Transport
Roads & Maritime
Services

10 September 2019

Our Reference: SYD18/00093

General Manager
The Hills Shire Council
PO Box 7064
Norwest NSW 2153

Attention: Kayla Atkins

Dear Mr Edgar

PLANNING PROPOSAL – DRAFT DEVELOPMENT CONTROL PLAN 2012 AND DRAFT VOLUNTARY PLANNING AGREEMENT AT 55 COONARA AVENUE, WEST PENNANT HILLS

I refer to the Roads and Maritime Services submission of 12 August 2019 (**TAB A**) regarding the above planning proposal and advise that the proponent's transport consultant Ason Group has provided a response to this submission dated 29 August 2019 (**TAB B**).

Roads and Maritime has reviewed the proponent's response to the submission and advises that upon review of the documentation provided, Roads and Maritime is of the view that the matters identified for Council's consideration have been satisfactorily addressed.

Council is also advised that as previously discussed with the proponent, Roads and Maritime may require (subject to further investigation) the proponent to provide a signalised pedestrian phase on the western leg of the Old Castle Road/Edward Bennett Drive/Coonara Avenue signalised intersection at no cost to Roads and Maritime under a 'Works Authorisation Deed'. However, Roads and Maritime is of the view that this matter can be deferred to the Part 4 Development Application stage and if deemed necessary can be imposed as a Condition of Consent.

Should you have any questions or further enquiries in relation to this matter, please contact James Hall – Senior Land Use Planner on phone [redacted] or email james.hall@rms.nsw.gov.au

Yours sincerely,

James Hall
Senior Land Use Planner
Sydney Planning, Sydney Division

MEMO

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29 August 2019

Mirvac
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Sydney NSW 2000

Attn: Amanda Blake, Senior Development Manager

RE: 55 Coonara Avenue, West Pennant Hills — Response to RMS Submission

Dear Amanda,

I refer to Roads & Maritime Services (RMS) letter dated 12 August 2019 in relation to the draft Voluntary Planning Agreement for 55 Coonara Avenue, West Pennant Hills. It is important to note that RMS "…*does not have any objections to the planning proposa*l…", instead providing comments for consideration only. Nevertheless, we provide the following comments with respect to each comment for further clarification. This is particularly relevant noting that RMS comments relate to material from August 2018 which has subsequently been superseded by an independent peer review by GTA Consultants and more recent traffic data and modelling by Ason Group.

1 Background

To provide background to the history of the proposal, Mirvac has provided the following summary:

Mirvac commissioned ARC Traffic and Transport in 2015, to inform our initial proposal for the site which comprised 1,269 dwellings. A number of traffic assessments were undertaken throughout the evolution of the Planning Proposal as negotiations progressed with The Hills Shire Council (Council). Subsequently, a peer review and further traffic studies were undertaken by Ason Group and discussed in detail with RMS and Department of Planning, Industry and Environment (DPIE). All transport studies have been undertaken in consultation with engagement from Council's Traffic Engineer.

A summary of the studies and reports undertaken to date are noted below.

Report	Date	Dwellings	Summary
ARC Report (Revision 1)	*January 2016*	*1,269*	*"Trip generation of the project would be significantly lower during the commuter peak periods."*
ARC Report (Revision 2)	*July 2016*	*1,119*	*"Trip generation of the project would be significantly lower during the commuter peak periods."*
ARC Report (Revision 3)	*October 2016*	*800*	*"The trip generation of the Project would be significant lower during the commuter peak periods."* *"This is a total significantly less than would be generated under capacity commercial operations at the Site."* *"This finding specifically accounts for the redistribution of arrival/departure trips during the peak periods."*

ARC Letter	*March 2017*	*800*	*"the Proposal would, quite simply, generate fewer peak hour trips (and potentially very significantly fewer trips) than currently allowable commercial operations at the Site."* *"As such, there is no question in our opinion that the Proposal would generate significantly fewer trips during the peak periods than commercial operations at the Site. Again, this conclusion was fully discussed and in our opinion agreed with Council traffic officers."*
Ason Peer Review	*April 2017*	*800*	*"the Proposal is supportable and has been thoroughly assessed and justified to support this position."*
ARC Report (Revision 4)	*July 2017*	*600*	*"The trip generation of the Proposal would be significant lower during the peak periods than capacity commercial operations,"* *"as agreed with Council officers, the total trip generation determined with regard to any of these rates is significantly less than would be generated under capacity commercial operations at the Site"* *"The Proposal would generate significantly fewer trips to the southern route in both peak periods…… the Proposal would have little if any significant impact on the operation of the southern route."*
ARC Letter	*July 2017*	*600*	*"the fact is that the Planning Proposal would result in the generation of significantly fewer trips to the road network when compared to commercial operations, and as such could not in any way be considered to be contributing to the cumulative intensification of traffic issues within the locality."* *"The only conclusion that can be reached is that the Planning Proposal will result in a deintensification of traffic issues within the locality, as literally hundreds of trips in the peak periods and across the day are removed not only from local intersections but from the broader road network providing access to and from the Site when compared to commercial operations at the Site. Indeed, if anything this could only reduce the demand for local and broader road network upgrades."*

In addition, The Hills Shire Council engaged GTA Consultants in October 2018 to conduct a peer review, which concluded:

> *Based on the analysis and discussions presented within this report it can be concluded the additional traffic generated by the proposed development is expected to have marginal impact on the performance of the existing network. The results of SIDRA analysis indicate that there are existing capacity constraints at Castle Hill Road, Oakes Road and Aiken Road. The opening of NorthConnex is expected to reduce traffic volumes on the arterial road network, which in turn may relieve congestion on local roads.*
>
> *The Aiken Road / Oakes Road roundabout is currently performing at capacity and any increase in traffic will lead to long queues and delays at this roundabout. The poor performance of this intersection is attributed to downstream queues reaching the roundabout and reducing its capacity. Therefore, the*

poor performance of this roundabout cannot be directly attributed to the development traffic as the additional traffic only exacerbates existing issues.

The following meetings have been held directly with RMS since issue of the Gateway Determination by DPIE in October 2017:

28 June 2018	*Meeting held with RMS (James Hall, Liam (surname not noted)), Mirvac (Adrian Checchin, Amanda Blake) and Ason (Piran Trethewey, Tim Lewis).* *Copies of all reports undertaken to date were provided.* *Electronic SIDRA files were provided to RMS to confirm inputs, particularly:* • *Phasing arrangement (split phasing)* • *Signal phase timings (priority to Castle Hill Rd)* • *Surveyed volumes vs. SCATS volumes to confirm not latent demand not picked up by surveys.* • *Scenarios provided to RMS:* 1. *Existing (current surveys) baseline* 2. *Business park at full operation* 3. *Existing 2018 baseline PLUS the proposed development*
21 September 2018	*Response received from James Hall outlining:* • *Recommendations for amendments to the phasing system scenario used in the SIDRA model.* • *Further guidance on RMS requirements in relation to 117 Direction - Ministerial Direction 5.9 – North West Rail Link Corridor Strategy.* • *Further guidance on additional information required by RMS – a strategic level understanding of the likely road network interventions (intersection upgrades) required on the adjacent regional road network.*
22 October 2018	*Meeting held with RMS (James Hall), DPE (Ann-Maree Carruthers, Sebastian Tauny), Mirvac (Adrian Checchin, Amanda Blake), FPD (Michael File), Ason (Piran Trethewey)* *Confirmed that the subject site was to be considered on its site-specific merits and not be assessed as part of a wider study area, as previously indicated.* *Mirvac agreed to undertake updated traffic surveys.*
15 January 2019	*Updated traffic assessment.* *Review of GTA's traffic study provided to RMS.*
14 February 2019	*Meeting held with RMS (James Hall, Laura Van Putten) and Mirvac (Adrian Checchin, Amanda Blake), FPD (Michael File), Ason (Piran Trethewey).*

Accordingly, we believe RMS' submission raises issues which have already been addressed during the many meetings held, correspondence and information provided to RMS throughout the planning proposal process.

Notwithstanding we respond to each item as follows.

2 Response to Latest RMS Submission

RMS Comment
Cumulative studies and developer contributions towards regional transport infrastructure upgrades
It is understood that the site is located within the Cherrybrook Precinct of the North West Rail Link (NWRL) Corridor Strategy. The Cherrybrook Precinct Structure Plan identifies the need for detailed cumulative studies and infrastructure contributions plans in support of the proposed Precinct uplift. It is understood that a precinct-wide traffic and transport study has not yet been completed. Council should be satisfied that a suitable funding mechanism is in place to obtain developer contributions on an equitable basis towards regional transport infrastructure upgrades to support future growth associated with the multiple planning proposals across the Cherrybrook precinct.

As previously demonstrated to RMS, the vehicular trip generation associated with the proposed residential land-use is actually lower than that of the existing site (being a commercial land-use zoning). As such, the proposal has benefits for the local transport network and, accordingly, there is no nexus between the planning proposal and any negative impacts found via cumulative studies — therefore no justification for developer contributions. Indeed, at the meeting on 22 October 2018 with DPIE, it was confirmed that this proposal should be considered on its own merits and wider traffic studies are not required. There is no apparent justification to link this proposal to any upgrades or contributions on the basis of traffic and transport matters.

Given the intensity of use of the site is reduced under the proposal, Mirvac do not believe any developer contributions are justified for the site. However, in the spirit of meeting community expectations, Mirvac have offered to enter into a Voluntary Planning Agreement (VPA) with Council to provide public benefits of 2.493ha of public open space, a synthetic soccer field and upgrade and dedication of the perimeter road within the site, in lieu of any developer contributions. Council endorsed the Draft VPA in September 2018 and it was exhibited alongside the Planning Proposal in May 2019. In addition, Mirvac have offered to dedicate approximately 10 hectares of forest area to the State Government, on the basis that it will fully satisfy all NSW government levies, charges, fees, contributions or works related to the proposal. This offer is currently being considered by DPIE.

RMS Comment
Connectivity with bus stops and active transport linkage
It is noted that the Cherrybrook Precinct Structure Plan indicated that pedestrian/cycle access across Castle Hill Road is a key connectivity issue within the Cherrybrook area. To encourage connecting people to public transport as indicated in the planning proposal's supporting material Attachment H Traffic Assessment Report, consideration should be given to improving whole journey accessibility. The emphasis being on pedestrian and cycling amenity in line with the movement and place framework. This may include (but is not be limited to) provisions for safe and accessible footpaths, pedestrian crossing points (taking into account pedestrian desire lines) and cycle paths. These considerations will better meet the needs of the community in a way that supports a safe, efficient and reliable journey for pedestrians and cyclist in addition to reducing the congestion on the road network.

As discussed in the previous Ason Group letter in response to Transport of NSW (TfNSW) dated in 5 July 2019 (ref: *0442l10*) – copy provided at **Attachment 1** for ease of reference — the mode share of bus and 'active transport' travel is limited in West Pennant Hills and, accordingly, does not warrant special provisions or improvements to local infrastructure.

Notwithstanding, as shown in Figure 1 below, a pedestrian footpath is already in place along the site frontage, providing connections to:

- Castle Hill Road and on to Cherrybrook Metro Station, via signalised crossing points, and
- Coonara Shopping Village

Figure 1: Pedestrian Routes to Metro and Coonara Shopping Village

Additional crossing points are not required to aid these desire lines.

The demand for bus services is expected to be moderate only. Therefore, the proposal does not necessitate improvements to bus facilities or connectivity thereto.

RMS Comment
Comments on traffic assessment report
Roads and Maritime provides comments at Tab A on the Traffic Assessment Report submitted for Council's consideration and to be addressed before further studies are undertaken.

It is noted that the *Traffic Assessment Report* that RMS assessed is dated 1 August 2018. The SIDRA modelling included in that report was based upon historic modelling files provided by ARC Traffic + Transport (the former traffic consultants on the project), not the most current information.

The most current traffic assessment report is Ason Group, *0442l08v1 RMS Memorandum in relation to GTA Review_55 Coonara Ave, West Pennant Hills*, dated 15 January 2019, which was provided to RMS (James Hall) on 15 January 2019. A copy of this report has been included at **Attachment 2**.

Notwithstanding, a detailed response to the comments on the *Traffic Assessment Report* is included in **Attachment 3**.

In summary, given the proposal reduces traffic generation, we do not believe any future scenario modelling is necessary, as both the current and the future case models will logically show an improvement between the existing business park use and the proposed residential use.

RMS' detailed comments are based on a report which has been superseded and have already been addressed in the current report, included at Attachment 2.

RMS Comment
Bus priority measures
In consultation with Transport for NSW (TfNSW) and Roads and Maritime, Council should give consideration to identifying potential bus service planning options and routes, including the need for bus priority measures for the cumulative development uplift associated with the Cherrybrook Structure Plan.

It is understood that this is a requirement for Council in context of wider redevelopment of the Cherrybrook Station precinct. As explained in our response to Transport for NSW, the proposed development does not warrant any special provisions or improvements to local bus infrastructure.

Council's peer review by GTA also finds that "*it would be expected that impacts to bus travel times resulting from the additional traffic generated by the development would be minimal*" and indicates that Council already have plans for a dedicated bus lane along Highs Road and Aiken Road all the way to Oakes Road roundabout. This is a State Government / Council issue and is unrelated to the proposed development which reduces the intensity of use of the site.

RMS Comment
Site access point
Vehicular access to Coonara Avenue from the development should occur to ensure safe and efficient access with minimal impacts on the queuing traffic. Consideration should be given to one access to the development with appropriate intersection traffic controls. The access should be located as far as practical away from the intersection of Coonara Avenue and Castle Hill Road to minimise impacts to the traffic signals.

There are already two existing established access points servicing the site from Coonara Avenue. These provide access for circa 1,700 existing car spaces. The existing use generates more car trips than the planning proposal and notwithstanding this, the two existing access points to the site currently operate efficiently. The proposal includes deletion of approximately 700 car spaces and reduces trip generation. The northern access is a desire line for pedestrian and cycle access to the new Metro Station, encouraging the use of those services and thereby promoting active transport.

The Coonara Avenue frontage comprises established bushland which is proposed to be maintained. The existing ring road around the site from the two entrance points is proposed to be maintained and upgraded, primarily to avoid environmental impacts which would occur if this road or the two Coonara Avenue access points were moved.

The concept plan of the proposed development was established when discussions first commenced with Council in 2015 and has been discussed with RMS on numerous occasions previously and formed the basis

of extensive public consultation. Furthermore, Fire and Rescue NSW have advised that multiple access points are required for emergency services access. Therefore, it is considered unreasonable to revisit the site access point fundamentals at this late stage.

RMS Comment
Assessment of transport demand
Given the proximity of the site to the new NWRL Cherrybrook station, consideration should be given to appropriate maximum parking controls for the future residential development, which could be included in the LEP or DCP for the site. This will help to reduce reliance on private vehicles and encourage the use of public transport.

Car parking has been an item that has been negotiated and agreed with Council in July 2017 as follows;

- 1 and 2 bedroom dwellings: 1 space per dwelling
- 3 or more bedroom dwellings: 2 spaces per dwelling
- Visitors: 1 space per 5 dwellings

These rates reduce existing parking levels by circa 700 car spaces and result in less traffic than compared to existing uses. The proposed planning controls for the site outline the above agreed parking requirements with council and were exhibited alongside the Planning Proposal in May 2019.

Furthermore, it is emphasised that the traffic modelling undertaken in support of the proposal is not reliant on reduced trip generation rates as a result of car parking restraint measures. Therefore, provision of parking at reasonable levels has been demonstrated to improve the surrounding road network.

In closing we note the proposal clearly reduces existing traffic and public transport trips compared to the current approved land-use and zoning. Many years of studies, negotiations with council, consultation with RMS and analysis has demonstrated this.

We trust the above is of assistance and please contact the undersigned should you have any queries or require further information in relation to the above.

Yours sincerely,

Principal Traffic Engineer – Ason Group
Email: tim.lewis@asongroup.com.au

Attachments:

1) *Response to TFNSW submission, dated 18 July 19, by Ason*
2) *0442l08v1 RMS Memorandum in relation to GTA Review 55 Coonara Ave, West Pennant Hills*, dated 15 January 2019, by Ason

   (Note: the above includes the Traffic Assessment Review of 55 Coonara Avenue West Pennant Hills, dated October 2018, by GTA Consultants)
3) Response to RMS Comments on the *Traffic Assessment Report*

Attachment 1

MEMO

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18 July 2019

Mirvac
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Attn: Amanda Blake, Senior Development Manager

RE: 55 Coonara Avenue, West Pennant Hills — Response to TfNSW

Dear Amanda,

I refer to Transport for NSW (TfNSW) letter dated 31 May 2019 in relation to the draft Voluntary Planning Agreement for 55 Coonara Avenue, West Pennant Hills. In this regard, we provide the following comments, as summarised below.

TfNSW Comment / Recommendation
Assessment of transport demand
Comment: *There are two traffic studies prepared for the planning proposal, however, both of the studies focused on assessing the traffic implications of private vehicles. Limited information is provided to assess the impact of other transport users, in particular bus and active transport including pedestrian and cyclist. The proposal would have a potential public transport demand of more than 400 people based on average people per household and existing travel patterns based on the ABS's Census data for West Pennant Hills.* *Recommendation:* *An assessment of public and active transport demand should be carried out to examine the adequacy of existing facilities in the vicinity of the site and any mitigation measures identified should be considered to be included in the draft VPA.*

A summary of the travel by various modes, adopting historic West Pennant Hills rates, is provided in **Table 1**.

Table 1: Summary of Travel by Mode (West Pennant Hills rates)

Travel Mode	Mode Share	Peak Hourly Pers Trips @ 0.30 / pers.	Daily Pers Trips @ 2.86 / pers.
Car Driver	57.4%	325	3,103
Bus	15.9%	90	859
Worked at home / Not Stated / Did Not Work	15.6%	88	843
Train	5.7%	32	308
Car Passenger	3.6%	20	195
Other	0.7%	4	38
Walked only	0.4%	2	22
Truck	0.2%	1	11
Motorcycle	0.2%	1	11

Bicycle	0.2%	1	11
TOTAL	**100%**	**564**	**5,401**

Notes: 1) Journey-to-Work (JTW) data for West Pennant Hills is included in Attachment 1. .Assumes 3.15 persons per dwelling. This is based on 2016 Census data for West Pennant Hills and may not be reflective of the future dwelling character which, with more medium density housing typologies, is likely to have reduced per dwelling occupancy.

2) 600 dwellings envisaged by Planning Proposal submission.

3) Daily and peak hourly trips based on Person Trip data for Westleigh included in RMS TDT 2013/04a

Notwithstanding the above, it is emphasised that Cherrybrook Station was not complete at the time the 2016 Census was undertaken. As such, further reference to more realistic mode share has been made with comparison to mode share data from Epping and Pennant Hills; nearby suburbs that include train stations; travel modes for Pennant Hills as follows.

Table 2: Summary of Travel by Mode (Pennant Hills rates)

Travel Mode	Mode Share	Peak Hourly Pers Trips @ 0.30 / pers.	Daily Pers Trips @ 2.86 / pers.
Car Driver	47.8%	271	2,584
Train	28.1%	159	1,519
Worked at home / Not Stated / Did Not Work	14.4%	82	778
Bus	1.8%	10	97
Car Passenger	3.0%	17	162
Walked only	3.3%	19	178
Other	0.5%	3	27
Motorcycle	0.4%	2	22
Bicycle	0.2%	1	11
Truck	0.5%	3	27
TOTAL	**100%**	**567**	**5,405**

Notes: 1) Journey-to-Work (JTW) data for West Pennant Hills is included in Attachment 1. .Assumes 3.15 persons per dwelling. This is based on 2016 Census data for West Pennant Hills and may not be reflective of the future dwelling character which, with more medium density housing typologies, is likely to have reduced per dwelling occupancy.

2) 600 dwellings envisaged by Planning Proposal submission.

3) Daily and peak hourly trips based on Person Trip data for Westleigh included in RMS TDT 2013/04a

The above trip profile in Table 2 is expected to be more representative of future travel characteristics of the subject site than reliance on historic data from West Pennant Hills which – at that time – did not include rail or Metro services.

Following from the above, it is evident that the mode share of bus and active transport travel is limited. Furthermore, the planning proposal reduces the intensity of use of the site from a 34,000m^2 business park with 3,000 workers at capacity, to a residential community with 600 dwellings. Studies and analysis has confirmed that the proposal will reduce the demand on public and active transport. **Accordingly, the proposal does not warrant special provisions or improvements to bus or active transport infrastructure.**

TfNSW Comment / Recommendation
Connectivity with bus stops and active transport linkage
Comment: *Coonara Avenue is currently configured with one traffic lane on each direction and served with parking lane on both sides. There are currently three bus stops located on the northbound direction of Coonara Avenue where the subject site fronts. Consideration should be given to the increase pedestrian crossing demand to access these bus stops which provide the necessary bus services connecting with Cherrybrook Station. On the southbound direction, there are currently two bus stops provided on Coonara Avenue. The preliminary concept indicates that future dwellings would locate along the site frontage on Coonara Avenue.* *Recommendation:* *The planning proposal should consider the need for improved pedestrian facilities on and along Coonara Avenue to accommodate the future demand as a result of the proposed development. In the subsequent design phases, it is recommended to promote through site links where new cycle and walking routes provide connectivity within the local neighbourhood.*

A pedestrian footpath is provided along the site frontage, providing connections to:

- Castle Hill Road and on to Cherrybrook Metro Station, via signalised crossing points, and
- Coonara Shopping Village

Additional pedestrian crossings are not required to aid these desire lines, with suitable paths available, as shown in Attachment 3.

As explained above, the demand for bus services is expected to be moderate and not necessitate improvements to bus facilities or connectivity thereto.

Future development applications will provide for and promote pedestrian and cycle links from within the site to existing pedestrian and cycle links to bus and rail connections.

Existing pedestrian footpaths and crossings provide pedestrian access from the site to the new Cherrybrook Metro Station. **Accordingly, the proposal does not warrant special provisions or improvements to local infrastructure.**

TfNSW Comment / Recommendation
Access to public open space
Comment: *The planning proposal is accompanied by a preliminary concept that indicates a public road connection between Coonara Avenue and the proposed public open space including the synthetic turf playing field. It is reasonable to assume the playing field would be accessible for sports activities held by schools or local sport clubs.* *Recommendation:* *In the subsequent design phases, the design of this public road should consider accommodating larger vehicles such as buses for use during events.*

The proposed public perimeter road – being delivered by Mirvac – between Coonara Avenue and Council's connection to the proposed public open space and soccer field was the subject of negotiation and agreement

with the Hills Shire Council, with the detailed road design to be provided at development application phase. The width of the perimeter road was negotiated with Council to ensure public access to the new playing field, including by schools and local sporting clubs; being designed to accommodate access by fire trucks and other large services vehicles as per Council and NSW Rural Fire Service requirements.

It is noted that the connection between the perimeter road and open space / playing field car park is to be owned by Council, with no changes to the existing car park proposed as part of the agreement between Mirvac and the Hills Shire Council.

With reference to Attachment 4, it is noted that the existing car park itself is not capable of facilitating access by large buses/coaches. Therefore it would be expected that any demand for bus setdown / pick-up would occur from the perimeter road and not from the car park area itself. This is considered an acceptable outcome given the low frequency that bus demands would occur and moderate walking distances required between the perimeter road and playing fields. Nevertheless, this is a future detailed matter for Council consideration.

On the above basis, we do not believe the road width included in the Proposal needs to be adjusted.

We trust the above is of assistance and please contact the undersigned should you have any queries or require further information in relation to the above.

Yours sincerely,

Principal Traffic Engineer – Ason Group
Email: tim.lewis@asongroup.com.au

Attachments:
1) Travel Mode Share data summaries
2) Hills Bus Area Map
3) Pedestrian Access Routes
4) Swept Paths

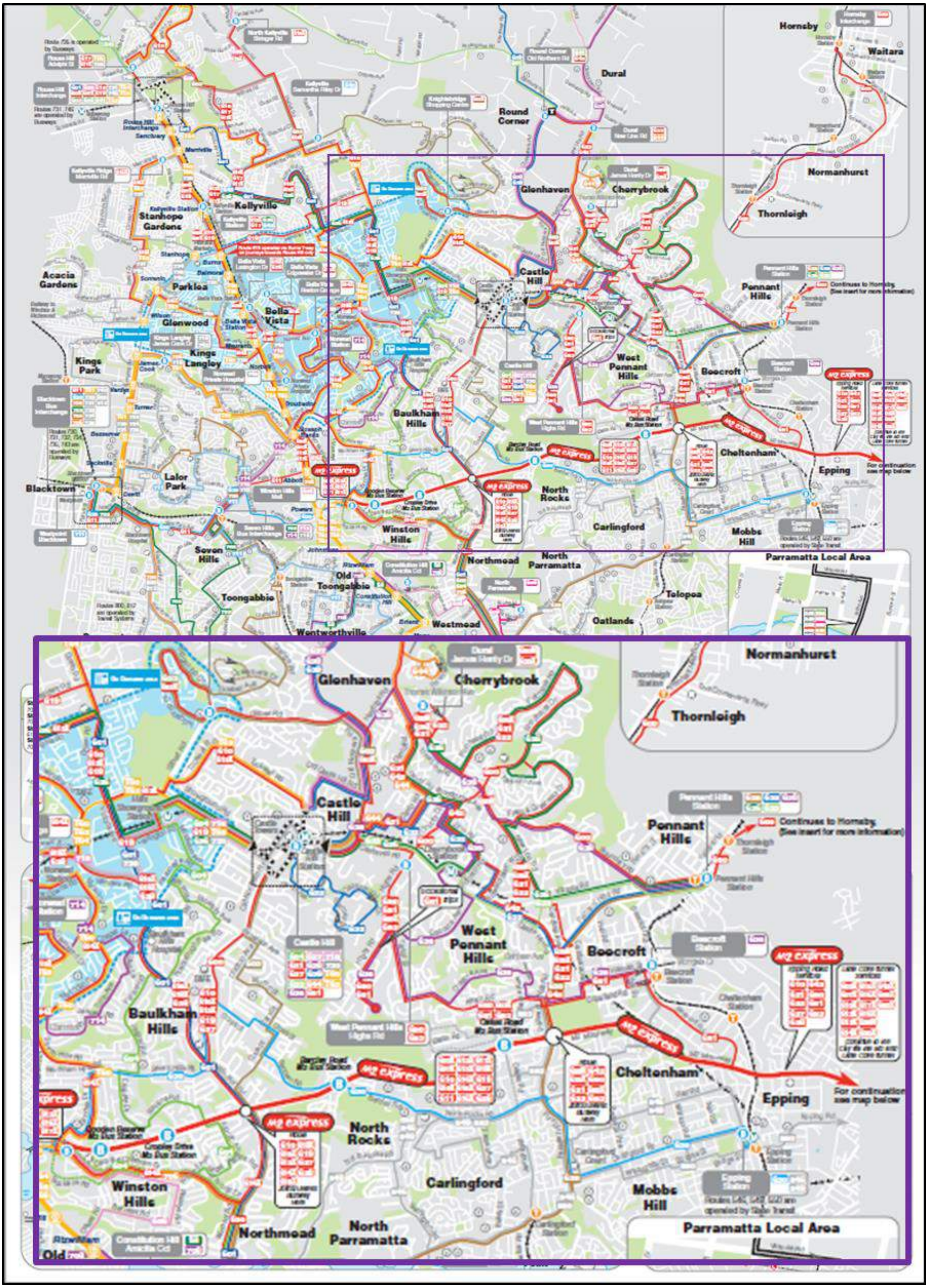
Attachment 1

West Pennant Hills - Employed persons (Usual residence)	2016			2011			Change
Main method of travel	Number	%	The Hills Shire %	Number	%	The Hills Shire %	2011 to 2016
Train	371	5.7	3.8	306	4.6	3.0	+65
Bus	1,030	15.9	12.2	859	12.8	9.9	+171
Tram or Ferry	0	--	0.0	0	--	--	0
Taxi	3	0.0	0.1	9	0.1	0.1	-6
Car - as driver	3,707	57.4	62.1	4,031	60.1	64.1	-324
Car - as passenger	232	3.6	3.6	278	4.1	4.1	-46
Truck	15	0.2	0.9	21	0.3	1.0	-6
Motorbike	16	0.2	0.4	16	0.2	0.3	0
[a] Bicycle	11	0.2	0.2	3	0.0	0.1	+8
[a] Walked only	27	0.4	1.2	35	0.5	1.2	-8
Other	43	0.7	0.9	22	0.3	0.6	+21
[a] Worked at home	474	7.3	6.1	439	6.5	5.8	+35
Did not go to work	515	8.0	7.7	626	9.3	8.7	-111
Not stated	17	0.3	0.6	65	1.0	1.1	-48
Total employed persons aged 15+	6,461	100.0	100.0	6,710	100.0	100.0	-249

Epping - Employed persons (Usual residence)	2016			2011			Change
Main method of travel	Number	%	City of Parramatta %	Number	%	City of Parramatta %	2011 to 2016
Train	3,798	33.9	21.5	2,838	28.4	18.8	+961
Bus	385	3.4	5.9	273	2.7	5.0	+111
Tram or Ferry	0	--	0.2	0	--	0.1	0
Taxi	0	0.0	0.2	24	0.2	0.1	-24
Car - as driver	4,937	44.0	51.4	4,742	47.5	54.1	+195
Car - as passenger	331	3.0	3.7	380	3.8	4.2	-49
Truck	15	0.1	0.6	35	0.4	0.7	-20
Motorbike	33	0.3	0.5	35	0.4	0.5	-2
[a] Bicycle	36	0.3	0.4	35	0.4	0.4	0
[a] Walked only	204	1.8	3.5	269	2.7	3.6	-65
Other	67	0.6	0.9	25	0.3	0.7	+43
[a] Worked at home	528	4.7	3.4	418	4.2	3.0	+111
Did not go to work	831	7.4	7.1	823	8.2	7.8	+8
Not stated	42	0.4	0.8	89	0.9	1.1	-47
Total employed persons aged 15+	11,212	100.0	100.0	9,990	100.0	100.0	+1,222

Pennant Hills - Employed persons (Usual residence)	2016			2011			Change
Main method of travel	Number	%	Hornsby Shire %	Number	%	Hornsby Shire %	2011 to 2016
Train	1,028	28.1	23.3	947	26.8	20.3	+81
Bus	65	1.8	3.9	59	1.7	3.4	+7
Tram or Ferry	0	--	0.0	0	--	0.0	0
Taxi	0	--	0.1	0	--	0.1	0
Car - as driver	1,747	47.8	49.6	1,751	49.5	51.8	-4
Car - as passenger	107	3.0	3.1	102	2.9	3.4	+5
Truck	18	0.5	0.6	7	0.2	0.8	+11
Motorbike	14	0.4	0.5	7	0.2	0.4	+8
[a] Bicycle	9	0.2	0.3	6	0.2	0.2	+3
[a] Walked only	122	3.3	2.7	95	2.7	2.9	+27
Other	17	0.5	0.9	28	0.8	0.7	-11
[a] Worked at home	182	5.0	5.8	160	4.5	5.6	+22
Did not go to work	318	8.7	8.6	342	9.7	9.7	-24
Not stated	23	0.7	0.6	28	0.8	0.9	-5
Total employed persons aged 15+	3,656	100.0	100.0	3,536	100.0	100.0	+119

Attachment 2

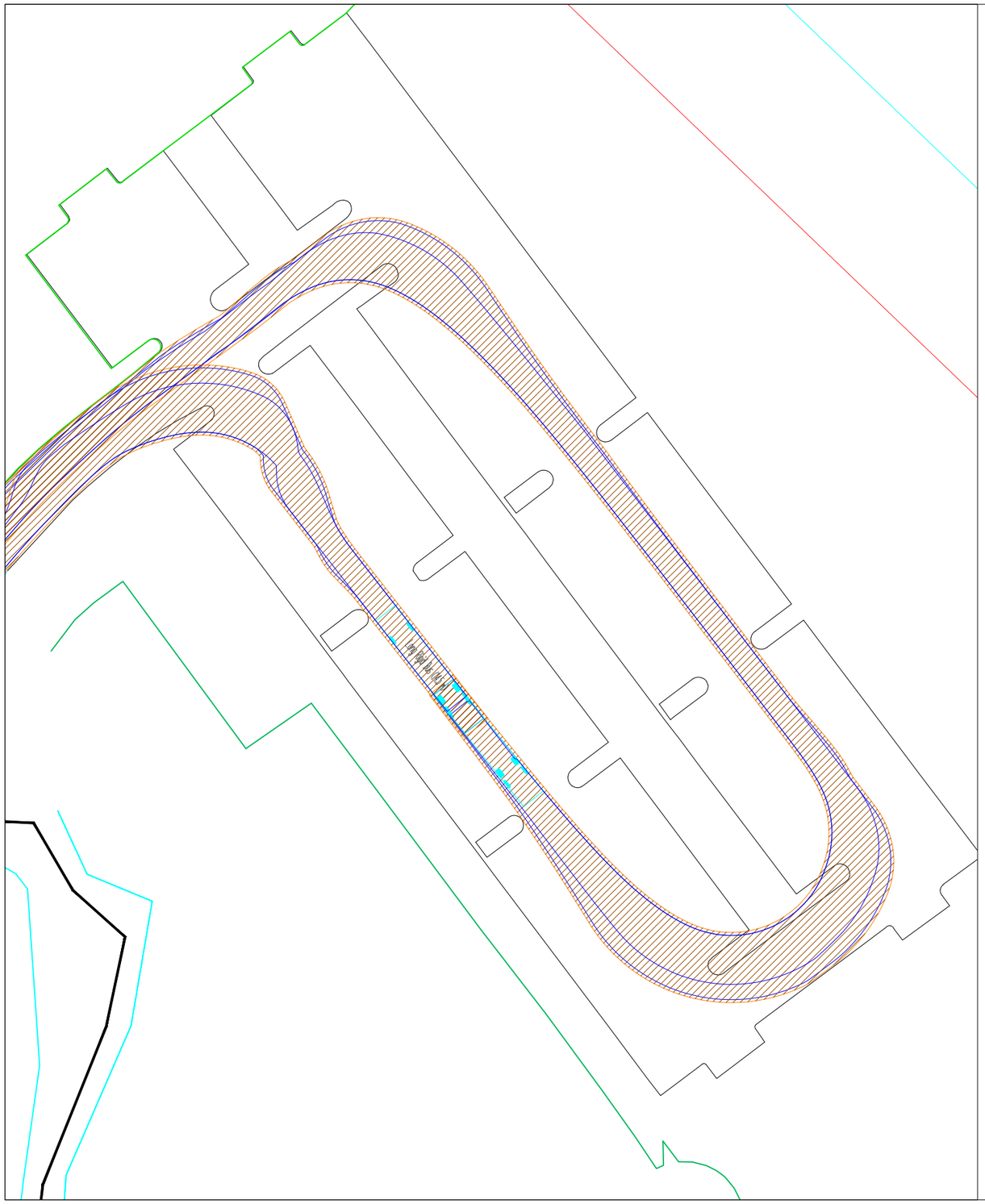


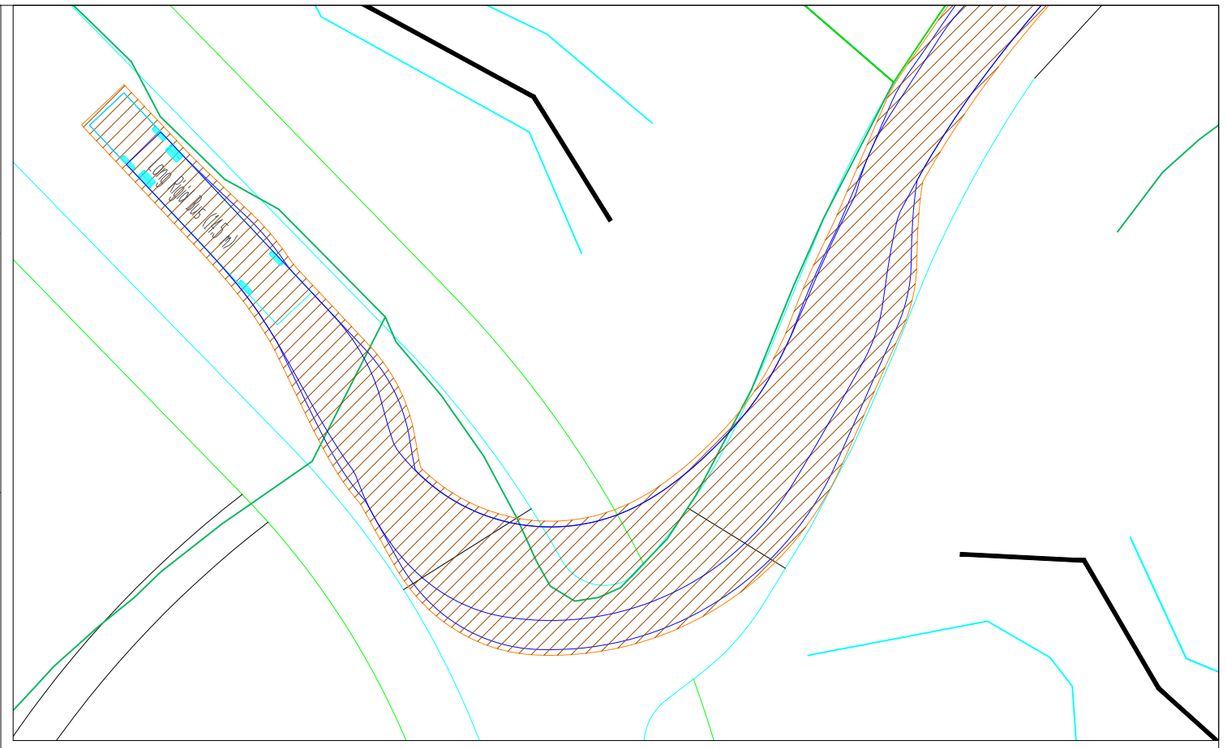
Hornsby
Waitara
Dural
Round Corner
Normanhurst
Thornleigh
Glenhaven
Cherrybrook
Kellyville
Stanhope Gardens
Acacia Gardens
Parklea
Castle Hill
Pennant Hills
Continues to Hornsby (See insert for more information)
Bella Vista
Glenwood
Kings Park
Kings Langley
West Pennant Hills
Beecroft
M2 express
Baulkham Hills
Cheltenham
Epping
For continuation see map below
Lalor Park
Blacktown
North Rocks
Winston Hills
Carlingford
Mobbs Hill
Seven Hills
Northmead
North Parramatta
Parramatta Local Area
Old Toongabbie
Toongabbie
Telopea
Westmead
Oatlands
Wentworthville
Glenhaven
Cherrybrook
Normanhurst
Thornleigh
Castle Hill
Pennant Hills
Continues to Hornsby (See insert for more information)
West Pennant Hills
Beecroft
M2 express
Baulkham Hills
Cheltenham
Epping
For continuation see map below
North Rocks
Winston Hills
Carlingford
Mobbs Hill
Northmead
North Parramatta
Parramatta Local Area

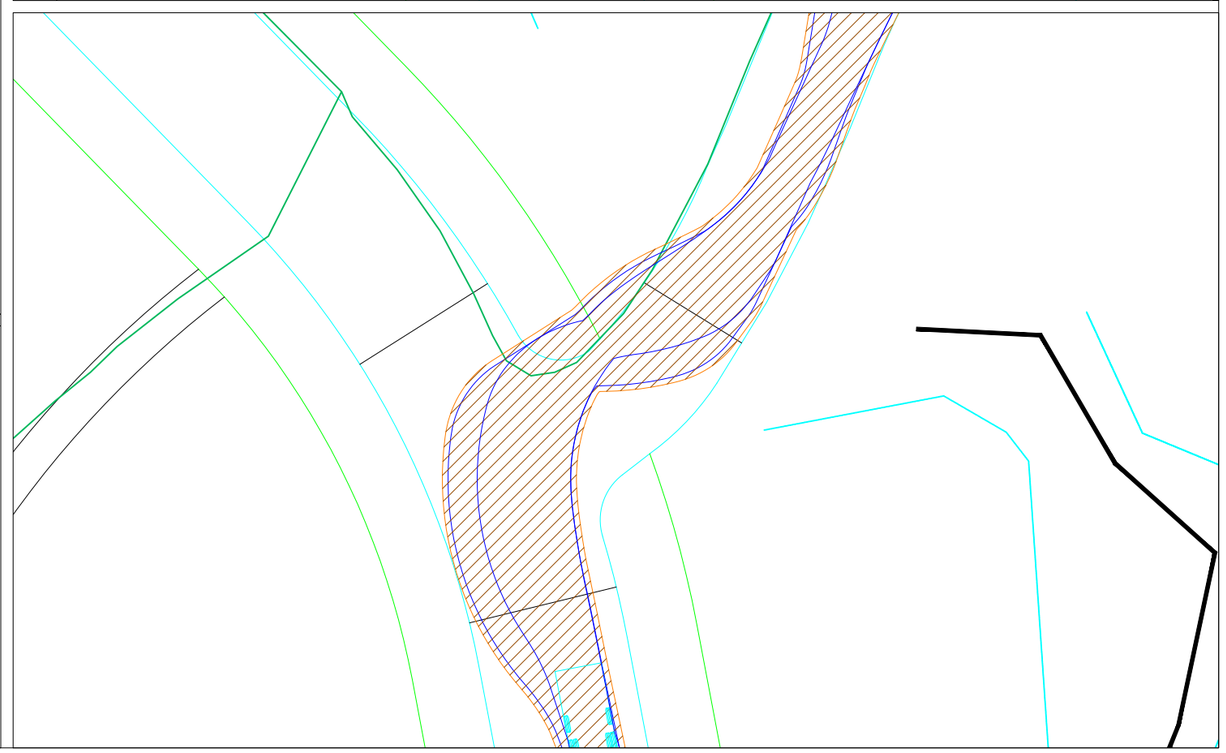
Attachment 3

Figure 1: Pedestrian Routes to Metro and Coonara Shopping Village

Attachment 4







Notes:

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Document Info:

Drawn by: timle

File name: P0442d02 Bus Access Review.dwg

Client:

Mirvac

Project:

0442

55 Coonara Ave, West Pennant Hills

Drawing Title:

Swept Paths

14.5m coach access to playing fields

Date:

18-Jul-19

Scale @ A3:

Varies

Drawing Number:

P0442D.02-SK.01

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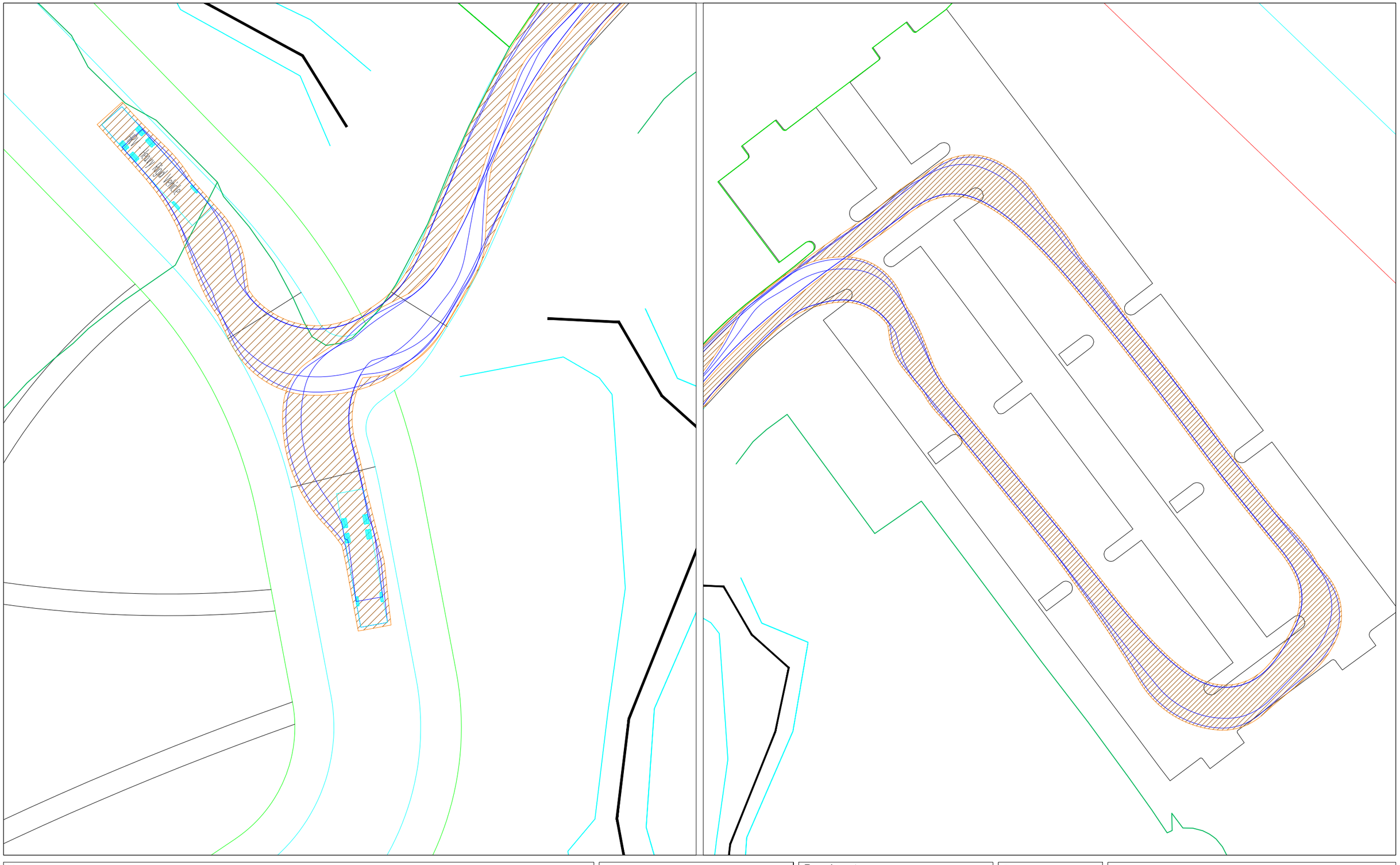

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Document Info:

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File name: P0442d02 Bus Access Review.dwg

Client:

Mirvac

Project:

0442

55 Coonara Ave, West Pennant Hills

Drawing Title:

Swept Paths

12.5m rigid vehicle access to playing fields

Date:

18-Jul-19

Scale @ A3:

Varies

Drawing Number:

P0442D.02-SK.02

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Attachment 2

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15 January 2019

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Mirvac
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Attn: Amanda Blake; Development Manager

RE: 55 Coonara Avenue, West Pennant Hills – RMS Memorandum in relation to GTA Review

Dear Amanda,

We refer to the site at 55 Coonara Avenue, West Pennant Hills and the rezoning submission (Proposal) which has received Council and Department of Planning and Environment (DPE) support for public exhibition. The Proposal has been the subject of extensive assessment and analysis with a number of reports and reviews being undertaken in relation to transport matters.

We note that additional requested SIDRA modelling was provided by Mirvac on email to RMS on 21 August 2018.

At our recent meeting on 22 October 2018 with RMS, DPE, Mirvac and Ason Group (Ason), it was confirmed by DPE that the subject site was to be considered on its site-specific merits and not be assessed as part of a wider study area. We believe the reports completed by ARC Traffic and Transport and Ason, as previously provided to RMS (refer Mirvac's letter of 24 May 2018), have conclusively demonstrated that the subject site's existing use operating at full capacity has a far greater traffic impact than the Proposal.

As further validation, it has come to our attention that Council (via Mu Group) requested GTA Consultants (GTA) to undertake a further, independent study to assess the implications of the development on the broader road network. This study included assessment of:

- Castle Hill Road / Coonara Avenue / Edward Bennett Drive (RMS signals)
- Castle Hill Road/Highs Road/County Drive (RMS signals)
- Coonara Avenue / Highs Road / Taylor Street (Council roundabout)
- Aiken Road / Oakes Road (Council roundabout)

A copy of the GTA report is provided at **Attachment 1**.

Ason takes this opportunity to provide our commentary as follows in relation to review of the following document(s):

- GTA Consultants, Traffic Assessment Review, Issue A, dated 16/10/18 (GTA Review)
- GTA Consultants, *Roads and Maritime Services Trip Generation Surveys, Medium Density Residential Dwellings Analysis Report*, Issue B, dated 08/08/2013 (RMS M-D Report)

For the purposes of this advice, special consideration is given to the impacts at RMS signal sites along Castle Hill Road at Coonara Avenue and Highs Road. Impacts at other intersections being considered a Council matter and therefore outside the RMS scope of assessment and therefore not forming part of this commentary.

Having regard for the above, we now advise as follows.

1. There appears to be a missing piece in the assessment undertaken by GTA in that there has not been regard for the traffic generation that could reasonably be generated by the existing facilities operating at full capacity. This is a fundamental baseline that must be used as the relevant comparison metric to the rezoning proposal; not existing traffic counts which understate implications of the existing facilities operating at full capacity. After all, there has not been a concerted effort to seek a long-term commercial tenant to replace the historic use and fulfil the site potential; pending resolution of the current planning proposal.

2. Notwithstanding the above, we note GTA's conclusion: "…*traffic generated by the proposed development is expected to have marginal impact on the performance of the existing network"*. This indicates to us, that even though GTA's assessment was undertaken using existing traffic counts and not data relating to traffic generation that could reasonably be generated by the existing facilities operating at full capacity, their review concludes a marginal impact at one location. Our view is that this understates the reduction in traffic the proposal will have on the overall network which has broader transport benefits. There is no doubt the existing facilities operating at full capacity will have a far greater impact on the network than that of the rezoning proposal.

3. There are a number of minor modelling aspects of note in relation to the calibration of the SIDRA models presented in the GTA Review. Of particular note are the adopted signal cycle timings at Coonara Ave / Castle Hill Rd; generally less than the SCATS History files provided to Ason Group by RMS. Notwithstanding, further review by Ason Group has shown this to have only marginal - but inconsequential - impacts on the conclusions of the assessment. In this regard, reference is made to the alternative modelling undertaken by Ason Group as summarised in **Annexure 2**.

4. The GTA Review has effectively adopted the traffic generation figures presented in the ARC Report, being:

   AM Peak 339 veh/hr

   PM peak 347 veh/hr

5. In this regard, it is our view that reduced rates would be appropriate; further minimising the impact of the proposal. Indeed, reducing the generation rate for the medium-density townhouse product to 0.6 veh/hr/dwelling (consistent with RMS surveys for low-density development in Westleigh, further from a train station and therefore still conservative in this instance) would result in the following volumes:

   AM Peak 269 veh/hr (-70 veh/hr) (or -691 veh/hr comparing to Full Commercial)

   PM peak 269 veh/hr (-78 veh/hr) (or -691 veh/hr comparing to Full Commercial)

6. If adopting the Sydney average generation rates for medium-density development during surrounding road network peak periods (0.27 in AM and 0.31 in PM) – as outlined in the RMS M-D Report - would result in the following peak hourly volumes:

   AM Peak 203 veh/hr (-136 veh/hr) (or -757 veh/hr comparing to Full Commercial)

   PM peak 211 veh/hr (-136 veh/hr) (or -749 veh/hr comparing to Full Commercial)

7. Notwithstanding, a summary of the relative performance of key intersections based on recent Ason Group modelling is presented in **Attachment 2**. This analysis is based on the conservative (low-density) traffic generation rates outlined in Item 5 above, with a distribution pattern derived from review of 2016 journey-to-work data. Adoption of lower traffic generation rates – in our opinion supportable given the medium-

density and high-density nature of the development – as outlined in Item 6, would further improve the 'relative' performance of Project Case scenarios.

8. It is noted that signalised intersections along Castle Hill Road – the focus of RMS consideration with regard to the Classified Road network – all operate at acceptable Level of Service D or better during all Project Case scenarios assessed by GTA and Ason Group.

9. Furthermore, the comparison of link flows on north of the site access on Coonara Avenue show a clear reduction in traffic volumes as a result of the proposal. As such, assessment of other signalised intersections originally requested by RMS is not deemed necessary.

10. Finally, even though the GTA Review fails to compare the existing improvements operating at full capacity to the rezoning proposal, as referred in Point 1, the GTA Review is taken as an endorsement of the proposal, demonstrating acceptable performance at all key RMS signalised intersections in the locality. Capacity issues at Oakes Rd / Aiken Rd being an existing issue – not attributable to the proposal – and therefore a matter to be addressed by Council.

In summary, the GTA Review does not include a complete assessment comparing the difference between existing facilities operating at full capacity compared to the rezoning proposal. Notwithstanding this, even using the lower traffic count numbers, which we believe is not reasonable to use as the relevant baseline assessment, GTA have undertaken a fairly robust assessment exploring the 'sensitivity' of the modelling to varying distribution assumptions. Whilst we there is some contention regarding some of the finer details with regard to traffic generation and modelling; the conclusions are clear in that the proposal is supportable.

We trust the above provides further support of the Proposal providing RMS additional analysis and evidence. We would greatly appreciate a further meeting at your earliest convenience to close this matter out.

Yours sincerely,

Principal Traffic Engineer – Ason Group
Email: tim.lewis@asongroup.com.au

Attachment(s): 1) GTA Consultants, Traffic Assessment Review, Issue A, dated 16/10/18
2) SIDRA Results
3) Link Volume Comparison

Attachment 1

GTAconsultants

Traffic Assessment Review
55 Coonara Avenue, West Pennant Hills

Client // The Hills Shire Council
Office // NSW
Reference // N148250
Date // 16/10/18

55 Coonara Avenue, West Pennant Hills

Traffic Assessment Review

Issue: A 16/10/18

Client: The Hills Shire Council
Reference: N148250
GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	16/10/18	Final	John Duong, Mansee Sachdeva	Mansee Sachdeva	Robert Dus	Robert Dus

GTAconsultants

Melbourne | Sydney | Brisbane
Canberra | Adelaide | Perth

Table of Contents

Appendices

Figures

Tables

1. Introduction

1.1 Background

GTA has been engaged by Mu Group, who have been engaged by the Hills Shire Council, to assess the wider network impacts of proposed rezoning of land at 55 Coonara Avenue West Pennant Hills. The site is presently zoned as office/ commercial and is proposed to be zoned as a mix of high and low density residential. Mirvac proposes to develop a total of 600 dwellings (200 low density and 400 apartment style dwellings) within the site.

Anton Reich Consulting (ARC) have previously prepared a traffic impact assessment[1] (ARC Report) for the proposed development. The assessment looked at the impact of the traffic generated by the development on the nearby intersection of Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive. The Hills Shire Council identified the need to assess the wider impacts of this development traffic particularly on congested intersections such as the Oakes Road/ Aiken Road.

ARC have assessed comprehensive scenarios looking at trip generation for the site. It is noted that should the full commercial potential of the site be realised, it would generate significantly higher amount of traffic as compared to what is currently being proposed. As such, the zoned potential of the site was never realised with the highest occupancy being 3500 staff in 1980. This number has significantly dropped since then and 2015 estimates show that about 1200 staff are currently employed there.

With the decreasing employment figures, it can be deduced that the site was never really an attractive site for commercial operations and therefore never realised its full commercial potential. In assessing the potential impacts of the proposed residential development, trip rates and distribution calculated in Section 3 of the ARC Report have been utilised, noting that these are based on The Hills Shire Council (Council) trip rates.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated traffic impacts of the proposed rezoning development, including consideration of the following:

i existing traffic conditions surrounding the site
ii the traffic generating characteristics of the proposed development
iii the transport impact of the rezoning proposal on the surrounding road network.

[1] 55 Coonara Avenue West Pennant Hills Planning Proposal Revision 4 Traffic Assessment July 2017

1.3 References

In preparing this report, reference has been made to the following:

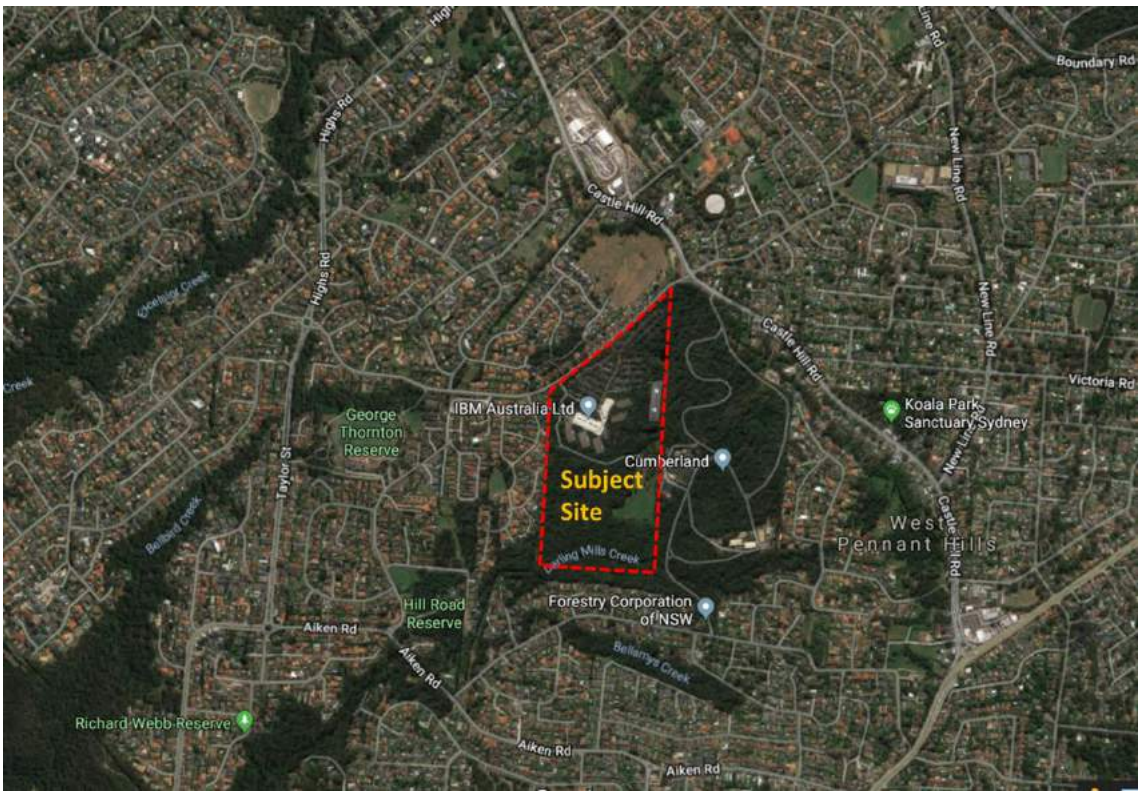
- an inspection of the site and its surrounds
- The Hills Shire Council Development Control Plan (DCP) 2012
- The Hills Shire Council Local Environmental Plan (LEP) 2012
- Anton Reich Consulting Traffic and Transport Traffic Assessment, July 2017
- West Pennant Hills Bus Priority Measure, Cardno, June 2010
- NorthConnex EIS (July 2014)
- other documents and data as referenced in this report.

2. Existing Conditions

The subject site is located at 55 Coonara Avenue, West Pennant Hills. The site currently has a land use classification as B7 Business Park and is occupied by NorthConnex.

The surrounding properties are predominately low density residential. There is a local shopping centre located 300 metres west of the site. The location of the subject site and its surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject site and its environs



2.1 Existing Network

Coonara Avenue

Coonara Avenue is a collector road and on the northern boundary of the site running in the east-west direction. It is a two-way road with one lane in each direction and a posted speed limit of 50 km/hr. It is a 13-metre-wide carriageway, set within a 20-metre-wide road reserve (approximately). Parking lane is marked along the length of Coonara Avenue subject to time restrictions on some sections.

Figure 2.2: Coonara Avenue- looking southbound outside the site access point

Source: Google Maps

Castle Hill Road

Castle Hill Road is a State Road and is generally two lanes in each direction with storage lanes provided for turning traffic. It has a posted speed limit of 60 km/hr.

Figure 2.3: Castle Hill Road – looking westbound

Source: Google Maps

2.2 Existing Traffic

2.2.1 Traffic Surveys

The following surveys were conducted by Council in order to understand the existing conditions within the study area:

- Classified Intersection Counts – Tuesday 5th June 2018 Queue Length Surveys – Tuesday 5th June 2018
- Origin-Destination Surveys – Wednesday 7th February 2018

The following sections provide further details on each type of data collected.

Classified Intersection Counts

Classified intersection turn counts were collected at the following four intersections:

- Aiken Road & Oakes Road
- Coonara Avenue & Highs Road & Taylor Street
- Coonara Avenue & Castle Hill Road & Edward Bennett Drive
- Highs Road & Castle Hill Road & Country Drive

The data was collected for the morning hours from 7 am to 9 am and afternoon hours of 4 pm to 6 pm. The total traffic volumes (summed up across all sites) are shown in Figure 2.4 and Figure 2.5 for AM and PM peak hours respectively. The intersection counts indicate the AM peak period for the study intersections is 8:00am to 9:00am and the PM peak is 4:30pm to 5:30pm.

Figure 2.4: AM Peak Hour Volume

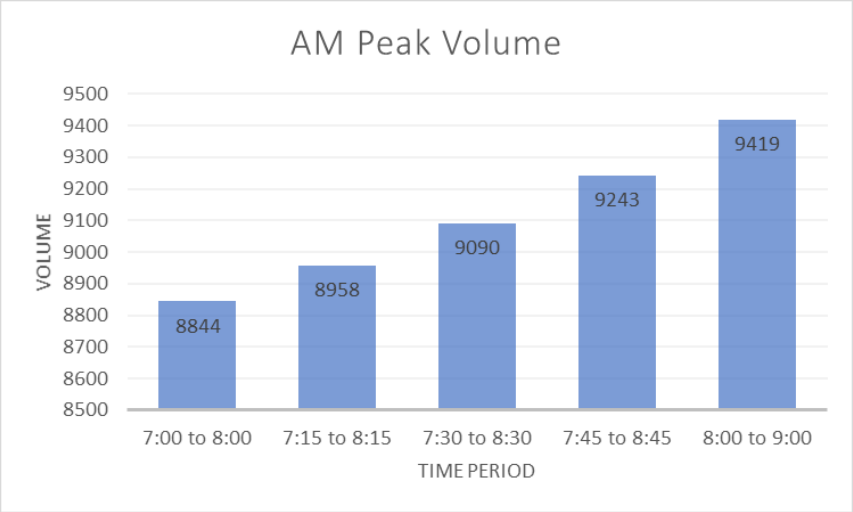
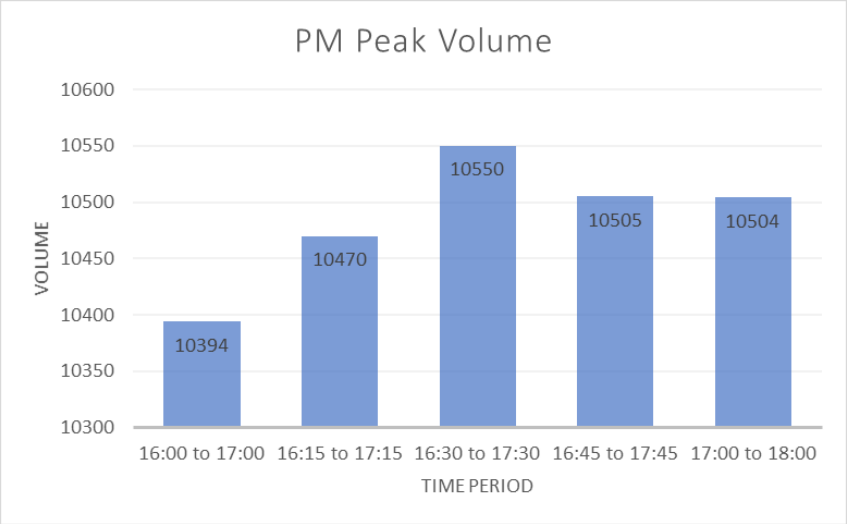


Figure 2.5: PM Peak Hour Volume



The observed peak hour turn traffic for all four intersections is shown in Figure 2.6 and Figure 2.7 for AM and PM peak hours respectively.

Figure 2.6: Existing AM Peak Hour Traffic Volumes

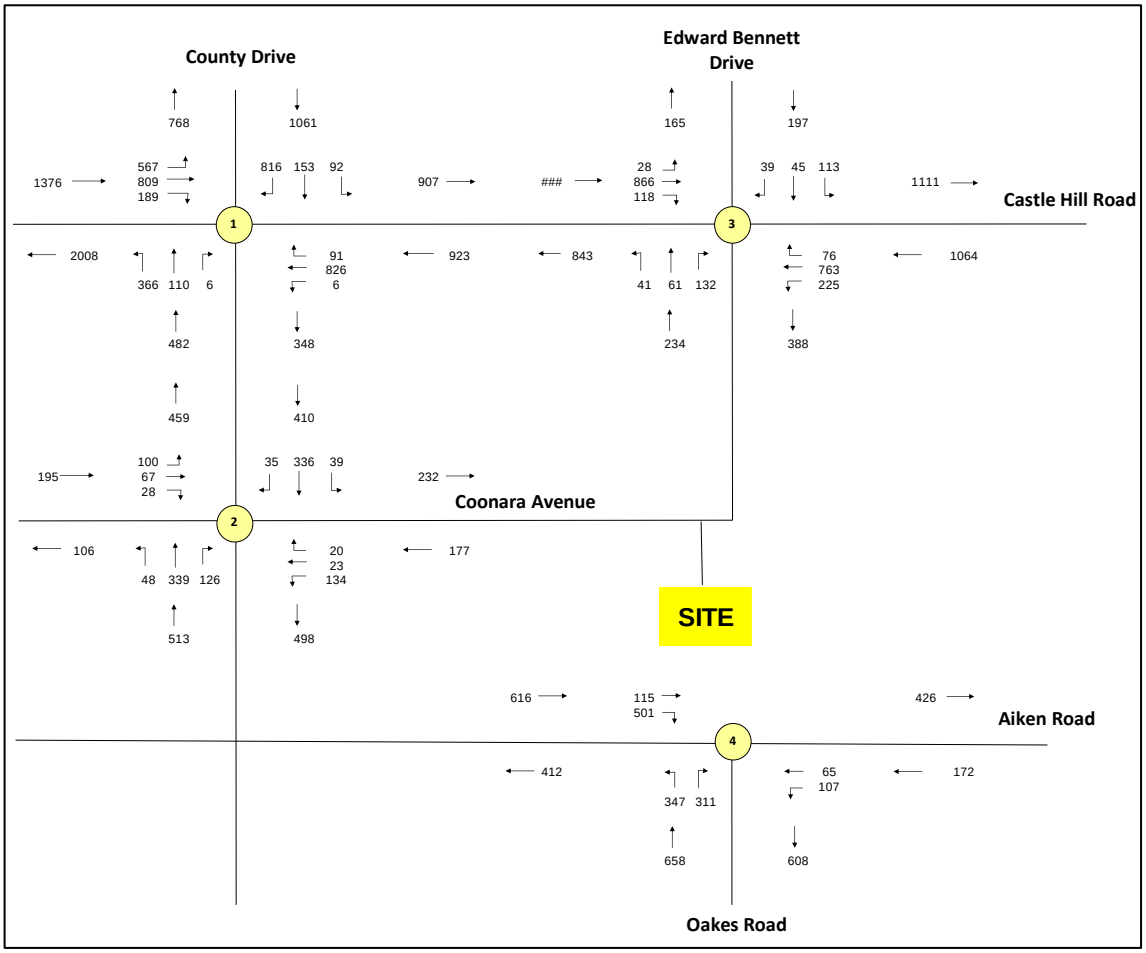
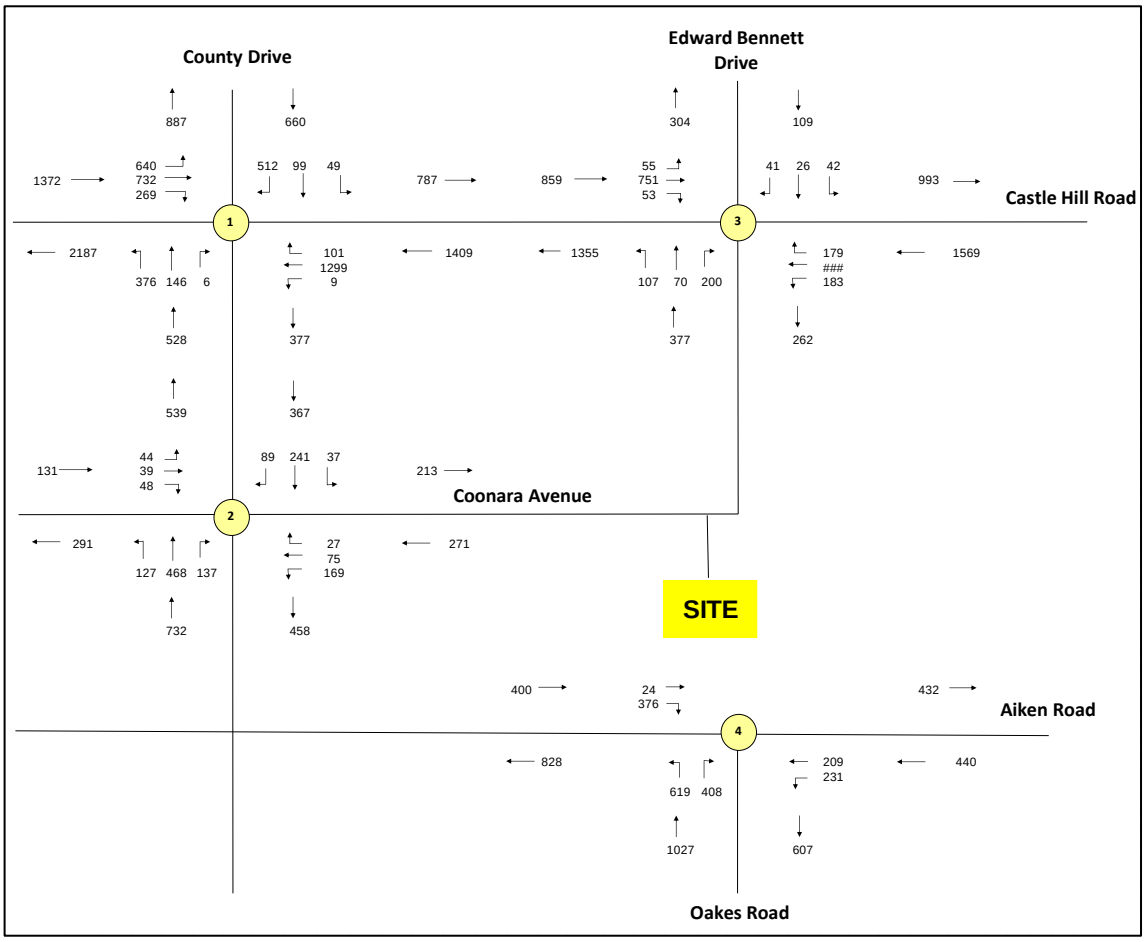
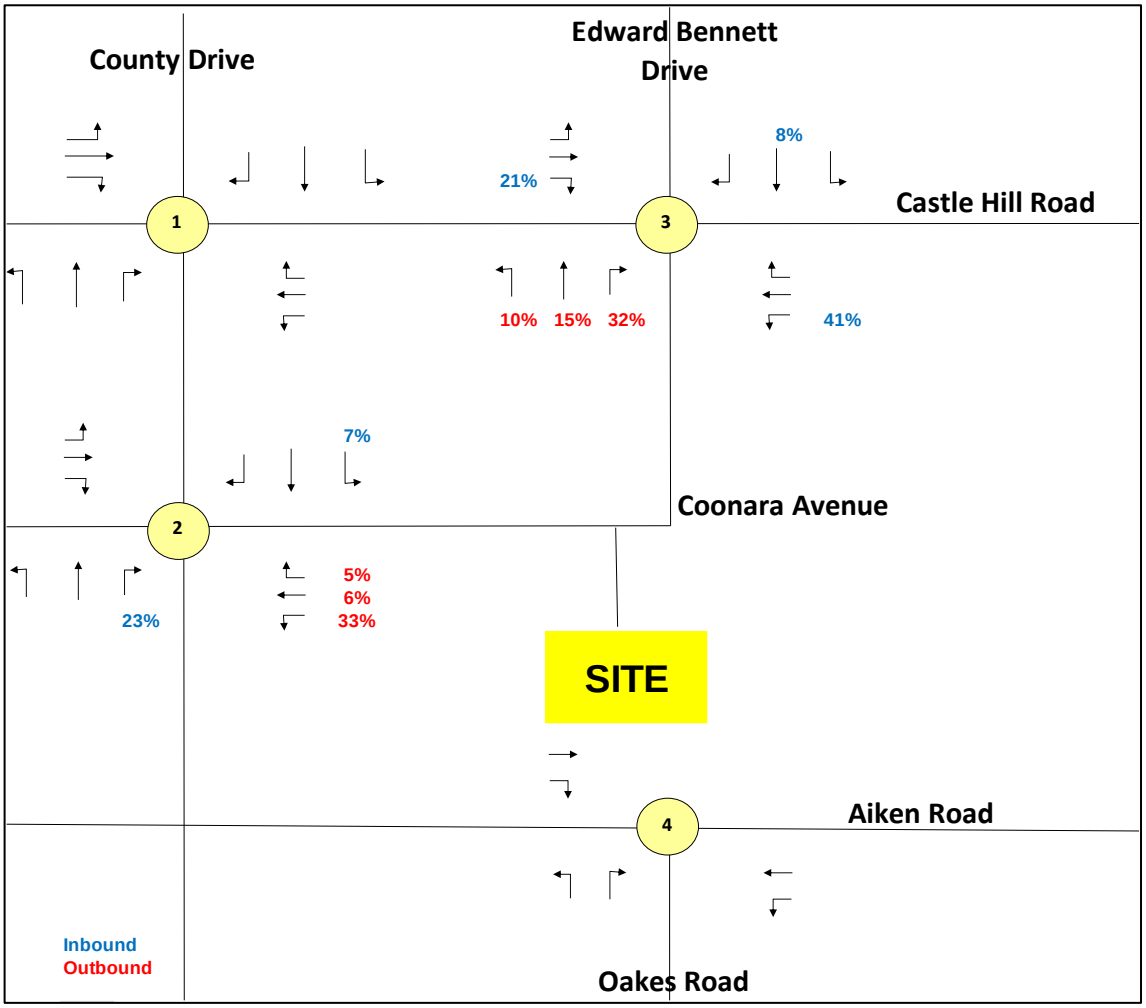


Figure 2.7: Existing PM Peak Hour Traffic Volumes



It is noted that traffic surveys did not include the site access. It is expected that the majority of traffic on Coonara Avenue would either have an origin or a destination at the site as the area is predominantly residential with a small shopping complex including a Woolworths located about 300 meters south of the site. Therefore the existing percentage split (Figure 2.9) inbound and outbound traffic is based on the existing survey data shown in Figure 2.6 and Figure 2.7.

Figure 2.8: Existing Percentage Traffic Distribution



Queue Length Surveys

Consistent with the Intersection count surveys, queue length data was collected for the morning hours from 7:00am to 9:00am and afternoon hours of 4:00pm to 6:00pm. Observed queue lengths in each traffic lane for the assessed intersections is provided from Figure 2.9 to Figure 2.12

Figure 2.9: Observed Queue Length at Oakes Road / Aiken Road roundabout

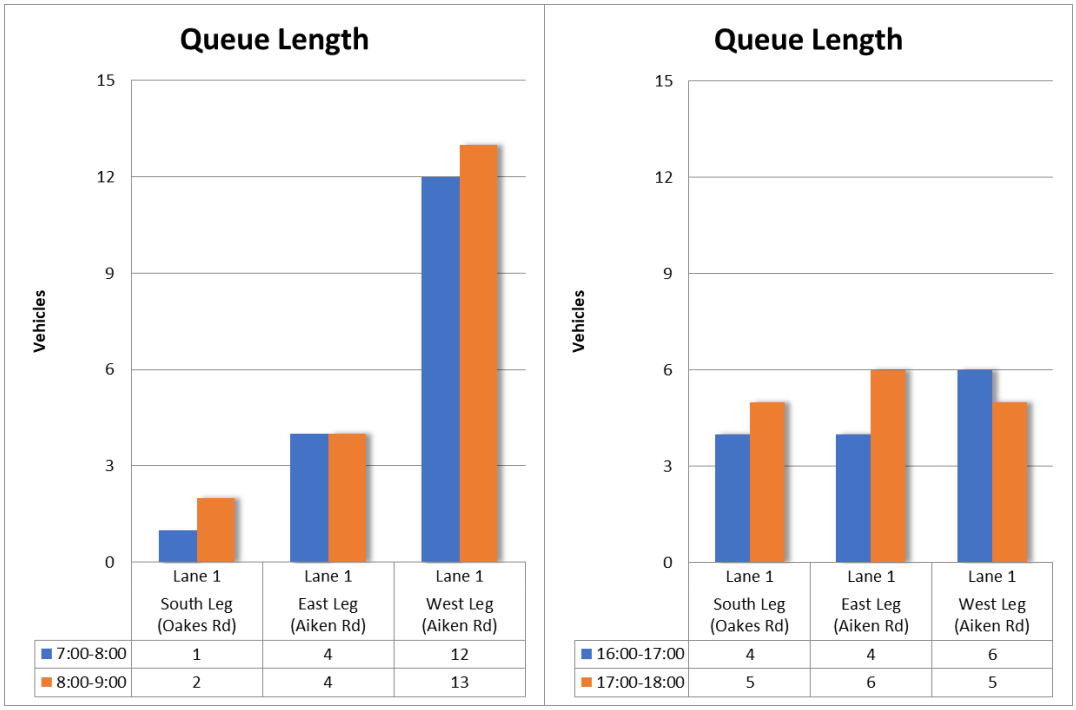


Figure 2.10: Observed Queue Length at Coonara Avenue / Highs Road / Taylor Street intersection

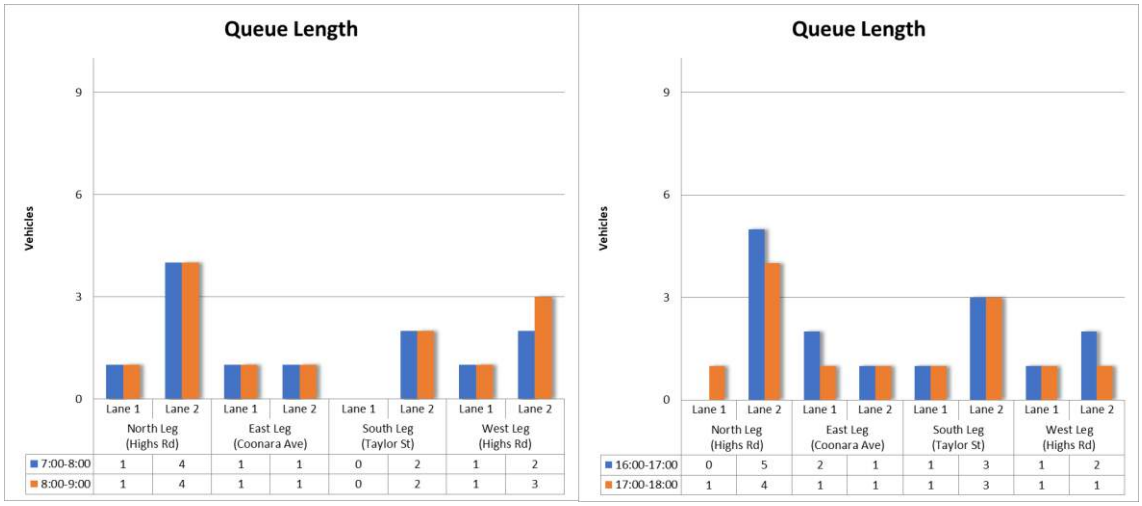
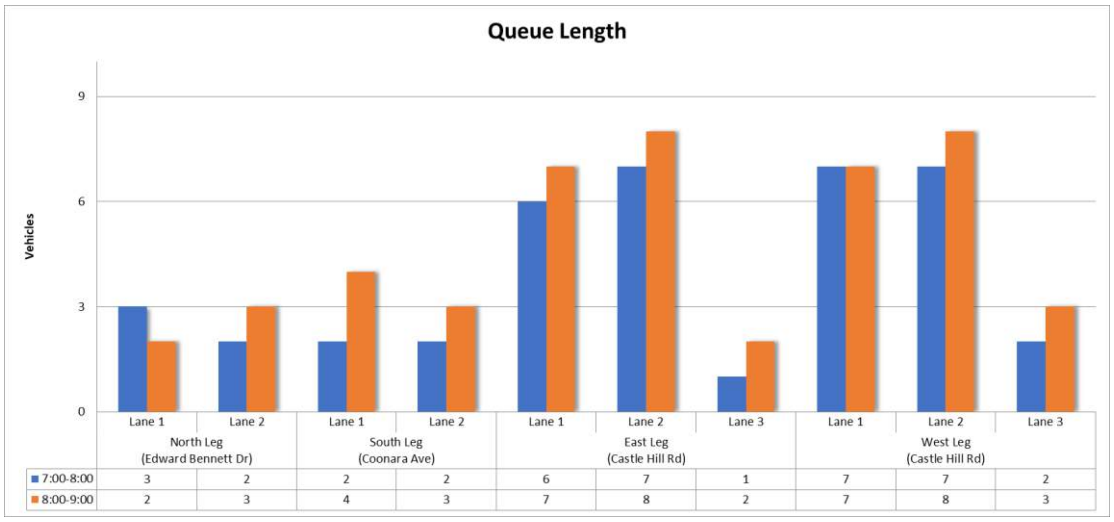


Figure 2.11: Observed Queue Length at Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive intersection



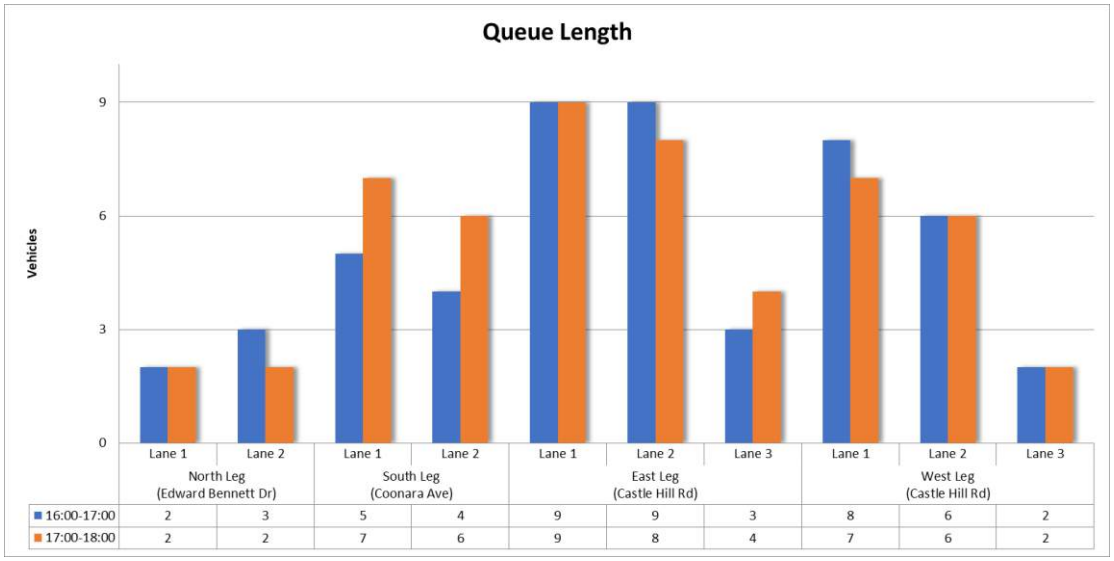
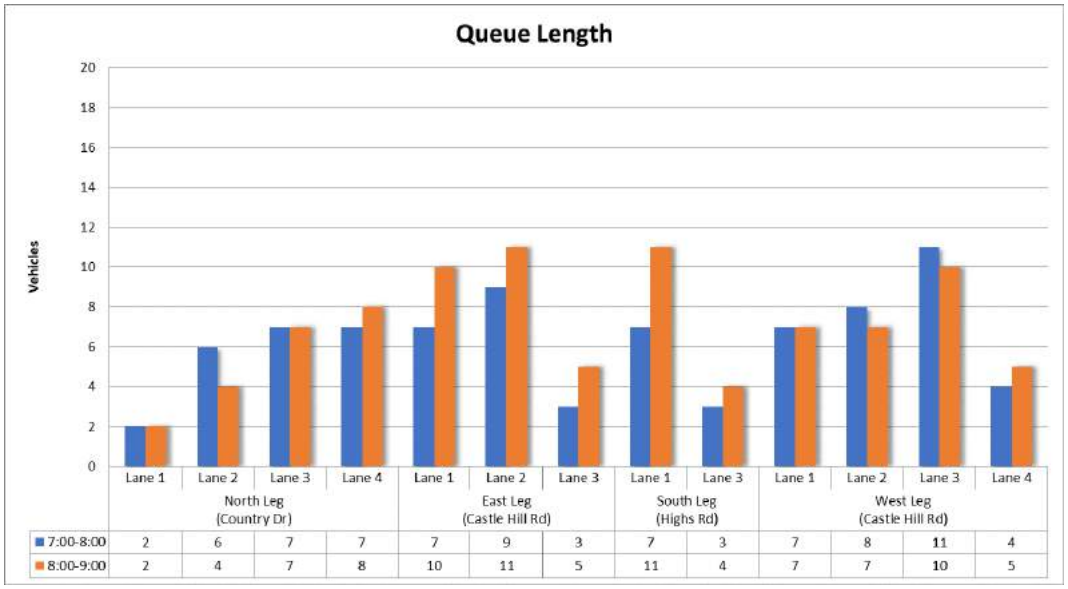
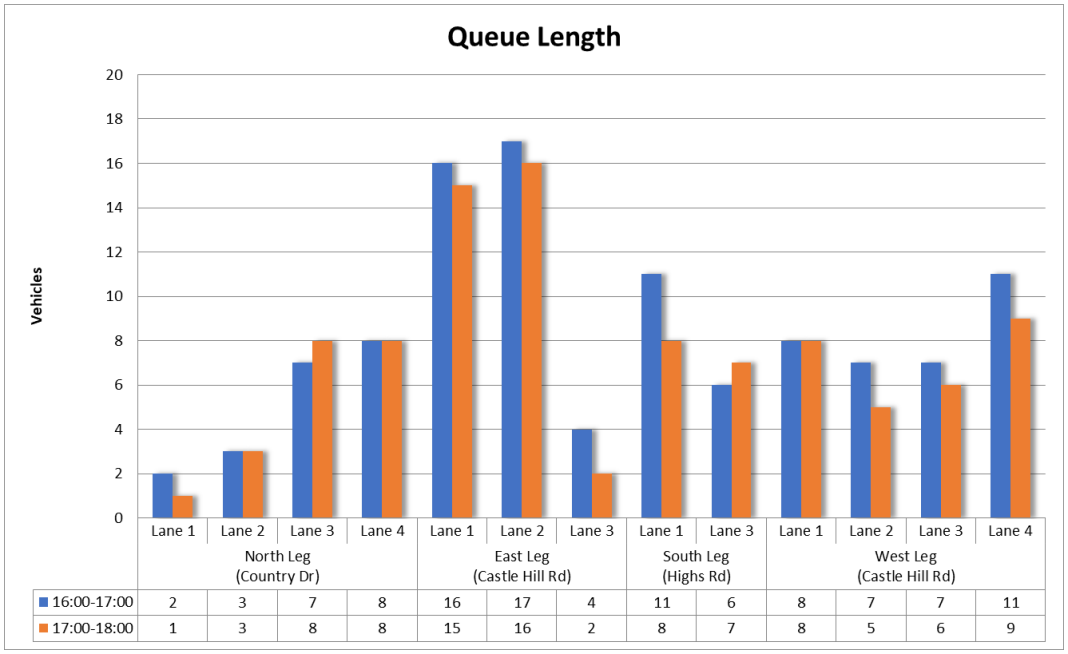


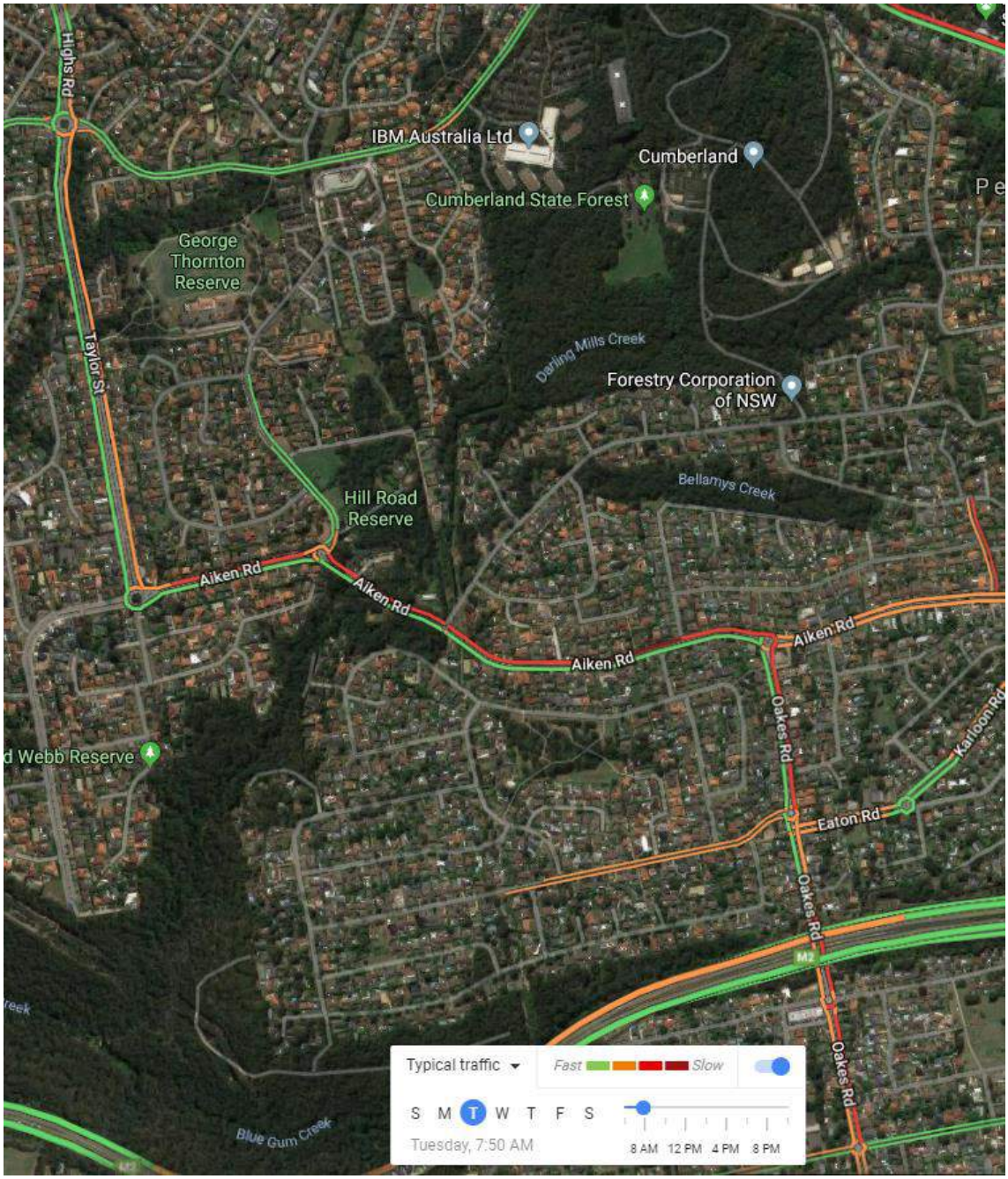
Figure 2.12: Observed Queue Length at Highs Road/ Castle Hill Road/ County Drive intersection





It is noted that the collection of queue length data is very subjective as it depends on the person collecting data to quantify the queue length. Desktop review and local knowledge indicated that long moving queues are observed at Aiken Road in the eastbound direction that extend from Oakes Road all the way back to Taylor Street during the AM peak period. A screenshot from Google Traffic is provided in Figure 2.13.

Figure 2.13: Observed Queue Length at Aiken Road during AM peak period



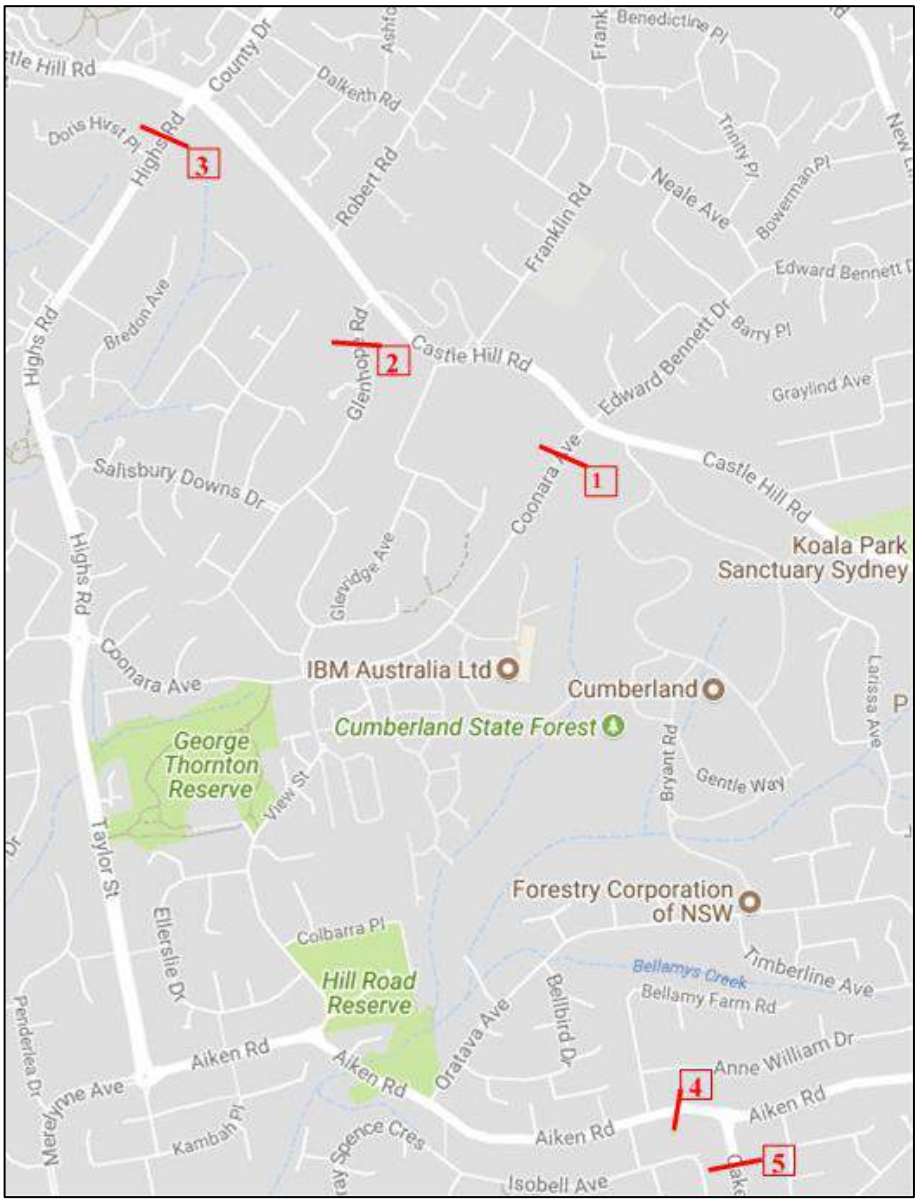
Origin Destination Surveys

To determine travel patterns in the study area, an O-D survey was commissioned by Council on 7th February 2018 at five survey locations for the AM peak period only in the southbound/ eastbound direction. Locations of the five O-D survey stations are described in Table 2.1 and shown graphically in Figure 2.14.

Table 2.1: Origin-Destination Survey Locations

Number	Direction	Road	Location
1S	Southbound	Coonara Avenue	south of Castle Hill Road
2S	Southbound	Glenhope Road	south of Castle Hill Road
3S	Southbound	Highs Road	south of Castle Hill Road
4E	Eastbound	Aitken Road	west of Oakes Road
5S	Southbound	Oakes Road	south of Aitken Road

Figure 2.14: Origin- Destination Survey Locations



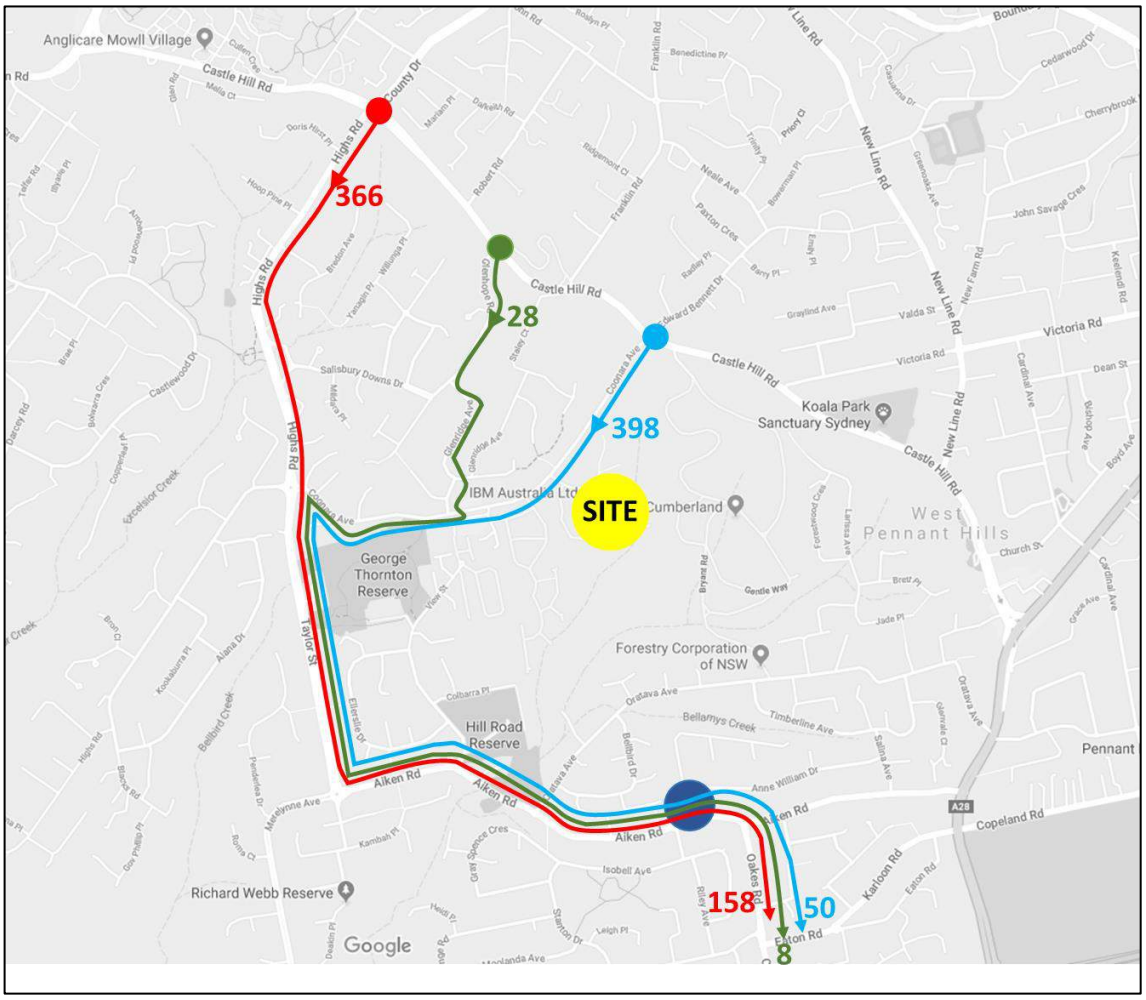
The O-D surveys provide an understanding of how many vehicles utilise Oakes Road to travel towards Paramatta and Carlingford and their respective origins.

Following was observed from the O-D data analysis:

- About 608 vehicles per hour are observed to travel southbound at Oakes Road (Station 5S)
- 36% (216 vehicles) of this southbound traffic is observed to arrive from the three stations in total, namely Coonara Avenue, Glenhope Road and Highs Road.
    - About 158 (26%) vehicles arrive from the Highs Road Station (3S)
    - About 50 (8%) vehicles arrive from the Coonara Avenue Station (1S)
    - About 8 (1%) vehicles arrive from the Glenhope Road intersection (2S)
- Similar amount of traffic is observed travelling southbound at Coonara Avenue (388 veh per hour) and at Highs Road (356 veh per hour)
    - A higher proportion of traffic at Highs Road travels towards Oakes Road (SB) from Highs Road (44%) as compared to Coonara Avenue (13%).

The O-D analysis is shown graphically in Figure 2.15.

Figure 2.15: Origin-Destination Analysis



2.3 Existing Network Performance

The operation of the key intersections within the study area have been assessed using SIDRA INTERSECTION[2], a computer-based modelling package which calculates intersection performance.

The commonly used measure of intersection performance, as defined by the Road and Maritime, is vehicle delay. SIDRA INTERSECTION determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 2.2 shows the criteria that SIDRA INTERSECTION adopts in assessing the level of service. For the purposes of this assessment LOS D is considered acceptable.

Degree of saturation (DOS) is defined as the ration of demand (in vehicles per hour) over the capacity. DOS is a good measure of spare capacity available at the intersection. A DOS >0.9 implies that the intersection is performing close to capacity.

For a signalised intersection an overall average delay is reported whereas for a roundabout the worst movement is reported.

Table 2.2: SIDRA INTERSECTION Level of Service Criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Table 2.3 presents a summary of the existing operation of the intersection, with detailed results presented in Appendix B of this report.

Table 2.3: Existing Performance Results

Intersection	Control	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Highs Road/ Castle Hill Road/ County Drive	Signals	AM	0.92	39	164	C
		PM	0.95	46	308	D
Coonara Avenue/ Highs Road/ Taylor Street	Roundabout	AM	0.10	10	4	A
		PM	0.07	9	2	A
Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive	Signals	AM	0.91	34	169	C
		PM	0.89	33	290	C
Aiken Road/ Oakes Road	Roundabout	AM	0.96	44	170	D
		PM	0.47	10	25	A

[2] Program used under license from Akcelik & Associates Pty Ltd.

The following can be observed from the intersection performance results:

- All intersections assessed are performing at acceptable levels (LOS D) or better except for the Aiken Road/ Oakes Road roundabout during the AM peak hour.
- The right turn from Aiken Road to Oakes Road is operating at acceptable LOS D, however has a high degree of saturation (>0.9). This is due to the southbound queues at Oakes Road spilling back from upstream intersections as observed in Figure 2.9. Any further increase in traffic will significantly impact the performance of this roundabout.

It is noted that, should the upstream queues not impact the performance of the Aiken Road/ Oakes Road roundabout, the roundabout is expected to operate at acceptable levels

3. Traffic Impact Assessment

3.1 Traffic Generation

For the purposes of this assessment the trips generated by the proposed development have been added to the observed traffic volumes at the adjacent intersections. This approach does not exclude traffic generated by the existing land uses at the site (included in the traffic surveys) and is therefore considered on the conservative side

3.1.1 Trip Rates

Traffic generation estimates for the proposed development have been sourced from Section 3 of the ARC Report. Estimated peak hour traffic volumes resulting from the proposal are set out in Table 3.1.

Table 3.1: Traffic Generation Estimates

Period	Traffic Generation Rate (trips)
AM Peak	339
PM Peak	347

Table 3.1 indicates that the site could potentially generate 339 vehicle movements in the AM peak hour and up to 347 vehicle movements in the PM peak hour.

The following trip inbound/ outbound distribution has been applied (as per the ARC Report):

- AM Peak hour
  - Arrival – 20%
  - Departure – 80%
- PM Peak Hour
  - Arrival – 80%
  - Departure – 20%

3.1.2 Trip Distribution

With the development of the NorthConnex and the Sydney Metro station it is anticipated that congestion levels at Castle Hill Road and at Pennant Hills Road are likely to reduce. Traffic distribution may also change after opening of the NorthConnex and Sydney Metro in 2019. Therefore, for a robust analysis three different trip distribution analysis have been tested.

- Scenario 1 – 80% traffic to/ from Castle Hill Road
- Scenario 2 – 20% traffic to/ from Castle Hill Road
- Scenario 3 – 50% traffic to/ from Castle Hill Road

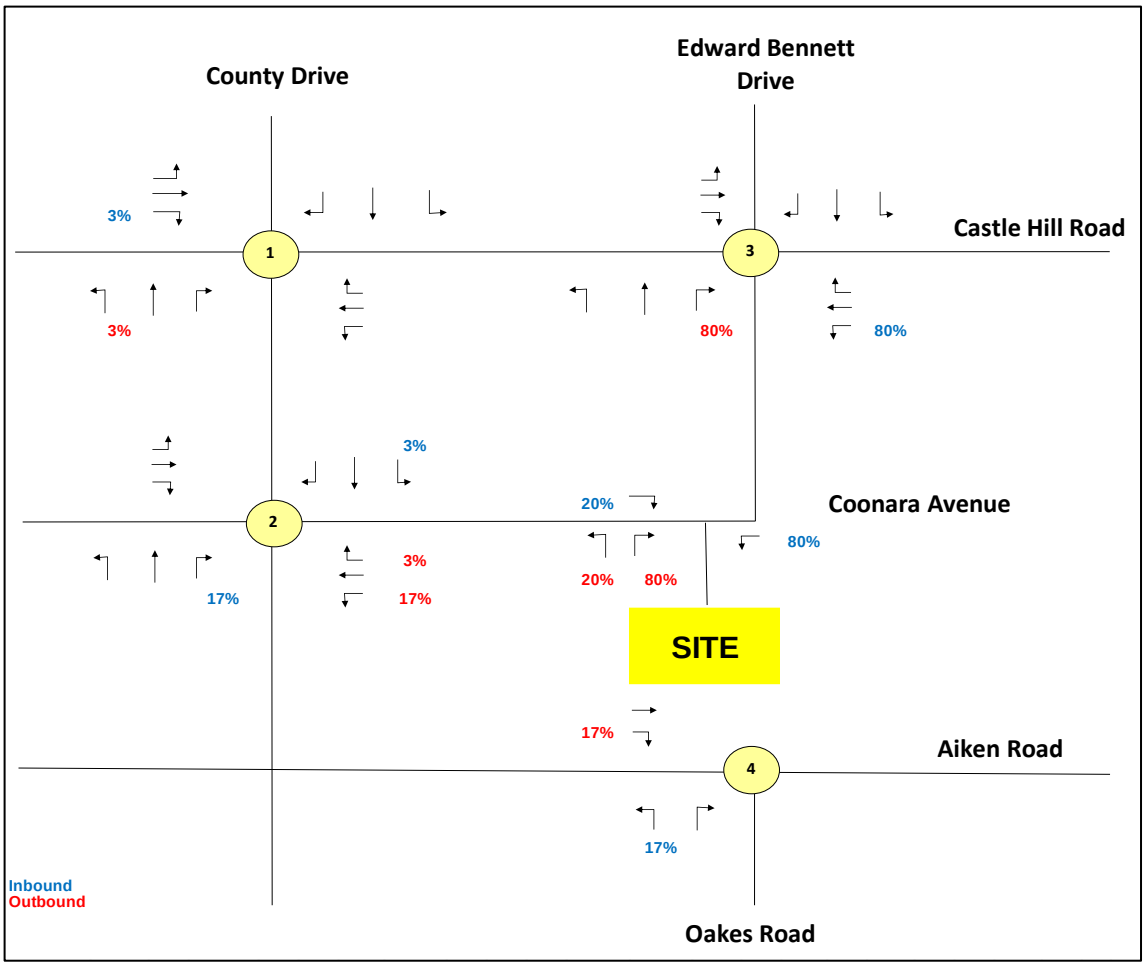
Scenario 1

For the purposes of estimating vehicle movements, the following directional distributions have been assumed:

- Taylor Street 17 per cent
- Highs Road 3 per cent
- Castle Hill Road (via Coonara Avenue) 80 per cent.

Figure 3.1 graphically shows the percentage of traffic distribution across the four intersections.

Figure 3.1: Percentage Traffic Distribution under Scenario 1



Additional traffic generated due to the development under Scenario 1 is shown in Figure 3.2 for the AM peak hour and Figure 3.3 for the PM peak hour.

Figure 3.2: Scenario 1 Development Traffic -AM Peak Hour

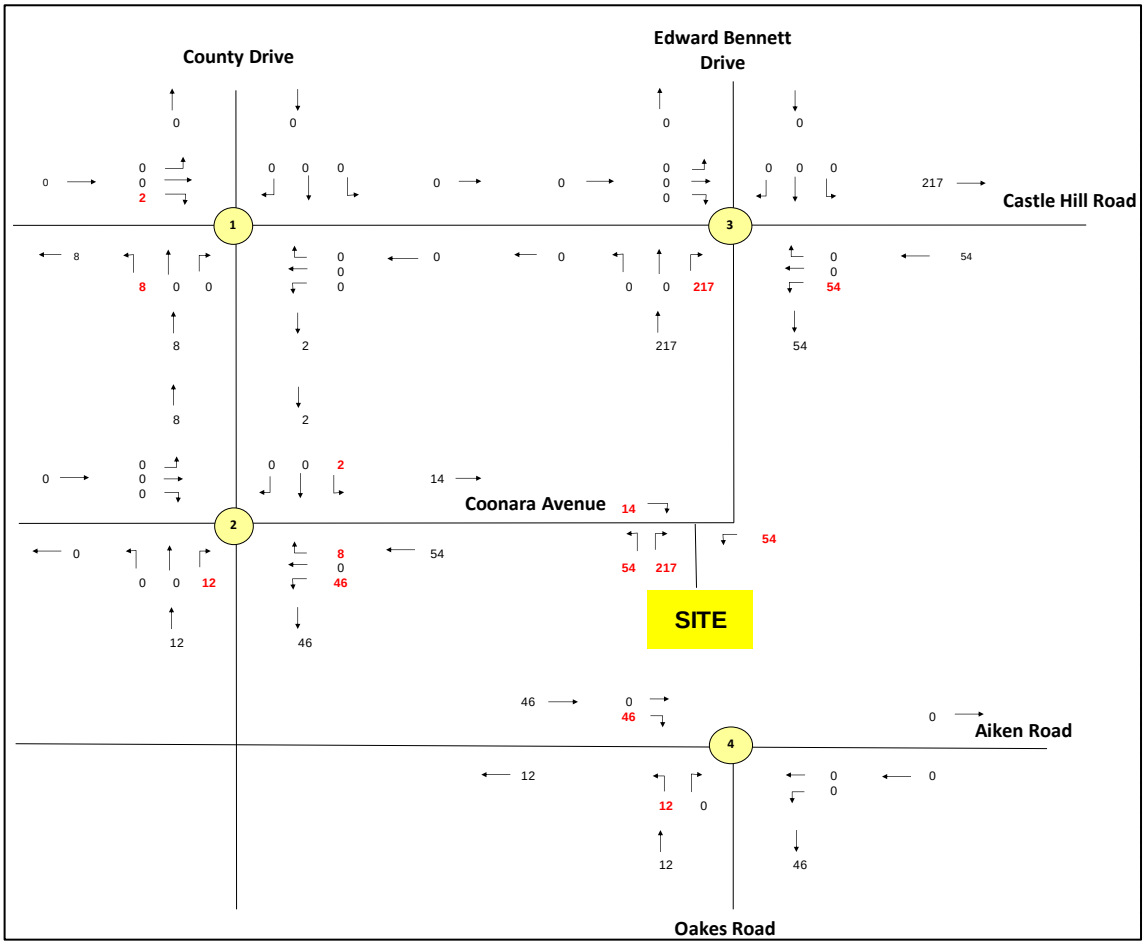
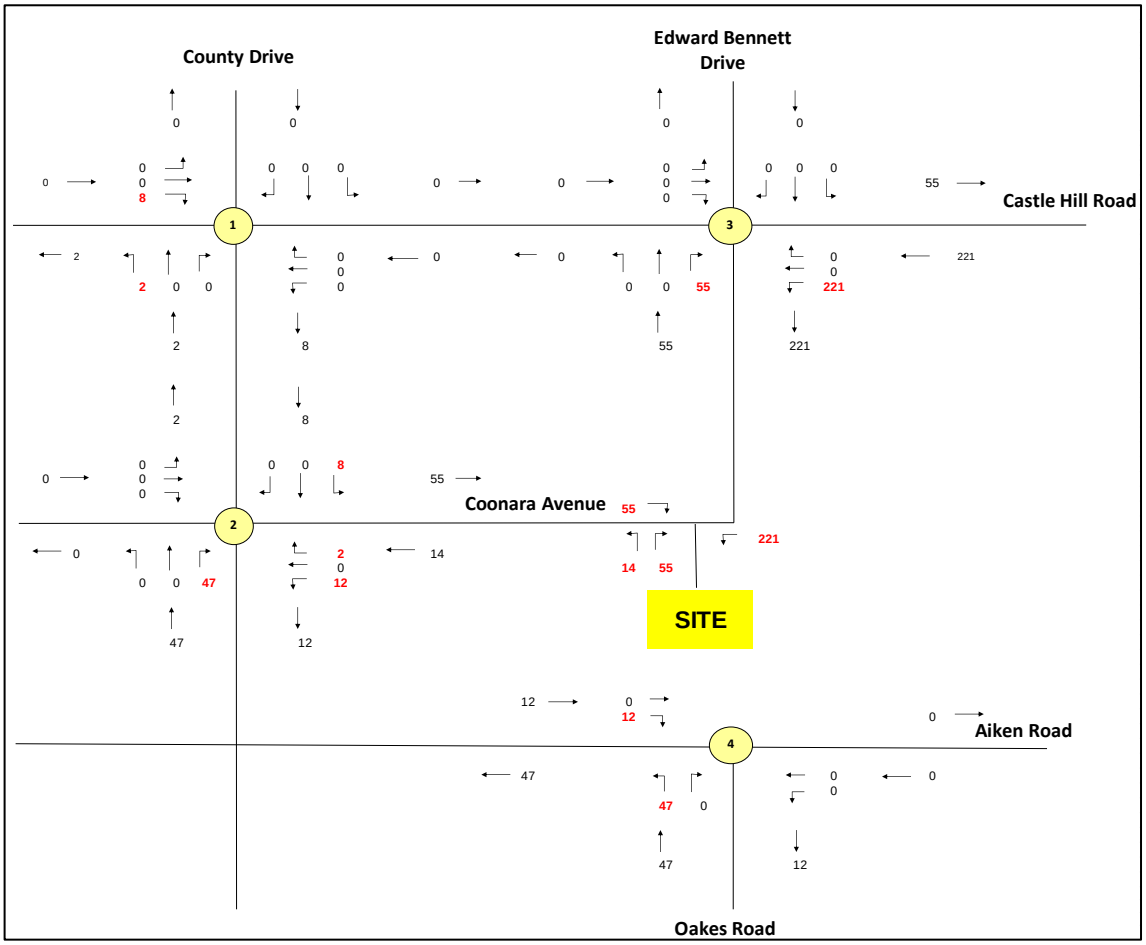


Figure 3.3: Scenario 1 Development Traffic - PM Peak Hour



Total traffic with the proposed development under Scenario 1 is shown in Figure 3.4 and Figure 3.5 for AM and PM peak hours respectively.

Figure 3.4: Scenario 1 total traffic with proposed development – AM Peak Hour

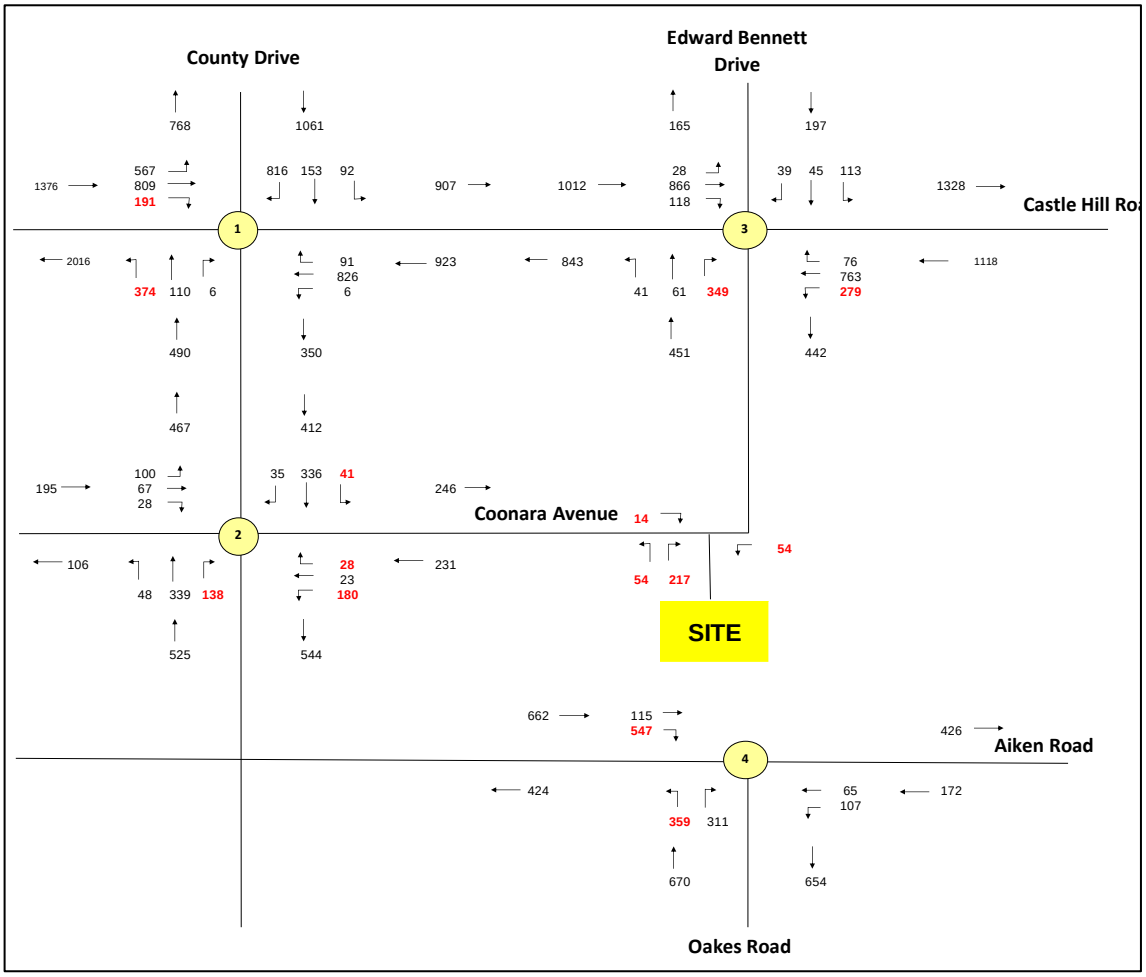
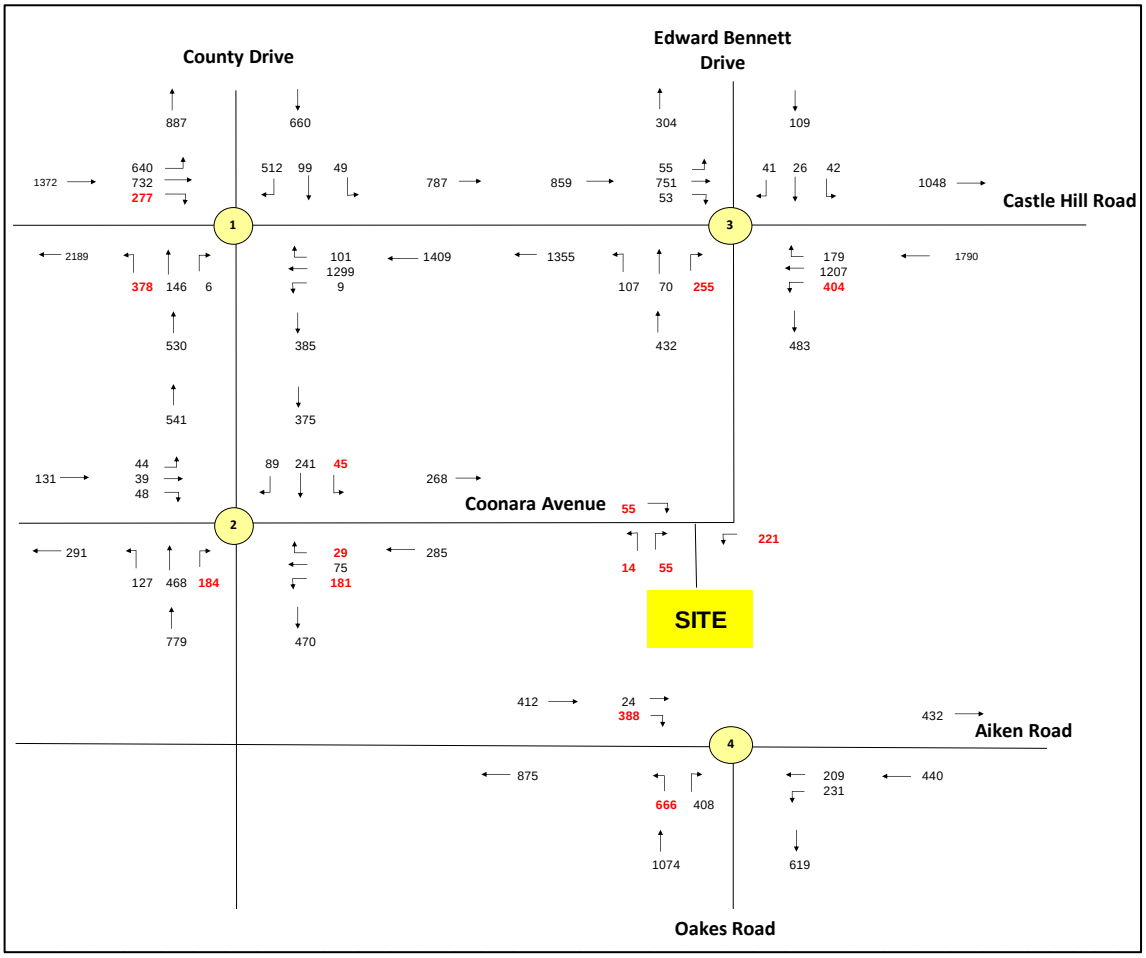


Figure 3.5: Scenario 1 total traffic with proposed development – PM Peak Hour



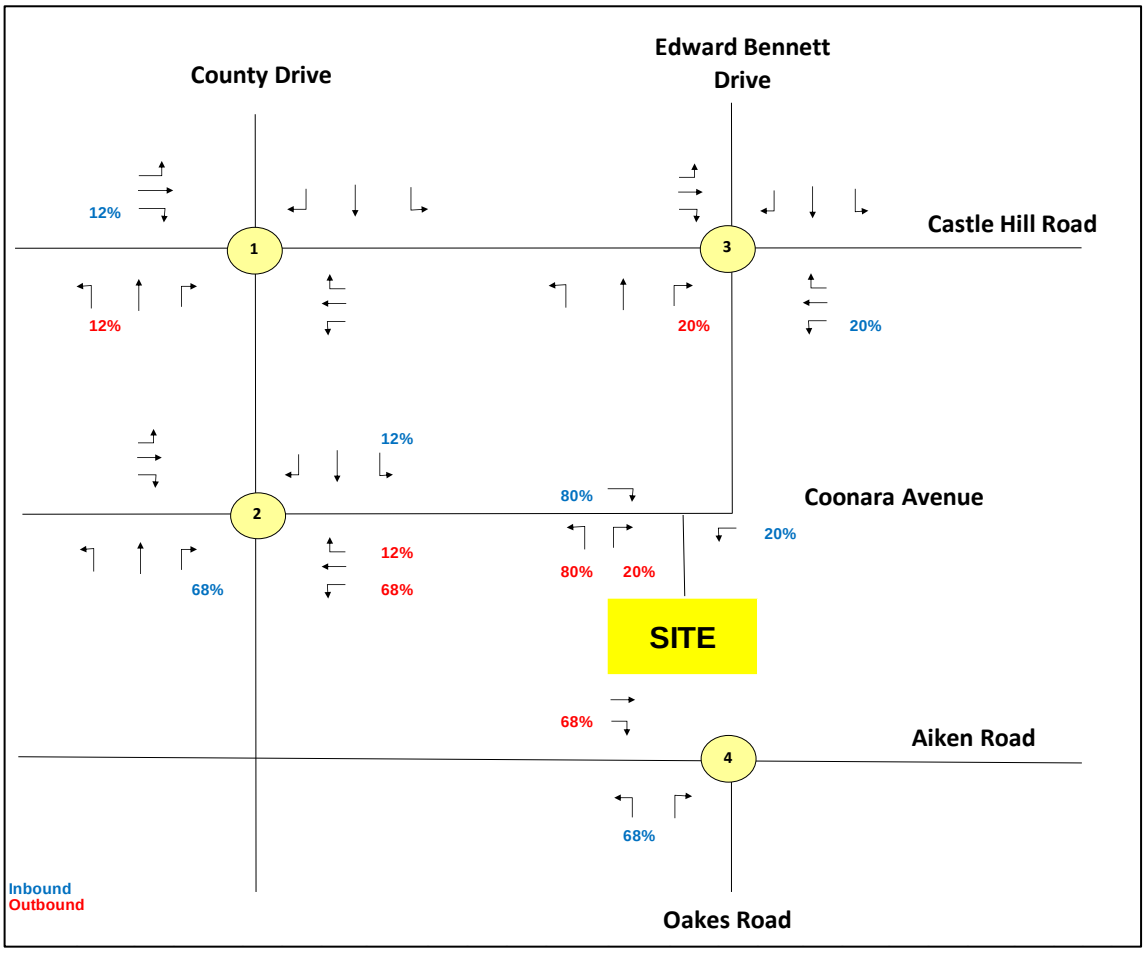
Scenario 2

For the purposes of estimating vehicle movements, the following directional distributions have been assumed under Scenario 2:

- Taylor Street 68 per cent
- Highs Road 12 per cent
- Castle Hill Road (via Coonara Avenue) 20 per cent.

Figure 3.6 graphically shows the percentage of traffic distribution under Scenario 2 across the four intersections.

Figure 3.6: Percentage Traffic Distribution under Scenario 2



Additional traffic generated due to the development under scenario 2 is shown in Figure 3.7 for the AM peak hour and Figure 3.8 for the PM peak hour.

Figure 3.7: Scenario 2 Development Traffic -AM Peak Hour

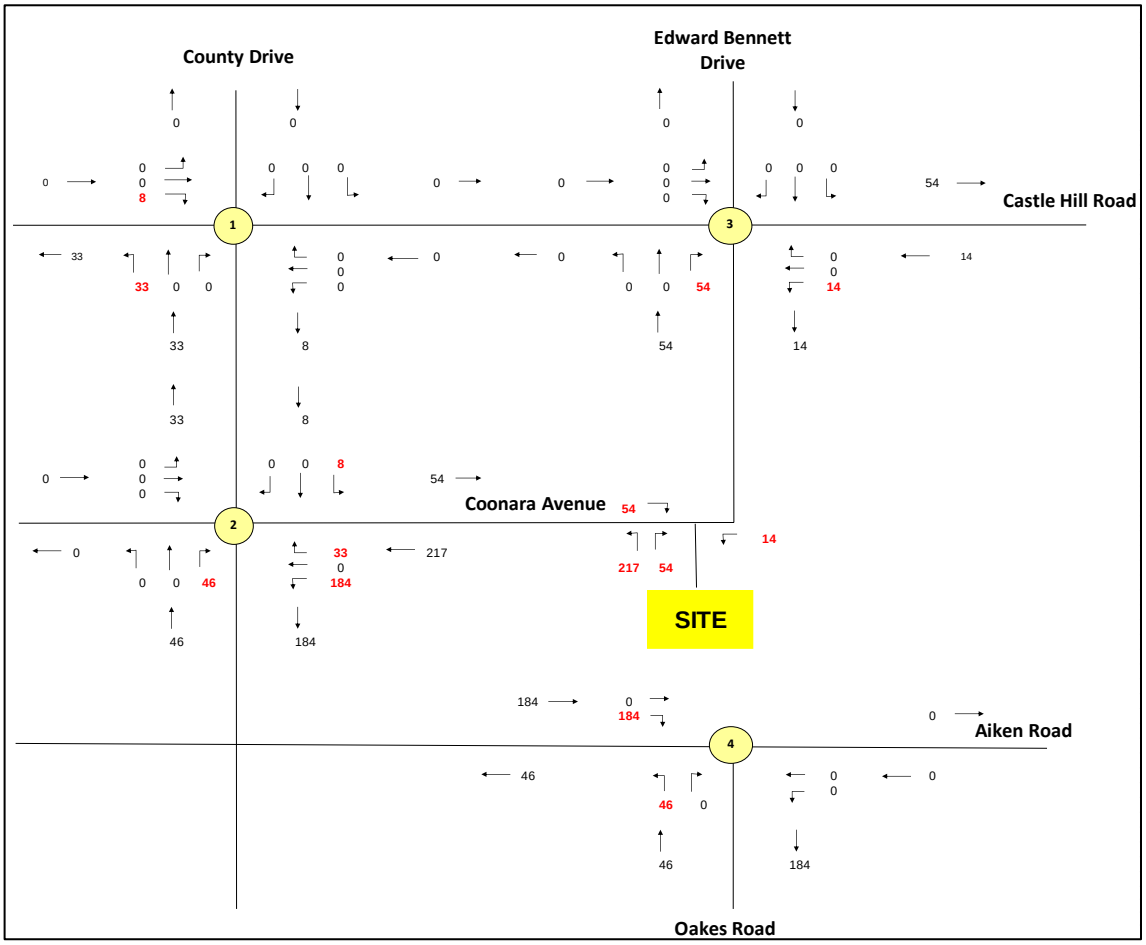
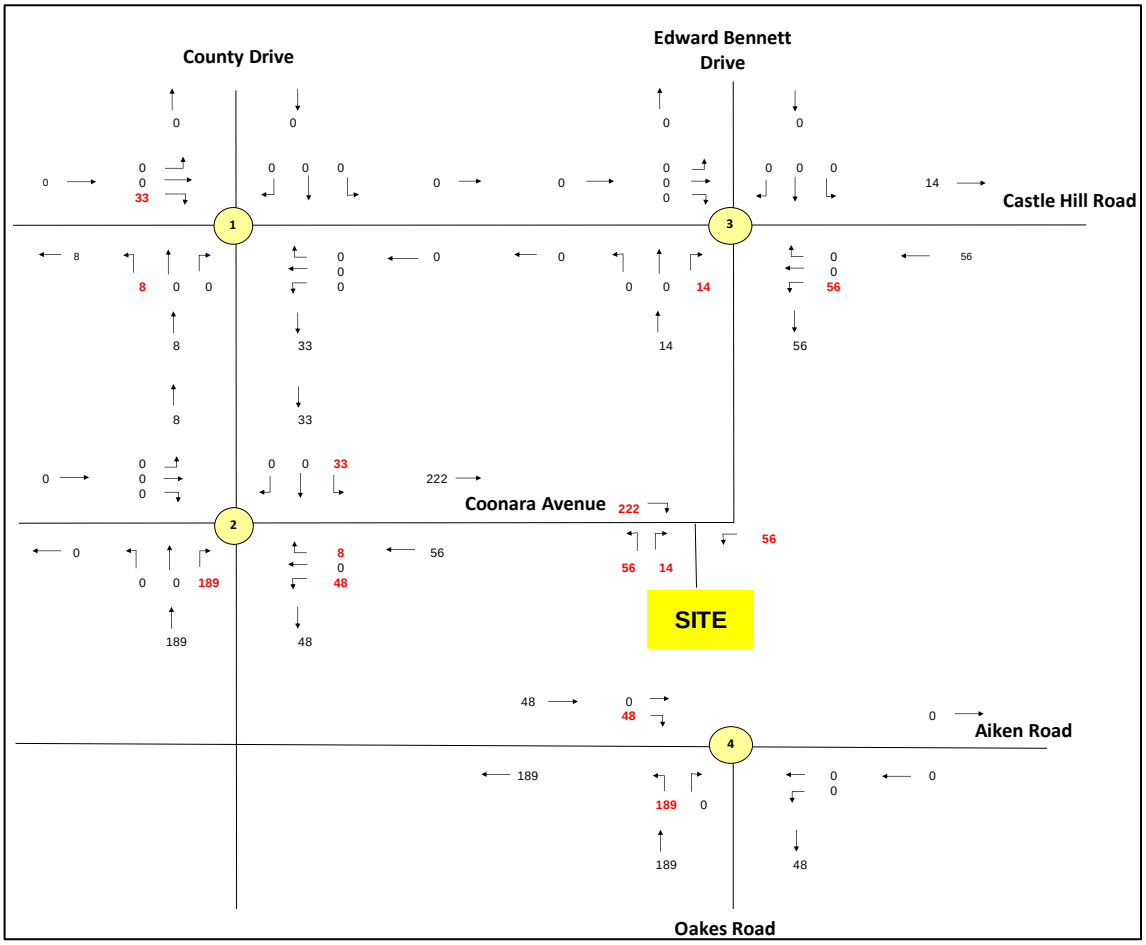


Figure 3.8: Scenario 2 Development Traffic - PM Peak Hour



Total traffic with the proposed development under Scenario 2 is shown in Figure 3.9 and Figure 3.10 for AM and PM peak hours respectively.

Figure 3.9: Scenario 2 Total Traffic - AM Peak Hour

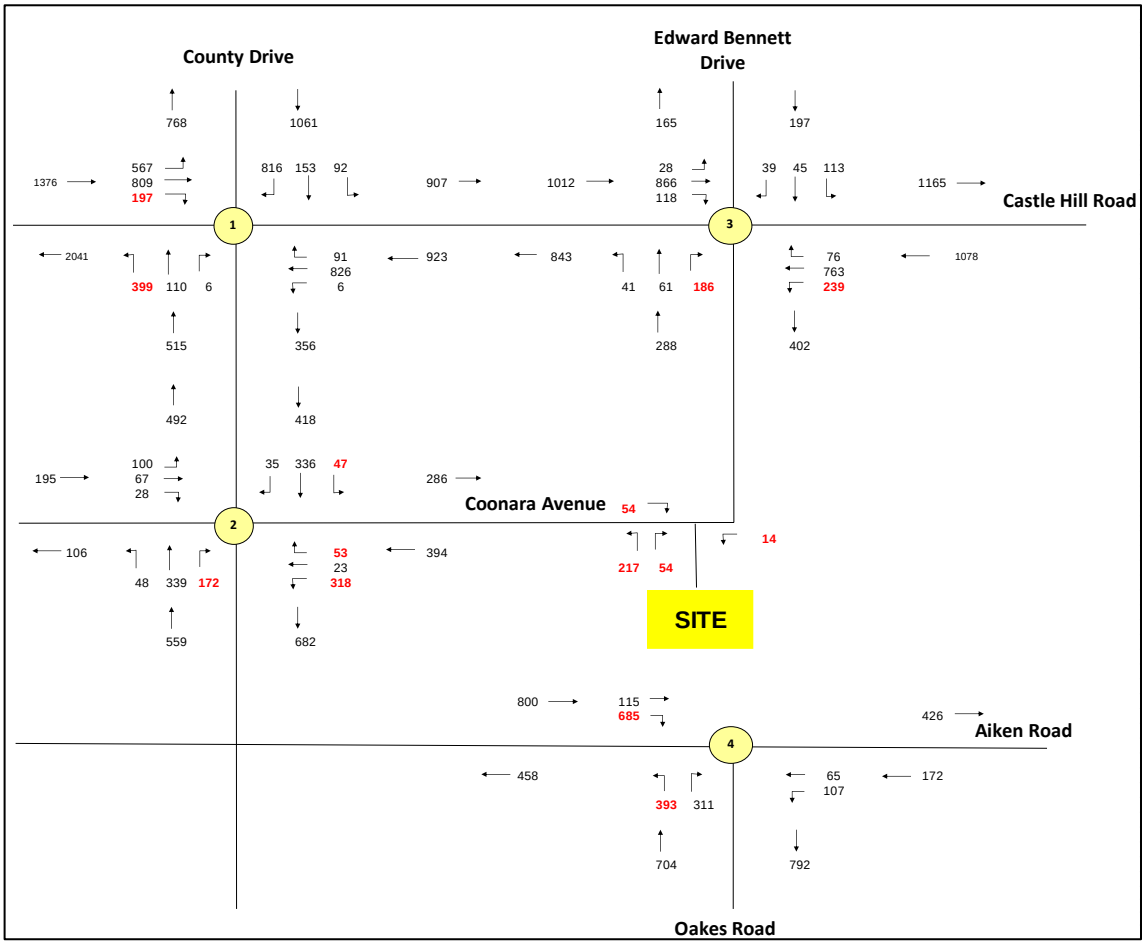
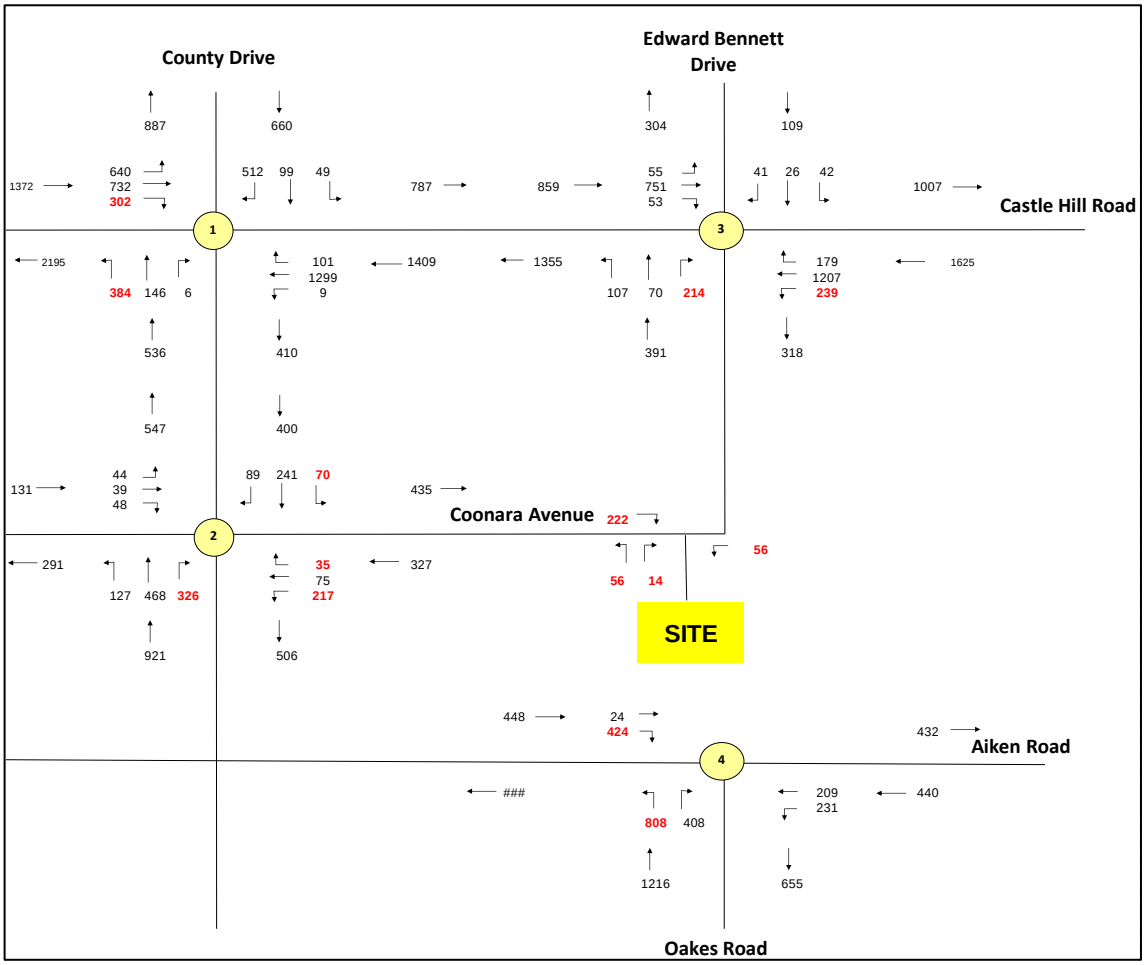


Figure 3.10: Scenario 2 Total Traffic - PM Peak Hour



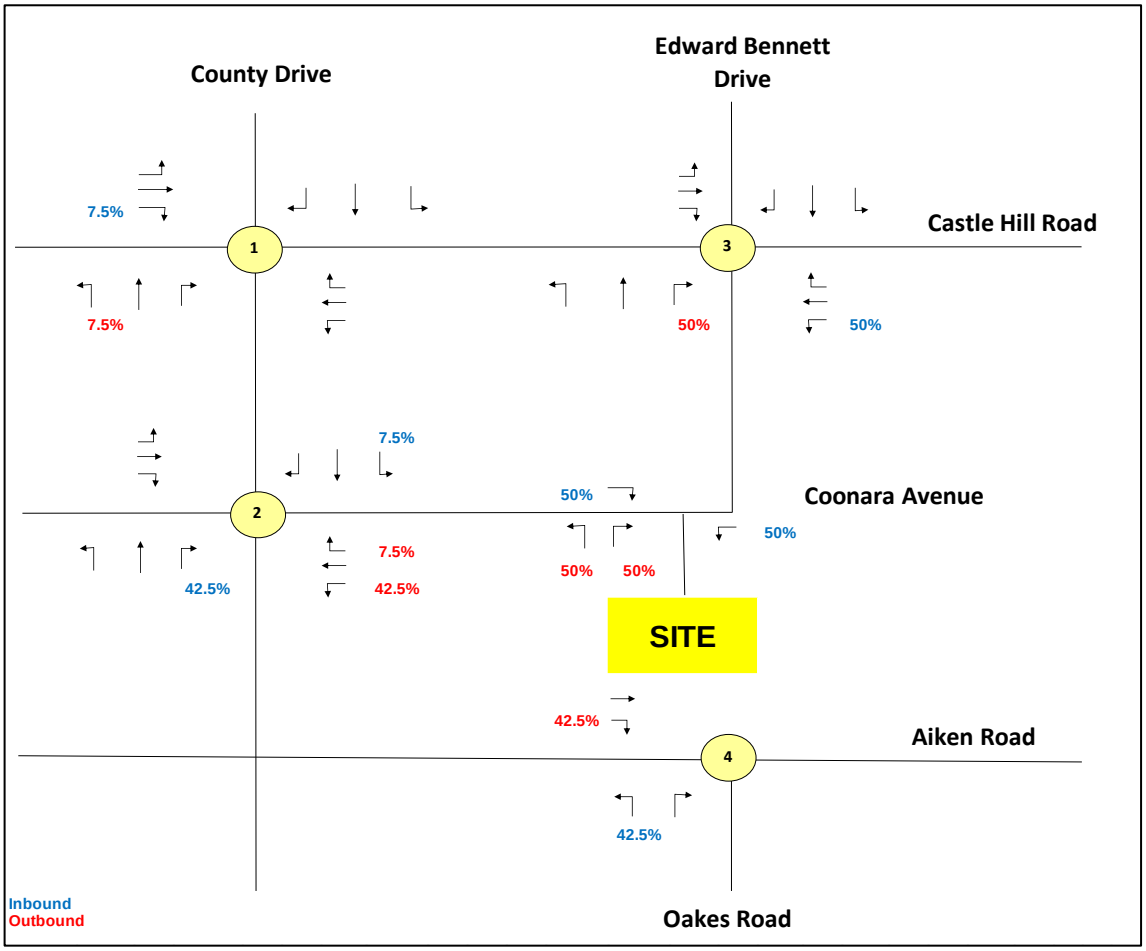
Scenario 3

For the purposes of estimating vehicle movements, the following directional distributions have been assumed:

- Taylor Street 42.5 per cent
- Highs Road 7.5 per cent
- Castle Hill Road (via Coonara Avenue) 50 per cent.

Figure 3.11 graphically shows the percentage of traffic distribution under Scenario 3 across the four intersections.

Figure 3.11: Percentage Traffic Distribution under Scenario 3



Additional traffic generated due to the development under Scenario 3 is shown in Figure 3.12 for the AM peak hour and Figure 3.13 for the PM Peak hour.

Figure 3.12: Scenario 3 Development Traffic – AM Peak Hour

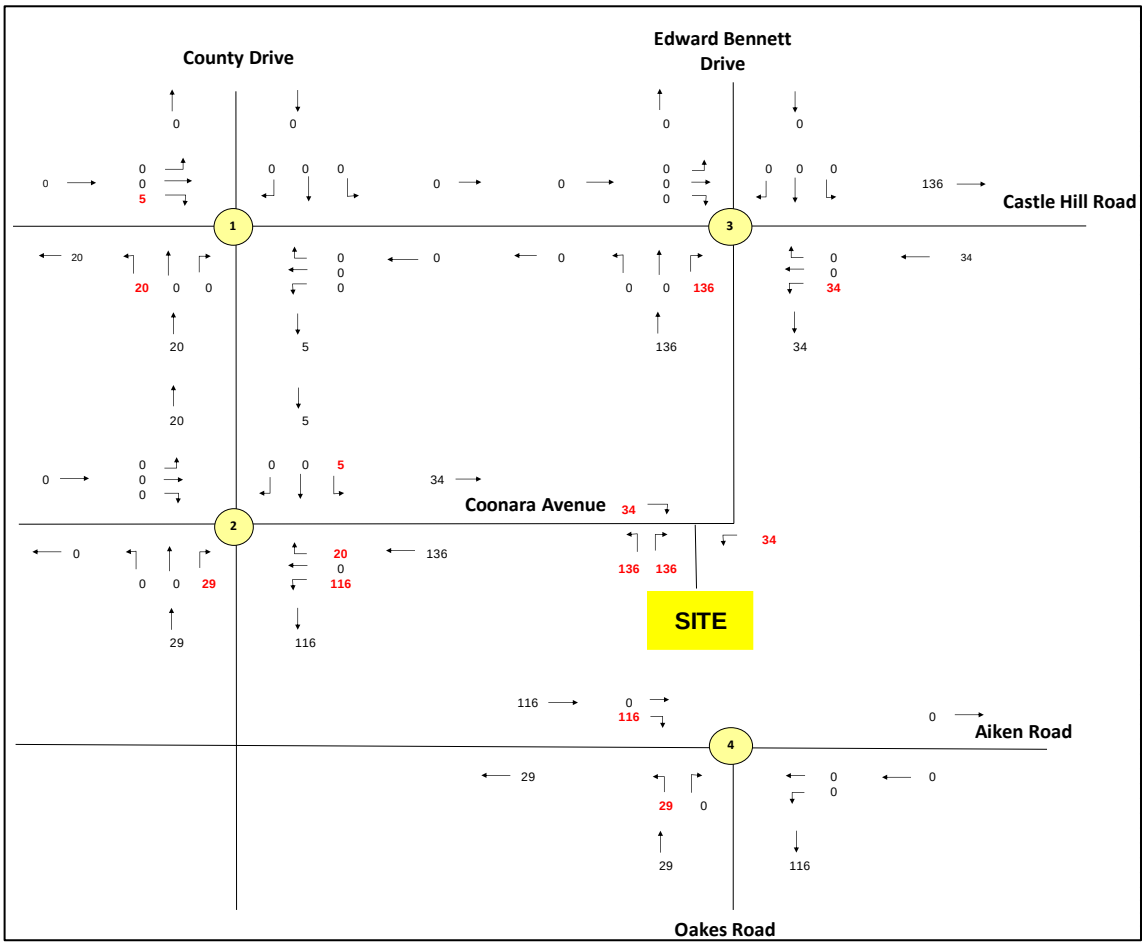
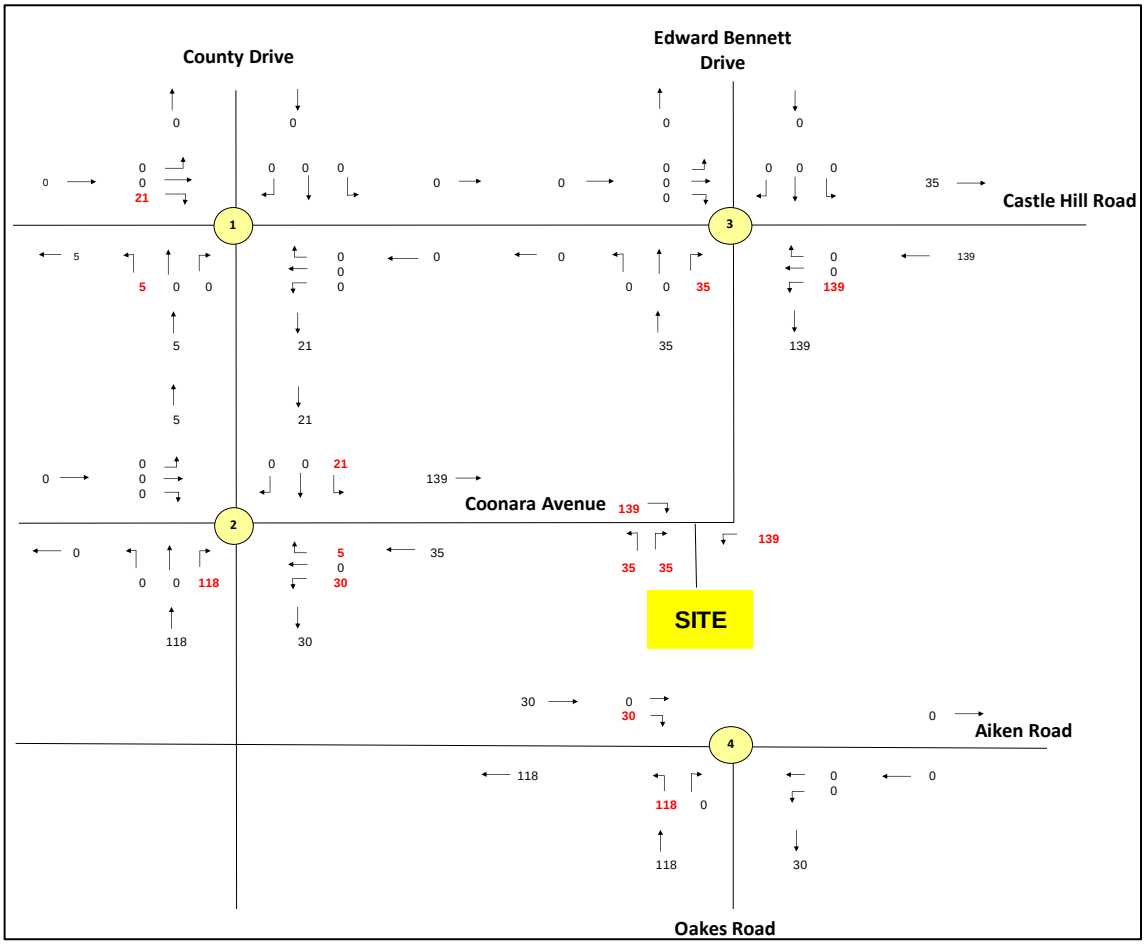


Figure 3.13: Scenario 3 Development Traffic – PM Peak Hour



Total traffic with the proposed development under Scenario 2 is shown in Figure 3.14 and Figure 3.15 for AM and PM peak hours respectively.

Figure 3.14: Scenario 3 Total Traffic – AM Peak Hour

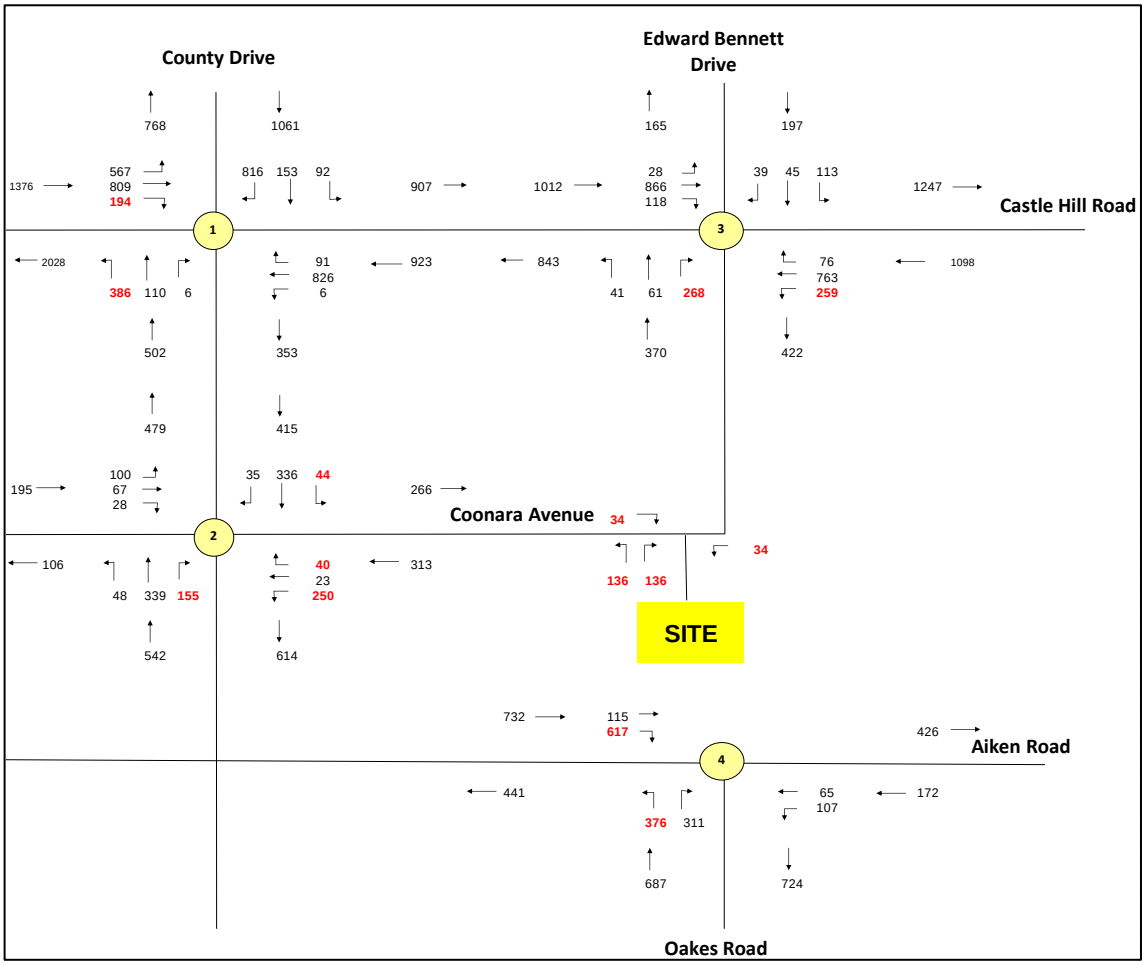
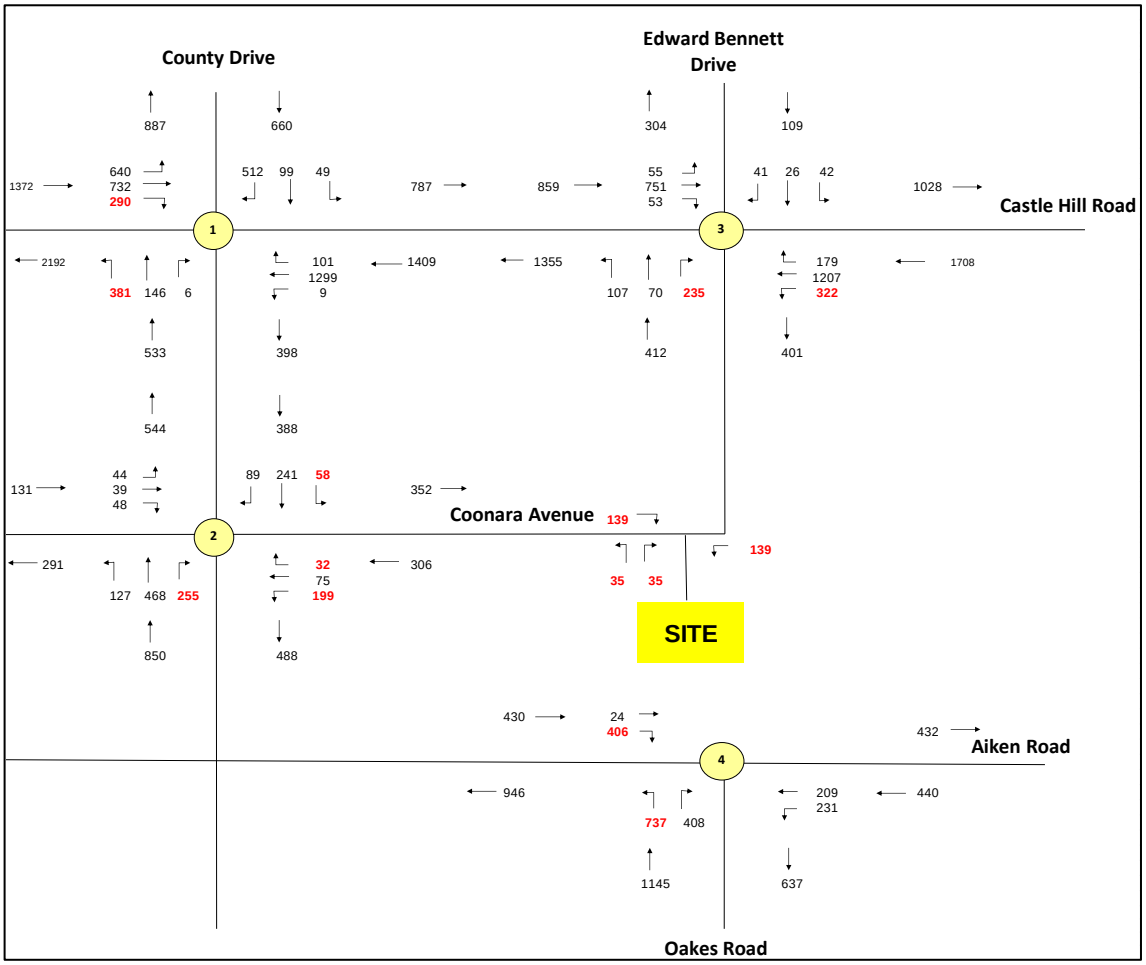


Figure 3.15: Scenario 3 Total Traffic – PM Peak Hour



3.2 Traffic Impact Assessment

All four intersections were assessed in SIDRA using volumes estimated for the three distribution scenarios. The LOS results are summarised in Table 3.2 with detailed results provided in Appendix B.

Table 3.2: Level of Service Summary

Intersection	Peak	Existing Conditions	Scenario 1	Scenario 2	Scenario 3
Highs Road/ Castle Hill Road/ County Drive	AM	C	C	C	C
	PM	D	D	D	D
Coonara Avenue/ Highs Road/ Taylor Street	AM	A	A	A	A
	PM	A	A	A	A
Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive	AM	C	C	C	C
	PM	C	D	C	C
Aiken Road/ Oakes Road	AM	D	F	F	F
	PM	A	A	A	A

With the development traffic, all four intersections are expected to operate at similar levels (acceptable LOS D or better) which is comparable to the existing conditions for both the AM and the PM peak hours for all scenarios tested. The Aiken Road/ Oakes Road roundabout is operating at capacity under existing condition and the additional development traffic leads to its deterioration in performance. As outlined in Section 2, the operation of this roundabout is impacted by the upstream queues and should this constraint be removed, the roundabout itself is expected to perform at acceptable levels. Therefore, the impacts from the development traffic is considered minimal at this roundabout and it only exacerbates the existing congestion issues.

Scenario 1 Performance

The performance of all four intersections is summarised in Table 3.3.

Table 3.3: Scenario 1 Operating Conditions

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Highs Road/ Castle Hill Road/ County Drive	AM	0.95	40	163	C
	PM	0.95	46	305	D
Coonara Avenue/ Highs Road/ Taylor Street	AM	0.10	10	3	A
	PM	0.08	10	2	A
Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive	AM	0.94	42	234	C
	PM	0.92	46	437	D
Aiken Road/ Oakes Road	AM	1.04	87	332	F
	PM	0.73	10	27	A

The following can be observed from Scenario 1 results:

- Except for the Aiken Road/ Oakes Road roundabout, all intersections are performing at acceptable LOS D or better
- Long queues (>200 meters) and a high DOS (>0.9) are observed at Highs Road/ Castle Hill Road/ County Drive intersection indicating that the intersection is operating at capacity during the PM peak hour
- Long queues (>200 meters) and a high DOS (>0.9) are observed at Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive intersection indicating that the intersection is operating at capacity during the PM peak hour

Scenario 2 Performance

The performance of all four intersections is summarised in Table 3.4

Table 3.4: Scenario 2 Operating Conditions

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Highs Road/ Castle Hill Road/ County Drive	AM	0.95	42	178	C
	PM	0.96	49	318	D
Coonara Avenue/ Highs Road/ Taylor Street	AM	0.12	10	3	A
	PM	0.09	10	3	A
Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive	AM	0.92	36	181	C
	PM	0.94	36	323	C
Aiken Road/ Oakes Road	AM	1.29	284	979	F
	PM	0.82	11	5	A

The following can be observed from Scenario 2 results:

- Except for the Aiken Road/ Oakes Road roundabout, all intersections are performing at acceptable LOS D or better
- Long queues (>200 meters) and a high DOS (>0.9) are observed at Highs Road/ Castle Hill Road/ County Drive intersection indicating that the intersection is operating at capacity during the PM peak hour
- Long queues (>200 meters) and a high DOS (>0.9) are observed at Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive intersection indicating that the intersection is operating at capacity during the PM peak hour

Scenario 3 Performance

The performance of all four intersections is summarised in Table 3.5

Table 3.5: Scenario 3 Operating Conditions

Intersection	Peak	Degree of Saturation (DOS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LOS)
Highs Road/ Castle Hill Road/ County Drive	AM	0.92	41	176	C
	PM	0.97	53	309	D
Coonara Avenue/ Highs Road/ Taylor Street	AM	0.11	10	4	A
	PM	0.08	10	3	A
Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive	AM	0.93	39	208	C
	PM	0.88	40	364	C
Aiken Road/ Oakes Road	AM	1.17	180	643	F
	PM	0.52	11	29	A

The following can be observed from Scenario 3 results:

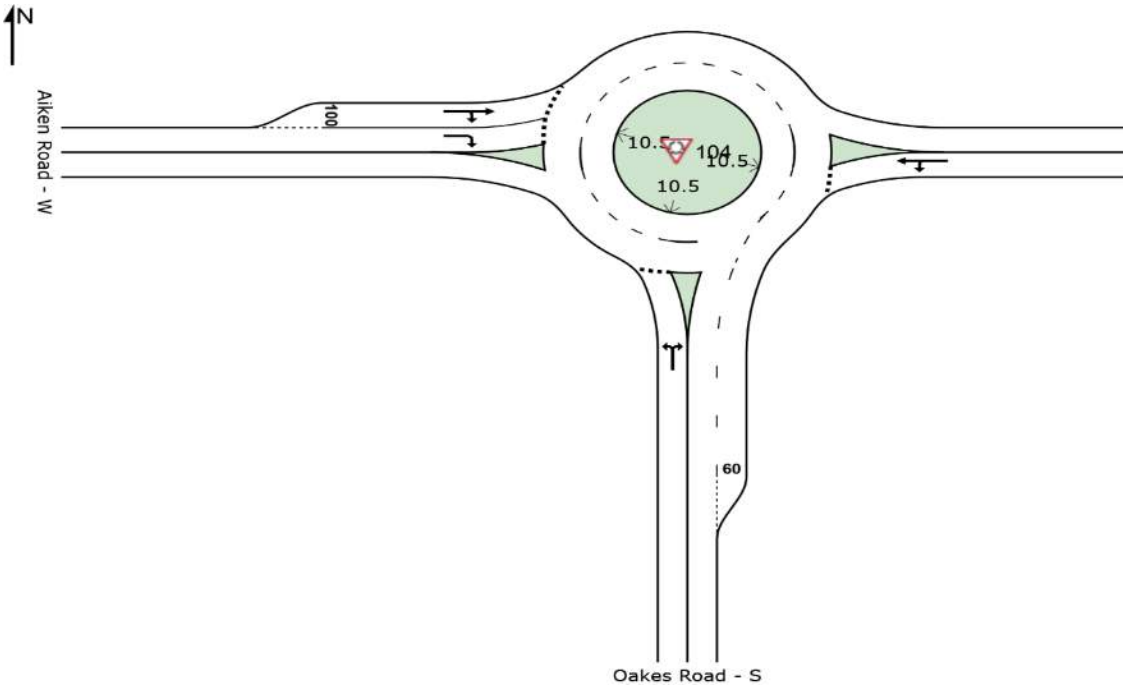
- Except for the Aiken Road/ Oakes Road roundabout, all intersections are performing at acceptable LOS D or better
- Long queues (>200 meters) and a high DOS (>0.9) are observed at Highs Road/ Castle Hill Road/ County Drive intersection indicating that the intersection is operating at capacity during the PM peak hour
- Long queues (>200 meters) and a high DOS (>0.9) are observed at Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive intersection indicating that the intersection is operating at capacity during both AM and PM peak hour

Mitigation Measures

As discussed in Section 3.1.2, travel patterns in the vicinity of the site are likely to change due to the NorthConnex and Sydney Metro opening in year 2019. As such it is expected that congestion levels at Castle Hill Road and Pennant Hills Road improve which may attract some of the existing rut running trips to revert back to the arterial road network. This change in travel patterns offers opportunities for improved performance at the Aiken Road/ Oakes Road intersection.

In case the future congestion levels remain at the level observed currently, a potential upgrade option was assessed at the Aiken Road/ Oakes Road roundabout. A layout change was assessed for Scenario 2 conditions as this scenario generates the highest proportion of development traffic at this intersection. The proposed layout is shown in Figure 3.16.

Figure 3.16: Proposed Layout at Aiken Road / Oakes Road intersection



The dual right turn provides additional storage capacity and the SIDRA results illustrate that the intersection performs at LOS B and has a DOS of 0.85. Detailed SIDRA results are provided in Appendix B.

3.3 Potential Impact on buses with and without the proposed development traffic

The West Pennant Hills Bus Priority Measures Business Case was prepared by Cardno in June 2010 (the Bus Priority Cardno Report). In general, it proposes to provide dedicated bus lane along Highs Road and Aiken Road all the way to Oakes Road Roundabout. As the program provides a separate bus lane, it would be expected that impacts to bus travel times resulting from the additional traffic generated by the development would be minimal. Notwithstanding, any additional traffic at intersections where bus priorities cannot be incorporated (give-way or roundabout intersection) is likely to increase delays to bus travel times.

Given the amount of infrastructure upgrades within the area, the travel patterns and levels of congestion are likely to change with some local traffic routes likely to experience reductions in volumes. However, the extent and probability of those changes is still uncertain and outside the scope of this assessment.

4. Conclusion

Based on the analysis and discussions presented within this report it can be concluded the additional traffic generated by the proposed development is expected to have marginal impact on the performance of the existing network. The results of SIDRA analysis indicate that there are existing capacity constraints at Castle Hill Road, Oakes Road and Aiken Road. The opening of NorthConnex is expected to reduce traffic volumes on the arterial road network, which in turn may relieve congestion on local roads.

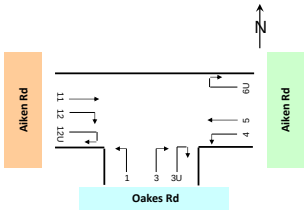
The Aiken Road/ Oakes Road roundabout is currently performing at capacity and any increase in traffic will lead to long queues and delays at this roundabout. The poor performance of this intersection is attributed to downstream queues reaching the roundabout and reducing its capacity. Therefore, the poor performance of this roundabout I cannot be directly attributed to the development traffic as the additional traffic only exacerbates existing issues.

Appendix A

Survey Results

Job No.	: N4220
Client	: GTA
Suburb	: West Pennant Hills
Location	: 1. Aiken Rd / Oakes Rd
Day/Date	: Tue, 5th June 2018
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

Classifications	**Class 1**	**Class 2**
	Lights	Heavies



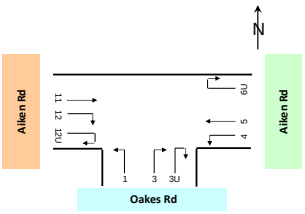
Approach	**Oakes Rd**									**Aiken Rd**									
Direction	**Direction 1 (Left Turn)**				**Direction 3 (Right Turn)**			**Direction 3U (U Turn)**			**Direction 4 (Left Turn)**			**Direction 5 (Through)**				**Direction 6U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**		**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**		**Lights**	**Heavies**	**Total**
7:00 to 7:15	35	1	**36**		62	2	**64**	1	0	**1**	39	0	**39**	12	2	**14**		1	0	**1**
7:15 to 7:30	45	1	**46**		77	0	**77**	0	0	**0**	26	2	**28**	11	4	**15**		0	0	**0**
7:30 to 7:45	58	1	**59**		49	1	**50**	8	0	**8**	25	1	**26**	9	2	**11**		1	0	**1**
7:45 to 8:00	69	3	**72**		100	0	**100**	0	0	**0**	30	0	**30**	15	2	**17**		1	0	**1**
8:00 to 8:15	79	1	**80**		74	3	**77**	1	0	**1**	26	0	**26**	14	2	**16**		0	0	**0**
8:15 to 8:30	81	3	**84**		84	0	**84**	4	0	**4**	26	0	**26**	17	0	**17**		0	1	**1**
8:30 to 8:45	85	1	**86**		79	0	**79**	1	0	**1**	28	4	**32**	13	1	**14**		1	2	**3**
8:45 to 9:00	95	2	**97**		68	3	**71**	0	0	**0**	22	1	**23**	17	1	**18**		0	0	**0**
AM Totals	**547**	**13**	**560**		**593**	**9**	**602**	**15**	**0**	**15**	**222**	**8**	**230**	**108**	**14**	**122**		**4**	**3**	**7**
16:00 to 16:15	134	3	**137**		110	1	**111**	3	0	**3**	49	1	**50**	39	1	**40**		0	0	**0**
16:15 to 16:30	126	2	**128**		112	0	**112**	0	0	**0**	59	1	**60**	31	1	**32**		1	0	**1**
16:30 to 16:45	149	1	**150**		109	1	**110**	2	0	**2**	56	0	**56**	41	0	**41**		0	0	**0**
16:45 to 17:00	152	0	**152**		105	0	**105**	5	0	**5**	65	0	**65**	48	1	**49**		1	0	**1**
17:00 to 17:15	147	2	**149**		96	0	**96**	2	0	**2**	60	0	**60**	65	2	**67**		0	0	**0**
17:15 to 17:30	168	0	**168**		96	1	**97**	1	0	**1**	50	0	**50**	51	1	**52**		1	0	**1**
17:30 to 17:45	159	2	**161**		75	0	**75**	2	0	**2**	49	0	**49**	53	3	**56**		1	0	**1**
17:45 to 18:00	172	1	**173**		81	0	**81**	1	0	**1**	62	0	**62**	54	2	**56**		0	0	**0**
PM Totals	**1,207**	**11**	**1,218**		**784**	**3**	**787**	**16**	**0**	**16**	**450**	**2**	**452**	**382**	**11**	**393**		**4**	**0**	**4**

Approach	**Aiken Rd**								
Direction	**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**
7:00 to 7:15	23	2	**25**	226	1	**227**	0	0	**0**
7:15 to 7:30	28	6	**34**	193	1	**194**	0	0	**0**
7:30 to 7:45	27	4	**31**	142	2	**144**	0	0	**0**
7:45 to 8:00	19	3	**22**	103	1	**104**	0	0	**0**
8:00 to 8:15	20	4	**24**	88	0	**88**	0	0	**0**
8:15 to 8:30	35	6	**41**	161	2	**163**	0	0	**0**
8:30 to 8:45	22	1	**23**	90	0	**90**	0	0	**0**
8:45 to 9:00	24	3	**27**	157	3	**160**	0	0	**0**
AM Totals	**198**	**29**	**227**	**1,160**	**10**	**1,170**	**0**	**0**	**0**
16:00 to 16:15	10	2	**12**	113	1	**114**	0	0	**0**
16:15 to 16:30	7	1	**8**	103	0	**103**	0	0	**0**
16:30 to 16:45	5	0	**5**	110	1	**111**	1	0	**1**
16:45 to 17:00	5	1	**6**	99	0	**99**	0	0	**0**
17:00 to 17:15	6	0	**6**	80	2	**82**	0	0	**0**
17:15 to 17:30	7	0	**7**	84	0	**84**	0	0	**0**
17:30 to 17:45	8	1	**9**	102	1	**103**	0	0	**0**
17:45 to 18:00	13	1	**14**	89	1	**90**	0	0	**0**
PM Totals	**61**	**6**	**67**	**780**	**6**	**786**	**1**	**0**	**1**

Job No. : N4220
Client : GTA
Suburb : West Pennant Hills
Location : 1. Aiken Rd / Oakes Rd

Day/Date : Tue, 5th June 2018
Weather : Fine
Description : Classified Intersection Count
: Hourly Summary

MATRIX Traffic and Transport Data

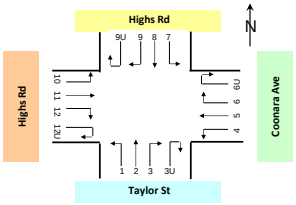


Approach	Oakes Rd												Aiken Rd											
Direction	Direction 1 (Left Turn)				Direction 3 (Right Turn)				Direction 3U (U Turn)				Direction 4 (Left Turn)				Direction 5 (Through)				Direction 6U (U Turn)			
Time Period	Lights	Heavies	Total		Lights	Heavies	Total		Lights	Heavies	Total		Lights	Heavies	Total		Lights	Heavies	Total		Lights	Heavies	Total	
7:00 to 8:00	207	6	**213**		288	3	**291**		9	0	**9**		120	3	**123**		47	10	**57**		3	0	**3**	
7:15 to 8:15	251	6	**257**		300	4	**304**		9	0	**9**		107	3	**110**		49	10	**59**		2	0	**2**	
7:30 to 8:30	287	8	**295**		307	4	**311**		13	0	**13**		107	1	**108**		55	6	**61**		2	1	**3**	
7:45 to 8:45	314	8	**322**		337	3	**340**		6	0	**6**		110	4	**114**		59	5	**64**		2	3	**5**	
8:00 to 9:00	340	7	**347**		305	6	**311**		6	0	**6**		102	5	**107**		61	4	**65**		1	3	**4**	
AM Totals	**547**	**13**	**560**		**593**	**9**	**602**		**15**	**0**	**15**		**222**	**8**	**230**		**108**	**14**	**122**		**4**	**3**	**7**	
16:00 to 17:00	561	6	**567**		436	2	**438**		10	0	**10**		229	2	**231**		159	3	**162**		2	0	**2**	
16:15 to 17:15	574	5	**579**		422	1	**423**		9	0	**9**		240	1	**241**		185	4	**189**		2	0	**2**	
16:30 to 17:30	616	3	**619**		406	2	**408**		10	0	**10**		231	0	**231**		205	4	**209**		2	0	**2**	
16:45 to 17:45	626	4	**630**		372	1	**373**		10	0	**10**		224	0	**224**		217	7	**224**		3	0	**3**	
17:00 to 18:00	646	5	**651**		348	1	**349**		6	0	**6**		221	0	**221**		223	8	**231**		2	0	**2**	
PM Totals	**1,207**	**11**	**1,218**		**784**	**3**	**787**		**16**	**0**	**16**		**450**	**2**	**452**		**382**	**11**	**393**		**4**	**0**	**4**	

Approach					Aiken Rd									
Direction					Direction 11 (Through)			Direction 12 (Right Turn)			Direction 12U (U Turn)			
Time Period					Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	
7:00 to 8:00					97	15	**112**	664	5	**669**	0	0	**0**	
7:15 to 8:15					94	17	**111**	526	4	**530**	0	0	**0**	
7:30 to 8:30					101	17	**118**	494	5	**499**	0	0	**0**	
7:45 to 8:45					96	14	**110**	442	3	**445**	0	0	**0**	
8:00 to 9:00					101	14	**115**	496	5	**501**	0	0	**0**	
AM Totals					**198**	**29**	**227**	**1,160**	**10**	**1,170**	**0**	**0**	**0**	
16:00 to 17:00					27	4	**31**	425	2	**427**	1	0	**1**	
16:15 to 17:15					23	2	**25**	392	3	**395**	1	0	**1**	
16:30 to 17:30					23	1	**24**	373	3	**376**	1	0	**1**	
16:45 to 17:45					26	2	**28**	365	3	**368**	0	0	**0**	
17:00 to 18:00					34	2	**36**	355	4	**359**	0	0	**0**	
PM Totals					**61**	**6**	**67**	**780**	**6**	**786**	**1**	**0**	**1**	

Job No.	: N4220
Client	: GTA
Suburb	: West Pennant Hills
Location	: 2. Coonara Ave / Highs Rd / Taylor St
Day/Date	: Tue, 5th June 2018
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

MATRIX Traffic and Transport Data



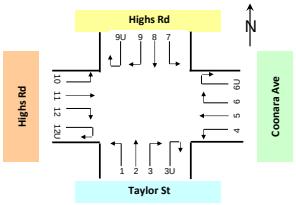
Classifications	**Class 1**	**Class 2**
	Lights	Heavies

Approach	**Taylor St**												**Coonara Ave**											
Direction	**Direction 1 (Left Turn)**			**Direction 2 (Through)**			**Direction 3 (Right Turn)**			**Direction 3U (U Turn)**			**Direction 4 (Left Turn)**			**Direction 5 (Through)**			**Direction 6 (Right Turn)**			**Direction 6U (U Turn)**		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 7:15	7	0	**7**	41	0	**41**	19	1	**20**	2	0	**2**	35	0	**35**	2	0	**2**	9	0	**9**	2	0	**2**
7:15 to 7:30	5	4	**9**	46	0	**46**	15	0	**15**	3	0	**3**	36	2	**38**	5	0	**5**	3	1	**4**	2	1	**3**
7:30 to 7:45	4	1	**5**	50	2	**52**	21	0	**21**	6	0	**6**	39	2	**41**	4	0	**4**	7	0	**7**	3	1	**4**
7:45 to 8:00	12	0	**12**	65	1	**66**	16	1	**17**	1	0	**1**	40	0	**40**	4	0	**4**	2	1	**3**	1	0	**1**
8:00 to 8:15	10	4	**14**	97	2	**99**	26	0	**26**	2	0	**2**	34	0	**34**	2	0	**2**	4	1	**5**	1	0	**1**
8:15 to 8:30	7	1	**8**	83	2	**85**	32	1	**33**	4	0	**4**	37	0	**37**	5	0	**5**	3	1	**4**	0	0	**0**
8:30 to 8:45	9	0	**9**	73	0	**73**	37	0	**37**	6	0	**6**	26	0	**26**	8	0	**8**	3	1	**4**	0	0	**0**
8:45 to 9:00	15	2	**17**	80	2	**82**	30	0	**30**	8	0	**8**	37	0	**37**	8	0	**8**	7	0	**7**	1	1	**2**
AM Totals	**69**	**12**	**81**	**535**	**9**	**544**	**196**	**3**	**199**	**32**	**0**	**32**	**284**	**4**	**288**	**38**	**0**	**38**	**38**	**5**	**43**	**10**	**3**	**13**
16:00 to 16:15	31	3	**34**	90	2	**92**	36	1	**37**	3	0	**3**	43	0	**43**	16	2	**18**	5	1	**6**	3	0	**3**
16:15 to 16:30	21	1	**22**	96	2	**98**	31	2	**33**	2	0	**2**	27	0	**27**	8	0	**8**	10	1	**11**	0	1	**1**
16:30 to 16:45	23	0	**23**	115	1	**116**	29	0	**29**	2	0	**2**	54	0	**54**	19	0	**19**	10	0	**10**	0	0	**0**
16:45 to 17:00	30	1	**31**	119	3	**122**	37	0	**37**	4	0	**4**	29	1	**30**	17	0	**17**	7	0	**7**	0	0	**0**
17:00 to 17:15	42	1	**43**	109	2	**111**	33	0	**33**	1	0	**1**	39	1	**40**	18	0	**18**	2	1	**3**	0	0	**0**
17:15 to 17:30	30	0	**30**	117	2	**119**	38	0	**38**	0	0	**0**	45	0	**45**	21	0	**21**	6	1	**7**	1	1	**2**
17:30 to 17:45	34	3	**37**	113	2	**115**	34	0	**34**	2	0	**2**	57	1	**58**	23	0	**23**	11	0	**11**	1	0	**1**
17:45 to 18:00	24	0	**24**	115	2	**117**	42	0	**42**	2	0	**2**	32	0	**32**	15	0	**15**	7	0	**7**	0	1	**1**
PM Totals	**235**	**9**	**244**	**874**	**16**	**890**	**280**	**3**	**283**	**16**	**0**	**16**	**326**	**3**	**329**	**137**	**2**	**139**	**58**	**4**	**62**	**5**	**3**	**8**

Approach	**Highs Rd**												**Highs Rd**											
Direction	**Direction 7 (Left Turn)**			**Direction 8 (Through)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Direction 10 (Left Turn)**			**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 7:15	5	0	**5**	123	4	**127**	5	4	**9**	3	0	**3**	19	0	**19**	16	2	**18**	49	4	**53**	0	0	**0**
7:15 to 7:30	7	2	**9**	139	6	**145**	8	4	**12**	6	0	**6**	21	1	**22**	20	1	**21**	43	4	**47**	0	0	**0**
7:30 to 7:45	5	1	**6**	89	5	**94**	8	3	**11**	2	0	**2**	17	4	**21**	18	1	**19**	32	1	**33**	0	0	**0**
7:45 to 8:00	2	0	**2**	80	4	**84**	7	4	**11**	0	0	**0**	28	0	**28**	11	0	**11**	31	3	**34**	0	0	**0**
8:00 to 8:15	5	1	**6**	66	2	**68**	6	3	**9**	1	0	**1**	29	1	**30**	16	1	**17**	20	4	**24**	0	0	**0**
8:15 to 8:30	8	0	**8**	93	2	**95**	9	2	**11**	3	0	**3**	35	0	**35**	18	2	**20**	47	5	**52**	0	0	**0**
8:30 to 8:45	8	0	**8**	83	2	**85**	5	0	**5**	1	0	**1**	17	0	**17**	18	0	**18**	29	0	**29**	0	0	**0**
8:45 to 9:00	16	1	**17**	84	4	**88**	9	1	**10**	1	0	**1**	16	2	**18**	11	1	**12**	22	1	**23**	0	0	**0**
AM Totals	**56**	**5**	**61**	**757**	**29**	**786**	**57**	**21**	**78**	**17**	**0**	**17**	**182**	**8**	**190**	**128**	**8**	**136**	**273**	**22**	**295**	**0**	**0**	**0**
16:00 to 16:15	11	0	**11**	74	0	**74**	22	1	**23**	3	0	**3**	19	3	**22**	10	0	**10**	12	0	**12**	0	0	**0**
16:15 to 16:30	9	1	**10**	61	1	**62**	17	0	**17**	4	0	**4**	13	3	**16**	12	0	**12**	14	1	**15**	0	0	**0**
16:30 to 16:45	3	0	**3**	60	0	**60**	22	1	**23**	1	0	**1**	7	0	**7**	9	0	**9**	12	1	**13**	0	0	**0**
16:45 to 17:00	11	1	**12**	56	1	**57**	14	0	**14**	2	0	**2**	7	1	**8**	9	0	**9**	13	0	**13**	0	0	**0**
17:00 to 17:15	10	0	**10**	55	0	**55**	19	0	**19**	0	0	**0**	15	0	**15**	11	0	**11**	8	0	**8**	0	0	**0**
17:15 to 17:30	11	1	**12**	69	0	**69**	32	1	**33**	4	0	**4**	13	1	**14**	10	0	**10**	13	1	**14**	0	0	**0**
17:30 to 17:45	7	0	**7**	73	1	**74**	20	0	**20**	2	0	**2**	12	1	**13**	13	0	**13**	9	0	**9**	0	0	**0**
17:45 to 18:00	14	1	**15**	68	0	**68**	10	0	**10**	6	0	**6**	5	2	**7**	12	0	**12**	4	0	**4**	0	0	**0**
PM Totals	**76**	**4**	**80**	**516**	**3**	**519**	**156**	**3**	**159**	**22**	**0**	**22**	**91**	**11**	**102**	**86**	**0**	**86**	**85**	**3**	**88**	**0**	**0**	**0**

Job No. : N4220
Client : GTA
Suburb : West Pennant Hills
Location : 2. Coonara Ave / Highs Rd / Taylor St

Day/Date : Tue, 5th June 2018
Weather : Fine
Description : Classified Intersection Count
: Hourly Summary

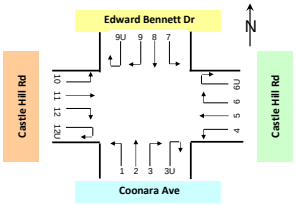


Approach	Taylor St												Coonara Ave											
Direction	Direction 1 (Left Turn)			Direction 2 (Through)			Direction 3 (Right Turn)			Direction 3U (U Turn)			Direction 4 (Left Turn)			Direction 5 (Through)			Direction 6 (Right Turn)			Direction 6U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 8:00	28	5	**33**	202	3	**205**	71	2	**73**	12	0	**12**	150	4	**154**	15	0	**15**	21	2	**23**	8	2	**10**
7:15 to 8:15	31	9	**40**	258	5	**263**	78	1	**79**	12	0	**12**	149	4	**153**	15	0	**15**	16	3	**19**	7	2	**9**
7:30 to 8:30	33	6	**39**	295	7	**302**	95	2	**97**	13	0	**13**	150	2	**152**	15	0	**15**	16	3	**19**	5	1	**6**
7:45 to 8:45	38	5	**43**	318	5	**323**	111	2	**113**	13	0	**13**	137	0	**137**	19	0	**19**	12	4	**16**	2	0	**2**
8:00 to 9:00	41	7	**48**	333	6	**339**	125	1	**126**	20	0	**20**	134	0	**134**	23	0	**23**	17	3	**20**	2	1	**3**
AM Totals	**69**	**12**	**81**	**535**	**9**	**544**	**196**	**3**	**199**	**32**	**0**	**32**	**284**	**4**	**288**	**38**	**0**	**38**	**38**	**5**	**43**	**10**	**3**	**13**
16:00 to 17:00	105	5	**110**	420	8	**428**	133	3	**136**	11	0	**11**	153	1	**154**	60	2	**62**	32	2	**34**	3	1	**4**
16:15 to 17:15	116	3	**119**	439	8	**447**	130	2	**132**	9	0	**9**	149	2	**151**	62	0	**62**	29	2	**31**	0	1	**1**
16:30 to 17:30	125	2	**127**	460	8	**468**	137	0	**137**	7	0	**7**	167	2	**169**	75	0	**75**	25	2	**27**	1	1	**2**
16:45 to 17:45	136	5	**141**	458	9	**467**	142	0	**142**	7	0	**7**	170	3	**173**	79	0	**79**	26	2	**28**	2	1	**3**
17:00 to 18:00	130	4	**134**	454	8	**462**	147	0	**147**	5	0	**5**	173	2	**175**	77	0	**77**	26	2	**28**	2	2	**4**
PM Totals	**235**	**9**	**244**	**874**	**16**	**890**	**280**	**3**	**283**	**16**	**0**	**16**	**326**	**3**	**329**	**137**	**2**	**139**	**58**	**4**	**62**	**5**	**3**	**8**

Approach	Highs Rd												Highs Rd											
Direction	Direction 7 (Left Turn)			Direction 8 (Through)			Direction 9 (Right Turn)			Direction 9U (U Turn)			Direction 10 (Left Turn)			Direction 11 (Through)			Direction 12 (Right Turn)			Direction 12U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 8:00	19	3	**22**	431	19	**450**	28	15	**43**	11	0	**11**	85	5	**90**	65	4	**69**	155	12	**167**	0	0	**0**
7:15 to 8:15	19	4	**23**	374	17	**391**	29	14	**43**	9	0	**9**	95	6	**101**	65	3	**68**	126	12	**138**	0	0	**0**
7:30 to 8:30	20	2	**22**	328	13	**341**	30	12	**42**	6	0	**6**	109	5	**114**	63	4	**67**	130	13	**143**	0	0	**0**
7:45 to 8:45	23	1	**24**	322	10	**332**	27	9	**36**	5	0	**5**	109	1	**110**	63	3	**66**	127	12	**139**	0	0	**0**
8:00 to 9:00	37	2	**39**	326	10	**336**	29	6	**35**	6	0	**6**	97	3	**100**	63	4	**67**	118	10	**128**	0	0	**0**
AM Totals	**56**	**5**	**61**	**757**	**29**	**786**	**57**	**21**	**78**	**17**	**0**	**17**	**182**	**8**	**190**	**128**	**8**	**136**	**273**	**22**	**295**	**0**	**0**	**0**
16:00 to 17:00	34	2	**36**	251	2	**253**	75	2	**77**	10	0	**10**	46	7	**53**	40	0	**40**	51	2	**53**	0	0	**0**
16:15 to 17:15	33	2	**35**	232	2	**234**	72	1	**73**	7	0	**7**	42	4	**46**	41	0	**41**	47	2	**49**	0	0	**0**
16:30 to 17:30	35	2	**37**	240	1	**241**	87	2	**89**	7	0	**7**	42	2	**44**	39	0	**39**	46	2	**48**	0	0	**0**
16:45 to 17:45	39	2	**41**	253	2	**255**	85	1	**86**	8	0	**8**	47	3	**50**	43	0	**43**	43	1	**44**	0	0	**0**
17:00 to 18:00	42	2	**44**	265	1	**266**	81	1	**82**	12	0	**12**	45	4	**49**	46	0	**46**	34	1	**35**	0	0	**0**
PM Totals	**76**	**4**	**80**	**516**	**3**	**519**	**156**	**3**	**159**	**22**	**0**	**22**	**91**	**11**	**102**	**86**	**0**	**86**	**85**	**3**	**88**	**0**	**0**	**0**

Job No.	: N4220
Client	: GTA
Suburb	: West Pennant Hills
Location	: 3. Coonara Ave / Castle Hill Rd / Edward Bennett Dr
Day/Date	: Tue, 5th June 2018
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

MATRIX Traffic and Transport Data



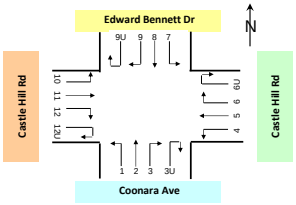
Classifications	**Class 1**	**Class 2**
	Lights	Heavies

Approach	**Coonara Ave**												**Castle Hill Rd**											
Direction	**Direction 1 (Left Turn)**			**Direction 2 (Through)**			**Direction 3 (Right Turn)**			**Direction 3U (U Turn)**			**Direction 4 (Left Turn)**			**Direction 5 (Through)**			**Direction 6 (Right Turn)**			**Direction 6U (U Turn)**		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 7:15	2	0	**2**	1	0	**1**	23	1	**24**	0	0	**0**	41	0	**41**	133	11	**144**	3	1	**4**	0	0	**0**
7:15 to 7:30	5	1	**6**	5	0	**5**	34	4	**38**	0	0	**0**	39	2	**41**	124	16	**140**	3	1	**4**	0	0	**0**
7:30 to 7:45	3	0	**3**	5	1	**6**	31	2	**33**	0	0	**0**	33	1	**34**	148	18	**166**	4	0	**4**	0	0	**0**
7:45 to 8:00	6	0	**6**	8	0	**8**	24	3	**27**	0	0	**0**	45	3	**48**	170	20	**190**	11	1	**12**	0	0	**0**
8:00 to 8:15	10	1	**11**	21	1	**22**	22	0	**22**	0	0	**0**	39	2	**41**	158	20	**178**	15	3	**18**	0	0	**0**
8:15 to 8:30	11	1	**12**	19	0	**19**	26	2	**28**	0	0	**0**	50	0	**50**	190	19	**209**	17	3	**20**	0	0	**0**
8:30 to 8:45	8	1	**9**	7	1	**8**	40	0	**40**	0	0	**0**	53	2	**55**	173	11	**184**	22	0	**22**	0	0	**0**
8:45 to 9:00	7	2	**9**	12	0	**12**	40	2	**42**	0	0	**0**	77	2	**79**	183	9	**192**	15	1	**16**	0	0	**0**
AM Totals	**52**	**6**	**58**	**78**	**3**	**81**	**240**	**14**	**254**	**0**	**0**	**0**	**377**	**12**	**389**	**1,279**	**124**	**1,403**	**90**	**10**	**100**	**0**	**0**	**0**
16:00 to 16:15	17	0	**17**	16	0	**16**	41	0	**41**	0	0	**0**	49	3	**52**	245	12	**257**	27	3	**30**	0	0	**0**
16:15 to 16:30	22	1	**23**	12	0	**12**	52	2	**54**	0	0	**0**	27	2	**29**	320	10	**330**	38	4	**42**	0	0	**0**
16:30 to 16:45	18	0	**18**	13	0	**13**	45	1	**46**	0	0	**0**	43	1	**44**	296	6	**302**	32	2	**34**	0	0	**0**
16:45 to 17:00	27	0	**27**	15	0	**15**	25	2	**27**	0	0	**0**	35	1	**36**	309	8	**317**	42	2	**44**	0	0	**0**
17:00 to 17:15	26	0	**26**	23	0	**23**	58	0	**58**	0	0	**0**	54	1	**55**	285	5	**290**	48	1	**49**	0	0	**0**
17:15 to 17:30	36	0	**36**	19	0	**19**	67	2	**69**	0	0	**0**	46	2	**48**	295	3	**298**	49	3	**52**	0	0	**0**
17:30 to 17:45	28	0	**28**	26	0	**26**	61	0	**61**	0	0	**0**	57	2	**59**	278	3	**281**	41	2	**43**	0	0	**0**
17:45 to 18:00	18	0	**18**	24	0	**24**	52	1	**53**	0	0	**0**	42	3	**45**	311	2	**313**	45	5	**50**	0	0	**0**
PM Totals	**192**	**1**	**193**	**148**	**0**	**148**	**401**	**8**	**409**	**0**	**0**	**0**	**353**	**15**	**368**	**2,339**	**49**	**2,388**	**322**	**22**	**344**	**0**	**0**	**0**

Approach	**Edward Bennett Dr**												**Castle Hill Rd**											
Direction	**Direction 7 (Left Turn)**			**Direction 8 (Through)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Direction 10 (Left Turn)**			**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 7:15	22	5	**27**	7	0	**7**	4	1	**5**	0	0	**0**	4	2	**6**	251	9	**260**	12	1	**13**	0	0	**0**
7:15 to 7:30	36	2	**38**	8	0	**8**	5	0	**5**	0	0	**0**	3	1	**4**	311	8	**319**	14	0	**14**	0	0	**0**
7:30 to 7:45	25	4	**29**	7	0	**7**	14	0	**14**	0	0	**0**	6	3	**9**	256	12	**268**	16	2	**18**	0	0	**0**
7:45 to 8:00	33	5	**38**	7	0	**7**	4	0	**4**	0	0	**0**	6	0	**6**	200	5	**205**	18	2	**20**	0	0	**0**
8:00 to 8:15	19	3	**22**	12	0	**12**	5	0	**5**	0	0	**0**	9	0	**9**	204	10	**214**	30	0	**30**	0	0	**0**
8:15 to 8:30	27	3	**30**	15	0	**15**	10	0	**10**	0	0	**0**	6	0	**6**	206	8	**214**	16	1	**17**	0	0	**0**
8:30 to 8:45	28	2	**30**	5	0	**5**	16	0	**16**	0	0	**0**	5	0	**5**	210	3	**213**	31	0	**31**	0	0	**0**
8:45 to 9:00	30	1	**31**	13	0	**13**	7	1	**8**	0	0	**0**	6	2	**8**	213	12	**225**	40	0	**40**	1	0	**1**
AM Totals	**220**	**25**	**245**	**74**	**0**	**74**	**65**	**2**	**67**	**0**	**0**	**0**	**45**	**8**	**53**	**1,851**	**67**	**1,918**	**177**	**6**	**183**	**1**	**0**	**1**
16:00 to 16:15	18	2	**20**	9	1	**10**	4	1	**5**	0	0	**0**	6	1	**7**	143	22	**165**	8	0	**8**	0	0	**0**
16:15 to 16:30	13	2	**15**	2	1	**3**	4	1	**5**	0	0	**0**	13	1	**14**	191	10	**201**	10	1	**11**	0	0	**0**
16:30 to 16:45	11	0	**11**	9	0	**9**	19	1	**20**	0	0	**0**	13	2	**15**	192	8	**200**	14	0	**14**	0	0	**0**
16:45 to 17:00	13	1	**14**	5	0	**5**	11	0	**11**	0	0	**0**	13	2	**15**	186	8	**194**	10	1	**11**	1	0	**1**
17:00 to 17:15	9	2	**11**	7	0	**7**	5	0	**5**	0	0	**0**	12	1	**13**	161	5	**166**	7	0	**7**	0	0	**0**
17:15 to 17:30	5	1	**6**	5	0	**5**	5	0	**5**	0	0	**0**	12	0	**12**	186	5	**191**	21	0	**21**	0	0	**0**
17:30 to 17:45	11	0	**11**	2	0	**2**	4	0	**4**	0	0	**0**	4	0	**4**	146	3	**149**	9	0	**9**	0	0	**0**
17:45 to 18:00	14	1	**15**	7	0	**7**	5	0	**5**	0	0	**0**	11	0	**11**	179	0	**179**	9	0	**9**	0	0	**0**
PM Totals	**94**	**9**	**103**	**46**	**2**	**48**	**57**	**3**	**60**	**0**	**0**	**0**	**84**	**7**	**91**	**1,384**	**61**	**1,445**	**88**	**2**	**90**	**1**	**0**	**1**

Job No. : N4220
Client : GTA
Suburb : West Pennant Hills
Location : 3. Coonara Ave / Castle Hill Rd / Edward Bennett Dr

Day/Date : Tue, 5th June 2018
Weather : Fine
Description : Classified Intersection Count
: Hourly Summary

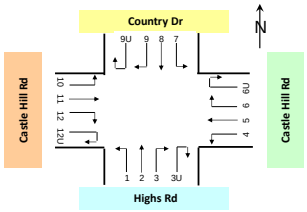


Approach	Coonara Ave												Castle Hill Rd											
Direction	Direction 1 (Left Turn)			Direction 2 (Through)			Direction 3 (Right Turn)			Direction 3U (U Turn)			Direction 4 (Left Turn)			Direction 5 (Through)			Direction 6 (Right Turn)			Direction 6U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 8:00	16	1	**17**	19	1	**20**	112	10	**122**	0	0	**0**	158	6	**164**	575	65	**640**	21	3	**24**	0	0	**0**
7:15 to 8:15	24	2	**26**	39	2	**41**	111	9	**120**	0	0	**0**	156	8	**164**	600	74	**674**	33	5	**38**	0	0	**0**
7:30 to 8:30	30	2	**32**	53	2	**55**	103	7	**110**	0	0	**0**	167	6	**173**	666	77	**743**	47	7	**54**	0	0	**0**
7:45 to 8:45	35	3	**38**	55	2	**57**	112	5	**117**	0	0	**0**	187	7	**194**	691	70	**761**	65	7	**72**	0	0	**0**
8:00 to 9:00	36	5	**41**	59	2	**61**	128	4	**132**	0	0	**0**	219	6	**225**	704	59	**763**	69	7	**76**	0	0	**0**
AM Totals	**52**	**6**	**58**	**78**	**3**	**81**	**240**	**14**	**254**	**0**	**0**	**0**	**377**	**12**	**389**	**1,279**	**124**	**1,403**	**90**	**10**	**100**	**0**	**0**	**0**
16:00 to 17:00	84	1	**85**	56	0	**56**	163	5	**168**	0	0	**0**	154	7	**161**	1,170	36	**1,206**	139	11	**150**	0	0	**0**
16:15 to 17:15	93	1	**94**	63	0	**63**	180	5	**185**	0	0	**0**	159	5	**164**	1,210	29	**1,239**	160	9	**169**	0	0	**0**
16:30 to 17:30	107	0	**107**	70	0	**70**	195	5	**200**	0	0	**0**	178	5	**183**	1,185	22	**1,207**	171	8	**179**	0	0	**0**
16:45 to 17:45	117	0	**117**	83	0	**83**	211	4	**215**	0	0	**0**	192	6	**198**	1,167	19	**1,186**	180	8	**188**	0	0	**0**
17:00 to 18:00	108	0	**108**	92	0	**92**	238	3	**241**	0	0	**0**	199	8	**207**	1,169	13	**1,182**	183	11	**194**	0	0	**0**
PM Totals	**192**	**1**	**193**	**148**	**0**	**148**	**401**	**8**	**409**	**0**	**0**	**0**	**353**	**15**	**368**	**2,339**	**49**	**2,388**	**322**	**22**	**344**	**0**	**0**	**0**

Approach	Edward Bennett Dr												Castle Hill Rd											
Direction	Direction 7 (Left Turn)			Direction 8 (Through)			Direction 9 (Right Turn)			Direction 9U (U Turn)			Direction 10 (Left Turn)			Direction 11 (Through)			Direction 12 (Right Turn)			Direction 12U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 8:00	116	16	**132**	29	0	**29**	27	1	**28**	0	0	**0**	19	6	**25**	1,018	34	**1,052**	60	5	**65**	0	0	**0**
7:15 to 8:15	113	14	**127**	34	0	**34**	28	0	**28**	0	0	**0**	24	4	**28**	971	35	**1,006**	78	4	**82**	0	0	**0**
7:30 to 8:30	104	15	**119**	41	0	**41**	33	0	**33**	0	0	**0**	27	3	**30**	866	35	**901**	80	5	**85**	0	0	**0**
7:45 to 8:45	107	13	**120**	39	0	**39**	35	0	**35**	0	0	**0**	26	0	**26**	820	26	**846**	95	3	**98**	0	0	**0**
8:00 to 9:00	104	9	**113**	45	0	**45**	38	1	**39**	0	0	**0**	26	2	**28**	833	33	**866**	117	1	**118**	1	0	**1**
AM Totals	**220**	**25**	**245**	**74**	**0**	**74**	**65**	**2**	**67**	**0**	**0**	**0**	**45**	**8**	**53**	**1,851**	**67**	**1,918**	**177**	**6**	**183**	**1**	**0**	**1**
16:00 to 17:00	55	5	**60**	25	2	**27**	38	3	**41**	0	0	**0**	45	6	**51**	712	48	**760**	42	2	**44**	1	0	**1**
16:15 to 17:15	46	5	**51**	23	1	**24**	39	2	**41**	0	0	**0**	51	6	**57**	730	31	**761**	41	2	**43**	1	0	**1**
16:30 to 17:30	38	4	**42**	26	0	**26**	40	1	**41**	0	0	**0**	50	5	**55**	725	26	**751**	52	1	**53**	1	0	**1**
16:45 to 17:45	38	4	**42**	19	0	**19**	25	0	**25**	0	0	**0**	41	3	**44**	679	21	**700**	47	1	**48**	1	0	**1**
17:00 to 18:00	39	4	**43**	21	0	**21**	19	0	**19**	0	0	**0**	39	1	**40**	672	13	**685**	46	0	**46**	0	0	**0**
PM Totals	**94**	**9**	**103**	**46**	**2**	**48**	**57**	**3**	**60**	**0**	**0**	**0**	**84**	**7**	**91**	**1,384**	**61**	**1,445**	**88**	**2**	**90**	**1**	**0**	**1**

Job No.	: N4220
Client	: GTA
Suburb	: West Pennant Hills
Location	: 4. Highs Rd / Castle Hill Rd / Country Dr
Day/Date	: Tue, 5th June 2018
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data

	Class 1	Class 2
Classifications	Lights	Heavies



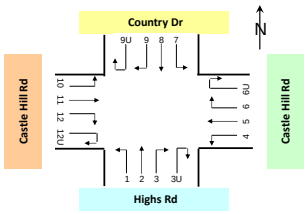
Approach	Highs Rd												Castle Hill Rd											
Direction	**Direction 1 (Left Turn)**			**Direction 2 (Through)**			**Direction 3 (Right Turn)**			**Direction 3U (U Turn)**			**Direction 4 (Left Turn)**			**Direction 5 (Through)**			**Direction 6 (Right Turn)**			**Direction 6U (U Turn)**		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 7:15	42	1	**43**	18	0	**18**	0	0	**0**	0	0	**0**	1	2	**3**	127	10	**137**	11	4	**15**	0	0	**0**
7:15 to 7:30	56	2	**58**	5	2	**7**	2	1	**3**	0	0	**0**	1	0	**1**	140	11	**151**	26	1	**27**	0	0	**0**
7:30 to 7:45	59	3	**62**	14	0	**14**	2	0	**2**	0	0	**0**	3	0	**3**	167	13	**180**	9	7	**16**	0	0	**0**
7:45 to 8:00	71	2	**73**	15	2	**17**	3	0	**3**	0	0	**0**	0	3	**3**	184	12	**196**	18	4	**22**	0	0	**0**
8:00 to 8:15	94	3	**97**	27	0	**27**	2	0	**2**	0	0	**0**	0	1	**1**	172	17	**189**	24	3	**27**	0	0	**0**
8:15 to 8:30	108	3	**111**	29	0	**29**	1	0	**1**	0	0	**0**	0	0	**0**	217	13	**230**	31	8	**39**	0	0	**0**
8:30 to 8:45	83	2	**85**	33	0	**33**	2	0	**2**	0	0	**0**	1	1	**2**	197	9	**206**	8	0	**8**	0	0	**0**
8:45 to 9:00	70	3	**73**	20	1	**21**	1	0	**1**	0	0	**0**	3	0	**3**	189	12	**201**	15	2	**17**	0	0	**0**
AM Totals	**583**	**19**	**602**	**161**	**5**	**166**	**13**	**1**	**14**	**0**	**0**	**0**	**9**	**7**	**16**	**1,393**	**97**	**1,490**	**142**	**29**	**171**	**0**	**0**	**0**
16:00 to 16:15	87	2	**89**	24	0	**24**	1	0	**1**	0	0	**0**	1	0	**1**	243	12	**255**	21	1	**22**	0	0	**0**
16:15 to 16:30	84	2	**86**	33	4	**37**	1	0	**1**	0	0	**0**	3	0	**3**	334	8	**342**	20	3	**23**	0	0	**0**
16:30 to 16:45	79	2	**81**	32	0	**32**	4	0	**4**	0	0	**0**	4	0	**4**	356	5	**361**	17	4	**21**	0	0	**0**
16:45 to 17:00	89	5	**94**	40	1	**41**	0	0	**0**	0	0	**0**	0	0	**0**	331	11	**342**	24	0	**24**	0	0	**0**
17:00 to 17:15	95	1	**96**	47	0	**47**	2	0	**2**	0	0	**0**	2	0	**2**	284	3	**287**	25	0	**25**	0	0	**0**
17:15 to 17:30	102	3	**105**	26	0	**26**	0	0	**0**	0	0	**0**	3	0	**3**	307	2	**309**	30	1	**31**	0	0	**0**
17:30 to 17:45	73	2	**75**	27	0	**27**	0	0	**0**	0	0	**0**	3	0	**3**	350	1	**351**	16	2	**18**	0	0	**0**
17:45 to 18:00	116	3	**119**	43	2	**45**	2	0	**2**	0	0	**0**	5	0	**5**	311	2	**313**	22	0	**22**	0	0	**0**
PM Totals	**725**	**20**	**745**	**272**	**7**	**279**	**10**	**0**	**10**	**0**	**0**	**0**	**21**	**0**	**21**	**2,516**	**44**	**2,560**	**175**	**11**	**186**	**0**	**0**	**0**

Approach	Country Dr												Castle Hill Rd											
Direction	**Direction 7 (Left Turn)**			**Direction 8 (Through)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Direction 10 (Left Turn)**			**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 7:15	18	0	**18**	62	1	**63**	86	4	**90**	0	0	**0**	90	6	**96**	244	14	**258**	64	7	**71**	0	0	**0**
7:15 to 7:30	14	0	**14**	63	6	**69**	140	4	**144**	0	0	**0**	152	7	**159**	279	9	**288**	60	6	**66**	0	0	**0**
7:30 to 7:45	12	2	**14**	34	1	**35**	133	4	**137**	0	0	**0**	109	7	**116**	255	9	**264**	40	9	**49**	0	0	**0**
7:45 to 8:00	19	2	**21**	42	2	**44**	200	4	**204**	0	0	**0**	170	6	**176**	180	7	**187**	33	2	**35**	0	0	**0**
8:00 to 8:15	19	1	**20**	22	1	**23**	185	3	**188**	0	0	**0**	154	3	**157**	204	9	**213**	37	4	**41**	0	0	**0**
8:15 to 8:30	18	1	**19**	41	0	**41**	186	8	**194**	0	0	**0**	166	2	**168**	180	5	**185**	51	2	**53**	0	0	**0**
8:30 to 8:45	23	3	**26**	47	2	**49**	242	7	**249**	0	0	**0**	121	4	**125**	177	9	**186**	49	0	**49**	0	0	**0**
8:45 to 9:00	25	2	**27**	40	0	**40**	179	6	**185**	0	0	**0**	112	5	**117**	218	7	**225**	41	5	**46**	0	0	**0**
AM Totals	**148**	**11**	**159**	**351**	**13**	**364**	**1,351**	**40**	**1,391**	**0**	**0**	**0**	**1,074**	**40**	**1,114**	**1,737**	**69**	**1,806**	**375**	**35**	**410**	**0**	**0**	**0**
16:00 to 16:15	14	2	**16**	33	0	**33**	173	4	**177**	0	0	**0**	146	3	**149**	175	16	**191**	73	1	**74**	0	0	**0**
16:15 to 16:30	15	0	**15**	35	2	**37**	150	4	**154**	0	0	**0**	138	4	**142**	186	6	**192**	50	1	**51**	0	0	**0**
16:30 to 16:45	9	1	**10**	17	0	**17**	121	0	**121**	0	0	**0**	158	3	**161**	189	8	**197**	65	1	**66**	0	0	**0**
16:45 to 17:00	12	1	**13**	19	0	**19**	131	2	**133**	0	0	**0**	151	2	**153**	177	6	**183**	61	1	**62**	0	0	**0**
17:00 to 17:15	12	1	**13**	36	0	**36**	139	4	**143**	0	0	**0**	177	1	**178**	171	4	**175**	51	0	**51**	0	0	**0**
17:15 to 17:30	12	1	**13**	27	0	**27**	114	1	**115**	0	0	**0**	145	3	**148**	174	3	**177**	88	2	**90**	0	0	**0**
17:30 to 17:45	10	0	**10**	30	0	**30**	160	2	**162**	0	0	**0**	142	4	**146**	163	1	**164**	62	1	**63**	0	0	**0**
17:45 to 18:00	2	0	**2**	26	0	**26**	131	1	**132**	0	0	**0**	164	3	**167**	160	3	**163**	60	1	**61**	0	0	**0**
PM Totals	**86**	**6**	**92**	**223**	**2**	**225**	**1,119**	**18**	**1,137**	**0**	**0**	**0**	**1,221**	**23**	**1,244**	**1,395**	**47**	**1,442**	**510**	**8**	**518**	**0**	**0**	**0**

Job No. : N4220
Client : GTA
Suburb : West Pennant Hills
Location : 4. Highs Rd / Castle Hill Rd / Country Dr

Day/Date : Tue, 5th June 2018
Weather : Fine
Description : Classified Intersection Count
: Hourly Summary

MATRIX Traffic and Transport Data



Approach	Highs Rd												Castle Hill Rd											
Direction	Direction 1 (Left Turn)			Direction 2 (Through)			Direction 3 (Right Turn)			Direction 3U (U Turn)			Direction 4 (Left Turn)			Direction 5 (Through)			Direction 6 (Right Turn)			Direction 6U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 8:00	228	8	**236**	52	4	**56**	7	1	**8**	0	0	**0**	5	5	**10**	618	46	**664**	64	16	**80**	0	0	**0**
7:15 to 8:15	280	10	**290**	61	4	**65**	9	1	**10**	0	0	**0**	4	4	**8**	663	53	**716**	77	15	**92**	0	0	**0**
7:30 to 8:30	332	11	**343**	85	2	**87**	8	0	**8**	0	0	**0**	3	4	**7**	740	55	**795**	82	22	**104**	0	0	**0**
7:45 to 8:45	356	10	**366**	104	2	**106**	8	0	**8**	0	0	**0**	1	5	**6**	770	51	**821**	81	15	**96**	0	0	**0**
8:00 to 9:00	355	11	**366**	109	1	**110**	6	0	**6**	0	0	**0**	4	2	**6**	775	51	**826**	78	13	**91**	0	0	**0**
AM Totals	**583**	**19**	**602**	**161**	**5**	**166**	**13**	**1**	**14**	**0**	**0**	**0**	**9**	**7**	**16**	**1,393**	**97**	**1,490**	**142**	**29**	**171**	**0**	**0**	**0**
16:00 to 17:00	339	11	**350**	129	5	**134**	6	0	**6**	0	0	**0**	8	0	**8**	1,264	36	**1,300**	82	8	**90**	0	0	**0**
16:15 to 17:15	347	10	**357**	152	5	**157**	7	0	**7**	0	0	**0**	9	0	**9**	1,305	27	**1,332**	86	7	**93**	0	0	**0**
16:30 to 17:30	365	11	**376**	145	1	**146**	6	0	**6**	0	0	**0**	9	0	**9**	1,278	21	**1,299**	96	5	**101**	0	0	**0**
16:45 to 17:45	359	11	**370**	140	1	**141**	2	0	**2**	0	0	**0**	8	0	**8**	1,272	17	**1,289**	95	3	**98**	0	0	**0**
17:00 to 18:00	386	9	**395**	143	2	**145**	4	0	**4**	0	0	**0**	13	0	**13**	1,252	8	**1,260**	93	3	**96**	0	0	**0**
PM Totals	**725**	**20**	**745**	**272**	**7**	**279**	**10**	**0**	**10**	**0**	**0**	**0**	**21**	**0**	**21**	**2,516**	**44**	**2,560**	**175**	**11**	**186**	**0**	**0**	**0**

Approach	Country Dr												Castle Hill Rd											
Direction	Direction 7 (Left Turn)			Direction 8 (Through)			Direction 9 (Right Turn)			Direction 9U (U Turn)			Direction 10 (Left Turn)			Direction 11 (Through)			Direction 12 (Right Turn)			Direction 12U (U Turn)		
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total
7:00 to 8:00	63	4	**67**	201	10	**211**	559	16	**575**	0	0	**0**	521	26	**547**	958	39	**997**	197	24	**221**	0	0	**0**
7:15 to 8:15	64	5	**69**	161	10	**171**	658	15	**673**	0	0	**0**	585	23	**608**	918	34	**952**	170	21	**191**	0	0	**0**
7:30 to 8:30	68	6	**74**	139	4	**143**	704	19	**723**	0	0	**0**	599	18	**617**	819	30	**849**	161	17	**178**	0	0	**0**
7:45 to 8:45	79	7	**86**	152	5	**157**	813	22	**835**	0	0	**0**	611	15	**626**	741	30	**771**	170	8	**178**	0	0	**0**
8:00 to 9:00	85	7	**92**	150	3	**153**	792	24	**816**	0	0	**0**	553	14	**567**	779	30	**809**	178	11	**189**	0	0	**0**
AM Totals	**148**	**11**	**159**	**351**	**13**	**364**	**1,351**	**40**	**1,391**	**0**	**0**	**0**	**1,074**	**40**	**1,114**	**1,737**	**69**	**1,806**	**375**	**35**	**410**	**0**	**0**	**0**
16:00 to 17:00	50	4	**54**	104	2	**106**	575	10	**585**	0	0	**0**	593	12	**605**	727	36	**763**	249	4	**253**	0	0	**0**
16:15 to 17:15	48	3	**51**	107	2	**109**	541	10	**551**	0	0	**0**	624	10	**634**	723	24	**747**	227	3	**230**	0	0	**0**
16:30 to 17:30	45	4	**49**	99	0	**99**	505	7	**512**	0	0	**0**	631	9	**640**	711	21	**732**	265	4	**269**	0	0	**0**
16:45 to 17:45	46	3	**49**	112	0	**112**	544	9	**553**	0	0	**0**	615	10	**625**	685	14	**699**	262	4	**266**	0	0	**0**
17:00 to 18:00	36	2	**38**	119	0	**119**	544	8	**552**	0	0	**0**	628	11	**639**	668	11	**679**	261	4	**265**	0	0	**0**
PM Totals	**86**	**6**	**92**	**223**	**2**	**225**	**1,119**	**18**	**1,137**	**0**	**0**	**0**	**1,221**	**23**	**1,244**	**1,395**	**47**	**1,442**	**510**	**8**	**518**	**0**	**0**	**0**

Appendix B

SIDRA INTERSECTION Results

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - AM - Scenario 1]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	378	1.9	0.315	3.7	LOS A	2.7	19.0	0.23	0.53	45.0
3	R2	327	1.9	0.315	7.1	LOS A	2.7	19.0	0.23	0.53	45.8
Approach		705	1.9	0.315	5.3	LOS A	2.7	19.0	0.23	0.53	45.4
East: Aiken Road - E											
4	L2	113	4.7	0.325	7.3	LOS A	1.7	12.3	0.73	0.77	44.1
5	T1	68	6.2	0.325	7.3	LOS A	1.7	12.3	0.73	0.77	45.7
Approach		181	5.2	0.325	7.3	LOS A	1.7	12.3	0.73	0.77	44.8
West: Aiken Road - W											
11	T1	121	12.2	1.043	79.2	LOS F	46.4	332.7	1.00	2.69	23.3
12	R2	576	0.9	1.043	86.5	LOS F	46.4	332.7	1.00	2.69	21.2
Approach		697	2.9	1.043	85.2	LOS F	46.4	332.7	1.00	2.69	21.6
All Vehicles		1583	2.7	1.043	40.7	LOS C	46.4	332.7	0.63	1.51	30.3

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - AM - Scenario 2_mitigation]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	414	1.8	0.330	3.7	LOS A	2.8	20.2	0.23	0.53	45.1
3	R2	327	1.9	0.330	7.1	LOS A	2.8	20.2	0.23	0.53	45.8
Approach		741	1.8	0.330	5.2	LOS A	2.8	20.2	0.23	0.53	45.4
East: Aiken Road - E											
4	L2	113	4.7	0.351	7.8	LOS A	1.5	11.2	0.71	0.83	43.8
5	T1	68	6.2	0.351	7.9	LOS A	1.5	11.2	0.71	0.83	45.4
Approach		181	5.2	0.351	7.9	LOS A	1.5	11.2	0.71	0.83	44.4
West: Aiken Road - W											
11	T1	121	12.2	0.373	5.7	LOS A	1.6	12.0	0.57	0.73	45.2
12	R2	721	0.7	0.851	17.3	LOS B	8.9	62.7	0.76	1.14	39.5
Approach		842	2.4	0.851	15.7	LOS B	8.9	62.7	0.74	1.08	40.3
All Vehicles		1764	2.4	0.851	10.5	LOS A	8.9	62.7	0.52	0.82	42.7

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - AM - Scenario 2]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	414	1.8	0.331	3.7	LOS A	2.9	20.4	0.24	0.53	45.1
3	R2	327	1.9	0.331	7.1	LOS A	2.9	20.4	0.24	0.53	45.8
Approach		741	1.8	0.331	5.2	LOS A	2.9	20.4	0.24	0.53	45.4
East: Aiken Road - E											
4	L2	113	4.7	0.329	7.3	LOS A	1.7	12.4	0.73	0.77	44.1
5	T1	68	6.2	0.329	7.4	LOS A	1.7	12.4	0.73	0.77	45.7
Approach		181	5.2	0.329	7.4	LOS A	1.7	12.4	0.73	0.77	44.7
West: Aiken Road - W											
11	T1	121	12.2	1.287	276.9	LOS F	137.0	978.8	1.00	6.06	10.4
12	R2	721	0.7	1.287	283.6	LOS F	137.0	978.8	1.00	6.06	9.0
Approach		842	2.4	1.287	282.7	LOS F	137.0	978.8	1.00	6.06	9.2
All Vehicles		1764	2.4	1.287	137.9	LOS F	137.0	978.8	0.65	3.19	15.7

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - AM - Scenario 3]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	396	1.9	0.323	3.7	LOS A	2.8	19.7	0.23	0.53	45.1
3	R2	327	1.9	0.323	7.1	LOS A	2.8	19.7	0.23	0.53	45.8
Approach		723	1.9	0.323	5.3	LOS A	2.8	19.7	0.23	0.53	45.4
East: Aiken Road - E											
4	L2	113	4.7	0.328	7.3	LOS A	1.7	12.4	0.73	0.77	44.1
5	T1	68	6.2	0.328	7.4	LOS A	1.7	12.4	0.73	0.77	45.7
Approach		181	5.2	0.328	7.3	LOS A	1.7	12.4	0.73	0.77	44.8
West: Aiken Road - W											
11	T1	121	12.2	1.166	172.8	LOS F	89.8	642.7	1.00	4.45	14.6
12	R2	649	0.8	1.166	179.8	LOS F	89.8	642.7	1.00	4.45	12.9
Approach		771	2.6	1.166	178.7	LOS F	89.8	642.7	1.00	4.45	13.2
All Vehicles		1675	2.6	1.166	85.3	LOS F	89.8	642.7	0.64	2.36	21.2

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - AM]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	365	2.0	0.309	3.7	LOS A	2.6	18.3	0.23	0.53	45.0
3	R2	327	1.9	0.309	7.1	LOS A	2.6	18.3	0.23	0.53	45.8
Approach		693	2.0	0.309	5.3	LOS A	2.6	18.3	0.23	0.53	45.4
East: Aiken Road - E											
4	L2	113	4.7	0.309	7.0	LOS A	1.6	11.4	0.70	0.75	44.2
5	T1	68	6.2	0.309	7.1	LOS A	1.6	11.4	0.70	0.75	45.9
Approach		181	5.2	0.309	7.0	LOS A	1.6	11.4	0.70	0.75	44.9
West: Aiken Road - W											
11	T1	121	12.2	0.962	37.9	LOS C	23.7	170.2	0.94	1.77	31.8
12	R2	527	1.0	0.962	44.1	LOS D	23.7	170.2	0.94	1.77	29.7
Approach		648	3.1	0.962	42.9	LOS D	23.7	170.2	0.94	1.77	30.2
All Vehicles		1522	2.8	0.962	21.5	LOS B	23.7	170.2	0.59	1.09	37.2

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - PM - Scenario 1]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	701	0.5	0.728	4.7	LOS A	8.1	57.0	0.68	0.62	44.2
3	R2	429	0.5	0.728	8.5	LOS A	8.1	57.0	0.68	0.62	44.9
Approach		1131	0.5	0.728	6.2	LOS A	8.1	57.0	0.68	0.62	44.5
East: Aiken Road - E											
4	L2	243	0.0	0.535	7.4	LOS A	4.3	30.5	0.74	0.78	44.1
5	T1	220	1.9	0.535	7.5	LOS A	4.3	30.5	0.74	0.78	45.7
Approach		463	0.9	0.535	7.5	LOS A	4.3	30.5	0.74	0.78	44.9
West: Aiken Road - W											
11	T1	25	4.2	0.487	7.0	LOS A	3.7	26.4	0.75	0.81	44.3
12	R2	408	0.8	0.487	10.3	LOS A	3.7	26.4	0.75	0.81	43.2
Approach		434	1.0	0.487	10.1	LOS A	3.7	26.4	0.75	0.81	43.3
All Vehicles		2027	0.7	0.728	7.3	LOS A	8.1	57.0	0.71	0.70	44.3

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - PM - Scenario 2]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	851	0.4	0.819	5.7	LOS A	12.8	89.8	0.79	0.66	44.1
3	R2	429	0.5	0.819	9.5	LOS A	12.8	89.8	0.79	0.66	44.8
Approach		1280	0.4	0.819	7.0	LOS A	12.8	89.8	0.79	0.66	44.3
East: Aiken Road - E											
4	L2	243	0.0	0.558	8.2	LOS A	4.8	33.6	0.78	0.84	43.6
5	T1	220	1.9	0.558	8.3	LOS A	4.8	33.6	0.78	0.84	45.2
Approach		463	0.9	0.558	8.2	LOS A	4.8	33.6	0.78	0.84	44.4
West: Aiken Road - W											
11	T1	25	4.2	0.536	7.6	LOS A	4.6	32.4	0.79	0.85	44.0
12	R2	446	0.7	0.536	10.8	LOS A	4.6	32.4	0.79	0.85	42.9
Approach		472	0.9	0.536	10.7	LOS A	4.6	32.4	0.79	0.85	43.0
All Vehicles		2215	0.6	0.819	8.0	LOS A	12.8	89.8	0.79	0.74	44.0

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - PM - Scenario 3]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	776	0.4	0.774	5.2	LOS A	10.1	71.1	0.73	0.64	44.1
3	R2	429	0.5	0.774	8.9	LOS A	10.1	71.1	0.73	0.64	44.9
Approach		1205	0.4	0.774	6.5	LOS A	10.1	71.1	0.73	0.64	44.4
East: Aiken Road - E											
4	L2	243	0.0	0.547	7.8	LOS A	4.5	32.0	0.76	0.81	43.8
5	T1	220	1.9	0.547	7.9	LOS A	4.5	32.0	0.76	0.81	45.5
Approach		463	0.9	0.547	7.8	LOS A	4.5	32.0	0.76	0.81	44.7
West: Aiken Road - W											
11	T1	25	4.2	0.512	7.3	LOS A	4.1	29.3	0.77	0.83	44.1
12	R2	427	0.7	0.512	10.5	LOS A	4.1	29.3	0.77	0.83	43.1
Approach		453	0.9	0.512	10.4	LOS A	4.1	29.3	0.77	0.83	43.1
All Vehicles		2121	0.6	0.774	7.6	LOS A	10.1	71.1	0.75	0.72	44.2

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

MOVEMENT SUMMARY

Site: 104 [4. Aiken Road/ Oakes Road - PM]

Aiken Road/ Oakes Road existing intersection
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oakes Road - S											
1	L2	652	0.5	0.698	4.7	LOS A	7.4	52.0	0.65	0.62	44.2
3	R2	429	0.5	0.698	8.4	LOS A	7.4	52.0	0.65	0.62	45.0
Approach		1081	0.5	0.698	6.1	LOS A	7.4	52.0	0.65	0.62	44.5
East: Aiken Road - E											
4	L2	243	0.0	0.527	7.2	LOS A	4.2	29.5	0.73	0.77	44.2
5	T1	220	1.9	0.527	7.3	LOS A	4.2	29.5	0.73	0.77	45.8
Approach		463	0.9	0.527	7.2	LOS A	4.2	29.5	0.73	0.77	45.0
West: Aiken Road - W											
11	T1	25	4.2	0.472	6.9	LOS A	3.5	24.7	0.74	0.80	44.4
12	R2	396	0.8	0.472	10.1	LOS A	3.5	24.7	0.74	0.80	43.3
Approach		421	1.0	0.472	9.9	LOS A	3.5	24.7	0.74	0.80	43.4
All Vehicles		1965	0.7	0.698	7.2	LOS A	7.4	52.0	0.69	0.69	44.4

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

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM - Scenario 1]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	43	12.2	0.804	47.2	LOS D	10.4	74.8	1.00	0.96	31.7
11	T1	64	3.3	0.804	42.6	LOS D	10.4	74.8	1.00	0.96	30.7
12	R2	367	1.1	0.804	47.0	LOS D	10.9	77.0	1.00	0.95	31.7
Approach		475	2.4	0.804	46.4	LOS D	10.9	77.0	1.00	0.95	31.6
East: Castle Hill Road - E											
1	L2	294	2.2	0.938	56.3	LOS D	32.1	234.3	1.00	1.20	30.1
2	T1	803	7.7	0.938	51.8	LOS D	32.1	234.3	0.98	1.19	32.1
3	R2	80	9.2	0.340	25.3	LOS B	2.0	15.1	0.92	0.75	39.3
Approach		1177	6.4	0.938	51.2	LOS D	32.1	234.3	0.98	1.16	32.0
North: Edward Bennett Drive - N											
4	L2	119	8.0	0.303	21.0	LOS B	2.6	19.4	0.87	0.76	40.5
5	T1	47	0.0	0.306	35.6	LOS C	3.4	23.8	0.93	0.74	33.0
6	R2	41	2.6	0.306	40.2	LOS C	3.4	23.8	0.93	0.74	34.3
Approach		207	5.1	0.306	28.1	LOS B	3.4	23.8	0.90	0.75	37.3
West: Castle Hill Road - W											
7	L2	29	7.1	0.804	37.7	LOS C	20.8	150.7	0.98	0.94	36.4
8	T1	912	3.8	0.804	31.8	LOS C	20.8	150.7	0.95	0.92	39.3
9	R2	124	0.8	0.559	27.7	LOS B	3.2	22.5	0.99	0.77	38.3
Approach		1065	3.6	0.804	31.5	LOS C	20.8	150.7	0.96	0.91	39.1
All Vehicles		2924	4.6	0.938	41.6	LOS C	32.1	234.3	0.97	1.00	34.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	24.1	LOS C	0.1	0.1	0.75	0.75
P1	East Full Crossing	53	36.8	LOS D	0.1	0.1	0.93	0.93
P2	North Full Crossing	53	24.1	LOS C	0.1	0.1	0.75	0.75
All Pedestrians		158	28.4	LOS C			0.81	0.81

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.

Project: C:\Users\mansee.sachdeva\Desktop\180622sid-N148250 55 Coonara Avenue, West Pennant Hills.sip7

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM - Scenario 1]

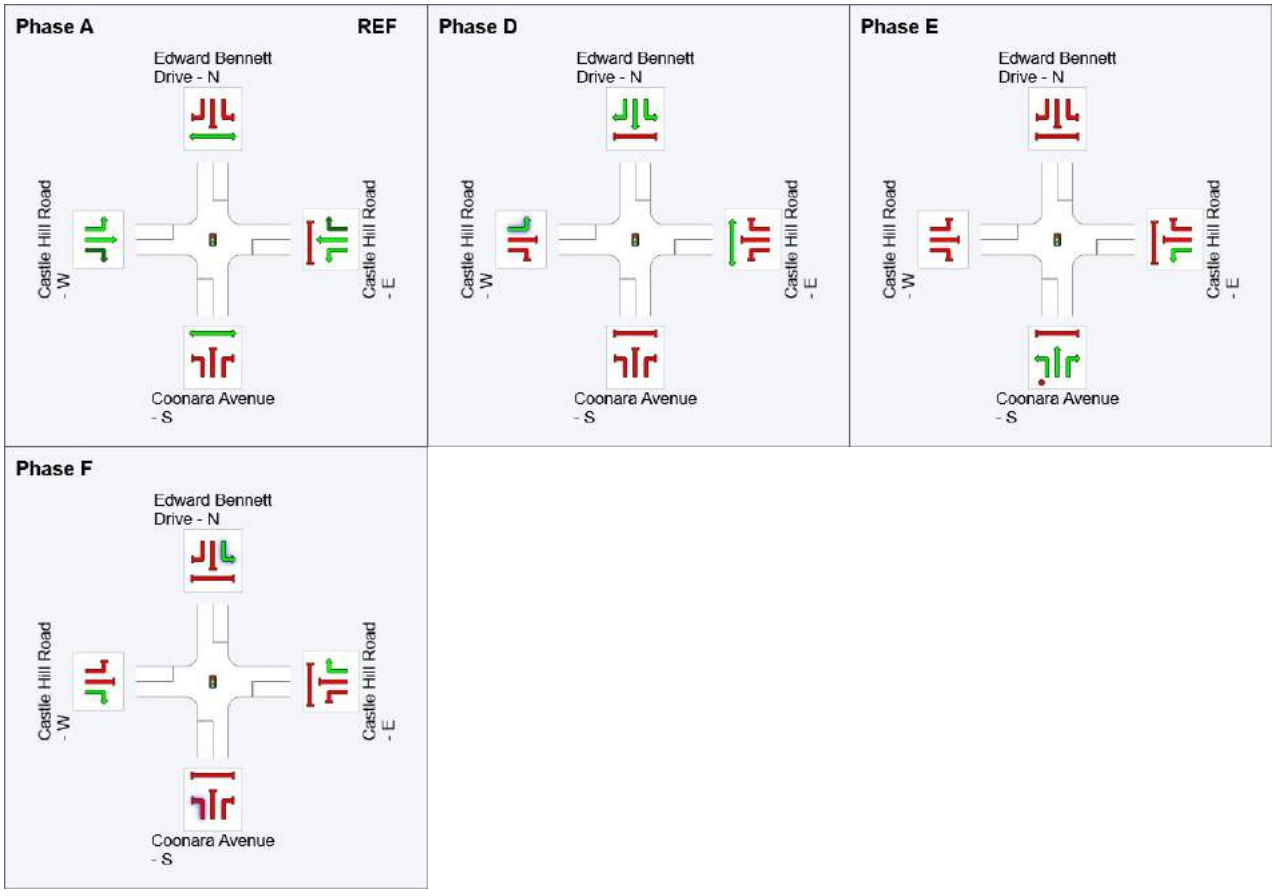
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, D, E, F
(* Variable Phase)

Phase Timing Results

Phase	A	D	E	F
Phase Change Time (sec)	0	34	53	73
Green Time (sec)	28	13	14	6
Phase Time (sec)	34	19	20	12
Phase Split	40%	22%	24%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM - Scenario 2]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	43	12.2	0.851	46.1	LOS D	5.9	43.2	1.00	1.02	32.2
11	T1	64	3.3	0.851	41.6	LOS C	5.9	43.2	1.00	1.02	31.2
12	R2	196	2.2	0.851	45.9	LOS D	6.2	44.0	1.00	1.02	32.0
Approach		303	3.8	0.851	45.0	LOS D	6.2	44.0	1.00	1.02	31.8
East: Castle Hill Road - E											
1	L2	252	2.5	0.924	48.0	LOS D	24.8	181.4	1.00	1.22	32.4
2	T1	803	7.7	0.924	42.8	LOS D	24.8	181.4	0.99	1.20	34.9
3	R2	80	9.2	0.301	21.8	LOS B	1.6	12.1	0.92	0.75	40.8
Approach		1135	6.7	0.924	42.5	LOS D	24.8	181.4	0.99	1.17	34.6
North: Edward Bennett Drive - N											
4	L2	119	8.0	0.279	17.9	LOS B	2.2	16.6	0.85	0.75	42.0
5	T1	47	0.0	0.298	29.3	LOS C	2.8	19.7	0.92	0.74	35.0
6	R2	41	2.6	0.298	33.9	LOS C	2.8	19.7	0.92	0.74	36.5
Approach		207	5.1	0.298	23.7	LOS B	2.8	19.7	0.88	0.74	39.0
West: Castle Hill Road - W											
7	L2	29	7.1	0.837	35.8	LOS C	18.6	134.9	0.99	1.01	37.1
8	T1	912	3.8	0.837	30.2	LOS C	18.6	134.9	0.97	0.99	40.0
9	R2	124	0.8	0.462	22.8	LOS B	2.6	18.0	0.97	0.77	40.4
Approach		1065	3.6	0.837	29.5	LOS C	18.6	134.9	0.97	0.97	40.0
All Vehicles		2711	5.0	0.924	36.2	LOS C	24.8	181.4	0.98	1.04	36.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	21.7	LOS C	0.1	0.1	0.79	0.79
P1	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P2	North Full Crossing	53	21.7	LOS C	0.1	0.1	0.79	0.79
All Pedestrians		158	24.2	LOS C			0.83	0.83

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

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM - Scenario 2]

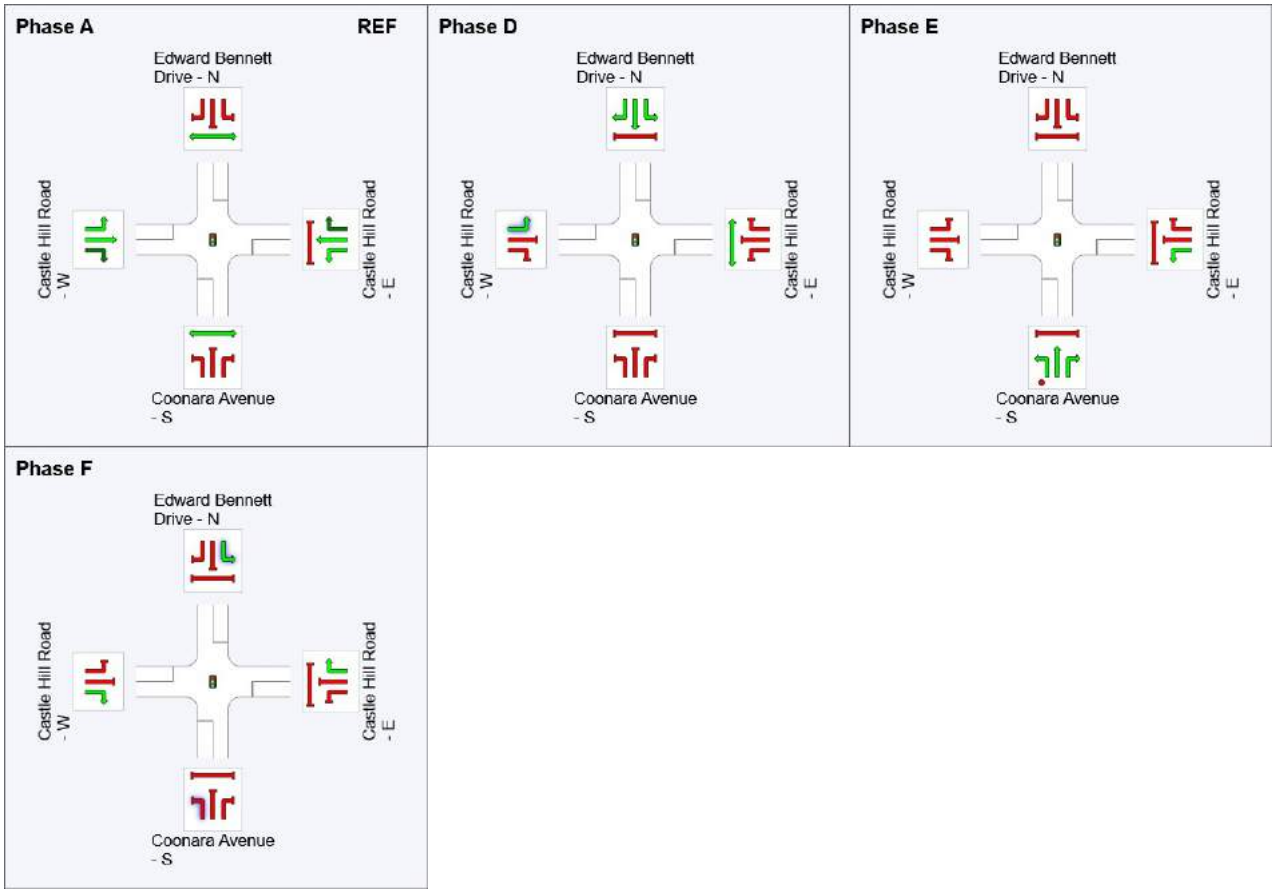
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, D, E, F
(* Variable Phase)

Phase Timing Results

Phase	A	D	E	F
Phase Change Time (sec)	0	28	45	58
Green Time (sec)	22	11	7	6
Phase Time (sec)	28	17	13	12
Phase Split	40%	24%	19%	17%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM - Scenario 3]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 78 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	43	12.2	0.772	44.2	LOS D	7.8	56.4	1.00	0.94	32.6
11	T1	64	3.3	0.772	39.6	LOS C	7.8	56.4	1.00	0.94	31.6
12	R2	282	1.5	0.772	44.0	LOS D	8.2	57.8	1.00	0.92	32.5
Approach		389	3.0	0.772	43.3	LOS D	8.2	57.8	1.00	0.93	32.4
East: Castle Hill Road - E											
1	L2	273	2.3	0.932	52.6	LOS D	28.5	208.4	1.00	1.21	31.1
2	T1	803	7.7	0.932	47.8	LOS D	28.5	208.4	0.99	1.20	33.3
3	R2	80	9.2	0.327	24.0	LOS B	1.8	13.8	0.93	0.75	39.8
Approach		1156	6.6	0.932	47.3	LOS D	28.5	208.4	0.99	1.17	33.1
North: Edward Bennett Drive - N											
4	L2	119	8.0	0.293	19.5	LOS B	2.4	18.0	0.86	0.75	41.2
5	T1	47	0.0	0.304	32.7	LOS C	3.1	21.9	0.93	0.74	33.9
6	R2	41	2.6	0.304	37.3	LOS C	3.1	21.9	0.93	0.74	35.3
Approach		207	5.1	0.304	26.1	LOS B	3.1	21.9	0.89	0.75	38.1
West: Castle Hill Road - W											
7	L2	29	7.1	0.824	37.0	LOS C	20.0	144.8	0.98	0.98	36.7
8	T1	912	3.8	0.824	31.4	LOS C	20.0	144.8	0.96	0.96	39.5
9	R2	124	0.8	0.514	25.5	LOS B	2.9	20.5	0.98	0.77	39.3
Approach		1065	3.6	0.824	30.9	LOS C	20.0	144.8	0.97	0.94	39.4
All Vehicles		2818	4.8	0.932	39.0	LOS C	28.5	208.4	0.97	1.02	35.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	23.1	LOS C	0.1	0.1	0.77	0.77
P1	East Full Crossing	53	33.3	LOS D	0.1	0.1	0.93	0.93
P2	North Full Crossing	53	23.1	LOS C	0.1	0.1	0.77	0.77
All Pedestrians		158	26.5	LOS C			0.82	0.82

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.

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM - Scenario 3]

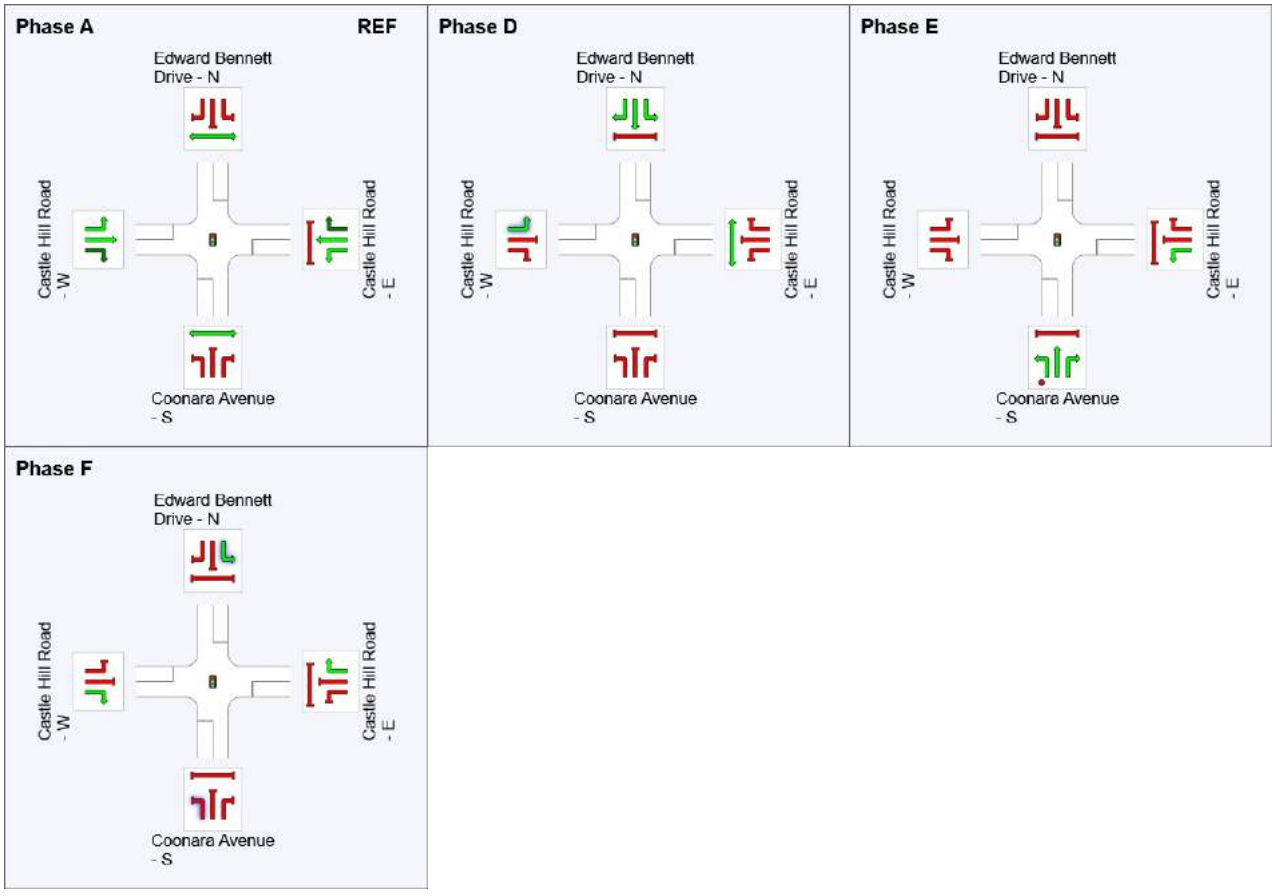
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 78 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, D, E, F
(* Variable Phase)

Phase Timing Results

Phase	A	D	E	F
Phase Change Time (sec)	0	31	49	66
Green Time (sec)	25	12	11	6
Phase Time (sec)	31	18	17	12
Phase Split	40%	23%	22%	15%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	43	12.2	0.694	41.3	LOS C	4.4	32.6	1.00	0.87	33.8
11	T1	64	3.3	0.694	36.7	LOS C	4.4	32.6	1.00	0.87	32.7
12	R2	139	3.0	0.694	41.2	LOS C	4.6	33.1	1.00	0.87	33.3
Approach		246	4.7	0.694	40.0	LOS C	4.6	33.1	1.00	0.87	33.2
East: Castle Hill Road - E											
1	L2	237	2.7	0.906	44.5	LOS D	23.0	168.4	1.00	1.18	33.5
2	T1	803	7.7	0.906	39.1	LOS C	23.0	168.4	0.99	1.15	36.2
3	R2	80	9.2	0.303	22.1	LOS B	1.6	12.1	0.93	0.75	40.7
Approach		1120	6.8	0.906	39.1	LOS C	23.0	168.4	0.99	1.13	35.8
North: Edward Bennett Drive - N											
4	L2	119	8.0	0.279	17.9	LOS B	2.2	16.6	0.85	0.75	42.0
5	T1	47	0.0	0.298	29.3	LOS C	2.8	19.7	0.92	0.74	35.0
6	R2	41	2.6	0.298	33.9	LOS C	2.8	19.7	0.92	0.74	36.5
Approach		207	5.1	0.298	23.7	LOS B	2.8	19.7	0.88	0.74	39.0
West: Castle Hill Road - W											
7	L2	29	7.1	0.837	35.8	LOS C	18.6	134.9	0.99	1.01	37.1
8	T1	912	3.8	0.837	30.2	LOS C	18.6	134.9	0.97	0.99	40.0
9	R2	124	0.8	0.459	22.8	LOS B	2.6	18.0	0.97	0.77	40.4
Approach		1065	3.6	0.837	29.5	LOS C	18.6	134.9	0.97	0.97	40.0
All Vehicles		2639	5.1	0.906	34.1	LOS C	23.0	168.4	0.98	1.01	37.4

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	21.7	LOS C	0.1	0.1	0.79	0.79
P1	East Full Crossing	53	29.3	LOS C	0.1	0.1	0.92	0.92
P2	North Full Crossing	53	21.7	LOS C	0.1	0.1	0.79	0.79
All Pedestrians		158	24.2	LOS C			0.83	0.83

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

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - AM]

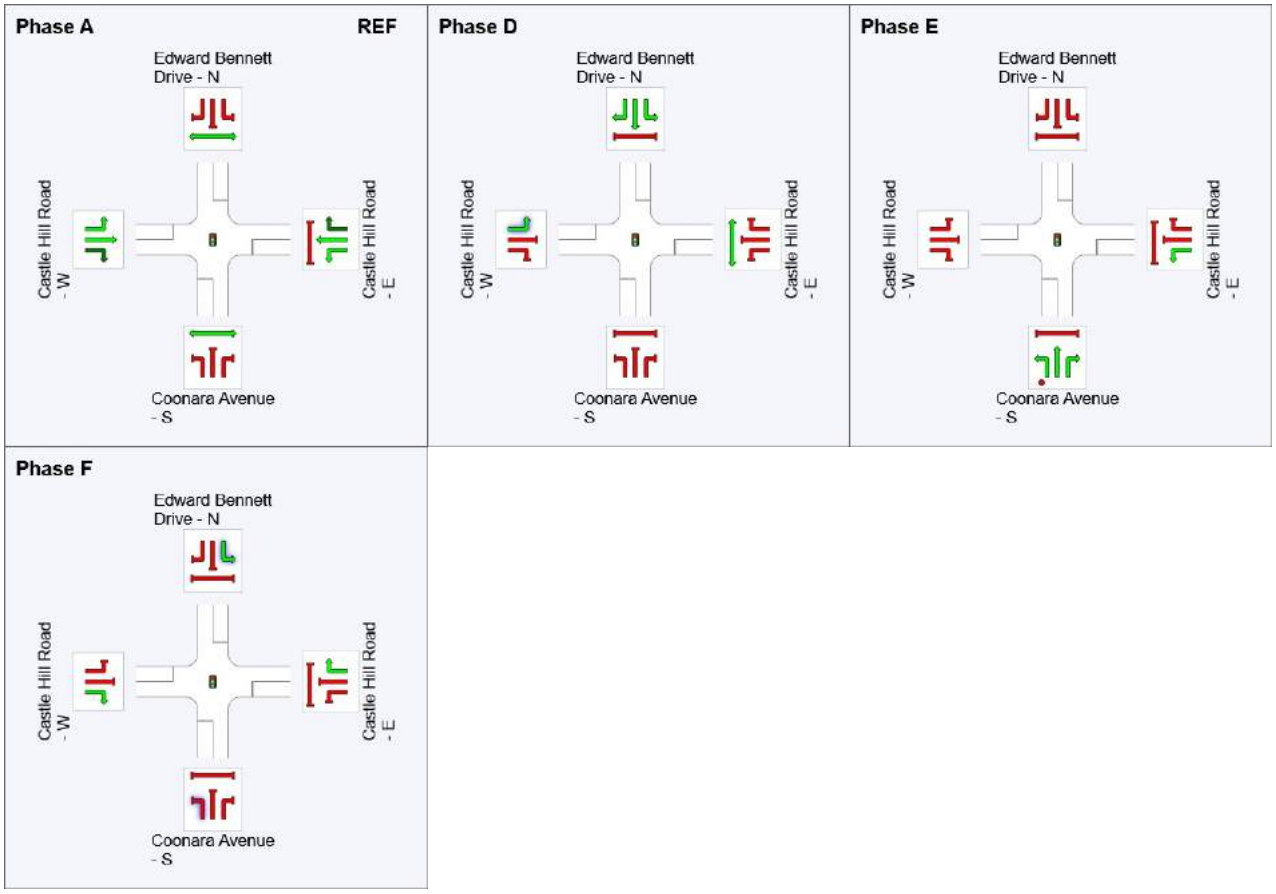
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, D, E, F
(* Variable Phase)

Phase Timing Results

Phase	A	D	E	F
Phase Change Time (sec)	0	28	45	58
Green Time (sec)	22	11	7	6
Phase Time (sec)	28	17	13	12
Phase Split	40%	24%	19%	17%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM - Scenario 1]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	113	0.0	0.887	71.4	LOS F	15.0	105.1	1.00	1.03	26.4
11	T1	74	0.0	0.887	66.9	LOS E	15.0	105.1	1.00	1.03	25.6
12	R2	268	2.0	0.887	71.2	LOS F	15.3	108.9	1.00	1.00	26.2
Approach		455	1.2	0.887	70.6	LOS F	15.3	108.9	1.00	1.01	26.1
East: Castle Hill Rd - E											
1	L2	425	1.2	0.920	43.8	LOS D	61.6	436.8	0.95	0.98	33.7
2	T1	1271	1.8	0.920	39.7	LOS C	61.6	436.8	0.82	0.90	35.9
3	R2	188	4.5	0.428	44.1	LOS D	9.3	67.3	0.89	0.88	32.7
Approach		1884	2.0	0.920	41.1	LOS C	61.6	436.8	0.86	0.92	35.1
North: Edward Bennett Drive - N											
4	L2	44	9.5	0.191	55.5	LOS D	2.4	17.8	0.93	0.74	29.3
5	T1	27	0.0	0.283	51.5	LOS D	3.8	26.9	0.94	0.75	28.7
6	R2	43	2.4	0.283	56.1	LOS D	3.8	26.9	0.94	0.75	29.7
Approach		115	4.6	0.283	54.8	LOS D	3.8	26.9	0.94	0.74	29.3
West: Castle Hill Road - W											
7	L2	58	9.1	0.748	47.1	LOS D	25.0	181.0	0.95	0.87	33.2
8	T1	791	3.5	0.748	39.0	LOS C	25.0	181.0	0.91	0.83	36.4
9	R2	56	1.9	0.767	73.3	LOS F	3.7	26.6	1.00	0.91	25.9
Approach		904	3.7	0.767	41.6	LOS C	25.0	181.0	0.92	0.84	35.3
All Vehicles		3358	2.4	0.920	45.7	LOS D	61.6	436.8	0.90	0.90	33.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	30.9	LOS D	0.1	0.1	0.72	0.72
P1	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	30.9	LOS D	0.1	0.1	0.72	0.72
All Pedestrians		158	38.7	LOS D			0.80	0.80

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

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM - Scenario 1]

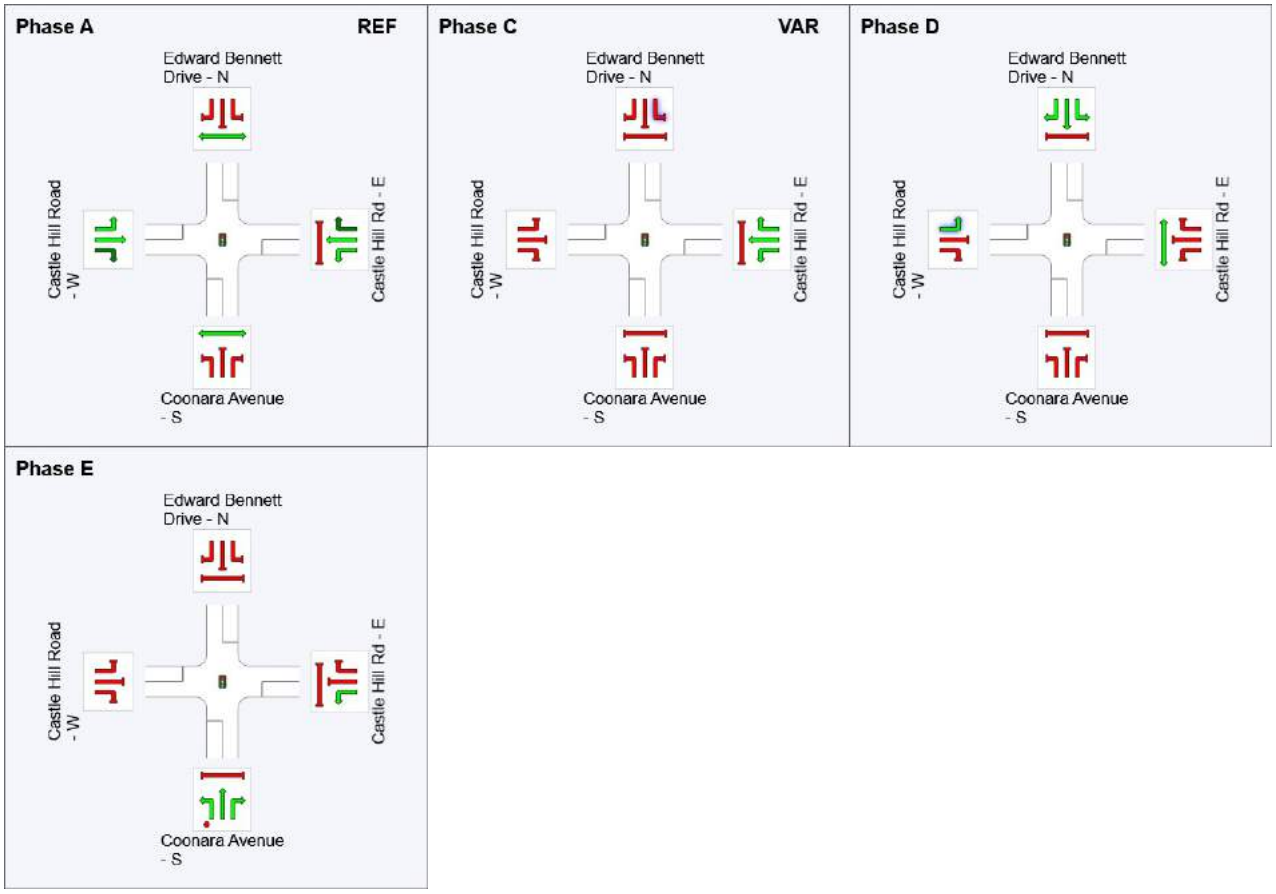
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F*, F1*, F2*
Output Phase Sequence: A, C*, D, E
(* Variable Phase)

Phase Timing Results

Phase	A	C	D	E
Phase Change Time (sec)	0	47	75	97
Green Time (sec)	41	22	16	17
Phase Time (sec)	47	28	22	23
Phase Split	39%	23%	18%	19%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM - Scenario 2]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 107 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	113	0.0	0.936	74.8	LOS F	13.2	92.8	1.00	1.15	25.8
11	T1	74	0.0	0.936	70.3	LOS E	13.2	92.8	1.00	1.15	25.0
12	R2	225	2.3	0.936	74.6	LOS F	13.5	96.1	1.00	1.09	25.5
Approach		412	1.3	0.936	73.9	LOS F	13.5	96.1	1.00	1.11	25.5
East: Castle Hill Rd - E											
1	L2	252	2.1	0.870	32.1	LOS C	45.5	323.3	0.90	0.90	38.2
2	T1	1271	1.8	0.870	27.5	LOS B	45.5	323.3	0.79	0.82	40.9
3	R2	188	4.5	0.531	36.1	LOS C	8.5	62.0	0.92	0.83	35.2
Approach		1711	2.2	0.870	29.1	LOS C	45.5	323.3	0.82	0.84	39.8
North: Edward Bennett Drive - N											
4	L2	44	9.5	0.181	49.4	LOS D	2.1	15.8	0.92	0.73	30.8
5	T1	27	0.0	0.269	45.3	LOS D	3.4	23.9	0.93	0.74	30.2
6	R2	43	2.4	0.269	49.9	LOS D	3.4	23.9	0.93	0.74	31.3
Approach		115	4.6	0.269	48.6	LOS D	3.4	23.9	0.93	0.74	30.8
West: Castle Hill Road - W											
7	L2	58	9.1	0.577	34.0	LOS C	17.5	127.1	0.83	0.77	37.7
8	T1	791	3.5	0.577	27.2	LOS B	17.5	127.1	0.82	0.74	41.3
9	R2	56	1.9	0.759	67.9	LOS E	3.2	23.0	1.00	0.82	27.0
Approach		904	3.7	0.759	30.2	LOS C	17.5	127.1	0.83	0.74	39.7
All Vehicles		3141	2.6	0.936	36.0	LOS C	45.5	323.3	0.85	0.84	36.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	23.6	LOS C	0.1	0.1	0.67	0.67
P1	East Full Crossing	53	47.8	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	23.6	LOS C	0.1	0.1	0.67	0.67
All Pedestrians		158	31.7	LOS D			0.76	0.76

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.

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM - Scenario 2]

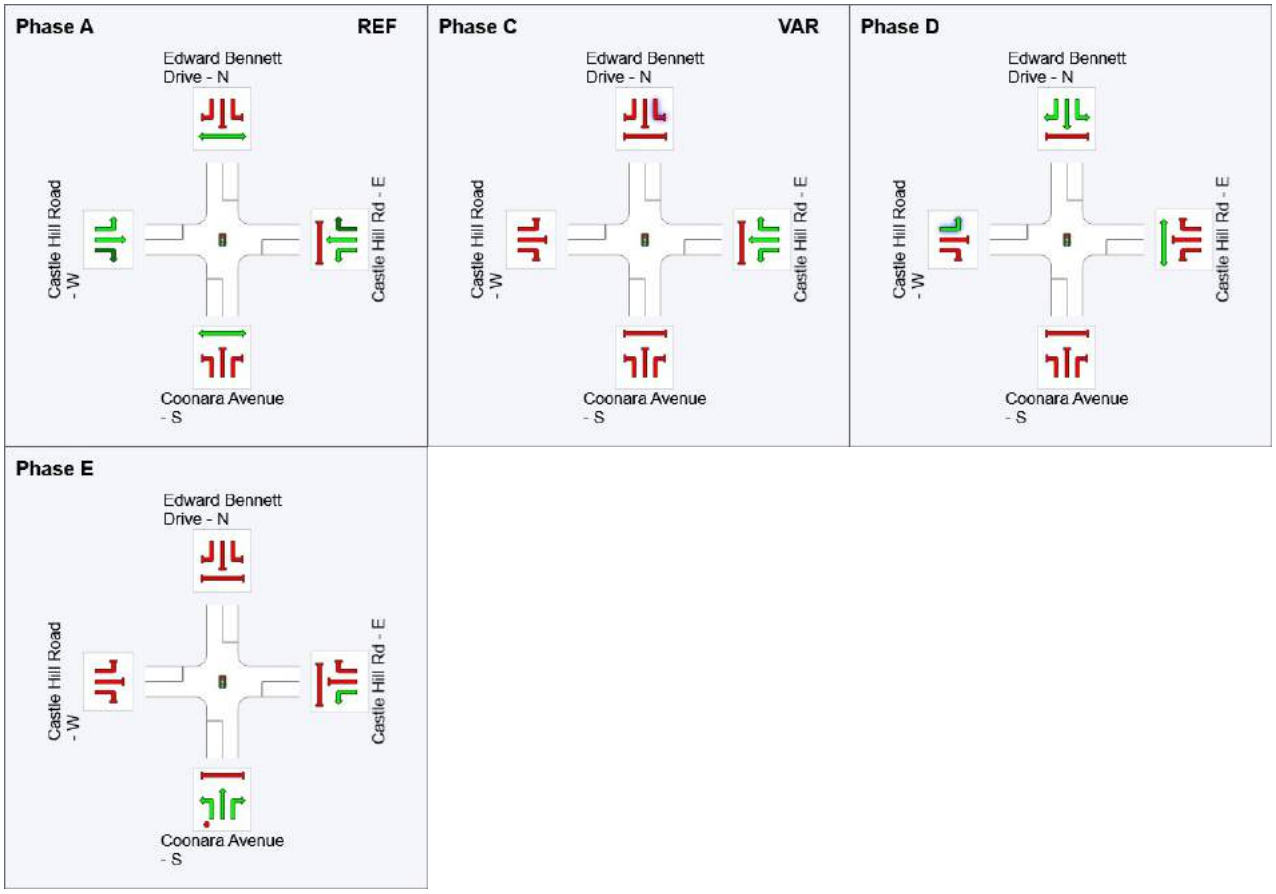
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 107 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F*, F1*, F2*
Output Phase Sequence: A, C*, D, E
(* Variable Phase)

Phase Timing Results

Phase	A	C	D	E
Phase Change Time (sec)	0	49	67	88
Green Time (sec)	43	12	15	13
Phase Time (sec)	49	18	21	19
Phase Split	46%	17%	20%	18%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM - Scenario 3]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 118 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	113	0.0	0.884	70.5	LOS E	14.0	98.5	1.00	1.03	26.6
11	T1	74	0.0	0.884	65.9	LOS E	14.0	98.5	1.00	1.03	25.8
12	R2	247	2.1	0.884	70.3	LOS E	14.3	102.0	1.00	0.99	26.3
Approach		434	1.2	0.884	69.6	LOS E	14.3	102.0	1.00	1.01	26.3
East: Castle Hill Rd - E											
1	L2	339	1.6	0.881	34.5	LOS C	51.2	363.9	0.91	0.91	37.1
2	T1	1271	1.8	0.881	29.9	LOS C	51.2	363.9	0.80	0.82	39.8
3	R2	188	4.5	0.448	44.0	LOS D	9.2	67.2	0.91	0.88	32.7
Approach		1798	2.0	0.881	32.3	LOS C	51.2	363.9	0.83	0.85	38.4
North: Edward Bennett Drive - N											
4	L2	44	9.5	0.187	54.4	LOS D	2.3	17.5	0.92	0.73	29.6
5	T1	27	0.0	0.278	50.4	LOS D	3.7	26.4	0.94	0.74	29.0
6	R2	43	2.4	0.278	55.0	LOS D	3.7	26.4	0.94	0.74	30.0
Approach		115	4.6	0.278	53.7	LOS D	3.7	26.4	0.93	0.74	29.6
West: Castle Hill Road - W											
7	L2	58	9.1	0.737	44.5	LOS D	24.7	179.3	0.94	0.86	34.0
8	T1	791	3.5	0.737	36.5	LOS C	24.7	179.3	0.89	0.81	37.3
9	R2	56	1.9	0.696	66.5	LOS E	3.5	25.2	1.00	0.88	27.2
Approach		904	3.7	0.737	38.9	LOS C	24.7	179.3	0.90	0.82	36.3
All Vehicles		3251	2.5	0.884	39.9	LOS C	51.2	363.9	0.88	0.86	35.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	29.3	LOS C	0.1	0.1	0.70	0.70
P1	East Full Crossing	53	53.3	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	29.3	LOS C	0.1	0.1	0.70	0.70
All Pedestrians		158	37.3	LOS D			0.79	0.79

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.

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM - Scenario 3]

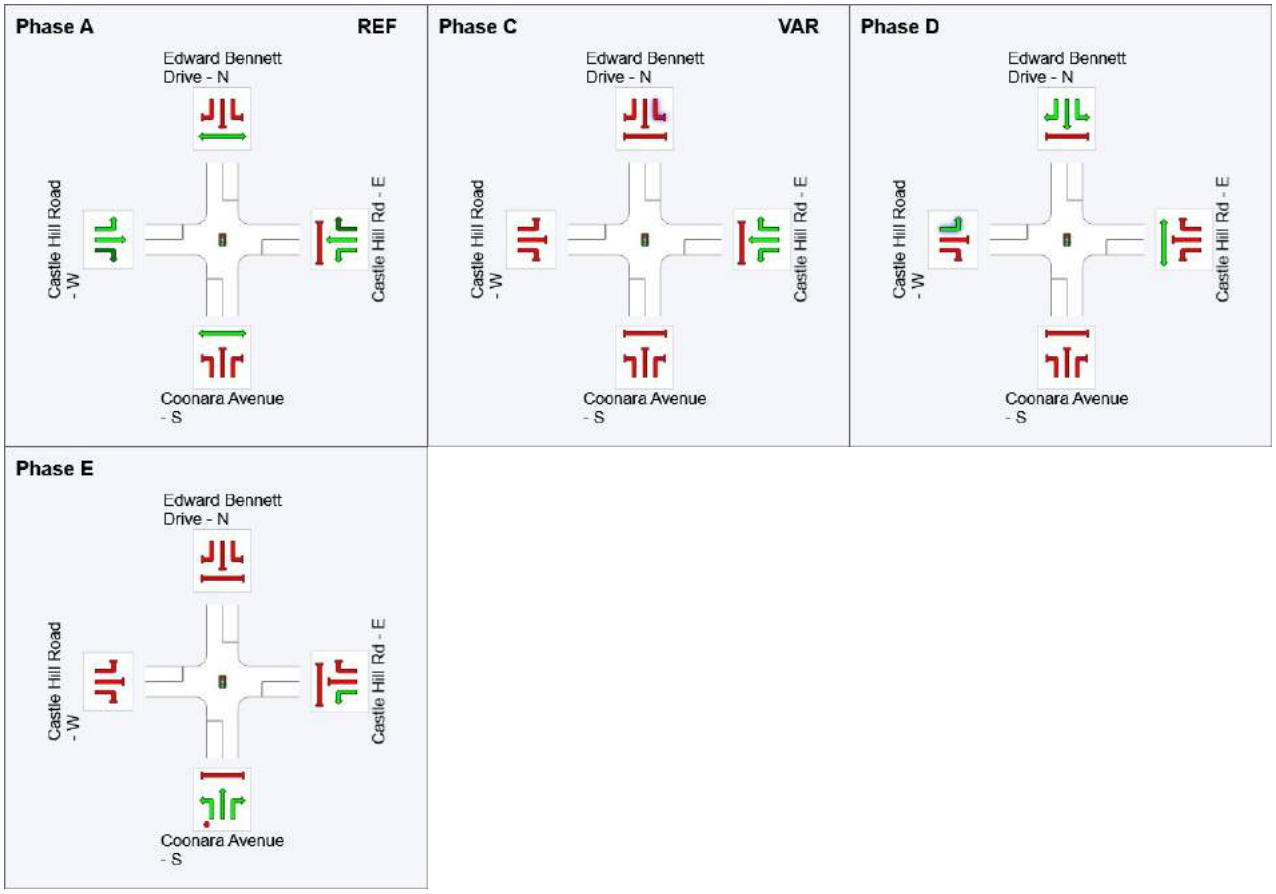
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 118 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F*, F1*, F2*
Output Phase Sequence: A, C*, D, E
(* Variable Phase)

Phase Timing Results

Phase	A	C	D	E
Phase Change Time (sec)	0	48	74	96
Green Time (sec)	42	20	16	16
Phase Time (sec)	48	26	22	22
Phase Split	41%	22%	19%	19%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM]

Existing intersection
Signals - Fixed Time Isolated Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Coonara Avenue - S											
10	L2	113	0.0	0.886	65.2	LOS E	11.6	81.5	1.00	1.05	27.7
11	T1	74	0.0	0.886	60.6	LOS E	11.6	81.5	1.00	1.05	26.8
12	R2	211	2.5	0.886	65.1	LOS E	11.8	84.4	1.00	1.01	27.3
Approach		397	1.3	0.886	64.3	LOS E	11.8	84.4	1.00	1.03	27.3
East: Castle Hill Rd - E											
1	L2	193	2.7	0.848	29.5	LOS C	40.7	290.1	0.89	0.87	39.4
2	T1	1271	1.8	0.848	24.5	LOS B	40.7	290.1	0.79	0.80	42.5
3	R2	188	4.5	0.527	36.5	LOS C	8.5	61.6	0.93	0.83	35.1
Approach		1652	2.2	0.848	26.4	LOS B	40.7	290.1	0.82	0.81	41.1
North: Edward Bennett Drive - N											
4	L2	44	9.5	0.178	48.3	LOS D	2.0	15.5	0.92	0.73	31.1
5	T1	27	0.0	0.264	44.2	LOS D	3.3	23.4	0.93	0.74	30.5
6	R2	43	2.4	0.264	48.8	LOS D	3.3	23.4	0.93	0.74	31.6
Approach		115	4.6	0.264	47.5	LOS D	3.3	23.4	0.92	0.74	31.1
West: Castle Hill Road - W											
7	L2	58	9.1	0.594	34.6	LOS C	17.5	127.2	0.85	0.78	37.5
8	T1	791	3.5	0.594	27.8	LOS B	17.5	127.2	0.84	0.75	41.0
9	R2	56	1.9	0.745	66.6	LOS E	3.2	22.5	1.00	0.81	27.2
Approach		904	3.7	0.745	30.6	LOS C	17.5	127.2	0.85	0.76	39.5
All Vehicles		3067	2.6	0.886	33.3	LOS C	40.7	290.1	0.85	0.82	37.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	24.1	LOS C	0.1	0.1	0.68	0.68
P1	East Full Crossing	53	46.8	LOS E	0.1	0.1	0.94	0.94
P2	North Full Crossing	53	24.1	LOS C	0.1	0.1	0.68	0.68
All Pedestrians		158	31.6	LOS D			0.77	0.77

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.

PHASING SUMMARY

Site: 2575 [3. Coonara Avenue/ Castle Hill Road/ Edward Bennett Drive - PM]

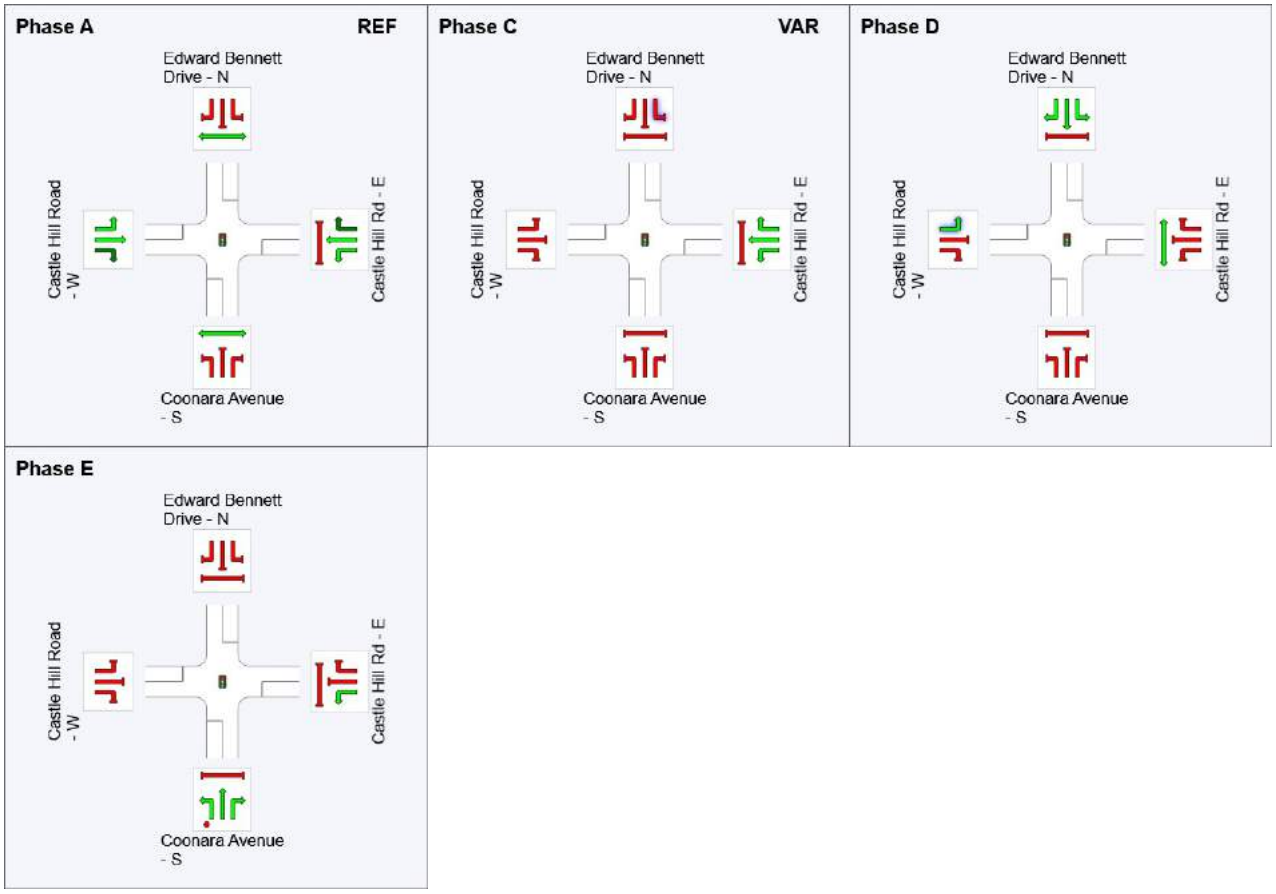
Existing intersection
Signals - Fixed Time Isolated Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F*, F1*, F2*
Output Phase Sequence: A, C*, D, E
(* Variable Phase)

Phase Timing Results

Phase	A	C	D	E
Phase Change Time (sec)	0	47	65	86
Green Time (sec)	41	12	15	13
Phase Time (sec)	47	18	21	19
Phase Split	45%	17%	20%	18%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - AM - Scenario 1]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	51	14.6	0.203	3.3	LOS A	1.0	7.1	0.23	0.34	47.5
2	T1	357	1.8	0.203	2.9	LOS A	1.0	7.1	0.23	0.40	48.5
3	R2	145	0.7	0.203	7.7	LOS A	1.0	6.9	0.23	0.50	47.9
Approach		553	2.7	0.203	4.2	LOS A	1.0	7.1	0.23	0.42	48.2
East: Coonara Ave - E											
4	L2	189	0.0	0.166	4.1	LOS A	0.7	4.9	0.44	0.56	47.1
5	T1	24	0.0	0.076	4.7	LOS A	0.3	2.1	0.47	0.65	46.8
6	R2	29	10.7	0.076	9.8	LOS A	0.3	2.1	0.47	0.65	46.9
Approach		243	1.3	0.166	4.8	LOS A	0.7	4.9	0.44	0.58	47.0
North: Highs Rd - N											
7	L2	43	4.9	0.184	3.8	LOS A	0.8	6.0	0.36	0.41	47.1
8	T1	354	3.0	0.184	3.5	LOS A	0.8	6.0	0.36	0.43	48.3
9	R2	37	17.1	0.184	8.6	LOS A	0.8	6.1	0.37	0.46	48.2
Approach		434	4.4	0.184	4.0	LOS A	0.8	6.1	0.36	0.43	48.2
West: Highs Road - W											
10	L2	105	3.0	0.104	4.3	LOS A	0.4	2.9	0.44	0.56	47.0
11	T1	71	6.0	0.104	4.3	LOS A	0.4	2.9	0.46	0.58	47.6
12	R2	29	35.7	0.104	9.9	LOS A	0.4	3.1	0.47	0.58	47.4
Approach		205	8.7	0.104	5.1	LOS A	0.4	3.1	0.45	0.57	47.2
All Vehicles		1435	3.8	0.203	4.4	LOS A	1.0	7.1	0.34	0.47	47.9

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

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - AM - Scenario 3]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	51	14.6	0.212	3.4	LOS A	1.0	7.6	0.25	0.35	47.4
2	T1	357	1.8	0.212	2.9	LOS A	1.0	7.6	0.25	0.40	48.4
3	R2	163	0.6	0.212	7.8	LOS A	1.0	7.3	0.25	0.51	47.7
Approach		571	2.6	0.212	4.4	LOS A	1.0	7.6	0.25	0.43	48.1
East: Coonara Ave - E											
4	L2	263	0.0	0.230	4.2	LOS A	1.0	7.2	0.46	0.57	47.0
5	T1	24	0.0	0.099	4.9	LOS A	0.4	2.7	0.48	0.68	46.4
6	R2	42	7.5	0.099	10.0	LOS A	0.4	2.7	0.48	0.68	46.7
Approach		329	1.0	0.230	5.0	LOS A	1.0	7.2	0.46	0.59	46.9
North: Highs Rd - N											
7	L2	46	4.5	0.188	3.9	LOS A	0.9	6.1	0.37	0.42	47.1
8	T1	354	3.0	0.188	3.6	LOS A	0.9	6.1	0.38	0.44	48.2
9	R2	37	17.1	0.188	8.7	LOS A	0.8	6.2	0.38	0.46	48.1
Approach		437	4.3	0.188	4.0	LOS A	0.9	6.2	0.38	0.44	48.1
West: Highs Road - W											
10	L2	105	3.0	0.106	4.4	LOS A	0.4	3.0	0.45	0.57	47.0
11	T1	71	6.0	0.106	4.3	LOS A	0.4	3.0	0.48	0.59	47.5
12	R2	29	35.7	0.106	10.0	LOS A	0.4	3.2	0.48	0.59	47.3
Approach		205	8.7	0.106	5.2	LOS A	0.4	3.2	0.47	0.58	47.2
All Vehicles		1542	3.5	0.230	4.5	LOS A	1.0	7.6	0.36	0.49	47.7

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

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - AM -Scenario 2]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	51	14.6	0.222	3.5	LOS A	1.1	8.0	0.27	0.35	47.4
2	T1	357	1.8	0.222	3.0	LOS A	1.1	8.0	0.27	0.41	48.3
3	R2	181	0.6	0.222	7.9	LOS A	1.1	7.8	0.27	0.53	47.5
Approach		588	2.5	0.222	4.5	LOS A	1.1	8.0	0.27	0.44	48.0
East: Coonara Ave - E											
4	L2	335	0.0	0.293	4.3	LOS A	1.4	9.6	0.48	0.58	46.9
5	T1	24	0.0	0.119	5.0	LOS A	0.5	3.3	0.49	0.70	46.3
6	R2	56	5.7	0.119	10.0	LOS A	0.5	3.3	0.49	0.70	46.5
Approach		415	0.8	0.293	5.1	LOS A	1.4	9.6	0.48	0.60	46.8
North: Highs Rd - N											
7	L2	49	4.3	0.191	3.9	LOS A	0.9	6.3	0.38	0.43	47.0
8	T1	354	3.0	0.191	3.6	LOS A	0.9	6.3	0.39	0.45	48.2
9	R2	37	17.1	0.191	8.8	LOS A	0.9	6.3	0.39	0.47	48.1
Approach		440	4.3	0.191	4.1	LOS A	0.9	6.3	0.39	0.45	48.0
West: Highs Road - W											
10	L2	105	3.0	0.108	4.4	LOS A	0.4	3.1	0.47	0.58	46.9
11	T1	71	6.0	0.108	4.4	LOS A	0.4	3.1	0.49	0.60	47.5
12	R2	29	35.7	0.108	10.2	LOS A	0.4	3.3	0.49	0.60	47.3
Approach		205	8.7	0.108	5.3	LOS A	0.4	3.3	0.48	0.59	47.2
All Vehicles		1648	3.3	0.293	4.6	LOS A	1.4	9.6	0.38	0.50	47.6

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

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - AM]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	51	14.6	0.197	3.3	LOS A	0.9	6.8	0.21	0.34	47.6
2	T1	357	1.8	0.197	2.9	LOS A	0.9	6.8	0.21	0.39	48.5
3	R2	133	0.8	0.197	7.7	LOS A	0.9	6.6	0.22	0.48	48.0
Approach		540	2.7	0.197	4.1	LOS A	0.9	6.8	0.21	0.41	48.3
East: Coonara Ave - E											
4	L2	141	0.0	0.123	4.0	LOS A	0.5	3.5	0.42	0.54	47.1
5	T1	24	0.0	0.061	4.5	LOS A	0.2	1.7	0.46	0.61	47.1
6	R2	21	15.0	0.061	9.7	LOS A	0.2	1.7	0.46	0.61	47.2
Approach		186	1.7	0.123	4.7	LOS A	0.5	3.5	0.43	0.56	47.1
North: Highs Rd - N											
7	L2	41	5.1	0.182	3.8	LOS A	0.8	5.9	0.35	0.40	47.2
8	T1	354	3.0	0.182	3.4	LOS A	0.8	5.9	0.35	0.43	48.3
9	R2	37	17.1	0.182	8.6	LOS A	0.8	6.0	0.36	0.45	48.2
Approach		432	4.4	0.182	3.9	LOS A	0.8	6.0	0.35	0.43	48.2
West: Highs Road - W											
10	L2	105	3.0	0.103	4.2	LOS A	0.4	2.9	0.43	0.55	47.0
11	T1	71	6.0	0.103	4.2	LOS A	0.4	2.9	0.46	0.57	47.6
12	R2	29	35.7	0.103	9.8	LOS A	0.4	3.1	0.46	0.57	47.4
Approach		205	8.7	0.103	5.0	LOS A	0.4	3.1	0.44	0.56	47.3
All Vehicles		1363	4.0	0.197	4.3	LOS A	0.9	6.8	0.32	0.46	48.0

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

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - PM - Scenario 1]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	134	1.6	0.327	3.8	LOS A	1.8	12.6	0.38	0.42	47.1
2	T1	493	1.7	0.327	3.5	LOS A	1.8	12.6	0.38	0.47	47.9
3	R2	194	0.0	0.327	8.3	LOS A	1.8	12.4	0.39	0.54	47.6
Approach		820	1.3	0.327	4.7	LOS A	1.8	12.6	0.38	0.47	47.7
East: Coonara Ave - E											
4	L2	191	1.1	0.165	4.0	LOS A	0.7	5.0	0.42	0.55	47.1
5	T1	79	0.0	0.116	4.0	LOS A	0.5	3.3	0.43	0.53	47.6
6	R2	31	6.9	0.116	9.0	LOS A	0.5	3.3	0.43	0.53	47.8
Approach		300	1.4	0.165	4.5	LOS A	0.7	5.0	0.43	0.54	47.3
North: Highs Rd - N											
7	L2	47	4.4	0.168	3.9	LOS A	0.8	5.4	0.38	0.42	47.1
8	T1	254	0.4	0.168	3.5	LOS A	0.8	5.4	0.38	0.47	48.0
9	R2	94	2.2	0.168	8.4	LOS A	0.7	5.3	0.38	0.55	47.6
Approach		395	1.3	0.168	4.7	LOS A	0.8	5.4	0.38	0.48	47.8
West: Highs Road - W											
10	L2	46	4.5	0.075	4.7	LOS A	0.3	2.2	0.51	0.56	46.7
11	T1	41	0.0	0.075	4.4	LOS A	0.3	2.2	0.52	0.61	47.4
12	R2	51	4.2	0.075	9.6	LOS A	0.3	2.1	0.53	0.71	46.4
Approach		138	3.1	0.075	6.4	LOS A	0.3	2.2	0.52	0.63	46.8
All Vehicles		1653	1.5	0.327	4.8	LOS A	1.8	12.6	0.40	0.50	47.6

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

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - PM - Scenario 2]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	134	1.6	0.387	3.8	LOS A	2.2	15.9	0.41	0.42	47.0
2	T1	493	1.7	0.387	3.5	LOS A	2.2	15.9	0.41	0.47	47.9
3	R2	343	0.0	0.387	8.4	LOS A	2.2	15.6	0.42	0.60	46.9
Approach		969	1.1	0.387	5.3	LOS A	2.2	15.9	0.41	0.51	47.4
East: Coonara Ave - E											
4	L2	228	0.9	0.200	4.1	LOS A	0.9	6.3	0.45	0.55	47.0
5	T1	79	0.0	0.128	4.1	LOS A	0.5	3.7	0.45	0.56	47.4
6	R2	37	5.7	0.128	9.1	LOS A	0.5	3.7	0.45	0.56	47.7
Approach		344	1.2	0.200	4.6	LOS A	0.9	6.3	0.45	0.55	47.2
North: Highs Rd - N											
7	L2	74	2.9	0.199	4.4	LOS A	1.0	6.8	0.48	0.50	46.7
8	T1	254	0.4	0.199	4.1	LOS A	1.0	6.8	0.49	0.54	47.6
9	R2	94	2.2	0.199	9.1	LOS A	0.9	6.6	0.49	0.60	47.3
Approach		421	1.3	0.199	5.3	LOS A	1.0	6.8	0.49	0.55	47.4
West: Highs Road - W											
10	L2	46	4.5	0.081	5.0	LOS A	0.3	2.4	0.56	0.60	46.6
11	T1	41	0.0	0.081	4.7	LOS A	0.3	2.4	0.56	0.65	47.3
12	R2	51	4.2	0.081	10.0	LOS A	0.3	2.3	0.57	0.75	46.2
Approach		138	3.1	0.081	6.7	LOS A	0.3	2.4	0.57	0.67	46.6
All Vehicles		1873	1.3	0.387	5.3	LOS A	2.2	15.9	0.45	0.54	47.3

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

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - PM - Scenario 3]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	134	1.6	0.357	3.8	LOS A	2.0	14.2	0.39	0.42	47.1
2	T1	493	1.7	0.357	3.5	LOS A	2.0	14.2	0.39	0.47	47.9
3	R2	268	0.0	0.357	8.4	LOS A	2.0	13.9	0.40	0.57	47.2
Approach		895	1.2	0.357	5.0	LOS A	2.0	14.2	0.40	0.49	47.5
East: Coonara Ave - E											
4	L2	209	1.0	0.182	4.1	LOS A	0.8	5.6	0.44	0.55	47.0
5	T1	79	0.0	0.122	4.0	LOS A	0.5	3.5	0.44	0.55	47.5
6	R2	34	6.3	0.122	9.0	LOS A	0.5	3.5	0.44	0.55	47.8
Approach		322	1.3	0.182	4.6	LOS A	0.8	5.6	0.44	0.55	47.2
North: Highs Rd - N											
7	L2	61	3.4	0.183	4.1	LOS A	0.9	6.0	0.43	0.46	46.9
8	T1	254	0.4	0.183	3.8	LOS A	0.9	6.0	0.43	0.50	47.8
9	R2	94	2.2	0.183	8.8	LOS A	0.8	5.9	0.44	0.57	47.4
Approach		408	1.3	0.183	5.0	LOS A	0.9	6.0	0.43	0.51	47.6
West: Highs Road - W											
10	L2	46	4.5	0.078	4.8	LOS A	0.3	2.3	0.54	0.58	46.6
11	T1	41	0.0	0.078	4.5	LOS A	0.3	2.3	0.54	0.63	47.3
12	R2	51	4.2	0.078	9.8	LOS A	0.3	2.2	0.55	0.73	46.3
Approach		138	3.1	0.078	6.6	LOS A	0.3	2.3	0.54	0.65	46.7
All Vehicles		1763	1.4	0.357	5.0	LOS A	2.0	14.2	0.42	0.52	47.4

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

MOVEMENT SUMMARY

Site: 102 [2. Coonara Avenue/ Highs Road/ Taylor Street - PM]

Coonara Avenue/ Highs Road/ Taylor Street existing conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Taylor St - S											
1	L2	134	1.6	0.308	3.7	LOS A	1.6	11.6	0.37	0.42	47.1
2	T1	493	1.7	0.308	3.4	LOS A	1.6	11.6	0.37	0.46	48.0
3	R2	144	0.0	0.308	8.3	LOS A	1.6	11.4	0.38	0.51	47.8
Approach		771	1.4	0.308	4.4	LOS A	1.6	11.6	0.37	0.46	47.8
East: Coonara Ave - E											
4	L2	178	1.2	0.154	4.0	LOS A	0.6	4.6	0.42	0.54	47.1
5	T1	79	0.0	0.112	4.0	LOS A	0.4	3.1	0.43	0.53	47.6
6	R2	28	7.4	0.112	8.9	LOS A	0.4	3.1	0.43	0.53	47.9
Approach		285	1.5	0.154	4.5	LOS A	0.6	4.6	0.42	0.54	47.3
North: Highs Rd - N											
7	L2	39	5.4	0.160	3.7	LOS A	0.7	5.0	0.34	0.40	47.2
8	T1	254	0.4	0.160	3.3	LOS A	0.7	5.0	0.34	0.45	48.1
9	R2	94	2.2	0.160	8.3	LOS A	0.7	4.9	0.35	0.53	47.7
Approach		386	1.4	0.160	4.6	LOS A	0.7	5.0	0.34	0.46	47.9
West: Highs Road - W											
10	L2	46	4.5	0.073	4.6	LOS A	0.3	2.1	0.50	0.55	46.8
11	T1	41	0.0	0.073	4.2	LOS A	0.3	2.1	0.50	0.60	47.5
12	R2	51	4.2	0.073	9.4	LOS A	0.3	2.1	0.51	0.69	46.5
Approach		138	3.1	0.073	6.2	LOS A	0.3	2.1	0.50	0.62	46.9
All Vehicles		1580	1.5	0.308	4.6	LOS A	1.6	11.6	0.38	0.49	47.7

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

MOVEMENT SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - AM - Scenario 1]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 82 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	394	2.9	0.946	61.3	LOS E	21.5	154.0	1.00	1.14	28.1
11	T1	116	0.9	0.863	49.3	LOS D	5.7	39.9	1.00	1.00	31.8
12	R2	6	0.0	0.863	53.8	LOS D	5.7	39.9	1.00	1.00	31.0
Approach		516	2.4	0.946	58.5	LOS E	21.5	154.0	1.00	1.11	28.8
East: Castle Hill Road - E											
1	L2	6	33.3	0.913	59.8	LOS E	22.0	162.7	1.00	1.15	30.0
2	T1	869	6.2	0.913	50.7	LOS D	22.0	162.7	1.00	1.14	32.8
3	R2	96	14.3	0.777	52.3	LOS D	4.3	33.7	1.00	0.90	31.9
Approach		972	7.2	0.913	50.9	LOS D	22.0	162.7	1.00	1.12	32.7
North: Country Drive - N											
4	L2	97	7.6	0.167	17.7	LOS B	1.9	14.0	0.74	0.73	45.3
5	T1	161	2.0	0.327	28.3	LOS B	5.3	37.8	0.86	0.73	38.5
6	R2	859	2.9	0.922	51.8	LOS D	20.8	149.1	1.00	1.03	32.2
Approach		1117	3.2	0.922	45.5	LOS D	20.8	149.1	0.96	0.96	33.8
West: Castle Hill Road - W											
7	L2	597	2.5	0.657	14.3	LOS A	12.9	92.2	0.59	0.76	47.5
8	T1	852	3.7	0.733	28.4	LOS B	15.0	108.4	0.90	0.81	41.0
9	R2	201	5.8	0.651	26.7	LOS B	5.4	39.5	0.98	0.82	38.7
Approach		1649	3.5	0.733	23.1	LOS B	15.0	108.4	0.80	0.79	42.8
All Vehicles		4254	4.1	0.946	39.6	LOS C	22.0	162.7	0.91	0.95	35.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	28.3	LOS C	0.1	0.1	0.83	0.83
P1	East Full Crossing	53	35.3	LOS D	0.1	0.1	0.93	0.93
P2	North Full Crossing	53	35.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	33.0	LOS D			0.90	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.

PHASING SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - AM - Scenario 1]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 82 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

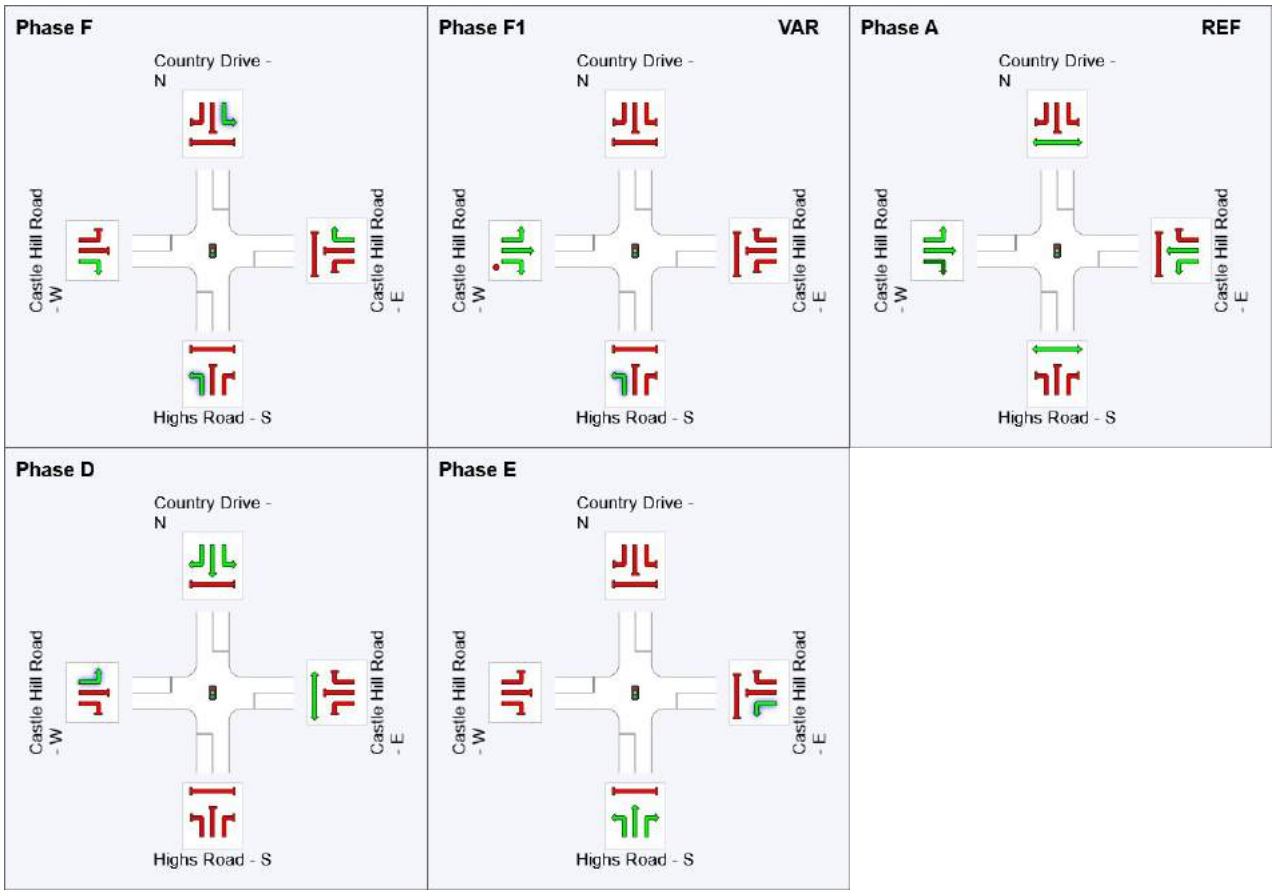
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: F, F1*, F2*, A, B*, C*, D, E
Output Phase Sequence: F, F1*, A, D, E
(* Variable Phase)

Phase Timing Results

Phase	F	F1	A	D	E
Phase Change Time (sec)	66	78	0	27	54
Green Time (sec)	6	***	21	21	6
Phase Time (sec)	12	4	27	27	12
Phase Split	15%	5%	33%	33%	15%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.



REF: Reference Phase
VAR: Variable Phase

Normal Movement
Permitted/Opposed
Slip/Bypass-Lane Movement
Opposed Slip/Bypass-Lane


Stopped Movement
Other Movement Class (MC) Running
Mixed Running & Stopped MCs
Other Movement Class (MC) Stopped
Turn On Red
Undetected Movement
Continuous Movement
Phase Transition Applied

MOVEMENT SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - AM - Scenario 2]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	420	2.8	0.949	64.9	LOS E	24.8	177.6	1.00	1.12	27.3
11	T1	116	0.9	0.812	50.6	LOS D	6.0	42.0	1.00	0.94	31.4
12	R2	6	0.0	0.812	55.2	LOS D	6.0	42.0	1.00	0.94	30.6
Approach		542	2.3	0.949	61.8	LOS E	24.8	177.6	1.00	1.08	28.1
East: Castle Hill Road - E											
1	L2	6	33.3	0.915	63.7	LOS E	23.9	176.4	1.00	1.14	29.1
2	T1	869	6.2	0.915	54.6	LOS D	23.9	176.4	1.00	1.13	31.8
3	R2	96	14.3	0.852	59.9	LOS E	4.9	38.2	1.00	0.96	29.9
Approach		972	7.2	0.915	55.2	LOS D	23.9	176.4	1.00	1.12	31.5
North: Country Drive - N											
4	L2	97	7.6	0.171	19.4	LOS B	2.1	15.8	0.75	0.73	44.4
5	T1	161	2.0	0.327	30.9	LOS C	5.8	41.4	0.86	0.73	37.5
6	R2	859	2.9	0.924	55.6	LOS D	22.6	162.1	1.00	1.02	31.1
Approach		1117	3.2	0.924	48.9	LOS D	22.6	162.1	0.96	0.95	32.8
West: Castle Hill Road - W											
7	L2	597	2.5	0.627	14.0	LOS A	13.3	94.9	0.55	0.75	47.6
8	T1	852	3.7	0.671	26.8	LOS B	14.9	107.9	0.85	0.74	41.8
9	R2	207	5.6	0.606	26.9	LOS B	5.8	42.2	0.97	0.80	38.6
Approach		1656	3.5	0.671	22.2	LOS B	14.9	107.9	0.75	0.75	43.2
All Vehicles		4286	4.1	0.949	41.6	LOS C	24.8	177.6	0.89	0.93	35.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	30.5	LOS D	0.1	0.1	0.82	0.82
P1	East Full Crossing	53	37.4	LOS D	0.1	0.1	0.91	0.91
P2	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		158	35.7	LOS D			0.89	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.

PHASING SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - AM - Scenario 2]

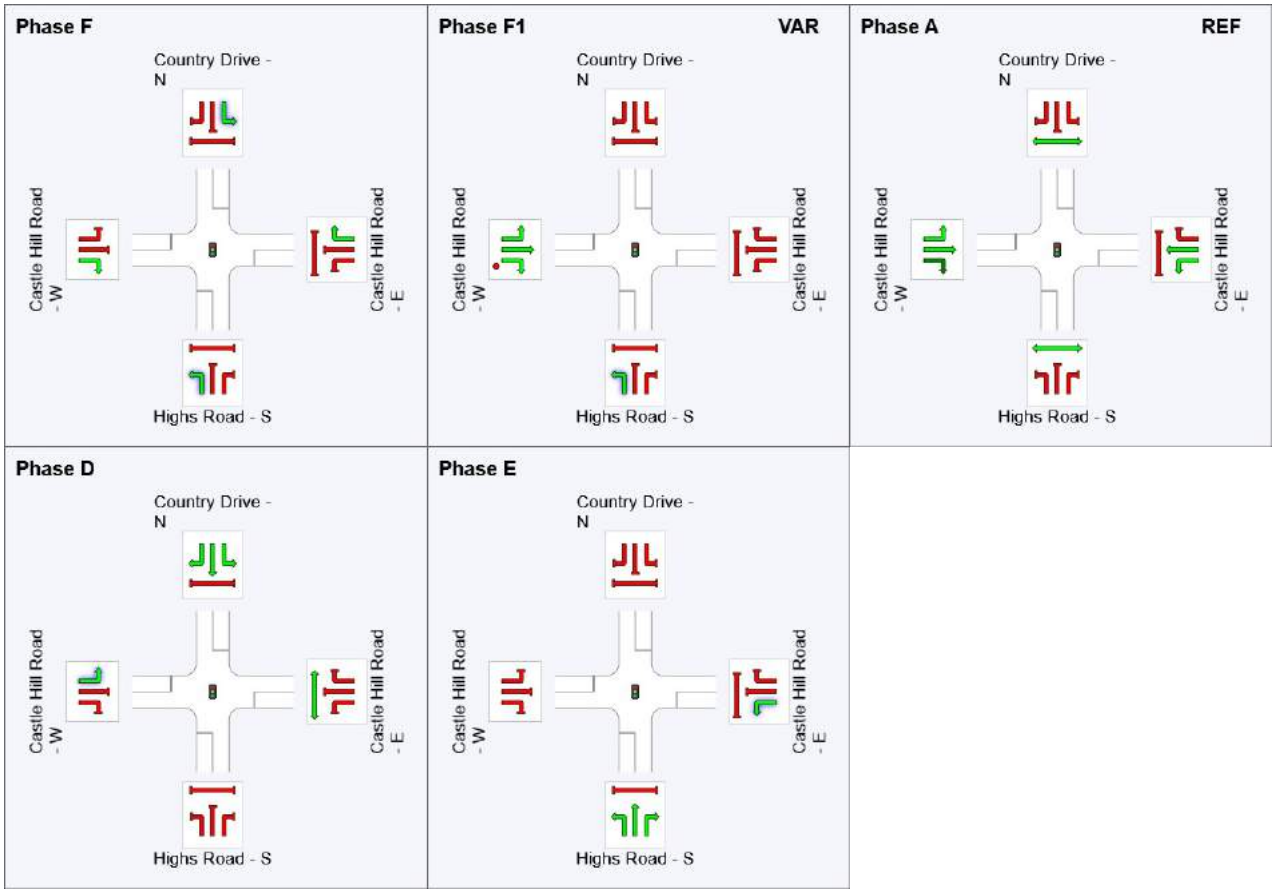
Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: F, F1*, F2*, A, B*, C*, D, E
Output Phase Sequence: F, F1*, A, D, E
(* Variable Phase)

Phase Timing Results

Phase	F	F1	A	D	E
Phase Change Time (sec)	71	83	0	29	58
Green Time (sec)	6	1	23	23	7
Phase Time (sec)	12	7	29	29	13
Phase Split	13%	8%	32%	32%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

 Other Movement Class (MC) Stopped

 Phase Transition Applied

MOVEMENT SUMMARY

Site: 1 [91. Highs Road / Castle Hill Road/ Country Drive]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performances - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	406	2.8	0.921	57.0	LOS E	22.2	159.1	0.99	1.07	29.0
11	T1	116	0.9	0.812	50.6	LOS D	6.0	42.0	1.00	0.94	31.4
12	R2	6	0.0	0.812	55.2	LOS D	6.0	42.0	1.00	0.94	30.6
Approach		528	2.4	0.921	55.6	LOS D	22.2	159.1	0.99	1.04	29.5
East: Castle Hill Road - E											
1	L2	6	33.3	0.915	63.7	LOS E	23.9	176.4	1.00	1.14	29.1
2	T1	869	6.2	0.915	54.6	LOS D	23.9	176.4	1.00	1.13	31.8
3	R2	96	14.3	0.852	59.9	LOS E	4.9	38.2	1.00	0.96	29.9
Approach		972	7.2	0.915	55.2	LOS D	23.9	176.4	1.00	1.12	31.5
North: Country Drive - N											
4	L2	97	7.6	0.171	19.4	LOS B	2.1	15.8	0.75	0.73	44.4
5	T1	161	2.0	0.327	30.9	LOS C	5.8	41.4	0.86	0.73	37.5
6	R2	859	2.9	0.924	55.6	LOS D	22.6	162.1	1.00	1.02	31.1
Approach		1117	3.2	0.924	48.9	LOS D	22.6	162.1	0.96	0.95	32.8
West: Castle Hill Road - W											
7	L2	597	2.5	0.627	14.0	LOS A	13.3	94.9	0.55	0.75	47.6
8	T1	852	3.7	0.671	26.8	LOS B	14.9	107.9	0.85	0.74	41.8
9	R2	204	5.7	0.597	26.9	LOS B	5.7	41.5	0.96	0.80	38.6
Approach		1653	3.5	0.671	22.2	LOS B	14.9	107.9	0.75	0.75	43.2
All Vehicles		4269	4.1	0.924	40.8	LOS C	23.9	176.4	0.89	0.92	35.3

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

Movement Performances - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Pedestrian Back of Queue ped	Pedestrian Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	30.5	LOS D	0.1	0.1	0.82	0.82
P1	East Full Crossing	53	37.4	LOS D	0.1	0.1	0.91	0.91
P2	North Full Crossing	53	39.3	LOS D	0.1	0.1	0.94	0.94
All Pedestrians		158	35.7	LOS D			0.89	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.

PHASING SUMMARY

Site: 1 [91. Highs Road / Castle Hill Road/ Country Drive]

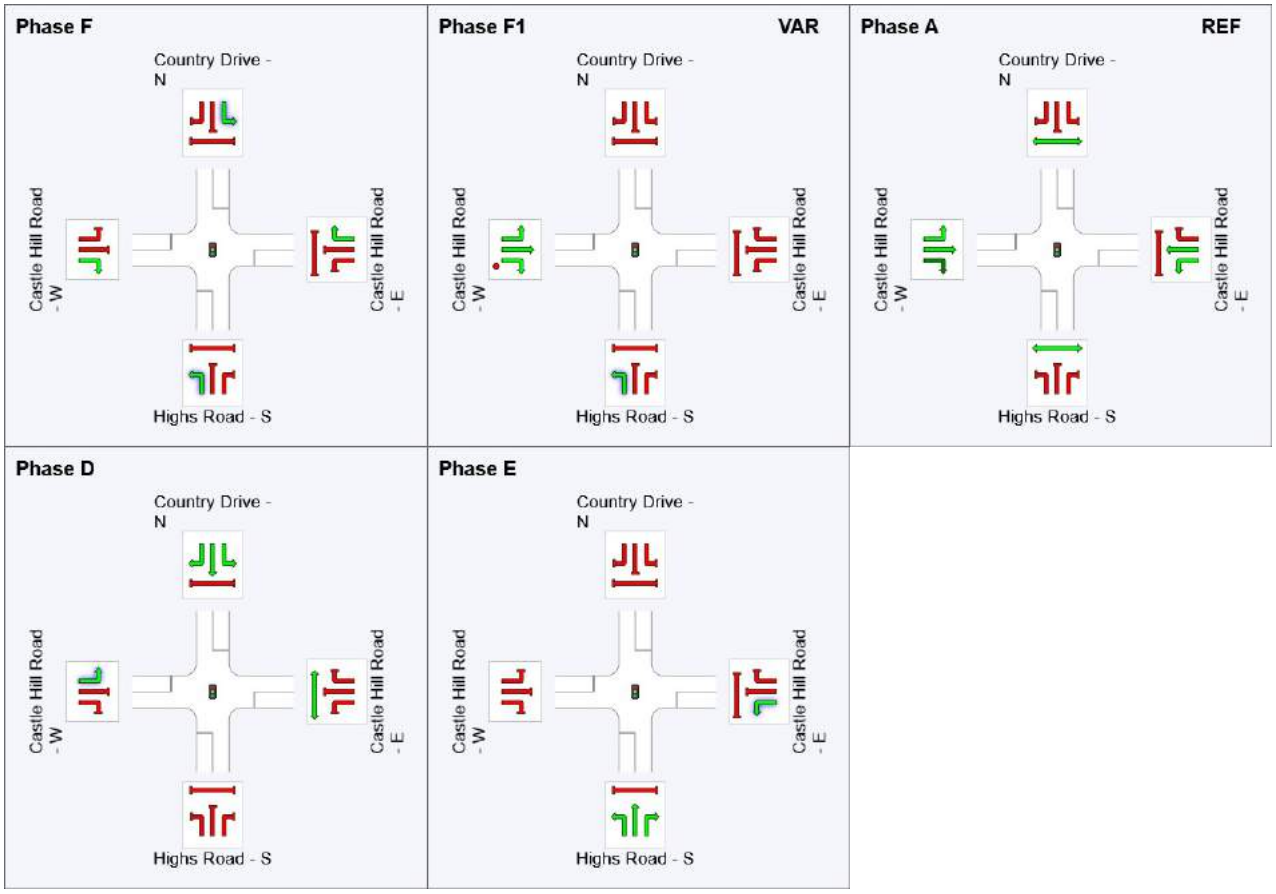
Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 90 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: F, F1*, F2*, A, B*, C*, D, E
Output Phase Sequence: F, F1*, A, D, E
(* Variable Phase)

Phase Timing Results

Phase	F	F1	A	D	E
Phase Change Time (sec)	71	83	0	29	58
Green Time (sec)	6	1	23	23	7
Phase Time (sec)	12	7	29	29	13
Phase Split	13%	8%	32%	32%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

Other Movement Class (MC) Stopped

Phase Transition Applied

MOVEMENT SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - AM]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	385	3.0	0.925	56.7	LOS E	20.4	146.1	1.00	1.09	29.1
11	T1	116	0.9	0.894	53.3	LOS D	6.0	42.3	1.00	1.04	30.7
12	R2	6	0.0	0.894	57.9	LOS E	6.0	42.3	1.00	1.04	30.0
Approach		507	2.5	0.925	56.0	LOS D	20.4	146.1	1.00	1.08	29.4
East: Castle Hill Road - E											
1	L2	6	33.3	0.903	59.1	LOS E	22.2	163.8	1.00	1.12	30.1
2	T1	869	6.2	0.903	50.1	LOS D	22.2	163.8	1.00	1.12	33.0
3	R2	96	14.3	0.805	54.9	LOS D	4.5	35.3	1.00	0.92	31.2
Approach		972	7.2	0.903	50.6	LOS D	22.2	163.8	1.00	1.10	32.8
North: Country Drive - N											
4	L2	97	7.6	0.167	18.3	LOS B	2.0	14.7	0.74	0.73	45.0
5	T1	161	2.0	0.323	29.0	LOS C	5.5	39.0	0.85	0.72	38.2
6	R2	859	2.9	0.912	51.2	LOS D	20.9	150.2	1.00	1.01	32.3
Approach		1117	3.2	0.912	45.2	LOS D	20.9	150.2	0.96	0.95	33.9
West: Castle Hill Road - W											
7	L2	597	2.5	0.625	14.0	LOS A	12.9	92.1	0.57	0.76	47.7
8	T1	852	3.7	0.704	27.3	LOS B	14.8	107.1	0.88	0.77	41.5
9	R2	199	5.8	0.620	26.5	LOS B	5.3	39.3	0.98	0.81	38.8
Approach		1647	3.5	0.704	22.4	LOS B	14.8	107.1	0.78	0.77	43.2
All Vehicles		4243	4.1	0.925	38.9	LOS C	22.2	163.8	0.90	0.93	36.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	28.9	LOS C	0.1	0.1	0.83	0.83
P1	East Full Crossing	53	35.9	LOS D	0.1	0.1	0.92	0.92
P2	North Full Crossing	53	36.8	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		158	33.8	LOS D			0.89	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.

PHASING SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - AM]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 85 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

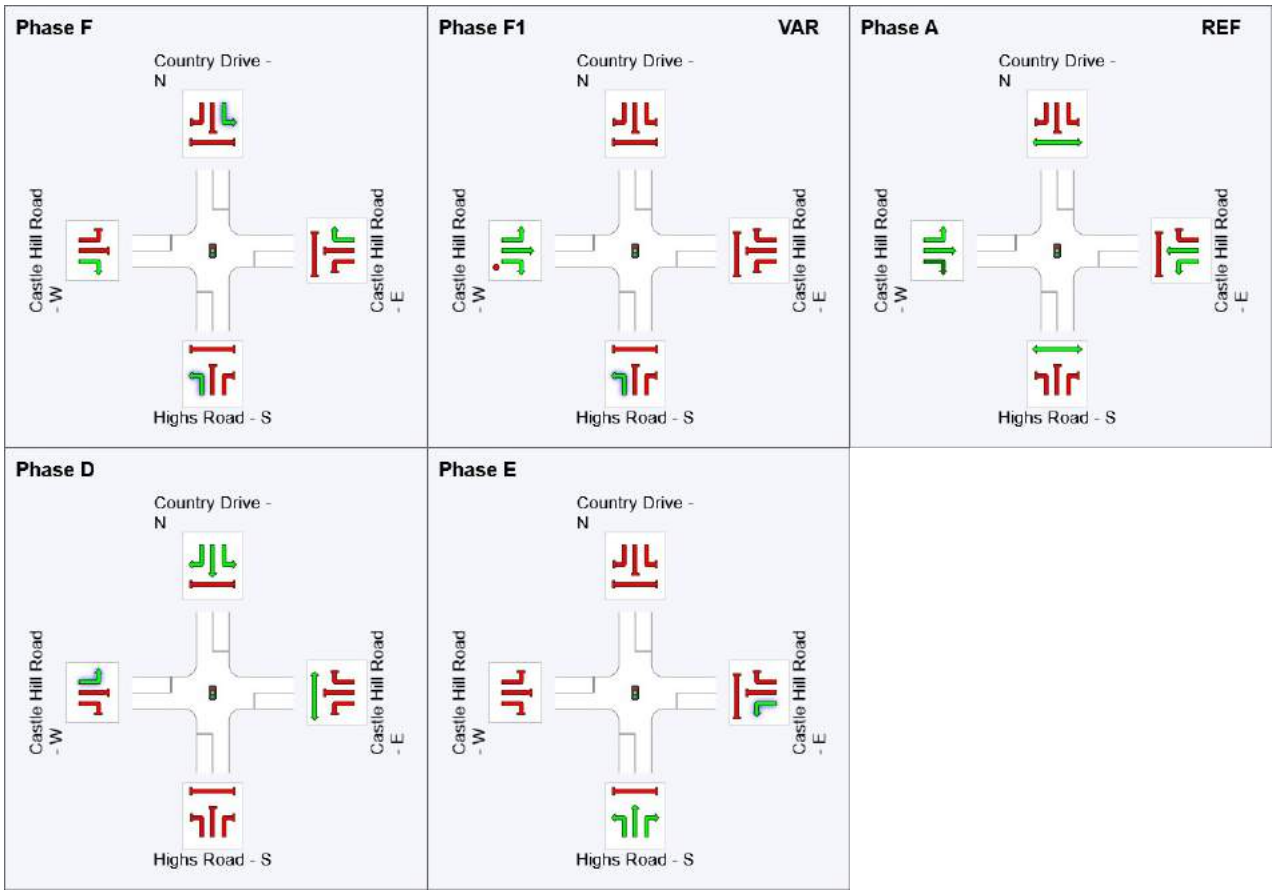
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: F, F1*, F2*, A, B*, C*, D, E
Output Phase Sequence: F, F1*, A, D, E
(* Variable Phase)

Phase Timing Results

Phase	F	F1	A	D	E
Phase Change Time (sec)	68	80	0	28	56
Green Time (sec)	6	***	22	22	6
Phase Time (sec)	12	5	28	28	12
Phase Split	14%	6%	33%	33%	14%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.



REF: Reference Phase
VAR: Variable Phase

Normal Movement
Permitted/Opposed
Slip/Bypass-Lane Movement
Opposed Slip/Bypass-Lane


Stopped Movement
Other Movement Class (MC) Running
Mixed Running & Stopped MCs
Other Movement Class (MC) Stopped
Turn On Red
Undetected Movement
Continuous Movement
Phase Transition Applied

MOVEMENT SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - PM - Scenario 1]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 104 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	398	2.9	0.952	72.2	LOS F	26.4	189.1	0.99	1.10	25.9
11	T1	154	0.7	0.859	58.8	LOS E	9.1	64.1	1.00	1.00	29.4
12	R2	6	0.0	0.859	63.3	LOS E	9.1	64.1	1.00	1.00	28.7
Approach		558	2.3	0.952	68.4	LOS E	26.4	189.1	0.99	1.07	26.8
East: Castle Hill Road - E											
1	L2	9	0.0	0.944	58.3	LOS E	43.0	305.0	1.00	1.13	30.5
2	T1	1367	1.6	0.944	51.2	LOS D	43.0	305.0	0.99	1.12	32.7
3	R2	106	5.0	0.616	57.3	LOS E	5.5	40.2	1.00	0.81	30.7
Approach		1483	1.8	0.944	51.6	LOS D	43.0	305.0	0.99	1.10	32.5
North: Country Drive - N											
4	L2	52	8.2	0.118	25.4	LOS B	1.5	11.1	0.81	0.72	41.3
5	T1	104	0.0	0.347	44.5	LOS D	4.8	33.9	0.94	0.75	32.9
6	R2	539	1.4	0.952	77.5	LOS F	17.8	126.0	1.00	1.09	26.3
Approach		695	1.7	0.952	68.7	LOS E	17.8	126.0	0.98	1.02	27.9
West: Castle Hill Road - W											
7	L2	674	1.4	0.802	20.2	LOS B	21.3	150.6	0.62	0.80	44.1
8	T1	771	2.9	0.476	20.2	LOS B	11.6	83.1	0.64	0.55	45.2
9	R2	292	1.4	0.894	52.1	LOS D	13.3	94.5	1.00	1.03	30.5
Approach		1736	2.1	0.894	25.5	LOS B	21.3	150.6	0.69	0.73	41.5
All Vehicles		4472	2.0	0.952	46.2	LOS D	43.0	305.0	0.87	0.94	33.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	24.3	LOS C	0.1	0.1	0.68	0.68
P1	East Full Crossing	53	46.3	LOS E	0.1	0.1	0.94	0.94
P2	North Full Crossing	53	28.6	LOS C	0.1	0.1	0.74	0.74
All Pedestrians		158	33.0	LOS D			0.79	0.79

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.

PHASING SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - PM - Scenario 1]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 104 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

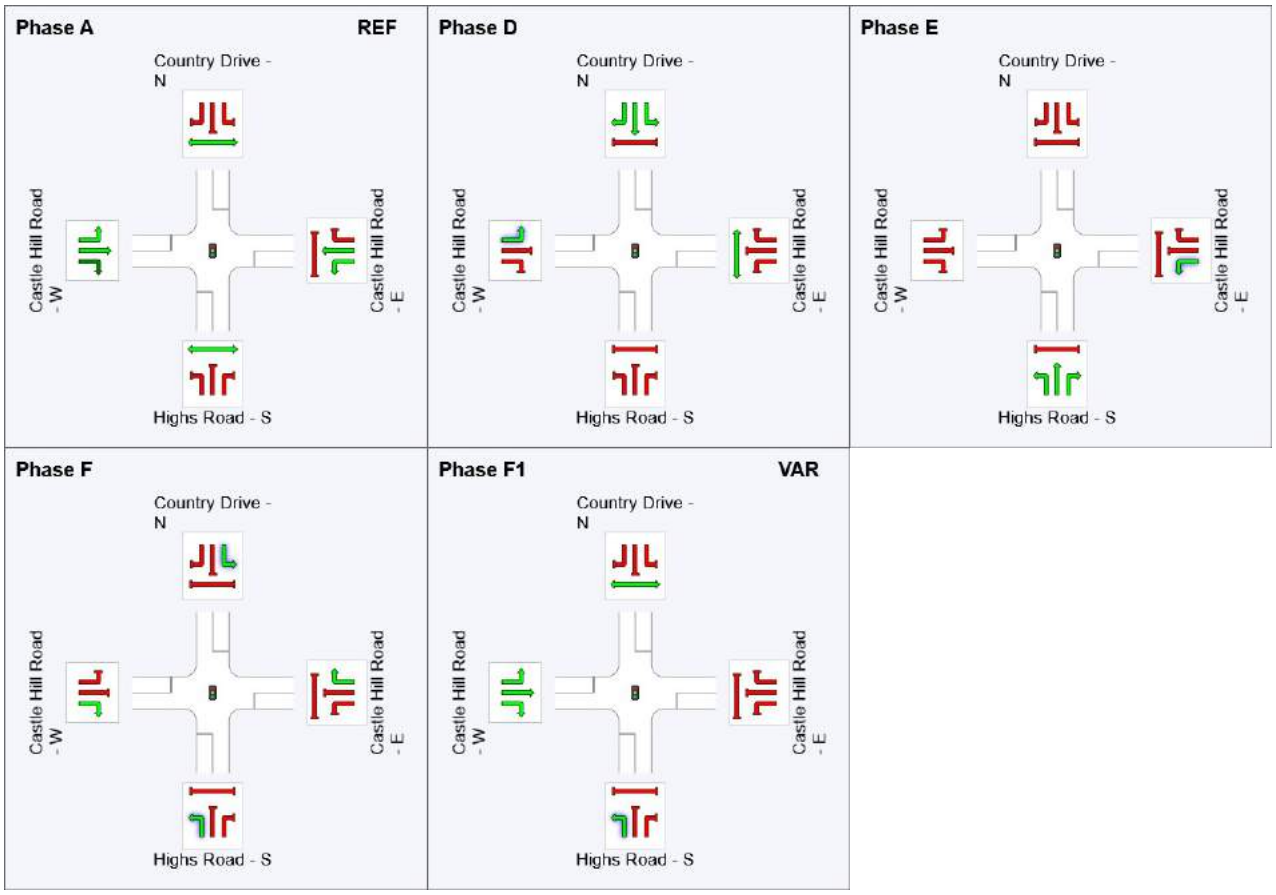
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, D, E, F, F1*
(* Variable Phase)

Phase Timing Results

Phase	A	D	E	F	F1
Phase Change Time (sec)	0	46	68	84	100
Green Time (sec)	40	16	10	10	***
Phase Time (sec)	46	22	16	16	4
Phase Split	44%	21%	15%	15%	4%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

*** No green time has been calculated for this phase because the next phase starts during its intergreen time. This occurs with overlap phasing where there is no single movement connecting this phase to the next, or where the only such movement is a dummy movement with zero minimum green time specified.
If a green time is required for this phase, specify a dummy movement with a non-zero minimum green time.



REF: Reference Phase
VAR: Variable Phase


Stopped Movement
Other Movement Class (MC) Running
Mixed Running & Stopped MCs
Other Movement Class (MC) Stopped
Turn On Red
Undetected Movement
Continuous Movement
Phase Transition Applied

MOVEMENT SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - PM - Scenario 2]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 109 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	404	2.9	0.955	75.1	LOS F	28.0	200.7	0.99	1.10	25.4
11	T1	154	0.7	0.900	65.5	LOS E	9.9	69.6	1.00	1.05	27.9
12	R2	6	0.0	0.900	70.1	LOS E	9.9	69.6	1.00	1.05	27.3
Approach		564	2.2	0.955	72.5	LOS F	28.0	200.7	0.99	1.09	26.0
East: Castle Hill Road - E											
1	L2	9	0.0	0.945	59.9	LOS E	44.8	318.1	1.00	1.12	30.0
2	T1	1367	1.6	0.945	52.8	LOS D	44.8	318.1	0.99	1.11	32.2
3	R2	106	5.0	0.497	55.9	LOS D	5.5	40.1	0.98	0.78	31.0
Approach		1483	1.8	0.945	53.1	LOS D	44.8	318.1	0.99	1.08	32.1
North: Country Drive - N											
4	L2	52	8.2	0.107	25.0	LOS B	1.5	11.3	0.78	0.72	41.5
5	T1	104	0.0	0.343	46.3	LOS D	5.0	35.3	0.94	0.75	32.4
6	R2	539	1.4	0.939	76.2	LOS F	18.0	127.3	1.00	1.06	26.5
Approach		695	1.7	0.939	67.9	LOS E	18.0	127.3	0.97	0.99	28.0
West: Castle Hill Road - W											
7	L2	674	1.4	0.819	22.7	LOS B	23.5	166.5	0.64	0.81	42.8
8	T1	771	2.9	0.532	22.2	LOS B	14.2	101.5	0.66	0.57	44.1
9	R2	318	1.3	0.920	60.0	LOS E	16.6	117.5	1.00	1.06	28.6
Approach		1762	2.0	0.920	29.2	LOS C	23.5	166.5	0.71	0.75	39.8
All Vehicles		4504	1.9	0.955	48.5	LOS D	44.8	318.1	0.88	0.94	32.9

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	25.2	LOS C	0.1	0.1	0.68	0.68
P1	East Full Crossing	53	48.8	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	30.2	LOS D	0.1	0.1	0.74	0.74
All Pedestrians		158	34.7	LOS D			0.79	0.79

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.

PHASING SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - PM - Scenario 2]

Existing conditions
Sign-Fixed Time Coordinated Cycle Time - Minimum 109 Seconds (Coordinated)
Variable Sequence Analysis applied. The results are gi

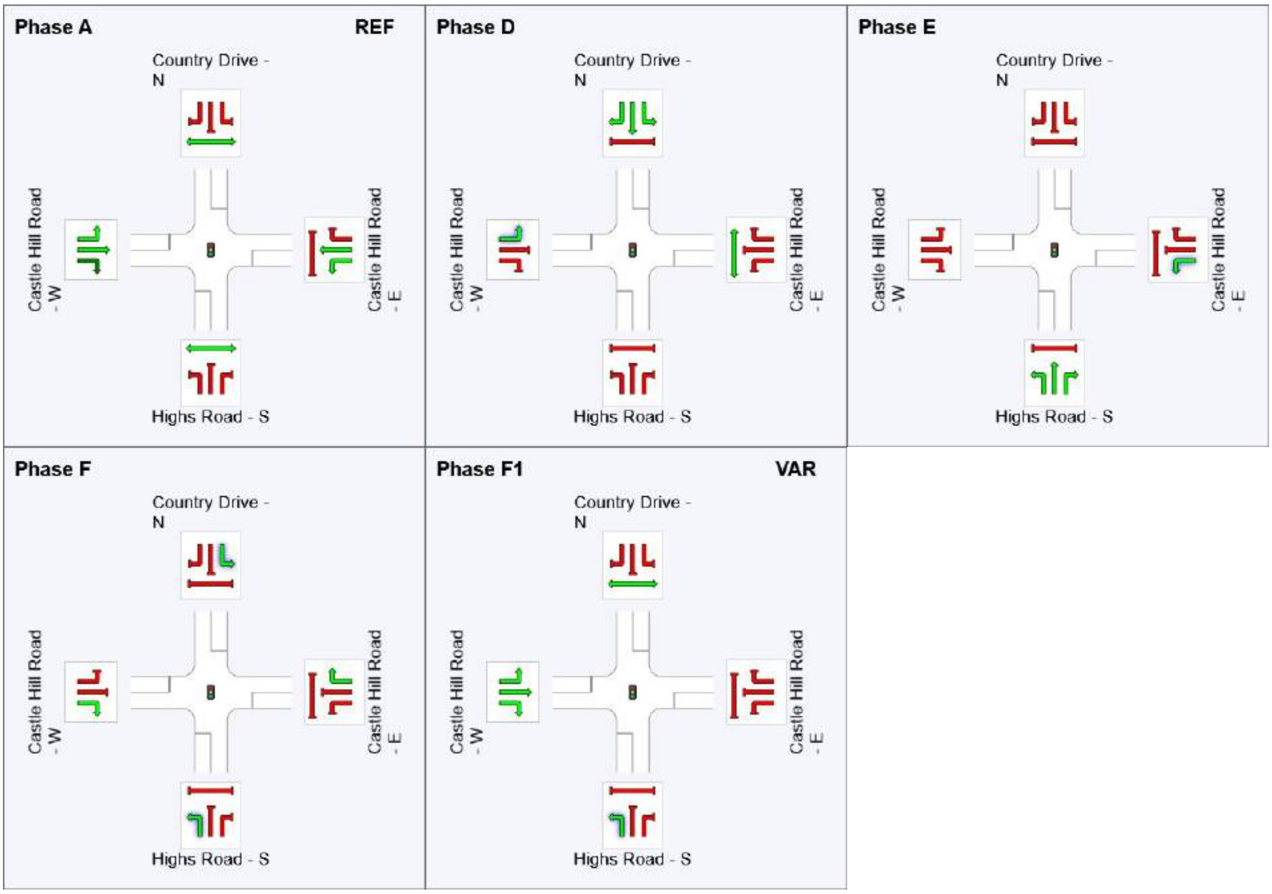
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, D, E, F, F1*
(* Variable Phase)

Phase Timing Results

Phase	A	D	E	F	F1
Phase Change	0	48	71	87	106
Green Time (s	42	17	10	13	***
Phase Time (s	48	23	16	19	3
Phase Split	44 %	21 %	15 %	17 %	3 %

See the Phase Information section in the Detailed Output report f
including input values for Yellow Time and All-Red Time and on any adjustments t
Intergreen Time, Phase Time and Green Time values in cases of Pede
and Phase Frequency values specified (user input) less than 100%.

*** No green time has been calculated for this phase because the nex
This occurs with overlap phasing where there is no single movemen
where the only such movement is a dummy movement with zero minimu
If a green time is required for this phase, specify a dummy movem



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass

	Stopped Movement		Turn On Red
	Other Movement Clas		Undetected Movement
	Mixed Running & St		Continuous Movement
	Other Movement Clas		Phase Transition Ap

MOVEMENT SUMMARY

Site: 1 [91. Highs Road / Castle Hill Road/Country Drive]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 112 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performances: Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	401	2.9	0.949	73.9	LOS F	27.8	199.7	0.98	1.08	25.6
11	T1	154	0.7	0.925	70.9	LOS F	10.5	73.6	1.00	1.09	26.8
12	R2	6	0.0	0.925	75.5	LOS F	10.5	73.6	1.00	1.09	26.2
Approach		561	2.3	0.949	73.1	LOS F	27.8	199.7	0.99	1.08	25.9
East: Castle Hill Road - E											
1	L2	9	0.0	0.929	55.4	LOS D	43.5	308.8	1.00	1.08	31.2
2	T1	1367	1.6	0.929	48.3	LOS D	43.5	308.8	0.98	1.06	33.6
3	R2	106	5.0	0.289	27.0	LOS B	2.6	19.3	0.88	0.76	41.0
Approach		1483	1.8	0.929	46.8	LOS D	43.5	308.8	0.97	1.03	34.0
North: Country Drive - N											
4	L2	52	8.2	0.072	17.7	LOS B	1.1	8.5	0.63	0.70	45.3
5	T1	104	0.0	0.352	48.0	LOS D	5.2	36.5	0.94	0.75	31.9
6	R2	539	1.4	0.965	86.0	LOS F	19.5	138.1	1.00	1.10	24.8
Approach		695	1.7	0.965	75.2	LOS F	19.5	138.1	0.96	1.02	26.6
West: Castle Hill Road - W											
7	L2	674	1.4	0.940	49.5	LOS D	35.5	251.2	0.95	1.00	32.6
8	T1	771	2.9	0.727	39.1	LOS C	18.9	135.2	0.90	0.79	36.7
9	R2	305	1.4	0.752	29.3	LOS C	11.5	81.7	0.83	0.84	37.7
Approach		1749	2.0	0.940	41.4	LOS C	35.5	251.2	0.91	0.88	35.1
All Vehicles		4488	1.9	0.965	52.4	LOS D	43.5	308.8	0.95	0.98	31.8

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

Movement Performances: Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	25.2	LOS C	0.1	0.1	0.67	0.67
P1	East Full Crossing	53	50.3	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	42.1	LOS E	0.1	0.1	0.87	0.87
All Pedestrians		158	39.2	LOS D			0.83	0.83

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

PHASING SUMMARY

Site: 1 [91. Highs Road / Castle Hill Site Road/ Country Drive]

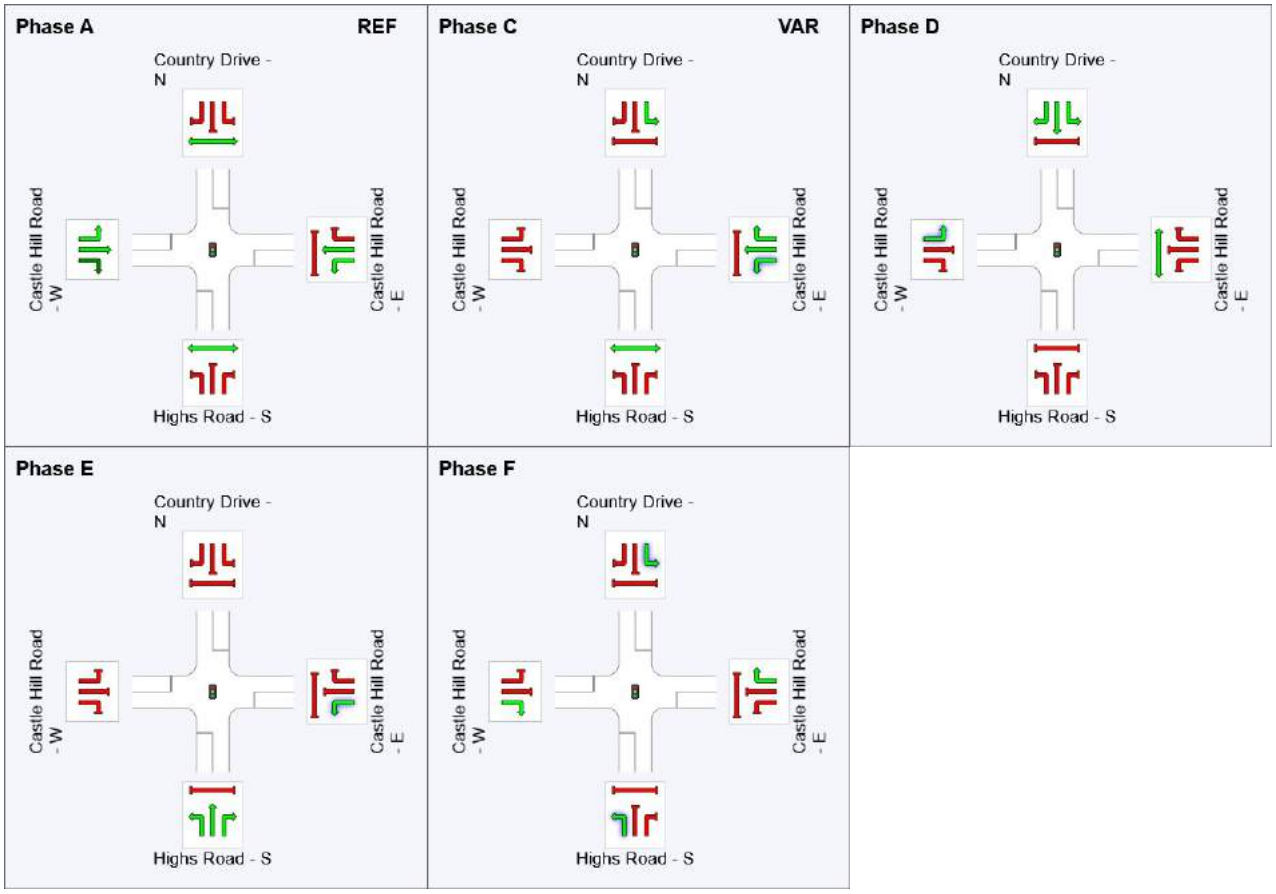
Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 112 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, C*, D, E, F
(* Variable Phase)

Phase Timing Results

Phase	A	C	D	E	F
Phase Change Time (sec)	0	38	50	73	89
Green Time (sec)	32	6	17	10	17
Phase Time (sec)	38	12	23	16	23
Phase Split	34%	11%	21%	14%	21%

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

Other Movement Class (MC) Stopped

Phase Transition Applied

MOVEMENT SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - PM]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Highs Road - S											
10	L2	396	2.9	0.947	72.7	LOS F	27.0	193.6	0.98	1.08	25.8
11	T1	154	0.7	0.908	67.2	LOS E	10.1	70.8	1.00	1.07	27.5
12	R2	6	0.0	0.908	71.7	LOS F	10.1	70.8	1.00	1.07	27.0
Approach		556	2.3	0.947	71.2	LOS F	27.0	193.6	0.99	1.08	26.3
East: Castle Hill Road - E											
1	L2	9	0.0	0.933	56.1	LOS D	43.4	307.7	1.00	1.09	31.0
2	T1	1367	1.6	0.933	48.9	LOS D	43.4	307.7	0.98	1.07	33.4
3	R2	106	5.0	0.593	59.3	LOS E	5.7	41.9	1.00	0.80	30.2
Approach		1483	1.8	0.933	49.7	LOS D	43.4	307.7	0.98	1.05	33.1
North: Country Drive - N											
4	L2	52	8.2	0.115	26.7	LOS B	1.6	11.9	0.80	0.72	40.8
5	T1	104	0.0	0.346	46.8	LOS D	5.1	35.7	0.94	0.75	32.2
6	R2	539	1.4	0.948	79.1	LOS F	18.5	130.7	1.00	1.08	26.0
Approach		695	1.7	0.948	70.4	LOS E	18.5	130.7	0.98	1.00	27.5
West: Castle Hill Road - W											
7	L2	674	1.4	0.795	19.0	LOS B	21.1	149.2	0.61	0.78	44.8
8	T1	771	2.9	0.461	19.9	LOS B	11.7	84.1	0.61	0.53	45.3
9	R2	283	1.5	0.823	46.2	LOS D	12.1	85.5	1.00	0.97	32.1
Approach		1727	2.1	0.823	23.9	LOS B	21.1	149.2	0.67	0.70	42.3
All Vehicles		4461	2.0	0.948	45.6	LOS D	43.4	307.7	0.86	0.91	33.8

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P4	South Full Crossing	53	24.9	LOS C	0.1	0.1	0.67	0.67
P1	East Full Crossing	53	49.3	LOS E	0.2	0.2	0.95	0.95
P2	North Full Crossing	53	28.4	LOS C	0.1	0.1	0.72	0.72
All Pedestrians		158	34.2	LOS D			0.78	0.78

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.

PHASING SUMMARY

Site: 2719 [1. Highs Road/ Castle Hill Road/ Country Drive - PM]

Existing conditions
Signals - Fixed Time Coordinated Cycle Time = 110 seconds (Minimum Delay)
Variable Sequence Analysis applied. The results are gi

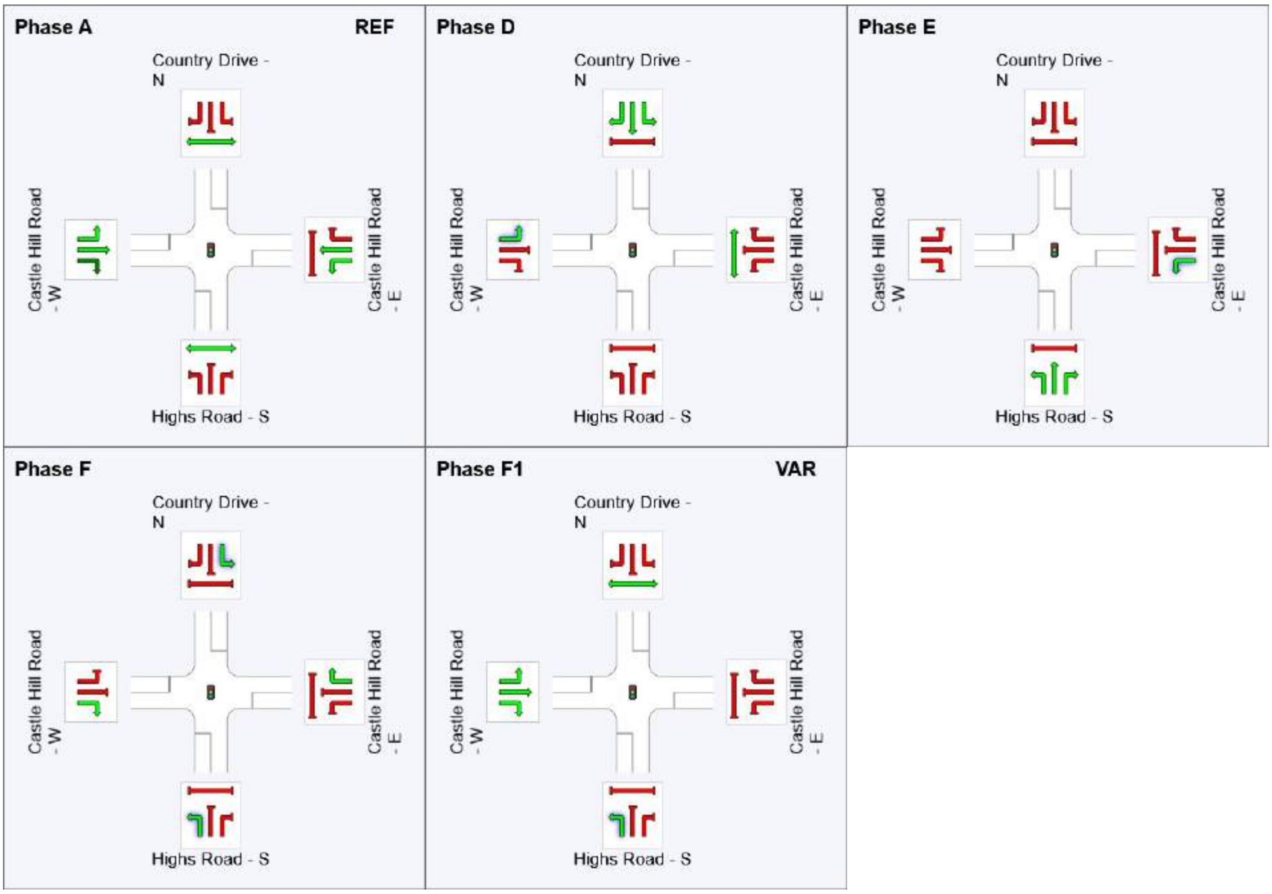
Phase Times determined by the program
Phase Sequence: Variable Phasing
Reference Phase: Phase A
Input Phase Sequence: A, B*, C*, D, E, F, F1*, F2*
Output Phase Sequence: A, D, E, F, F1*
(* Variable Phase)

Phase Timing Results

Phase	A	D	E	F	F1
Phase Change	0	49	72	88	105
Green Time (s	43	17	10	11	***
Phase Time (s	49	23	16	17	5
Phase Split	45%	21%	15%	15%	5%

See the Phase Information section in the Detailed Output report f
including input values of Yellow Time and All-Red Time and information on any adjustments t
Intergreen Time, Phase Time and Green Time values in cases of Pede
and Phase Frequency values (user-specified) less than 100%.

*** No green time has been calculated for this phase because the nex
This occurs with overlap phasing where there is no single movemen
where the only such movement is a dummy movement with zero minimu
If a green time is required for this phase, specify a dummy movem



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass

Stopped Movement	Turn On Red
Other Movement Clas	Undetected Movement
Mixed Running & St	Continuous Movement
Other Movement Clas	Phase Transition Ap

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Attachment 2

Table 1: Intersection Performance Summary

Intersection	Peak Period	2018 Survey		Full Commercial (Base Case)		Planning Proposal (Project Case)		Relative Change
		Delay	LoS	Delay	LoS	Delay	LoS	From Full Commercial
Castle Hill Rd / Coonara Ave	AM	49.1	D	47.5	D	45.8	D	-1.7
	PM	42.7	D	78.2	F	43.2	D	-35

NOTE: The above *Project Case* assumes:

- Trip generation rates:
  - 0.6 trips per townhouse

    (This is based on the review of the GTGD Update survey data for the Westleigh site, as more realistic estimate of future traffic generation rate in contrast to the overly conservative rate of 0.95-0.99 trips / dwelling adopted by the previous ARC report.)
- Apartment dwellings:
  - Based on Council High Density Trip Generation Rates
  - 0.35 peak hour trips per one or two-bedroom dwelling
  - 0.5 peak hour trips per three-bedroom / four-bedroom dwelling

Trip distribution has been assigned based on review of 2011 JTW data:

- Commercial:
  - 35.0% - Castle Hill Rd W
  - 13.9% - Oakes Rd S
  - 49.9% - Castle Hill Rd E
- Residential:
  - 24.2% - Castle Hill Rd W
  - 25.9% - Oakes Rd S
  - 49.9% - Castle Hill Rd E

Attachment 3

Table 2: Link Volume Comparison

Scenario	Period	Site Generation			Link flow - Coonara Ave North		Link flow - Coonara Ave South	
		In	Out	Total	N	S	N	S
Existing (2018 Survey)	AM	256	30	286	240	432	269	239
	PM	71	373	444	500	290	207	296
Base Case - Full Commercial	AM	768	192	960	382	890	323	259
	PM	192	768	960	864	388	230	327
Project Case - Planning Proposal (Low Density Rates)	AM	54	215	269	376	269	230	288
	PM	215	54	269	243	382	259	234
Project Case - Planning Proposal (Medium Density Rates)	AM	41	162	203	337	259	227	274
	PM	169	42	211	234	348	247	231
Relative Change (from Base Case)								
Project Case - Planning Proposal (Low Density Rates)	AM	-714	23	-691	-6	-621	-93	29
	PM	23	-714	-691	-621	-6	29	-93
Project Case - Planning Proposal (Medium Density Rates)	AM	-727	-30	-757	-45	-631	-96	15
	PM	-23	-726	-749	-630	-40	17	-96

Attachment 3

Ref:	RMS Comment	Ason Group Response
A	***Traffic Study***	
A1	*Roads and Maritime is of the view that any future traffic and transport study provided should be expanded to consider ultimate development plus 10 years background traffic (e.g. model key intersection(s) at 2031) and identify an equitable contribution for the provision regional infrastructure to support Precinct growth.*	As discussed above, the proposal actually reduced the traffic generated by the site and, accordingly, does not warrant extensive model of potential future scenarios, or contribution toward precinct infrastructure — for which there is no nexus associated with the subject proposal. Furthermore, and in light of the above, Council has already agreed to provision of open space (including synthetic sports field) and dedication of the perimeter road as a public road is sufficient contribution towards regional infrastructure.
A2	*Any future traffic studies should identify the impacts of an increase in pedestrian activity as a result of development in the area. The study should identify the pedestrian desire lines to the Cherrybrook Station - North West Rail Link in particular the impacts at the Castle Hill Road and Coonara Avenue intersection. The study should determine if there is a need to provide a direct pedestrian link across Castle Hill Road.*	An assessment of active and public transport mode share was provided in the response to TfNSW, dated July 2019, and is discussed further above. In this regard, it is our view that additional crossing points are not required to aid these desire lines to key destinations (Metro Station at Cherrybrook) or Coonara Shopping Village. Furthermore, the demand for bus services is expected to be moderate only and not, in isolation, necessitate improvements to bus facilities or connectivity thereto.
B	***SIDRA Modelling Report Ason Group report dated 1 August 2018 — TCS 2575***	As a general note, RMS comments are based on what is now an outdated report, dated 1 August 2018, and associated SIDRA modelling. That modelling was a revisited version of the historic modelling files provided by ARC Traffic + Transport (the former traffic consultants on the project) which has subsequently been superseded by subsequent traffic assessments by Ason Group — namely the memorandum dated 15 January 2019 (Ref: *0442l08v1 RMS Memorandum in relation to GTA Review_55 Coonara Ave, West Pennant Hills*)

Ref:	RMS Comment	Ason Group Response
B1	*The report quotes "Obtained intersection signal phase timing data (SCATS history files) from RMS", however the signal setting in SIDRA is not compatible with the SCATS.*	The original August 2018 modelling — based on the original 2015 work by other — had some discrepancies which were subsequently addressed as part of the updated SIDRA modelling. Ason Group has conducted traffic count surveys at Castle Hill Rd / Coonara Ave / Edward Bennet Dr on 31 October 2018 and obtained relevant signal timing (SCATS) data. Signal settings in the revised SIDRA models have been developed using the SCATS data provided by RMS and then then verified by review of survey videos and on-site inspections.
B2	*The exact date of the traffic survey has not been supplied in this report and therefore cannot be verified. However, analysis was undertaken of the SIDRA volumes against the SCATS output files 2018 for the intersection of Coonara Avenue and Castle Hill Road. Based on this data it is noted that the traffic volumes used to model the existing scenario are lower than the traffic counts from SCATS. It is further noted that Google typical PM peak queues show a high level of queuing in Coonara Avenue and Google Live traffic queuing in PM peak period in all directions. This queuing is different to what the base model supplied by the proponent. The justification is located in Tab B.*	As discussed above, the original modelling (upon which RMS comments are based) relied upon 18 November 2015 traffic surveys. More recent traffic count surveys were conducted on 31 October 2018. Additionally, site visits during both morning and evening have been undertaken for the purpose of queue length calibration. It is noted that the updated surveys are more consistent with the 2018 SCATS volumes noted by RMS.
B3	*As Roads and Maritime does not have details of the proposed zoning and FSR controls it cannot be confirmed whether the trip generation assumptions are appropriate. However, based on the analysis of the SIDRA output files it is noted that there is an additional 189 veh/hr (392-202) in the AM peak period in the modelling scenario. These additional volumes are lower than what Council's Planning Proposal report received by Roads and Maritime in December 2017 indicated. See justification located in Tab C.*	Adopted traffic generation rates are outlined in the Ason Group memo, dated 15 January 2019. These rates were agreed with Council during early stages of the assessment.
B4	*The signal phasing under AM proposed scenario shows conflicting vehicle movements with pedestrian movements. It is necessary to revise the proposed scenario phasing system. The revision should separate vehicles from pedestrian movements when filtering is not possible.*	As mentioned above, the signal setting in the revised SIDRA models has been updated and validated with the SCATS data, survey videos and on-site investigations.

Ref:	RMS Comment	Ason Group Response
B5	*Higher pedestrian numbers should be utilised in the AM and PM peak period together with allowance for adequate red arrow pedestrian protection during peak periods for the model to accurately reflect the site conditions and how the TCS would operate.*	Pedestrian volumes, whilst not included within the surveys, have been checked from review of the survey videos and on-site investigation. The survey videos indicate low pedestrian activity at the surveyed intersections during both morning and evening peak periods; however, for conservative assessment, the revised SIDRA model included 50 pedestrians per hour on all approaches (as default in SIDRA). It is acknowledged that pedestrian movements could increase in the future, upon completion of the Metro. However, the increase in pedestrian movements solely related to the subject site will be moderate and unlikely to materially impact the modelled signal performance — noting that the existing base case model adopted conservatively high pedestrian movement volumes in the first place.
B6	*Peak Hour Factors are used inconsistently in SIDRA model. Vehicles and most of pedestrian movements have a factor of 100%. The south approach pedestrian volume has a factor of 95%.*	This has been updated in subsequent models. A Peak Hour Factor of 95% (as default in SIDRA) has been applied for vehicles and pedestrian movements under all scenarios in the revised SIDRA models.
B7	*It is not clear whether pedestrian volume / percentage of heavy vehicles are surveyed.*	The updated traffic count survey undertaken on 31 October 2018 — adopted in the revised SIDRA model — included separate Light Vehicle and Heavy Vehicle counts. Pedestrian counts were not included, however numerous on-site investigations indicate that levels of pedestrian activity at the time of the surveys was low. As such, for conservative assessment, the revised SIDRA model includes 50 pedestrians per hour at all directions (as default in SIDRA).