TRAFFIC & PARKING ASSESSMENT

HOLIDAY INN EXPRESS HOTEL
LOT 2 DP 542059 AND LOT 9 DP 446798
500 KING STREET, NEWCASTLE WEST

PREPARED FOR: HOLIDAY INN EXPRESS

JUNE 2016

16/067

TRAFFIC AND PARKING ASSESSMENT
HOLIDAY INN EXPRESS

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500 KING STREET NEWCASTLE WEST

Intersect Traffic Pty Ltd (ABN: 43 112 606 952)

Address:
Shop7 Metford Shopping Village
Cnr Chelmsford Drive & Tennyson Street
Metford NSW 2323
PO Box 268
East Maitland NSW 2323

Contact:
(Ph) 02 4936 6200
(Mob) 0423 324 188
Email: jeff@intersecttraffic.com.au

QUALITY ASSURANCE

This document has been prepared, checked and released in accordance with the Quality Control Standards established by Intersect Traffic Pty Ltd.

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D	21/06/16	Approved	JG

This document has been authorised by

Date 21st June 2016

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EXECUTIVE SUMMARY

Intersect Traffic Pty Ltd was engaged by Tactical Project Management Pty Ltd on behalf of Holiday Inn Express to prepare a Traffic and Parking Assessment Report for the construction of a multi-storey 170 room Holiday Inn Express Hotel on Lot 2 DP 542049 and Lot 9 DP 446798, 500 King Street, Newcastle West. Building frontage is to the section of King Street known as Little King Street with vehicular access also being via Little King Street to a multi-level car park within the building.

The proposal includes the following;

- 170 room hotel development and associated facilities over 5 levels;
- Ground floor lobby, bar, gymnasium and meeting room;
- Ground floor retail space (273.3 m^2 GFA); and
- 104 on-site car parks over two (2) levels.

The development plans are shown in ***Attachment A***. This report is required to support a development application to Newcastle City Council and has concluded the following;

- The local road network in the vicinity of the site has a likely technical mid-block capacity of up to 5,600 vtph (four lane, two way roads) and 300 vtph (Little King Street) if a LOS D is considered acceptable and the environmental capacity goals are applied to Little King Street. As this is in excess of current traffic volumes on the respective sections of the local road network the local road network has spare capacity to cater for development in the area.
- It is expected that the additional traffic generated by the development in the critical PM peak period will be a maximum of 82 vtph.
- The local road network has sufficient spare mid-block capacity to cater for the additional development traffic generated by the proposal and other developments in the area without the need for any road upgrading works.
- SIDRA modelling of the Stewart Avenue / King Street / Parry Street signalised intersection and the Stewart Avenue / Hunter Street signalised intersection has shown that the proposed development on its own does not adversely impact on the operation of these intersections.
- The Sidra modelling also showed that these intersections are operating at near capacity and future growth in the Newcastle CBD will see these intersections reach capacity in the near future unless road network upgrades and changes occur or a modal trip making shift occurs to public transport trip making. This is however considered a regional problem requiring a regional solution and is not the responsibility of one particular development.
- The proposed vehicular access to the on-site car parking is compliant with Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking* and therefore satisfactory for the development.
- That sufficient and suitable on-site car parking, motorbike parking and bicycle storage has been incorporated into the development such that the development is compliant with Newcastle City Council's DCP (2012) and Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking.*
- Servicing arrangements are satisfactory with vehicles up to a medium rigid vehicle (MRV 8.8 metres long) utilising the on-site loading bay and larger vehicle servicing utilising a proposed loading zone area on Little King Street adjacent to the development which is proposed within the public domain works on Little King Street. All on-site servicing can enter and exit the site in a forward direction.
- Construction traffic generated by the development will be less than the additional traffic generated by the operation of the development. Therefore as this assessment determined the operational traffic will not adversely impact on the local road network it is also

reasonable to conclude that the construction traffic associated with the new development will not adversely impact on the local road network.

- It is recommended that a construction traffic management plan be prepared and implemented prior to commencement of construction activities on the site to ensure the impacts of the construction activities on the internal traffic flows are minimised during construction.
- The conditioning of the agreed public domain works on any consent issued for this development would ensure suitable pedestrian facilities are provided in the vicinity of the site to meet the additional pedestrian demand generated by the development.
- Existing public transport services to the site are considered excellent and no new facilities or service amendments will be required as a result of the level of additional public transport usage generated by the development.
- The development is not likely to significantly increase bicycle traffic to the site and would not warrant additional specific external bicycle infrastructure being provided. On-site bicycle storage and bicycle racks within the public domain works would be beneficial to the development.

Having carried out this traffic impact assessment it is recommended that the proposed multi-storey 170 room tourist hotel on Lot 2 DP 542049 and Lot 9 DP 446798, 500 King Street, Newcastle West can be supported from a traffic and parking impact perspective as the development will not adversely impact on the local and state road network and complies with all relevant Newcastle City Council, Australian Standard and NSW Roads and Maritime Services (RMS) requirements.

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1.0 INTRODUCTION

Intersect Traffic Pty Ltd was engaged by Tactical Project Management Pty Ltd on behalf of Holiday Inn Express to prepare a Traffic and Parking Assessment Report for the construction of a multi-storey 170 room Holiday Inn Express Hotel on Lot 2 DP 542049 and Lot 9 DP 446798, 500 King Street, Newcastle West. Building frontage is to the section of King Street known as Little King Street with vehicular access also being via Little King Street to a multi-level car park within the building.

The proposal includes the following;

- 170 room hotel development and associated facilities over 5 levels;
- Ground floor lobby, bar, gymnasium and meeting room;
- Ground floor retail space (273.3 m^2 GFA); and
- 104 on-site car parks over two (2) levels.

The development plans are shown in ***Attachment A***.

This report is required to support a development application to Newcastle City Council and presents the findings of the traffic and parking assessment including;

1. An outline of the existing situation in the vicinity of the site.
2. An assessment of the traffic impacts of the proposed development including the predicted traffic generation and its impact on existing road and intersection capacities.
3. Reviews parking, public transport, pedestrian and cycle way requirements for the proposed development, including assessment against Council and Australian Standards.
4. Presentation of conclusions and recommendations.

2.0 SITE LOCATION

The subject site is shown in ***Figure 1*** below. It is located on the north-eastern side of Little King Street, Newcastle West immediately south-east of Stewart Avenue. It is addressed as 500 King Street, Newcastle West and was previously part of the Newcastle City Holden site as a car sales yard. The site is directly opposite Birdwood Park which separates King Street and Little King Street.

The site is formally titled as Lot 2 DP 542059 and Lot 9 DP 446798 and is currently zoned B3 – Commercial Core pursuant to the Newcastle LEP (2012). ***Photographs 1 & 2*** below show existing conditions at the site.

The site currently has two 6 metre wide concrete vehicular access crossings off Little King Street separated by approximately 10 metres.

Figure 1 – Site Location

Photograph 1 – Development site from Little King Street

Photograph 2 – Existing vehicular access off Little King Street

3.0 EXISTING ROAD NETWORK

3.1 Stewart Avenue

Stewart Avenue is a classified State Highway (SH 10 – Pacific Highway) and in the vicinity of the site is a four lane two way sealed urban road (see ***Photograph 3)***. Kerb and gutter and longitudinal drainage are provided while lane widths are in the order of 3 metres to 3.5 metres. A 60 km/h speed limit applies to this section of road and at the time of inspection it was observed to be in good condition.

Under a functional road hierarchy Stewart Avenue functions as a major arterial road which not only connects Newcastle to the Central Coast, Mid North Coast and Sydney but represents a major transport route for the residential areas south of Newcastle. Being a State Highway it is under the care and control of the NSW Roads and Maritime Service (RMS). On-street parking in Stewart Avenue in the vicinity of the site is prohibited and there are limited on-road cycle lanes along its length.

Photograph 3 – Stewart Avenue in the vicinity of the site

3.2 Hunter Street

Hunter Street is also part of State Highway 10 (Pacific Highway) and in the vicinity of the site is a four lane two way sealed urban road (see ***Photograph 4)***. Kerb and gutter and longitudinal drainage are provided while lane widths are in the order of 3 metres to 3.5 metres. A 60 km/h speed limit applies to this section of road and at the time of inspection it was observed to be in good condition.

Under a functional road hierarchy Hunter Street functions as a major arterial road which not only connects Newcastle to the Central Coast, Mid North Coast and Sydney but represents an important transport route for the residential areas in the inner west of Newcastle i.e. Mayfield , Islington etc. Being a State Highway it is under the care and control of the RMS.

Photograph 4 – Hunter Street in the vicinity of the site

3.3 King Street

King Street is major urban local collector road in the Newcastle area. It runs east - west connecting the Newcastle East area to the sub-arterial road network (Pacific Highway / Stewart Avenue) and provides connection to the inner suburbs of Hamilton and Cooks Hill. It also provides a connection to the Newcastle beaches and from the beachside suburbs of Bar Beach and Merewether south of Newcastle. In the vicinity of the site King Street is a four lane two-way median separated road. Both eastbound and westbound carriageways have two lanes, a cycle lane and limited parking lanes, all sealed. Each carriageway is 10 metres wide (approx.) and has concrete kerb and gutter and longitudinal drainage along its outer edges. A 50 km/h speed limit applies to this section of road. At the time of inspection King Street was observed to be in good condition. ***Photograph 5*** below shows King Street in the vicinity of the site.

Photograph 5 – King Street in the vicinity of the site

3.4 Little King Street

Little King Street in the vicinity of the site is an urban local road under the care and control of Newcastle City Council. Its primary function is to provide access to properties along its length however it is also used as a thoroughfare 'rat-run' for vehicles heading south along Stewart Avenue heading towards the Newcastle CBD and beach areas. On-street parking in Little King Street is time restricted and metered being parallel parking on the north-eastern side and 90°angle parking on the south-western side of the street. In the vicinity of the site Little King Street is a two lane two way urban road with adjacent parking lanes and kerb and gutter. Lane widths are typically 3 metres to 3.2 metres and a 50 km/h speed limit applies to this section of road. At the time of inspection Little King Street was observed to be in fair condition (***Photograph 6)***.

Photograph 6 – Little King Street in the vicinity of the site

4.0 ROAD NETWORK IMPROVEMENTS

The recent termination of train services east of Hamilton and the removal of the Stewart Avenue railway level crossing near the site have reduced some congestion on the local road network during peak periods. However future construction of the Newcastle light rail is likely to increase traffic volumes on King Street reducing its spare capacity and reduce the availability of on-street car parking in the Newcastle CBD areas adjacent to the site. This could further reduce available spare capacity in the Newcastle CBD due to an increase in circulating traffic. However a likely modal transport shift towards use of public transport on completion of the light rail will not only negate the negative transport impacts of the construction of the light rail but also negate the need for future road network improvements.

From discussion with Newcastle City Council it is understood that some amendments to the Stewart Avenue / Hunter Street traffic signals and the Stewart Avenue / King Street / Parry Street traffic signals are being considered as part of upgrading works associated with the Light Rail interchange at Wickham. These include a left turn lane on the southern approach (Stewart Avenue) to the Stewart Avenue / Hunter Street traffic signals and a left turn lane on the northern approach (Stewart Avenue) to the Stewart Avenue / King Street / Parry Street traffic signals. These have been included in the future traffic modelling undertaken in this assessment. Further these works include a left turn deceleration lane on Stewart Avenue on its northern approach to Little King Street.

Newcastle City Council is currently undertaking strategic planning in to the future function and form of Little King Street. Whilst there are no concept plans available at the time of drafting this report it is understood a reduced speed environment and more pedestrian friendly environment is being sought through the use of traffic calming measures and possibly a shared carriageway. A one way traffic system is also being considered however this is seen as a negative proposal for the developments proposed on Little King Street as access to the development sites for northbound vehicles will be inconvenient particularly to visitors to the area.

5.0 TRAFFIC VOLUMES

To determine traffic volumes on the road network Northern Transport Planning and Engineering on behalf of Intersect Traffic undertook manual traffic counts at the intersections of Stewart Avenue and Hunter Street as well as the intersection of Stewart Avenue / King Street / Parry Street on Thursday 28th April 2016 and Friday 29th April 2016 during the AM and PM peak periods. Intersect Traffic also undertook similar manual traffic counts during the AM and PM peak periods on Thursday 5th May 2016. Manual traffic count sheets recorded during these counts are provided in ***Attachment C***.

The existing mid-block peak traffic volumes adopted for this assessment as recorded in the manual traffic counts are;

- Stewart Avenue – 2,451 vtph
- King Street – 2,907 vtph
- Hunter Street – 1,680 vtph; and
- Little King Street – 261 vtph.

Adopting a background traffic growth rate of 1.5 % per annum the future 2026 peak traffic volumes adopted for this assessment are;

- Stewart Avenue – 2,845 vtph
- King Street – 3,375 vtph
- Hunter Street – 1,950 vtph; and
- Little King Street – 305 vtph.

6.0 ROAD CAPACITY

The capacity of urban roads is generally determined by the capacity of intersections. However, Tables 4.3 and 4.4 of the RMS' *Guide to Traffic Generating Developments* provides some guidance on mid block capacities for urban roads and likely levels of service. These tables are reproduced below.

Table 4.3
Typical mid-block capacities for urban roads with interrupted flow

Type of Road	One-Way Mid-block Lane Capacity (pcu/hr)	
Median or inner lane:	Divided Road	1,000
	Undivided Road	900
Outer or kerb lane:	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 lane undivided:	Occasional Parked Cars	1,500
	Clearway Conditions	1,800
4 lane divided:	Clearway Conditions	1,900

Table 4.4
Urban road peak hour flows per direction

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Based on these tables it is considered that Stewart Avenue, Hunter Street and King Street (four lane, two way roads) would have a two way mid-block road capacity of up to 5,600 vph if a LOS D is considered satisfactory in a CBD area. Little King Street as a two lane two way road would have a mid-block road capacity of up to 2,800 vtph if a LOS D is considered satisfactory in a CBD area however further development of Little King Street as a pedestrian friendly area would see the desirable capacity reduce to a value in the order of 200 to 300 vtph through the discouragement of through traffic in the street.

Given the existing traffic data collected in ***Section 5*** is less than the likely technical mid-block road capacity of the local roads as determined above for all roads in the local road network it is considered that the adjacent road network is currently operating within its technical mid-block capacity and has scope to cater for additional traffic generated by new development in the area.

7.0 ALTERNATE TRANSPORT MODES

Public transport is available to the site via both train and bus services. The site is within convenient walking distance of bus stops on Hunter Street providing access to the Hamilton Station shuttle buses ensuring adequate connection to both the Hunter and CityRail rail lines. It is also within convenient walking distance (250 metres) of the future Wickham Transport Interchange.

Most of Newcastle Buses services also run past the site via either Hunter Street or King Street again providing regular public bus services during both peak and non-peak periods seven days a week. Private bus companies also run services past the site to many of the lower Hunter townships as well as to Newcastle airport. The nearest bus stops are located on King Street east of National Park Street and Hunter Street at the Wood Street intersection, both within convenient walking distance of the site (170 metres). The local bus routes are shown below in ***Figure 2***.

Figure 2 – Local Bus Route Map

Pedestrian connections around the site are considered good with a reinforced concrete or asphalt footpath network existing along both sides of King Street, Hunter Street, Stewart Avenue and Little King Streets all connecting to the available public transport facilities in the area. (See ***Photographs 7*** and ***8***).

There are, however, no on or off road bicycle paths in the vicinity of the site though limited on road markings are provided through the Parry Street / Stewart Avenue signalised intersection and within the recently upgraded section of Stewart Avenue through to Honeysuckle Drive (See ***Photograph 9***). Therefore in the vicinity of the site cyclists would in most areas be required to share the outside travel lanes with other vehicles. Given the traffic volumes on the road network and the on street parking demand in the area it is likely only experienced cyclists would feel comfortable in utilising the existing cycle facilities.

Photograph 7 –Bus stop – King Street east of National Park Street

Photograph 8 – Footpath – Little King Street in the vicinity of the site

Photograph 9 – On-road cycle lane – Stewart Avenue

8.0 DEVELOPMENT PROPOSAL

The proposed development is the construction of a multi-storey 170 rooms Holiday Inn Express Hotel on Lot 2 DP 542049 and Lot 9 DP 446798, 500 King Street, Newcastle West. The development plans are shown in ***Attachment A***. Specifically the proposal seeks to undertake the following works;

- 170 room hotel development and associated facilities over 5 levels;
- Ground floor lobby, bar, gymnasium and meeting room;
- Ground floor retail space (273.3 m^2 GFA);
- 104 on-site car parks over two (2) levels;
- 6 motorbike parks within the car parking areas; and
- 12 bicycle racks in the car parking areas.

Building frontage is to Little King Street with vehicular access also being via a new median separated entry and exit driveway off Little King Street to a secured multi-level car park (two levels) within the building. The existing vehicular accesses are to be removed as part of the development works which include the reconstruction of the kerb and footpath along the frontage of the development.

9.0 TRAFFIC GENERATION

The RMS' *Guide to Traffic Generating Development's* and *RMS Technical Direction TDT 2013/04 dated May 2013* provide specific advice on the traffic generation potential of various land uses.

In regard to this development the relevant land uses and traffic generation rates would be noting the retail area is most likely to accommodate a restaurant / café type use;

- *Motels – Weekday daily vehicle trips = 3 per unit, Evening peak hour vehicle trips = 0.4 per unit. Note for this assessment AM peak hour volumes have been assumed to be the same as PM peak hour volumes.*
- *Restaurant – Daily vehicle trips = 60 per 100m^2 GFA, Evening peak hour vehicle trips = 5 per 100 m^2 GFA*

For the purposes of this assessment the gymnasium and bar area within the hotel have been assumed to only be for the use of hotel guests therefore do not generate additional traffic i.e. are ancillary to the hotel land use. Given the location of the development within the Newcastle CBD area with excellent public transport accessibility it is likely traffic generation rates will be reduced. However for the purposes of this assessment the RMS rates have been adopted to provide a conservative assessment of the traffic impacts of the development. It is also noted that the critical peak hour period for assessment due to the type of land use and the current peak traffic volumes will be the PM peak and as such this assessment has concentrated on the PM peak.

On this basis the following peak hour traffic generation calculations can be made for the proposed development, noting traffic impact assessment is based on peak hour traffic volumes;

Daily vehicle trips = 170 units x 3 + 273.3/100 x 60 = 674 vtpd.
PM peak hour trips = 170 units x 0.4 + 273.3/100 x 5 = 82 vtph.

Other Developments

There are two major developments known to be proposed in close proximity to the site these being an adjoining Aged Care Facility (vertical village) and a major commercial development on the corner of Hunter Street and Stewart Avenue. Intersect Traffic has undertaken work on both projects and from this work has determined the additional traffic from these two developments is in the order of;

Daily vehicle trips = 1,900 vtpd
PM peak hour trips = 190 vtph

This represents approximately 10 % of existing traffic volumes on the road network therefore would also represent a 1 % per annum traffic growth when considering 2026 traffic volumes. On this basis noting current background traffic growth in the lower Hunter is approximately 1.5 % per annum, adoption of a 2.5 % per annum background traffic growth in this assessment would also cater for these two other major developments in the area.

10.0 TRIP DISTRIBUTION

Before carrying out any traffic assessment the additional peak hour traffic generated by the development needs to be distributed through the adjoining road network. This involves making a number of assumptions as to distribution patterns to and from the complex. Key assumptions made were;

- Traffic is likely to access the site via Parry Street for most suburbs west of Newcastle and the Pacific and Hunter Motorways. (60%)
- Traffic is likely to access the site via Stewart Avenue and into Parry Street for suburbs south of Newcastle. (20%)
- Traffic from the Lower Hunter i.e. Raymond Terrace, Maitland etc would access the site from Stewart Avenue either via Hunter Street or Parry Street i.e. from Industrial Highway/Hannell Street. (20%)
- In the PM traffic peak 70 % of traffic generation is inbound and 30 % is outbound.

The resulting predicted PM peak hour trip distributions for the additional traffic generated by the development has therefore been determined as shown below in ***Figure 3.***

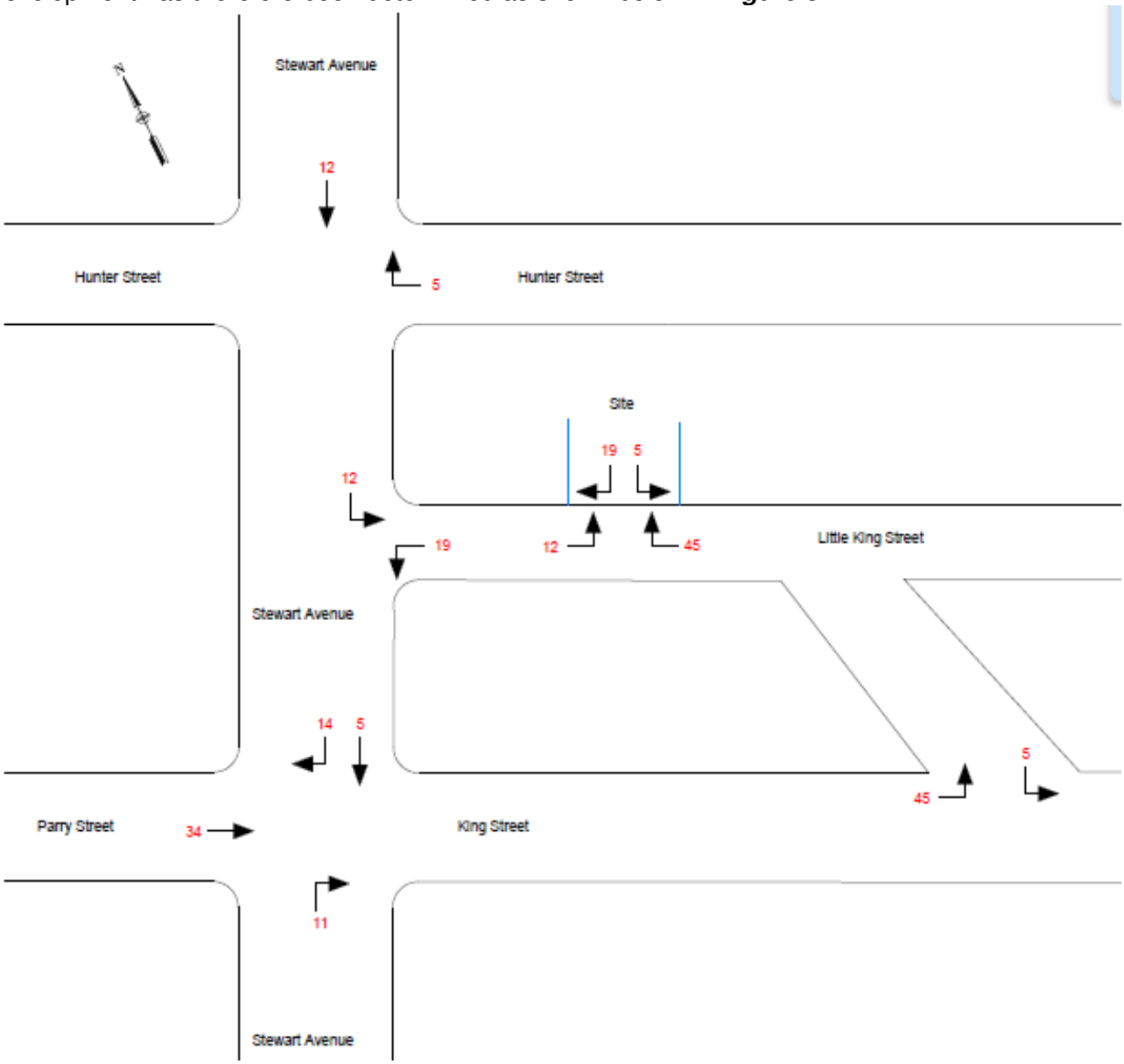


Figure 3 – Development Traffic PM Trip Distribution

11.0 TRAFFIC IMPACTS OF DEVELOPMENT

11.1 Road Network Capacity

It has previously been shown in ***Section 6*** of this report that the local road network is currently operating within its technical mid-block capacity.

The proposed development will result in the following peak hour additional two way traffic flows within the local road network in the PM peak period.

- Stewart Avenue (Hunter Street to Honeysuckle Drive) – 17 vtph;
- Stewart Avenue (Hunter Street to King Street) – 19 vtph;
- Stewart Avenue (south of King Street) – 16 vtph;
- Parry Street (west of Stewart Avenue) – 48 vtph;
- King Street (between Stewart Avenue & Little King Street) – 45 vtph;
- King Street (east of Little King Street) – 5 vtph;
- Hunter Street (east of Stewart Avenue) –5 vtph; and
- Little King Street – 50 vtph.

The addition of this additional traffic generated by the development will not result in the capacity thresholds for these roads being reached. The peak two way traffic volumes on the road network on operation of the development is still only likely to be in the order of as follows;

- Stewart Avenue (Hunter Street to King Street) – 2,470 vtph;
- King Street (Stewart Avenue to Little King Street) – 2,952 vtph
- Hunter Street (east of Stewart Avenue) – 1,685 vtph
- Little King Street – 311 vtph

These figures are still below the technical two way mid-block capacity of the road network of 5,600 vtph for Stewart Avenue, King Street and Hunter Street and remain at an acceptable level for a pedestrian friendly Little King Street. It is noted that up to 200 vtph of existing traffic on Little King Street is currently through traffic using the street as a 'rat run' from Stewart Avenue to King Street east thereby avoiding the Stewart Avenue / King Street signals. With the introduction of traffic calming measures within Little King Street as part of this proposal and the proposed left turn lane at the Stewart Avenue / Parry Street traffic signals it is likely this through traffic volume will reduce significantly in the future as the route will become less attractive to those looking to save time.

It is concluded that the local road network has sufficient spare two way mid-block capacity to cater for the proposed development.

11.2 Intersection Capacity

The intersections likely to be most affected by this development are;

- Stewart Avenue / Parry Street / King Street signal controlled cross intersection; and
- Hunter Street / Stewart Avenue signalled controlled cross intersection.

To determine the impact of the development on these two intersections they have been modelled using the SIDRA traffic modelling software. This software package predicts likely delays, queue lengths and thus levels of service that will occur at intersections. Assessment is then based on the level of service requirements of the RMS shown below;

Table 4.2
Level of service criteria for intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode

Modelling was carried out for the critical PM peak period for both the post development (2016) and for ten years background traffic growth at 2.5 % per annum (2026) scenarios. The adoption of a higher than average background traffic growth ensures the modelling also accounts for other developments in the area.

The results of the modelling are shown in the following ***Tables 1 & 2*** while the Sidra Movement Summary Tables for each scenario modelled are provided in ***Attachment B.***

Table 1– Sidra Results 'All Vehicles' – Stewart Avenue / King Street / Parry Street intersection.

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Level of Service	95% back of queue length (cars)
2016 PM	0.921	40.7	C	22.6
2016 PM + development	0.902	41.4	C	23.9
2026 PM	1.010	90	F	63.4
2026 PM + development	1.034	104.1	F	74.5
2026 PM + development + 20 % modal shift	0.92	45.6	D	29.3

Table 2 – Sidra Results 'All Vehicles' – Stewart Avenue / Hunter Street intersection.

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Level of Service	95% back of queue length (cars)
2016 PM	0.928	32.1	C	32.8
2016 PM + development	0.896	35.2	C	37.5
2026 PM	1.087	147.2	F	141.8
2026 PM + development	1.088	149.5	F	139.2
2026 PM + development + 20 % modal shift	0.915	48.1	D	56.7

The modelling shows that the proposed development will on its own not adversely impact on the operation of the intersections. No change in overall level of service will be experienced and the increases in average delay and 95 % back of queue length are minor and within acceptable limits as designated by NSW RMS in Table 4.2 of the *RTA's Guide to Traffic Generating Developments*.

The modelling also shows however that currently these intersections are operating near capacity and continued growth in the Newcastle CBD will see these intersections reach capacity in the near future unless road network upgrades and changes occur or a modal shift occurs in the area towards public transport i.e. more trips are made via public transport instead of motor vehicles. This is seen as a regional issue that all developments in the area are contributing to therefore a regional solution is required and is not the responsibility of one particular development.

Both Newcastle City Council and the NSW Government within their strategic planning documentation are seeking up to a 20 % modal shift towards alternative transport modes for future trip making in the area which is one of the main reasons for the implementation of the light rail system in Newcastle. Basic Sidra modelling of the two subject intersections with a 20 % modal shift by 2026 has shown that satisfactory operation of the future intersections would occur should this be achieved.

In summary based on the results of the Sidra modelling it can be concluded the proposed development on its own will not adversely impact on the operation of adjoining intersections and thus the capacity of the local road network.

11.3 Access

Access to the proposed development is proposed via a combined entry / exit driveway approximately 7 metres wide to Newcastle City Council requirements directly off Little King Street approximately 60 metres east of Stewart Avenue.

Compliance with Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking* is demonstrated as shown below;

- Parking Class – Class 1 and Class 1A – all day parking;
- Parking Numbers – 106 car spaces;
- Access Facility Category – Class 1 – combined entry / exit 3.0 to 5.5 metres wide – Access 7 metres wide complies;
- Access in prohibited location (Figure 3.1) – No;
- Sight Distance (Figure 3.2) 50 km/h speed zoning – 45 metres to 70 metres – Achieved.
- Minimum sight lines pedestrians – Achieved with driveway 7 metres wide and mirror if required; and
- Queueing areas – Level 1 parking ensures queueing area well in excess of 1 to 2 spaces – satisfactory.

It is concluded that the proposed vehicular access to the on-site car parking is compliant with Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking* and therefore satisfactory for the development.

11.4 On-site Parking

With regard to on-site parking the proposal should comply with Australian Standard *AS2890.1-2004 Parking facilities – Part 1 Off-street car parking* and *Section 7.03 – Traffic, Parking and Access* of Newcastle City Council's DCP 2012. The peak parking demand rates relevant within Council's DCP are as follows noting that the site is within the Newcastle City Centre area;

> *Except for residential development, car parking for development in the City Centre is provided at the rate of one space per 60 m^2 gross floor area.*

Bicycle and motorcycle parking is also required by the DCP as follows;

Restaurant / Cafe

> *Bike parking – 1 space per 100 m^2 GFA (Class 2)*
> *Motor bike parking – 1 space per 20 cars.*

Motels / Hotels

> *Bike parking – 1 space per 20 units (Class 2)*
> *Motor bike parking – 1 space per 20 cars.*

The total parking requirement (peak parking demand) for the proposed development as required by the DCP can then be calculated as shown below in ***Table 3;***

Table 3 – NCC DCP- Car Parking Calculation

Land-Use	Quantity	Unit	Car parking Rate	Car Parking	Bicycle rate	Bicycles	Motorbike Rate	Motorbikes
Retail / Restaurant / Cafe	273.3	m^2	0.02	5	0.01	3	0.05	0
Hotel	170	units			0.05	9		
Hotel	5577	m^2	0.02	93	0.00	0	0.05	5
				98		12		5

Therefore it is considered that to comply with the Newcastle DCP (2012) the proposal needs to provide 98 on-site car parks, 5 on-site motor bike parks and a bicycle rack with a capacity to hold 12 bicycles.

The development provides 104 on-site car spaces and motor bike parking areas with a capacity of at least 6 motorbikes (Level 1 and Level 2 parking floors). Twelve (12) bicycle racks will be provided in the Level 1 car parking area to accommodate the required bicycle parking for the development. It is therefore considered the proposal is compliant with Newcastle City Council's DCP (2012) in regard to on-site parking.

The on-site car park design should be in accordance with Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking* to ensure forward entry and exit from the site. Whilst this can be conditioned on the consent and checked at Construction Certificate stage a review of the car park design and layout indicates compliance with Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking* and suitable car spaces (minimum 2.4 metres x 5.4 metres) and aisle widths (> 5.8 metres) have been provided. Manoeuvrability through the car park is satisfactory and convenient enough to ensure forward entry and exit from the site (see swept path plans in ***Attachment A***).

Overall it is concluded that sufficient and suitable on-site car and motorbike parking has been incorporated into the development such that the development is compliant with Newcastle City Council's DCP (2012) and Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking.*

11.5 Servicing

Servicing of the commercial premises on the site is likely to be of the order of 3 to 4 vehicles per day with mainly food, beveridge and laundry deliveries as well as waste collection being the main servicing requirements. To accommodate service vehicles a loading bay is provided at ground level immediately inside the vehicular access to the site. The loading bay as demonstrated on the plans (***Attachment A***) has been designed to accommodate the turning movements for a medium rigid vehicle (8.8 metre length) ensuring forward entry and exit from the site. This loading bay will accommodate the majority of servicing associated with the hotel. Any deliveries carried out using a heavy rigid vehicle (HRV) will be accommodated in an on-street loading zone to be provided on Little King Street as part of the public domain plan / works to be undertaken in Little King Street currently being negotiated with Newcastle City Council.

Waste collection from the site is proposed to be via private contractor using a MRV collection vehicle specifically designed for use in basement areas, utilising the provided loading bay. This is a common waste collection solution in the Newcastle CBD area.

It is concluded that the proposed servicing arrangements for the development are satisfactory.

11.6 Construction Traffic

The construction of the development will result in additional traffic entering and exiting the site. It is estimated that during the peak construction periods up to 50 construction employees will be on-site at any one time. If a car occupancy rate of 1.2 is assumed for employee traffic this would result in an AM and PM peak traffic flow to the site of in the order of 40 vtph. This of course will also increase the peak parking demand at the site by a similar number during construction.

Material deliveries will add to this traffic with peak materials delivery traffic expected during the pouring of concrete slabs early on in the construction period. With a large pour and a fleet of concrete trucks sourced from nearby it is likely that a further 10 vtph could occur during the AM peak period as a result of this construction activity. Therefore overall it is estimated that the peak construction traffic generation resulting from the construction of the development will be in the order of 50 vtph during the AM peak or 40 vtph in the PM peak

This assessment has already determined that the additional post development traffic generation from the site is in the order of up to 82 vtph and that this will not adversely impact on the capacity of the local road network. As this is more than the likely construction traffic generation from the site it would also be reasonable to assume that the construction traffic associated with the new development will also not adversely impact on the local road network.

Construction traffic is a short term traffic impact that is best managed through the preparation of a construction traffic management plan prepared and implemented prior to commencement of construction activities. This plan may seek to minimise the impacts of construction activities by designating travel routes, access points, construction employee parking areas, material delivery procedures and times etc. This plan is best prepared, implemented and enforced by the head contractor. It is recommended that a construction traffic management plan be prepared and implemented prior to the commencement of construction activities with particular attention being paid to provide off street construction employee traffic whether on-site or remote from the site with a suitable shuttle service being provided.

12.0 PEDESTRIAN FACILITIES

The development is likely to generate additional pedestrian movements as guests access the local retail and business areas as well as public transport facilities. By observation the existing external pedestrian facilities are considered adequate and no additional external pedestrian facilities are deemed warranted apart from the proposed improvements to the facilities in Little King Street currently being negotiated with Newcastle City Council for the proposed public domain plan / work in Little King Street. The plan is likely to encompass strategies to improve the standard of pedestrian paths and crossing facilities in the immediate area of the development while creating a pedestrian friendly environment with suitable connection to Birdwood Park and through measures to slow traffic in the street i.e. traffic calming.

The conditioning of the agreed public domain works on any consent issued for this development would ensure suitable pedestrian facilities are provided in the vicinity of the site to meet the additional pedestrian demand generated by the development.

13.0 ALTERNATE TRANSPORT MODE FACILITIES

The proposed development is likely to generate additional public transport usage as it is likely residents, employees, visitors and some customers will utilise existing bus services, taxi's and the light and heavy rail services to access the site. However the accessibility of the site to existing public transport services is considered excellent and no new facilities or service amendments will be required as a result of the additional public transport usage generated by the development particularly with planned upgrades associated with the construction of the light rail in Newcastle.

The development is not likely to significantly increase bicycle traffic to the site and would not warrant additional specific external bicycle infrastructure though a small bicycle storage area for resident and staff use and the visitor bicycle racks as required by the DCP would be of benefit to the development.

14.0 CONCLUSIONS

This traffic impact assessment for the proposed multi-storey 170 room Holiday Inn Express Hotel on Lot 2 DP 542049 and Lot 9 DP 446798, 500 King Street, Newcastle West has determined the following;

- The local road network in the vicinity of the site has a likely technical mid-block capacity of up to 5,600 vtph (four lane, two way roads) and 300 vtph (Little King Street) if a LOS D is considered acceptable and the environmental capacity goals are applied to Little King Street. As this is in excess of current traffic volumes on the respective sections of the local road network the local road network has spare capacity to cater for development in the area.
- It is expected that the additional traffic generated by the development in the critical PM peak period will be a maximum of 82 vtph.
- The local road network has sufficient spare mid-block capacity to cater for the additional development traffic generated by the proposal and other developments in the area without the need for any road upgrading works.
- SIDRA modelling of the Stewart Avenue / King Street / Parry Street signalised intersection and the Stewart Avenue / Hunter Street signalised intersection has shown that the proposed development on its own does not adversely impact on the operation of these intersections.
- The Sidra modelling also showed that these intersections are operating at near capacity and future growth in the Newcastle CBD will see these intersections reach capacity in the near future unless road network upgrades and changes occur or a modal trip making shift occurs to public transport trip making. This is however considered a regional problem requiring a regional solution and is not the responsibility of one particular development.
- The proposed vehicular access to the on-site car parking is compliant with Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking* and therefore satisfactory for the development.
- That sufficient and suitable on-site car parking, motorbike parking and bicycle storage has been incorporated into the development such that the development is compliant with Newcastle City Council's DCP (2012) and Australian Standard *AS2890.1-2004 Parking Facilities – Part 1 Off-street car parking.*
- Servicing arrangements are satisfactory with vehicles up to a medium rigid vehicle (MRV 8.8 metres long) utilising the on-site loading bay and larger vehicle servicing utilising a proposed loading zone area on Little King Street adjacent to the development which is proposed within the public domain works on Little King Street. All on-site servicing can enter and exit the site in a forward direction.
- Construction traffic generated by the development will be less than the additional traffic generated by the operation of the development. Therefore as this assessment determined the operational traffic will not adversely impact on the local road network it is also reasonable to conclude that the construction traffic associated with the new development will not adversely impact on the local road network.
- It is recommended that a construction traffic management plan be prepared and implemented prior to commencement of construction activities on the site to ensure the impacts of the construction activities on the internal traffic flows are minimised during construction.
- The conditioning of the agreed public domain works on any consent issued for this development would ensure suitable pedestrian facilities are provided in the vicinity of the site to meet the additional pedestrian demand generated by the development.
- Existing public transport services to the site are considered excellent and no new facilities or service amendments will be required as a result of the level of additional public transport usage generated by the development.
- The development is not likely to significantly increase bicycle traffic to the site and would not warrant additional specific external bicycle infrastructure being provided. On-site bicycle storage and bicycle racks within the public domain works would be beneficial to the development.

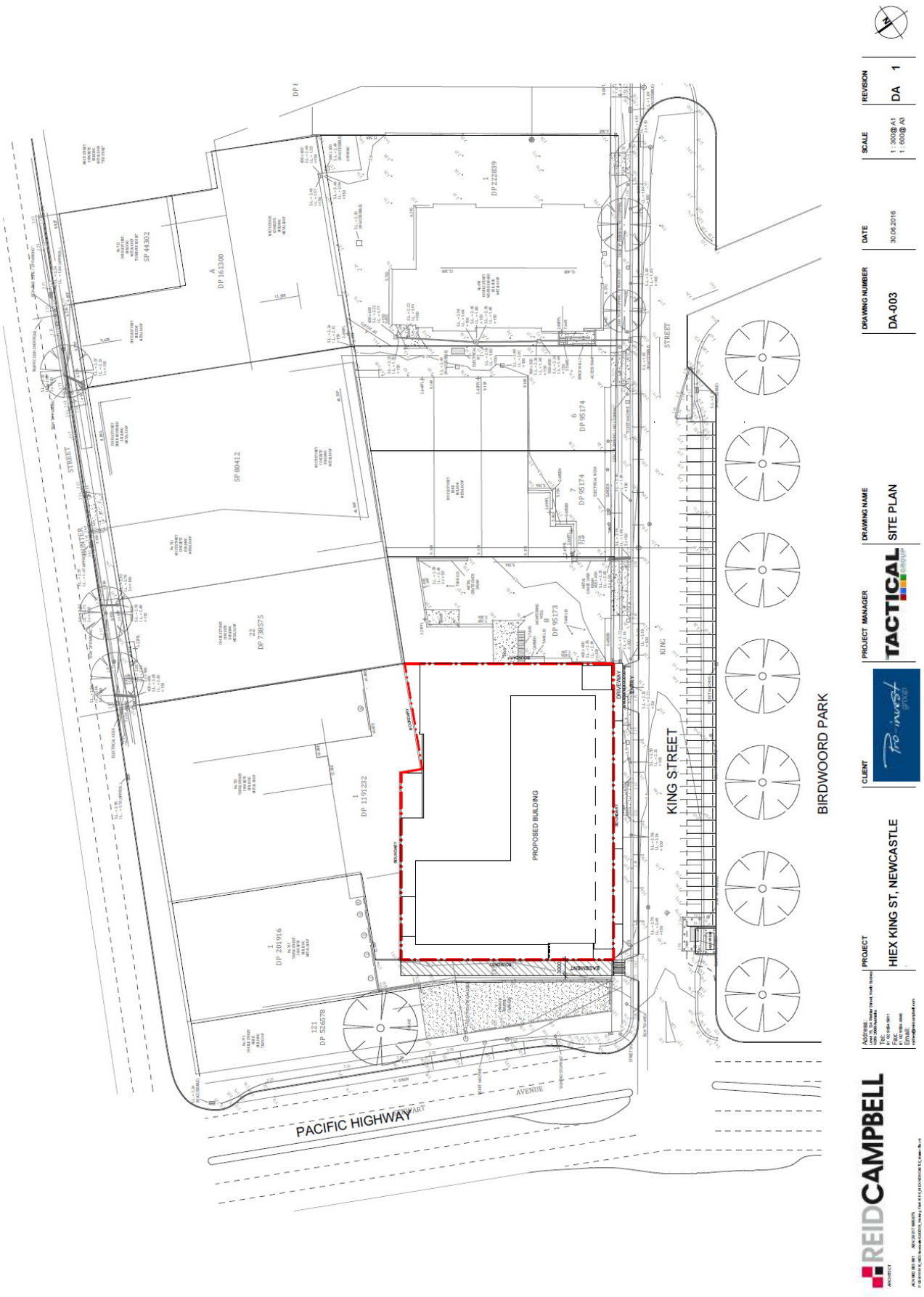
15.0 RECOMMENDATION

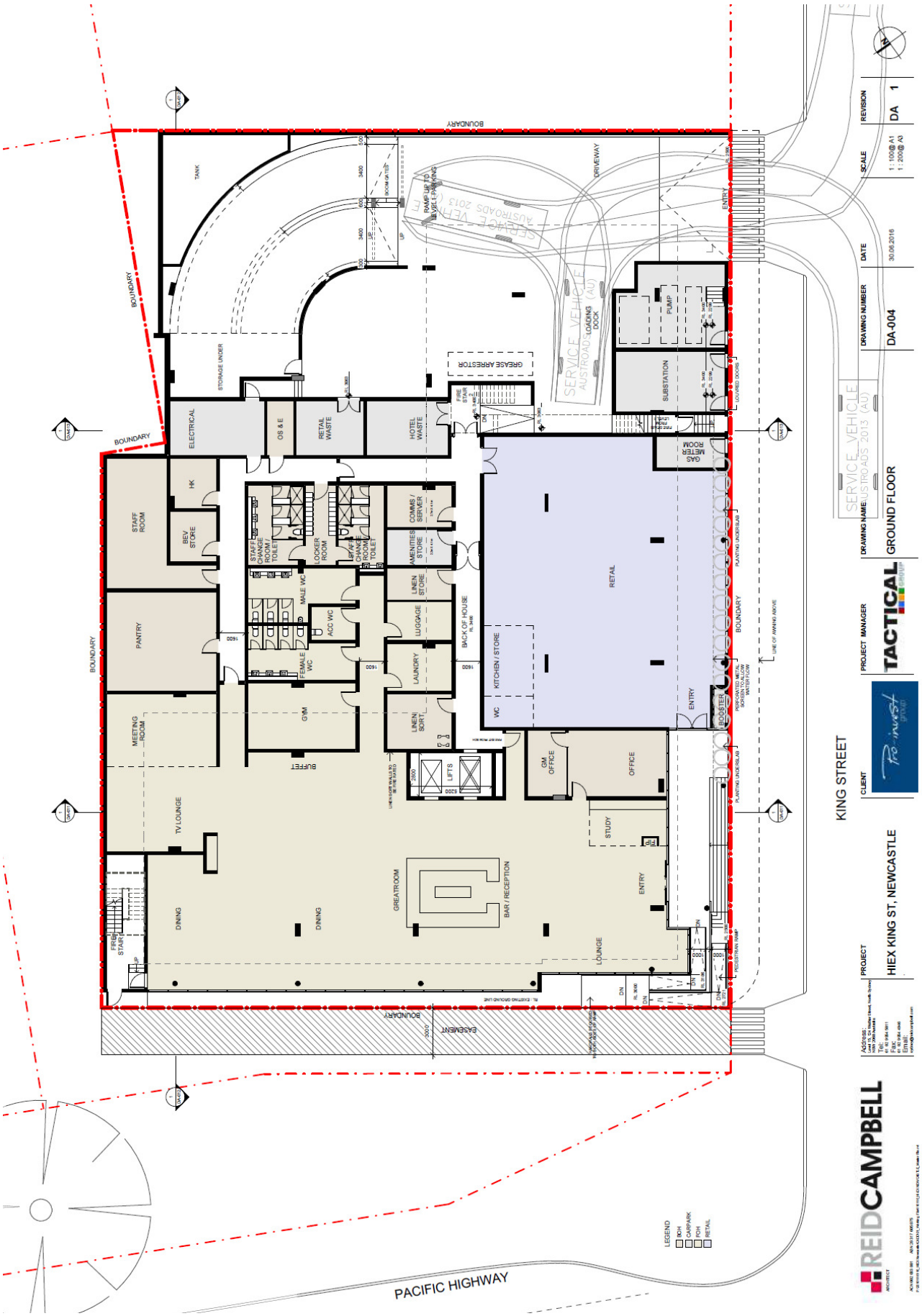
Having carried out this traffic impact assessment for the proposed multi-storey 170 room Holiday Inn Express Hotel on Lot 2 DP 542049 and Lot 9 DP 446798, 500 King Street, Newcastle West it is recommended that the proposal can be supported from a traffic and parking impact perspective as it will not adversely impact on the local and state road network and complies with all relevant Newcastle City Council, Australian Standard and RMS requirements.

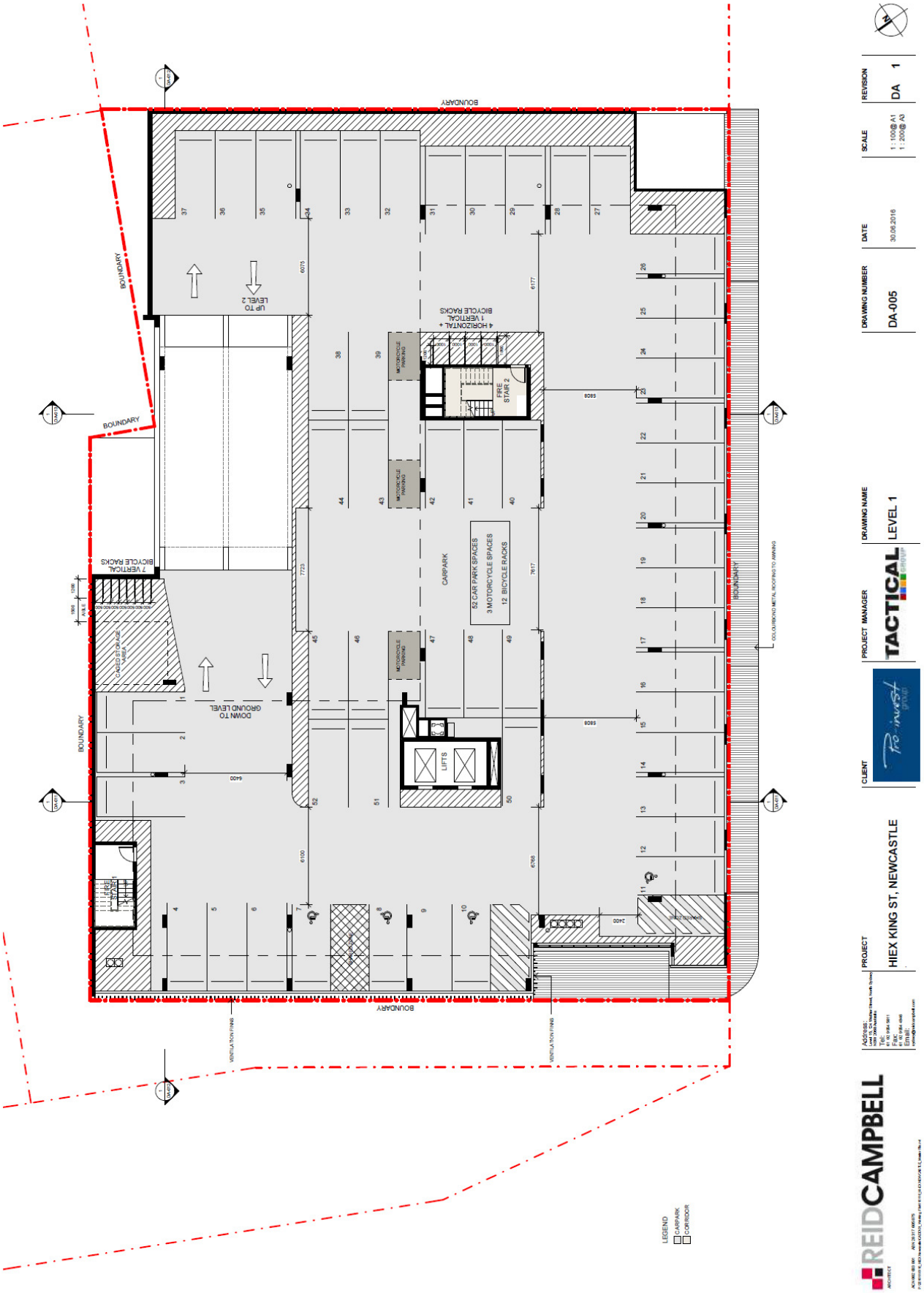
JR Garry BE (Civil), Masters of Traffic
Director
Intersect Traffic Pty Ltd

ATTACHMENT A

Development Plans


KING STREET
BIRDWOOD PARK
PACIFIC HIGHWAY
PROPOSED BUILDING
HUNTER STREET
AVENUE
REIDCAMPBELL
HIEX KING ST, NEWCASTLE
TACTICAL
SITE PLAN
DA-003
30.06.2016
1 : 300@ A1
1 : 600@ A3
DA 1


KING STREET
PACIFIC HIGHWAY
BOUNDARY
EASEMENT
DRIVEWAY
ENTRY
RAMP UP TO LEVEL 1 PARKING
SERVICE VEHICLE AUSTROADS 2013 (AU)
LOADING DOCK
PUMP
SUBSTATION
GREASE ARRESTOR
TANK
STORAGE UNDER
ELECTRICAL
OS & E
RETAIL WASTE
HOTEL WASTE
GAS METER ROOM
STAFF ROOM
HK
BEV STORE
STAFF CHANGE ROOM
TOILET
LOCKER ROOM
LAUNDRY CHANGE ROOM
COMMS / SERVER
AMENITIES STORE
LINEN STORE
LUGGAGE
LAUNDRY
LINEN SORT
MALE WC
ACC WC
FEMALE WC
GYM
BACK OF HOUSE
KITCHEN / STORE
WC
RETAIL
ROSTER
PANTRY
MEETING ROOM
BUFFET
LIFTS
GM OFFICE
OFFICE
STUDY
TV LOUNGE
DINING
GREATROOM
BAR / RECEPTION
LOUNGE
FIRE STAIR
LEGEND
BOH
CARPARK
FOH
RETAIL
DRAWING NAME GROUND FLOOR
DRAWING NUMBER DA-004
DATE 30.06.2016
SCALE 1 : 100@ A1 1 : 200@ A3
REVISION DA 1
PROJECT MANAGER TACTICAL
CLIENT
PROJECT HIEX KING ST, NEWCASTLE
REIDCAMPBELL


BOUNDARY
UP TO LEVEL 2
4 HORIZONTAL + 1 VERTICAL BICYCLE RACKS
MOTORCYCLE PARKING
FIRE STAIR 2
CARPARK
52 CAR PARK SPACES
3 MOTORCYCLE SPACES
12 BICYCLE RACKS
7 VERTICAL BICYCLE RACKS
CAGED STORAGE AREA
DOWN TO GROUND LEVEL
LIFTS
FIRE STAIR 1
VENTILATION FINS
COLOURBOND METAL ROOFING TO AWNING
LEGEND
CARPARK
CORRIDOR
DRAWING NUMBER DA-005
DATE 30.06.2016
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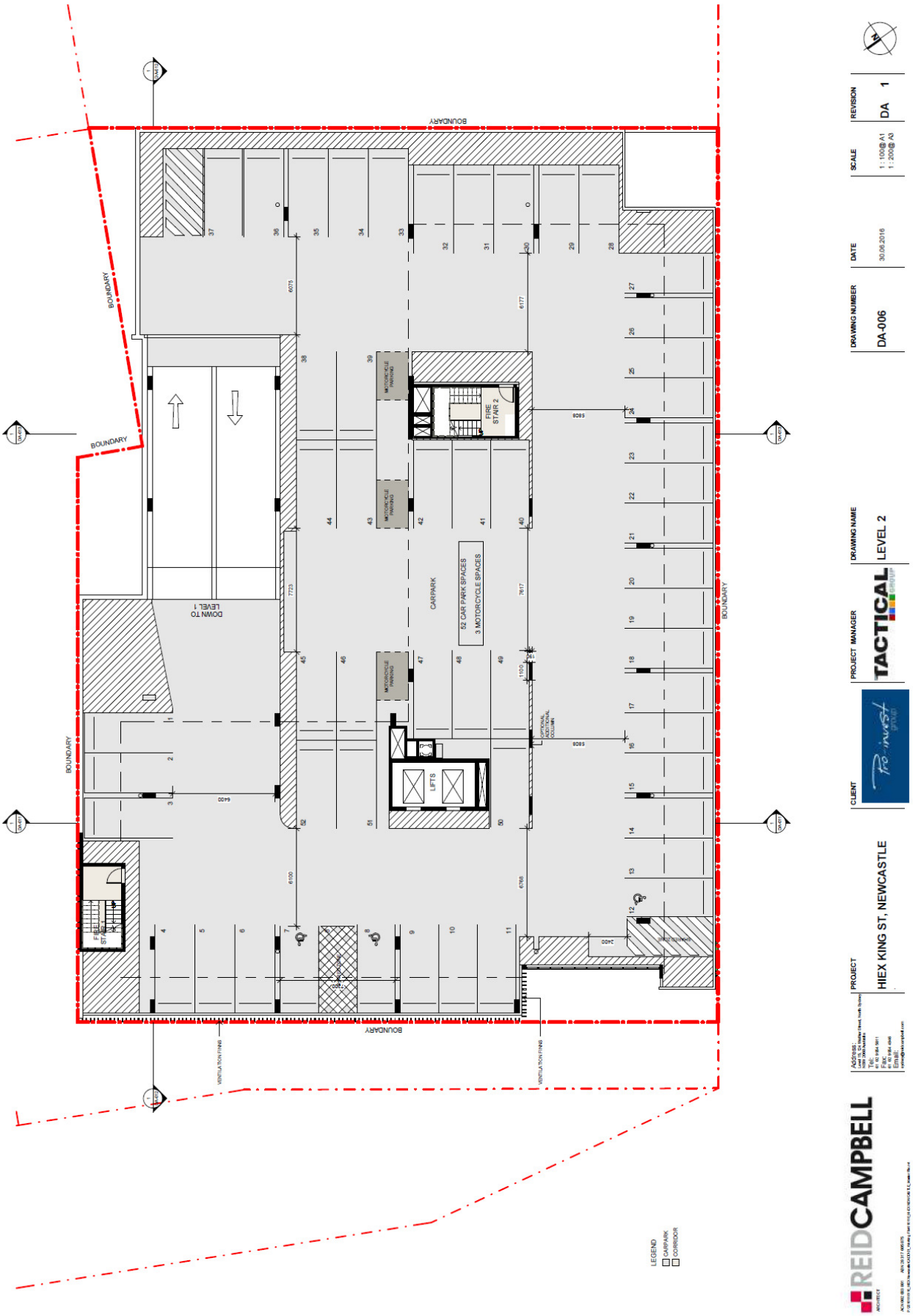
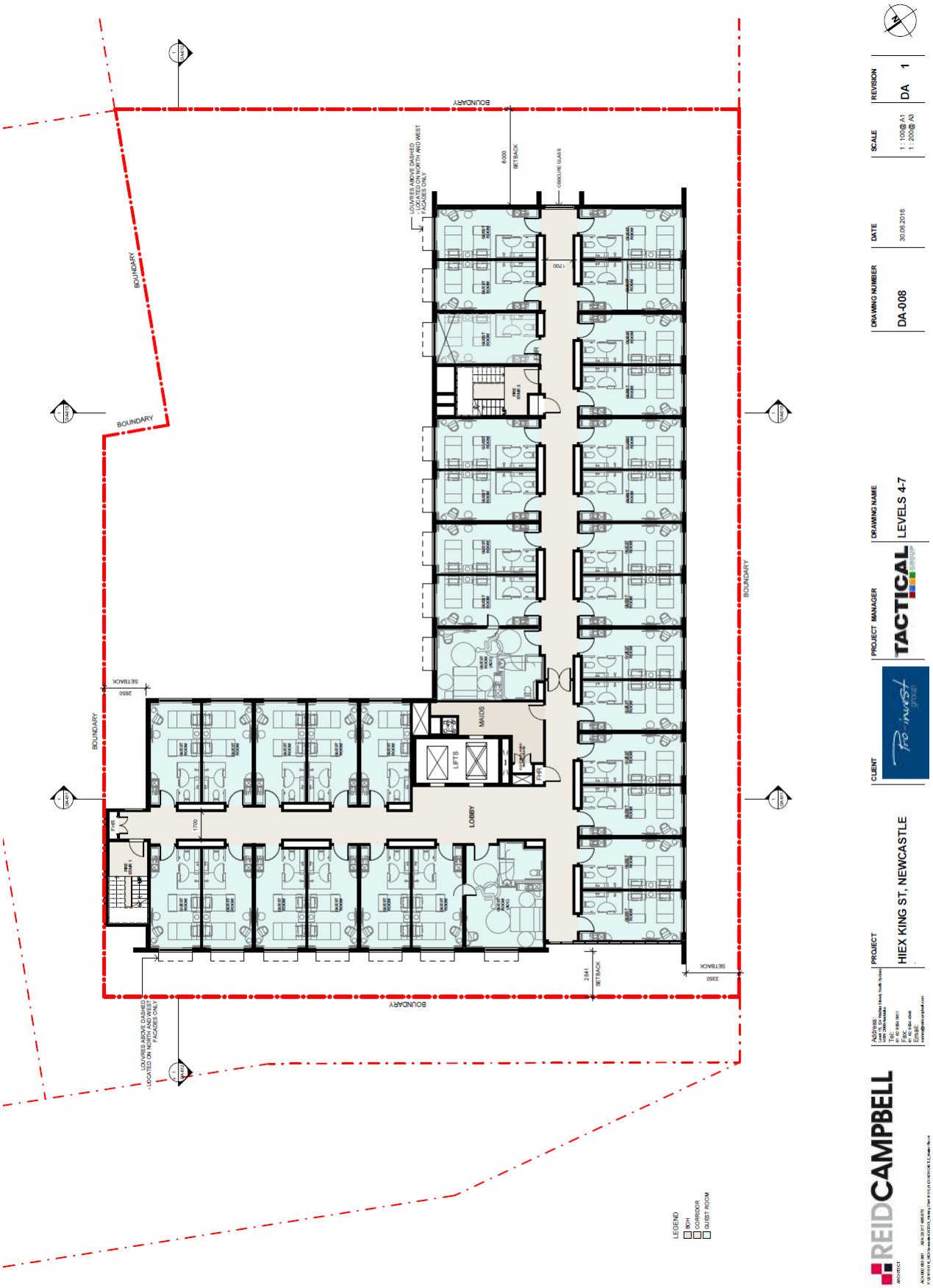
CLIENT Pro-invest group
PROJECT HIEX KING ST, NEWCASTLE
REIDCAMPBELL


BOUNDARY
BOUNDARY
BOUNDARY
BOUNDARY
BOUNDARY
DOWN TO LEVEL 1
CARPARK
52 CAR PARK SPACES
3 MOTORCYCLE SPACES
MOTORCYCLE PARKING
MOTORCYCLE PARKING
MOTORCYCLE PARKING
FIRE STAIR 2
FIRE STAIR 1
LIFTS
OPTIONAL ADDITIONAL COLUMN
VENTILATION FINNS
VENTILATION FINNS
LEGEND
CARPARK
CORRIDOR
DRAWING NUMBER
DA-006
DATE
30.06.2016
SCALE
1:100@A1
1:200@A3
REVISION
DA 1
DRAWING NAME
LEVEL 2
PROJECT MANAGER
TACTICAL
CLIENT
PROJECT
HIEX KING ST, NEWCASTLE
REIDCAMPBELL


BOUNDARY
BOUNDARY
BOUNDARY
BOUNDARY
BOUNDARY
6000
SETBACK
OBSCURE GLASS
LOUVRES ABOVE DASHED - LOCATED ON NORTH AND WEST FACADES ONLY
1700
FIRE STAIR 2
LIFTS
MAIDS
LOBBY
3660
SETBACK
2841
SETBACK
3350
LEGEND
NCH
CORRIDOR
GUEST ROOM
DRAWING NUMBER
DA-007
DATE
30.06.2016
SCALE
1 : 100@ A1
REVISION
DA 1
DRAWING NAME
LEVEL 3
PROJECT MANAGER
TACTICAL
CLIENT
PROJECT
HIEX KING ST, NEWCASTLE
REIDCAMPBELL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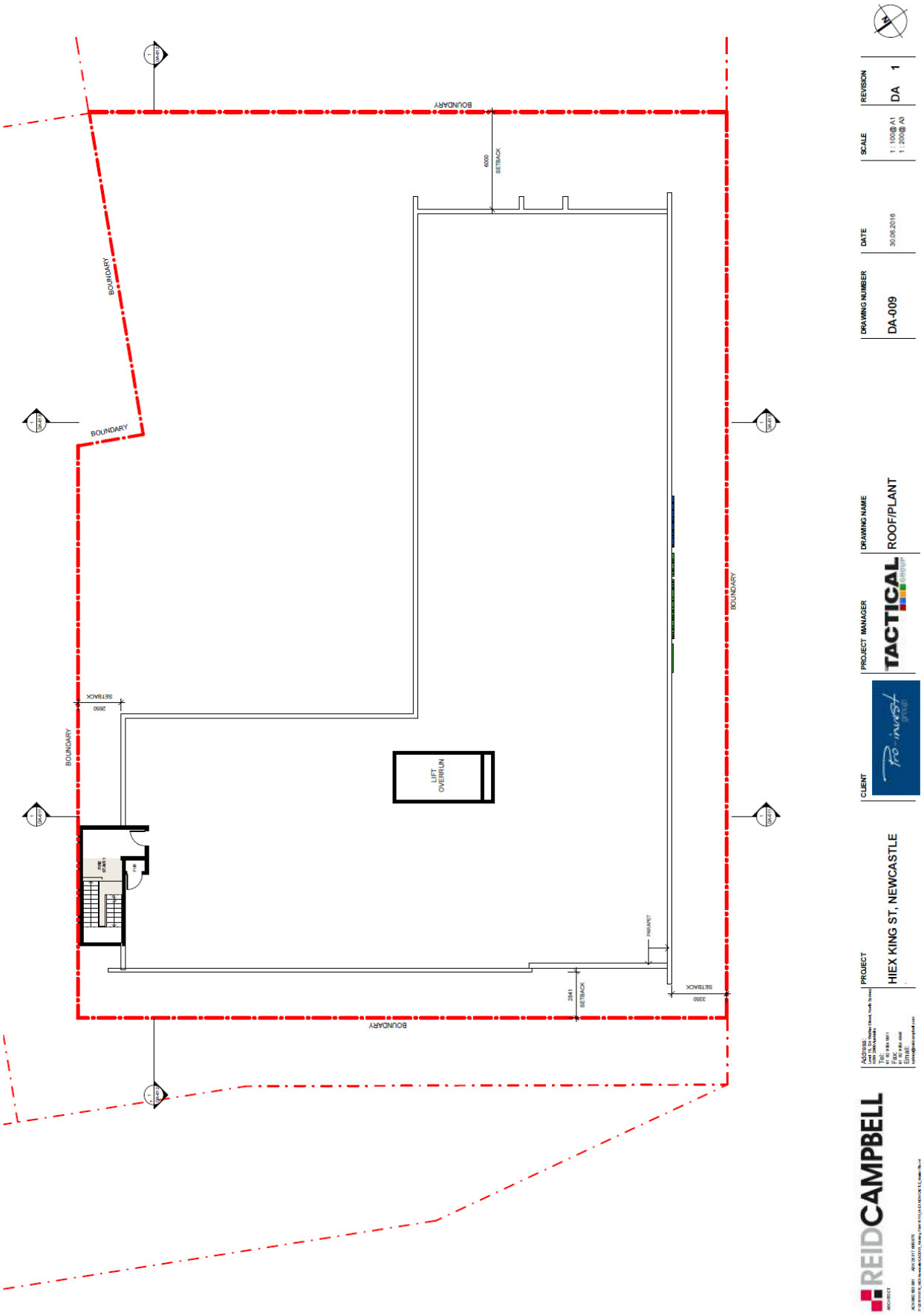
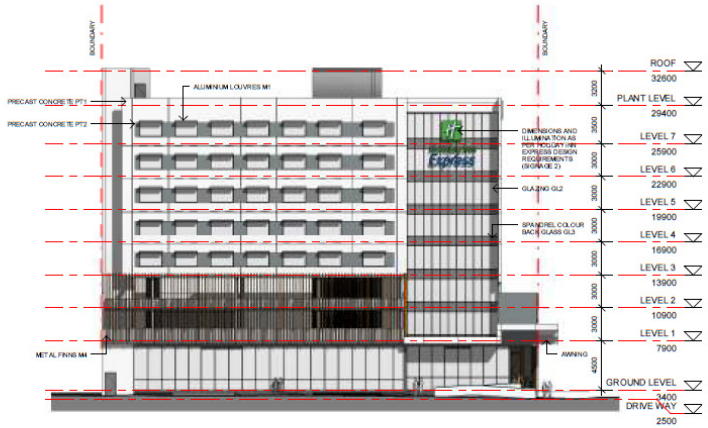
BOUNDARY
BOUNDARY
BOUNDARY
BOUNDARY
SETBACK
SETBACK
SETBACK
6000
2650
2841
3350
1700
LOUVRES ABOVE DASHED LINE TO NORTH AND WEST FACADES ONLY
LOUVRES ABOVE DASHED LINE TO NORTH AND WEST FACADES ONLY
OBSCURE GLASS
LIFTS
MAIDS
LOBBY
LEGEND
BOH
CORRIDOR
GUEST ROOM
DRAWING NUMBER
DA-008
DATE
30.06.2016
SCALE
1 : 100@ A1
1 : 200@ A3
REVISION
DA 1
DRAWING NAME
LEVELS 4-7
PROJECT MANAGER
TACTICAL
CLIENT
PROJECT
HIEX KING ST, NEWCASTLE
REIDCAMPBELL
ARCHITECT


BOUNDARY
6000
SETBACK
BOUNDARY
BOUNDARY
BOUNDARY
SETBACK
2600
LIFT OVERRUN
FIRE STAIRS
FIP
PARAPET
2841
SETBACK
3350
SETBACK
DRAWING NUMBER
DA-009
DATE
30.09.2016
SCALE
1 : 100 @ A1
1 : 200 @ A3
REVISION
DA 1
DRAWING NAME
ROOF/PLANT
PROJECT MANAGER
TACTICAL
CLIENT
PROJECT
HIEX KING ST, NEWCASTLE
REIDCAMPBELL



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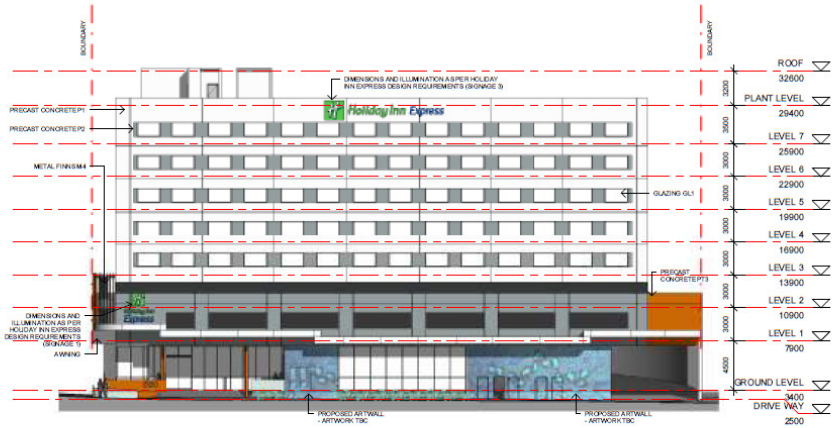
1 : 200



1 SW ELEVATION (KING STREET)
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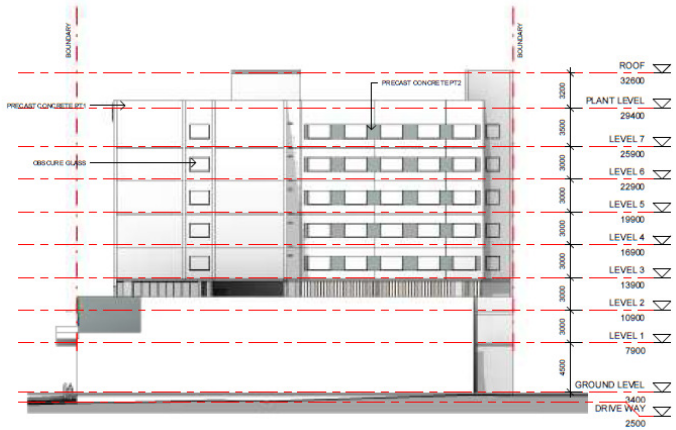
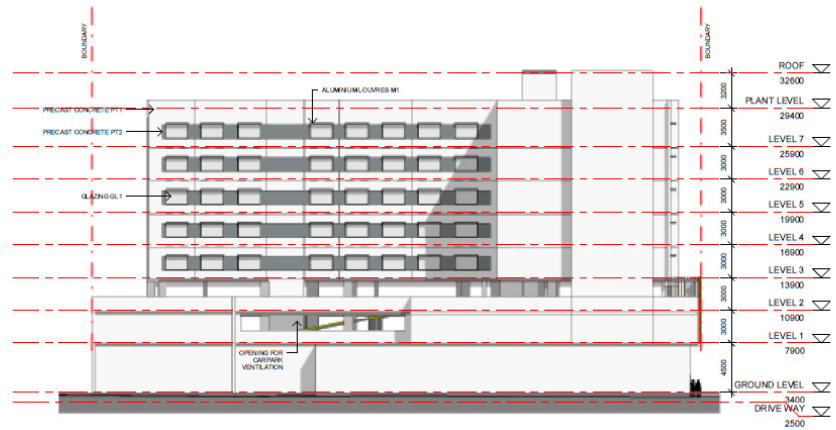


3 SE ELEVATION
1 : 200



4 NE ELEVATION
1 : 200

REIDCAMPBELL
ARCHITECT

Address:
Level 15, 64 Walker Street, North Sydney
NSW 2060 Australia
Tel: 61 02 9964 9011
Fax: 61 02 9964 4948
Email: sydney@reidcampbell.com

PROJECT: HIEX KING ST, NEWCASTLE

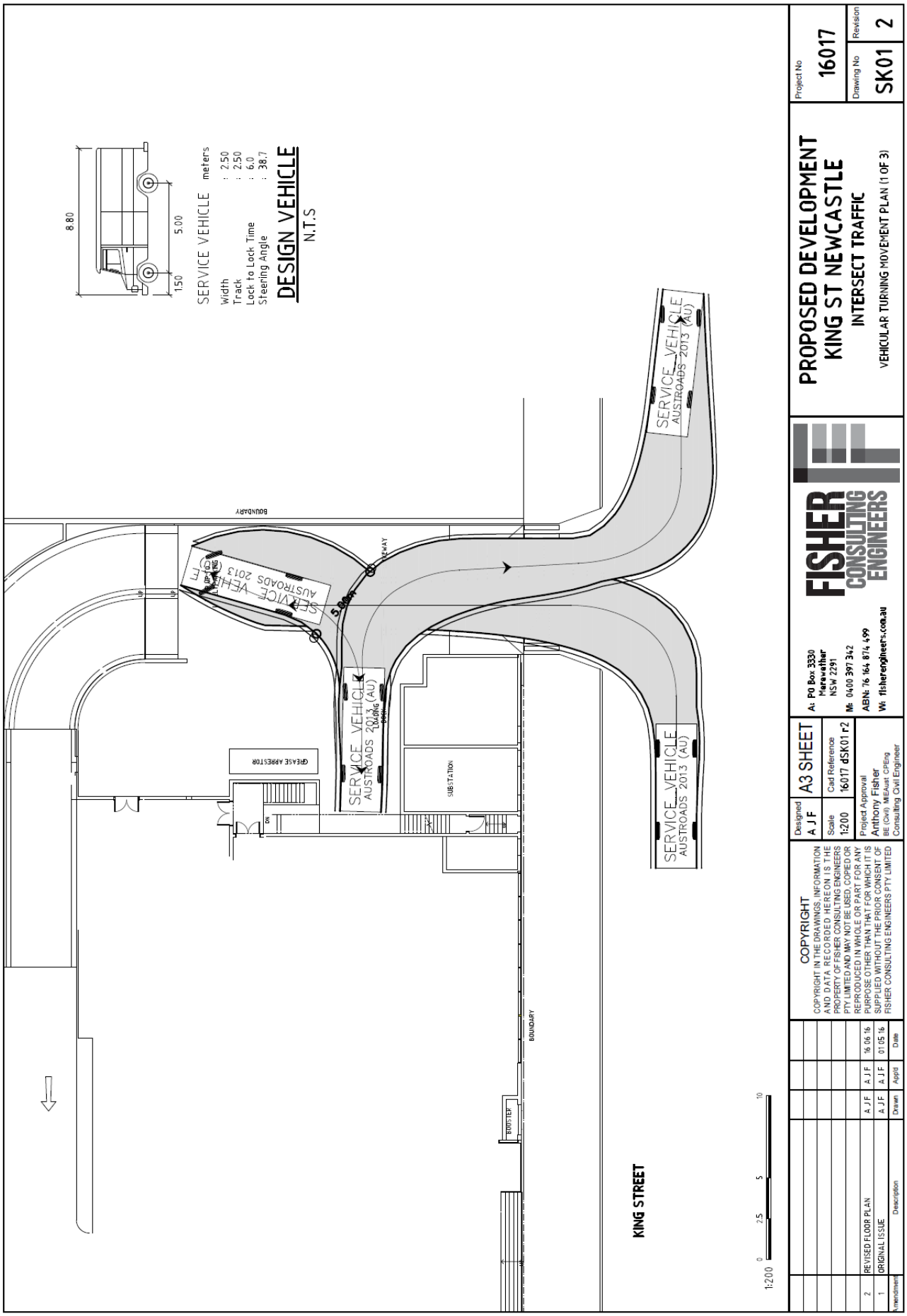
CLIENT: Pro-invest group

PROJECT MANAGER: TACTICAL group

DRAWING NAME: ELEVATIONS

DRAWING NUMBER	DATE	SCALE	REVISION
DA-010	30.06.2016	1 : 200@ A1 1 : 400@ A3	DA 1


LEVEL 3-7 GFA
1 : 200
LEVEL 1-2 GFA
1 : 200
GROUND LEVEL - GFA
1 : 200
LEGEND
EXCLUDED
HOTEL BOH
HOTEL FOH
RETAIL
LEVEL 3-7 (919.8 m²/Floor X 5) 4599.0 m²
LEVEL 1&2 CARPARK 0 m²
GROUND LEVEL 1251.3 m²
TOTAL = 5850.3m²
EXCLUDED
RETAIL 274.7m²
HOTEL BOH
HOTEL FOH
DRAWING NUMBER DA-018
DATE 30.06.2016
SCALE 1:200@A1 1:400@A3
REVISION DA 1
DRAWING NAME AREA PLAN - GFA
PROJECT MANAGER TACTICAL
CLIENT
PROJECT HIEX KING ST, NEWCASTLE
REIDCAMPBELL


DESIGN VEHICLE
N.T.S
SERVICE VEHICLE meters
Width : 2.50
Track : 2.50
Lock to Lock Time : 6.0
Steering Angle : 38.7
8.80
5.00
1.50
SERVICE VEHICLE AUSTROADS 2013 (AU)
KING STREET
BOUNDARY
SUBSTATION
GREASE ARRESTOR
1:200
PROPOSED DEVELOPMENT
KING ST NEWCASTLE
INTERSECT TRAFFIC
VEHICULAR TURNING MOVEMENT PLAN (1 OF 3)
Project No 16017
Drawing No SK01
Revision 2
FISHER CONSULTING ENGINEERS
A: PO Box 3330 Marewather NSW 2291
M: 0400 397 342
ABN: 76 164 874 499
W: fisherengineers.com.au
Designed A J F
Scale 1:200
A3 SHEET
Cad Reference 16017 dSK01 r2
Project Approval Anthony Fisher BE (Civil) MIEAust CPEng Consulting Civil Engineer
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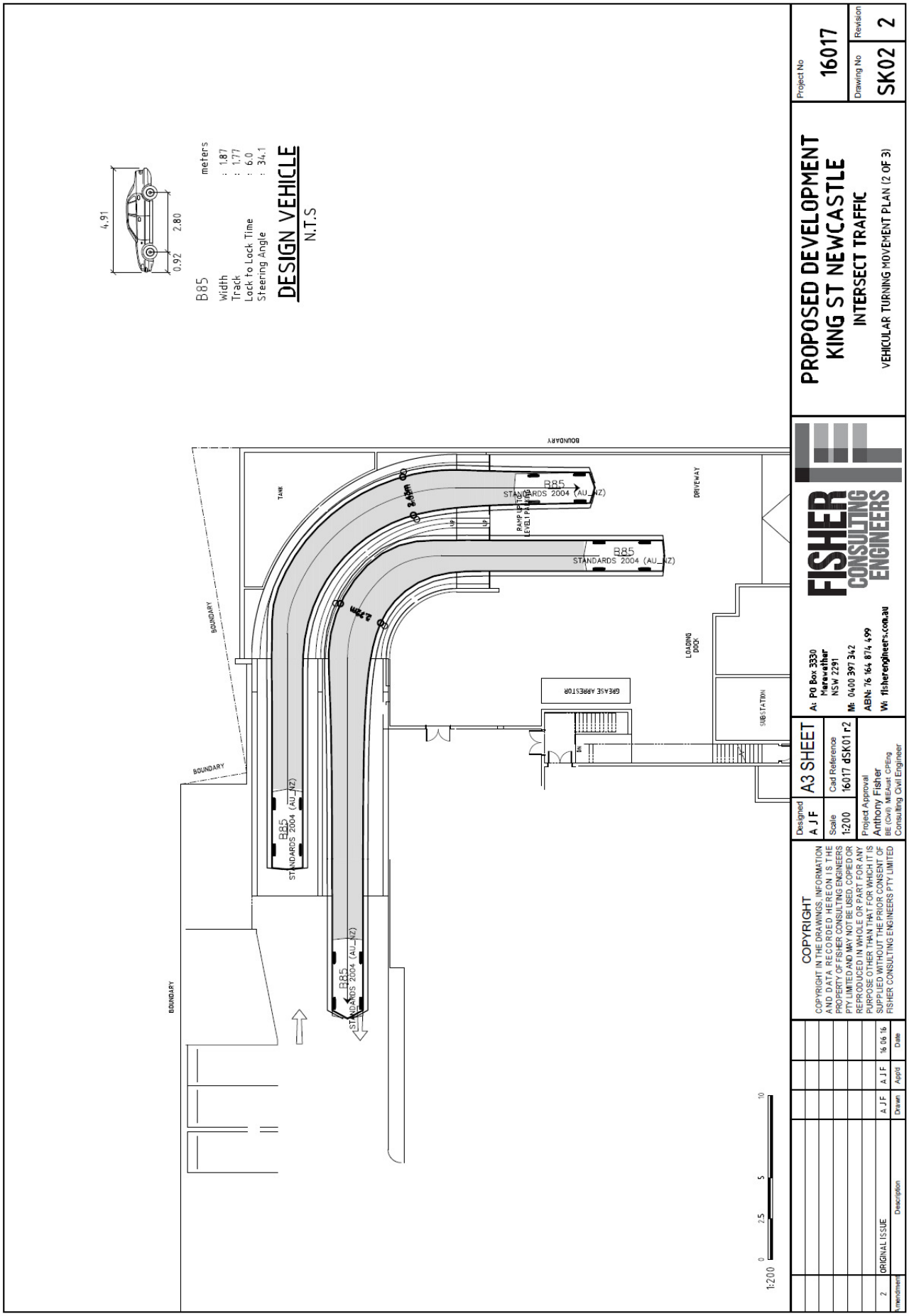
Amendment
2 REVISED FLOOR PLAN A J F A J F 16 06 16
1 ORIGINAL ISSUE A J F A J F 01 05 16
Description Drawn Appd Date


DESIGN VEHICLE
N.T.S
B85
meters
Width : 1.87
Track : 1.77
Lock to Lock Time : 6.0
Steering Angle : 34.1
4.91
2.80
0.92
PROPOSED DEVELOPMENT
KING ST NEWCASTLE
INTERSECT TRAFFIC
VEHICULAR TURNING MOVEMENT PLAN (2 OF 3)
Project No 16017
Drawing No SK02
Revision 2
FISHER CONSULTING ENGINEERS
A: PO Box 3330 Marweather NSW 2291
M: 0400 397 342
ABN: 76 164 874 499
W: fisherengineers.com.au
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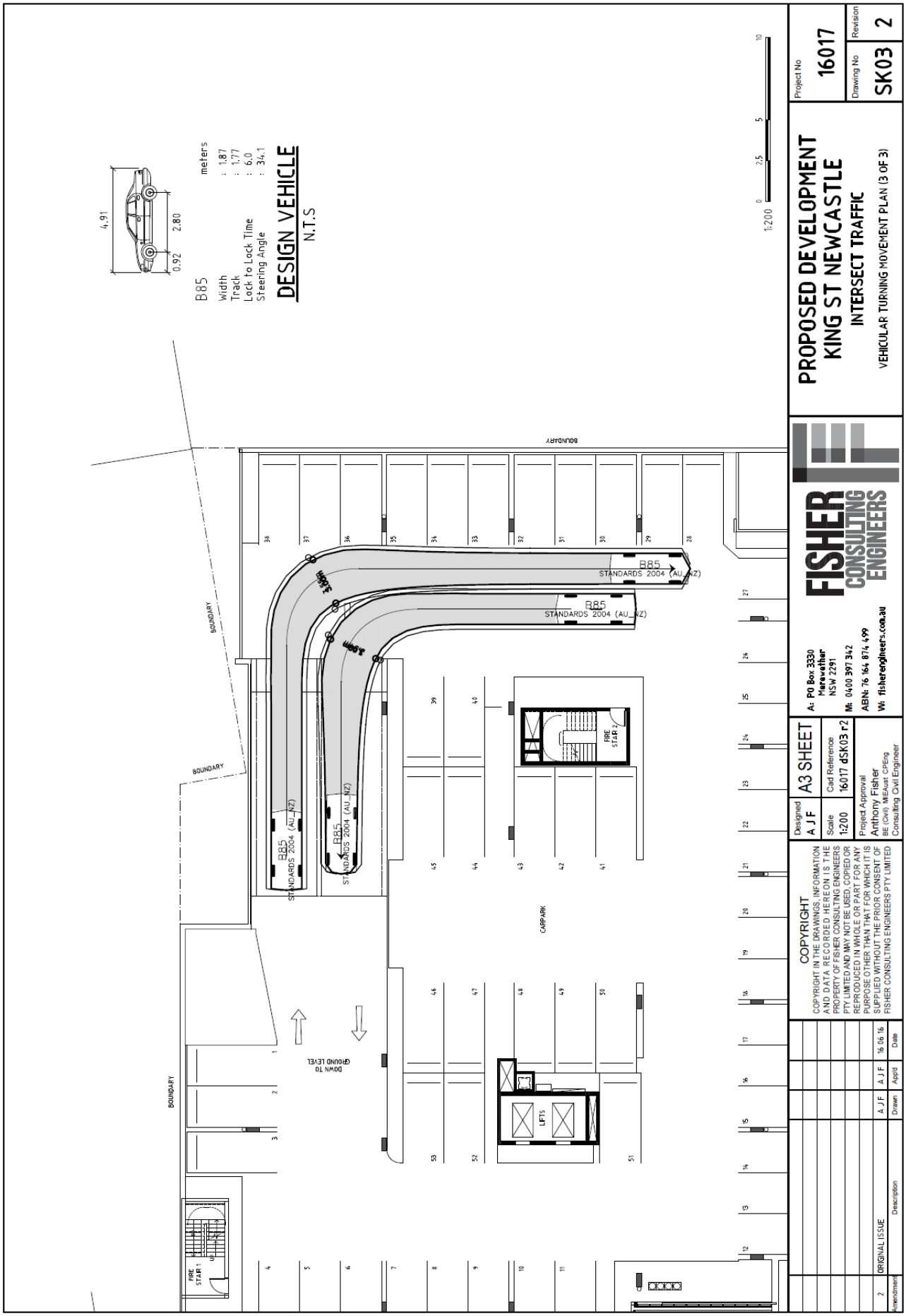
Revision Description Drawn Appd Date
2 ORIGINAL ISSUE A J F A J F 16 06 16
BOUNDARY
TANK
DRIVEWAY
LOADING DOCK
SUBSTATION
GREASE ARRESTOR
RAMP UP TO LEVEL PARKING
B85 STANDARDS 2004 (AU_NZ)
2.75m
1:200
0 2.5 5 10


DESIGN VEHICLE
N.T.S
B85
meters
Width : 1.87
Track : 1.77
Lock to Lock Time : 6.0
Steering Angle : 34.1
4.91
2.80
0.92
1:200
PROPOSED DEVELOPMENT
KING ST NEWCASTLE
INTERSECT TRAFFIC
VEHICULAR TURNING MOVEMENT PLAN (3 OF 3)
Project No 16017
Drawing No SK03
Revision 2
FISHER CONSULTING ENGINEERS
A: PO Box 3330 Marewather NSW 2291
M: 0400 397 342
ABN: 76 164 874 499
W: fisherengineers.com.au
Designed A J F
Scale 1:200
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Cad Reference 16017 dSK03 r2
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Amendment
2 ORIGINAL ISSUE A J F A J F 16 06 16
Description Drawn Appd Date
BOUNDARY
BOUNDARY
BOUNDARY
B85 STANDARDS 2004 (AU_NZ)
3.50m
CARPARK
DOWN TO GROUND LEVEL
LIFTS
FIRE STAIR 1
FIRE STAIR 2

ATTACHMENT B
SIDRA MOVEMENT SUMMARY TABLES

MOVEMENT SUMMARY

Site: 2016 PM

Stewart Avenue / Parry Street / King Street
Newcastle West.
Signals - Fixed Time Isolated Cycle Time = 82 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	54	1.9	0.115	31.0	LOS C	1.7	11.9	0.80	0.73	32.1
2	T1	491	2.4	0.499	28.5	LOS C	8.5	61.0	0.90	0.75	35.8
3	R2	224	1.3	0.713	49.4	LOS D	4.8	34.1	1.00	0.86	28.6
Approach		769	2.1	0.713	34.8	LOS C	8.5	61.0	0.92	0.78	33.0
East: King Street											
4	L2	315	1.6	0.297	12.5	LOS A	5.5	38.9	0.54	0.71	46.2
5	T1	1109	1.4	0.784	35.1	LOS C	15.1	107.0	0.99	0.94	23.1
6	R2	376	1.6	0.840	51.2	LOS D	8.5	60.3	1.00	0.98	19.7
Approach		1800	1.4	0.840	34.5	LOS C	15.1	107.0	0.92	0.91	26.1
North: Stewart Avenue											
7	L2	36	0.0	0.901	51.4	LOS D	21.9	154.1	1.00	1.13	21.1
8	T1	858	0.7	0.901	45.9	LOS D	22.0	154.6	1.00	1.13	28.7
9	R2	284	1.4	0.905	58.7	LOS E	6.9	49.0	1.00	1.08	14.0
Approach		1178	0.8	0.905	49.1	LOS D	22.0	154.6	1.00	1.12	25.2
West: Parry Street											
10	L2	106	0.9	0.090	9.6	LOS A	1.3	9.1	0.40	0.65	38.1
11	T1	847	0.5	0.921	50.9	LOS D	22.6	159.0	1.00	1.19	18.1
12	R2	218	0.0	0.481	43.6	LOS D	4.3	30.0	0.98	0.78	27.8
Approach		1171	0.4	0.921	45.8	LOS D	22.6	159.0	0.94	1.06	21.0
All Vehicles		4918	1.2	0.921	40.7	LOS C	22.6	159.0	0.94	0.97	25.8

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	23	35.3	LOS D	0.0	0.0	0.93	0.93
P2	East Full Crossing	29	35.3	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	23	35.3	LOS D	0.0	0.0	0.93	0.93
P4	West Full Crossing	20	35.2	LOS D	0.0	0.0	0.93	0.93
All Pedestrians		95	35.3	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: 08 May 2016 15:23:31
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Stewart_King dev.sip6

MOVEMENT SUMMARY

Site: 2016 PM - dev

Stewart Avenue / Parry Street / King Street
Newcastle West.
Signals - Fixed Time Isolated Cycle Time = 87 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	54	1.9	0.111	31.8	LOS C	1.7	12.4	0.79	0.73	31.7
2	T1	491	2.4	0.484	29.5	LOS C	8.9	63.8	0.89	0.75	35.3
3	R2	233	1.3	0.688	50.7	LOS D	5.2	37.0	1.00	0.84	28.2
Approach		778	2.1	0.688	36.0	LOS C	8.9	63.8	0.92	0.78	32.5
East: King Street											
4	L2	315	1.6	0.293	12.9	LOS A	5.8	41.2	0.53	0.71	45.9
5	T1	1109	1.4	0.756	35.0	LOS C	15.4	109.4	0.98	0.90	23.1
6	R2	376	1.6	0.891	58.5	LOS E	9.5	67.4	1.00	1.06	18.0
Approach		1800	1.4	0.891	36.1	LOS C	15.4	109.4	0.91	0.90	25.4
North: Stewart Avenue											
7	L2	36	0.0	0.876	49.1	LOS D	21.9	153.9	1.00	1.06	21.8
8	T1	862	0.7	0.876	43.5	LOS D	21.9	154.4	1.00	1.06	29.5
9	R2	296	1.4	0.875	57.9	LOS E	7.3	51.9	1.00	1.03	14.2
Approach		1194	0.8	0.876	47.2	LOS D	21.9	154.4	1.00	1.05	25.7
West: Parry Street											
10	L2	106	0.9	0.089	9.7	LOS A	1.3	9.5	0.39	0.65	38.0
11	T1	876	0.5	0.924	53.8	LOS D	25.0	176.0	1.00	1.19	17.4
12	R2	218	0.0	0.511	46.6	LOS D	4.6	32.0	0.98	0.78	26.8
Approach		1200	0.4	0.924	48.6	LOS D	25.0	176.0	0.94	1.07	20.1
All Vehicles		4972	1.1	0.924	41.8	LOS C	25.0	176.0	0.94	0.96	25.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	23	37.7	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	29	37.8	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	23	37.7	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	20	37.7	LOS D	0.0	0.0	0.93	0.93
All Pedestrians		95	37.7	LOS D			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: 08 May 2016 15:27:50
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Stewart_King dev.sip6

MOVEMENT SUMMARY

Site: 2026 PM

Stewart Avenue / Parry Street / King Street
Newcastle West.
Signals - Fixed Time Isolated Cycle Time = 180 seconds (Practical Cycle Time)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	67	1.9	0.121	53.1	LOS D	4.2	29.8	0.76	0.74	24.4
2	T1	614	2.4	0.581	54.9	LOS D	24.3	173.4	0.88	0.76	26.1
3	R2	280	1.3	0.761	95.1	LOS F	12.6	88.9	1.00	0.86	19.3
Approach		961	2.1	0.761	66.5	LOS E	24.3	173.4	0.91	0.79	23.5
East: King Street											
4	L2	394	1.6	0.419	32.8	LOS C	19.2	136.3	0.67	0.87	34.4
5	T1	1386	1.4	0.843	64.8	LOS E	42.7	302.5	0.98	0.91	15.2
6	R2	470	1.6	1.010	186.2	LOS F	31.6	224.2	1.00	1.21	7.3
Approach		2250	1.4	1.010	84.6	LOS F	42.7	302.5	0.93	0.96	14.4
North: Stewart Avenue											
7	L2	45	0.0	0.079	52.3	LOS D	2.7	19.2	0.74	0.72	19.1
8	T1	1073	0.7	1.002	149.5	LOS F	72.9	513.2	1.00	1.32	13.2
9	R2	355	1.4	1.005	166.7	LOS F	22.3	158.2	1.00	1.20	5.9
Approach		1473	0.8	1.005	150.7	LOS F	72.9	513.2	0.99	1.28	11.5
West: Parry Street											
10	L2	133	0.9	0.116	17.0	LOS B	4.1	29.3	0.41	0.66	30.4
11	T1	1059	0.5	1.023	180.1	LOS F	76.4	537.2	1.00	1.43	6.5
12	R2	273	0.0	0.489	81.6	LOS F	11.0	77.3	0.97	0.80	19.0
Approach		1464	0.4	1.023	147.0	LOS F	76.4	537.2	0.94	1.25	8.6
All Vehicles		6148	1.2	1.023	112.4	LOS F	76.4	537.2	0.94	1.08	12.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	28	57.7	LOS E	0.1	0.1	0.80	0.80
P2	East Full Crossing	35	58.5	LOS E	0.1	0.1	0.81	0.81
P3	North Full Crossing	28	57.7	LOS E	0.1	0.1	0.80	0.80
P4	West Full Crossing	24	58.5	LOS E	0.1	0.1	0.81	0.81
All Pedestrians		114	58.1	LOS E			0.80	0.80

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Tuesday, 10 May 2016 10:34:06 AM
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_King\Stewart_King dev.sip6

MOVEMENT SUMMARY

Site: 2026 PM - dev

Stewart Avenue / Parry Street / King Street
Newcastle West.
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	67	1.9	0.123	46.0	LOS D	3.5	25.1	0.76	0.74	26.4
2	T1	614	2.4	0.550	46.7	LOS D	19.3	137.8	0.89	0.76	28.5
3	R2	291	1.3	0.791	82.5	LOS F	11.2	79.0	1.00	0.89	21.2
Approach		972	2.1	0.791	57.4	LOS E	19.3	137.8	0.91	0.80	25.6
East: King Street											
4	L2	394	1.6	0.408	27.0	LOS B	15.6	110.8	0.65	0.84	37.1
5	T1	1386	1.4	0.829	54.4	LOS D	35.5	251.3	0.97	0.91	17.3
6	R2	470	1.6	1.010	152.0	LOS F	26.7	189.4	1.00	1.26	8.7
Approach		2250	1.4	1.010	70.0	LOS E	35.5	251.3	0.92	0.97	16.6
North: Stewart Avenue											
7	L2	45	0.0	0.081	45.4	LOS D	2.3	16.2	0.75	0.72	20.9
8	T1	1078	0.7	1.008	142.1	LOS F	65.4	460.8	1.00	1.44	13.8
9	R2	370	1.4	1.006	146.5	LOS F	20.3	143.9	1.00	1.26	6.7
Approach		1493	0.8	1.008	140.3	LOS F	65.4	460.8	0.99	1.37	12.2
West: Parry Street											
10	L2	133	0.9	0.112	13.7	LOS A	3.2	22.4	0.39	0.65	33.5
11	T1	1095	0.5	1.029	172.9	LOS F	72.5	509.5	1.00	1.57	6.8
12	R2	273	0.0	0.579	73.4	LOS F	9.6	67.1	0.99	0.80	20.4
Approach		1500	0.4	1.029	140.8	LOS F	72.5	509.5	0.94	1.35	8.9
All Vehicles		6215	1.1	1.029	102.0	LOS F	72.5	509.5	0.94	1.13	13.9

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	28	50.5	LOS E	0.1	0.1	0.82	0.82
P2	East Full Crossing	35	52.2	LOS E	0.1	0.1	0.83	0.83
P3	North Full Crossing	28	50.5	LOS E	0.1	0.1	0.82	0.82
P4	West Full Crossing	24	52.1	LOS E	0.1	0.1	0.83	0.83
All Pedestrians		114	51.3	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Tuesday, 10 May 2016 10:32:17 AM
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_King\Stewart_King dev.sip6

MOVEMENT SUMMARY

Site: 2026 PM - dev - 20 % modal shift

Stewart Avenue / Parry Street / King Street
Newcastle West.
Signals - Fixed Time Isolated Cycle Time = 98 seconds (Practical Cycle Time)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	57	1.9	0.117	35.0	LOS C	2.1	14.6	0.79	0.73	30.3
2	T1	516	2.4	0.506	33.2	LOS C	10.6	75.6	0.90	0.76	33.6
3	R2	245	1.3	0.724	56.7	LOS E	6.2	43.8	1.00	0.86	26.6
Approach		817	2.1	0.724	40.4	LOS C	10.6	75.6	0.92	0.79	30.8
East: King Street											
4	L2	331	1.6	0.306	13.6	LOS A	6.9	48.8	0.52	0.71	45.3
5	T1	1164	1.4	0.729	36.0	LOS C	17.4	123.0	0.97	0.86	22.7
6	R2	395	1.6	0.878	62.2	LOS E	10.9	77.4	1.00	1.03	17.4
Approach		1890	1.4	0.878	37.5	LOS C	17.4	123.0	0.90	0.87	24.9
North: Stewart Avenue											
7	L2	38	0.0	0.077	34.5	LOS C	1.4	9.5	0.78	0.71	24.6
8	T1	905	0.7	0.889	49.6	LOS D	25.4	178.6	1.00	1.08	27.6
9	R2	311	1.4	0.920	69.6	LOS E	9.1	64.5	1.00	1.11	12.3
Approach		1254	0.8	0.920	54.1	LOS D	25.4	178.6	0.99	1.08	23.8
West: Parry Street											
10	L2	111	0.9	0.093	10.2	LOS A	1.6	11.2	0.38	0.65	37.4
11	T1	920	0.5	0.904	51.9	LOS D	27.7	194.8	1.00	1.11	17.9
12	R2	229	0.0	0.503	50.7	LOS D	5.3	37.3	0.98	0.78	25.6
Approach		1260	0.4	0.904	48.0	LOS D	27.7	194.8	0.94	1.01	20.3
All Vehicles		5221	1.1	0.920	44.5	LOS D	27.7	194.8	0.93	0.94	24.5

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	28	42.3	LOS E	0.1	0.1	0.93	0.93
P2	East Full Crossing	35	43.2	LOS E	0.1	0.1	0.94	0.94
P3	North Full Crossing	28	42.3	LOS E	0.1	0.1	0.93	0.93
P4	West Full Crossing	24	43.2	LOS E	0.1	0.1	0.94	0.94
All Pedestrians		114	42.8	LOS E			0.93	0.93

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Tuesday, 10 May 2016 10:35:11 AM
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_King\Stewart_King dev.sip6

MOVEMENT SUMMARY

Site: 2016 PM

Hunter Street / Stewart Avenue signals
Newcastle West
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	70	0.0	0.119	23.7	LOS B	2.5	17.2	0.66	0.68	34.5
2	T1	905	2.2	0.597	22.6	LOS B	15.2	108.4	0.83	0.73	29.9
Approach		975	2.1	0.597	22.7	LOS B	15.2	108.4	0.82	0.72	30.3
East: Hunter Street											
4	L2	178	1.1	0.508	23.6	LOS B	13.5	98.1	0.75	0.72	32.5
5	T1	608	7.1	0.508	17.4	LOS B	13.5	98.1	0.72	0.65	39.9
6	R2	293	0.7	0.928	64.2	LOS E	16.5	116.0	0.95	1.11	17.0
Approach		1079	4.4	0.928	31.1	LOS C	16.5	116.0	0.79	0.79	30.1
North: Stewart Avenue											
7	L2	202	0.0	0.153	10.0	LOS A	2.8	19.7	0.34	0.67	41.3
8	T1	1225	0.7	0.875	36.4	LOS C	32.8	230.9	0.95	1.01	22.9
Approach		1427	0.6	0.875	32.7	LOS C	32.8	230.9	0.86	0.96	24.7
West: Hunter Street											
10	L2	128	1.6	0.448	44.0	LOS D	5.3	37.5	0.95	0.79	24.9
11	T1	501	5.0	0.853	48.2	LOS D	12.4	90.2	1.00	1.01	25.9
Approach		629	4.3	0.853	47.4	LOS D	12.4	90.2	0.99	0.97	25.7
All Vehicles		4110	2.5	0.928	32.1	LOS C	32.8	230.9	0.85	0.86	27.4

Level of Service (LOS) Method: Delay (RTA NSW).
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.
The results of iterative calculations indicate a somewhat unstable solution. See the Diagnostics section in the Detailed Output report.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	19	39.2	LOS D	0.0	0.0	0.93	0.93
P2	East Full Crossing	12	26.5	LOS C	0.0	0.0	0.77	0.77
P3	North Full Crossing	24	39.2	LOS D	0.1	0.1	0.93	0.93
P4	West Full Crossing	13	26.5	LOS C	0.0	0.0	0.77	0.77
All Pedestrians		68	34.5	LOS D			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Sunday, 8 May 2016 4:21:21 PM
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_Hunter\Stewart_Hunter dev.sip6

MOVEMENT SUMMARY

Site: 2016 PM - dev

Hunter Street / Stewart Avenue signals
Newcastle West
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	70	0.0	0.131	25.8	LOS B	3.0	21.2	0.67	0.67	33.5
2	T1	905	2.2	0.656	24.9	LOS B	16.6	118.4	0.83	0.72	28.4
Approach		975	2.1	0.656	25.0	LOS B	16.6	118.4	0.82	0.72	28.8
East: Hunter Street											
4	L2	178	1.1	0.501	24.6	LOS B	14.8	107.9	0.73	0.71	31.9
5	T1	608	7.1	0.501	18.3	LOS B	14.8	107.9	0.70	0.64	39.3
6	R2	297	0.7	0.893	57.6	LOS E	16.3	115.0	0.92	1.01	18.3
Approach		1083	4.3	0.893	30.1	LOS C	16.3	115.0	0.77	0.75	30.5
North: Stewart Avenue											
7	L2	202	0.0	0.149	9.8	LOS A	2.9	20.4	0.32	0.66	41.5
8	T1	1235	0.7	0.886	41.2	LOS C	37.3	262.6	0.95	1.02	21.2
Approach		1437	0.6	0.886	36.8	LOS C	37.3	262.6	0.87	0.97	23.0
West: Hunter Street											
10	L2	128	1.6	0.465	48.7	LOS D	5.9	41.8	0.96	0.79	23.5
11	T1	501	5.0	0.884	56.5	LOS E	14.2	103.3	1.00	1.06	23.6
Approach		629	4.3	0.884	54.9	LOS D	14.2	103.3	0.99	1.00	23.6
All Vehicles		4124	2.5	0.893	35.0	LOS C	37.3	262.6	0.85	0.86	26.2

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	19	44.2	LOS E	0.1	0.1	0.94	0.94
P2	East Full Crossing	12	28.1	LOS C	0.0	0.0	0.75	0.75
P3	North Full Crossing	24	44.2	LOS E	0.1	0.1	0.94	0.94
P4	West Full Crossing	13	28.1	LOS C	0.0	0.0	0.75	0.75
All Pedestrians		68	38.3	LOS D			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: 08 May 2016 16:25:43
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_Hunter\Stewart_Hunter dev.sip6

MOVEMENT SUMMARY

Site: 2026 PM

Hunter Street / Stewart Avenue signals
Newcastle West
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	87	0.0	0.114	34.0	LOS C	3.9	27.0	0.65	0.72	28.7
2	T1	1131	2.2	0.970	86.3	LOS F	45.6	325.4	0.82	1.07	12.4
Approach		1219	2.1	0.970	82.6	LOS F	45.6	325.4	0.81	1.04	13.2
East: Hunter Street											
4	L2	223	1.1	0.645	34.2	LOS C	32.0	233.3	0.79	0.76	26.9
5	T1	760	7.1	0.645	26.4	LOS B	32.0	233.3	0.73	0.67	34.3
6	R2	366	0.7	1.072	281.7	LOS F	58.0	408.4	1.00	1.43	5.0
Approach		1349	4.4	1.072	97.0	LOS F	58.0	408.4	0.81	0.89	14.8
North: Stewart Avenue											
7	L2	253	0.0	0.179	10.8	LOS A	5.0	34.8	0.30	0.66	40.5
8	T1	1531	0.7	1.087	252.2	LOS F	141.8	998.9	1.00	1.92	4.9
Approach		1784	0.6	1.087	218.0	LOS F	141.8	998.9	0.90	1.74	5.7
West: Hunter Street											
10	L2	160	1.6	0.544	68.7	LOS E	10.9	77.4	0.97	0.81	18.9
11	T1	626	5.0	1.050	199.4	LOS F	43.1	314.5	1.00	1.62	9.3
Approach		786	4.3	1.050	172.8	LOS F	43.1	314.5	0.99	1.45	10.3
All Vehicles		5138	2.5	1.087	147.2	LOS F	141.8	998.9	0.87	1.31	9.4

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	23	68.2	LOS F	0.1	0.1	0.95	0.95
P2	East Full Crossing	14	35.4	LOS D	0.0	0.0	0.69	0.69
P3	North Full Crossing	29	66.3	LOS F	0.1	0.1	0.94	0.94
P4	West Full Crossing	16	35.4	LOS D	0.0	0.0	0.69	0.69
All Pedestrians		82	55.5	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Tuesday, 10 May 2016 10:23:53 AM
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_Hunter\Stewart_Hunter dev.sip6

MOVEMENT SUMMARY

Site: 2026 PM - dev

Hunter Street / Stewart Avenue signals
Newcastle West
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	87	0.0	0.112	33.4	LOS C	3.8	26.7	0.64	0.72	29.0
2	T1	1131	2.2	0.952	73.7	LOS F	42.0	299.5	0.81	0.99	14.0
Approach		1219	2.1	0.952	70.8	LOS F	42.0	299.5	0.80	0.97	14.8
East: Hunter Street											
4	L2	223	1.1	0.656	35.1	LOS C	32.6	237.7	0.80	0.77	26.5
5	T1	760	7.1	0.656	27.2	LOS B	32.6	237.7	0.74	0.68	33.9
6	R2	371	0.7	1.081	294.1	LOS F	60.5	426.2	1.00	1.46	4.9
Approach		1354	4.3	1.081	101.7	LOS F	60.5	426.2	0.82	0.91	14.3
North: Stewart Avenue											
7	L2	253	0.0	0.177	10.5	LOS A	4.8	33.8	0.29	0.66	40.8
8	T1	1544	0.7	1.078	236.8	LOS F	138.2	973.4	1.00	1.86	5.2
Approach		1796	0.6	1.078	205.0	LOS F	138.2	973.4	0.90	1.69	6.0
West: Hunter Street											
10	L2	160	1.6	0.568	69.8	LOS E	11.0	78.1	0.98	0.81	18.7
11	T1	626	5.0	1.088	258.5	LOS F	49.7	362.6	1.00	1.81	7.5
Approach		786	4.3	1.088	220.1	LOS F	49.7	362.6	1.00	1.61	8.4
All Vehicles		5155	2.5	1.088	148.5	LOS F	138.2	973.4	0.87	1.30	9.3

Level of Service (LOS) Method: Delay (RTA NSW).
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	23	69.2	LOS F	0.1	0.1	0.96	0.96
P2	East Full Crossing	14	34.7	LOS D	0.0	0.0	0.68	0.68
P3	North Full Crossing	29	67.3	LOS F	0.1	0.1	0.95	0.95
P4	West Full Crossing	16	34.7	LOS D	0.0	0.0	0.68	0.68
All Pedestrians		82	55.8	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Tuesday, 10 May 2016 10:26:32 AM
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_Hunter\Stewart_Hunter dev.sip6

MOVEMENT SUMMARY

Site: 2026 PM - dev - 20 % modal shift

Hunter Street / Stewart Avenue signals
Newcastle West
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	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 per veh	Average Speed km/h
South: Stewart Avenue											
1	L2	73	0.0	0.094	33.1	LOS C	3.2	22.2	0.64	0.72	29.1
2	T1	950	2.2	0.732	33.4	LOS C	22.2	158.2	0.78	0.67	24.2
Approach		1024	2.1	0.732	33.4	LOS C	22.2	158.2	0.77	0.68	24.6
East: Hunter Street											
4	L2	187	1.1	0.534	32.6	LOS C	24.3	177.1	0.74	0.72	27.6
5	T1	638	7.1	0.534	25.5	LOS B	24.3	177.1	0.69	0.64	34.8
6	R2	312	0.7	0.913	78.9	LOS F	24.8	174.5	0.89	0.97	14.7
Approach		1137	4.3	0.913	41.3	LOS C	24.8	177.1	0.75	0.74	26.0
North: Stewart Avenue											
7	L2	212	0.0	0.149	10.3	LOS A	4.0	27.7	0.28	0.66	40.9
8	T1	1297	0.7	0.902	54.7	LOS D	56.4	397.5	0.95	0.97	17.5
Approach		1509	0.6	0.902	48.4	LOS D	56.4	397.5	0.85	0.93	19.2
West: Hunter Street											
10	L2	134	1.6	0.477	68.8	LOS E	9.1	64.5	0.96	0.80	18.9
11	T1	526	5.0	0.908	83.7	LOS F	22.1	161.2	1.00	1.07	18.3
Approach		660	4.3	0.908	80.7	LOS F	22.1	161.2	0.99	1.02	18.4
All Vehicles		4330	2.5	0.913	47.9	LOS D	56.4	397.5	0.83	0.83	21.7

Level of Service (LOS) Method: Delay (RTA NSW).
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.

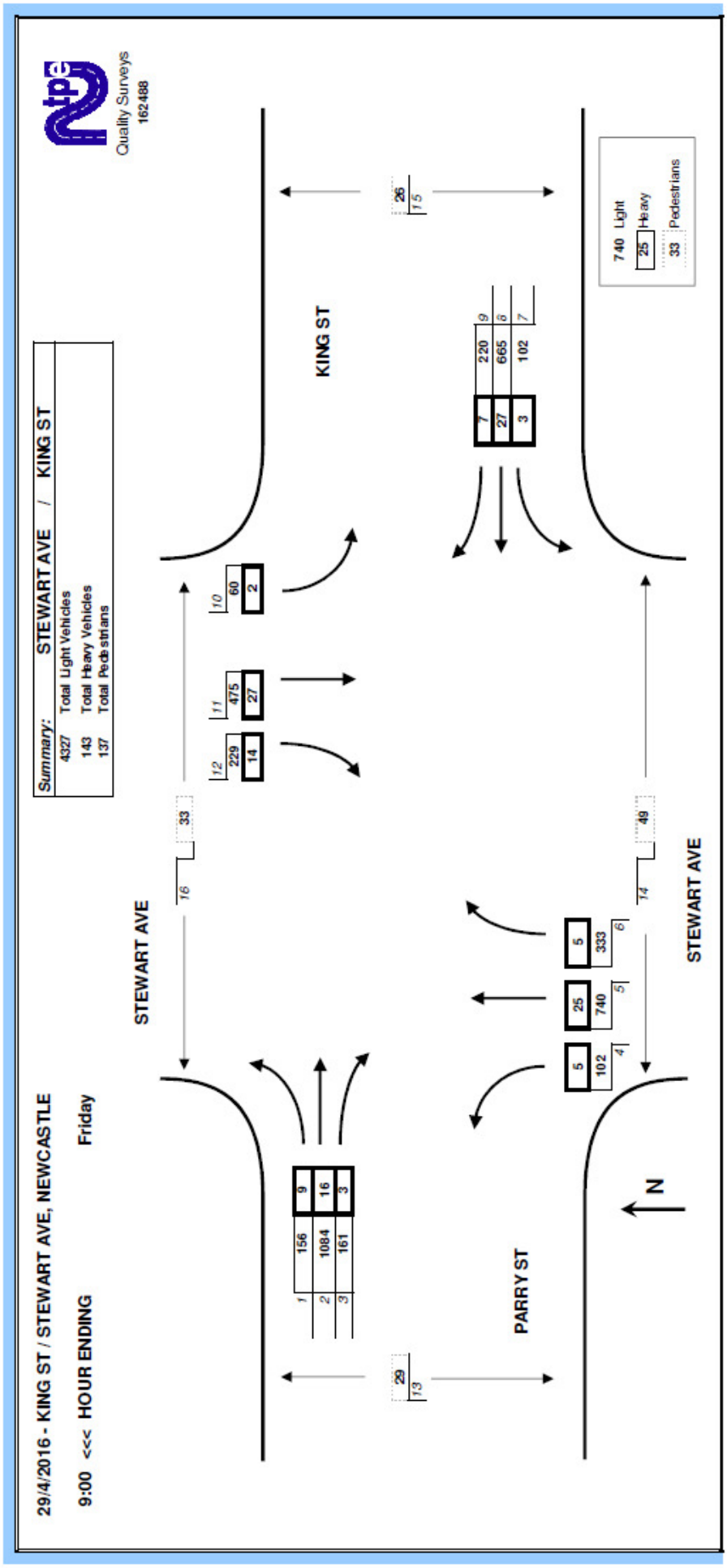
Movement Performance - Pedestrians

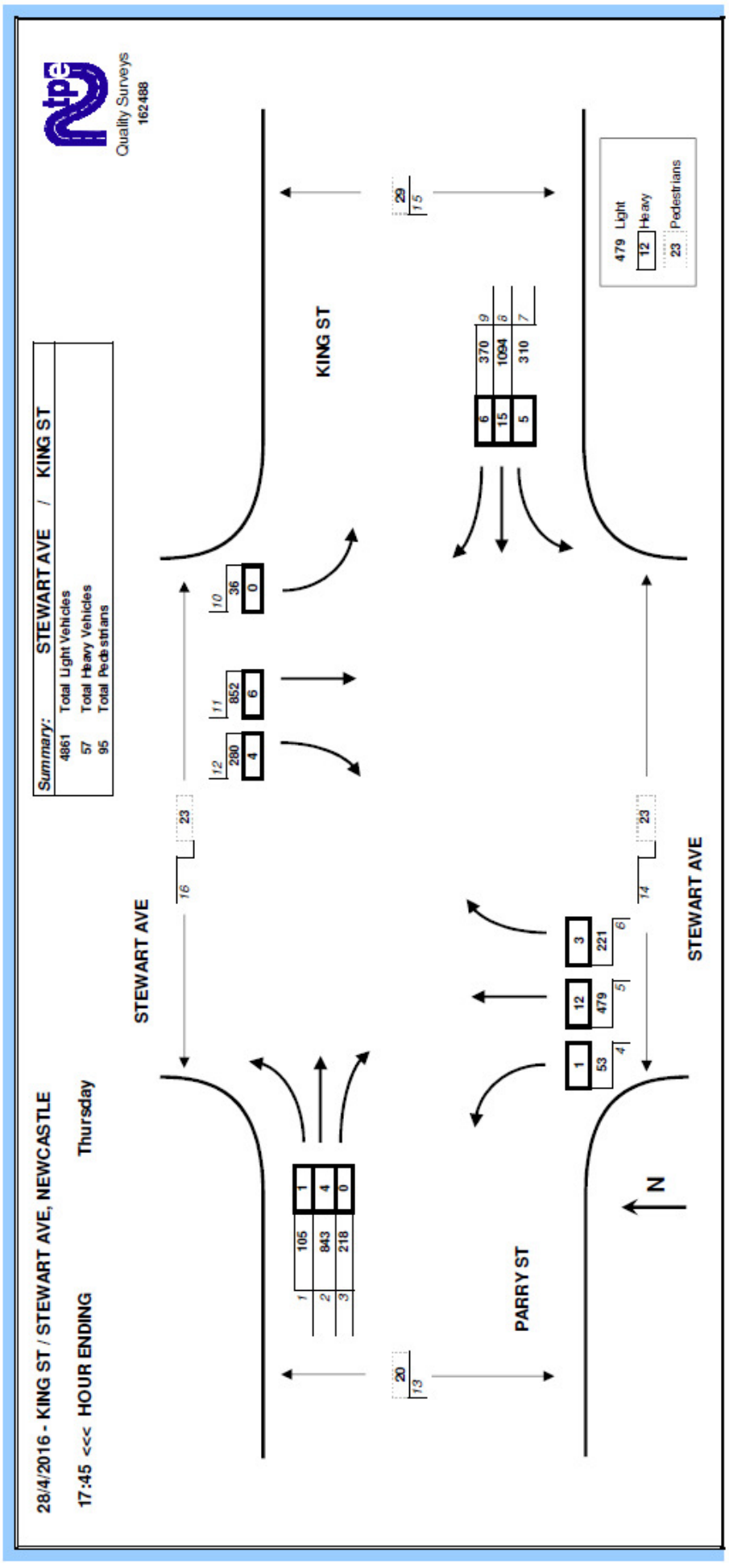
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	23	69.2	LOS F	0.1	0.1	0.96	0.96
P2	East Full Crossing	14	34.7	LOS D	0.0	0.0	0.68	0.68
P3	North Full Crossing	29	67.3	LOS F	0.1	0.1	0.95	0.95
P4	West Full Crossing	16	34.7	LOS D	0.0	0.0	0.68	0.68
All Pedestrians		82	55.8	LOS E			0.85	0.85

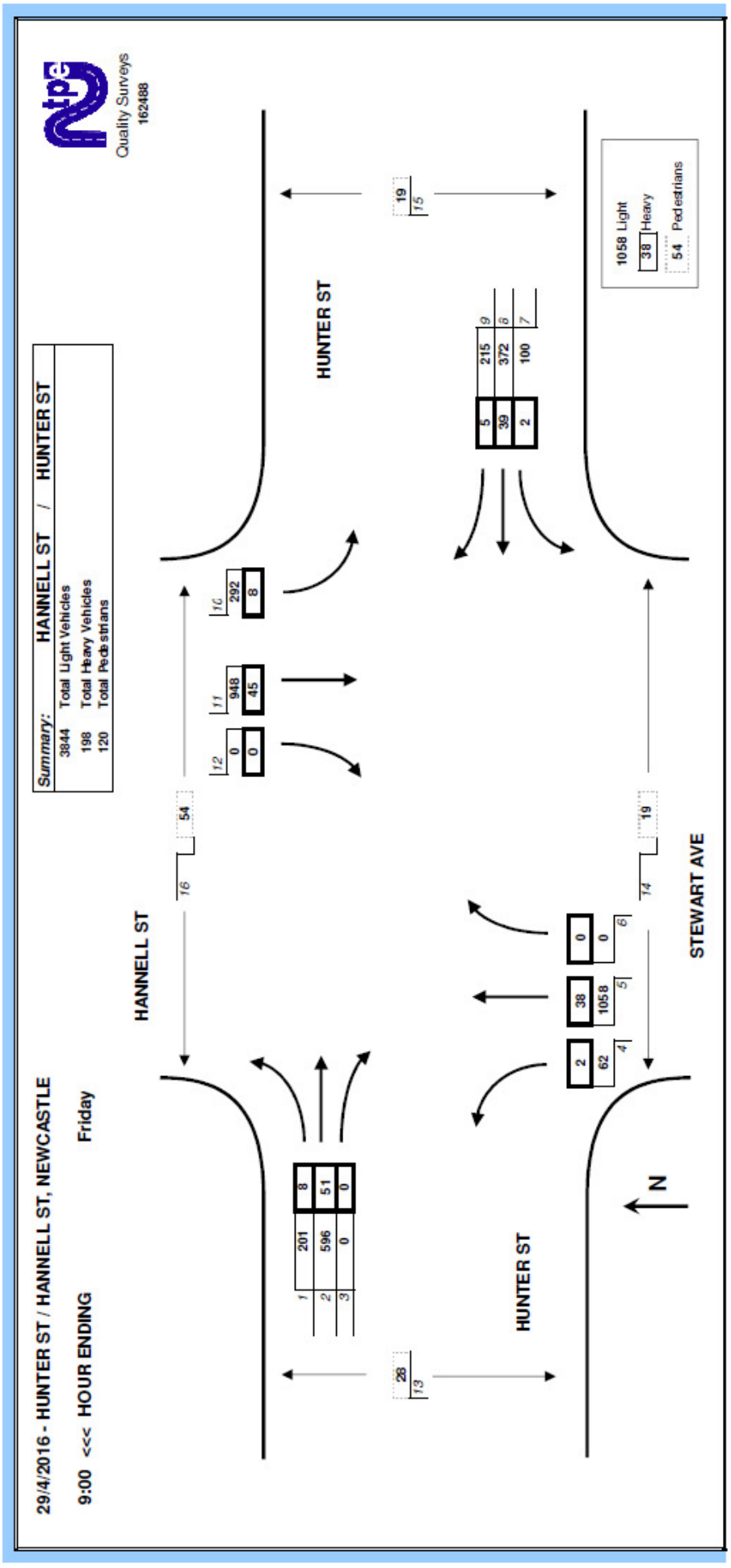
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

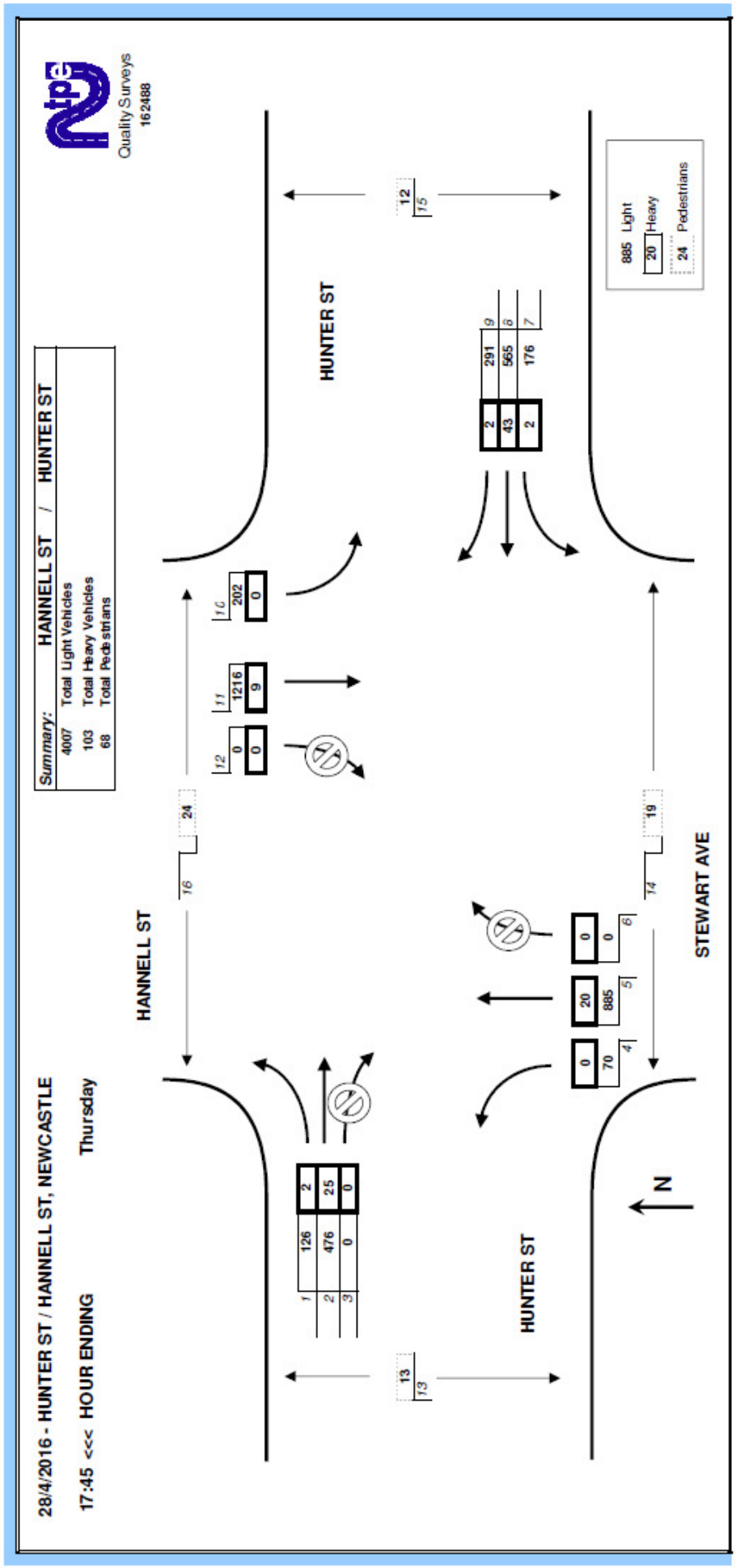
Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Tuesday, 10 May 2016 10:28:13 AM
Project: C:\Work Documents\Project Files\2016\16.054 - Birdwood Park Development, Newcastle West\Sidra\Stewart_Hunter\Stewart_Hunter dev.sip6

ATTACHMENT C
MANUAL TRAFFIC COUNT SHEETS


29/4/2016 - KING ST / STEWART AVE, NEWCASTLE
9:00 <<< HOUR ENDING
Friday
Quality Surveys
162488
Summary: STEWART AVE / KING ST
4327 Total Light Vehicles
143 Total Heavy Vehicles
137 Total Pedestrians
KING ST
STEWART AVE
PARRY ST
STEWART AVE
740 Light
25 Heavy
33 Pedestrians
N


28/4/2016 - KING ST / STEWART AVE, NEWCASTLE
17:45 <<< HOUR ENDING
Thursday
Quality Surveys
162 488
Summary: STEWART AVE / KING ST
4861 Total Light Vehicles
57 Total Heavy Vehicles
95 Total Pedestrians
KING ST
STEWART AVE
PARRY ST
STEWART AVE
N
479 Light
12 Heavy
23 Pedestrians

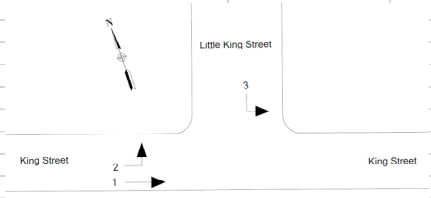

29/4/2016 - HUNTER ST / HANNELL ST, NEWCASTLE
Friday
9:00 <<< HOUR ENDING
Quality Surveys
162488
Summary: HANNELL ST / HUNTER ST
3844 Total Light Vehicles
198 Total Heavy Vehicles
120 Total Pedestrians
HANNELL ST
HUNTER ST
STEWART AVE
HUNTER ST
1058 Light
38 Heavy
54 Pedestrians
N


28/4/2016 - HUNTER ST / HANNELL ST, NEWCASTLE
17:45 <<< HOUR ENDING
Thursday
Quality Surveys
162488
Summary: HANNELL ST / HUNTER ST
4007 Total Light Vehicles
103 Total Heavy Vehicles
68 Total Pedestrians
HANNELL ST
HUNTER ST
STEWART AVE
HUNTER ST
885 Light
20 Heavy
24 Pedestrians
N

Date	5th May 2016
Day	Thursday
Time	8:00am - 9:00am
Weather	Fine
Conducted by:	Jeff

MOVEMENT	1	2	3	
8:00 - 8:15	323	4	54	
8:15 - 8:30	372	5	58	
8:30 - 8:45	354	6	70	
8:45 - 9:00	321	2	62	
				1631
SUM	1370	17	244	
PEAK	1370	17	244	

Leg	PHT (vph)
King Street East	1614
King Street West	1387
Little King Street	261



Date	5th May 2016
Day	Thursday
Time	4.00 pm - 5.00 pm
Weather	Fine
Conducted by:	Pete

MOVEMENT	1	2	3	
4:00 - 4:15	204	4	62	
4:15 - 4.30	311	4	60	
4:30 - 4:45	266	2	48	
4:45 - 5:00	286	1	70	
				1318
SUM	1067	11	240	
PEAK	1067	11	240	

Leg	PHT (vph)
King Street East	1307
King Street West	1078
Little King Street	251