URaP – TTW

Traffic/Transport

Consulting Services

(Revision No.5)

Traffic and Parking Report for Proposed Development at 6-16 Atchison St, St Leonards, NSW

for FJMT Architects

April 2011

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1.0 INTRODUCTION

This Transport Assessment addresses the suitability of the site and implications for traffic and non-car modes of travel for the conversion of a older style commercial/ office tower to residential apartments at 6-16 Atchison Street, St Leonards, the subject of a Part 3A, major project application.

This part of St Leonards is undergoing rapid change with the revitalisation of a “Specialised Centre” with attendant redevelopment of many sites of low to medium scale commercial and service industry uses being converted to multi storey mixed use developments.

The subject site is located on the northern side of Atchison Street between Mitchell Street and Christie Street. The site is approximately rectangular in shape measuring approximately 50m wide and 34-35m deep between Atchison Street and Atchison Lane. The site is only 100m to the east of the major 39 storey mixed use development, the Forum, which is the entrance to St Leonards railway Station.

The site consists of three existing lots with a total site area of 1,740m2. Current use of the site is a 3 x 3 storey office/commercial development developed to a total of approximately 5,000sqm GFA. There are 60 car spaces on the site at present.

The proposal is to convert the buildings to **173** privately owned residential apartments and **76** serviced apartments and mixed use development. A café with an area of 238 sqm is also included. The total floorspace of the proposal totals 20,819 sqm.

A basement carpark is to accommodate 168 parking spaces. Vehicular access is via the rear lane onto Atchison Lane. This will reduce the existing three entry/exit points into one access point; hence improving efficiency and road safety for vehicular as well as pedestrian traffic.

A major aspect of this assessment is the justification of below-maximum levels of car parking provision based on consideration of the site’s public transport accessibility and other relevant factors.

Background influences to the assessment are the environmental assessment requirements supplied by the North Sydney Council.

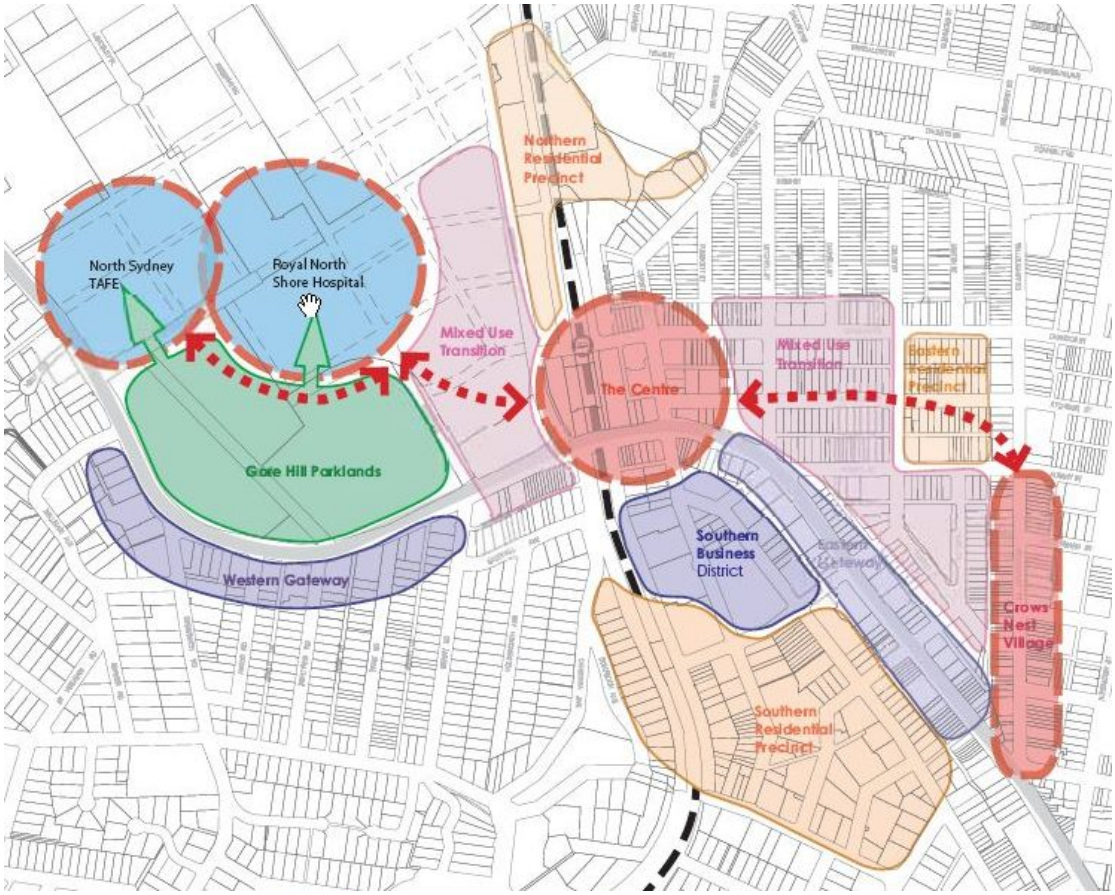
As well as the traditional aspects of traffic impact assessment, the agencies have requested consideration of the non-car transport mode impacts of the development, and provision of facilities or initiatives to increase use of sustainable travel.

2.0 EXISTING SITE ACCESSIBILITY

St Leonards is served by both bus and rail services. Being a major employment centre in its own right and accommodating Royal North Shore Hospital Campus, St Leonards has developed as a transport hub that has a high level of connectivity to surrounding suburbs and centres and high frequency of services.

The NSW Metropolitan Strategy identifies St Leonards as a Specialised Centre around which jobs, services and new housing will be clustered. The planning intent behind the designation is to reduce the need for people to travel long distances to work or to access local services etc, in the process reducing travel by car and attendant congestion, emissions and energy use, and improve liveability of centres by encouraging a mix of activities and walkability.

The proposal responds to those objectives. Its key transport attributes are its top level public transport accessibility and location within the core of a large mixed use town centre. These attributes will enable its residents to get around easily without a car and meet most of their living needs within their local environment. The following illustrates the urban structure of St Leonards extracted from the 2006 St Leonards Strategy.



This section of the report expands on the high-level public transport accessibility of the site which then puts into context, the following sections on parking provision, improvements to support non-car modes, traffic generation and impact.

2.1 Existing and Future Rail Services

The redevelopment site is approximately 100 metres from the entrance to the railway station. Rail services through this station run on the North Shore Line, linking to the CBD to the south and Hornsby to the north. There are also direct services between the Central Coast and CBD; and Hornsby and the Western Line.

Major interchanges in the City, Central and Chatswood provide inter-connection to the complete network of CityRail lines providing ready access to the entire Metropolitan area. Service frequencies are summarised below:

Table 1 – Rail Services through St Leonards Station, weekdays

Direction	Time Period		
	7-9am	11am-1pm	4-6pm
Southbound	30	12	30
Northbound	30	14	27
Total	60	26	57

Source: (http://www.cityrail.info/timetables/timetables_by_line.htm)

First services begin at 4:00-5:00am and the last generally run till 12:00-1:00am or just after. Friday and Saturday nights have additional services running in the early morning hours.

In both absolute and relative terms, St Leonards Station precinct has one of the highest levels of rail and bus accessibility in the Sydney Metropolitan area. It is only surpassed by the likes of Sydney and North Sydney CBD stations, Strathfield and other interchanges.

On top of that St Leonards Station itself is a modern stream-lined rail facility that is fully integrated into the neighbouring buildings, and this has high quality, active and secure pedestrian connections in all directions.

Subject to funding, a variety of future rail projects will enhance accessibility by rail to St Leonards. These include:

- The North West Rail Line from Epping to Rouse Hill which has been committed to begin within the next decade;
- On-going rail clearway works to continue sectorisation and system-wide improvements of the rail network to improve reliability and capacity; and
- Eventual continuation of the Chatswood - Epping line to Parramatta.

2.2 Existing and Future Bus Services

A large number of scheduled bus services run along the Pacific Highway, in part forming bus networks for major residential and commercial catchments. Other non-Pacific Highway corridors are also served – These are shown in an extract from the STA web-site below and include:

- Epping Road services – Epping/ North Ryde/ Denistone to City/North Sydney/ Milsons Point/ Manly;
- Pacific Highway services – Chatswood to Bondi Junction via North Sydney & Chatswood to Manly via St Leonards and Falcon Street;
- Hills District to North Sydney/ Milsons Point services.
- Warringah Freeway/ Willoughby Road to Military Road services;
- Eastern Valley Way services

Service numbers include:

Via Pacific Highway	140	Manly – Epping
	E43, 143	Chatswood - Manly
	144	Manly - St Leonards/RNSH
	200	Bondi Junction - Chatswood
	252	Lane Cove west - City
	254	City – Riverview via Nth Sydney
	286	Denistone East – City/ Milsons Pt
	287	Ryde – Milsons Pt
	290	City - Epping

Via Other	257	Balmoral - Chatswood
	263	Crows Nest - City
	265	Lane Cove – McMahons Pt
	267	Chatswood – Crows Nest
	273	Chatswood - City

Collectively, these routes tally to some 90-100 services in peak two hour periods and 40-50 services in non-peak periods. Services begin during the hours of 5:00-6:00am while most last into the middle evening and some later. Longer service duration is experienced on Friday and Saturday evenings.

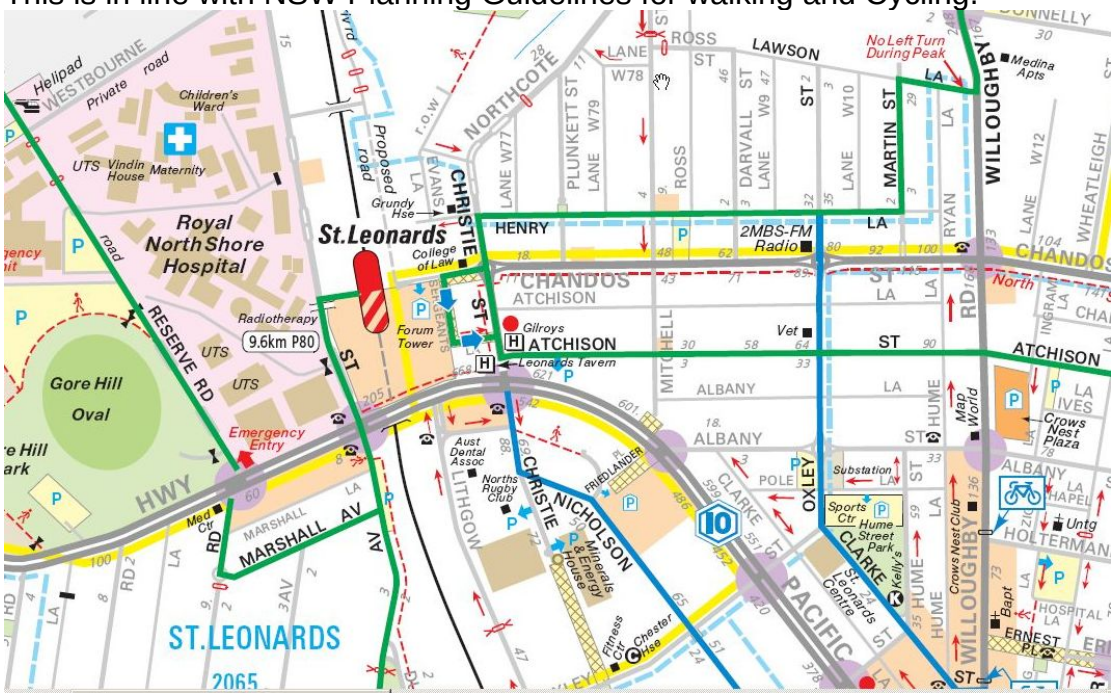
Subject to funding, a variety of future bus projects will further enhance accessibility by bus to St Leonards. These include:

- On-going bus priority improvements to the Pacific Highway and other bus corridors that pass through the St Leonards area as part of the Strategic Bus Corridor programme.

- On-going integrated ticketing improvements and similar system-wide initiatives.

2.3 Active Transport Modes

The North Sydney Bicycle Strategy 2009 outlines initiatives to improve conditions for cyclists in its densely built up centres. Council has embarked on extending its bicycle network in all directions from St Leonards Centre and has constructed bicycle lanes through back streets to connect these together. This is in line with NSW Planning Guidelines for walking and Cycling.



The network is shown in the preceding excerpt from the Bicycle Strategy. Existing routes are shown in green and blue (yellow represents council boundaries). Atchison Street itself is a critical east-west route that has a designated bike lane.

St Leonards is a major centre in which the three Councils that share its administration have invested in public domain and pedestrian improvements. Atchison Street and neighbouring streets have been recently subject to a variety of footpath extensions, traffic calming, lighting and streetscape enhancements.

The linkages between the railway station and surrounding areas are well established. This includes the redevelopment site, of which public transport passengers have options of passing through arcades associated with the Forum development or at a variety of signalised and unsignalised surface crossings.

3.0 EXISTING AND PROPOSED SITE PARKING

3.1 Existing Provision

The existing site car parking provision is 60 parking spaces in a basement structure.

The existing floor space of the combined site is some 5,000 sq.m.

Based on the North Sydney Council parking schedule rates documented in the North Sydney DCP 2002 for non-residential zones, the appropriate maximum rate of car parking is 1 space per 400 sq.m of floor space or 2.5 spaces per 1000 sq.m.

The theoretical maximum parking provision of the existing site is therefore approximately 13 spaces. The site therefore has a theoretical over-provision of 47 spaces.

3.2 Proposed Provision and Justification

The proposed floor space of the combined site is anticipated to be approximately 21,000 sq.m.

The buildings are proposed to be developed as 173 privately owned apartments and 76 serviced apartments. A small ground floor café is also proposed with GFA of about 238 sqm.

North Sydney Council has objectives of reducing on-site parking due to the proximity of public transport. Its aims are also to contain traffic congestion and encourage the use of public and active modes of travel. Maximum rates of car parking have been set. In circumstances where it is appropriate, Council accepts parking provision below the maximum rate on the proviso it does not impact adversely on surrounding residential streets.

North Sydney Council's DCP 2002 Based on the North Sydney Council parking schedule rates documented in the North Sydney DCP 2002 for non-residential zones, the appropriate maximum rate of car parking is 0.5 spaces per bedsitter or 1 bedroom apartment and 1.0 space per apartment where there are 2 or more bedrooms. The resultant calculations for maximum parking provision are also summarised in the following table.

The theoretical parking provision for the resident components of the proposal is 141 spaces, considering that the DCP does not require any visitor parking. The café would require 1 car parking space.

The DCP also requires 1 motor bike spaces per 10 cars spaces. A total of 14 motor bike spaces would be in order.

The maximum provision allowable is summarised in the following table.

Table 2 – Rates of Car Parking Provision

Composition	Number	Parking rate	Maximum parking
Studio	30	0.5 per apartment	15
1 bedroom apartments	64	0.5 per apartment	32
2 bedroom apartments	66	1 per apartment	66
3 bedroom apartments	13	1 per apartment	13
Serviced apartments	76	1 space per 5 units	15
Sub-total	249		141 spaces
Café (non-residential)	238sqm	1 per 50sqm	5
Motor cycle parking		1/10 cars	15

Source – North Sydney DCP 2002 – Section 9: Car Parking

The proposed parking available to the site is 168 spaces while additional 2 spaces could be provided as car wash bay.

It is recommended that residents be allocated 151 spaces including 2 accessible spaces. These would be allocated primarily to the resident apartments as this is the category of parking that is the most problematic to manage should demand spill out onto surrounding streets. The remaining parking provision will include 15 spaces for serviced apartments (including 2 accessible spaces) and 2 spaces for café use.

This level of parking provision is imminently justifiable:

- The location of the development in the immediate vicinity of St Leonards Railway Station and Pacific Highway give the site a superior level of public transport accessibility and ability for residents to live well and travel around without a motor car;

- St Leonards has a good mix and intensity of land uses that provide residents with all requisite services;

- The nature of surrounding streets is commercial as opposed to residential and on-street parking is strictly time managed. This gives authorities the ability to deter nuisance parking should it occur.

- At a broader policy level, this proposed renewal project adds mix and intensity of development around a transport hub. It provides a classic example of leveraging redevelopment, better public spaces and services off investment by Government in transport facilities and in doing so,

meets the objectives of the State Plan. It also helps meet accessibility and mode share targets for major centres. The approach reflects objectives of North Sydney Council's DCP and transport strategy direction, and also puts into practice the NSW Government's Integrated Land Use Transport Policy.

However, reduction of parking provision (considering the RTA's requirements and North Sydney Draft DCP) is plausible given accessibility offered by the nearby trains and buses and ability of users to either pre-plan their generally limited stay or park on-street in restricted duration spaces.

Minimal parking for the serviced apartments/hotel/cafe is recommended – no more than 2 space for management staff/cafe and visitors with disabilities. The accessibility of the site and high likelihood of ancillary use by companies in the St Leonards precinct justify this approach.

Comparison to RTA Guide to Traffic Generating Development

The above parking provision is also within the RTA 's guide for parking provision as shown below.

30 Studio units @0.4space/unit = 12
64 one bed units@0.4space/unit = 26
66 two bed units@0.7space/unit = 46
13 three/four bed units@1.2space/unit = 16
173 units @1visitor space/7 units = 25
76 serviced units@0.4space/unit = 30
Total = 155 parking spaces

The parking requirements based on Council's Draft DCP would be in order of some 195 spaces while the current DCP requires a total of some 146 spaces.

Considering the location of the site and acknowledging the fact that the café will mainly be used by the patrons of the site or people who already are in the area, the parking provision of some 168 spaces will comply within the RTA's guide as well as Council's draft DCP and their parking requirements. It should be noted that the RTA Guide and Draft DCP are used as a tool for general high density residential units in metropolitan area while St Leonards has a very high level of public transport facilities within a very close walking distance to the proposed site.

The proposed development provides a total of **168** car parking spaces including four spaces for people with disability. In addition car washing bays will also be provided. Provision for parking of **14** motor bikes also is included as part of the development proposal.

Bicycle Parking: As part of the proposal a total of **58** bicycle lockers and **14** bicycle rails will be provided at the site per Council's DCP requirements (173 residential units and 238 sqm of commercial).

3.3 Supportive Measures for Non-Car Modes

As covered above, the greatest single measure in support of non-car modes is the restriction of resident and visitor car parking in the circumstance of this site where:

(a) there is a very high level of metropolitan network level of public transport accessibility, and

(b) the development is in the midst of a commercial/ mixed use area with heavily enforced restricted on-street car parking which will enable car ownership to be realistically curtailed and overflow onto the street network severely limited.

Other supportive measures that could be implemented are:

Bicycle Parking

Section 7 of the North Sydney DCP outlines required provision for bicycles. These are requested to be provided at a rate of 1 secure bicycle locker per 3 apartments (57 lockers total) and 1 bicycle rail per 12 apartments (14 bicycle rails) and 1 locker per 600 sqm of commercial use.

Accordingly, the above bicycle parking provision will be met as part of the proposed development.

Nevertheless, the site is well situated to the bicycle network running through St Leonards – Atchison Street has a designated bicycle path that leads on to surrounding areas. Bicycle parking facilities are included as part of the proposal (indoor and outdoor).

Public Transport Information

Realistically, an individual development in a large centre such as St Leonards will not warrant funding of public transport services and infrastructure. However, its contribution will come from the addition of potential passengers with the catchment of public transport and fill up existing or support greater provision of services over time.

It is desirable that new residents get acquainted with the public transport services on offer however, and it is proposed that new residents during the initial wave of occupancy, be issued with travel packs detailing local connections, service maps and timetables (rail and bus), bike path maps and sources of update information.

In addition to this a transport access map showing available taxi ranks (particularly in the vicinity of the St Leonards Train Station) and opportunities for car pool and car share arrangement be available to the users of the site. Some of these information could also be obtained from Council and transport agencies.

In addition to the above share care facilities could also be included as part of the proposal in conjunction with the development of the precinct.

Public Domain and Pedestrians

Atchison Street has a road reserve of approximately 20m. It has recently been the subject of road and public domain improvement works by Council and is now a one way street within wide footpaths and streetscape enhancements.

The quality of the public domain will be improved by the development as the host building and general environs of the development are in need of refurbishment in places. The Council's DCP 2002 outlines requirements which are covered in the architectural statement.

Improvements associated with the proposed development add to the support of pedestrians in the general vicinity, particularly to and from its public transport hubs. Included in the design are features that maximize visibility of people, parking areas and building entrances: doors and windows that look out on to streets, see-through barriers, pedestrian-friendly entrances and feature lighting.

Moving further away from the development, pedestrians are supported by formal crossings of streets, both major and minor. The proposal site being only 200m from the railway line and 100m from the Pacific Highway is readily reachable from all directions. Active and attractive street frontages are progressively being provided and result in a positive experience for pedestrians.

4.0 IMPACTS OF THE DEVELOPMENT

4.1 Traffic Generation

The methodology used for the estimation of traffic generation is based on the generic rates for medium-density residential rates sourced from the RTA's *Guide to Traffic Generating Developments.* The development would be classed as high density residential for which the guidelines recommend a rate of 0.24 vehicular trips per peak hour per unit. The traffic generation rate for serviced apartment is 0.4 vehicular trips per serviced apartments. The peak hour vehicular traffic generation for commercial land uses is 2 trips/100 sqm GFA (this would be appropriate for the café considering that its main patrons will be people who use the site or are already in the area).

At a rate of 0.24 trips per unit per peak hour, the 173 units would generate some 42 vehicular trips per peak hour and the 76 serviced apartments would generate some 30 trips while the commercial site will generate some 5 vehicular trips per peak hour. This would result in a total of **77** vehicular trips during a peak period.

By comparison, the previous use of the site with commercial use of some 5000 sqm would have an estimated minimum traffic generation of **100** vehicular trips per peak hour.

Therefore, the proposed development would generate lower vehicular trips than its existing (previous) use.

4.2 Vehicular Traffic Impact

An assessment of road network in terms of intersection operation at critical locations has been carried out. Accordingly, intersection counts have been undertaken at the following locations:

- Pacific Highway/Christie Street;
- Pacific Highway/Albany Street;
- Christie Street/Atchison Street;
- Willoughby Road/Atchison Street;
- Christie Street/Chandos Street; and
- Willoughby Road/Chandos Street.

The counts took place on Wednesday 19 May 2010 between hours of 7.00AM – 9.00AM and 4.00PM-6.00PM. The results of the survey are shown in Appendix A.

Level of Service

The adequacy of the capacity of an intersection is judged by whether it can physically and operationally cater for the traffic using it.

The performance of the intersections has been assessed using the intersection modelling software SIDRA. This model provides parameters of the performance of an intersection including the degree of saturation (DoS) and the average delay per vehicle. SIDRA does provide an accurate and consistent guide to the performance of an intersection under the given different traffic flow scenarios. The recommended criteria for evaluating capacity of intersections are shown in Table 4.1.

Table 4.1 Criteria for Evaluating Capacity of Intersection

Level of Service	Degree of Saturation (DoS)	Ave. Delay/ Veh. (Secs)
A/B good operation	less than 0.80	Less than 28
C satisfactory	0.80 to 0.85	29-42
D poor but manageable	0.85 to 0.90	43-56
E at capacity		57-70
F unsatisfactory, extra capacity required	over 0.90	Over 70

Intersection Operation

The above intersections were modelled using existing intersection layouts for the morning and afternoon commuter peak hour traffic volumes.

The results of the assessment have been tabulated in Table 4.2 and revealed that the above intersections are operating at a good level of service during the morning and afternoon commuter peak hours on a weekday.

Table 4.2 Performance of Intersections

AM & PM Commuter Peak Hour Traffic on a Weekday

Intersection	Traffic Controls	Level of Service (LoS) AM(PM)	Average Delay/Veh (Sec/Veh) AM (PM)
Pacific Highway/Christie Street	Signals	A (A)	10.1 (9.6)
Pacific Highway/Albany Street	Signals	A (B)	14.1 (15)
Christie Street/Atchison Street	Signs	A (A)	6.5 (6.4)
Willoughby Road/Atchison Street	Signs	B (B)	18.8 (20)
Christie Street/Chandos Street	Roundabout	A (A)	12.6 (13.3)
Willoughby Road/Chandos Street	Signals	B (B)	23.6 (26.5)

Note: the above results are also applicable for future scenario when the development is completed due to lower/similar level of traffic generation from the proposed development.

Considering that the proposed development will have a lower traffic generation than its existing situation, therefore the intersections along the road network in the vicinity of the site will continue to operate at a similar level of service to the current situation (with a marginally better LoS). The development proposal would have no adverse traffic impact whether taken in isolation or considered cumulatively.

The construction traffic management plan however should be prepared once approval has been obtained for the proposed development and prior to commencement of demolition/construction activities.

4.3 Vehicular Access

The vehicle access to the site will maintain from Atchison Lane. A generous separated double vehicle width driveway is proposed at the western boundary of the site via Atchison Lane. The driveway width is 5.5m wide and is in accordance with the Australian Standards. The frequency of vehicles passing each other will be considerably small while adequate width are available that would allow for larger vehicles to pass. The proposal will combine the existing three vehicular access points to one location via Atchison Lane. This will improve efficiency and safety of vehicular movements to and from the site.

Service Vehicle access to the site is via the loading dock with an improved ingress/egress layout. The loading dock is 8.5m X 3.6m. This enables a small rigid vehicle to reverse into the dock and egress in forward direction. Turning path analysis of vehicular movements are included in the Appendix.

4.4 Visibility and Pedestrian Safety

The proposal allows vehicles to enter and exit the basement in a forward direction. The new driveway will be constructed at the rear of the site. The driveway area would allow adequate visibility for entering and emerging drivers.

As noted earlier, pedestrian amenities are available along streets in the vicinity of the site providing a safe pedestrian environment. Pedestrian access is from Atchison Street for both serviced apartments and residential uses

4.5 Car Park Design

The carpark layout has been reviewed during the design development process and amendments made to improve its functionality within the constraints of the site dimensions and structural elements. Consequently, the dimensions of spaces are substantially compatible with those given by *Australian Standards*

2890.1 Parking Facilities – Off-street Parking that would offer a high level of service to users.

The basement carpark is serviced by an aisle of 5.8m width and parking spaces of generally 2.5 m X 5.5 m. Carpark entry/exit will be via Atchison Lane.

All spaces have been made as wide as physically possible. Entry/exit driveway ramp dimensions and grades are acceptable for two-way operation while ramps connecting parking decks are well within the acceptable level for one-way operation.

Finally, fish eye mirrors are recommended at the top and base of ramps to provide visibility of approaching and manoeuvring vehicles.

5 CONCLUSION & RECOMMENDATION

The routes to the site are , Pacific Highway, Christie, Chandos, Michell and Atchison Streets with Atchison Lane as an immediate access road to the site. These roads have a satisfactory level of service and will continue to have a similar level of service as part of the development proposal.

The main vehicular accesses to and from the site will be maintained via Atchison Lane.

It has been estimated that about **77** vehicle trips during a peak hour could be generated by the proposed development which is lower than its previous (existing) use (about 100 vph). Therefore, all the road network will continue to operate at better or similar level of service to the existing situation.

The assessment of parking situation and analysis of data has shown a car parking provision of some **168** spaces for the site will be well appropriate due to high level of public transport choices and their availability in close proximity to the site.

The proposed development provides a total of **14** parking spaces for motorbikes, **58** lockers and **14** rails for bicycle parking.

All movements to and from the proposed development site will be in forward direction. Access for service vehicles are provided in accordance with the Australian Standards and relevant guidelines

The carpark design and access arrangements are acceptable and should comply with Australian Standards. As well, the development should have no unacceptable traffic implications.

APPENDIX

Manual Count Data

TTM Reference: **80606**
Location: **Willoughby Rd / Atchison St**
Suburb: **St Leonards**
Date: **Wednesday 19-05-10**
Duration: **0700-0900 & 1600-1800**
Weather: **Light Showers AM / Fine PM**
Notes:

Peak Hours

AM Peak Hour: **0800-0900**
PM Peak Hour: **1700-1800**

Links

Graphical Reports

- → AM Full Graphical Report
- → AM Peak Hour Graphical Report
- → PM Full Graphical Report
- → PM Peak Hour Graphical Report

Tabular Report

- → Tabulated Data

Image

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TTM Reference:	80606
Location:	Willoughby Rd / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
Survey Period:	0700-0900
Weather:	Light Showers AM / Fine PM

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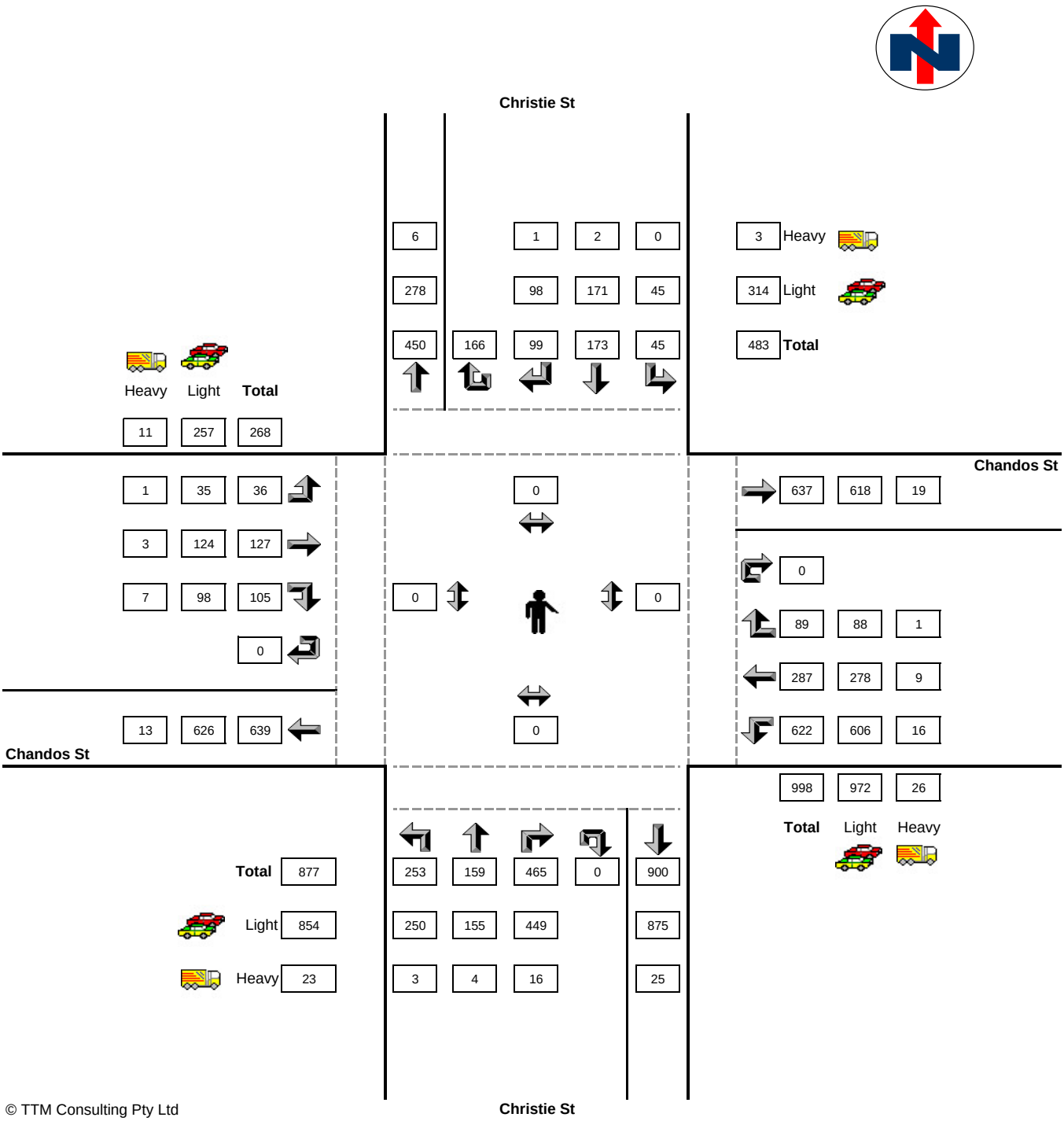

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TTM Reference:	80606
Location:	Willoughby Rd / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
AM Peak	0800-0900
Weather:	Light Showers AM / Fine PM

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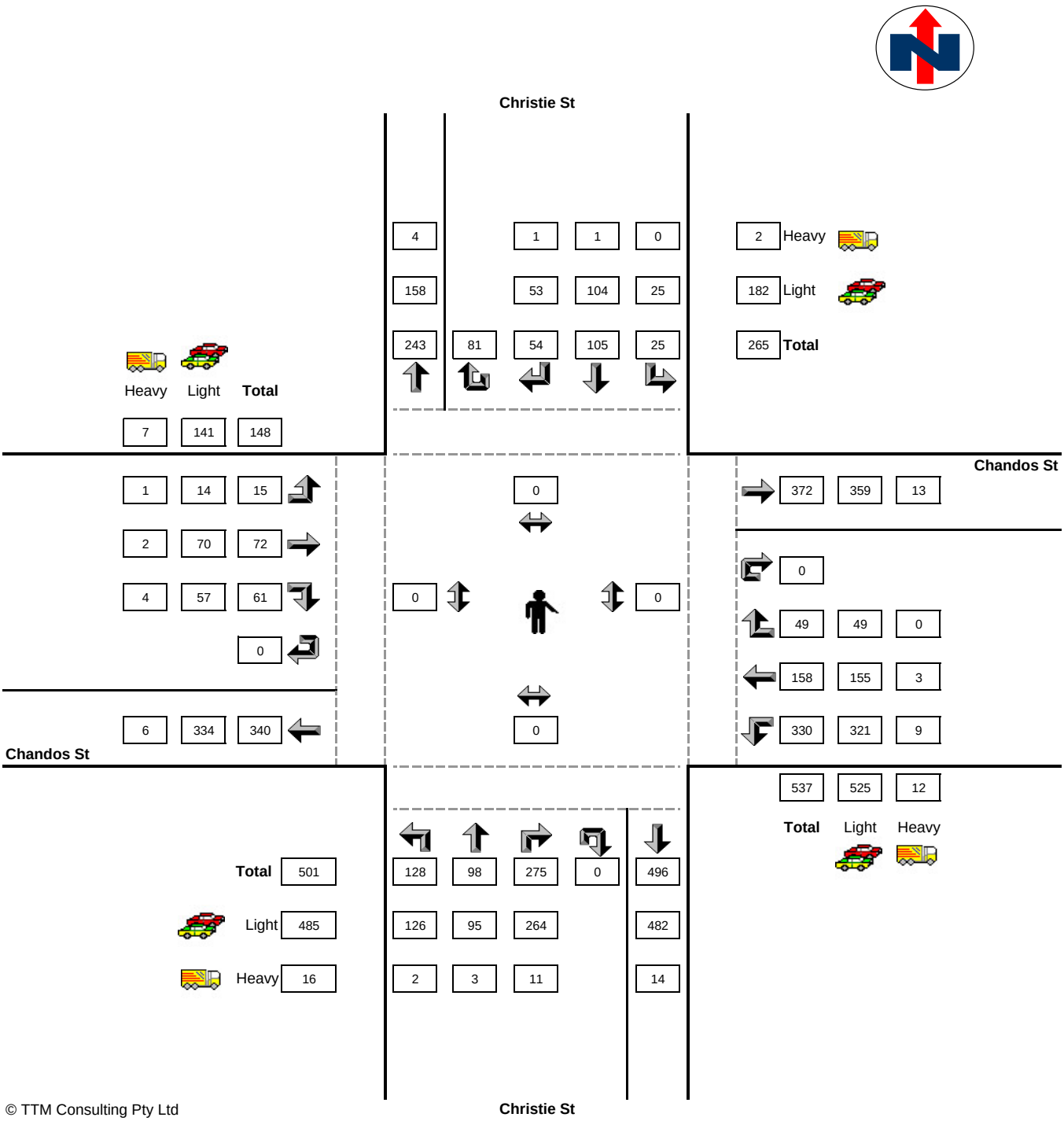

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TTM Reference:	80606
Location:	Willoughby Rd / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
Survey Period:	1600-1800
Weather:	Light Showers AM / Fine PM

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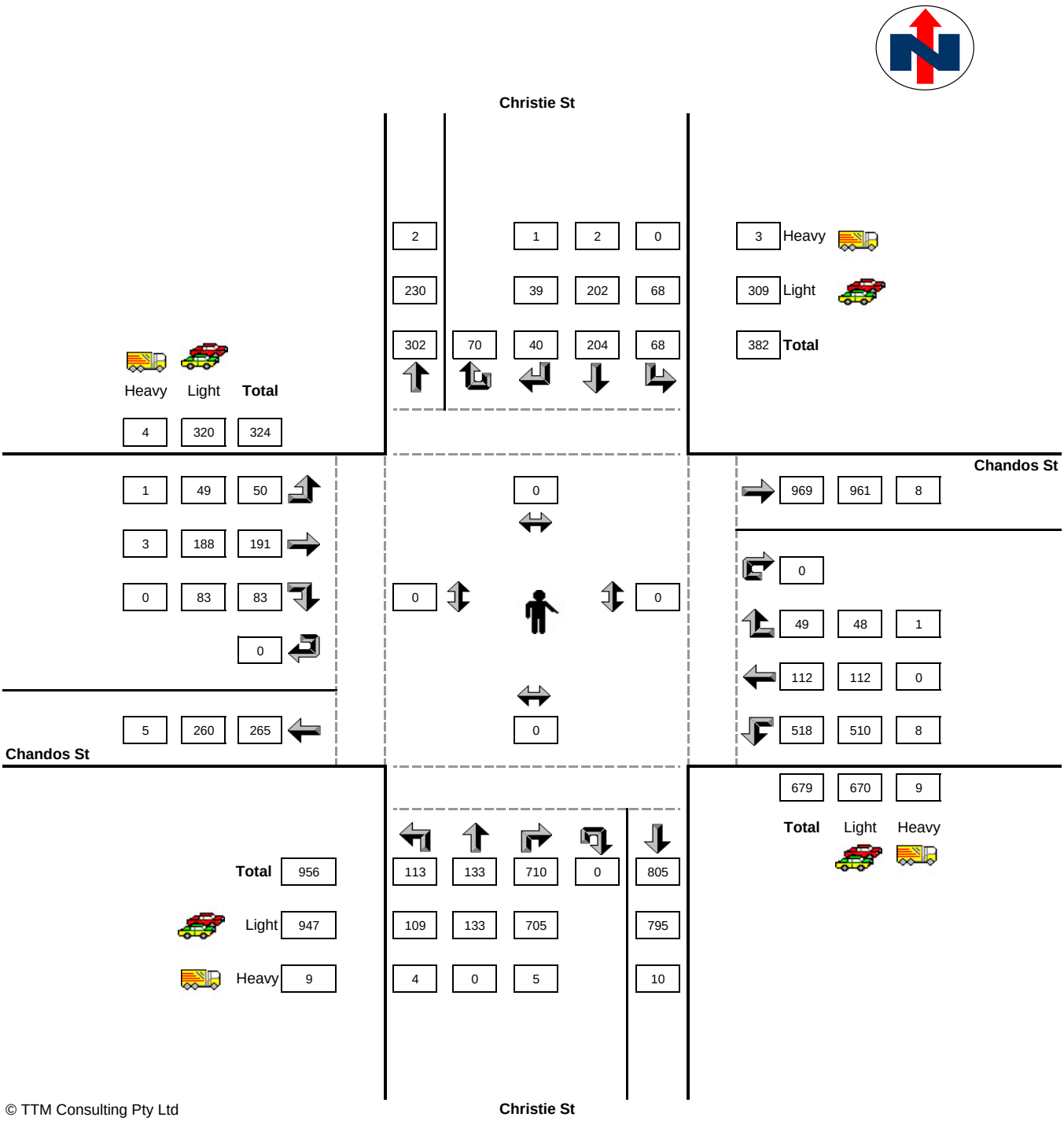

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TTM Reference:	80606
Location:	Willoughby Rd / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
PM Peak	1700-1800
Weather:	Light Showers AM / Fine PM

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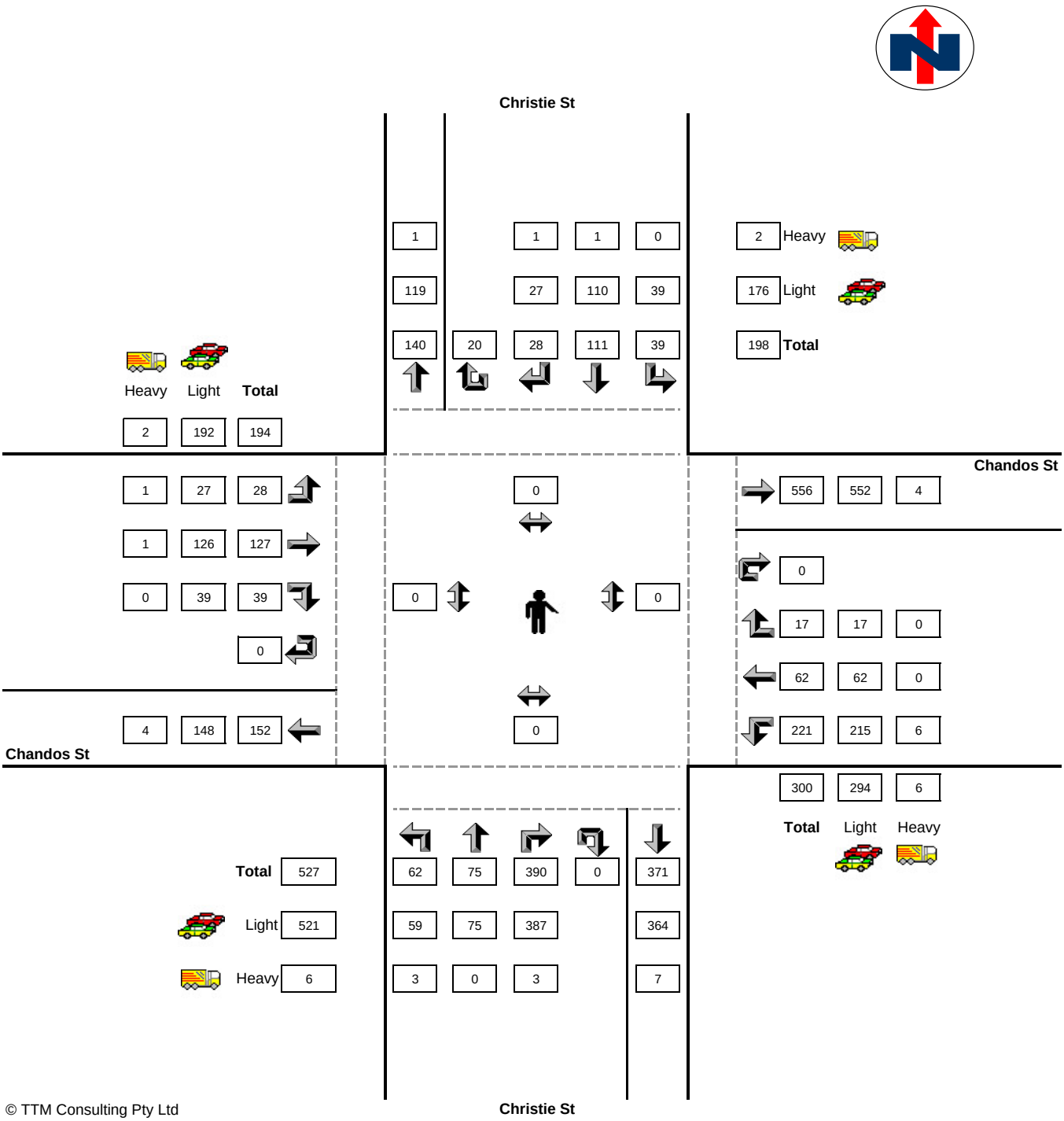

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TTM Data

TTM Reference: 80606
Location: Willoughby Rd / Atchison St
Suburb: St Leonards
Date: Wednesday 19-05-10
Survey Duration: 0700-0900 & 1600-1800 AM Peak: 0800-0900
Weather: Light Showers AM / Fine PM PM Peak: 1700-1800
Notes:

Time	Northern Approach: Christie St												Southern Approach: Christie St											
15 min	Left			Straight			Right			U-turns	TOTAL	Peds	Left			Straight			Right			U-turns	TOTAL	Peds
time start	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total				Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total			
7:00	5	0	**5**	13	0	**13**	10	0	**10**	**9**	**37**	0	31	0	**31**	14	0	**14**	32	1	**33**	**0**	**78**	0
7:15	3	0	**3**	14	0	**14**	8	0	**8**	**25**	**50**	0	29	1	**30**	12	0	**12**	35	1	**36**	**0**	**78**	0
7:30	2	0	**2**	19	0	**19**	15	0	**15**	**30**	**66**	0	30	0	**30**	18	1	**19**	57	0	**57**	**0**	**106**	0
7:45	10	0	**10**	21	1	**22**	12	0	**12**	**21**	**65**	0	34	0	**34**	16	0	**16**	61	3	**64**	**0**	**114**	0
8:00	5	0	**5**	29	1	**30**	7	0	**7**	**18**	**60**	0	28	0	**28**	22	2	**24**	69	5	**74**	**0**	**126**	0
8:15	6	0	**6**	23	0	**23**	22	0	**22**	**22**	**73**	0	45	2	**47**	31	0	**31**	59	1	**60**	**0**	**138**	0
8:30	4	0	**4**	24	0	**24**	9	0	**9**	**25**	**62**	0	33	0	**33**	17	1	**18**	68	3	**71**	**0**	**122**	0
8:45	10	0	**10**	28	0	**28**	15	1	**16**	**16**	**70**	0	20	0	**20**	25	0	**25**	68	2	**70**	**0**	**115**	0
TOTAL	**45**	**0**	**45**	**171**	**2**	**173**	**98**	**1**	**99**	**166**	**483**	**0**	**250**	**3**	**253**	**155**	**4**	**159**	**449**	**16**	**465**	**0**	**877**	**0**
AM Peak	25	0	25	104	1	105	53	1	54	81	265	0	126	2	128	95	3	98	264	11	275	0	501	0
16:00	9	0	**9**	24	0	**24**	5	0	**5**	**13**	**51**	0	9	1	**10**	21	0	**21**	70	0	**70**	**0**	**101**	0
16:15	8	0	**8**	21	1	**22**	2	0	**2**	**15**	**47**	0	8	0	**8**	13	0	**13**	71	1	**72**	**0**	**93**	0
16:30	8	0	**8**	23	0	**23**	3	0	**3**	**11**	**45**	0	14	0	**14**	15	0	**15**	76	0	**76**	**0**	**105**	0
16:45	4	0	**4**	24	0	**24**	2	0	**2**	**11**	**41**	0	19	0	**19**	9	0	**9**	101	1	**102**	**0**	**130**	0
17:00	6	0	**6**	31	0	**31**	1	1	**2**	**9**	**48**	0	12	0	**12**	22	0	**22**	104	0	**104**	**0**	**138**	0
17:15	8	0	**8**	32	0	**32**	9	0	**9**	**2**	**51**	0	13	1	**14**	19	0	**19**	96	2	**98**	**0**	**131**	0
17:30	16	0	**16**	27	0	**27**	11	0	**11**	**2**	**56**	0	17	1	**18**	17	0	**17**	89	0	**89**	**0**	**124**	0
17:45	9	0	**9**	20	1	**21**	6	0	**6**	**7**	**43**	0	17	1	**18**	17	0	**17**	98	1	**99**	**0**	**134**	0
TOTAL	**68**	**0**	**68**	**202**	**2**	**204**	**39**	**1**	**40**	**70**	**382**	**0**	**109**	**4**	**113**	**133**	**0**	**133**	**705**	**5**	**710**	**0**	**956**	**0**
PM Peak	39	0	39	110	1	111	27	1	28	20	198	0	59	3	62	75	0	75	387	3	390	0	527	0

Time	Eastern Approach: Chandos St												Western Approach: Chandos St											
15 min	Left			Straight			Right			U-turns	TOTAL	Peds	Left			Straight			Right			U-turns	TOTAL
time start	Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total				Light	Heavy	Total	Light	Heavy	Total	Light	Heavy	Total		
7:00	71	1	**72**	29	0	**29**	12	0	**12**	**0**	**113**	0	5	0	**5**	11	0	**11**	11	1	**12**	**0**	**28**
7:15	66	3	**69**	28	1	**29**	7	0	**7**	**0**	**105**	0	6	0	**6**	9	1	**10**	10	1	**11**	**0**	**27**
7:30	67	1	**68**	33	2	**35**	15	1	**16**	**0**	**119**	0	6	0	**6**	21	0	**21**	8	0	**8**	**0**	**35**
7:45	81	2	**83**	33	3	**36**	5	0	**5**	**0**	**124**	0	4	0	**4**	13	0	**13**	12	1	**13**	**0**	**30**
8:00	84	2	**86**	37	1	**38**	10	0	**10**	**0**	**134**	0	2	0	**2**	13	0	**13**	10	1	**11**	**0**	**26**
8:15	74	3	**77**	34	1	**35**	14	0	**14**	**0**	**126**	0	4	0	**4**	24	0	**24**	16	0	**16**	**0**	**44**
8:30	86	2	**88**	45	1	**46**	17	0	**17**	**0**	**151**	0	3	1	**4**	15	2	**17**	12	2	**14**	**0**	**35**
8:45	77	2	**79**	39	0	**39**	8	0	**8**	**0**	**126**	0	5	0	**5**	18	0	**18**	19	1	**20**	**0**	**43**
TOTAL	**606**	**16**	**622**	**278**	**9**	**287**	**88**	**1**	**89**	**0**	**998**	**0**	**35**	**1**	**36**	**124**	**3**	**127**	**98**	**7**	**105**	**0**	**268**
AM Peak	321	9	330	155	3	158	49	0	49	0	537	0	14	1	15	70	2	72	57	4	61	0	148
16:00	95	1	**96**	11	0	**11**	8	0	**8**	**0**	**115**	0	4	0	**4**	11	1	**12**	9	0	**9**	**0**	**25**
16:15	67	0	**67**	10	0	**10**	10	1	**11**	**0**	**88**	0	4	0	**4**	9	1	**10**	13	0	**13**	**0**	**27**
16:30	71	0	**71**	11	0	**11**	7	0	**7**	**0**	**89**	0	7	0	**7**	19	0	**19**	8	0	**8**	**0**	**34**
16:45	62	1	**63**	18	0	**18**	6	0	**6**	**0**	**87**	0	7	0	**7**	23	0	**23**	14	0	**14**	**0**	**44**
17:00	62	0	**62**	11	0	**11**	4	0	**4**	**0**	**77**	0	9	0	**9**	28	1	**29**	12	0	**12**	**0**	**50**
17:15	52	2	**54**	9	0	**9**	3	0	**3**	**0**	**66**	0	4	0	**4**	42	0	**42**	9	0	**9**	**0**	**55**
17:30	54	2	**56**	19	0	**19**	4	0	**4**	**0**	**79**	0	8	0	**8**	19	0	**19**	9	0	**9**	**0**	**36**
17:45	47	2	**49**	23	0	**23**	6	0	**6**	**0**	**78**	0	6	1	**7**	37	0	**37**	9	0	**9**	**0**	**53**
TOTAL	**510**	**8**	**518**	**112**	**0**	**112**	**48**	**1**	**49**	**0**	**679**	**0**	**49**	**1**	**50**	**188**	**3**	**191**	**83**	**0**	**83**	**0**	**324**
PM Peak	215	6	221	62	0	62	17	0	17	0	300	0	27	1	28	126	1	127	39	0	39	0	194

Manual Count Data

TTM Reference: **80606**
Location: **Pacific Hwy / Albany St**
Suburb: **St Leonards**
Date: **Wednesday 19-05-10**
Duration: **0700-0900 & 1600-1800**
Weather: **Light Showers AM / Fine PM**
Notes:

Peak Hours

AM Peak Hour: **0745-0845**
PM Peak Hour: **1700-1800**

Links

Graphical Reports

- → AM Full Graphical Report
- → AM Peak Hour Graphical Report
- → PM Full Graphical Report
- → PM Peak Hour Graphical Report

Tabular Report

- → Tabulated Data

Image

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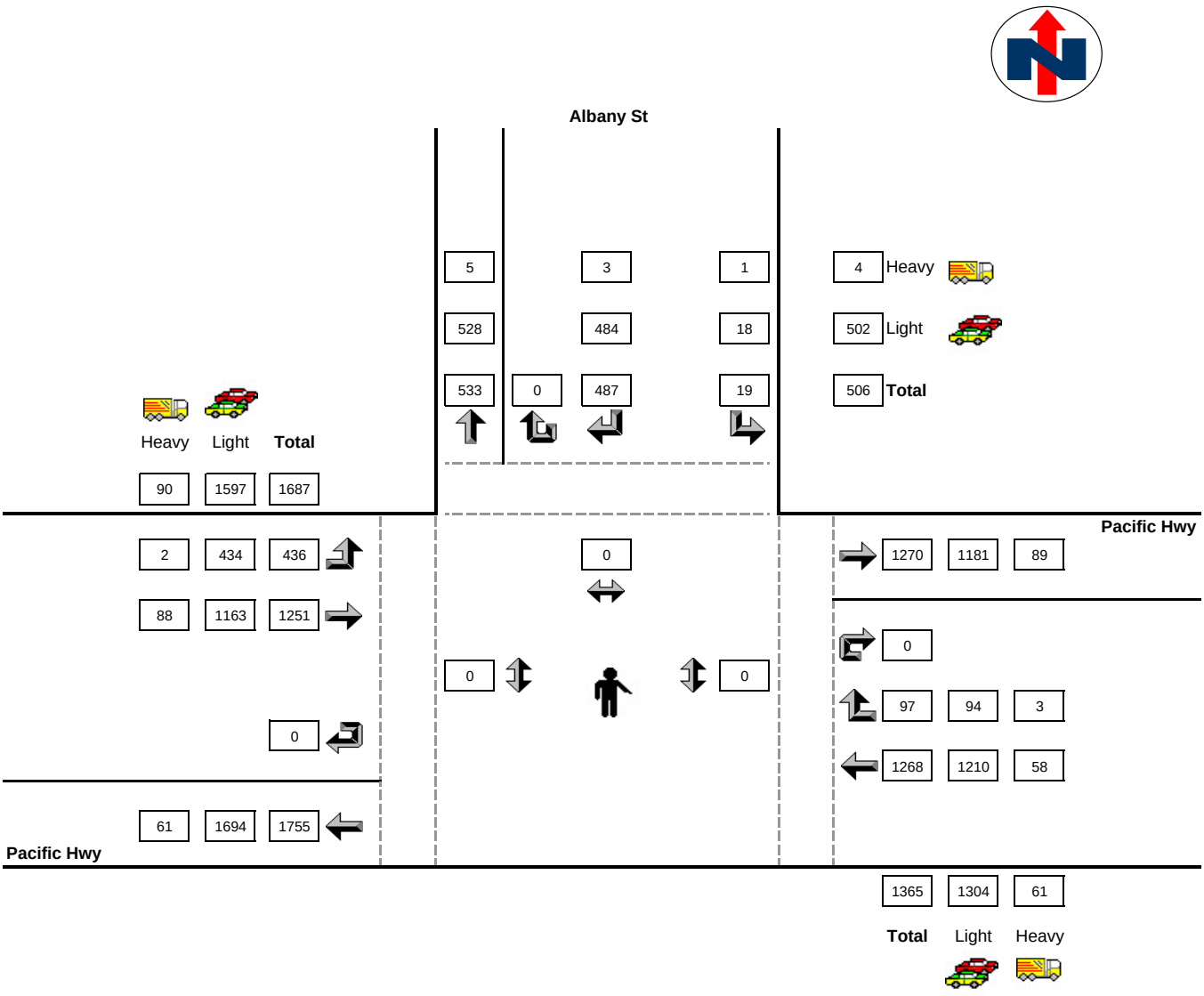
TTM Reference:	80606
Location:	Pacific Hwy / Albany St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
AM Peak	0745-0845
Weather:	Light Showers AM / Fine PM

www.ttmgroup.com.au



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TTM Reference:	80606
Location:	Pacific Hwy / Albany St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
PM Peak	1700-1800
Weather:	Light Showers AM / Fine PM

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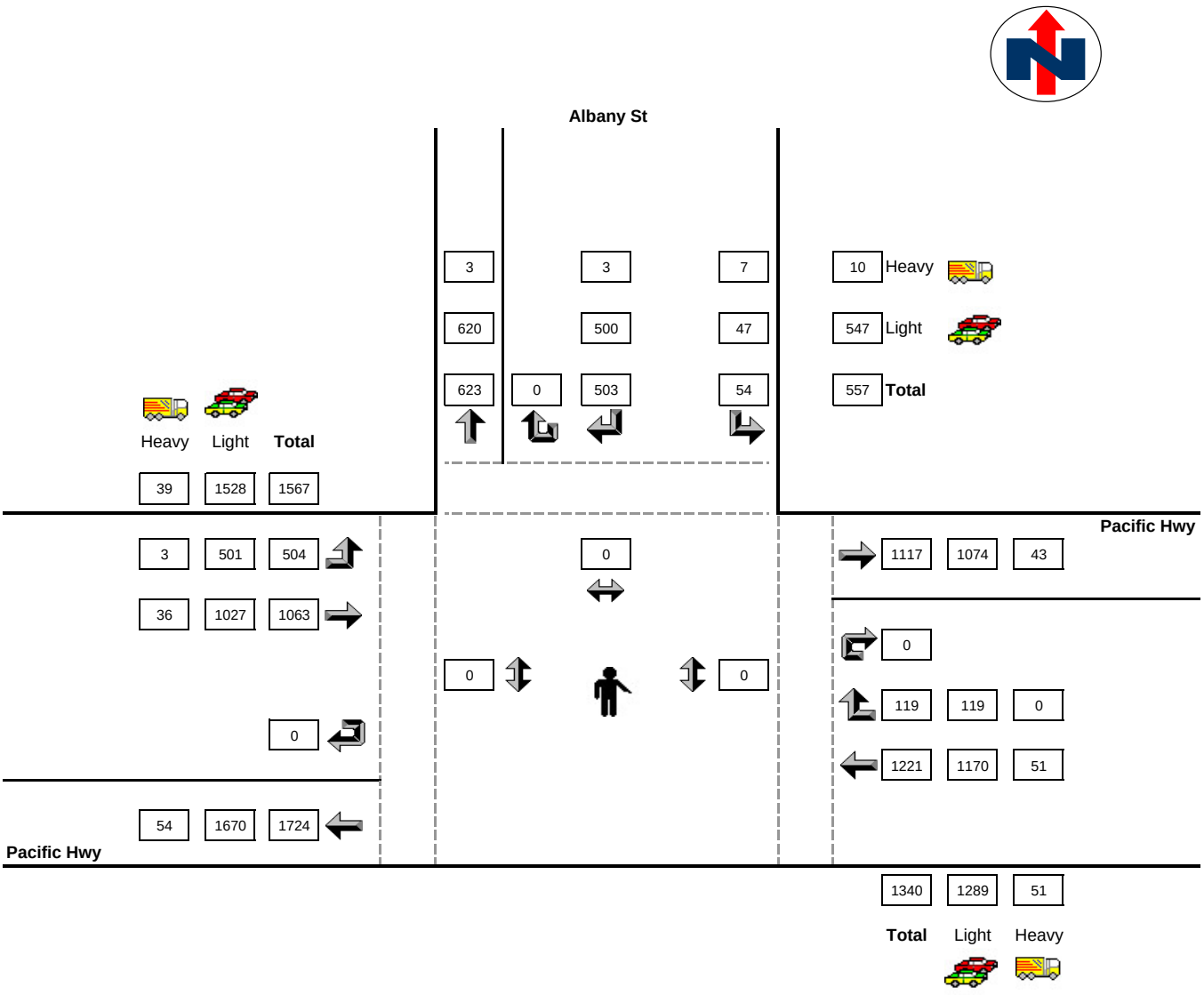

© TTM Consulting Pty Ltd

TTM Reference:	80606
Location:	Pacific Hwy / Christie St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
AM Peak	0800-0900
Weather:	Light Showers AM / Fine PM

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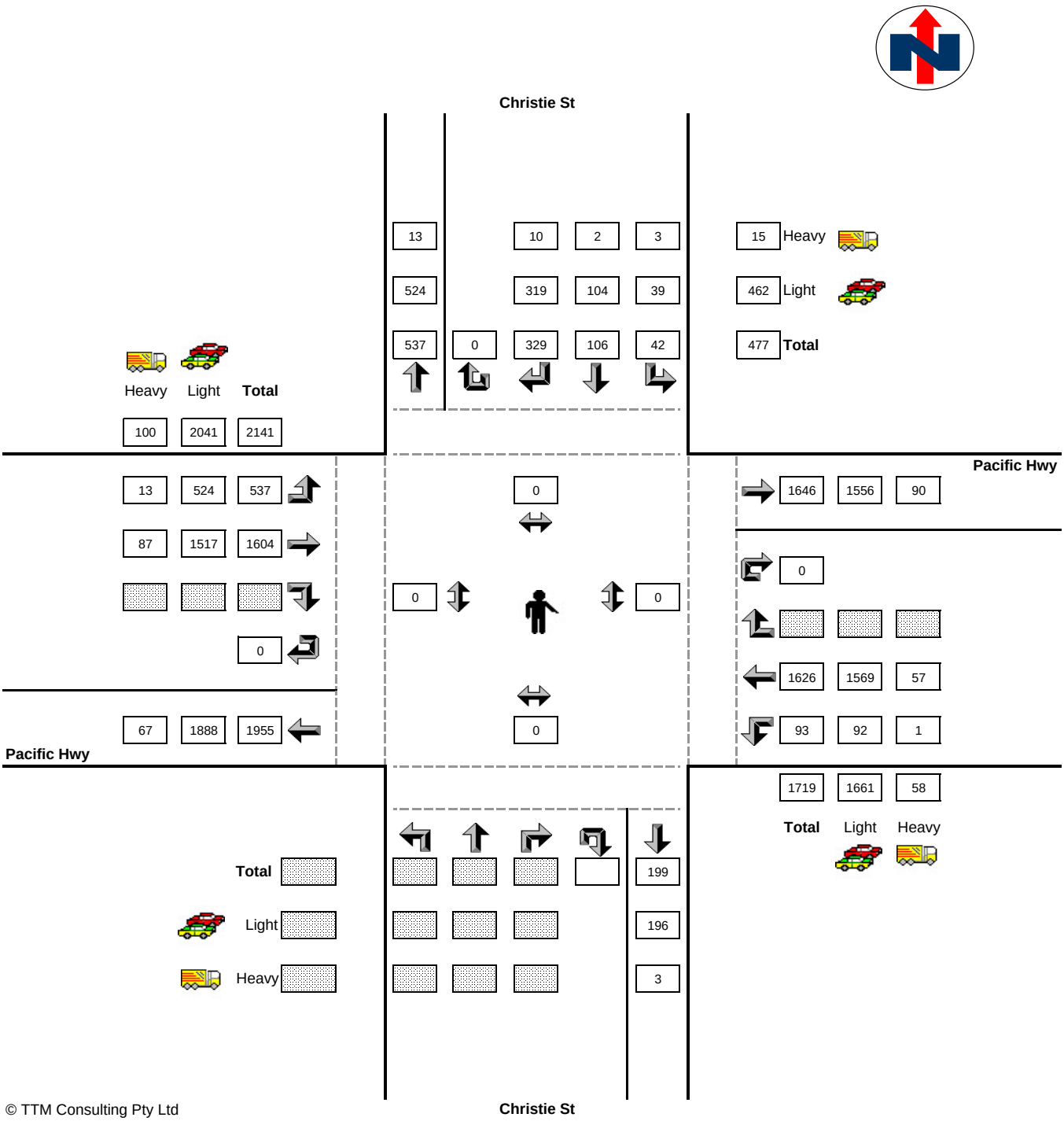

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TTM Reference:	80606
Location:	Pacific Hwy / Christie St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
PM Peak	1645-1745
Weather:	Light Showers AM / Fine PM

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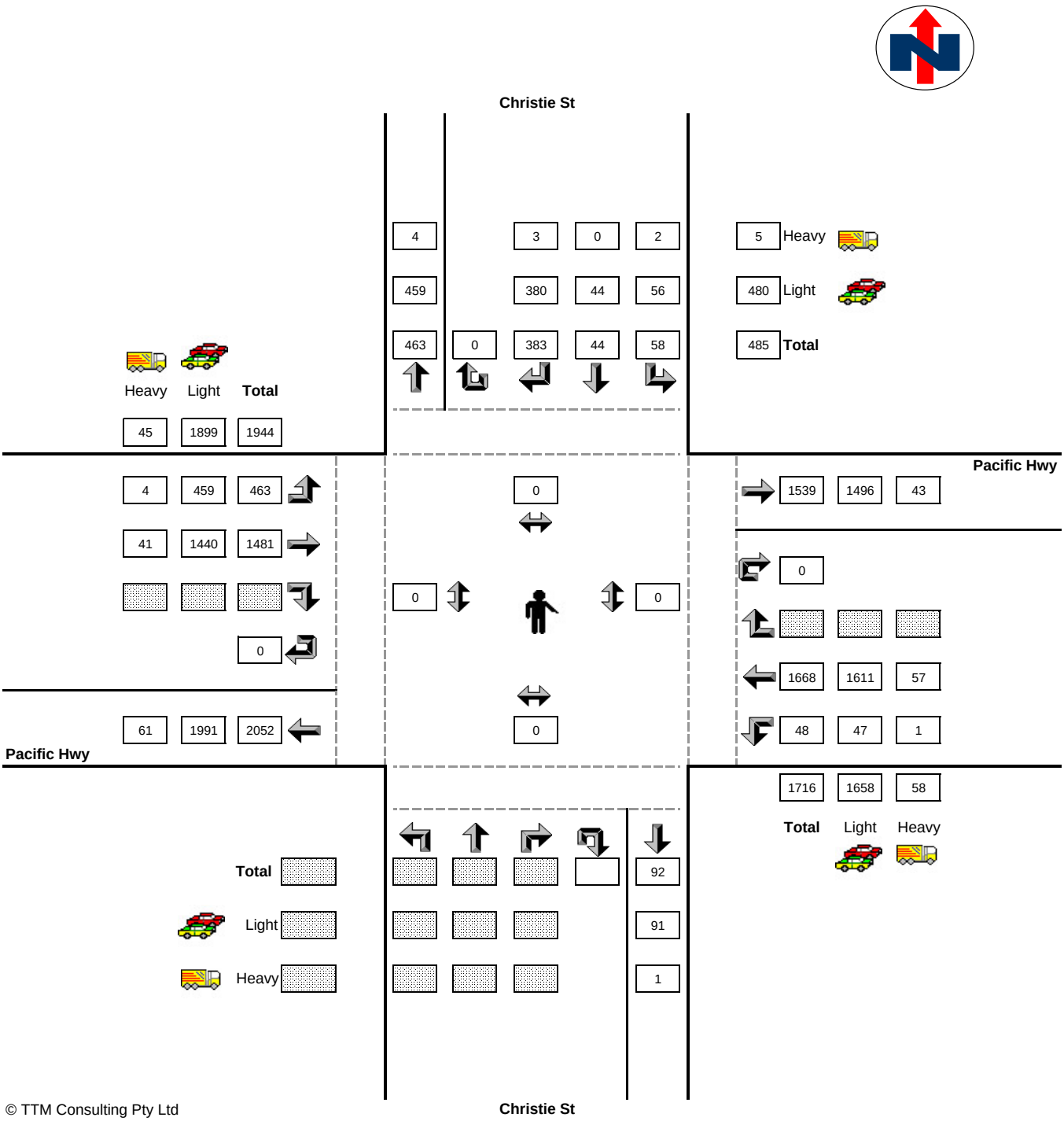

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TTM Reference:	80606
Location:	Willoughby Rd / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
AM Peak	0800-0900
Weather:	Light Showers AM / Fine PM

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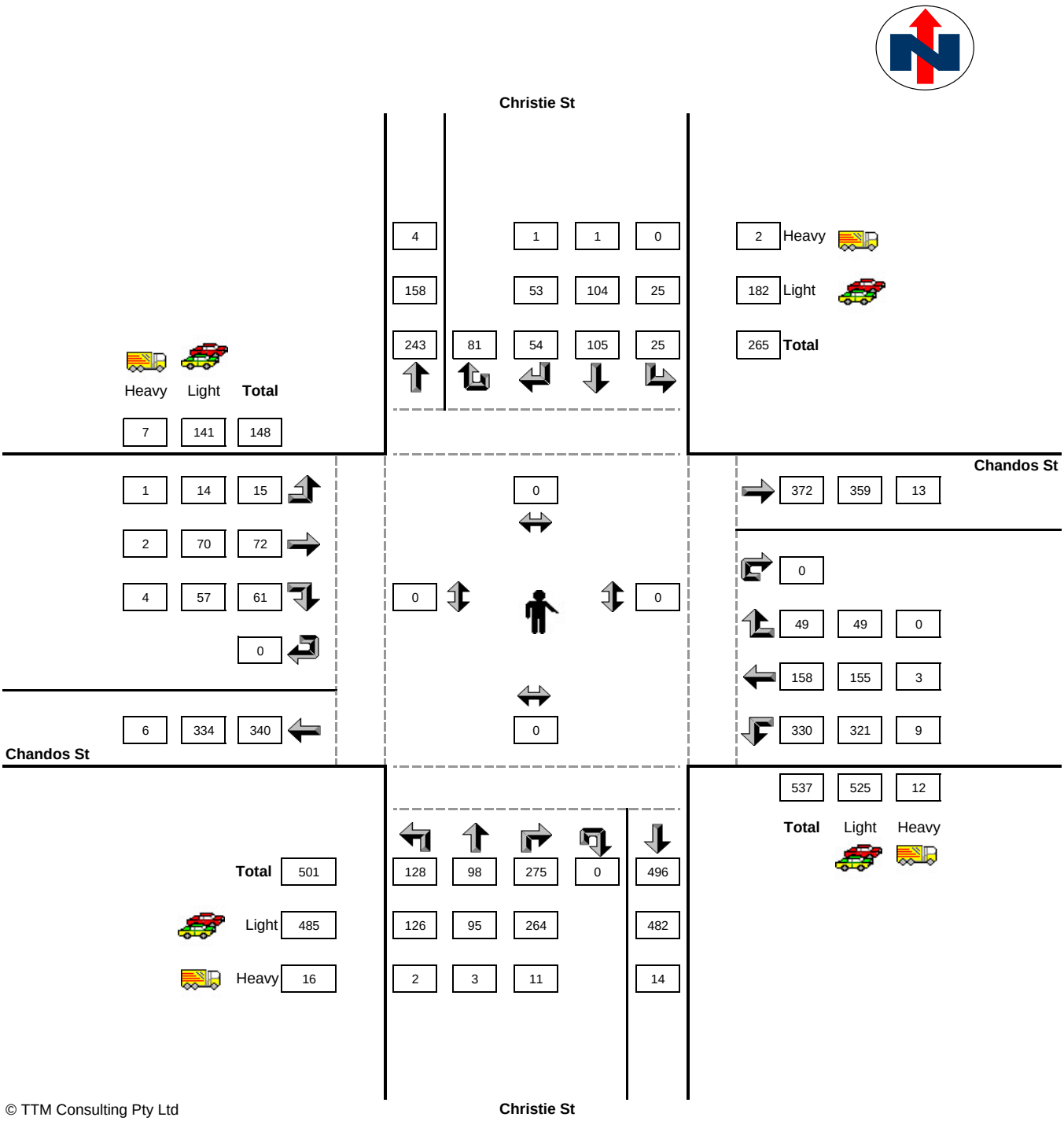

© TTM Consulting Pty Ltd

TTM Reference:	80606
Location:	Willoughby Rd / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
PM Peak	1700-1800
Weather:	Light Showers AM / Fine PM

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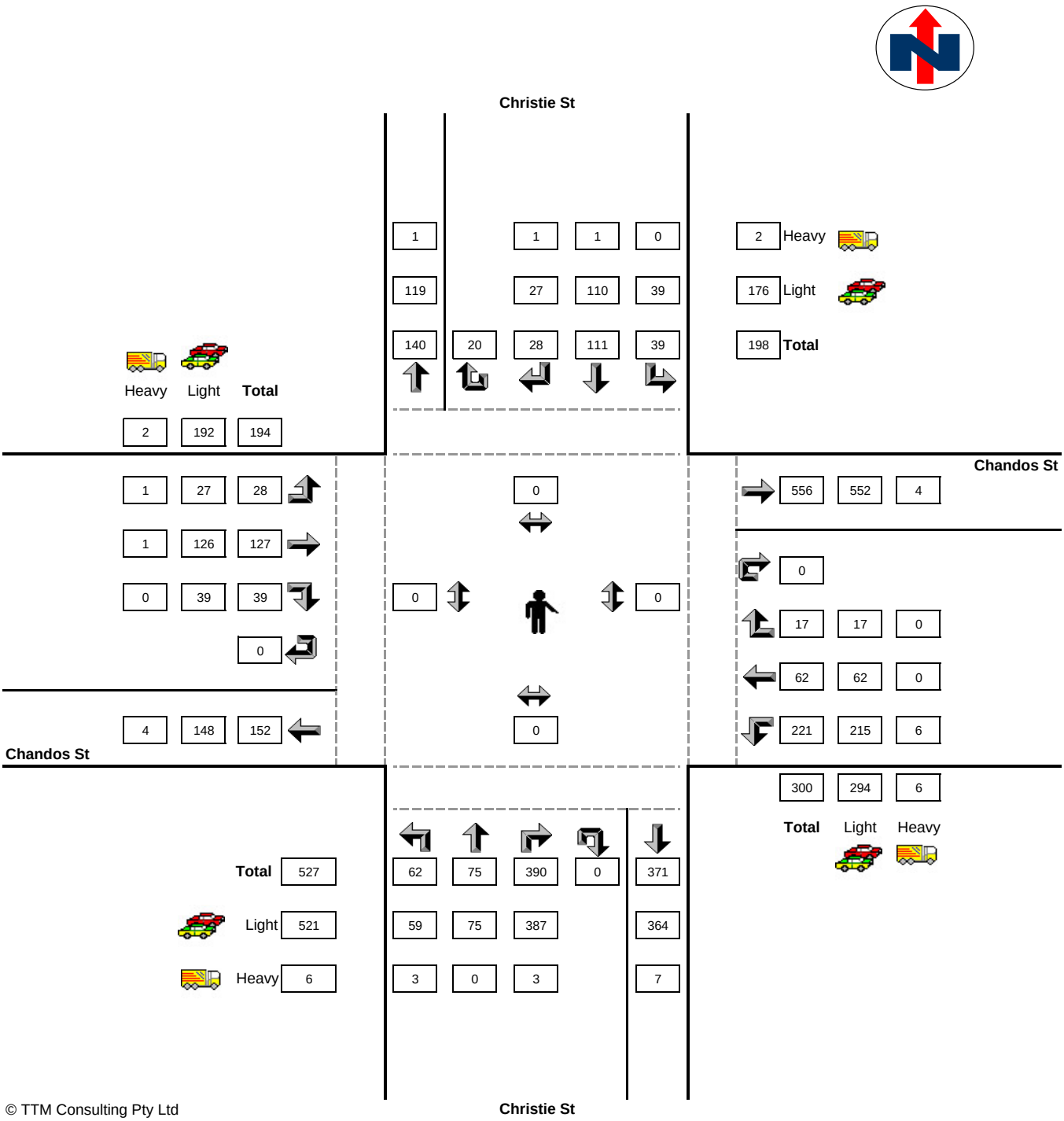

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TTM Reference:	80606
Location:	Christie St / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
AM Peak	0800-0900
Weather:	Light Showers AM / Fine PM

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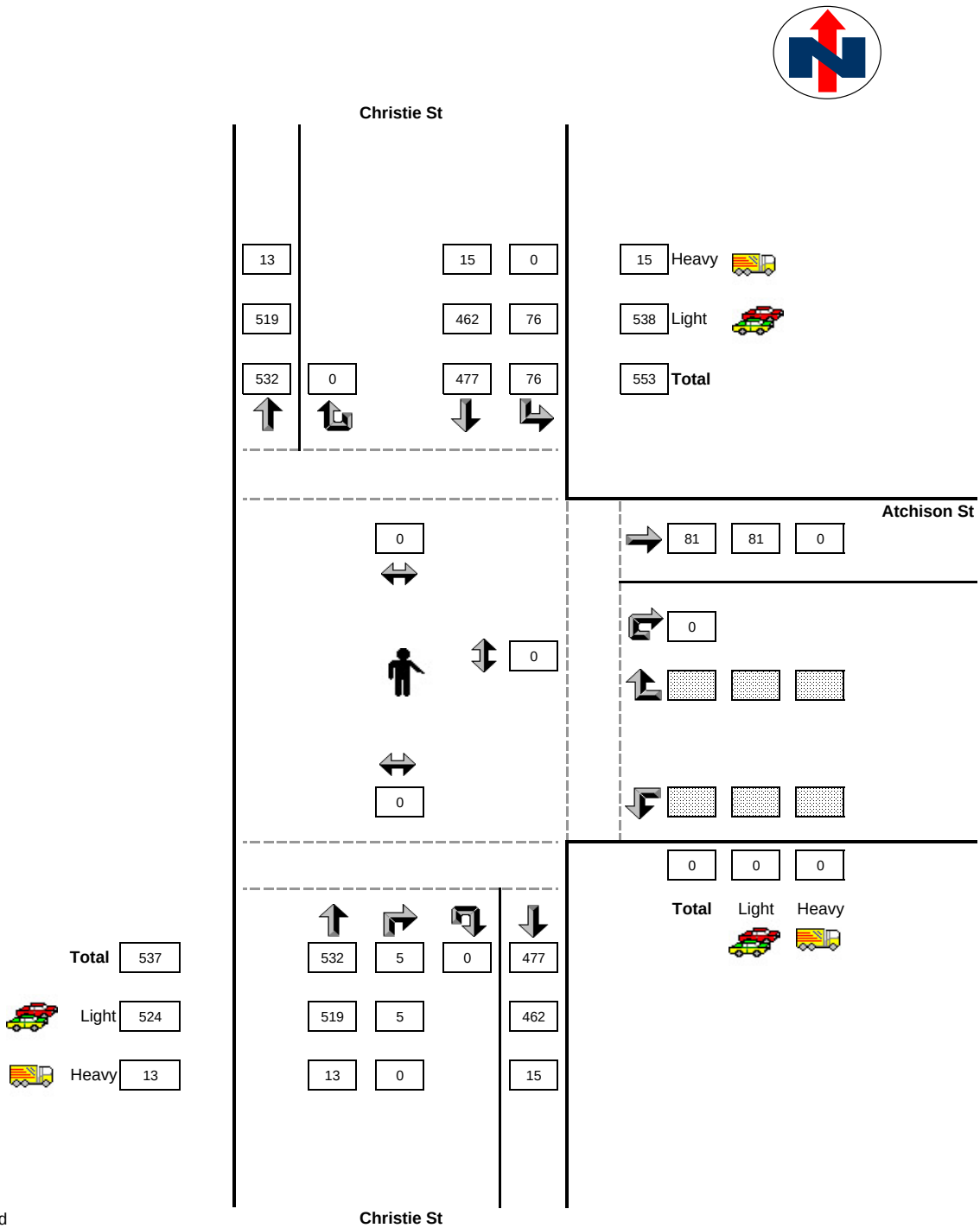

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TTM Reference:	80606
Location:	Christie St / Atchison St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
PM Peak	1630-1730
Weather:	Light Showers AM / Fine PM

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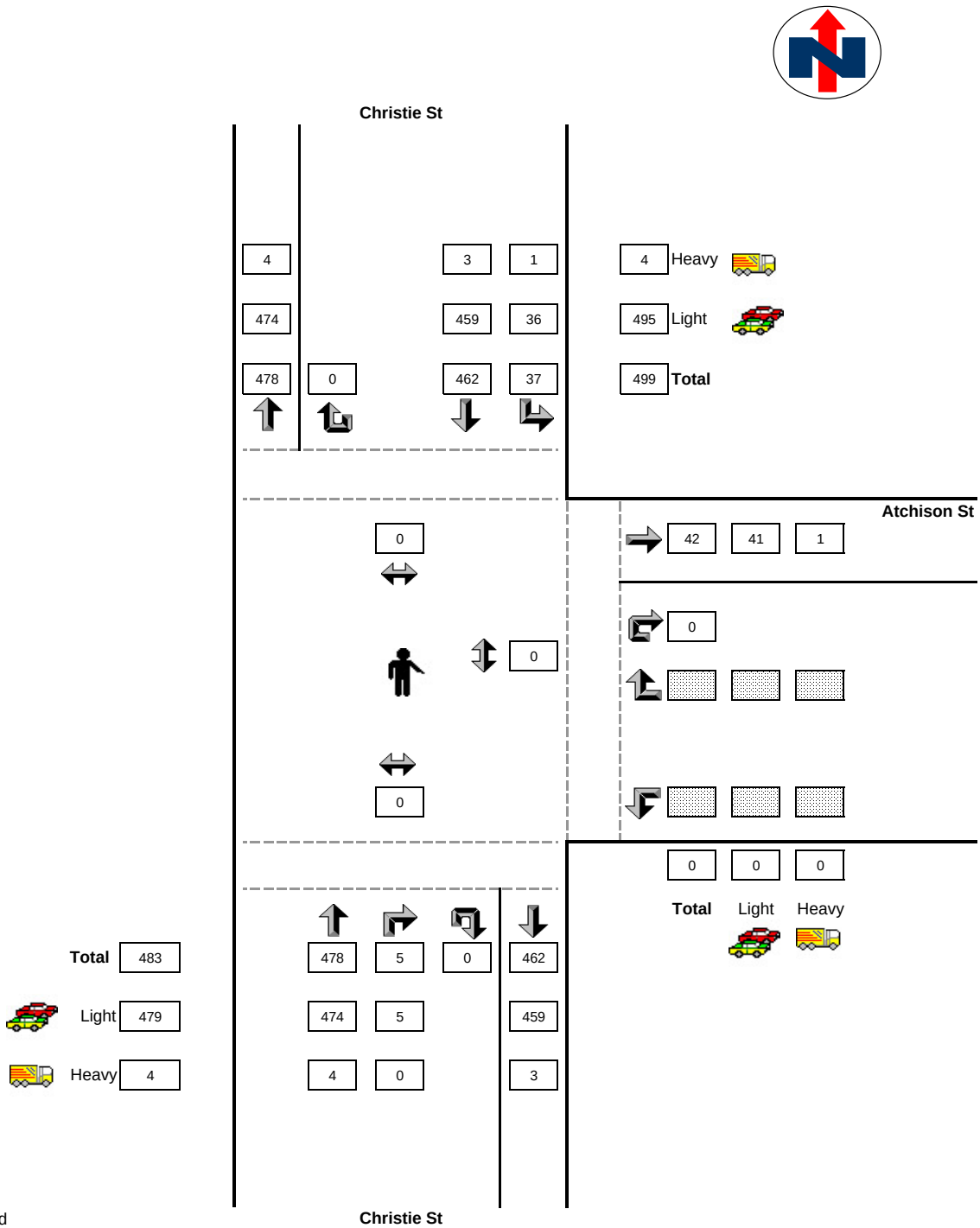

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TTM Reference:	80606
Location:	Willoughby Rd / Chandos St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
AM Peak	0800-0900
Weather:	Light Showers AM / Fine PM

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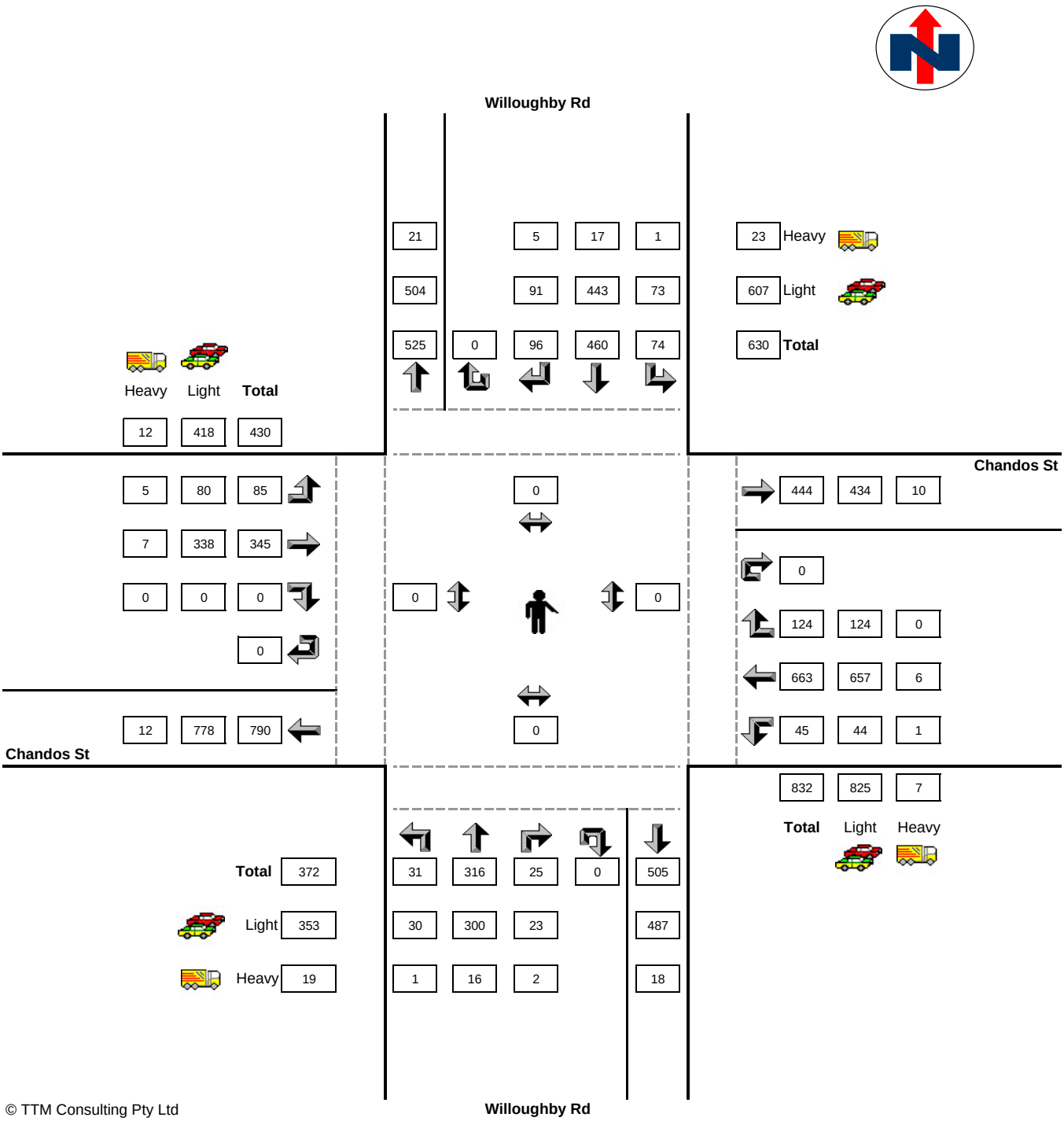

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TTM Reference:	80606
Location:	Willoughby Rd / Chandos St
Suburb:	St Leonards
Date:	Wednesday 19-05-10
PM Peak	1700-1800
Weather:	Light Showers AM / Fine PM

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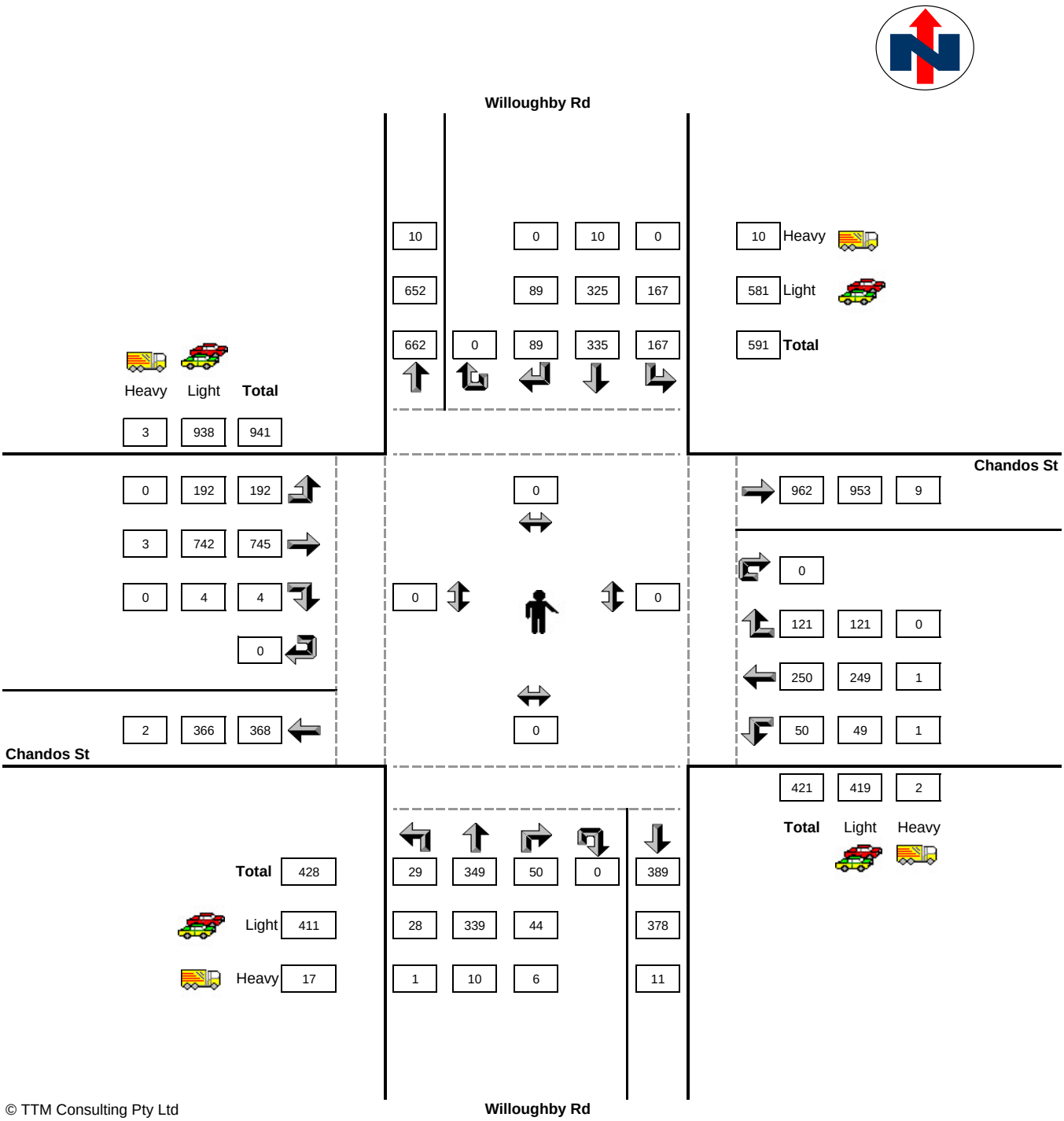

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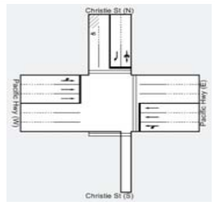
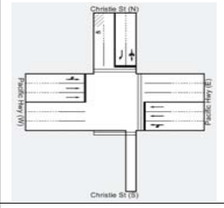
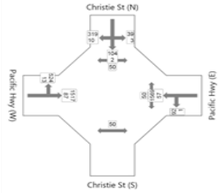
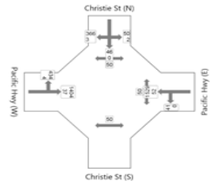
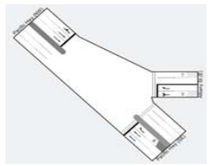
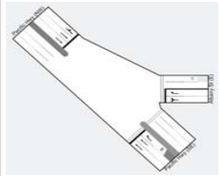
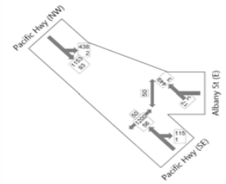
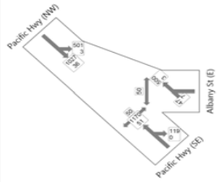
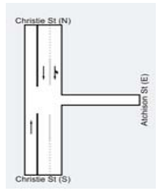
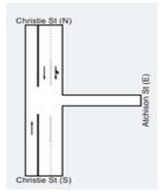
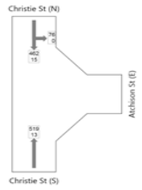
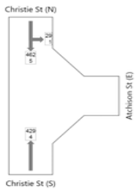
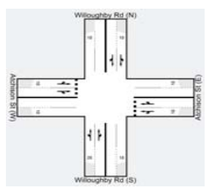
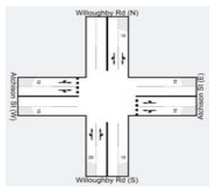
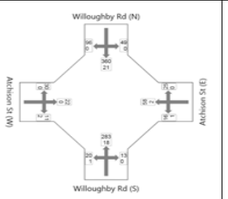
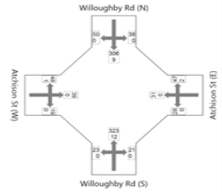
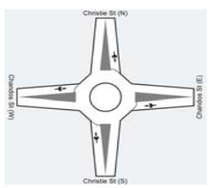
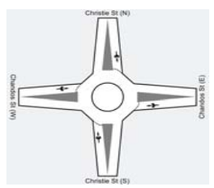
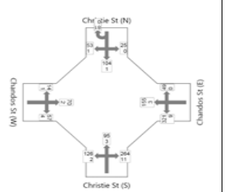
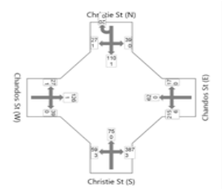
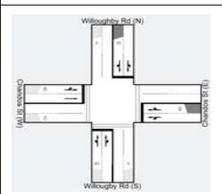
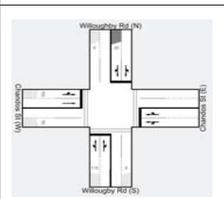
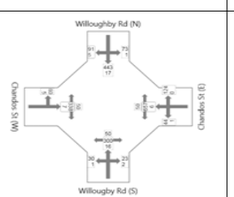
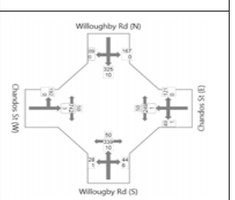
Design Layout Code	SIDRA Layout Code	Location	Data Source	Modelled Peak Hours	SIDRA Indicative layout tested (AM Peak)	SIDRA Indicative layout tested (PM Peak)	AM Peak Traffic Volume (Car and Truck)	PM Peak Traffic Volume (Car and Truck)
S-1	AM Existing / PM Existing	Pacific Hwy / Christie St	19/05/2010	AM: 8-9 PM:5-6				
S-2	AM Existing / PM Existing	Pacific Hwy / Albany St	19/05/2010	AM: 8-9 PM:5-6				
S-3	AM Existing / PM Existing	Christie St / Atchison St	19/05/2010	AM: 8-9 PM:5-6				
S-4	AM Existing / PM Existing	Willoughby Rd / Atchison St	19/05/2010	AM: 8-9 PM:5-6				
S-5	AM Existing / PM Existing	Christie St / Chandos St	19/05/2010	AM: 8-9 PM:5-6				
S-6	AM Existing / PM Existing	Willoughby Rd / Chandos St	19/05/2010	AM: 8-9 PM:5-6				

Colour code based on Degree of Saturation

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0] Continuous

Colour code based on Level of Service

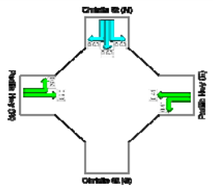
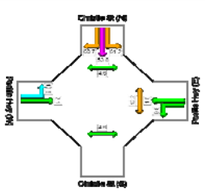
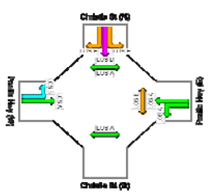
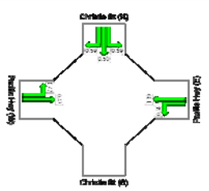
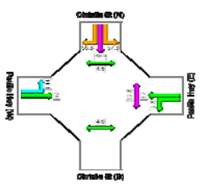
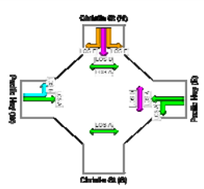
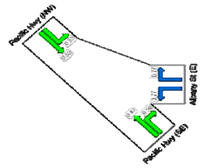
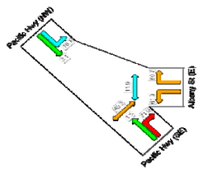
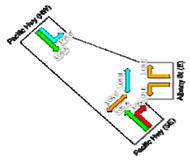
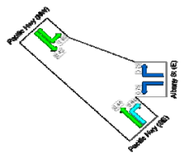
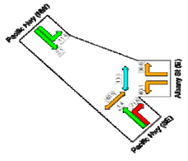
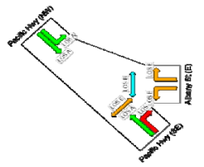
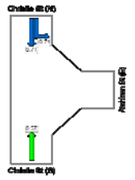
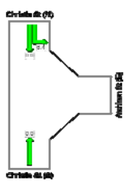
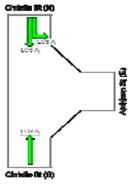
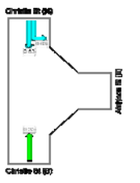
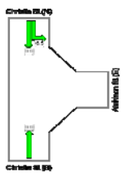
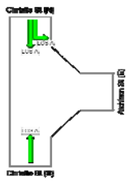
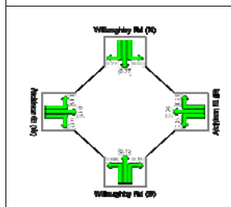
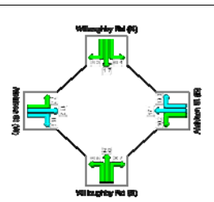
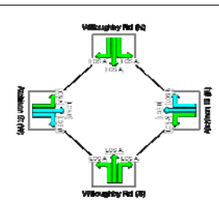
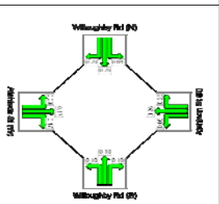
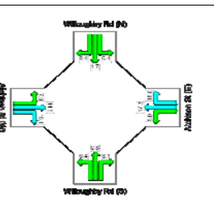
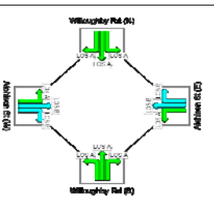
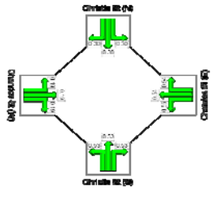
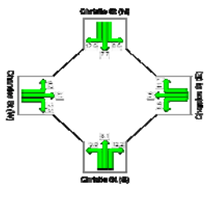
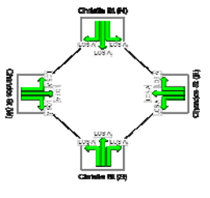
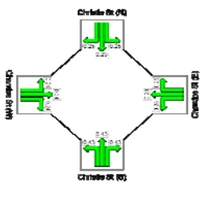
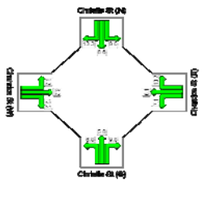
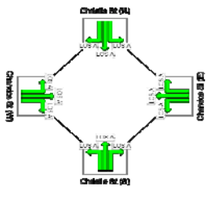
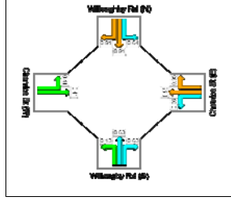
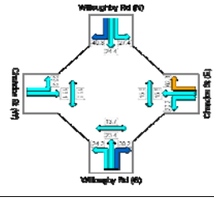
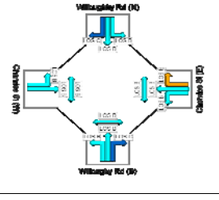
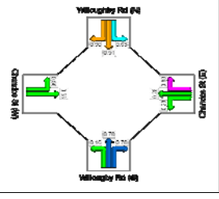
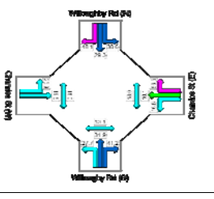
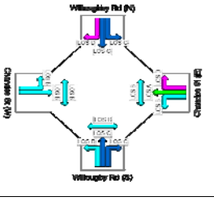
LOS A LOS B LOS C LOS D LOS E LOS F Continuous

Level of Service Method used in this display: Delay (RTA NSW)

Pedestrian Level of Service Method used in this display: Delay (HCM)

SIDRA Note: The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.

2010

AM			PM			Overall Results					
						DoS		Avg. Delay (sec)		LoS	
Degree of Saturation all Movements	Average Delay (Sec) all Movements	Level of Service all Movements	Degree of Saturation all Movements	Average Delay (Sec) all Movements	Level of Service all Movements	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
						0.63	0.59	10.1	9.6	A	A
						0.77	0.75	14.1	15	A	B
						0.71	0.63	6.4 (worst movement)	6.5 (worst movement)	A (worst movement)	A (worst movement)
						0.27	0.26	20 (worst movement)	18.8 (worst movement)	B (worst movement)	B (worst movement)
						0.55	0.43	12.6 (worst movement)	13.3 (worst movement)	A (worst movement)	A (worst movement)
						0.95	0.91	23.6	26.5	B	B

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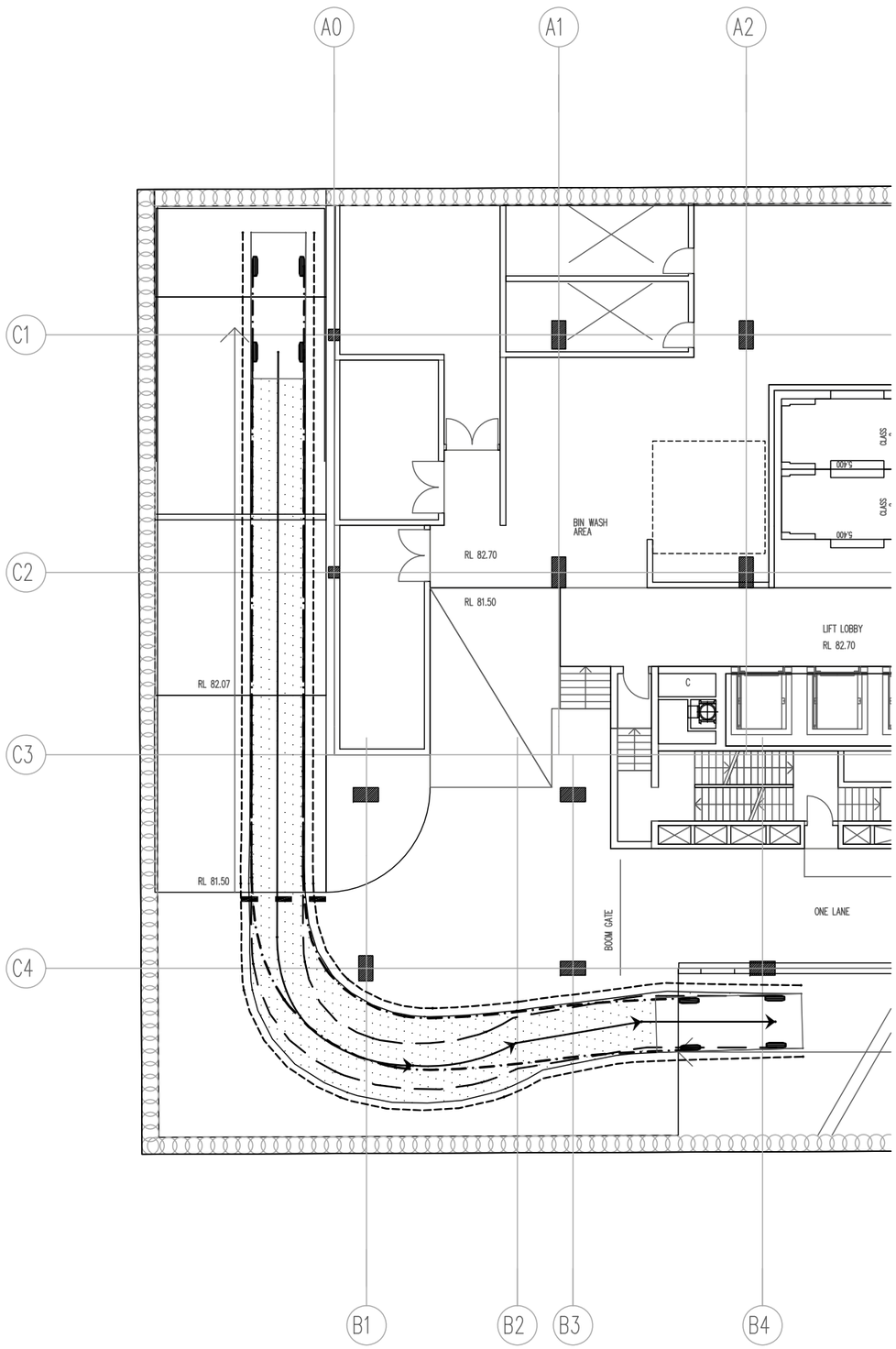
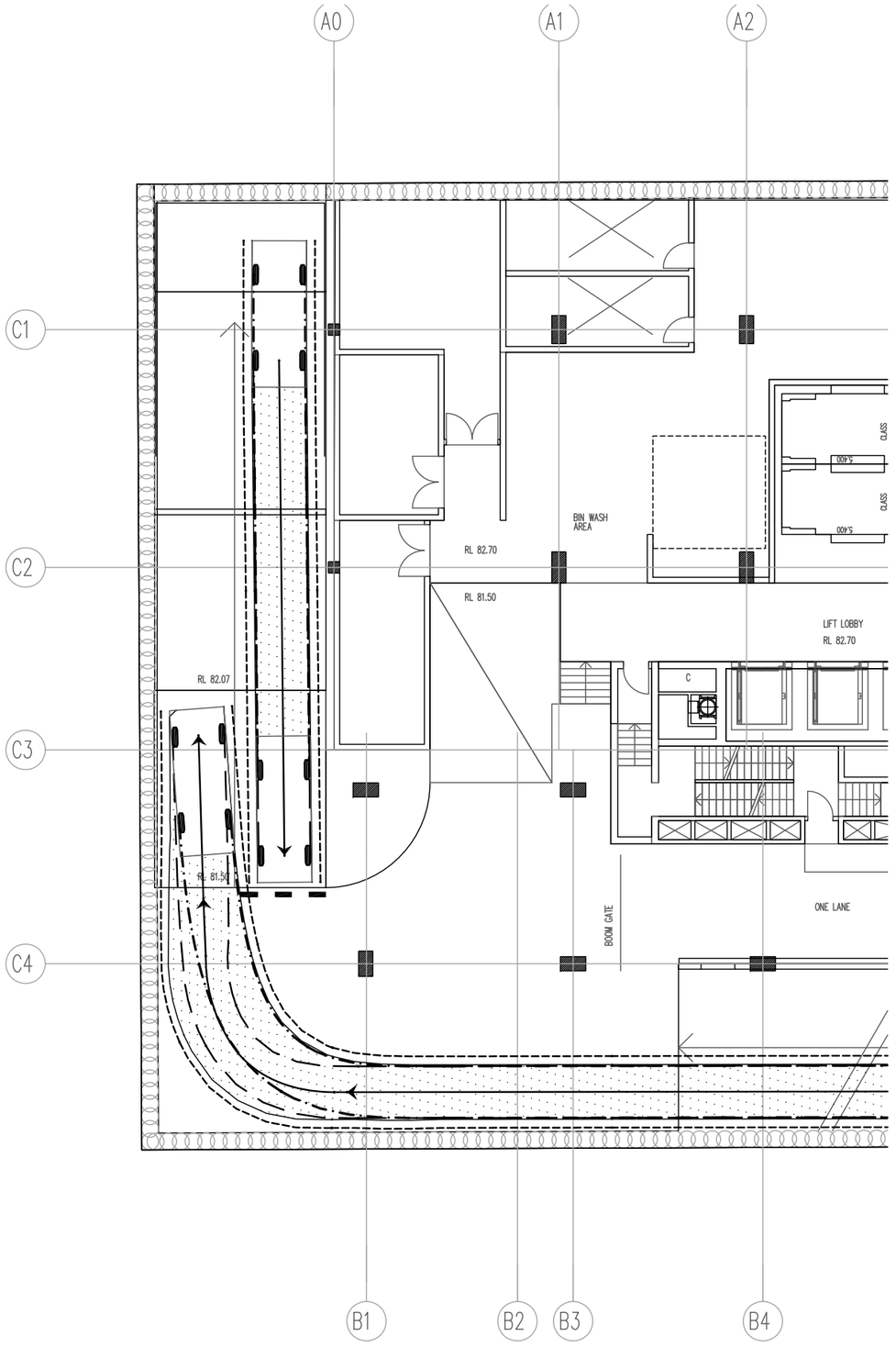
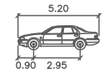


B99 ENTERING BUILDING- NOT REQUIRED TO GIVE WAY



B99 ENTERING REQUIRED TO GIVE WAY TO EXITING B99 VEHICLE



CAR meters

Width	: 1.90
Track	: 1.55
Lock to Lock Time	: 6.0
Steering Angle	: 24.0

FileName: SKC100.dwg - USER: enoh - Plot File Created: Apr 05, 2011 - 5:23pm

A1 0 1 2 3 4 5 6 7 8 9 10

PRELIMINARY

Rev	Description	Eng	Draft	Date
P1	ISSUE FOR INFORMATION	KH	EN	05.04.11

Architect
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Taylor Thomson Whitting (NSW) Pty Ltd A.C.N. 113 578 377

Project
BANCOR-ATCHISON STREET
ST LEONARDS

Sheet Subject
TURNING PATH PLAN
BASEMENT LEVEL B99
VEHICLE

Scale : A1	Drawn	Authorised
1:100	EN	

Job No	Drawing No	Revision
091602	SKC100	P1

Plot File Created: Apr 05, 2011 - 5:23pm

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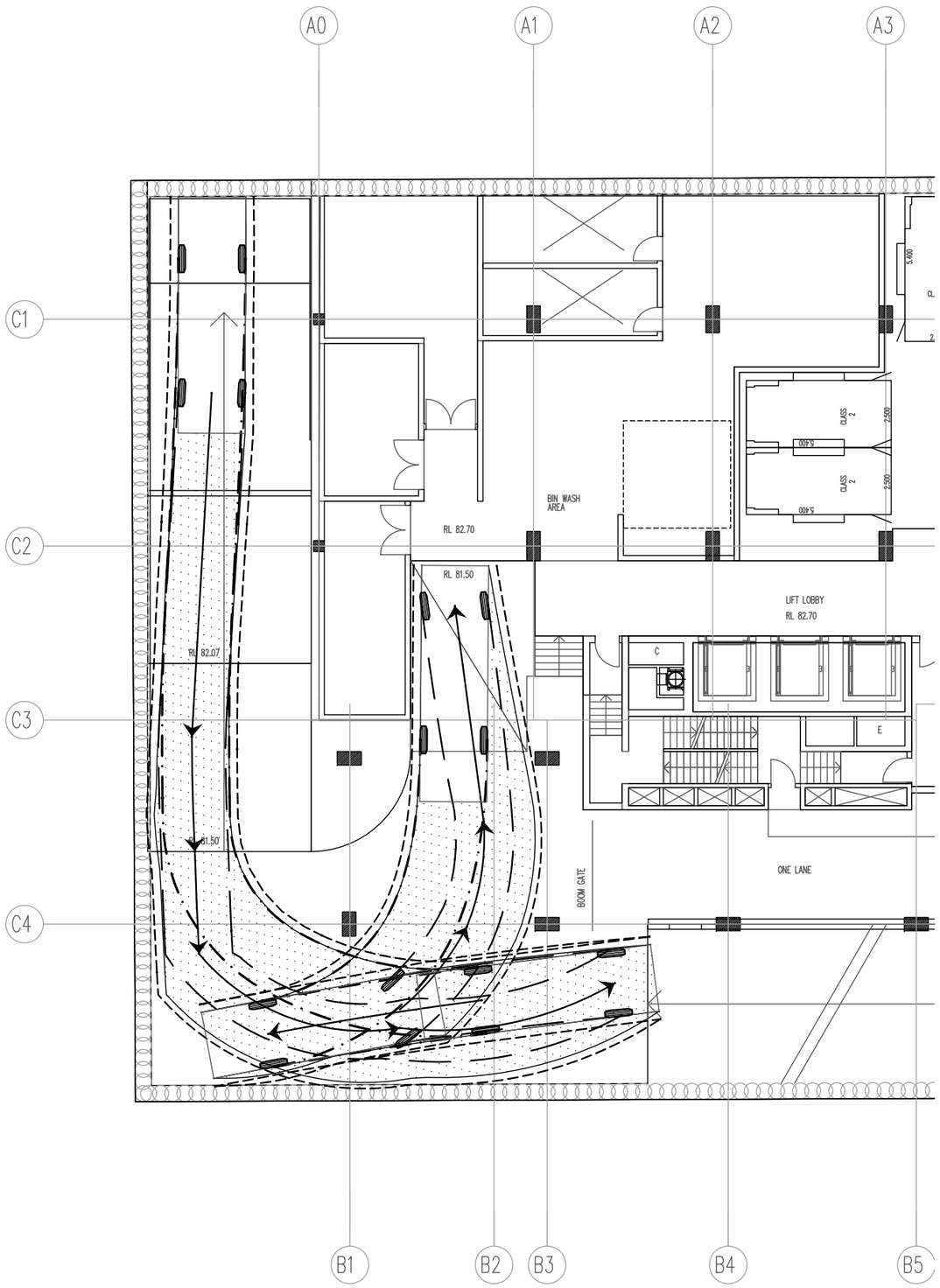
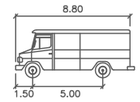
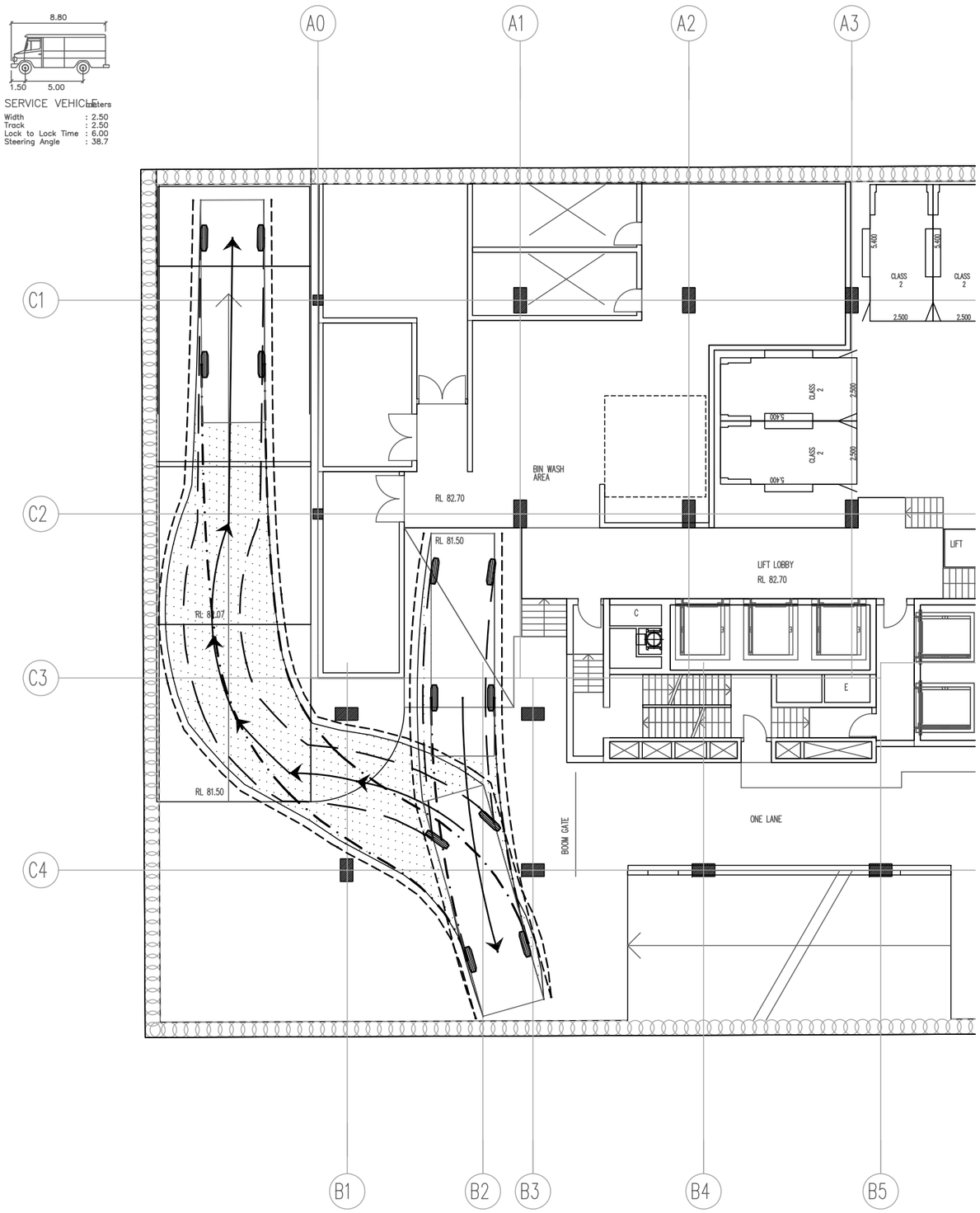




SERVICE VEHICLE Dimensions in Meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.00
Steering Angle	: 38.7

8.8m MEDIUM RIGID VEHICLE ENTERING



8.8m MEDIUM RIGID VEHICLE EXITING

FileName: SKC101.dwg - USER: enoah - Plot File Created: Apr 05, 2011 - 5:22pm

A1 0 1 2 3 4 5 6 7 8 9 10

PRELIMINARY

Rev	Descriptton	Eng	Draft	Date
P1	ISSUE FOR INFORMATION	KH	EN	05.04.11

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Project
BANCOR-ATCHISON STREET
ST LEONARDS

Sheet Subject
TURNING PATH PLAN
BASEMENT LEVEL FOR 8.8m MRV

Scale : A1	Drawn	Authorised
1:100	EN	

Job No	Drawing No	Revision
091602	SKC101	P1

Plot File Created: Apr 05, 2011 - 5:22pm

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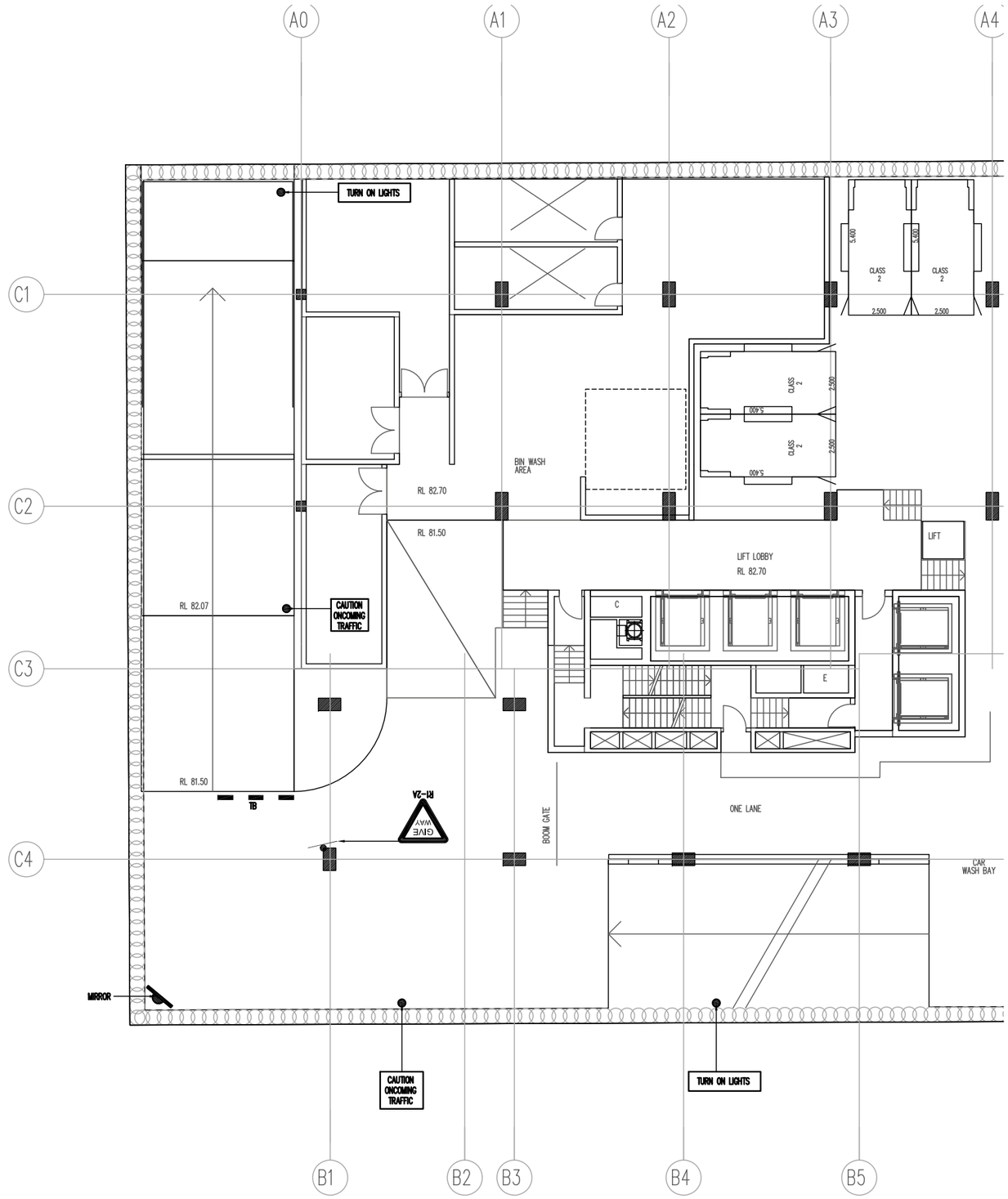

FileName: SKC102.dwg - USER: enoth - Plot File Created: Apr 05, 2011 - 5:19pm

A1 0 1 2 3 4 5 6 7 8 9 10

PRELIMINARY

Rev	Description	Eng	Draft	Date
P1	ISSUE FOR INFORMATION	KH	EN	05.04.11

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Project
BANCOR-ATCHISON STREET
ST LEONARDS

Sheet Subject
LINEMARKING AND SIGNS
PLAN BASEMENT LEVEL

Scale : A1	Drawn	Authorised
1:100	EN	

Job No	Drawing No	Revision
091602	SKC102	P1

Plot File Created: Apr 05, 2011 - 5:19pm

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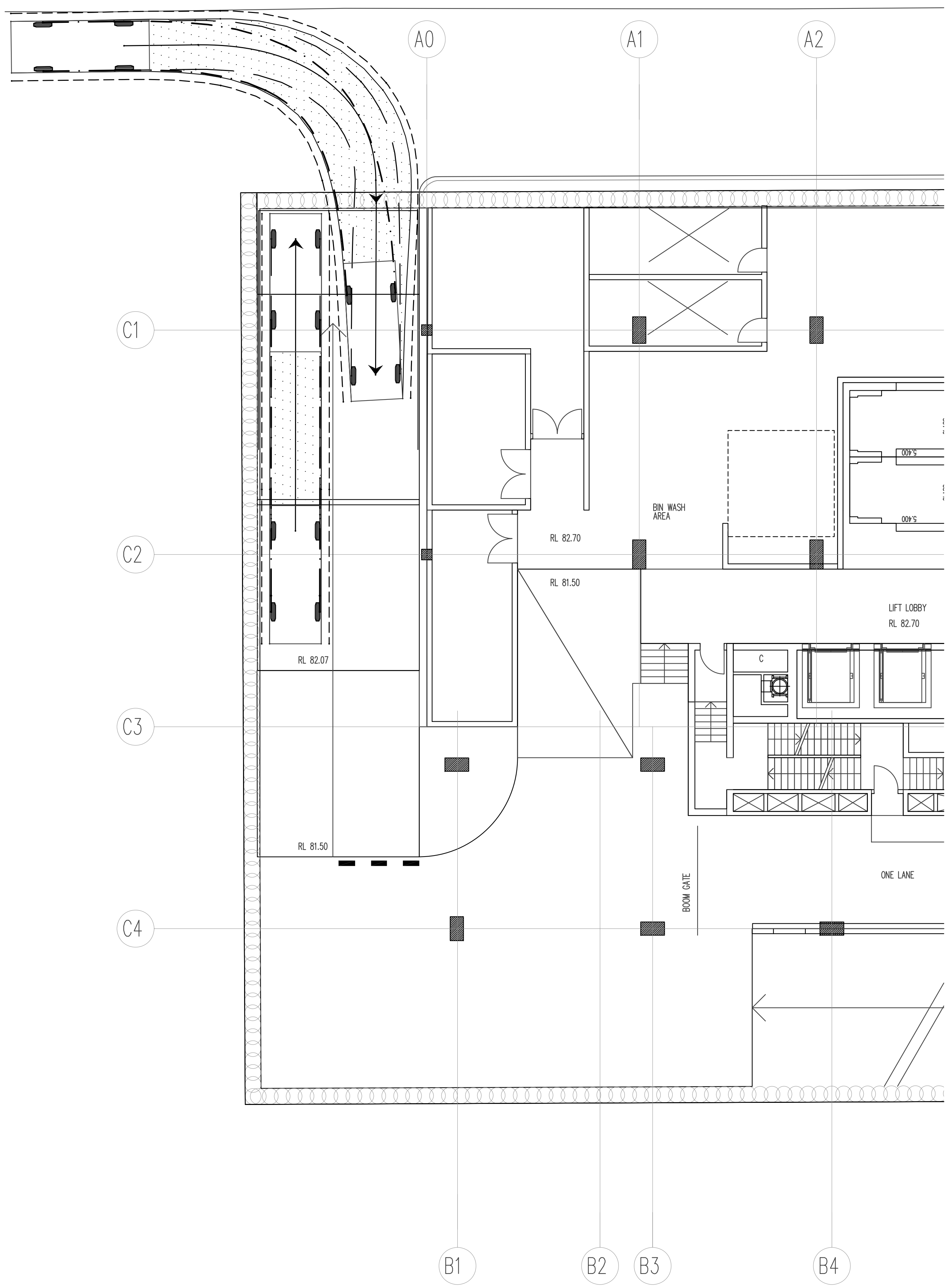
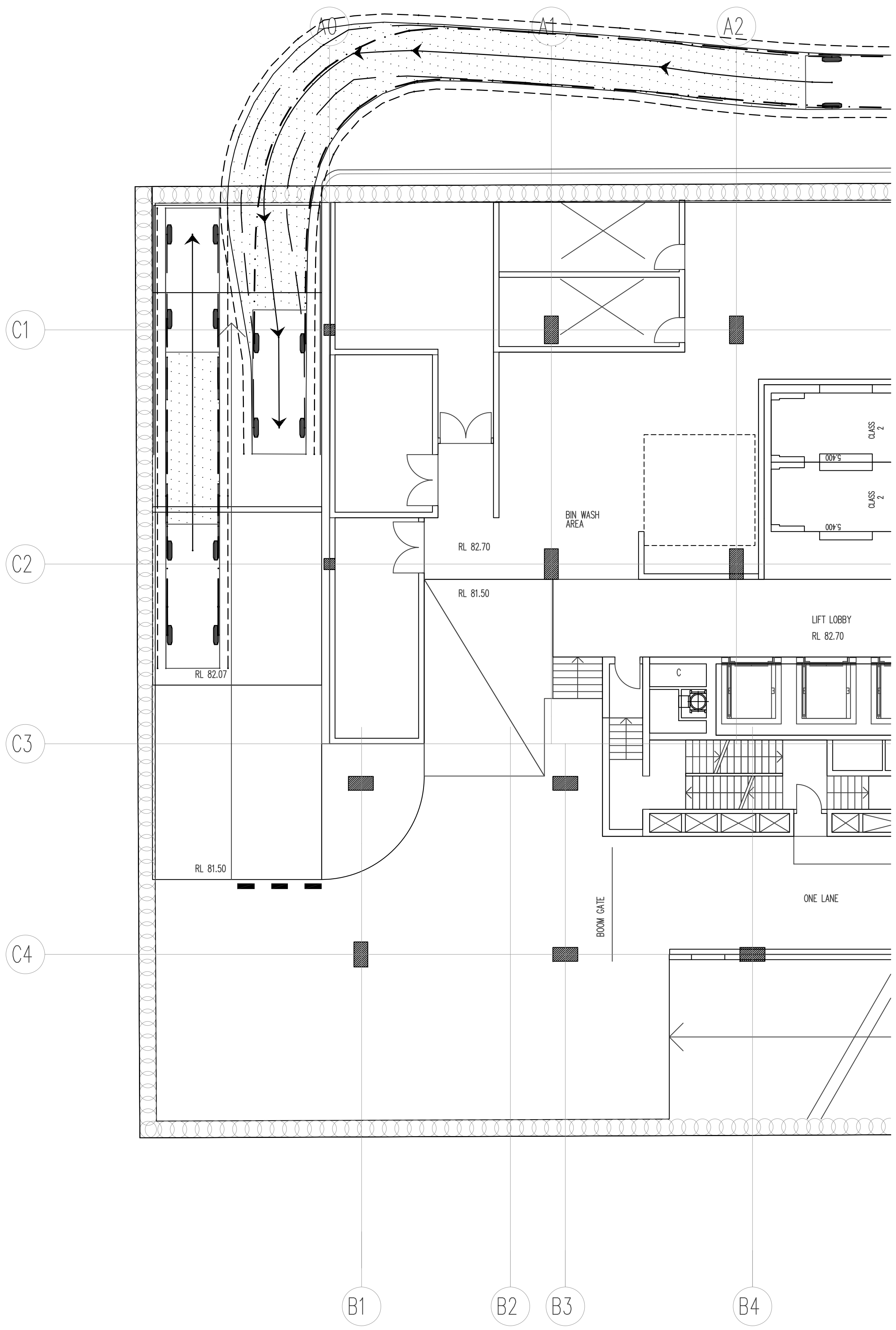
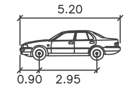


B99 ENTERING DRIVEWAY OPTION 1



B99 ENTERING DRIVEWAY OPTION 2



CAR meters
Width : 1.90
Track : 1.55
Lock to Lock Time : 6.0
Steering Angle : 24.0

PRELIMINARY

Rev	Description	Eng	Draft	Date
P1	ISSUE FOR INFORMATION	KH	EN	07.04.11

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Project: BANCOR-ATCHISON STREET ST LEONARDS

Sheet Subject: TURNING PATH PLAN DRIVEWAY ENTRY B99 VEHICLE

Scale : A1 1:100
Drawn: EN
Authorised:
Job No: 091602
Drawing No: SKC103
Revision: P1
Plot File Created: Apr 07, 2011 - 2:19pm