

Report

Hornby Library, Service Centre and South West Leisure Centre Denton Park Access Strategy

Prepared for Christchurch City Council

Prepared by Beca Limited

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Revision History

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Action	Name	Signed	Date
Prepared by	Hayden Trumper		6 April 2018
Reviewed by	Joe Phillips		6 April 2018
Approved by	Andrew Jackson		6 April 2018
on behalf of	Beca Limited		

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Executive Summary

Beca Limited (Beca) has been commissioned by Christchurch City Council (CCC) to develop the transport access strategy for the Hornby Library, Service Centre and South West Leisure Centre (SWLC) located in Denton Park. The proposed development consists of a relocation of the Hornby Library and Service Centre, as well as new leisure pools and gym.

CCC has identified the south west of Christchurch as an area with significant population growth that is expected to continue. Following a site selection process, incorporating consultation with the wider community and Beca's previous transport advice, CCC has identified Denton Park as its preferred location for the new community facilities.

Denton Park currently consists of three rugby fields during winter, a cricket pitch during summer, velodrome and small stadium, Hornby Rugby Club clubroom, Hornby Football Club clubrooms and Hornby Cricket Club clubrooms. The Denton Park site has a southern frontage with SH1 Main South Road with short road frontages on both Chalmers Street and Kathleen Crescent to the northeast and west respectively.

The facilities for the proposed development have been identified to be likely to include a 4,050m² building consisting of 2,000m² wet sport area, 675m² dry sport area, 750m² library, 250m² governance services and 375m² ancillary areas. The approximate catchment of the proposed development is anticipated to include to the suburbs of Hornby, Hei Hei, Broomfield, North Wigram, Islington, Hornby South and the western side of Sockburn, with an equally likely chance for visitors to come from each of these suburbs.

The proposed development will consolidate a number of community recreation facilities near a major shopping centre that allows easy pedestrian access between them, reducing the length and number of trips required for people to access multiple recreational and leisure facilities, when compared to existing facilities. The proposed development is located at the centre of the anticipated catchment, which extends for approximately 3km from the site, making the walking or cycling transport modes viable.

The proposed development site is well located to take advantage of a network of more sustainable travel options for visitors and staff (such as the Major Cycle Route and Hornby Superstop for buses) making these modes a realistic option. Indeed, public feedback to CCC during the site selection consultation, indicated that many people considered walking, cycling and travelling by bus were realistic options, when travelling to and from the proposed development.

It is currently anticipated that the maximum parking demand for the proposed development would be around 144 parking spaces occurring during the weekend (Saturday) peak period. There is currently little information available on the parking demand for libraries and community leisure facilities, in the typical industry sources. As such, it is recommended further surveys of similar facilities around Christchurch are conducted to assist in 'benchmarking' the likely arrival and departure profile, as further detail of the proposed development concept is progressed for a resource consent application.

To assess the effects on the surrounding transport network for this reporting, only the weekday evening and Saturday peaks have been considered, as these two periods represent the more critical operational periods, when there is a combination of background traffic being at its peak and a higher number of trips anticipated to be generated by the proposed development. In order to consider the vehicle access strategy options, for the purpose of this report and associated traffic modelling, all vehicle access is assumed to be taken off Chalmers Street (from which CCC has indicated they will secure necessary routes) and there is no displacement of any of the existing uses of the park.

The traffic modelling indicates that, whilst the surrounding road network currently operates near capacity, there is the ability to accommodate the proposed development during the weekday evening peak, whilst

maintaining a similar level of operational performance. However, it is recommended that additional signal phases are added (at the Main South Road / Chalmers Street signalised intersection) to accommodate right turning traffic entering and exiting Chalmers Street. This change is required to accommodate the proposed development during the Saturday peak, assuming all vehicle access is to be taken from Chalmers Street. This would require further liaison and approval of the NZ Transport Agency and the Christchurch Transport Operations Centre.

In combination with the above, particularly to reduce the potential impacts during the Saturday peak at the Main South Road / Chalmers Street intersection, it is recommended that the access strategy provide for alternative access for existing and proposed activities, such as a left-in / left-out arrangement along SH1 Main South road frontage and access to a limited number car parks off Kathleen Crescent (no through traffic to Chalmers Street). This would provide the opportunity to reduce the operational impacts on Chalmers Street, particularly at its intersection with Main South Road. Moreover, should Hornby Rugby Club and/or Hornby Cricket Club decide to relocate to another location, this may reduce background traffic demands and improve the road network's ability to accommodate the proposed development.

In combination with the recommended vehicle access strategy, and to take full advantage of the location of the proposed development site in terms more sustainable travel options for visitors and staff, it is recommended that a staff travel plan is developed and that information is provided on the relevant websites (or in other formats) to provide clear information on the travel options that are available to visitors. Ample cycle parking is proposed to be provided to support the use of cycling to access the proposed development.

In relation to progressing the proposed development through further concept design, as part of the process for preparing a resource consent application, it is recommended that the following safety matters also be addressed in more detail:

- The proposed northern access to Denton Park off Chalmers Street has restricted sightlines and shares access with 19 Chalmers Street, so it is recommended that discussions are held with the relevant landowner/s to consolidate the access to provide a suitable access arrangement
- The Pak 'n' Save loading facilities are located adjacent to the proposed southern access off Chalmers Street and have been observed to be operational throughout the day, albeit it is understood current consent conditions should restrict operational hours of this loading bay. This presents a safety risk in relation to the southern access, particularly for pedestrians and cyclists. As such, it is recommended that liaison with The Hub Hornby and Pak 'n' Save be undertaken to remove these potential conflicts.
- Staff and visitors alighting or boarding at the Hornby Superstop will likely have a pedestrian desire line along a route that currently does not provide a safe crossing point on Chalmers Street. It is recommended that options for a crossing point are considered.
- The NZ Transport Agency has identified concerns with the potential for westbound traffic on Main South Road to 'U-turn' to access the proposed left-in access off Main South Road. As such, for this proposed access, it is recommended solutions to prevent or control this manoeuvre are developed in liaison with the NZ Transport Agency.
- On the basis that the access strategy includes some car parking off Kathleen Crescent (through traffic to the proposed development is not currently anticipated), it is recommended that further consideration is given to the safe and efficient operation of Kathleen Crescent with the measures required dependant on the amount of parking provided off Kathleen Crescent.

In summary, the proposed site is well situated to take advantage of nearby sustainable transport mode facilities from a catchment that is largely within a reasonable walking and cycling distance. It is considered that a satisfactory vehicle access solution can be developed for the proposed development. However, this will potentially require changes to current traffic signal intersection operation on Main South Road and/or additional access points to distribute the traffic demands associated with existing and proposed activities at Denton Park and provide more resilient access arrangements. This should also be accompanied by a comprehensive travel management strategy for staff and visitors.

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1 Introduction

1.1 Overview

Beca Limited (Beca) has been commissioned by Christchurch City Council (CCC) to develop the transport access strategy for the Hornby Library, Service Centre and South West Leisure Centre (SWLC) located in Denton Park. The proposed development consists of a relocation of the Hornby Library and Service Centre, as well as new leisure pools and gym. The initial bulk and location plan of the proposed development, prepared by Warren and Mahoney (WAM) is shown in **Figure 1-1**.

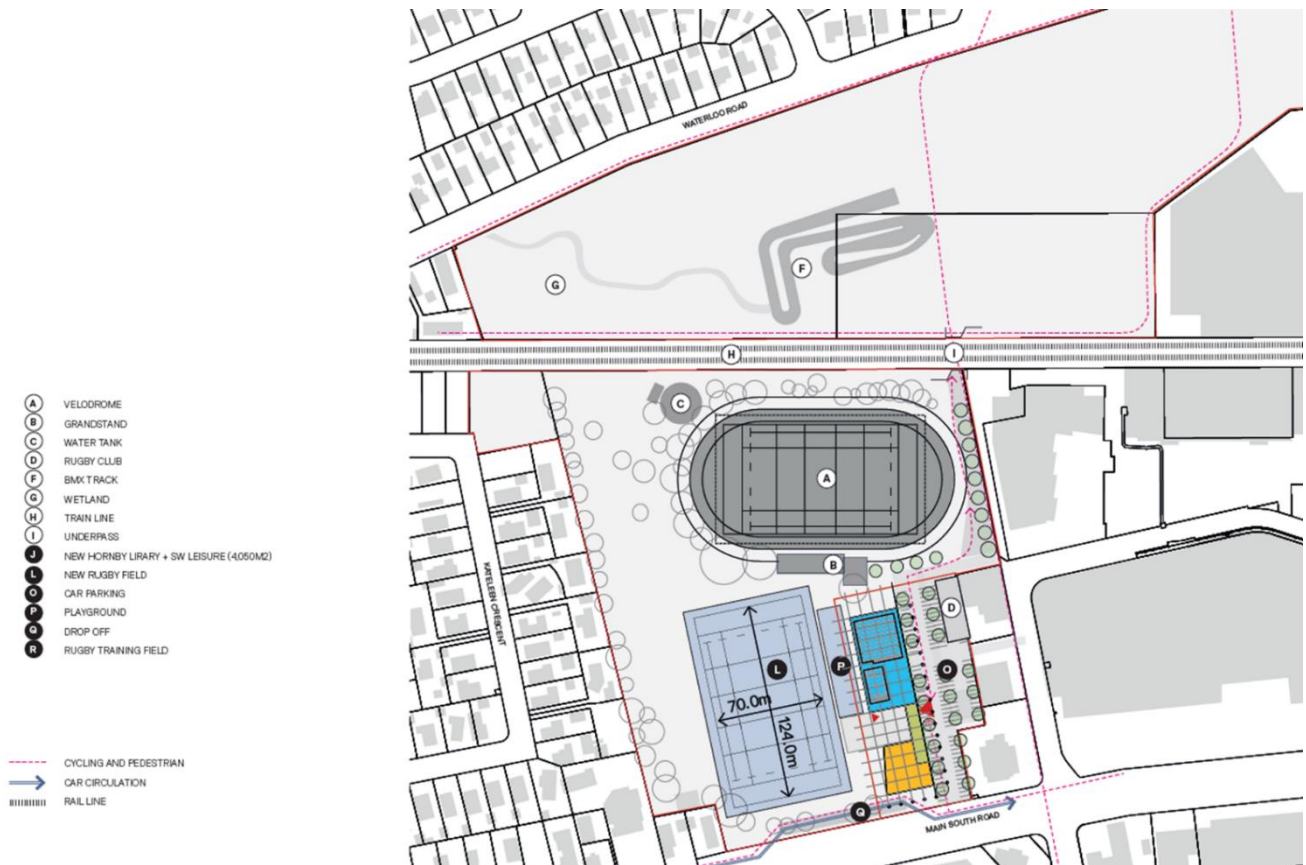


Figure 1-1: Bulk and Location Plan of Proposed Development at Denton Park

1.2 Background

CCC has identified the south west of Christchurch as an area with significant population growth that is expected to continue. The 2009 South West Christchurch Area Plan established a framework for the development of more than 12,000 new homes and 200 hectares of industrial land. The CCC Long Term Plan considered how to provide for the need of this expanding, diverse and changing community. The plan anticipated the provision of a new aquatic facility, new library and new service centre in the south west to provide access to good community facilities and services.

Following a site selection process, incorporating consultation with the wider community and our previous transport advice services, CCC has identified Denton Park as the preferred location for the new community facilities. The facilities have been identified to be likely to include a 4,050m² building consisting of 2,000m² wet sport area, 675m² dry sport area, 750m² library, 250m² governance services and 375m² ancillary areas.

It is understood that from a transport and access perspective, key priorities for CCC are to achieve a site that has proximity to public transport, arterial roads and sufficient car parking provision, with safe active mode (pedestrian and cycle) transport links. CCC has identified these priorities, in order to enable equitable access to all members of the community, including children and those of limited means.

This report has been prepared to assist in the further development of the transport access strategy for the site and the key transport safety matters that may be associated with development at this site. Following this reporting, it is understood that a concept plan will be developed by CCC, and then an Integrated Transport Assessment (ITA) would be required to accompany a resource consent application.

1.3 Report Structure

This report consists of the following structure:

- *Section 2*: provides an overview of the site and how it fits within the current and future transport environment;
- *Section 3*: provides an overview of the proposed development and provides information on the anticipated trip generation and associated parking demand;
- *Section 4*: assesses the impact of the proposed development on the transport network
- *Section 5*: considers the key transport safety matters associated with the proposed development
- *Section 6*: outlines the recommended access strategy of the proposed development
- *Section 7*: provides the summary and recommendations of the report.

2 Site Context

2.1 Surrounding Land-Use

The land uses near the Denton Park site are shown in **Figure 2-1**. To the east of Carmen Road (State Highway 1, SH1), the land use is mainly commercial. The Hub Hornby shopping centre is a major trip attractor in the area and located between the eastern edge of the Denton Park and SH1 Carmen Road. To the west of Carmen Road, Kyle Park and Denton Park, the land use is mainly residential with Hornby High School and Hornby Primary School co-located on the northwest corner of the SH1 Carmen Road / Waterloo Road intersection.

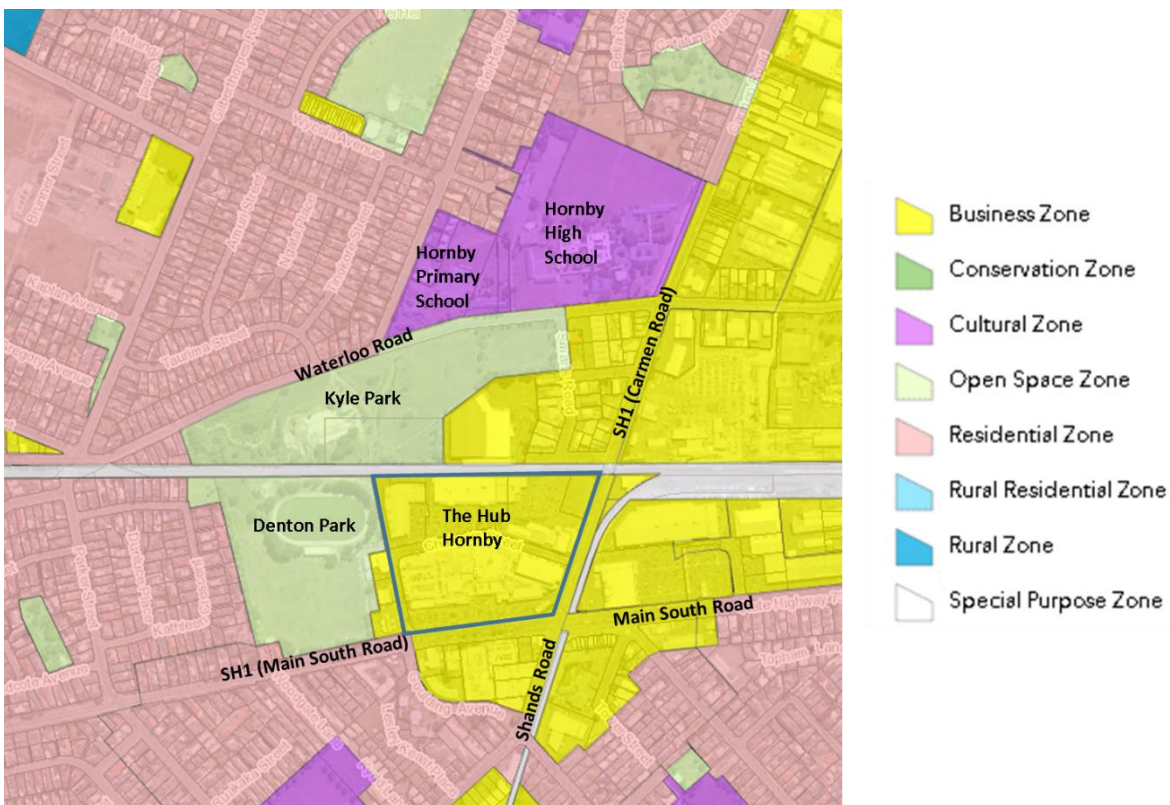


Figure 2-1: Surrounding Land Uses

2.2 Existing Use

Denton Park currently consists of three rugby fields during winter, a cricket pitch during summer, velodrome and small stadium, Hornby Rugby Club clubroom, Hornby Football Club clubrooms and Hornby Cricket Club clubrooms.

2.3 Existing Road Network

The Denton Park site has a southern frontage with SH1 Main South Road with short road frontages on both Chalmers Street and Kathleen Crescent to the northwest and east respectively. The Main South Line rail line travels between Denton Park and Kyle Park. Road crossings of the rail line are located on SH1 Carmen Road and Parker Street. The surrounding roads are shown in **Figure 2-2** below and further described below.

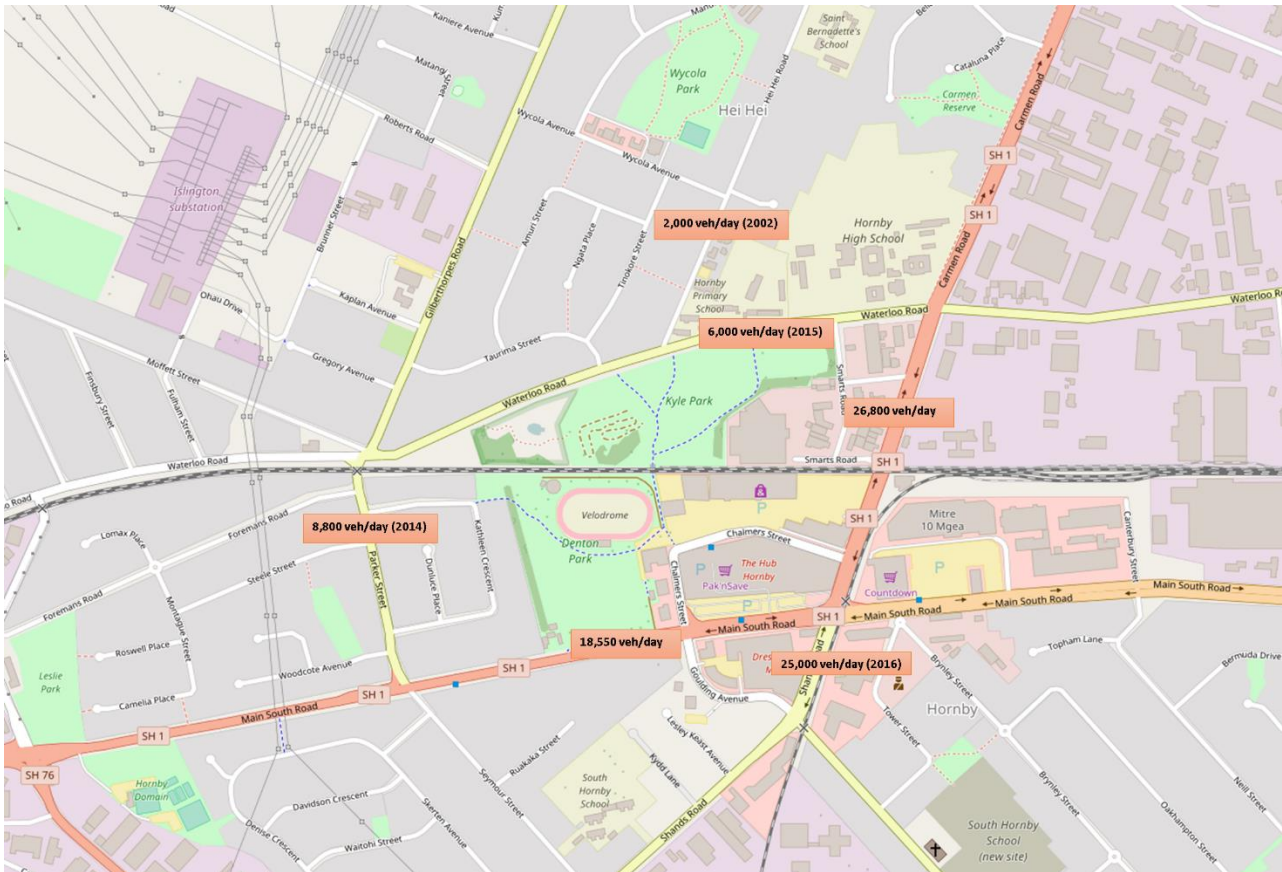


Figure 2-2: Traffic Volumes on Surrounding Side Roads

- SH1 (Carmen Road and Main South Road):** This is a four-lane two-way road to the east of the Denton Park site and a two-lane two-way road to the west of the Denton Park site with associated merge/diverge between these lane configurations occurring on the Denton Park site frontage. The carriageway width varies between approximately 16 and 23m and includes ‘clearways’ on each side on the road that function as bus lanes during the weekday peak periods.

This road is considered a High Volume National Strategic road by NZ Transport Agency (The Transport Agency) and connects Christchurch to Dunedin and Picton. Under the Christchurch District Plan, SH1 is defined as a Major Arterial and is to cater primarily for traffic movement with property access as a secondary function.

- Shands Road:** This is a four-lane two-way road to the south east of the Denton Park site and a two-lane two-way road to the south west of the Goulding Avenue with associated merge/diverge between these lane configurations. The carriageway width at the four lane section is approximately 21m and narrows to approximately 14.5m at the two-lane section. Under the Christchurch District Plan this road is considered a Major Arterial and is intended to cater primarily for traffic movement with property access as a secondary function.

- **Chalmers Street:** This is two-lane two-way road with a 7.5m wide carriageway with ‘no stopping’ lines along most of its length. This road has all main vehicles entrances to ‘The Hub Hornby’ shopping mall and provides two connections to SH1 off Main South Road and Carmen Road. Under the Christchurch District Plan this road is considered a local road and its primary purpose is to provide access to properties.
- **Kathleen Crescent:** This is a two-lane two-way road with a 9m wide carriageway with no parking restrictions and deep-dish channels present between house numbers 1-15 and 2-22. This road intersects with Parker Street twice within a 250m stretch. Under the Christchurch District Plan, this road is considered a local road and its primary purpose is to provide access to properties.
- **Parker Street:** This is a two-lane two-way road with a 12.5m wide carriageway with no parking restrictions and deep-dish channels on both sides. This road connects to SH1 Main South Road and Gilberthorpes Road and also crosses the Main South Line rail line that runs between Denton Park and Kyle Park. Under the Christchurch District Plan, this road is considered a Collector road and its primary purpose is to provide connection between the local and arterial roads.

2.4 South West Area Plan

The Christchurch City Council’s 2009 South West Area Plan (SWAP) outlines the proposed residential areas, community facilities and activities centres for the next 35 years. Some of the proposed facilities, such as the Halswell Library, have already been implemented but there are some areas around Wigram and Hornby that are yet to be developed into residential suburbs.

The new development identified in the SWAP will increase the transport demand for all modes of travel in the south west of Christchurch. The majority of the infrastructure proposed in the south west area will be developed to support the new developments in the south west. Stage 2 of the Christchurch Southern Motorway, which runs through the SWAP, is expected to be completed in 2020 (refer to **Section 2.7**).

2.5 Public Transport

Public transport services available around the two sites are shown in **Figure 2-3** below. The Hub Hornby shopping centre is a key transfer point between high frequency city-bound bus routes and less frequent suburban bus routes in this area.

In terms of the services at this locations:

- The Yellow Bus route is the high frequency bus route that runs every 15 minutes throughout the day and connects The Hub Hornby shopping centre to the CBD to the east and Rolleston/Templeton to the west.
- The number 125 bus route is a suburban bus route that connects the suburbs of Halswell to Redwood with a stop at The Hub Hornby. This service runs every 15 minutes at 8:00am-9:00am and 3:00-5:00am and every 30 minutes outside these times.
- The number 130 bus route is a suburban bus route that connects the suburbs of Avonhead and Hei Hei to The Hub Hornby. This service runs every 15 minutes at 8:00am-9:00am and 3:00-5:00am and every 30 minutes outside these times.
- The number 140 bus route is a suburban bus route that connects the suburbs of Mt Pleasant, Linwood, Riccarton and Russley with a stop at The Hub Hornby and outside Hornby High School. This service runs every 30 minutes throughout the day.

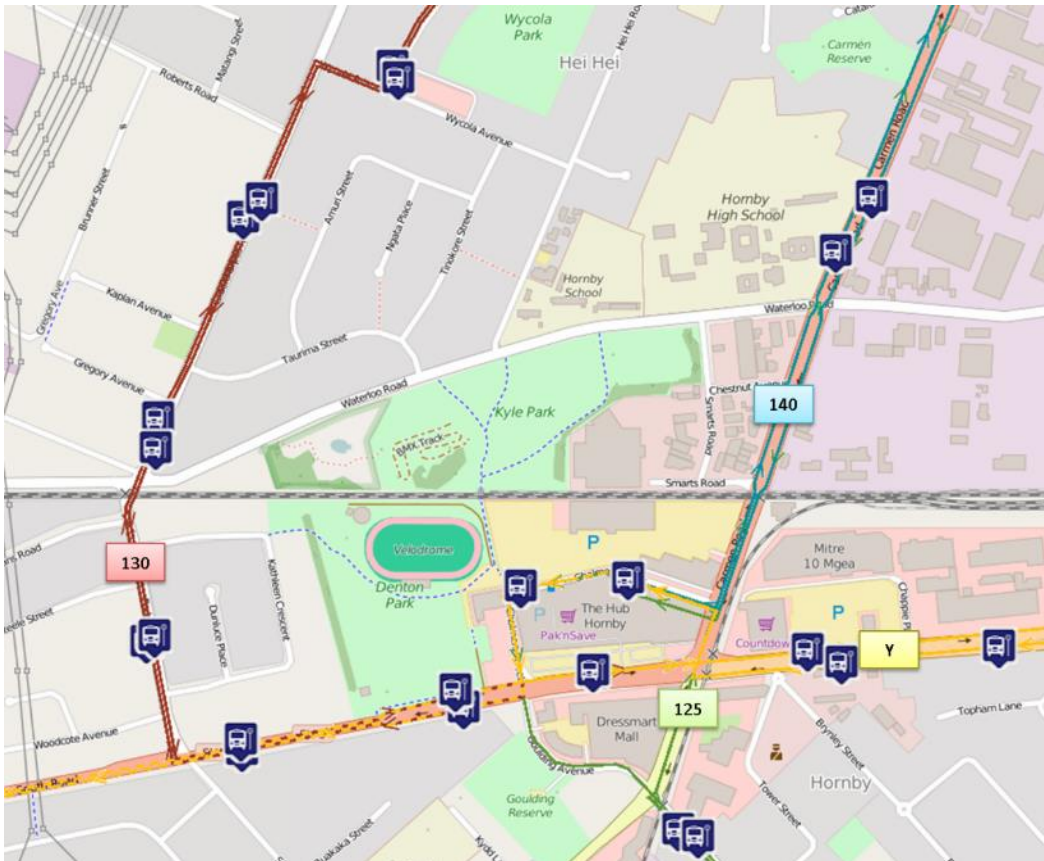


Figure 2-3: Bus Routes around the Hornby Area

2.6 Active Modes

The roads around the Denton Park sites generally have footpaths on both sides. Walking (off-road) paths also connect Waterloo Road to Denton Park via an underpass under the rail line on the boundary between the Denton Park and Kyle Park. The current walking paths to access Denton Park are shown in **Figure 2-4** below.

There are currently limited cycle facilities provided in the vicinity of the Denton Park and Kyle Park sites. The cycle facilities provided are cycle lanes and shared use of the bus lanes on SH1.

As part of the Major Cycleways Project, a new high quality cycleway will be provided along the northern frontage of Kyle Park on Waterloo Road connecting Hornby and Templeton to Hagley Park and the CBD. According to the Draft CCC Long Term Plan (2018-2028), this part of the cycleway is scheduled for completion in the financial year 2022/2023. The paths cyclists and pedestrians can take to Denton Park are shown in **Figure 2-4** below.

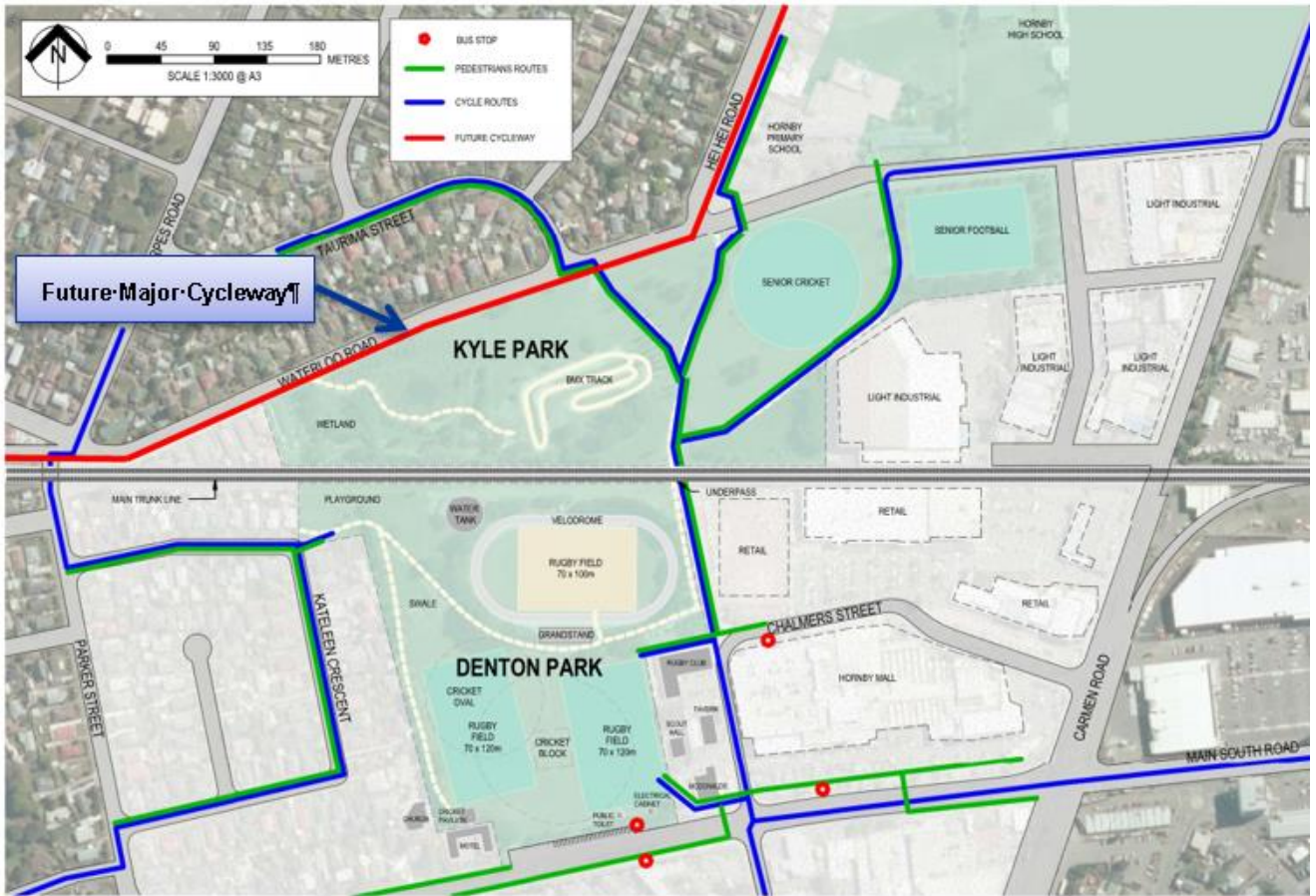


Figure 2-4: Current and Future Pedestrian and Cycle Routes

2.7 Christchurch Southern Motorway – Stage 2

The Christchurch Southern Motorway – Stage 2 (CSM2) is a four-lane motorway that runs from Halswell Junction Road to the north east of Rolleston as shown in **Figure 2-5** below. This project involves greenfield construction between Halswell Junction Road and an interchange with SH1 to the south west of Templeton. South west of the SH1 / CSM2 Interchange, SH1 will be widened to accommodate four lanes of traffic west to Rolleston.

This project is expected to be fully open in 2020 and it is currently scheduled to open prior to the opening of the proposed development. Therefore, it is assumed for the purposes of the analysis of the proposed development that CSM2 will be completed prior to opening the proposed development.

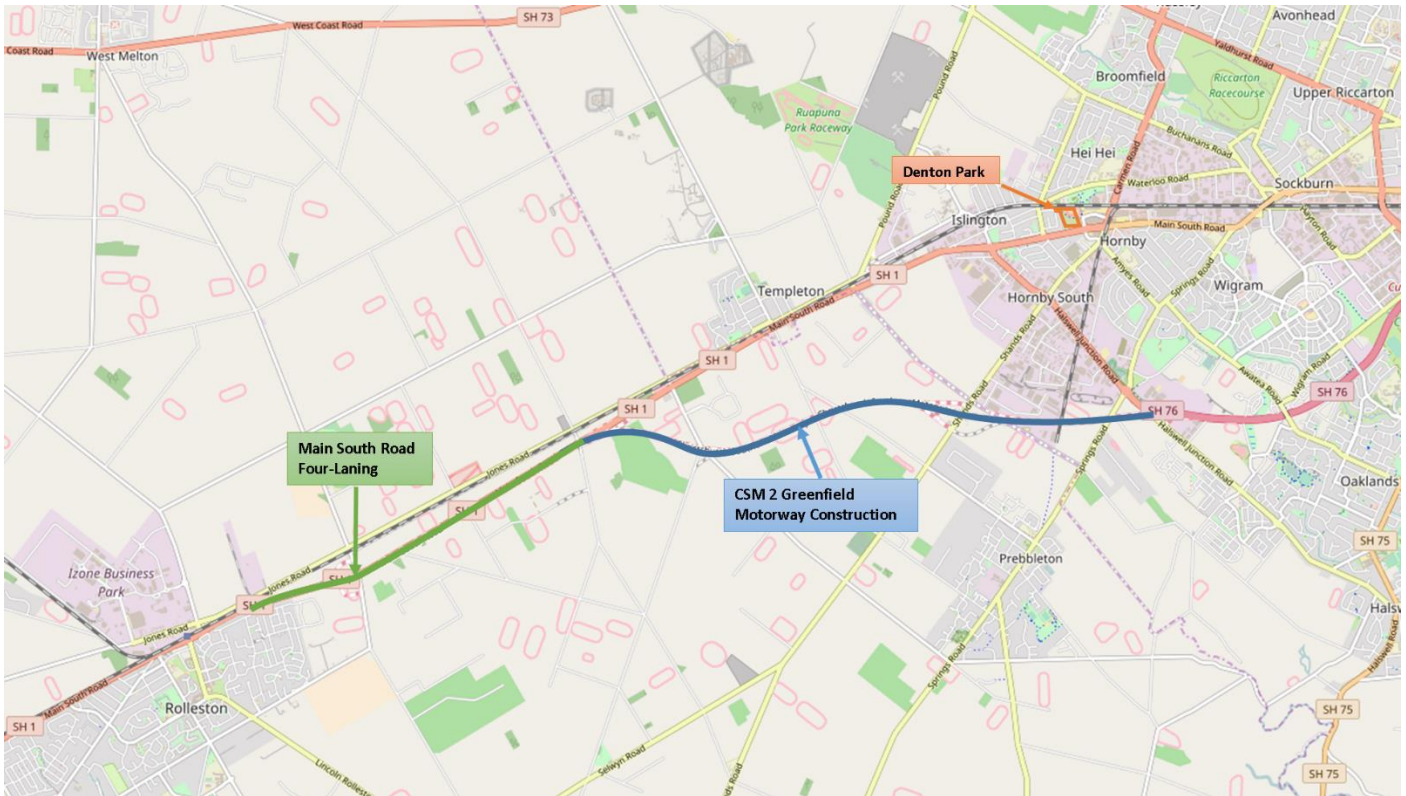


Figure 2-5: CSM2 Alignment

2.8 Summary

The proposed development located on Denton Park provides the opportunity for staff and visitor access using sustainable transport options (walking, cycling and bus services).

The Hornby Superstop is less than 200m from the proposed site and is serviced by a number of suburban bus routes and the high frequency Yellow Route that runs to the Christchurch CBD. This close proximity to a number of bus routes allows for easy access to the site by bus, which will encourage bus use.

The proposed development is also within 500m of the proposed Southern Express Major Cycle Route that is currently due to be constructed two to three years after the opening of the proposed development. Once constructed, the Southern Express Major Cycle route provides a safe and convenient link to the Major Cycleway Network, encouraging people to cycle to the proposed development.

The proposed development is also adjacent to The Hub Hornby shopping centre that results in a short walk between the two facilities. This encourages visitors to link multiple trips together without the need to undertake a separate trip to get between the two facilities.

3 Development Overview

3.1 Proposed Development

The proposed development is a 4,050m² facility that consists of a relocation of the Hornby Library and Service Centre as well as new leisure pools and gym. The proposed development consists of the following components:

- 2,000m² wet sport area including changing rooms, leisure area, sauna, spa and associated plant
- 675m² dry sport area including group exercise and fitness rooms with associated offices/changing areas
- 750m² library
- 250m² for governance services including meeting rooms and board rooms
- 375m² in ancillary services including lobby, reception, café administration area and toilets.

CCC has indicated that the Library and Service Centre (library, governance services and ancillary services) is expected to attract 150,000 visitors per year. The SWLC (wet and dry sport areas) is expected to attract 220,000 visitors per year.

The current proposed access arrangements for the proposed development consists of two accesses on Chalmers Street and separate left in entry and left in exit arrangement on SH1. Additional access to the proposed development could potentially be obtained from a Kathleen Crescent, if required. These access points are shown in **Figure 3-1**. The purpose of this report is to further test this access strategy.

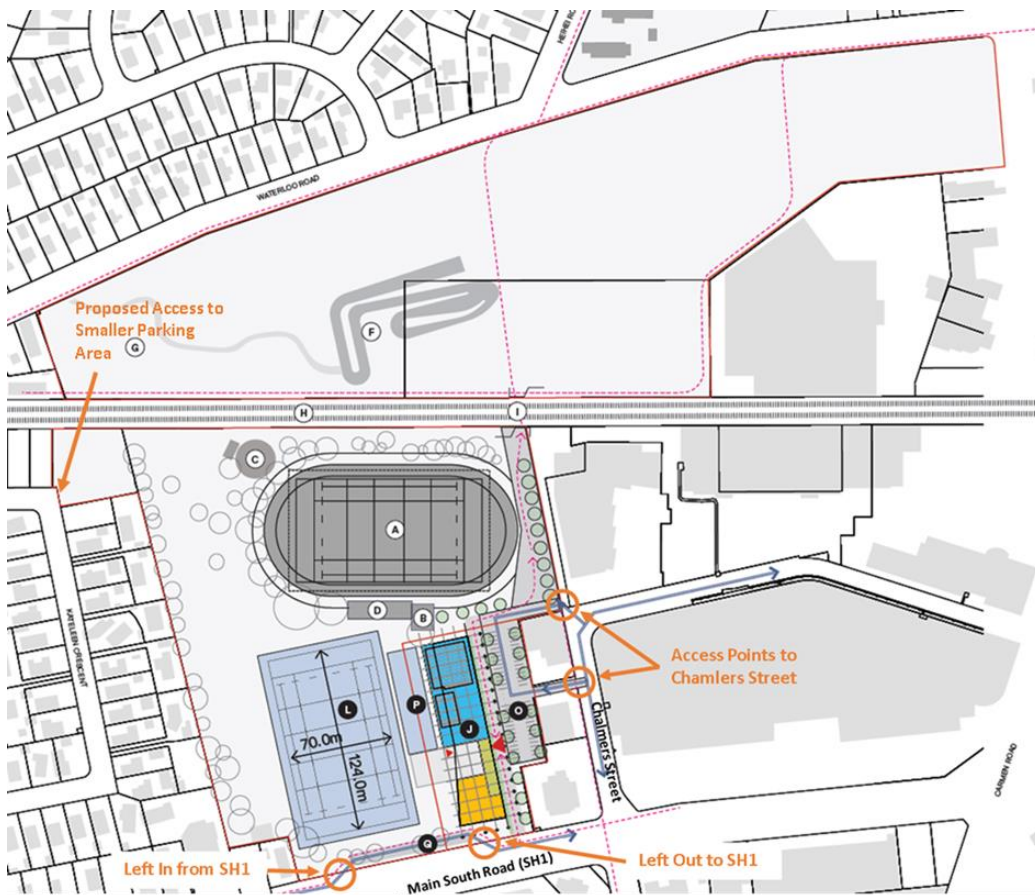


Figure 3-1: Potential Access Locations for the Proposed Development

3.2 Existing Use

The proposed development will require the relocation of one of the existing rugby fields. However, at this stage it is considered that existing activities on Denton Park could continue to occur after the proposed development is completed. As such, the proposed development is unlikely to result in a change in background traffic.

The Hornby Library and Service Centre is currently located at Goulding Avenue, approximately 100m south of the SH1 / Chalmers Street / Goulding Avenue intersection. However, details on current and future usage of this facility is currently not available so the reduction in background traffic due to the relocation of this facility has not been considered at this stage.

There is potential that some existing sports clubs may wish to relocate from Denton Park. However, this has not been finalised and as such is not relied upon for the assessment of the proposed development.

3.3 Vehicle Trip Generation

3.3.1 Proposed Development

The typical industry standard source of traffic and person trip generation in New Zealand is the New Zealand Trips and Parking Database (NZTPDB). However, there is currently little information available in the NZTPDB for Aquatic Centres and no information available for the usage of Libraries.

A combination of a 'first principles' approach and other typical sources of traffic/person trip generation has therefore been used to determine the potential customer numbers and assess the likely traffic generation. The only suitable information available at the time of this assessment was the Institute of Transportation Engineers Trip Generation 7th Edition (USA) and the TRICS (UK) database, which are also typical industry sources of traffic generation in NZ. CCC has supplied some high level information on anticipated demand for the proposed development. CCC has indicated that the Library and Service Centre is expected to attract 150,000 visitors per year and the SWLC is expected to attract 220,000 visitors per year.

Based on the ITE Trip Generation 7th Edition, a Library typically generates on average 16% of the weekly traffic on a weekday and 15% on a Saturday that translates to approximately 460 visitors per day on a weekday and Saturday. The NZ Household Travel Survey (NZHTS) 2015 states that the total amount of recreational travel is similar for weekends and weekdays (i.e. 50% of weekly trips occur over weekdays and 50% of weekly trips occur over the weekend). Applying this to the SWLC results in approximately 420 visitors per weekday. The SWLC facility is predominately to be used for un-structured leisure activities so trips generated on Saturday and Sunday are likely to be similar therefore Saturdays and Sunday are likely to generate 1,060 visitors per day. This is deemed appropriate for determining the approximate proportion of weekday traffic generated during the morning (AM), evening (PM) and Saturday peak hours.

The resulting predicted patronage calculations are shown in **Table 3-1** and **Table 3-2** below.

Table 3-1: Predicted AM and PM Peak Patronage Calculations

Activity	Expected Weekday Trips (In+Out)	Proportion of Daily Trips During AM Peak	Expected Trips During AM Peak	Proportion of Daily Trips during PM Peak	Expected Trips During PM Peak
Library	460 people generating 920 total weekday trips	2%*	18 trips	13%*	130 trips
SWLC	420 people generating 840 total weekday trips	6%#	50 visitors	13%#	110 trips

* - Derived from ITE Trip Generation 7th Edition (USA)

- Derived from TRICS Database (UK)

Table 3-2: Predicted Saturday Peak Patronage Calculations

Activity	Expected Weekend Trips (In+Out)	Proportion of Daily Trips During Saturday Peak Hour	Expected Trips During Saturday Peak Hour
Library	460 people generating 920 total weekday trips	14%*	130 trips
SWLC	1,060 people generating 2,120 total weekday trips	15%#	320 trips

* - Derived from ITE Trip Generation 7th Edition (USA)

- Derived from TRICS Database (UK)

The NZHTS 2015 identifies the mode share for cars for all recreation related trips was 59% with an average vehicle occupancy of 1.51 people per vehicle. The mode share for public transport was 5%, cycling was 6% and walking was 31% of all recreation related trips.

For the purposes of this analysis, the mode share for vehicles was assumed to be 95%, as this represents a higher traffic generating scenario, should the adjacent commercial development and nearby high volume roads potentially discourage trips by active modes. It is expected that the Library will have a lower car occupancy than the NZHTS for recreational trips, as this tends to be a more solitary (one person) activity, so it has been assumed the vehicle occupancy for people using the library is 1.2 people per vehicle. The SWLC offers more social / group activities and it is expected that the vehicle occupancy for the SWLC will be higher than the average occupancy for recreational activities. This has therefore been assumed to be two people per vehicle, including parents travelling with children to swimming classes etc.

The proportion of vehicles entering and exiting the proposed development is based on the information extracted from the ITE (US) and TRICS (UK) databases. Generally the in/out split is approximately even except for the Library during the AM Peak. This indicates the majority of the trips to the Library during the AM Peak are likely to be staff members. The resulting predicted trips during the AM, PM and Saturday peaks are shown in **Table 3-3** to **Table 3-5** below.

Table 3-3: Predicted Vehicle Movements Generated during AM Peak

Activity	Expected Patronage During AM Peak	Expected Vehicle Mode Share	Expected Vehicle Occupancy (People/Vehicle)	In/Out Spilt	Vehicles In	Vehicles Out
Library	18 trips	95%	1.2	72% Entering 28% Exiting*	10 vehicles	4 vehicles
SWLC	50 trips	95%	2	53% Entering 47% Exiting#	13 vehicles	11 vehicles
Total	68 trips	-	-	-	23 vehicles	15 vehicles

Table 3-4: Predicted Vehicle Movements Generated during PM Peak

Activity	Expected Patronage During PM Peak	Expected Vehicle Mode Share	Expected Vehicle Occupancy (People/Vehicle)	In/Out Spilt	Vehicles In	Vehicles Out
Library	120 trips	95%	1.2	48% In 52% Out*	46 vehicles	49 vehicles
SWLC	110 trips	95%	2	51% In 49% Out#	27 vehicles	26 vehicles
Total	230 trips	-	-	-	73 vehicles	75 vehicles

Table 3-5: Predicted Vehicle Movements Generated during Saturday Peak

Activity	Expected Patronage During PM Peak	Expected Vehicle Mode Share	Expected Vehicle Occupancy (People/Vehicle)	In/Out Spilt	Vehicles In	Vehicles Out
Library	130 trips	95%	1.2	50% In 50% Out*	51 vehicles	51 vehicles
SWLC	320 trips	95%	2	51% In 49% Out#	78 vehicles	74 vehicles
Total	450 trips	-	-	-	129 vehicles	126 vehicles

The proposed development is within 200m of The Hub Hornby, so it is anticipated there will be some trip chaining (linked trips) by visitors, who were visiting The Hub Hornby and may already be using the surrounding road network. Based on parking reduction factors on Table 7.5.14.1 of the City Plan, it is therefore estimated that 10% of vehicles visiting the proposed development would also be visiting The Hub Hornby. As such, these vehicles are already on the road network and a reduction of 10% can be applied to the vehicles generated by the proposed development. **Table 3-6** details the vehicles generated by the proposed development with and without the adjustment for trip chaining (linked trips).

Table 3-6: Trip Chaining Vehicle Movement Adjustment

	Vehicles In (Not Adjusted for Trip Chaining)	Vehicles Out (Not Adjusted for Trip Chaining)	Trip Chaining Reduction Factor	Vehicles In (Adjusted for Trip Chaining)	Vehicles Out (Adjusted for Trip Chaining)
AM Peak	34 vehicles	25 vehicles	10%	31 vehicles	22 vehicles
PM Peak	97 vehicles	98 vehicles	10%	87 vehicles	88 vehicles
Saturday Peak	129 vehicles	126 vehicles	10%	116 vehicles	113 vehicles

3.4 Trip Assignment

For the purposes of trip assignment, it has been assumed that trips to and from the proposed development will be home based (i.e. trips start and end at the home of visitors). The approximate catchment of the proposed development is anticipated to include the suburbs of Hornby, Hei Hei, Broomfield, North Wigram, Islington, Hornby South and the western side of Sockburn. The catchment has been divided up based on the likely approach to the proposed development as shown in **Figure 3-2** and **Figure 3-3**.

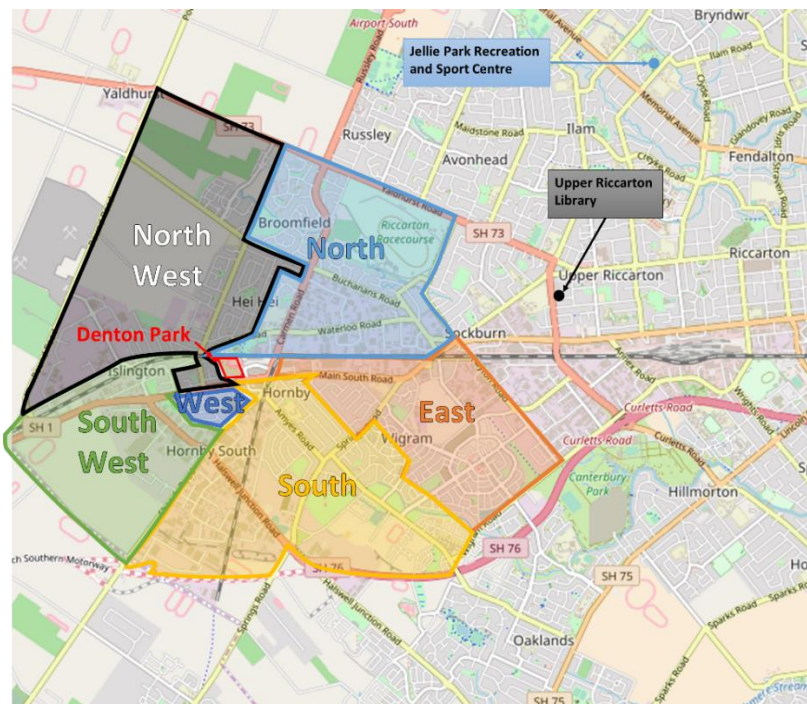


Figure 3-2: Catchment Assignment to areas

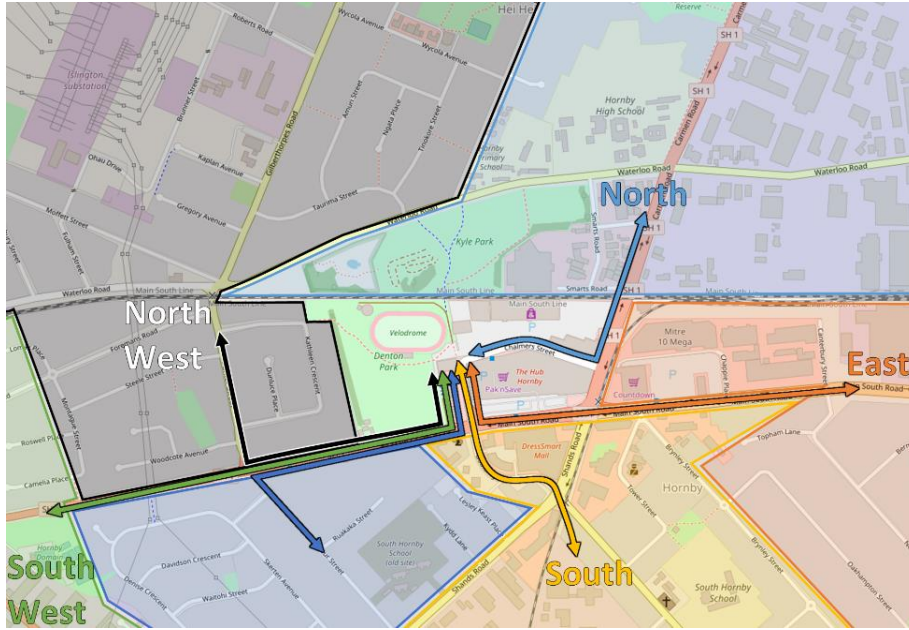


Figure 3-3: Route of Suburbs Approaching the Proposed Development

There is an equally likely chance for a visitors to come from each of the suburbs so the proportion of visitors from each area is assumed to be based on the population of each area. The population of the each of the areas has been taken from the land use inputs for the CTM model in the 2021 and 2031 model years. There is some variation in the population within the catchment. Although when combining with adjacent suburbs that are likely to use a similar route, the variation is typically less than 1.5%. Therefore, an average of the 2021 and 2031 model years has been taken to give the average location on visitors between 2021 and 2031.

Table 3-7: CTM Model Population and Anticipated Proportion of Visitors

Suburb Location	CTM Population 2021	CTM Population 2031	Average (2021/2031)	Anticipate Proportion of Visitors
North	4358	4205	4282	16%
East	8932	9777	9355	35%
South	4813	5092	4953	18%
West	1208	1256	1232	5%
South West	711	675	693	3%
North West	6445	6460	6453	24%

3.5 Anticipated Parking Requirements

There is currently little information regarding the detailed operation of the proposed development. The Library and SWLC are both leisure facilities without structured activities and as such are likely to have a similar vehicle arrival profile. The parking demand profile of the likely parking demand for the SWLC has been used to estimate the likely profile for the Library.

The TRICS database indicates that the maximum parking demand is on average 63% of the peak parking trip generation in the weekend. Applying this to the proposed development results in a parking demand of 144 parking spaces.

As such, it is recommended further surveys of similar facilities around Christchurch are conducted to assist in 'benchmarking' the likely arrival and departure profile, as further detail of the proposed development concept is progressed for a resource consent application.

4 Assessment of Transport Effects

4.1 Location Opportunities

The proposed development will group a number of community provided leisure activities/services (library, gym, leisure pools) together in close proximity to a large shopping centre and community fields. These type of facilities are considered discretionary activities, where people tend to visit them for leisure in their spare time. As such, people may want to use a number of these facilities in a single trip. Currently, this requires people to journey to a number of different locations in the west of Christchurch that would typically be completed in a car.

The proposed development will consolidate these facilities into an area that allows easy pedestrian access between them, reducing the length and number of trips required for people to visit multiple discretionary activities. The proposed development provides a location that is well connected to the sustainable transport network (i.e. Major Cycle Route and Hornby Superstop), so this will encourage staff and visitors to use these modes to access the proposed development.

The proposed development is also located at the centre of the anticipated catchment, which extends for approximately 3km from the site, making the walking or cycling distances viable¹, as shown in **Figure 3-1**. Indeed, public feedback to CCC during the site selection consultation, indicated that many people considered walking, cycling and travelling by bus were realistic options, when travelling to and from for the proposed development (refer to **Figure 3-1**).

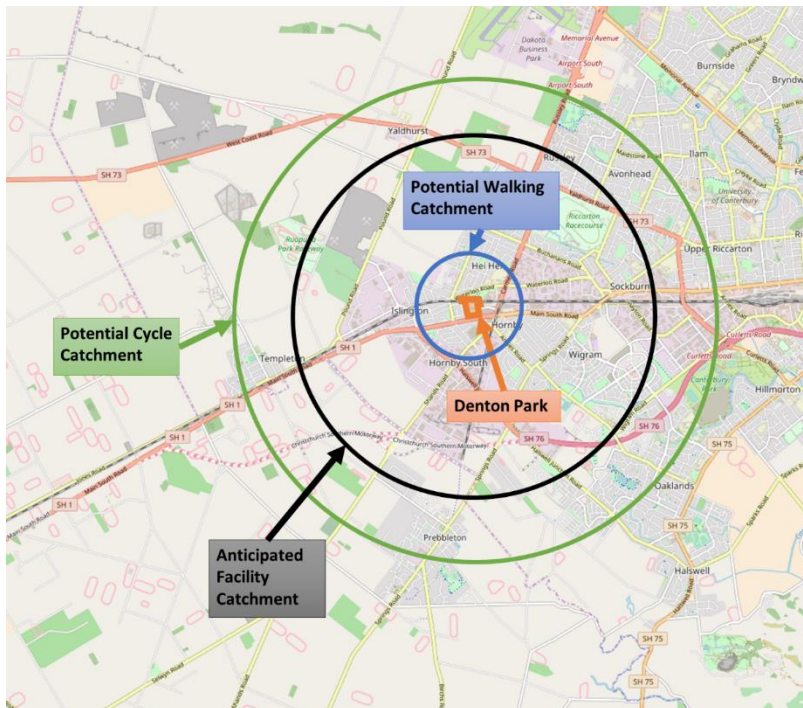


Figure 4-1: Potential Walking and Cycling Catchment

¹ Based on average walking distance per trip of 800m and average cycling distance per trip of 4.5km (NZ Household Travel Survey)

4.2 Traffic Modelling

4.2.1 Overview

Anecdotally, the busiest part of the road network near Denton Park is the Main South Road / Carmen Road / Shand Road and Main South Road / Chalmers Street / Goulding Avenue intersections. To assess the potential 'worst case' scenario for access to the proposed development, it has been assumed all vehicle access is to be taken from Chalmers Street. This will help develop the access strategy, as it provides information on whether additional access points are required to spread the traffic demand on the adjacent road network to manage the impact of the proposed development.

Two traffic models have been developed to assess the impact of the proposed development on the adjacent road network.

- A LinSig model was developed to assess the impacts on the closely spaced intersections around The Hub Hornby as shown in **Figure 4-2**. A LinSig model of this area was chosen for the closely spaced intersections to model the traffic platooning and coordination required to effectively model these intersections without undertaking micro-simulation.
- A SIDRA model was developed to model the impact on the SH1 / Parker Street / Seymour Street intersection as shown in **Figure 4-2**. A SIDRA model was chosen at this location as it is far enough from adjacent signalised intersections that the impact of queue progression from adjacent signalised intersection will be less significant.

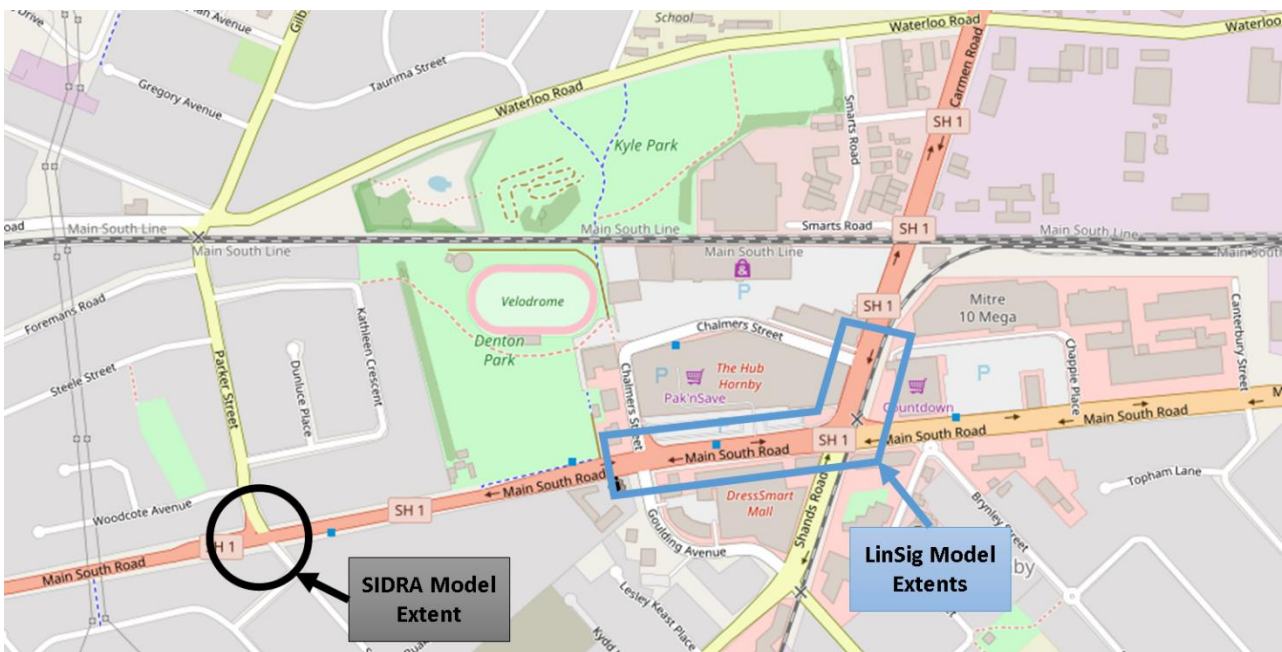


Figure 4-2: Models Developed to Assess Impacts of Proposed Development

The models will consider the 2021 and 2031 PM and Saturday peak hours as these two periods represent the more critical operational periods. The primary purpose of the 2021 models is to assess the effects of the proposed development. The primary purpose of the 2031 is to highlight longer term network operational performance in the area that may need to be considered by CCC and the Transport Agency.

A Level of Service assessment will be conducted to qualitatively assess the impact of the proposed development on the transport network. This system consists of the following bands:

- A: is free flow conditions where traffic flows near the posted speed limit. Motorists have a high level of comfort. This usually occurs at night in urban areas
- B: is reasonably free flow where speeds are maintained and manoeuvrability is slightly restricted. Motorists have a high level of comfort
- C: is stable flow at or near free flow. The ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness.
- D: is approaching unstable flow. Speeds slightly decrease as traffic volume slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease.
- E: is unstable flow operating at capacity. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream and speeds rarely reach the posted limit
- F: is forced or breakdown flow. Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity

4.2.2 Model Calibration

4.2.2.1 LinSig Model

The model has been calibrated against queue length surveys done in the PM peak on 7 December 2017. The demand matrices for calibration have been determined by furnishing the 2016 PM peak CAST matrix using traffic counts taken at the same time as the queue length surveys with the full model calibration provided in **Appendix A**.

The calibrated model has been validated using an estimated trip matrix based on furnishing the CAST inter-peak model against observed traffic counts on Saturday 17 February 2018 similar to the model calibrations. The outputs of the model were compared against the queue length measurements also taken on 17 February 2018 and found a reasonable level of agreement between the model and observed queue lengths as shown in **Appendix B**.

4.2.2.2 SIDRA Model

The SIDRA model for the PM peak has been calibrated against queue lengths observed during the traffic counts conducted 7 December 2017 and SCATS data obtained for the same time period. The following changes were made to default SIDRA model inputs:

- The signal phasing was set to the average phase time obtained from the SCATS data
- The all-red times were reduced from 2 seconds to 1 second to match what was observed on site
- The number of pedestrians crossing was reduced to the number of pedestrian call obtained from SCATS data to more accurately reflect the number of pedestrian calls
- Set the signal coordination on the westbound approach to favourable as this is the dominant flow direction and will have some coordination with the upstream signals
- Provided 10% extra bunching on Seymour Street and Main South Road Westbound approaches and 5% extra bunching on Main South Road Eastbound due to upstream signals

The results of SIDRA model calibration and observed queue lengths are shown in **Table 4-1**. This displays that the model with the default inputs and changes mentioned above over estimates the amount of queuing observed on site. As such, the model is likely to show more queuing and delay than what is being experienced in reality.

Table 4-1: Modelled and Observed Queue Lengths for the PM Peak Period

Approach	Seymour Street	Main South Road [Westbound]	Parker Street	Main South Road [Eastbound]
Observed PM Peak 50% Queue Length (Vehicles)	7	14	7	10
2017 PM Peak Modelled 50% Queue (Vehicles)	12	25	25*	15

*Movement over capacity

The same model methodology used in the calibration of the PM peak model was used on the traffic counts data and SCATS data collected on Saturday 17 February 2018 to provide a validation of the model with the results shown in **Table 4-2**. This also displays an over estimation of the amount of queuing observed on site and as such the model is likely to show more queuing and delay than what is being experienced in reality.

Table 4-2: Modelled and Observed Queue Lengths for the Saturday Peak Period

Approach	Seymour Street	Main South Road [Westbound]	Parker Street	Main South Road [Eastbound]
Observed Saturday Peak 50% Queue Length (Vehicles)	4	11	7	10
2017 Saturday Peak Modelled 50% Queue (Vehicles)	3	19	9	19

4.2.3 Assessment of Access Requirements

4.2.3.1 Forecast Background Traffic Demands

To assess the access requirements to facilitate the proposed development on Denton Park, the key time periods to consider are the PM peak hour (when the background traffic is at its peak) and the Saturday peak hour (when the proposed development will generate the most traffic). As such, the AM peak hour has not been considered, however, may need to be considered as part of the ITA to support resource consent.

The traffic flows for modelling the PM peak have been taken from the 2021 and 2031 PM peak hour CAST models. However, this model does not adequately model traffic associated large shopping centres and local parks. As such, the furnishing exercise against traffic counts undertaken on 7 December 2018 was completed as part of the model calibration that was applied to the traffic volumes extracted from the 2021 and 2031 PM peak hour CAST models.

There is currently no Saturday traffic model so the trip matrix required for LinSig was estimated by furnessing the 2016 interpeak CAST model against traffic counts conducted on 17 February 2018. The furnessing was applied to the 2021 and 2031 interpeak CAST models to provide trip matrices for the 2021 and 2031 Saturday Peak. The interpeak CAST model was selected to approximate the Saturday peak as this does not have the tidal home-work flows present in the AM and PM peak models.

To estimate the 2021 and 2031 PM peak and Saturday peak traffic flows for input into the relevant SIDRA models, the observed traffic flows (collected on 7 December 2017 and 17 February 2018) have been scaled based on the relative change in approach traffic volume. The PM peak also had a portion of the absolute change in approach volume prorated amongst the movements at each approach to dampen the effects of large relative changes that would be unrealistic if applied to the observed counts.

4.2.3.2 LinSig Modelling

The furnished trip matrices for the 2021 and 2031 PM and Saturday Peak periods have been inputted into the model retaining the current phasing arrangements and cycle times (114 seconds during the Saturday Peak and 111 seconds during the PM Peak). Sub-scenarios with pedestrian demand and without pedestrian demand have been completed for the LinSig model to represent the potential upper-bound and lower-bound performance of the intersection for a range of pedestrian crossing demands at the intersections. The results of this modelling has been provided in **Appendix C**.

The change in the average delay for arrival and departure movements at Chalmers Street for each origin/destination route, which experience an increase in traffic is shown in **Table 4-3** and **Table 4-4** below for 2021 and 2031 respectively. The change in average delay experienced by vehicles in the base case (without the proposed development) and with the proposed development at the Main South Road / Chalmers Street / Goulding Street and Main South Road / Shands Road / Carmen Road is shown **Table 4-5** below.

Table 4-3: 2021 Difference in Average Delay between Base Model and Post Development Model (Base Model Delay shown in Brackets)

Origin / Destination	Arrival Movements				Departure Movements			
	With Pedestrian Demand		Without Pedestrian Demand		With Pedestrian Demand		Without Pedestrian Demand	
	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak
North	1s (25s)	<1s (30s)	1s (25s)	<1s (30s)	<1s (30s)	1s (30s)	<1s (30s)	1s (30s)
East*	<1s (30s)	29s (40s)	3s (35s)	14s (40s)	<1s (45s)	4s (40s)	<1s (50s)	5s (40s)
South	<1s (30s)	<1s (30s)	<1s (25s)	2s (25s)	<1s (40s)	2s (35s)	<1s (40s)	6s (35s)
North West, South West, West	<1s (30s)	3s (35s)	3s (25s)	<1s (30s)	3s (35s)	40s (70s)	<1s (35s)	69s (60s)

*Delay occurs at two intersections so delay has been halved to allow comparison a delay per intersection basis

Table 4-4: 2031 Difference in Average Delay between Base Model and Post Development Model (Base Model Delay shown in Brackets)

Origin / Destination	Arrival Movements				Departure Movements			
	With Pedestrian Demand		Without Pedestrian Demand		With Pedestrian Demand		Without Pedestrian Demand	
	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak
North	<1s (25s)	<1s (30s)	<1s (25s)	<1s (30s)	<1s (55s)	1s (30s)	5s (50s)	<1s (30s)
East*	<1s (35s)	58s (60s)	<1s (35s)	58s (60s)	1s (45s)	7s (45s)	3s (50s)	7s (45s)
South	1s (25s)	<1s (30s)	1s (20s)	<1s (25s)	3s (45s)	6s (40s)	3s (40s)	6s (40s)
North West, South West, West	<1s (35s)	2s (40s)	<1s (30s)	2s (30s)	5s (35s)	168s (115s)	5s (35s)	159s (115s)

*Delay occurs at two intersections so delay has been halved to allow comparison a delay per intersection basis

Table 4-5: Difference in Average Intersection Delay between Base Models and Post Development Models (Base Model Delay shown in Brackets)

Intersection	With Pedestrian Demand				Without Demand			
	2021		2031		2021		2031	
	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak
Chalmers Street / Seymour Street / SH1 Intersection	1s (20s)	14s (25s)	2s (25s)	37s (40s)	1s (20s)	13s (25s)	1s (25s)	36s (35s)
SH1 / Shands Road / Main South Road Intersection	2s (60s)	2s (55s)	2s (60s)	3s (55s)	2s (60s)	2s (55s)	2s (60s)	2s (55s)

This shows that during the PM peak the change in delay for these movements is typically less than 10 seconds. The movements that experience an increase in delay have a Level of Service of E² or better in the base model (without the proposed development) and retain their existing Level of Service in the model with the proposed development.

The results from the 2021 and 2031 Saturday peak modelling (noting this uses the existing phasing arrangement and cycle time) indicate that the proposed development will have a significant impact on movements, where additional traffic is generated by the proposed development. This results in the average delay experienced at the SH1 / Chalmers Street intersection increasing significantly and reducing the Level of Service at this intersection to an unacceptable level as shown in **Table 4-5**.

The right turning movement in and out of Chalmers Street, as shown in **Figure 4-3**, are the movements that are shown to be beyond theoretical capacity of the movements and therefore resulting in the predicted delays at the intersection. These movements currently operate as filter movements with the conflicting traffic currently under capacity. A potential solution for this issue is to alter the phasing arrangement at the SH1/ Chalmers Street intersection to allow the overcapacity movements to clear the intersection without conflicting movements. As such, a potential revision to the phasing at the Main South Road / Chalmers Street / Goulding Avenue intersection is shown **Figure 4-3**.

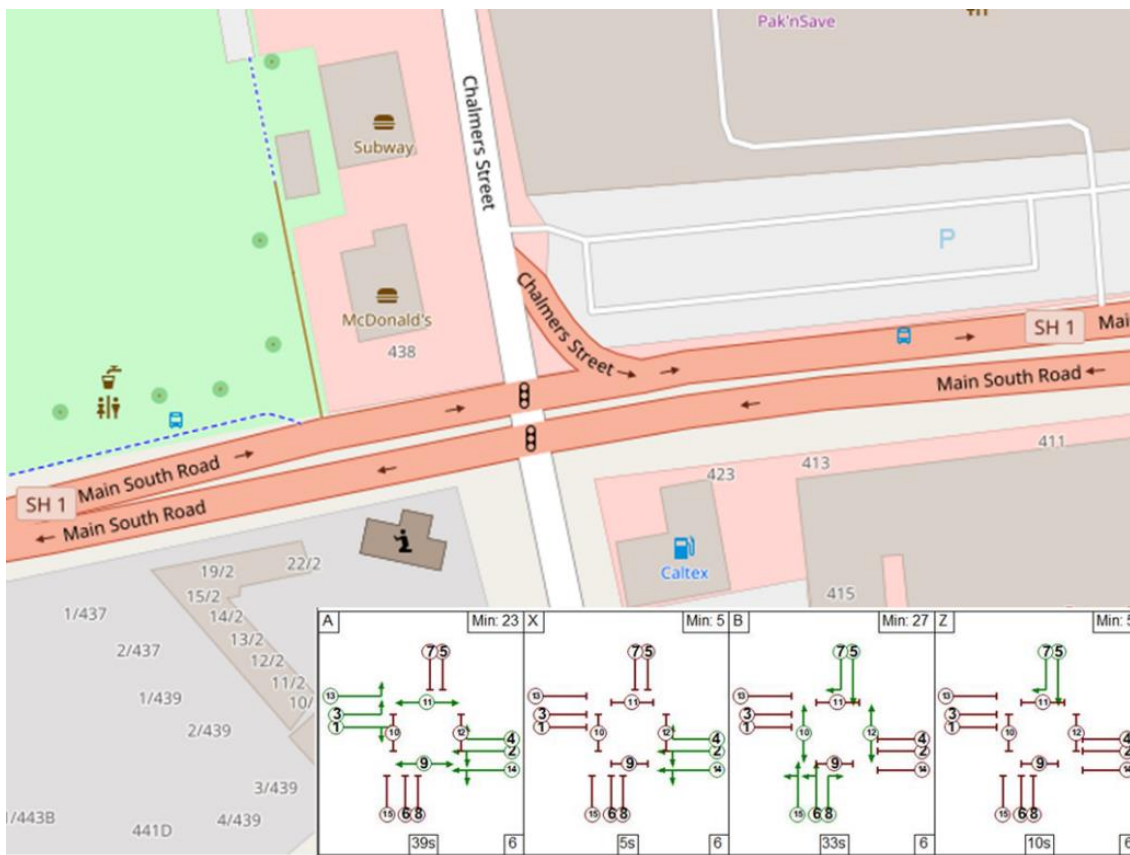


Figure 4-3: Revised Phasing at the Main South Road / Chalmers Street / Goulding Avenue Intersection

² Based on average vehicle delay (using HCM 2010)

The results of this phasing arrangement is also shown in **Appendix C** with the average delay for the movements with additional traffic generated by the proposed development shown in **Table 4-6** and **Table 4-7** with the average intersection delay shown in **Table 4-8** below.

Table 4-6: 2021 Difference in Average Delay between Base Model and Post Development Model with Revised Signal Phasing (Base Model Delay shown in Brackets)

Origin / Destination	Arrival Movements				Departure Movements			
	With Pedestrian Demand		Without Pedestrian Demand		With Pedestrian Demand		Without Pedestrian Demand	
	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak
North	<1s (25s)	<1s (30s)	2s (25s)	<1s (30s)	<1s (30s)	1s (30s)	<1s (30s)	1s (30s)
East*	<1s (30s)	2s (40s)	<1s (35s)	<1s (40s)	<1s (45s)	5s (40s)	<1s (50s)	6s (40s)
South	17s (30s)	17s (30s)	14s (25s)	17s (25s)	8s (40s)	4s (35s)	8s (40s)	6s (35s)
North West, South West, West	5s (30s)	20s (35s)	5s (25s)	11s (30s)	9s (35s)	3s (70s)	9s (35s)	10s (60s)

*Delay occurs at two intersections so delay has been halved to allow comparison a delay per intersection basis

Table 4-7: 2031 Difference in Average Delay between Base Model and Post Development Model with Revised Phasing (Base Model Delay shown in Brackets)

Origin / Destination	Arrival				Exit			
	With Pedestrian Demand		Without Pedestrian Demand		With Pedestrian Demand		Without Pedestrian Demand	
	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak
North	<1s (25s)	<1s (30s)	<1s (25s)	<1s (30s)	2s (55s)	1s (30s)	4s (50s)	<1s (30s)
East*	<1s (35s)	<1s (60s)	<1s (35s)	<1s (60s)	<1s (45s)	8s (45s)	<1s (50s)	9s (45s)
South	19s (25s)	32s (30s)	15s (20s)	29s (25s)	17s (45s)	9s (40s)	15s (40s)	9s (40s)
North West, South West, West	4s (35s)	32s (40s)	5s (30s)	18s (30s)	15s (35s)	<1s (115s)	15s (35s)	<1s (115s)

*Delay occurs at two intersections so delay has been halved to allow comparison a delay per intersection basis

Table 4-8: Difference in Average Intersection Delay and Largest Change in Travel Time between Base Models and Post Development Models with Revised Phasing

Intersection	With Pedestrian Demand				Without Demand			
	2021		2031		2021		2031	
	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak	PM Peak	Saturday Peak
Chalmers Street / Seymour Street / SH1 Intersection	5s (20s)	9s (25s)	8s (25s)	11s (40s)	4s (20s)	9s (25s)	7s (25s)	6s (35s)
SH1 / Shands Road / Main South Road Intersection	2s (60s)	3s (55s)	1s (60s)	3s (55s)	2s (60s)	3s (55s)	1s (60s)	3s (55s)

This shows the movements with additional traffic, due to the proposed development, experience a moderate increase in delay due to the proposed development. The average overall intersection delay at the SH1 / Chalmers Street and SH1 / Shands Road / Main South Road intersections experiences a slight increase. However, the intersections continue to operate at a Level of Service of E or better, similar to the base case (without the proposed development).

Whilst it is not possible to determine the exact phasing and timings of the intersections at this stage, it is considered that this modelling demonstrates that there is a potential solution available to minimise the impact of the proposed development on the adjacent intersections along SH1 without alterations to the overall cycle times.

The road network is predicted to maintain the operational efficiency of the strategic function of SH1 through the study area, as the majority of scenarios with the proposed development traffic, retain the same Level of Service and operational performance for that corridor as the base case (without development). The scenarios where the Level of Service decreased, when development traffic was added to the network, were considered acceptable, as these scenarios resulted in a reduction in Level of Service from C to D, so a reasonable level of operational performance was predicted to be maintained.

While the current intersection layout with revised phasing could accommodate the proposed development, it is recognised that the SH1 / Chalmers Street intersection is at capacity during the Saturday peak. Further liaison and approval of the NZ Transport Agency and the Christchurch Transport Operations Centre will be required through the next stage of the project to confirm the viability of the suggested changes to the signal operation at the Main South Road (SH1) / Chalmers Street intersection.

While a potential solution is available, it is possible to further manage the potential impact of the proposed development by providing additional access points to help distribute the development traffic generated (and that associated with current activities) to other parts of the network where there is more available capacity. Potential additional accesses are available directly via SH1 Main south Road (limited to left-in / left-out to minimise the safety impact on SH1, refer to **Section 3.1**) and for a limited number of carparks off Kathleen Crescent, as shown in **Figure 3-1**.

4.2.3.3 SIDRA Model

The predicted traffic volumes for the 2021 and 2031 PM peak and Saturday peak hours have been input in the SIDRA model of the Main South Road / Parker Street / Seymour Street intersection.

The future year models retain the existing phasing arrangement and cycle time for 2021 and 2031 with the inter-greens set to the five seconds for each phase to allow for optimisation of the green splits. Therefore this assumes that all phases will be called throughout the peak hour, which may overestimate the level of delay experienced on movements with lower turning volumes. Given the overestimation of the queue lengths during calibration and validation of the model, the model is likely to overestimate the level of delay experienced at the intersection.

The results of the SIDRA modelling are shown in **Appendix D** and are summarised in **Table 4-9** and **Table 4-10** below.

Table 4-9: 2021 SIDRA Model Results of Main South Road / Parker Street / Seymour Street

Approach	PM Peak				Saturday Peak			
	Base Model		With Development		Base Model		With Development	
	Delay (LOS)	95% Queue	Delay (LOS)	95% Queue	Delay (LOS)	95% Queue	Delay (LOS)	95% Queue
Seymour Street	50s (D)	70m	50s (D)	70m	40s (D)	35m	45s (D)	35m
Main South Road (Westbound)	12s (B)	150m	12s (B)	150m	10s (A)	90m	10s (A)	120m
Parker Street	45s (D)	80m	45s (D)	80m	40s (D)	70m	40s (D)	80m
Main South Road (Eastbound)	20s (C)	130m	20s (C)	130m	14s (B)	140m	15s (B)	150m
Intersection Average	24s (C)	150m	24s (C)	150m	20s (C)	140m	21s (C)	150m

The modelling results indicate that the proposed development is predicted to have a minimal impact on this intersection with small increases to delays and small increases to the 95th percentile queues in 2021 and 2031. The level of service at the intersection is expected to remain the same with an overall intersection level of service of C during the PM peak and Saturday Peak. The 95th percentile queues are not predicted to extend significantly and encroach on additional adjacent intersections, due to the proposed development. It should be noted that the models are likely to overestimate the level of delay experienced at the intersection resulting in the intersection performing better than the modelling indicates.

It is worth noting that the volume of traffic using this intersection is expected to decrease by approximately 20% from the current traffic volumes, most likely due to traffic diverting onto CSM2, between the current situation (2017/18) and the 2021 scenario. This means that there is additional capacity available at this intersection to distribute development traffic to reduce the impact of the proposed development on other parts of the network, i.e. should access be provided via the Parker Street / Kathleen Crescent route.

Table 4-10: 2031 SIDRA Model Results of Main South Road / Parker Street / Seymour Street

Approach	PM Peak				Saturday Peak			
	Base Model		With Development		Base Model		With Development	
	Delay (LOS)	95% Queue	Delay (LOS)	95% Queue	Delay (LOS)	95% Queue	Delay (LOS)	95% Queue
Seymour Street	50s (D)	75m	50s (D)	75m	45s (D)	40m	45s (D)	40m
Main South Road (Westbound)	20s (B)	200m	20s (B)	220m	10s (A)	85m	10s (A)	80m
Parker Street	45s (D)	90m	45s (D)	90m	40s (D)	85m	40s (D)	90m
Main South Road (Eastbound)	20s (C)	140m	25s (C)	140m	14s (B)	145m	15s (B)	160m
Intersection Average	27s (C)	200m	29s (C)	220m	21s (C)	145m	22s (C)	160m

4.3 Public Transport and Active Modes

4.3.1 Public Transport

The Denton Park site is located close to the Superstop (or key transfer location) located at The Hub Hornby for frequent city bound bus services and less frequent suburban bus services. The bus stops at The Hub Hornby shopping centre are likely to be the main bus stops used by people using proposed development. It is therefore recommended that high quality pedestrian links are provided to the bus stops at The Hub Hornby to encourage staff and visitors to arrive and depart by bus.

4.3.2 Active Modes

The only cycle facilities present on the roads around Denton Park is the cycle lanes on Chalmers Street and SH1 (Carmen Road). There is a proposed Major Cycle Route for the South Express Cycleway, which is currently planned to run along the northern boundary of Kyle Park between Hei Hei Road and its western boundary. A strong connection to the proposed South Express Major Cycleway should be provided to encourage cyclists to cycle to the proposed development.

Pedestrian and cycle connectivity to the north of Denton Park is provided via a rail line underpass that connects Denton Park to Kyle Park / Waterloo Road and beyond, as shown in **Figure 4-4** below. This is not considered to be an attractive route, as a pedestrian link. It is also unlikely to be assessed well from a Crime Prevention Through Environmental Design (CPTED) perspective, as there is little natural surveillance of this area. It is understood a separate CPTED assessment is being undertaken by CCC that should consider this link as it connects to Kyle Park / Waterloo Road and the South Express Major Cycle Route.



Figure 4-4: Denton Park/Kyle Park Railway Underpass

5 Safety Review

5.1 Overview

A safety review of the bulk and location plan has been conducted and has raised a number of issues that should be addressed as part of the further assessment of the site, both during the preparation of the ITA and concept design, plus subsequent design stages, provided a resource consent is pursued and approved.

The following safety issues have been identified:

- Chalmers Street Northern Access Point
- Chalmers Street Southern Access Point
- Hornby Superstop Connectivity
- U-turning for a Potential Access from State Highway 1
- Width of Kathleen Crescent

5.2 Chalmers Street Northern Access Point

The current layout of the potential Northern Access to Denton Park does not clearly identify if the access to 19 Chalmers Street or if the Denton Park access is the main access point to Chalmers Street. The current layout also suggests that two vehicles could queue side-by-side which will block vehicles entering the access and would be unclear about the intentions of the drivers exiting the access as shown in **Figure 5-1**. The current arrangement is poorly laid out and confusing for drivers increasing the risk of vehicles colliding at these accesses. The building at 13-17 Chalmers Street restricts the intervisibility between vehicles exiting Denton Park and vehicles entering into the 19 Chalmers Street, as shown in **Figure 5-1**.

This combined with the unclear priority, results in an unsafe area for vehicles using this access. Given the anticipated increase in traffic generation from the proposed facility the current access arrangement would be unsafe. To mitigate this safety risk, it is recommended that discussions are held with owners of 19 Chalmers Street with the purpose of consolidating the two access points into a safer arrangement with clear priority and appropriate sight lines.

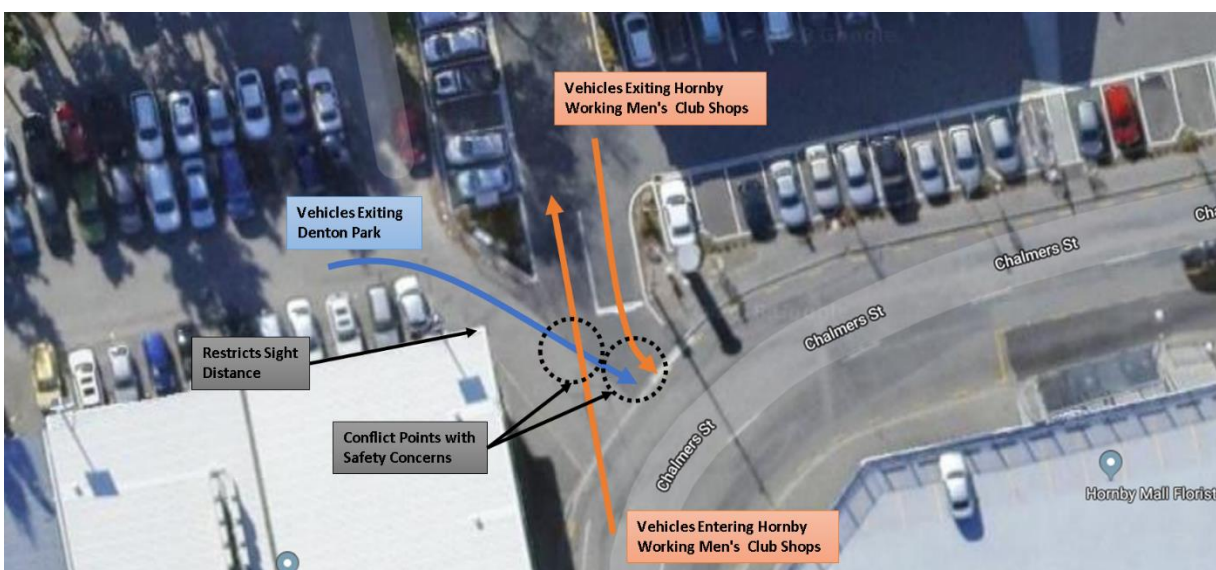


Figure 5-1: Denton Park Northern Access

5.3 Chalmers Street Southern Access Point

The proposed southern access is currently located opposite the loading bay for Pak 'n' Save and a general loading zone as shown in **Figure 5-2**. It has been observed that trucks routinely use this access throughout the day. This could create a confusing environment with trucks exiting the loading bay at the same time as vehicles from the proposed facility.

The likely low movement speeds in the area are unlikely to result in serious crashes involving vehicles. However, this may impact the safety of vulnerable users (cyclists and pedestrians) in the area due heavy vehicles, which have limited visibility to vulnerable users, performing sharp manoeuvres in this area. The current consent conditions restrict the operation times for this loading bay to hours outside of the likely operation hours of the proposed development.

It is recommended that discussions are held with The Hub Hornby and Pak 'n' Save to develop a solution for trucks to abide by these consent conditions to remove the potential conflict with the proposed development.

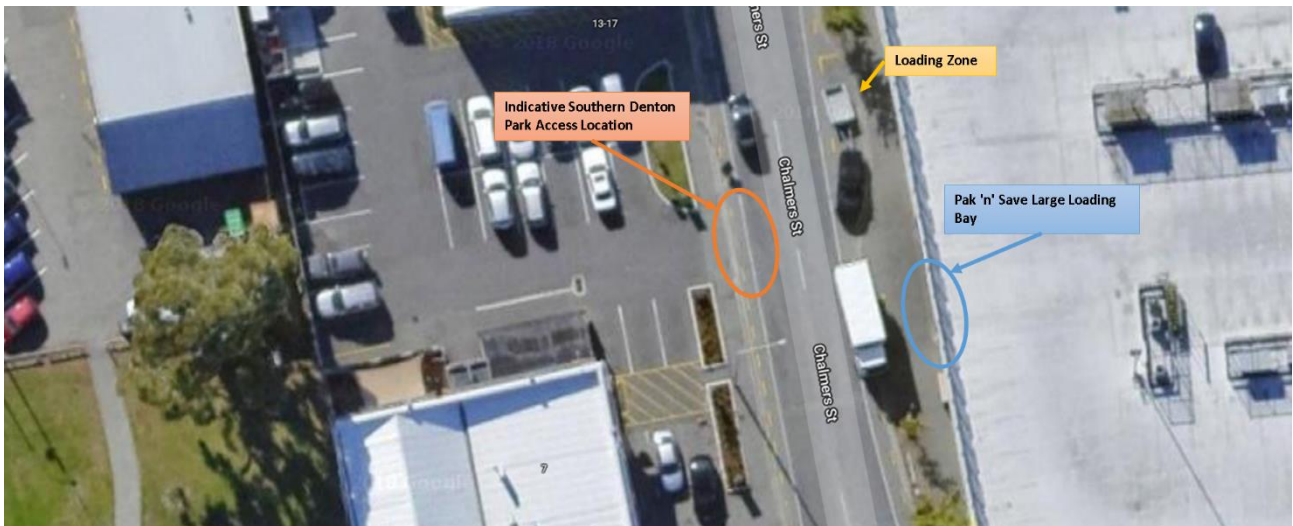


Figure 5-2: Denton Park South Access Location

5.4 Hornby Superstop Connectivity

Bus users alighting from buses stops closest to the proposed development at Hornby Superstop are unlikely to walk to the existing pedestrian crossing outside main entrance to The Hub Hornby. This may lead to pedestrian crossing at unsafe locations on Chalmers Street to access the proposed development. The visibility of traffic is limited by the north western corner of The Hub Hornby with a limited safe crossing locations between the Superstop and the southern access on Chalmers Street as shown in **Figure 5-3** below.

A formalised pedestrian crossing should be provided across Chalmers Street closer to the proposed development to encourage pedestrians to cross at a safe location. The potentially poor visibility of a pedestrian crossing due to the north western corner of The Hub Hornby may require additional traffic calming measures to be introduced on Chalmers Street to further slow traffic to facilitate appropriate sight distances.

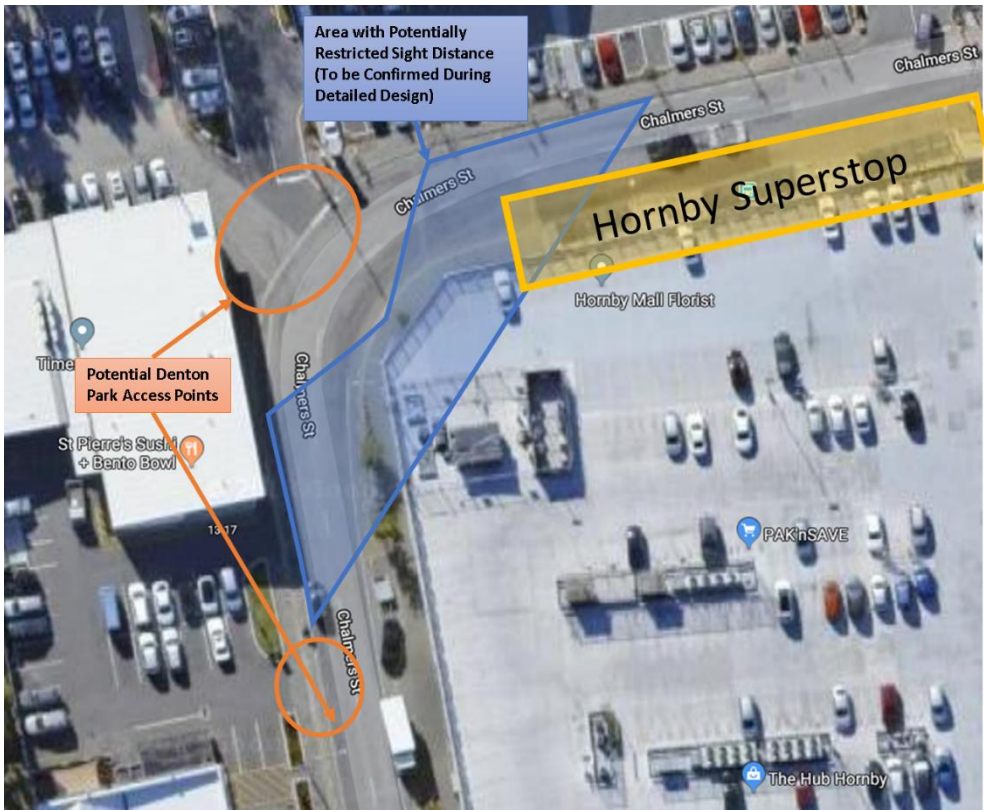


Figure 5-3: Area with Potentially Restricted Sight Distance between Hornby Superstop and Denton Park Access Points

5.5 U-turning for a Potential Access from State Highway 1

The Transport Agency have highlighted safety concerns regarding traffic accessing a carpark on Denton Park directly from SH1 as shown in **Figure 5-4** below. The concern is vehicles stopping to wait to U-turn at the merge point of two lanes into a single lane on SH1.

The current layout requires u-tuning traffic to wait in the live lane for an appropriate gap. Vehicles at this merge point will be concentrating on merging resulting on them being less aware of vehicles slowing/stopping to perform a U-turn. The proposed development may increase demand for this manoeuvre, increasing the risk of rear-end type crashes.

Potential measure to mitigate these safety concerns are as follows:

- Removal of entry to Denton Park from SH1 to eliminate the demand for u-turning manoeuvre.
- Extended the raised median past the merge point with a potential u-turning pocket if access from Denton Park is to be retained to improve the safety of vehicles u-turning around the traffic island.



Figure 5-4: Unexpected U-turn at Main South Road Merge Point

5.6 Width of Kathleen Crescent

Kathleen Crescent is currently 9m wide which may require alteration to the road cross section if large traffic volume increases were anticipated on Kathleen Crescent, albeit it is currently only anticipated that access to a limited number of carparks may be provided (without through access to the proposed development).

The on-street parking reduces the available width for traffic to a point where the road is unable to support two-way traffic while cars are parked on either side of the road. Currently the low traffic volumes and low traffic speeds on this road means that the risk of serious crashes is relatively low. An increase in traffic increases the risk of crashes occurring, however, forward sightlines are likely to be good and the traffic speed is anticipated to remain low resulting in minimal increase in the risk of serious crashes occurring.

The measures required to mitigate the additional crash risk will be dependent on the level of parking provided from Kathleen Crescent. Providing a small car park from Kathleen Crescent will result in a minimal increase in risk and may not require additional mitigation measures. Whereas, a large car park or direct access to the proposed facility will result in a larger increase in crash risk and may require mitigation measures such as widening or prohibiting parking on at least one side of the road.

6 Recommendations for Access Strategy

6.1 Vehicle Access

The situation modelled, as part of this assessment for the access strategy development, represents a scenario for the proposed development, where all traffic accessing the proposed facility uses Chalmers Street for access and the Hornby Rugby Club and Hornby Cricket Clubs remain at Denton Park. On this basis, which provides a potentially higher demand on Chalmers Street than may actually eventuate, it is still considered that an appropriate access solution can be provided for the proposed development.

There is potential that some existing sports clubs may wish to relocate from Denton Park. This will reduce the impact of the proposed development, as it will remove some background traffic but is not deemed to be necessary to accommodate the proposed development.

To manage the impact of the proposed development on the surrounding network, it is also recommended that additional vehicle access be provided directly from SH1 Main South Road (limited to left-in / left-out), as well as via Kathleen Crescent, as shown in **Figure 6-1**. These accesses will help to distribute the traffic generated by the proposed development to other parts of the transport network and to utilise other movements that may have additional capacity available.

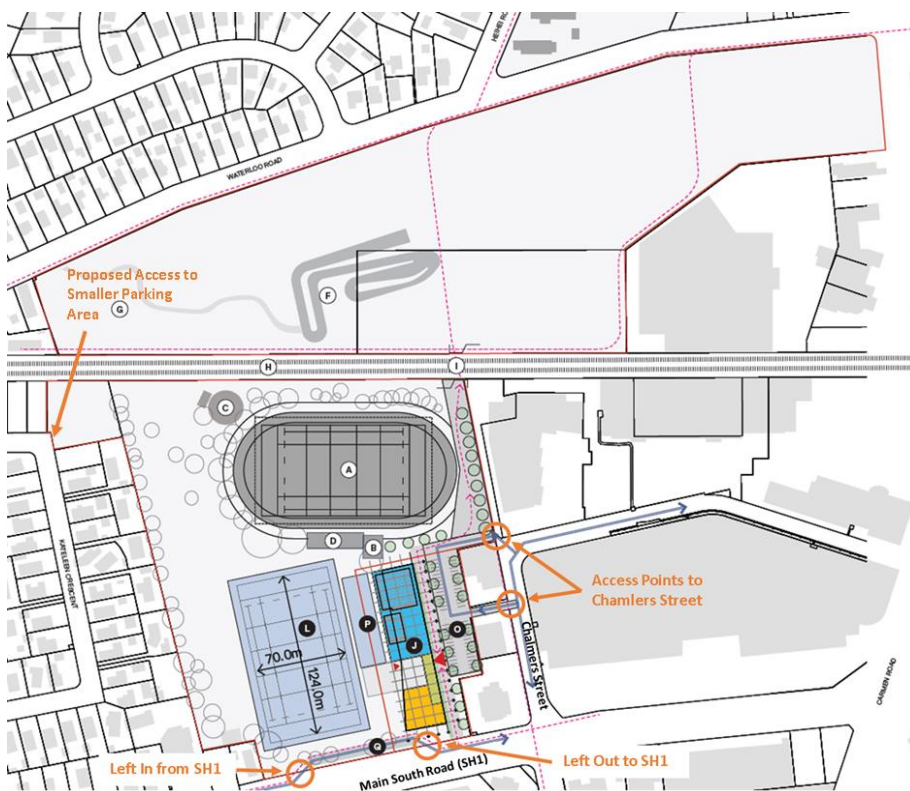


Figure 6-1: Potential Access Strategy to Manage Impact of the Proposed Development

The additional traffic generated by the access from Kathleen Crescent could create congestion issues due to the narrow carriageway and parking availability potentially restricting two way flow. The current access strategy has access to a smaller car park from Kathleen Crescent, which is unlikely to create congestion issues. Whereas, the provision of a larger car park or access to the main car park from Kathleen Crescent may create congestion issues and require mitigation measure such as carriageway widening or removing car parking from one side.

The further assessment of the impact and any mitigation for access provided to Denton Park via these other access points will need to be assessed as part of the further concept development and in preparing transport reporting (an ITA) for a resource consent application.

6.2 Managing Demand

Given the capacity constraints on the adjacent road network, wayfinding for vehicles accessing the proposed development is important that vehicles use the appropriate route to minimise unnecessary travel on the surrounding road network. This could include additional signage to direct traffic accessing the facility from Carmen Road to use the Chalmers Street / Carmen Road intersection to access Chalmers Street. If an access is provided on Kathleen Crescent then this should be supported with signage to direct traffic toward this access.

In combination with the vehicle access strategy, and to take full advantage of the location of the proposed development site in terms more sustainable travel options for visitors and staff, it is recommended that a staff travel plan is developed and that information provided on the relevant websites (or in other forms) provides clear information on the travel option that are available to visitors.

7 Summary and Conclusions

7.1 Summary

Beca has been commissioned to assess the transport impacts of the Hornby Library, Service Centre and South Western Leisure Centre located at Denton Park. For this type of facility, the PM peak (peak background traffic combined with a high number of trips generated by the facility) and the Saturday peak (highest number of trips generated by the proposed development) are the times where adjacent intersections are likely to under the highest demand. As such, this report considered only these two periods when assessing the potential impact of the proposed development on adjacent intersection.

To assess the impacts of the proposed development on adjacent intersections, a combination of LinSig and SIDRA models have been developed. These models have been calibrated and validated based on traffic counts and queue length observations taken on 7 December 2017 and 17 February 2018. The traffic models have been used to assess the predicted traffic in 2021 (post opening) and 2031. A higher demand scenario for traffic impacts has been developed, where all access is assessed as being via Chalmers Street and there is no displacement of existing uses of the park.

This found that the current intersections and signal phasing can adequately accommodate the proposed development during the PM peak. However, changes to the signal phasing will be required to accommodate the proposed development during the Saturday peak, if all access is to be taken from Chalmers Street. During the Saturday peak, the Main South Road / Chalmers Street intersection is predicted to be operating at close to capacity, so alternative access points will be required to distribute traffic to other parts of the network/movements with available capacity (e.g. access from Kathleen Crescent and left-in-left-out arrangement from SH1). There is potential that some existing sports clubs may wish to relocate from Denton Park, which will reduce the impact of the proposed development by removing background traffic. However, it is not deemed to be necessary to accommodate the proposed development.

It is currently anticipated that the maximum parking demand for the proposed development would be around 144 parking spaces occurring during the weekend (Saturday) peak period. There is currently little information available on the parking demand for libraries and community leisure facilities, in the typical industry sources. As such, it is recommended further surveys of similar facilities around Christchurch are conducted to assist in 'benchmarking' the likely arrival and departure profile, as further detail of the proposed development concept is progressed for a resource consent application.

In relation to progressing the proposed development through further concept design, as part of the process for preparing a resource consent application, it is recommended that the following safety matters be addressed in more detail:

- The proposed northern access to Denton Park off Chalmers Street has restricted sightlines and shares access with 19 Chalmers Street, so it is recommended that discussions are held with the relevant landowner/s to consolidate the access to provide a suitable access arrangement
- The Pak 'n' Save loading facilities are located adjacent to the proposed southern access off Chalmers Street and have been observed to be operational throughout the day, albeit it is understood current consent conditions should restrict operational hours of this loading bay. This presents a safety risk in relation to the southern access, particularly for pedestrians and cyclists. As such, it is recommended that liaison with The Hub Hornby and Pak 'n' Save be undertaken to remove these potential conflicts
- Staff and visitors alighting or boarding at the Hornby Superstop will likely have a pedestrian desire line along a route that currently does not provide a safe crossing point on Chalmers Street. It is recommended that options for a crossing point are considered

- The Transport Agency has identified concerns with the potential for westbound traffic on Main South Road to 'U-turn' to access the proposed left-in access off Main South Road. As such, for this proposed access, it is recommended solutions to prevent or control this manoeuvre are developed in liaison with the Transport Agency
- On the basis that the access strategy includes some car parking off Kathleen Crescent (through traffic to the proposed development is not currently anticipated), it is recommended that further consideration is given to the safe and efficient operation of Kathleen Crescent with the measures required dependant on the amount of parking provided off Kathleen Crescent.

7.2 Conclusion

The proposed site is well situated to take advantage of nearby sustainable transport mode facilities from a catchment that is largely within a reasonable walking and cycling distance.

It is considered possible that a satisfactory access solution can be developed for access to the proposed development. However, this will potentially require changes to the traffic signal operation on Main South Road and/or additional access points to distribute the traffic to provide more resilient access arrangements. This should also be accompanied by a comprehensive travel management strategy for staff and visitors.

The following matters will need to be addressed as part of further design of the proposed development and for the preparation of the Integrated Transport Assessment for any resource consent process:

- Finalise access locations and design, as well as confirm existing activities retained at Denton Park
- Confirm the potential car parking demand on the basis of further surveys of similar facilities
- Review and identification of measures for the following safety issues:
 - Design of northern access point on Chalmers Street sharing an access with 19 Chalmers Street
 - Design of the southern access point on Chalmers Street including proximity of loading bays
 - Pedestrian facilities across Chalmers Street to provide a safe crossing point for bus users
 - Unexpected u-turning movements on SH1, if access is provided from SH1
 - Enabling the safe and efficient operation of Kathleen Crescent, based on the car parking facilities to be provided off Kathleen Crescent
- Discussions with the Transport Agency and CTOC regarding phasing of nearby signalised intersections and safe and efficient operation of the adjacent road network.

Appendix A

LinSig Calibration Technical Note



Appendix B

LinSig Validation Results



Appendix C

LinSig Model Results



Appendix D

SIDRA Model Results

