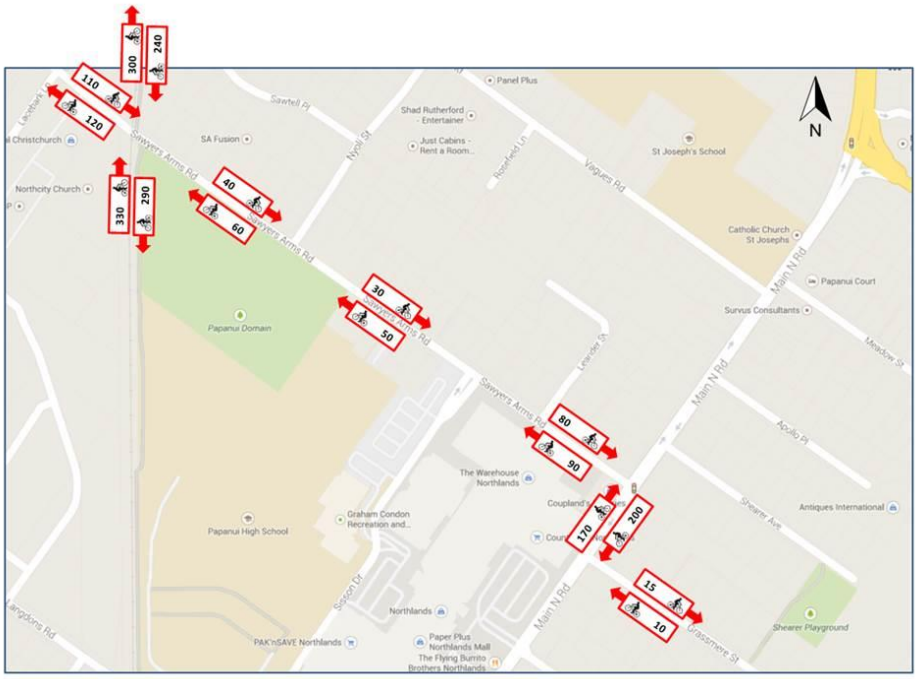
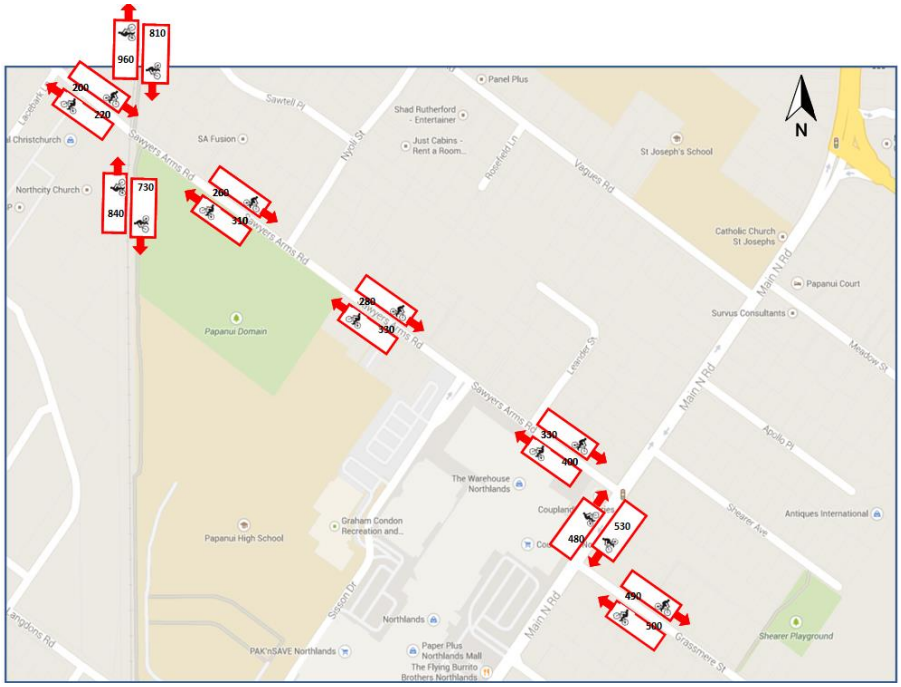


Figure 7-33: 2031 Daily Cycle Volume Estimates



7.2.6 Crash history

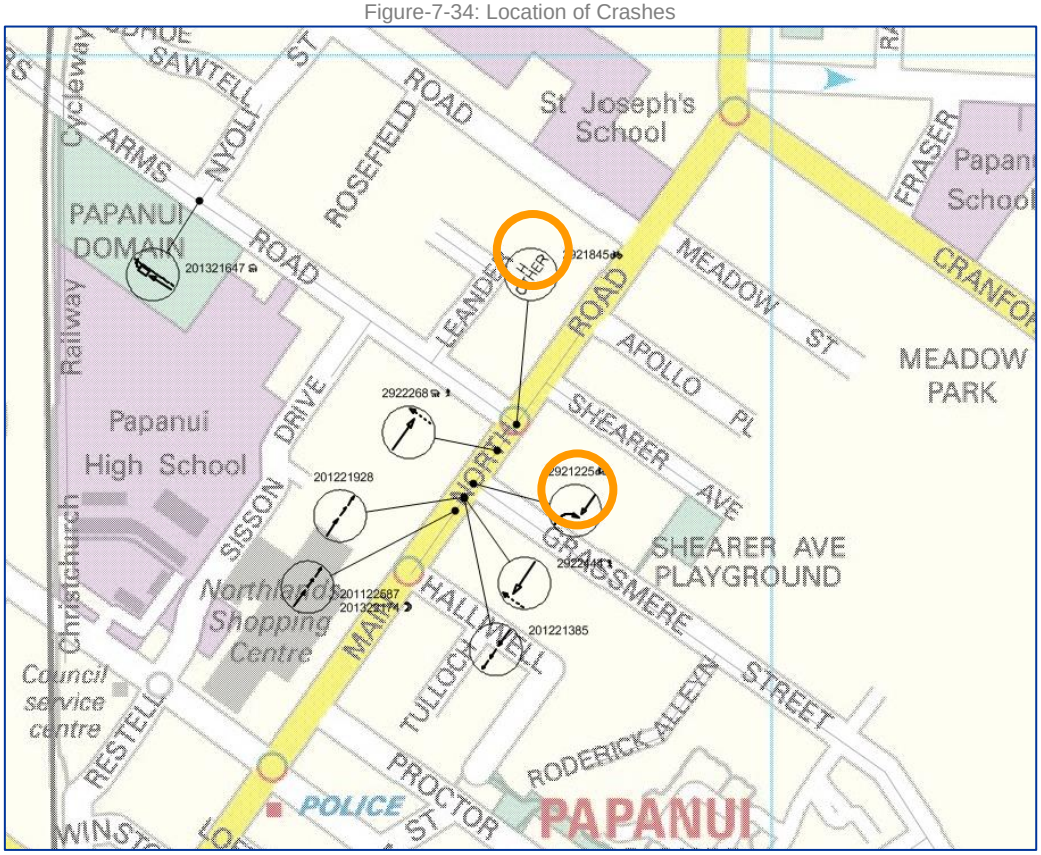
Reported crashes along the proposed route and within 50m of all intersections in the study area were retrieved from the NZ Transport Agency Crash Analysis System (CAS). For the five year period from 2009 – 2013, 24 crashes were recorded including 1 serious injury crash, 8 minor injury crashes and 15 non-injury

crashes. Two of the crashes involved cyclists as detailed in Table 7-10. The locations of the injury crashes are shown in the collision diagram in Figure-7-34, crashes involving cyclists are outlined in orange.

Table 7-10 Crashes involving Cyclists

Crash ID	Description	Severity
2921225	Car waiting to turn right into Grassmere Street from Main North Road turned through gap in traffic but did not see cyclist approaching on other side of cars. The cyclist saw the car turning in front of them and braked quickly causing them to be thrown over the handle bars. No collision occurred.	Minor Injury
2921845	Cyclist crossing Main North Road on pedestrian crossing on red light at Sawyers Arms Road. Northbound car on Main North Road hit cyclist on Green light for through traffic. Driver did not see cyclist before hitting them.	Minor Injury

Figure-7-34: Location of Crashes



The number of crashes per year in the study area ranged from eight in 2009 down to four in 2010-2013 as shown in

Figure 7-35. The most prevalent crash type in the study area is rear end crashes, followed by right turn against and crossing/turning crashes, as shown in Table 7-11. The majority of crashes have occurred on, or at intersections with, Main North Road.

Figure 7-35: Number and severity of crashes

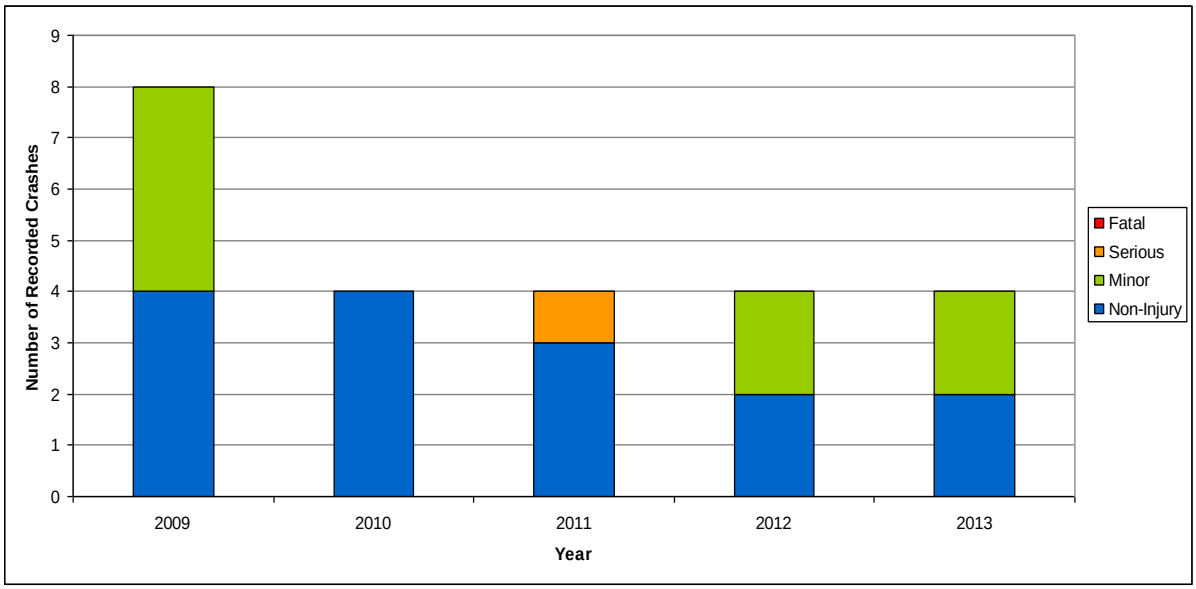


Table 7-11: Crash type and number per year

Crash Type	2009	2010	2011	2012	2013	Total
Overtaking and lane change						
Head on	1					**1**
Straight road lost control	1					**1**
Cornering - lost control/head on						
Collision with obstruction						
Rear end	2	4	2	2	2	**12**
Crossing/turning	1*			1	1	**3**
Merging						
Right Turn Against	1*		1		1	**3**
Manoeuvring			1	1		**2**
Pedestrian Crashes						
Miscellaneous	2					**2**
Total	**8**	**4**	**4**	**4**	**4**	**24**

* Crashes involving a cyclist

7.2.7 Risk Mapping

Risk Mapping uses historical traffic and crash data to produce colour-coded maps to illustrate the relative level of risk on sections of the road network. Collective risk levels defined by the NZ Transport Agency are used in this report to understand the level of risk on the corridors and at the intersections within the study area. A heatmap of crashes involving vulnerable road users is also used to understand how these users are related to the levels of risk on the associated road corridors.

The risk map produced by Abley Transportation Consultants, shown in Figure 7-36**,** shows that Main North Road is a High Risk corridor in the vicinity of the study area. Sawyers Arms Road is a medium risk corridor and Grassmere Street is a low risk corridor. The intersection of Grassmere Street with Main North Road is a medium risk intersection.

Figure 7-36: Collective risk at the intersection including pedestrian and cycle heat map

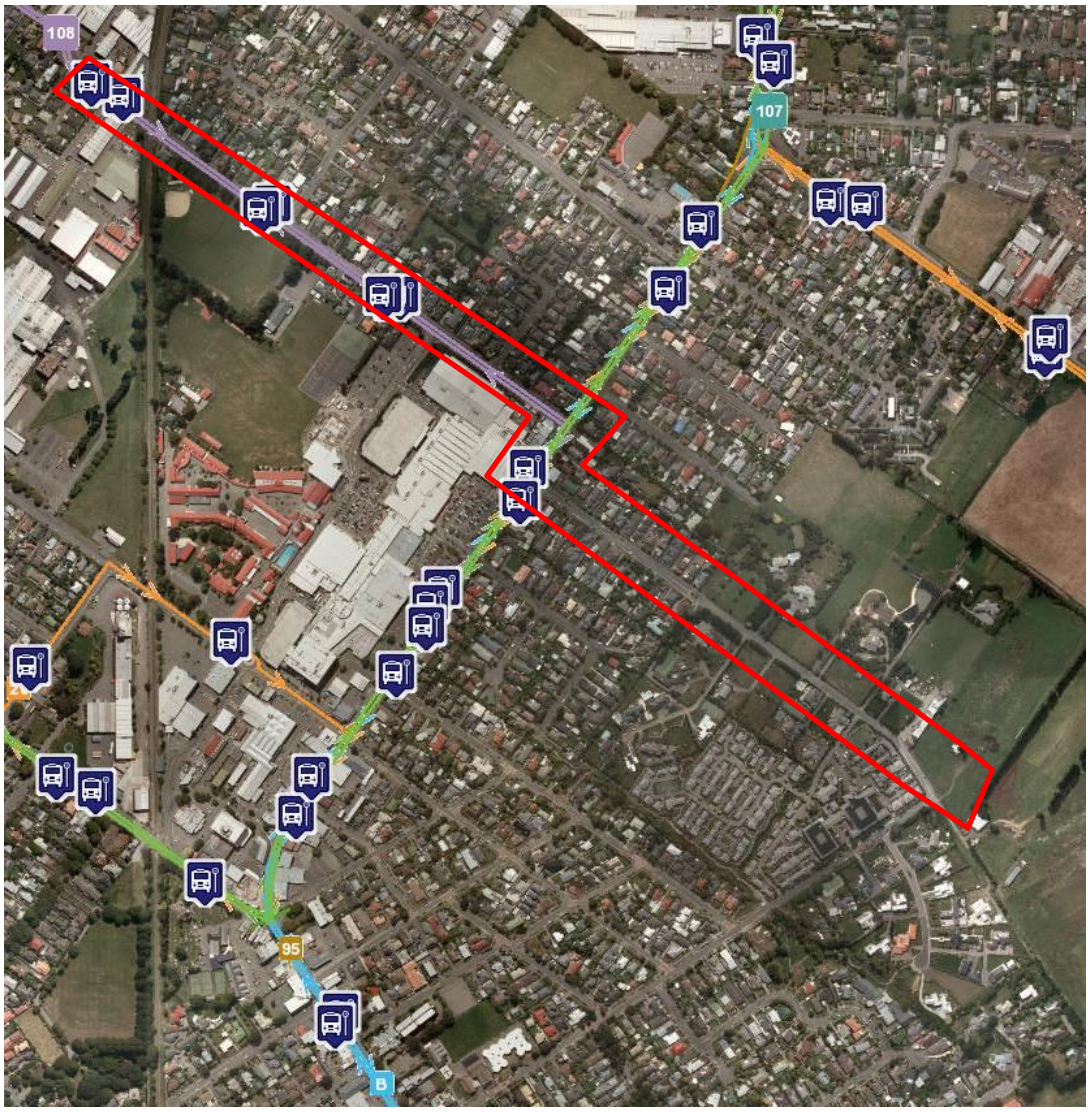
7.2.8 Public Transport

Main North Road is a core public transport route and accommodates several bus services, all services pass through the Northlands Super Stop to the south of the Papanui Parallel Cycleway. The current services that pass through the study area are listed below:

- The Blue Line (along Main North Road)
- The Orbiter (along Main North Road)
- 125 Redwood-Westlake – previously The Comet (along Main North Road)
- 28 Papanui/Lyttelton-Rapaki (along Main North Road)
- 95 Waikuku and Pegasus (along Main North Road)
- 107 Styx Mill/Northlands (along Main North Road)
- 108 Casebrook/Northlands (along Main North Road and Sawyers Arms Road)

An overview of the routes and bus stop locations is shown in Figure 7-37. Due to recent changes to bus routes made on 8 December 2014 there is no longer a bus route on Grassmere Street.

Figure 7-37: Bus routes through the study area and bus stop locations (source: ECan – Metroinfo website)

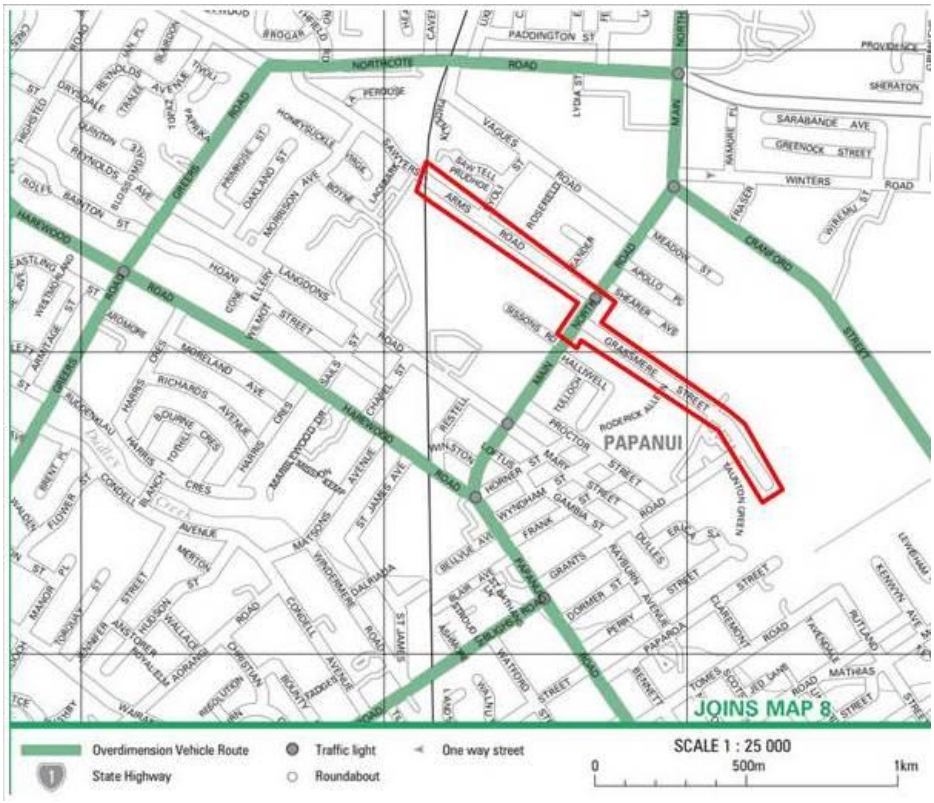


7.2.9 Large Vehicles

Main North Road is part of the NZTA Over Dimension route as shown in

Figure 7-38. The Heavy Haulage Association recommends that a 11.5m wide x 6.5m tall clear envelope is provided on over dimension routes to accommodate the 97th percentile over dimension vehicle in New Zealand.

Figure 7-38: Over dimension Vehicle Route (Source: NZTA Website)



8 Option Assessment – Facility Types – Southern Section

At this point in the scheme assessment, the full Papanui Parallel route has been defined, and the transport and land use environment in which the routes are located have been considered in detail. In the following sections, the type of cycle facilities that could operate in the sections of each route are described in detail, and then subject to multi-criteria assessment to establish the preferred facility type. The northern and southern sections are covered in separate report sections (southern in Section 8, the northern in Section 9), as the identification and assessment processes are slightly different.

8.1 Introduction

The Route Option assessment process has been developed to confirm the selection of routes and types of facility Options from within a route corridor – a specific route or facility is not predetermined.

Determining the preferred Facility Type Option for a given route or sub route uses the same MCA methodology used for Route Selection as detailed in Section 6.

As per Section 5.6, two Yellow Routes emerged from the Route Selection MCA assessment as preferred routes. Further testing using a route specific MCA assessment was necessary to establish the preferred Route and also the preferred Route Options (facility types).

For this MCA assessment, as described in Section 5.7, the short list of possible routes was split into three sections as follows:

- Bealey Ave / Colombo Street /Edgeware Road to Trafalgar Street/Dover Street Intersection
- Trafalgar Street/Dover Street Intersection to St Albans / Rutland St Roundabout
- Rutland Street between St Albans Street and Rutland Reserve

Using three sections allowed a more in depth review of both sub Routes and Options in discrete areas to pin point routes or options that were clearly favoured.

Section 7.3 compares route and sub-route options in an MCA assessment to identify a preferred route and option (facility type) along the route. The full MCA assessment table can be found in **Appendix H.**

Following the MCA assessment, using the initial criteria weightings, the Route Selection for Section 1 – Bealey Ave to Trafalgar St / Dover St Intersection – did not reveal a clear favourite. Further review was necessary using Sensitivity Analysis the Section 1 preferred route as described in Section 7.4.

Prior to the MCR assessment a review of Issues associated with implementation of an MCR within the Yellow Route environment was completed as detailed below in Section 7.1.

With Issues understood, an Option Development review was completed. Refer Section 7.2 which shows a table of Facility Types (Options) that were identified for each route and sub route in each section. This included the benefits and impacts as shown in the Table in Section 7.2. The rationale for the preferred selected option was made clear.

8.2 Route Issues

With the “Route Selection” Assessment reducing the list of preferred options to two overall routes (on the Yellow Route), a “Route Option” Assessment was necessary to consider more closely the issues relevant to each route and facility type, and consider design details that may address (or not), key issues.

Each route option was considered by comparison to other options for route, and it is determined whether the design sub-routes should be taken through to the next step of MCA.

The issues to be considered for development of treatment options have been identified through some community and stakeholder engagement; site detail walkovers (following initial MCA), previous experience in design and delivery of cycle facilities, and through discussion with CCC personnel.

The key issues for this project (and reflected in the Objectives in Section 2) are as follows:

8.2.1 Consultation

During the Option Development phase in 2014, preliminary consultation by Beca has included:

8.2.1.1 Meeting with St. Albans School

A meeting with the St. Albans School Principal was conducted on 5 June 2014 and the minutes of this meeting are shown in **Appendix B**. The school raised several concerns regarding the proposed major cycleway to run on Trafalgar Street. The school feels the road is currently used as a thoroughfare which results in high traffic volumes. They also feel the current speed humps do not sufficiently slow traffic around the school to allow cyclists to safely cycle. The school indicated any cycleway should be able to be ridden by young children as there are some children who currently cycle to school.

The school highlighted parking as an issue on Trafalgar Street and Sheppard Place. Parents dropping off children at St. Albans School tend to use Sheppard Place and attempt to park on Sheppard Place. Poor driver behaviour exacerbates parking and access problems on Sheppard Place. An example of this is an instance where 90 parking tickets were issued during one week of enforcement. The school has tried in the past to encourage parents to drop their children off using the car park at English Park with access from Cranford Street. This has not proved to be effective as parents find it difficult to exit the car park on to Cranford Street due to high traffic volumes on Cranford Street. There is also a visibility problem for vehicles exiting Sheppard Place due to nearby vegetation.

8.2.1.2 Street Operations and Maintenance

Discussions have been held with CCC maintaining agents (Citycare and Waste Management) to determine operational issues that need to be considered for cycleway implementation. The key findings from these discussions are summarised in a separate report CCC Major Cycleways – Operational and Accessability Guidelines Review, dated 16th October 2014.

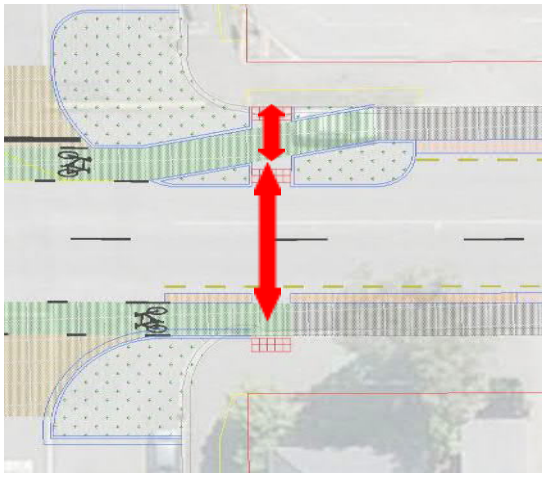
8.2.1.3 Disabled and visually Impaired Advocate

A meeting with Mike Thomson (CCC) was held on 22/08/2014 to discuss impacts on pedestrians / visually impaired users with the proposed Colombo -Trafalgar section of the Papanui Parallel Major Cycleway.

Key issues for consideration are:

- Colombo St or Caledonian Road, Rutland Street: As linear schemes, no problems are envisaged with provision of separators etc;

- Bus stops (general): A discussion about raising the level of the cycleway and creating a mini shared space. Beca and CCC were unsure if tactile paving should be provided at bus stops. This issue should be allowed for at scheme stage and addressed in more detail at detailed design. The provision of bus stops does not affect the refuse collections methods outlined in this report.
- Intersections (for example Purchas Street and Canon Place): No significant issues were raised. Tactile paving should be provided to guide visually impaired users through the unnatural layout. Positions of crossings should be consistent. The alignment and layouts of tactile paving will be confirmed at detailed design, however, initial thoughts are to provide a 2 stage crossing where widths allow, see below;



- Edgeware Village
  - CCC noted the presence of visually impaired users due to the blind foundation offices
  - The Copenhagen path option maybe confusing for pedestrians and visually impaired users as these are not common around Christchurch.
  - The signalised T intersection is more standard in terms of pedestrian users' expectations.
  - It was noted that CCC would prefer the crossing points closer together to optimise the intersection signals. However, pedestrian surveys undertaken as part of the main scheme report suggest the crossings may be better placed in relation to desire lines. Crossing locations can be confirmed at detailed design.
  - Tactile paving is required at crossing points.

- Trafalgar Street
  - Both the shared path and greenway have minimal effect on pedestrians and visually impaired users.
  - It was noted that standard tactile arrangements should be provided at crossing points.

Mike Thomson was happy that the options presented are easily workable and suit the user needs. Layout of tactile paving and pedestrian crossing points will need to be finalised at detailed design, however CCC see no "show stopper" ideas / concepts.

8.2.1.4 CCC Operations Personnel

Several CCC technical personnel were engaged in March 2015, specifically considering the form and impacts of cycle facilities on Rutland Street. Of particular concern were the detrimental network effects likely to result from turning restrictions at Innes Road/ Rutland Street intersection, in combination with the left-in/left-out restrictions likely to be placed on the Cranford Street intersections with McFaddens Road, Weston Road, Knowles Street, Dee Street and Malvern Street.

The CCC decision is that the cycle facilities at Innes Road / Rutland Street must not restrict any of the turning movements at this intersection.

8.2.2 Further Consultation

Further consultation with stakeholders (including Emergency Services) will be necessary as the project goes forward. CCC Cycleway group have advised that Community Boards will be informed of the scheme development so all options presented should (as much as possible) take account of the key issues known to be important to the immediate community. Issues associated with the Cycleway Scheme Development are discussed below.

Further engagement will also be worthwhile with the asset replacement planners within the CCC. Caledonian Road has deep dish kerb and channel, which will no doubt be replaced in due course. If the opportunity presents to modify the kerb and channel as an asset replacement in co-ordination with the MCR development, cost savings to both programmes may be achievable.

8.2.3 Cycleway Objectives

The guidance for the development of the Cycleway is the principles and objectives in CCC's Major Cycleways Guideline and Design Requirements document. Fundamentally important to the promotion of cycling to the public is provision of a safe, consistent and user friendly facility that will attract new users.

8.2.4 Intersection Treatment / Access Issues

There are several key intersections on the route. Innes/Rutland must be configured to retain all current movements. At other significant intersections – Bealey/Colombo, Colombo/Edgeware, Caledonian/Edgeware, and Rutland/St Albans, the issue of cyclists being exposed to turning traffic needs to be addressed. It is also noted that local business are located near intersections on the route which will influence parking and road spaced at these intersections.

Further, it is noted (after the first round of scheme assessments), that restricting access to and from local roads is a possibility within options to reduce crossings of cycle facilities, to improve on-road parking opportunities, or may be a pre-requisite, from other projects such as CSU. The implications of restricted access need to be properly assessed.

8.2.5 Public Transport

Where applicable (eg Colombo Street) the team discussed how existing public transport facilities (eg bus stops) would be affected and proposed treatment/solutions to limit any adverse impacts and associated safety concerns. The desired outcome for the scheme is to maintain existing public transport corridor along Colombo Street.

8.2.6 Pedestrian Safety

Whilst a key objective for the cycleway is to promote safe cycling, safety for the larger community also needs to be considered. This includes impact on other users eg pedestrians and in particular the elderly, disabled or visually impaired. This is of importance for any shared path options and also at road crossings where pedestrians and cyclists merge, and where pedestrian numbers are likely to be greatest (eg at local shops especially at Bealey Ave, Edgeware Village and Rutland Street, and schools including St Albans School and Paparoa Street School).

8.2.7 Impact on Local Businesses

Several issues were discussed and noted regarding the impact to local businesses. These included the requirement for access to be maintained for delivery vehicles and customers. Also it was noted some local businesses have existing loading zones (either P5, P30 or P120 minutes) in front of their property, and how that might be accommodated within the proposed works. Impact of visibility was also discussed with the potential for shop frontages to be less visible if the route cross section was to alter significantly, particularly if the cycleway option was a two way off road facility on one side of the road. One of the Goals of the CTSP is to promote and support economic vitality, hence the need to ensure impact on local business is kept to a minimum.

8.2.8 Impact on Local Residents

Potential issues that may arise from each option could include the following.

- Land acquisition
- Access restrictions; or changes to existing access
- Loss of on street parking
- Changes to refuse collection and maintenance within the road reserve

From the above, land acquisition and loss of on street parking are likely to cause the most objections from the community in association with any proposed scheme. The options put forward to CCC look to minimise the objections by considering impacts to local residents

8.2.9 Asset/Operational Issues (Access for maintenance and refuse collection)

Discussions with operators of refuse collection and street maintaining agents were held to understand how these operations would be affected if the road layout changed with the addition of separated cycleways.

It should be noted that Beca prepared a separate report covering the issues surrounding refuse collection and maintenance, titled CCC Major Cycleways – Operational and Accessability Guidelines Review, dated 16th October 2014. This document is to be used by designers involved in CCC Cycleway implementation projects.

The main points to consider are provision of space for refuse collection trucks, dependant on layout, and access for street sweepers and verge mowing operators.

Consideration also has been given to operation and access of existing utilities and services, and the potential relocation for some options. This also includes the provision of lighting and the signs and road marking for clear delineation for all road users. This includes how and importantly where service providers will maintain their assets within a new road configuration.

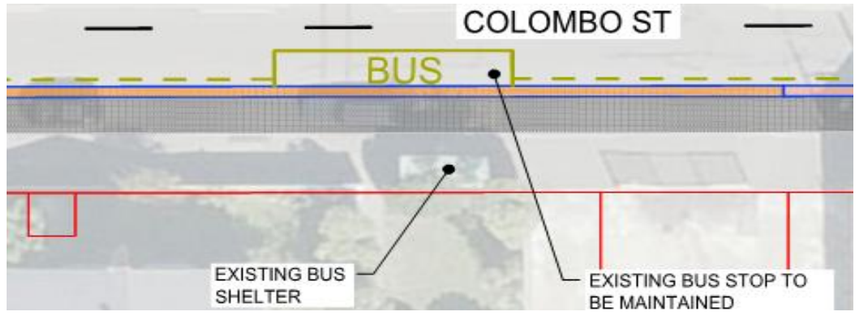
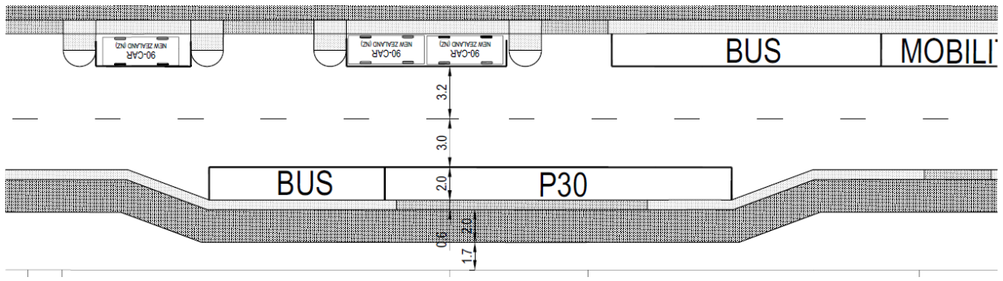
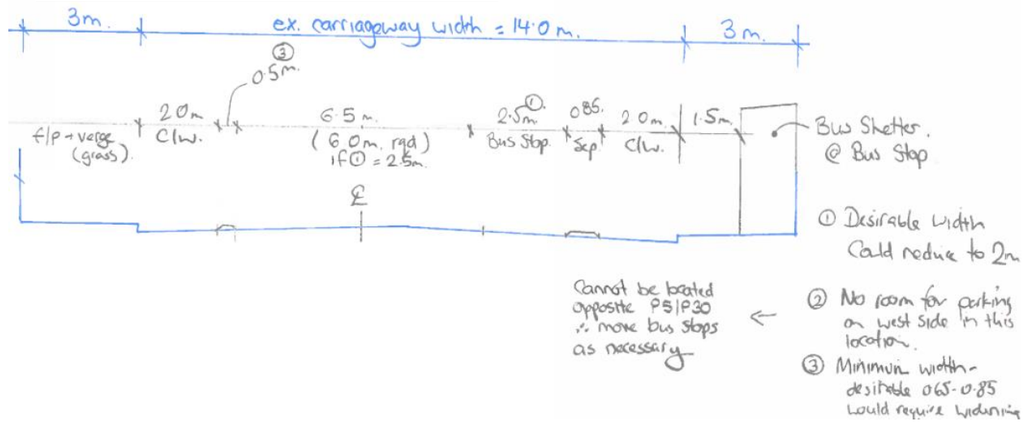
8.2.9.1 Demarcation of wheelie bin placement areas and parking extents

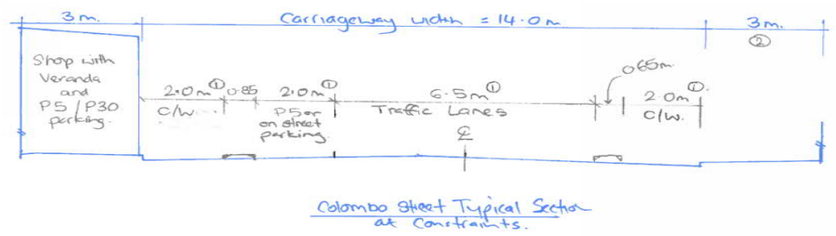
In locations with parking adjacent to a separated cycleway, wheelie bins are to be placed on the traffic side of the cycle lane separator in order to be picked up by the refuse collection trucks. Consideration has been given to how to define and demarcate areas designated for the placement of wheelie bins and for parking, particularly due to the novelty of bins needing to be placed away from the berm where they are usually placed. Consideration has also been given to the space required for the placement of the number of wheelie bins around each driveway, based on the number of households the driveway services. This issue is reviewed in the Issues Table below.

8.2.10 Costs (both construction and future maintenance)

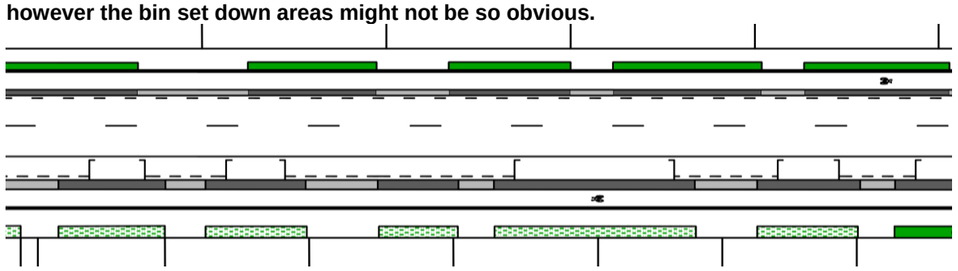
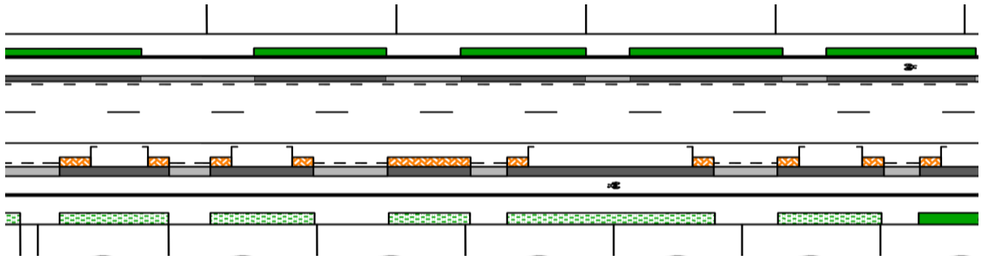
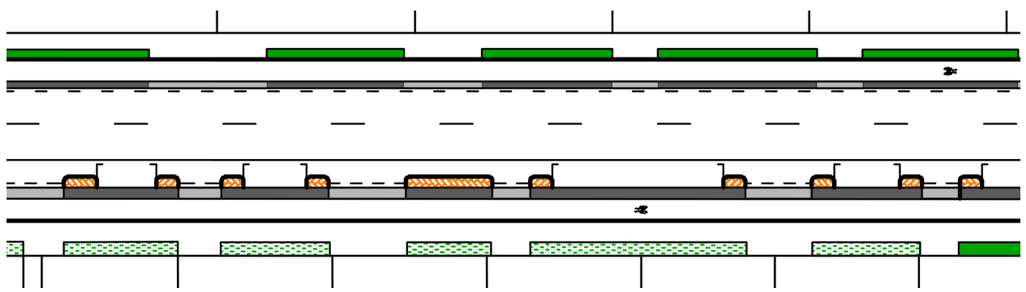
The team reviewed the likely costs associated with the possible options. The main issues included whether services and utilities would need to be relocated, how easy to construct each option was and what potential change to future maintenance would be required.

The main issues above have been reviewed and options put forward to address them. The following table looks into these issues in more depth, providing examples and possible solutions.

Issue	Description	Issues Discussion	Options
1	**Impact of scheme on public transport – Bus Route facilities**	Alternative to allow for Public Transport route - Bus Stops. Colombo Street is a public transport route with existing services (No. 28 bus route) along Colombo Street between Bealey and Edgeware identified in the City Plan to be continued in the future. Where bus stops are located and the option proposes to remove on street parking, bus stops either have to be located within the traffic lane or an alternative alignment be provided for the cycle lane to accommodate a bus bay. Adoption of a Separated on road cycleway will require modification of the standard design cross section as shown. Existing Bus Shelter on east side near Edgeware Shops.  Existing Bus Shelter on east side near Purchas Street  A key issue of the route is that due to site constraints local bus stops are not currently in accordance with the IDS as there is not sufficient room to accommodate the standard. This is largely due to other parking demands and loading zones immediately adjacent to bus stops in the area (picture above). Strict adherence to standards in the implementation of the cycleways may result in implementation issues should the standards be adopted without due care of the existing constraints. **Outcome** – The preferred option needs to consider how existing bus shelters and bus stops are accommodated given site constraints which have to be allowed for. Details to be confirmed at next phase. For northbound buses a refuge is possible within the 2m on street parking space. For southbound buses parking in the lane is the likely solution unless widening can be achieved to provide a bus bay (this is unlikely due to site constraints. Update A review by CCC following establishing the preferred cycleway option has resulted in the northbound bus stops being rationalised. The proposal put to Ecan is to remove the northbound Purchas and Canon St stops and replace them with a centrally location bus stop, thus providing 3 stops along Colombo street in the study area. South bound buses are to stop in the lane and no overtaking lines installed.	• **Option 1 - on road facility (on southbound side) – issue include safety and delay to on road traffic, Relies on bus stops could stay in lane Northbound will have facility within 2m shoulder.** • **Option 2 -Bus bay – preferred if possible to improve safety and minimise disruption to traffic. Will require reduction to verge. Examples below for Option 4 and**  • **Option 3 –In Lane Bus Stops as applied to Southbound Bus Stops (for Options 2A-C).**  • **Option 4 – Consider reducing traffic lane to 3m locally** • **Option 5 – Consider cycleway continuing in front of bus bay to reduce pedestrian cyclist conflict – albeit creating bus- cyclist conflict** • **<u>Bus Shelter on east side near Purchas Street</u>** 

Issue	Description	Issues Discussion	Options
2 **3**	**Local Business Buildings** **+** **Existing Trees**	Some local shops/offices have verandas that extend to the existing kerb lines and parking zones. Design will need to Consider these constraints.  Outcome – Design must consider how to accommodate existing businesses. Preferred option keeps existing kerb lines to minimise impact. 	Local Trees located in Eastern verge would need to be removed if widening proposed.  Outcome – Consider alternatives to removing exiting trees or provide alternative planting if some trees removed
4	**Issue – Loss of On Street Parking**	Currently there are approximately 150 on street parking spaces on Colombo Street, and 188 on Rutland Street to service the demand of local residents. The CCC recommended standard for cycleways is to adopt a 5m exclusion zone at accessways improves safety and in particular visibility between cyclists and motorists. Adopting these criteria will result in approximately 20 on street spaces on the west side of Colombo Street and a similar number on the west side of Rutland Street (west side in response to business location). From the parking demand survey it is expected that this reduction in parking will be felt locally and objections are likely, therefore it is recommended that any way of providing additional parking should be explored. The MCR group's safety concern is that residents arriving home will not see cyclists if there are cars too close to driveways. For the proposed layout the majority of the Colombo and Rutland Street sections affords good visibility of cyclists along most of the route and visibility to cyclists should be to a reasonable level sufficient to react and stop if a cyclist is approaching.	• **Option 1 – Adopt 5m exclusion zone which will result in approx. 20 on street parking spaces on each street and is likely to raise objections from the local residents.** • **Option 2 - An alternative could be to relax the 5m exclusion zone. If the is relaxed to 2 m the number of on street parks will be approximately 40 spaces on each street** • **Option 3 - If the parking exclusion zone is kept at the minimum legal requirement (1m) approx. 80 spaces will remain on Colombo, but only marginally more on Colombo.** • **Purchas Street – Upgrade to Purchas Street to provide right angle parking similar to the Canon Street treatment is a possibility, similar opportunities exist on Malvern Street, Hawkesbury Avenue, Knowles Street and Weston Road.** **Outcome** – A 2m exclusion zone is recommended to retain an acceptable level of on street parking. CCC to consider reduction in 5m exclusion zone to 2m to support local resident's interests by maintaining approximately 40 spaces for local parking on both Rutland Street and Colombo Street. Build outs to be constructed to ensure exclusion zone in maintained. Details to be confirmed at next (Design) phase or as part of a separate commission. **Update** – Safety audit teams have expressed a preference for the 5m exclusion zone. However there seems little supporting justification from either a timing or sightline perspective. The 2m exclusion recommendation will be carried through this scheme process.

Issue	Description	Issues Discussion	Options
5	**Issue – Impact of scheme on existing local business P5/P30 parking restrictions**	Local Businesses rely on existing parking for customers. The Cycleway route along Colombo and Rutland Streets needs to consider the impact on Local Businesses and amenities • **Pah's Dairy has a veranda encroaching into the road reserve (see photo below), and the bus stop opposite will not be able to remain should option 1A be implemented.**  • **Pahs Dairy has a P5 Loading Zone**  • **Dry Cleaning Business has a P5 zone outside also.** The Rutland Street shops have P15 zone outside them. **Outcome** – Maintaining existing P5/15/30 zones supports local business interests. Options/Details to be confirmed at next phase. Recommend relocating the east side Loading Zones to the west side on Colombo Street and any LZ on west side of Rutland St may be accommodated with localised widening. There may be issues with localised widening that will need careful consultation before implementation.	• **Option 1 - If widening to maintain full width of footpath and cycleway – further details are required to be considered.** • **Option 2 - Localised widening to accommodate existing Bus Stops/P5/15/30 Parking Restrictions** • **Option 3 - Variation could be a 2m wide cycle way and 3.0m wide traffic lane.** • **Option 4 - Consider reducing traffic lane to 3m locally** • **Option 5 - Consider relocating eastern side zones (2 no.) to the west side** Dry Cleaning Business (at Canon St) has a P5 zone outside. Edgeware Dairy has a P5 zone adjacent to a bus stop. Refer to image – the Pa's Dairy has a veranda encroaching into the road reserve, and the bus stop opposite will not be able to remain should option 1A be implemented. Careful consideration of how to accommodate local business is required.  Edgeware Dairy (above) has a P5 zone adjacent to a bus stop  Colombo Street – Eastern Side – P5 zone at local shops

Issue	Description	Issues Discussion	Options
7	**Demarcation of wheelie bin placement areas**	With the proposed placement of wheelie bins on the traffic side of the cycle lane separator in locations with on-street parking, the bins will be placed in the same area as cars will park. It has been identified that the locations where wheelie bins are to be set down needs to be kept free of parked cars. Consideration has also been given to the space required for the placement of the number of wheelie bins around each driveway, based on the number of households the driveway services. This generally coincides with the parking exclusion zones around driveways. Wheelie bins are less than the eye height of both drivers and cyclists, so are not expected to cause obstruction issues. The preferred option needs to clearly define the extents of parking, as well as be clear to residents where their wheelie bins are to be placed. Affected residents will need to be educated on the placement of bins for all of the options, due to the novelty of kerbside refuse collection no longer being carried out from the kerbside. **Outcome:** Option 2 has been selected as the preferred option as it gives clarity around the placement of wheelie bins, whilst minimising operational issues. No stopping markings will be extended across the textured surface to reinforce the extents of parking.	• Option 1 **– paint no stopping lines and parking extents. This option is the cheapest, both in terms of installation and maintenance, and provides good demarcation of parking areas, however the bin set down areas might not be so obvious.**  • Option 2 **– flush textured surface, in addition to painted lines. The textured surface would be similar to a flush platform, formed with pavers or stamped/coloured concrete. This option will cost more than simple paint markings, but will formalise and more clearly define the locations to place bins and has potential to enhance the streetscape.**  • Option 3 **– extension to the separator forming a kerb build-out. This would provide a highly formalised area for the placement of wheelie bins, whist limiting parking to the designated locations, and has potential to enhance the streetscape as well as offering a degree of traffic calming. This option is the most expensive of the three, with maintenance requirements being higher than the other options also.** 

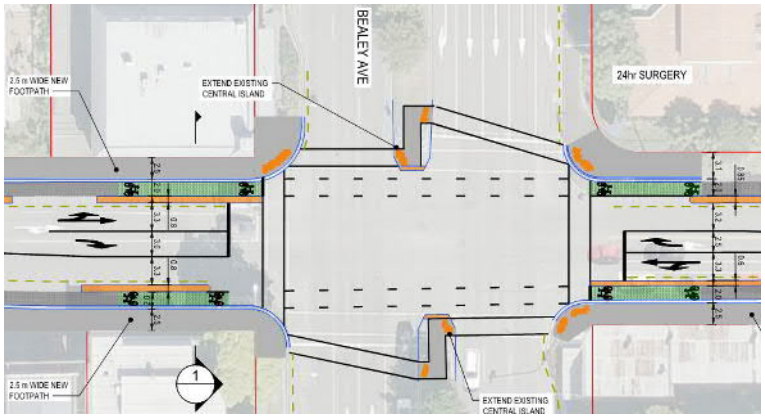
8.3 Option Development

The project corridor can be considered in a number of sections/sub-routes. The options for each are discussed separately with consideration of the environment of each location (based on future traffic volumes) and the need to meet the cycleway objectives, issues and other risks to delivery.

A summary of the options considered for each outcome of the options considerations process is shown below. Each of the options considered is discussed in detail in **Appendix F**.

8.3.1 Colombo Street / Bealey Avenue Intersection

8.3.1.1 Option 1A – One Way Cycleway (Single Stage Crossing Movement)

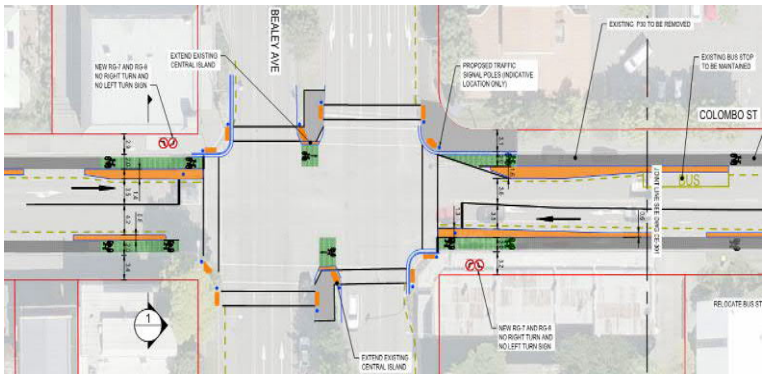


Plan view showing Option 1A

This option consists of the separator present up to the limit line for cyclists and an on-road one-stage crossing across Bealey Avenue. The cyclists can be fully protected from conflicting traffic via signal phasing.

OUTCOME: Option 1A taken forward to for MCA assessment. Best Option to retain all movements however some reduction in cycle safety and narrowing to existing footpath required to accommodate.

8.3.1.2 Option 1C – One Way Cycleway (Single Stage Crossing Movement)



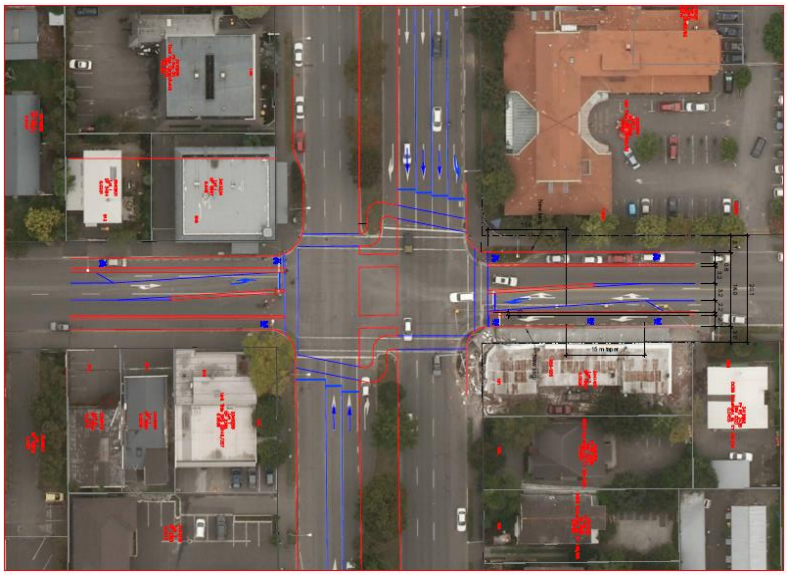
Plan View showing Option 1C

Two sub-options for MCA assessment are as follows:

1B – Bans Left-turn from Colombo Street.
1C – Bans Left and right turn from Colombo Street.

Option 1C is the cheapest and safest for Cycleway users and does not compromise movements on Bealey Avenue. However restrictions of access to local shops likely to be an issue during consultation

8.3.1.3 Option 2 – One Way Cycleway (ViaStrada Option 2)

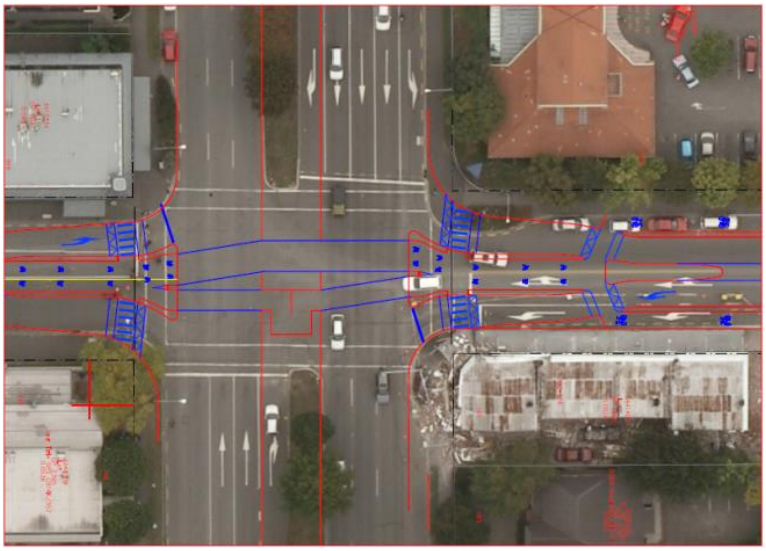


Option 2 consists of constructing a solid median on Bealey Avenue through Colombo Street with a bypass for cyclists. This will convert Colombo Street to a left-in-left-out arrangement with signals provided to assist with cyclists crossing. Also Bealey Avenue right turns will be banned.

OUTCOME: Option discounted in earlier Beca SAR as it does not maintain connectivity for the number 28 bus route on Colombo Street, and restricts Bealey Avenue and Colombo Street connectivity.

(above plan c/o Via Strada)

8.3.1.4 Option 3 – Two-way Cycle Crossing (ViaStrada Option 3)

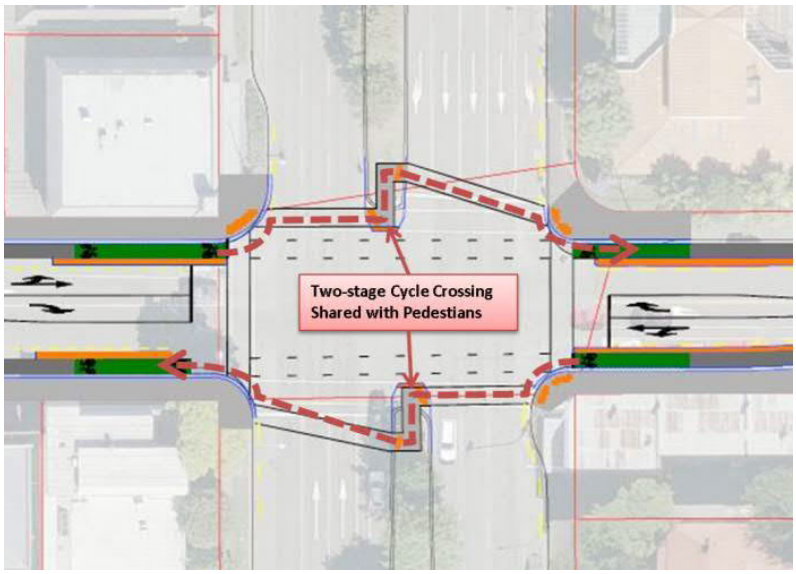


Option 3 involves constructing a solid median on Bealey Avenue through Colombo Street with a bypass for cyclists. This will convert Colombo Street to a left-in-left-out arrangement with signals provided to assist with cyclists crossing Bealey Avenue. Cyclists are to cross Bealey Avenue in the Centre of Colombo Street with a mid-block transition provided to connect to the facilities to the north and south of the intersection.

OUTCOME: Option discounted in earlier Beca SAR. CCC rejected this option as it does not maintain connectivity for the number 28 bus route on Colombo Street and restricts Bealey Ave connectivity. The facility creates unnecessary conflict between cyclists and traffic in order to enter and exit the shared facility in the middle of Colombo St.

(above plan c/o Via Strada)

8.3.1.5 Option 4 – One Way Cycle Crossings (Two-Stage Crossing)



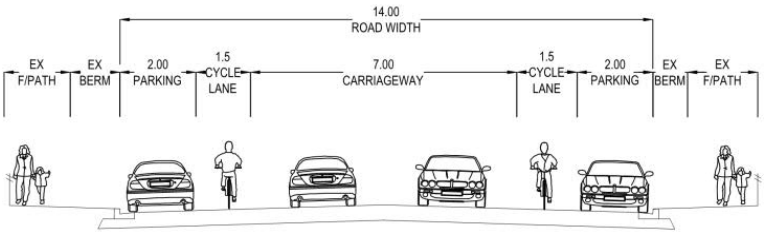
This option consists of cyclists crossing Bealey Avenue in two stages shared with pedestrians. The separator will lead cyclists to the crossing point. Cyclists can be fully protected from conflicting traffic via signal phasing. An example of the layout is shown below.

OUTCOME: Option discounted in earlier Beca SAR as it requires the cyclists to cross in two-phases. This will delay cyclists crossing Bealey Avenue and may be confusing and uncomfortable for cyclists due to the indirect routing. This option was rejected by CCC as it does not support key MCR objectives, due to delay of a 2 stage crossing.

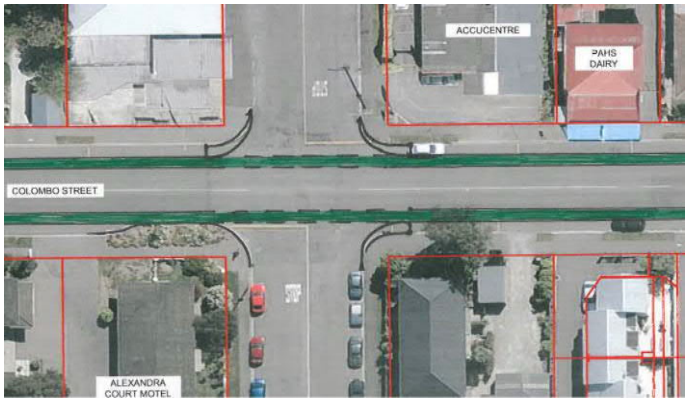
8.3.2 Colombo Street

8.3.2.1 Option 1 – Do Minimum

Cross-Section



Plan of Side Road Crossings



Provide on road one way cycle lanes in both directions. The Do Minimum cross section would accommodate:

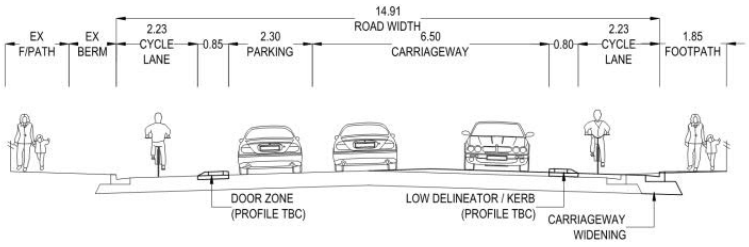
- 2 x 3.5m traffic lanes
- 2 x 1.5m on street cycle lanes
- 2 x 2.0m on street parking

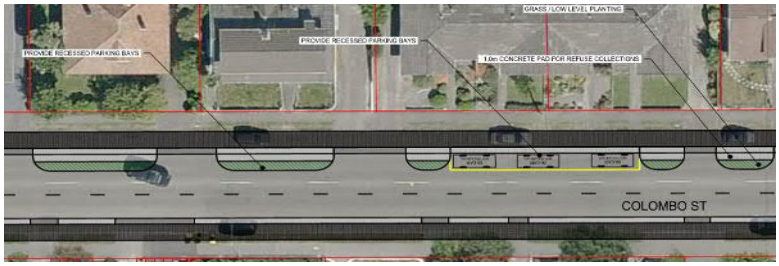
Cycle lanes could be marked in standard green or simply be delineated with 100mm white line and cycle symbols. A rumble strip is recommended to alert errant vehicles to encroachment into cycle lane.

OUTCOME: Option discarded prior to MCA as this option does not support the Major Cycleway Objectives in particular the lack of separation and encroachment of the cycle lane (by service and on street parking at the kerb side).

8.3.2.2 Option 2A – Separated On Road Cycleway (Desirable Standard Widths)

Cross-Section



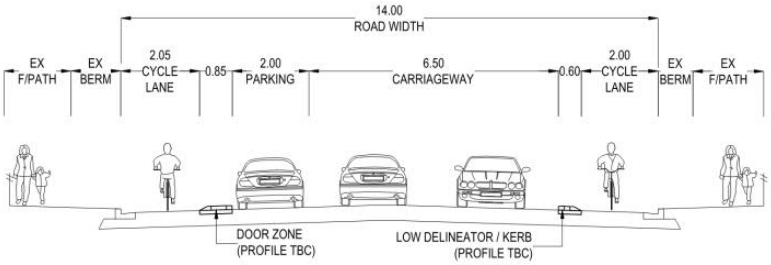


Option 2A widens the existing kerb to kerb road width to accommodate a Desirable Standard cross section. Option 2A consists of the removal of parking along the eastern side of Colombo Street and the construction of a widened carriageway to accommodate 2.2 metre wide cycle lanes with a 0.80 - 0.85m wide separator on each side of the road. The widening will require the relocation of the eastern kerb lines.

OUTCOME: Option discounted prior to new MCA based on outcomes from Beca SAR, due to site constraints.

8.3.2.3 Option 2B – Separated On Road Cycleway (Minimum Widths using Existing Cross Section)

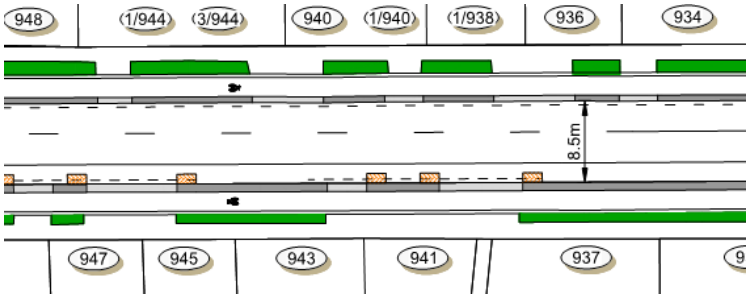
Cross-Section



Option 2B is based on Option 2A, however the widths of the cycle lanes, separators and parking bays have been reduced slightly to ensure the cross section stays within the existing kerblines

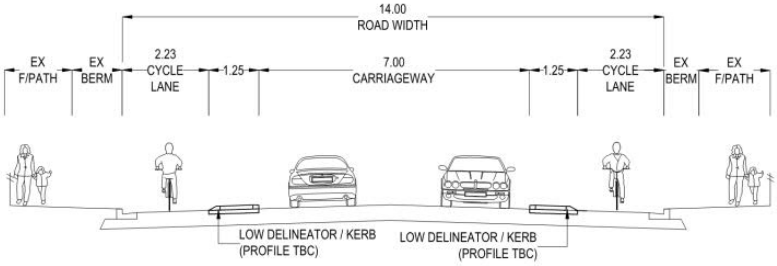
OUTCOME: Option taken forward for MCA review.

Plan



Plan showing application of 2m exclusion zone at driveways (requires relaxation from CCC). Note textured flush build out arrangement for Rubbish Bin collection may vary.

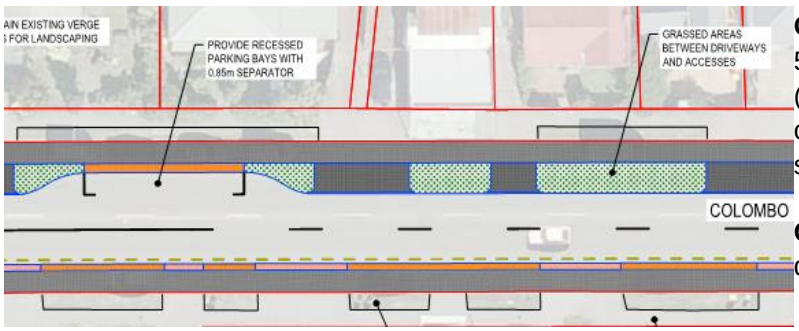
8.3.2.4 Option 2C – Separated On Road Cycleway (Removal of On-Street Parking)



Option 2C - This option is based on option 2. However, this option removes all on street parking for the length of Colombo Street. This option does not require carriageway widening.

OUTCOME: Option 2C – Rejected during Becas SAR due to high impact on Local Business and Residential on street parking..

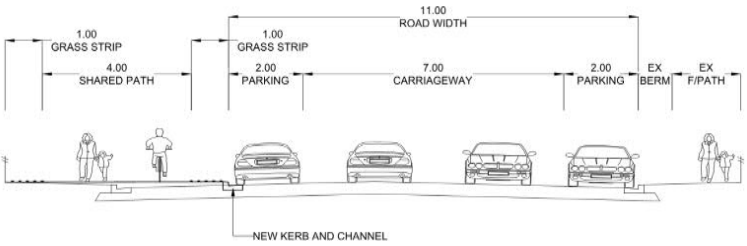
8.3.2.5 Option 2D – One Way Cycleway with Wide verge on west side



Option 2D – Option with application of 5m exclusion zone at driveways (desirable standards). Additional verge created between driveway extensions, on street parking bays to std CCC layout.

OUTCOME: Option not taken to MCA due to high impact on street parking.

8.3.2.6 Option 3 – 5m Wide Shared Path



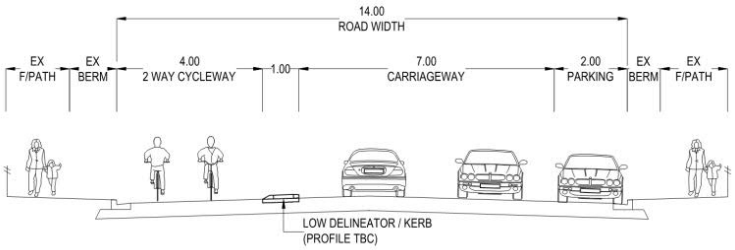
Plan view at Side Road Crossings

This option provides a 4-5m off road shared use path to cater for cyclists and pedestrians. The carriageway would be narrowed to 12m but still achieves 7.0m carriageway with on street parking provision on both sides of Colombo St.

OUTCOME: This Option was initially assessed in the Beca SAR, however the shared path option was later discounted as it was not preferred or supported by the design criteria shown in the CCC Design Criteria in Section 4.6.

8.3.2.7 Option 4 – Two Way On-Road Cycleway (Within Existing Carriageway)

Cross-Section



Side Road Crossings

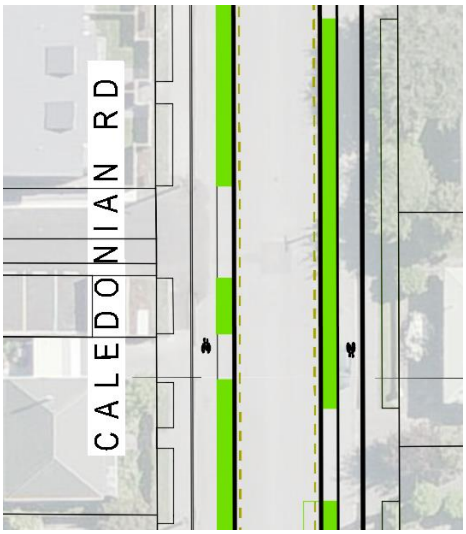
This option retains existing kerb lines with the installation of a 3.5m two way cycleway on one side of Colombo Street with parking provided on the other side of Colombo Street. The cycleway would be separated from the footpath with the provision of a narrow verge.

OUTCOME: This Option was initially assessed in the Beca SAR. However the 2 Way cycleway was later discounted as it was not preferred or supported by the traffic volumes on Colombo Street and the acceptable facility types provided in the design criteria shown in the CCC Design Criteria in Section 4.6.

8.3.3 Caledonian Road

An Alternative Route was considered along Caledonian Road, to mitigate the impact of One Way Facilities on Colombo Street. Several Facility type configurations were considered and reviewed in the MCA Route Option Assessment. The main options are described below.

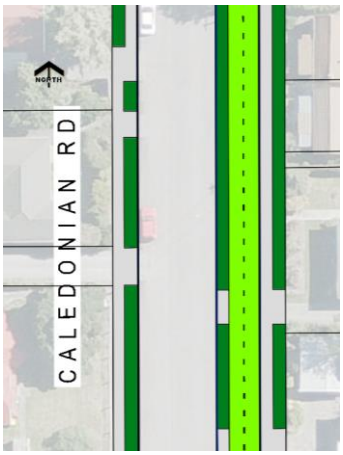
8.3.3.1 Option 1 – One Way on Road facilities



Advantages for using Caledonian Road are largely to enable more on street parking to be retained. A One way facility does not achieve this benefit and is not warranted for the future traffic volumes of Caledonian Road.

Outcome. Option taken forward for Route Selection MCA assessment.

8.3.3.2 Option 2 – Two Way on Road facilities

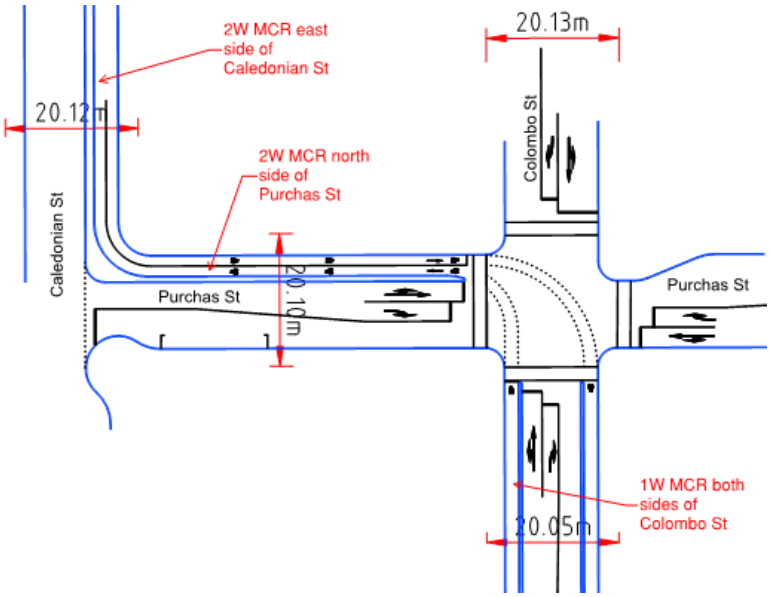


A two way facility is suitable for the traffic volumes on this road and allow on street parking to be maintained. A 3.5m wide facility is proposed maintaining existing verge and footpath widths. The best location for the two way cycleway is the east side of the road which affords better connectivity to Colombo Street and for a combined crossing of Edgeware Road

Outcome. Option taken forward for MCA review

8.3.4 Colombo – Caledonian – Purchas Street link

8.3.4.1 **Option 1** Signalised Intersection, two way MCR along north side of Purchas Street to join two way facility in Caledonian

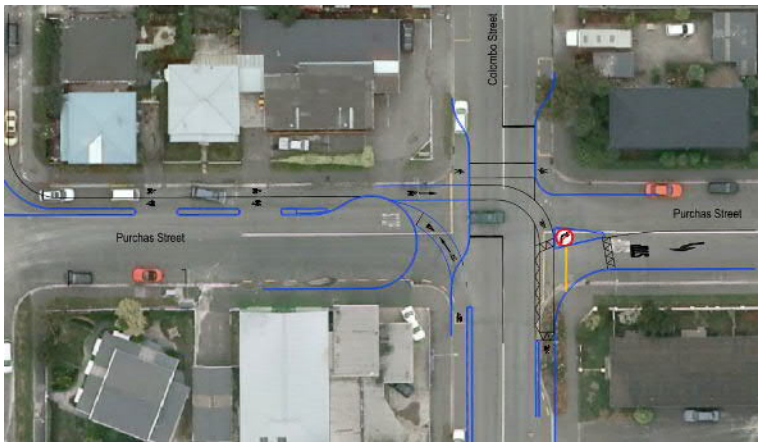


Option 1 involves installing a fully signalised intersection at Colombo /Purchas Street with phasing for cycleway users and Purchas Street, predominantly on green for Colombo Street. Requires clear direction for both sound and north bound cyclists to transition to and from Colombo Street. Need for turning lanes to be confirmed (unlikely for Purchas)

Outcome – this option was discounted prior to the Route Selection MCA in favour of Option 2.

However should the Caledonian Route be favoured, following further consultation with stakeholders, further refinement of options is recommended to confirm the preferred solution for the Colombo Caledonian link through Purchas Street.

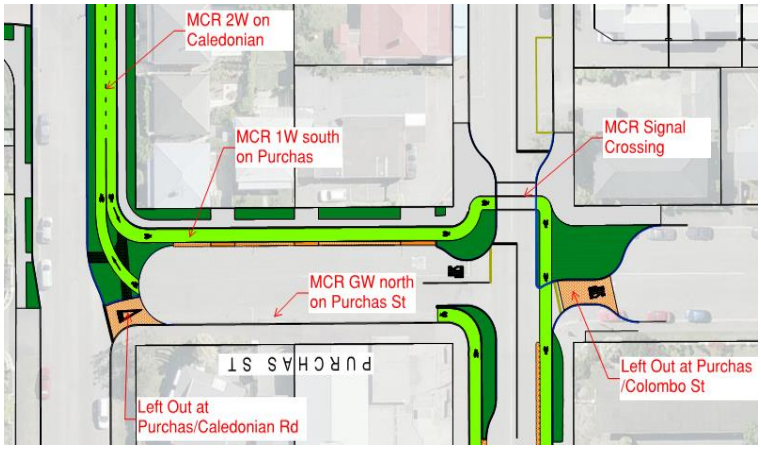
8.3.4.2 Option 2 - Cul-de sac Intersection at Colombo Street, two way MCR along north side of Purchas Street to join two way facility in Caledonian



This option provides a cul de sac at the east end of Purchas St to facilitate This option keeps eastbound access to Purchas Street and west

Outcome. Option taken forward for MCA review. This option was preferred by the Team to ensure least impact on existing business at this location.

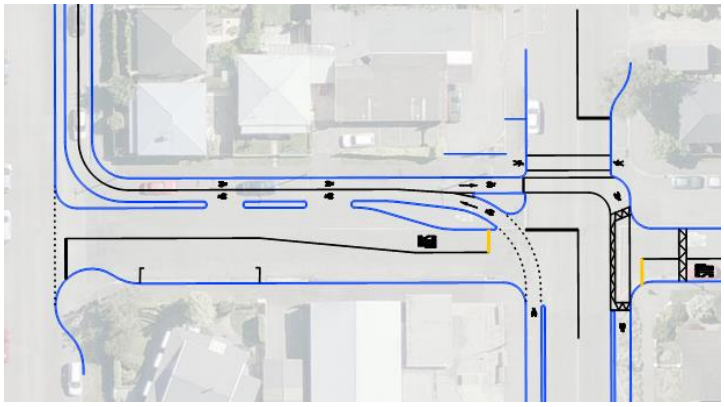
8.3.4.3 **Option 3** Left In Left Out at Purchas Street with Greenway for northbound cyclists / one way facility to mid-block signals over Colombo Street



This option restricts Purchas Street Traffic movements to provide protection to cycleway users. A “mid block” signal crossing is proposed across Colombo St for south bound cyclists. Some interpretation is required for northbound cyclists, protected for the left turn into Purchas Street from Colombo, but then on road to the end of Purchas (50m) to join the two way path north on Caledonian Rd.

Outcome – This Option was discounted prior to the MCA in favour of Option 2 should the Caledonian Route be favoured further assessment is required to

8.3.4.4 Option 4 Two Way on Purchas + Signals for southbound Colombo St



Similar to Option3 but two way along Purchas. Also this option allows more traffic movements into Purchas east of Colombo and from Purchas at Caledonian.

Outcome – this option was discounted prior to the MCA in favour of option 2 should the Caledonian Route be favoured further assessment is required to

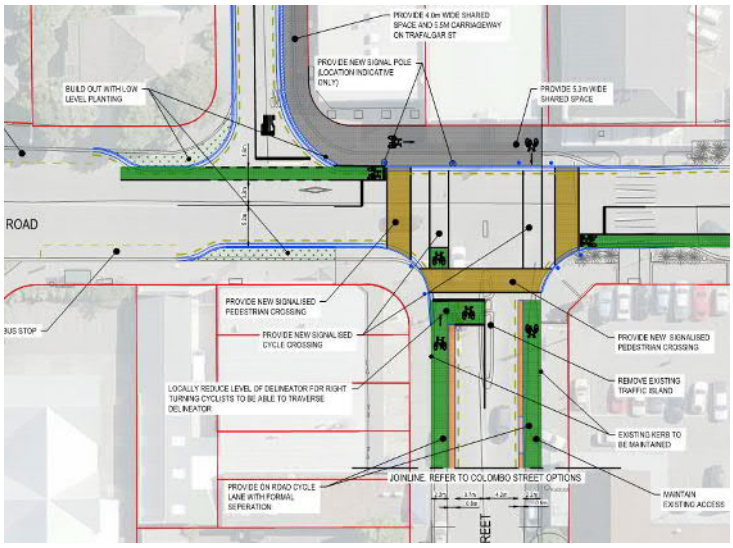
8.3.5 Edgeware Road – Colombo Crossings

8.3.5.1 Option 1 – Copenhagen Style two way Path – Signalised Crossing of Edgeware Road

This option will require cyclists using the southbound cycleway on Colombo Street to cross the road at a signalised crossing on Colombo Street. These cyclists will join the cyclists using the northbound cycleway on Colombo Street on a contraflow Copenhagen style cycleway on the western side of Colombo Street. This will lead up to a signalised crossing on Edgeware Road between Colombo Street and Trafalgar Street. This will link into a shared path which leads to Trafalgar Street. The existing stop control at Colombo St intersection at Edgeware and the splitter island and pedestrian refuge is to remain unchanged.

OUTCOME: This Option was initially assessed in the Beca SAR, however the two way crossing facility was later discounted in preference to the separate one way crossings, due to the number of conflict points with pedestrians in the Copenhagen style facility.

8.3.5.2 Edgeware Option 2 – One Way Signalised Crossings of Edgeware Road

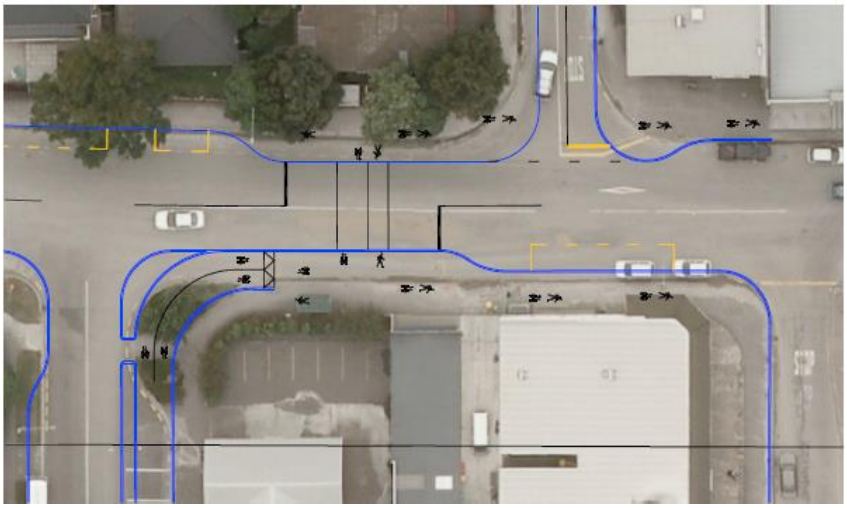


This option will be the signalisation of the Colombo Street / Edgeware Road intersection and the construction of a shared cycleway along the northern side of Edgeware Road to connect to facilities provided for Trafalgar Street.

OUTCOME: Option taken forward for MCA review. In the initial Beca Assessment the crossing options were assessed in an MCA which showed a slight preference for the one way crossings. The latest assessment has not challenged this assessment and assumes that the crossing of Edgeware will be similar to Option 2

8.3.6 Edgeware Road – Caledonian Crossing

8.3.6.1 Option 1 – From Caledonian Two-way on Eastern Side



This option will require cyclists using the Caledonian two way cycleway to enter a shared space on Edgeware Road, then cross using a signalised crossing.

The north side of the crossing along Edgeware Road provides a shared space to allow the cycle route to progress into Trafalgar Street.

Alternatively, the facility on the north side of Edgeware Road could provide a shared space to the west, to allow progress into Dover Street. The bus and taxi spaces shown would flip to the east side of the crossing.

OUTCOME: Option taken forward for MCA review.

8.3.6.2 Option 2 – From Caledonian One-ways

Option 2a: from the (red) one-ways on Caledonian uses a crossing point on Caledonian Road, south of Edgeware to connect to the same type of facility as described in Option 1 above (red and yellow)

Option 2b uses a similar crossing point to Option 1, further to the west on Edgeware Road, using a two way facility to connect to the greenway on Dover Street (red and blue in diagram).

OUTCOME: Both options carried forward to MCA assessment

8.3.7 Trafalgar Street

8.3.7.1 Option 1- 4m Shared Path on Eastern side

This Option involves the construction of a 4.0m shared path on the eastern side of Trafalgar St. The path will be hard up against the road reserve boundary and require some width from the existing carriageway

The proposed layout allows for 2.3m wide parking bays with a 1.0m door zone to separate pedestrians from vehicles on the west side of Trafalgar St.

OUTCOME: Option 1 previously reviewed in the Beca SAR MCA, discounted in favour of Option 3 below.

8.3.7.2 Option 2 - Neighborhood Greenway with recessed parking

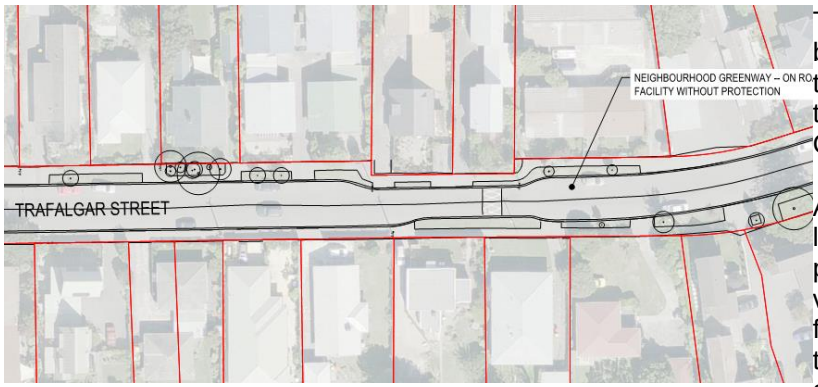
Option 2 severs Trafalgar St north of Dover St. with the construction of a cul de sac, to reduce traffic volumes to be consistent with an on road Greenway facility. Dedicated recessed parking bays are provided on both sides of Trafalgar St. Parking bays are staggered along the route.

OUTCOME: Option previously reviewed in the Beca SAR MCA discounted this option in favour of Option 3 below.

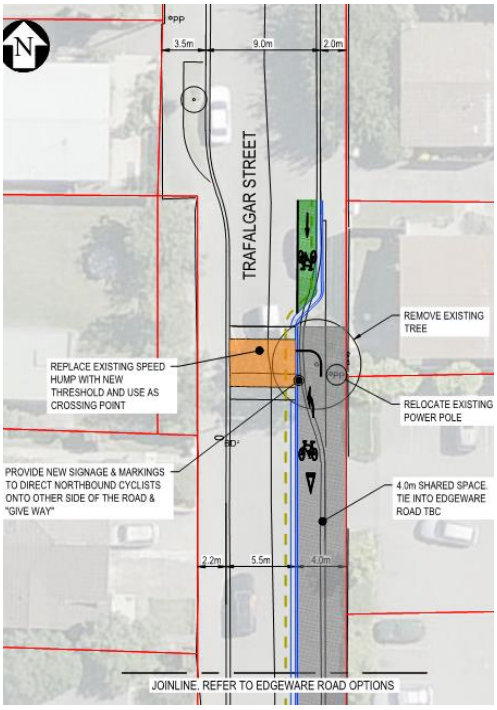
Cul–de–sac Layout – a number of options are possible. The layout shown was put forward for review.

The option involves severing Trafalgar St at the intersection with Dover St, as per option 2. The route remains the same as existing and cyclists are on road except at the tie ins where they enter and exit Trafalgar street on a shared path at Edgeware Road and a two way path at St Albans School.

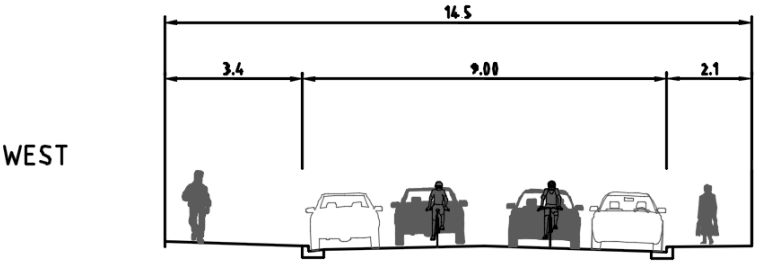
8.3.7.3 Option 3 - Neighborhood Greenway – no recessed parking bays



Plan of transition to shared path at Edgeware Road



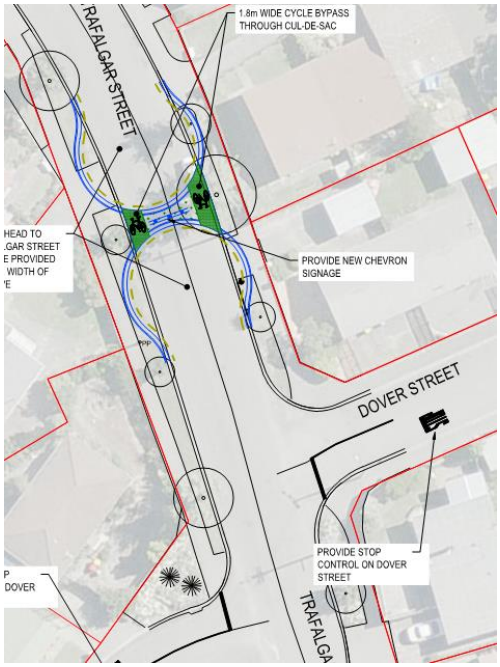
OUTCOME: Preferred Option 3 taken forward for MCA assessment.



Trafalgar Street has a typical boundary to boundary width of 11 m, and current kerb-to-kerb of 5-8 m. Traffic volumes are less than 1500 vpd. This road lends itself to a Greenway type facility.

A cheaper alternative to Option 2 is to leave the existing parking layout as is and provide the cul-de-sac to reduce traffic volumes to acceptable levels appropriate for a greenway. Existing threshold treatments are to be maintained – although removing them where possible is recommended to provide a consistent cross section that allows

Cul de sac location and arrangement was reviewed following the Beca SAR. The layout below was agreed as the best fit within the constraints of the site.



8.3.8 Dover Street

Dover Street has a typical boundary to boundary width of 10m, and current kerb-to-kerb of 6.5m. Traffic volumes are less than 700vpd. This road lends itself only to a Greenway type facility.

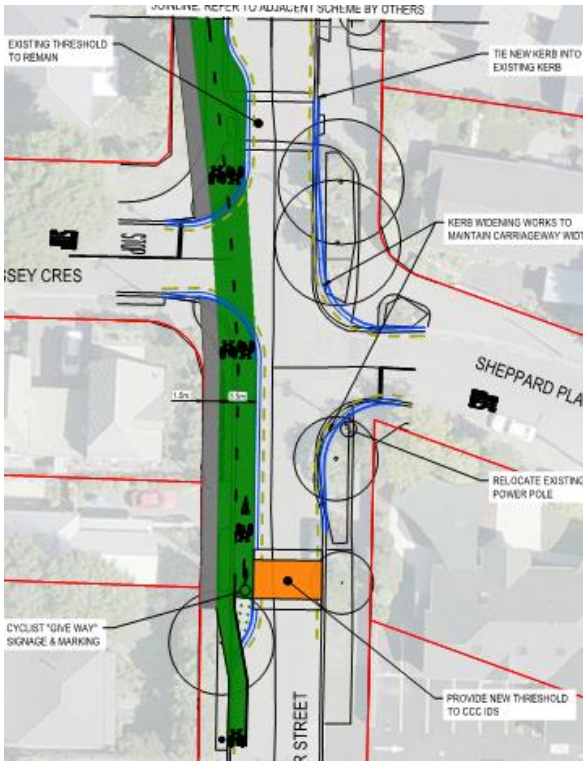
Parking would need to be removed on one side of the road, corridor width does not permit indented parking areas.

OUTCOME: Option taken forward for MCA review.

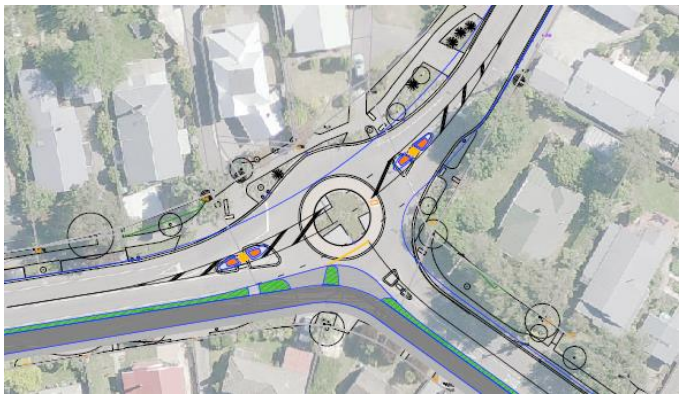
Note: Dover Street intersects with Trafalgar Street approximately at its mid-way point. Trafalgar Street options need to be considered beyond that point.

8.3.9 Trafalgar – St Albans – Rutland

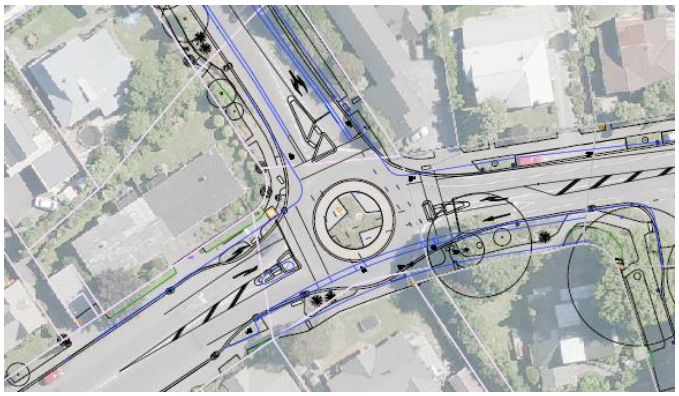
8.3.9.1 Option 1 – Trafalgar two way separated path on west side to St Albans St two way on south side to Rutland one-ways via signalised intersection



Trafalgar Street north end treatment



Trafalgar/St Albans/Courtenay 2W separated CW



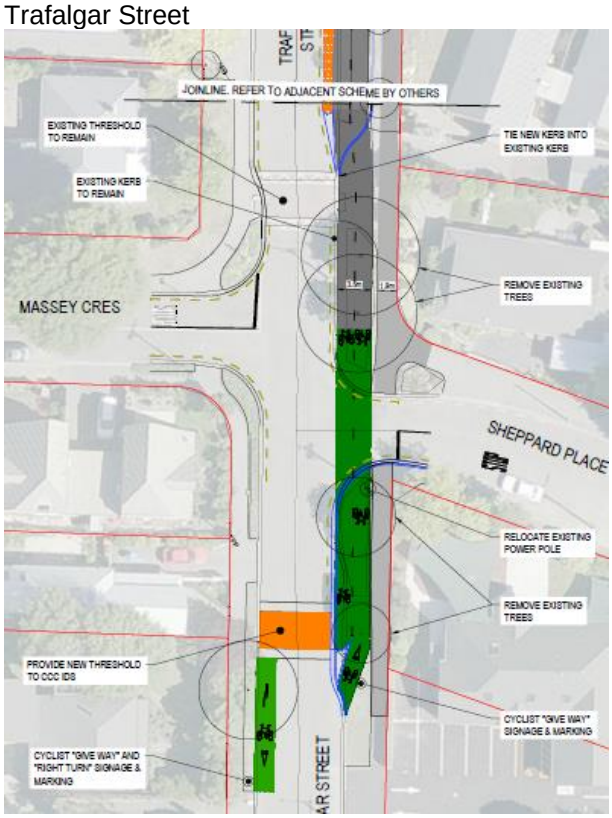
St Albans/Rutland St Signals – for Shared Path to One Way transition

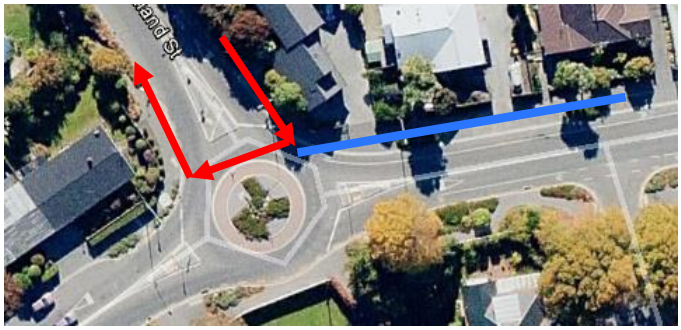
In this option, the Trafalgar greenway is developed into a two way facility on the western berm. The separated facility is developed around the Trafalgar/St Albans corner. The roundabout is converted to a T-intersection with control against Trafalgar Street. The two way facility continues on the south side of St Albans Street. The St Albans Street/Rutland Street intersection is converted to traffic signals and cyclists can move to and from the path from the one-way facilities on Rutland Street. The traffic signals have a separate phase for cyclists.

OUTCOME: Taken forward to MCA assessment.

8.3.9.2 Option 2 – Trafalgar east separated two-way cycleway and along St Albans Street north side to Rutland one-ways.

Plan of Alternative Layout on western side of Trafalgar Street





In this option, the Trafalgar Street greenway is developed into a two way facility on the eastern berm, which continues across Courtenay Street with a signalised cycle/pedestrian crossing. The roundabout is removed to facilitate the crossing, and replaced with a T-junction, priority control against Trafalgar Street. The two way facility continues on the north side of St Albans Street, until Rutland Street. The current roundabout would be replaced by fully signalised intersection, with a phase allowing west to north bound cyclists to cross Rutland Street and reach the north bound one-way cycle lane on the west side.

OUTCOME: This option is carried through to an MCA assessment. The complication with this option is the two sets of traffic signals on the St Albans – Courtenay alignment, which has signficiant operational impacts.

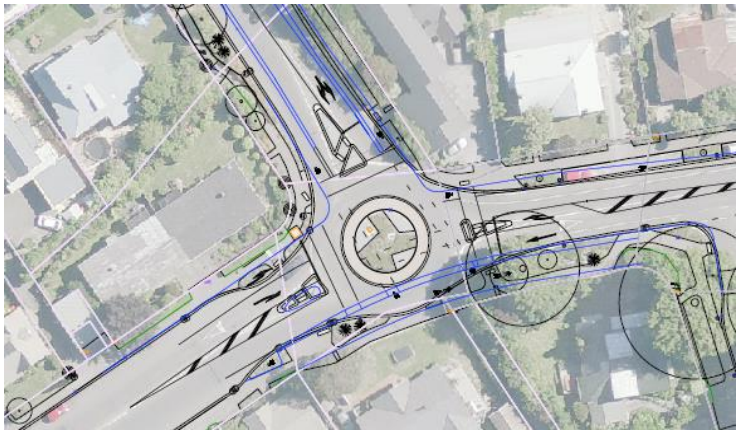
8.3.9.3 Option 3 – Trafalgar Greenway – to one-way separated facilities each side of St Albans Street

Option 3 (not illustrated) is a combination of Option 1 and 2, where the north bound cyclists on Trafalgar Street turn left onto a one way facility on St Albans Street, then right turn onto one way facilities on Rutland Street at a fully signalised Rutland/ St Albans intersection (as per option 1). Southbound cyclists from Rutland Street turn left onto one way facilities on St Albans Street north side, before turning right onto Trafalgar Street at a signalised crossing (as per option 2).

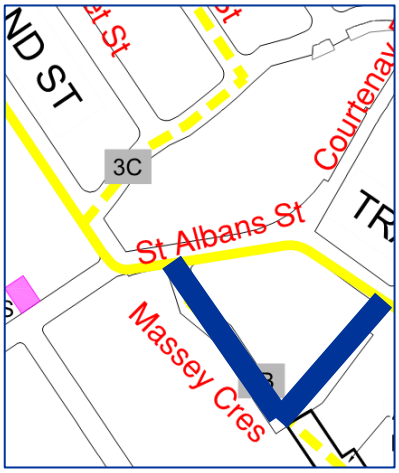
OUTCOME: While this option will have significant impacts on traffic efficiency on St Albans – Courtenay due to two signal sets, it is carried through to MCA assessment as it still offers a coherent connection to Rutland Street facilities.

8.3.9.4 Option 4 – Trafalgar Greenway to Massey Greenway to signalised intersection Rutland/St Albans.

Rutland St Albans intersection – path on south side from Massey.



Massey Crescent greenway connected to Trafalgar St and St Albans St



In this option, the Trafalgar greenway connects to a similar greenway on Massey Crescent. Massey, in turn links to a shared path on the south side of St Albans St, which links to signals at Rutland/St Albans. This option leaves most of St Albans St relatively unaffected. Massey is a quiet and green link, very heavily treed making it an attractive link during the day, but may have CPTED issues at night. It is also longer than the Trafalgar-St Albans option.

OUTCOME: Taken forward to MCA assessment.

8.3.10 Rutland Street

8.3.10.1 Option 1 – Rutland Street on-road cycle lanes

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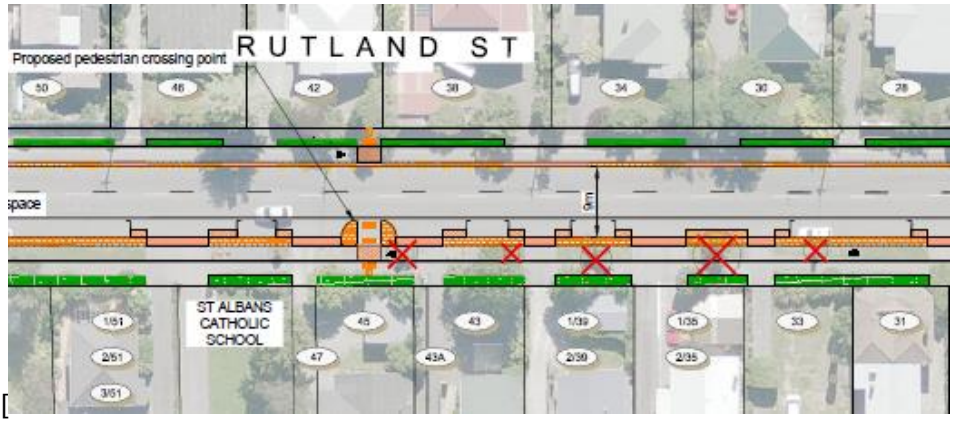
This option considers on-road cycle lanes, marked at standard 1.8m width. They would have green colouring at intersections and high volume crossing points. It would allow most of the existing parking to remain where kerb to kerb width is 14m. Where narrower, there would either be no parking on one side, or widening would be required.

This option is the cheapest type of facility to install, but it does not provide any form of physical protection and separation, and would offer no encouragement to new cyclists.

OUTCOME: Not taken forward to MCA assessment due to failing to meet MCR design standards.

8.3.10.2 Option 2 – Rutland Street one-way separated cycle facility



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This option considers separated on-road cycle lanes. Standard 2.0m width minimum, separated by physical separator on both sides. Some parking is permitted on western side of the road (side with the shops). A total of 53 parking spaces remain. Stamped concrete areas are provided, where there is no parking, for rubbish bin location.

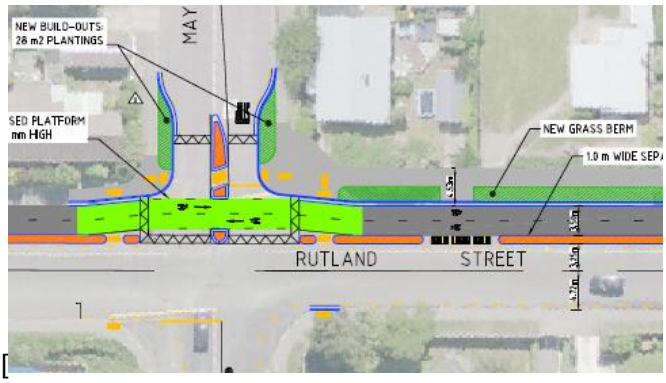
The facility meets MCR design guidelines. It is a direct, coherent facility engaging all cycle attractors/facilities on Rutland Street (shops, school, and recreational facilities). Pedestrian crossing points are provided.

No kerb alteration is required where road width is 14m. Where kerb to kerb width is 12m, the intention is to widen to 15m typically, or 14.6m where wider footpaths (pedestrian activity) are provided.

This option proposes the cul-de-sac treatment for Hawkesbury Ave, to allow a greater amount of parking adjacent to the shopping area, and reduce the vehicle crossing movements of the cycleway.

OUTCOME: Carried forward to MCA Assessment.

8.3.10.3 Option 3 – Rutland Street 2 way separated cycle facility



This option considers separated two-way on-road cycle facility, on the eastern side. Width varies from 3.5 to 3.0m depending on pedestrian demand in the general location. Parking is removed on the eastern side, but existing parking remains on the west.

It is a direct, coherent facility engaging all cycle attractors/facilities on Rutland Street (shops, school, and recreational facilities). The facility does not meet MCR design guidelines, in that the traffic volume is too high on Rutland Street for this type of facility. Pedestrian crossing points are provided.

OUTCOME: While this option cannot be implemented, as it does not meet minimum MCR design standards, it is carried forward to MCA Assessment for a comparison based on its other attributes.

8.3.10.4 Option 4 - Rutland – Westminster – Carrington or Gosset – Malvern Park – to Weston Street then Rutland St to the Reserve

Route Option 4 (is labelled as 3C in diagram below)

In this option, a two-way facility is developed from the Rutland /St Albans intersection, on the east side of Rutland Street to Westminster Street. It crosses Westminster Street and continues on its north side to either Carrington Street or Gosset Street (Option 4a is Gosset Street, Option 4b is Carrington Street). Either of these two streets can be a greenway or shared path (low traffic volumes).
Both streets connect to a pathway through Malvern Park, to a signalised crossing point on Innes Road, then through the existing right of way, crossing Knowles Street to Weston Road. Two-way path on north side of Weston Street, connects to two way facility on eastern side of Rutland Street.

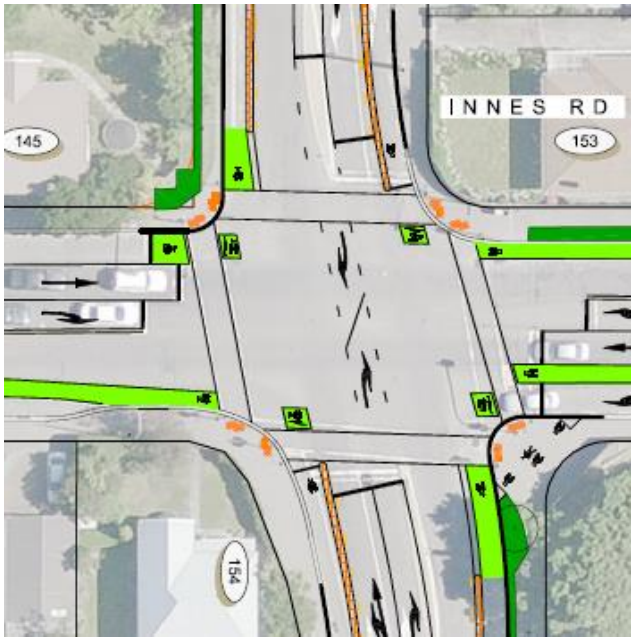
Mays Road could be a cul-de-sac at Rutland Street so that two-way path crosses McFaddens Road only.
In general, 50% of on street parking would be removed on each of the streets. Overall this route removes less parking than the other Rutland Street options, as much of the route is off-street.

Option 4a uses Gosset Street. This version requires less two-way path on Westminster Street, and therefore avoids at least two property accesses (the 3m separation from which would be difficult to achieve, given a narrow Westminster Street). Gosset is heavily treed, which would be a pleasant daytime greenway environment, but less friendly (CPTED) at night. At the northern end the greenway would need to connect to a two way facility on Malvern Street to reach the park access. In doing so, on street parking adjacent to the Rugby Park grandstand would need to be removed.

Option 4b uses Carrington Street. This would require the Westminster two-way path to travel further on Westminster, crossing two accesses. Carrington Street could be either greenway or shared space on the wide berms. With fewer trees, Carrington Street would potentially have less CPTED issues, but it remains a quiet, low trafficked street with big set-back to properties. This option would have much less effect on parking at Rugby Park, as it aligns very closely to the path through the park.

OUTCOME: Both options carried forward to MCA assessment.

8.3.11 Innes/Rutland Intersection

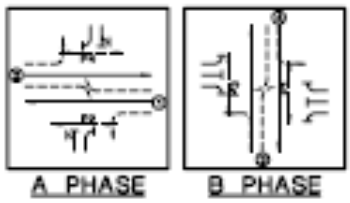


The configuration of cycle facilities on Rutland Street is determined by the street's traffic volume, which points to one-way separated facilities. This analysis considers how they are managed at the Rutland/Innes intersection.

This intersection is arranged with one-way facilities on either side of Rutland Street, both approaches. Hook turn boxes are marked for right turning from all approaches, and a left turn by-pass for cyclists travelling from Innes (east approach) to Rutland (southbound) is marked. Solid cycle lane separators are continued as close to the limit lines as possible.

Traffic lanes are retained from the existing configuration, and right turn vehicle queuing lanes are approximately the same length as existing. Options are developed around signal phasing.

Option 1: Existing Phasing

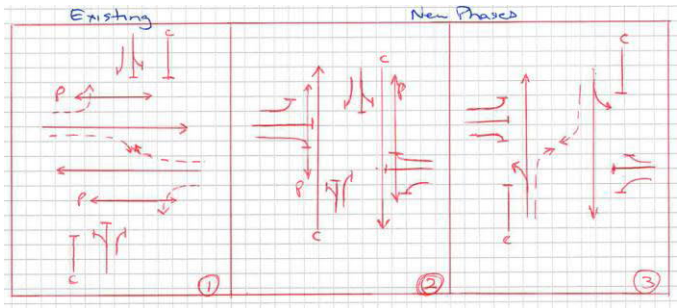


With normal phasing, cyclists will progress through the intersection with the normal traffic phase for Rutland Street (B phase). Cyclists and drivers would need to filter for any turning manoeuvres, which could be daunting for younger, inexperienced cyclists.

Intersection would retain its general phase timing, resulting in little efficiency loss for the intersection.

OUTCOME: Option carried forward to MCA Assessment

Option 2: Include Cycle only phase



A separate phase is provided for cyclists which offers much improved protection for the cyclists, but which will result in an extra phase in the signal cycle. This will influence the efficiency of the intersection.

The extent of the efficiency loss is not yet known (signals modelling to be resolved).

OUTCOME: Based on potential improvements to cycle safety and route attraction, Option carried forward to MCA assessment.

8.4 Option Assessment (using Multi-Criteria Analysis)

This route was divided into three sections which have different traffic environments, requiring different treatments and therefore have been evaluated separately. The sections are as follows:

- Bealey Ave / Colombo Street /Edgeware Road to Trafalgar Street/Dover Street Intersection
- Trafalgar Street/Dover Street Intersection to St Albans / Rutland St Roundabout
- Rutland Street between St Albans Street and Rutland Reserve

Table 8-1 summarises the MCA results for the assessment of the options within each route section with a description of the main scoring differentiators. The MCA analyses are contained in **Appendix H**.

Note 1W = One Way separated cycleway on both sides;
2W = Two way separated cycleway on one side;
SP = Shared Path
GW = Green Way – on road cycle facility in low volume low speed environment

Table 8-1: MCA Summary Tables

Section 1: Bealey Ave to Trafalgar/Dover Intersection	
Route Description	**MCA Assessment findings**
Colombo (1W), Edgeware, Trafalgar (GW)	Very good score for cycleway levels of service, but has the most significant impact for local and business stakeholders, with the parking impacts on Colombo Street. Costs likely to be cheaper than Caledonian Options. Requires one signal set on Edgeware Road. **Rank = 1**
Colombo (1W) Purchas (2W), Caledonian (1W), Edgeware(2W), Dover (GW)	Not as beneficial for cyclists as route has deviation off desire line (Caledonian and Dover) and will need some connection to amenities. Overall will remove less parking – keeps Colombo Street parking but removes some of Caledonian. Very expensive (due k&c on Caledonian Road). Requires two new signal sets.
Colombo (1W) Purchas (2W), Caledonian (2W), Edgeware(2W), Dover (GW)	Similar to above, not as beneficial for cyclists as route has deviation off desire line and will need some connection to amenities. Overall will remove less parking – keeps Colombo Street parking and keeps more on Caledonian. Remains very expensive (due to existing deep dish channel which would need to be replaced with kerb and flat on Caledonian Road). Requires two new signal sets.
Colombo (1W) Purchas (2W), Caledonian (2W), Edgeware(2W), **Trafalgar** (GW)	Generally a good option for cyclists, as level of deviation is less than two previous, but still Caledonian is a deviation. Requires two signal sets. Remains expensive with k&c on Caledonian. This option scores most closely to the preferred option. **Rank = 2.**
Colombo/ Caledonian 1W split (both back to Trafalgar)	Assessed, and not considered effective. Route would be would be difficult to navigate and require specific connections for cyclists wanting to turn around, and reverse direction, otherwise would face two directional travel on one-way facility.

Section 1: Bealey Ave to Trafalgar/Dover Intersection – continued.	
Route Description	**MCA Assessment findings**
Colombo/ Caledonian 1W split (outside of block, Dover/Trafalgar split)	Assessed, and not considered effective. Route would be would be difficult to navigate and require specific connections for cyclists wanting to turn around, and reverse direction, otherwise would face two directional travel on one-way facility.
Bealey Ave - Caledonian 2W (via Trafalgar St)	Assessed and not considered effective, as this would require a two-way facility along Bealey Avenue. MCR design guide standards are not met, traffic lanes on Bealey Ave would be compromised, and the configuration of Bealey / Colombo extremely difficult to configure successfully.
Colombo 2W Edgeware SP and Trafalgar St GW	Traffic volumes too high for 2W in accordance with Best Practice Design Guide so not considered further.
Section 2: Trafalgar/Dover to St Albans/Rutland (this section assessed last, as connectivity and coherence depend on adjacent sections)	
Route Description	**MCA Assessment findings**
Trafalgar Greenway to Sheppard Pl then 2W to St Albans, continuing as 2W on south side connecting to Rutland/St Albans Signals	Exposed to higher traffic St Albans Street and traffic for St Albans School. Parking removed from St Albans St. Signals are good facility for cyclist crossing. Most direct of options and only involves one crossing point. **Rank = 1**
Trafalgar GW to Sheppard Pl then St Albans 2W - north side. Signals at Courtenay Street and Rutland/St Albans	Exposed to higher traffic St Albans Street and traffic for St Albans School. Parking removed from St Albans St. Signals at Rutland/St Albans and second set required on Courtenay crossing which has impact on cycle convenience and network efficiency. Second best directness. This assessment considers the difference in safety between 2W and 1W path (see below) is minimal.
Trafalgar greenway to Sheppard Pl then joins 1W facility on either side of St Albans. Signals required at Courtenay crossing and at Rutland/St Albans.	Exposed to higher traffic St Albans Street and traffic for St Albans School. Parking removed from St Albans St. Signals at Rutland/St Albans and second set required on Courtenay crossing which has impact on cycle convenience and network efficiency. Second best directness. This assessment considers the difference in safety between 2W and 1W path (see above) is minimal.
Trafalgar Street Greenway connects to Massey Crescent Greenway, to St Albans Street and Rutland/St Albans Signals.	Greenways have low traffic volumes - avoids St Albans for longer than other routes. Recommend speed posting to 30kph to reinforce safe environment. Good cycle route as avoids conflicts with school traffic and pleasant environment during the day, but has CPTED concerns and is longer route so may be less attractive.
Trafalgar 1W on both sides (regardless of connection to St Albans St	One way facilities on either side of Trafalgar Street do not fit within reserve.
Trafalgar shared path (regardless of connection to St Albans St	There is insufficient offset from property boundaries to develop a shared pathway (offset = 3m) and still retain a viable carriageway.

Section 2: Trafalgar/Dover to St Albans/Rutland - continued.	
Route Description	**MCA Assessment findings**
Massey 1W or 2W (regardless of connection to Trafalgar and St Albans)	Massey Crescent has very big, established trees. One-way or two-way facilities will fit without removal of the trees.
Section 3: St Albans/Rutland to Rutland Reserve	
Rutland St 1W both sides	One way facilities on both sides of the road in accordance with MCR standards. Direct and connects to all options. No CPTED issues. Higher traffic volume on Rutland than Colombo. Retains approx. 40% of parking spaces. Cul-de-sac for Hawkesbury Ave is recommended to allow additional parking outside shops. **Rank = 1**
Rutland 2W on east side	Two way facility on east side. Full parking retained west side. Traffic volumes on Rutland Street too high to permit this type of facility, and also at risk from high crossing volumes at McFaddens. Not assessed further.
Rutland 2W, Westminster 2W, Gosset Street GW, path through park, right-of-way path, 2W on Weston to Rutland, 2W to reserve.	Fewer access crossings overall and less on street facilities, hence less overall parking removal. Signal crossing of Innes better for cyclists than at Rutland, but will have other negative network effects. Issue with 2W on Rutland north end and crossing McFaddens – too high street volumes for 2W facility. Gosset connection to Malvern Street will remove parking outside Rugby Park grandstand.
Westminster 2W, Carrington Street. 2W, shared paths through reserves , ROW's and 2W on Weston/Rutland	Fewer access crossings overall and less on street facilities, hence less overall parking removal. Signal crossing of Innes better for cyclists than at Rutland, but will have other negative network effects. Issue with 2W on Rutland north end and crossing McFaddens – too high street volumes for 2W facility. Carrington connection to Malvern Street will have much less parking removal on Malvern Street.

Innes Road / Rutland Street	
Route Description	**MCA Assessment findings**
Signals operate on normal phasing with cyclists on 1W facility moving with Rutland traffic.	Best option for network efficiency and cost of implementation, as it won't alter current phasing. Cyclists still face risk from filtering turning traffic. Not supportive of encouraging younger, concerned cyclists.
Signals operate with dedicated cycle phase.	Best option for cycle safety and encouragement of vulnerable cyclists as removes filtering risk. Has network efficiency implications and higher cost due to additional cycle displays, phasing. **Rank = 1**

8.5 Sensitivity Analysis

The MCA scores have been totalled and weighted in a number of ways, to test the sensitivity of the results.

- Normal weighting: There are nine individually scored fields. Under the normal weighting criteria safety and land requirements/programme risk elements are scored at 1.5 weighting and the totals summed.
- Unweighted: In the unweighted scenario, each of the nine fields are added directly, with no weighting on any individual element.
- Cycle weighted: All four scores under the criteria for cyclists are added and doubled, emphasising the cycle score. All other scores are directly added.
- Context weighted: All three scores under context (local, business, network and operational effects) are added and doubled, emphasising the impacts on the local environment. All other scores are directly added.
- Cost and programme weighted: All two scores related to costs and risks to programme delivery are added and doubled. Remaining scores are directly added.

All MCA scores were subject to the sensitivity analysis. Throughout the weighting assessment there is general reinforcement that the option identified as the preferred is supported through the weighting assessment. The MCAs in **Appendix H** show the results of the weighting assessment which are summarised in Table 8-2 below. Note that where the weightings may indicate that preferred options are not clear cut (close in positioning), the preferred option has been that which ranks the highest for cycle attributes.

Table 8-2: MCA Weighting Summary

Weighting	Normal weighting	Cost & Prog weighted	Context Weighted	Cycle Weighted	Unweighted
	Placing				
Section 1: Bealey Ave to Trafalgar St - Dover St Intersection					
Colombo (1W), Edgeware, Trafalgar (GW)	1	1	2	1	1
Colombo (1W) Purchas (2W), Caledonian (1W), Edgeware(2W), Dover (GW)					
Colombo (1W) Purchas (2W), Caledonian (2W), Edgeware(2W), Dover (GW)					
Colombo (1W) Purchas (2W), Caledonian (2W), Edgeware(2W), Trafalgar (GW)	2	2	1	2	2
Colombo/ Caledonian 1W split (both back to Trafalgar)					
Colombo/ Caledonian 1W split (outside of block, Dover/Trafalgar split)					

Weighting	Normal weighting	Cost & Prog weighted	Context Weighted	Cycle Weighted	Unweighted
Bealey, Caledonian 2W (then either Trafalgar or Devon)					
Colombo 2W, Edgeware 2w, Trafalgar GW					
Section 2: Dover St Intersection to Rutland St/St Albans St Intersection					
Trafalgar Greenway to Sheppard Pl then 2W to St Albans continuing as 2W on south side	1	1	1	1	1
Trafalgar GW to Sheppard Pl then St Albans 2W - north side (+ future property purchase option)	2=			2	2
Trafalgar greenway to Sheppard Pl then St Albans 1W on both sides,					
Trafalgar Street Greenway to Massey Crescent Greenway	2=	2	2		
Section 3: Rutland St / St Albans St to Rutland Reserve					
Rutland St 1W both sides	1	2=		1	1
Rutland 2W		2-		2	2=
Rutland 2W, Westminster 2W, Gosset GW, Rugby Park, right-of-way, Weston 2W, Rutland 2W		2=	2		
Rutland 2W, Westminster 2W, Carrington GW, Rugby Park, right-of-way, Weston 2W, Rutland 2W	2	1	1		2=
Rutland St / Innes Road Traffic Signal Sequencing					
Existing signal phasing	2	1	1	2	1=
Separate cycle phase.	1	2	2	1	1=

9 Facility Type Option Assessment – Northern Section

This section of the assessment duplicates the facility type option assessment from the scheme assessment report for the northern section of the Papanui Parallel cycleway.

9.1 Section 1 – Grassmere Street Option Assessment

This section outlines the options considered for the Grassmere Street section of the Papanui Parallel Major Cycle Route. This section includes Grassmere Street from 20 metres south east of the Grassmere Street/Main North Road intersection to south east of the Grants Road/Grassmere Street intersection. The assessment of options is undertaken against the project objectives and strategic alignment.

The preliminary assessment is outlined in Table 9-1 and Table 9-2. Options have been tested for the south eastern and north western ends of Grassmere St separately:

- Option A1 – Greenway along south eastern section of Grassmere Street
- Option A2 – Shared path along south eastern section of Grassmere Street on the Northern Side
- Option B1 – Greenway along north western section of Grassmere Street
- Option B2 – 2 way facility along north western section of Grassmere Street on the Northern Side.

9.1.1 Option Assessment

The south eastern and north western section of Grassmere Street have been assessed separately, see Table 9-1 and Table 9-2 respectively and in **Appendix S**. It should be noted that although these are assessed separately the transition between the facilities on the two segments also plays a role in the best combination of facilities.

It is considered that both options could be designed to provide a safe route for cyclists. However, the interventions required to achieve this for option A1, a greenway, would be more extreme. Due to the rural type environment along the south eastern segment of Grassmere Street the roadway feels very open and is more conducive to a higher speed environment. The environment combined with traffic volumes at the upper limit for a neighbourhood greenway have led to the consideration that a cul-de-sac at this end of Grassmere Street would be beneficial to create an acceptable environment for a greenway. Even if this did occur the necessary low speeds may not be achieved therefore a shared path is considered favourable predominantly on the grounds of comfort.

High traffic speeds on the carriageway directly adjacent to a shared path are still undesirable, however they are less critical than for a greenway. It is considered that a comfortable environment for a shared path can be achieved through the implementation of traffic calming along this section of Grassmere Street.

Because there are no side streets along the mid-section of Grassmere Street it is not considered that there is any significant difference in terms of way-finding between the two options. However, a shared path is likely to be a more recognisable facility in this environment due to continuity from the pathway through the reserve.

Table 9-1: Preliminary Cycleway Option Assessment – Grassmere South Eastern Segment

	Safety (minimum requirement)		Coherence & Connectivity		Directness (distance and time)		Comfort		Attractiveness & Social Safety	
Option B1 Greenway at Northern End of Grassmere		The built up environment can be designed to be more conducive to lower speeds, would need design features to lower speeds. Traffic volumes are at the recommended threshold for a neighbourhood greenway. However, recommended changes at Main North Road/Grassmere Street intersection would reduce traffic volumes. Current lane widths would need to be altered to allow cyclists and vehicles to safely share lanes. Requires cyclists to enter/leave traffic at each end, creating two conflict points however Grassmere Street is a relatively low volume road. Daily traffic volumes of cyclists and motor vehicles similar.	✓	Different facility type to further north on route and off-road link through reserve. Due to no side roads on Grassmere Street this is unlikely to create any wayfinding confusion. Markings and signage could be used to assist with wafinding. Other Neighbourhood Greenways are being considered along the Papanui Parallel Route.	✓✓	Cyclists would be given right of way over vehicles. Grassmere Street has priority along entire length so no additional delay would be incurred once cyclists have entered the greenway.		Flat gradient. Greenway slightly less recognisable than separated facility however this can be overcome by wayfinding signage etc. Traffic volumes could be at the limit of what is acceptable for a greenway if change to Grassmere Street/Main North Road intersection is not successful. Traffic speeds can be managed through design.	✓✓	Would provide an attractive local street and allow incorporation of interesting components and more landscaping. Allows all street trees to be retained.
Option B2 Bi-Directional Facility at Northern End of Grassmere		2-way separated paths can have higher safety risks associated with them due to drivers not being accustomed to needing to look in the contra flow direction for cyclists. However, 1b does not cross any intersections, is only a short distance and only crosses residential driveways (relatively low volume and familiar users). It is expected that any safety risks can be managed.	✓✓	Direct and would be consistent with facility on Main North Road/Sawyers Arms Road and through reserve to the south. Does not cross any intersections or require cyclists to merge with traffic ie no complicated manoeuvres. Obvious and easy to follow.	✓✓	Cyclists continue from shared path without giving way to traffic. Cyclists have priority over all driveways therefore no delays. No detour, same side of Grassmere Street to shared path and Main North Road facility.		Flat gradient., easily recognisable as an MCR. Crosses several driveways which would need to be managed carefully.	✓	Relatively straight route does not reduce perception of distance. Could be less attractive option for a local street environment dependant on appearance of separators. Allows majority of street trees to be retained.

Table 9-2: Preliminary Cycleway Option Assessment – Grassmere North Western Segment

	Safety (minimum requirement)		Coherence & Connectivity		Directness (distance and time)		Comfort		Attractiveness & Social Safety	
Option B1 Greenway at Northern End of Grassmere		The built up environment can be designed to be more conducive to lower speeds, would need design features to lower speeds. Traffic volumes are at the recommended threshold for a neighbourhood greenway. However, recommended changes at Main North Road/Grassmere Street intersection would reduce traffic volumes. Current lane widths would need to be altered to allow cyclists and vehicles to safely share lanes. Requires cyclists to enter/leave traffic at each end, creating two conflict points however Grassmere Street is a relatively low volume road. Daily traffic volumes of cyclists and motor vehicles similar.	✓	Different facility type to further north on route and off-road link through reserve. Due to no side roads on Grassmere Street this is unlikely to create any wayfinding confusion. Markings and signage could be used to assist with wafinding. Other Neighbourhood Greenways are being considered along the Papanui Parallel Route.	✓✓	Cyclists would be given right of way over vehicles. Grassmere Street has priority along entire length so no additional delay would be incurred once cyclists have entered the greenway.		Flat gradient. Greenway slightly less recognisable than separated facility however this can be overcome by wayfinding signage etc. Traffic volumes could be at the limit of what is acceptable for a greenway if change to Grassmere Street/Main North Road intersection is not successful. Traffic speeds can be managed through design.	✓✓	Would provide an attractive local street and allow incorporation of interesting components and more landscaping. Allows all street trees to be retained.
Option B2 Bi-Directional Facility at Northern End of Grassmere		2-way separated paths can have higher safety risks associated with them due to drivers not being accustomed to needing to look in the contra flow direction for cyclists. However, 1b does not cross any intersections, is only a short distance and only crosses residential driveways (relatively low volume and familiar users). It is expected that any safety risks can be managed.	✓✓	Direct and would be consistent with facility on Main North Road/Sawyers Arms Road and through reserve to the south. Does not cross any intersections or require cyclists to merge with traffic ie no complicated manoeuvres. Obvious and easy to follow.	✓✓	Cyclists continue from shared path without giving way to traffic. Cyclists have priority over all driveways therefore no delays. No detour, same side of Grassmere Street to shared path and Main North Road facility.		Flat gradient, easily recognisable as an MCR. Crosses several driveways which would need to be managed carefully.	✓	Relatively straight route does not reduce perception of distance. Could be less attractive option for a local street environment dependant on appearance of separators. Allows majority of street trees to be retained.

Options B1 and B2 have relatively similar outcomes from the options assessment. However, considering this section of the route in the context of the wider route option B2, a 2 way facility, is preferred. Option B2 allows a continuous facility along the length of Grassmere Street when combined with a shared path along the south eastern segment. If a greenway was implemented along this segment cyclists would need to enter/exit the traffic part way along Grassmere Street, a complex manoeuvre. There would also be a need for cyclists to enter/exit the traffic again at the Main North Road/Grassmere Street intersection to access the proposed cycle/pedestrian crossing.

It is noted that 2 way cycle facilities can have safety issues at driveways. It is considered that this can be managed through design. Relatively large off-sets from the boundaries can be achieved and the residential nature of the property accesses means that users will quickly become familiar with the cycleway.

Two options were considered for the 2 way facility cross section. Both options considered were on the northern side of Grassmere Street to avoid the need for cyclists to cross Grassmere Street at each end of the facility. Cross sections for the options are shown in Figure 9-1 and Figure 9-2.

Figure 9-1 Grassmere Street 2 way Facility Option 1

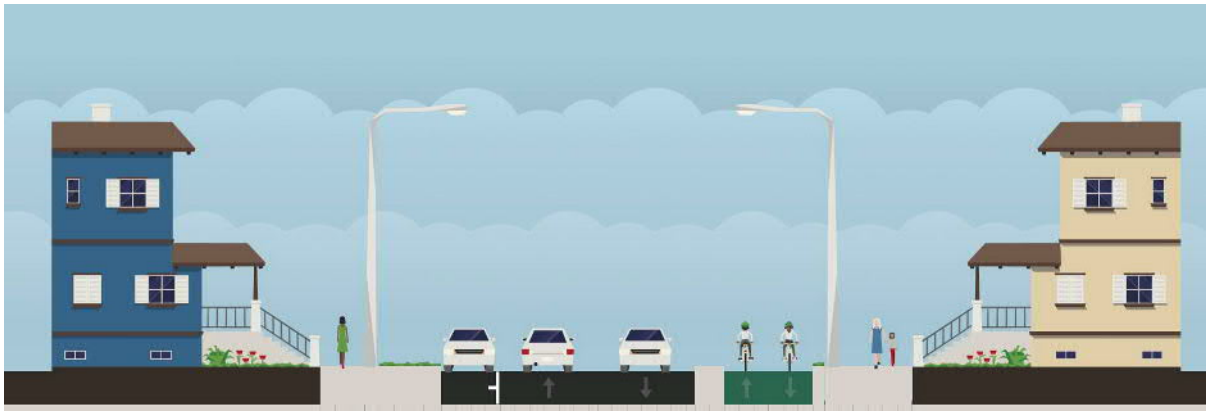


Figure 9-2 Grassmere Street 2 way Facility Option 2

The key differences between the facilities are:

- Option 1 keeps the existing kerb line (11.0m wide carriageway) and reduces the trafficable width to 5.0m. Option 2 shifts the kerb line and has 3.25m wide lanes.
- Option 2 requires the removal of existing street trees.

- Option 1 allows a 5.0m wide separation from the boundary along half of the facility. This provides better visibility and greater reaction times for vehicles and cyclists interacting in this area.
- Option 2 is anticipated to be higher cost due to the need to shift the kerb alignment.
- Both options provide 1.0m separation from the carriageway and a 3.0m wide cycleway.

It is noted that the reduction of the trafficable width to 5.0m is likely to make some drivers feel uncomfortable driving in two directions past each other, but volumes are low and interactions between two vehicles would be low. The frequent spacing of driveways is considered to reduce this concern by allowing drivers many opportunities to yield. The possibility of drivers moving into the cycleway to yield to oncoming vehicles needs to be managed through the design of the separation between the carriageway and cycleway.

An indicative cross-section for a shared path along the south eastern segment of Grassmere Street is shown in Figure 9-2.

Figure 9-3 Grassmere Street Shared Path – Indicative Cross Section

9.1.2 Assessment Conclusion

The preferred option is a shared path at the south eastern end of Grassmere Street transitioning to a 2 way facility along the north western section of Grassmere Street. The shared path would require land purchase along Grassmere Street where the road corridor is very narrow. The removal of parking along one side of Grassmere Street will also be required.

The preferred option for the 2 way facility is option 1, which retains the existing kerb line and reduces the trafficable lane widths

9.2 Section 2 – Main North Road – Sawyers Arms Road Option Assessment

The option selection was based on two component types; the intersections and the midblock sections. The appropriate layout / type of provision for each component were assessed individually and then they were assessed as a whole for compatibility between components and appropriateness of the entire route.

9.2.1 Main North Road (Grassmere to Sawyers Arms) intersection designs

Five options for the Main North Road sections of the route, from Grassmere Street to Sawyers Arms Road, were presented to the MCR signalised intersection team as part of the investigations into designing signalised intersections on Major Cycle Routes. This section involved the Grassmere Street/Main North Road and Main North Road/Sawyers Arms Road intersections, although most options focused on a crossing point at one of these two intersections with minimal effects on the other.

The five options are described in the multi-criteria analysis spreadsheet, see **Appendix S**, and have been previously discussed in the report entitled "*MCR Signalised Intersections – Papanui Parallel Route: Main North Road / Sawyers Arms Road & Sawyers Arms Road / Sisson Drive*" (ViaStrada, 3 November 2014) which is included as **Appendix T** of this report (note that an updated phasing plan for the Main North Road / Sawyers Arms intersection is also included). A brief description of these options is as follows:

- Option 1 - 2 way Separated Bicycle Facility (SFB) on east side of Main North Rd
- Option 2 - 2 way SBF on west side of Main North Rd with midblock crossing at Grassmere Street
- Option 3 - 2 way SBF with route diversion via Shearer Ave
- Option 4 - underpass connecting 2 way facilities
- Option 5 - 2 way SBF from Shearer Ave on north side of Sawyers Arms between Main North and Sisson

The options have been discussed and evaluated by the CCC MCR intersection team and this investigation flows on from their conclusions. The CCC MCR intersections team stated that the preferred option would be Option 2, as this would allow the best level of access to Northlands Mall. There was some concern about the efficiency impacts this could have on the operation of Main North Road and the impact that banning right turns out of Grassmere Street may have on some users.

Modelling has been undertaken to quantify these impacts. Modelling was performed for the first three options only, as Options 4 and 5 were developed later in the process and CCC considered that it was not necessary to further explore these additional options at this point.

9.2.1.1 Main North Road / Grassmere Street Modelling

The first three options for this intersection were tested in the CAST model. The modelling results are outlined in the QTP modelling reports, see **Appendix U**. The conclusion of the modelling is that all three options tested (options 1 to 3) appear to be feasible and will not result in any significant re-routing of traffic.

The results show that Option 2 (midblock crossing immediately north of Grassmere Street) is a viable option as it would have very little effect on the operation of the Main North Road/Sawyers Arms intersection and is potentially the option that is least disruptive to traffic overall.

The modeller, in subsequent discussions, also suggested that inclusion of pedestrians on the midblock crossing would not severely impact on the operation of the corridor. This eliminates the concern that some pedestrians might use the cycle crossing but would not have enough time to cross and would risk collision with motor vehicles.

The restrictions applied to make Grassmere Street left-out / right-in only are not expected to have any major adverse effects on the wider network; but some minor diversion will occur. QTP considered that appropriate options exist within the network to accommodate the diverted traffic.

9.2.1.2 Main North / Grassmere safety implications

The safety implications of the various options were identified in the options comparisons in the preliminary intersections report (**Appendix T**). These are re-stated in Table 9-4, according to the colour-coding scheme relating to the various advantages and disadvantages presented in Table 9-3:

Table 9-3: Relative weighting levels for advantages and disadvantages

Advantages			Disadvantages		
High	Medium	Low	Low	Medium	High

Table 9-4: Comparison of options for Main North / Sawyers Arms (reproduced from preliminary intersections report –in Appendix T)

Option 1	Option 2	Option 3	Option 4	Option 5
	Location of the new signalised crossing in close proximity to adjacent signalised intersection and crossing may reduce safety as motorists may confuse the traffic signals belonging to each location.			
Passes multiple driveways along Main North Road, including a hairdressers (high volumes of motorists having poor familiarity / experience with the site) and a medical centre (a driveway servicing 3 parking spaces likely to be used by staff who are more familiar with the site; the access to the medical centre's main carpark is off the head of the T at the intersection).	MCR alignment avoids driveways along east side of Main North Road. (And while southbound cyclists on Main North Road will still have to pass these driveways the scheme is still an improvement with respect to current provision in this location).	Route alignment avoids driveways along east side of Main North Road. (And while southbound cyclists on Main North Road will still have to pass these driveways the scheme is still an improvement with respect to current provision in this location).		Route alignment avoids driveways along east side of Main North Road.

Option 1	Option 2	Option 3	Option 4	Option 5
		Increases potential for conflict between vehicles exiting / entering driveway at head of T and MCR users as the diagonal crossing is non-standard and perhaps unexpected.		
	Minor potential for conflict between MCR users and pedestrians on zebra crossing on south-west corner.	Minor potential for conflict between MCR users and pedestrians on zebra crossing on south-west corner.		
Facility crosses two accesses to heavy vehicle loading area on Sawyers Arms Road.	Facility crosses two accesses to heavy vehicle loading area on Sawyers Arms Road.	Facility crosses two accesses to heavy vehicle loading area on Sawyers Arms Road.	Bypasses the two accesses to heavy vehicle loading area on Sawyers Arms Road.	Avoids the two accesses to heavy vehicle loading area on Sawyers Arms Road. (But as it passes multiple driveways and a side road, it is less safe in this respect than the underpass option)
			May be some security issues associated with curved alignment through underpass – lack of visibility from start to finish of underpass. Can be mitigated by including light shaft, CCTV surveillance etc.	

Note that the initial concern for Option 2 that safety issues might occur if some pedestrians use the midblock crossing (which was initially intended to be cycle-only) has been mitigated by making this crossing for cyclists and pedestrians, and the appropriateness of this has been confirmed through modelling.

9.2.1.3 Main North Road/Grassmere Street Assessment Conclusion

The preliminary intersection report (**Appendix T**) outlines the advantages and disadvantages of the options; these will not be restated here as they have already been evaluated previously. Given that CCC has stated a preference for Option 2 (based on accessibility between the MCR and Northlands Mall), the deciding factor is the modelling advice, which concluded that Option 2 is viable from an

operational perspective and that the midblock crossing could accommodate pedestrians as well as cyclists.

Thus, the assessment concluded that Option 2 should be adopted as the design option.

9.2.1.4 Main North Road/ Sawyers Arms Road Operation

QTP have modelled options 1-3 proposed for the intersection, the results are provided as part of **Appendix U**. It was identified that all options appear to be feasible and will not result in any significant re-routing of traffic. Option 2 (with the midblock crossing located at Grassmere Street) was identified as being the least disruptive to traffic overall and as having the least impact on Main North Road during the peak periods.

Note that Option 2 involves land purchase which allows the intersection operation to remain relatively unchanged from the existing situation. Were land purchase not to be undertaken, further modelling would be required.

9.2.2 Sawyers Arms Road / Sisson Drive Intersection

This intersection is currently Give-Way controlled and will be signalised as part of the MCR introduction. The QTP modelling report for this intersection is provided in **Appendix U**. The intersection layout depended on the choice of midblock facility chosen along Sawyers Arms Road, as discussed earlier.

9.2.2.1 Options considered

Options for this intersection were considered by the MCR signalised intersection team. Whether or not to provide a “crosswalk to the right of the stem of the T” was discussed by this team and the decision made that overall, this would not be desirable or essential in this location. The team’s decision is supported based on:

- The ready availability of gaps in traffic away from the intersection suitable for able-bodied pedestrians,
- The short additional travel distance (some 40 m) for those pedestrians who do want to utilise a signalised crossing, and the low number of pedestrians who would be affected by this (i.e. those coming from the south-east), and
- The relatively high operational impact on all intersection users if the crosswalk were to be provided.

9.2.2.2 Modelling

The preferred scheme (two way SBF on the south-west side of Sawyers Arms Road, no crosswalk on the south-east leg) was subject to CAST modelling. The adjacent Main North Road / Sawyers Arms Road intersection is just over 200 m away, and there is little queuing predicted. The longest queues are predicted for the right turn on Sisson Drive in the evening peak (four vehicles).

Overall, it may be more efficient to not co-ordinate the two intersections, but to run this site isolated. It will certainly not require the same high cycle time that the Main North Road / Sawyers Arms Road intersection needs to be operated at.

A site visit during the evening peak revealed that there are plenty of gaps in Sawyers Arms Road traffic for drivers to come out of Sisson Drive without any difficulty or much delay. As such, it is not

surprising that the QTP modelling does not show traffic flow reassignment once this intersection gets signalised. An intersection movement count is thus not essential. Given that CCC has counts for all signalised intersections, one could be commissioned for this site at this point. Should it be decided that further modelling is desirable (e.g. to test whether co-ordination should be provided, and the resulting impacts on intersection performance), it would be valuable to have such count data.

9.2.3 Sawyers Arms Road – midblock facility type

Based on CCC's initial preference (a 2 way facility on the south side of Sawyers Arms Road), preliminary intersection designs, findings from the initial version of a conflict evaluation tool and subsequent discussions, three options have been tested:

- Option A – 2 way facility, south side along entire route
- Option B – 1 way facilities on both sides along entire route
- Option C – 2 way facility, north side between Main North Road and Sisson Drive; then 2 way facility, south side between Sisson and railway crossing

9.2.3.1 Sawyers Arms Road conflict modelling to inform choice of midblock facility type

The performance of the options with respect to the five MCR main objectives (safety, coherence & connectivity, directness, comfort, and attractiveness & social security) has been assessed using the multi-criteria analysis matrix, see **Appendix S**. Option A has the best performance in terms of the latter four criteria.

All three options have the same rating in terms of safety, as they involve significant safety issues (which must be mitigated through design) however, none of the options can be termed "inherently unsafe". Thus, the safety of the options (in particular, Option A, which is preferred in terms of the other criteria) has been investigated more thoroughly.

The "Sawyers Arms conflict calculation" spreadsheet-based tool has been developed and used to assess the appropriateness of provision along Sawyers Arms Road.

The tool is based on the relative risk weightings between different conflict location types. These weightings are based more on experience and reasoning than actual, empirical evidence as the latter is not conclusively documented in most cases.

The conflict locations have been further sub-classified according to direction of flow of the cycle facility relative to that of the general traffic flow (i.e. whether cycling is in the "correct" direction or in the contra-flow direction) and the presence of surrounding parking provision, which affects inter-visibility. The base case conflict location was taken as a standard residential driveway for cyclists travelling in the correct direction and no parking in the immediate vicinity, this was assigned a factor of 1 and all other conflict locations were weighted relative to this.

The table presented in **Appendix V** identifies the various conflict locations, their parameters (including the direction of cycle flow, presence / absence of adjacent on-street parking and the corresponding vehicle flows to be used) their standard assigned factors and the reasoning for these choices.

Note that it has been assumed that parking will not be provided on the same side of the road as a 2 way facility (i.e. involving contra-flow cycling) along Sawyers Arms Road. Some combinations of location, cycling flow direction and parking provision have not been assigned factors as these combinations will not be present in the study area (for example, none of the options include the scenario of a cycle facility crossing a commercial heavy vehicle access which has on-street parking in

the immediate vicinity). Were the tool to be applied to areas where such combinations are present, these factors should be developed.

Table 9-5 outlines the various data relating to the conflict locations along Sawyers Arms Road required for the tool inputs.

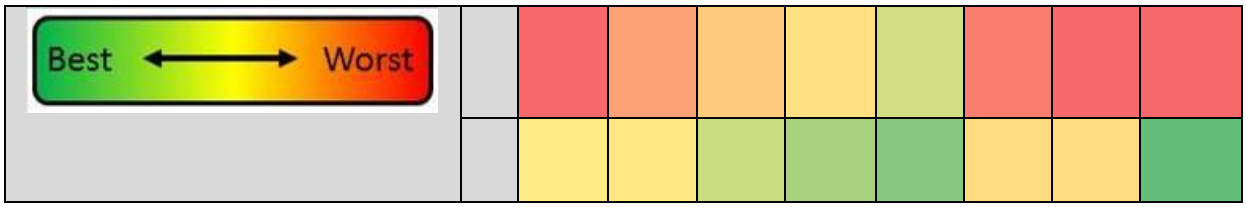
Table 9-5: Potential conflict locations for MCR on Sawyers Arms Road

South side	**North side**
6 driveways servicing 13 residential properties	39 driveways servicing 66 residential properties One driveway situated on the head of the T at the Sawyers Arms / Sisson intersection.
1 side street: • Sisson Drive – predicted 2021 PM peak turning movements: o 171 left turns out o 298 right turns out o 53 left turns in o 69 right turns in **Will be signalised to provide protection to MCR traffic.**	2 side-streets: • Nyoli Street – predicted 2021 PM peak turning movements: o 48 left turns out o 22 right turns out o 75 left turns in o 161 right turns in • Leander Street - cul-de-sac o 29 residential properties
2 commercial heavy vehicle accesses (just west of Main North intersection) – assumed 5 heavy vehicle movements per peak period per access 1 commercial accesses servicing 9 parking spaces 2 sporting facilities with approximately 32 and 70 parking spaces respectively	No additional access types

The model has been applied using the factors outlined in **Appendix V**, with sensitivity testing performed to determine the effects of the least certain factors by applying various scenarios. The results are as follows:

Table 9-6: Model output and sensitivity analysis

		Scenario							
				u	v	w	x	y	z
Factor	side streets, correct flow, no parking								
	commercial heavy vehicle access, correct flow, no parking								
Option, according to colour code:									



The sensitivity testing shows that:

- Option B (1 way facilities on both sides along entire route), in most cases except the most extreme, involves the greatest risk. In no cases was it the most favourable option.
- With the commercial heavy vehicle access factors held as for the base case, the critical weighting for side streets is 1.28; above this value Option A (2 way facility, south side along entire route) is preferable, below this value Option C (2 way facility, north side between Main North Road and Sisson Drive; then 2 way facility, south side between Sisson and railway crossing) is preferable.
- With the side street factors held as for the base case, the critical weighting for the commercial heavy vehicle accesses is 7.1; below this value Option A is preferable, above this value Option C is preferable.

9.2.3.2 Sawyers Arms Road midblock facility type assessment conclusion

Using the multi-criteria analysis matrix, Option A has been identified as the preferred option in terms of coherence & connectivity, directness, comfort and attractiveness & social safety.

However, several safety issues have been identified for Option A, as well as for the other two options.

Based on the conflict modelling and sensitivity testing, the following conclusions have been made:

- From a risk perspective, it would be reasonable to base further comparisons between Options A and C only.
- The difference between Options A and C hinges on:
  - the assumption that a priority side street has a greater weighting than an individual driveway for the same number of vehicle movements; and
  - the weightings applied to (and actual volumes of) heavy vehicles crossing the commercial accesses.
- Within the reasonable ranges for the two critical factors, Options A and C have very similar risk values, according to the tool. Given this, and the fact that the actual weightings of these two factors cannot be determined more accurately, it seems appropriate that the choice between Options A and C be determined by the choice of treatment at the Main North Road/ Sawyers Arms Road intersection.
  - CCC has indicated a strong preference to retain the route along Grassmere Street (rather than a proposed diversion along Shearer Avenue) with a midblock crossing across Main North Road immediately north of Grassmere Street (to optimise access between the MCR and Northlands Mall entrance on Main North Road).
  - QTP modelling results indicate that a midblock crossing immediately north of Grassmere Street is a viable option and is the preferred option in terms of traffic operation.

Therefore, Option A, a two way separated cycleway along the south side of Sawyers Arms Road, has been selected.

9.2.4 Sawyers Arms Road – bus stop locations

Having determined that a 2 way SBF along the south side of Sawyers Arms Road will be used, there are some finer details and location-specific options to be discussed:

There are currently two bus stop pairs along Sawyers Arms Road. Sheets 3a and 4a of **Appendix W** show three options for the road layout in the vicinity of the bus stops.

- Bus Stop Option 1 – stops directly opposite (current locations) with central flush median
- Bus Stop Option 2 – staggered bus stops with central flush median
- Bus Stop Option 3 – stops directly opposite (current locations) bus boarder operation on westbound lane

In each case, the bus stop on the westbound lane is now separated from the footpath by the SBF and has effectively been moved further into the carriageway. The adjacent SBF separator has been widened to allow space for queuing and alighting bus patrons.

The two bus stop pairs along Sawyers Arms Road are very close (approximately 200 metres apart). This may be strategic, based on their positions relative to side streets and access to Papanui High School. It may, however, be something to be reviewed. Regardless of the eventual spacing between the bus stop pairs, the important step at this point is to determine the layout to be used at each bus stop location.

9.2.4.1 Bus Stop Option 1

The paired bus stops for the Option 1 layout are located directly opposite each other and situated within the general traffic lane without any markings to deviate through traffic. This is similar to a "bus boarder" style arrangement, however as there is also a central flush median separating the general traffic lanes in each direction motorists can pass a stopped bus by driving on the flush median.

The reasoning for this is that it avoids any horizontal deviation in the road layout, which is more comprehensible for drivers; especially during the majority of times when there are no buses stopped and drivers can continue straight through. To illustrate the opposite situation, consider the bus priority corridor along Papanui Road where the general traffic lanes deviate around certain bus stops. In practice many drivers do not follow the lane markings and instead travel straight through at times when there is no bus present; this leads to confusion and conflict. The Option 1 bus stop layout also reduces the number of parking spaces required to be removed compared with a staggered bus stop arrangement.

When a bus is stopped in a bus stop, following traffic can overtake it by using the flush median. There are several sections of the Road User Rule (Ministry of Transport, 2004) that relate to this and are presented and discussed to avoid any ambiguities on this subject:

> ***1.6 Interpretation***
>
> *In this rule, unless the context otherwise requires,—*
> ***centre line,—***
>
> > *(b) in relation to any portion of a roadway marked with a flush median, means the longitudinal white line that forms the left side of the flush median as viewed by a driver facing forward*
>
> ***flush median** in relation to a portion of a roadway, means an area marked by white diagonal lines for the purpose of separating opposing traffic that is-*

a) Painted along the middle of the roadway; and

b) Bounded by approximately parallel, longitudinal white lines.

2.3 Use of lanes

(1) A driver, when driving, must not use—

(b) on a two-way roadway marked in 2 or more lanes, a lane on the right side of the centre line unless the driver is passing another vehicle travelling in the same direction; or

(2) A driver, when driving on a road marked in lanes,—

(a) must drive as far as practicable entirely within a lane except when complying with subclause 2.1(2) or when changing lanes; and

(b) must not move from a lane until he or she has first ascertained that the manoeuvre may be made safely.

(3) However, a driver may drive, either wholly or partly, in a lane that is unavailable to the driver under subclause (1) or subclause 4.6(2) to (4) if—

(a) it is impracticable to proceed otherwise because of the size of the driver's vehicle or the size of the load on the driver's vehicle or because of a road obstruction, and driving in that lane can be done safely and without impeding other traffic; or

(4) A driver using a lane in accordance with subclause (3)(b) must keep his or her use of the lane to the minimum necessary in order to complete his or her manoeuvre.

2.7 Passing on right

A driver must not pass or attempt to pass on the right of another vehicle moving in the same direction when—

(b) approaching or passing a flush median, unless the driver—

(i) intends to turn right from the road marked with the flush median into another road or vehicle entrance; or

(ii) has turned right onto the road marked with the flush median; or

(iii) can make the entire movement without encroaching on the flush median.

As the left side of a flush median counts as the centreline, a vehicle overtaking a bus in this location will effectively be crossing the centreline to do so. While the manoeuvre required involves passing on the right on a flush median (i.e. clause 2.7(b) of the RUR), a bus stopped in a bus stop is not moving and therefore counts as an obstruction and vehicles are allowed to pass it, according to clause 2.3(3)(a). Therefore this design is acceptable and motorists in either direction can lawfully use the flush median to pass a bus stopped in the bus stop.

Obviously, there is potential for conflict in the situation involving a bus parked in each stop of a pair with following traffic in each direction. However, this situation is extremely unlikely to occur. There is only one bus route along Sawyers Arms Road – the number 108. In the periods of most frequent operation, there is a 108 bus travelling in each direction and these leave their respective stations (Casebrook and Northlands) at roughly the same time. This means the two buses are unlikely to meet on Sawyers Arms Road at this point as it is much closer to the Northlands end rather than near the middle of the route. This advice has been provided by Sam Wilkes from ECan.

9.2.4.2 Bus Stop Option 2

This option addresses any concern that there may in fact be a bus parked in each stop of a pair by staggering the two stops. This effectively increases the length of the flush median and increases the number of parking spaces to be removed compared with Option 1.

9.2.4.3 Bus Stop Option 3

This option retains the bus stops of a pair directly opposite each other but without a flush median. The eastbound stop is in the parking lane and thus eastbound traffic travels through without any delay or obstruction whilst a bus is in the stop. The westbound stop, however, operates as a bus boarder and, as there is no flush median in this option, following traffic will have to wait behind the bus during the time it is stopped, or can overtake the bus using the opposite traffic lane. This option involves the greatest retention of parking spaces.

9.2.4.4 Bus Stop Option Assessment

Note that the achievement of the MCR main objectives (safety, coherence & connectivity, directness, comfort, and attractiveness & social security) do not differ among the three bus stop options as the SBF provision essentially remains the same.

The differences between the options relate to drivers only (both in terms of travel and parking). Therefore, the multi-criteria assessment matrix has not been completed for the bus stop options as this matrix relates to provision to MCR users. Instead, the key advantages and disadvantages to all road users are discussed in the following table:

Table 9-7: Preliminary Bus Stop Option Assessment

Bus Stop Option	Advantages	Disadvantages
Option 1	• Retains both stops in current location • Lowest delay to traffic • Less parking removal than Option 2	• Some safety implications in the case where buses are parked in both stops at the same time – there is a very low likelihood that this will occur and a low associated risk that this will result in a serious crash.
Option 2	• Lowest delay to traffic	• Highest level of parking removal • Westbound stop relocated, increased distance to Northlands Mall.
Option 3	• Retains both stops in current location • Least amount of parking removal	• Possible delay to westbound traffic when bus is stopped. • May be some safety concerns if westbound traffic tries to pass stopped bus.

9.2.4.5 Bus stop options assessment conclusion

The bus stop assessment concluded that Bus Stop Option 1 (stops directly opposite with central flush median) is the preferred layout. However, in the interests of future-proofing and mitigating the effects were two buses to be parked in opposite stops at the same time (however unlikely this may be) CCC has advised that Option 2 should be implemented.

9.2.5 Northern Line MCR midblock crossings on Saywers Arms Road

The scheme design is required to include all intersections and connections into linking cycleways, thus it must link in with the Northern Line MCR and thus the midblock crossing provision of the Northern Line MCR at Sawyers Arms Road must be considered.

CCC has indicated that a threshold of 6,000 vehicles per day will be used to determine which roads warrant signalised midblock crossings for MCRs. Therefore Sawyers Arms Road, which has an ADT of 6,356 vehicles per day across the railway, would require a signalised midblock crossing.

However, based on extensive previous experience with signalised crossings along the Railway Cycleway, this threshold is much too low. Path users are likely to be stopped at the crossing even when there are sufficient gaps in traffic, thus undue delay can result in unsafe behaviour as path users attempt to cross during a red light or during a stale green not wanting to wait until the next cycle.

Thus, two options have been considered for the midblock crossing of the Northern Line MCR across Sawyers Arms Road, which ties in with the Papanui Parallel MCR:

- Option 1 – island refuge with kerb extensions
- Option 2 – signalised crossing

9.2.5.1 Analysis

The analysis has been based on the premise that a signalised midblock crossing involves much greater installation costs than physical works (median islands, kerb build outs, lane marking etc) and therefore if option 1 can be proven feasible in terms of safety and efficiency there is no need to further explore option 2.

The pedestrian planning and design guide crossing facilities evaluation spreadsheet has been used to gauge the appropriateness of the option 1. The relevant input parameters were adjusted for cyclist crossing speeds according to the aspects summarised in the following table and discussed below:

Table 9-8: Inputs to evaluate LOS at cycle path crossing

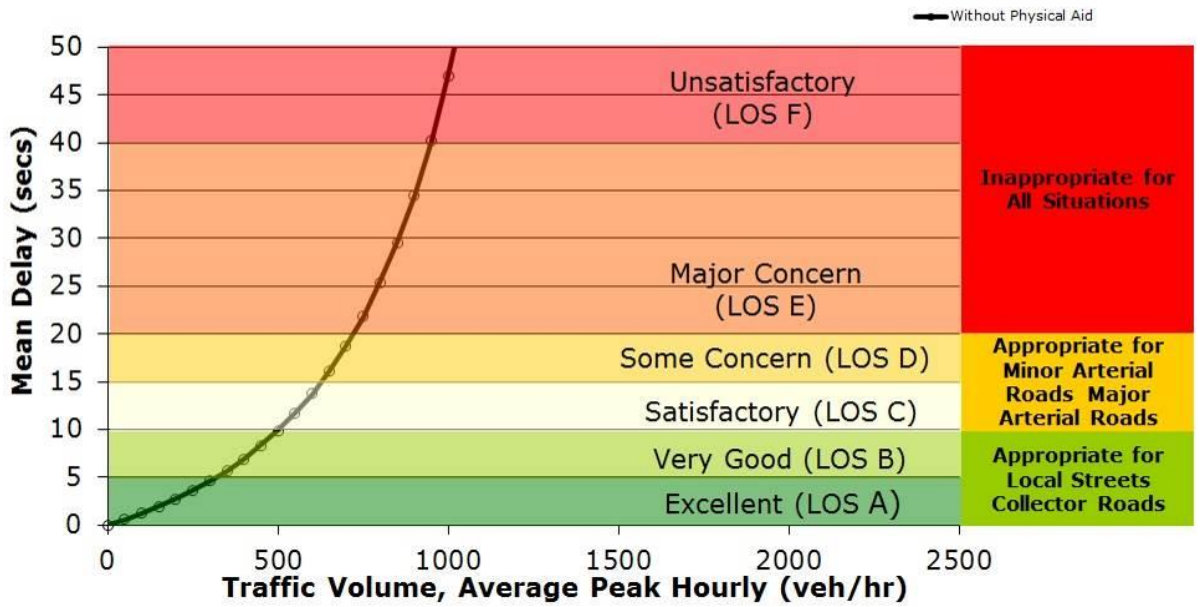
Input	Value	Source / justification
Speed limit	50 km/h	
Vehicle approach speed (85^{th} percentile)	50 km/h	Assumed to be equal to the existing speed limit.
Average vehicle volume:		Data from CCC survey, 15/06/12
Eastbound, AM peak (9:00)	212 veh/h	
Westbound, AM peak (9:00)	319 veh/h	
Eastbound, PM peak (16:00)	275 veh/h	
Westbound, PM peak (16:00)	297 veh/h	
Average cyclist volume:		QTP 2021 model at Northern Line / Sawyers Arms using only cyclist movements that will use the crossing.
AM peak	279 cyc/h	
PM peak	303 cyc/h	
Cyclist speed	4.47 m/s (16.1 km/h)	AASHTO (2012). Concurs with 15^{th} percentile cyclist speed from Christchurch study (Wilke, 1999)
Cyclist acceleration	0.457 m/s^2	AASHTO (2012)

Input	Value	Source / justification
Bicycle length	1.8 m	AASHTO (2012), DfT (2008).
Physical crossing distance:		
(Existing crossing)	(10.0 m)	
Crossing eastbound lane	4.0 m	According to Option 1 layout
Crossing westbound	3.3 m	
Actual crossing distance:		Actual distance for cyclists to travel when crossing = physical crossing distance + length of bicycle
(Existing crossing)	(11.8 m)	
Crossing eastbound lane	5.8 m	
Crossing westbound lane	5.1 m	
Average crossing speed:		Based on equations of motion, assuming:
(Existing crossing)	(1.64 m/s)	a. constant acceleration
Crossing eastbound lane	1.15 m/s	b. cyclists starting from stationary (most conservative scenario)
Crossing westbound lane	1.08 m/s	
Used in spreadsheet	1.1 m/s	As the spreadsheet uses one velocity only, a value of 1.1 m/s was used for both crossings.

The calculations, which are based on fundamental principles of physics and industry standard values for 15th percentile cyclists, show that for the situation with a central median island, the crossing time (and therefore average speed) of a 15th percentile cyclist is not much greater than that of a 15th percentile pedestrian (normally taken as 1.0 m/s). We acknowledge that this seems slow, it stems from the value used for cyclist acceleration. As acceleration rate used is an industry standard value we have retained it and consider that it gives a conservative indication.

The current road layout (a 10 m crossing distance directly across two lanes of traffic) modelled using these principles for the PM peak (the worst case scenario in terms of traffic volumes) yields the following:

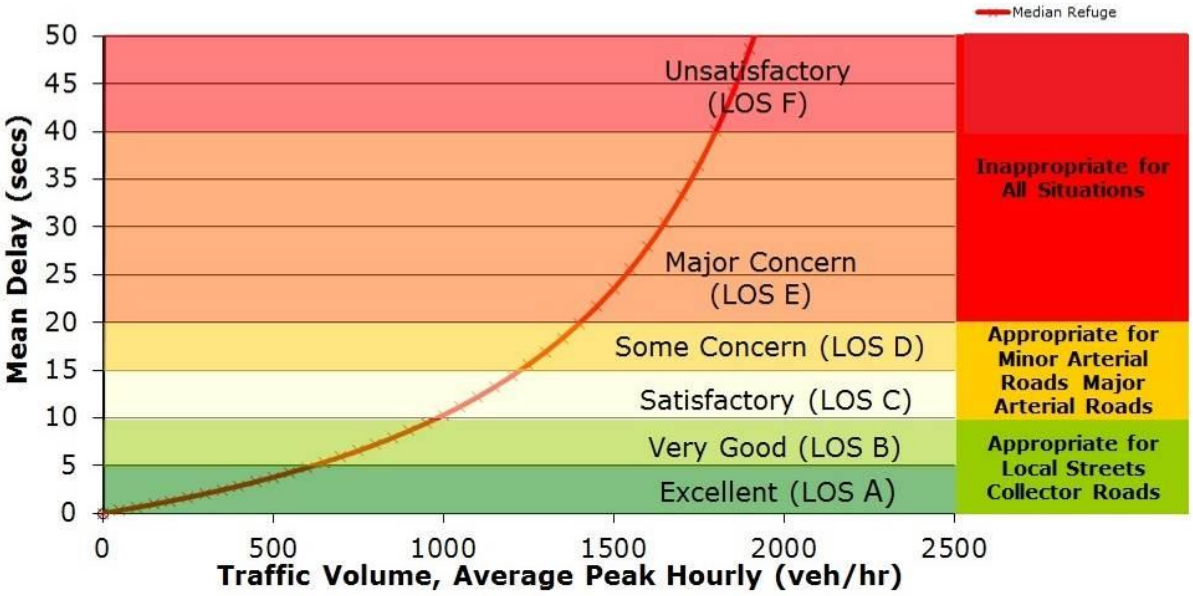
Figure 9-4: Level of Service to 15th percentile cyclists for PM peak with no crossing aids



Thus the current road layout, with existing traffic volumes (572 veh/h) and future predicted cycle volumes for 2021 would give cyclists a delay of 12.5 seconds, which represents level C LOS. We consider that this is not acceptable for a major cycle route crossing a collector road and, furthermore, this analysis does not take into account the safety implications of young cyclists or vulnerable pedestrians crossing a two-way road in one go.

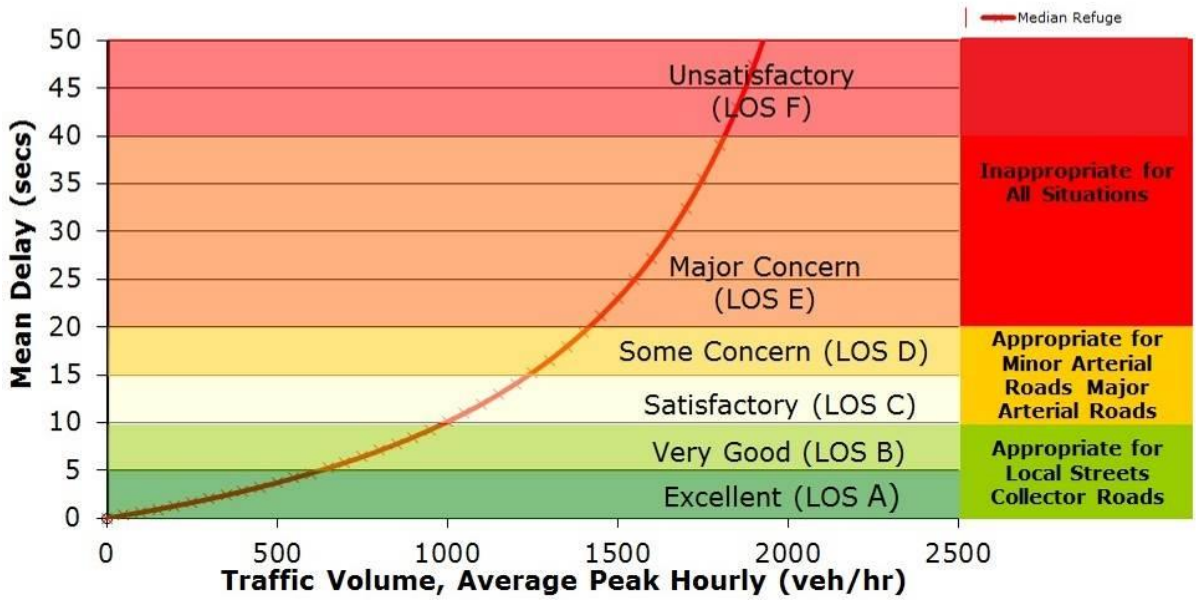
For the Option 1 (median island) layout the LOS is at level A for both the AM (531 veh/h) and PM peak (572 veh/h) periods, as shown in the following figures:

Figure 9-5: Level of Service to 15th percentile cyclists for AM peak under Option 1 (median island) layout



During the AM peak, 15th percentile cyclists would experience some 4.0 sec delay, which represents LOS A.

Figure 9-6: Level of Service to 15th percentile cyclists for PM peak under Option 1 (median island) layout



During the PM peak, 15th percentile cyclists would experience some 4.4 sec delay, which represents LOS A.

As a high LOS to cyclists can be achieved through minor physical works and layout changes, it is considered that it is not worth pursuing further the option of signalising the midblock crossing.

Signalisation would be much more costly to implement and would probably increase delays to cyclists (and therefore reduce LOS). There are safety concerns related to increasing delay in a situation where gaps in traffic are plentiful. Signalising the crossing would also result in introducing delay to drivers and public transport.

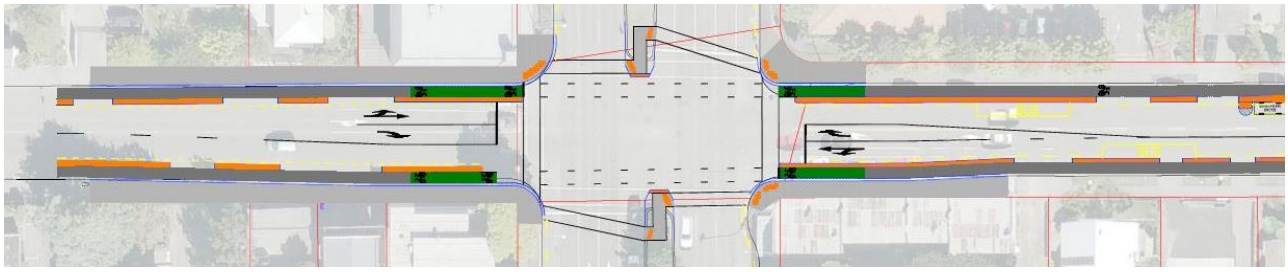
10 Chosen Preferred Solution

10.1 Colombo Street / Bealey Avenue Intersection

10.1.1 Option 1A (Preferred)

The preferred option is for cyclists to cross Bealey Avenue in a single stage with all traffic movements retained as shown in Figure 10-1 below. To provide cyclists with full protection from turning traffic, cyclists will cross in a phase where only through traffic on Colombo Street is allowed with turning traffic held back with red arrows. Through traffic may be affected during this phase as left-turning vehicles will block the through lane. This option will require the narrowing of footpaths on Colombo Street to accommodate a suitable width cycleway and cycle separator whilst retaining the required number of lanes.

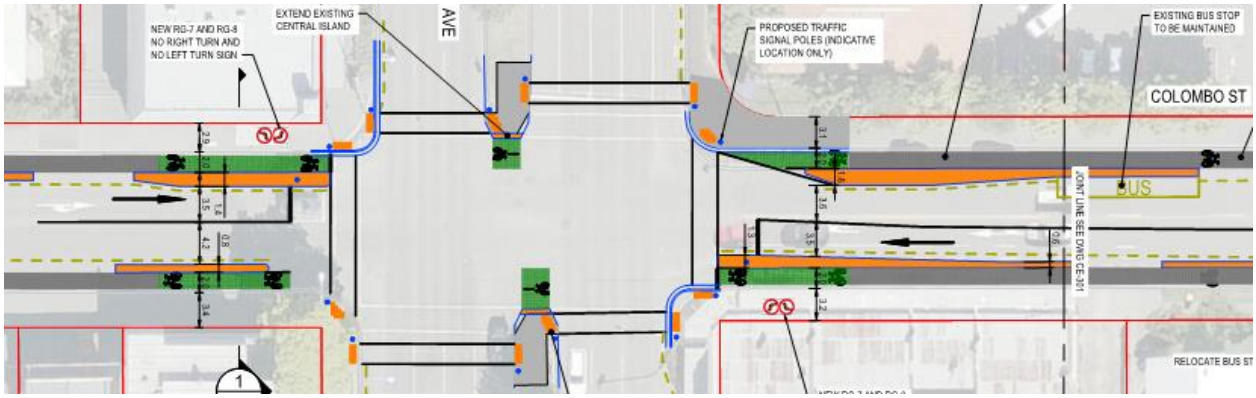
Figure 10-1: Option 1A for the Colombo Street / Bealey Avenue Intersection



10.1.1 Option 1C (Second Preferred)

The second preferred option for the Colombo Street / Bealey Avenue intersection is for cyclists to cross Bealey Avenue in one stage with the banning of left and right turns from Colombo Street and is shown in Figure 10-2. Turning bans have been implemented to protect cyclists from turning traffic. If turning movements were retained a separate phase for cyclists would be required which would reduce the efficiency of the intersection (as per Option 1A). This Option retains the existing kerbs with new cycle separators being constructed up to the limit line. Kerb extensions are proposed in 3 quadrants to facilitate the cycleway and provide extra left turn protection. The Bealey Avenue Pedestrian Crossing will be a 2 phase crossing with a 3m stagger.

Figure 10-2: Option 1C for the Colombo Street / Bealey Avenue Intersection



10.2 Colombo Street

10.2.1 Option 2B – One Way Cycleway on both sides within existing kerbs

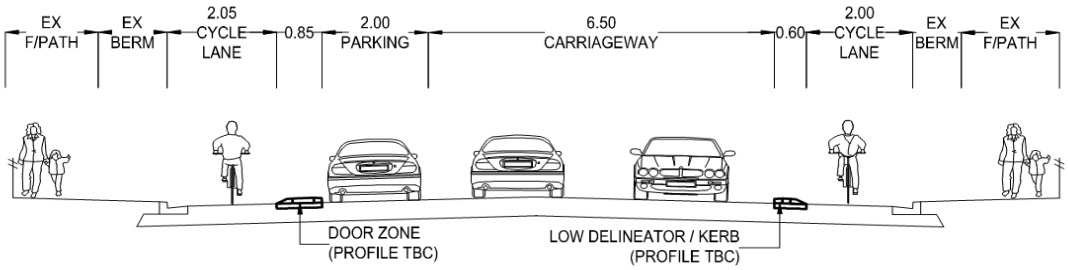
The preferred **Option 2B** removes parking on the eastern side of Colombo Street and retains the existing kerb lines, with the exception of the kerb build out at Purchas Street. Stops for southbound buses will be in lane i.e. buses stop in the lane, and existing P5/P30 loading zones for local businesses are proposed to be relocated to the western (northbound) side. Option 2B recommended a 2 m parking exclusion zone at driveways which is a relaxation of the CCC guidelines. A discussion regarding the application of a 2m exclusion zone is provided in 7.2.2. This option was proposed to maintain as much residential and business on street parking as possible.

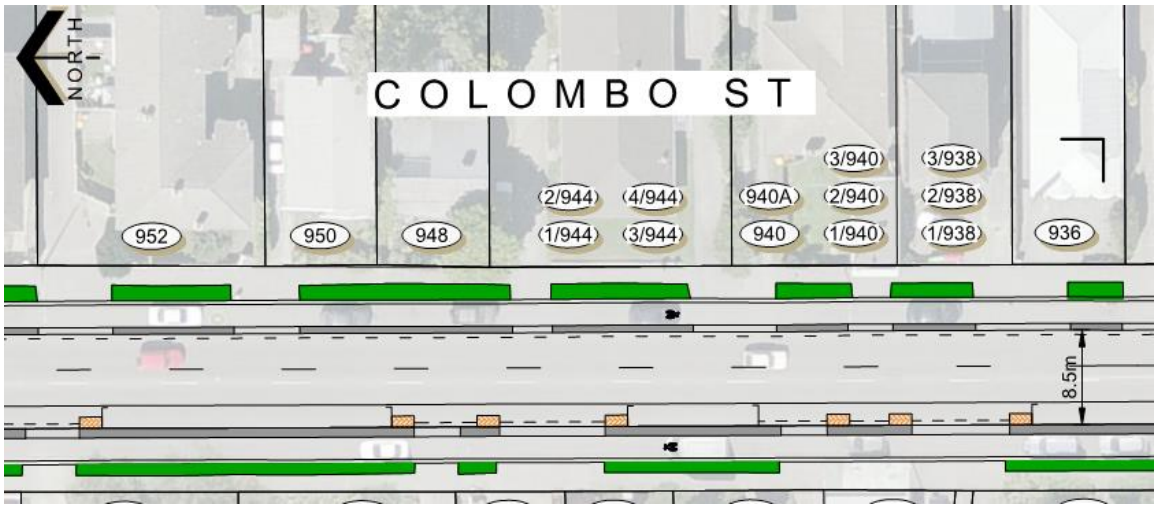
10.2.1.1 Driveway exclusion zone

Option 2B recommends a 2m parking exclusion zone at driveways which is a relaxation of the CCC guidelines, and required CCC approval. Safety concerns were raised by the SAT and CCC as a potential issue. The Designer has reviewed available sight distance and the available clear space of 8.1m (minimum) is considered adequate for residents entering their driveway to identify and stop for cyclists as there is good visibility of the cycleway along the route. A far greater safety hazard (which cannot be eliminated) is reversing cars not seeing cyclists (or pedestrians). This option is proposed to maintain as much residential on street parking as possible. It is recommended that 2m is adopted.

Option 2B proposes a minimum 2m wide cycle lane on each side of the road with parking provided in designated bays. The cycleway will be separated by a continuous kerb with drop downs for access ways. Indicative cross sections for Colombo Street are shown in Figure 10-3.

Figure 10-3: Preferred Option 2B Typical Cross Section / Plan View



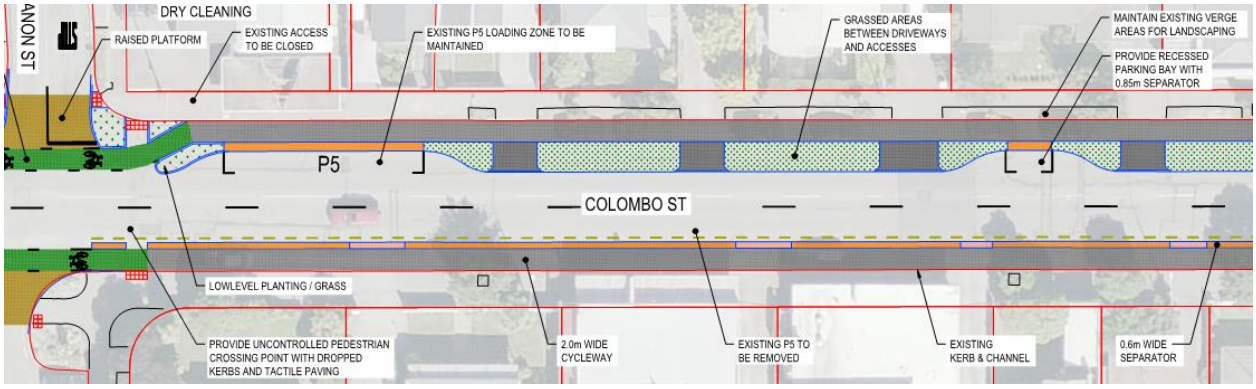


10.2.2 Second Preferred Option

With concerns over visibility (between northbound cyclists and residents) for Option 2B expressed by SAT and CCC, the Option has been further developed as **Option 2D** as shown below in Figure 10-4 below, to apply a 5m exclusion zone at driveways.

This option will incorporate landscaping areas in areas where parking is excluded and existing driveways will be extended out to a new kerb. Tracking for vehicles around these landscaping features has been considered with appropriate manoeuvring space provided. CCC preference is to narrow the widening at driveways which may result in some vehicles having to traverse the centreline to undertake turning manoeuvres. This option is more expensive with new asphalt driveway extensions, kerbing and grass verge areas. The option retains approximately 15 on street car parks and removes all but one loading zone due to the 5m exclusion zone. With a significant reduction in available parking and removal of local business parking, the proposal at Consultation may be at risk of local objections. Scheme plans have been developed as shown below.

Figure 10-4: CCC Preferred Option 2D Colombo Street Plan



10.2.3 Cycle Lane Width

The 2.0m wide cycle lane does not meet the width proposed in CCC's Design Principle and Requirements for the Major Cycleways Guideline, Table 7-2. A major cycleway lane should allow for the two cyclists to ride on the cycleway together. It is noted in the guide a 2.1m wide lane is acceptable, whilst 2.0m is the minimum standard over short lengths. Variation to the width of the separator can facilitate a desirable standard cycle lane width of 2.1m. This would reduce the separator width on the east side to 0.5m (allowable within the guideline with approval from the Principle Requirements Team). Following discussion during the Road Safety Audit review, CCC have accepted that a 2m cycle lane is allowable in this case due to site constraints.

10.3 Edgeware Road

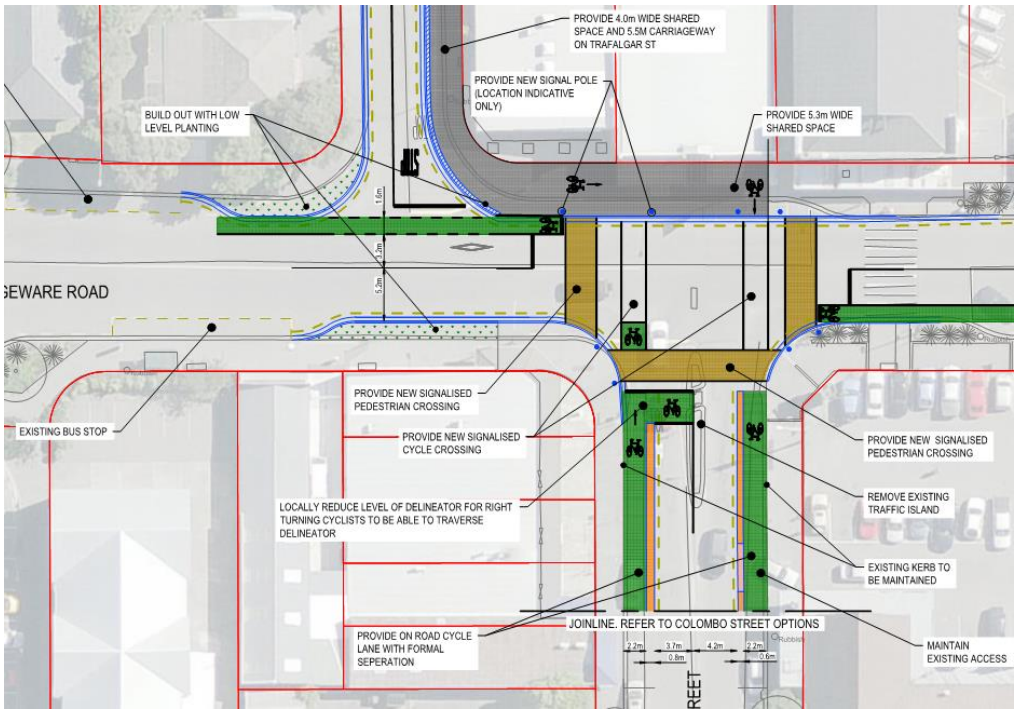
The preferred option (Option 2) is the signalisation of the Colombo Street / Edgeware Road intersection and the construction of a shared cycleway along the northern side of the Edgeware Road to connect to facilities provided for Trafalgar Street.

Separate crossing facilities are provided for north and southbound cyclists across Edgeware Road via the signalised crossing. Edgeware Road is narrowed with new build outs to provide enhanced shared footpath/ cycleways.

When a pedestrian or cyclist crossing phase is activated the signal phasing would stop all vehicle movements while all pedestrian and cycle crossings movement are activated.

The cycle crossings will connect to a small section of shared use path on the south side of Edgeware Road (on either side of Colombo Street), transitioning to the separated cycle facilities on Colombo Street. A layout plan of this option is shown in Figure 10-5 below.

Figure 10-5: Preferred Option (Option 2)



With signals at Colombo Street a formal pedestrian crossing is provided and the existing splitter island and refuge on Colombo Street removed. The use of a Copenhagen style shared path is not common in Christchurch. The main concern is pedestrian cyclist conflicts in shared space. The facility allows commuter cyclists to choose the road over the cycle crossings.

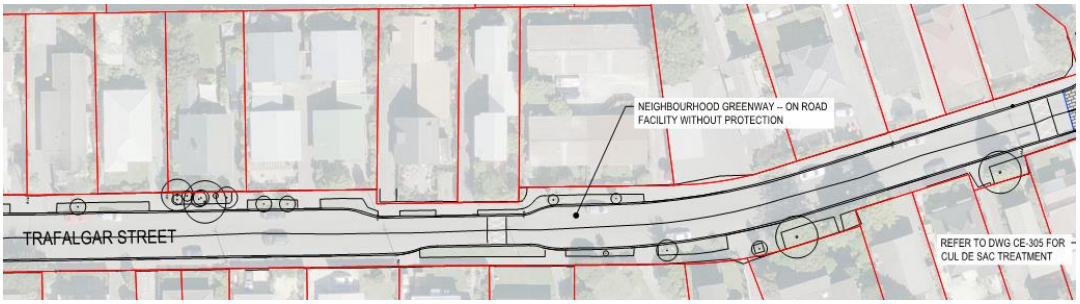
Review of the layout following the Road Safety Audit completed in the Beca SAR, brings changes to the layout to eliminate the south side shared path conflicts by aligning the Edgeware cycle crossings with the Colombo street one way facilities. Also Pedestrian crossings are moved closer to the intersection as shown below. Another key issue was connectivity for Edgeware Road cyclists who are now provided for in the scheme layout. Signal phasing has now been completed for CCC/CTOC review. Minor comments were received and updates carried out.

10.4 Trafalgar Street

10.4.1 Preferred Option – Trafalgar Street

The preferred option (**Option 3**) for Trafalgar Street is to provide a neighbourhood greenway south of Sheppard Place, refer Figure 10-6 below. This required construction of a cul-de-sac (at Dover Street) – to reduce traffic volumes to less than 1,500 veh/day to meet the design criteria. Option 3 proposes to keep existing traffic calming measures and on street parking without modifications.

Figure 10-6: Trafalgar Street Option 3 - Neighbourhood Greenway Plan



The Edgeware Road shared path will terminate with a new threshold treatment and give way for northbound cyclists as shown in the following Figure 10-7. A similar facility except on a two way path is to be provided south of Sheppard Place.

Figure 10-7: Edgeware Shared Path Transition (Option 3)

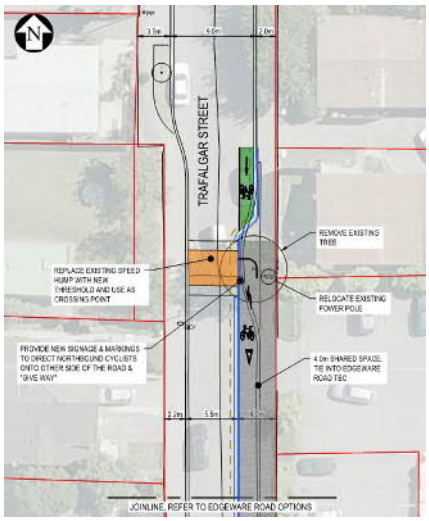
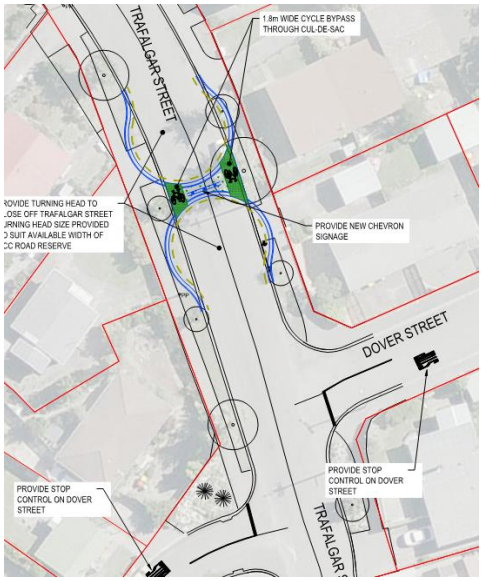


Figure 10-8: Cul-de-sac Plan (Option 3



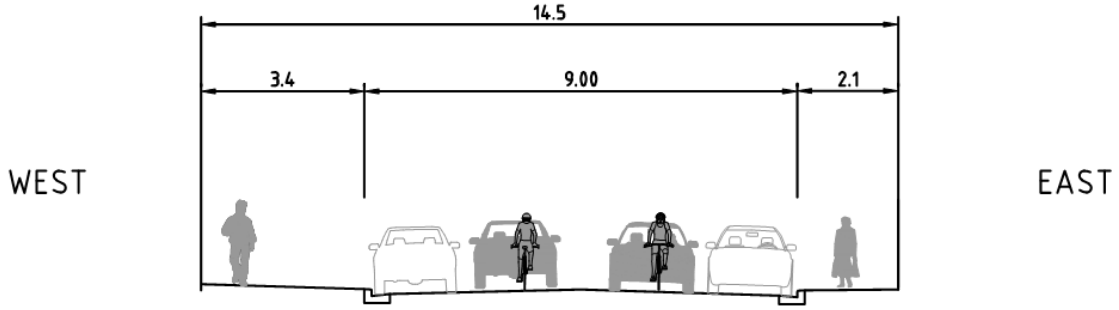
As part of the scheme review during the RSA closeout safety concerns regarding the proposed cul-de-sac layout have prompted an alternative layout (shown in Figure 10-8) for the cul-de-sac which is now preferred.

This moves the cul-de-sac to the north of Dover Street to minimise conflict between cyclists and motorists.

It is proposed to install low planting and chevron boards to discourage local drivers using the cul-de-sac as a cut through.

Dover street will be altered to be Stop priority intersections to emphasise cyclists having right of way.

Figure 10-9: Typical Cross Section - Greenway



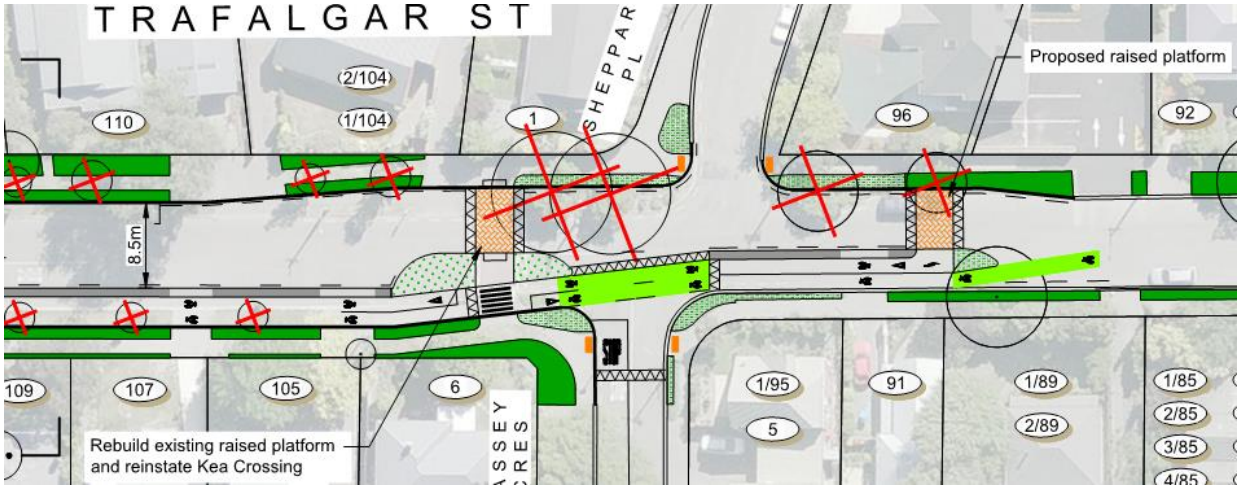
This option does not preclude additional traffic calming features or landscaping at a later date. This option will require cyclists to cycle in the traffic lane. It is recommended that a 30kph posted speed limit is imposed to reduce the speed differential between cyclists and vehicles. Traffic volumes will be reduced to local traffic with the recommended cul-de-sac treatment.

10.4.2 North of Sheppard Place (Trafalgar Street / St. Albans Street Tie In)

North of Sheppard Place, traffic volumes exceed 1,500 vpd, due to the traffic generated from St. Albans School, and does not meet the criteria for a neighbourhood greenway. Therefore, it is proposed that the two way the facilities that tie into the Trafalgar Street / St. Alban Street intersection can be extended south of Sheppard Place.

The preferred layout for the tie in at the north of Trafalgar Street is a two way separated on road cycleway on the west side of Trafalgar Street, joining the two way path on the south side of St Albans Street. While no other option has been assessed in this report we recommend that an alternative of having the cycleway located on the west side (opposite the school entrance) be reviewed. This alternative would reduce school pedestrian/ commuter cyclist conflicts providing a safer facility.

Figure 10-10: Preferred Solution at Sheppard Place – tie in to 2W path to north



10.4.3 North of Sheppard Place (Trafalgar Street / St. Albans Street)

North of Sheppard Place, traffic volumes exceed 1,500 vpd, due to the traffic generated from St. Albans School, and does not meet the criteria for a neighbourhood greenway. Therefore, it is proposed that the two way the facilities that tie into the Trafalgar Street / St. Alban Street intersection can be extended south of Sheppard Place.

The preferred facility is a two way separated facility on the western side of Trafalgar Street which turns onto the south side of St Albans Street. Having the facility on the western side of Trafalgar Street (opposite the school entrance) reduces the school pedestrian/ commuter cyclist conflicts providing a safer facility.

Figure 10-11: Tie in from Trafalgar Street to St Albans Street.

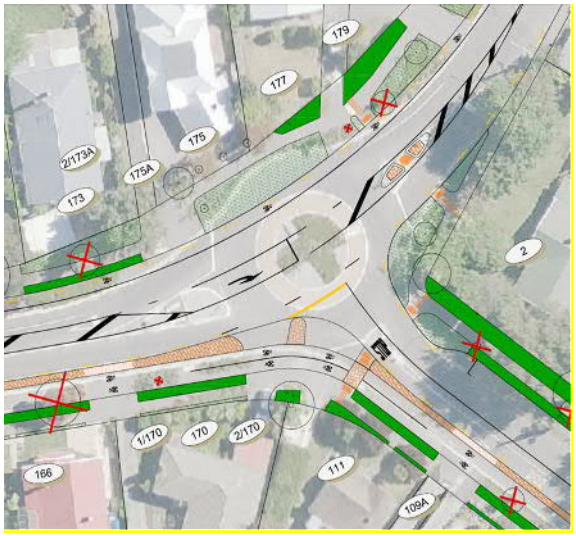
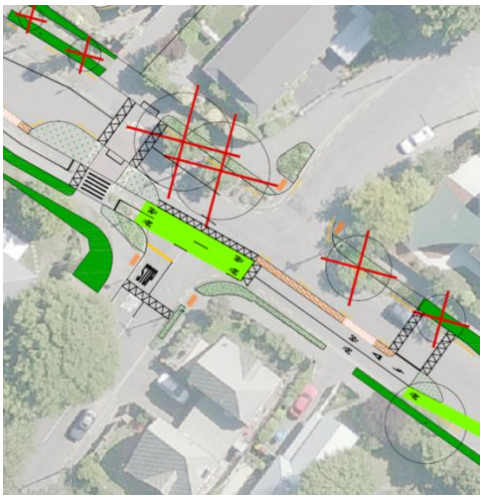


Figure 10-12: Trafalgar transition from greenway to two-way facility on west side



10.5 St Albans Street

10.5.1 St Albans Street/Trafalgar Street/Courtenay intersection

The preferred option has the two-way on-road cycleway continue unimpeded around the corner from the west side of Trafalgar Street onto the south side of St Albans Street. The required 3 m offset of the cycleway from the property boundaries, the width of the cycleway and the width of the separator means that the existing roundabout needs to be removed. Converting the intersection to a stop control against Trafalgar Street further deemphasises Trafalgar Street as a through road. Pedestrian crossing points are provided on the Trafalgar Street and Courtenay Street approaches to the intersection. The road space on the St Albans Street approach has been utilised to provide a right turn bay for vehicles turning into Trafalgar Street to wait clear of the St Albans-Courtenay through movement. Given the nearby signalised crossing at Rutland Street and the Courtenay Street refuge island, the majority of pedestrian crossing movements will be adequately catered for.

10.5.2 St Albans Street

The general preferred configuration of St Albans Street has a two way cycle facility on its south side. An on-road cycle lane is marked on the north side of the road for cyclists who continue along the St Albans/Courtenay link. A median is marked as this simply connects the right turn lanes required for the Rutland and Trafalgar Streets intersections. Parking is removed on both sides of the road.

The two way facility crosses the Massey Crescent intersection, and immediately to its west, transitions to a shared use facility, which, although not ideal, recognises the reduced road space available (limited separation from property boundaries), and the use and interaction by pedestrians in this area.

The preferred cross-section for St Albans Street is shown in Figure 10-13. A general layout, including the Massey Crescent intersection, is shown in Figure 10-14.

Figure 10-13: St Albans St cross-section

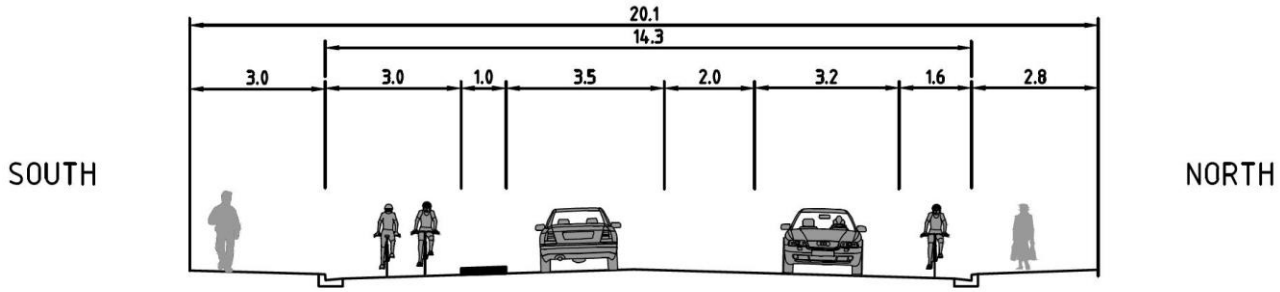
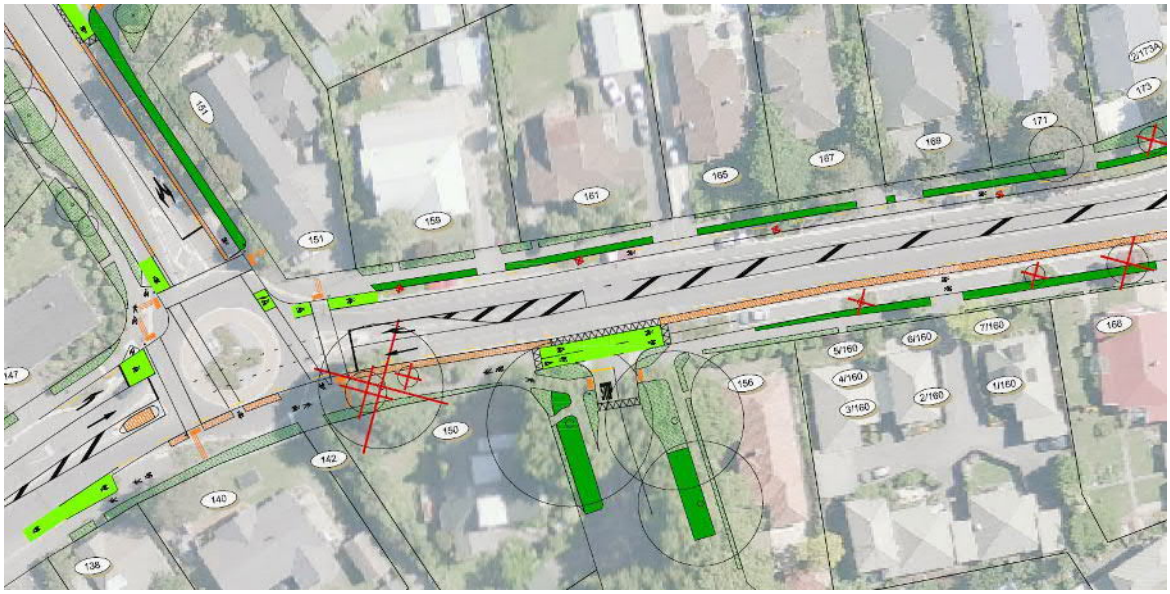


Figure 10-14: St Albans Street preferred arrangement



10.6 Rutland Street

10.6.1 Rutland Street/St Albans Street intersection

To accommodate the two way cycle facility transitioning to one-way, the Rutland / St Albans roundabout intersection is signalised. The shared path facility on the south side of St Albans Street is linked to the one-way separated cycle lanes on Rutland Street through dedicated cycle phase at the signals. Pedestrian linkages are provided across all legs of the intersection too. The intersection arrangement is seen in Figure 10-14.

Cyclists travelling westward, continuing on St Albans Street can leave the facility with a specially marked transition.

10.6.2 Rutland Street General Arrangement

The preferred layout of the MCR on Rutland Street is for one-way cycle lanes on each side of the road. The cycle lanes are separated from traffic by a solid separator. The one-way cycle facilities are the only type of facilities that the MCR design guidelines consider acceptable for a road with the traffic volumes that Rutland Street carries.

In sections where the road is currently 14m wide, it is not intended to widen the kerbs – the cycle facility, parking and traffic lanes will fit within that dimension, as per Figure 10-15. In circumstances where the existing carriageway is 12m wide, it is intended to widen to 14.0 or 15.0 m (Figure 10-16). The narrower dimension used to accommodate additional path width, where larger numbers of pedestrians are expected. Buildouts are provided where pedestrians will be guided to cross – an example is shown outside the shopping area in Figure 10-18 A general cross section layout of the cycle lanes and separators can be seen in Figure 10-15 and Figure 10-16.

Figure 10-15: Rutland Street 14m cross-section

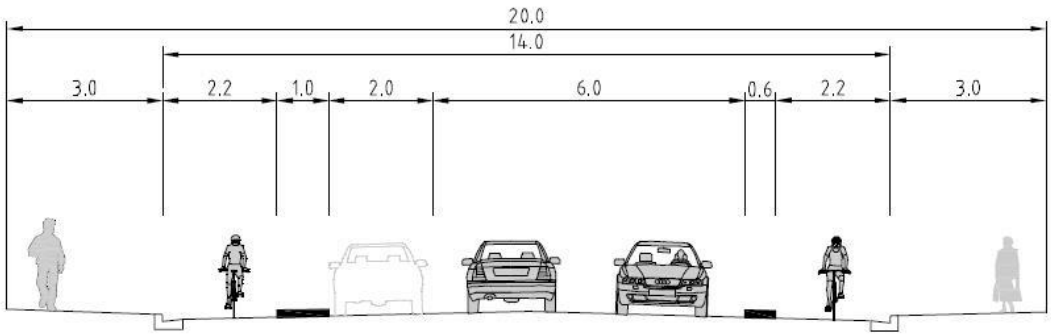
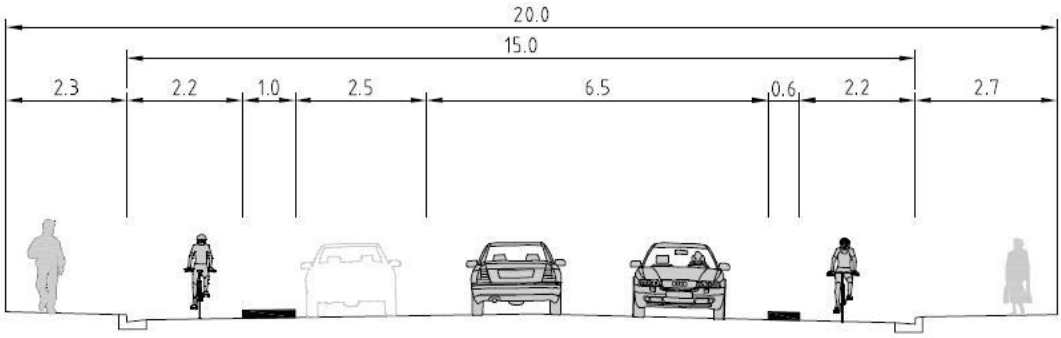


Figure 10-16: Rutland Street 15m cross-section



10.6.3 On-street parking and rubbish bin location pads

Parking is provided on the west side of Rutland Street, wherever sight lines from property accesses and side streets allow. A typical set back (distance of parked vehicle from access way) has been set at a minimum of 2m, but in other circumstances may be longer, depending on the length of the overall parking area. Parking spaces are marked by parking space marking ticks. No stopping areas are marked with no-stopping lines, including the set back areas as discussed.

The 2m setback (or longer area) on the western side of Rutland Street is intended to be used for rubbish bin set down areas. The bins can be located here without operational, sight line concerns, and are considered a pragmatic place for bins, given that the fewer parking spaces on the road are likely to be occupied more often than currently. The bin areas will be marked by stamped concrete as shown in Figure 10-17 as the terracotta coloured rectangular areas next to the parking ticks.

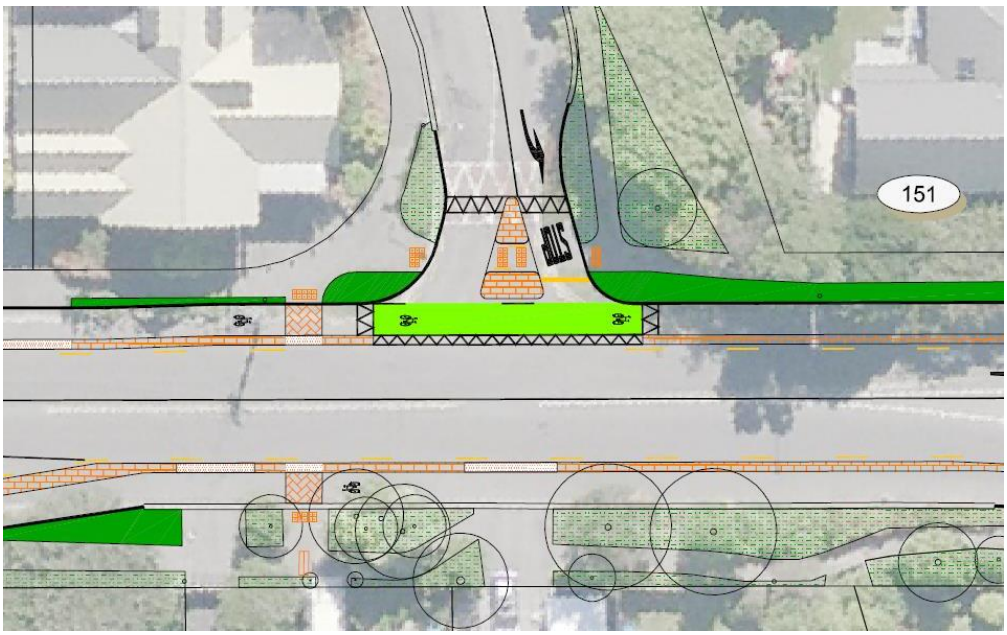
10.6.4 Rutland/Westminster Intersection

Westminster Street intersects Rutland Street approximately 80m north of the intersection with St Albans Road. As the Rutland/St Albans intersection is being signalised, there is the possibility that southbound vehicles may queue at the signals, causing a number of concerns:

- They may obscure southbound cyclists from vehicles turning right into Westminster Street, putting the cyclist at risk:
- They may block the right turners completely, which will have the effect of locking up the intersection, as other vehicles queue behind the right turner.

In the interests of cycle safety and network efficiency, the preferred configuration imposes a left-in/left-out turn restriction on Westminster Street at Rutland Street (Figure 10-17. It is not expected that this should cause any issues for network operations, or access to properties normally accessed from Rutland/ Westminster, as all locations can easily be accessed from other directions, without restrictions.

Figure 10-17: Rutland/Westminster intersection

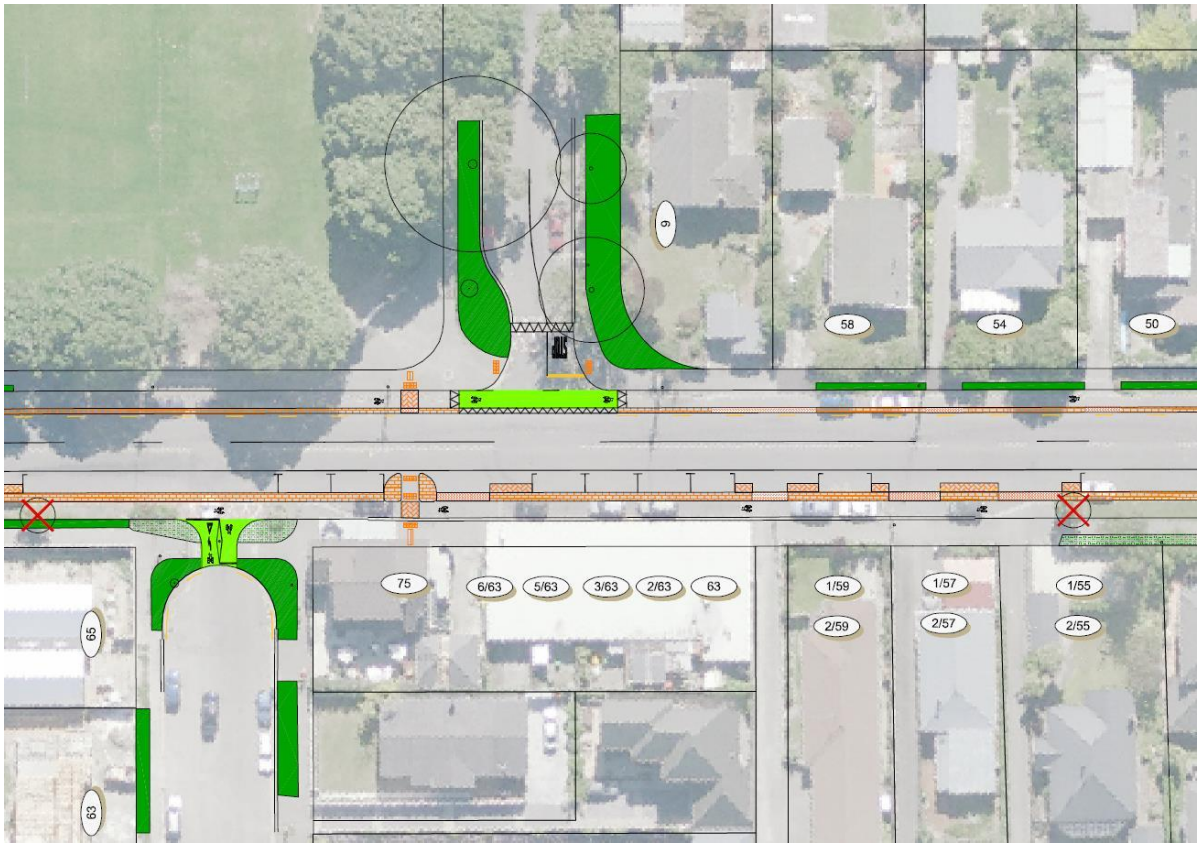


10.6.5 Rutland Street Shops and Hawkesbury Avenue Intersection

The shopping and café area on the west side of Rutland Street, south of Hawkesbury Ave currently have approximately 8 short term limited parking spaces. The importance of parking to smaller retail businesses such as these is noted and accepted, hence the Rutland Street typical arrangement has been modified slightly to support as much parking outside the shops as possible.

The sightline requirements from Hawkesbury Avenue, with a cycle facility threshold, would have impacted on 3 or four of the available spaces. Therefore, it is recommended to cul-de-sac Hawkesbury Avenue, and allow the full current allocation of spaces outside the businesses, plus further spaces, to the north, where the intersection would have been. At least twelve spaces are now available in general proximity to the shops and café (Figure 10-18). The closure of Hawkesbury Ave will be minor inconvenience to some residents in the area, but on a network basis, all properties accessed from Hawkesbury/Rutland are fully accessible from other roads in the area.

Figure 10-18: Rutland Street general arrangement, Malvern Street and Hawkesbury Ave cul-de-sac



10.6.6 Rutland Street Threshold Treatments

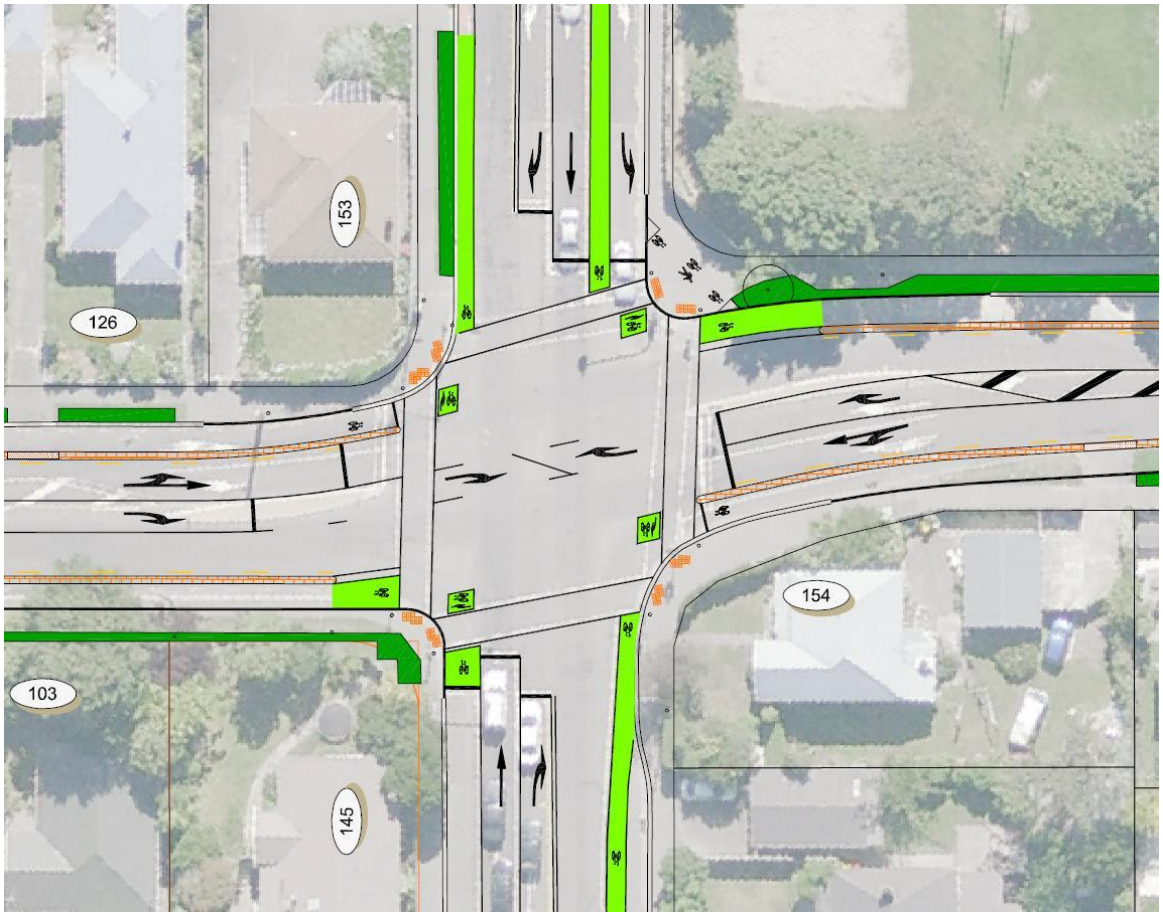
The threshold treatment for side streets on Rutland Street is consistent with the treatment for Colombo Street. It typically consists of green surfacing, which serves to both alert cyclists of the proximity of the intersection and potentially crossing traffic; and alert drivers to the proximity of the cycle lane and cyclists. The whole intersection sits on a raised platform, further providing an alert to both cyclists and pedestrians. Figure 10-18 shows a general, typical arrangement for Malvern/Rutland intersection.

10.6.7 Innes/Rutland Intersection

The signalised Innes Road / Rutland Street intersection separates the north and south halves of Rutland Street. The proposed physical arrangement of the intersection is to continue the physical cycle facility separators to as close to the limit lines as possible. Where the tracking paths of turning vehicles require the removal of the separator, green surfacing is applied (Figure 10-19).

The preferred option for signal phasing is to give the cyclists a dedicated crossing phase, between the Innes Road and Rutland Street phases. This is the lowest risk option for cyclists. The level of protection provided by this approach should mean the route is not considered unattractive to “uncertain” users. This option has the negative effect, however, of reducing the intersection efficiency from its current level of service. The degree of impact has yet to be quantified.

Figure 10-19: Innes/Rutland Intersection



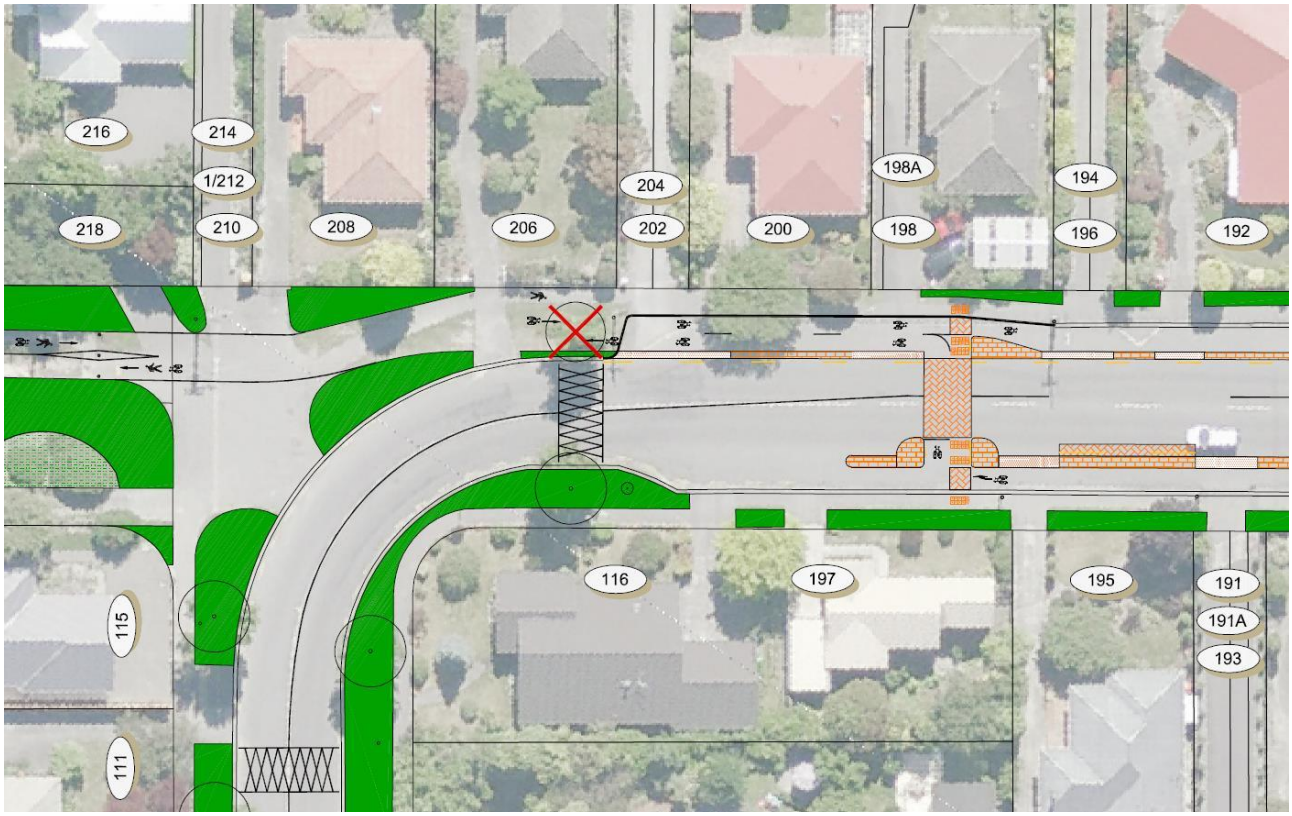
The other phasing option is to leave the intersection phasing as it currently operates, and require the cyclists to proceed through the intersection at the same time as Rutland Street traffic does. While this will not negatively impact on the intersection's efficiency, there are some safety concerns for cyclists, as drivers will need to filter any turns they need to make through the crossing cyclists. The effect is less for turning cyclists who can use the hook-turn boxes.

While the balance between the two options is not clear cut, the preference is for the cycle only phase option, as it provides the additional level of protection to cyclists, which is a key objective of the MCR.

10.6.8 Rutland Street northern transition to Rutland Reserve

A pathway has already been formed to the north of Rutland Street, past Paparoa Street School and into Rutland Reserve. The Rutland Street one-way facilities need to transition to a shared two way path on the eastern side of the road.

Figure 10-20: Rutland Street cycle lane transition to Rutland Reserve



The intended method to achieve this is a dedicated cycle and pedestrian crossing facility to the south of the curve from Tomes Road. Shaped pavers are positioned to direct cyclists to their crossing point, clear of pedestrians. Small platforms within the cycle lanes alert cyclists to the pedestrian facilities. The facilities are positioned as far south of the intersection as practical, to allow maximum opportunities for vehicles turning into Rutland Street to see crossing pedestrians or cyclists.

Speed humps are intended for both entries to the curve from/to Tomes Road to further alert drivers to the change in general environment.

10.7 Grassmere Street

The preferred option for Grassmere Street is to:

Provide a shared path between Grants Road and the 'teardrop island' outside 29 Grassmere Street.

Provide a 2 way separated cycleway following the existing kerb line on the north eastern side of Grassmere St from number 29 to 20m from the Grassmere/Main North Intersection.

10.7.1 Grants Road to 29 Grassmere Street - Shared Path

The proposed shared path is 4.0m wide and aligns with the preferred width in the Major Cycleways design guidance. Cycle flows on Grassmere Street during peak periods are predicted to have a 70/30 split in the strategic cycle model.

The shared path is proposed to be separated by 1.0m from all property boundaries along the majority of its length with the exception of the frontage of 31 Grassmere St where a separation of 0.5 metres is proposed. Cycle and pedestrian symbols will be painted across all driveways along the length of the shared path. All driveways that cross the shared path are residential.

The formation of a shared path will require new kerb along the northern side of Grassmere Street for the majority of the section. Where the new kerb is provided, a 1.1 m grass berm will provide horizontal separation between motor traffic and shared path users. In other sections, where the existing kerb is retained, a painted buffer is marked on the carriageway to provide a horizontal separation between motor traffic and shared path users. The section of the carriageway available to general traffic (excluding the painted buffer) will be 5.4 m wide with parking permitted on one side. Currently vehicles park on the grass verge adjacent to the carriageway, this will not be able to occur once the shared path is implemented.

When two oncoming vehicles encounter each other one may have to move into the parking space or painted buffer area to allow the other to pass. Given the low traffic volumes and low parking occupancy, this is not expected to cause any problems.

It is not anticipated that parking restrictions adjacent to the shared path will have a significant effect on properties as these properties are generally large, located down long driveways and provide ample off street parking.

Kerb build-outs to narrow Grassmere Street and reduce sightlines and speed humps are proposed along the length of Grassmere Street adjacent to the shared path to reduce vehicle speeds. This is considered necessary due to the relatively rural environment and to increase comfort for cyclists on the shared path directly adjacent to the trafficable carriageway.

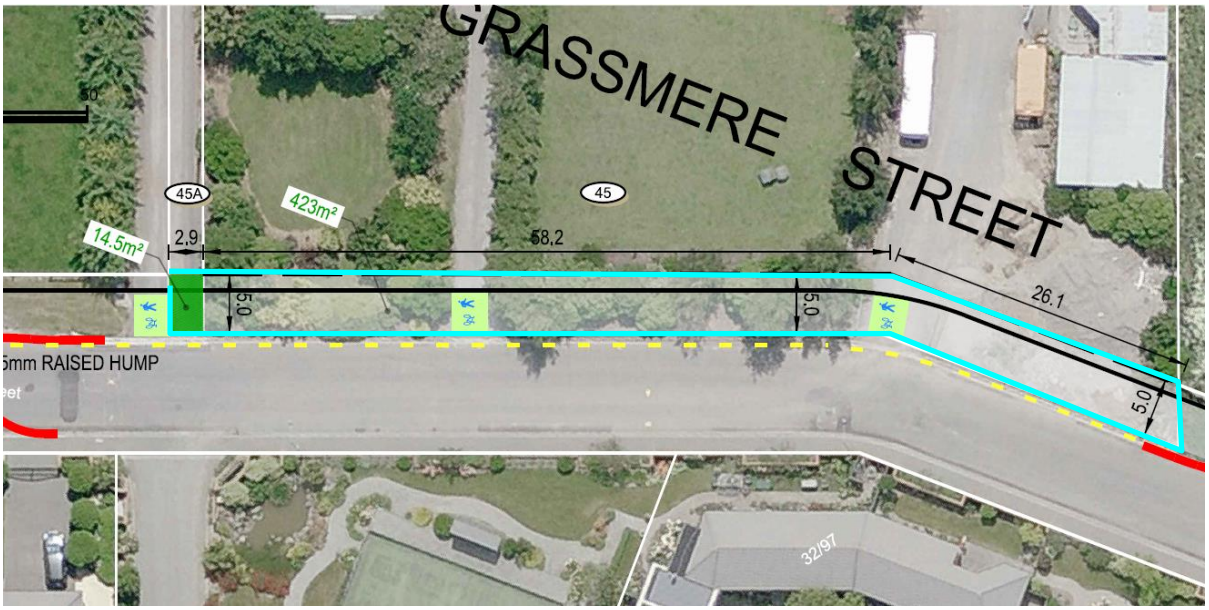
At the Grants Road / Grassmere Street corner a raised platform is proposed. This will assist with slowing vehicles travelling around the corner and reduce the risk of vehicles travelling too fast and hitting a cyclist on the adjacent cycleway. CAS records show that in the past 10 years 1 crash has been recorded where a vehicle lost control travelling too fast around the Grassmere Street/Grants Road corner and hit the fence on the outside of the curve.

East of Grants Road, Grassmere Street is effectively an unsealed driveway servicing two properties and subsequently has low vehicle volumes. The shared path transitions from the northeast side to the southwest side of this driveway on a secondary raised platform, which is elevated higher than the Grants Road / Grassmere Street platform (as there is no ramp down when travelling from the Grants Road / Grassmere Street bend to the eastern driveway section of Grassmere Street. This will allow cyclists a smooth transition between the shared paths on either side of this section of the cycleway. This section of Grassmere Street will also be sealed between the two platforms for maintenance reasons.

A small amount of land purchase is proposed to achieve the shared path (see the property purchase memo in Appendix X). A total of 423m^2 from 45 Grassmere and 14.5m^2 from 45a Grassmere is required. It is understood that both property owners have been contacted by the CCC property team and have indicated that they are willing to sell, dependent on price. Required land is shown in

Figure 10-21.

Figure 10-21: Land Purchase Required on Grassmere Street



10.7.2 29 Grassmere Street to Main North Road - 2 way Facility

The 2 way facility at the western end of Grassmere Street is proposed to be 3 metres wide (in line with the minimum width for a 2 way facility in the Major Cycleway design guide) with a 1 metre separation from the carriageway and dual kerbs according to the "Copenhagen style" as used on Matai Street. Cycle and pedestrian symbols (and potentially green surfacing) will be painted in front of key driveways to alert drivers to the possible presence of path users, the driveways that will receive this treatment are yet to be rationalised and confirmed. It is anticipated that drivers will become accustomed to looking for cyclists at driveways because:

- Daily cycle and vehicle volumes along Grassmere Street are very similar, therefore drivers are equally likely to encounter a cyclist as another vehicle when entering/exiting a property.
- All properties along the 2 way facility are residential and therefore will be familiar with the cycleway. Residential accesses are also relatively low volume compared to commercial accesses.
- No parking will be permitted adjacent to the cycleway; this will provide good visibility for vehicles exiting driveways so that they do not need to stop across the cycleway in order to look up and down the street.

The retention of the existing kerb alignment is considered an advantage of this design. The existing kerbs at the north western end of Grassmere Street are relatively new assets. The Copenhagen style kerbs may require some changes to drainage along this segment.

The carriageway will be 7m wide with parking on the south western side only. Essentially the trafficable width of the western section of Grassmere Street will be 5 metres, which is similar to Christchurch streets that are 9 metres wide and allow parking on both sides resulting in a 5 metres carriageway. Due to the high frequency of driveways along this section of Grassmere Street it is considered that there are ample opportunities for drivers to pull to the side to yield to oncoming vehicles if necessary. The 1.0 metre separation will allow some scope for this to occur on the cycleway side without vehicles having to drive onto the cycleway.

The 1.0 metre separation between the cycleway and the carriageway also allows space for wheelie bins to be positioned without impeding the cycleway.

The existing tear drop island at 29 Grassmere Street that marks the transition between the two distinct sections of Grassmere Street and the transition between the shared path and separated facilities for pedestrians and cyclists, will be modified. The proposal includes a raised crossing platform. The stagger in the new island is not aligned in the conventional direction towards oncoming traffic due to the design constraints of driveways, power poles and triple stormwater sumps, given the low volumes and speed reduction methods is not anticipated that this will cause any problems. The proposed pedestrian crossing distance is 6.0 m across the carriageway.

East of the transition point, the cycleway ramps up to footpath level where shared path begins. The transition between the 2 way facility and the footpath into a shared path has been kept as wide as possible to allow space for different users to negotiate around each other, whilst retaining a wide separation from the carriageway. The island adjacent to the platform and transition to the shared path will be landscaped to clearly define the end of the 2 way facility and the direction that the path takes.

Unrestricted parking on the western end of Grassmere Street near Main North Road is currently highly utilised. The removal of parking adjacent to the 2 way facility will require rationalisation of the current parking restrictions. Sections of P120 restrictions may need to be extended further down Grassmere Street as the demand for unrestricted parking is likely to also extend further down the street than it currently does

10.8 Main North Road – Sawyers Arms Road

The preferred option is to:

- cross Main North Road at a midblock cycle crossing (with adjacent pedestrian crossing) directly North of Grassmere Street;
- Note that this incorporates the removal of the bus stop pair currently located outside Countdown, which is consistent with ECan's plans to rationalise the stops provided at the Northlands Super Stop.
- continue the MCR along the south side of Sawyers Arms Road;
- As for all the schemes considered, this will require land purchase on the northern corner of the Main North / Sawyers Arms intersection, to accommodate the MCR (see property purchase memo in **Appendix X**).
- the bus stops in the pair west of Sisson Drive, will be staggered, with a central flush median to allow following vehicles to overtake a stopped bus (and also provide opportunity to turn into the businesses / sports complexes on the south side of Sawyers Arms Road);
- the bus stop pair currently located west of Nyoli Street will be removed; and
- provide a median refuge crossing adjacent to the railway line for users travelling along the Northern Line MCR or transitioning between the Northern Line MCR and the Papanui Parallel MCR.

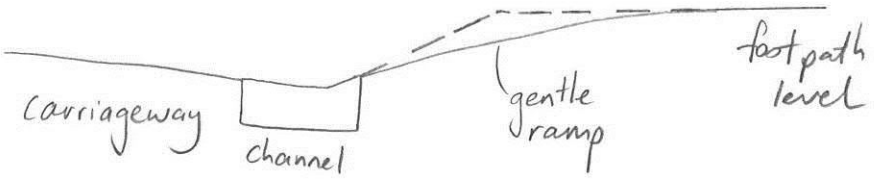
The rest of this section gives further descriptions of important elements of these designs.

10.8.1 Grassmere Street/ Main North Road – Shared space

The two approaches to the midblock crossing across Main North Road (as shown in **Appendix G**) involve shared spaces between pedestrians and cyclists. These will be potential sources of conflict between pedestrians and cyclists. It is recommended that CCC adopt a standard treatment to delineate such areas that is consistent throughout all MCRs. This is particularly relevant to the shared space on the mall side, as this area involves high pedestrian volumes combined with cycle movements along Main North Road in both directions and to/ from Grassmere Street.

This situation is particularly important on the Northlands Mall (west) side as the SBF running along Main North Road has been extended southwards, beyond the Papanui Parallel route alignment, to cater for cyclists wishing to travel between the mall and the MCR. Here, the SBF on Main North Road is ramped to footpath level but will require a gentle ramp down to road level at the crossing, as indicated in Figure 10-22 to avoid a gradient that results in cyclists queued at the crossing limit line rolling onto the road.

Figure 10-22: Indication of gentle slope transition between crossing and shared area at footpath level



10.8.2 Grassmere Street/ Main North Road – turn restrictions

The intersection has been redesigned to accommodate the midblock cycle and pedestrian crossings immediately north of Grassmere Street. This includes Grassmere Street being limited to left-out / right-in only turns. The reason for designing the intersection in this way and the resulting consequences are outlined in the Grassmere Street/Main North Road design considerations memorandum (ViaStrada, 18 November 2014) which is attached as **Appendix T** to this report. The key points being:

1. It is necessary to ban the right turn from Grassmere Street to ensure the safety of cyclists and pedestrians using the crossing as drivers are likely to concentrate on finding a gap in traffic and not realise that they will encounter a crossing immediately after making their turn. The gap in traffic may indeed occur because the signals have changed to the crossing phase; drivers might commence their right turn when pedestrians and cyclists start crossing.

2. A reasonably high volume of rat-running traffic currently turns left from Main North Road into Grassmere Street. To enhance the comfort of MCR users along Grassmere Street, it is preferable to reduce the traffic volumes. Given the high levels of congestion along Main North Road and the existing heavy traffic calming on adjacent side streets, a reduction in volumes cannot be achieved by simple traffic calming measures along Grassmere Street.

CCC has expressed agreement with this layout approach and recognises that the banning of the right turn from and left turn into Grassmere will affect some Grassmere Street residents and therefore require public consultation.

10.8.3 Grassmere Street / Main North Road – proximity to Main North Road / Sawyers Arms Road

The proximity of the midblock crossing introduced north of Grassmere Street to the Main North Road / Sawyers Arms Road intersection may result in “see through” problems. Drivers heading southbound on Main North Road may see through to the midblock signals and not notice the signals at the Main North Road/Sawyers Arms Road intersection and thus run the risk of running a red light at the intersection.

As the distance between the primary pole for the midblock crossing and the primary pole for the through traffic at the intersection will be 86 metres, this situation is not likely to cause a problem. The concern could be further mitigated in the traffic signal design through consideration of a mast arm on

signal pole 16 (for the southbound traffic on Main North Road) at the Main North Road/Sawyers Arms Road intersection.

10.8.4 Grassmere Street/ Main North Road - bus stop removal

The proposed Main North / Grassmere intersection design involves the removal of three bus stops from:

1. Grassmere Street
2. Main North Road, northbound lane, on the head of the T intersection with Grassmere Street.
3. Main North Road, southbound lane, immediately south of the Grassmere Street intersection.

The first stop (on Grassmere Street) became redundant on 8 December 2014 with the revised bus network.

It is necessary to remove the bus stop currently located on the head of the T outside Countdown to accommodate the SBF in this constrained location. As this was removed, it seems logical to also remove the other stop from the pair, which is immediately south of Grassmere Street.

We understand that the bus stop on the head of the T outside Countdown is not viewed by ECan as necessary, nor is it officially part of the Main North Road SuperStop but has been retained due to Countdown's request. Consultation has not been undertaken with ECan regarding the removal of this bus stop which will be required before the next phase.

10.8.5 Grassmere Street/ Main North Road /Sawyers Arms Road – provision for cycle movements

Cycle facilities appropriate for the interested but concerned target audience have been provided for in both directions along the MCR alignment, with an extension linking to the Northlands Mall access on Main North Road.

Cyclists wishing to leave the MCR and head north on Main North Road can do so by entering the kerbside traffic lane at the break in the SBF where it bends around towards to the inside of the on-street parking. This break in the SBF has been designed to prevent motorists from turning left sharply or quickly. Alternatively, cyclists can access the advanced stop box via a kerb cut-down on the corner buildout.

10.8.6 Existing crossing island on Main North Road

CCC could consider removing the existing crossing island on Main North Road near the south side of the Countdown building. Ideally, pedestrians should be encouraged to cross at the new signalised crossing just north of Grassmere Street, or at the existing signalised intersection at the Northlands car park access just south of the existing crossing island. During the site visit it was observed that the existing island is not large enough to accommodate the volumes of pedestrians that currently use it thus involves a safety hazard.

However, the crossing is currently used by large numbers of school students and is probably part of their desire line which is influenced by habit as much as directness (they would not likely suffer an increase in travel distance if they were to align their route with one of the adjacent signalised crossings, but this may be perceived as being longer or less desirable). Thus, many people choose to cross at this location even if the crossing is removed.

Furthermore, the crossing island is a valuable tool in preventing motorists turning right from driving a long distance along the flush median, which involves various safety risks. Thus, we recommend retaining the crossing island.

10.8.7 Main North Road / Sawyers Arms Road – property purchase

The preferred design enables the current phasing and operation to be used and incorporates CCC's plans to extend the left turn lane on Sawyers Arms Road. This scenario requires kerb realignment on the northern corner as a result of the removal of the existing on-road cycle lane which is currently used by trucks turning left from Sawyers Arms Road. The kerb realignment necessitates purchase of 24.6 m^2 of land.

Various options to avoid the need to purchase property in this location have been investigated. There are three distinct alternative options:

1. Allow trucks turning left from Sawyers Arms Road to "swing out" further into the intersection, without changing the phasing.
2. Change phasing to separate conflicting movements, whilst still requiring trucks turning left from Sawyers Arms Road to "swing out" further into the intersection.
3. Assume that trucks turning left from Sawyers Arms Road will utilise part of the right turn approach lane so as to not conflict with the opposing turning movement.

Alternative 1

The first alternative assumes that trucks turning left from Sawyers Arms Road would use the left turn lane under the existing layout but as the existing cycle lane would no longer be available to them the required manoeuvre would put them in conflict with vehicles turning right from Main North Road. These two movements are currently operated simultaneously and thus there would be significant safety risks under the current phasing. It is unacceptable to intentionally design an intersection operation with conflicting movements.

Alternative 2

The second alternative seeks to address the conflict identified in Alternative 1 above, by changing the phasing to ensure the conflicting movements are separated, whilst still allowing trucks to turn from the left turn lane.

Prior to the introduction of bus priority measures along the Main North Road corridor, there were two northbound through lanes at the intersection. Now, with the bus priority measures and the reduction in general through lanes, the corridor is under considerable stress, with queues sometimes reaching back to Blighs Road (1.2 km away). Previous investigations of the efficiency of this intersection indicate that changing the phasing to operate these turns during different phases will result in a significant decrease in efficiency of the intersection. It has therefore been decided by the CCC network operations team that this would be unacceptable.

Alternative 3

The third alternative seeks to maintain the current phasing and existing kerb alignment by assuming the existing truck tracking, where trucks utilise the existing cycle lane, will continue. However, as the existing cycle lane must be removed (to accommodate the MCR within the corridor), left turning trucks will block the traffic in the right turn lane. This assumed operation requires truck drivers to understand

the intended intersection operation and realise that they must move into the right turn lane before reaching the limit line so as to be able to perform the required turning movement. It may be difficult to communicate this message to truck drivers and is contrary to the principles designing road layouts that are intuitive with markings that are consistent for the intentions of use. Truck drivers may be less intuitively inclined to encroach on part of the right turn traffic lane (which has a reasonably high demand and therefore risks angering other drivers) than they are currently to drive over the existing cycle lane (which has a lower volume of demand).

As identified in Alternative 1, a truck driver's failure to comply with the intended alignment could compromise safety as left turning trucks would be in conflict with opposing right turning vehicles into Sawyers Arms Road. Truck drivers "accidentally" attempting a left turn from within the left turn lane and realising that they will be in conflict with opposing traffic may seek to adjust their manoeuvre which could result in the rear wheels of the truck mounting the footpath and damaging signal hardware or, in the worst case scenario, harming pedestrians, without the driver necessarily being aware of this.

This approach also seems to contradict the principle of lengthening the left turn lane, as the left turn lane will not in fact be sufficient in providing for the trucks' turning requirements. In the times when a truck is present, this will reduce the efficiency of the intersection as left turning trucks queuing in the right turn lane will block the right turn from Sawyers Arms Road, which operates in different phases to the left turn.

In reality, the crashes resulting from this alternative are expected to be of low frequency but this still represents a compromise over the preferred solution, both in terms of safety and efficiency. However, it may be a necessary compromise to make if implementing the second alternative which temporarily enables the MCR to be installed without years of undue delay. This should be considered a temporary solution only, with a view to implementing the preferred scheme once the required property has been acquired.

The Main North Road property purchase memo (see **Appendix X)** provides further detail on the investigations of this issue. It was concluded that property purchase, as per the proposed plans, is required.

10.8.8 Sawyers Arms Road / Sisson Drive

In the initial intersections consideration (**Appendix T**, the report produced for the MCR signalised intersection team) one option was presented for the signalisation of the Sawyers Arms Road/Sisson Drive intersection, with a further sub-option of relocating the kerb on the north corner. This sub-option was to increase the shared space at the start of the Sisson Drive shared pathway (and thus reduce conflict between pedestrians and cyclists) and reduce the carriageway width (and thus reduce the crossing distance).

However, it was noted during the site visit that school students (presumed to be the greatest cause of large groups of pedestrians occurring) generally shortcut through the Graham Condon car park and so it was determined that it was not necessary to spend the extra money required to widen the corner.

10.8.9 Nyoli Street / Sawyers Arms Road – bus stop removal

After discussion with ECan, it has been decided to remove the bus stop pair on Sawyers Arms Road immediately west of Nyoli Street; this will rationalise the bus stop provision. There is only 160 m between the two existing bus stop pairs on Sawyers Arms Road.

10.8.10 Permeability of separated bicycle facilities

The CCC design guidance does not provide any direction on the separation devices to be used, other than to specify their widths. A key issue that has been considered is that of permeability, which has two components:

- How motorists can cross an SBF to travel between a driveway and the road.
- How cyclists can access and leave a separated facility partway along a route.

Driveways and side roads obviously require gaps in the separation devices so that vehicles can traverse a separated facility; these gaps also offer opportunities to cyclists to enter or leave a facility. The gaps in separation devices should not be too large as this may result in motorists inadvertently (or purposefully) entering the SBF and driving along it. The separation device design at driveway locations has been discussed above.

In areas where there are few driveways gaps are still required to allow permeability to cyclists. For example, the section of the route that runs adjacent to the Papanui Domain on Sawyers Arms Road. Cyclists may still want to access the facility from / leave it to access houses across the street or the adjacent side street, Nyoli Street. In general, we propose the following criteria for the location and spacing of additional gaps in SBF separators:

- Gaps provided for cyclist permeability should be 2 m long.
    - To allow for a comfortable transition for cyclists.
    - To limit the possibility of motor vehicles passing through them.
    - They need not be as long as those at driveways.
- They can be located based on specific attractions / generators on the opposite side of the road
- Except for in the rare circumstance where it is inconceivable that no cyclist would want to enter the SBF coming from a location on the other side of the road or leave the SBF to go to a location on the other side of the road, gaps should be provided at least every 50 metres.

10.8.11 Parking provision

The introduction of a SBF requires the removal of parking along one side of the road. Where parking has been retained, it is on the opposite side of the road to the SBF. This is to prevent manoeuvring vehicles, opening vehicle doors or vehicle occupants from posing hazards to MCR users.

10.8.12 Parking restrictions

Indicative parking restrictions are shown on the plans for the northern side of Sawyers Arms Road. The parking provision alternates between P120 and no time restriction. The governing logic has been to provide a mix of both parking types, to cater for:

- short-term parking (e.g. for visitors to local residences or businesses); and
- long-term parking (e.g. for residents who may park their vehicles on-street, or staff from Northlands and surrounding businesses, assumed to be the main contributors to the current high occupancy of long-term parking spaces).

Note that the current provision of P120 parking involves ambiguous restrictions; some signs designate “P120 at all times” and others simply designate “P120” (i.e. the restriction only applies 8am to 6pm, Monday to Sunday) which is fundamentally different.

In some sections, the two different types are applied one at either end; this is a legal ambiguity that could result in dismissal of parking fines. It is advisable that the P120 parking restrictions be of exactly the same form the whole length of Sawyers Arms Road, to avoid confusion.

CCC parking staff should advise on which form of P120 restriction to use.

10.8.13 Sawyers Arms Road – quality of existing kerb and channel

During the site visit, extensive damage to the kerb and channel was noted in the vicinity of 33-47 Sawyers Arms Road (which is on the south side) and in the seal at the bus stop. Examples are shown in Figure 10-23. This will require remediation when it becomes part of the SBF, and we suggest that the kerb and channel be replaced in this location.

Figure 10-23: Kerb and channel degradation, south side of Sawyers Arms

10.8.14 Sawyers Arms Road – steep gradients on access to League clubrooms

The crossfall of the road surface at the League clubrooms on Sawyers Arms Road is approximately 7 degrees. The driveway is also very steep. Scratches on the pavement indicate that the undersides of vehicles scrape against the pavement. This degree of crossfall may be too high for a MCR, as it is likely to cause significant discomfort to cyclists riding along the SBF. It is suggested that the carriageway be reshaped in this location.

Figure 10-24: Steep driveway at Papanui League Club

10.8.15 Northern Line midblock crossing at Sawyers Arms Road

An uncontrolled crossing point with median refuge has been chosen.

The Sawyers Arms Road SBF approach (adjacent to the westbound traffic lane) is to be ramped up to footpath level and become a shared path. This requires the two access points to the Scout hall to be ramped through the gap in the SBF as well.

The southern Northern Line approach has been realigned to eliminate the severe dog-leg alignment, increase the space provided to path users and reduce the potential for conflict among users at this location. The new alignment does not require any land purchase and remains on the CCC-owned Papanui Domain.

The two approaches to the midblock crossing across Sawyers Arms Road (as shown in sheet 2) involve shared spaces. These will be potential sources of conflict between pedestrians and cyclists. We recommend that CCC adopt a standard treatment to delineate such areas that is consistent throughout all MCRs. This is particularly relevant to the shared space on the west side, as this is where the two MCRs cross and will involve high pedestrian volumes as well.

One lighting pole will need to be relocated.

11 Design Issues

11.1 Traffic Modelling of the Proposed Changes

11.1.1 Colombo Street / Bealey Avenue

The changes made to the CAST model to reflect the preferred option cause traffic to re-route in and around Colombo Street depending on the delay experienced at the Colombo Street / Bealey Avenue intersection and the movements allowed. The resulting traffic volume forecasts for 2021 are shown in Table 11-1 below. This shows an increase in two-way traffic volumes on Colombo Street north of Bealey Avenue for both options, with both options also resulting in a decrease in two-way traffic volumes on Colombo Street south of Bealey Avenue.

Table 11-1: Forecast Colombo Street Two-Way Daily Traffic Volumes in 2021

Option	Colombo Street (North of Bealey Ave)	Colombo Street (South of Bealey Ave)
Do-Minimum	4,450 veh/day	8,225 veh/day
Option 1a (**Change**)	5,325 veh/day (**+775 veh/day**)	7,900 veh/day (**-325 veh/day**)
Option 1c (**Change**)	5,600 veh/day (**+1,050 veh/day**)	7,450 veh/day (**-775 veh/day**)

Bealey Avenue is a major arterial so any increase in delay for traffic on Bealey Avenue due to the proposed changes should be minimised. The re-routed traffic is likely to have a minimal impact (small variations of 1-2 seconds) on the delay experienced at other intersections on the surrounding road network (including Bealey Avenue). The traffic volume and delay difference plots are shown in **Appendix K**. Neither of the proposed changes to the intersection are likely to result in a noticeable difference in delay experienced by traffic on Bealey Avenue between Madras Street and Durham Street (as shown in Table 11-2).

Table 11-2: Delay experienced on Bealey Avenue in 2021 (Madras Street – Durham Street)

Direction of Travel		AM Peak	Inter-Peak	PM Peak
Eastbound	Do Minimum Delay	20s	46s	41s
	Option 1A Delay (**Change**)	21s (**+1s**)	46s (**0s**)	40s (**-1s**)
	Option 1C Delay (**Change**)	20s (**0s**)	46s (**0s**)	39s (**-2s**)
Westbound	Do Minimum Delay	60s	19s	42s
	Option 1A Delay (**Change**)	62s (**+2s**)	18s (**-1s**)	43s (**+1s**)
	Option 1C Delay (**Change**)	62s (**+2s**)	17s (**-2s**)	44s (**+2s**)

A sensitivity test was conducted on Option 1A and Option 1C using the 2031 model, which includes additional growth from 2021 to 2031 and the Northern Arterial Project. The traffic volume and delay difference plots are shown in **Appendix K**. The proposed changes have a similar effect on other intersections as the 2021 modelling, while at the Colombo Street / Bealey Avenue intersection, some differences exist between Option 1A and Option 1C. While the delay experienced on Bealey Avenue is similar, the delay experienced on Colombo Street is 20-40 seconds higher under Option 1A compared to Option 1C during the peak periods as shown in Table 11-3. For vehicles on Colombo Street, the difference in delay is less than 5 seconds between the Do-Minimum scenario and Option 1C except for the southern approach during the PM peak period which is likely to experience an additional 18 seconds of delay. Traffic approaching Bealey Avenue from the north or south have several alternative routes that can accommodate the additional traffic diverted due to the proposed changes to the Bealey Avenue / Colombo Street intersection.

Table 11-3: 2031 Average Delays to Colombo Street Vehicles

Colombo Street Approach		AM Peak	Inter-Peak	PM Peak
Northern Approach	Do Minimum Delay	62s	40s	36s
	Option 1a Delay (**Change**)	89s (**+27s**)	31s (**-9s**)	57s (**+21s**)
	Option 1c Delay (**Change**)	67s (**+5s**)	37s (**-3s**)	35s (**-1s**)
Southern Approach	Do Minimum Delay	38s	58s	59s
	Option 1a Delay (**Change**)	67s (**+29s**)	66s (**+8s**)	118s (**+59s**)
	Option 1c Delay (**Change**)	36s (**-2s**)	62s (**+4s**)	77s (**+18s**)

An operational assessment of the required length for right turn bays is shown in **Appendix K** with a summary of right-turning queue lengths shown in

Table 11-4 below. This illustrates the right turn bay on the western approach of Bealey Avenue may need to be extended by approximately 40m for Option 1A and approximately 10m for Option 1C beyond what is required for the implementation of An Accessible City. It is likely to be difficult to extend the right turn bays on Bealey Avenue due to the presence of protected trees. The operational assessment was conducted in SIDRA which considers the intersection in isolation so signal coordination with upstream signal and changes to signal phasing could reduce the impact of queuing on the right turn bays. In particular, running the eastbound right turn twice each cycle (at the start and end of the main through movement) could reduce this queue significantly without impacting the operational efficiency of the intersection too much.

Table 11-4: 95th Percentile Queues at Right Turn Bays on Bealey Avenue

Scenario	Right Turn Approach	AM Peak	PM Peak
Do-Minimum	Bealey Avenue (West)	110m	30m
	Bealey Avenue (East)	<1m	1m
Option 1a	Bealey Avenue (West)	150m	25m
	Bealey Avenue (East)	<1m	<1m
Option 1c	Bealey Avenue (West)	120m	30m
	Bealey Avenue (East)	<1m	<1m

Delays experienced by cyclists are likely to be smaller for Option 1C compared to Option 1A. Option 1C has cyclists crossing Bealey Avenue at the same time as traffic on Colombo Street. Whereas, Option 1A requires cyclists to stop at the end of the Colombo Street phase to allow for turning traffic from Colombo Street. The impact of this is likely to be small as the green time required for turning traffic from Colombo Street is likely to be small.

11.1.2 Colombo Street / Edgeware Road

CCC has conducted CAST modelling of the proposed changes to the Colombo Street / Edgeware Road intersection with an assumed phasing similar to the proposed phasing. CCC has provided the traffic flows from their 2021 model, however modelling has not been conducted yet for 2031. The CAST modelling done to date by CCC indicates some of the movements have little or no demand, which is unrealistic given the place of Colombo Street and Edgeware Road within the road hierarchy. For the purposes of operational modelling, a minimum flow for each movement has been assumed as 20 vehicles, with a high level of coordination with the nearby Cranford Street / Edgeware Road intersection. The results of the operational modelling in SIDRA are shown in **Appendix K** with the results summarised in Table 11-5. This modelling shows that the intersection will perform well in 2021 with a maximum degree of saturation for the intersection of approximately 45%. This indicates that there is sufficient capacity within the intersection to increase the green time for the cycleway to improve the level of service on the cycleway without significantly disadvantaging other road users.

Table 11-5: 2021 Operational Modelling Results of Colombo Street / Edgeware Road

Approach	AM Peak			PM Peak		
	Average Delay (Level of Service)	95% Queue	Degree of Saturation	Average Delay (Level of Service)	95% Queue	Degree of Saturation
Colombo Street	45s (**D**)	14m	35%	45s (**D**)	15m	35%
Edgeware Road (East)	4s (**A**)	15m	45%	2s (**A**)	5m	20%

Approach	AM Peak			PM Peak		
Edgeware Road (West)	15s (**B**)	40m	40%	14s (**B**)	70m	45%
Intersection	**13s (B)**	**40**	**45%**	**15s (B)**	**70m**	**45%**

The operational model gives less green time to the Colombo Street and Edgeware Road approaches compared to the strategic CAST model to accommodate the proposed cycleway phase. If these phasing timings were to be used in the CAST model then the capacity of the intersection would reduce and attract less traffic. Therefore, the traffic volumes used for the operational modelling may have slightly over estimated traffic on Edgeware Road while the only traffic on Colombo Street shown in the CCC CAST model is the buses for the number 28 bus route. The net effect of the signals in the CAST model is to discourage southbound vehicles from using Edgeware Road and Colombo Street and encourage them to use Sherbourne Street - Cranford Street and other parallel collector routes. Sherbourne Street - Cranford Street has a higher classification in the road hierarchy that prioritises vehicular traffic movements so it is suitable for larger traffic volumes than Colombo Street. Other parallel collector routes, with the exception of Papanui Road, are not competing for space and priority over other transport modes like Colombo Street so they are also likely to have more capacity to accommodate vehicles.

Although CAST modelling for 2031 has not yet been undertaken, it is considered that results will be similar to those predicted for 2021. The completion of the Northern Arterial and Northern Arterial Extension is expected to lead to increased traffic volumes on Cranford Street – Sherbourne Street and the parallel collector roads connecting through to Bealey Avenue and the central city. This is likely to include Colombo Street, with drivers using it as a partial alternative to Sherbourne Street. However, the 2021 operational modelling has indicated that there is sufficient capacity at the Colombo street / Edgeware Road intersection to accommodate these likely additional traffic volumes.

11.1.3 Trafalgar Street

The proposed cul-de-sac on Trafalgar Street will stop through traffic, forcing traffic to alternative parallel north-south routes such as Springfield Street – Durham Street North and Cranford Street - Sherbourne Street. South of the cul-de-sac Trafalgar Street services 38 houses which equates to approximately 380 vehicle trips per day[4]. North of the cul-de-sac Trafalgar Street services 90 houses and St. Alban School which has a roll of 523 students which equates to approximately 1,640 vehicles trips per day[5]. Traffic accessing St. Alban School tends to use Sheppard Place only and not venture too far south of Sheppard Place. Therefore, the traffic volumes south of Sheppard Place are likely to meet the requirement for a Greenway while traffic volumes north of Sheppard Place likely to exceed the requirements for a greenway.

[4] Based on a trip rate of 10 trips/households/day (Based on CCC IDS) assuming a worst case 100% car split

[5] Based on a trip rate of 10 trips/households/day (Based on CCC IDS) assuming a worst case 100% car split and 1.4 cars/student/day (NZ Trips and Parking Database)

11.1.1 St Albans Street / Rutland Street

The proposed signalisation of the St Albans Street/Rutland Street, combined with restricting Westminster Street to left in/left-out and removing through traffic from Trafalgar Street, is predicted to result in an overall reduction in the number of vehicles travelling through this intersection in both peak hours. However, this reduction is not evenly spread across all approaches, as increases are expected on the St Albans Street north-eastern approach in the morning peak hour and the opposite south-western approach in the PM peak hour.

The forecast traffic volumes from the CAST model have been used in the operational modelling undertaken using SIDRA. These results are reported in Table 11-6.

Table 11-6: Operational Modelling Results of St Albans Street / Rutland Street

Approach	AM Peak			PM Peak		
	Average Delay (Level of Service)	95% Queue	Degree of Saturation	Average Delay (Level of Service)	95% Queue	Degree of Saturation
St Albans Street (SW)	23s (C)	30m	21%	29s (C)	135m	87%
St Albans Street (NE)	42s (D)	225m	91%	16s (B)	50m	31%
Rutland Street (NW)	47s (D)	125m	86%	45s (D)	35m	75%
Intersection	**42s (D)**		**91%**	**28s (C)**		**87%**

During the AM peak hour, average delays on the main approach (St Albans Street north-east) are predicted to be in the order of 40-45 seconds per vehicle, although vehicles turning right into Rutland Street are likely to be waiting up to a minute. Overall, delays are fairly evenly distributed between all approaches. With a degree of saturation of over 90% on the busier north-eastern approach, and above 85% on Rutland Street, the intersection is likely to be operating near its' capacity.

In the PM peak hour, the demand through the intersection is more uneven, with almost 900 vehicles predicted on the St Albans Street south-west approach, over double the combined volume on the other approaches. Maybe as a result of this, the intersection is predicted to operate well, with average delays under 30 seconds for the (busier) St Albans Street approaches, although vehicles on Rutland Street are likely to experience average delays of 45 seconds or so. With only one approach having a high degree of saturation (87% for the St Albans Street south-west approach), there is some spare capacity at the intersection for additional traffic.

11.1.2 Innes Road/Rutland Street

Using the forecast traffic volumes from the CAST model network with the preferred option, SIDRA has been used to assess the likely operation of the intersection in 2031. With the closure of Trafalgar Street as a through route, and the signalisation of the St Albans Street/Rutland Street intersection, CAST is predicting that there will be a decrease in the number of vehicles using Rutland Street to head into or out of the central city. These changes are evident in both peak hours, especially for

southbound movements south of Innes Road in the morning peak hour and for northbound movements in the evening peak hour.

Some of these vehicles appear to be squeezed onto routes parallel to Rutland Street, such as Roosevelt Avenue and Browns Road. This also results in more traffic on Innes Road west of Rutland Street in both peak hours.

The results of this operational modelling are reported in Table 11-7.

Table 11-7: 2031 Operational Modelling Results of Innes Road / Rutland Street

Approach	AM Peak			PM Peak		
	Average Delay (Level of Service)	95% Queue	Degree of Saturation	Average Delay (Level of Service)	95% Queue	Degree of Saturation
Innes Road (East)	30s (**C**)	325m	89%	27s (**C**)	175m	80%
Innes Road (West)	18s (**B**)	50m	24%	32s (**C**)	235m	88%
Rutland Street (North)	53s (**D**)	100m	80%	48s (**D**)	85m	74%
Rutland Street (South)	55s (**E**)	45m	49%	47s (**D**)	135m	83%
Intersection	**33s (C)**		**89%**	**35s (C)**		**88%**

For general traffic, the intersection operates well overall. Delays for vehicles on Innes Road (a Minor Arterial road) are kept below 35 seconds, resulting in a level of service of C or better for both peak hours and both directions. To some extent, the intersection performance for the Innes Road approaches comes at the expense of vehicles on Rutland Street. During the morning peak, average delays of around 55 seconds are predicted on both approaches, primarily as a result of the time given to the Innes Road traffic and the protection given to cyclists (and pedestrians) crossing Innes Road. During the evening peak, a slightly shorter cycle time and increased demand on Rutland Street results in a shorter inter-green (waiting) period and a longer green time allocation. Average delays of just under 50 seconds are predicted for both of the Rutland Street approaches.

In both the morning and evening peaks, the degree of saturation for the intersection is just under 90% (on the eastern and western approaches respectively). This indicates that the intersection is approaching its' practical capacity, with the possibility that the arrival of more vehicles than predicted could result in the intersection operation breaking down, resulting in over-capacity queues. However, as the forecast year is almost 15 years post-construction, there is both an element of uncertainty around the forecasting outcomes as well as time to implement additional capacity improvements elsewhere on the network.

11.1.3 Main North Road / Grassmere Road

All four options to connect the cycle path from Grassmere Road to Sawyers Arms Road across Main North Road have been assessed as part of the Via Strada work on the northern section of the route. This assessment, undertaken using results from the CAST model, indicated that the preferred option (option 2) was expected to operate satisfactorily, with average delays at the Main North Road/Sawyers Arms Road intersection of 21 seconds in the AM peak and 31 seconds in the PM peak. Potential issues may arise from a high degree of saturation for southbound vehicles on Main North Road during the AM peak and marginal level of service for the right turn from Sawyers Arms Road during the AM Peak and left turn from Sawyers Arms Road during the PM peak.

No issues were identified at the Main North Road/Grassmere Road intersection, with average delays of 10 seconds or under predicted across the day.

11.1.4 Sawyers Arms Road / Sisson Drive

The assessment of the Sawyers Arms Road/Sisson Drive indicates that it should operate satisfactorily, with average delay of 11 seconds in the AM peak and 27 seconds in the PM peak. The only potential issue identified was a marginal level of service for the right turn from Sisson Drive during the PM peak.

11.2 Bus Stops

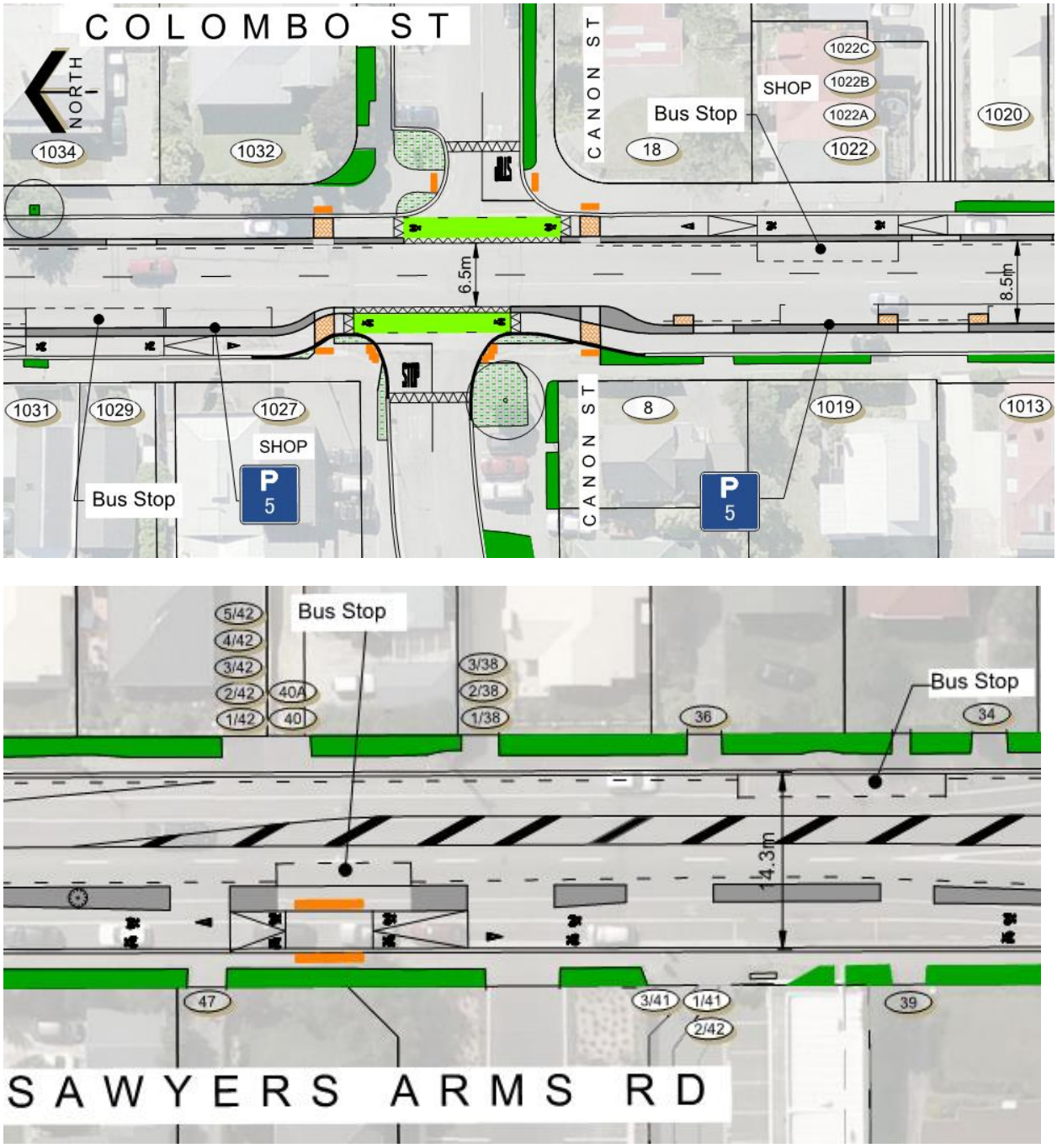
Colombo Street is a Public Transport Route in the CCC PTP. There are currently bus stops located in pairs on both sides of the road on Colombo Street. At intersections the existing bus stops have been relocated or removed. At the Bealey Avenue Colombo Street intersection both bus stops immediately north of the intersection will be relocated to accommodate the new cycleway and intersection layout. The bus stops currently located near Purchas Street and Canon Street are rationalised; removing one stop and relocating a new stop midway between Canon and Purchas Streets.

In general the bus stops on the western side of Colombo Street replace car parking or parking exclusion zones. The bus stops on the south bound side of Colombo Street will be kept and located in the traffic lane. In lane bus stops are required due to site constraints. CCC prefers to include no overtaking centreline markings in these locations. The locations of the bus stops are shown in the option drawings for Colombo Street in **Appendix G**. Refer to the Figure 11-1 below.

Sawyers Arms Road bus stops will be provided within the traffic lane as per the Colombo Street southbound bus route.

Safety concerns of conflicts between bus passengers and cyclists were voiced in previous Road Safety Audits. It is proposed to provide a raised platform through the cycleway adjacent to bus stops. The intent is the cyclists Give Way to pedestrians in a shared space. Preliminary layouts are provided however further guidance is required from CCC to ensure consistency throughout the implementation of the major cycle way network.

Figure 11-1: Typical Bus Stop Treatments - Colombo Street and Sawyers arms Road



11.3 Street Side Road Treatment

The cycleway crosses side roads on along the preferred route. The cycleway on Colombo and Rutland Street is a one way facility on both sides, separated from traffic so treatment across the side roads has been developed to make it clear that priority is given to cyclists on the Cycleway.

Colombo and Rutland Streets. The one way cycleway on the eastern side will not obstruct visibility for vehicles. The treatment for this side would be to stop the delineator at side roads to have cyclists legally on-road to give them priority and to allow unrestricted movement for vehicles using the side roads. An indicative layout of a side road crossing on Colombo Street is provided in figure 10-2 below.

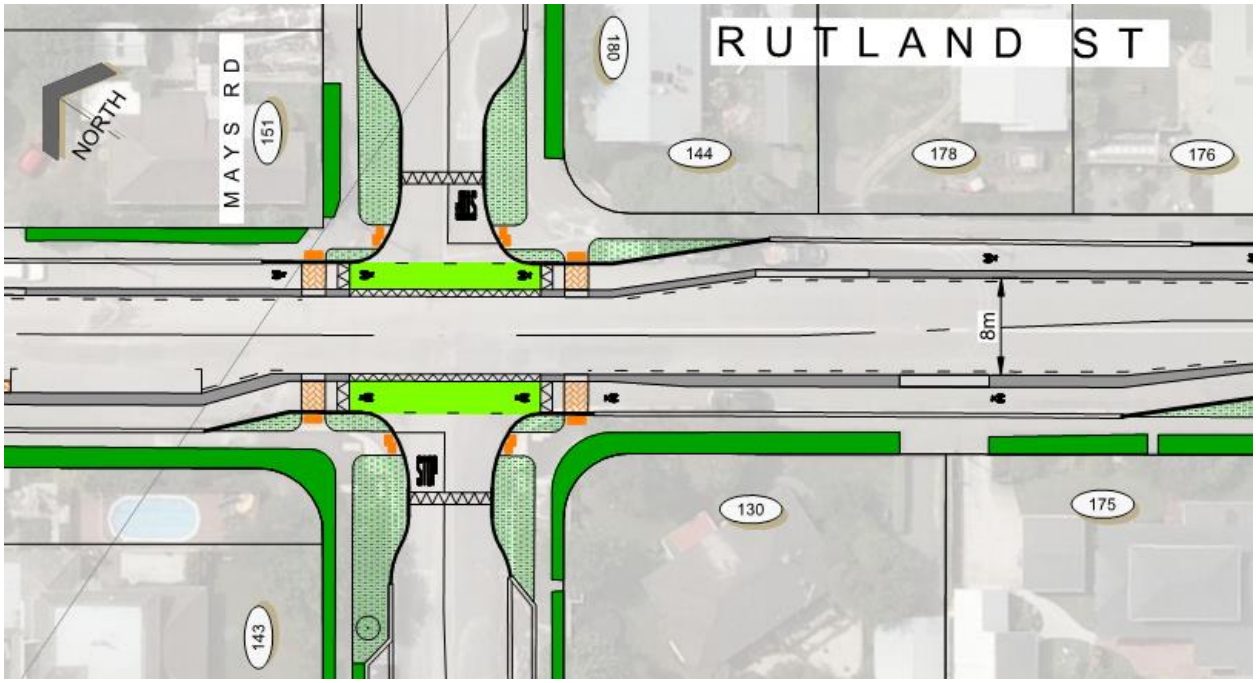
To alert drivers to the presence of the cycleway a raised table which encompasses the cycleway and one car length on the side road will be provided on the side road approaches.

The layout below was developed in discussion with CCC, following earlier Road Safety Audit comments. The available road reserve area does not allow enough space to provide the treatment in the CCC Cycleway Design guideline (as shown in section 8.2, Issues Table – Issue 6) without land acquisition.

The solution represents the safest way for cyclists to cross side roads as it this brings cyclists on road to make it easier for vehicles turning off the main road to see cyclists and gives cyclists priority over side road traffic.

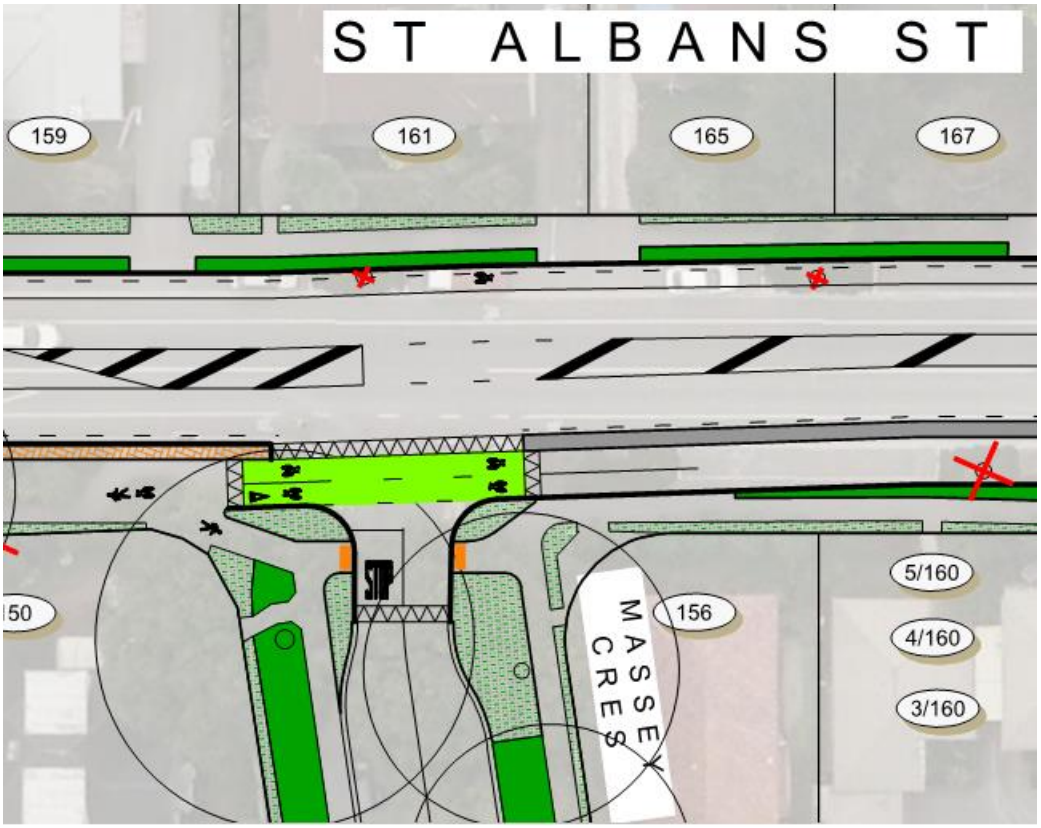
Pedestrians crossing near side roads are accommodated by constructing drop kerbs at locations which minimises the diversion from desire lines, gives pedestrians an adequate waiting area and require the smallest crossing distance.

Figure 11-2: Preferred Layout for Side Road Crossings for One Way Facilities (Colombo and Rutland Streets)



Trafalgar Street and St Albans Streets. For two way cycleways along Trafalgar Street (north of Sheppard Place) and St Albans Street, the side road treatments follow a similar layout as described above. Figure 10-3 shows a typical treatment.

Figure 11-3: Preferred Layout for Side Road Crossings for One Way Facilities (Colombo and Rutland Streets)



11.4 Stormwater Assessment

The proposed changes to cross sections to incorporate MCR's will have some implications for the stormwater system as follows:

- The delineator and new grassed build outs will interrupt the existing flow paths and concentrate water near driveways where there are not usually sumps. This will increase the risk of stormwater entering private property, particularly where driveways and properties are lower than the road.
- If a channel is not provided then water is more likely to pond into the carriageway exacerbated by the, reduced width of the traffic lane and concentration of flow.
- Even if the existing kerb has a longitudinal grade, the chip seal pavement alongside it may not. This chip seal will be the new flow path next to the proposed delineator, and thus ponding will be an issue. As well as presenting an issue, increasing the extent and time of ponding water may cause damage to the pavement.
- Consideration needs to be given to drainage around the parking bays. Sumps or a channel will need to be provided.
- Private property connections are currently draining to kerb entries in the kerb and channel. These will need to be retained.
- Raising levels at existing intersections and bus stops will interrupt existing drainage paths. This will require the flow paths at around these areas to be checked.
- There are only minor changes to be made to the kerbs or levels on Trafalgar Street so improvement in this section will not be detrimental to the existing stormwater drainage. The proposed cycleway around the Edgeware Village and Bealey Avenue Intersection will require the relocation of kerb lines which will require some minor changes to the storm water system.

- The proposed raised platform treatments for all of the minor intersections along the route are generally going to interrupt the existing flow patterns. Allowance has been made to install new sumps, either connecting to the adjacent pipe network or as bubble-up systems across the platforms to maintain the flow of stormwater.
- There will be changes to the stormwater network on Trafalgar Street following the road widening associated with the installation of the two-way cycleway. This will require the removal and replacement of a length of under channel pipe, as well as the relocation and possible addition of sumps.
- The existing flow patterns along St Albans Street are expected to be mostly retained following the removal of the roundabouts and the road widening, however some changes to the stormwater system, including new sumps and connections are likely.
- There will be changes to the stormwater network on Rutland Street following the road widening associated with the installation of the one-way cycleways. This will require the removal and replacement of several lengths of under channel pipe, as well as the relocation and possible addition of sumps. New sumps and connecting pipes will be required to connect new low points, particularly where the widening doesn't continue through the side road intersections. The existing interpath channel on Rutland Street will largely be retained, being used as a tie-in point following the road widening and berm re-levelling.
- New property drains and inspection boxes have been allowed for in all locations where road widening is proposed.

These implications for the storm water system are considered to be minor and can be addressed during the detailed design phase.

11.5 Landscaping

The scheme will include new areas that will either be grassed or be covered in low planting (at intersections). Where possible, new trees should be incorporated. The tree species suggested in the CCC Central City Planting Strategy on Colombo Street are *Quercus robur 'fastigata'* – Upright oak tree. These trees are upright in nature with limited spread – (max. 5m width and 15m height).

There is a risk to planting trees in tree pits as the trees may grow adequately for the first stage of their lives but they may not get the required nutrients they need to keep growing healthily and die prematurely. It is recommend that tree pits be at least 2m in width where a concrete strip has been proposed directly behind the planting areas. It is recommended that a grassed or a groundcover planting strip is provided instead to allow for a more permeable surface.

In terms of groundcover species, it is recommended massing low groundcover species include:

- *Carex testacea* – Orange Sedge
- *Dianella nigra* – NZ Blueberry
- *Libertia ixioides* – NZ Iris
- *Muehlenbeckia axillaris* – Creeping Pohuehue

North of Rutland Reserve, an arboriculturalist's report has been commissioned and covers the removal of trees and shrubs and works within the vicinity of trees and shrubs on Grassmere Street and Sawyers Arms Road. The report recommends the planting of:

- 3 x Field Maple (*Acer campestre*) outside 96 Main North Road (in Grassmere Street).
- 4 x Field Maple (*Acer campestre*) within the vicinity of the road crossing, outside 27, 29 and 31 Grassmere Street.

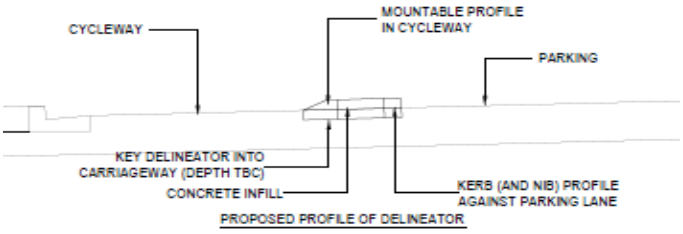
- 2 x Field Maple (*Acer campestre*) within the vicinity of the road crossing, outside 41 Grassmere Street.
- 5 x Small-leaved Lime (*Tilia cordata*) within the vicinity of the Grants Road corner, outside 1 Taunton Green (in Grassmere Street).

The plantings will need to confirmed and managed in accordance with the CCC IDS during design and construction. The arborists report is included in **Appendix Y** to this report.

11.6 Separator Details

The proposed separator between the new cycleway and traffic lanes / parking bays is to be a continuous concrete strip that runs for the full length, only breaking at the intersections. Where the delineator crosses residential driveways and commercial access ways, where it will be finished flush with the carriageway surface. This means the delineator, coupled with narrower lane widths will help to create a continuous cross section for road users which will result in a slower speed environment and also make cyclists feel more comfortable and confident. The proposed profile of the delineator is shown in Figure 11-4.

Figure 11-4: Proposed Delineator Cross Section



The separator may be constructed from concrete, with a vertical kerb profile adjacent to the parking bays / traffic lanes and a mountable kerb face adjacent to the cycle lanes. There are 2 possible methods of construction, suitable for various widths of delineator, as noted below:

- The first option for constructing the delineator is to mass pour the concrete. This would include milling the existing pavement to a depth of 150 mm and constructing the delineator as one slab of concrete, using formwork to create the edge shape.

- The second option would be to mill the existing pavement to a depth of 150mm (as with option 1) and to extrude the 2 edge profiles as if the contractor was constructing standard kerbing. Once the kerbs had cured, the remaining width could then be in-filled with mass concrete. This option would need to include the reinstatement of a narrow strip of existing pavement on both sides of the delineator to facilitate the kerb construction.

Where there is parking adjacent to the separated cycle lane, the length of cut-down separator can be 4.1 m, the same as the width of a standard residential crossing. On collector roads where there is no parking adjacent to the cycle lane, the length of the cut-down may need to be extended to allow for vehicles turning left into and out of driveways to do so without crossing the road centreline. This includes reversing movements.

As part of the detailed design stage of the project, the delineator design and construction method will need to be finalised, including the depth the delineator that needs to be set into the existing pavement to ensure it is suitable for trafficking at driveways and access ways, and also an assessment to determine if any reinforcement would be required. At this stage it is not proposed to provide reinforcement.

A key to the success of the delineator will be the aesthetics. It is also vital that the delineator is visually and physically obvious to avoid vehicles colliding with it, and also to ensure it forms a clear edge to the carriageway. Several options have been discussed to date, including, plain or stamped concrete, coloured concrete, and, stamped autumn tone concrete as used in traffic islands around the city. This will need to be confirmed as part of the detailed design of the delineator during the detailed design phase.

11.7 Meeting the Project Objectives and Strategic Plan

This project meets the actions listed in the CTSP to support the city's growth and community aspiration for the next 30 years. More specifically this cycleway helps support all four goals by providing a facility with objectives that are consistent with these goals. This provides residents with a safe alternative transport mode which helps to provide and promote a sustainable transport system.

The objectives of this project are to provide a cycleway which is safe, direct, connected, attractive and comfortable. The preferred cross sections meet the objectives of the project as each option considered is assessed directly against these objectives with the practicality of delivery of each option also considered.

11.8 Asset Management Issues

11.8.1 Refuse Collection

This scheme will impact on refuse collection operations. For the proposed scheme, where one way cycle lanes are to be constructed (Colombo and Rutland Streets) the following impacts/provisions are likely

Colombo Street:

West Side: The preferred option provides space by way of a flush textured (concrete or similar) pad, for bins to be placed in between parking bays and driveways, in the western shoulder. The carriageway is 6.5m. Bins can be picked up from this designated (no stopping) space in the shoulder from the traffic lane.

East Side: Residents will place their bin on the footway and the collection truck will have to straddle the delineator to occupy the cycleway. This will be clear to cyclists that they are collecting rubbish. It is recommended that rubbish collection on this route be conducted at non-peak / low use times.

Edgeware Road:

Proposed changes will not affect refuse collection so it will continue as is.

Trafalgar Street - Greenway:

Proposed changes will not affect general refuse collection but the cul-de-sac will result in changed manoeuvres to get in and out of Dover Street.

Trafalgar Street (two-way cycleway section)

East side: Residents will place their bins on the grass berm to be picked up by the collection trucks in the conventional fashion.

West side: Residents will place their bins on the grass berm, with refuse collection operators being able to stop the collection truck in the roadway and walk the bins across the cycleway to the truck with the low traffic volumes and speeds on this street. Alternatively, the collection trucks could travel up the 3 m wide two-way cycleway to collect the bins, however access points through extensions in the separator cut down would need to be confirmed at detailed design. Regardless of which option is used, collection should be carried out away from the start and end of the school day.

St Albans Street

North side: Residents will place their bins on the grass berm to be picked up by the collection trucks in the conventional fashion.

South side: Residents will place their bins on the grass berm, with the collection trucks to travel up the 3 m wide two-way cycleway to collect the bins. A flush platform/ island treatment has been provided on the widened separator area at the intersection with Trafalgar Street through over which the collection trucks can travel to gain access to the cycleway. Confident east-bound cyclists may choose to ride around the refuse collection trucks in the traffic lane, whilst all other cyclists will be expected to dismount and walk along the footpath. Whilst the trucks could potentially straddle the separator to collect the bins, space would then remain for a cyclist to attempt to slip past the truck, leading to potential conflicts between cyclists and the bin collection arm. It is recommended that rubbish collection on this route be conducted at non-peak / low use times.

The trucks will travel up the cycleway to the intersection with Massey Crescent, where they will be able to re-join St Albans Street proper. The trucks will be able to collect the bins for no's 140 and 142 St Albans Street from the roadway. The patterned surface at the edge of the shared path provides space to set the bins down clear of the path of cyclists and pedestrians.

Rutland Street

East side: Residents will place their bins on the grass berm to be picked up by the collection trucks in the conventional fashion.

West side: In areas where there is on-street parking, residents will place their bins on the flush bin pads provided on the roadway side of the separator at all driveways, for a collection truck to pick up from the traffic lane. Where there is no on-street parking, refuse collection will be carried out as on the east side of the road. In isolated locations where sections with on-street parking are located adjacent to locations with no on-street parking (such as no's 7-15 Rutland Street), it is intended that the refuse collection truck collect the refuse from the berm, reaching across the cycleway. Alternatively, crossing points at driveways could be confirmed at detailed design so the collection trucks can move from straddling the separator to being on one side of it, as per the regular methodology.

It is recommended that rubbish collection on this route be conducted at non-peak / low use times for all parts of Rutland Street.

Grassmere Street

North side: Residents will place their bins on the 1 m wide grass strip separating the two-way cycleway from the roadway, which will be picked up by the collection truck in the conventional fashion. The separator narrows slightly in the section past numbers 31, 37 and 41 Grassmere Street, however the bins will be able to be placed mostly clear of the shared path, and there will be sufficient visibility for approaching path users to observe both the bins and other path users.

South side: Residents will place their bins on the path/berm to be picked up by the collection trucks in the conventional fashion.

Sawyers Arms Road

North side: Residents will place their bins on the path/berm to be picked up by the collection trucks in the conventional fashion.

South side: Refuse collection will be made in the section of two-way cycleway between Sisson Drive and the Papanui Domain. Residents will place their bins on the existing path/berm, with the collection trucks to travel up the minimum 3 m wide two-way cycleway to collect the bins. Access to the cycleway will be gained at the Sisson Drive intersection, whilst a length of cutdown separator (not shown in drawings) would need to be provided at the east end of the Papanui Domain for the trucks to exit the cycleway. It is recommended that rubbish collection on this route be conducted at non-peak / low use times.

11.8.2 Street Cleaning

The preferred solution provides space for parking (and rubbish Collection on Colombo and Rutland Street) for unrestricted street sweeping operations. The option keeps the shoulder space flush with the existing carriageway and utilises no stopping lines to demarcate on street and loading zone parking. As described above for north bound one way facilities a flush textured set down area – adjacent to driveways – is recommended. This layout allows the use of standard plant for street cleaning.

Additional cleaning will be required for the new separated one way cycleways (2-2.5m wide) and new 2 way and shared path cycleways (3-3.5m wide). Discussion with street sweeping team indicated alternative smaller plant would be required to access the separated cycleway and new intersection areas and parking bays if included. This will increase the scope of cleaning and increase future maintenance costs.

Further discussion is recommended at the next phase.

11.9 Lighting Assessment

A lighting assessment has been completed by Connetics and information provided by CCC to include in the cost estimate. The assessment completed on the Rutland Street and St Albans Street section of the route was based on an earlier design featuring a two-way cycle lane on the east side of Rutland Street and the north side of St Albans Street. The costs have been factored up to provide an indicative estimate for the two one-way cycle lanes on Rutland Street and the changes on St Albans Street that comprise the preferred solution.

A lighting assessment has been completed by Connetics for the northern section. That report is included in **Appendix Z** and its cost recommendations have been included in the project cost schedule. It is noted that both road and cycleway lighting improvements are recommended.

11.10 Utility Relocation

Scheme Plans have been submitted to CCC for review with relevant utility providers for the section of the route from Trafalgar Street south. The following scope identifies the extent of pole relocations with indicative costs where available.

- 18 Trafalgar – Orion Pole. Pole needs to be relocated north. Indicative cost $30K+GST
- At Edgeware shops – Lighting Pole (3 No.) in footpaths near pedestrian crossing to be relocated – costs to be confirmed
- Some 22 power poles on Rutland Street and a further four on Trafalgar Street have been identified as requiring relocation following the proposed road widening. Indicative cost $10K+GST each
- Two Chorus utility boxes are located in parts of St Albans Street that will be affected by the preferred solution. These are expected to need to be adjusted to match new road and path levels, at an estimated cost of $20K+ GST
- A potential conflict between an existing Chorus copper cable and the proposed kerb relocation on the west side of Trafalgar Street to the north of Massey Crescent has been identified. Potholing will be required at Detailed Design stage to confirm if the conflict will be an issue, however an estimated cost of $10K+GST has been allowed for lowering or protecting the cable
- A potential conflict between an existing Chorus copper cable and the proposed kerb relocation on the east side of Rutland Street in several locations to the south of Innes Road has been identified. Potholing will be required at Detailed Design stage to confirm if the conflict will be an issue, however an estimated cost of $15K+GST has been allowed for lowering or protecting the cable
- A potential conflict between an existing Orion underground cable (low voltage) and the proposed kerb relocation on the east side of Rutland Street between Innes Road and Malvern Street has been identified. Potholing will be required at Detailed Design stage to confirm if the conflict will be an issue, however an estimated cost of $15K+GST has been allowed for lowering or protecting the cable

For the northern section, the following utilities will be affected:

- 43 Grassmere Street – outside unformed driveway; telecommunications cabinet flush with ground to be raised to shared path level. Service provider – Enable
- Main North / Sawyers Arms - south west corner; telecommunications cabinet (flush with ground). Service provider – Telecom; Contractor - Chorus
- Main North / Sawyers Arms - north west corner; link box (above ground) requires relocation due to change in property boundary and kerbline; Service provider – Orion; Contractor - Connetics
- Railway crossing – Sawyers Arms Road; tensioner pole, requires relocation (or complete removal achieved by upgrading adjacent pole); Service provider – Orion; Contractor - Connectics

11.11 Safety in Design

The previous version of the Bealey Avenue to Trafalgar Street MCR arrangement was reviewed by an internal, independent Safety in Design Panel at Beca. The panel raised a number of points, many of which are directly applicable to the updated design from Bealey to Trafalgar, and can also be applied to the remainder of the full MCR. For reference, the original Safety in Design Register is provided in **Appendix O**. The key points from the original review are updated and amended for reference to the full route, below:

- Need to check the position of signage (even though this is only scheme design, they should go where they will be most effective). Check that there is a safe width to maintain them and width for maintenance of traffic lights.
- Important to acknowledge feedback of separation systems used elsewhere in CHCH, and in other cities.
- No provisions for wheel chairs and prams in a 800mm wide separator, highlight this to the client.
- Where bus stops are proposed a raised platform is likely to require specific stormwater design. Can existing infrastructure be maintained safely

- Check tracking provisions for maintenance street sweepers
- Moving centrelines of Colombo Street, St Albans Street and Rutland Street may put services/utilities into new wheel paths
- Check tracking for exiting cars so they don't cross the centreline, or identify this as a technical issue, if it occurs. Note the new carriageway on Colombo Street and Rutland Street is narrow (6.5m)
- Branding of the cycleway is a key factor to its success
- Tactile paver positions need to be fully assessed.
- Rubbish bin locations need to be carefully considered. The separator is typically too narrow for successful bin pick up and set down. Specific consideration needs to be given to where the bins are located, otherwise, they may be placed on the road in front of driveways. Check provision
- A workshop with CCC to discuss what the questions will be from the public before any open days
- Consider barriers at Edgeware to channel both cyclists and pedestrian to crossings
- Need to undertake consultation with emergency services. Impact to emergency services for proposed Trafalgar Street cul-de-sac and other access restrictions (Hawkesbury, Westminster) should be discussed
- Consider removal of speed humps in Trafalgar St
- Consider using an edge line along the western side of Colombo Street, St Albans Street and Rutland Street
- Review Street lighting on all collector roads – consider upgrading especially with risk of night use of the cycleway and risk of reversing exiting residents

Actions following the SiD review

- Provide final layout showing tactile paving, road marking, signs and signal positions in final drawings. Refer final drawings.
- Check separator width is adequate to locate signs and signals. The final drawings show widened separators where signs and signals require it. Road marking have also been updated
- Review swept paths at driveways and critical commercial accessways. This review has been completed including the 24 hour Surgery access on Colombo Street immediately north of Bealey Avenue.
- Review rubbish collection requirements on west side of Colombo Street, St Albans Road and Rutland Street and ensure adequate space is provided. This review has been completed with drawings revised..
- A revised layout is provided in the final drawings showing barriers for the preferred cul-de-sac layout north of the Trafalgar – Dover Street intersection

The actions for CCC are as follows

- Acceptance that in order to keep on street parking and existing kerb lines there are limitations with the separator width, noting that the narrow (0.85m) separator does not provide adequate width for set down of wheelchairs, prams etc
- Acceptance that for the scheme to provide as much on street parking as possible standard kerb returns will need to be compromised, which will require bespoke street cleaning (in on street parking bays) and that overall the cycleway will increase future maintenance costs for street cleaning
- Accept that for Colombo Street, St Albans Street and Rutland Street there may be times where residents use either the road shoulder or their driveway to put rubbish bins if space is

not available on the marked pads. Consultation with residents is required to inform where rubbish bins should be located
- Decision over branding for cycleways and how way finding will be implemented
- Review the issues with the Project Team ahead of Consultation that are likely to be raised in objection to the scheme and acknowledge

11.12 Environment

11.12.1 Coal Tar

Bealey Avenue/Colombo Street/Edgeware Road/Trafalgar Street/Rutland Street. Due to the age of the road pavement, contamination in the form of polycyclic aromatic hydrocarbons (PAH's) is likely to be present in the upper pavement layers. This contaminant will be in the form of coal tar residue and was used as a binder or stabilizing agent in the pavement construction process. If testing shows that PAH's are present in the pavement, any contaminated material will either need to be disposed off-site in an approved facility or encapsulated/stabilized within a pavement reconstruction area. During any disturbance or working of the contaminated material, appropriate measures will need to be taken to control dust and stormwater runoff. Appropriate precautions for the workers include long sleeved clothing and gloves.

11.12.2 Contaminated Land

Within the study area several Hail sites are identified as shown in **Appendix L**. Generally the sites are located adjacent to the road with the risk of potential contamination into the road reserve low as there are no sites on both sides of the road. The constructor of this project will have to implement an Environmental Management Plan to deal with the management of work adjacent to HAIL sites. For Contaminated Land maps refer **Appendix L**.

11.12.3 Archaeology

St Albans Street, Trafalgar Street and Bealey Avenue are sites of pre 1900 pipelines, which will have to be assessed and managed during construction. Generally the work proposed is shallow and unlikely to influence these pipelines. Provision within the Contractors CMP will be required for supervision by a suitable archaeologist during excavation.

Colombo Street is the site of an old tramway which will require similar attention and duty of care during implementation. For Archaeology maps refer **Appendix L**.

11.13 Consent Requirements

The proposed cycleway meets all development and critical standards in Section 4 of Chapter 8 of the Christchurch City Plan as shown in **Appendix J**.

Resource consent is needed for the stormwater and for the proposed earthworks (quantities outlined above) under both the plans. Also of relevance if the land that the earthworks is to occur on is deemed to be a HAIL/ contaminated site then this may trigger a resource consent application to the Christchurch City Council under the NES - depending on the amount of soil that is to be disturbed off that 'piece of land'.

It is unclear whether the road where the proposed works are to be carried out is considered to be a HAIL (contaminated) site. In the past, the precautionary approach has been adopted and resource

consent has been obtained in order to ensure that appropriate conditions are in place to cover the event that contaminated material is discovered during the works.

At this stage of project assessment, it is considered that resource consents are not required where the cycle facilities have changed the trafficable lane widths. This issue will need to be further considered as the design process progresses. Even while uncertainty remains at this point, when the Replacement City Plan becomes operational, it is does not have the same conditions for road width management.

Therefore it is recommended that further discussion to confirm consent requirements is held early at the next stage.

11.14 Property Requirements

The majority of the proposed MCR is located within legal road reserve and CCC reserves. In two places land is required (Sawyers Arms Road and Grassmere Street). Acquisition processes for these properties are underway (see **Appendix X**)

11.15 Cost Estimate

A preliminary cost estimate for the preferred option is $13,900,000 including P&G, TM, Design Fees and a 30% contingency.

Refer **Appendix I** for a breakdown and cost comparison with other options.

11.16 Safety Audit Outcomes

Road safety audits have been completed on previous versions of sections of the route. At time of report preparation, a safety audit had yet to be completed on the latest preferred configuration of the full MCR. A number of changes have occurred in the route facilities and design, hence a new audit, incorporating the full route, is worthwhile.

11.17 Risk

The scheme has been developed with the key objectives for cycleways in mind. The objectives look to promote cycling and are focussed on safety and provision for cyclists. However a prime consideration for the success of the scheme will be community acceptance and hence a significant risk to the scheme is lack of acceptance at Consultation. CCC indicated that the process for Consultation is to inform the public only, therefore it is likely that there will be objections that may have political repercussions, and delay project implementation. The development of the preferred option has tried to support, as much as is practical, local business and residents who will be affected by the scheme. The following risks are live risks that CCC should be aware of.

- Public objections to the scheme at Consultation delaying the project programme and increasing the project budget. The particular issues under scrutiny are related to:
  - Cycle facilities outside or adjacent to resident's properties
  - Reduction in available parking
  - Further development of roads which have previously been upgraded – in particular St Albans Street and Courtenay Streets which were subject to an extended consultation and development process approximately a decade ago.
- Local Business objections to removal or relocation of short term parking and loading zones
- Safety Risk to Cyclists of left and right turners at Bealey Ave/Colombo Street intersection.

- Conflict risk between cyclists and car drivers/passenger parking where separator is narrow with no set down area for prams, children, wheelchairs etc and using the cycle lane for unloading.
- Conflict risk to cyclists and pedestrians where high volumes of crossing pedestrians are expected – such as adjacent to Rugby Park, shops on Rutland Street and outside some schools. This type of risk extends to conflict in shared areas where separation/delineation is not provided (Edgeware and near St Albans School, Rutland/St Albans Street signals and entry to Rutland Reserve.)
- Risk of post implementation parking in restricted areas needing additional enforcement
- Risk to cyclists with the (as yet) untested exclusion zone at driveways
- Risk of conflict between residents reversing out of driveways and cyclists
- Risk of project delay or additional costs due to the property purchase requirements.

In general, the conflict risks will always remain, regardless of how well designed a facility is. The best mitigation approaches are good design; clear signage; guidance and information to those living or working close to the conflict areas; and to a certain degree – reliance on familiarity over time.

The risk related to the objections to reallocated road space, such as parking, loading zone removal are also unavoidable to a certain degree, however they can be mitigated by a focused consultation and engagement activity which recognises the various types of concerns from different parties, and is geared to respond to those. This will have implications for the type of consultation process which is used for the project from this point.