Hunter Indoor Sports Centre

Basketball Association of Newcastle

Traffic Impact Assessment

August 2024

SECA solution

Hunter Indoor Sports Centre, Turton Road, New Lambton

Traffic Impact Assessment

Author: Cathy Thomas/Sean Morgan

Client: Basketball Association of Newcastle Ltd

Issue: Ver04

Reference: P2614

19 August 2024

Quality Review and Document History

Version	Date	Description	Prepared By	Reviewed and Approved By
Ver01	11/3/24	Draft	C.Thomas	S.Morgan
Ver02	24/3/24	Draft	C.Thomas	S.Morgan
Ver03	18/5/24	Final	C.Thomas	S.Morgan
Ver04	19/8/24	Updated plan	C.Thomas	S.Morgan

PO Box 570, Toronto NSW 2283
Newcastle Ph. (02) 40327979
www.secasolution.com.au

Contents

1 Introduction

Background

Seca Solution Pty Ltd has been commissioned by Basketball Association of Newcastle Limited (BANL) to prepare this report in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs), and in support of the State Significant Development Application (**SSD- 65595459**) for the proposed Hunter Indoor Sport Centre with courts, indoor stadium, amenities and associated civil and landscaping works, at 2 Monash Road and 24 Wallarah Road, New Lambton.

Description of the Site and Locality

The site is located at 2 Monash Road and 24 Wallarah Road, New Lambton, within the Newcastle local government area (LGA). The site comprises multiple parcels of land and is legally described as:

- Lot 2380 DP755247
- Lot 2379 DP755247
- Lot 2378 DP755247
- Lot 2377 DP755247

The project area also includes the land on which the existing amenities block is located.

The site is identified in the figure below.

Figure 1-1 Subject Site

The plans for the development allow for a staged development incorporating a mixture of nine courts, a show court, administration office and commercial tenancies to provide ancillary support services. At grade parking will be provided on the site with all vehicle access from Turton Road (left in left out only).

Traffic modelling has been undertaken by Bitzios Consulting in response to requests by Transport for NSW (TfNSW) and in response to the SEARs issued for the project.

Seca Solution has collected current traffic data at the intersection of Turton Road and Monash Road in the vicinity of the site and have observed the traffic operations in the locality of the site during peak periods.

1.1 Scope of Report

The scope of this report is to review and assess the external traffic arrangements and impacts for the proposed development, the operation of the proposed access points, internal vehicle circulation and the suitability of parking.

A Green Travel Plan and Event Management Plan have been prepared in conjunction with this report.

1.2 Issues and Objectives of the study

The issues relative to the proposal are:

- Assess the additional parking requirements generated by the proposed development;
- Review the access arrangements for the development;
- Review the service arrangement for the development;
- Assess any other transport impacts associated with the development; and
- Consider the impacts of the daily operations whilst taking into account local major events

The objective of the report is to document the impacts of the proposed development and provide advice on any infrastructure work required as part of the development.

1.3 Planning Context

In preparing this document, the following guides and publications were used:

- Guide to Traffic Management Part 12, Austroads 2020
- The Guide to Traffic Generating Developments published by TfNSW, Version 2.2 Dated October 2002;
- RMS TDT 2013/04 “Update Traffic surveys August 2013”.
- SEPP Transport and Infrastructure 2021
- Newcastle City Council Development Control Plan 2023 (Dated 1/3/2024)
- Australian / New Zealand Standard – Parking Facilities Part 1 : off-street car parking (AS2890.1:2004);

1.4 SEARs

The following SEARs have been addressed in this report.

SEARS Requirement	Section
an analysis of the existing transport network, including the road hierarchy and any pedestrian, bicycle or public transport infrastructure, current daily and peak hour vehicle movements, and existing performance levels of nearby intersections.	Existing Situation Sec 2.3-2.6 Plus Bitzios Modelling Report (Appendix D)
details of the proposed development, including pedestrian and vehicular access arrangements (including swept path analysis of the largest vehicle and height clearances), parking arrangements and rates (including bicycle and end-of-trip facilities), drop-off/pick-upzone(s) and bus bays (if applicable), and provisions for servicing and loading/unloading	Chapter 3 The Development Chapter 5 Transportation Analysis
consideration of the traffic impacts on existing and proposed intersections including Turton Road/Griffiths Road, Turton Road/Young Road and Turton Road/Lambton Road	Sec 5.2 Traffic Impact Plus Bitzios Modelling Report (Appendix D)
analysis of the impacts of the proposed development (including justification for the methodology used), including predicted modal split, a forecast of additional daily and peak hour multimodal network flows as a result of the development	Chapter 5 Transportation Analysis

(using industry standard modelling) and peak movements during events (if relevant), identification of potential traffic impacts on road capacity, intersection performance and road safety (including pedestrian and cyclist conflict) and any cumulative impact from surrounding approved developments.	Plus Bitzios Modelling Report (Appendix D)
measures to mitigate any traffic impacts, including details of any new or upgraded infrastructure to achieve acceptable performance and safety, and the timing, viability and mechanisms of delivery (including proposed arrangements with local councils or government agencies) of any infrastructure improvements in accordance with relevant standards. explanation and justification of all inputs informing the proposed mitigation measures and conclusions	Appendix D Bitzios Modelling Report Chapter 6 Improvement Analysis
measures to promote sustainable travel choices for residents and employees such as connections into existing walking and cycling networks, minimising car parking provision, encouraging car share and public transport, providing adequate bicycle parking and high quality end-of-trip facilities, and implementing a Green Travel Plan	Green Travel Plan
include an Operation Management Plan inclusive of an Events Management Plan that details measures to be implemented during large events to mitigate traffic impacts, including parking and traffic controls. The plan should have regard to the existing Operational Management Plan for McDonald Jones Stadium and comprise measures to ensure large scale events do not coincide.	Event Traffic Management Plan
Matters raised by Transport for NSW at Attachment B	Refer Appendix B
Matters raised by Council at Attachment B	Refer Appendix C

2 Existing Situation

2.1 Site Description and Proposed Activity

The subject site is a sports ground located within the Newcastle LGA. To the west are additional sports grounds with Lambton High School to the north; to the south there is a stormwater channel with residential development. To the east is Turton Road and various sports grounds including the Newcastle International Hockey Centre, McDonald Jones Stadium, Newcastle Harness Racing Club and several commercial sites. This area forms part of a larger precinct which incorporates the Newcastle Showground, Knights Centre of Excellence, the Newcastle Entertainment Centre as well as the existing Newcastle Basketball site and Broadmeadow Railway Station.

The proposed development is to provide for an indoor sports centre with 12 courts and various ancillary facilities.

2.2 Site Location

The site is located within the Newcastle LGA in the suburb of New Lambton.

The location of the site is shown below in Figure 2-1.

Figure 2-1 Site Location (Source Nearmap)

The site is on the western side of Turton Road and has street frontage to Turton Road (eastern frontage) and Monash Road (southern frontage). There is pedestrian access only from Monash Road with the only road frontage for the site for vehicles being to Turton Road. There is no existing vehicle access to the site.

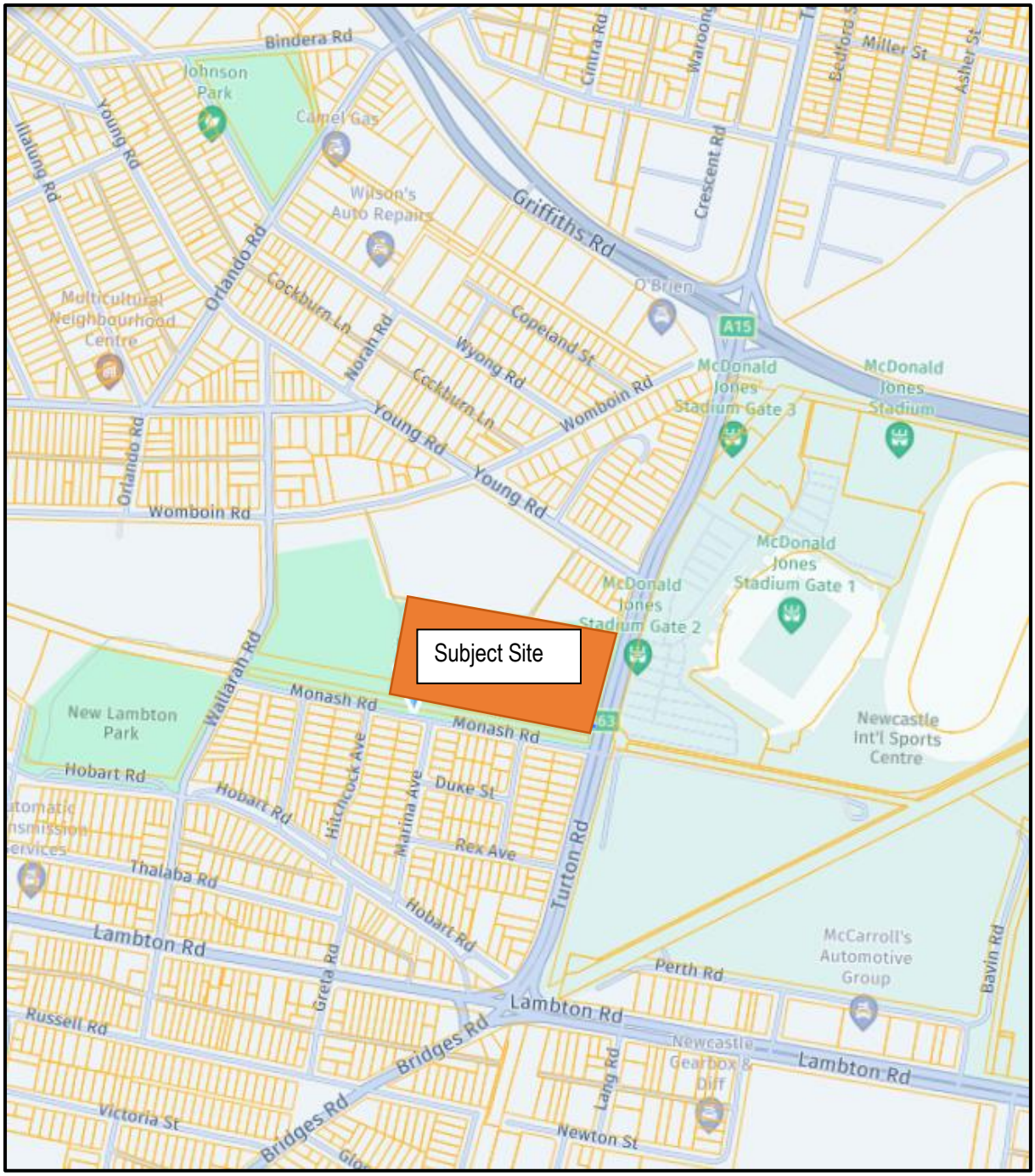
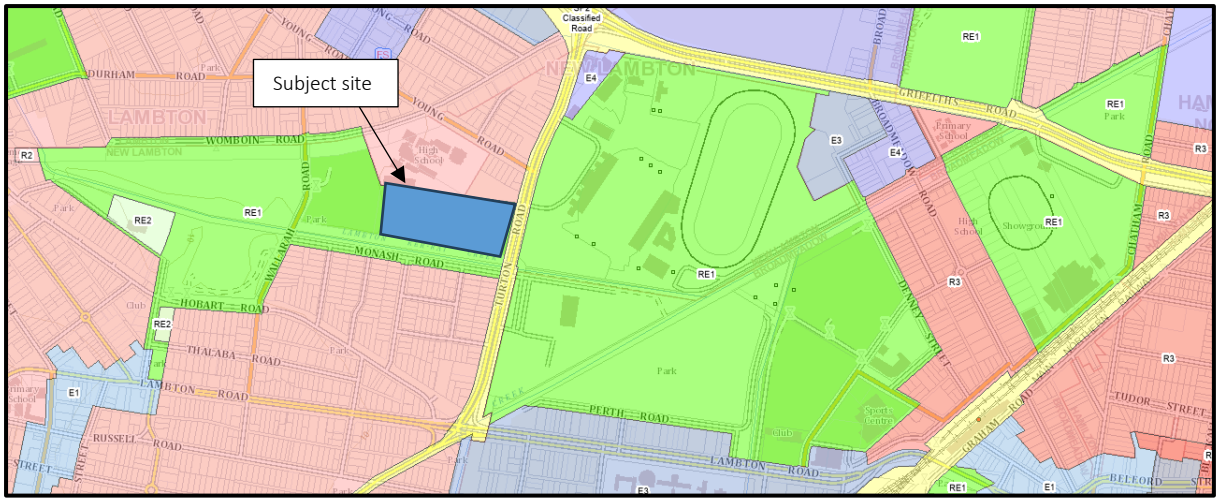


Figure 2-2 Study Area within context of local road network (Source: Nearmap)

2.2.1 Zoning and Adjacent Land Use

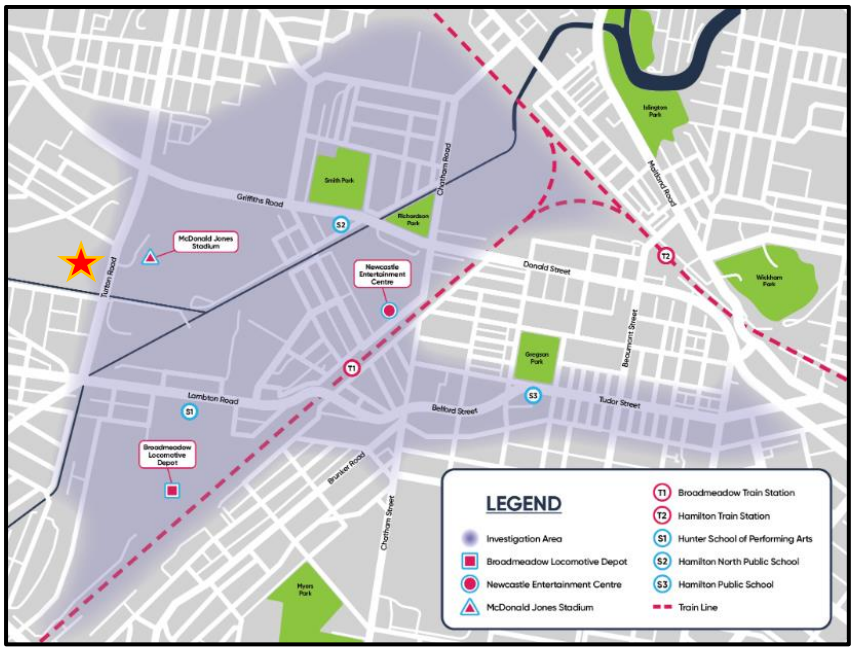
Zoning for the land is RE1 being part of a recreational precinct surrounded primarily by a mix of residential (R2) lands.



■ *Figure 2-3 –Subject site within context of adjoining land uses*

2.2.2 Anticipated Future Development

The site is located on the western edge of an area known as the Broadmeadow Regionally Significant Growth Area identified in the Hunter Regional Plan 2041. The area to the immediate east is referred to as the Hunter Park Precinct, a proposed "entertainment, sporting and lifestyle precinct". This area has been identified to provide future mixed use development opportunities and is the subject of a Place Strategy being developed by the City of Newcastle.



■ *Figure 2-4 –Broadmeadow Regionally Significant Growth Area (Subject site ★)*

2.3 Site Accessibility and Traffic Conditions

2.3.1 Road Hierarchy

The main road through the locality is **Turton Road** which forms part of the regional road network (B63). It provides a major north-south connection between Mayfield and Industrial Drive to the north and Kotara through to the Pacific Highway to the south. In the vicinity of the site, it provides two lanes of travel northbound and three lanes of travel southbound separated by a raised central median. Additional lanes are provided at key intersections to maintain capacity. There is kerbside parking provided within the sealed shoulder on the northbound side of the road with no parking along the southbound lanes. Street lighting is provided to both sides of the road, and it operates under the posted speed limit of 60 km/hr. The majority of the intersections along its length are controlled by traffic signals. It carries a high volume of traffic especially during traditional commuter peaks, reflecting its role and function within the road network.

Photo 1 Turton Road looking north along site frontage

North of the site Turton Road intersects with **Griffiths Road**, a classified state road (MR 82) which provides an important east-west connection between the centre of Newcastle (via Donald Street) and Wallsend (via Newcastle Road) with links to the M1 Pacific Motorway and M15 Hunter Expressway to the west. In the locality of the subject site, it provides a dual carriageway with two or three lanes of travel east and west, separated by a raised central median. Additional turn lanes are also provided at intersections to maintain capacity.

To the south of the site Turton Road intersects with **Lambton Road**, an arterial road which forms part of the regional road network providing an east-west connection between Lookout Road at New Lambton Heights to the west and through to Tudor Street at Hamilton in the east. It carries high volumes of traffic, forming part of a major connection between the Newcastle CBD and surrounding suburbs including Hamilton, Broadmeadow and Lambton. Street lighting is provided and there are pedestrian footpaths to both sides. The posted speed limit on Lambton Road is 60 km/hr, with a number of school zone reducing traffic to 40km/hr between 8-9:30am and 2:30-4pm on school days. Kerbside parking is permitted along the majority of its length, controlled with timed parking throughout the working day and further restrictions during traditional school pick up and drop off times.

Young Road is a local street providing access to a school (Lambton High School) as well as existing residential development, together with light industrial users. It provides a single lane of travel in both directions with footpaths to both sides. It generally provides a straight alignment and connects with other roads in the locality via simple give way controls. Parking is permitted along Young Road, with 90 degree angle parking on the north side of the road adjacent to the school and parallel parking with controls during the school period.

Turton Road connects with Young Road via a 3-way set of traffic signals which allows for all turning movements and provides for pedestrians on all legs.

Monash Road is a local road with a single lane of traffic in each direction. Parking is allowed along both sides of Monash Road with 90 degree parking provided along the north side (site frontage). Monash Road connects with Turton Road at a Give Way controlled T-intersection with a Keep Clear zone on the northbound side of Turton Road allowing for all turning movements. The right turn out of Monash Road in particular is difficult at peak times due to the high through traffic movements. There is a sheltered right turn lane into Monash Road off Turton Road however the high northbound traffic movement during the peak periods can limit turn capacity. Outside the peak times this intersection operates satisfactorily.

Photo 2 Monash Road looking west with site to right of photo

Wallarah Road and Womboin Road are local roads to the west and north of the site. Wallarah Road connects Lambton Road to the south with Young Road to the north. It intersects with Monash Road at a simple T-intersection with Wallarah Road having priority. It in turn connects with Womboin Road at a 4 way Stop-sign controlled intersection. Womboin Road connects with Young Road at a 4 way intersection with Stop signs on all approaches. These roads have frontages to various sports grounds and residential dwellings along the north side of Womboin Road. Parking is permitted along their lengths.

Photo 3 Wallarah Road looking south showing typical cross section

2.3.2 Roadworks and Traffic Management Works

There are no roadworks currently being undertaken in the vicinity of the subject site.

The extension of the Newcastle Inner City Bypass to the west of the site will remove significant through traffic from Lookout Road/Croudace Street with a grade separated interchange being constructed on Newcastle Road to allow for all turn movements.

There are some local traffic management controls within the vicinity of the site, primarily associated with the management of parking and access to buses during significant events.

2.4 Traffic Volumes and Conditions

2.4.1 Peak Hour Flows

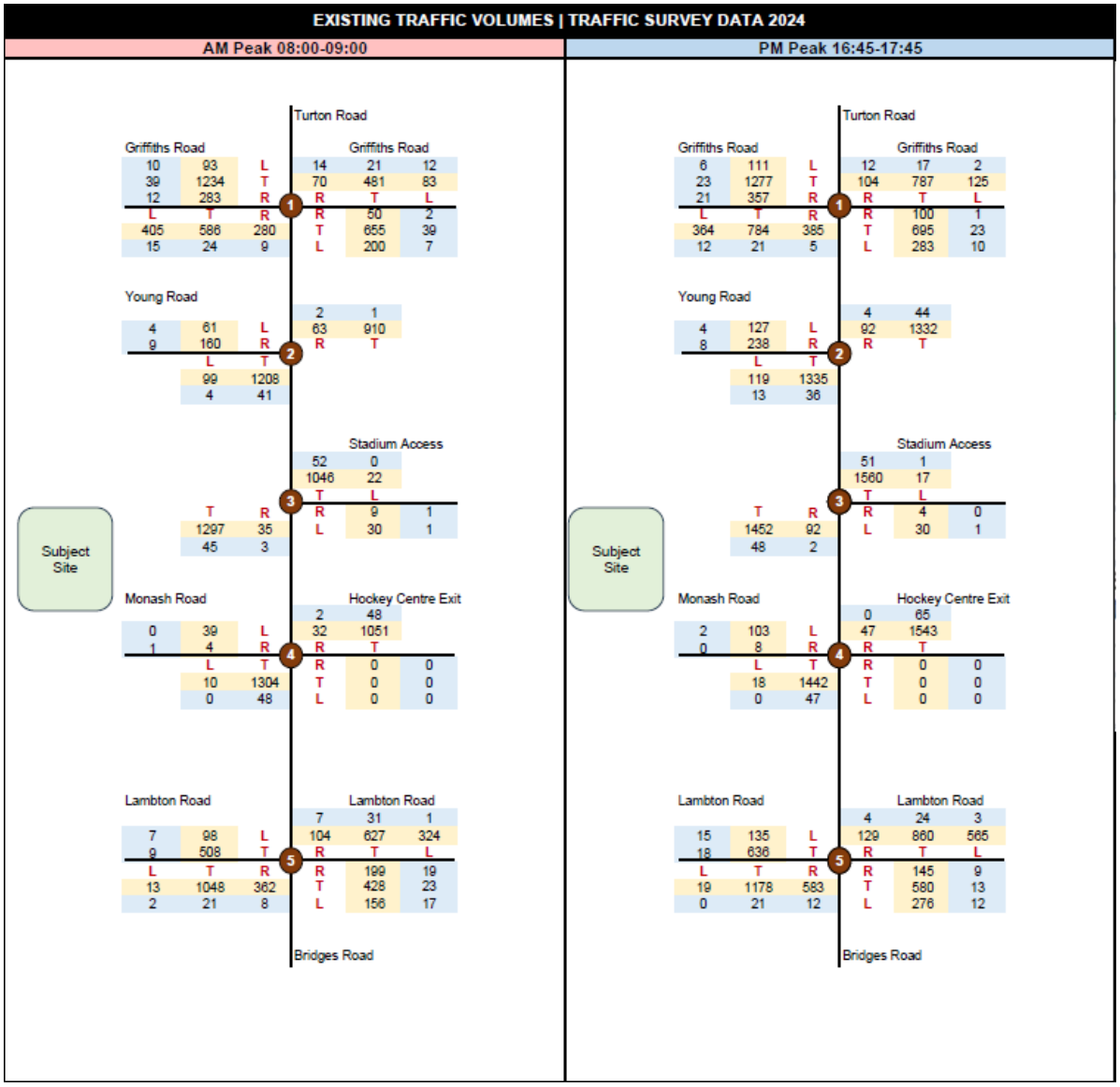
Traffic surveys have been completed to determine the current traffic demands at the key intersections along Turton Road to support the traffic modelling undertaken (Bitzios Consulting). A summary of the traffic flows is provided over.

This data shows that in the morning and afternoon peak hours, associated with commuter demands, the traffic flows northbound past the site are 1,390vph and 1,595 vph respectively whilst traffic flows on a Saturday are lower being 1,086vph. Southbound flows are generally higher with Saturday flows still lower than mid-week peak demands. The two way flows however see Saturday flows generally consistent with AM peaks due to the higher demand for southbound traffic on a Saturday.

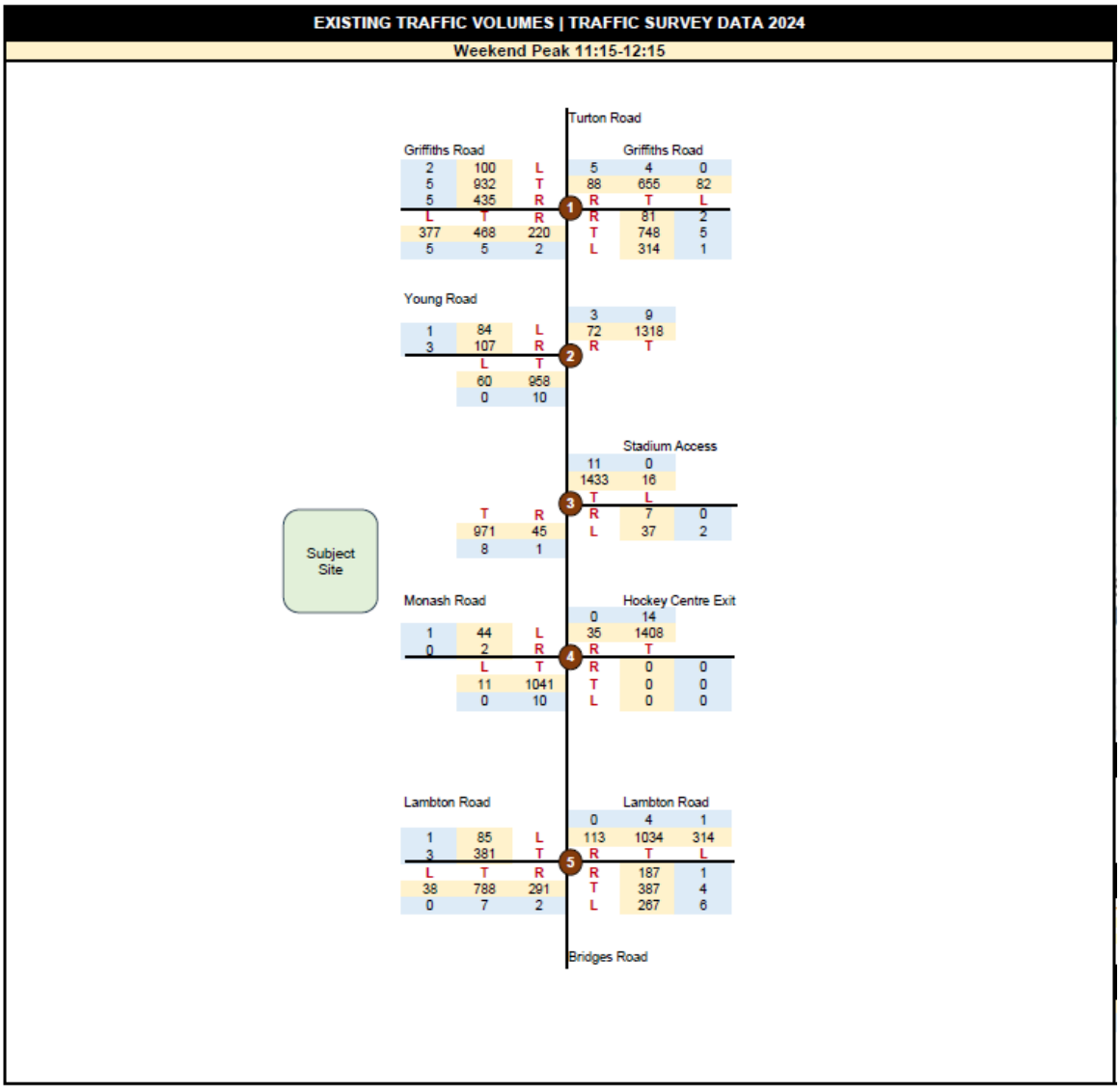
Traffic flows on the local roads are significantly lower, characteristic of their local road function.

Table 2-1 Two way traffic flows on local streets

		PM Peak	Saturday AM
Young Road	Eastbound	377	195
	Westbound	228	135
Monash Road	Eastbound	113	47
	Westbound	65	46



■ *Figure 2-5 – AM/PM Peak Hour traffic/turn volumes (Source: Bitzios Consulting)*



■ *Figure 2-6 – Saturday Peak Hour traffic/turn volumes (Source: Bitzios Consulting)*

2.4.2 Daily Traffic Flows

Traffic data provided by TfNSW for daily traffic flows on Turton Road north of the site (Count Station 05984) showed flows in 2010 of 35,500 vehicles per day (vpd) two way with a slight bias southbound. This is consistent with current flows allowing for peak hour flows to typically represent 10% of the daily flows.

This reflects Turton Road carrying high traffic demands during peak periods with peak hour spread rather than increases in hourly traffic flows.

2.4.3 Daily Traffic Flow Distribution

The daily traffic volumes are reasonably balanced in both directions, with the above data indicating a slight bias in movements southbound.

2.4.4 Vehicle Speeds

No speed surveys were completed as part of the study work. It is considered however that traffic does not speed in this location due to its interaction with the various intersections etc.

2.4.5 Existing Site Flows

The site is currently a sports field which, particularly in the winter, sees junior football games of a weekend and training during the week. Cricket also is played at this location during the summer.

Whilst there have been no traffic counts coinciding with this it is anticipated that allowing 20 vph per junior pitch and four games played on this field could see Saturday flows in the order of 80 vph.

Mid-week flows associated with training are likely to be less than this. Parking for this occurs along Monash Road.

2.4.6 Heavy Vehicle Flows

Survey data indicates approximately 2% heavy vehicle flows on Turton Road in the afternoon peak and less than 1% of a Saturday. These flows include bus services and typical through delivery vehicles etc.

2.4.7 Current Road Network Operation

Observations on site indicate that the local road network in this location operates to a satisfactory standard with some delays and congestion observed in the morning and afternoon peak periods. The signalised intersections control the movement of vehicles along the Turton Road corridors create large delays during the peak periods, with heavy delays northbound in the morning peak period in particular. Outside of the peak periods, the length of Turton Road operates well with low delays and congestion.

The Guide to Traffic Generating Developments provides a framework for assessing the mid-block capacity of an urban road applying a Level of Service criteria.

Allowing for the northbound flows on Turton Road to be in the order of 1,600 vph with two lanes of travel, the level of service per Table 4.4 of the Guide to Traffic Generating Developments would be LoS C being less than 1,800vph but more than 1,400 vph.

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

This indicates a level of service which is *"in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level."*

During the weekend flows are lower and Turton Road operates at LoS B being < 1400vph northbound.

For Monash Road the two way flows mid-week are 178 vph, on a Saturday 93 vph. Flows during the winter sports season are expected to be higher. The GtTGDs provides guidance on the environmental capacity of minor roads with a collector road being the road which connects the sub-arterial roads to the local road system in developed areas. For a collector road such as this, providing access to the various playing fields and connecting to an arterial road would be a maximum of 500 vph, 300 vph desirable. Monash Road is operating within its environmental capacity.

2.5 Traffic Safety and Accident History

Crash data provided by TfNSW (Centre for Road Safety) for the five years 2018-2022 shows that there have been two accidents northbound on Turton Road between Monash Road and Young Road. Each has been non-casualty (tow-away) incidents. There have also been four incidents involving right turning vehicles at the access to the carpark on the east side of Turton Road, (right and through). One resulted in moderate injury and one resulted in a minor injury. Given the high volume of traffic northbound these represent a low number of crashes over the five year period.

In 2019 there was an accident at the intersection of Young Road and Womboin Road resulting in a moderate injury. No accidents have been reported at the intersections of Wallarah Road and Womboin Road or Wallarah Road and Monash Road.

The local road network in this location provides a safe road environment, with no notable safety concerns. The roads and intersections surrounding the site are typically well laid out, with suitable line marking provided to guide drivers and adequate sight lines available approaching intersections.

There is a signalised mid-block crossing of Turton Road, located along the site frontage, to allow for safe and controlled pedestrian and cyclist movements in this location. The various signalised intersections along this corridor also have pedestrian phases.

2.6 Parking Supply and Demand

2.6.1 On-street Parking Provision

Vehicles can be parked on both sides of the local roads in the vicinity of the site.

90 degree angle parking is provided on the northern side of Monash Road and Young Road and along the sports fields on the southern side of Womboin Road west of Wallarah Road. Monash Road has a length in excess of 430 meters which, allowing 3 metres per space per the marking on street, and allowing for the length along the northern side of the road along the site frontage alone provides parking for 80 odd vehicles (248 metres).

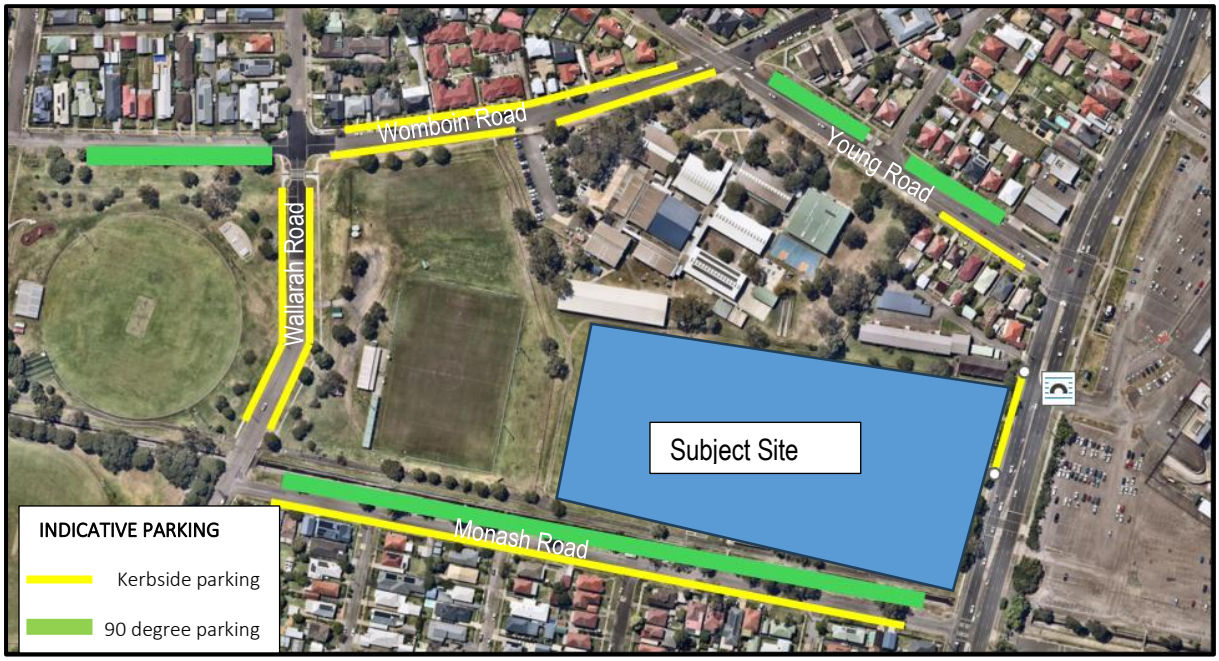


Figure 2-7 On-street parking in the vicinity of the subject site (approx. 300m) NB not adjusted for bus stops

2.6.2 Off-Street Parking Provision

There is a large off-street parking area associated with the McDonald Jones Stadium on Turton Road opposite the subject site.

To the west of the site (400m) past the various sports pitches there is a public carpark adjacent to Harker Oval off Tauranga Road.

Figure 2-8 Off-street parking adjacent to Harker Oval

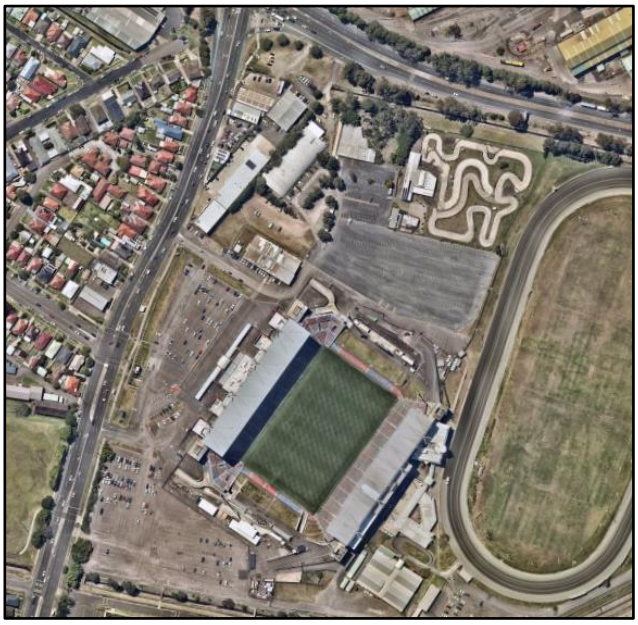


Figure 2-9 Off-street parking surrounding McDonald Jones Stadium

2.6.3 Parking Demand and Utilisation

Parking demands on Monash Road and Wallarah Road are low except during times when there is sport being played on the playing fields, including the subject site.

On Young Road and Womboin Road, parking demands associated with the high school occur during the week. This includes senior students (P-plate drivers) parked on Womboin Road both in the vicinity of the school entry and on the southern side of the road past the intersection with Wallarah Road.

This area is also a popular area for vehicles to be parked when events are on at the McDonald Jones Stadium. During this time parking is managed in conjunction with an Event Management Plan for the broader area.

2.6.4 Short term Set down or pick up areas

There are no set down or pick up areas in the locality of the site. Coaches use the parking area within the McDonalds Jones stadium during major events. Temporary bus stops are also provided along Turton Road at special events for bus travel.

2.7 Public Transport

2.7.1 Rail Station Locations

Broadmeadow railway station is approximately 1 kilometre east of the site and provides regular train services on the Central Coast Newcastle Line between Newcastle and Sydney. It is also a stop on the XPT Regional Train service between Sydney and Brisbane.

The station also acts as a hub for bus services operating throughout the area.

2.7.2 Bus Routes and Associated Facilities

Bus stops are located on Turton Road to the north of the site and are serviced by:

Route 27 – Wallsend

Route 138 – Lemon Tree Passage (Monday to Friday)

Route 266 – West Wallsend (Monday to Friday)

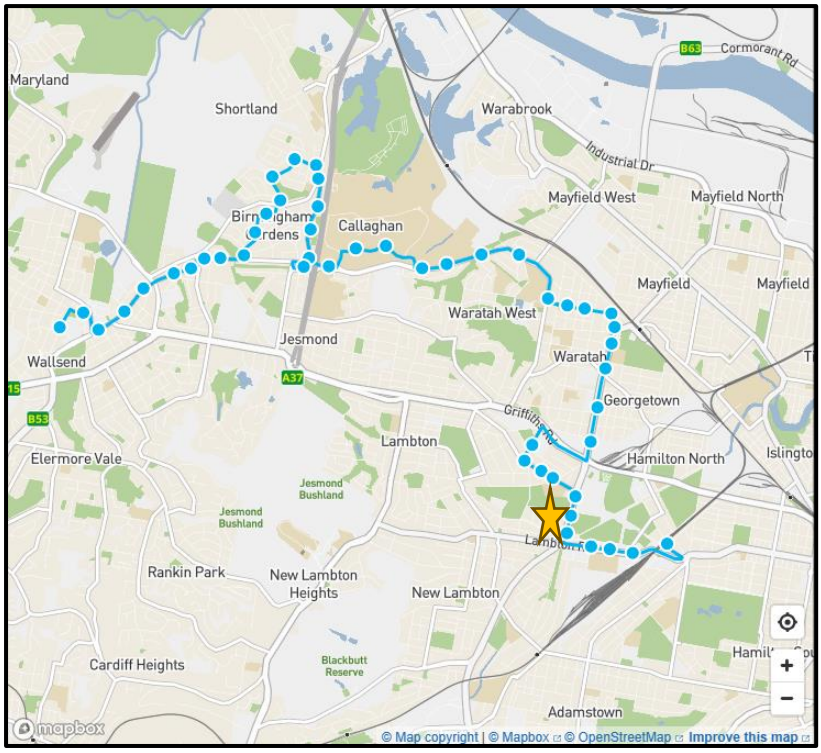


Figure 2-10 Bus service 27 to Wallsend (Subject site ★)

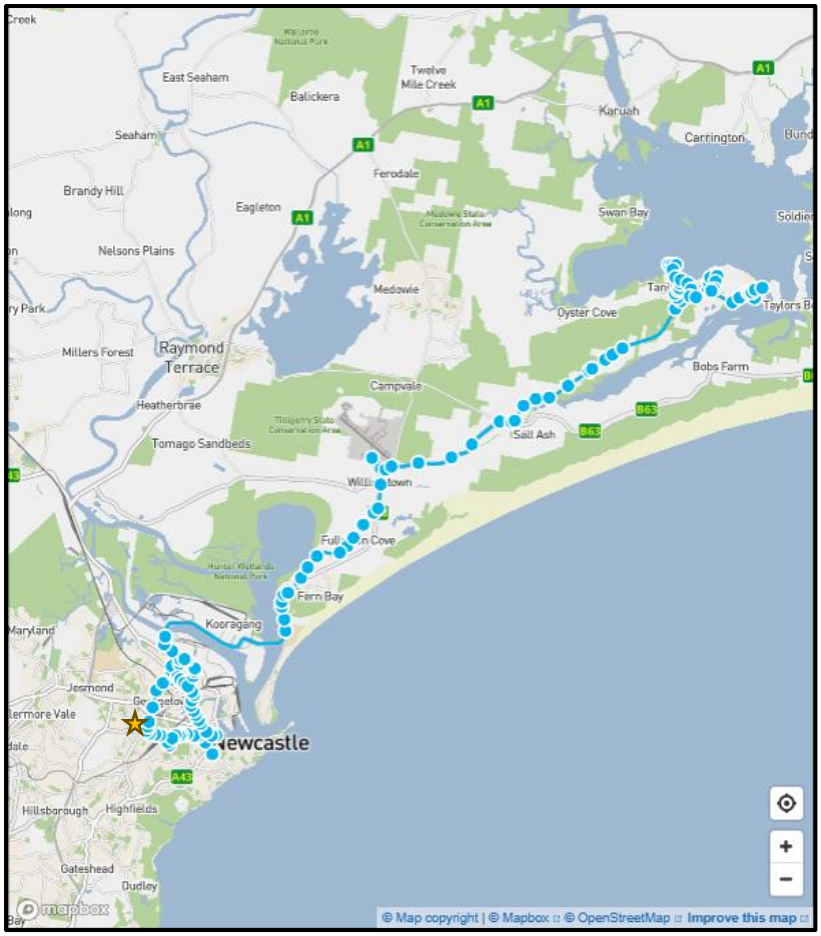


Figure 2-11 Bus service 138 Lemon Tree Passage to Newcastle (Subject site ★)

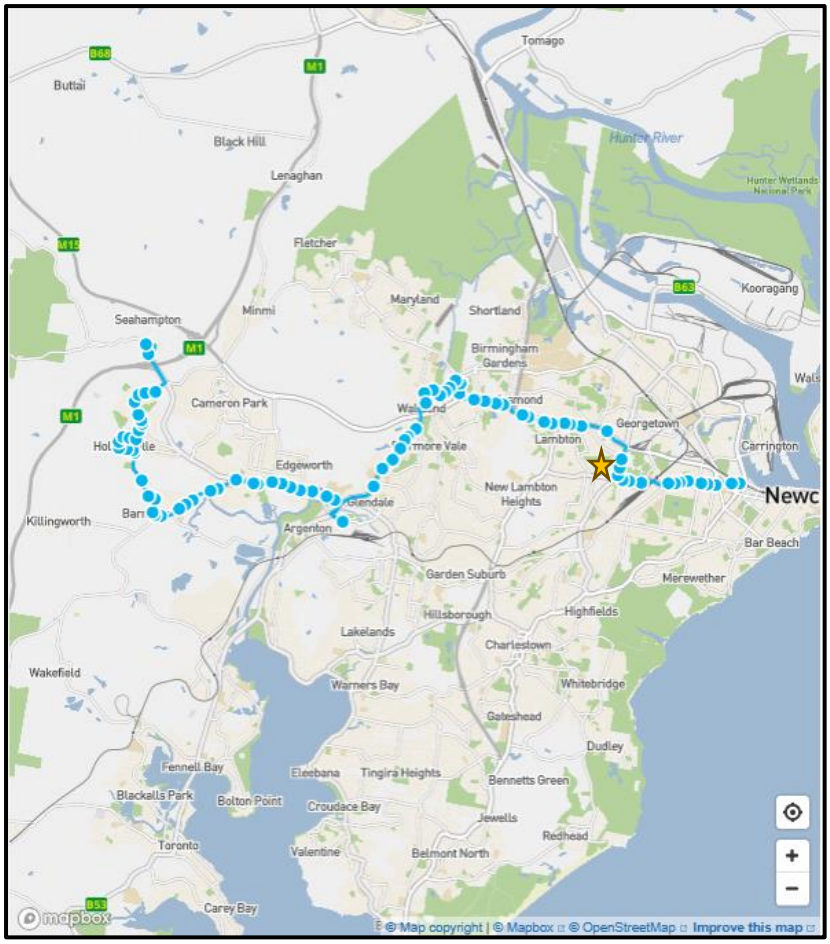


Figure 2-12 Bus service 266 Newcastle to West Wallsend (Subject site ★)

Southbound stops have shelters and seating. Northbound the stop before Monash Road is signal only however north of the site near Young Road there is a shelter and seating.

2.7.3 Rail and Bus Service Frequencies

Both bus and rail services operate a high frequency in this area.

Broadmeadow is a major stop on the main Central Coast Newcastle line with all trains stopping at this station. A number of bus services also connect at this station.

On Turton Road service 27 runs daily whilst routes 138 and 266 operate Monday to Friday.

Northbound Bus Services

Turton Rd at Monash Rd

B 27 Wallsend	10:09 AM
B 27 Wallsend	10:55 AM
B 27 Wallsend	11:55 AM
B 27 Wallsend	12:55 PM
B 27 Wallsend	1:55 PM
B 27 Wallsend	2:55 PM
B 27 Wallsend	3:30 PM
B 138 Lemon Tree Passage	3:36 PM
B 266 Seahampton	3:38 PM
B 27 Wallsend	4:10 PM
B 27 Wallsend	4:50 PM
B 27 Wallsend	5:20 PM
B 266 West Wallsend	5:36 PM
B 27 Wallsend	5:54 PM
B 27 Wallsend	6:24 PM
B 27 Wallsend	7:39 PM
B 27 Wallsend	8:34 PM
B 27 Wallsend	9:14 PM
B 27 Wallsend	10:06 PM
B 27 Wallsend	5:50 AM
B 27 Wallsend	6:45 AM
B 27 Wallsend	7:17 AM
B 27 Wallsend	7:55 AM
B 27 Wallsend	8:20 AM
B 27 Wallsend	8:45 AM

Southbound Bus Services

Turton Rd opp Young Rd

B 27 Broadmeadow Station	10:17 AM
B 27 Broadmeadow Station	11:13 AM
B 27 Broadmeadow Station	12:13 PM
B 27 Broadmeadow Station	1:13 PM
B 27 Broadmeadow Station	2:10 PM
B 27 Broadmeadow Station	3:03 PM
B 27 Broadmeadow Station	4:13 PM
B 27 Broadmeadow Station	4:43 PM
B 27 Broadmeadow Station	5:11 PM
B 27 Broadmeadow Station	5:51 PM
B 27 Broadmeadow Station	6:15 PM
B 27 Broadmeadow Station	7:16 PM
B 27 Broadmeadow Station	8:26 PM
B 27 Broadmeadow Station	9:26 PM
B 27 Broadmeadow Station	10:26 PM
B 27 Broadmeadow Station	5:13 AM
B 27 Broadmeadow Station	6:10 AM
B 27 Broadmeadow Station	7:10 AM
B 27 Broadmeadow Station	7:46 AM
B 266 Newcastle Interchange	7:51 AM
B 138 Newcastle Interchange	8:12 AM
B 27 Broadmeadow Station	8:14 AM
B 266 Newcastle Interchange	8:17 AM
B 27 Broadmeadow Station	8:50 AM
B 27 Broadmeadow Station	9:13 AM

Figure 2-13 Bus schedules at Turton Road near Monash Road

2.7.4 Event Bus Parking on Turton Road

On Turton Road, along the site frontage there are signs allowing for event bus stops during certain activities at McDonald Jones Stadium.

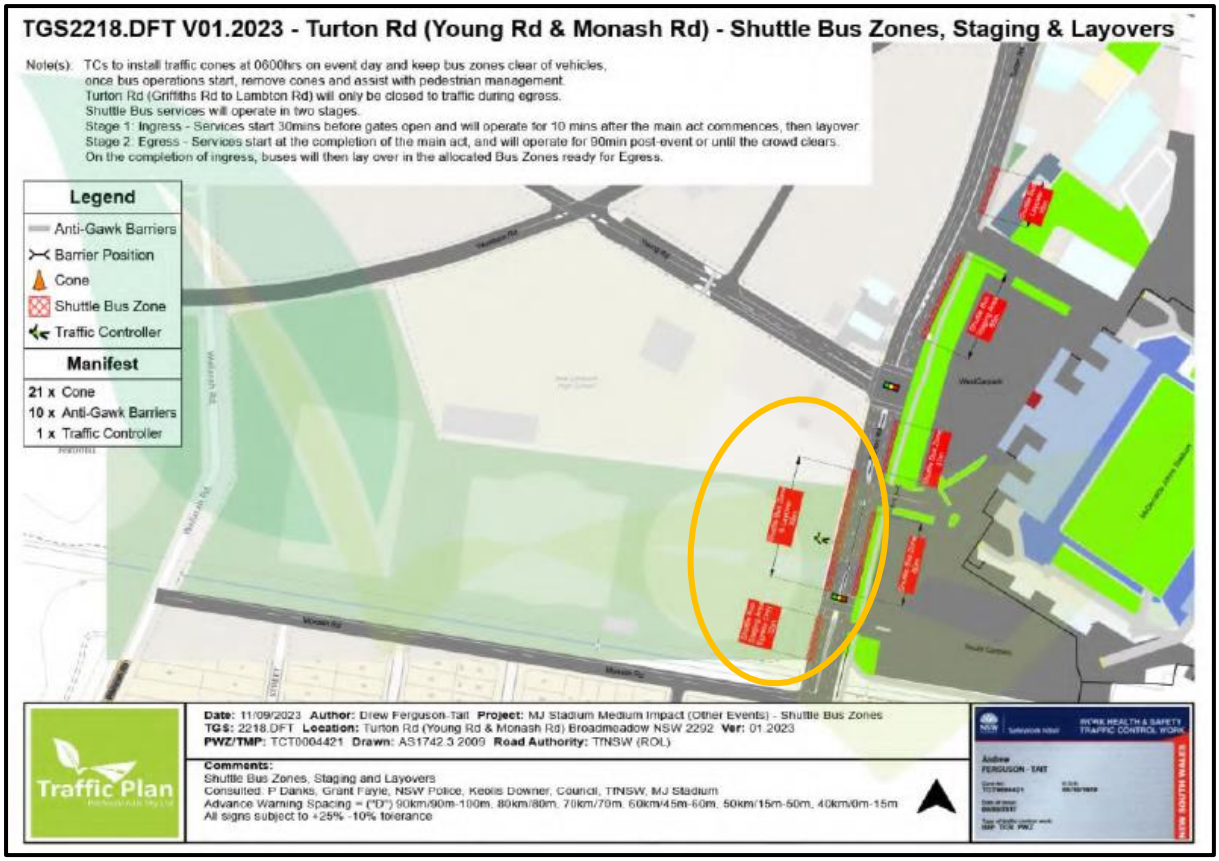


Figure 2-14 Turton Road Shuttle Bus Zones along site frontage (MJ Stadium EMP)

2.8 Pedestrian and Cycling Network

There is a wide network of pedestrian paths in the locality, reflecting the high demand for pedestrian movements in the area, in particular for students accessing the schools (Hunter School of Performing Arts and Lambton Road) and the sports facilities. This includes footpaths along both sides of Lambton Road and Turton Road.

There is a signalised mid-block crossing of Turton Road, located along the site frontage to allow for safe and controlled pedestrian and cyclist movements in this location.

The site sits adjacent to the intersection of two main cycling routes (R4 and R5) which connect east and west with a mix of primarily shared paths and low difficulty on road cycle routes.

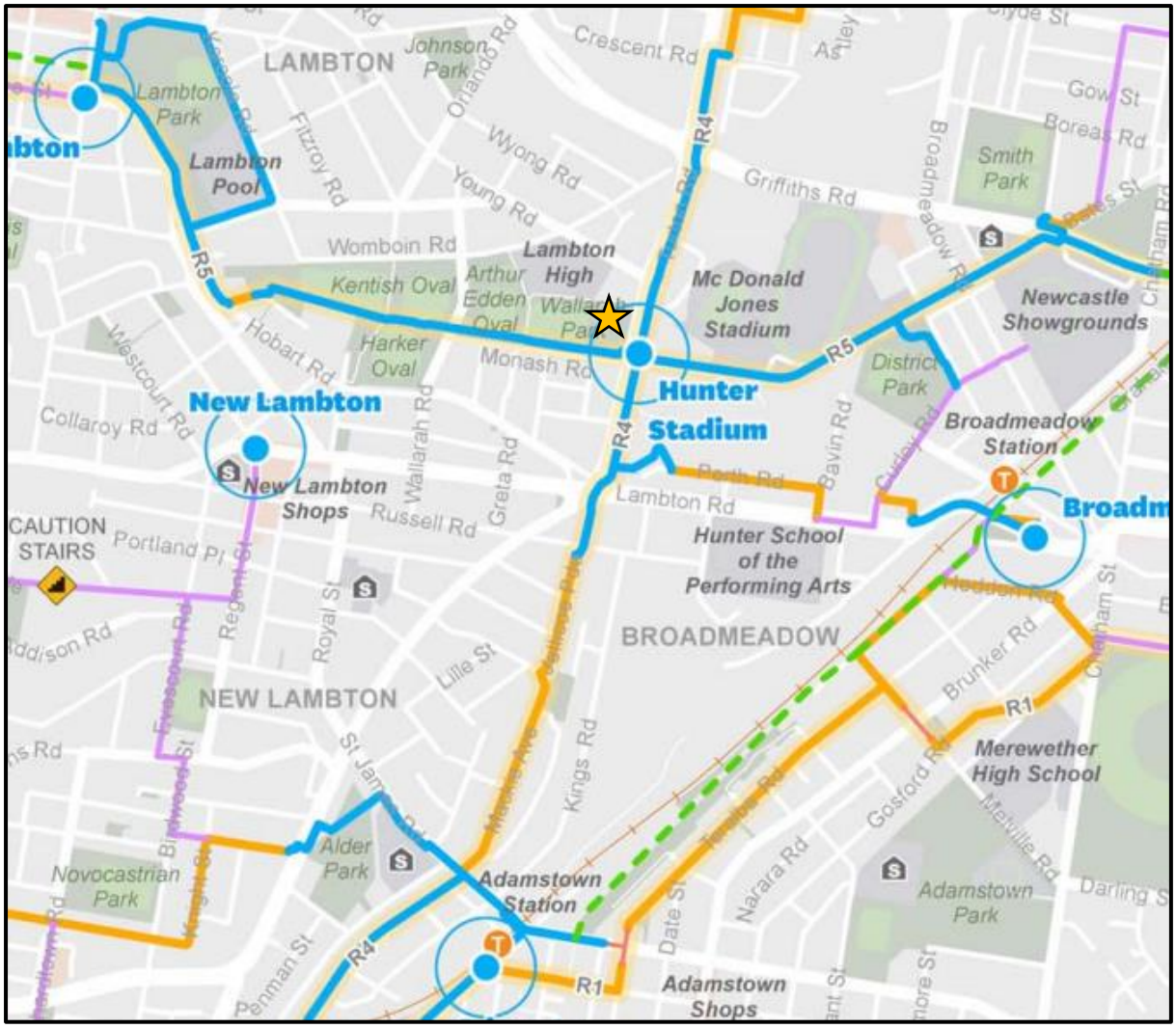


Figure 2-15 Kotara South to Mayfield, TAFE and University (Source: CN Cycleways Map) (Site ☆)

3 Proposed Development

3.1 Offsite or Background Developments

Future development to the east of the site (Hunter Park Precinct) has been identified however is only in the strategic planning stages at present (March 2024).

There is no other significant development identified in the immediate vicinity.

3.2 The Development

The plans for the development are shown in **Appendix A**.

The Indoor Sports Centre includes 12 indoor courts including a 2,500 seat show court, offices, ancillary/players facilities, allied health hub, café, corporate lounge, multi-use space along with car parking on-site.

The facility will provide for the week by week demands of the local community as well as providing a high-class facility to allow for professional/semi-professional competition games.

Table 3-1 Various components

Use	Area/number
Courts	12
Training & Performance Hub	803.2m2
Café	516m2 + 497.1m2
Allied Health Hub	243.8m2
Gym-Movement Studio-Functional Testing	344.8m2
Multi-purpose rooms	299m2
Office/administration	303.5m2 + 351.1m2
Players Lounge/ Corporate Lounge	

Access will be provided via a new access connection to Turton Road allowing for a left in left out only.

A permanent sealed car park with 240 formal spaces, which includes 8 disabled parking spaces and 9 drop off spaces, will be provided on site for car parking, with additional space for bus drop off. Two dedicated bus parking spaces are provided.

There is a loading/service bay along with a port cochere and adjacent area providing for the 9 drop off spaces.

3.2.1 Location

The location of the site is shown above in Figure 3-1 and Figure 3-2.

3.2.2 Projected number of employees/users

The facility will allow for daily demands associated with local use of the courts for training mid-week and for competitions at the weekend along with school groups and the community using the courts.

From this it can be seen that the mid-week daytime demands for the site are much lower than the peak demands generated between 4pm-8pm mid-week. Saturday use is high but not as high as the mid-week uses.

		Visits/hr	Av Visits/hr	Av Visits/hr	Av Visits/hr	Av Visits/hr	Av Visits/hr	Visit/period	Total
Typical Weekday	**Hrs/Period**	**Sport**	**Function/Program**	**Schools/Groups**	**Services**	**Staff/Admin**	**Total**		
6am - 9am	3	6	30		20	15	71	213	
9am-4pm	7	10	30	60	40	30	170	1190	
4pm-8pm	4	480	20		10	5	515	2060	
8pm-11pm	3	345	5			2	352	1056	
							Av/hr	**Total**	
							121	1403	Off peak
							434	3116	Peak
								4519	**Total**
		Visits/hr	Visits/hr	Visits/hr	Visits/hr	Visits/hr	Visits/hr	Visit/period	Total
Typical Weekend Day	**Hrs/Period**	**Sport**	**Function/Program**	**Schools/Groups**	**Services**	**Staff/Admin**	**Total**		
6am - 9am	3	100	20	0	0	0	120	360	
9am-4pm	7	100	0	0	20	0	120	840	
4pm-8pm	4	50	100	0	0	0	150	600	
8pm-11pm	3	0	100	0	0	0	100	300	
							Av/hr	Total	
							125	900	Off peak
							120	1200	Peak
								2100	Total

Figure 3-1 Site utilisation model (Source: Basketball NSW)

Peak events created by major tournaments at the site will be infrequent and will be controlled under a site-specific Event Management Plan. During such major events, the attendance is expected to be in the order of 1500 patrons based on attendance numbers for the Sydney Flame and Canberra Capitals basketball teams. "Full house" events are less likely, where the main stadium/show court with its capacity of 2,500 people could see in the order of 2200-2500 in attendance.

3.2.3 Hours and days of operations

The facility may be open from 6:00 AM through to 11:00 PM daily.

3.2.4 Phasing and Timing

The proposal has been designed so that the project can be delivered as an initial block of six courts with subsequent additions to be delivered over several construction stages, as described below:

Stage 1A

A single storey building with total GFA of approximately 10,218m2 comprising:

- Ground floor: 6 x basketball courts, amenities to support the functioning of the complex including bathrooms, change rooms, lobby and foyer, retail tenancy and café.
- Car park with 110 spaces

Stage 1B

- Ground floor extension to the west to provide 2 x courts with a GFA of approximately 1,630m2.
- Additional 75 Car parks, total 185 spaces at completion of Stage 1b.
- Mezzanine level: function rooms, administration space and training areas.

Stage 2

Extension to the northern and southern sides of the existing building with total additional GFA of approximately 7,180m2 comprising:

- Ground floor 3 x courts including Show court with retractable grandstand seating over the 2 adjacent courts
- Extension to the southern side of the building to provide 1 x court plus high performance training area.
- Mezzanine level: extension of mezzanine to provide additional corporate spaces.
- Expansion of existing carpark to provide 240 spaces

The staging approach will be dependent on available funding and full details will be provided in the EIS. BANL is committed to delivery of the full proposal subject to allocation of additional funding.

The project shall be developed in stages however the whole project has been assessed.

Estimated construction start date for construction of the first stage is April 2025 subject to approval.

3.2.5 Selection of appropriate design vehicles for access and circulation requirements

The development will generally need to accommodate light vehicles with occasional heavy vehicles associated with waste collection and site servicing. 12 seater people movers or 22 seater mini-buses will typically be used by teams to travel to the site, particularly those associated with regional competitions whilst some buses/coaches shall be used in association with dropping off players and school children using the courts.

- B99 – vehicles access
- 8.8m MRV – deliveries and site servicing
- 10.8m garbage truck – waste collection
- 14.5m – allowing for buses and coaches

4 Projected Traffic

4.1 Traffic Generation

The Guide to Traffic Generating Developments does not provide any specific advice for this type of development. As part of previous discussions between the applicant, TfNSW and Council the projected traffic movements for the project have been based on surveys of a similar facility and adjusted to suit the number of courts on site (being 12). The projected peak hour traffic flows associated with the project are shown below and have been adopted in the network traffic modelling for the project.

Table 4-1 Estimated site traffic generation

Time	Arrival	Departure
4.00-4.15	54	41
4.15-4.30	50	44
4.30-4.45	48	49
4.45-5.00	48	53
5.00-5.15	48	54
5.15-5.30	49	54
5.30-5.45	53	54
5.45-6.00	52	53
Total PM peak two hours (4pm to 6pm)	402	402

Allowing for the various ancillary services operating on site, there shall be less demands for vehicles to access and exit the site during the balance of the day. Ancillary traffic in the afternoon is primarily office staff who will leave between 4PM and 5PM.

Peak AM demands that coincide with the local road peak would be associated primarily with staff arrivals as well as some demands for the ancillary services provided on site for players eg attendance at the allied health service or gym/training sessions.

Table 4-2 AM Trip Generation for additional uses on site

Use	Traffic Rate	Area for assessment	Peak Trips
Courts	20 spaces per court	12	As above
Café or Restaurant	Ancillary		5 in AM / 5 out PM
Health Consulting Rooms (9AM-6PM)	No rate – first principles Primarily ancillary	243.8m2 Assume 3 practitioners + 2 staff	8 in prior to 9am/out post 6pm 3 in /3 out per hour (assume 60 minute consultation)
Gym	Peak 9 / 100m2 GFA Daily 45 / 100m2 GFA	344.8m2	16 in / 15 out (assume AM)
Office-High Performance	Daily vehicle trips = 10 per 100 m2 gross floor area Evening peak hour vehicle trips = 2 per 100 m2 gross floor area.	351.1m2	AM 7 in/PM 7 out
Office	Daily vehicle trips = 10 per 100 m2 gross floor area Evening peak hour vehicle trips = 2 per 100 m2 gross floor area.	303.5m2	AM 6 in/ PM 6 out
TOTAL			AM Arrival 42 / Departure 18

On a weekend, the site could generate in the order of 240 vehicle movements per hour (120 inbound and 120 outbound).

Major events

Major events will be the subject of an Event Management Plan to detail overflow parking and opportunities to manage traffic and access public transport.

Such events typically occur of a weekend along with the potential for occasional school gala type events which would occur mid-week but during school hours. For these events, there will be buses to carry people to and from the site which will help to reduce the overall traffic demands. Parking for two buses is provided on site.

4.1.1 Daily and Seasonal Factors

The traffic flows associated with the site will vary between weekday use, weekend use and occasional major events as described above.

4.1.2 Pedestrian Movements

The site will generate some pedestrian movements towards Turton Road to connect to the public buses in this location. A path will be provided through the site (Forecourt Promenade) to connect with the existing pathway along the site frontage which in turn allows connection to the signalised pedestrian/cycling crossing in this location. This pathway along Turton Road shall be widened to the south to Monash Road.

A separate footpath within the site will connect with the pedestrian footbridge joining to Monash Road to the south of the site.

4.1.3 Traffic Distribution and Assignment

The site is located central to the Newcastle LGA as well as within travel distance from Lake Macquarie and parts of Port Stephens and Maitland LGAs. This wider catchment area would be relevant for representative training and the more elite levels of basketball or where there are no local basketball competitions available. The centre is therefore expected to draw attendees equally from all directions.

All trips shall be left in and left out from Turton Road.

Traffic approaching and departing the site will use a range of routes with Turton Road providing a north-south spine connecting with the Pacific Highway to the south (Highfields) along with sub-arterial roads with an east-west orientation being Lambton Road to the south and Griffiths Road to the north.

4.1.4 Hourly Distribution of Trips

Traffic movements will be as assumed above.

The facility will generate minor traffic demands during the morning peak period, potentially associated with staff and servicing requirements.

On a weekend, the site could generate in the order of 240 vehicle movements per hour (120 inbound and 120 outbound).

4.1.5 Modal Split

As the site is located adjacent to two main regional cycling routes, it is likely to see players and staff riding to and from the site daily.

Similarly, the site is located within walking distance of two high schools which would enable students to walk to the courts for afternoon training and games.

The location of the site within walking distance of bus stops on Turton Road also provides for players, particularly students of an afternoon, to catch a bus to the venue after school to then be picked up by parents afterwards.

These travel patterns involving students has been observed at other venues eg Coffs Harbour Indoor Sports Centre where children arrived for afternoon competitions.

The site is also within 1 kilometre of the Broadmeadow Railway Station and so is likely to see a high number of patrons travel by train or by various bus routes when there are main events, consistent with attendance at various events at the adjacent stadiums.

Whilst these numbers have not been quantified, they do support opportunities for discounted trips and reduced parking demands for the site.

4.1.6 Trip assignment

Whilst all traffic arriving and leaving the site shall approach from the south on Turton Road and depart to the north due to the left in, left out access the assignment of trips to the broader network has been further considered.

There are multiple routes available to approach the site allowing for the distribution of traffic across numerous roads and via various intersection.

Table 4-3 Trip Assignment

		Approaching	Departing
East	Newcastle/Hamilton	Lambton Road/Turton Rd	Right at Griffiths Rd
North-East	Tighes Hill/Wickham	Griffiths Rd/Lambton Rd	Right at Griffiths Rd
North	Mayfield/Waratah/Stockton	Turton Rd/Young Rd	Turton Road northbound
North-West	Wallsend/Minmi/Callaghan	Griffiths Rd/Croudace Rd/Russell Rd/Turton Rd	Left at Griffiths Rd
West	Cameron Park/Elermore Vale	Lookout Rd/Russell Rd/Turton Rd	Left at Griffiths Rd/left at Croudace Rd
South-West	Cardiff/west Lake Macquarie	Lookout Rd/Russell Rd/Turton Rd	Left at Griffiths Rd to Newcastle Rd or then left at Croudace Rd
South	East Lake Macquarie/Kotara	Bridges Rd/Turton Rd	Left at Griffiths Rd then left at Croudace Rd
South-East	Charlestown/Dudley/Adamstown/Merewether	Glebe Rd or Pacific Hwy/Bridges Rd /Turton Rd	Right at Griffiths Rd

Given the network of roads throughout this area there are numerous alternate routes available for drivers in addition to these. For example, a driver approaching from west Lake Macquarie could approach turning right at Carnley Avenue or Russell Road whilst a driver approaching east along Griffiths Road may turn right at Croudace Road, at Lloyd Road or at Turton Road, all signalised intersections. This filtering of traffic will reduce the impact on any single route.

4.2 Total Traffic

As detailed in the Bitzios Consulting modelling assessment (Appendix D).

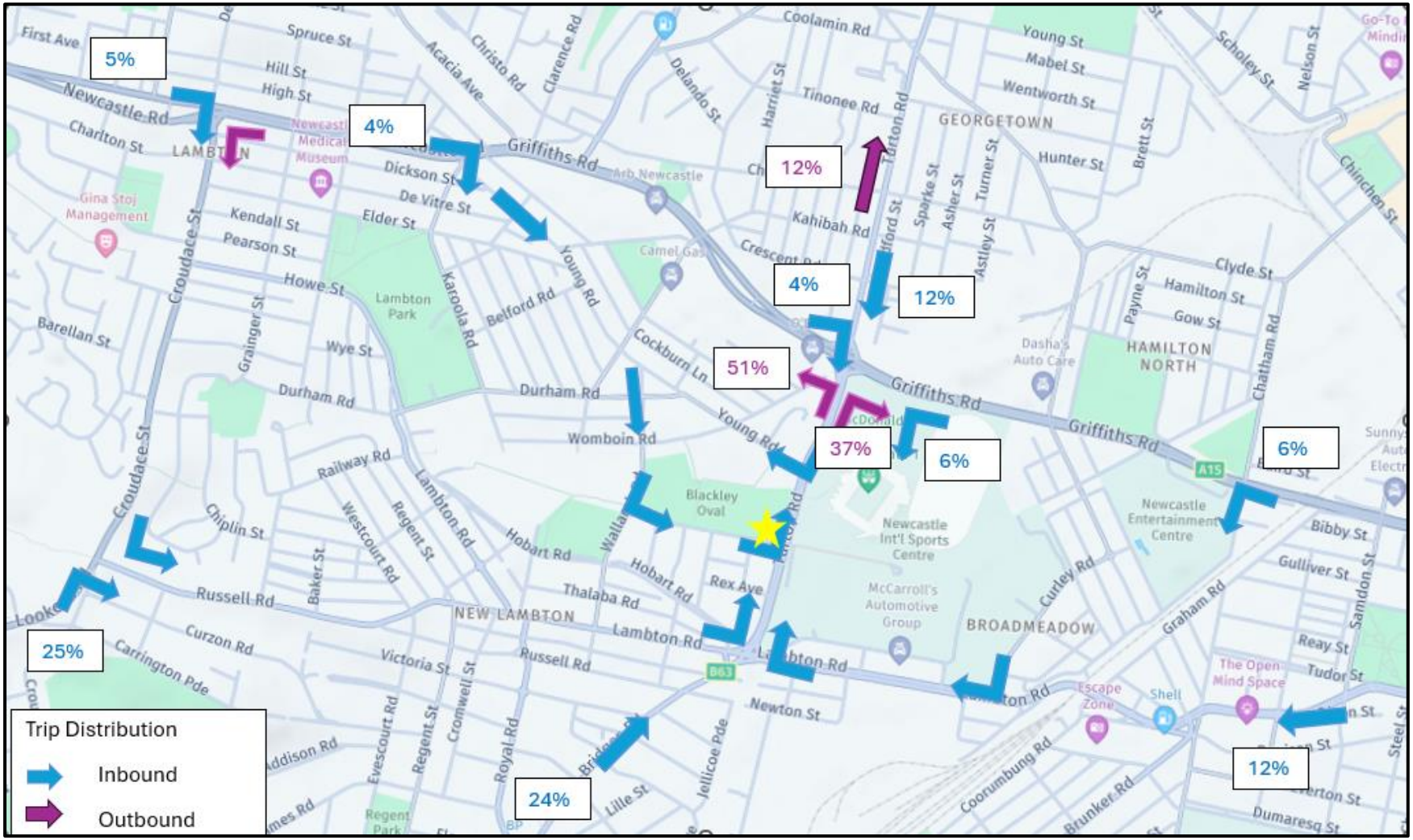


Figure 4-1 Estimated Site Traffic Distribution

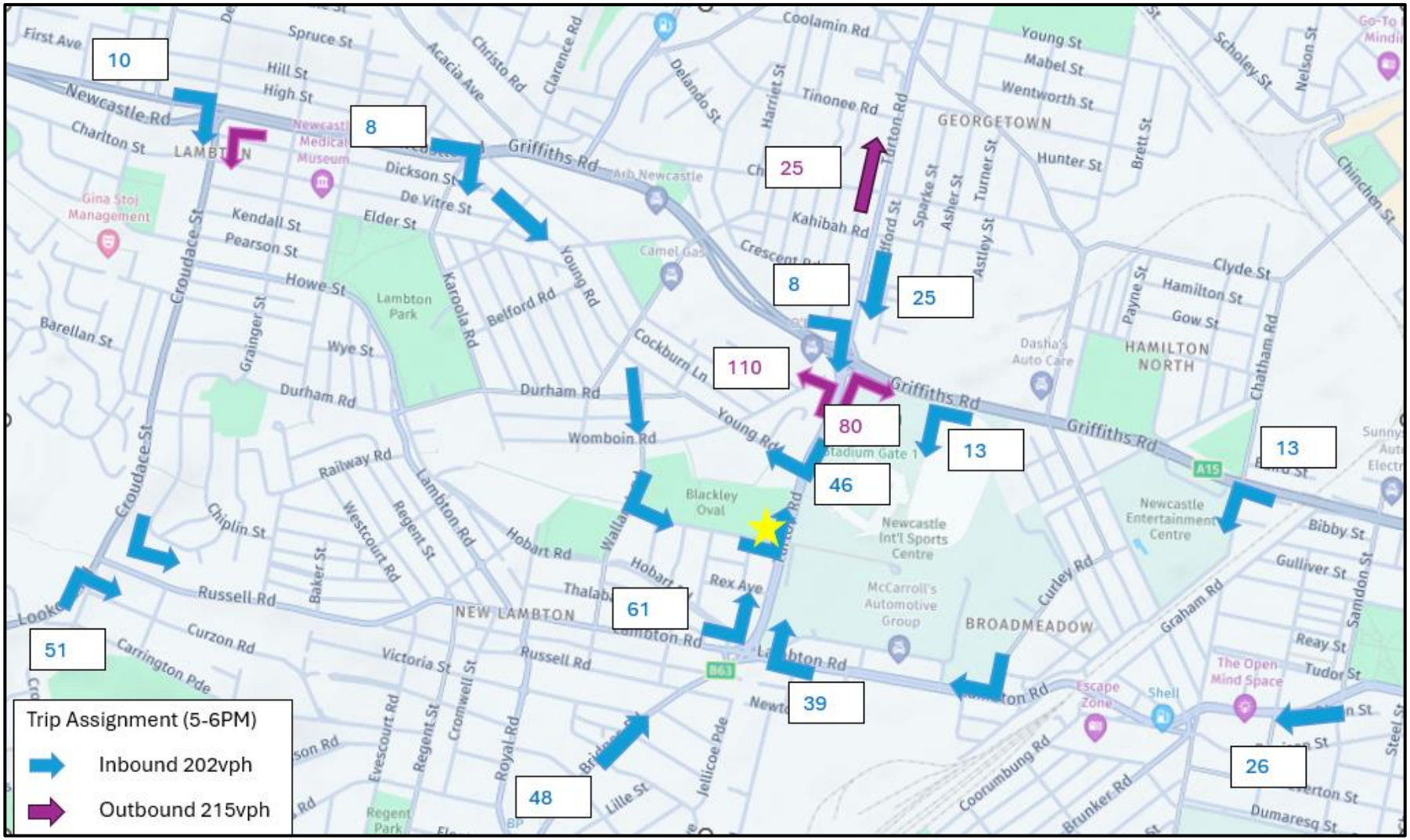


Figure 4-2 PM Traffic Assignment

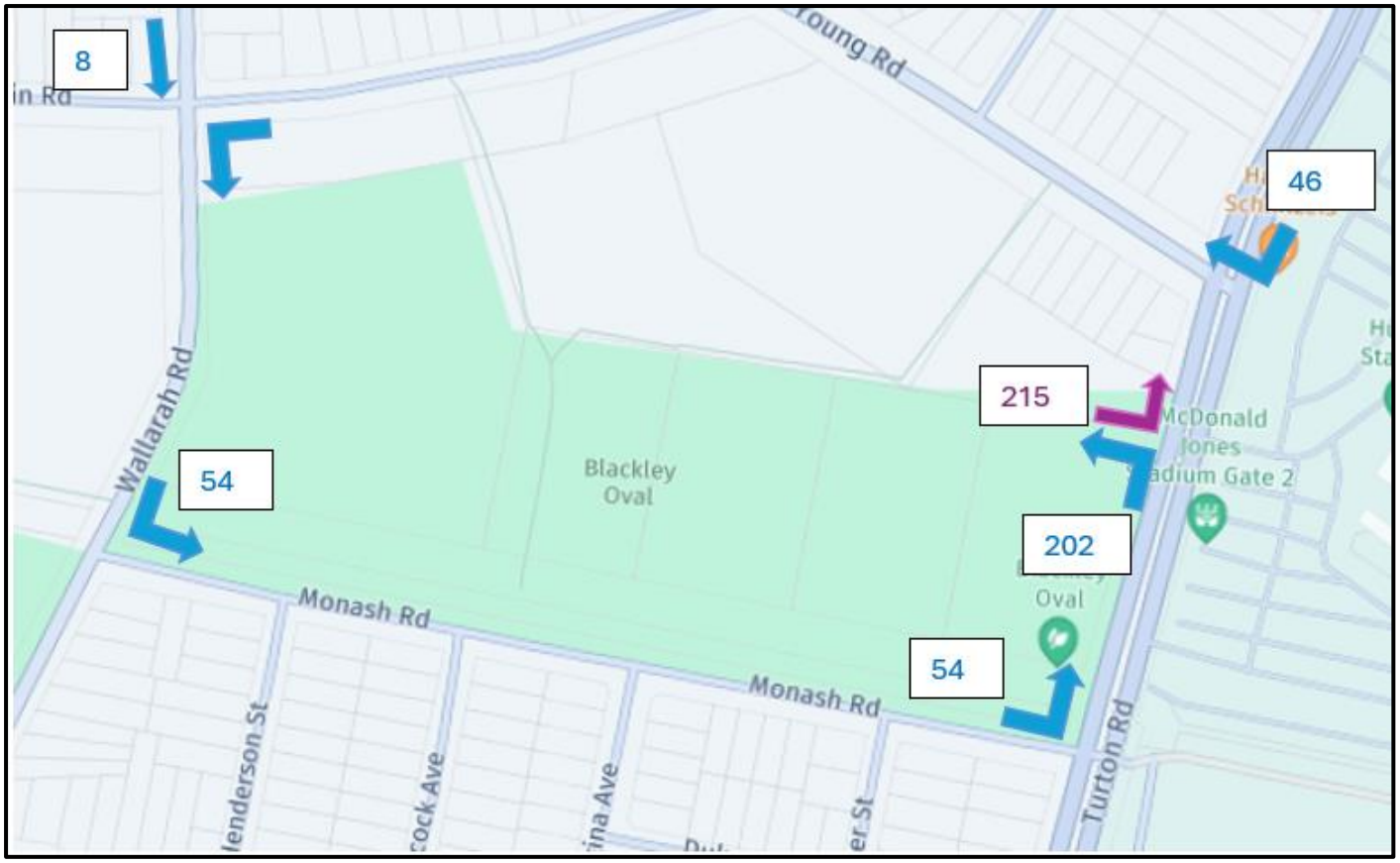


Figure 4-3 Traffic Assignment at site access

5 Transportation Analysis

5.1 Access

5.1.1 Driveway Location

Direct access to **Turton Road** is proposed, allowing for a left in and left out only, similar to other similar users on the opposite side of Turton Road e.g. the hockey centre. Users of this sporting facility accept this constraint and adjust their approach and departure routes accordingly.

This driveway has been located on the northern edge of the site taking into consideration the pedestrian crossing and cycling demands to the south and the layout of the adjacent roadway.

The inclusion of an auxiliary left turn lane shall see the removal of parking on the north side of the signalised pedestrian crossing.

5.1.2 Sight Distances

Turton Road in this location provides a straight and level alignment allowing for visibility to the right for exiting vehicles and good forward visibility for drivers approaching the access. The access provides a left turn deceleration lane. Exiting vehicles benefit from gaps in the traffic movement created by the signals at Lambton Road to the south.

Allowing for the frontage speed of 60km/hr Austroads requires a minimum sight distance of 114 metres and a desirable distance of 123 metres.

The visibility has been checked on site and it exceeds 127 metres to the south (right) being to Monash Road. As the driveway is left out only, visibility to the north (left) does not require review.

■ *Photo 4 View to right for drivers exiting the proposed site access on Turton Road*

5.1.3 Service Vehicle Access

Vehicle entry and exit movements shall be via a new driveway connection to Turton Road which shall cater for all large vehicles including bus and delivery vehicles in and out of the site.

All vehicles shall be able to enter and exit the site in a forward direction. Adequate provision shall be made for the manoeuvring, loading and unloading of vehicles associated with the servicing of the site. All vehicular crossings are to be designed and located in accordance with the relevant Australian Standards (AS/NZS 2890 - Parking Facilities).

The development will require minimal service vehicle access. The largest service vehicle would be the occasional delivery van and garbage truck. The refuse will be collected by a private contractor with vehicles typically 10.8metres long.

5.1.4 Queuing at entrances

Minimal queuing is expected at the entry point as there is no conflict within the site so that traffic entering can move easily within the site and away from this entry point. There is free flow into the site with the car park located 80 metres from the entry point on Turton Road.

5.1.5 Current access compared with proposed access

There is no vehicle access to the site.

5.1.6 Turn lane warrant analysis and access assessment

To assess the potential capacity for a left in and left out access to Turton Road, Seca Solution collected traffic data at the signal controlled intersection of Turton Road and Young Road as well as at the intersection of Monash Road and Turton Road. There traffic surveys were completed on the following day / time:

- Tuesday 21st November 2023 between 3-6 PM
- Saturday 25th November 2023 between 10.30AM and 1.30 PM

These times were selected to represent the peak use mid week, which would be afterschool use coinciding with peak commuter demands along Turton Road and on a Saturday midday with peak use at the stadium and peak traffic demands along Turton Road.

Note the surveys were completed at a time when there was no major event occurring at the stadium opposite e.g. Jets game as at these times there is an Event Management Plan in place and normal traffic conditions do not apply.

To assess the potential impact of the proposed left in and left out for access to the stadium site, Sidra modelling has been completed. The assessment allowed for the following:

- Left turn deceleration lane for the new access to reduce the impact on the through traffic lane.
- NO left turn acceleration lane provided. Observations on site show that the adjacent downstream intersection at Monash Road allows drivers to enter the through traffic stream generally in gaps created by the traffic signals at the Lambton Road traffic signals.
- A generation value of 300 vehicles per hour has been assumed for the site, giving 150 inbound and 150 outbound traffic movements per hour for the general day to day use of the stadium. This is significantly higher than predicted demands to provide for the worst case scenario either of a Saturday or of an afternoon.
- A sensitivity test with 600 vehicles per hour for the Sports Centre site, with 300 inbound and outbound per hour.

A summary of the results of the Sidra modelling are provided below.

Table 5-1– Results for 2023 with 300 vehicles per hour for HICS

Approach	Degree of saturation	Average delay	Level of service	Queue distance (metres)
Turton Road south	0.406 / 0.366	0.6 / 0.7	A / A	0.0 / 0.0
Turton Road north	0.498 / 0.451	0.2 / 0.2	A / A	0.0 / 0.0
Site access	0.315 / 0.276	12.6 / 11.1	A / A	8.9 / 7.7

- Note: Tuesday PM / Saturday peak

Table 5-2 Results for 2023 with 600 vehicles per hour for HICS

Approach	Degree of saturation	Average delay	Level of service	Queue distance (metres)
Turton Road south	0.406 / 0.366	1.1 / 1.1	A / A	0.0 / 0.0
Turton Road north	0.498 / 0.451	0.2 / 0.2	A / A	0.0 / 0.0
Site access	0.630 / 0.552	16.5 / 13.8	B / A	26.1 / 22.0

- Note: Tuesday PM / Saturday peak

The above results show that the impact of the potential access to HICS via a left in and left out on Turton Road is negligible.

5.1.7 Access to Public Transport

The nearest bus stops are located on Turton Road, a 100m metre walk from the main entry point to the facility. Pedestrians can walk along the existing footpaths on Turton Road and use the signalised crossing for southbound services.

The site will accommodate bus entry and exit movements which will allow for dedicated bus access for major sporting events when held at the facility.

5.2 Impact of Generated Traffic

5.2.1 Impact on daily Traffic Flows

The capacity of urban roads is generally determined by the capacity of the intersections. The Bitzios Consulting Modelling Report modelled the Turton Road corridor between Griffiths Road and Lambton Road assessing the impact on the various intersections. It was observed that for most intersections, the impact upon additional development traffic would be negligible for which no particular upgrades would be required.

As the impact of the development traffic is acceptable in the peak periods it can be concluded that it is acceptable on daily traffic flows.

5.2.1.1 Local Roads

PM arrivals 200-202vph, Saturday 120vph arriving disbursed across various routes, some of which rely upon local roads.

Outside the afternoon peak, daytime demands across the road network are much lower being 1/3 of afternoon demands.

Young Road – 22% of inbound development traffic turning right at Turton Road and Young Road - 46 vph

Wallarah Road and Monash Road – 26% of inbound traffic – 54 vph

Table 5-3 Future flows on local roads

		Mid-weekPM Peak	Including Development	Saturday AM	Including Development
Young Road	Eastbound	377	377	195	195
	Westbound	228	274	135	164
Monash Road	Eastbound	113	167	47	79
	Westbound	65	65	46	46

Allowing for the above Young Road would see two way flows increasing to 651 vph (377+274) with Monash Road increasing to 232 vph (167+65).

Young Road operates as an urban road with a mid-block capacity of 900 vph per direction. The additional flows would see no change to the existing level of service which would remain as LoS B westbound (< 380vph).

For Monash Road the future traffic movements are within the environmental capacity of this road being well within the maximum capacity of 500 vph and below the desirable level of 300vph. Flows on the surrounding secondary roads are similar and the development shall therefore have an acceptable impact based on the Guide to Traffic Generating Developments.

5.2.2 Peak Hour Impacts on Intersections

As part of the assessment for the proposed development, the impact of the development traffic on the road network, including intersection capacity, has been assessed by Bitzios Consulting (**Appendix D**)

5.2.3 Background traffic and other developments

As advised by Transport for NSW, growth on this corridor is minimal in the peak period with peak hour spread accommodating any overall increases in background traffic.

It is notable that both the 'Project Case' and 'Project Case with Upgrades' account for zero-growth for the 10-year horizon/future year scenarios, as per advice and confirmation from TfNSW.

5.2.4 Summary of Modelling (Bitzios Consulting)

Bitzios Consulting was engaged by the Basketball Association of Newcastle Limited to undertake SIDRA intersection modelling as requested by Transport for NSW.

The study area encompasses the following five (5) intersections:
- **Intersection 1**: Turton Road / Griffiths Road
- **Intersection 2**: Turton Road / Young Road
- **Intersection 3**: Turton Road / MacDonald Jones Stadium Site Access
- **Intersection 4**: Turton Road / Monash Road
- **Intersection 5**: Turton Road / Lambton Road.

The purpose of the modelling is to assess the potential traffic impacts at the subject intersections and identify any potential upgrades required to mitigate the significant and detrimental traffic impacts.

The report is provided in **Appendix D** and summarised below:

After analysing and comparing the intersection performances between the Base Case and the Project Case, it was observed that for most intersections, the impact upon additional development traffic would be negligible for which no particular upgrades would be required.

For Turton Road / Griffiths Road, the average delay denotes that the performance deteriorated in considerable amount at Turton Road right turn bay during the PM peak, which required necessary mitigation. This was resolved by optimising signal timing. No other geometric upgrades were adopted.

For some intersections, for instance Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit, the delay appears excessively high for SIDRA having at least one vehicle in the model where in reality there isn't any vehicle waiting.

It is well understood that the modelling results, even with the signal optimisation, reflect the outputs of the 'Project Case' in most of the cases except for the boosted improvement in Delay and Queue at Turton Road / Griffiths Road intersection performance in Weekday PM peak. The weekend results in the project case would remain unchanged due to similarity of intersections performance in both scenarios.

Findings of the modelling are summarised below:

- *Optimisation of traffic lights phase times is mainly required for Turton Road / Griffiths Road due to the development traffic assigned to the northbound right turn lane at this intersection causing extra 24.6 seconds of delay at this approach during the PM peak*
- *No geometrical upgrades are seemingly required across any of the intersections due to the development*
- *Pedestrian movements are quite nominal/insignificant and hence unlikely to impact any of the signalised intersection phase times in a larger scale.*

Upon undertaking SIDRA analysis, it can be confirmed that no to minor extra delays would be expected across most surrounding intersections after construction of the proposed Indoor Sports Centre.

5.2.5 Impact of Construction Traffic

As part of the SEARs requirement a preliminary Construction Traffic Management Plan has been prepared to document the traffic routes in and out of the site and controls for heavy vehicles etc.

During construction there will be a demand for heavy lifting machinery as well as some earthwork equipment. The construction work will all be located on site and as such will have a minimal impact upon the local road network.

The size of the site will allow for construction traffic to be parked on site subject to a construction access being created (anticipated to be to Turton Road) in a location similar to the final access and north of the signalised crossing.

Staff numbers for the construction phase will typically be in the order of 20 people on site, with higher numbers during peak periods such as concrete pours and final fit outs. The operational demands for the site has been assessed to allow for 48 arrivals in the AM peak, more than twice the construction traffic anticipated. Construction traffic will arrive to site before the local road peak (8AM-9AM) during which time there is more available capacity to accommodate these extra short term demands. The impacts are therefore acceptable.

Suitable signage per the Traffic Guidance Scheme will advise motorists of inbound and outbound traffic based on the provision of a temporary construction access onto Turton Road.

The shared path on the southern side of the site and the signalised crossing on Turton Road shall continue to be available for pedestrians and cyclists through the majority of the construction. Some minor detours may be required during tie-in to the new pathway and public domain works.

Parking on Turton Road shall be removed along the site frontage to allow for vehicle access.

Later stages of the development shall be undertaken maintaining vehicles access to the carpark and pathways within the site. This may require internal detours for pedestrians or on site management which shall be subject to appropriate signage/controls determined in conjunction with the construction methodology once determined.

A separate Traffic Guidance Scheme (TGS) will be required to allow for the work directly impacting Turton Road which will be the subject of a Works Authorisation Deed (WAD) with Transport for NSW.

5.3 Impact on Road Safety

The entry point on Turton Road shall be located on a straight section of road providing good visibility for drivers entering and exiting the site. A left turn deceleration lane is to be provided to allow for the safe entry of vehicles. All outbound vehicles shall have good visibility and will benefit from gaps in the traffic movements created by the traffic signals south of the site. The layout of this access has been discussed with Council and Transport for NSW and will allow for a simple driveway type entry.

The sight lines available meet with the requirements with all traffic turning left out of the site.

The road network in the vicinity of the site operates well and there are no significant road safety issues noted on the road network in the vicinity of the subject site. Overall, it is considered that the traffic movements associated with the project shall have an acceptable impact upon road safety in the vicinity of the subject site.

No Right Turn signs are recommended at the site exit as well as on the median on Turton Road to reinforce the Left In/Left Out only access. A No U Turn sign at Monash Road is also recommended, consistent with the existing one for northbound traffic in this location. Any southbound traffic passing this point can turn right at Lambton Road and use various routes to approach the site.

5.4 Traffic Signals

Assessed by Bitzios Consulting and summarised below (Attachment D)

- *Optimisation of traffic lights phase times is mainly required for Turton Road / Griffiths Road due to the development traffic assigned to the northbound right turn lane at this intersection causing extra 24.6 seconds of delay at this approach during the PM peak.*

- *Pedestrian movements are quite nominal/insignificant and hence unlikely to impact any of the signalised intersection phase times in a larger scale.*

5.5 Circulation and Parking

5.5.1 Pattern of circulation

All vehicles will be able to enter and exit the site in a forward direction, with the proposed entry and internal site layout providing for two-way movements throughout.

The drop off zone along the site frontage will be one way (clockwise).

5.5.2 Internal Road width

The main internal roads will provide sufficient width to support two-way movements, including light and heavy vehicles as described above with these two-way roads providing a minimum width of 6.5 metres along the spine and 6.0 metres elsewhere.

5.5.3 Internal Bus Movements

Private buses/coaches will be used during peak events to transport teams and some spectators to the site with all entry and exit movements via the new access on Turton Road.

Parking for two buses is provided on site which has been determined as suitable to accommodate this demand.

At other times demands for buses to the site will be low, for example a school sports activity. These times do not coincide with after school operational peak demands for the site but rather occur mid-week when the centre is much quieter. As well as the two bus/coach parking spaces, there is parking available on site to accommodate demands for smaller people-mover (ie 12 seater) vehicles as well as space for Coaster style 22 seater if required.

5.5.4 Service Area Layout

A dedicated service bay is provided. This is located to the side of the building with direct access from the internal site road. The garbage collection will be managed to avoid the busy periods associated with the use on the site.

Swept paths have been undertaken by others.

5.5.5 Proposed Parking Supply

Formal parking is provided throughout the site with 240 spaces, including eight accessible spaces and nine spaces for drop offs.

Parking shall be developed per the following stages:

- Stage 1A 110 spaces
- Stage 1B 75 spaces
- Stage 2 55 spaces

There are also 12 motorbike parking spaces as well as parking for bicycles.

During peak events off site spill over parking shall be available in the stadium parking on the opposite side of Turton Road.

5.5.6 Parking provision per Stage Government policy

The Guide to Traffic Generating Developments provides the following parking provisions:

Table 5-4 Parking Rates per GtTGDs

Use	Car Parking
Indoor Sports Centre	No rate provided
Commercial parking – Office	Unrestrained situation: 1 space per 40m2 GFA
Café or Restaurant	whichever is greater of: 15 spaces per 100m2 GFA, or 1 space per 3 seats
Gym	Metropolitan regional centres 3 spaces per 100m$_2$ GFA Metropolitan sub-regional centres 7.5 spaces per 100m$_2$ GFA (desirable) 4.5 spaces per 100m$_2$ GFA (minimum)

5.5.7 Council code and local parking policies and plans

Under the Council DCP there is no rate for Indoor Sports Centres. For squash courts, tennis courts etc the parking shall be assessed as a merit-based assessment.

For this reason, guidance was sought from other sources to provide a suitable parking rate. The Guide to Traffic Generating Developments (GtTGD) does not nominate parking rates for basketball or similar sports centres. The Lake Macquarie DCP does provide for "indoor cricket and other court games" at the rate of 20 spaces per court. The Cessnock DCP allows a rate of 16 spaces per court plus 1 space per 2 employees, plus 3 spaces per spectators. Port Stephens DCP allows 15 spaces per indoor soccer/cricket/netball pitch or court.

This is also consistent with the existing 6 court stadium at Broadmeadow which provides 114 marked spaces on site, a rate of 19 spaces per court.

Allowing for this existing court rate of 19 spaces per court has been applied to this development.

Table 5-5 Parking Rates per Newcastle DCP (March 2024)

Use	Car Parking	Bike Parking	Motorbike Parking
Commercial parking – Office	1 space per 50m2 GFA	1 space per 200m2 GFA (Security Level B) 1 space per 400m2 GFA (Security level C)	1 space per 20 car spaces
Commercial parking – Shop	1 space per 40m² GLFA	2 spaces per 200m2 GFA (50% Security Level B, 50% Security Level C)	
Café or Restaurant	1 space per 10m2 GFA or 1 space per 5 seats	1 space per 100m2 GFA (Security Level B) 1 space per 100m2 GFA (Security Level C)	
Health Consulting Rooms	1 space per practitioner plus 1 space per 2 other staff 2 spaces per practitioner for visitors		
Gym	Minimum 4.5 spaces per 100m²	1 space per 15 staff (Security Level B) 1 space per 7 staff (Security Level C)	

Accessible parking - e. class 5, 6, 7, 8, 9b or 9c buildings — at least 1 space every 33 spaces

5.5.8 Parking Layout

Car parking will be provided in accordance with AS/NZS 2890.1:2004 and AS/NZS 2890.6:2009.

For a Class 2 Parking Facility (which is the recommended classification for sports facilities being Full opening, all doors being generally medium term parking) the minimum dimensions for a car parking space are 2.5 metres wide by 5.4 metres long. Car parking aisles shall be at least 5.8 metres wide.

5.5.9 Projected peak parking demand

Use	Car Parking	Area for assessment	
Courts	19 spaces per court	12	228 spaces
Café or Restaurant	1 space per 10m2 GFA or 1 space per 5 seats		Ancillary 5 staff spaces
Health Consulting Rooms	1 space per practitioner plus 1 space per 2 other staff 2 spaces per practitioner for visitors	Assume 3 practitioners + 2 staff	10 spaces
Gym	Minimum 4.5 spaces per 100m²	344.8m2	15.5 spaces
High Performance Office	1 space per 50m2 GFA	351.1m2	7 spaces
Office	1 space per 50m2 GFA	303.5m2	6 spaces

Ancillary services to players and teams as well as staff, referees and officials on site shall primarily occur during the day when the courts are operating at significantly lower capacity and often by school groups who arrive by bus.

The café is ancillary, designed to provide food and drink services during games and for workers on site. Parking has been provided for staff only.

On this basis, during the week (9-4pm) the typical parking demands would be 158 spaces (44 + 114 being 50% of the court use). It can be seen that the project will cater for these typical everyday parking demands on site.

After 4pm, the staff associated with the administrative functions operating from the site will be generally leaving and the ancillary services will be primarily associated with those already on site. Such parking demands would therefore be in the order of 238 spaces (228 + 10 for staff on site). Allowing for players to be dropped off by parents and higher car occupancy associated with players travelling together it is considered that the parking provision on

site can accommodate this demand. This also makes no concession for mode share nor for those who may travel to the site by motorbike.

It can be seen therefore that the peak afternoon parking demands can also be accommodated on-site with no reliance on on-street parking. It is noted however that some attendees may choose to park off-site including on Monash Road in a manner consistent with the prior use of the site as playing fields.

The provision of 12 motorbike parking spaces is consistent with the DCP rate of 1 space per 20 vehicle parking spaces.

Peak parking demands created by major events will be managed with a site-specific Event Management Plan. This shall outline the use of parking to be made available within the stadium opposite.

5.5.10 Service Vehicle Parking

A dedicated service bay is provided adjacent to the building.

Buses associated with school sports during the day can stand on site using the two bus parking spaces or vehicle spaces for people movers.

5.5.11 Pedestrian and Bicycle Facilities

Suitable bicycle parking is to be provided within the site to accommodate the potential demands associated with staff and patrons. Secure bike parking will be provided to support and encourage cycling to the site and reduce the dependency on private motor vehicle access to the site.

Whilst parking rates are not provided for facilities such as this the following rates have been provided to the ancillary areas (1250m^2 being office, health and gym) to allow for a suitable number of bike parking spaces:

- 1 space per 200m2 GFA (Security Level B) consistent with staff parking for office - 7 spaces
- Visitor parking consistent with a rate of 1 space per 100m2 of ancillary area allows for 13 spaces which also equates to 1 space per court.

8 staff spaces and 14 visitor bicycle spaces have been provided. End of trip facilities are available given the provision of showers etc on site with lockers suitable for use by staff available within the change rooms.

The majority of the pedestrian demands will be contained movements within the site. Parking along Monash Road on the southern side of the site connects to the site via an existing pedestrian footbridge over the stormwater drain.

Pedestrians will also be able to connect to Turton Road using the pedestrian promenade to connect with the bus stops located on this road.

A footpath connects the building frontage to the two internal bus parking spaces.

The pedestrian promenade shall be marked as a pedestrian crossing across the driveway within the site ensuring priority for pedestrians whilst cyclists in this location can dismount to cross. The carpark shall be sign posted as a shared zone at the entry to reinforce that this area is a driveway and that the site is shared with pedestrians.

During events traffic/pedestrian control on the crossing within the site shall manage the movement of inbound pedestrians to ensure there is no queuing of vehicles back towards Turton Road. At other times these movements would be minimal and have no significant impact on vehicle movements entering the site.

Signalised crossings on Turton Road allow for the safe movement of pedestrians between the site and the opposite side of Turton Road.

5.6 Public Transport

5.6.1 Options for improving services

No improvements required. Regular bus services along Turton Road have sufficient capacity to accommodate the day to day demands of the centre.

5.6.2 Pedestrian Access to Bus Stops

The internal footpath shall connect with the pedestrian pathway on Turton Road to access northbound services. Signalised pedestrian crossings across Turton Road provide connection to southbound services.

5.6.3 McDonald Jones Stadium Event Bus Parking

The Event Management Plans for the McDonald Jones Stadium provide event bus stops along the site frontage.

5.7 Pedestrian and Cyclists

The footpath across the site between the crossing and Monash Road, outside the site boundary, shall be widened to allow for the relocation of the shared pathway that currently crosses the bottom corner of the site near Monash Road.

6 Improvement Analysis

6.1 Improvements to Accommodate Existing Traffic

There is no improvement required to accommodate existing traffic.

It is considered that the proposed site access and circulation will provide a safe and appropriate access arrangement for the proposal. The access arrangements will be designed and constructed in accordance with Council Design Standards.

6.2 Improvements to Accommodate Background Traffic

No improvements are required. The extension of the Newcastle Inner City Bypass will see significant reduction in through traffic on parts of Newcastle Road, Croudace Road and Lookout Road providing increased capacity for traffic along these routes.

6.3 Additional Improvements to Accommodate Development Traffic

It is considered that there are no additional requirements to upgrade pedestrian or cycling facilities in the general locality of the site.

Per the Bitzios Consulting Report (Appendix D).

- *Optimisation of traffic lights phase times is mainly required for Turton Road / Griffiths Road due to the development traffic assigned to the northbound right turn lane at this intersection causing extra 24.6 seconds of delay at this approach during the PM peak*
- *No geometrical upgrades are seemingly required across any of the intersections due to the development*
- *Pedestrian movements are quite nominal/insignificant and hence unlikely to impact any of the signalised intersection phase times in a larger scale.*

Upon undertaking SIDRA analysis, it can be confirmed that no to minor extra delays would be expected across most surrounding intersections after construction of the proposed Indoor Sports Centre.

6.4 Alternative Improvements

It is considered that the proposed works are acceptable and no alternate improvements are required.

6.5 Status of Improvements Already Funded, Programmed or Planned

The planning for the Broadmeadow Precinct is in its early stages only at this time.

6.6 Evaluation

Based on the traffic modelling undertaken by Bitzios Consulting, in consultation with Transport for NSW, and allowing for the assessment above the proposed development can be accommodated as proposed.

7 Summary and Recommendations

7.1 Summary

Access to the site is proposed via a new driveway on Turton Road that will allow for left turn movements in and left out consistent with the International Hockey Centre opposite. Given the network of roads available trips will disperse across various routes to access the site being able to use a number of signalised intersections where required. This access will allow for all heavy vehicle movements in and out of the site.

Traffic modelling completed by Bitzios Consulting has been undertaken and is to be reviewed in conjunction with this report (Appendix D).

Allowing for optimisation of traffic signals in the PM, the impact of the traffic associated with the project shall have an acceptable impact upon the local road network during the critical afternoon peak period. On a weekend, when the traffic flows are lower, the impact shall be lower again. Local roads will remain within their mid-block or environmental capacity.

Parking for the typical peak use Monday to Friday and of a weekend is provided on site in a permanent car park providing 240 parking spaces including 9 drop off spaces and accessible parking. The on-site parking for the normal use through the week and the weekend is provided in accordance with the Council DCP allowing for the complimentary nature of the uses on site.

During major events, the parking shall be as detailed in the Event Management Plan. This separate Event Management Plan has been prepared for the project and will be developed further in consultation with the road authorities.

The site layout provides for the efficient movement of vehicles throughout the site with parking provided within a dedicated sealed parking area to the front of the main entry to the building. This will also allow for a service vehicle accessing the site.

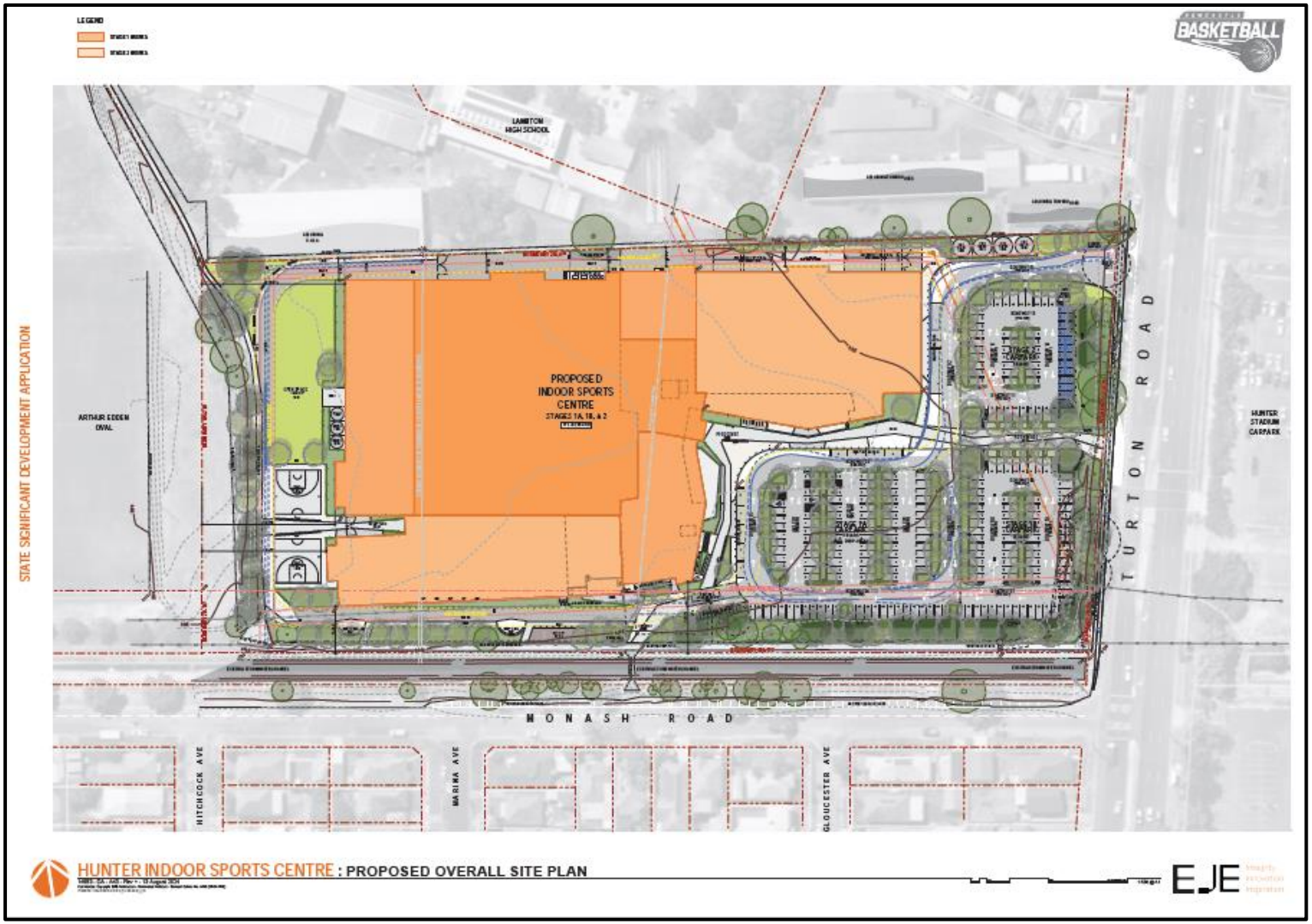
7.2 Recommendations

From the site work undertaken and the review of the development proposal and associated plans against the requirements of the Guide to Traffic Generating Developments and Austroads Guide to Traffic Management, it is concluded that the proposed development should be approved on traffic, access and car parking grounds.

To maintain safety in the vicinity of the site the following is recommended:

1. No Right Turns signs be included at the exit as well as on the median on Turton Road adjacent to the site
2. Include a No U Turn sign on the median on Turton Road at Monash Road consistent with the current one for northbound traffic
3. Optimisation of traffic lights phase times is mainly required for Turton Road / Griffiths Road due to the development traffic assigned to the northbound right turn lane at this intersection causing extra 24.6 seconds of delay at this approach during the PM peak (per Bitzios Report)

Appendix A – Site Plan



Appendix B – Transport for NSW

The TIA should be tailored to the scope of the proposed development and include, but not necessarily be limited to, consideration of the following; • A map of the surrounding road network identifying the site access, nearby accesses, intersections and transport related facilities. • A map of the proposed transport route/s identifying all public roads proposed to obtain access from the classified (State) road/s to the development site.	Figure 2-2 Figure 4-1 – Figure 4-3
• The total impact of existing and proposed development on the road network with consideration for a 10 year horizon. This should include; Identify Annual Average Daily Traffic (AADT) volumes with percentage heavy vehicles along the transport route/s and diagrammatically demonstrate AM and PM peak hour movements at key intersections. Background traffic data from published sources and/or recent survey data. The source of data and any assumptions are to be clearly explained and justified, including the growth rate applied to the future horizon. Due to the impact of COVID- 19 on travel patterns, traffic counts undertaken at this time may not be representative of normal volumes. Alternative approaches to understanding the impact of COVID-19 on traffic patterns should be discussed with TfNSW. The volume and distribution of existing and proposed trips to be generated by the construction, operational and decommission phases of the development. This should identify the maximum daily and hourly demands generated by the development, particularly where they coincide with the network peak hour.	Chapter 2 Existing Situation Chapter 4 Projected Traffic Chapter 5 Transport Analysis Appendix D – Bitzios Modelling Report
The type and frequency of design vehicles accessing the development site.	Sec 3.2.5
Details of the road geometry and alignment along the identified transport route/s, including existing formations, crossings, intersection treatments and any identified hazards. This should include; Available sight distances at the site access and nearby intersections and any constraint to achieving the required sight distance for the posted speed limit.	Turton Road is a State Road with intersections and alignment in accordance with Austroads Guidelines. 5.1.2 Sight line
An assessment of turn treatment warrants in accordance with the Austroads Guide to Traffic Management Part 6 and Austroads Guide to Road Design Part 4A for intersections along the identified transport route/s, identifying the existence of the minimum basic turn treatments and addressing the need for any warranted higher order treatments.	5.1.6 Turn lane warrant analysis and access assessment
Swept path analysis demonstrating the largest design vehicle entering and leaving the development, and moving in each direction through intersections along the proposed transport route/s.	Refer Civil Package
Capacity analysis using SIDRA or other relevant application, to identify an acceptable Level of Service (LOS) at intersections with the classified (State) road/s, and where relevant, analysis of any other intersections along the proposed transport route/s**. Intersections are to include Turton Road/Griffiths Road, Turton Road/Young Road, Turton Road/Lambton Road.**	Appendix D – Bitzios Consulting Modelling Report
A review of crash data along the identified transport route/s for the most recent 5 year reporting period and an assessment of road safety along the proposed transport route/s considering the safe systems principles adopted under Future Transport 2056.	2.5 Traffic Safety and Accident History

• Strategic (2D) design drawings of all proposed road works and the site access demonstrating scope, estimated cost and constructability of works required to mitigate the impacts of the development on road safety, traffic efficiency and the integrity of transport infrastructure. Works must be appropriately designed for the existing posted speed limit.	Refer Civil Package
• Site plan demonstrating site access, internal manoeuvring, servicing and parking areas consistent with the relevant parts of AS2890 and Council requirements.	Appendix A – Site Plan Refer architectural package
• Details of measures to address impacts and/or provide connections for public transport services and active transport modes, such as, public and school bus services, walking and cycling.	Sec 2.7 and Sec 5.6 Green Travel Plan
• Details of measures to ameliorate the impacts of road traffic noise, dust, and/or glare generated along the proposed transport route/s.	Refer CTMP and Drivers Code of Conduct
• Details of any Traffic Management Plan (TMP) proposed to address the construction and operation phases of the proposed development. The TMP should be prepared and implemented in accordance with *Australian Standard 1742.3* and the *Work Health and Safety Regulation 2017.* It is recommended that any TMP include, but not necessarily limited to, the following; A map of the primary transport route/s highlighting critical locations. An induction process for vehicle operators and regular toolbox meetings. Procedures for travel through residential areas, school zones and/or bus route/s. Any proposed temporary measures such a Traffic Guidance Scheme (TGS) A Driver Code of Conduct for heavy vehicle operators. A complaint resolution and disciplinary procedure.	Refer CTMP and Drivers Code of Conduct
Community consultation measures proposed for peak periods.	

Appendix C – City of Newcastle Council

Consultation with Transport for New South Wales (TfNSW)	Undertaken by Bitzios Consulting with regard to modelling requirements
It is recommended the applicant consult with TfNSW during preparation of the Environmental Impact Statement (EIS) to obtain support for the proposed vehicle accesses on Turton Road. It is also noted that the proposal is likely to require referral to (TfNSW) pursuant to State Environmental Planning Policy (Transport and Infrastructure) 2021 Clause 2.122 – Traffic Generating Development based on size, capacity, and location of vehicle access.	Consultation with TfNSW has been undertaken. Requirement for referral is noted.
Vehicle accesses	
The proposed vehicle accesses in Turton Road are required to conform with AS 2890.1 – Off Street Parking with particular attention given to the following: • Width of the access • Provision of a relatively level landing for a minimum 5.0m inside property • Driver sight lines for an existing vehicle being maintained in accordance with AS 2890.1 Figure 3.2 Sight Requirements at Access Driveways • Driver sight lines to a pedestrian being maintained for vehicles exiting the site in accordance with AS 2890.1 – Off-street Parking Facilities Figure 3.3. • Any proposed entry/exit security gates being offset from the property frontage to adequately cater for the largest vehicle expected to access the site, such to ensure all vehicles do not obstruct the public pedestrian footway. Furthermore, adequate provision should be made for tourist coach and service vehicle access with all vehicles entering and exiting the site in a forward direction. Vehicle turning paths for all relevant vehicle sizes (i.e. car, bus, service truck) are required to be displayed on plans submitted in support of the application to confirm accessibility.	Refer Civil Package
On-site parking	
A comprehensive assessment of parking will be required to be undertaken to determine the adequacy of the proposed on-site parking. Comparisons should be made with facilities of a similar nature and size and as appropriate the existing Broadmeadow Basketball site. In this regard, opportunities to reduce the amount of on-site car parking by investigating the option of utilising the adjacent McDonald Jones Stadium car park to cater for car parking demands of this development, including possible fluctuations, need to be explored.	Refer Sec 5.5-5.9
The applicant is also requested to address the following matters: • The proposal should incorporate the provision of an appropriate 'kiss and ride' facility to allow vehicles to pick up and drop off patrons. • Adequate parking provision should be made for electric vehicle charging in accordance with NDCP 2012 Section 7.03 Traffic, Parking & Access. • Adequate servicing facilities are required to be provided to cater for the projected demand likely to be generated by the proposed development. Refer to NDCP 2012 Section 7.03 Traffic, Parking and Access and the NSW Government's 'Freight and Servicing Last Mile Tool Kit '.	Allows for 9 vehicles Sec 5.4
Service vehicle parking and associated loading and unloading facilities are provided on site in a manner that is conveniently accessible.	Sec 5.4

Pedestrian access	
Defined pedestrian pathways and crossing facilities are to be provided throughout the proposed car park to building entry /exits, such assisting to minimise the potential for pedestrian /vehicle conflict. Full details should be provided on the plans submitted in support of the application. This proposal will form part of the cluster of sporting and entertainment venues referred to as Hunter Park. It is important that the site has an obvious and pedestrian friendly entrance to accommodate way-finding and pedestrian movement between the Basketball stadium and wider Hunter Park and Broadmeadow precinct.	Noted
The current plans indicate the frontage to Turton Road being dominated by vehicle entrances and car parking. Consultation with Venues NSW on their masterplan for McDonald Jones Stadium and public domain should be undertaken to ensure the two sites can connect. It is recommended that proper consideration be given to reducing carparking onsite, and demands addressed through a shared arrangement with McDonald Jones, to improve the overall outcome of the development.	Noted – consultation undertaken by others
Cycleways	
There is an existing regional cycleway running along the southern and south-east edge of the site. The proposed development, including service driveway, must not conflict with this cycleway which is an important spine in the existing network and future active transport network proposed in Broadmeadow. Additionally, the cycleway is adjacent to Lambton Ker-Rai Creek and adequate allowance for landscaping should be provided to allow for the riparian corridor to be re-established in the future.	Noted
Green travel plan	
A Green travel plan is required to be submitted in support of application – refer to NDCP 2012 Section 7.03 – Traffic Parking and Access.	Refer Green Travel Plan
Draft Operational Management Plan (OMP)	
A draft OMP inclusive of an Events Traffic Management Plan should form part of the documentation submitted in support of the application. The draft OMP should have regard to the existing OMP for McDonald Jones Stadium and comprise measures to ensure large scale events do not coincide.	Refer Event Traffic Management Plan
Traffic Impact Study	
The Traffic Impact Study should investigate public transport services and stops, and measures proposed to increase mode share to public transport and improve access to services. Evidence of liaison with public transport service providers and TfNSW is required within documentation submitted in support of the application.	A Green Travel Plan has been prepared for the project.

Appendix D – Bitzios Consulting Traffic Modelling Technical Note

Appendix D – Bitzios Consulting Traffic Modelling Technical Note

Issue History

File Name	Prepared	Reviewed	Issued by	Date	Issued to
P6458.001T Newcastle Indoor Sports Facility SIDRA Intersection Modelling Technical Note	R. Jain T. Islam	A. Grey	A. Grey	04/05/2024	Simone.Larsen@app.com.au
P6458.002T Newcastle Indoor Sports Facility SIDRA Intersection Modelling Technical Note	T. Islam	A. Grey	A. Grey	20/05/2024	Simone.Larsen@app.com.au
P6458.003T Newcastle Indoor Sports Facility SIDRA Intersection Modelling Technical Note	T. Islam	A. Grey	A. Grey	28/05/2024	Simone.Larsen@app.com.au

Newcastle Indoor Sports Facility

SIDRA Intersection Modelling Technical Note

1. Introduction

1.1 Background

Bitzios Consulting has been engaged by the Basketball Association of Newcastle Limited to undertake SIDRA intersection modelling to inform a Traffic and Transport Impact Assessment, prepared by SECAsolution, for the proposed Hunter Basketball Stadium (subject site) located at the corner of Turton Road / Monash Road. The study area encompasses the following five (5) intersections:

- **Intersection 1**: Turton Road / Griffiths Road
- **Intersection 2**: Turton Road / Young Road
- **Intersection 3**: Turton Road / MacDonald Jones Stadium Site Access
- **Intersection 4**: Turton Road / Monash Road
- **Intersection 5**: Turton Road / Lambton Road.

The locations of the subject sites and intersections are shown below Figure 1.1.

Adapted from Google Maps

Figure 1.1: Subject Site and Intersections

The purpose of the modelling is to assess the potential traffic impacts at the subject intersections and identify any potential upgrades required to mitigate the significant and detrimental traffic impacts. To understand these impacts, the subject intersections were modelled in SIDRA 9.1 Plus. This technical note outlines the model development process and modelling results of the Base and Project Case scenarios.

2. Modelling Methodology

2.1 Modelling Scenarios

The following scenarios were modelled:

- **Base Case**: Existing conditions of the subject intersection
- **Project Case**: Similar to **Base Case**, with additional traffic generated from the proposed development of Hunter Basketball Stadium
- **Project Case with Upgrades**: Similar to **Project Case**, with SIDRA-optimised signal phasing time.

It is notable that both the 'Project Case' and 'Project Case with Upgrades' account for zero-growth for the 10-year horizon/future year scenarios, as per advice and confirmation from TfNSW. The summary of the traffic input for each scenario is provided in Table 2.1.

Table 2.1: Traffic Demand for Modelling Scenarios

Scenario	Applied Traffic Demand
Base Case	Intersection Turn Count 2024 only
Project Case	Intersection Turn Count 2024 + Development Traffic from the subject site*
Project Case with Upgrades	Same as Project Case.

**Development Traffic is determined as per the Report: P2614 Newcastle Indoor Sports Centre Traffic Generation and Assignment by SECAsolution for Weekday and Weekend.*

All the scenarios were modelled for the following peak hours:

- **Weekday:**
  - AM Peak: 08:00 – 09:00
  - PM Peak: 16:45 – 17:45
- **Weekend:**
  - Peak: 11:15 AM -12:15 PM.

For all the scenarios, the intersections were modelled and processed as individual sites. No queue pushbacks or queuing across the intersections were observed from the survey videos, nor from the SIDRA models and hence processing the sites as one whole network was not necessitated.

3. Base Model Development

3.1 Geometrical Layout

The geometric layouts have been coded in SIDRA in accordance with the existing arrangements using Google Maps. The geometric layouts for all the subject intersections are attached in **Attachment B.**

3.2 Traffic Surveys

Matrix was commissioned by Bitzios Consulting to undertake the Intersection Counts Survey for all the intersections modelled. For different scenarios of the model the following days and times of the same week were nominated for data collection:

- **Weekday: Thursday, 4th April 2024**

- AM: 07:00 – 10:00 (3-hour survey)
- PM: 15:00 – 18:00 (3-hour survey)

- **Weekend: Saturday, 6th April 2024**
  - Time: 10:00 – 14:00 (4-hour survey).

Traffic flow diagrams with the collected survey data for Weekday AM, PM and Weekend have been provided in **Attachment A.**

3.3 Bus Movements

Bus movements were accounted for at the intersections during the nominated peak hours. The following measures were implemented for bus movements:

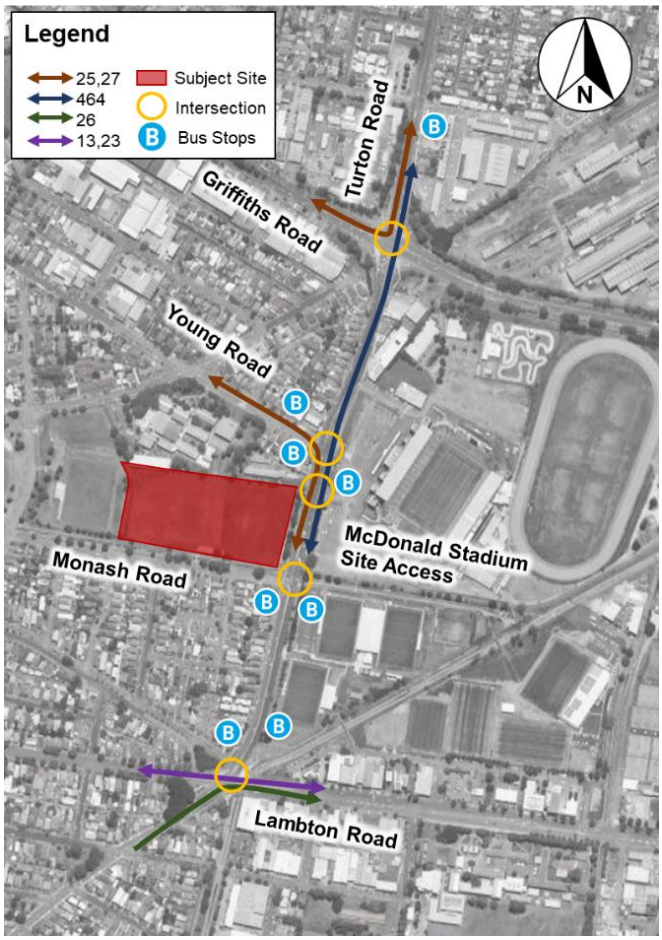
- Buses were treated as Heavy Vehicle and so the volumes for Heavy Vehicles were inclusive of the identified Buses for all scenarios. Exception applies for Turton Road / Lambton Road. Due to having bus queue jump lane at the intersection, buses were exclusively classified in terms of volume and vehicle class
- For Turton Road / Lambton Road, buses are configured to pass through the bus queue jump lane in every cycle of the model.

The classified bus movement for Weekday AM, PM and Weekend peak at Turton Road / Lambton Road are provided in Table 3.1.

Table 3.1: Bus Services and Volumes (AM Peak)

West Approach (Weekday: AM Peak)	
Service/Route No.	**Number of Services (Through)**
13	4
23	2
761	1
830	1
832	1
833	1
Total	**10**
West Approach (Weekday: PM Peak)	
13	4
23	3
Total	**7**
West Approach (Weekend Peak)	
13	2
23	1
Total	**3**

The bus movements along with adjacent stops at the subject intersections have been depicted in Figure 3.1.



Adapted from TfNSW Bus Routes

Figure 3.1: Bus Services at the Subject Intersections

The classified bus movement routes for Weekday AM, PM and Weekend peak at Turton Road / Lambton Road bus lane is showed in Figure 3.2.

Adapted from SIX Maps

Figure 3.2: Eastbound Bus Services at Turton Road / Lambton Road / Bridges Road

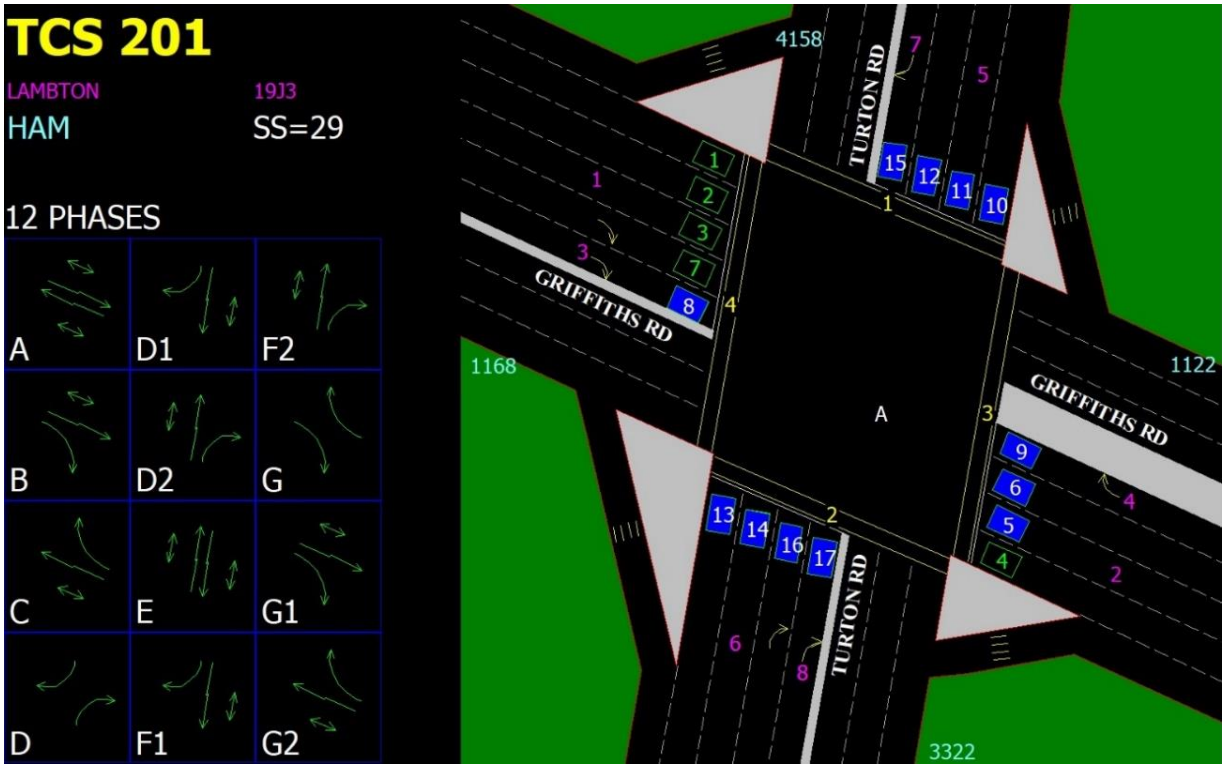
3.4 SCATS Data

For the three signalised intersections, SCATS data were acquired from Transport for New South Wales (TfNSW) for the same survey days (Weekday: Thursday 4th April and Weekend: Saturday 6th April) as the Intersection Counts survey. The phase time data was analysed for every 15 minutes of the peak hour to determine the phase sequences, average phases and cycle times for each peak period of the different days for the following intersections:

- Turton Road / Griffiths Road - TCS 201
- Turton Road / Young Road - TCS 3322
- Turton Road / Lambton Road / Bridges Road - TCS 350.

In addition, LX file was also acquired for the relevant region (HAM = Hamilton) to check the signal coordination direction between the signalised intersections.

The provided TCS graphics and all the phases for the above mentioned intersections are shown in , Figure 3.4 and Figure 3.5 respectively.

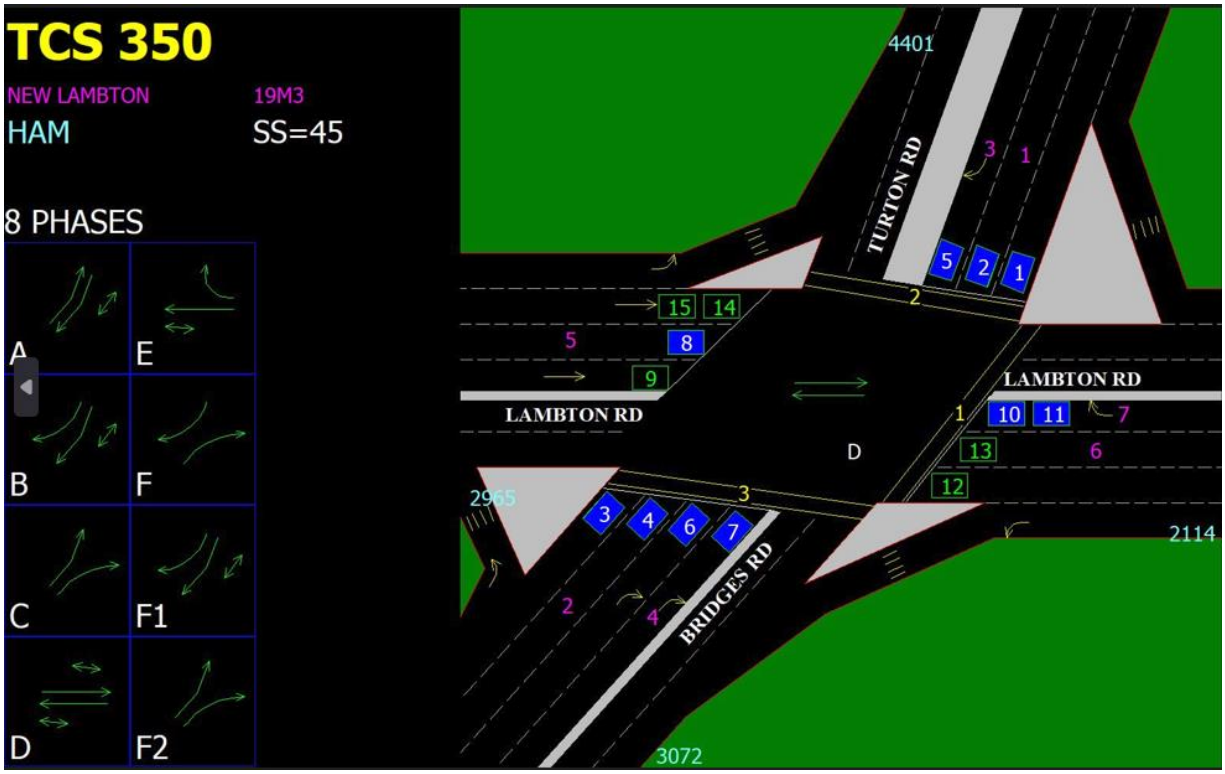


Adapted from TfNSW

Figure 3.3: Turton Road / Griffiths Road - TCS 201 Signal Phasing

Adapted from TfNSW

Figure 3.4: Turton Road / Young Road - TCS 3322 Signal Phasing



Adapted from TfNSW

Figure 3.5: Turton Road / Lambton Road / Bridges Road - TCS 350 Signal Phasing

3.5 Calibration and Validation

Initially, the 95th percentile back of queue lengths were recorded from the video footage of traffic surveys of Thursday 4th April and Friday 6th April for each approach. Due to limitation of the camera coverage and quality of the videos, the back of queue lengths were estimated based on logical judgement and visual queueing where required.

A detailed comparison between modelled queues and observed queues for the critical (signalised) intersections is summarised in Table 3.2.

Table 3.2: Weekday Peaks Comparison of Back of Queue Lengths

Approach	Turns	AM Peak			PM Peak		
		Observed (Length)	Modelled (Length)	Difference (Length)	Observed (Length)	Modelled (Length)	Difference (Length)
Turton Road / Griffiths Road							
Turton Road (N)	T	90	87	3	126	136	10
	R	NA	47	NA	NA	55	NA
Griffiths Road (E)	T	96	115	19	114	115	1
	R	42	27	15	24	45	21
Turton Road (S)	T	NA	156	NA	NA	435	NA
	R	66	85	19	132	149	17
Griffiths Road (W)	T	126	138	12	138	171	33
	R	78	66	12	108	82	-26
Turton Road / Young Road							
Turton Road (N)	T	48	45	3	120	160	40
	R	18	15	3	18	23	5
Turton Road (S)	L/T	66	85	19	66	46	20
Young Road (W)	L	NA	26	NA	NA	54	NA
	R	NA	77	NA	NA	142	NA
Turton Road / Lambton Road / Bridges Road							
Turton Road (N)	T	126	137	11	150	126	24
	R	48	63	15	48	61	13
Lambton Road (E)	T	66	91	25	60	92	32
	R	NA	362	NA	NA	49	NA
Bridges Road (S)	T	NA	199	NA	NA	683	NA
	R	NA	55	NA	NA	467	NA
Lambton Road (W)	T	NA	135	NA	NA	102	NA

A detailed comparison between modelled queues and observed queues for the critical (signalised) intersections for Weekend peak is summarised in Table 3.3.

Table 3.3: Weekend Peak Comparison of Back of Queue Lengths

Approach	Turns	Weekend Peak		
		Observed (veh)	Modelled (veh)	Difference (veh)
Turton Road / Bridges Road				
Turton Road (N)	T	84	104	20
	R	NA	43	NA
Griffiths Road (E)	T	114	122	8
	R	30	39	9
Turton Road (S)	T	NA	90	NA
	R	36	50	14
Griffiths Road (W)	T	108	102	6
	R	90	87	4
Turton Road / Young Road				
Turton Road (N)	T	126	114	12
	R	12	11	1
Turton Road (S)	L/T	72	70	2
Young Road (W)	L	NA	34	NA
	R	NA	46	NA
Turton Road / Lambton Road / Bridges Road				
Turton Road (N)	T	138	157	19
	R	42	49	7
Lambton Road (E)	T	54	63	9
	R	NA	65	NA
Bridges Road (S)	T	NA	130	NA
	R	NA	70	NA
Lambton Road (W)	T	NA	72	NA

In some of the instances in different scenarios, the modelled queue lengths or their differences (highlighted in red or marked as NA) did not meet the acceptable range of queue. Following section investigates this unacceptable queue lengths:

Turton Road / Griffiths Road

- **Turton Road North RT:** Queue in right turn cannot be verified due to camera coverage limitations
- **Turton Road South:** Queue in through turn cannot be verified due to limitations of camera set-up
- **Griffiths Road West:** Through turn in PM does not meet the range for queue length but it does satisfy the modelled number of vehicle and so the length could be unsatisfactory due to variable queue length as the range considers vehicles of only 6m. Right turn on the other hand, is unacceptable only 1m of queue length which is negligible and can be deemed to be acceptable.

Turton Road / Young Road

- **Young Road West:** The queues could not be verified due to camera setup angle camera set-up.

Turton Road / Lambton Road / Bridges Road

- **Lambton Road East:** The right turn queues could not be verified due to camera setup angle camera set-up.

- **Bridges Road South:** Queue in through and right turn cannot be verified due to limitations of camera set-up
- **Lambton Road West:** Queues cannot be observed entirely from the camera

To further satisfy the validation requirements, the following parameters were adjusted in SIDRA:

- Shifting allocated times in given phase times of SCATS
- Change in signal coordination using LX data
- Change in default Area Type Factor.

A detailed comparison of the acceptable range of Queue Lengths between observation and model has been tabulated in **Attachment D.**

3.6 Modelling Results

The modelled performance of the Base Case intersections in the AM and PM peaks are provided in Table 3.4, Table 3.5 and Table 3.6.

Table 3.4: Base Case Weekday AM Intersection Performance

Approach	Weekday: AM Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
Turton Road / Griffiths Road				
North	0.62	44.0	D	86.6
East	0.66	38.6	C	115.3
South	0.94	51.9	D	155.5
West	0.59	29.3	C	137.8
Turton Road / Young Road				
North	0.27	6.5	A	44.6
South	0.55	6.1	A	84.9
West	0.59	54.8	D	77.1
Turton Road / Lambton Road / Bridges Road				
North-east	0.88	36.9	C	137.1
East	1.70	207.1	F	361.6
South-west	0.86	26.7	B	198.5
West	0.85	56.7	E	135.3
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit				
North	0.22	0.8	NA	4.7
East	1	913.3	F	29.3
South	0.39	0.1	NA	0
West	1.07	110.2	F	30.8

Table 3.5: Base Case Weekday PM Intersection Performance

Approach	Weekday: PM Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
Turton Road / Griffiths Road				
North	0.58	51.5	D	136.2
East	0.48	39.0	C	114.9
South	1.22	196.0	F	434.7
West	0.64	38.5	C	170.6
Turton Road / Young Road				
North	0.43	11.3	A	160.1
South	0.55	2.5	A	45.7
West	0.92	100.3	F	141.6
Turton Road / Lambton Road / Bridges Road				
North-east	0.73	19.2	B	126.4
East	0.37	24.9	B	92.3
South-west	1.79	809.1	F	467.3
West	0.44	30.8	C	102.3
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit				
North	0.34	1.0	NA	7.9
East	1	760.7	F	26.6
South	0.43	0.2	NA	0
West	1.63	589.1	F	219.5

Table 3.6: Base Case Weekend Intersection Performance

Approach	Weekend Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
Turton Road / Griffiths Road				
North	0.61	44.1	D	104
East	0.73	40.5	C	121.5
South	0.70	36.6	C	90.3
West	0.57	34.8	C	102.1
Turton Road / Young Road				
North	0.33	8.9	A	114.4
South	0.35	6.0	A	69.7
West	0.45	56.2	D	45.7
Turton Road / Lambton Road / Bridges Road				

Approach	Weekend Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
North-east	0.72	23.7	B	156.6
East	0.57	27.6	B	65.3
South-west	0.85	34.9	C	129.8
West	0.35	39.0	C	72.2
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit				
North	0.26	0.3	NA	2.4
East	1.0	842.3	F	25.8
South	0.29	0.1	NA	0
West	1.07	102.9	F	31.8

Detailed SIDRA results are supplemented in **Attachment B.**

4. Project Case Development

4.1 Site Access

There are two main ways to access the site:

- **From North:** Vehicles proceed to the south on Turton Road and then turn right at Young Road. Drivers would have to turn right and loop around until they get onto Turton Road again via Monash Road, before making a final left turn to the site access from Turton Road
- **From South:** Vehicles can drive up north along Turton Road and then turn left to access the site entrance.

For traffic travelling from west, they can just travel from Monash Road or Lambton Road to access the site.

The travel paths to access the site for both northbound and southbound vehicles are illustrated in Figure 4.1.

Figure 4.1: Travel Paths to Site Access

4.2 Development Traffic Generation and Distribution

For modelling the Project Case, development traffic was added on top of the Base Case existing traffic volumes. This additional demand is considered to make trips in and out of the proposed development.

The forecast trip generation from the development traffic were distributed as per the Report: *P2614 Newcastle Indoor Sports Centre Traffic Generation and Assignment by* SECAsolution for Weekday and Weekend. The forecast trip distribution from the traffic report was utilized to form the final volumes of Project Case in addition to the existing surveys.

The Total inbound and outbound trips are summarised in Table 4.1.

Table 4.1: Inbound and Outbound Trips

	Scenarios		
Trips	**Weekday: AM Peak**	**Weekday: PM Peak**	**Weekend Peak**
Inbound	42	202	120
Outbound	18	215	120
Total	**60**	**417**	**240**

4.2.1 Trip Distribution Diagrams

The traffic flow distribution diagram of the Development as well as Project Traffic (Base Traffic + Development Traffic) are illustrated in **Attachment A.**

4.3 Modelling Results

The modelled performance of the Project Case in AM and PM peaks are enlisted in Table 4.2 and Table 4.3.

Table 4.2: Project Case Weekday AM Intersection Performance

Approach	Weekday: AM Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
Turton Road / Griffiths Road				
North	0.62	44.0	D	87.5
East	0.66	38.6	C	115.3
South	0.96	53.6	D	157.2
West	0.59	29.3	C	137.8
Turton Road / Young Road				
North	0.31	6.7	A	44.6
South	0.56	6.1	A	87.3
West	0.59	54.8	D	77.1
Turton Road / Lambton Road / Bridges Road				
North-east	0.88	36.9	C	137.1
East	1.75	225.5	F	385.4
South-west	0.81	46.0	D	55.1
West	0.85	56.0	D	135.3
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit				

Approach	Weekday: AM Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
North	0.23	0.9	NA	5
East	1.0	892.8	F	29
South	0.39	0.1	NA	0
West	1.10	122.9	F	39.5

Table 4.3: Project Case Weekday PM Intersection Performance

Approach	Weekday: PM Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
Turton Road / Griffiths Road				
North	0.60	52.2	D	141.4
East	0.48	38.9	C	114.9
South	1.30	262.4	F	493.6
West	0.64	38.6	C	170.6
Turton Road / Young Road				
North	0.76	18.2	B	147.3
South	0.62	2.5	A	60.9
West	0.92	90.0	F	141.6
Turton Road / Lambton Road / Bridges Road				
North-east	0.73	19.2	B	126.4
East	0.46	25.4	B	92.3
South-west	1.79	493.9	F	755.9
West	0.44	30.3	C	102.3
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit				
North	0.23	0.9	NA	5
East	1.00	892.8	F	29
South	0.39	0.1	NA	0
West	1.10	122.9	F	39.5

The modelled performance of the Project Case Weekend peak is presented in Table 4.4.

Table 4.4: Project Case Weekend Intersection Performance

Approach	Weekend Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
Turton Road / Griffiths Road				
North	0.62	44.6	D	106.3
East	0.73	40.4	C	121.5
South	0.84	37.9	C	93.4
West	0.58	34.9	C	102.1
Turton Road / Young Road				
North	0.39	9.1	A	118.6
South	0.39	6.6	A	82.4
West	0.45	56.3	D	45.7
Turton Road / Lambton Road / Bridges Road				
North-east	0.72	23.7	B	156.6
East	0.63	28.1	B	74.2
South-west	0.85	35.6	C	138
West	0.35	37.5	C	72.2
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit				
North	0.26	0.4	NA	2.7
East	1.00	911.2	F	29.2
South	0.32	0.1	NA	0
West	1.12	137.4	F	59.4

Detailed SIDRA intersection results are supplemented in **Attachment C.**

4.4 Base Case vs Project Case Performance

Comparison of the intersections performance results is illustrated in Table 4.5. The majority of the intersections performance results show either improvements or negligible additional delay times at some approaches. The only anomalies are observed at Newcastle Hockey Centre Northern Exit approach's movements. This approach has no vehicle recorded for any turns as per the 2024 peak hour surveys for Weekday or Weekend. However, due to SIDRA software's limitations of being unable to model with zero vehicle volume for a specific approach, the technical assumption of one vehicle each turn for that very approach has been made in the model. Thus, the delay issue of crossing five lanes of Turton Road for the through movement or turning left or right onto Turton Road is observed in the Base Case and has only deteriorated in the Project Case. In contrast to the model, there is no demand in reality which leads to no delays. The modelled LoS for this approach, therefore, should not be interpreted as part of the intersection performance. This issue persists in the AM, PM and Weekend SIDRA models. No particular action would be required to address this delay as it is a very minor and unsafe movement for a priority-controlled driveway.

The other delay increase occurs at the intersection of Turton Road/Griffith Road during the PM peak. The delay increase is attributed to additional distributed traffic at Turton Road northbound right turn bay with

25 seconds additional delay during the PM peak. The performance comparison between Base Case and Project Case is provided in Table 4.5.

Table 4.5: Base Case vs Project Case SIDRA Results Comparison

Intersection	2024 Base					2024 Project					Average Delay Difference
	Traffic Volume (veh/h)	DoS (v/c)	Average Delay (s)	LoS	95th Percentile Queue (m)	Traffic Volume (veh/h)	DoS (v/c)	Average Delay (s)	LoS	95th Percentile Queue (m)	
AM Peak											**Project - Base**
Turton Road / Griffiths Road	4,869	0.94	39.8	LOS C	156	4,897	0.97	40.4	LOS C	157	0.6
Turton Road / Young Road	2,697	0.59	10.7	LOS A	85	2,726	0.59	10.7	LOS A	87	0.0
Turton Road / McDonald's Jones Stadium	2,675	1.79	896.8	LOS F	103	2,719	1.79	888.0	LOS F	103	-8.8
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit	2,676	1.07	1,885.7	LOS F	31	2,720	1.10	1,966.5	LOS F	40	80.8
Turton Road / Lambton Road / Bridges Road	4,234	1.70	72.0	LOS F	362	4,269	1.76	76.1	LOS F	385	4.1
PM Peak											
Turton Road / Griffiths Road	5,771	1.22	86.1	LOS F	435	6,045	1.30	110.7	LOS F	494	24.6
Turton Road / Young Road	3,528	0.92	16.2	LOS B	160	3,803	0.92	18.2	LOS B	147	2.0
Turton Road / McDonald's Jones Stadium	3,429	1.44	482.4	LOS F	209	3,642	1.44	482.4	LOS F	326	0.0
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit	3,451	1.63	2,201.8	LOS F	220	3,663	1.79	2,152.3	LOS F	360	-49.5
Turton Road / Lambton Road / Bridges Road	5,488	1.79	178.1	LOS F	683	5,644	1.79	186.1	LOS F	756	8.0
Weekend Peak											
Turton Road / Griffiths Road	4,780	0.73	38.4	LOS C	17	4,934	0.84	38.8	LOS C	122	0.4
Turton Road / Young Road	2,763	0.45	11.3	LOS A	16	2,917	0.45	11.4	LOS A	119	0.1
Turton Road / McDonald's Jones Stadium	2,664	1.28	454.2	LOS F	9	2,791	1.28	421.4	LOS F	66	-32.8
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit	2,704	1.07	1,597.0	LOS F	5	2,831	1.12	1,981.7	LOS F	59	384.7
Turton Road / Lambton Road / Bridges Road	4,123	0.85	29.6	LOS C	22	4,215	0.85	29.8	LOS C	157	0.2

5. Project Case Upgrade

Upgrades or signal optimisations have been introduced to resolve the limitations of accommodating the development traffic to improve the performances of the critical intersections as much as possible. It should be noted that proposed signal optimisations are expected to be implemented automatically by the SCATS system.

5.1 Development Traffic

The same traffic demand and distribution were applied as the Project Case.

5.2 Upgrade Measures

After analysing and comparing the intersection performances between the Base Case and the Project Case, it was observed that for most intersections, the impact upon additional development traffic would be negligible for which no particular upgrades would be required.

For Turton Road / Griffiths Road, the average delay denotes that the performance deteriorated in considerable amount at Turton Road right turn bay, which required necessary mitigation. This was resolved by optimising signal timing. No other geometric upgrades were adopted.

For some intersections, for instance Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit, the delay appears excessively high for SIDRA having at least one vehicle in the model where in reality there isn't any vehicle waiting and the single vehicle coded for the approach is due to SIDRA limitations.

The comparison of intersections performances is detailed in **Attachment E.**

5.3 Modelling Results

The modelled performance of the Project Case Upgrades/Signal Optimisation for Weekday PM peak are provided in Table 5.1. The AM signal coding was retained due to similar performance in the Base Case and the Project Case.

Table 5.1: Project Case Upgrades Weekday PM Intersection Performance

Approach	Weekday: PM Peak			
	DoS	Delay (s)	LoS	95% Back of Queue (m)
Turton Road / Griffiths Road				
North	0.46	40.3	C	116.2
East	0.81	38.5	C	112.6
South	1.05	126.9	F	324.2
West	0.71	59.2	E	86.4
Turton Road / Young Road				
North	0.76	18.2	B	147.3
South	0.62	2.5	A	60.9
West	0.92	90.0	F	141.6
Turton Road / Lambton Road / Bridges Road				
North-east	0.73	19.2	B	126.4
East	0.46	25.4	B	92.3
South-west	1.79	493.9	F	755.9
West	0.44	30.3	C	102.3
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit				
North	0.49	1.5	NA	11.2
East	1.0	743.7	F	26
South	0.47	0.2	NA	0
West	1.79	733.8	F	359.6

It is well understood that the modelling results, even with the upgrades, reflect the outputs of the 'Project Case' in most of the cases except for the boosted improvement in Delay and Queue (highlighted in green) at Turton Road / Griffiths Road intersection performance in Weekday PM peak. The weekend results in the project case would remain unchanged due to similarity of intersections performance in both scenarios and as explained for the AM peak.

Detailed SIDRA intersection results are supplemented in **Attachment B.**

6. Conclusion

Findings of the modelling are summarised below:

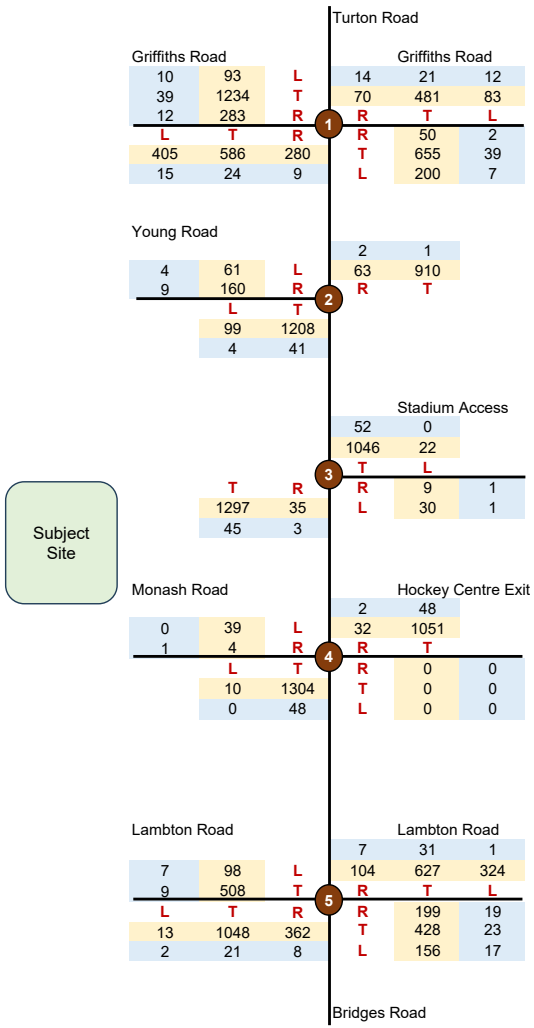
- SCATS traffic lights optimisation is mainly required for Turton Road / Griffiths Road due to the development traffic assigned to the northbound right turn lane at this intersection causing extra 24.6 seconds of delay at this approach
- No geometrical upgrades are seemingly required across any of the intersections due to the development
- Pedestrian movements are quite nominal/insignificant and hence unlikely to impact any of the signalised intersection phase times in a larger scale.

Upon undertaking SIDRA analysis, it can be confirmed that no to minor extra delays would be expected across most surrounding intersections after construction of the proposed Hunter Basketball Stadium.

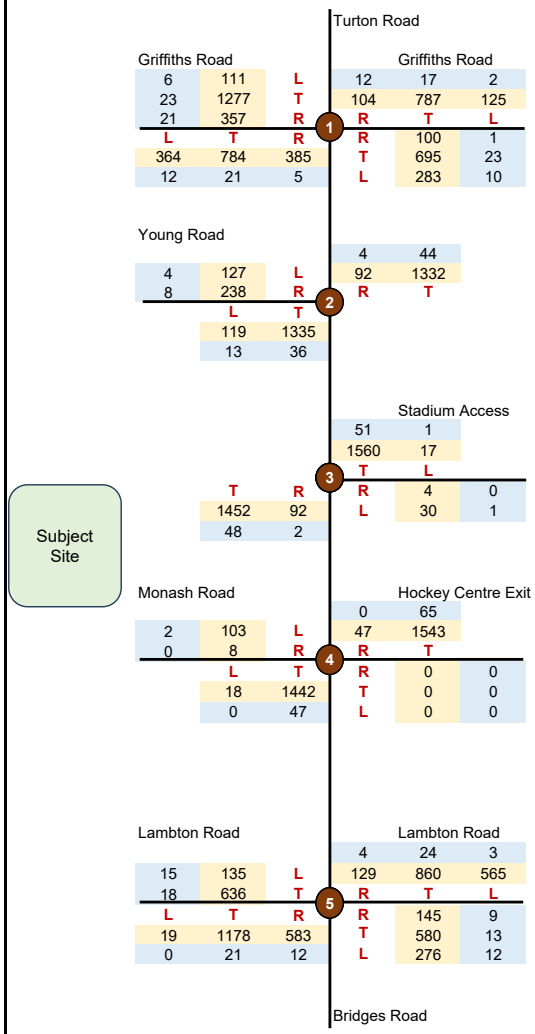
Attachment A: Traffic Flow Diagrams & Trip Generation

EXISTING TRAFFIC VOLUMES | TRAFFIC SURVEY DATA 2024

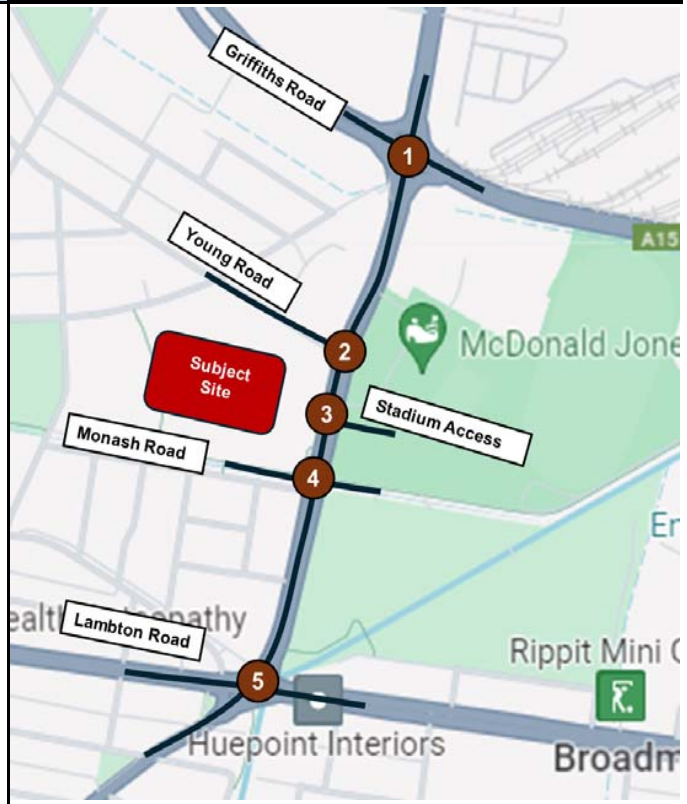
AM Peak 08:00-09:00



PM Peak 16:45-17:45



Locality Plan



Details

Date of Surveys:	Thu 4/04/2024
AM Peak:	8:00-9:00am
PM Peak:	4:45-5:45pm
Base Year:	2024

Document Control

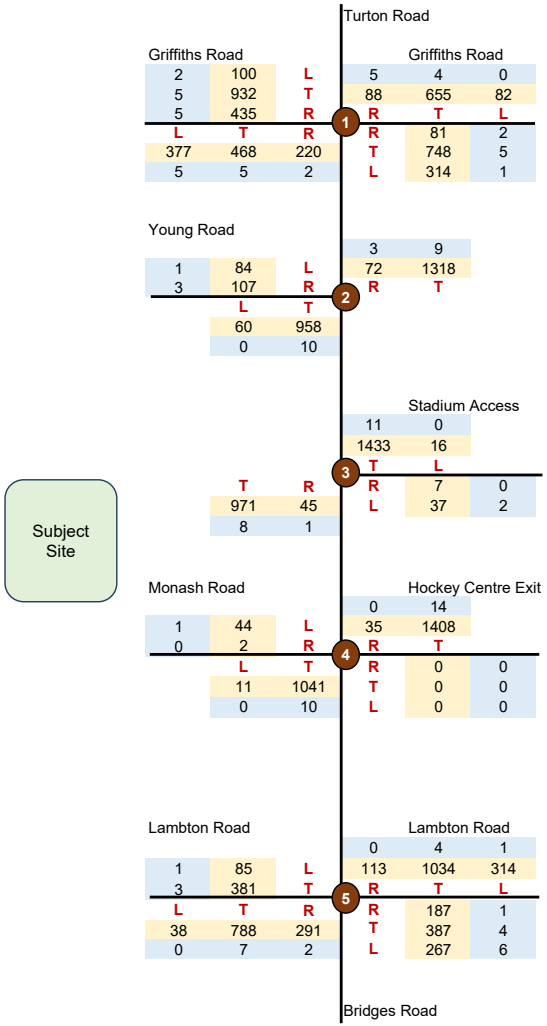
Job Number:	P6458	Job Name:	Newcastle Indoor Sports Facility TIA Modelling
Prepared By:	Tahmim Islam		
Reviewed By:	Alex Grey		

Legend

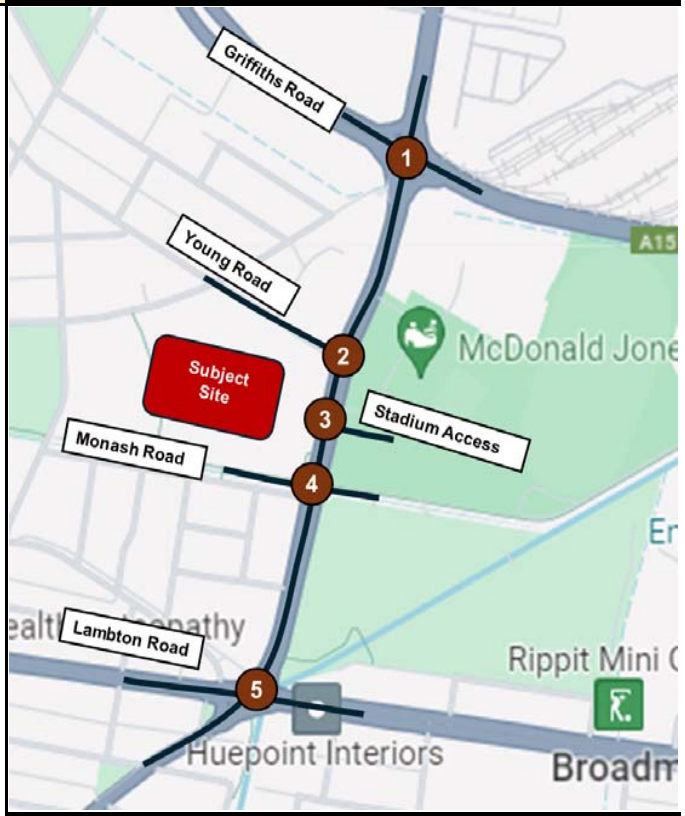
XX	Light Vehicle (LV) Volumes	L	Left Turn Movement
XX	Heavy Vehicle (HV) Volumes	T	Through Turn Movement
X	Intersection ID	R	Right Turn Movement

EXISTING TRAFFIC VOLUMES | TRAFFIC SURVEY DATA 2024

Weekend Peak 11:15-12:15



Locality Plan



Details

Date of Surveys:	Sat 6/04/2024
Weekend Peak:	11:15am-12:15pm
Base Year:	2024

Document Control

Job Number:	P6458	Job Name:	Newcastle Indoor Sports Facility TIA Modelling
Prepared By:	Tahmim Islam		
Reviewed By:	Alex Grey		

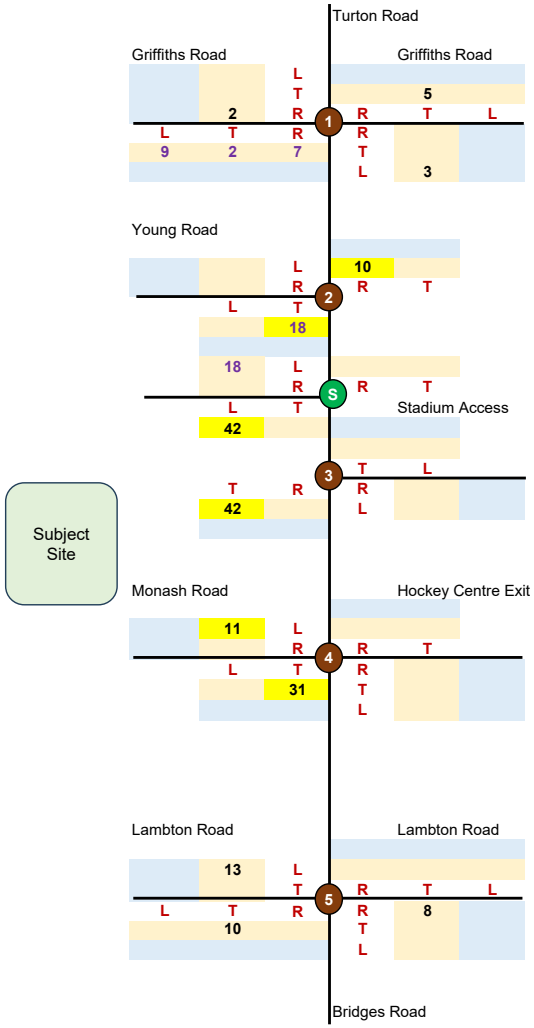
Legend

XX	Light Vehicle (LV) Volumes	L	Left Turn Movement
XX	Heavy Vehicle (HV) Volumes	T	Through Turn Movement
X	Intersection ID	R	Right Turn Movement

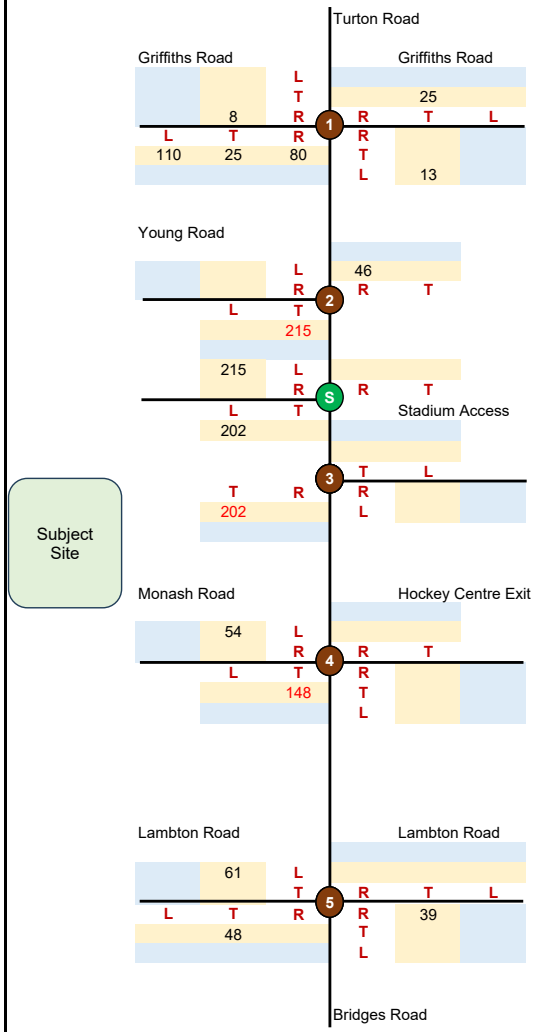
DEVELOPMENT TRAFFIC VOLUMES | TRAFFIC SURVEY DATA 2024

AM Peak 08:00-09:00

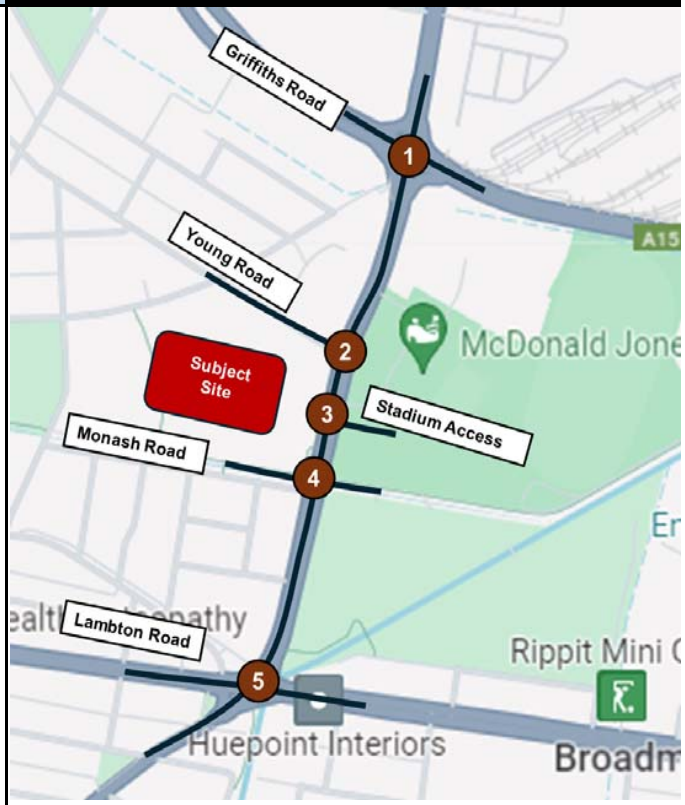
Inbound 42
Outboun 18



PM Peak 16:45-17:45



Locality Plan



Details

Date of Surveys:	Thu 4/04/2024
AM Peak:	8:00-9:00am
PM Peak:	4:45-5:45pm
Base Year:	2024

Document Control

Job Number:	P6458	Job Name:	Newcastle Indoor Sports Facility TIA Modelling
Prepared By:	Tahmim Islam		
Reviewed By:	Alex Grey		

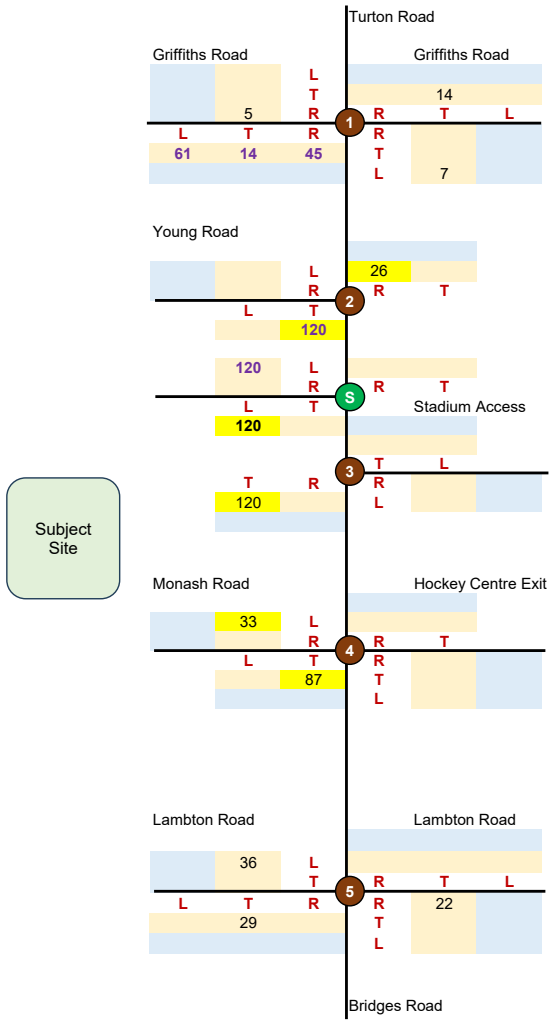
Legend

XX	Light Vehicle (LV) Volumes	L	Left Turn Movement
XX	Heavy Vehicle (HV) Volumes	T	Through Turn Movement
X	Intersection ID	R	Right Turn Movement

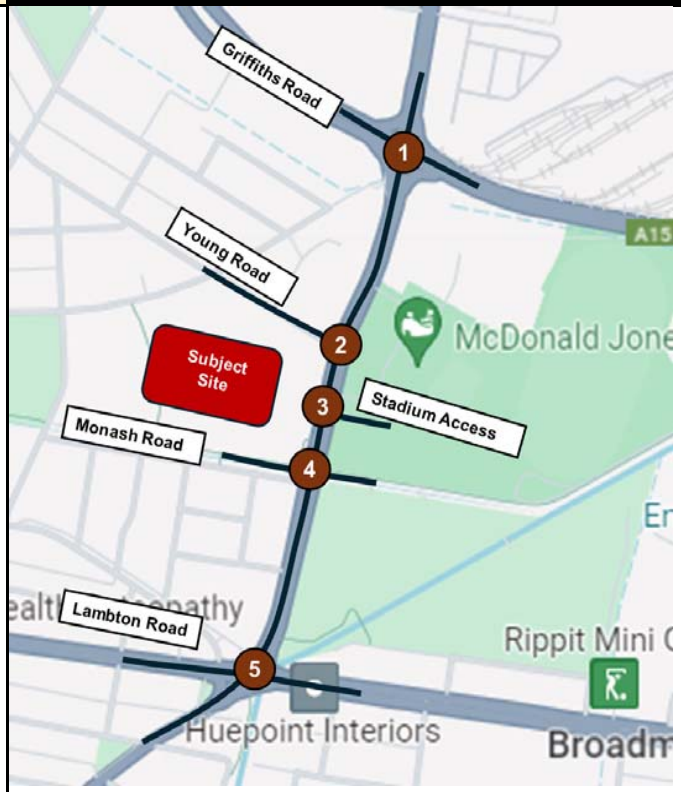
DEVELOPMENT TRAFFIC VOLUMES | TRAFFIC SURVEY DATA 2024

Weekend Peak 11:15-12:15

Inbound	120
Outbound	120



Locality Plan



Details

Date of Surveys:	Sat 6/04/2024
Weekend Peak:	11:15am-12:15pm
Base Year:	2024

Document Control

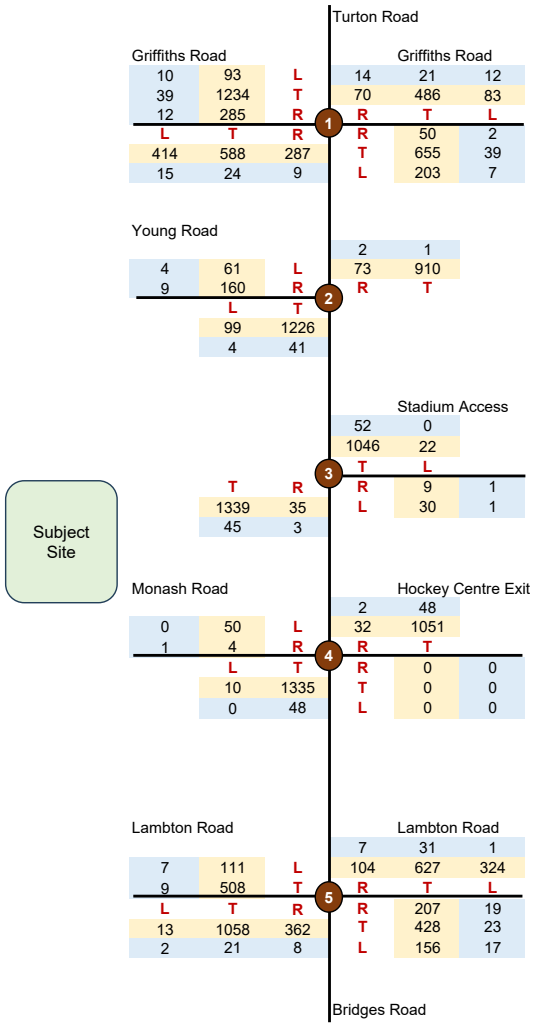
Job Number:	P6458	Job Name:	Newcastle Indoor Sports Facility TIA Modelling
Prepared By:	Tahmim Islam		
Reviewed By:	Alex Grey		

Legend

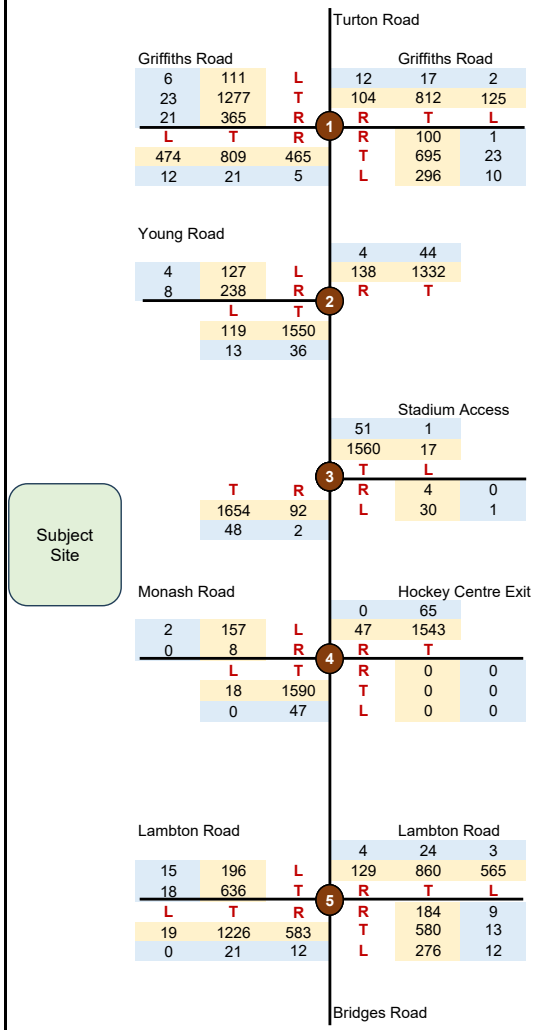
XX	Light Vehicle (LV) Volumes	L	Left Turn Movement
XX	Heavy Vehicle (HV) Volumes	T	Through Turn Movement
X	Intersection ID	R	Right Turn Movement

PROJECT TRAFFIC VOLUMES | TRAFFIC SURVEY DATA 2024

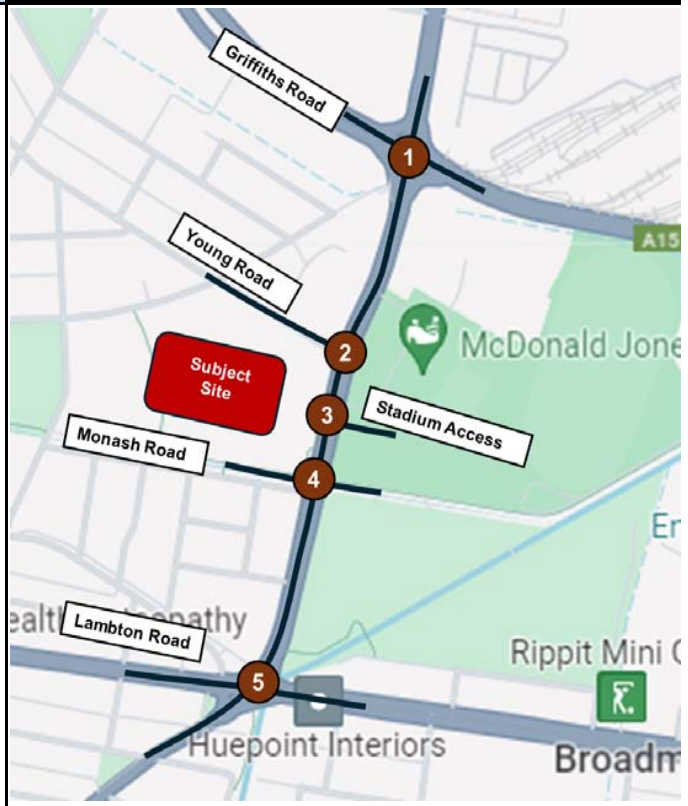
AM Peak 08:00-09:00



PM Peak 16:45-17:45



Locality Plan



Details

Date of Surveys:	Thu 4/04/2024
AM Peak:	8:00-9:00am
PM Peak:	4:45-5:45pm
Base Year:	2024

Document Control

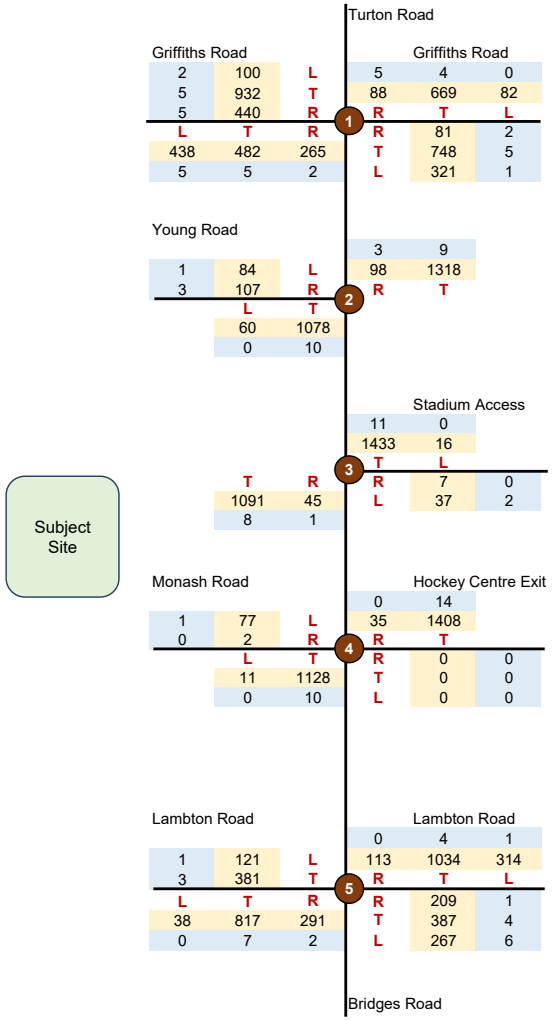
Job Number:	P6458	Job Name:	Newcastle Indoor Sports Facility TIA Modelling
Prepared By:	Tahmim Islam		
Reviewed By:	Alex Grey		

Legend

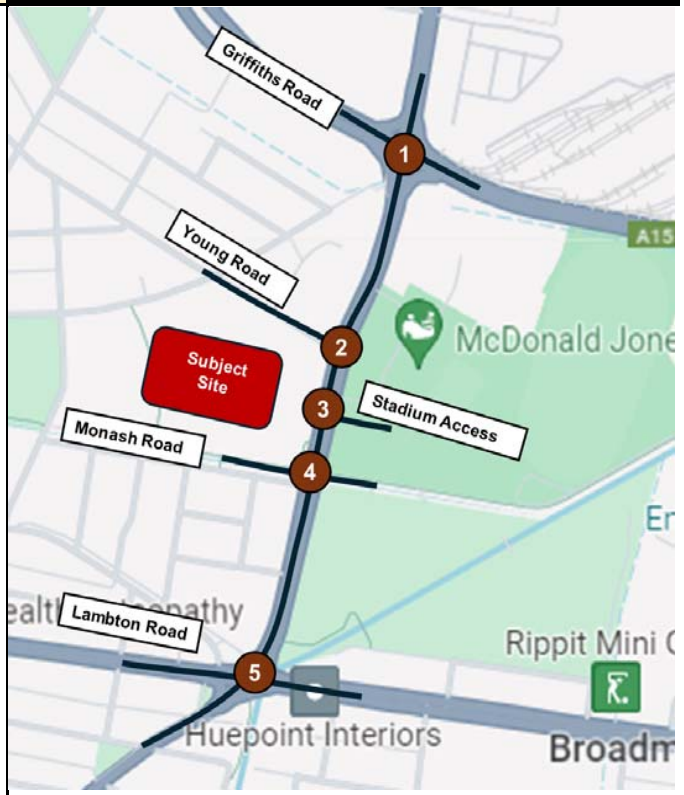
XX	Light Vehicle (LV) Volumes	L	Left Turn Movement
XX	Heavy Vehicle (HV) Volumes	T	Through Turn Movement
X	Intersection ID	R	Right Turn Movement

PROJECT TRAFFIC VOLUMES | TRAFFIC SURVEY DATA 2024

Weekend Peak 11:15-12:15



Locality Plan



Details

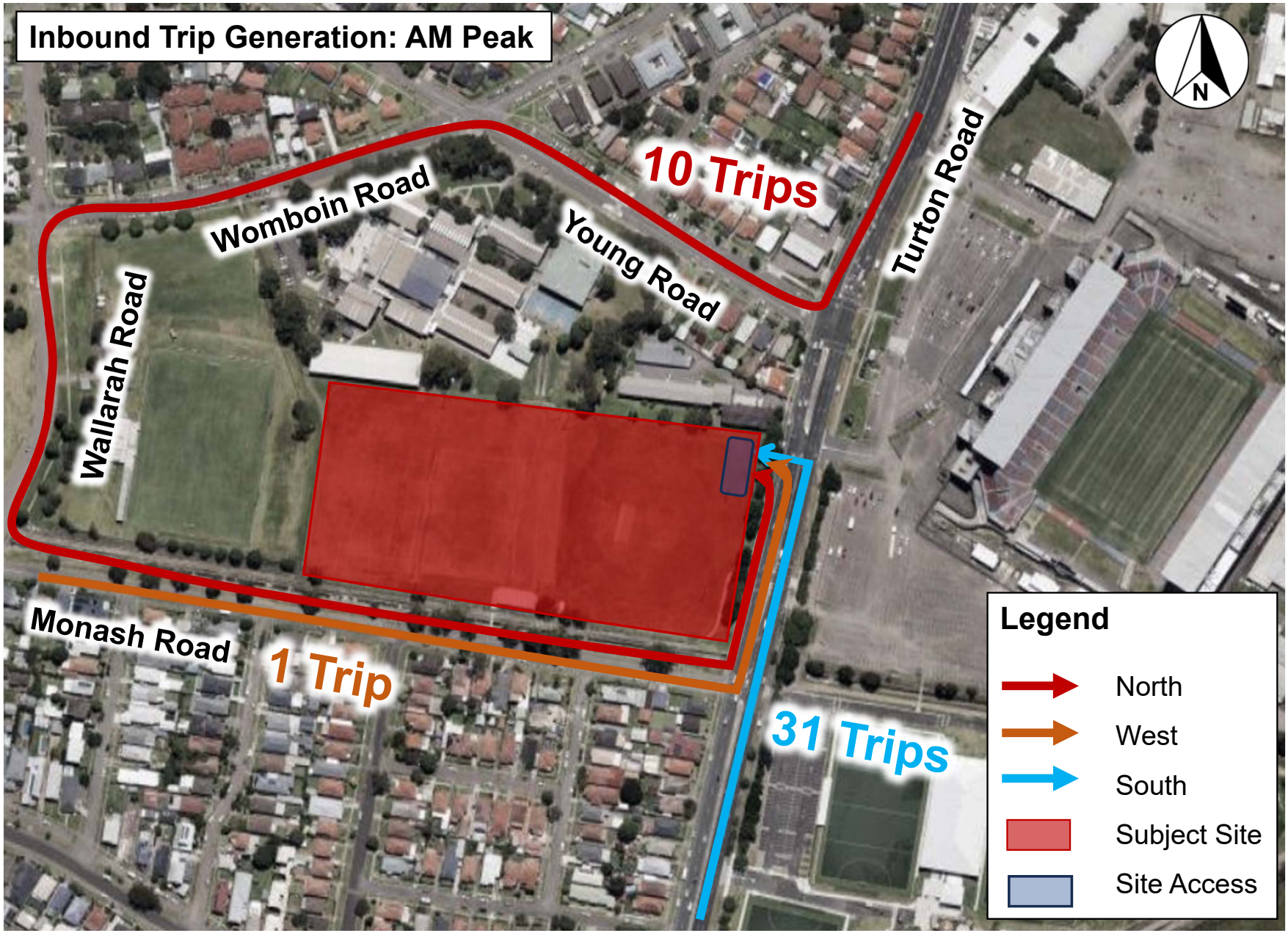
Date of Surveys:	Sat 6/04/2024
Weekend Peak:	11:15am-12:15pm
Base Year:	2024

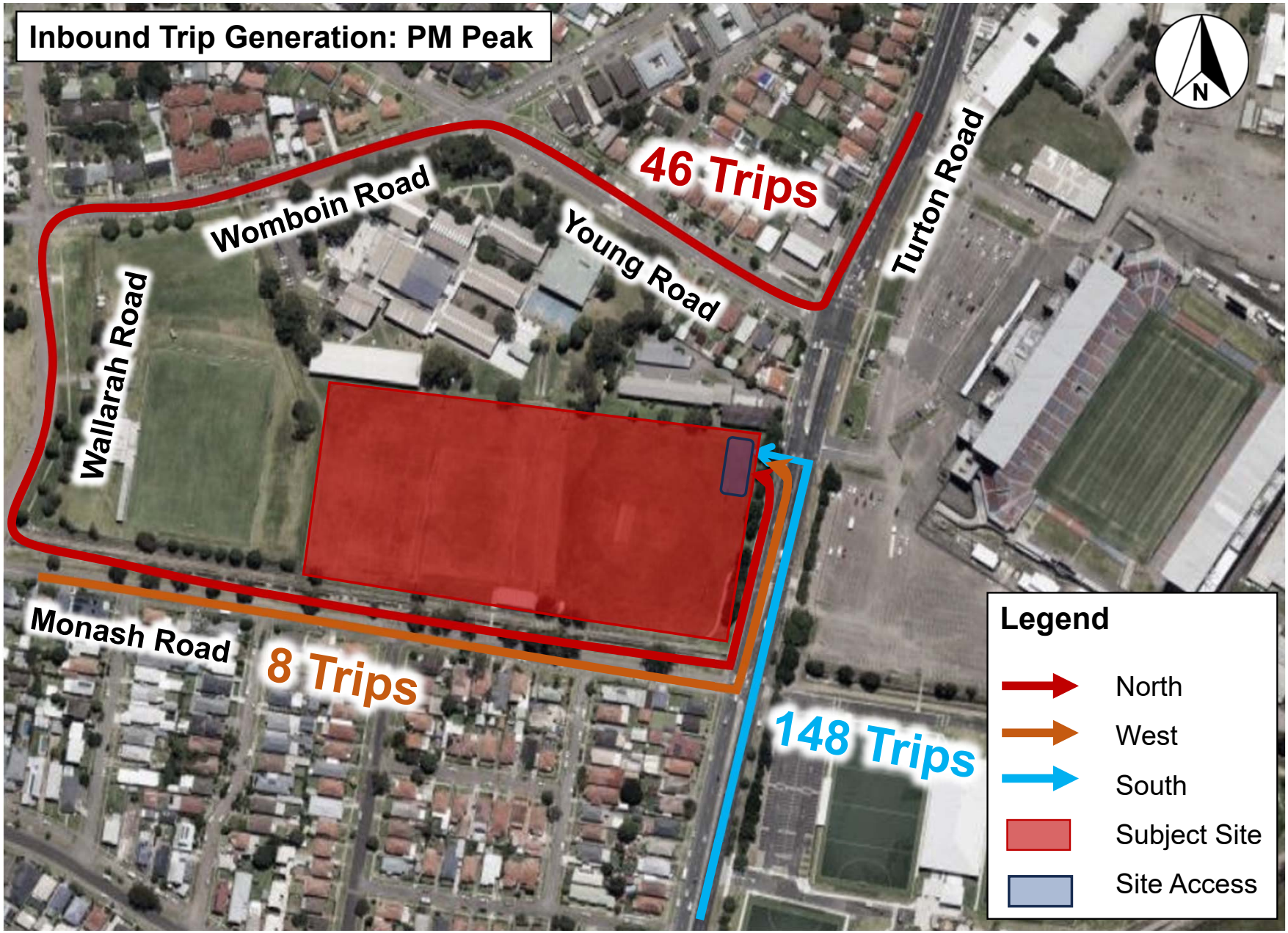
Document Control

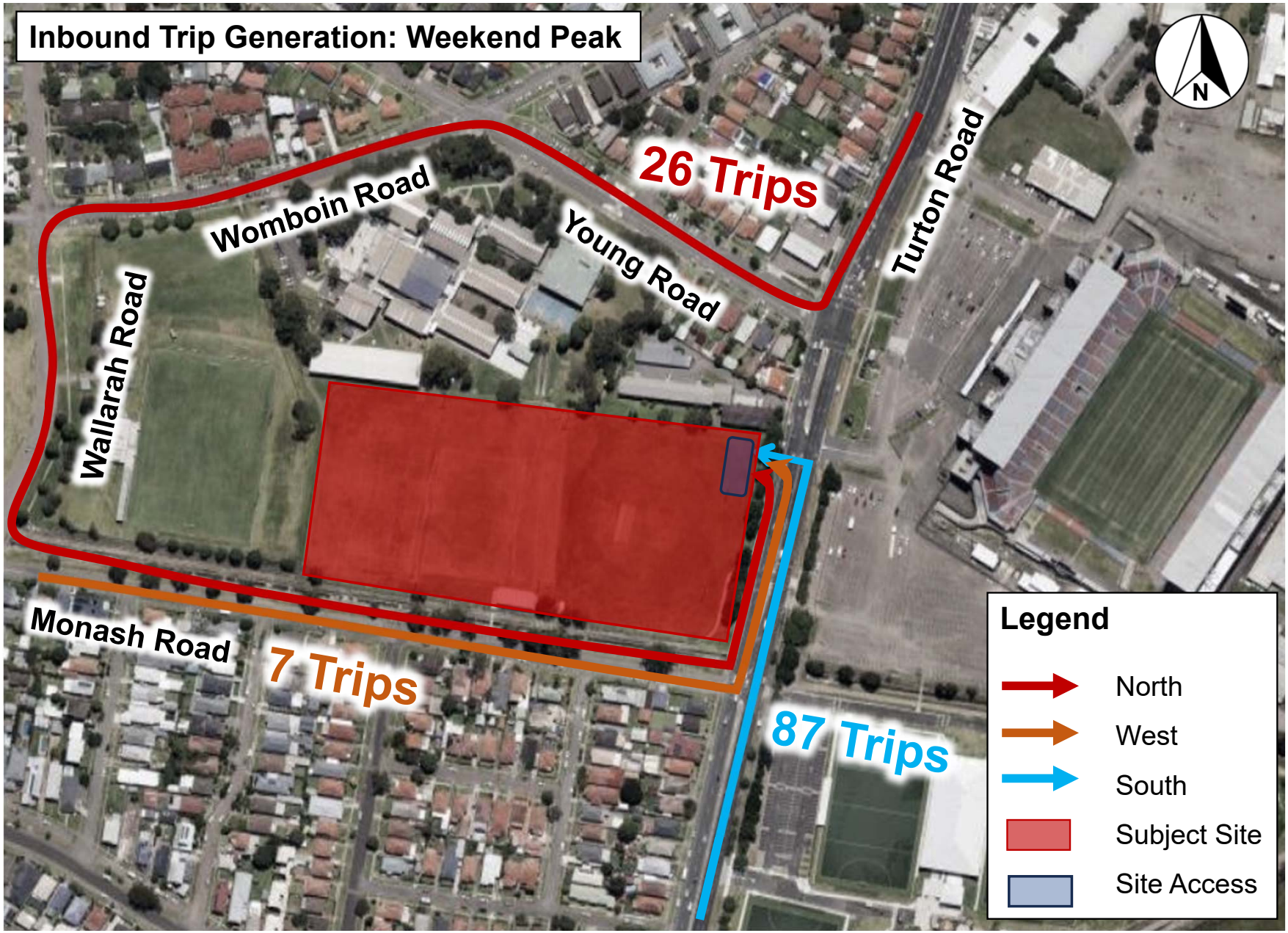
Job Number:	P6458	Job Name:	Newcastle Indoor Sports Facility TIA Modelling
Prepared By:	Tahmim Islam		
Reviewed By:	Alex Grey		

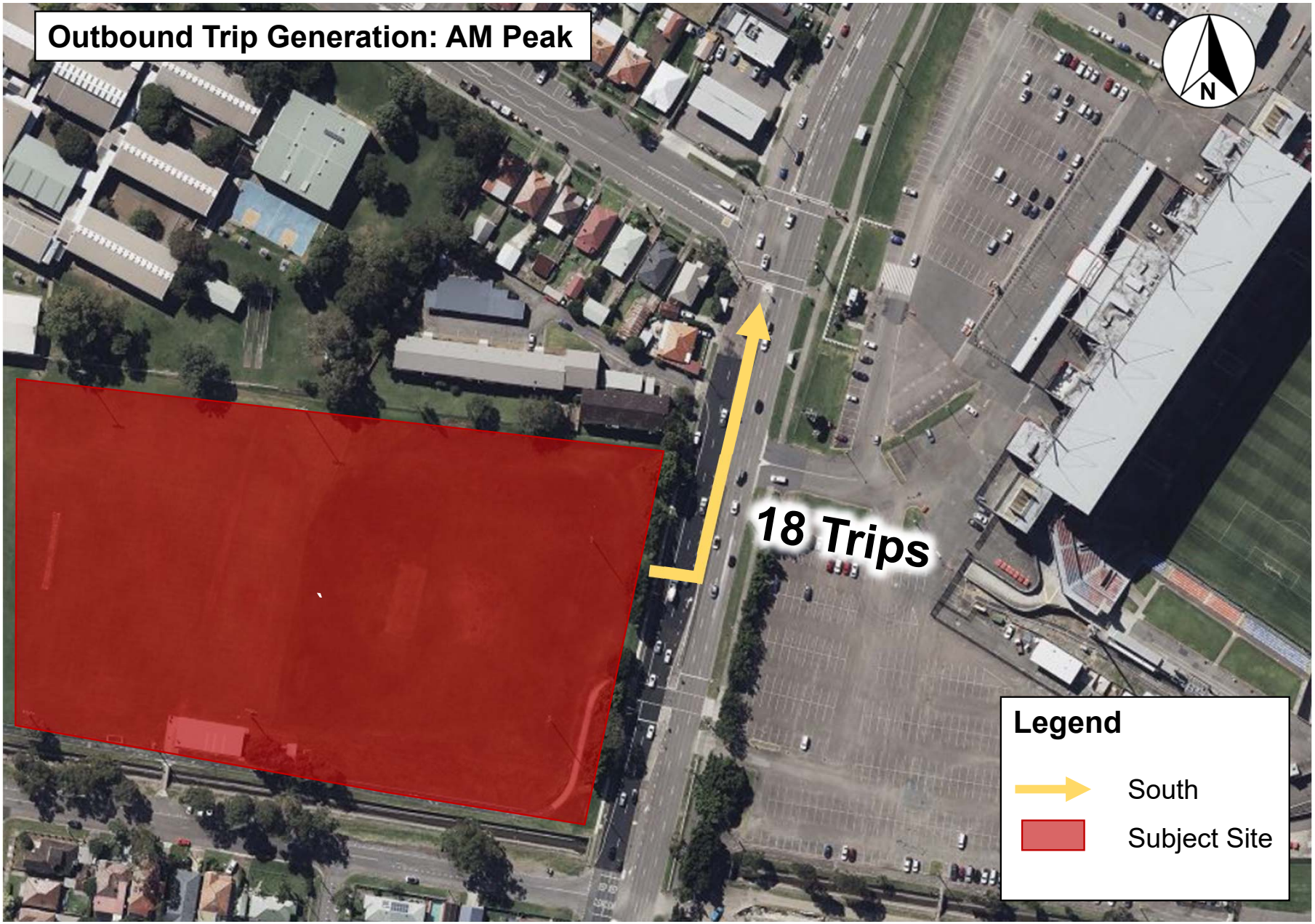
Legend

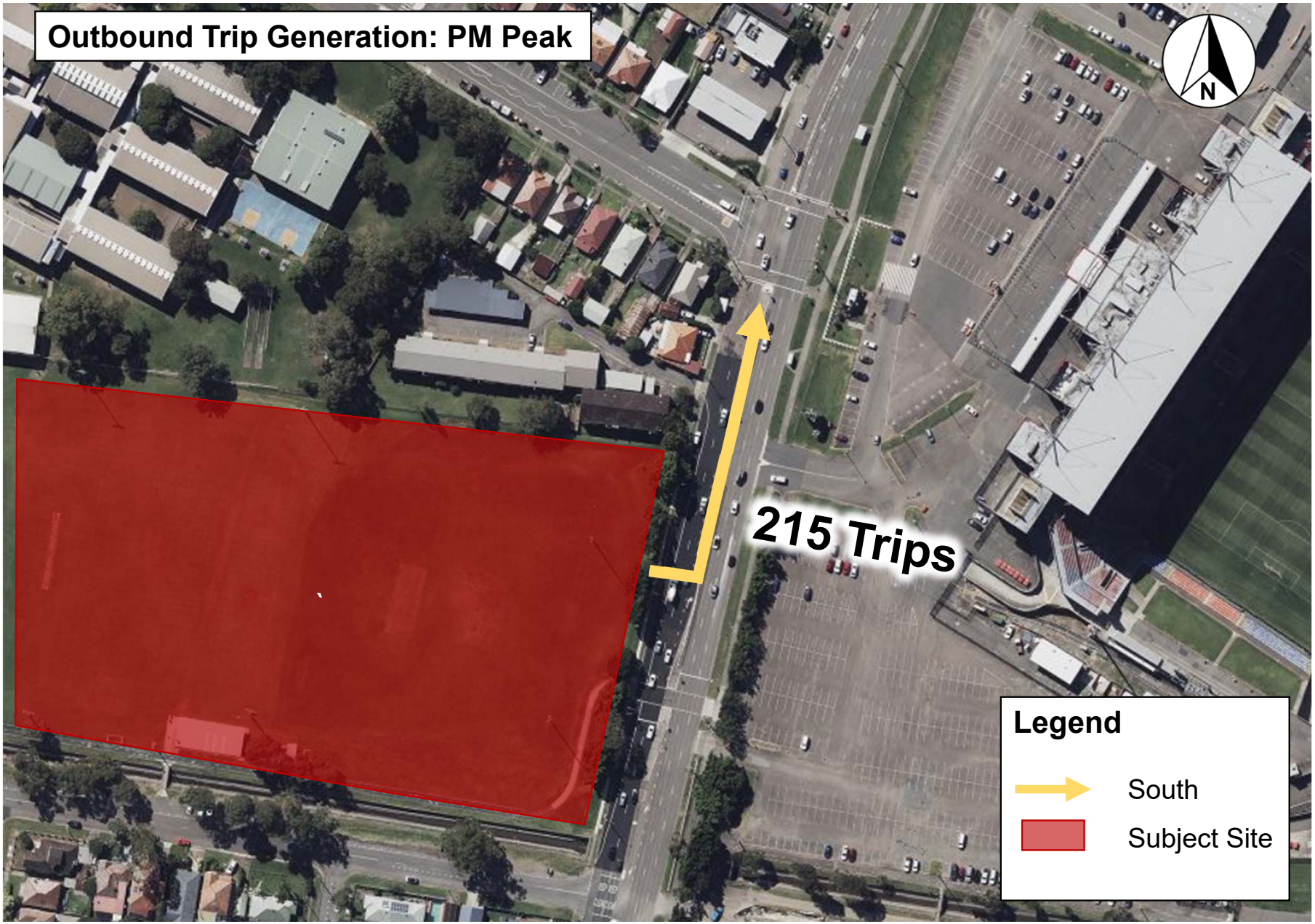
XX	Light Vehicle (LV) Volumes	L	Left Turn Movement
XX	Heavy Vehicle (HV) Volumes	T	Through Turn Movement
X	Intersection ID	R	Right Turn Movement

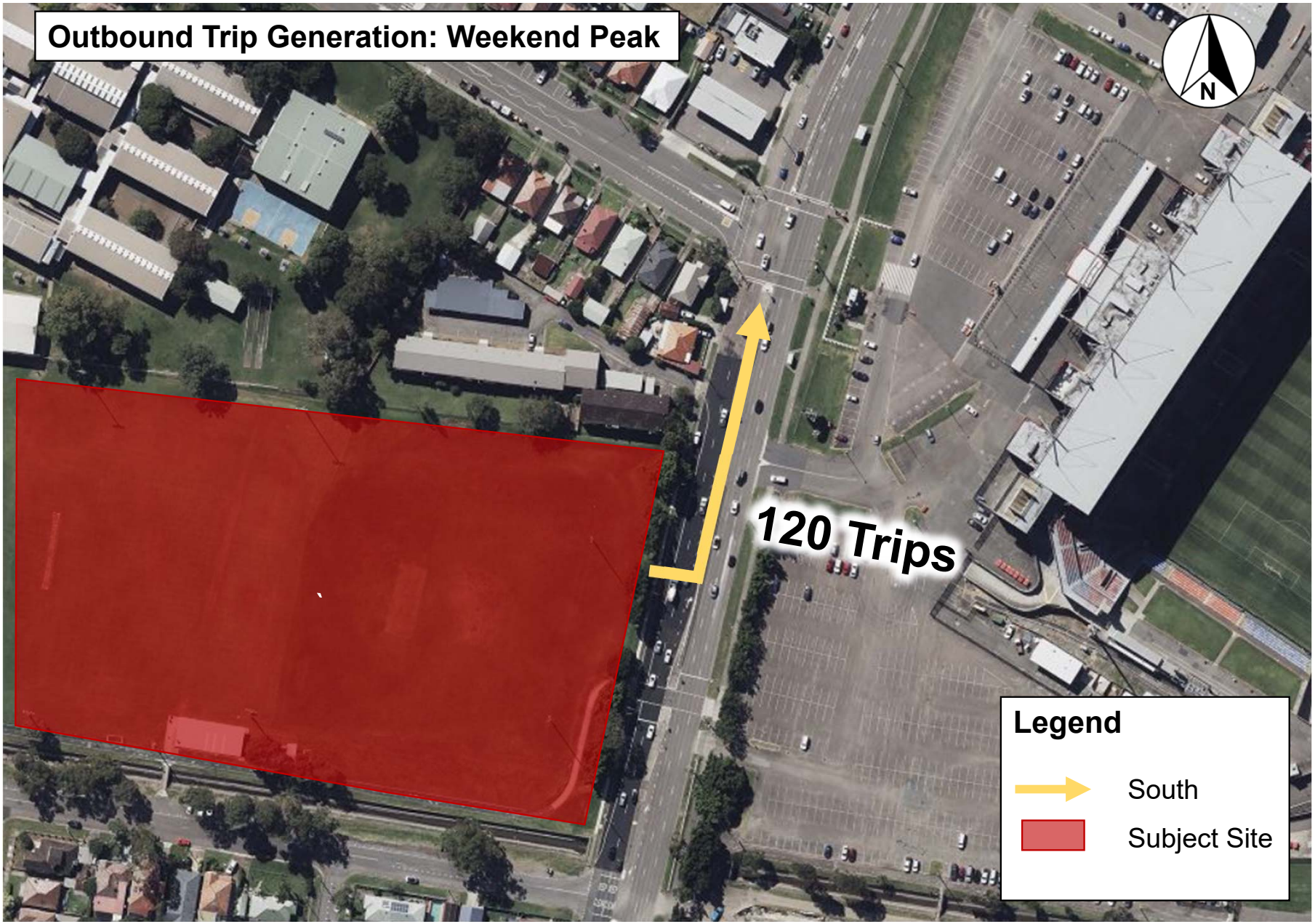

Inbound Trip Generation: AM Peak
N
10 Trips
Womboin Road
Young Road
Turton Road
Wallarah Road
Monash Road
1 Trip
31 Trips
Legend
North
West
South
Subject Site
Site Access


Inbound Trip Generation: PM Peak
N
46 Trips
Womboin Road
Young Road
Turton Road
Wallarah Road
Monash Road
8 Trips
148 Trips
Legend
North
West
South
Subject Site
Site Access


Inbound Trip Generation: Weekend Peak
N
26 Trips
Womboin Road
Young Road
Turton Road
Wallarah Road
Monash Road
7 Trips
87 Trips
Legend
North
West
South
Subject Site
Site Access


Outbound Trip Generation: AM Peak
N
18 Trips
Legend
South
Subject Site


Outbound Trip Generation: PM Peak
N
215 Trips
Legend
South
Subject Site


Outbound Trip Generation: Weekend Peak
N
120 Trips
Legend
South
Subject Site

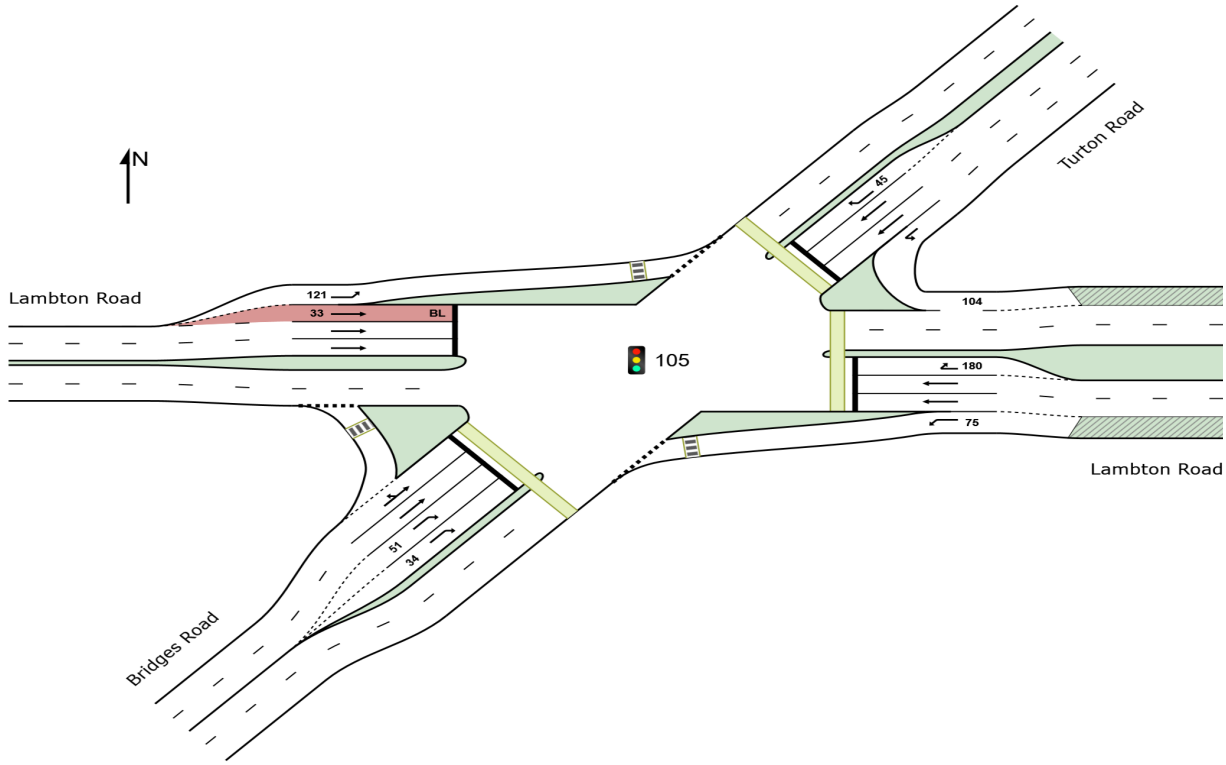
Attachment B: SIDRA Geometric Layouts

SITE LAYOUT

Site: 105 [Turton Road / Lambton Road / Bridges Road - TCS 350 (Site Folder: 2024 Base AM Peak)]

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



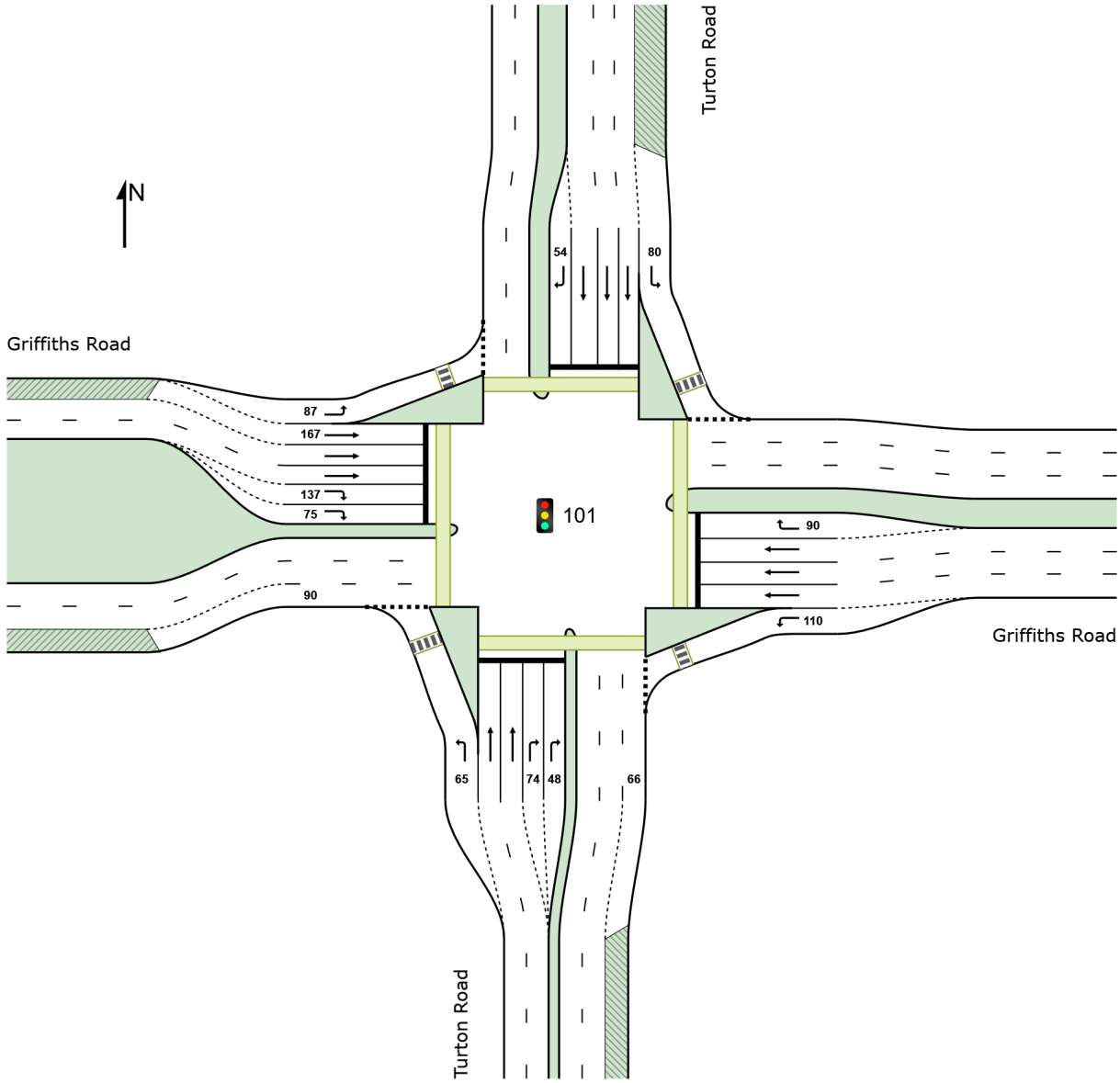
Organisation: BITZIOS CONSULTING | Licence: PLUS / FLOATING | Created: Thursday, 2 May 2024 3:37:39 PM
Project: P:\P6458 Newcastle Indoor Sports Facility TIA Modelling\Technical\Models\P6458.001M Newcastle Indoor Sports Facility TIA SIDRA Models.sip9

SITE LAYOUT

Site: 101 [Turton Road / Griffiths Road - TCS 201 (Site Folder: 2024 Base AM Peak)]

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



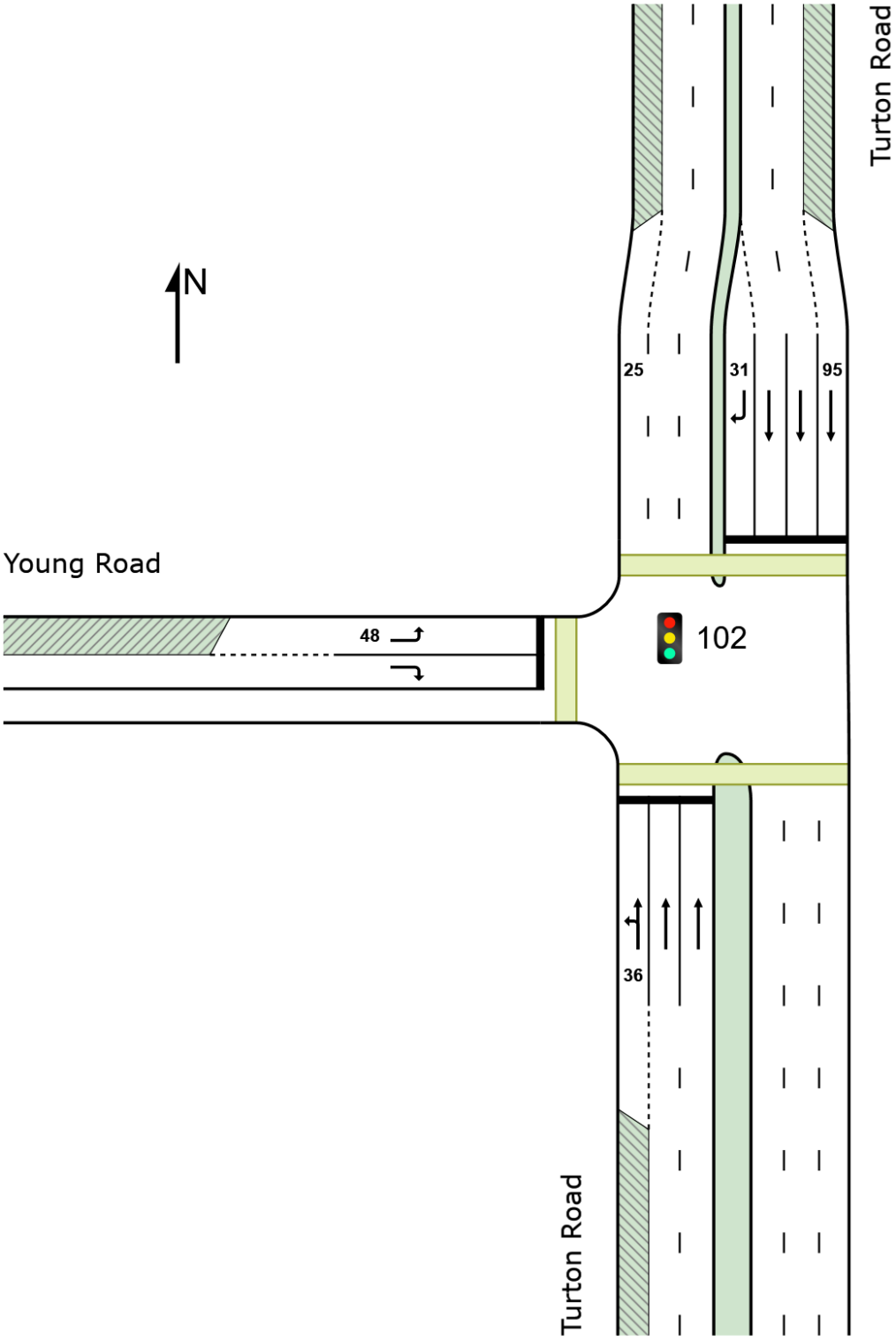
Organisation: BITZIOS CONSULTING | Licence: PLUS / FLOATING | Created: Thursday, 2 May 2024 3:37:36 PM
Project: P:\P6458 Newcastle Indoor Sports Facility TIA Modelling\Technical\Models\P6458.001M Newcastle Indoor Sports Facility TIA SIDRA Models.sip9

SITE LAYOUT

Site: 102 [Turton Road / Young Road - TCS 3322 (Site Folder: 2024 Base AM Peak)]

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

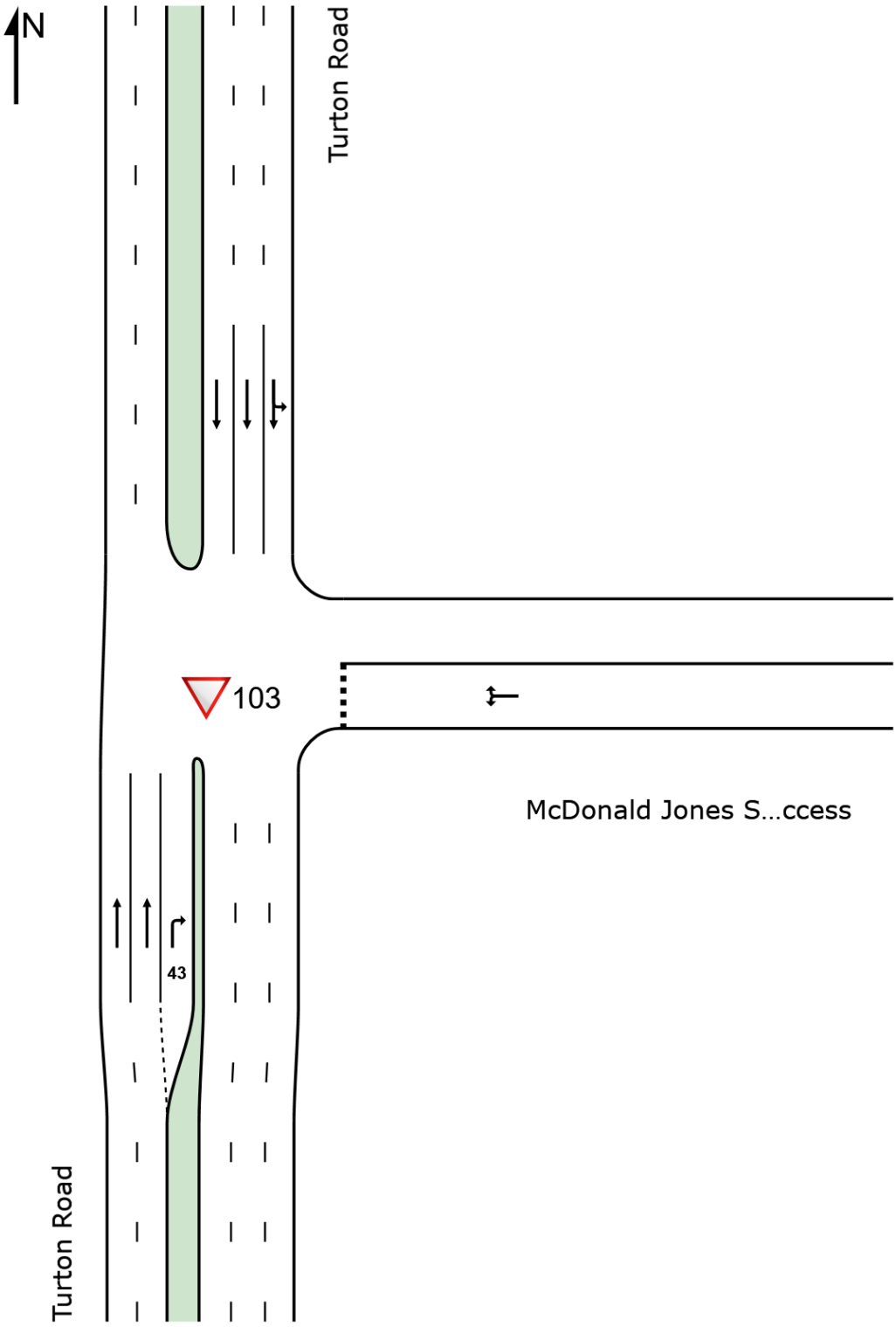


SITE LAYOUT

Site: 103 [Turton Road / McDonald Jones Stadium Southern Access (Site Folder: 2024 Base AM Peak)]

0800-0900
Site Category: Base Year
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

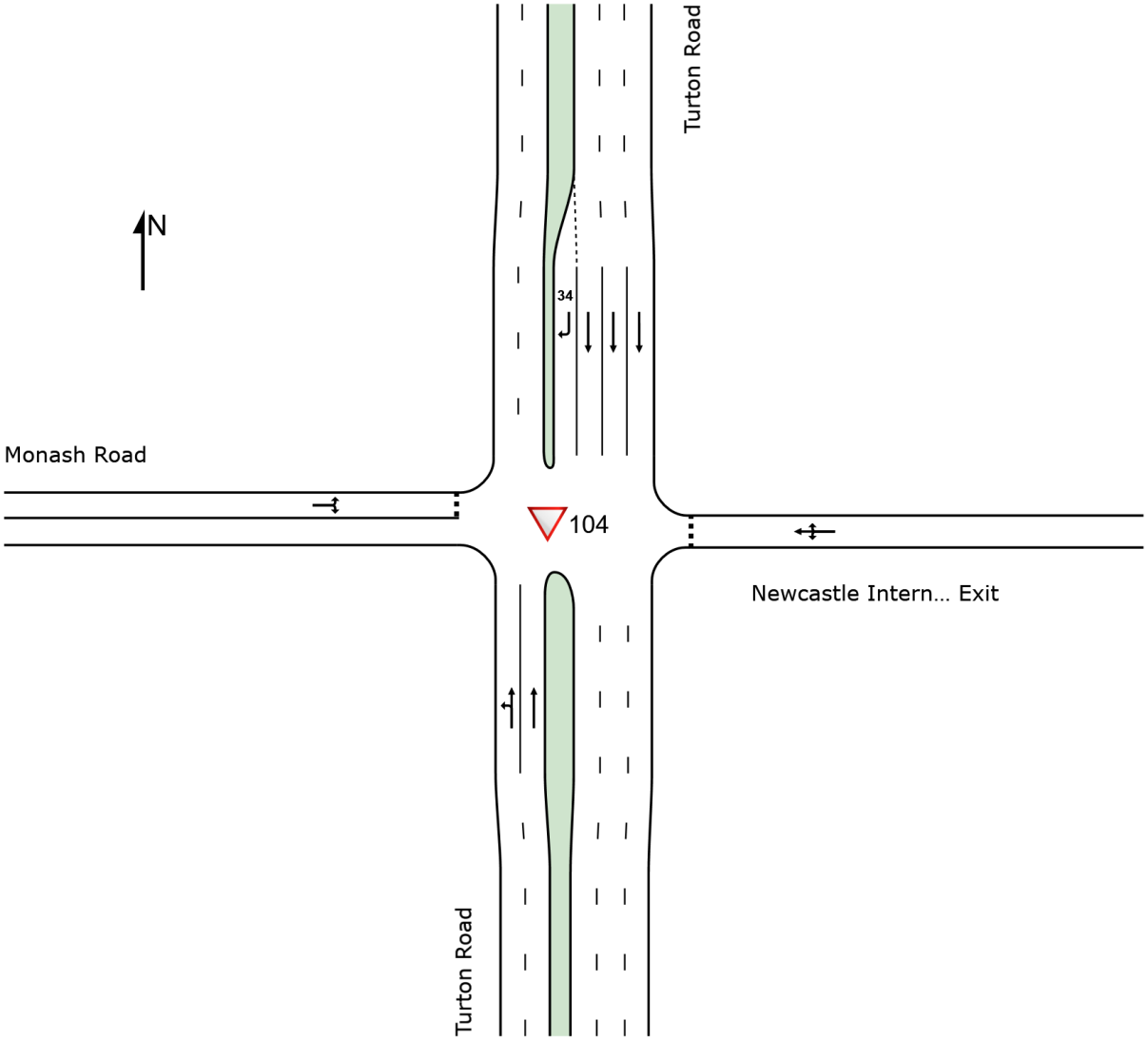


SITE LAYOUT

Site: 104 [Turton Road / Monash Road / Newcastle International Hockey Centre Northern Exit (Site Folder: 2024 Base AM Peak)]

0800-0900
Site Category: Base Year
Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Organisation: BITZIOS CONSULTING | Licence: PLUS / FLOATING | Created: Thursday, 2 May 2024 3:37:39 PM
Project: P:\P6458 Newcastle Indoor Sports Facility TIA Modelling\Technical\Models\P6458.001M Newcastle Indoor Sports Facility TIA SIDRA Models.sip9

Attachment C: SIDRA Model Outputs

MOVEMENT SUMMARY

Site: 101 [Turton Road / Griffiths Road - TCS 201 (Site Folder: 2024 Base AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 132 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	442	3.6	442	3.6	0.401	15.1	LOS B	8.7	62.5	0.41	0.92	0.41	48.3
2	T1	All MCs	642	3.9	642	3.9	*0.776	57.2	LOS E	21.5	155.5	0.99	0.97	1.06	23.1
3	R2	All MCs	304	3.1	304	3.1	*0.943	94.0	LOS F	11.9	85.3	1.00	1.08	1.48	22.8
Approach			1388	3.6	1388	3.6	0.943	51.9	LOS D	21.5	155.5	0.81	0.98	0.94	27.5
East: Griffiths Road															
4	L2	All MCs	220	3.3	220	3.3	0.173	11.2	LOS A	3.9	28.2	0.32	0.64	0.32	48.9
5	T1	All MCs	731	5.6	731	5.6	0.561	43.9	LOS D	15.7	115.3	0.90	0.76	0.90	37.1
6	R2	All MCs	55	3.8	55	3.8	*0.662	78.5	LOS F	3.8	27.3	1.00	0.81	1.12	22.9
Approach			1005	5.0	1005	5.0	0.662	38.6	LOS C	15.7	115.3	0.78	0.74	0.78	37.8
North: Turton Road															
7	L2	All MCs	100	12.6	100	12.6	0.143	15.5	LOS B	2.7	20.9	0.45	0.67	0.45	43.7
8	T1	All MCs	528	4.2	528	4.2	0.456	44.7	LOS D	11.9	86.6	0.89	0.73	0.89	25.4
9	R2	All MCs	88	16.7	88	16.7	0.624	71.7	LOS F	5.8	46.5	1.00	0.81	1.05	22.9
Approach			717	6.9	717	6.9	0.624	44.0	LOS D	11.9	86.6	0.84	0.74	0.84	27.1
West: Griffiths Road															
10	L2	All MCs	108	9.7	108	9.7	0.101	10.1	LOS A	1.7	13.3	0.33	0.63	0.33	46.5
11	T1	All MCs	1340	3.1	1340	3.1	*0.589	24.1	LOS B	19.2	137.8	0.72	0.64	0.72	44.7
12	R2	All MCs	311	4.1	311	4.1	0.491	58.7	LOS E	9.1	66.2	0.95	0.80	0.95	28.0
Approach			1759	3.7	1759	3.7	0.589	29.3	LOS C	19.2	137.8	0.74	0.66	0.74	41.3
All Vehicles			4869	4.4	4869	4.4	0.943	39.8	LOS C	21.5	155.5	0.78	0.78	0.82	34.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	1	1	60.1	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
East: Griffiths Road												

P2	Full	9	9	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
North: Turton Road												
P3	Full	1	1	60.1	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
West: Griffiths Road												
P4	Full	7	7	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
All Pedestrians		18	19	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88

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.

MOVEMENT SUMMARY

Site: 102 [Turton Road / Young Road - TCS 3322 (Site Folder: 2024 Base AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 129 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	108	3.9	108	3.9	0.123	13.5	LOS A	2.9	21.0	0.37	0.59	0.37	28.5
2	T1	All MCs	1315	3.3	1315	3.3	* 0.554	5.4	LOS A	11.8	84.9	0.31	0.29	0.31	49.2
Approach			1423	3.3	1423	3.3	0.554	6.1	LOS A	11.8	84.9	0.32	0.31	0.32	46.3
North: Turton Road															
8	T1	All MCs	959	0.1	959	0.1	0.231	5.7	LOS A	6.4	44.6	0.34	0.30	0.34	48.1
9	R2	All MCs	68	3.1	68	3.1	* 0.270	18.2	LOS B	2.1	15.1	0.55	0.72	0.55	34.0
Approach			1027	0.3	1027	0.3	0.270	6.5	LOS A	6.4	44.6	0.35	0.33	0.35	46.2
West: Young Road															
10	L2	All MCs	68	6.2	68	6.2	0.178	47.7	LOS D	3.6	26.4	0.85	0.71	0.85	22.5
12	R2	All MCs	178	5.3	178	5.3	* 0.594	57.5	LOS E	10.5	77.1	0.97	0.81	0.97	12.8
Approach			246	5.6	246	5.6	0.594	54.8	LOS D	10.5	77.1	0.94	0.78	0.94	15.6
All Vehicles			2697	2.4	2697	2.4	0.594	10.7	LOS A	11.8	84.9	0.39	0.36	0.39	39.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	5	5	58.7	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89
North: Turton Road												
P3	Full	7	7	58.7	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89
West: Young Road												
P4	Full	4	4	58.6	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89
All Pedestrians		16	17	58.7	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89

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.

MOVEMENT SUMMARY

Site: 103 [Turton Road / McDonald Jones Stadium Southern Access (Site Folder: 2024 Base AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
2	T1	All MCs	1413	3.4	1413	3.4	0.380	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
3	R2	All MCs	40	7.9	40	7.9	0.237	26.9	LOS B	0.7	5.2	0.85	0.96	0.94	11.5
Approach			1453	3.5	1453	3.5	0.380	0.8	NA	0.7	5.2	0.02	0.03	0.03	54.1
East: McDonald Jones Stadium Southern Access															
4	L2	All MCs	33	3.2	33	3.2	1.791	724.1	LOS F	14.1	102.8	1.00	4.06	4.57	0.5
6	R2	All MCs	11	10.0	11	10.0	1.791	896.8	LOS F	14.1	102.8	1.00	4.06	4.57	0.5
Approach			43	4.9	43	4.9	1.791	766.2	LOS F	14.1	102.8	1.00	4.06	4.57	0.5
North: Turton Road															
7	L2	All MCs	23	0.0	23	0.0	0.214	4.0	LOS A	0.0	0.0	0.00	0.03	0.00	28.9
8	T1	All MCs	1156	4.7	1156	4.7	0.214	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.3
Approach			1179	4.6	1179	4.6	0.214	0.1	NA	0.0	0.0	0.00	0.01	0.00	58.4
All Vehicles			2675	4.0	2675	4.0	1.791	12.8	NA	14.1	102.8	0.03	0.08	0.09	22.9

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

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

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

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 104 [Turton Road / Monash Road / Newcastle International Hockey Centre Northern Exit (Site Folder: 2024 Base AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	11	0.0	11	0.0	0.387	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	56.5
2	T1	All MCs	1423	3.6	1423	3.6	0.387	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
Approach			1434	3.5	1434	3.5	0.387	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.6
East: Newcastle International Hockey Centre Northern Exit															
4	L2	All MCs	1	0.0	1	0.0	1.000	251.0	LOS F	4.2	29.3	1.00	1.01	1.02	1.5
5	T1	All MCs	1	0.0	1	0.0	1.000	1885.7	LOS F	4.2	29.3	1.00	1.01	1.02	1.9
6	R2	All MCs	1	0.0	1	0.0	1.000	603.0	LOS F	4.2	29.3	1.00	1.01	1.02	0.4
Approach			3	0.0	3	0.0	1.000	913.3	LOS F	4.2	29.3	1.00	1.01	1.02	1.3
North: Turton Road															
8	T1	All MCs	1157	4.4	1157	4.4	0.208	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	All MCs	36	5.9	36	5.9	0.216	27.2	LOS B	0.6	4.7	0.89	0.97	0.96	25.7
Approach			1193	4.4	1193	4.4	0.216	0.8	NA	0.6	4.7	0.03	0.03	0.03	56.8
West: Monash Road															
10	L2	All MCs	41	0.0	41	0.0	1.073	108.1	LOS F	4.3	30.8	1.00	1.46	2.13	11.8
12	R2	All MCs	5	20.0	5	20.0	1.073	126.7	LOS F	4.3	30.8	1.00	1.46	2.13	16.3
Approach			46	2.3	46	2.3	1.073	110.2	LOS F	4.3	30.8	1.00	1.46	2.13	12.4
All Vehicles			2676	3.9	2676	3.9	1.073	3.4	NA	4.3	30.8	0.03	0.04	0.05	51.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 105 [Turton Road / Lambton Road / Bridges Road - TCS 350 (Site Folder: 2024 Base AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 132 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Lambton Road															
4a	L1	All MCs	182	9.8	182	9.8	0.189	8.8	LOS A	3.0	23.1	0.34	0.62	0.34	50.5
5	T1	All MCs	475	5.1	475	5.1	0.447	41.2	LOS C	12.5	91.1	0.87	0.73	0.87	37.9
6b	R3	All MCs	229	8.7	229	8.7	* 1.698	707.7	LOS F	48.1	361.6	1.00	2.10	3.88	3.9
Approach			886	7.0	886	7.0	1.698	207.1	LOS F	48.1	361.6	0.79	1.07	1.54	13.9
NorthEast: Turton Road															
24b	L3	All MCs	342	0.3	342	0.3	0.221	8.1	LOS A	0.0	0.0	0.00	0.58	0.00	51.0
25	T1	All MCs	693	4.7	693	4.7	0.551	41.7	LOS C	18.8	137.1	0.86	0.74	0.86	34.9
26a	R1	All MCs	117	6.3	117	6.3	* 0.884	92.7	LOS F	8.5	62.8	1.00	0.99	1.37	25.8
Approach			1152	3.6	1152	3.6	0.884	36.9	LOS C	18.8	137.1	0.62	0.72	0.65	34.8
West: Lambton Road															
10a	L1	All MCs	111	6.7	111	6.7	0.168	17.4	LOS B	3.3	24.6	0.51	0.67	0.51	45.4
11	T1	All MCs	555	3.6	555	3.6	* 0.846	64.5	LOS E	19.0	135.3	1.00	0.97	1.17	31.3
Approach			665	4.1	665	4.1	0.846	56.7	LOS E	19.0	135.3	0.92	0.92	1.06	32.9
SouthWest: Bridges Road															
30b	L3	All MCs	16	13.3	16	13.3	0.865	15.6	LOS B	14.0	99.7	0.41	0.48	0.49	49.1
31	T1	All MCs	1125	2.0	1125	2.0	* 0.865	20.3	LOS B	27.9	198.5	0.55	0.57	0.61	46.2
32a	R1	All MCs	389	2.2	389	2.2	0.807	45.8	LOS D	7.7	55.1	1.00	0.88	1.16	35.0
Approach			1531	2.1	1531	2.1	0.865	26.7	LOS B	27.9	198.5	0.67	0.65	0.75	39.7
All Vehicles			4234	3.9	4234	3.9	1.698	72.0	LOS F	48.1	361.6	0.72	0.80	0.94	26.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Lambton Road												
P2	Full	22	23	60.2	LOS F	0.1	0.1	0.96	0.96	226.9	200.0	0.88
NorthEast: Turton Road												
P6	Full	6	6	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88

SouthWest: Bridges Road											
P8 Full	1	1	60.1	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
All Pedestrians	29	31	60.2	LOS F	0.1	0.1	0.96	0.96	226.9	200.0	0.88

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: BITZIOS CONSULTING | Licence: PLUS / FLOATING | Processed: Wednesday, 1 May 2024 4:18:09 PM
Project: P:\P6458 Newcastle Indoor Sports Facility TIA Modelling\Technical\Models\P6458.001M Newcastle Indoor Sports Facility TIA SIDRA Models.sip9

MOVEMENT SUMMARY

Site: 101 [Turton Road / Griffiths Road - TCS 201 (Site Folder: 2024 Base PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 131 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	396	3.2	396	3.2	0.341	27.2	LOS B	5.8	41.4	0.33	0.67	0.33	49.7
2	T1	All MCs	847	2.6	847	2.6	* 1.217	284.1	LOS F	60.7	434.7	1.00	1.87	2.40	6.6
3	R2	All MCs	411	1.3	411	1.3	* 1.081	176.8	LOS F	21.1	149.0	1.00	1.33	1.92	15.4
Approach			1654	2.4	1654	2.4	1.217	196.0	LOS F	60.7	434.7	0.84	1.45	1.78	10.9
East: Griffiths Road															
4	L2	All MCs	308	3.4	308	3.4	0.206	14.3	LOS A	6.8	49.1	0.39	0.67	0.39	47.5
5	T1	All MCs	756	3.2	756	3.2	0.467	45.4	LOS D	16.0	114.9	0.90	0.75	0.90	36.6
6	R2	All MCs	106	1.0	106	1.0	* 0.482	64.8	LOS E	6.4	45.3	0.96	0.77	0.96	25.6
Approach			1171	3.1	1171	3.1	0.482	39.0	LOS C	16.0	114.9	0.77	0.73	0.77	37.4
North: Turton Road															
7	L2	All MCs	128	1.6	128	1.6	0.176	19.7	LOS B	4.2	29.6	0.53	0.70	0.53	41.4
8	T1	All MCs	812	2.1	812	2.1	0.578	52.8	LOS D	19.1	136.2	0.93	0.78	0.93	24.3
9	R2	All MCs	117	10.3	117	10.3	0.474	77.6	LOS F	7.2	54.8	0.99	0.78	0.99	24.1
Approach			1058	3.0	1058	3.0	0.578	51.5	LOS D	19.1	136.2	0.89	0.77	0.89	24.7
West: Griffiths Road															
10	L2	All MCs	123	5.1	123	5.1	0.121	14.7	LOS B	2.4	17.8	0.38	0.65	0.38	45.4
11	T1	All MCs	1368	1.8	1368	1.8	* 0.642	36.3	LOS C	24.0	170.6	0.88	0.78	0.88	40.0
12	R2	All MCs	398	5.6	398	5.6	0.508	53.5	LOS D	11.2	82.3	0.92	0.81	0.92	29.4
Approach			1889	2.8	1889	2.8	0.642	38.5	LOS C	24.0	170.6	0.86	0.77	0.86	37.5
All Vehicles			5771	2.8	5771	2.8	1.217	86.1	LOS F	60.7	434.7	0.84	0.96	1.11	23.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	1	1	59.6	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
East: Griffiths Road												

P2	Full	7	7	59.7	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
North: Turton Road												
P3	Full	1	1	59.6	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
West: Griffiths Road												
P4	Full	4	4	59.6	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
All Pedestrians		13	14	59.7	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88

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.

MOVEMENT SUMMARY

Site: 102 [Turton Road / Young Road - TCS 3322 (Site Folder: 2024 Base PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 137 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	139	9.8	139	9.8	0.123	11.3	LOS A	3.0	23.0	0.36	0.65	0.36	31.6
2	T1	All MCs	1443	2.6	1443	2.6	* 0.546	1.7	LOS A	6.4	45.7	0.15	0.13	0.15	55.9
Approach			1582	3.3	1582	3.3	0.546	2.5	LOS A	6.4	45.7	0.16	0.18	0.16	53.0
North: Turton Road															
8	T1	All MCs	1448	3.2	1448	3.2	0.391	10.8	LOS A	22.3	160.1	0.65	0.30	0.65	41.8
9	R2	All MCs	101	4.2	101	4.2	* 0.431	18.4	LOS B	3.2	22.8	0.52	0.73	0.52	38.4
Approach			1549	3.3	1549	3.3	0.431	11.3	LOS A	22.3	160.1	0.64	0.32	0.64	40.3
West: Young Road															
10	L2	All MCs	138	3.1	138	3.1	0.237	70.3	LOS E	7.4	53.5	0.86	0.77	0.86	22.6
12	R2	All MCs	259	3.3	259	3.3	* 0.921	100.3	LOS F	19.7	141.6	1.00	1.02	1.31	10.3
Approach			397	3.2	397	3.2	0.921	89.9	LOS F	19.7	141.6	0.95	0.93	1.16	12.0
All Vehicles			3528	3.3	3528	3.3	0.921	16.2	LOS B	22.3	160.1	0.46	0.33	0.49	34.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	20	21	62.7	LOS F	0.1	0.1	0.96	0.96	229.4	200.0	0.87
North: Turton Road												
P3	Full	16	17	62.7	LOS F	0.1	0.1	0.96	0.96	229.3	200.0	0.87
West: Young Road												
P4	Full	7	7	62.7	LOS F	0.0	0.0	0.96	0.96	229.3	200.0	0.87
All Pedestrians		43	45	62.7	LOS F	0.1	0.1	0.96	0.96	229.3	200.0	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.

MOVEMENT SUMMARY

Site: 103 [Turton Road / McDonald Jones Stadium Southern Access (Site Folder: 2024 Base PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
2	T1	All MCs	1579	3.2	1579	3.2	0.711	23.3	LOS B	29.1	209.0	0.16	0.15	0.49	15.5
3	R2	All MCs	99	2.1	99	2.1	1.440	482.4	LOS F	22.0	157.0	1.00	2.39	7.17	0.9
Approach			1678	3.1	1678	3.1	1.440	50.4	NA	29.1	209.0	0.21	0.29	0.88	8.2
East: McDonald Jones Stadium Southern Access															
4	L2	All MCs	33	3.2	33	3.2	1.047	87.7	LOS F	3.2	22.6	1.00	1.50	1.68	4.3
6	R2	All MCs	4	0.0	4	0.0	1.047	51.5	LOS D	3.2	22.6	1.00	1.50	1.68	3.6
Approach			37	2.9	37	2.9	1.047	83.5	LOS F	3.2	22.6	1.00	1.50	1.68	4.2
North: Turton Road															
7	L2	All MCs	19	5.6	19	5.6	0.307	4.0	LOS A	0.0	0.0	0.00	0.02	0.00	29.0
8	T1	All MCs	1696	3.2	1696	3.2	0.307	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach			1715	3.2	1715	3.2	0.307	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.0
All Vehicles			3429	3.2	3429	3.2	1.440	25.6	NA	29.1	209.0	0.11	0.16	0.45	14.3

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

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

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

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 104 [Turton Road / Monash Road / Newcastle International Hockey Centre Northern Exit (Site Folder: 2024 Base PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	19	0.0	19	0.0	0.426	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	56.4
2	T1	All MCs	1567	3.2	1567	3.2	0.426	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach			1586	3.1	1586	3.1	0.426	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.4
East: Newcastle International Hockey Centre Northern Exit															
4	L2	All MCs	1	0.0	1	0.0	1.000	2201.8	LOS F	3.8	26.6	1.00	1.00	1.00	1.8
5	T1	All MCs	1	0.0	1	0.0	1.000	40.1	LOS C	3.8	26.6	1.00	1.00	1.00	2.3
6	R2	All MCs	1	0.0	1	0.0	1.000	40.1	LOS C	3.8	26.6	1.00	1.00	1.00	0.5
Approach			3	0.0	3	0.0	1.000	760.7	LOS F	3.8	26.6	1.00	1.00	1.00	1.5
North: Turton Road															
8	T1	All MCs	1693	4.0	1693	4.0	0.304	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
9	R2	All MCs	49	0.0	49	0.0	0.340	34.1	LOS C	1.1	7.9	0.93	1.01	1.08	25.9
Approach			1742	3.9	1742	3.9	0.340	1.0	NA	1.1	7.9	0.03	0.03	0.03	57.0
West: Monash Road															
10	L2	All MCs	111	1.9	111	1.9	1.629	590.4	LOS F	30.9	219.5	1.00	3.97	10.11	3.0
12	R2	All MCs	8	0.0	8	0.0	1.629	572.2	LOS F	30.9	219.5	1.00	3.97	10.11	4.5
Approach			119	1.8	119	1.8	1.629	589.1	LOS F	30.9	219.5	1.00	3.97	10.11	3.1
All Vehicles			3451	3.5	3451	3.5	1.629	21.6	NA	30.9	219.5	0.05	0.16	0.37	30.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 105 [Turton Road / Lambton Road / Bridges Road - TCS 350 (Site Folder: 2024 Base PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 123 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Lambton Road															
4a	L1	All MCs	303	4.2	303	4.2	0.310	10.1	LOS A	6.6	48.0	0.44	0.67	0.44	49.7
5	T1	All MCs	624	2.2	624	2.2	0.281	29.0	LOS C	12.9	92.3	0.75	0.63	0.75	42.5
6b	R3	All MCs	162	5.8	162	5.8	* 0.374	36.5	LOS C	6.7	49.4	0.84	0.77	0.84	33.5
Approach			1089	3.3	1089	3.3	0.374	24.9	LOS B	12.9	92.3	0.68	0.66	0.68	42.8
NorthEast: Turton Road															
24b	L3	All MCs	598	0.5	598	0.5	0.369	9.0	LOS A	0.0	0.0	0.00	0.58	0.00	50.9
25	T1	All MCs	931	2.7	931	2.7	0.725	18.4	LOS B	17.6	126.4	0.64	0.56	0.64	45.6
26a	R1	All MCs	140	3.0	140	3.0	0.734	67.8	LOS E	8.5	61.4	1.00	0.85	1.09	29.6
Approach			1668	2.0	1668	2.0	0.734	19.2	LOS B	17.6	126.4	0.44	0.59	0.45	43.7
West: Lambton Road															
10a	L1	All MCs	158	10.0	158	10.0	0.198	19.7	LOS B	4.7	35.6	0.58	0.68	0.58	44.1
11	T1	All MCs	674	3.8	674	3.8	* 0.439	33.3	LOS C	14.3	102.3	0.76	0.63	0.76	40.7
Approach			832	5.0	832	5.0	0.439	30.8	LOS C	14.3	102.3	0.73	0.64	0.73	41.3
SouthWest: Bridges Road															
30b	L3	All MCs	20	0.0	20	0.0	1.291	279.7	LOS F	86.7	615.8	1.00	1.73	2.72	11.7
31	T1	All MCs	1262	1.8	1262	1.8	* 1.291	308.1	LOS F	96.2	683.2	1.00	2.04	2.71	8.7
32a	R1	All MCs	616	0.3	616	0.3	* 1.792	809.1	LOS F	66.6	467.3	1.00	2.45	4.27	4.3
Approach			1898	1.3	1898	1.3	1.792	470.4	LOS F	96.2	683.2	1.00	2.17	3.22	6.1
All Vehicles			5488	2.4	5488	2.4	1.792	178.1	LOS F	96.2	683.2	0.72	1.16	1.49	14.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Lambton Road												
P2	Full	27	28	55.7	LOS E	0.1	0.1	0.95	0.95	222.4	200.0	0.90
NorthEast: Turton Road												
P6	Full	14	15	55.7	LOS E	0.0	0.0	0.95	0.95	222.3	200.0	0.90

SouthWest: Bridges Road											
P8 Full	5	5	55.7	LOS E	0.0	0.0	0.95	0.95	222.3	200.0	0.90
All Pedestrians	46	48	55.7	LOS E	0.1	0.1	0.95	0.95	222.4	200.0	0.90

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.

MOVEMENT SUMMARY

Site: 101 [Turton Road / Griffiths Road - TCS 201 (Site Folder: 2024 Base Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	402	1.3	402	1.3	0.359	11.4	LOS A	7.2	51.3	0.41	0.68	0.41	48.3
2	T1	All MCs	498	1.1	498	1.1	0.537	42.9	LOS D	12.8	90.3	0.92	0.78	0.92	26.0
3	R2	All MCs	234	0.9	234	0.9	* 0.702	66.6	LOS E	7.1	50.1	1.00	0.85	1.10	27.2
Approach			1134	1.1	1134	1.1	0.702	36.6	LOS C	12.8	90.3	0.76	0.76	0.78	32.7
East: Griffiths Road															
4	L2	All MCs	332	0.3	332	0.3	0.285	15.4	LOS B	7.8	55.1	0.46	0.69	0.46	46.7
5	T1	All MCs	793	0.7	793	0.7	* 0.730	47.8	LOS D	17.3	121.5	0.97	0.84	1.00	35.8
6	R2	All MCs	87	2.4	87	2.4	* 0.709	69.8	LOS E	5.4	38.8	1.00	0.85	1.14	24.5
Approach			1212	0.7	1212	0.7	0.730	40.5	LOS C	17.3	121.5	0.83	0.80	0.86	36.9
North: Turton Road															
7	L2	All MCs	86	0.0	86	0.0	0.100	11.6	LOS A	1.6	11.5	0.36	0.64	0.36	46.8
8	T1	All MCs	694	0.6	694	0.6	* 0.605	44.7	LOS D	14.8	104.0	0.93	0.78	0.93	25.9
9	R2	All MCs	98	5.4	98	5.4	0.615	68.5	LOS E	5.8	42.7	1.00	0.81	1.04	24.3
Approach			878	1.1	878	1.1	0.615	44.1	LOS D	14.8	104.0	0.88	0.77	0.88	26.8
West: Griffiths Road															
10	L2	All MCs	107	2.0	107	2.0	0.092	8.3	LOS A	1.3	8.9	0.28	0.62	0.28	48.5
11	T1	All MCs	986	0.5	986	0.5	0.462	30.3	LOS C	14.5	102.1	0.81	0.70	0.81	42.0
12	R2	All MCs	463	1.1	463	1.1	0.574	50.7	LOS D	12.2	86.5	0.94	0.82	0.94	30.2
Approach			1557	0.8	1557	0.8	0.574	34.8	LOS C	14.5	102.1	0.81	0.73	0.81	38.5
All Vehicles			4780	0.9	4780	0.9	0.730	38.4	LOS C	17.3	121.5	0.82	0.76	0.83	35.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
East: Griffiths Road												

P2	Full	9	9	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
North: Turton Road												
P3	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
West: Griffiths Road												
P4	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
All Pedestrians		12	13	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91

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.

MOVEMENT SUMMARY

Site: 102 [Turton Road / Young Road - TCS 3322 (Site Folder: 2024 Base Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

1115 - 1215
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	63	0.0	63	0.0	0.077	8.8	LOS A	1.6	11.6	0.29	0.48	0.29	36.6
2	T1	All MCs	1019	1.0	1019	1.0	* 0.347	5.9	LOS A	9.9	69.7	0.37	0.34	0.37	48.0
Approach			1082	1.0	1082	1.0	0.347	6.0	LOS A	9.9	69.7	0.37	0.35	0.37	46.9
North: Turton Road															
8	T1	All MCs	1397	0.7	1397	0.7	0.330	8.6	LOS A	16.3	114.4	0.61	0.26	0.61	45.1
9	R2	All MCs	79	4.0	79	4.0	* 0.247	15.5	LOS B	1.6	11.4	0.42	0.68	0.42	40.4
Approach			1476	0.9	1476	0.9	0.330	8.9	LOS A	16.3	114.4	0.60	0.28	0.60	43.1
West: Young Road															
10	L2	All MCs	89	1.2	89	1.2	0.319	55.5	LOS D	4.8	33.7	0.94	0.77	0.94	21.7
12	R2	All MCs	116	2.7	116	2.7	* 0.453	56.7	LOS E	6.4	45.7	0.96	0.79	0.96	13.6
Approach			205	2.1	205	2.1	0.453	56.2	LOS D	6.4	45.7	0.95	0.78	0.95	17.4
All Vehicles			2763	1.0	2763	1.0	0.453	11.3	LOS A	16.3	114.4	0.53	0.35	0.53	39.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	8	8	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
North: Turton Road												
P3	Full	15	16	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91
West: Young Road												
P4	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
All Pedestrians		24	25	54.2	LOS E	0.1	0.1	0.95	0.95	220.8	200.0	0.91

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.

MOVEMENT SUMMARY

Site: 103 [Turton Road / McDonald Jones Stadium Southern Access (Site Folder: 2024 Base Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
2	T1	All MCs	1031	0.8	1031	0.8	0.271	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	All MCs	48	2.2	48	2.2	0.468	49.1	LOS D	1.5	10.4	0.94	1.04	1.20	7.3
Approach			1079	0.9	1079	0.9	0.468	2.2	NA	1.5	10.4	0.04	0.05	0.05	46.3
East: McDonald Jones Stadium Southern Access															
4	L2	All MCs	41	5.1	41	5.1	1.283	271.6	LOS F	9.1	66.4	1.00	3.15	3.68	1.3
6	R2	All MCs	7	0.0	7	0.0	1.283	454.2	LOS F	9.1	66.4	1.00	3.15	3.68	1.1
Approach			48	4.3	48	4.3	1.283	299.4	LOS F	9.1	66.4	1.00	3.15	3.68	1.3
North: Turton Road															
7	L2	All MCs	17	0.0	17	0.0	0.269	4.0	LOS A	0.0	0.0	0.00	0.02	0.00	29.1
8	T1	All MCs	1520	0.8	1520	0.8	0.269	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach			1537	0.8	1537	0.8	0.269	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.0
All Vehicles			2664	0.9	2664	0.9	1.283	6.4	NA	9.1	66.4	0.04	0.08	0.09	32.9

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

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

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

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 104 [Turton Road / Monash Road / Newcastle International Hockey Centre Northern Exit (Site Folder: 2024 Base Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	12	0.0	12	0.0	0.294	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	56.6
2	T1	All MCs	1106	1.0	1106	1.0	0.294	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach			1118	0.9	1118	0.9	0.294	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.6
East: Newcastle International Hockey Centre Northern Exit															
4	L2	All MCs	1	0.0	1	0.0	1.000	239.9	LOS F	3.7	25.8	1.00	1.01	1.02	1.6
5	T1	All MCs	1	0.0	1	0.0	1.000	1597.0	LOS F	3.7	25.8	1.00	1.01	1.02	2.1
6	R2	All MCs	1	0.0	1	0.0	1.000	690.1	LOS F	3.7	25.8	1.00	1.01	1.02	0.5
Approach			3	0.0	3	0.0	1.000	842.3	LOS F	3.7	25.8	1.00	1.01	1.02	1.4
North: Turton Road															
8	T1	All MCs	1497	1.0	1497	1.0	0.261	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	All MCs	37	0.0	37	0.0	0.101	13.2	LOS A	0.3	2.4	0.77	0.90	0.77	36.3
Approach			1534	1.0	1534	1.0	0.261	0.3	NA	0.3	2.4	0.02	0.02	0.02	58.6
West: Monash Road															
10	L2	All MCs	47	2.2	47	2.2	1.067	97.5	LOS F	4.5	31.8	1.00	1.39	2.05	12.1
12	R2	All MCs	2	0.0	2	0.0	1.067	223.4	LOS F	4.5	31.8	1.00	1.39	2.05	18.1
Approach			49	2.1	49	2.1	1.067	102.9	LOS F	4.5	31.8	1.00	1.39	2.05	12.4
All Vehicles			2704	1.0	2704	1.0	1.067	3.1	NA	4.5	31.8	0.03	0.04	0.05	52.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 105 [Turton Road / Lambton Road / Bridges Road - TCS 350 (Site Folder: 2024 Base Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Lambton Road															
4a	L1	All MCs	287	2.2	287	2.2	0.313	11.8	LOS A	7.3	51.8	0.50	0.69	0.50	48.6
5	T1	All MCs	412	1.0	412	1.0	0.322	31.9	LOS C	8.9	63.1	0.79	0.66	0.79	41.3
6b	R3	All MCs	198	0.5	198	0.5	*0.569	41.7	LOS C	9.3	65.3	0.91	0.80	0.91	31.7
Approach			897	1.3	897	1.3	0.569	27.6	LOS B	9.3	65.3	0.73	0.70	0.73	41.0
NorthEast: Turton Road															
24b	L3	All MCs	332	0.3	332	0.3	0.194	7.7	LOS A	0.0	0.0	0.00	0.58	0.00	51.0
25	T1	All MCs	1093	0.4	1093	0.4	0.725	23.3	LOS B	22.3	156.6	0.71	0.63	0.71	43.8
26a	R1	All MCs	119	0.0	119	0.0	0.608	71.8	LOS F	7.0	48.7	1.00	0.80	1.02	29.8
Approach			1543	0.3	1543	0.3	0.725	23.7	LOS B	22.3	156.6	0.58	0.63	0.58	40.9
West: Lambton Road															
10a	L1	All MCs	91	1.2	91	1.2	0.109	12.5	LOS A	1.9	13.7	0.43	0.64	0.43	48.5
11	T1	All MCs	407	1.6	407	1.6	*0.348	44.9	LOS D	10.2	72.2	0.91	0.74	0.91	36.7
Approach			498	1.5	498	1.5	0.348	39.0	LOS C	10.2	72.2	0.82	0.72	0.82	38.2
SouthWest: Bridges Road															
30b	L3	All MCs	40	0.0	40	0.0	0.719	8.7	LOS A	13.2	93.0	0.65	0.64	0.65	47.5
31	T1	All MCs	837	0.9	837	0.9	*0.719	21.8	LOS B	18.4	129.8	0.67	0.62	0.68	44.4
32a	R1	All MCs	308	0.7	308	0.7	*0.846	73.8	LOS F	9.9	69.8	1.00	0.97	1.28	27.5
Approach			1185	0.8	1185	0.8	0.846	34.9	LOS C	18.4	129.8	0.76	0.71	0.83	36.2
All Vehicles			4123	0.8	4123	0.8	0.846	29.6	LOS C	22.3	156.6	0.69	0.68	0.71	39.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Lambton Road												
P2	Full	38	40	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91
NorthEast: Turton Road												
P6	Full	16	17	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91

SouthWest: Bridges Road											
P8 Full	7	7	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
All Pedestrians	61	64	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91

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.

MOVEMENT SUMMARY

Site: 101 [Turton Road / Griffiths Road - TCS 201 (Site Folder: 2024 Project AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 132 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	452	3.5	452	3.5	0.410	15.3	LOS B	8.9	64.4	0.41	0.93	0.41	48.2
2	T1	All MCs	644	3.9	644	3.9	* 0.783	57.8	LOS E	21.7	157.2	0.99	0.97	1.07	22.9
3	R2	All MCs	312	3.0	312	3.0	* 0.965	100.4	LOS F	12.6	90.8	1.00	1.11	1.54	21.8
Approach			1407	3.6	1407	3.6	0.965	53.6	LOS D	21.7	157.2	0.81	0.99	0.96	27.0
East: Griffiths Road															
4	L2	All MCs	221	3.3	221	3.3	0.174	11.2	LOS A	3.9	28.4	0.32	0.64	0.32	48.9
5	T1	All MCs	731	5.6	731	5.6	0.561	43.9	LOS D	15.7	115.3	0.90	0.76	0.90	37.1
6	R2	All MCs	55	3.8	55	3.8	* 0.662	78.5	LOS F	3.8	27.3	1.00	0.81	1.12	22.9
Approach			1006	5.0	1006	5.0	0.662	38.6	LOS C	15.7	115.3	0.78	0.74	0.78	37.8
North: Turton Road															
7	L2	All MCs	100	12.6	100	12.6	0.144	15.5	LOS B	2.7	21.0	0.45	0.67	0.45	43.7
8	T1	All MCs	534	4.1	534	4.1	0.460	44.8	LOS D	12.1	87.5	0.89	0.74	0.89	25.4
9	R2	All MCs	88	16.7	88	16.7	0.624	71.7	LOS F	5.8	46.5	1.00	0.81	1.05	22.9
Approach			722	6.9	722	6.9	0.624	44.0	LOS D	12.1	87.5	0.84	0.74	0.85	27.1
West: Griffiths Road															
10	L2	All MCs	108	9.7	108	9.7	0.101	10.1	LOS A	1.8	13.3	0.33	0.63	0.33	46.5
11	T1	All MCs	1340	3.1	1340	3.1	* 0.589	24.1	LOS B	19.2	137.8	0.72	0.64	0.72	44.7
12	R2	All MCs	313	4.0	313	4.0	0.495	58.7	LOS E	9.2	66.7	0.95	0.80	0.95	28.0
Approach			1761	3.6	1761	3.6	0.589	29.3	LOS C	19.2	137.8	0.74	0.66	0.74	41.3
All Vehicles			4897	4.4	4897	4.4	0.965	40.4	LOS C	21.7	157.2	0.78	0.78	0.83	34.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	1	1	60.1	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
East: Griffiths Road												

P2	Full	9	9	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
North: Turton Road												
P3	Full	1	1	60.1	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
West: Griffiths Road												
P4	Full	7	7	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
All Pedestrians		18	19	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88

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.

MOVEMENT SUMMARY

Site: 102 [Turton Road / Young Road - TCS 3322 (Site Folder: 2024 Project AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 129 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	108	3.9	108	3.9	0.125	13.6	LOS A	2.9	21.2	0.37	0.59	0.37	28.5
2	T1	All MCs	1334	3.2	1334	3.2	* 0.562	5.5	LOS A	12.1	87.3	0.31	0.29	0.31	49.2
Approach			1442	3.3	1442	3.3	0.562	6.1	LOS A	12.1	87.3	0.32	0.31	0.32	46.2
North: Turton Road															
8	T1	All MCs	959	0.1	959	0.1	0.231	5.7	LOS A	6.4	44.6	0.34	0.30	0.34	48.1
9	R2	All MCs	79	2.7	79	2.7	* 0.314	18.9	LOS B	2.6	18.3	0.58	0.73	0.58	33.6
Approach			1038	0.3	1038	0.3	0.314	6.7	LOS A	6.4	44.6	0.36	0.33	0.36	45.9
West: Young Road															
10	L2	All MCs	68	6.2	68	6.2	0.178	47.7	LOS D	3.6	26.4	0.85	0.71	0.85	22.5
12	R2	All MCs	178	5.3	178	5.3	* 0.594	57.5	LOS E	10.5	77.1	0.97	0.81	0.97	12.8
Approach			246	5.6	246	5.6	0.594	54.8	LOS D	10.5	77.1	0.94	0.78	0.94	15.6
All Vehicles			2726	2.4	2726	2.4	0.594	10.7	LOS A	12.1	87.3	0.39	0.36	0.39	39.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	5	5	58.7	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89
North: Turton Road												
P3	Full	7	7	58.7	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89
West: Young Road												
P4	Full	4	4	58.6	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89
All Pedestrians		16	17	58.7	LOS E	0.0	0.0	0.95	0.95	225.3	200.0	0.89

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.

MOVEMENT SUMMARY

Site: 103 [Turton Road / McDonald Jones Stadium Southern Access (Site Folder: 2024 Project AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
2	T1	All MCs	1457	3.3	1457	3.3	0.392	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
3	R2	All MCs	40	7.9	40	7.9	0.237	26.9	LOS B	0.7	5.2	0.85	0.96	0.94	11.5
Approach			1497	3.4	1497	3.4	0.392	0.7	NA	0.7	5.2	0.02	0.03	0.03	54.3
East: McDonald Jones Stadium Southern Access															
4	L2	All MCs	33	3.2	33	3.2	1.791	725.8	LOS F	14.1	102.6	1.00	4.08	4.59	0.5
6	R2	All MCs	11	10.0	11	10.0	1.791	888.0	LOS F	14.1	102.6	1.00	4.08	4.59	0.5
Approach			43	4.9	43	4.9	1.791	765.4	LOS F	14.1	102.6	1.00	4.08	4.59	0.5
North: Turton Road															
7	L2	All MCs	23	0.0	23	0.0	0.214	4.0	LOS A	0.0	0.0	0.00	0.03	0.00	28.9
8	T1	All MCs	1156	4.7	1156	4.7	0.214	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.3
Approach			1179	4.6	1179	4.6	0.214	0.1	NA	0.0	0.0	0.00	0.01	0.00	58.4
All Vehicles			2719	3.9	2719	3.9	1.791	12.6	NA	14.1	102.6	0.03	0.08	0.09	23.1

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

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

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

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 104 [Turton Road / Monash Road / Newcastle International Hockey Centre Northern Exit (Site Folder: 2024 Project AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	11	0.0	11	0.0	0.395	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	56.5
2	T1	All MCs	1456	3.5	1456	3.5	0.395	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
Approach			1466	3.4	1466	3.4	0.395	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.6
East: Newcastle International Hockey Centre Northern Exit															
4	L2	All MCs	1	0.0	1	0.0	1.000	273.1	LOS F	4.1	29.0	1.00	1.01	1.01	1.5
5	T1	All MCs	1	0.0	1	0.0	1.000	1966.5	LOS F	4.1	29.0	1.00	1.01	1.01	2.0
6	R2	All MCs	1	0.0	1	0.0	1.000	438.8	LOS F	4.1	29.0	1.00	1.01	1.01	0.5
Approach			3	0.0	3	0.0	1.000	892.8	LOS F	4.1	29.0	1.00	1.01	1.01	1.3
North: Turton Road															
8	T1	All MCs	1157	4.4	1157	4.4	0.208	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	All MCs	36	5.9	36	5.9	0.232	29.4	LOS C	0.7	5.0	0.90	0.98	0.98	25.0
Approach			1193	4.4	1193	4.4	0.232	0.9	NA	0.7	5.0	0.03	0.03	0.03	56.7
West: Monash Road															
10	L2	All MCs	53	0.0	53	0.0	1.096	122.6	LOS F	5.6	39.5	1.00	1.67	2.66	11.0
12	R2	All MCs	5	20.0	5	20.0	1.096	125.9	LOS F	5.6	39.5	1.00	1.67	2.66	15.2
Approach			58	1.8	58	1.8	1.096	122.9	LOS F	5.6	39.5	1.00	1.67	2.66	11.4
All Vehicles			2720	3.8	2720	3.8	1.096	4.1	NA	5.6	39.5	0.03	0.05	0.07	49.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 105 [Turton Road / Lambton Road / Bridges Road - TCS 350 (Site Folder: 2024 Project AM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

0800-0900
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 132 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Lambton Road															
4a	L1	All MCs	182	9.8	182	9.8	0.189	8.8	LOS A	3.0	23.1	0.34	0.62	0.34	50.5
5	T1	All MCs	475	5.1	475	5.1	0.447	41.2	LOS C	12.5	91.1	0.87	0.73	0.87	37.9
6b	R3	All MCs	238	8.4	238	8.4	* 1.755	759.1	LOS F	51.4	385.4	1.00	2.16	4.00	3.7
Approach			895	6.9	895	6.9	1.755	225.5	LOS F	51.4	385.4	0.80	1.09	1.60	13.0
NorthEast: Turton Road															
24b	L3	All MCs	342	0.3	342	0.3	0.221	8.1	LOS A	0.0	0.0	0.00	0.58	0.00	51.0
25	T1	All MCs	693	4.7	693	4.7	0.551	41.7	LOS C	18.8	137.1	0.86	0.74	0.86	34.9
26a	R1	All MCs	117	6.3	117	6.3	* 0.884	92.7	LOS F	8.5	62.8	1.00	0.99	1.37	25.8
Approach			1152	3.6	1152	3.6	0.884	36.9	LOS C	18.8	137.1	0.62	0.72	0.65	34.8
West: Lambton Road															
10a	L1	All MCs	124	5.9	124	5.9	0.189	18.2	LOS B	3.9	28.5	0.53	0.68	0.53	45.0
11	T1	All MCs	558	4.2	558	4.2	* 0.846	64.4	LOS E	19.0	135.3	1.00	0.97	1.17	31.4
Approach			682	4.5	682	4.5	0.846	56.0	LOS D	19.0	135.3	0.91	0.92	1.05	33.0
SouthWest: Bridges Road															
30b	L3	All MCs	16	13.3	16	13.3	0.874	16.7	LOS B	14.9	106.1	0.42	0.50	0.51	48.5
31	T1	All MCs	1136	1.9	1136	1.9	* 0.874	21.4	LOS B	28.8	205.3	0.57	0.58	0.63	45.6
32a	R1	All MCs	389	2.2	389	2.2	0.807	46.0	LOS D	7.7	55.1	1.00	0.88	1.16	35.0
Approach			1541	2.1	1541	2.1	0.874	27.6	LOS B	28.8	205.3	0.67	0.66	0.76	39.3
All Vehicles			4269	3.9	4269	3.9	1.755	76.1	LOS F	51.4	385.4	0.72	0.81	0.95	25.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Lambton Road												
P2	Full	22	23	60.2	LOS F	0.1	0.1	0.96	0.96	226.9	200.0	0.88
NorthEast: Turton Road												
P6	Full	6	6	60.2	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88

SouthWest: Bridges Road											
P8 Full	1	1	60.1	LOS F	0.0	0.0	0.95	0.95	226.8	200.0	0.88
All Pedestrians	29	31	60.2	LOS F	0.1	0.1	0.96	0.96	226.9	200.0	0.88

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.

MOVEMENT SUMMARY

Site: 101 [Turton Road / Griffiths Road - TCS 201 (Site Folder: 2024 Project PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 131 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	512	2.5	512	2.5	0.439	28.7	LOS C	8.4	60.1	0.37	0.82	0.37	49.4
2	T1	All MCs	874	2.5	874	2.5	* 1.279	339.2	LOS F	69.0	493.6	1.00	2.06	2.64	5.6
3	R2	All MCs	495	1.1	495	1.1	* 1.301	368.4	LOS F	36.9	260.9	1.00	1.76	2.75	8.4
Approach			1880	2.1	1880	2.1	1.301	262.4	LOS F	69.0	493.6	0.83	1.64	2.05	8.7
East: Griffiths Road															
4	L2	All MCs	322	3.3	322	3.3	0.215	14.9	LOS B	7.4	53.1	0.41	0.67	0.41	47.2
5	T1	All MCs	756	3.2	756	3.2	0.467	45.5	LOS D	16.0	114.9	0.90	0.75	0.90	36.6
6	R2	All MCs	106	1.0	106	1.0	* 0.482	64.8	LOS E	6.4	45.3	0.96	0.77	0.96	25.6
Approach			1184	3.0	1184	3.0	0.482	38.9	LOS C	16.0	114.9	0.77	0.73	0.77	37.5
North: Turton Road															
7	L2	All MCs	128	1.6	128	1.6	0.177	19.8	LOS B	4.2	29.9	0.54	0.70	0.54	41.4
8	T1	All MCs	837	2.1	837	2.1	0.597	53.5	LOS D	19.9	141.4	0.94	0.79	0.94	24.3
9	R2	All MCs	117	10.3	117	10.3	0.474	78.7	LOS F	7.2	54.8	0.99	0.78	0.99	24.1
Approach			1083	2.9	1083	2.9	0.597	52.2	LOS D	19.9	141.4	0.90	0.78	0.90	24.5
West: Griffiths Road															
10	L2	All MCs	123	5.1	123	5.1	0.121	14.7	LOS B	2.4	17.8	0.38	0.65	0.38	45.4
11	T1	All MCs	1368	1.8	1368	1.8	* 0.642	36.3	LOS C	24.0	170.6	0.88	0.78	0.88	40.0
12	R2	All MCs	406	5.4	406	5.4	0.518	53.6	LOS D	11.5	84.1	0.93	0.81	0.93	29.3
Approach			1898	2.8	1898	2.8	0.642	38.6	LOS C	24.0	170.6	0.86	0.78	0.86	37.5
All Vehicles			6045	2.6	6045	2.6	1.301	110.7	LOS F	69.0	493.6	0.84	1.04	1.22	19.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	1	1	59.6	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
East: Griffiths Road												

P2	Full	7	7	59.7	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
North: Turton Road												
P3	Full	1	1	59.6	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
West: Griffiths Road												
P4	Full	4	4	59.6	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88
All Pedestrians		13	14	59.7	LOS E	0.0	0.0	0.95	0.95	226.3	200.0	0.88

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.

MOVEMENT SUMMARY

Site: 102 [Turton Road / Young Road - TCS 3322 (Site Folder: 2024 Project PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 137 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	139	9.8	139	9.8	0.138	10.3	LOS A	3.1	23.3	0.32	0.60	0.32	33.0
2	T1	All MCs	1669	2.3	1669	2.3	* 0.622	1.8	LOS A	8.5	60.9	0.17	0.16	0.17	55.5
Approach			1808	2.9	1808	2.9	0.622	2.5	LOS A	8.5	60.9	0.18	0.20	0.18	53.3
North: Turton Road															
8	T1	All MCs	1448	3.2	1448	3.2	0.380	14.7	LOS B	20.5	147.3	0.64	0.29	0.64	42.1
9	R2	All MCs	149	2.8	149	2.8	* 0.756	51.4	LOS D	11.4	81.8	1.00	1.02	1.16	24.7
Approach			1598	3.2	1598	3.2	0.756	18.2	LOS B	20.5	147.3	0.67	0.36	0.69	33.7
West: Young Road															
10	L2	All MCs	138	3.1	138	3.1	0.237	70.8	LOS F	7.4	53.5	0.86	0.77	0.86	22.6
12	R2	All MCs	259	3.3	259	3.3	* 0.921	100.3	LOS F	19.7	141.6	1.00	1.02	1.31	10.3
Approach			397	3.2	397	3.2	0.921	90.0	LOS F	19.7	141.6	0.95	0.93	1.16	12.0
All Vehicles			3803	3.0	3803	3.0	0.921	18.2	LOS B	20.5	147.3	0.47	0.34	0.50	33.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	20	21	62.7	LOS F	0.1	0.1	0.96	0.96	229.4	200.0	0.87
North: Turton Road												
P3	Full	16	17	62.7	LOS F	0.1	0.1	0.96	0.96	229.3	200.0	0.87
West: Young Road												
P4	Full	7	7	62.7	LOS F	0.0	0.0	0.96	0.96	229.3	200.0	0.87
All Pedestrians		43	45	62.7	LOS F	0.1	0.1	0.96	0.96	229.3	200.0	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.

MOVEMENT SUMMARY

Site: 103 [Turton Road / McDonald Jones Stadium Southern Access (Site Folder: 2024 Project PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
2	T1	All MCs	1792	2.8	1792	2.8	0.785	30.8	LOS C	45.5	326.3	0.18	0.17	0.67	12.5
3	R2	All MCs	99	2.1	99	2.1	1.440	482.4	LOS F	22.0	157.0	1.00	2.39	7.17	0.9
Approach			1891	2.8	1891	2.8	1.440	54.5	NA	45.5	326.3	0.22	0.29	1.01	7.7
East: McDonald Jones Stadium Southern Access															
4	L2	All MCs	33	3.2	33	3.2	1.047	86.2	LOS F	3.1	22.2	1.00	1.52	1.70	4.3
6	R2	All MCs	4	0.0	4	0.0	1.047	51.2	LOS D	3.1	22.2	1.00	1.52	1.70	3.7
Approach			37	2.9	37	2.9	1.047	82.2	LOS F	3.1	22.2	1.00	1.52	1.70	4.3
North: Turton Road															
7	L2	All MCs	19	5.6	19	5.6	0.307	4.0	LOS A	0.0	0.0	0.00	0.02	0.00	29.0
8	T1	All MCs	1696	3.2	1696	3.2	0.307	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach			1715	3.2	1715	3.2	0.307	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.0
All Vehicles			3642	3.0	3642	3.0	1.440	29.1	NA	45.5	326.3	0.13	0.17	0.54	12.9

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

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

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

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 104 [Turton Road / Monash Road / Newcastle International Hockey Centre Northern Exit (Site Folder: 2024 Project PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	19	0.0	19	0.0	0.467	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	56.4
2	T1	All MCs	1723	2.9	1723	2.9	0.467	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach			1742	2.8	1742	2.8	0.467	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.4
East: Newcastle International Hockey Centre Northern Exit															
4	L2	All MCs	1	0.0	1	0.0	1.000	2152.3	LOS F	3.7	26.0	1.00	1.00	1.00	1.8
5	T1	All MCs	1	0.0	1	0.0	1.000	39.4	LOS C	3.7	26.0	1.00	1.00	1.00	2.4
6	R2	All MCs	1	0.0	1	0.0	1.000	39.4	LOS C	3.7	26.0	1.00	1.00	1.00	0.5
Approach			3	0.0	3	0.0	1.000	743.7	LOS F	3.7	26.0	1.00	1.00	1.00	1.6
North: Turton Road															
8	T1	All MCs	1693	4.0	1693	4.0	0.304	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
9	R2	All MCs	49	0.0	49	0.0	0.486	53.4	LOS D	1.6	11.2	0.96	1.04	1.20	20.5
Approach			1742	3.9	1742	3.9	0.486	1.5	NA	1.6	11.2	0.03	0.03	0.03	55.7
West: Monash Road															
10	L2	All MCs	167	1.3	167	1.3	1.794	734.5	LOS F	50.9	359.6	1.00	5.19	14.26	2.4
12	R2	All MCs	8	0.0	8	0.0	1.794	720.8	LOS F	50.9	359.6	1.00	5.19	14.26	3.6
Approach			176	1.2	176	1.2	1.794	733.8	LOS F	50.9	359.6	1.00	5.19	14.26	2.5
All Vehicles			3663	3.3	3663	3.3	1.794	36.7	NA	50.9	359.6	0.06	0.27	0.70	23.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 105 [Turton Road / Lambton Road / Bridges Road - TCS 350 (Site Folder: 2024 Project PM Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1645 - 1745
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 123 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Lambton Road															
4a	L1	All MCs	303	4.2	303	4.2	0.310	10.1	LOS A	6.6	48.0	0.44	0.67	0.44	49.7
5	T1	All MCs	624	2.2	624	2.2	0.281	29.0	LOS C	12.9	92.3	0.75	0.63	0.75	42.5
6b	R3	All MCs	203	4.7	203	4.7	* 0.464	37.1	LOS C	8.6	62.5	0.86	0.79	0.86	33.3
Approach			1131	3.2	1131	3.2	0.464	25.4	LOS B	12.9	92.3	0.69	0.67	0.69	42.4
NorthEast: Turton Road															
24b	L3	All MCs	598	0.5	598	0.5	0.369	9.0	LOS A	0.0	0.0	0.00	0.58	0.00	50.9
25	T1	All MCs	931	2.7	931	2.7	0.725	18.4	LOS B	17.6	126.4	0.64	0.56	0.64	45.6
26a	R1	All MCs	140	3.0	140	3.0	0.734	67.8	LOS E	8.5	61.4	1.00	0.85	1.09	29.6
Approach			1668	2.0	1668	2.0	0.734	19.2	LOS B	17.6	126.4	0.44	0.59	0.45	43.7
West: Lambton Road															
10a	L1	All MCs	222	7.1	222	7.1	0.286	20.9	LOS B	6.9	51.5	0.62	0.71	0.62	43.6
11	T1	All MCs	674	3.8	674	3.8	* 0.439	33.3	LOS C	14.3	102.3	0.76	0.63	0.76	40.7
Approach			897	4.6	897	4.6	0.439	30.3	LOS C	14.3	102.3	0.73	0.65	0.73	41.3
SouthWest: Bridges Road															
30b	L3	All MCs	20	0.0	20	0.0	1.336	319.4	LOS F	95.0	674.6	1.00	1.81	2.90	10.6
31	T1	All MCs	1313	1.7	1313	1.7	* 1.336	348.7	LOS F	106.5	755.9	1.00	2.15	2.90	7.8
32a	R1	All MCs	616	0.3	616	0.3	* 1.792	809.1	LOS F	66.6	467.3	1.00	2.45	4.27	4.3
Approach			1948	1.2	1948	1.2	1.792	493.9	LOS F	106.5	755.9	1.00	2.24	3.33	5.8
All Vehicles			5644	2.4	5644	2.4	1.792	186.1	LOS F	106.5	755.9	0.73	1.19	1.53	14.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Lambton Road												
P2	Full	27	28	55.7	LOS E	0.1	0.1	0.95	0.95	222.4	200.0	0.90
NorthEast: Turton Road												
P6	Full	14	15	55.7	LOS E	0.0	0.0	0.95	0.95	222.3	200.0	0.90

SouthWest: Bridges Road											
P8 Full	5	5	55.7	LOS E	0.0	0.0	0.95	0.95	222.3	200.0	0.90
All Pedestrians	46	48	55.7	LOS E	0.1	0.1	0.95	0.95	222.4	200.0	0.90

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.

MOVEMENT SUMMARY

Site: 101 [Turton Road / Griffiths Road - TCS 201 (Site Folder: 2024 Project Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	466	1.1	466	1.1	0.416	11.8	LOS A	8.9	62.6	0.44	0.69	0.44	48.1
2	T1	All MCs	513	1.0	513	1.0	0.553	43.1	LOS D	13.2	93.4	0.93	0.78	0.93	25.9
3	R2	All MCs	281	0.7	281	0.7	* 0.843	71.9	LOS F	9.1	63.9	1.00	0.96	1.28	26.1
Approach			1260	1.0	1260	1.0	0.843	37.9	LOS C	13.2	93.4	0.76	0.79	0.83	32.4
East: Griffiths Road															
4	L2	All MCs	339	0.3	339	0.3	0.293	15.5	LOS B	8.1	57.0	0.46	0.69	0.46	46.7
5	T1	All MCs	793	0.7	793	0.7	* 0.730	47.8	LOS D	17.3	121.5	0.97	0.84	1.00	35.8
6	R2	All MCs	87	2.4	87	2.4	* 0.709	69.8	LOS E	5.4	38.8	1.00	0.85	1.14	24.5
Approach			1219	0.7	1219	0.7	0.730	40.4	LOS C	17.3	121.5	0.83	0.80	0.86	37.0
North: Turton Road															
7	L2	All MCs	86	0.0	86	0.0	0.102	12.0	LOS A	1.7	12.0	0.37	0.65	0.37	46.4
8	T1	All MCs	708	0.6	708	0.6	* 0.619	45.1	LOS D	15.1	106.3	0.93	0.78	0.93	25.9
9	R2	All MCs	98	5.4	98	5.4	0.615	69.3	LOS E	5.8	42.7	1.00	0.81	1.04	24.3
Approach			893	1.1	893	1.1	0.619	44.6	LOS D	15.1	106.3	0.88	0.77	0.89	26.7
West: Griffiths Road															
10	L2	All MCs	107	2.0	107	2.0	0.092	8.3	LOS A	1.3	8.9	0.28	0.62	0.28	48.5
11	T1	All MCs	986	0.5	986	0.5	0.462	30.3	LOS C	14.5	102.1	0.81	0.70	0.81	42.0
12	R2	All MCs	468	1.1	468	1.1	0.581	50.8	LOS D	12.4	87.6	0.95	0.82	0.95	30.2
Approach			1562	0.8	1562	0.8	0.581	34.9	LOS C	14.5	102.1	0.81	0.73	0.81	38.5
All Vehicles			4934	0.9	4934	0.9	0.843	38.8	LOS C	17.3	121.5	0.82	0.77	0.84	34.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
East: Griffiths Road												

P2	Full	9	9	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
North: Turton Road												
P3	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
West: Griffiths Road												
P4	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
All Pedestrians		12	13	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91

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.

MOVEMENT SUMMARY

Site: 102 [Turton Road / Young Road - TCS 3322 (Site Folder: 2024 Project Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	63	0.0	63	0.0	0.087	9.5	LOS A	1.9	13.2	0.29	0.45	0.29	36.9
2	T1	All MCs	1145	0.9	1145	0.9	* 0.392	6.5	LOS A	11.7	82.4	0.39	0.36	0.39	47.6
Approach			1208	0.9	1208	0.9	0.392	6.6	LOS A	11.7	82.4	0.38	0.36	0.38	46.1
North: Turton Road															
8	T1	All MCs	1397	0.7	1397	0.7	0.339	8.5	LOS A	16.8	118.6	0.62	0.26	0.62	44.9
9	R2	All MCs	106	3.0	106	3.0	* 0.386	16.9	LOS B	2.6	18.3	0.49	0.70	0.49	39.1
Approach			1503	0.8	1503	0.8	0.386	9.1	LOS A	16.8	118.6	0.61	0.30	0.61	42.9
West: Young Road															
10	L2	All MCs	89	1.2	89	1.2	0.319	55.7	LOS D	4.8	33.7	0.94	0.77	0.94	21.7
12	R2	All MCs	116	2.7	116	2.7	* 0.453	56.7	LOS E	6.4	45.7	0.96	0.79	0.96	13.6
Approach			205	2.1	205	2.1	0.453	56.3	LOS D	6.4	45.7	0.95	0.78	0.95	17.4
All Vehicles			2917	0.9	2917	0.9	0.453	11.4	LOS A	16.8	118.6	0.54	0.36	0.54	39.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Turton Road												
P1	Full	8	8	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
North: Turton Road												
P3	Full	15	16	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91
West: Young Road												
P4	Full	1	1	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
All Pedestrians		24	25	54.2	LOS E	0.1	0.1	0.95	0.95	220.8	200.0	0.91

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.

MOVEMENT SUMMARY

Site: 103 [Turton Road / McDonald Jones Stadium Southern Access (Site Folder: 2024 Project Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
2	T1	All MCs	1157	0.7	1157	0.7	0.304	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	All MCs	48	2.2	48	2.2	0.468	49.1	LOS D	1.5	10.4	0.94	1.04	1.20	7.3
Approach			1205	0.8	1205	0.8	0.468	2.0	NA	1.5	10.4	0.04	0.04	0.05	47.4
East: McDonald Jones Stadium Southern Access															
4	L2	All MCs	41	5.1	41	5.1	1.283	272.0	LOS F	9.0	65.7	1.00	3.17	3.71	1.4
6	R2	All MCs	7	0.0	7	0.0	1.283	421.4	LOS F	9.0	65.7	1.00	3.17	3.71	1.2
Approach			48	4.3	48	4.3	1.283	294.7	LOS F	9.0	65.7	1.00	3.17	3.71	1.3
North: Turton Road															
7	L2	All MCs	17	0.0	17	0.0	0.269	4.0	LOS A	0.0	0.0	0.00	0.02	0.00	29.1
8	T1	All MCs	1520	0.8	1520	0.8	0.269	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.5
Approach			1537	0.8	1537	0.8	0.269	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.0
All Vehicles			2791	0.8	2791	0.8	1.283	6.0	NA	9.0	65.7	0.03	0.08	0.09	33.8

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

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

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

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

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

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

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 104 [Turton Road / Monash Road / Newcastle International Hockey Centre Northern Exit (Site Folder: 2024 Project Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Turton Road															
1	L2	All MCs	12	0.0	12	0.0	0.318	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	56.6
2	T1	All MCs	1198	0.9	1198	0.9	0.318	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach			1209	0.9	1209	0.9	0.318	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.6
East: Newcastle International Hockey Centre Northern Exit															
4	L2	All MCs	1	0.0	1	0.0	1.000	318.2	LOS F	4.2	29.2	1.00	1.01	1.01	1.5
5	T1	All MCs	1	0.0	1	0.0	1.000	1981.7	LOS F	4.2	29.2	1.00	1.01	1.01	2.0
6	R2	All MCs	1	0.0	1	0.0	1.000	433.7	LOS F	4.2	29.2	1.00	1.01	1.01	0.4
Approach			3	0.0	3	0.0	1.000	911.2	LOS F	4.2	29.2	1.00	1.01	1.01	1.3
North: Turton Road															
8	T1	All MCs	1497	1.0	1497	1.0	0.261	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
9	R2	All MCs	37	0.0	37	0.0	0.117	15.0	LOS B	0.4	2.7	0.80	0.91	0.80	35.0
Approach			1534	1.0	1534	1.0	0.261	0.4	NA	0.4	2.7	0.02	0.02	0.02	58.5
West: Monash Road															
10	L2	All MCs	82	1.3	82	1.3	1.122	136.7	LOS F	8.4	59.4	1.00	1.95	3.55	10.0
12	R2	All MCs	2	0.0	2	0.0	1.122	166.0	LOS F	8.4	59.4	1.00	1.95	3.55	14.9
Approach			84	1.3	84	1.3	1.122	137.4	LOS F	8.4	59.4	1.00	1.95	3.55	10.1
All Vehicles			2831	0.9	2831	0.9	1.122	5.4	NA	8.4	59.4	0.04	0.07	0.12	47.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 105 [Turton Road / Lambton Road / Bridges Road - TCS 350 (Site Folder: 2024 Project Weekend Peak)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

1115 - 1215
Site Category: Base Year
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site User-Given Phase Times)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Lambton Road															
4a	L1	All MCs	287	2.2	287	2.2	0.313	11.8	LOS A	7.3	51.8	0.50	0.69	0.50	48.6
5	T1	All MCs	412	1.0	412	1.0	0.322	31.9	LOS C	8.9	63.1	0.79	0.66	0.79	41.3
6b	R3	All MCs	221	0.5	221	0.5	*0.635	42.3	LOS C	10.6	74.2	0.92	0.81	0.92	31.5
Approach			920	1.3	920	1.3	0.635	28.1	LOS B	10.6	74.2	0.73	0.71	0.73	40.7
NorthEast: Turton Road															
24b	L3	All MCs	332	0.3	332	0.3	0.194	7.7	LOS A	0.0	0.0	0.00	0.58	0.00	51.0
25	T1	All MCs	1093	0.4	1093	0.4	0.725	23.3	LOS B	22.3	156.6	0.71	0.63	0.71	43.8
26a	R1	All MCs	119	0.0	119	0.0	0.608	71.8	LOS F	7.0	48.7	1.00	0.80	1.02	29.8
Approach			1543	0.3	1543	0.3	0.725	23.7	LOS B	22.3	156.6	0.58	0.63	0.58	40.9
West: Lambton Road															
10a	L1	All MCs	128	0.8	128	0.8	0.161	14.1	LOS A	3.1	21.7	0.48	0.66	0.48	47.5
11	T1	All MCs	407	1.6	407	1.6	*0.348	44.9	LOS D	10.2	72.2	0.91	0.74	0.91	36.7
Approach			536	1.4	536	1.4	0.348	37.5	LOS C	10.2	72.2	0.81	0.72	0.81	38.6
SouthWest: Bridges Road															
30b	L3	All MCs	40	0.0	40	0.0	0.748	9.4	LOS A	14.6	102.6	0.68	0.67	0.69	47.0
31	T1	All MCs	867	0.8	867	0.8	*0.748	23.0	LOS B	19.6	138.0	0.70	0.65	0.70	44.0
32a	R1	All MCs	308	0.7	308	0.7	*0.846	74.3	LOS F	9.9	69.8	1.00	0.97	1.28	27.5
Approach			1216	0.8	1216	0.8	0.846	35.6	LOS C	19.6	138.0	0.77	0.73	0.85	35.9
All Vehicles			4215	0.8	4215	0.8	0.846	29.8	LOS C	22.3	156.6	0.70	0.69	0.72	39.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Lambton Road												
P2	Full	38	40	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91
NorthEast: Turton Road												
P6	Full	16	17	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91

SouthWest: Bridges Road											
P8 Full	7	7	54.2	LOS E	0.0	0.0	0.95	0.95	220.8	200.0	0.91
All Pedestrians	61	64	54.2	LOS E	0.1	0.1	0.95	0.95	220.9	200.0	0.91

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.

Attachment D: SIDRA Model Validation

Approach	Turn/s	Observed (veh)	Observed (m)	Acceptable Queue Range (m)	Modelled (m)	Within Acceptable Range?	Difference if Outside Acceptable Range (m)
AM Peak							
Turton Road / Griffiths Road							
Turton Road (N)	T	15	90	70-110	87	Yes	-
	R	NA	NA	NA	47	NA	-
Griffiths Road (E)	T	16	96	76-116	115	Yes	-
	R	7	42	27-57	27	Yes	-
Turton Road (S)	T	NA	NA	NA	156	NA	-
	R	11	66	46-86	85	Yes	-
Griffiths Road (W)	T	21	126	101-151	138	Yes	-
	R	13	78	58-98	66	Yes	-
Turton Road / Young Road							
Turton Road (N)	T	8	48	33-63	45	Yes	-
	R	3	18	8-28	15	Yes	-
Turton Road (S)	L/T	11	66	46-86	85	Yes	-
Young Road (W)	L	NA	NA	NA	26	NA	-
	R	NA	NA	NA	77	NA	-
Turton Road / Lambton Road / Bridges Road							
Turton Road (N)	T	21	126	101-151	137	Yes	-
	R	8	48	33-63	63	Yes	-
Lambton Road (E)	T	11	66	46-86	91	No	5
	R	NA	NA	NA	362	NA	-
Bridges Road (S)	T	NA	NA	NA	199	NA	-
	R	NA	NA	NA	55	NA	-
Lambton Road (W)	T	NA	NA	NA	135	NA	-
PM Peak							
Turton Road / Griffiths Road							
Turton Road (N)	T	21	126	101-151	136	Yes	-
	R	NA	NA	NA	199	NA	-
Griffiths Road (E)	T	19	114	89-139	115	Yes	-
	R	4	24	9-39	45	No	6
Turton Road (S)	T	NA	NA	NA	435	NA	-
	R	22	132	107-157	149	Yes	-
Griffiths Road (W)	T	23	138	113-163	171	No	8
	R	18	108	83-133	82	No	1
Turton Road / Young Road							
Turton Road (N)	T	20	120	95-145	160	No	15
	R	3	18	8-28	23	Yes	-
Turton Road (S)	L/T	11	66	46-86	45.70	No	0
Young Road (W)	L	NA	NA	NA	54	NA	-
	R	NA	NA	NA	142	NA	-

Table 28: Queue definition parameters

Observed Queue Range (m)	Acceptable Validation Error (m)	Example Observed Queue (m)	Demonstration Range (m)
1-20	10	15	5-25
21-50	15	45	30-60
51-100m	20	95	75-115
101-151m	25	145	120-170
151-200m	30	195	165-225
201-250m	35	245	210-280
251-500m	100	495	395-595
501-1000m	150	990	840-1140
1000m+	200	1240	1040-1440

Table 28: Queue definition parameters

Observed Queue Range (m)	Acceptable Validation Error (m)	Example Observed Queue (m)	Demonstration Range (m)
1-20	10	15	5-25
21-50	15	45	30-60
51-100m	20	95	75-115
101-151m	25	145	120-170
151-200m	30	195	165-225
201-250m	35	245	210-280
251-500m	100	495	395-595

Turton Road / Lambton Road / Bridges Road							
Turton Road (N)	T	25	150	125-175	126	Yes	-
	R	8	48	33-63	61	Yes	-
Lambton Road (E)	T	10	60	40-80	92	No	12
	R	NA	NA	NA	49	NA	-
Bridges Road (S)	T	NA	NA	NA	683	NA	-
	R	NA	NA	NA	467	NA	-
Lambton Road (W)	T	NA	NA	NA	102	NA	-
Weekend Peak							
Turton Road / Griffiths Road							
Turton Road (N)	T	14	84	64-104	104	Yes	-
	R	NA	NA	NA	43	NA	-
Griffiths Road (E)	T	19	114	89-139	122	Yes	-
	R	5	30	15-45	39	Yes	-
Turton Road (S)	T	NA	NA	NA	90	NA	-
	R	6	36	21-51	50	Yes	-
Griffiths Road (W)	T	18	108	83-133	102	Yes	-
	R	15	90	70-110	87	Yes	-
Turton Road / Young Road							
Turton Road (N)	T	21	126	101-151	114	Yes	-
	R	2	12	2-22	11	Yes	-
Turton Road (S)	L/T	12	72	52-92	70	Yes	-
Young Road (W)	L	NA	NA	NA	34	NA	-
	R	NA	NA	NA	46	NA	-
Turton Road / Lambton Road / Bridges Road							
Turton Road (N)	T	23	138	113-163	157	Yes	-
	R	7	42	27-57	49	Yes	-
Lambton Road (E)	T	9	54	34-74	63	Yes	-
	R	10	60	40-80	65	Yes	-
Bridges Road (S)	T	NA	NA	NA	130	NA	-
	R	NA	NA	NA	70	NA	-
Lambton Road (W)	T	8	48	33-63	72	No	9

501-1000m	150	990	840-1140
1000m+	200	1240	1040-1440

Table 28: Queue definition parameters

Observed Queue Range (m)	*Acceptable Validation Error (m)*	*Example Observed Queue (m)*	*Demonstration Range (m)*
1-20	10	15	5-25
21-50	15	45	30-60
51-100m	20	95	75-115
101-151m	25	145	120-170
151-200m	30	195	165-225
201-250m	35	245	210-280
251-500m	100	495	395-595
501-1000m	150	990	840-1140
1000m+	200	1240	1040-1440

Attachment E: SIDRA Model Intersection Performance

	2024 Base					2024 Project					
Intersection	Traffic Volume (veh/h)	DoS (v/c)	Average Delay (s)	LoS	95th Percentile Queue (m)	Traffic Volume (veh/h)	DoS (v/c)	Average Delay (s)	LoS	95th Percentile Queue (m)	Average Delay Difference
AM Peak											**Project - Base**
Turton Road / Griffiths Road	4,869	0.94	39.8	LOS C	156	4,897	0.97	40.4	LOS C	157	0.6
Turton Road / Young Road	2,697	0.59	10.7	LOS A	85	2,726	0.59	10.7	LOS A	87	0.0
Turton Road / McDonald's Jones Stadium	2,675	1.79	896.8	LOS F	103	2,719	1.79	888.0	LOS F	103	-8.8
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit	2,676	1.07	1,885.7	LOS F	31	2,720	1.10	1,966.5	LOS F	40	80.8
Turton Road / Lambton Road / Bridges Road	4,234	1.70	72.0	LOS F	362	4,269	1.76	76.1	LOS F	385	4.1
PM Peak											
Turton Road / Griffiths Road	5,771	1.22	86.1	LOS F	435	6,045	1.30	110.7	LOS F	494	24.6
Turton Road / Young Road	3,528	0.92	16.2	LOS B	160	3,803	0.92	18.2	LOS B	147	2.0
Turton Road / McDonald's Jones Stadium	3,429	1.44	482.4	LOS F	209	3,642	1.44	482.4	LOS F	326	0.0
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit	3,451	1.63	2,201.8	LOS F	220	3,663	1.79	2,152.3	LOS F	360	-49.5
Turton Road / Lambton Road / Bridges Road	5,488	1.79	178.1	LOS F	683	5,644	1.79	186.1	LOS F	756	8.0
Weekend Peak											
Turton Road / Griffiths Road	4,780	0.73	38.4	LOS C	17	4,934	0.84	38.8	LOS C	122	0.4
Turton Road / Young Road	2,763	0.45	11.3	LOS A	16	2,917	0.45	11.4	LOS A	119	0.1
Turton Road / McDonald's Jones Stadium	2,664	1.28	454.2	LOS F	9	2,791	1.28	421.4	LOS F	66	-32.8
Turton Road / Monash Road / Newcastle Hockey Centre Northern Exit	2,704	1.07	1,597.0	LOS F	5	2,831	1.12	1,981.7	LOS F	59	384.7
Turton Road / Lambton Road / Bridges Road	4,123	0.85	29.6	LOS C	22	4,215	0.85	29.8	LOS C	157	0.2