Invercargill Central Integrated Transport Assessment

HWCP Management Limited

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Quality Assurance Information

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Executive Summary

HWCP Management Limited propose to establish a mixed-use development in the heart of Invercargill. The proposed development will offer an array of retail, hospitality and entertainment activities to a transforming city centre. The proposed development will be referred to herein as Invercargill Central.

Invercargill Central includes a 950+ multi-storey car park accessed via a two-way vehicle crossing on Tay Street. As Tay Street is part of the State Highway Road Network, NZ Transport Agency was consulted. Initial feedback suggested that Invercargill Central should be designed to ensure a high level of pedestrian safety and that vehicle accesses do not interfere with the operations of the Tay Street/ Kelvin Street intersection.

The operations of the intersection and the car park access has been modelled using traffic modelling software. The modelling results indicate that car park users will have sufficient gaps in the eastbound traffic flow to enter and travel through the Kelvin Street intersection due to the relatively low traffic flow on Tay Street.

In order to maintain a high level of pedestrian safety, all vehicle accesses along Tay Street will be designed with safety elements such as visibility splays/ audio warning systems, surface treatments, and street furniture.

Invercargill Central has been assessed against the transport rules of the Invercargill District Plan. Invercargill Central complies with all transport rules, except two rules related to queueing space and vehicle access. The non-compliance has been further assessed and due to mitigating design elements of the proposal, it can be concluded that no notable effects are expected as a result of the non-compliance.

Based on this integrated transport assessment, the proposed development can be supported from a traffic and transportation perspective.

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1. Introduction

HWCP Management Limited propose to establish a mixed-use development in the heart of the Invercargill city. The proposed development will offer an array of retail, hospitality and entertainment activities. The proposed development will be referred to herein as Invercargill Central.

Abley Limited (Abley) has been commissioned by HWCP to provide transport advice and prepare an Integrated Transport Assessment (ITA) with respect to Invercargill Central.

This report provides an assessment of the transportation effects of the proposal. It has been prepared in accordance with the Operative Invercargill District Plan Transportation rules and NZTA Planning Policy Guidelines.

Report Structure

This report is divided into sections to aid understanding of the assessment methodology:

- Existing site information
  - Locality, zoning, existing land use
- Existing transport data
  - Road geometry, road hierarchy, existing vehicle flows, public transport and road safety
- Proposed activity
  - A description of the proposal giving specific attention to the transport related components
- Appraisal of transport effects
  - An assessment of the anticipated trip generation, parking demand and access arrangements
- Invercargill District Plan assessment
  - An assessment of the proposal against the transport provisions of the Operative Invercargill District Plan and NZTA Planning Policy
- Assessment of Non-Compliances
  - An assessment of the proposal against the transport provisions of the Operative Invercargill District Plan and NZTA Planning Policy
- Conclusions

2. Existing Site Information

2.1 Locality

Invercargill Central is located in the heart of the Invercargill city within land bound by Esk Street, Kelvin Street, Tay Street (State Highway 1) and Dee Street (State Highway 6). Invercargill Central in the context of the wider area is shown in **Figure 2.1**.

Figure 2.1 Development site location

2.2 Zoning

According to the Invercargill District Plan, Invercargill Central is located within Business 1 Zone and the Priority Redevelopment Precinct as well as the City Centre Heritage Precinct. A cluster of heritage sites are located within Invercargill Central. Street frontages bounding the site are categorised as Pedestrian Friendly Frontages. **Figure 2.2** shows the land use zoning of Invercargill Central as well as that of the wider area.

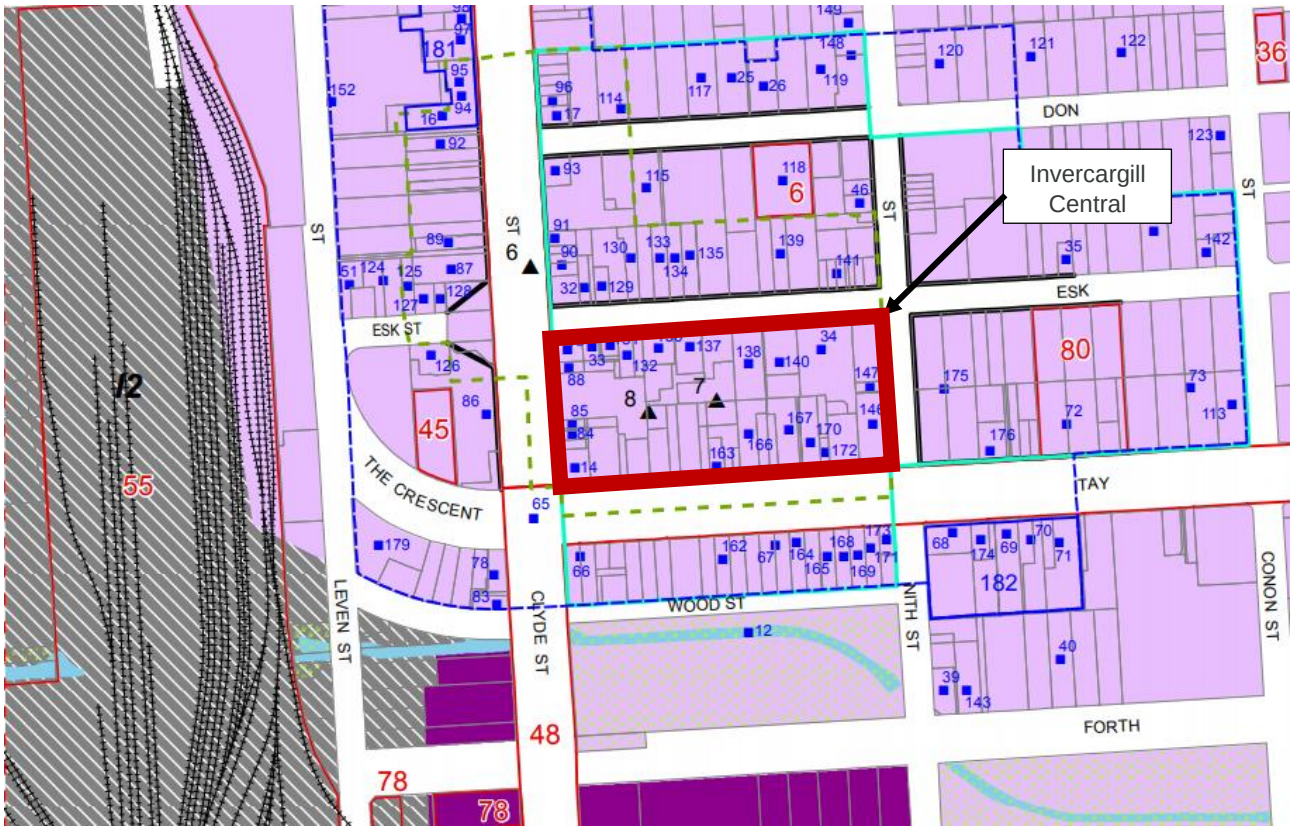


Figure 2.2 ICC Zoning map

2.3 Existing Land Use

With the exception of Kelvin Hotel located at the corner of Kelvin Street and Esk Street, the Invercargill Central area is predominantly occupied by retail and food and beverage land-use and associated car parking. A cluster of heritage and archaeological sites are located in and around the site and the surrounding land use is a mixture of retail/ commercial, hospitality and community activities as expected in a city centre.

Vehicle access to Invercargill Central is provided via three vehicle crossings of which two are located on Tay Street and one is located on Esk Street. The accesses on Tay Street are left in left out only and the access on Esk Street allows both left in and right in but right out only. Motorcycle Mecca is located across Tay Street from Invercargill Central, which is a popular tourist attraction.

The surrounding land use and vehicle access arrangement is shown in **Figure 2.3**.

Figure 2.3 Development site and surrounding land use

3. Existing Transport Environment

3.1 Road Geometry

Tay Street (State Highway 1)

Tay Street (State Highway 1) provides primary access to Invercargill Central and is part of the State Highway road network managed and maintained by NZ Transport Agency. In the vicinity of Invercargill Central the carriageway is 30m wide with two lanes of traffic in each direction separated by a 2m wide raised median. Time restricted on-street parking is permitted on both sides of Tay Street. The posted speed limit in the vicinity of Invercargill Central is 50km/h.

Dee Street (State Highway 6)

Dee Street (State Highway 6) does not provide vehicle access to Invercargill Central. However, it is also part of the State Highway road network managed and maintained by NZ Transport Agency. In the vicinity of the site the carriageway is 29m wide with two lanes of traffic in each direction separated by a 3m wide raised median. On-street parking is permitted on the western side and the Invercargill Bus Smart Central is located along the eastern side of Dee Street. The posted speed limit in the vicinity of Invercargill Central is 50km/h.

Esk Street

Esk Street is an Invercargill City Council (ICC) managed Local Road and is one-way in an eastbound direction. The carriageway is 10m wide with time restricted 45-degree angle parking provided on the north side. In the recent past Esk Street was transformed into a shared space street with improved pedestrian infrastructure. A 6m wide pedestrian zone is provided on the south side with ample outdoor seating. The posted speed limit on Esk Street is 30km/h. Esk Street was observed to have the highest volume of pedestrians and the parking spaces are almost always occupied. It has been identified as the most desired parking destination in the city centre due to its proximity to businesses.

Kelvin Street

Kelvin Street is a Local Road and is a two-way two lane road divided by a centreline. Between Tay Street and Esk Street, time restricted on street parking is permitted on both sides of the Street. The posted speed limit in the vicinity of Invercargill Central is 50km/h. No vehicle crossings exist in this section of Kelvin Street.

3.2 Significant Intersections

Tay Street/ Kelvin Street Intersection

The signalised X-intersection of Tay Street and Kelvin Street permits all vehicle turning movements with right turn bays on Tay Street and shared right and through lanes on the side streets. Signalised pedestrian crossings are provided on all approaches. No cycle lanes or advance cycle boxes are provided at the intersection.

Dee Street/ Esk Street Intersection

The Dee Street/ Esk Street is a signlaised intersection however the signals does not interupt traffc flow on Dee Street unless impeded by pedestrian activiation. As Esk Street is one-way eastbound the right turn from Dee Street to Esk Street is not permitted.

3.3 Road Classification

The ICC road classification for the roads in the vicinity of the Invercargill Central are shown in **Figure 3.1**, which shows that Invercargill Central has excellent connectivity to the Arterial road network of Invercargill.

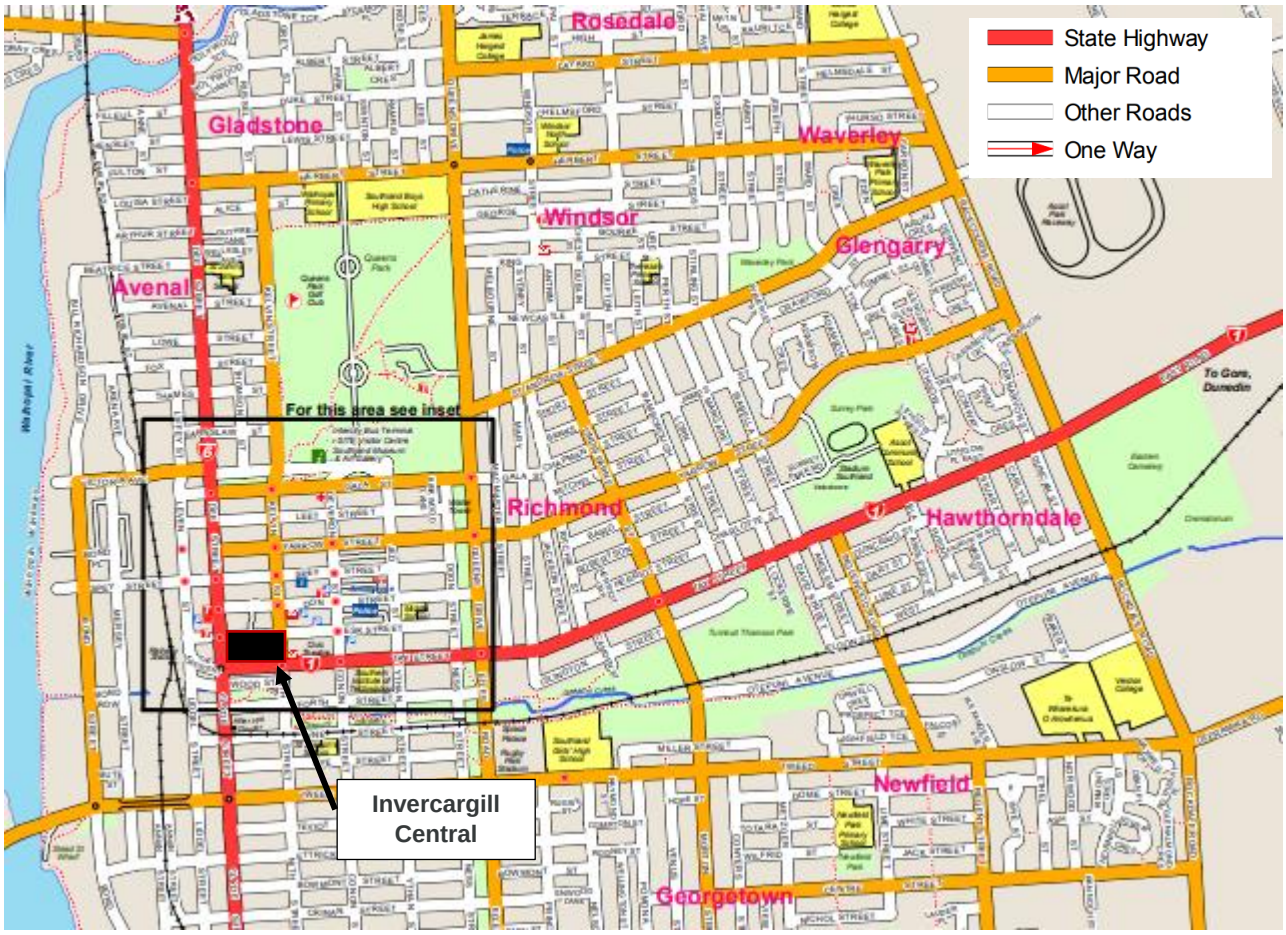
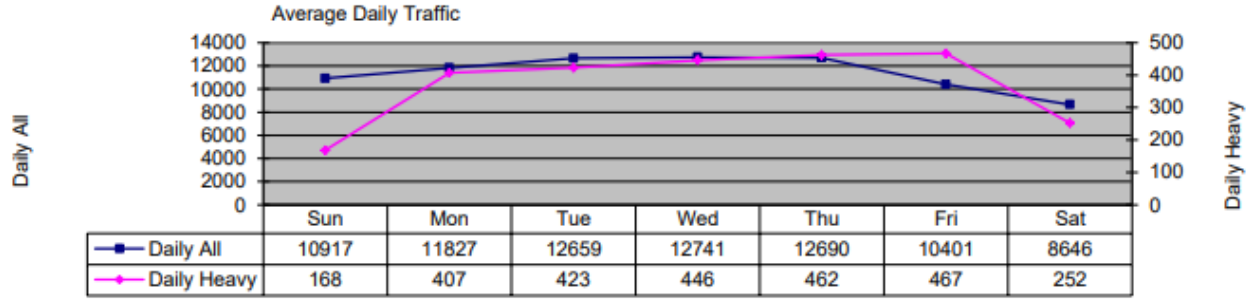


Figure 3.1 ICC Road Classification

3.4 Traffic Volumes

According to the NZTA telemetric count on Tay Street, the annual average daily traffic flow in 2017 on Tay Street was recorded to be approximately 11,400vpd with annual average heavy vehicle flow of 374 vpd. The average daily profile for Tay Street is shown in **Figure 3.2**, which has been sourced from NZTA.[1]

Figure 3.2 Tay Street average daily traffic profile



	Sun	Mon	Tue	Wed	Thu	Fri	Sat
Daily All	10917	11827	12659	12741	12690	10401	8646
Daily Heavy	168	407	423	446	462	467	252

Traffic count surveys were conducted on Thursday 12 April 2018 at Tay Street/ Kelvin Street intersection where all traffic movements were recorded. The results are summarised in **Table 3.1.**

[1 https://www.nzta.govt.nz/assets/resources/state-highway-traffic-volumes/docs/2013-2017- Development trip generationnational-telemetry-site-profiles.pdf

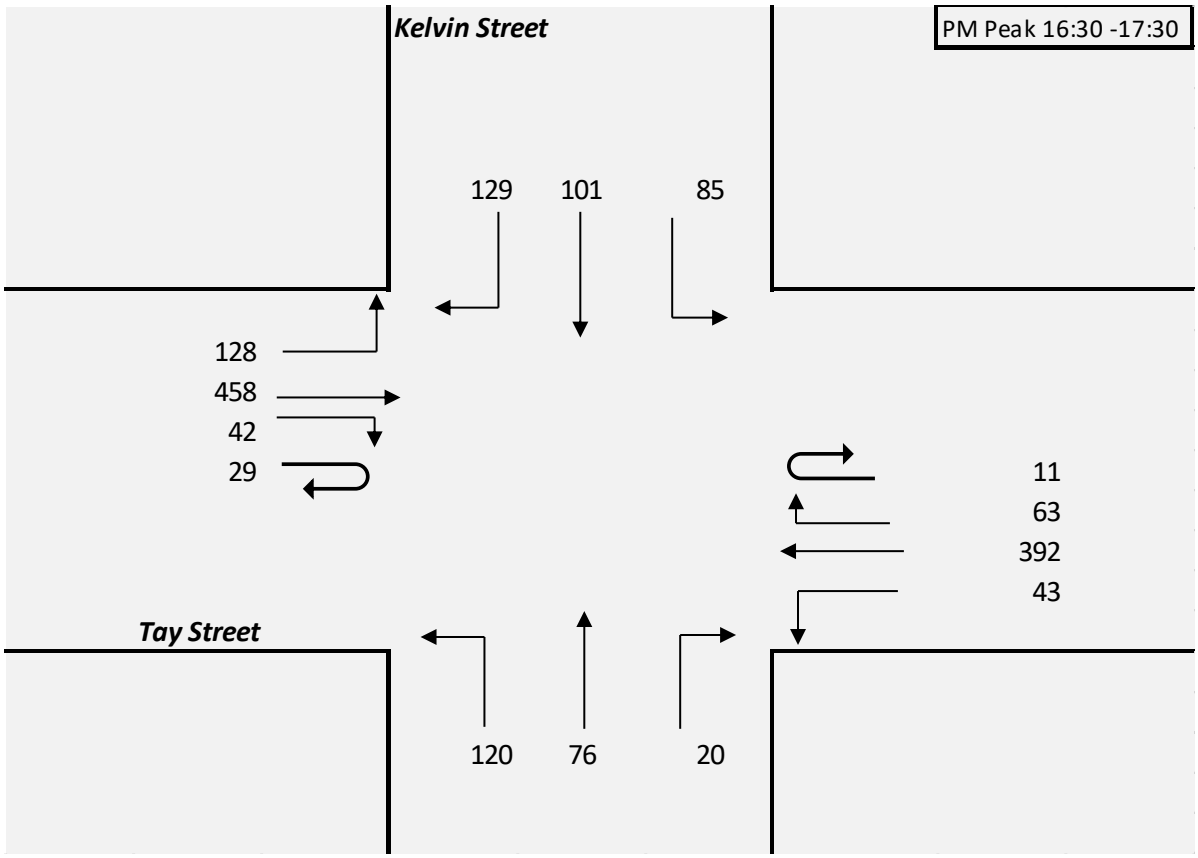


Figure 3.3 Traffic count survey results

The current operations and performance of the intersection has been assessed and detailed in **Chapter 6.**

3.5 On street carparking

Table 3.1 lists the existing ICC owned car parking supply in the city centre, which has been extracted from the ICC Roading Activity Management Plan 2017. The data shows that 480 off-street and 780 on street car parking spaces are located within a reasonable walking distance to the city centre. In addition to the above, a number of privately managed off-street car parks are scattered across the city centre. The on-street parking restrictions in the vicinity of Invercargill Central are shown in **Figure 3.4**.

Table 3.1 ICC owned on street parking supply

Car Park Location	Number of Parking Spaces	Fee
Esk Street No. 1	42	$1.20 per hour
Esk Street No. 2		$1.20 per hour Permit - $55.00 per month
Don Street	38	$1.20 per hour
Tay Street (rented)	51	$1.20 per hour
Leven Street	270	Casual $1.20 per hour Permit - $75.00 per month P90 free
On Street	780	$1.20 to $1.50 per hour

Figure 3.4 Invercargill City Parking Restrictions

3.6 Public Transport

Invercargill Central is well connected by public transport. There are four looped bus routes beginning and ending at Bus Smart Central, which is located outside Reading Cinemas on Dee Street. The buses leave concurrently every 45 minutes from 6.45am to 6pm Mondays to Fridays, and from 10.30am to 3pm on Saturdays. There are no services on Sundays and public holidays. The bus routes are shown in **Figure 3.5**.

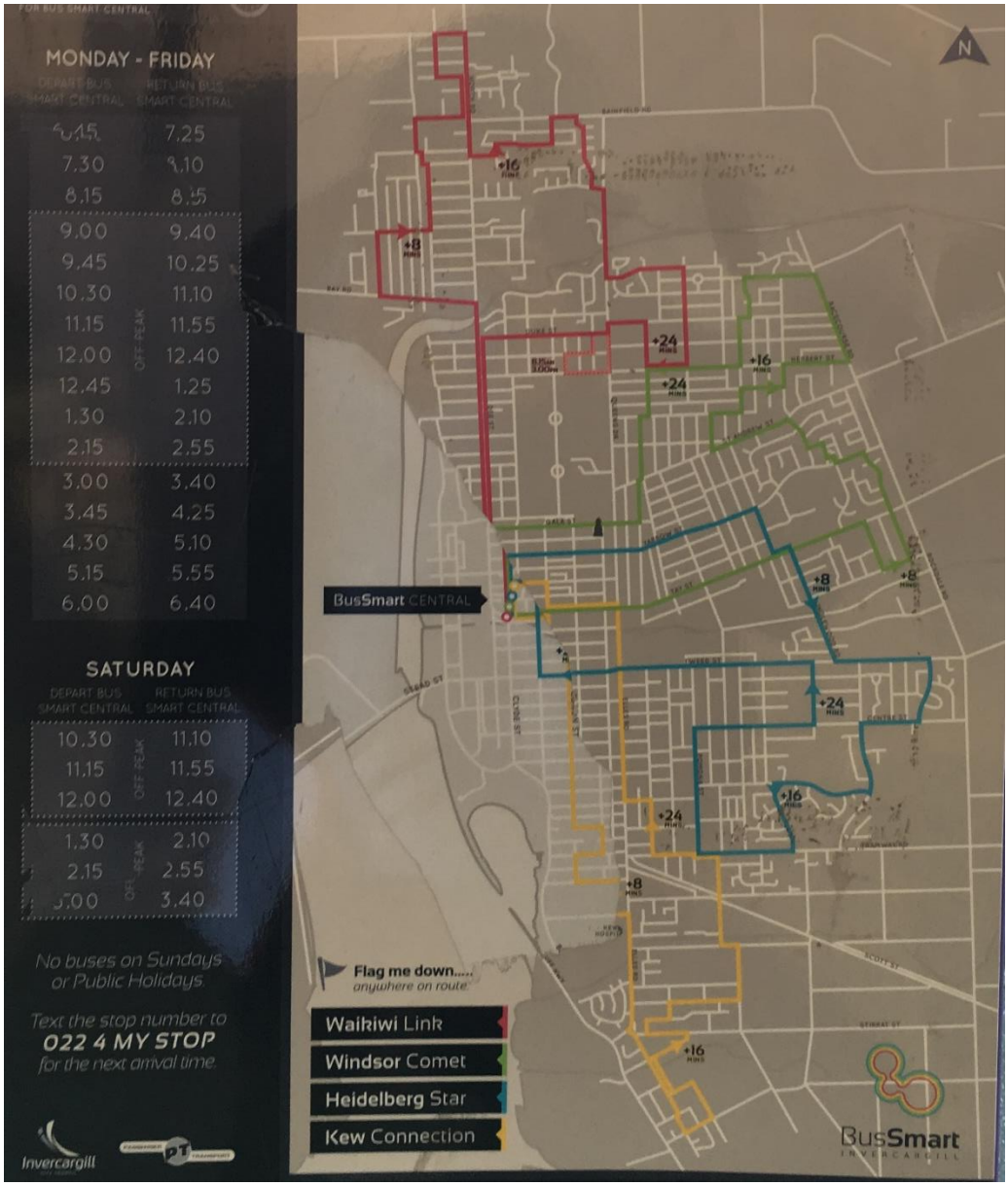


Figure 3.5 Invercargill bus routes

3.7 Walking and Cycling

Footpaths exist on all road corridors in the vicinity of Invercargill Central. Pedestrian crossing facilities in the area are shown in **Figure 3.6**. It is worth noting that the roads bounding the site are part of the Pedestrian Active Frontage as per the IDP which demands a high level of pedestrian infrastructure and safety.

Figure 3.6 Pedestrian crossings and walkways

The ICC Roading Asset Management Plan 2014 Appendix C maps key walking/ cycle routes in the area, which are shown in **Figure 3.7**. An off-street walking track runs east to west along Otepuni Creek. The map shows very little existing cycle infrastructure in the city centre however the map shows a number of proposed cycle lanes.

Figure 3.7 Cycle infrastructure in Invercargill

3.8 Road Safety

The New Zealand Road Assessment Process, Urban KiwiRAP[2], is used to analyse the road safety of urban road corridors. The two types of risk metric that form the fundamental risk mapping protocols for Urban KiwiRAP are Collective Risk and Personal Risk as described below:

- Collective Risk is a measure of the total estimated death and serious injury[3] (DSi) casualty equivalents for a site. It is effectively a measure of the number of deaths and serious injuries that can be expected at a site over the next analysis period (typically five years). At a corridor level, Collective Risk is the total estimated DSi casualty equivalents derived from the intersection and midblock components divided by the length of the corridor. It is expressed as estimated DSi / km.
- Personal Risk is a measure of the risk of an individual dying or being seriously injured at a site. It is calculated by dividing Collective Risk by a measure of traffic volume exposure.

The risk rating categories are low, low-medium, medium, medium-high and high (worst). The maps[4] showing these ratings for roads adjacent to Invercargill Central are included in **Figure 3.8**.

[2] https://roadsafetyrisk.co.nz/kiwi-rap
[3] Serious injuries- Fractures, concussion, internal injuries, crushings, severe cuts and lacerations, severe general shock necessitating medical treatment, and any other injury involving removal to and detention in hospital.
[4] https://roadsafetyrisk.co.nz/maps/personal-risk#Canterbury

The risk rating will help to identify any potential issues if traffic volumes on a particular road were to increase.

The data shows that Tay Street has a “Medium High” Collective Risk rating and a “High” Personal Risk rating. As Collective Risk is a measure of the number of crashes per length (km), generally roads with a higher traffic volume have a higher Collective Risk. Given Tay Street is part of the Arterial Road network this is somewhat expected.

Personal risk on the other hand is relatable to the public as it shows the risk to an individual using that road. As Personal Risk along Tay Street is categorised as High, the corridor may have an underlying safety issue that requires further investigation and road safety improvements may be necessary.

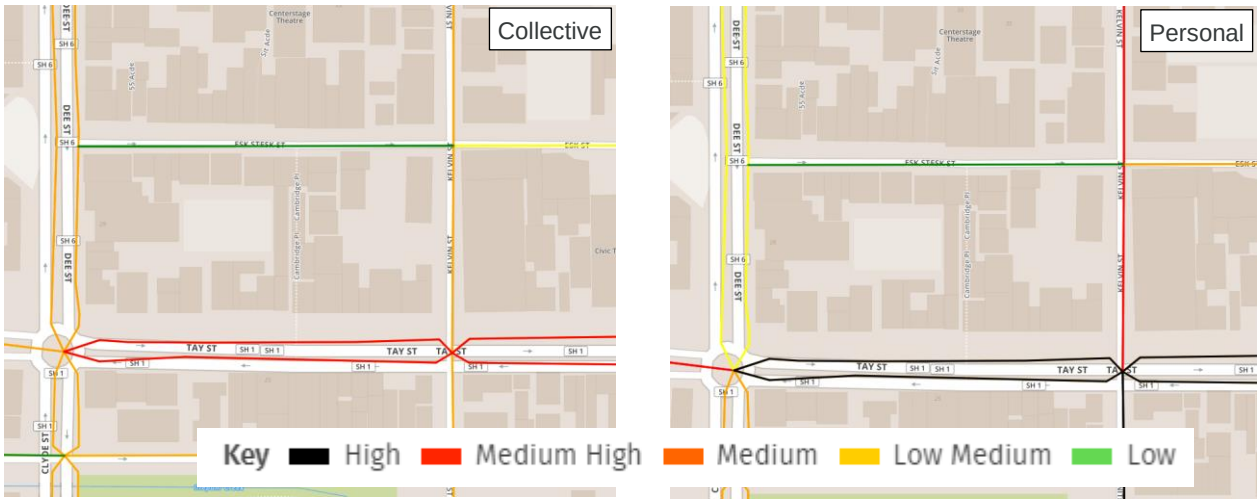


Figure 3.8 Risk maps

3.9 Proposed Other Developments

The Invercargill City centre is currently undergoing a revitalisation where a number of new developments are proposed. The location of these development projects is shown **Figure 3.9**. Although planned these developments are not yet committed therefore the traffic and transport effects are unknown.

Figure 3.9 Potential future developments

3.10 Proposed Transport Projects

Accessibility for motorists and pedestrians within the Invercargill City Centre was identified as a significant issue in the CBD Outline Action Plan 2011. The following changes to the existing road network were proposed by ICC. However, information on the implementation or the delivery of these projects are unknown.

Single Laning Tay Street

ICC discussed that the existing layout of Tay Street is unsuitable for a city centre environment where pedestrian movement is prominent. The 30m carriageway with two-lanes of traffic was considered to be too car focused. A proposal was put forward to reduce traffic flow on Tay street to one lane in each direction.

Two-way Don Street or Allow right turning movement into Esk Street from Dee Street

The current layout of Dee Street does not allow vehicles heading north to turn into the CBD due to no right turn into Esk Street and Don Street's one-way system. Vehicles on Dee Street heading south cannot turn into Don Street either and have to go around the block and in doing so go through three sets of traffic lights.

4. Proposed Development

Description of Proposal

HWCP Management Limited propose to establish a mixed-use development in the heart of the Invercargill city. The development will contain an office precinct, a medical centre, an up-scale food court/restaurant space, general retail, anchor retail tenant, gym and a public space in the block between Tay and Esk streets and Kelvin and Dee streets.

The following transport infrastructure features are proposed as part of Invercargill Central:

- 950+ off-street car parking spaces across four levels including mobility and parent car parking provisions
- Improved pedestrian connectivity through Invercargill Central
- A state-of the art car park access with boom gate control/ number plate recognition
- A dedicated service lane connecting Tay Street and Esk Street
- A covered servicing/delivery yard large enough for 5 trucks to be unloaded simultaneously
- A one-way service lane with extra servicing capacity
- Visitor and staff cycle parking spaces

The proposed site plans are attached as **Appendix A**.

5. Invercargill Central Access Strategy

5.1 NZTA Consultation

A pre-application meeting was held between the project team (Bonisch, Abley and Buchan) and NZTA representative, Richard Shaw on Monday 9 April 2018. A concept vehicle access strategy of the Invercargill Central was presented for NZTA comment.

Following the meeting, the concept plans were distributed to NZTA and Mike Brazil (Stantec Ltd) who is part of the Invercargill State Highway network management team. The concerns raised by Mike Brazil are shown in Figure 5.1 and our responses to the comments are listed below.

Figure 5.1 **NZTA/ Stantec Initial Concerns**

***Stantec Ltd**: The proposal will generate relatively large volumes of traffic and position of accesses is critical to both the functionality of the site and the retention of the excellent level of service provided by the existing pedestrian facilities on Tay Street. Our comments below expand on the notes on the attached ground floor plan.*

Stantec Ltd Comment 1: *We don't see a problem with the goods entry to the car park on Dee Street between the Civic building and the cinema.*

Abley Response: The subject access has been removed to consolidate vehicle access to the Invercargill Central and to eliminate the potential conflict between delivery/service vehicles and the existing Bus Smart Central on Dee Street.

Stantec Ltd Comment 2: *The entry (labelled A) to the same car park on Tay Street between the Civic building and the medical centre is in the same place as an existing zebra crossing. This is seen as a significant conflict. Relocating the crossing further from the roundabout would detour pedestrians travelling from Dee to Clyde Street further than they do*

already and compromise the attractiveness of the crossing and encourage informal crossing. The crossing should not be closer to the roundabout to allow drivers exiting the roundabout sufficient time to react to pedestrians on the crossing.

Abley Response: The subject access is a two-way service access located east of the existing pedestrian crossing. The service access will be left-in and left out only due to the raised median on Tay Street. Therefore, the access will not compromise the safety of pedestrians at the crossing for the following reasons;

1) All vehicles entering the access will have adequate sight distance of the pedestrian crossing upon exiting the Tay Street/ Dee Street roundabout similar to all other road users. Bollards or other forms of street furniture will be installed adjacent to the pedestrian crossing to protect pedestrians waiting at the crossing as shown in Figure 5.2.
2) The swept path diagram in **Appendix B** shows that a 11.5m rigid truck (design vehicle) could enter the site without sweeping over the footpath of Tay Street where pedestrians would wait to use the pedestrian crossing.
3) When exiting all service vehicles will be turning left out therefore no interaction with the pedestrian crossing is possible. The service access will either provide the necessary pedestrian visibility splays or an audio device will be installed to ensure pedestrians travelling along Tay Street are warned of exiting service vehicles.
4) The access provides service vehicle access to a 5- loading bay service yard, which is not expected to be used frequently and a service vehicle traffic management plan will be implemented to ensure that delivery vehicles are restricted to hours outside of peak hours.

Figure 5.2 Service access layout

Stantec Ltd Comment 3: *The entry/exit/goods vehicle entrance (labelled B) is much too close the Tay/Kelvin Street intersection. This lack of separation will create multiple conflict points as follows. Vehicles entering the car park will*

restrict the view for exiting drivers. Exiting drivers that are not destined for Kelvin Street will need to cross at least one lane of traffic in less than 20m. This will at busy times create queues in the car park. When there are queues of more than three or less vehicles on Tay Street at the adjacent signals they will prevent vehicles exiting the car park.

Abley Response: The Invercargill District Plan does not provide any guidance on the minimum distance of a new vehicle crossing from an intersection. NZTA Planning Policy - Appendix 5B – Accessway standards and guidelines recommends a minimum distance of 30m between an access and the nearest intersection (Posted speed limit 50km/h).

To address this concern, the car park access has been relocated further west from the Tay Street/ Kelvin Street intersection. The initial car park access which was located approximately 20m from the intersection is now proposed to be 44m west of the intersection (measured from the property boundary). The extra separation will ensure that vehicles exiting the Invercargill Central will have sufficient length to choose the lane they wish to enter without compromising road safety. The operations of the access and the intersection is further examined in the next chapter.

The service lane, which is located 20m west (measured from the property boundary) of the Tay Street/ Kelvin Street intersection is one-way from Tay Street to Esk Street. It is expected to be used infrequently as it only provides access to the anchor retail activity and refuse collection. The one-way arrangement eliminates the conflict between exiting servicing vehicles and the traffic operations of Tay Street.

5.2 Car Park Access Design

Car parking will be spread across four levels starting from the first-floor. Access to the parking levels will be provided through an entry/ exit ramp on Tay Street. The access ramp will comprise one entry lane, one exit lane and a central inter-changeable lane providing the option of allowing either two entry or two exit lanes depending on the dominant direction of traffic flow. The first 14m of the entry ramp (from the property boundary) will be formed to have a flat gradient and will provide sufficient queuing space for two vehicles to ensure vehicles do not queue across the footpath. The access point will be located 44m west of the Tay Street/Kelvin Street intersection and will be 11.5m wide at the property boundary.

Number plate recognition technology will be used to ensure free or long-term parking users are not held unnecessarily upon entry/exit to the car park. The car park access ramps will be designed with a 1:6 grade with 2m, 1:12 grade transitions. The car park will function with one-way circulation and signage and pavement marking will enforce circulation. Sensors and electronic signage will be used to guide motorists to vacant parking spaces reducing conflict and unnecessary circulation. Electronic signs will be located at the entry to the car park and at decision points throughout the car park. Similar technology used elsewhere is shown in **Figure 5.3**.

The carpark access is expected to be similar to the Lichfield Street Carpark in Christchurch as shown in **Figure 5.4**.

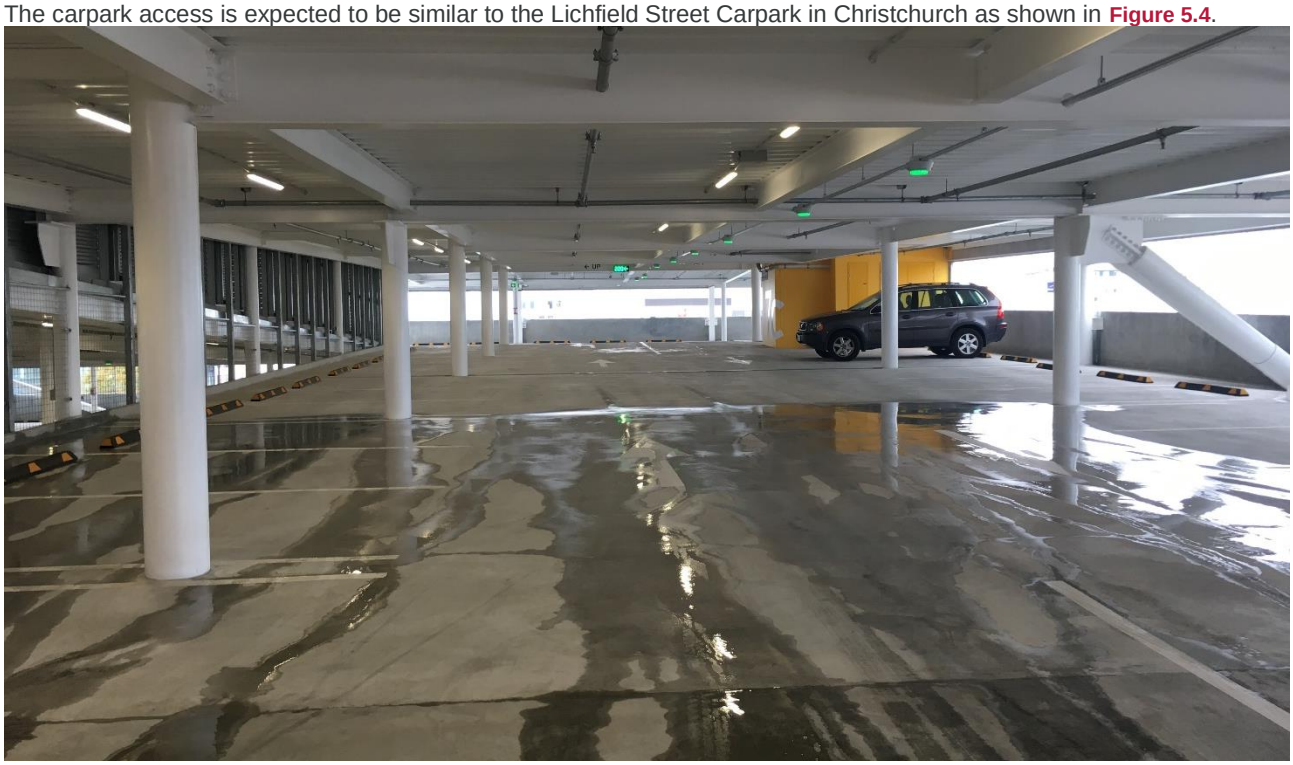


Figure 5.3 Car Park Technology

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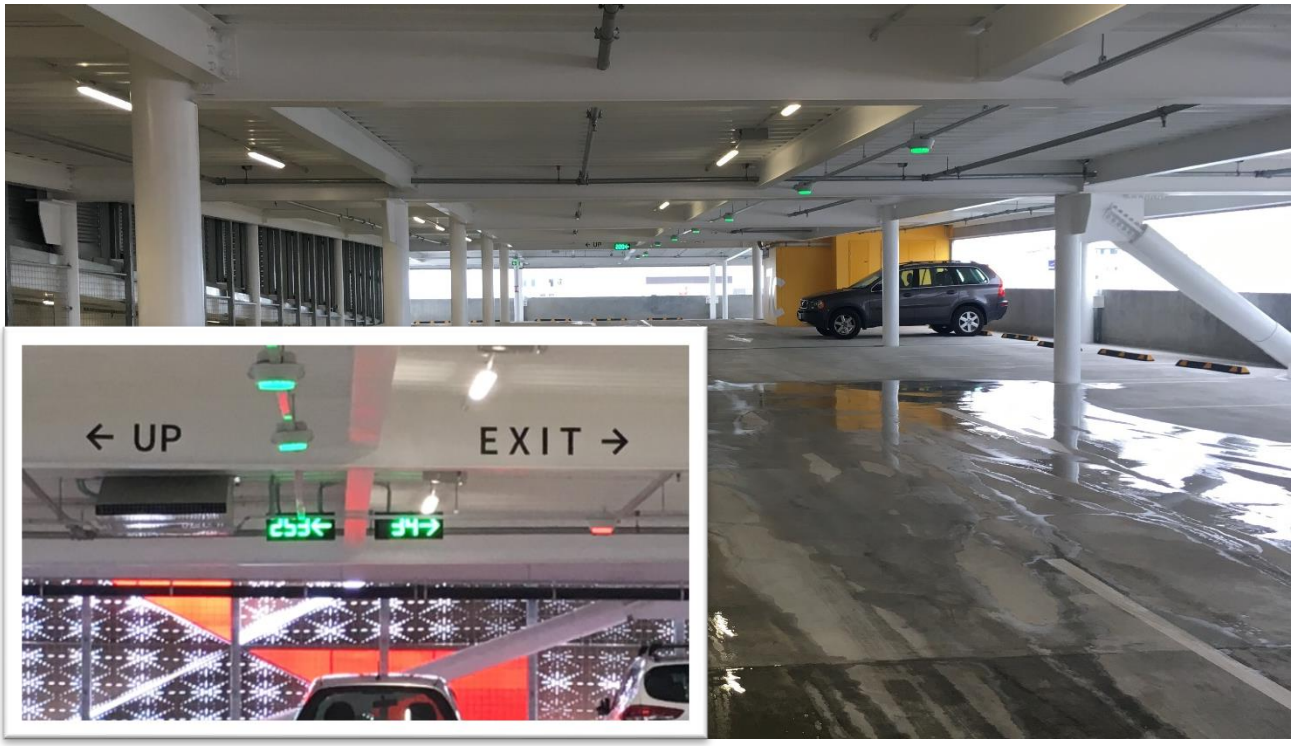

Figure 5.3 Car Park Technology

Figure 5.4 Lichfield Street Carpark Access

Access to the car park will be ticketed and hence both the access and exit lanes of the ramp will be boom gated. The location of the boom gate for entering vehicles will ensure that queueing is provided for at least two vehicles between the site boundary and the access gate. It is further noted that the wide shoulder on Tay Street between the existing pedestrian crossing and the proposed vehicle access means any entering vehicles queueing beyond the site boundary will not obstruct the through movement on Tay Street.

In order to facilitate efficient manoeuvrings for entering vehicles and also to ensure that exiting vehicles have unobstructed sightlines, approximately 7 of the existing angled car parks along Tay Street will have to be removed. These spaces are shown **Figure 5.5**

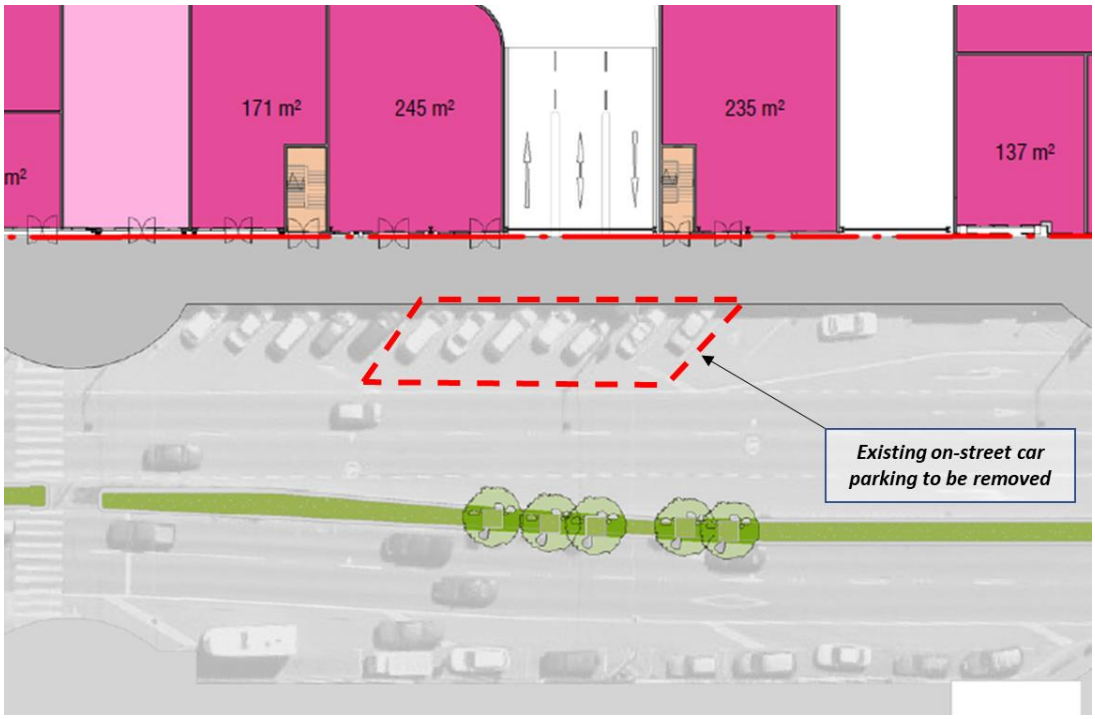

Figure 5.5 Loss of parking in the vicinity of the car park access

5.3 Servicing and delivery arrangements

Invercargill Central will be serviced by an enclosed service yard and a one-way service lane. Both service areas will be accessed via Tay Street. The location of the two service areas are show in **Figure 5.6**.

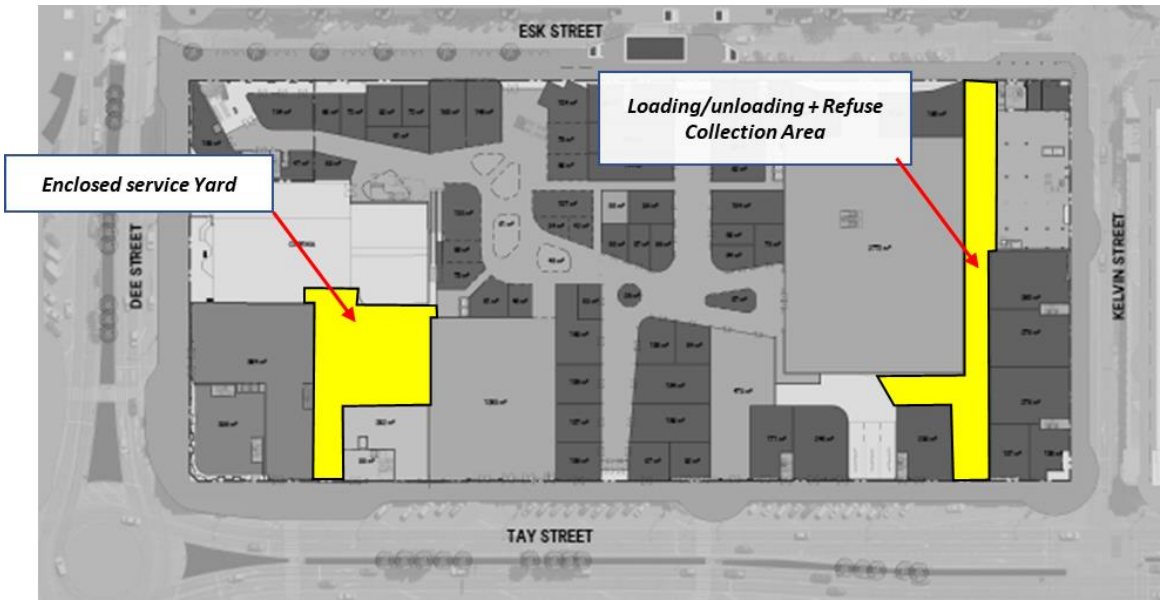

Figure 5.6 Service yard locations

The enclosed service yard has sufficient space to accommodate five 11.5m rigid truck loading bays. The service yard has been tracked for a 10.2m Envirowaste refuse collection truck, a 11.5m rigid truck and an 8m rigid truck. All vehicles will leave and enter Tay Street in forward gear. It is not anticipated that any larger vehicles will enter this service yard given its space constraints.

Refuse collection and more loading opportunities (up to 3 bays) could be provided along the eastern service lane. The service lane is 9m wide at the Tay Street end and is 7.6m wide at Esk Street. Along the western wall of the Kelvin Hotel, the service lane is 7.6m wide which allows loading/ unloading opportunities. A conventional heavy vehicle loading bay is 3.5m in width.

The Service lane has been designed to accommodate a 19m semi-trailer truck. All vehicles using the service lane will enter via Tay Street and exit onto Esk Street as shown in **Figure 5.7**. Automatic swing gates (set back from Tay Street property boundary) will be installed at either end of the service lane to act as a wind barrier and as a result, will restrict pedestrian access.

Figure 5.7 Service yard vehicle movements

There are no loading bay requirements in the Invercargill District Plan. Based on a GFA of approximately 33,500m^2 we conclude that 8 Heavy vehicle loading bays will be more than sufficient for the development. A summary of requirements for other District Council District Plans that include loading area requirements are listed in **Table 5.1**.

Table 5.1 Service bay requirements

District Plan	Requirement for Supermarkets, Shops, Malls, Shopping Centres:	Number of spaces for HWCP development of (Approximately 33,500 GFA)
Christchurch City	1 bay/ 1600 m2 GLFA for the first 6,400 m2 GLFA; and 1/ 5,000 m2 GLFA thereafter.	10
Tauranga City	1 HGV bay/1500m² GLFA for the first 5,000m² GLFA, then 1 HGV bay/5000m² GLFA	10
Auckland Unitary Plan	3 spaces for the first 10000m^2 plus 1 space for every additional 10,000m2	6

5.4 Pedestrian Safety

The proposed development is expected to increase the number of vehicle crossings and the corresponding vehicle movements along Tay Street. It is critical that the these increases in traffic movements does not adversely affect pedestrian movement on Tay Street.

The vehicle crossings/ accesses will be designed to safeguard a high level of pedestrian safety. The accesses will be designed with a surface that will stand out from the footpath surface. The change in surface/ environment will raise pedestrian awareness of vehicles using the car park access. Tactile paving will be used at the footpath edges to cater to visibility impaired pedestrians.

The car park access will be marked with give-way line marking to define the priority at the access. Signage will be used to inform motorists to be aware of pedestrians and vice-versa. The design will attempt to provide a 5m x 2.5m pedestrian visibility splay at all vehicle accesses. If the appropriate visibility splays cannot be achieved audio devices will be installed to warn pedestrians of exiting vehicles.

The proposal will not alter the existing pedestrian crossing facilities on Tay Street. The pedestrian connections within the development will align with the existing crossing facilities as shown in **Figure 5.8** ensuring new pedestrian desire lines are not created.

Automatic swing gates (set back from Tay Street property boundary) will be installed at either end of the service lane to act as a wind barrier and as a result, will restrict pedestrian access.

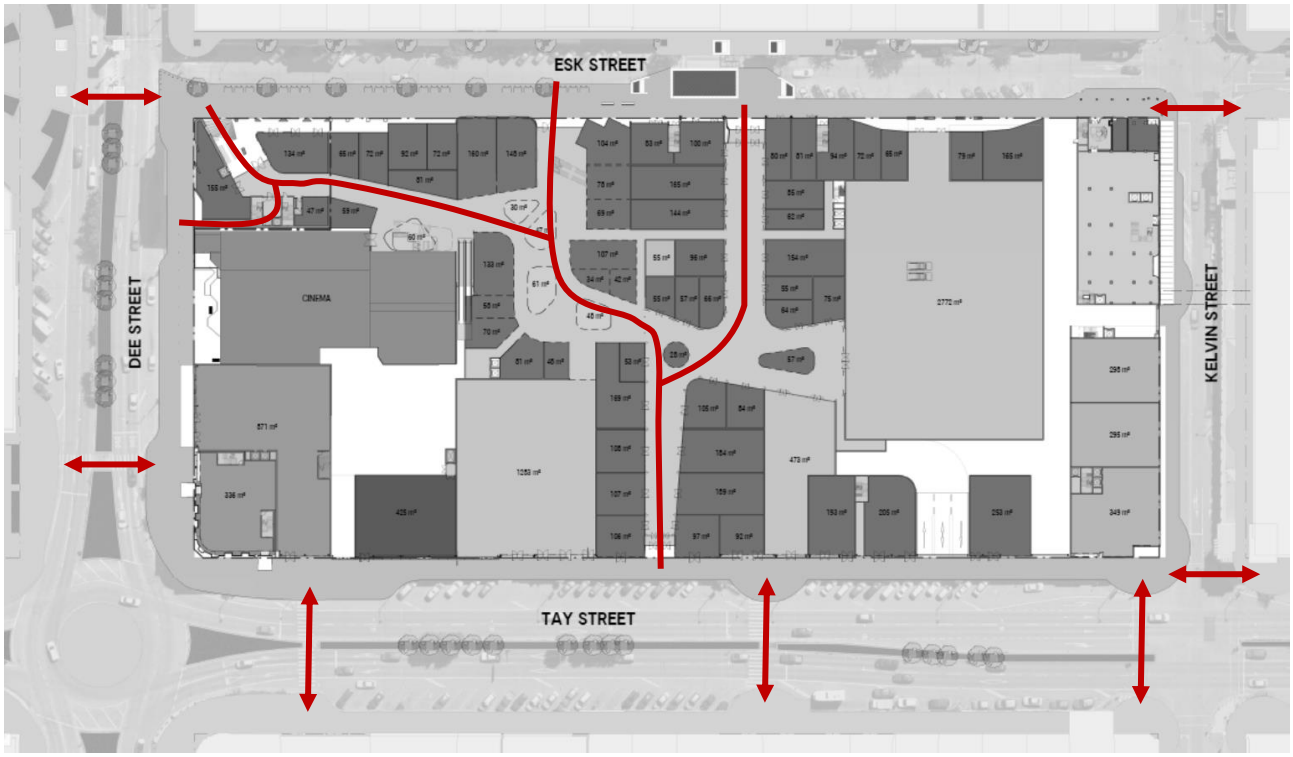

Figure 5.8 Pedestrian desire lines

6. Travel Characteristics and Trip Generation

6.1 Trip Generation

The *'NZTA Research Report 453 Trips and parking related to land use'* has been examined to identify the anticipated trip generation of the proposed development. The research report suggests using a PM peak hour trip rate of 9.9 vehicle per 100m^2 per hour for large shopping centres (>10,000m^2 GFA), a PM peak hour trip rate of 2.5 vehicle per 100m^2 for office, 14.2 vehicles per 100m^2 per hour for medical centre and 7.3 vehicles per 100m^2 per hour for gym activities respectively. The trip rates for the office, medical centre and gym are considered appropriate however the trip rate for the shopping centre has been considered as too high.

The Trips Database Bureau which is New Zealand's pre-eminent source of trips and parking information for land use activities has been referred to source trip and parking rates for similar developments. **Table 6.1** compares trip and parking rates for number of comparable shopping malls in New Zealand. The selection criteria was, more than 20,000m^2 GFA and also excluded sites from Auckland. Given the size and the demographics of Invercargill Central, the average of the three trip rates of the sites in **Table 6.1** has been used. Consequently, to estimate the trip generation of the Retail/ Food & Beverage, Major and Anchor Tenant and Cinema components of Invercargill Central, the rate of 5.34 vehicle per 100m^2 GFA per hour has been used.

Table 6.1 Shopping Mall Trip Rates

NZ shopping Centre	Parking Supply	GLFA	GFA	PM peak veh trip rate (per 100sqm GLFA)
The Base Shopping Centre, Hamilton	1489	26074	34765	3.98
Rotorua Central, Rotorua	1749	32600	43466	5.79
Northlands Shopping Centre, Christchurch	1809	42438	50178	6.24
Average	**1682.33**			**5.34**

The vehicle trip generation for each activity is summarised in **Table 6.2**. Based on a GFA of 33,500m^2 Invercargill Central is estimated to generate approximately 1,522 trips in the evening peak hour. However, as Invercargill city has a sizable on street and off-street car parking supply, some employees/ visitors will not use the Invercargill Central car park on a day to day basis. This event has been factored in the traffic modelling exercise in this section.

Table 6.2 Trip Generation of Invercargill Central

Land Use	Gross Floor Area (m^2)	Trip Rate	Vehicle Trip Generation in evening peak hour
F&B	2289	5.34/100m^2 GLFA	813
Retail	5077		
Major and Anchor Retail	7724		
Cinema	142		
Civic Centre	4241	2.5/100m^2 GFA	106
Office	10844	2.5/100m^2 GFA	271
Medical Centre	1913	14.2/100m^2 GFA	272
Gym	747	7.3/100m^2 GFA	55
Residential	556	1/100m^2 GFA	6
Total	**33533**		**1522 two-way movements**

Traffic generating activities have a range of different trip types associated with them with a proportion of trips being new to the road network. New developments, such as the one proposed, provide an alternative source of similar activities nearby so a proportion of trips can be associated with trips already being made on the network.

These trips are known as pass-by for trips travelling past the proposed access point and diverted trips for trips in close proximity to the site but not directly passing. The Christchurch City Council development contributions policy from 2009 sets out the proportion of trips for different activities into three categories being primary trips (new), diverted trips and pass-by trips.

The split of trips for the different activities proposed are shown in **Table 6.**3 as well as the total number of trips associated with those categories. All gym, medical centre and residential trips are treated as primary (new) trips.

Table 6.3 Development trip types and proportion

trip type	Primary	Divert	Pass-by
Shopping Centre >10,000m2	30%	50%	20%
	195	325	130
Commercial premises/offices	50%	30%	20%
	151	91	60

6.2 Parking Demand

The Invercargill City Council District Plan exempts the proposed development from providing on site car parking. However, it is understood that for the commercial viability of the project a car park with a capacity of 950+ spaces will be provided. Based on the GFA listed in **Table 6.**2 Invercargill Central is proposing car parking at a rate of 2.84 spaces per 100m^2 GFA. Noting the lack of detail on how car parking will be divided between activities, the majority of parking spaces will be available for the retail and hospitality uses of Invercargill Central. Therefore, a more realistic parking rate would exclude some of the office activity GFA. When 60% of office use GFA is discounted, car parking is provided at a rate of 3.52 spaces per 100m^2. The average parking rate for the three reference sites listed in **Table 6.**1 was calculated to be 3.97 spaces per 100m^2. Therefore, the proposed parking supply is considered appropriate.

6.3 Tay Street/ Kelvin Street Intersection Performance

Pre-Development Scenario (Existing)

A traffic count survey at the Tay Street/ Kelvin Street intersection was conducted on the 12 April 2018 by Bonisch Consultants Ltd. The survey captured all turning movements at the intersection between 4-6pm. It should be noted that during the survey the downstream approach was reduced to one lane due to road works therefore, motorists were observed to use only one through lane approaching the intersection from the west. In order to model the intersection operations under normal conditions the through traffic volume on the Tay Street West approach was divided between the two through lanes.

The turning movement survey data is shown in **Figure 6.**1.

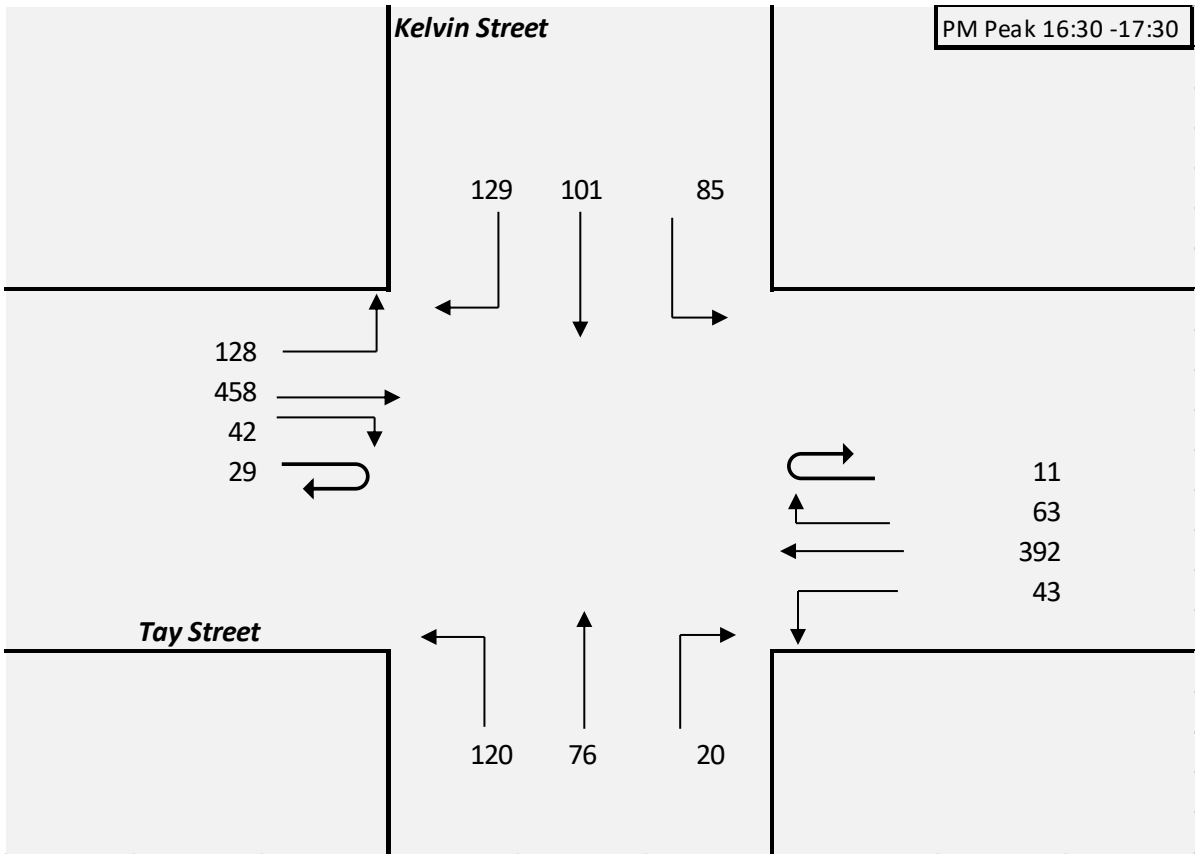

Figure 6.1 Surveyed traffic flow at Tay Street/ Kelvin Street intersection

The signal timing data was obtained from Advance Traffic Solutions Ltd as instructed by Russell Pearson (ICC Roading Manager). The performance of the Tay Street/ Kelvin Street signalised intersection under existing flows was tested using SIDRA Intersection 8 Software. SIDRA Intersection offers a range of outputs for any given model. The outputs selected for this analysis are:

- Degree of Saturation (DoS)
- Average delay (seconds);
- Level of Service (LOS); and
- 95th percentile back of queue and queue distance (metres).

The DOS is a ratio of the demand placed on the intersection against the capacity of the intersection. A DOS equal to 1.0 indicates that the intersection is operating at its maximum theoretical capacity.

Average delay is the average delay experienced by vehicles travelling through an intersection and includes deceleration, queuing, stopping and acceleration.

The LOS generally describes the traffic conditions in terms of travel time, volume, capacity, freedom to manoeuvre and convenience. The LOS ranges from A to F where A represents the least impediment to vehicle movement and F represents heavy congested conditions.

The 95th percentile back of queue and queue distance is the value below which 95% of all observed queue lengths fall (i.e. 5% of all observed queue lengths exceed this value).

SIDRA outputs for the existing traffic flows through the Tay Street/ Kelvin Street intersection are provided in **Table 6.4** for the 4.30pm – 5.30pm weekday evening peak hour. More detailed SIDRA outputs are available in **Attachment C**.

Table 6.4 Tay Street/ Kelvin Street intersection - Pre-Development

Movement	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of Queue (veh)	95% Queue (m)
South Approach: Ninth Street					
Left	0.260	29.4	LOS C	3.7	26.0
Through	0.217	25.3	LOS C	3.0	20.9
Right	0.217	29.8	LOS C	3.0	20.9
East Approach: Tay Street					
Left	0.482	17.8	LOS B	9.2	64.8
Through	0.482	13.2	LOS B	9.2	64.8
Right	0.144	11.4	LOS B	0.9	6.5
North Approach: Kelvin Street					
Left	0.253	29.2	LOS C	3.6	24.9
Through	0.482	28.4	LOS C	5.9	41.8
Right	0.482	32.9	LOS C	5.9	41.8
West Approach: Tay Street					
Left	0.149	17.8	LOS B	2.9	20.1
Through	0.257	14.0	LOS B	5.5	38.7
Right	0.141	13.8	LOS B	1.2	8.7
Intersection	**0.482**	**18.8**	**LOS B**	**9.2**	**64.8**

The above table indicates that during the evening peak hour, the average delay experienced at the intersection is 18.8 seconds. However, greater average delays of up to 33 seconds are experienced on the north and south approaches. Overall, the signalised intersection operates satisfactorily at LOS B.

Post Development Scenario

The future performance of the intersection has also been modelled using SIDRA. The analysis has been conducted based on the existing signal timing data. However, if opportunities to adjust signal timing data exists these will be discussed with the relevant parties in due course.

The pass-by trips have been discounted and the new and diverted trips have been added to the Tay Street/ Kelvin Street intersection. It has been assumed that 20% of the development traffic will not use the Invercargill Central car park due to the high availability of free on-street car parking within a 5-10-minute walk from the Invercargill Central. Therefore only 1218 vehicles (80% of 1522 vehicle movements) will travel in/out of the Invercargill Central car park. All office/ civic trips will be split 10/90 between entering and exiting movements (evening peak hour coincides with end of business day) whilst all other trips will be split 50/50 in and out. The trip generation/ distribution of the Invercargill Central is shown in **Figure 6.2**.It is assumed that customers will not approach the car park from Kelvin Street or Ninth Street due to better alternatives.

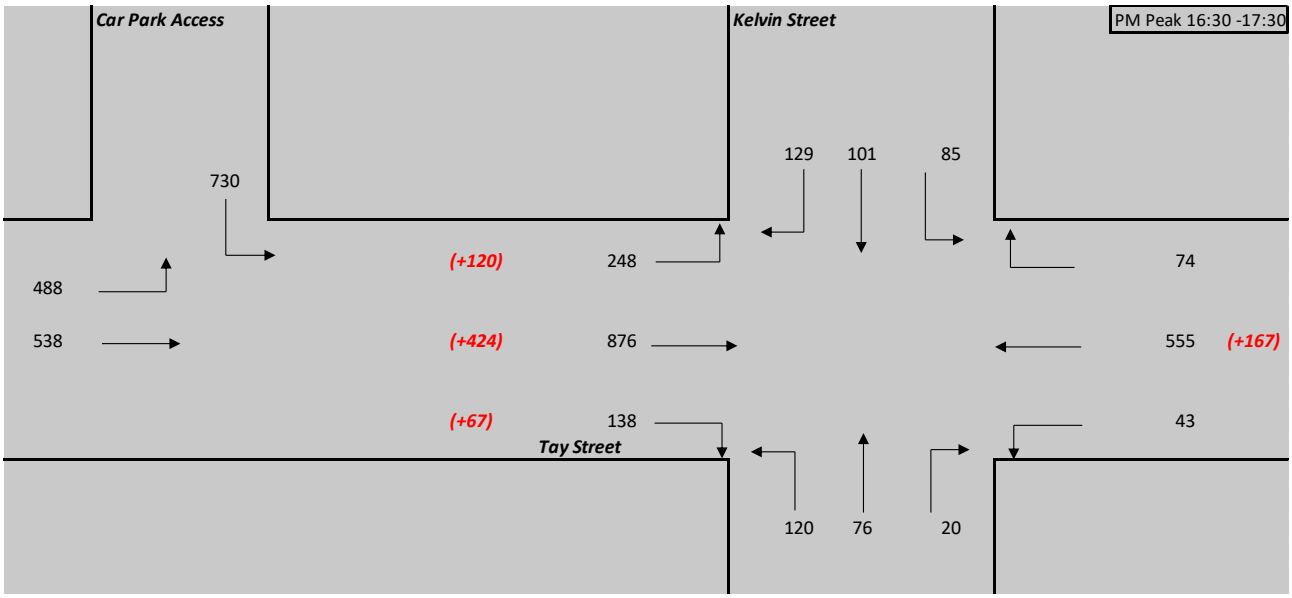

Figure 6.2 Trip Distribution of the Invercargill Central (Evening Peak Hour 16:30-17:30)

The results of the SIDRA analysis for the Tay Street/ Kelvin Street intersection during the evening peak hour with the redistributed development traffic is shown in **Table 6.5**. More detailed SIDRA outputs are available in **Attachment C.**

Table 6.5 Tay Street/ Kelvin Street Intersection Performance - Post Development

Movement	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of Queue (veh)	95% Queue (m)
South Approach: Ninth Street					
Left	0.336	34.2	LOS C	4.0	28.6
Through	0.286	30.1	LOS C	3.3	23.0
Right	0.286	34.7	LOS C	3.3	23.0
East Approach: Tay Street					
Left	0.679	14.8	LOS B	11.9	83.7
Through	0.679	10.2	LOS B	11.9	83.7
Right	0.200	10.8	LOS B	0.8	5.7
North Approach: Kelvin Street					
Left	0.327	34.0	LOS C	4.1	28.5
Through	0.642	34.3	LOS C	6.9	48.3
Right	0.642	38.8	LOS D	6.9	48.3
West Approach: Tay Street					
Left	0.283	14.6	LOS B	5.3	36.9
Through	0.540	12.5	LOS B	11.3	79.2
Right	0.296	11.6	LOS B	2.1	15.0
Intersection	0.679	16.8	LOS B	11.9	83.7

The above table indicates that during the evening peak hour, the average delay experienced at the intersection is 16.8 seconds. However, greater average delays of up to 38 seconds are experienced on the north and south approaches. Overall, the signalised intersection operates satisfactorily at LOS B.

The modelling results show that the queues on Tay Street West approach would be approximately 79m. More importantly, the results indicate that 95% of queues on Tay Street west will be 11 vehicles (79m) and the average queue will only be 7 vehicles (49m).

6.4 Tay Street/ Carpark Access

Similar to the Tay Street/ Kelvin Street intersection the performance of the Tay Street/ Carpark Access has been modelled in SIDRA. The layout of the intersection is shown in **Figure 6.3**. The delay caused by the boom gate cannot be replicated in SIDRA therefore the follow up gap acceptance has been adjusted to mimic the operations of the boom gate. In order to mitigate motorists changing lanes while exiting, the left exit lane will be marked as Tay Street/ Kelvin Street only while the central exit lane will be marked Tay Street/ Ninth Street only. Visibility splays will be provided on the right side of the access to ensure pedestrians have adequate visibility of exiting vehicles and if visibility splays cannot be achieved an audio device or signage will be used to increase pedestrian awareness of exiting vehicles.

Figure 6.3 Tay Street/ Carpark Access Layout

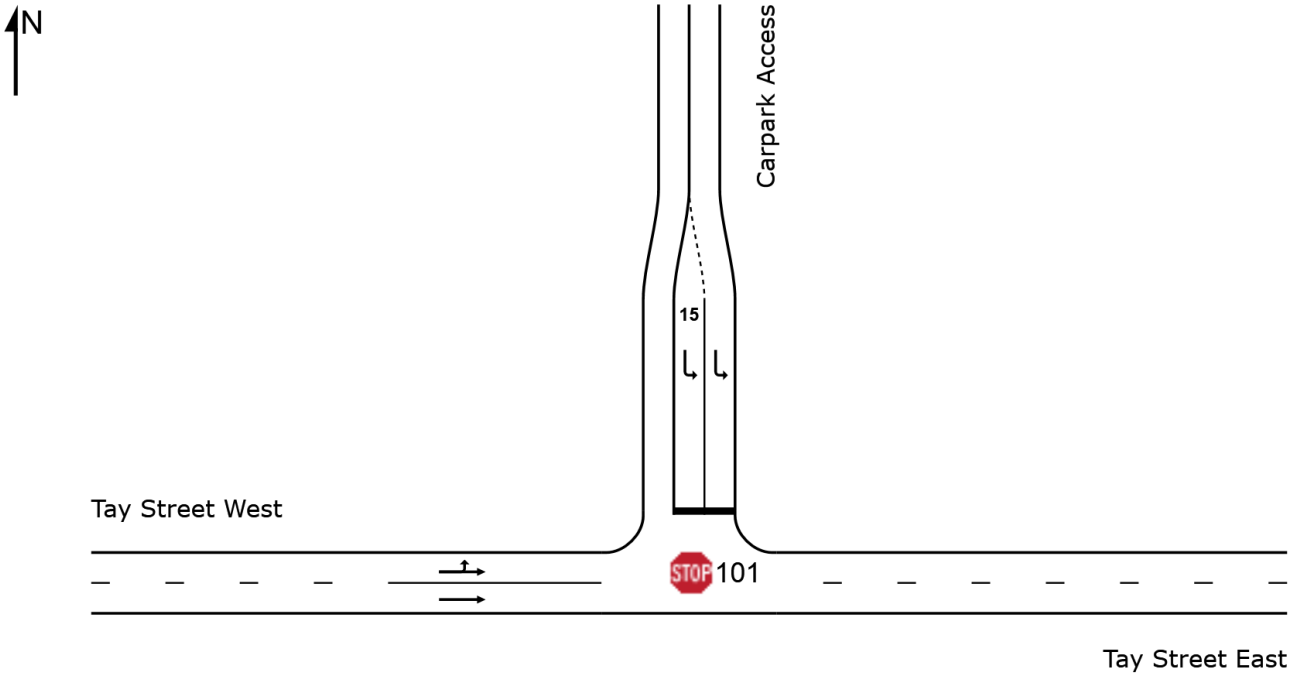

Table 6.6 Tay Street/ Carpark Access Intersection Performance

Movement	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of Queue (veh)	95% Queue (m)
North Approach: Carpark Access					
Left	0.476	10.3	LOS B	2.9	20.5
West Approach: Tay Street					
Left	0.284	4.6	LOS A	0.0	0.0
Through	0.284	0.0	LOS A	0.0	0.0
Intersection	**0.476**	**5.6**	**NA**	**2.9**	**20.5**

Table 6.6 indicates that the Tay Street/ Carpark Access intersection performs satisfactorily with the car park access experiencing a LOS B with an average delay of 10.3 seconds. The 95Th percentile queue was modelled to be 20m suggesting that the proposed exit arrangement will have sufficient queueing length within the site.

The modelling results show the 95th percentile queue on Tay Street is 79m (11 vehicles) long and will extend across the car park access. Based on our professional judgement we have analysed how the Tay Street/ Kelvin Street intersection and car park egress are likely to interact.

The signal phasing times show that the green time for Phase A (Tay Street eastbound through and left movement) is 38 seconds. **Figure 6.2** shows that the car park discharge is greater than the eastbound traffic flow on Tay Street in the evening peak hour. Therefore, the 11 vehicle (95th percentile) queue can be split into two segments. Segment one being the 6-vehicle queue between Kelvin Street and the car park access and segment two being the queue split into Tay Street beyond the car park access and the car park egress. This back end of the queue (5 vehicles) will be split 40/60 between Tay Street and the car park egress given the arrival split is approximately 40/60 (730 vehicles to 538 vehicles).

Assuming a vehicle takes 2 seconds to exit the signalised intersection, the six-vehicle queue within the 40m section between the car park access and Kelvin Street will take approximately 12 seconds to clear and 4 seconds will be necessary to clear the remaining queue on Tay Street West approach. Leaving 22 seconds within the green time in one cycle for the car park egress queue (3 vehicles) to enter Tay Street and travel through the intersection.

Furthermore, based on 538 peak hour vehicle movements, vehicles on Tay Street arrive at the car park intersection at a rate of 1 per every 6.7 seconds. Collectively, allowing sufficient time for vehicles leaving the car park to exit and travel through the Tay Street/ Kelvin Street intersection within a green time of 38 seconds.

Figure 6.4 Tay Street/ Kelvin Street west approach queue segments

7. District Plan Assessment

7.1 Review of Proposal against the District Plan

An assessment of the proposal against the transport related rules of the Invercargill District Plan has been undertaken. The results of this are summarised in **Table 7.1**. Any non-compliances are further assessed in the subsequent sections of this report, with regard to the corresponding assessment matters stated in the Invercargill District Plan.

Table 7.1 District plan rule assessment

Rule	Assessment	Status
3.20.1 Off-Street Car Parking Requirements: All land use activities specified in the table below shall provide the following minimum off-street car parking facilities except: (A) Within the Seaport 1 and 2 Zones, Smelter Zone and the City Centre Priority Redevelopment Precinct in the Business 1 Zone. Where staff parking is to be provided, all such spaces are to be so identified.	No off-street car parking is required as the site is located within the City Centre Priority Redevelopment Precinct. However, approximately 950 off-street car parking spaces will be provided.	Complies
3.20.2 Car parking design: All car parking spaces are to be designed to comply with the car parking standards set out in Appendix VIII (Transport Standards).	See below	Complies
APPENDIX VIII – TRANSPORT STANDARDS 1. CAR PARKING STANDARDS NOTES: (A) On road parking requirements: On road parking spaces are not detailed in the Invercargill City District Plan and are to be designed, constructed and signposted in accordance with the Invercargill City Council Bylaw Code of Practice for Land Development and Subdivision Infrastructure. (B) Accessible car parking spaces: Accessible car parking spaces are not detailed in the Invercargill City District Plan and are to be calculated, designed, constructed and signposted in accordance with the requirement in the New Zealand Building Code.	No on road parking spaces are proposed. New Zealand Building Code refers to Car parks and the New Zealand access standard (NZS 4121) for accessible car park requirements. NZS 4121 requires 20 accessible car parking spaces for a car park with 950 car parking spaces. 28 accessible parking spaces are proposed. Accessible car parking spaces are 3.5m x 5.5m satisfying the requirements of the New Zealand Building Code. All accessible parking spaces will be connected to the building cores via dedicated accessible paths. All circulating aisles and parking spaces will provide the minimum height requirement of 2.5m.	Complies
Car Parking Areas (1) Car parking spaces shall comply with Figure 1 and Table 1. Table 1: Car Park Dimensions requires 90-degree car parking spaces to be at least 2.5m x 5.4m with an 5.8m aisle. (2). Gradient: The gradient of car parking spaces shall be no more than 1 in 20 in any one direction. (3). Where the required parking area is outside the building, it shall connect to the building via a pedestrian access route.	The proposed car parking spaces are measured to be 2.6m x 5.5m with an aisle at least a 6.2m in width. Therefore, all car parking spaces will comply with the dimensions set out in this rule. It is assumed that the gradient of the car park will be no more than 1 in 20 in any direction. All parking spaces are located within the building it serves.	Complies

Car parking circulation roadway (4) Vehicle circulation routes shall have: (a) A width of no less than 3.5m for one-way circulation routes and 6.5m for two way circulation routes. Where pedestrians have to use the circulation roadway to reach a pedestrian access route the widths shall be increased by 800mm. (b) A grade of no more than 1 in 8. Note: For ramp grades greater than 1 in 8, a transition is required at changes in grade to avoid scraping the underside of vehicles or stranding them on humps. (c) Height clearances of no less than 2.1m. Where a circulation route roadway crosses a pedestrian access route, adequate visibility shall be provided. At the crossing, the circulation roadway shall have a gradient no more than 1 in 20 for a distance of 6.0m back from the pedestrian access route and visibility displays shall be provided	The car park has been designed for one-way circulation and all aisles are wider than 6m allowing for vehicle and pedestrian circulation. The car park will have 1:6 ramps and 1:12 transitions will be used to avoid scraping the underside of vehicles. It is assumed that the car park will have the minimum clearance for No vehicle circulation routes cross a pedestrian access route.	Complies
Queuing spaces Spaces for queuing of vehicles shall be provided between the street and any vehicle control points. To permit a free flow of traffic into the car parking area without adversely affecting traffic flows in surrounding areas, the queuing space shall be no less than given in Table 2. For storage capacity greater than 200 vehicles, reference to AS 2890.1 is made.	Table 3.3 of AS 2890.1 requires a minimum queuing space for 57 cars. This is calculated as below; 1st 100 cars: 3% of capacity 2nd 100 cars: 2% of capacity Additional cars: 1% of capacity Based on the above rates a minimum A queuing length of 2 cars per lane is provided.	Does not comply
Spaces and circulation for courier van delivery vehicles (7) Where buildings are required to be serviced only by courier vans, the loading space shall be no less than 6.0m long, 3.0m wide and 3.2m high. Circulation roadways between the street and loading spaces for courier vans shall: (a) Provide a height clearance of no less than 3.0m. (b) Have geometrics complying with paragraphs 4 (a) and (b) and 5. Note: Where buildings are required to be serviced by vehicles larger than courier vans, circulation roadways and loading spaces should be specifically designed.	The development will be serviced by vehicles larger than a courier van and the service areas has been specifically designed to accommodate such vehicles.	Complies
PRIVATE WAYS AND RIGHT OF WAYS Note: Commercial and Industrial development will be considered on a case by case basis in consultation with the Council's Roading Manager.	The development is a commercial development therefore the standards set out in Table 1: Private way and Right of Way Standards do not apply.	Complies
3.20.3 Parking Spaces for Non-Residential Activities: Where parking spaces are provided for a non-residential activity located within or adjoining a Residential Zone, the area comprising the off-street	The off-street car park will be screened from all street frontages.	Complies

parking spaces, together with their respective access drives and aisles, shall: (A) Be screened by a close boarded fence, solid wall or hedge not less than 1.8 metres in height. (B) Be designed to comply with the parking standards in Appendix VIII.		
3.20.4 Activity Status Where any of the provisions of Rules 3.20.1, 3.20.2 and 3.20.3 above will not be met then the activity is a discretionary activity.	The proposed activity does not meet the requirements of Rule 3.20.2, Appendix VIII queuing spaces.	Discretionary activity
3.20.5 Applications made under Rule 3.20.4 above shall address the following matters, which will be among those taken into account by the Council: (A) Alternative arrangements proposed for off-street parking. (B) Provision made for transportation modes other than the private motor vehicle. (C) Effects on the transportation network. (D) Effects on adjoining properties and the immediate neighbourhood.	The proposal has been assessed against these assessment matters in Section 8.	See Section 8
3.20.6 Loading Facilities and Manoeuvring Spaces: Provision is to be made for loading and unloading facilities and manoeuvring spaces on site for vehicles servicing that activity, except: (A) For infrastructure. (B) Within the Priority Redevelopment Precinct in the Business 1 Zone. (C) Within the Smelter Zone. (D) For residences fronting the street within the Residential 1, Residential 1A, Residential 2 and Residential 3 Zones.	No loading facilities are required as the site is located within the City Centre Priority Redevelopment Precinct. However, a service yard with capacity for 5 large rigid trucks and a service lane (with up to 3 spaces) designed for semi-trailer access is proposed.	Complies
3.20.7 Where any loading facility and/or manoeuvring space is provided: (A) It is to be so designed that vehicles using the facility are able to enter and leave the site in forward gear. (B) The facility and any associated vehicle manoeuvring area, is to be designed to comply with the manoeuvring diagram in Appendix VIII.	All vehicles accessing the service areas will enter and leave the service area in forward gear.	Complies
3.20.8 For residences fronting the street within the Residential 1, Residential 1A, Residential 2 and Residential 3 Zones: Where no manoeuvring space is provided on site and a garage is built with the garage door positioned towards the street, a setback of 5.2 metres shall be provided from the garage door to the property boundary.	N/A	N/A
3.20.9 Where any of the provisions of Rules 3.20.6, 3.20.7 and 3.20.8 above are not complied with then the activity is a discretionary activity.	N/A	N/A
3.20.10 Applications made under Rule 3.20.9 above shall address the following matters which will be among those taken into account by the Council: (A) The effect of loading and unloading facilities and manoeuvring spaces on site on the	Noted	N/A

transportation network and the amenities of the area.		
3.20.11 Accesses to, and Egresses from, Roads: It is a discretionary activity to construct and use new vehicle accesses from, and egresses on to, State Highways: (A) For any activity, where the speed limit exceeds 50 kph. (B) For any discretionary or non-complying activity where the speed limit is 50 kph or less. Note: The approval of the New Zealand Transport Agency is required for any works on the State Highway.	The activity is non-complying in the zone and the speed limit in the vicinity of the activity is 50km/h. Also, the activity will be accessed via a State Highway consequently NZTA approval is required.	Discretionary activity.
3.20.12 Applications made under Rule 3.20.11 shall address the following matters which will be among those taken into account by the Council: (A) The location of the vehicle accesses and egresses. (B) The dimensions, formation and surfacing of the vehicle accesses and egresses. (C) Any additional works that may be required on site or on the roadway itself to avoid, remedy or mitigate any potential traffic safety problems.	The proposal has been assessed against these assessment matters in Section 8.	See Section 8
3.20.13 The erection of, or addition to buildings and other structures, which exceed 1.2 metres in height, within the Railway Crossing Safety Zones shown on the District Planning Maps is a restricted discretionary activity. The matters over which Council shall exercise its discretion are: (i) Any adverse effect on the safety of the level crossing for vehicles and pedestrians. (ii) The extent to which vehicles entering and exiting the level crossing can see trains.	The site is not located within the Railway crossing Safety Zone.	N/A
3.20.14 Except within the Seaport 1 and Seaport 2 Zones, the construction of crossings at railway lines which are intended to be used by vehicles is a discretionary activity	N/A	N/A

8. Assessment of Non-Compliances

Rule 3.20.3 APPENDIX VIII – Transport Standards, 1. Car Parking Standards - Queuing Spaces

(A) Alternative arrangements proposed for off-street parking.

The queueing distance provided at the car park entry does not meet the requirement set out in Table 3.3. of the AS/ NZS 2890.1:2004. The minimum requirement of queuing space for 57 cars is considered excessive and unfeasible. The queueing space proposed at the car park is consistent with two multi storey car parks located in Christchurch. Namely, Lichfield Street car park building (805 spaces) and Hereford St car park building (580 spaces). Both car parks provide sufficient queueing distance for two vehicles per entry lane. The car park entry layouts for these car parks are shown in **Figure 8.1** and **Figure 8.2**.

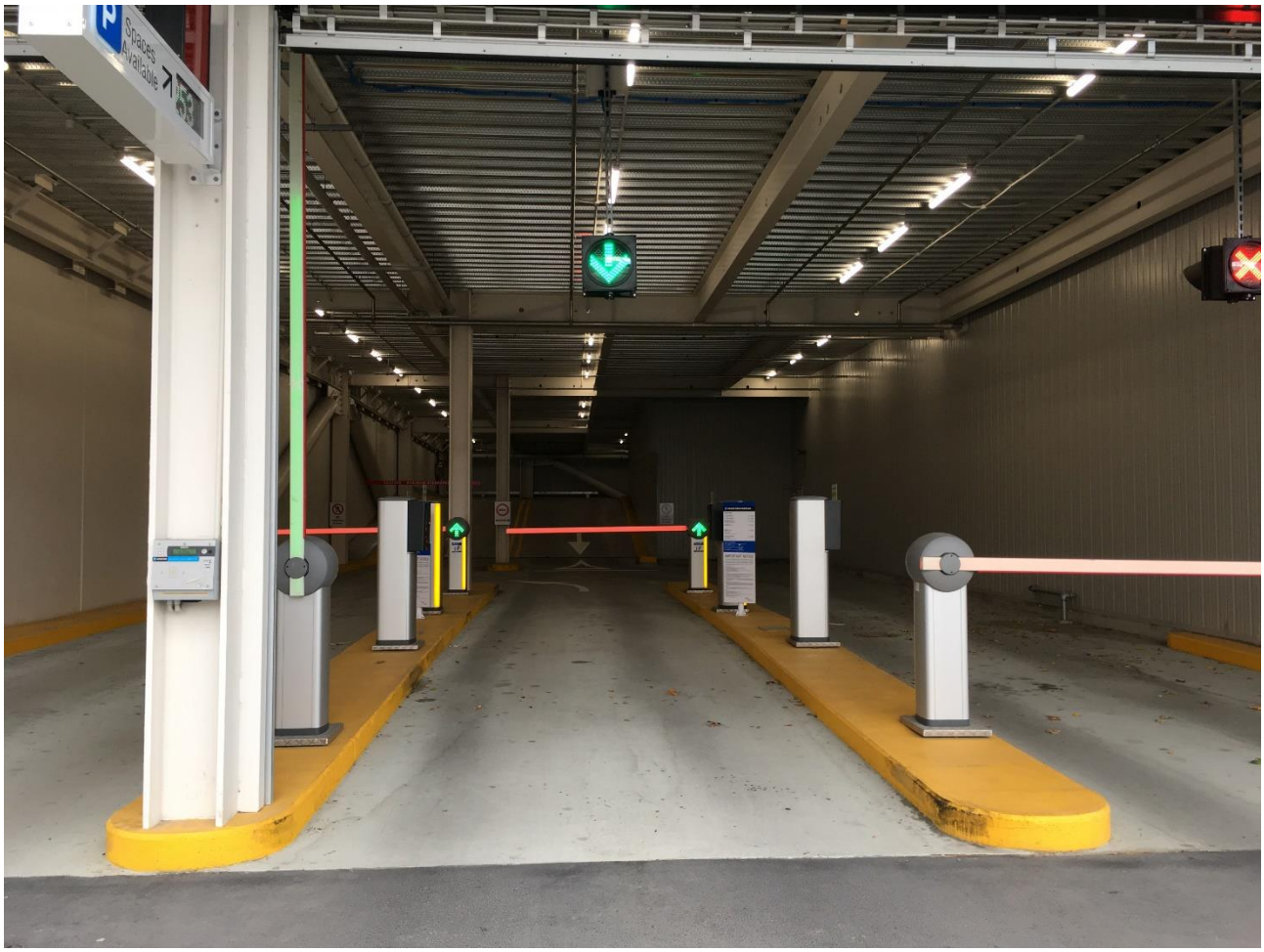

Figure 8.1 Hereford Street car park entry/ exit arrangement

(B) Provision made for transportation modes other than the private motor vehicle.

The Invercargill bus interchange will be located on the western perimeter of Invercargill Central providing employees/ visitors with easy access to bus services. A 5-metre-wide footpath with multiple crossing facilities will be provided along Tay Street and in the vicinity of the vehicle crossing a 3m or wider clear footpath will be maintained for continuous pedestrian access. A similar arrangement is shown in **Figure 8.3**.

Figure 8.2 Lichfield Street car park entry/exit arrangement

(C) Effects on the transportation network,

In general, queueing space is required at car park accesses to ensure the following;

- Vehicles do not queue on to the frontage road impeding the operations and the functioning of the frontage road
- Queueing vehicles do not block and compromise pedestrian movement and safety along the footpath

In the vicinity of the proposed car park access the Tay Street carriageway is approximately 31m wide with a 8m sealed shoulder in the eastbound direction. This allows ample space between the footpath and the traffic lane for a third and fourth vehicle to queue without impeding the operations of the traffic lanes on Tay Street.

Furthermore, It is proposed that at least 3m of clear footpath will be maintained for continuous pedestrian access.

(D) Effects on adjoining properties and the immediate neighbourhood.

The proposed car park access will be left in/ left out only, which means it will not interfere with any vehicle movement/ accesses on the westbound direction of Tay Street. In the eastbound direction a new service lane will be located approximately 15m from the car park access. The service lane will function as a left in one-way service lane from Tay Street to Esk Street and therefore will not interfere with the functioning of the car park access. Deliveries/ service vehicles will be scheduled not to coincide with peak trade hours.

Based on the above assessment the provided queueing spaces is considered appropriate for the car park access and the effects of not providing the minimum required queuing space is minimal.

Figure 8.3 Define pedestrian path across the vehicle access

Rule 3.20.11 Accesses to, and Egresses from, Roads

The proposed activity is a non-complying activity accessed via a New Zealand State Highway, therefore the proposal has been assessed against the assessment matters listed in 3.20.12.

a) **The location of the vehicle accesses and egresses/ b) The dimensions, formation and surfacing of the vehicle accesses and egresses**

Tay Street to Esk Street service lane – This 8m wide service lane will be located approximately 20m from the Tay Street/ Kelvin Street intersection (measured from the property boundary). The service lane will function as a one-way service lane from Tay Street to Esk Street. Given the one-way operations the service lane will not interfere with the functioning of the Tay Street/ Kelvin Street intersection. There is sufficient shoulder width between the pedestrian footpath and the eastbound traffic lanes for turning vehicles to use without impeding traffic flow on the eastbound traffic lanes.
The service lane will only be used by the land uses located in the eastern third of Invercargill Central and unlikely to be used by any food and beverage servicing vehicles. Therefore, the number of vehicles expected to use the service lane is minimal. The service lane has been designed to accommodate a 19m semi-trailer which may use the service lane for large furniture type deliveries. These types of deliveries are not expected to be rare (less than one delivery a day).
Since the service lane is an ingress, service vehicle drivers will always have visibility of pedestrian waiting to cross the access. Therefore, pedestrian safety will not be compromised.

Service lane exit on Esk Street – The existing Esk Street vehicle crossing will transition from a two-way access to a one way access. This is will improve the traffic conditions on Esk Street by removing the short two-way section on an otherwise one-way street. The regained space could be used to provide more on street parking or streetscape infrastructure. Visibility splays (5m by 2.5m) will be provided at the property boundary and similar to other accesses surface treatments will be used to differentiate the access from the foot path.

Multi-story car park access – The 11.5m wide multi-storey car park access will be left -in left out only due to the raised median on Tay Street. Details of the car park access were discussed in Chapter 5.

The service yard access – The 5m one-lane two -way service access will be located approximately 3m east of the existing zebra crossing located on Tay Street. The service yard has been designed to accommodate a 11.5 truck, which is expected to be the largest vehicle to use the service yard.
As mentioned previously the pedestrian crossing is located to the west of the service access and as the service access is left-in/ left-out the interaction between pedestrians and service vehicles is limited to when vehicles are approaching the pedestrian crossing from the west. Pedestrians will be protected by the use of street furniture as shown in **Figure 8.5**.

c) Any additional works that may be required on site or on the roadway itself to avoid, remedy or mitigate any potential traffic safety problems.

All four vehicle crossing surfaces will be differentiated from the pedestrian footpath to ensure pedestrians are aware of the changing environment. Where possible visibility splays or audio devices will be used to ensure pedestrians are alerted of exiting vehicles. A concept layout for the car park access is shown in **Figure 8.4**.

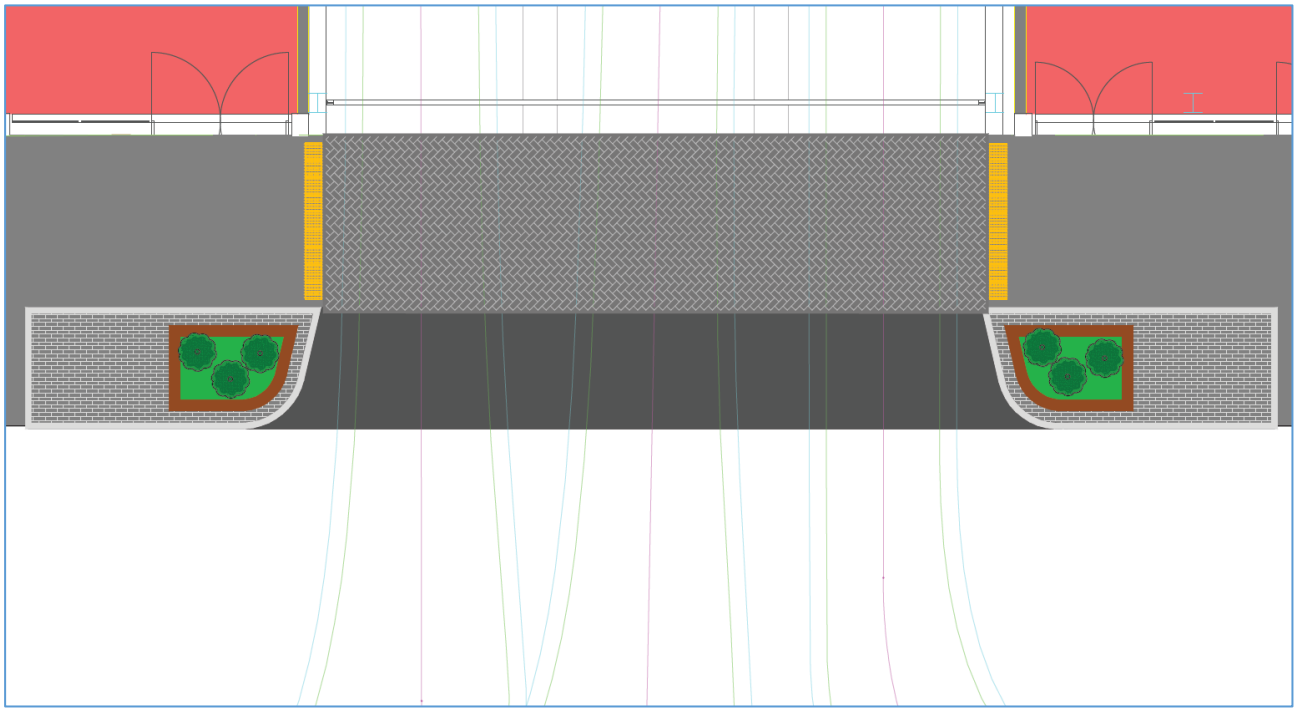

Figure 8.4 Concept car park access treatment

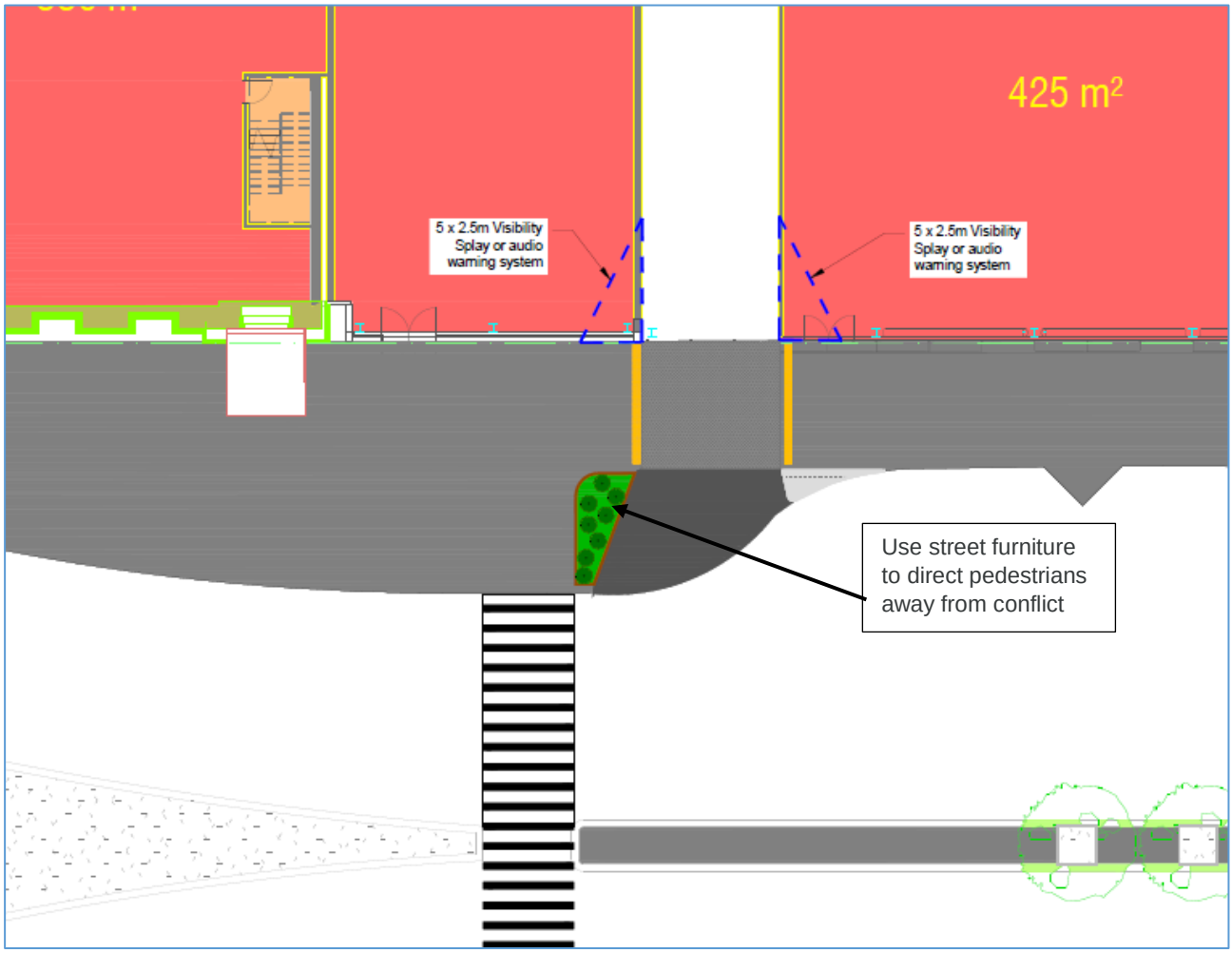

Figure 8.5 Potential treatment at west service yard access

9. Conclusion

HWCP Management Limited propose to establish a mixed-use development in the heart of the Invercargill city. The development will contain an office precinct, a medical centre, an up-scale food court/restaurant space, general retail, anchor retail tenant, gym and a public space in the block between Tay and Esk streets and Kelvin and Dee streets.

The proposal includes a 950+ car park accessed via a two-way vehicle crossing on Tay Street. The car park access is located 44m west of the Tay Street/ Kelvin Street intersection. The operations of the intersection and the car park access has been modelled using traffic modelling software.

The modelling results indicate that car park users will have sufficient gaps in the eastbound traffic flow to enter and travel through the Kelvin Street intersection due to the relatively low traffic flow on Tay Street.

Furthermore, all vehicle accesses along Tay Street has been designed to ensure pedestrian safety is not compromised by vehicles entering and leaving the site. Design elements such as visibility splays, surface treatments, and street furniture will be used to ensure pedestrian safety is preserved.

The proposal has been assessed against the transport rules of the Invercargill District Plan. The proposal complies with all transport rules, except two rules related to queueing space and vehicle access. The non-compliance has been further assessed and due to mitigating design elements of the proposal, it can be concluded that no notable effects are expected as a result of the non-compliance.

Based on the above assessment, the proposed development can be supported from a traffic and transportation perspective and it is considered that there are no traffic related reasons why consent should not be granted.

Appendix A
Site Plan - Street Level

HOTEL
RETAIL
CIVIC
AMENITIES
CARPARK
F&B SEATING
OFFICE
CIRCULATION
GYM
MAJOR & MINI MAJOR
F&B
MEDICAL
RESIDENTIAL

1 / 3010 OVERALL - GROUND FLOOR PLAN
1 : 500

OVERALL - GROUND FLOOR PLAN

1100

INVERCARGILL MASTERPLAN
BUCHAN

917077
MAY 2018

BUCHAN

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Appendix B
Swept Path Drawings

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Design	JB
Drawn	RT
Checked	XXX
Issued	18/07/2018
Scale	1:250 @ A3

Invercargill Central

Indicative Car Park Access Layout

Project No.	HML_J001
Dwg #	ATC10197
Sheet	3
Revision	--

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Scale	1:250 @ A3

Invercargill Central

Indicative Car Park Access Layout

99% Car Queuing Space

Project No.	HML_J001
Dwg #	ATC10197
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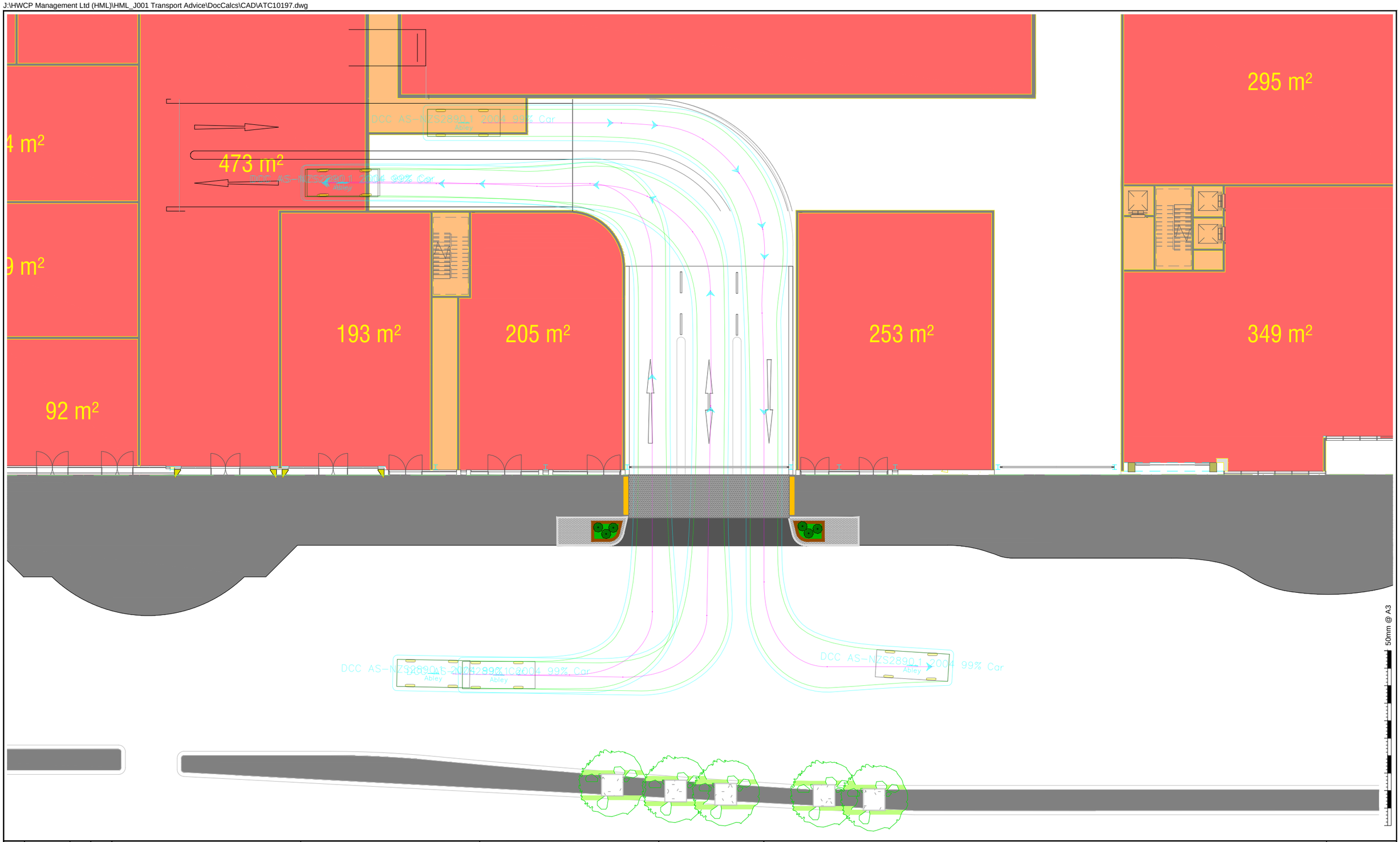

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Scale	1:250 @ A3

Invercargill Central

Indicative Car Park Access Layout

99% Car Swept Path Accessing Level 1

Project No.	HML_J001
Dwg #	ATC10197
Sheet	5
Revision	--

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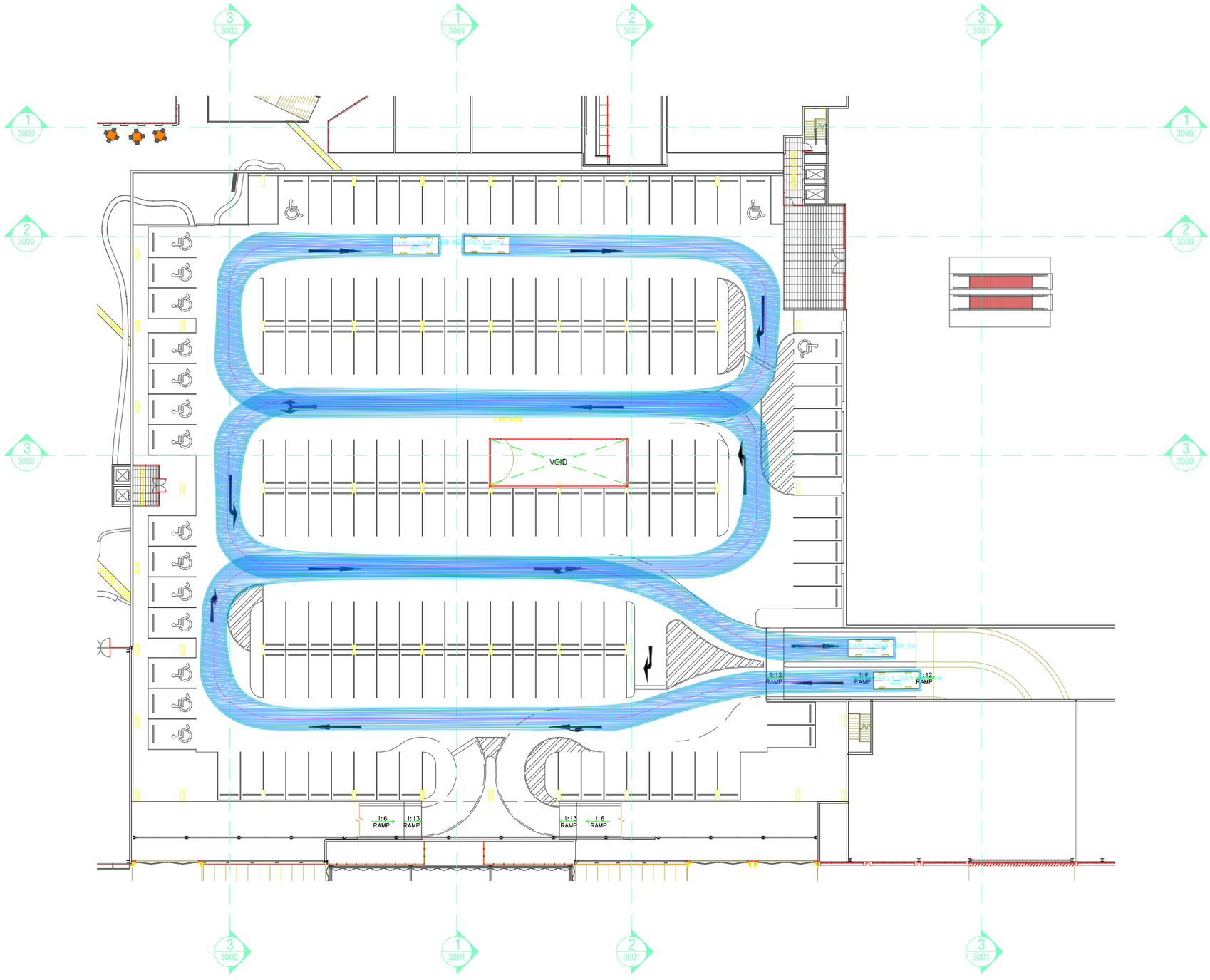

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Scale	1:500 @ A3

Invercargill Central

Level 1 Car Park Circulation

99% Car Swept Path of Exit Movements

Project No.	HML_J001
Dwg #	ATC10197
Sheet	9
Revision	--

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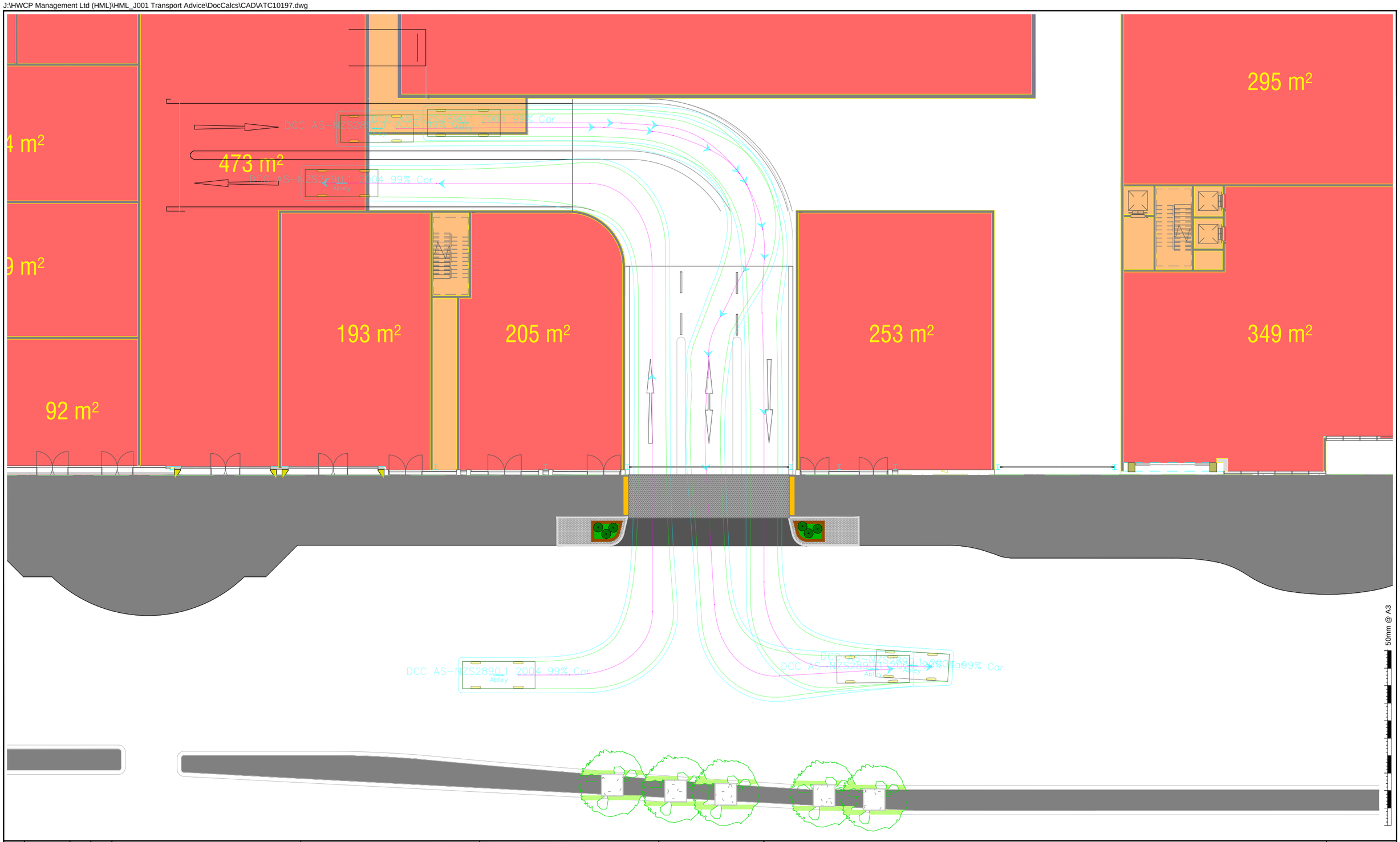

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Invercargill Central

Indicative Car Park Access Layout

99% Car Swept Path Accessing Level 1

Project No.	HML_J001
Dwg #	ATC10197
Sheet	6
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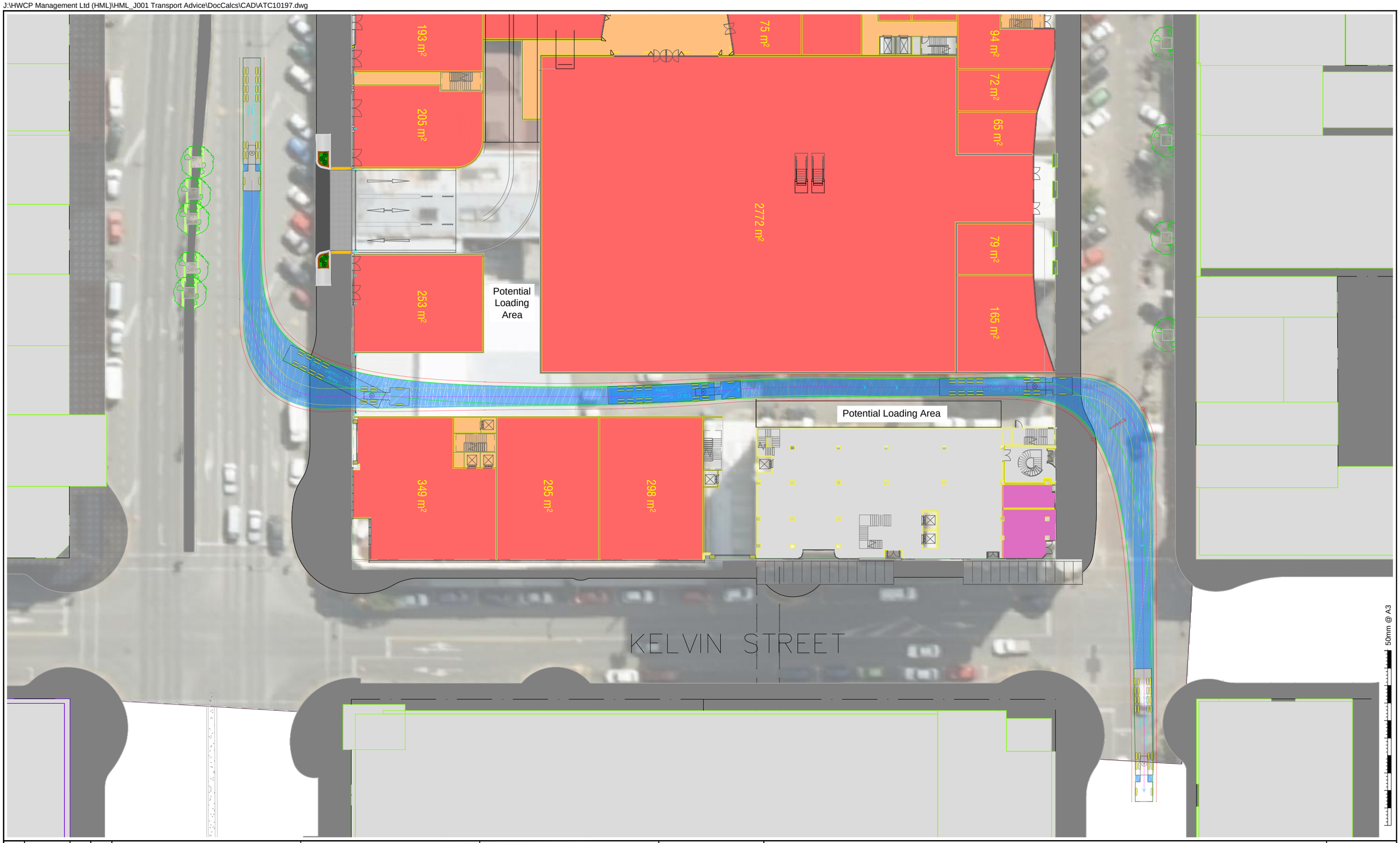

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Drawn	RT
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Issued	18/07/2018
Scale	1:500 @ A3

Invercargill Central

Semi-Trailer Swept Path

Project No.	HML_J001
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Revision	--

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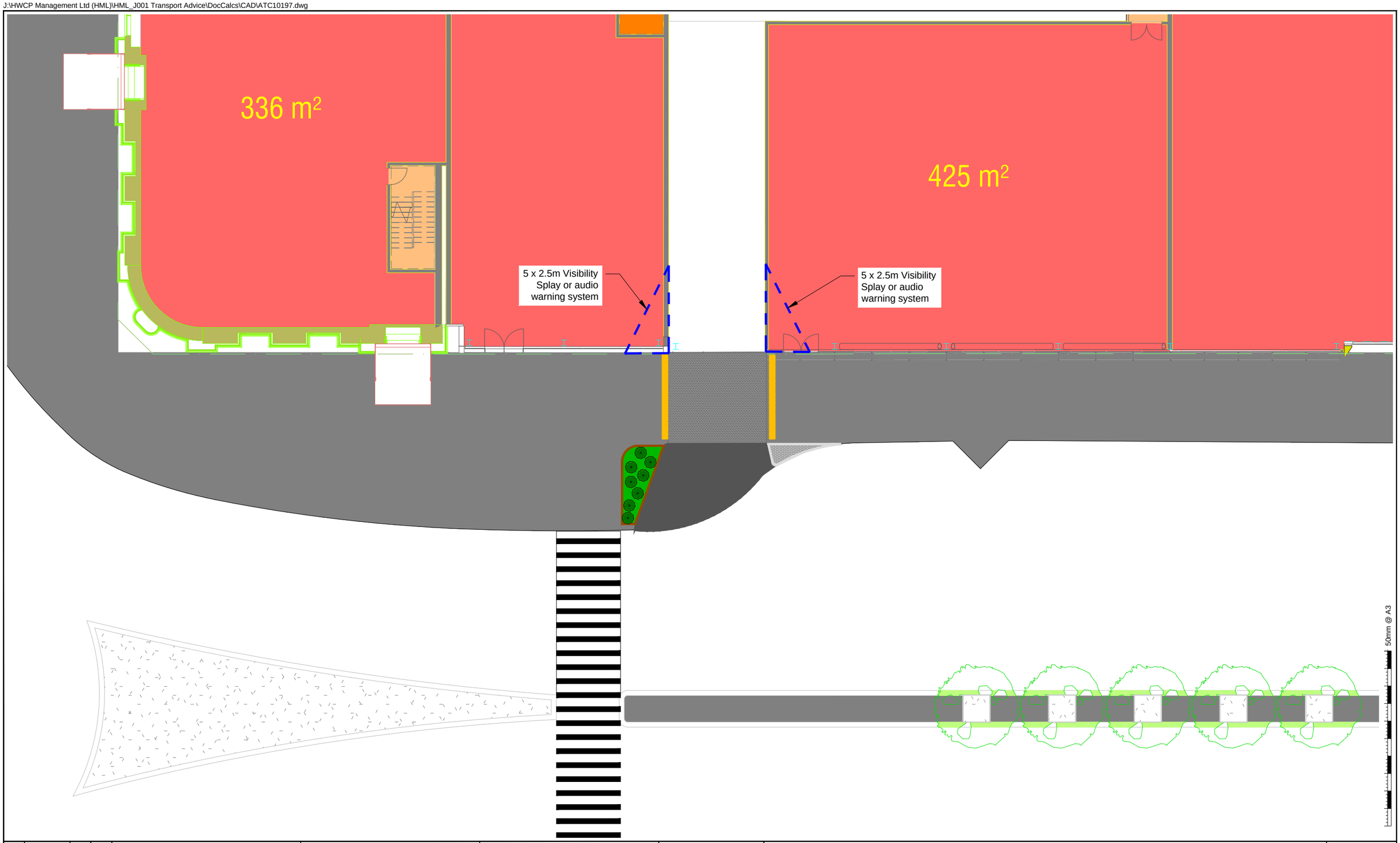

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Design	JB
Drawn	RT
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Issued	18/07/2018
Scale	1:200 @ A3

Invercargill Central

Indicative Service Yard Access Layout

Project No.	HML_J001
Dwg #	ATC10197
Sheet	7
Revision	--

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Issued	18/07/2018
Scale	1:400 @ A3

Invercargill Central

Indicative Service Yard Access and Layout

11.5m Truck Swept Path

Project No.	HML_J001
Dwg #	ATC10197
Sheet	2
Revision	--

Appendix C
SIDRA Modelling Results

MOVEMENT SUMMARY

Site: 101 [Tay Street/ Kelvin Street Intersection - Pre Development]

Tay Street/ Kelvin Street Intersection
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nith Street												
1	L2	118	1.7	0.260	29.4	LOS C	3.7	26.0	0.82	0.76	0.82	35.4
2	T1	76	0.0	0.217	25.3	LOS C	3.0	20.9	0.82	0.67	0.82	36.9
3	R2	20	0.0	0.217	29.8	LOS C	3.0	20.9	0.82	0.67	0.82	36.5
Approach		214	0.9	0.260	28.0	LOS C	3.7	26.0	0.82	0.72	0.82	36.0
East: Tay Street East												
4	L2	41	4.9	0.482	17.8	LOS B	9.2	64.8	0.58	0.53	0.58	41.8
5	T1	388	1.0	0.482	13.2	LOS B	9.2	64.8	0.58	0.53	0.58	42.2
6	R2	74	0.0	0.144	11.4	LOS B	0.9	6.5	0.41	0.63	0.41	42.9
Approach		503	1.2	0.482	13.3	LOS B	9.2	64.8	0.56	0.55	0.56	42.2
North: Kelvin Street												
7	L2	129	0.0	0.253	29.2	LOS C	3.6	24.9	0.73	0.73	0.73	35.5
8	T1	101	1.0	0.482	28.4	LOS C	5.9	41.8	0.84	0.73	0.84	35.3
9	R2	85	0.0	0.482	32.9	LOS C	5.9	41.8	0.84	0.73	0.84	35.3
Approach		315	0.3	0.482	30.0	LOS C	5.9	41.8	0.80	0.73	0.80	35.4
West: Tay Street West												
10	L2	128	0.0	0.149	17.8	LOS B	2.9	20.1	0.61	0.70	0.61	39.9
11	T1	452	1.3	0.257	14.0	LOS B	5.5	38.7	0.65	0.54	0.65	41.9
12	R2	71	0.0	0.141	13.8	LOS B	1.2	8.7	0.63	0.68	0.63	41.7
Approach		651	0.9	0.257	14.8	LOS B	5.5	38.7	0.64	0.59	0.64	41.5
All Vehicles		1683	0.9	0.482	18.8	LOS B	9.2	64.8	0.67	0.62	0.67	39.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Tay Street/ Kelvin Street Intersection - Post Development]

Tay Street/ Kelvin Street Intersection
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Nith Street												
1	L2	118	1.7	0.272	30.3	LOS C	3.7	26.5	0.84	0.76	0.84	27.8
2	T1	76	0.0	0.228	26.2	LOS C	3.0	21.3	0.83	0.68	0.83	36.5
3	R2	20	0.0	0.228	30.8	LOS C	3.0	21.3	0.83	0.68	0.83	36.1
Approach		214	0.9	0.272	28.9	LOS C	3.7	26.5	0.83	0.72	0.83	32.4
East: Tay Street East												
4	L2	41	4.9	0.549	17.4	LOS B	10.4	73.8	0.59	0.54	0.59	42.0
5	T1	443	0.9	0.549	12.7	LOS B	10.4	73.8	0.59	0.54	0.59	37.6
6	R2	74	0.0	0.182	12.4	LOS B	1.0	6.8	0.50	0.65	0.50	42.4
Approach		558	1.1	0.549	13.0	LOS B	10.4	73.8	0.58	0.55	0.58	39.0
North: Kelvin Street												
7	L2	129	0.0	0.265	30.1	LOS C	3.7	25.6	0.75	0.74	0.75	35.2
8	T1	101	1.0	0.507	29.4	LOS C	6.1	43.0	0.86	0.74	0.86	35.0
9	R2	85	0.0	0.507	34.0	LOS C	6.1	43.0	0.86	0.74	0.86	18.5
Approach		315	0.3	0.507	30.9	LOS C	6.1	43.0	0.82	0.74	0.82	30.4
West: Tay Street West												
10	L2	194	0.0	0.220	16.6	LOS B	4.4	31.0	0.62	0.71	0.62	34.9
11	T1	684	0.9	0.414	14.4	LOS B	9.6	67.5	0.68	0.59	0.68	36.7
12	R2	108	0.0	0.225	12.9	LOS B	1.9	13.2	0.67	0.70	0.67	37.3
Approach		986	0.6	0.414	14.7	LOS B	9.6	67.5	0.67	0.62	0.67	36.4
All Vehicles		2073	0.7	0.549	18.2	LOS B	10.4	73.8	0.68	0.63	0.68	35.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [CBD Site Carpark Access]

HWCP Mall
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
North: Carpark Access												
7	L2	587	0.0	0.343	9.7	LOS A	1.7	11.8	0.36	0.94	0.42	35.1
Approach		587	0.0	0.343	9.7	LOS A	1.7	11.8	0.36	0.94	0.42	35.1
West: Tay Street West												
10	L2	292	0.0	0.196	4.6	LOS A	0.0	0.0	0.00	0.42	0.00	44.2
11	T1	457	0.0	0.196	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	48.9
Approach		748	0.0	0.196	1.8	NA	0.0	0.0	0.00	0.21	0.00	46.7
All Vehicles		1336	0.0	0.343	5.3	NA	1.7	11.8	0.16	0.53	0.18	41.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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