TRAFFIC IMPACT ASSESSMENT

INDUSTRIAL SUBDIVISION

PART LOT 1131 IN DP 1057179
JOHN RENSHAW DRIVE, BLACK HILL

PREPARED FOR: BROADEN MANAGEMENT PTY LTD

AUGUST 2018

18/048

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LOT 1131 IN DP 1057179
JOHN RENSHAW DRIVE, BLACK HILL

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QUALITY ASSURANCE

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

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1.0 INTRODUCTION

Intersect Traffic Pty Ltd (Intersect) has been engaged by Barr Property and Planning on behalf Broaden Management Pty Ltd to undertake a traffic impact assessment for the proposed industrial subdivision of part Lot 1131 in DP 1057179 – John Renshaw Drive, Black Hill creating a total of 38 large industrial lots ranging in size from 1.8 ha to 6.3 ha, 1 environmental conservation lot and 1 lot to be dedicated to Ausgrid for the purpose of a zone substation. The site is located within the Cessnock Local Government Area (Cessnock LGA) and adjoins another proposed industrial subdivision to the east within the Newcastle Local Government Area (Newcastle LGA) that is being developed in partnership by The Stevens Group and Hunter Land. These lands are the subject of a concept masterplan approval which shows two subdivision accesses to John Renshaw Drive being a shared access at the shared boundary of the two sites (eastern access) and a further access within the subject site opposite the existing Donaldson Mine Access intersection (western access). This assessment is based on this concept masterplan approval.

Access to the lots will be via six (6) new public roads constructed to Cessnock City Council requirements with four (4) cul-des-sac heads. The proposed subdivision plan is shown in ***Attachment A***. The subdivision is to be staged over 6 separate stages with the eastern access constructed as a signalised intersection wholly within the subject land within Stage 1. The access is proposed to be constructed adjacent to the common boundary of the adjoining Coal and Allied Lands development, with an easement in favour of the adjoining land providing a suitable access for this development. A concept design for this intersection is also shown in ***Attachment B.***

This report is required to support an Environmental Impact Assessment and Statement to Cessnock City Council seeking approval from the Hunter Region Joint Regional Planning Panel.

This report presents the findings of the traffic impact assessment and includes the following;

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

In undertaking this assessment reference is made to the SEARS issued by the Department of Planning & Environment (***Attachment C***), RTA's Guide to Traffic Generating Developments (2002), Cessnock City Council's DCP (2010), Austroads Guide to Road Design – Part 4A – Signalised and Unsignalised Intersections and the Black Hill Planning Proposal – Traffic and Transport Report (Hyder September 2013).

In addressing the SEARS issued by the Department on 28th May 2018 the following advice regarding the location within the report where these issues are addressed is provided below;

- Traffic access routes are identified in ***Section 3.***
- Construction traffic is addressed in ***Section 12.5***.
- Traffic generation and distribution are considered in ***Sections 9 & 10***.
- Adjoining development is considered in ***Section 11***.
- Traffic impacts are considered in ***Section 12*** including cumulative impacts of adjoining development with SIDRA Intersection modelling of the key intersections including the proposed access intersections off John Renshaw Drive.
- Cessnock City Council DCP compliance is considered in ***Section 12.4***; and
- Alternative Transport Modes are considered in ***Sections 13 and 14***.

2.0 SITE DESCRIPTION

The subject site is located between John Renshaw Drive and Black Hill Road at Black Hill approximately 2.6 km south-west of the M1 Pacific Motorway and the Beresfield Industrial area, 7.3 km's east of the M15 Hunter Expressway,11 km's south-east of the Maitland CBD and 18 km's north-west of the Port of Newcastle. The site has frontage to John Renshaw Drive and all vehicular access will be via two access intersections to John Renshaw Drive. The site is vacant land and located adjacent to the Donaldson Coal Mine, the Beresfield Industrial area and the Black Hill rural residential area. The subject site is shown in ***Figure 1***.

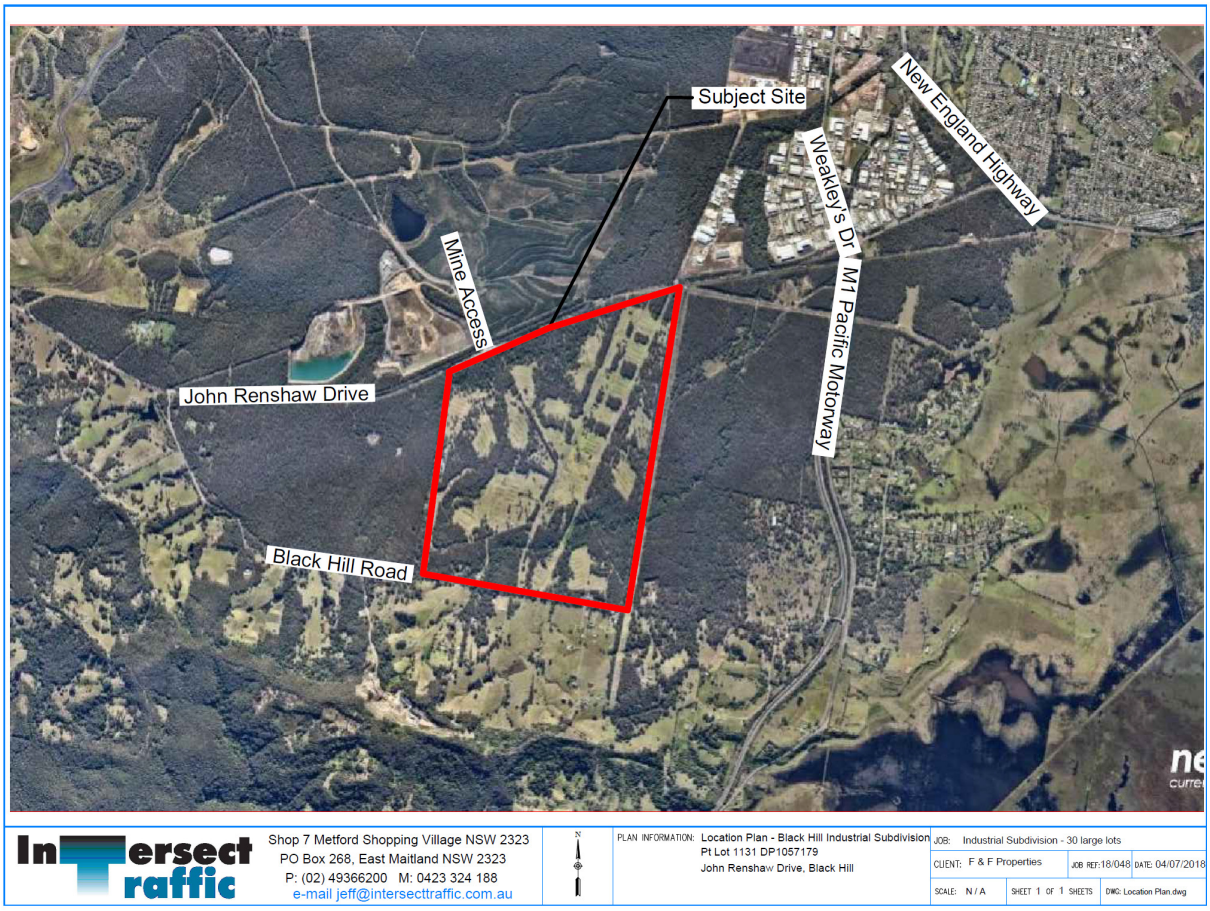


Figure 1 – Site Location

The site has the following property descriptors;

- Titled Part Lot 1131 in DP 105 7179;
- Addressed as John Renshaw Drive Black Hill;
- Area of 2.98 km^2; and
- Zoned E2 – Environmental Conservation & IN2 – Light Industrial.

Photograph 1 below shows the existing conditions at the site near the eastern access while ***Photograph 2*** shows the location of the western access opposite the Donaldson Mine Access Road.

Photograph 1 – Development site – near eastern access intersection

Photograph 2 – Western access location opposite Donaldson Mine access.

3.0 EXISTING ROAD NETWORK

The main travel routes to the site will be via John Renshaw Drive to the M1 Motorway, Weakley's Drive, New England Highway and M15 Hunter Expressway. The main origin / destinations are Newcastle, including the Port, Central Coast, Sydney, Maitland and the Hunter Valley as well as Tomago and the North Coast. The main traffic routes to the site are shown in ***Figure 2*** below.

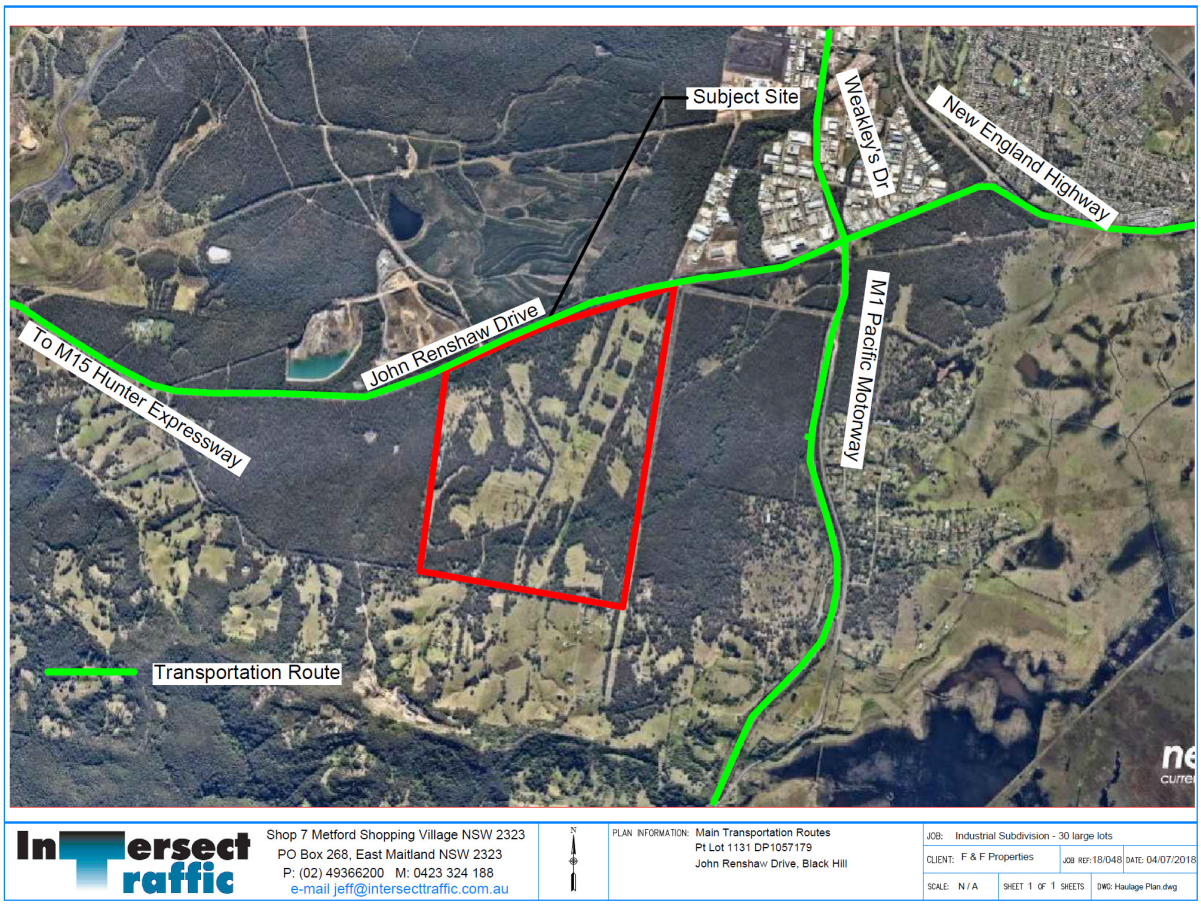


Figure 2 – Main Transportation Routes

3.1 M1 Pacific Motorway

The M1 Pacific Motorway, near the site, is a classified Motorway under the care and control of NSW Roads and Maritime Services (NSW RMS). It forms part of the north-south movements around the site providing access to the Central Coast and Sydney and is an important link in the the NSW arterial road (highway) network. Near the site the M1 Pacific Motorway is a two-way four lane road constructed to a high standard with separate carriageways and a wide vegetated median. Lane widths are in excess of 3.5 metres and wide sealed shoulders are provided. A 110 km/h speed limit exists on the road except as the Motorway approaches the John Renshaw Drive / Weakley's Drive intersection where 80 km/h and 60 km/h speed zones also exist. At the time of inspection, the M1 Motorway was observed to be in excellent condition.

3.2 M15 Hunter Expressway

The M15 Hunter Expressway, near the site, is a classified Motorway under the care and control of NSW RMS. It forms part of the east-west movements around the site providing access to the M1 Pacific Motorway, lower Hunter Valley areas, Golden Highway and New England Highway at Branxton. It is an important link in the NSW arterial road (highway) network. Near the site the M15 Hunter Expressway is a two-way four lane road constructed to a high standard with separate

carriageways and a wide vegetated median. Lane widths are in excess of 3.5 metres and wide sealed shoulders are provided. A 110 km/h speed limit exists on the road. At the time of inspection, the M15 Hunter Expressway was observed to be in excellent condition.

3.3 New England Highway

The New England Highway is a classified state highway (SH9) under the care and control NSW RMS and as such is an important link in the NSW arterial road (highway) network. It connects Newcastle at Hexham (Pacific Highway) to the upper Hunter Valley and New England areas through to the Queensland border. It will be the main route for vehicles with an origin / destination to Newcastle Harbour and the inner Newcastle industrial areas.

Generally, a 90 km/h speed limit applies to this section of road though during school holiday periods this is reduced to 70 km/h and is constructed to a high standard four lane two-way road with separate carriageways separated by either a wide vegetated median or raised concrete median. Lane widths are in excess of 3.5 metres and wide sealed shoulders are provided. At the time of inspection, the New England Highway was observed to be in excellent condition.

3.4 Weakley's Drive

From John Renshaw Drive to the New England Highway is a branch of state highway 9 (New England Highway) therefore is under the care and control of NSW RMS. It is an important link within the NSW arterial road network as it connects the M1 Pacific Motorway to the New England Highway at Thornton.

Near the site it is generally a two-way two-lane road though widens to a two-way four lane road near a number of roundabouts on its length and at the New England Highway connection. Lane widths are approximately 3.5 metres and wide sealed shoulders are provided. At the time of inspection, a 60 km/h speed zone was in force on the road and Weakley's Drive was observed to be in excellent condition.

3.5 John Renshaw Drive

John Renshaw Drive is a classified state road (MR588) and is a sub-arterial road linking Newcastle from the New England Highway at Beresfield to Kurri Kurri and Cessnock. As a classified state road, the road is under the care and control of NSW RMS. It is the connection to both the M1 Pacific Motorway and the M15 Hunter Expressway for traffic generated by the site. John Renshaw Drive is a two-lane two-way rural sealed road and a 100 km/h speed zone exists along the frontage of the site. Lane widths are of the order of 3.5 metres and wide sealed shoulders are provided. At the time of inspection John Renshaw Drive was observed to be in good condition as shown in ***Photograph 3*** below. Currently John Renshaw Drive connects to the M1 Pacific Motorway as a four-leg roundabout with Weakley's Drive at Beresfield however works are currently underway to convert this intersection to a signalised intersection as shown in ***Photograph 4*** below. Connection to the M15 Hunter Expressway from John Renshaw Drive is via on and off ramps and a grade separated intersection at Buchanan.

Photograph 4 – John Renshaw Drive near proposed eastern access.

Photograph 5- John Renshaw Drive / M1 Pacific Motorway / Weakley's Drive intersection

4.0 ROAD NETWORK IMPROVEMENTS

The major road network improvements occurring in the area that will impact on the capacity of the road network are;

- The conversion of the John Renshaw Drive / M1 Pacific Motorway / Weakley's Drive intersection from a roundabout to a signalised intersection; and
- M1 Pacific Motorway extension to Raymond Terrace.

The conversion of the John Renshaw Drive / M1 Pacific Motorway / Weakley's Drive intersection from a roundabout to a signalised this intersection is currently underway and the most recent information available on the NSW RMS major projects website is that completion is due at the end of 2019. Therefore, this assessment will assume a signalised intersection is in place. ***Figure 3*** below shows the concept intersection design and the scope of works involved in this upgrade.

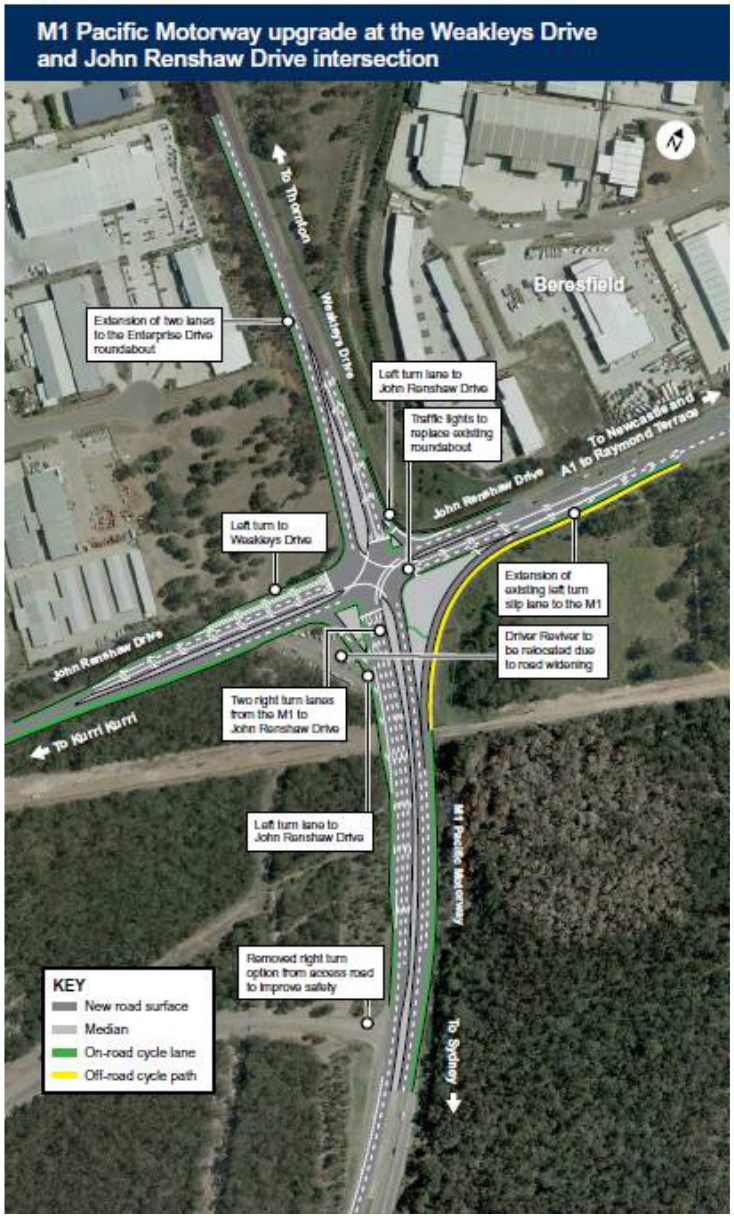


Figure 3 – Upgrade works - M1 Pacific Motorway / John Renshaw Drive /Weakley's Drive intersection.

The M1 Pacific Motorway extension to Raymond Terrace is still in the planning stage with a preferred route chosen and community consultation recently being undertaken. The results of the community consultation are currently being collated and NSW RMS have requested the issues of SEARS from the Department of Planning and Environment. The proposed latest route is shown below in ***Figure 4***. This project will reduce traffic volumes on the John Renshaw Drive / M1 Pacific Motorway / Weakley's Drive intersection and increase the spare capacity within the local and state road network adjacent to the site.

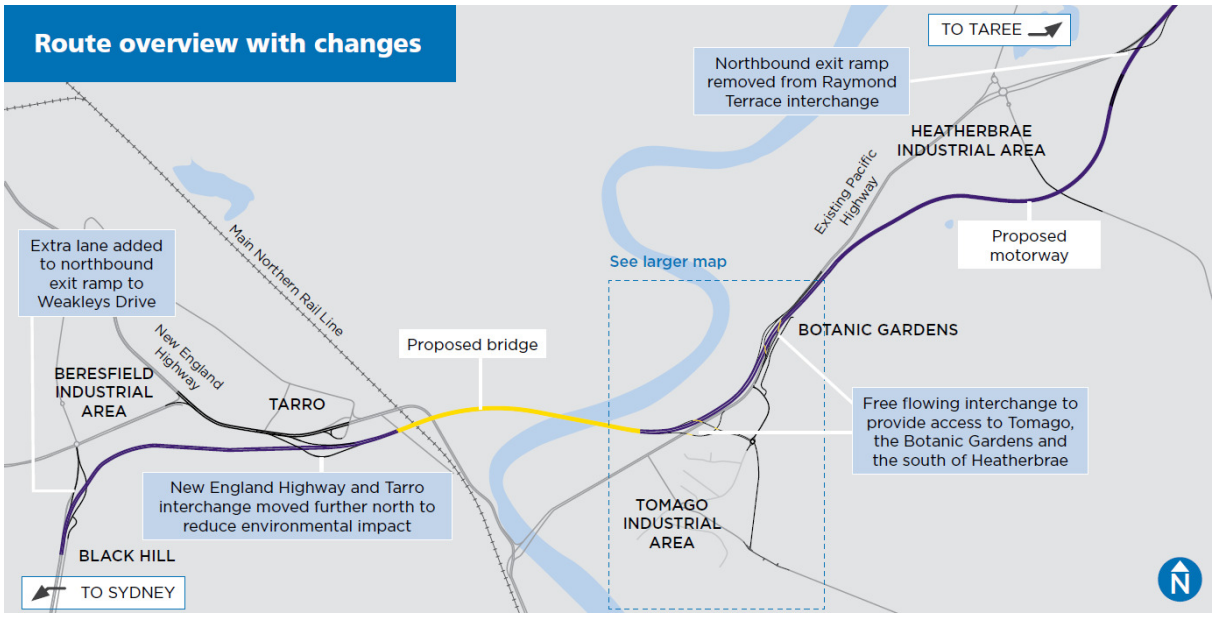


Figure 4 –M1 Pacific Motorway extension to Raymond Terrace – Concept Design.

5.0 TRAFFIC VOLUMES

As part of this assessment, Intersect Traffic engaged Northern Transport Planning and Engineering to undertake a traffic classifier count on John Renshaw Drive along the site frontage from 18/06/18 to 26/06/18. Further NSW RMS commissioned TTM to undertake manual intersection counts at the M1 Pacific Motorway / John Renshaw Drive / Weakley's Drive roundabout prior to the upgrading works commencing (Wednesday 10th October 2017). This recent traffic data has been used in this assessment and is provided within ***Attachment D.***

The TTM count identified the peak operating periods at the roundabout as 7.45 am to 8.45 am and 4.30 pm to 5.30 pm. This is likely to coincide with the peak traffic generation periods for the development. The two-way mid-block traffic volumes determined from this intersection count are as shown below in ***Table 1***. These have been adopted in this assessment. Note future 2028 traffic volumes without development have been estimated from these counts using a 1.6 % per annum background traffic growth which was determined as the historical background growth on John Renshaw Drive within the *Traffic and Transport Report for the Black Hill Planning Proposal (Hyder 2013)*.

Table 1 – Existing and predicted 2028 peak hour traffic volumes

Road	Section	2018		2028	
		AM (vtph)	PM (vtph)	AM (vtph)	PM (vtph)
John Renshaw Drive	west of Weakley's Drive	899	1069	1054	1253
John Renshaw Drive	east of Weakley's Drive	2187	2602	2563	3050
John Renshaw Drive	at Development Site	1023	1173	1199	1375
Weakley's Drive	north of John Renshaw Drive	1757	1505	2059	1764
M1 Pacific Motorway	south of John Renshaw Drive	2583	2918	3027	3420

6.0 ROAD CAPACITY

The capacity of urban and rural roads is generally determined by the capacity of intersections. However, Tables 4.3, 4.4 and 4.5 of the *RTA's Guide to Traffic Generating Developments* provides some guidance on mid-block capacities for urban and rural roads and likely levels of service. These tables are reproduced below.

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

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

Table 4.4
Urban road peak hour flows per direction

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

Table 4.5
peak hour flow on two-lane rural roads (veh/hr)
(Design speed of 100km/hr)

Terrain	Level of Service	Percent of Heavy Vehicles			
		0	5	10	15
Level	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290
Rolling	B	500	420	360	310
	C	920	760	650	570
	D	1370	1140	970	700
	E	2420	2000	1720	1510
Mountainous	B	340	230	180	150
	C	600	410	320	260
	D	1050	680	500	400
	E	2160	1400	1040	820

The data for Table 4.5 assumes the following criteria:

- *terrain level* with 20% no overtaking.
- *rolling* with 40% no overtaking.
- *mountainous* with 60% no overtaking.
- 3.7 m traffic lane width with side clearances of at least 2m.
- 60/40 directional split of traffic.

Source: - RTA's Guide to Traffic Generating Developments (2002)

In respect of the subject road network the M1 Pacific Motorway, Weakley's Drive and John Renshaw Drive east of Weakley's Drive and east of the western development access are assessed as urban roads while John Renshaw Drive west of the western development access is assessed as a rural road. In regard to John Renshaw Drive east of the western development access it is assessed as an urban road as post development it is likely to be upgraded and an 80 km/h speed zoning applied due to the two signalised access intersections proposed.

A desirable level of service on an urban or rural road is generally considered to be a level of service (LoS) C or better. However, on major roads such as arterial and sub-arterial roads a LoS D is still considered acceptable.

In terms of the urban roads it is noted a LoS E occurs on a single lane of flow when traffic volumes reach 1,400 vtph and on two lanes of single direction flow when traffic volumes reach 2,800 vtph. These represent the capacity threshold for a LoS D. Therefore, the two lane two-way roads will have a capacity of 2,800 vtph and the four lane two-way roads will have a capacity of 5,600 vtph. Therefore, for this assessment the following urban road two-way mid-block capacities have been adopted;

- M1 Pacific Motorway – 5,600 vtph;
- Weakley's Drive north of John Renshaw Drive – 2,800 vtph;
- John Renshaw Drive east of Weakley's Drive 5,600 vtph; and
- John Renshaw Drive east of the proposed western access – 2,800 vtph.

In respect of John Renshaw Drive west of the western access intersection being a rural road, assuming a 100 km/h speed limit, level terrain and 10 % heavy vehicles it is noted a LoS E would exist once two-way traffic volumes reach 2,390 vtph and as such this is considered the capacity threshold for a LoS D. Therefore, for this assessment the following rural road two-way mid-block capacity has been adopted;

- John Renshaw Drive west of Weakley's Drive, including the development frontage - 2,390 vtph

As the existing (2018) and predicted future (2028) peak mid-block traffic volumes without development are less than the two-way mid-block capacities of the existing road network determined above, it is concluded that there is spare capacity within the local and state road network to cater for additional traffic generated by new development.

7.0 ALTERNATIVE TRANSPORT MODES

Public transport in the area is limited and is not accessible to the site. The Rover Coaches 160 and 163 services (Cessnock to Newcastle) which previously ran past the site now head down the M15 Hunter Expressway therefore cannot service the site.

The Hunter Rail Line runs from Newcastle to Scone via Maitland and runs near the site however the nearest railway station at Beresfield is some 4 km's from the site which would not provide any benefit to the site unless a new bus service linking the site to the station was provided.

As a rural area there is no designated pedestrian or cycle network in the vicinity of the site or on John Renshaw Drive itself. Currently pedestrians would be required to utilise the sealed shoulders or grass verges for trip making while cyclists would need to also utilise the sealed shoulders or share the travel lanes with other vehicles. This would only be suited to experienced cyclists.

8.0 DEVELOPMENT PROPOSAL

The proposed development is a large lot industrial subdivision of part Lot 1131 in DP 1057179 – John Renshaw Drive, Black Hill creating a total of 38 large industrial lots ranging in size from 1.8 ha to 6.3 ha, 1 environmental conservation lot and 1 lot to be dedicated to Ausgrid for the purpose of a zone substation. The proposed subdivision plan is shown in ***Attachment A***. The proposal includes two signalised access intersections to John Renshaw Drive as described below;

- Eastern access – At the eastern boundary of the site which will service Stages 1, 2 & 3 of the development as well as the adjoining industrial development proposed by Stevens Group / Hunter Land. A signalised T-intersection as per ***Attachment B*** is proposed.
- Western access – Opposite the existing Donaldson Mine access and constructed as a four-leg signalised intersection as proposed as Option 2 in the *Traffic and Transport Report for the Black Hill Planning Proposal (Hyder 2013)* and shown in ***Attachment B***

Specifically, the development involves the following six stages;

- Stage 1 – 6 Lot subdivision with lot sizes ranging from 1.8 ha to 4.6 ha. Two new public roads and the eastern access to be constructed in this stage. Total lot area = 16.6 ha. Public road connection with right of way to adjoining property also provided within this stage.
- Stage 2 – 8 lot subdivision with lot sizes ranging from 2.3 ha to 8.4 ha. An extension of one of the public roads and a new public road. Total lot area = 29.8 ha.
- Stage 3 - 6 lot subdivision plus Ausgrid lot with lot sizes ranging from 3.1 ha to 6.3 ha. An extension of the public road network is provided in this stage. Total developable lot area = 28.5 ha.
- Stage 4 – 6 lot subdivision with lot sizes ranging from 4.9 ha to 5.1 ha. The western access will be constructed with a new public road access and another public road. Total lot area = 30.1 ha.
- Stage 5 – 6 lot subdivision with lot sizes ranging from 2.9 ha to 5.4 ha. Extension of two public roads and completion of internal road loop. Total lot area = 27.2 ha.
- Stage 6 – 6 lot subdivision with lot sizes ranging from 3.0 ha to 5.7 ha and extension of road network. Total lot area = 28.1 ha.

The subdivision access intersections are to be constructed to NSW RMS requirements while the internal road network (5 new roads) will be constructed to Cessnock City Council requirements. The overall total developable lot area within the subdivision is 160.3 ha.

9.0 TRAFFIC GENERATION

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

In regard to Business Parks and Industrial Estates the latest data for Regional areas contained within TDT 2013/04 is as follows based on a unit of per 100 m² GFA

Daily vehicle trips = Average 7.83 with a range of 3.78 – 11.99.
PM peak (1) hour = 0.78 with a range of 0.39 – 1.3
AM peak (1) hour = 0.70 with a range of 0.32 – 1.2.

As a large lot industrial subdivision, it would be argued that the likely trip generation rates for the development are likely to be at the lower end of the regional range and it is noted that the adopted values within the *Traffic and Transport Report for the Black Hill Planning Proposal (Hyder 2013)* were 0.47 in the AM peak and 0.56 in the PM peak which would equate to a daily rate of approximately 5.6. This report also adopted a GFA for the site as 35 % of the developable area. Again, with large lot subdivision it is likely the GFA will be less than 35 % of the developable area however to be consistent with the Planning Proposal report and to provide a robust assessment of the site these values have again been adopted in this assessment. There would be some scope to reduce the traffic generation if NSW RMS agreed to a lower traffic generation rate given the size of the lots and the likely use of the industrial land for logistic type developments. The likely total and stage traffic generation is therefore as shown in ***Table 2*** below.

Table 2 – Development Traffic Generation

Stage	Total developable area (m^2)	GFA (m^2)	Daily Vehicle Trips (vtpd)	AM Peak Hour Vehicles (vtph)	PM Peak Hour Vehicles (vtph)
1	166000	58100	3254	273	325
2	298000	104300	5841	490	584
3	285000	99750	5586	469	559
4	301000	105350	5900	495	590
5	272000	95200	5331	447	533
6	281000	98350	5508	462	551
Total	**1603000**	**561050**	**31419**	**2637**	**3142**

These values have been adopted in this assessment as the additional daily, AM peak hour and PM peak hour traffic generated by the development.

10.0 TRIP DISTRIBUTION

Before carrying out any traffic assessment the additional peak hour traffic generated by the development needs to be distributed through the adjoining road network. This involves making a number of assumptions as to distribution patterns to and from the development based on likely origin / destinations of trips as determined and shown in ***Figure 2***. Generally, the trip distribution adopted within the *Traffic and Transport Report for the Black Hill Planning Proposal (Hyder 2013)* has been adopted except that with the opening of the M15 Hunter Expressway more traffic has been attracted to and from the John Renshaw Drive (west) direction at the expense of the Weakley's Drive (north) direction. The trip distribution assumptions are therefore as follows;

- Traffic will be distributed as 80 % inbound and 20 % outbound in the AM peak which is mirrored in the PM peak;

- Origin / destinations for traffic accessing the development will be 40 % M1 Pacific Motorway, 25 % M15 Hunter Expressway, 25 % John Renshaw Drive (east) and 10 % Weakley's Drive north.

Based on the assumptions listed above and in **Section 9** the resulting predicted peak hour trip distributions for traffic generated by the development at the relevant intersections are as shown below in ***Figure 5.***

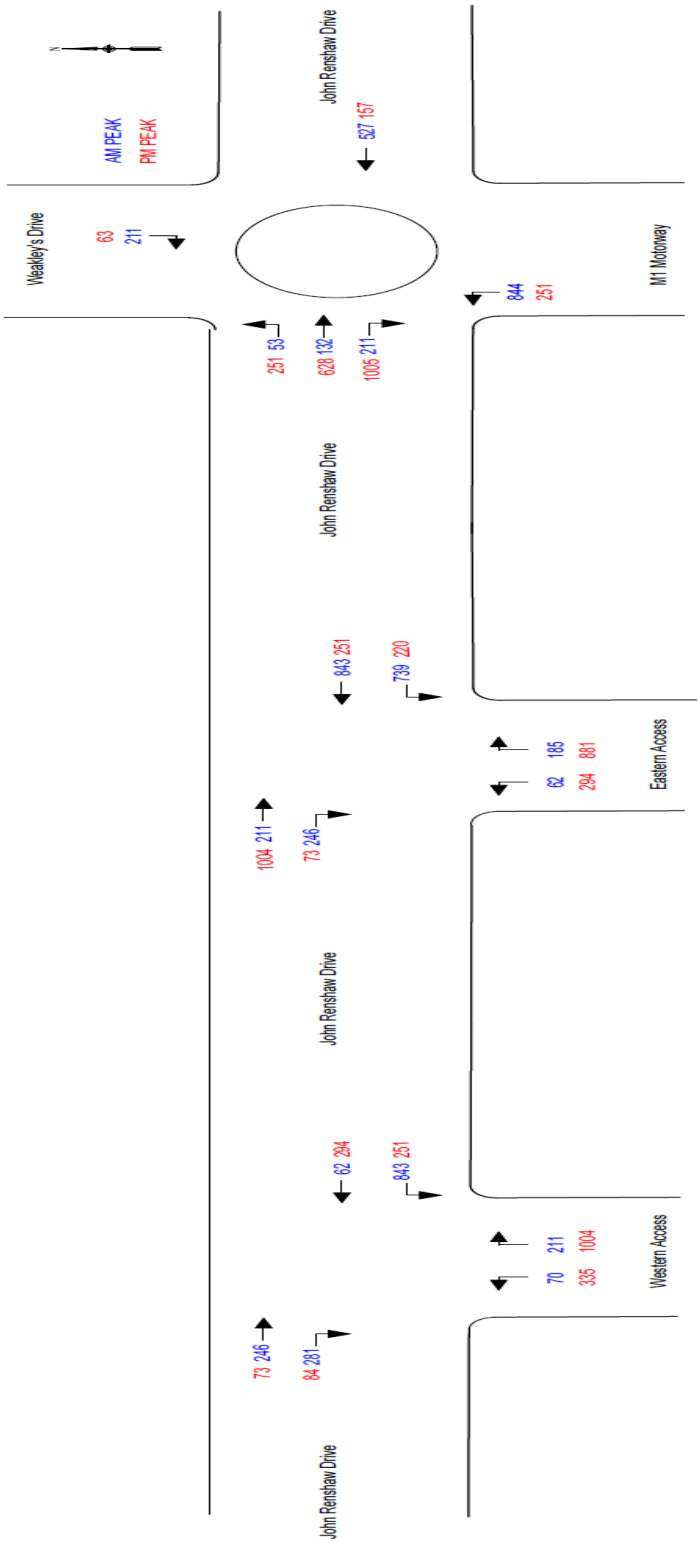


Figure 5 – Development Traffic Trip Distribution

11.0 CUMMULATIVE IMPACTS

In assessing the impact of this development on the road network the cumulative impacts of other known developments need to be considered. In this respect the only known development in the area is the development of a similar Industrial Estate on the adjoining Coal and Allied Lands. This is being undertaken as a joint project by Stevens Group and Hunter Land. From discussions with Newcastle City Council officers and viewing of the Hyder traffic report for the development it has been determined that the Coal and Allied Lands development is expected to generate;

- 2,265 vtph in the AM peak of which 1,812 vtph are inbound trips and 453 vtph are outbound trips.
- 2,589 vtph in the PM peak of which 518 vtph are inbound trips and 2,071 vtph are outbound trips.

Based on the trip distribution adopted in the report this traffic is distributed through the road network as shown in ***Figure 6*** below assuming all traffic utilises the eastern access.

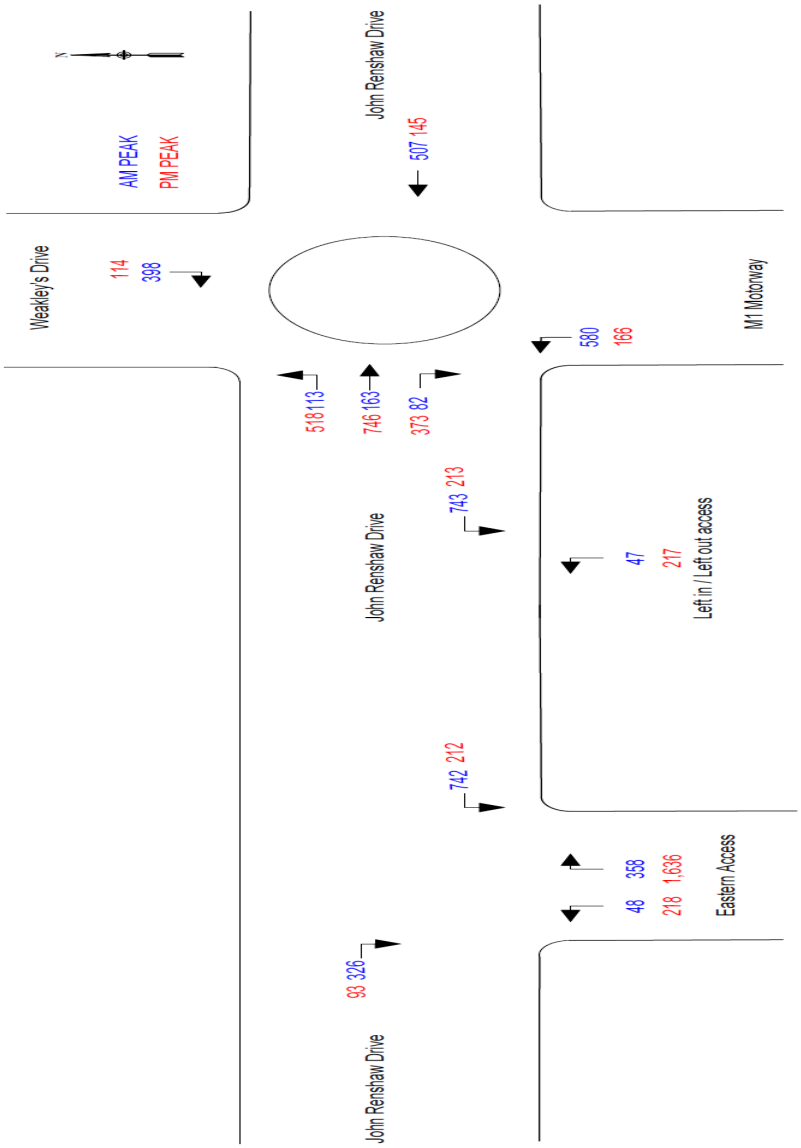


Figure 6 – Coal & Allied Land Development Traffic Trip Distribution

12.0 TRAFFIC IMPACTS OF DEVELOPMENT

The traffic impacts that developments have on the local road network include;

- The impact of the additional traffic generated by the development on the capacity of the road network;
- The road safety issues associated with the proposed access to the development; and
- The parking demand generated by the development.

12.1 Road Network Capacity

The assessment undertaken in ***Section 5*** of this report has determined the likely maximum current and future peak hour two-way traffic volumes for the local and state road network in the critical PM peak are:

- M1 Pacific Motorway - 2018 – 2,918 vtph & 2028 – 3,255 vtph two way;
- John Renshaw Drive east of M1 - 2018 – 2,602 vtph & 2028 – 2,903 vtph;
- John Renshaw Drive west of M1 and east of eastern development access – 2018 – 1,173 vtph & 2028 – 1,309 vtph;
- John Renshaw Drive – between eastern and western access - and
- Weakley's Drive north of M1 – 2018 – 1,757 (AM) vtph & 2028 – 1,960 vtph (AM).

Section 6 of this report determined that the likely 'LoS D' mid-block two-way capacities of the M1 Pacific Motorway and John Renshaw Drive east are 5,600 vtph, for Weakley's Drive north of the M1 Pacific Motorway is 2,800 vtph and for John Renshaw Drive west it is 2,390 vtph. It was also determined that the existing road network is operating within its technical mid-block capacity.

Section 9 of this report determined the proposed likely peak hour vehicle trips generated by the proposed industrial development are 2,637 vtph (AM) and 3,142 vtph (PM), and will be distributed through the local road network as per ***Figure 5***. Further the adjoining Coal and Allied Land Industrial development will generate 2,617 vtph (AM) and 3,118 vtph (PM) which will be distributed through the local road network as per ***Figure 6***. The result is that maximum mid-block traffic volume increases for the various roads near the site are;

- M1 Pacific Motorway – 1,717 vtph in the AM peak and 1,795 vtph in the PM peak.
- John Renshaw Drive east of M1 – 1,329 vtph in the AM peak and 1,676 vtph in the PM peak.
- Weakley's Drive north of M1 – 775 vtph in the AM peak and 946 vtph; and
- John Renshaw Drive west of M1 – 3,821 vtph in the AM peak and 4,417 vtph in the PM peak
- John Renshaw Drive west of the western access – 1,080 vtph in the AM peak and 1,114 vtph in the PM peak.

The addition of this traffic onto the 2018 traffic volumes determined in ***Section 5*** will result in the mid-block capacity threshold for John Renshaw Drive west of the M1 Pacific Motorway to be reached. All other roads remain within their mid-block capacities through to 2028. ***Table 3*** below shows the development traffic, the road capacity and the post development 2018 and 2028 likely maximum peak traffic volumes.

This result indicates that John Renshaw Drive should be widened to four lanes between the eastern development access and the M1 Pacific Motorway while John Renshaw Drive west of the eastern access is likely to be suitable for one lane in each direction subject to a LoS D be acceptable at this location.

Table 3 - Road Capacity Assessment – post development

Road	Section	2018 + development		2028 + development		Road	Development traffic	
		AM (vtph)	PM (vtph)	AM (vtph)	PM (vtph)	Capacity	AM	PM
John Renshaw Drive	west of Weakley's Drive	4720	5486	4875	5670	2,390	3821	4417
John Renshaw Drive	east of Weakley's Drive and eastern acce	4165	4957	4541	5405	5,800	1978	2355
John Renshaw Drive	Between eastern and western access	2385	2795	2561	2997	2,800	1362	1622
John Renshaw Drive	west of Development Site	2103	2287	2279	2489	2,390	1080	1114
Weakley's Drive	north of John Renshaw Drive	2532	2451	2834	2710	2,800	775	946
M1 Pacific Motorway	south of John Renshaw Drive	4300	4713	4744	5215	5,800	1717	1795

Subject to the widening of John Renshaw Drive between the eastern access and the M1 Pacific Motorway to four lanes, the proposal will not adversely impact on the mid-block traffic flows on the local and state road network.

12.2 Intersection Capacity

In assessing intersection performance, the main external intersections that may be impacted by the development would include;

- M1 Pacific Motorway / Weakley's Drive / John Renshaw Drive future traffic signals;
- Eastern access signalised intersection with John Renshaw Drive, and
- Western access signalised intersection with John Renshaw Drive.

The impacts of the development are best assessed using the SIDRA INTERSECTION modelling software. This software package predicts likely delays, queue lengths and thus levels of service that will occur at intersections. Assessment is then based on the level of service requirements of the RMS shown below;

Table 4.2
Level of service criteria for intersections

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

Source: - RTA's Guide to Traffic Generating Developments (2002)

Assumptions made in this modelling were;

- The intersection layouts were modelled as per the concept designs shown within ***Attachment 2*** and ***Figure 3*** and the subdivision accesses were amended to improve performance. The final modelled layouts are shown in ***Attachment E***.
- Traffic volumes used in the modelling were as collected by TTM on Wednesday 18th October 2017 and NTPE in June 2018.

- 2028 future traffic is predicted using a 1.6 % per annum background traffic growth rate.
- Traffic generated by the development and the adjoining development is distributed onto the local road network as per ***Figures 4 & 5*** respectively. In terms of the adjoining development it was noted that they have a second access to their site proposed as a left in and left out only access. Therefore, the left turn movements into and out of the adjoining development (Coal & Allied lands) were evenly split between the eastern access and the secondary left in and left out access between the eastern access and the John Renshaw Drive / M1 Pacific Motorway / Weakley's Drive intersection.
- Traffic for the Donaldson Mine access road was sourced from *Traffic and Transport Report for the Black Hill Planning Proposal (Hyder 2013)*

The results of the modelling for both the AM and PM peak hour traffic periods for these intersections and the 'all vehicles' case are shown below in ***Table 4, 5 & 6*** below. The Sidra Movement Summary Tables for the modelling are provided in ***Attachment E.***

Table 4 – John Renshaw Drive / Eastern Access – Sidra Modelling – Results Summary

Model Scenario	Degree of Saturation (v/c)	Average Delay (s)	LoS	95% back of Queue Length (cars)
2018 AM + development	0.893	24.2	B	30.4
2028 AM + development	0.910	25.8	B	34.3
2018 PM + development	0.906	45.5	D	55.8
2028 PM + development	0.906	50.5	D	62.6

Table 5 – John Renshaw Drive / Western Access / Mine Access – Sidra Modelling – Results Summary

Model Scenario	Degree of Saturation (v/c)	Average Delay (s)	LoS	95% back of Queue Length (cars)
2018AM + development	0.848	24.6	B	23.0
2028 AM + development	0.797	23.5	B	24.3
2018 PM + development	0.912	47.1	D	56.2
2028 PM + development	0.973	64.0	E	71.4

Table 6 – John Renshaw Drive / M1 Motorway / Weakley's Drive – Sidra Modelling – Results Summary

Model Scenario	Degree of Saturation (v/c)	Average Delay (s)	LoS	95% back of Queue Length (cars)
2018 AM + development	1.535	257.5	F	178.5
2028 AM + development	1.615	301.6	F	196.3
2018 PM + development	2.168	724.8	F	445.3
2028 PM + development	2.239	781.2	F	454.4

This modelling shows that suitable intersections can be constructed at the western and eastern access points to the subdivision with average delays, LoS and 95 % back of queue lengths for all separate movements remaining at acceptable levels based on the RMS assessment criteria listed above. The intersections would therefore be deemed suitable to accommodate the development traffic now and with ten years traffic growth. It is noted additional right turning lanes into and out of the eastern access are required when compared to the existing concept design for the intersection.

Modelling showed that the John Renshaw Drive / M1 Pacific Motorway / Weakley's Drive signalised intersection currently being upgraded is unable to cope with the additional traffic from both Black Hill Industrial developments. Significant upgrading works will be required though some level of development may be able to be undertaken before further upgrading is required. Further analysis of this intersection is not within the scope of this report and will require further discussion by both developers with NSW RMS taking into consideration the M1 link to Raymond Terrace and the traffic from Donaldson Mine, which is currently in care and maintenance.

12.3 – Staging

Staging of the development may allow for the further upgrading of the M1 Pacific Motorway / John Renshaw Drive / Weakley's Drive signals to be delayed until later in the development process. Therefore a further staging analysis of the development's impact on this intersection has been undertaken on the basis of the staging shown in the subdivision plan within Attachment A and assuming similar staging in the adjoining Coal and Allied land development. For simplicity the development traffic determined within the staging of this development was doubled to reflect similar development on the adjoining land.

The staged development traffic is shown below in ***Table 2*** while trip distributions were determined using the trip distribution assumptions in ***Section 10***.

The results of the modelling shown in the Sidra Movement Summary tables in ***Attachment E*** shows the following;

- Without the M1 Extension to Raymond Terrace, upgrading of the M1 Pacific Motorway / John Renshaw Drive / Weakley's Drive intersection would be required prior to Stage 1 of the subdivision. This is because all the spare capacity within the intersectuion is taken up by baclground traffic growth through to 2028.
- With the M1 Extension to Raymond Terrace, major upgrading of the M1 Pacific Motorway / John Renshaw Drive / Weakley's Drive intersection would be required prior to Stage 3 of the subdivision. This assumes minor upgrading of the intersection with the provision of left turn slip lanes from M1 Pacific Motorway to John Renshaw Drive and Weakley's Drive to John Renshaw Drive replacing the metered left turns currently proposed occur before Stage 1.
- Note: - Upgrading John Renshaw Drive from the eastern site access to the M1 Pacific Motorway would not be required before Stage 3.

12.4 Subdivision Access Roads

The concept plan for the proposed subdivision shows the new public road connections to John Renshaw Drive known as the western and eastern accesses. As detailed in ***Section 12.2*** above suitable intersections which operate satisfactorily with current and future traffic volumes can be constructed to service the subdivision.

Under Austroads *Guide to Road Design Part 4A – Unsignalised and Signalised Intersections (2009)* new intersections within a 80 km/h speed zone should provide the following minimum sight distance, noting for traffic signals to exist on the subdivision access roads the speed limit will need to be reduced to 80 km/h;

- Safe Intersection Sight Distance (SISD) – 181 metres desirable or 170 metres minimum; and
- Approach Sight Distance (ASD) – 114 metres.

By observation on site the available sight distance at the western access exceeded 300 metres while at the eastern access the available sight distance was measured as in excess of 300 metres to the east and approximately 220 metres to the west. Therefore, both locations are considered suitable such that public road intersections in accordance with Austroads *Guide to Road Design Part 4A – Unsignalised and Signalised Intersections (2009)* could be constructed.

Internally the subdivision intersections are expected to have traffic volumes below the traffic volume thresholds identified within *Austroads Guide to Traffic Management Part 6 – Intersections, Interchanges and Crossings* for uninterrupted flow conditions and for which further analysis of intersection performance is not required as presented in ***Table 7*** below. Therefore, no further

analysis of the internal intersections is required, and basic give way controlled urban BAR / BAL intersections constructed to Cessnock City Council's requirements would be suitable.

Table 7 – Austroads Traffic Volume Thresholds for Uninterrupted Flows at Intersections

Major road type[1]	Major road flow (vph)[2]	Minor road flow (vph)[3]
Two-lane	400	250
	500	200
	650	100
Four-lane	1000	100
	1500	50
	2000	25

Source Austroads Guide to Traffic Management Part 6 – Intersections, Interchanges and Crossings (2010).

Under Austroads *Guide to Road Design Part 4A – Unsignalised and Signalised Intersections (2009)* new intersections within a 60 km/h speed zone should provide the following minimum sight distance;

- Safe Intersection Sight Distance (SISD) – 123 metres; and
- Approach Sight Distance (ASD) – 73 metres.

It would be expected with a suitable internal road design these sight distances could be met and would need to be confirmed at the detailed design stage of the intersections.

Overall, it is considered that the proposed subdivision access arrangements and internal road layout, constructed to Cessnock City Council requirements, are suitable for the subdivision and the road environment in the vicinity of the site.

12.5 Off-Street Car Parking and Access

As an industrial subdivision, the development itself does not generate any on-site parking demand. However, future development of each of the allotments will and on-site car parking will need to be further assessed at the development application stage for the development of each individual allotment. It is noted that the proposed lots are large and exceed the minimum lot size requirements of Cessnock City Council therefore it would be reasonable to conclude they are large enough to accommodate industrial development conforming to the on-site car parking requirements listed within Cessnock City Council's DCP (2010).

Similarly, lot frontages would comply with the minimum requirements of Cessnock City Council therefore it would be reasonable to assume that they are wide enough to construct an access crossing to Cessnock City Council requirements.

12.6 Construction Traffic

Construction traffic associated with any of the road works required of this development would be insignificant compared to the operational traffic volumes generated by the fully developed subdivision. Likely peak hour traffic volumes would be in the order of 30 to 50 vtph and would be well less than 10 % of existing traffic volumes on the road network therefore would not have a noticeable impact on traffic flows on the road network. It would be expected that a construction traffic management plan be part of the environmental management system put in place for any of the construction works required either by condition of consent or as part of a Works Authorisation Deed with NSW RMS.

13.0 PEDESTRIAN & CYCLE FACILITIES

As an industrial development the proposal is unlikely to generate any significant pedestrian and cycle traffic therefore a nexus would not exist to provide external pedestrian and cycle infrastructure. Internal infrastructure would be designated within Cessnock City Council's subdivision standards and conditioned on any consent.

Contribution to external facilities aside from immediate connections would be more appropriately dealt with by S94 developer contributions or a voluntary planning agreement to ensure a fair and reasonable contribution is made to these facilities.

14.0 PUBLIC TRANSPORT FACILITIES

The proposed development may generate some demand for public transport services however the site is not currently serviced by any bus company. Therefore, a new service would need to be provided and liaison with the local bus companies (Rover Coaches and Hunter Valley Buses) would need to be undertaken. It is highly unlikely either company would commit to a new service or a re routed existing service to accommodate the subdivision until a demand is established with the problem being it is hard to determine if there is a demand if there is no service in the first place. Industrial subdivisions typically are not big generators of public transport usage and trip making and this subdivision is not expected to be any different. It is therefore reasonable to conclude that even though the site is not currently serviced by public transport there will not be sufficient demand generated by the subdivision for a public transport service to be established until the development is well established. Continual review of the need for a public transport service will need to be undertaken in future years.

As an industrial subdivision all roads will be constructed to a standard suitable for use by a bus therefore the proposed road network is not a constraint to the future provision of a bus service within the estate.

15.0 CONCLUSIONS

This traffic impact assessment for the proposed industrial subdivision of part Lot 1131 in DP 1057179 – John Renshaw Drive, Black Hill creating a total of 38 large industrial lots has concluded;

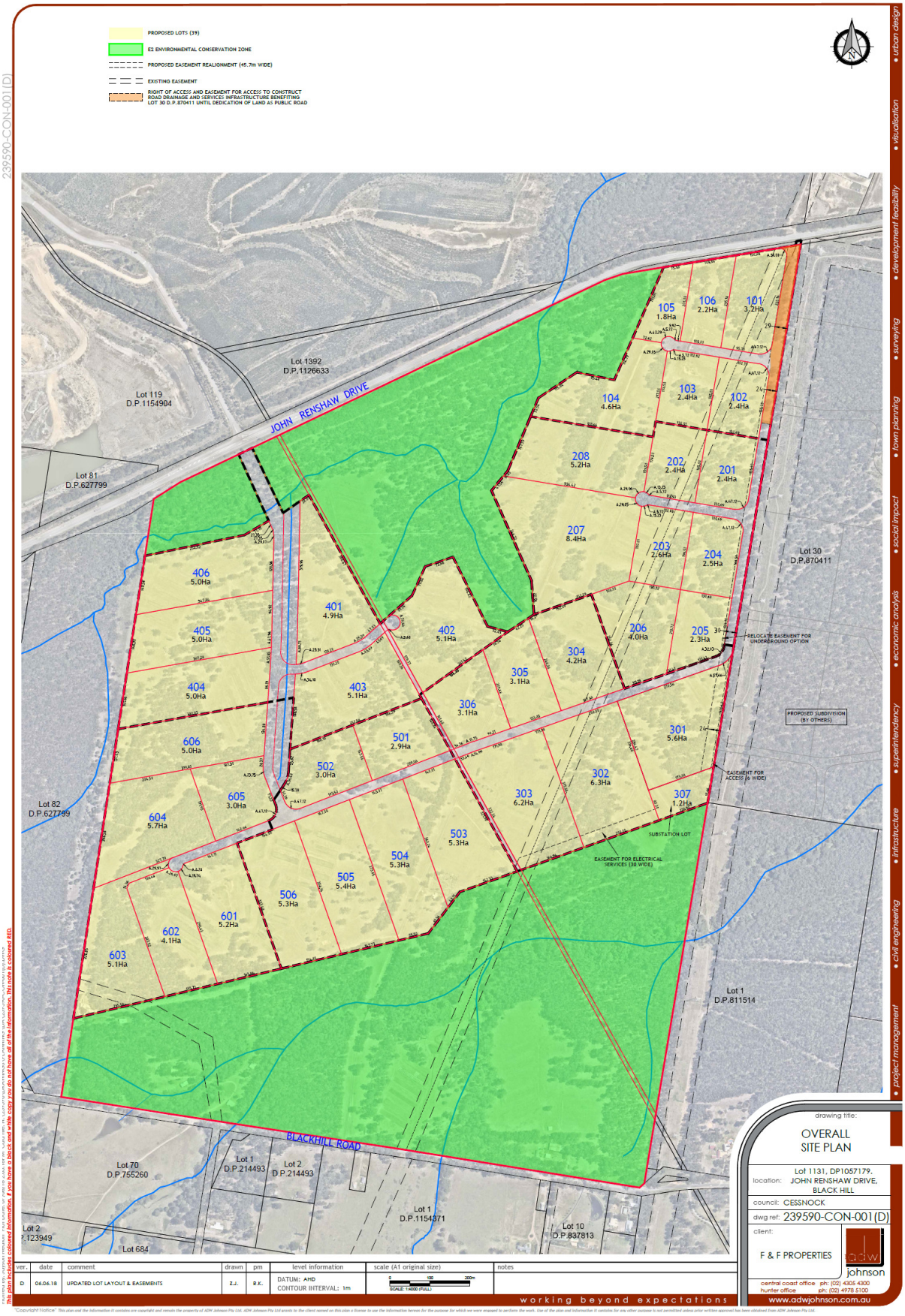
- Existing two-way mid-block traffic volumes on the local and state road network are within the technical and environmental capacity standards determined by Austroads and the NSW RMS.
- The proposed subdivision is likely to generate an additional 2,637 vtph during the AM peak hour traffic period and 3,142 vtph during the PM peak traffic period or approximately 31,419 vtpd.
- The local and state road network apart from the John Renshaw Drive from the site to the M1 Pacific Motorway has sufficient spare capacity to cater for the development traffic generated by this subdivision without adversely impacting on the current levels of service experienced by motorists on the road. It has been identified that with the cumulative impacts of this development and the proposed adjoining Coal and Allied lands development John Renshaw Drive from the M1 Motorway to the development site will need to be four lane two-way conditions. The regional importance of this upgrade and the amount of benefiting existing traffic it is considered the appropriate funding mechanism for this work is the State Infrastructure Contribution (SIC) plan and funding.
- Sidra Intersection modelling has shown that suitable access intersections can be constructed at the proposed locations to ensure that the local and state road network operates within the performance guidelines set by NSW RMS. Both accesses will need to be signalised and recommended layouts are provided in ***Attachment E***.
- Sidra Intersection modelling of the M1 Pacific Motorway / John Renshaw Drive / Weakley's Drive intersection has shown that this intersection fails as a result of the cumulative impacts of the proposal and the Coal and Allied lands development. Further discussion between both developers and the NSW RMS will be required to allow consideration of the M1 to Raymond Terrace upgrade.
- Both the subdivision access locations are considered suitable such that intersections in accordance with Austroads *Guide to Road Design Part 4A – Unsignalised and Signalised Intersections (2009)* could be constructed.
- Basic give way controlled urban BAR / BAL intersections constructed to Cessnock City Council's requirements would be suitable for the internal road network.
- The proposed lots exceed the minimum lot size requirements of Cessnock City Council therefore are large enough to accommodate industrial development conforming to the on-site car parking requirements listed within Cessnock City Council's DCP (2010).
- Lot frontages comply with the minimum requirements of Cessnock City Council therefore it would be reasonable to conclude that they are wide enough to construct an access crossing to Cessnock City Council requirements.
- Construction traffic will not adversely impact on the local and state road network.
- As an industrial development the proposal is unlikely to generate any significant pedestrian and cycle traffic therefore a nexus would not exist to provide external pedestrian and cycle infrastructure. Internal infrastructure would be designated within Cessnock City Council's subdivision standards and conditioned on any consent.
- Even though the site is not currently serviced by public transport there will not be sufficient demand generated by the subdivision for a public transport service to be established until the development is well established. Continual review of the need for a public transport service will need to be undertaken in future years. As an industrial subdivision all roads will be able to cater for a future bus service.

16.0 RECOMMENDATION

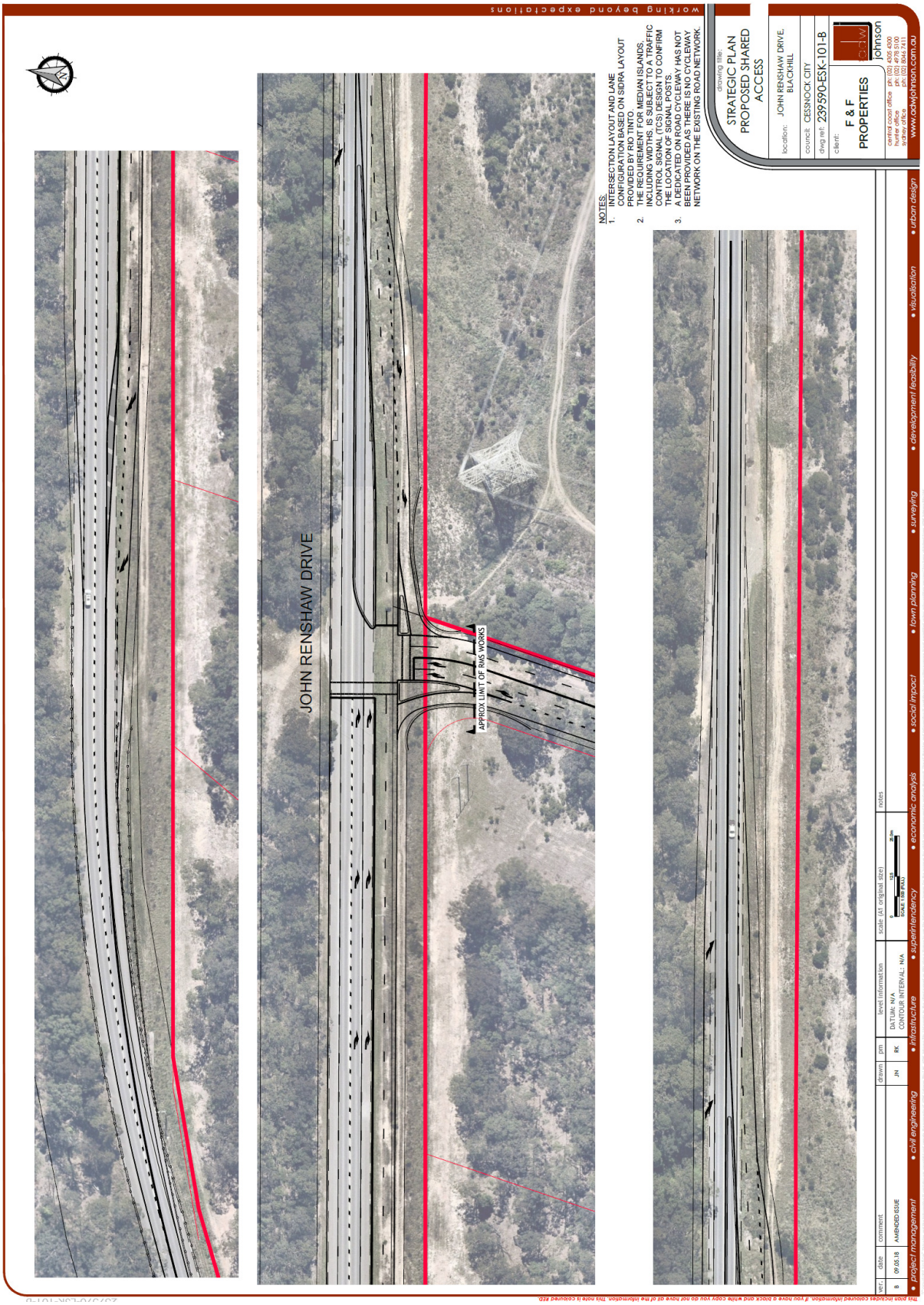
Having carried out this traffic impact assessment for the proposed industrial subdivision of part Lot 1131 in DP 1057179 – John Renshaw Drive, Black Hill creating a total of 38 large industrial lots ranging in size from 1.8 ha to 6.3 ha, it is recommended that the proposal subject to the proposed road upgrading's listed in this report can be supported from a traffic impact perspective as on completion of the road upgrades it will not adversely impact on the local and state road network and complies with all relevant Cessnock City Council, Austroads and NSW RMS requirements.

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

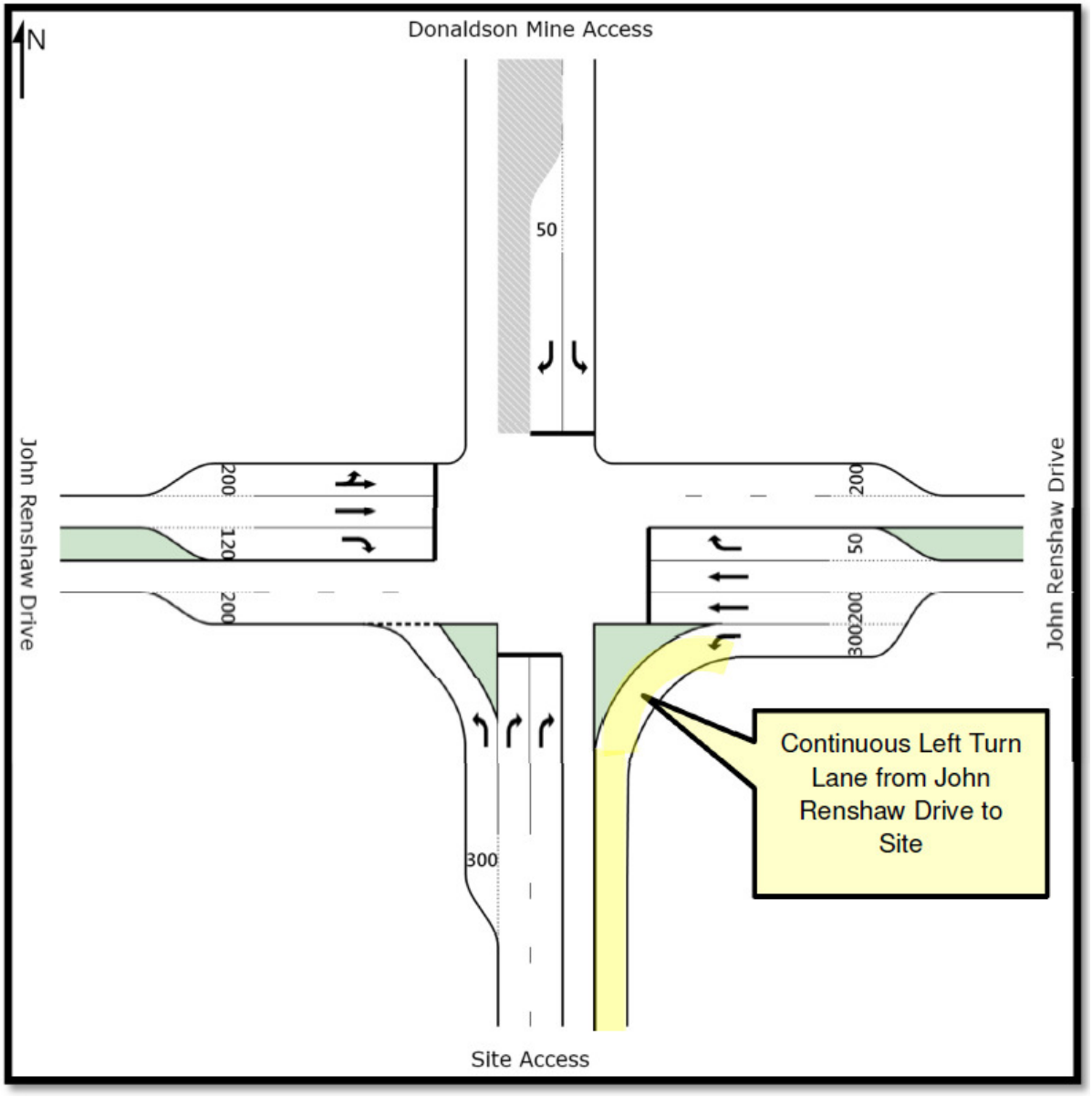
ATTACHMENT A
SUBDIVISION PLAN


PROPOSED LOTS (39)
E2 ENVIRONMENTAL CONSERVATION ZONE
PROPOSED EASEMENT REALIGNMENT (45.7m WIDE)
EXISTING EASEMENT
RIGHT OF ACCESS AND EASEMENT FOR ACCESS TO CONSTRUCT ROAD DRAINAGE AND SERVICES INFRASTRUCTURE BENEFITING LOT 30 D.P.870411 UNTIL DEDICATION OF LAND AS PUBLIC ROAD
239590-CON-001 (D)
JOHN RENSHAW DRIVE
BLACKHILL ROAD
Lot 1392 D.P.1126633
Lot 119 D.P.1154904
Lot 81 D.P.627799
Lot 82 D.P.627799
Lot 30 D.P.870411
Lot 1 D.P.811514
Lot 70 D.P.755260
Lot 1 D.P.214493
Lot 2 D.P.214493
Lot 1 D.P.1154371
Lot 10 D.P.837813
Lot 2 1.123949
Lot 684
105 1.8Ha
106 2.2Ha
101 3.2Ha
104 4.6Ha
103 2.4Ha
102 2.4Ha
208 5.2Ha
202 2.4Ha
201 2.4Ha
207 8.4Ha
203 2.6Ha
204 2.5Ha
406 5.0Ha
401 4.9Ha
402 5.1Ha
206 4.0Ha
205 2.3Ha
405 5.0Ha
304 4.2Ha
404 5.0Ha
403 5.1Ha
305 3.1Ha
306 3.1Ha
606 5.0Ha
501 2.9Ha
301 5.6Ha
502 3.0Ha
302 6.3Ha
605 3.0Ha
303 6.2Ha
307 1.2Ha
604 5.7Ha
503 5.3Ha
504 5.3Ha
505 5.4Ha
506 5.3Ha
601 5.2Ha
602 4.1Ha
603 5.1Ha
RELOCATE EASEMENT FOR UNDERGROUND OPTION
PROPOSED SUBDIVISION (BY OTHERS)
EASEMENT FOR ACCESS (6 WIDE)
SUBSTATION LOT
EASEMENT FOR ELECTRICAL SERVICES (30 WIDE)
ver. | date | comment | drawn | pm
D | 06.06.18 | UPDATED LOT LAYOUT & EASEMENTS | Z.J. | R.K.
level information
DATUM: AHD
CONTOUR INTERVAL: 1m
scale (A1 original size)
SCALE: 1:4000 (FULL)
notes
working beyond expectations
drawing title:
OVERALL SITE PLAN
location: Lot 1131, DP1057179. JOHN RENSHAW DRIVE, BLACK HILL
council: CESSNOCK
dwg ref: 239590-CON-001(D)
client:
F & F PROPERTIES
adw johnson
central coast office ph: (02) 4305 4300
hunter office ph: (02) 4978 5100
www.adwjohnson.com.au
urban design
visualisation
development feasibility
surveying
town planning
social impact
economic analysis
superintendency
infrastructure
civil engineering
project management

ATTACHMENT B
SUBDIVISION ACCESS CONCEPT PLANS



Eastern Access Intersection



Western Access Intersection

ATTACHMENT C
SEARS

NSW GOVERNMENT Planning & Environment

Industry Assessments
Contact: John Booth
Phone: (02) 8275 1281
Email: john.booth@planning.nsw.gov.au

Mark Griese
F&F Properties
Suite 11.02, 205 Pacific Highway
St Leonards NSW 2065

SF18/29318
SEAR 1224

Dear Mr Griese

Proposed Soil Treatment Works - 30 Lot Industrial Subdivision
John Renshaw Drive, Black Hill (Lot 1151 DP 1057179)
Secretary's Environmental Assessment Requirements (SEAR) 1224

Thank you for your request for the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the above development proposal. I have attached a copy of these requirements.

In support of your application, you indicated that your proposal is designated development under Part 4 of the *Environmental Planning and Assessment Act 1979*. In preparing the SEARs, the Department has consulted with the Mining Subsidence Board (MSB). Unfortunately, the MSB was unable to respond in time. You must undertake direct consultation with them and address their requirements in the EIS. The Department has also consulted with the Environment Protection Authority (EPA), Department of Primary Industries (DPI), the Office of Environment and Heritage (OEH), Roads and Maritime Services (RMS) and the Rural Fire Service (RFS).

If other integrated approvals are identified before the Development Application (DA) is lodged, you must undertake direct consultation with the relevant agencies, and address their requirements in the EIS.

If your proposal contains any actions that could have a significant impact on matters of National Environmental Significance, then it will require an additional approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. If you have any questions about the application of the EPBC Act to your proposal, you should contact the Commonwealth Department of the Environment and Energy on (02) 6274 1111.

Should you have any further enquiries, please contact John Booth, Planning Services, at the Department on the details above.

Yours sincerely

C. Ritchie 28/5/18.

Chris Ritchie
Director
Industry Assessments
as delegate of the Secretary

Department of Planning & Environment
320 Pitt Street Sydney NSW 2000 | GPO Box 39 Sydney NSW 2001 | T 1300 305 695 | www.planning.nsw.gov.au

Environmental Assessment Requirements

Section 4.12(8) of the *Environmental Planning and Assessment Act 1979*.

Designated Development

SEAR Number	1224
Proposal	30 lot Torrens Title subdivision, including the treatment of approximately 82,279m^3 of contaminated soil.
Location	John Renshaw Drive, Black Hill (Lot 1131 in DP 1057179) in the Cessnock LGA
Applicant	F&F Properties
Date of Issue	28/05/18
General Requirements	The Environmental Impact Statement (EIS) must meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.
Key Issues	The EIS must include an assessment of all potential impacts of the proposed development on the existing environment (including cumulative impacts if necessary) and develop appropriate measures to avoid, minimise, mitigate and/or manage these potential impacts. As part of the EIS assessment, the following matters must also be addressed: • **strategic context** – including: – a detailed justification for the proposal and suitability of the site for the development; – a demonstration that the proposal is consistent with all relevant planning strategies, environmental planning instruments, development control plans (DCPs), or justification for any inconsistencies; and – a list of any approvals that must be obtained under any other Act or law before the development may lawfully be carried out. • **remediation action plan** – including: – a site audit statement from a site auditor accredit under the *Contaminated Land Management Act 1997* determining the appropriateness of and approving the Remediation Action Plan; – details of the nature and extent of the contaminated material; – comprehensive program of the works proposed, including estimation of the surface area to be disturbed and excavation of contaminated material proposed to be undertaken; – details of the proposed measures to manage any disturbance of contaminated material; – justification for the proposed remediation approach; – details of the proposed remediation process, including equipment to be used and measures to dispose of contaminated material; – justification of the remediation criteria and process for the cleaning/verification of all equipment leaving the site (including workers clothing); – a detailed site validation plan; and – details of the consistency of the Remediation Action Plan with the relevant NSW Government legislation, environmental planning instruments, guidelines and standards. • **waste management** – including: – details of waste handling including, transport, identification, receipt, stockpiling and quality control; and – the measures that would be implemented to ensure that the proposed development is consistent with the aims, objectives and guidelines in the

	NSW Waste Avoidance and Resource Recovery Strategy 2014-21. • **hazards and risk** – including: – an assessment of the risk of bushfire, including addressing the requirements of *Planning for Bush Fire Protection 2006* (RFS). Any proposed Asset Protection Zones must not adversely affect environmental objectives (e.g. buffers). Provision is to be made for their appropriate management into the future; and – any geotechnical limitations that may occur on the site and if necessary, appropriate design considerations to address this. • **air quality** – including: – a description of all potential sources of air and odour emissions; – an air quality impact assessment in accordance with relevant Environment Protection Authority guidelines; and – a description and appraisal of air quality impact mitigation, management and monitoring measures. • **noise and vibration** – including: – a description of all potential noise and vibration sources during construction, including road traffic noise; – a noise and vibration assessment in accordance with the relevant Environment Protection Authority guidelines; and – a description and appraisal of noise and vibration mitigation, management and monitoring measures. • **soil and water** – including: – a description of local soils, topography, drainage and landscapes; – details of water usage for the proposal including existing and proposed water licencing requirements in accordance with the *Water Act 1912* and/or the *Water Management Act 2000*; – an assessment of potential impacts on floodplain and stormwater management and any impact to flooding in the catchment; – details of sediment and erosion controls; – a detailed site water balance; – an assessment of potential impacts on the quality and quantity of surface and groundwater resources; – details of the proposed stormwater and wastewater management systems (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts; – characterisation of the nature and extent of any contamination on the site and surrounding area; and – a description and appraisal of impact mitigation, management and monitoring measures. • **traffic and transport** – including: – details of road transport routes and access to the site; – road traffic predictions for the development during construction; and – an assessment of impacts to the safety and function of the road network and the details of any road upgrades required for the development. • **biodiversity** – including: – accurate predictions of any vegetation clearing on site or for any road upgrades; – an assessment of the proposal in accordance with the *Biodiversity Assessment Method* (BAM) including an assessment of any potential impacts on aquatic and riparian vegetation and groundwater dependent ecosystems; – a detailed assessment of the potential impacts on any threatened species, populations, endangered ecological communities or their habitats, groundwater dependent ecosystems and any potential for offset requirements; – details of weed management during construction and operation in accordance with existing State, regional or local weed management plans or strategies; and

	– a detailed description of the measures to avoid, minimise, mitigate and offset biodiversity impacts. • **contamination** – including: – conceptual site model detailing the potential risks to human health and the environmental receptors in the vicinity of the site; – the preparation of a Remedial Action Plan (RAP) for the site; and – a Part B Site Audit Statement and Report, prepared by an accredited NSW EPA Site Auditor, which details the site can be made suitable for a particular land use if remediated in accordance with the approved RAP. • **visual** – including an impact assessment at private receptors and public vantage points. • **heritage** – including Aboriginal and non-Aboriginal cultural heritage.
Environmental Planning Instruments and other policies	The EIS must assess the proposal against the relevant environmental planning instruments, including but not limited to: • *State Environmental Planning Policy (Infrastructure) 2007*; • *State Environmental Planning Policy (Rural Lands) 2008*; • *State Environmental Planning Policy No 33–Hazardous and Offensive Development*; • *State Environmental Planning Policy No 44–Koala Habitat Protection*; • *State Environmental Planning Policy No 55–Remediation of Land*; • *Cessnock City Council Local Environmental Plan 2011*; and • relevant development control plans and section 94 plans.
Guidelines	During the preparation of the EIS you should consult the Department's Register of Development Assessment Guidelines which is available on the Department's website at planning.nsw.gov.au under Development Proposals/Register of Development Assessment Guidelines. Whilst not exhaustive, this Register contains some of the guidelines, policies, and plans that must be taken into account in the environmental assessment of the proposed development.
Consultation	During the preparation of the EIS, you must consult the relevant local, State and Commonwealth government authorities, service providers and community groups, and address any issues they may raise in the EIS. In particular, you should consult with the: • Environment Protection Authority; • Office of Environment and Heritage; • Department of Primary Industries; • Roads and Maritime Services; • Rural Fire Service; • Mining Subsidence Board; • Cessnock City Council; and • the surrounding landowners and occupiers that are likely to be impacted by the proposal. Details of the consultation carried out and issues raised must be included in the EIS.
Further consultation after 2 years	If you do not lodge an application under Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* within 2 years of the issue date of these SEARs, you must consult with the Secretary in relation to any further requirements for lodgement.

Transport
Roads & Maritime
Services

CR2018/001743
SF2013/183729
MJD

7 May 2018

Department of Planning & Environment
Industry Assessments
GPO Box 39
SYDNEY NSW 2001

Attention: John Booth

REQUEST FOR INPUT: 30 LOT INDUSTRIAL SUBDIVISION – JOHN RENSHAW DRIVE, BLACK HILL, CESSNOCK LGA (LOT 1131 DP 1057179) – SEAR 1224

Reference is made to Department of Planning and Environment's (the Department) email dated 23 April 2018, requesting Roads and Maritime Services' (Roads and Maritime) requirements under Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* for the Environmental Impact Statement (EIS). The proposal is designated development Schedule 3, Part 1, Item 15, as it involves the treatment of more than 30,000 cubic metres or disturbs more than an aggregate area of 3 hectares of contaminated soil.

Transport for NSW and Roads and Maritime's primary interests are in the road network, traffic and broader transport issues. In particular, the efficiency and safety of the classified road network, the security of property assets and the integration of land use and transport.

Roads and Maritime understands the proposal to be for a 30 lot industrial subdivision.

Roads and Maritime response & requirements

Roads and Maritime have reviewed the 'Request for SEARs, Development Application, Industrial Subdivision and Site remediation', *prepared by Barr Property and Planning, dated 13 April 2018*. Roads and Maritime make the following comment:

- Roads and Maritime were requested to provide input on the Black Hill Urban Design Guidelines for MP10_0093, specifically the location of the future intersection accessing Lot 30 DP 870411, which is the neighbouring site east.
- Roads and Maritime provided written comment to the Department on 13 February 2018, regarding the Black Hill Urban Design Guidelines for MP10_0093, and provided subsequent comment to the Department on 3 May 2018. Roads and Maritime understand that the Department is yet to make a determination regarding the intersection location for the Black Hill Urban Design Guidelines.
- The lot layout for this site is provided in the submitted documentation. The lot layout cannot be considered nor the proposed access from John Renshaw Drive until the location of the eastern intersection is first determined by the Department.

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The EIS should refer to the following guidelines with regard to the traffic and transport impacts of the proposed development:

- Road and Related Facilities within the Department's EIS Guidelines, and,
- Section 2 Traffic Impact Studies of Roads and Maritime's *Guide to Traffic Generating Developments 2002*.

Furthermore, a traffic and transport study shall be prepared in accordance with the Roads and Maritime's *Guide to Traffic Generating Developments 2002* and is to include (but not be limited to) the following:

- Roads and Maritime recommend that the two sites be assessed as one release area, with limited intersections from John Renshaw Drive required for site access to the release area being nominated. The intersections will allow for the internal road design and lot layout to be created.
- Assessment of all relevant vehicular traffic routes and intersections for access to / from the release area.
- Current traffic counts for all of the traffic routes and intersections.
- The anticipated additional vehicular traffic generated from both the construction and operational stages of the release area.
- The distribution on the road network of the trips generated by the release area. It is requested that the predicted traffic flows are shown diagrammatically to a level of detail sufficient for easy interpretation.
- Consideration of the traffic impacts on existing and proposed intersections, and the capacity of the local and classified road network to safely and efficiently cater for the additional vehicular traffic generated by the proposed development during both the construction and operational stages. The traffic impact shall also include the cumulative traffic impact of other proposed developments in the area.
- Identify the necessary road network infrastructure upgrades required to maintain existing levels of service on both the local and classified road network for the development. In this regard, preliminary concept drawings shall be submitted with the EIS for any identified road infrastructure upgrades. However, it should be noted that any identified road infrastructure upgrades will need to be to the satisfaction of Roads and Maritime and Council.
- Traffic analysis of any major / relevant intersections impacted, using SIDRA or similar traffic model, including:
    - Current traffic counts and 10 year traffic growth projections
    - With and without development scenarios
    - 95th percentile back of queue lengths
    - Delays and level of service on all legs for the relevant intersections
    - Data files for Roads and Maritime review.
- Any other impacts on the regional and state road network including consideration of pedestrian, cyclist and public transport facilities and provision for service vehicles.

On determination of this matter, please forward a copy of the SEARs to Roads and Maritime for record and / or action purposes. Should you require further information please contact Marc Desmond on 0475 825 820 or by emailing development.hunter@rms.nsw.gov.au.

Yours sincerely

Peter Marler
Manager Land Use Assessment
Hunter Region

ATTACHMENT D
UPDATED TRAFFIC DATA

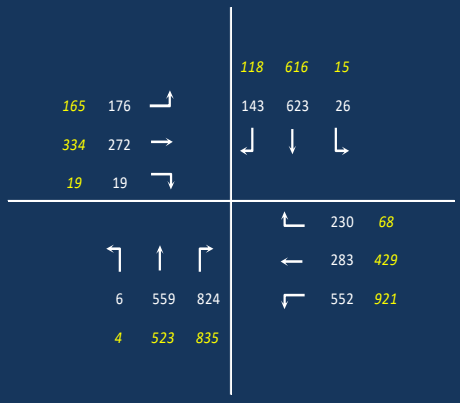
Survey Details

TTM Reference: **17SYD0118**
Location: **John Renshaw Dr / Weakleys Dr / Pacific Mwy**
Suburb: **Beresfield**
Date: **Wednesday 18/10/2017**
Duration: **0600-1000 & 1500-1800**
Weather: **Fine**
Notes:

Peak Hours

AM Peak Hour: 0745 - 0845
PM Peak Hour: 1630 - 1730

Peak Hour Summary



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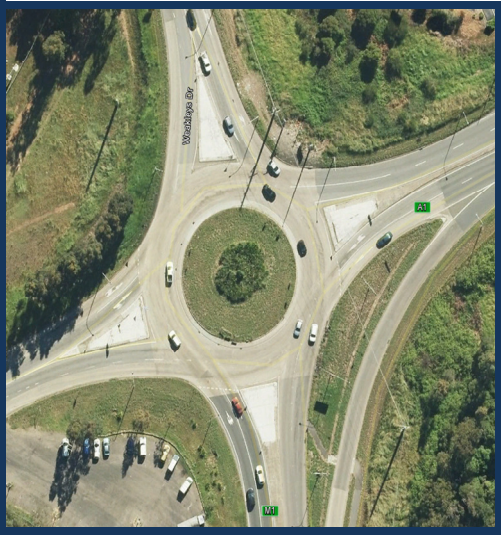
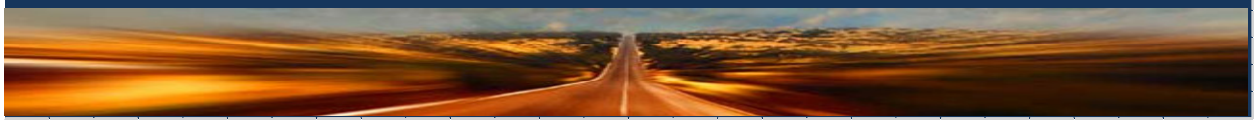
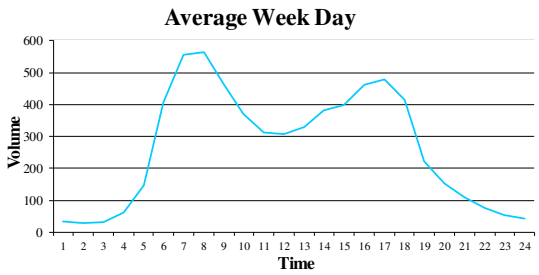




Site 1 John Renshaw DR 1km W of Weakleys DR <M1 **East bound** **Lane 1**

Day	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*W/Day*	*W/End*	*7 Day*
Time	18/06/2018	19/06/2018	20/06/2018	21/06/2018	22/06/2018	23/06/2018	24/06/2018	*Ave.*	*Ave.*	*Ave*
0:00	27	29	39	37	38	41	23	34	32	33
1:00	22	33	35	25	32	34	33	29	34	31
2:00	26	35	33	42	25	20	10	32	15	27
3:00	60	65	57	65	62	36	23	62	30	53
4:00	148	156	141	150	145	65	33	148	49	120
5:00	399	395	403	410	430	118	62	407	90	317
6:00	608	546	535	582	501	131	69	554	100	425
7:00	594	545	570	580	532	164	116	564	140	443
8:00	491	477	472	442	433	234	149	463	192	385
9:00	369	377	359	344	404	293	195	371	244	334
10:00	291	283	317	295	376	293	227	312	260	297
11:00	273	328	299	291	344	317	332	307	325	312
12:00	308	321	316	338	370	296	268	331	282	317
13:00	366	364	359	371	453	286	264	383	275	352
14:00	363	360	366	441	464	270	290	399	280	365
15:00	410	389	468	485	564	284	273	463	279	410
16:00	452	416	507	508	503	265	305	477	285	422
17:00	362	372	450	433	461	298	245	416	272	374
18:00	189	196	206	248	267	168	163	221	166	205
19:00	121	158	136	154	195	130	109	153	120	143
20:00	99	101	108	118	118	87	69	109	78	100
21:00	70	68	75	90	81	70	51	77	61	72
22:00	48	46	49	62	62	59	66	53	63	56
23:00	29	41	45	54	37	58	49	41	54	45
Total	**6125**	**6101**	**6345**	**6565**	**6897**	**4017**	**3424**	**6407**	**3721**	**5639**

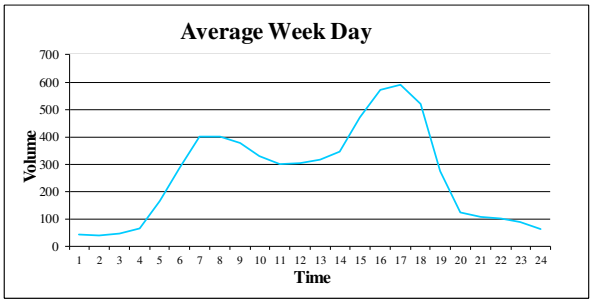


Summary

	from	to	
AM Peak	6:00 AM	7:00 AM	**608**
PM Peak	3:00 PM	4:00 PM	**564**
		Week Day Average	**6407**
		Weekend Day Average	**3721**
		7 Day Average	**5639**

Site 1 John Renshaw DR 1km W of Weakleys DR <100> **Westbound** **Lane 1**

Day	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*	*Sun*	*W/Day*	*W/End*	*7 Day*
Time	18/06/2018	19/06/2018	20/06/2018	21/06/2018	22/06/2018	23/06/2018	24/06/2018	*Ave.*	*Ave.*	*Ave*
0:00	19	44	53	54	45	55	31	43	43	43
1:00	35	39	41	47	41	27	24	41	26	36
2:00	32	64	44	56	42	46	29	48	38	45
3:00	69	64	65	64	66	41	20	66	31	56
4:00	173	179	161	168	141	72	55	164	64	136
5:00	289	276	275	310	274	117	75	285	96	231
6:00	413	359	389	441	402	136	74	401	105	316
7:00	402	385	415	417	391	180	92	402	136	326
8:00	422	373	378	399	314	222	136	377	179	321
9:00	335	316	330	323	352	253	200	331	227	301
10:00	342	267	294	294	306	308	243	301	276	293
11:00	335	266	284	275	352	376	308	302	342	314
12:00	360	301	305	263	352	331	293	316	312	315
13:00	352	315	314	326	424	276	291	346	284	328
14:00	458	446	446	504	504	322	352	472	337	433
15:00	566	485	619	579	609	259	320	572	290	491
16:00	583	590	589	623	568	254	295	591	275	500
17:00	500	500	530	522	545	249	246	519	248	442
18:00	243	261	309	249	318	151	163	276	157	242
19:00	108	114	139	110	141	108	99	122	104	117
20:00	95	108	100	118	117	79	66	108	73	98
21:00	83	81	102	115	123	89	70	101	80	95
22:00	82	77	73	112	101	90	88	89	89	89
23:00	59	53	69	68	60	52	53	62	53	59
Total	**6355**	**5963**	**6324**	**6437**	**6588**	**4093**	**3623**	**6333**	**3858**	**5626**



Summary

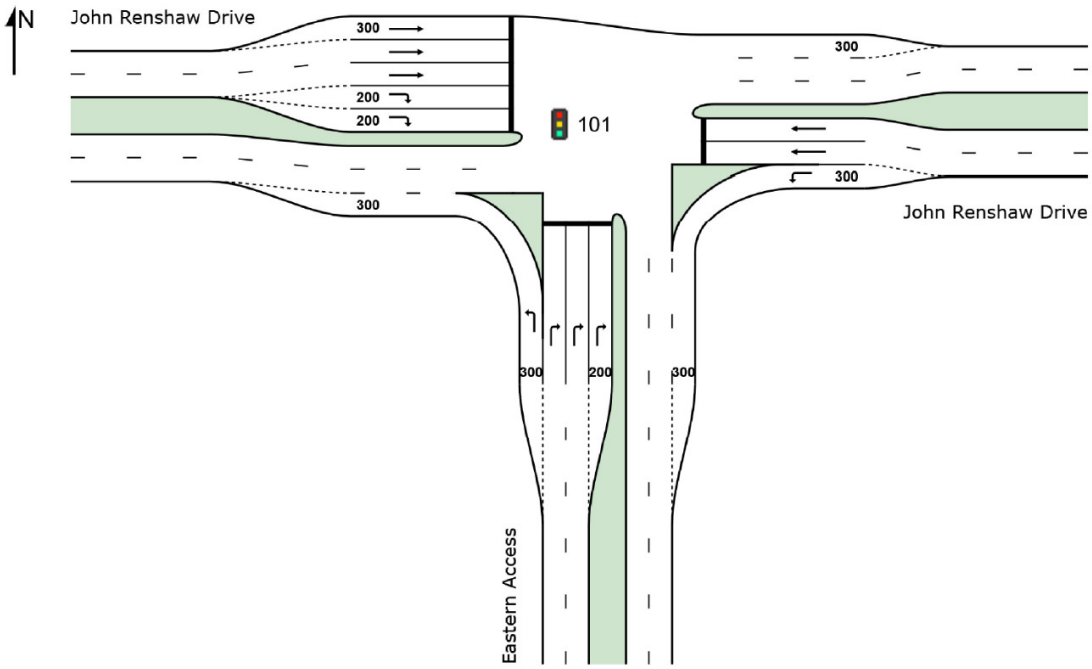
	from	to	
AM Peak	6:00 AM	7:00 AM	**441**
PM Peak	4:00 PM	5:00 PM	**623**
		Week Day Average	**6333**
		Weekend Day Average	**3858**
		7 Day Average	**5626**

ATTACHMENT E
SIDRA INTERSECTION RESULTS

SITE LAYOUT

Site: 101 [2018 AM - Eastern Access]

Eastern Access intersection with John Renshaw Drive
Site Category: (None)
Signals - Fixed Time Isolated



Organisation: INTERSECT TRAFFIC PTY LTD | Created: Wednesday, 18 July 2018 2:32:45 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2018 AM - Eastern Access]

Eastern Access intersection with John Renshaw Drive
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Access												
1	L2	115	10.0	0.066	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
3	R2	592	10.0	0.827	49.0	LOS D	8.6	65.5	1.00	0.96	1.33	35.0
Approach		706	10.0	0.827	41.9	LOS C	8.6	65.5	0.84	0.89	1.11	37.2
East: John Renshaw Drive												
4	L2	1548	10.0	0.893	9.5	LOS A	0.0	0.0	0.00	0.63	0.00	70.2
5	T1	1401	10.0	0.875	32.1	LOS C	30.4	231.2	0.98	0.99	1.19	53.5
Approach		2949	10.0	0.893	20.2	LOS B	30.4	231.2	0.47	0.80	0.56	61.2
West: John Renshaw Drive												
11	T1	862	10.0	0.220	4.2	LOS A	3.8	28.7	0.36	0.31	0.36	89.9
12	R2	602	10.0	0.868	51.9	LOS D	13.7	103.8	1.00	0.96	1.36	36.2
Approach		1464	10.0	0.868	23.8	LOS B	13.7	103.8	0.63	0.58	0.77	55.8
All Vehicles		5120	10.0	0.893	24.2	LOS B	30.4	231.2	0.56	0.75	0.70	54.8

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Wednesday, 18 July 2018 2:46:32 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2018 PM - Eastern Access]

Eastern Access intersection with John Renshaw Drive
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 130 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Access												
1	L2	539	10.0	0.311	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
3	R2	2649	10.0	0.895	41.8	LOS C	55.8	423.8	0.95	0.95	1.05	37.7
Approach		3188	10.0	0.895	35.7	LOS C	55.8	423.8	0.79	0.88	0.87	39.8
East: John Renshaw Drive												
4	L2	455	10.0	0.262	9.0	LOS A	0.0	0.0	0.00	0.63	0.00	71.2
5	T1	1148	10.0	0.906	67.7	LOS E	27.9	211.9	1.00	1.00	1.27	35.3
Approach		1603	10.0	0.906	51.0	LOS D	27.9	211.9	0.72	0.90	0.91	41.2
West: John Renshaw Drive												
11	T1	1651	10.0	0.888	55.0	LOS D	37.8	287.1	1.00	0.99	1.16	40.2
12	R2	175	10.0	0.819	82.1	LOS F	6.1	46.3	1.00	0.86	1.32	27.9
Approach		1825	10.0	0.888	57.6	LOS E	37.8	287.1	1.00	0.98	1.18	38.6
All Vehicles		6617	10.0	0.906	45.5	LOS D	55.8	423.8	0.83	0.91	0.97	39.8

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Wednesday, 18 July 2018 2:48:23 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028 AM - Eastern Access]

Eastern Access intersection with John Renshaw Drive
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Access												
1	L2	115	10.0	0.066	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
3	R2	592	10.0	0.910	57.2	LOS E	9.5	72.4	1.00	1.08	1.60	32.5
Approach		706	10.0	0.910	48.8	LOS D	9.5	72.4	0.84	0.99	1.34	34.8
East: John Renshaw Drive												
4	L2	1551	10.0	0.894	9.5	LOS A	0.0	0.0	0.00	0.63	0.00	70.2
5	T1	1481	10.0	0.899	35.6	LOS C	34.3	260.8	1.00	1.04	1.26	50.9
Approach		3032	10.0	0.899	22.3	LOS B	34.3	260.8	0.49	0.83	0.61	59.3
West: John Renshaw Drive												
11	T1	973	10.0	0.244	3.9	LOS A	4.2	31.7	0.36	0.31	0.36	90.4
12	R2	602	10.0	0.868	51.9	LOS D	13.7	103.8	1.00	0.96	1.36	36.2
Approach		1575	10.0	0.868	22.3	LOS B	13.7	103.8	0.60	0.56	0.74	57.5
All Vehicles		5313	10.0	0.910	25.8	LOS B	34.3	260.8	0.57	0.77	0.75	53.8

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Wednesday, 18 July 2018 2:52:43 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028 PM - Eastern Access]

Eastern Access intersection with John Renshaw Drive
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Eastern Access												
1	L2	539	10.0	0.311	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
3	R2	2649	10.0	0.899	44.9	LOS D	62.6	475.9	0.96	0.95	1.03	36.5
Approach		3188	10.0	0.899	38.3	LOS C	62.6	475.9	0.80	0.88	0.86	38.7
East: John Renshaw Drive												
4	L2	455	10.0	0.262	9.0	LOS A	0.0	0.0	0.00	0.63	0.00	71.2
5	T1	1261	10.0	0.906	73.5	LOS F	34.5	262.0	1.00	0.99	1.22	33.5
Approach		1716	10.0	0.906	56.4	LOS D	34.5	262.0	0.73	0.90	0.90	38.9
West: John Renshaw Drive												
11	T1	1753	10.0	0.903	62.6	LOS E	46.3	352.2	1.00	0.99	1.15	37.1
12	R2	175	10.0	0.840	93.6	LOS F	7.0	53.4	1.00	0.87	1.32	25.7
Approach		1927	10.0	0.903	65.5	LOS E	46.3	352.2	1.00	0.98	1.17	35.7
All Vehicles		6832	10.0	0.906	50.5	LOS D	62.6	475.9	0.84	0.91	0.95	37.8

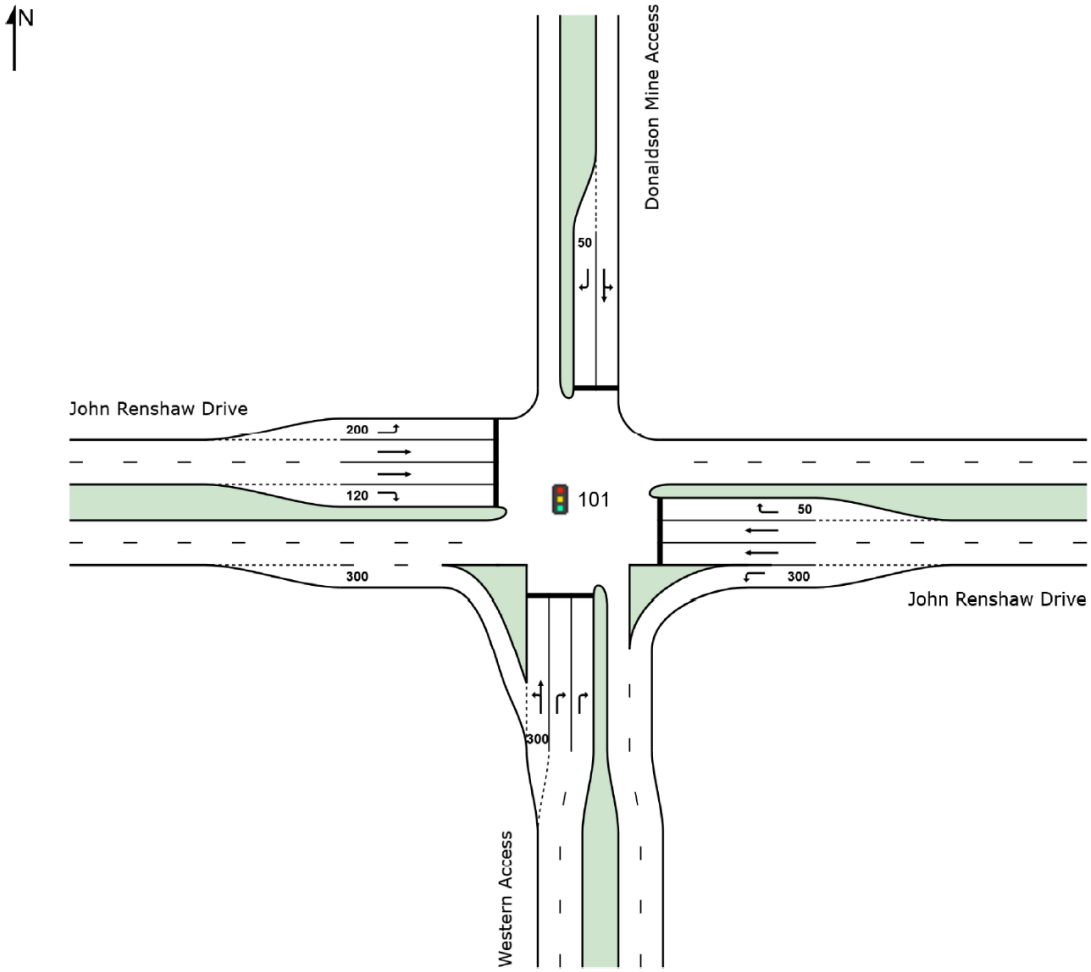
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard 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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Wednesday, 18 July 2018 2:50:50 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

SITE LAYOUT

Site: 101 [2028 PM - Western Access]

New Site - Western Access with JRD
Site Category: Signalised
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [2018 AM - Western Access]

New Site - Western Access with JRD
Site Category: Signalised
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Western Access												
1	L2	74	10.0	0.054	7.0	LOS A	0.5	3.7	0.20	0.57	0.20	58.9
2	T1	1	10.0	0.054	1.3	LOS A	0.5	3.7	0.20	0.57	0.20	54.0
3	R2	222	10.0	0.747	44.4	LOS D	4.2	32.0	1.00	0.89	1.28	36.6
Approach		297	10.0	0.747	35.0	LOS C	4.2	32.0	0.80	0.81	1.01	40.5
East: John Renshaw Drive												
4	L2	887	10.0	0.512	9.0	LOS A	0.0	0.0	0.00	0.63	0.00	71.1
5	T1	627	10.0	0.705	28.1	LOS B	10.5	79.5	0.97	0.85	1.05	56.6
6	R2	17	10.0	0.113	42.0	LOS C	0.6	4.3	0.95	0.69	0.95	39.5
Approach		1532	10.0	0.705	17.2	LOS B	10.5	79.5	0.41	0.72	0.44	63.9
North: Donaldson Mine Access												
7	L2	31	10.0	0.212	40.1	LOS C	1.1	8.2	0.96	0.72	0.96	38.1
8	T1	1	10.0	0.212	34.5	LOS C	1.1	8.2	0.96	0.72	0.96	36.3
9	R2	15	10.0	0.099	39.5	LOS C	0.5	3.8	0.95	0.68	0.95	38.4
Approach		46	10.0	0.212	39.8	LOS C	1.1	8.2	0.96	0.71	0.96	38.2
West: John Renshaw Drive												
10	L2	16	10.0	0.023	21.7	LOS B	0.3	2.5	0.63	0.69	0.63	50.6
11	T1	1242	10.0	0.848	27.9	LOS B	23.0	174.8	0.97	0.96	1.17	56.8
12	R2	296	10.0	0.703	36.7	LOS C	9.9	75.2	0.97	0.86	1.05	42.3
Approach		1554	10.0	0.848	29.5	LOS C	23.0	174.8	0.97	0.94	1.14	53.3
All Vehicles		3428	10.0	0.848	24.6	LOS B	23.0	174.8	0.70	0.83	0.82	55.6

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 SUMMARY

Site: 101 [2018 PM - Western Access]

New Site - Western Access with JRD
Site Category: Signalised
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Western Access												
1	L2	353	10.0	0.228	6.7	LOS A	3.2	24.0	0.14	0.57	0.14	59.2
2	T1	1	10.0	0.228	1.0	LOS A	3.2	24.0	0.14	0.57	0.14	54.2
3	R2	1057	10.0	0.898	62.1	LOS E	39.1	297.0	1.00	0.96	1.16	31.1
Approach		1411	10.0	0.898	48.2	LOS D	39.1	297.0	0.78	0.86	0.90	35.4
East: John Renshaw Drive												
4	L2	264	10.0	0.152	9.0	LOS A	0.0	0.0	0.00	0.63	0.00	71.2
5	T1	1423	10.0	0.912	57.1	LOS E	56.2	426.9	1.00	1.00	1.14	39.1
6	R2	2	10.0	0.020	81.0	LOS F	0.1	1.1	0.96	0.62	0.96	27.8
Approach		1689	10.0	0.912	49.6	LOS D	56.2	426.9	0.84	0.95	0.96	42.1
North: Donaldson Mine Access												
7	L2	46	10.0	0.208	68.9	LOS E	3.1	23.8	0.93	0.75	0.93	29.3
8	T1	1	10.0	0.208	63.2	LOS E	3.1	23.8	0.93	0.75	0.93	28.2
9	R2	14	10.0	0.025	43.2	LOS D	0.7	5.1	0.72	0.67	0.72	37.0
Approach		61	10.0	0.208	63.0	LOS E	3.1	23.8	0.88	0.73	0.88	30.7
West: John Renshaw Drive												
10	L2	7	10.0	0.005	11.9	LOS A	0.1	0.9	0.23	0.67	0.23	58.6
11	T1	768	10.0	0.492	33.1	LOS C	20.1	152.7	0.78	0.68	0.78	52.6
12	R2	88	10.0	0.850	94.1	LOS F	7.1	54.3	1.00	0.88	1.34	25.5
Approach		864	10.0	0.850	39.1	LOS C	20.1	152.7	0.80	0.70	0.83	47.5
All Vehicles		4025	10.0	0.912	47.1	LOS D	56.2	426.9	0.81	0.86	0.91	40.2

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2028 AM - Western Access]

New Site - Western Access with JRD
Site Category: Signalised
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Western Access												
1	L2	73	10.0	0.068	9.4	LOS A	0.8	6.4	0.38	0.63	0.38	56.3
2	T1	1	10.0	0.068	3.7	LOS A	0.8	6.4	0.38	0.63	0.38	52.1
3	R2	217	10.0	0.715	48.5	LOS D	4.6	34.8	1.00	0.86	1.20	35.2
Approach		291	10.0	0.715	38.6	LOS C	4.6	34.8	0.84	0.80	1.00	38.9
East: John Renshaw Drive												
4	L2	867	10.0	0.500	9.0	LOS A	0.0	0.0	0.00	0.63	0.00	71.1
5	T1	709	10.0	0.680	28.1	LOS B	12.8	97.0	0.94	0.81	0.96	56.7
6	R2	17	10.0	0.130	47.8	LOS D	0.7	5.0	0.96	0.69	0.96	37.2
Approach		1594	10.0	0.680	17.9	LOS B	12.8	97.0	0.43	0.71	0.44	63.4
North: Donaldson Mine Access												
7	L2	31	10.0	0.242	46.0	LOS D	1.2	9.5	0.98	0.72	0.98	35.9
8	T1	1	10.0	0.242	40.3	LOS C	1.2	9.5	0.98	0.72	0.98	34.3
9	R2	15	10.0	0.097	43.8	LOS D	0.6	4.2	0.95	0.69	0.95	36.7
Approach		46	10.0	0.242	45.2	LOS D	1.2	9.5	0.97	0.71	0.97	36.1
West: John Renshaw Drive												
10	L2	16	10.0	0.808	31.7	LOS C	25.2	191.5	0.92	0.88	1.01	49.1
11	T1	1353	10.0	0.808	23.6	LOS B	25.2	191.7	0.92	0.88	1.01	60.8
12	R2	289	10.0	0.668	38.7	LOS C	10.6	80.6	0.96	0.85	0.99	41.2
Approach		1658	10.0	0.808	26.3	LOS B	25.2	191.7	0.93	0.87	1.01	56.0
All Vehicles		3588	10.0	0.808	23.8	LOS B	25.2	191.7	0.70	0.79	0.75	56.5

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 SUMMARY

Site: 101 [2028 PM - Western Access]

New Site - Western Access with JRD
Site Category: Signalised
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

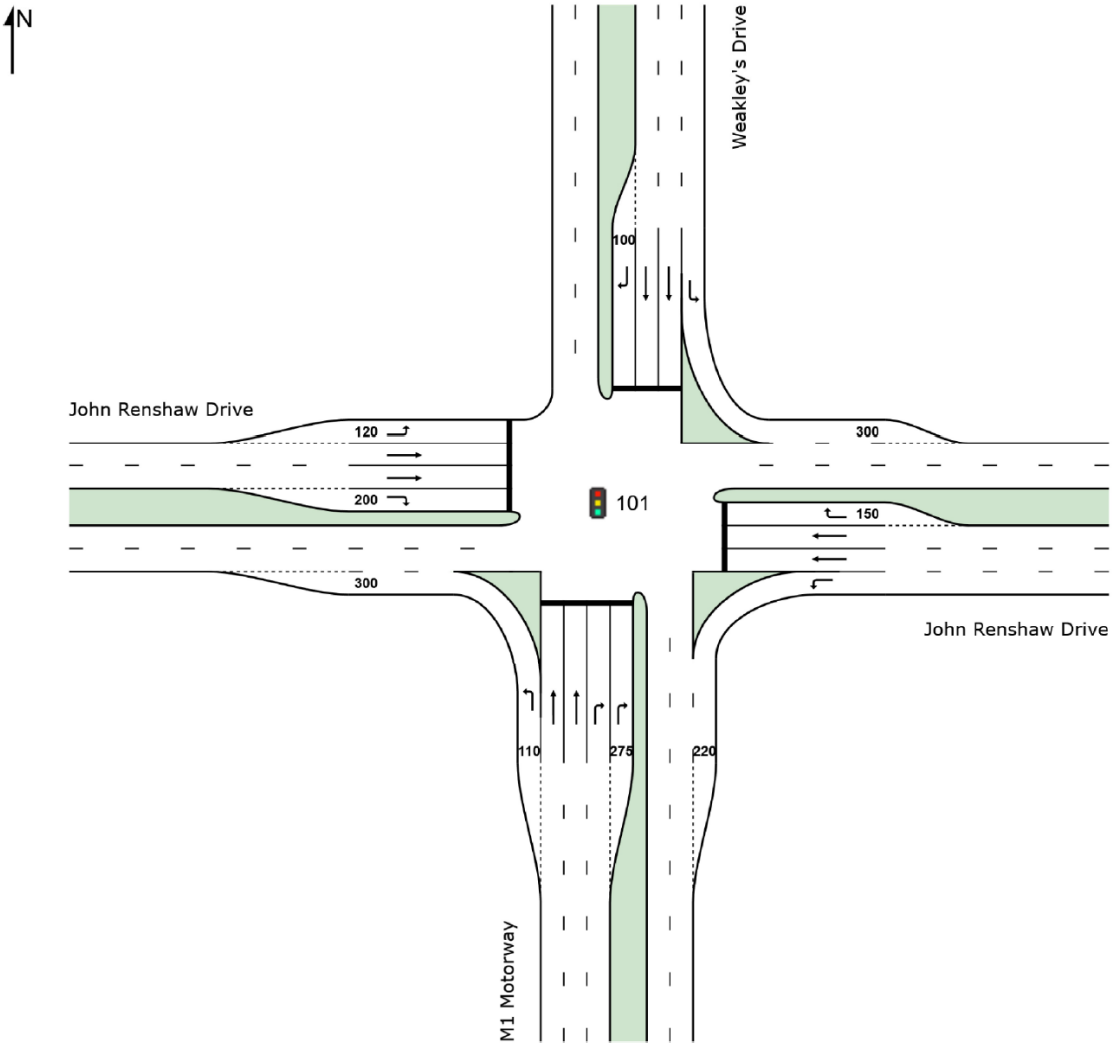
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Western Access												
1	L2	353	10.0	0.228	6.7	LOS A	3.2	24.0	0.14	0.57	0.14	59.2
2	T1	1	10.0	0.228	1.0	LOS A	3.2	24.0	0.14	0.57	0.14	54.2
3	R2	1057	10.0	0.973	98.1	LOS F	50.5	383.9	1.00	1.06	1.37	23.9
Approach		1411	10.0	0.973	75.2	LOS F	50.5	383.9	0.78	0.94	1.06	28.1
East: John Renshaw Drive												
4	L2	264	10.0	0.152	9.0	LOS A	0.0	0.0	0.00	0.63	0.00	71.2
5	T1	1536	10.0	0.969	78.4	LOS F	71.4	543.0	1.00	1.11	1.28	31.9
6	R2	2	10.0	0.030	85.6	LOS F	0.2	1.2	0.98	0.62	0.98	26.8
Approach		1802	10.0	0.969	68.2	LOS E	71.4	543.0	0.85	1.04	1.09	34.7
North: Donaldson Mine Access												
7	L2	46	10.0	0.682	89.4	LOS F	3.7	28.4	1.00	0.80	1.16	25.2
8	T1	1	10.0	0.682	83.7	LOS F	3.7	28.4	1.00	0.80	1.16	24.4
9	R2	14	10.0	0.025	43.2	LOS D	0.7	5.1	0.72	0.67	0.72	37.0
Approach		61	10.0	0.682	78.9	LOS F	3.7	28.4	0.94	0.77	1.06	27.1
West: John Renshaw Drive												
10	L2	7	10.0	0.010	32.1	LOS C	0.3	2.2	0.57	0.68	0.57	44.2
11	T1	871	10.0	0.532	31.9	LOS C	22.8	173.0	0.78	0.69	0.78	53.5
12	R2	88	10.0	0.956	109.8	LOS F	7.9	59.8	1.00	0.95	1.62	23.0
Approach		966	10.0	0.956	39.0	LOS C	22.8	173.0	0.80	0.71	0.86	47.6
All Vehicles		4240	10.0	0.973	64.0	LOS E	71.4	543.0	0.82	0.93	1.03	34.0

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.

SITE LAYOUT

Site: 101 [2028AM -M1_JRD_WD+ dev]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [2018AM - M1_JRD_WD + dev]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	1507	10.0	0.870	6.2	LOS A	0.0	0.0	0.00	0.52	0.00	53.9
2	T1	588	10.0	1.339	375.0	LOS F	54.6	415.2	1.00	1.91	2.75	8.1
3	R2	867	10.0	0.760	51.6	LOS D	27.8	228.4	0.94	0.86	0.94	32.1
Approach		2963	10.0	1.339	92.7	LOS F	54.6	415.2	0.47	0.89	0.82	23.3
East: John Renshaw Drive												
4	L2	581	10.0	0.335	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
5	T1	1386	10.0	1.535	542.9	LOS F	156.2	1187.5	1.00	2.67	3.23	5.9
6	R2	242	10.0	1.103	188.3	LOS F	30.6	232.7	1.00	1.28	1.97	14.3
Approach		2209	10.0	1.535	362.8	LOS F	156.2	1187.5	0.74	1.96	2.24	8.4
North: Weakley's Drive												
7	L2	27	10.0	0.016	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	656	10.0	1.492	506.6	LOS F	70.8	538.1	1.00	2.16	3.17	6.2
9	R2	792	10.0	1.520	537.1	LOS F	178.5	1356.8	1.00	1.90	3.20	6.0
Approach		1475	10.0	1.520	513.7	LOS F	178.5	1356.8	0.98	1.99	3.12	6.2
West: John Renshaw Drive												
10	L2	360	10.0	0.328	19.0	LOS B	11.9	90.4	0.50	0.73	0.50	44.5
11	T1	597	10.0	0.661	54.8	LOS D	19.7	149.5	0.96	0.82	0.96	31.8
12	R2	328	10.0	1.496	515.6	LOS F	71.2	541.4	1.00	1.90	3.18	6.1
Approach		1285	10.0	1.496	162.5	LOS F	71.2	541.4	0.84	1.07	1.40	16.0
All Vehicles		7933	10.0	1.535	257.5	LOS F	178.5	1356.8	0.70	1.42	1.74	11.2

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

Site: 101 [2018PM - M1_JRD_WD + dev]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	441	10.0	0.254	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
2	T1	551	10.0	1.735	717.4	LOS F	69.7	529.6	1.00	2.27	3.70	4.6
3	R2	879	10.0	2.113	1057.8	LOS F	138.8	971.5	1.00	2.39	4.28	3.2
Approach		1871	10.0	2.113	709.6	LOS F	138.8	999.9	0.76	1.91	3.10	4.6
East: John Renshaw Drive												
4	L2	969	10.0	0.559	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.4
5	T1	768	10.0	0.874	68.9	LOS E	30.0	228.2	1.00	1.00	1.17	28.4
6	R2	72	10.0	0.105	36.1	LOS C	3.2	24.7	0.67	0.71	0.67	37.3
Approach		1809	10.0	0.874	33.8	LOS C	30.0	228.2	0.45	0.73	0.52	38.7
North: Weakley's Drive												
7	L2	16	10.0	0.009	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	648	10.0	2.043	989.0	LOS F	93.5	710.3	1.00	2.53	4.19	3.4
9	R2	309	10.0	1.488	508.7	LOS F	66.7	506.6	1.00	1.82	3.16	6.2
Approach		974	10.0	2.043	820.4	LOS F	93.5	710.3	0.98	2.27	3.80	4.0
West: John Renshaw Drive												
10	L2	981	10.0	1.750	741.6	LOS F	255.9	1945.2	1.00	2.02	3.69	4.4
11	T1	1794	10.0	2.116	1059.0	LOS F	276.1	2098.2	1.00	3.48	4.26	3.2
12	R2	1463	10.0	2.168	1114.5	LOS F	445.3	3384.1	1.00	2.55	4.31	3.1
Approach		4238	10.0	2.168	1004.7	LOS F	445.3	3384.1	1.00	2.82	4.15	3.4
All Vehicles		8892	10.0	2.168	724.8	LOS F	445.3	3384.1	0.84	2.15	3.15	4.6

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.

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MOVEMENT SUMMARY

Site: 101 [2028AM -M1_JRD_WD+ dev]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	1500	10.0	0.865	6.2	LOS A	0.0	0.0	0.00	0.52	0.00	53.9
2	T1	689	10.0	1.412	437.3	LOS F	69.3	526.8	1.00	2.09	2.95	7.1
3	R2	1017	10.0	1.017	124.2	LOS F	61.6	497.2	1.00	1.14	1.54	19.6
Approach		3206	10.0	1.412	136.3	LOS F	69.3	526.8	0.53	1.05	1.12	18.2
East: John Renshaw Drive												
4	L2	681	10.0	0.393	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
5	T1	1434	10.0	1.587	588.9	LOS F	167.7	1274.5	1.00	2.77	3.35	5.5
6	R2	284	10.0	1.366	404.3	LOS F	54.5	414.3	1.00	1.70	2.84	7.6
Approach		2399	10.0	1.587	401.5	LOS F	167.7	1274.5	0.72	2.01	2.34	7.7
North: Weakley's Drive												
7	L2	32	10.0	0.018	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	768	10.0	1.574	577.3	LOS F	88.3	671.4	1.00	2.35	3.35	5.6
9	R2	816	10.0	1.615	621.1	LOS F	196.3	1492.2	1.00	2.00	3.42	5.2
Approach		1616	10.0	1.615	588.2	LOS F	196.3	1492.2	0.98	2.14	3.32	5.5
West: John Renshaw Drive												
10	L2	391	10.0	0.359	19.8	LOS B	13.5	102.2	0.52	0.74	0.52	44.1
11	T1	645	10.0	0.714	55.7	LOS D	21.6	164.3	0.98	0.84	0.98	31.6
12	R2	329	10.0	1.584	592.1	LOS F	76.3	580.0	1.00	2.00	3.39	5.4
Approach		1365	10.0	1.584	174.9	LOS F	76.3	580.0	0.85	1.09	1.43	15.1
All Vehicles		8586	10.0	1.615	301.6	LOS F	196.3	1492.2	0.72	1.53	1.93	9.8

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.

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MOVEMENT SUMMARY

Site: 101 [2028PM - M1_JRD_WD + dev]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	442	10.0	0.255	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
2	T1	645	10.0	1.888	852.2	LOS F	87.8	667.0	1.00	2.46	3.96	3.9
3	R2	1031	10.0	2.229	1162.0	LOS F	168.3	1178.1	1.00	2.46	4.42	2.9
Approach		2118	10.0	2.229	826.3	LOS F	168.3	1212.4	0.79	2.06	3.36	4.0
East: John Renshaw Drive												
4	L2	1136	10.0	0.655	5.9	LOS A	0.0	0.0	0.00	0.52	0.00	54.4
5	T1	846	10.0	0.990	106.2	LOS F	41.8	318.0	1.00	1.24	1.46	22.1
6	R2	84	10.0	0.128	37.7	LOS C	3.9	30.0	0.69	0.72	0.69	36.7
Approach		2066	10.0	0.990	48.3	LOS D	41.8	318.0	0.44	0.82	0.63	33.6
North: Weakley's Drive												
7	L2	19	10.0	0.011	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	760	10.0	2.224	1149.3	LOS F	115.6	878.8	1.00	2.72	4.42	2.9
9	R2	331	10.0	1.430	458.9	LOS F	67.7	514.6	1.00	1.76	3.01	6.8
Approach		1109	10.0	2.224	924.1	LOS F	115.6	878.8	0.98	2.39	3.92	3.6
West: John Renshaw Drive												
10	L2	1011	10.0	1.764	753.8	LOS F	265.5	2018.1	1.00	2.03	3.71	4.4
11	T1	1854	10.0	2.232	1162.4	LOS F	292.4	2222.3	1.00	3.59	4.40	2.9
12	R2	1466	10.0	2.239	1177.8	LOS F	454.4	3453.8	1.00	2.59	4.40	2.9
Approach		4331	10.0	2.239	1072.3	LOS F	454.4	3453.8	1.00	2.89	4.24	3.2
All Vehicles		9624	10.0	2.239	781.2	LOS F	454.4	3453.8	0.83	2.21	3.23	4.3

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Wednesday, 18 July 2018 3:50:50 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028AM -M1_JRD_WD+ dev - Stage 1]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	191	10.0	0.110	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
2	T1	689	10.0	0.831	65.1	LOS E	25.7	195.1	1.00	0.95	1.11	29.2
3	R2	1017	10.0	0.985	104.4	LOS F	49.9	410.1	1.00	1.08	1.42	22.0
Approach		1897	10.0	0.985	80.2	LOS F	49.9	410.1	0.90	0.98	1.16	25.9
East: John Renshaw Drive												
4	L2	681	10.0	0.393	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
5	T1	462	10.0	0.946	93.9	LOS F	20.4	155.4	1.00	1.10	1.43	23.8
6	R2	284	10.0	0.984	113.4	LOS F	27.5	209.0	1.00	1.09	1.51	20.9
Approach		1427	10.0	0.984	55.7	LOS D	27.5	209.0	0.52	0.82	0.76	31.4
North: Weakley's Drive												
7	L2	32	10.0	0.018	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	768	10.0	0.968	95.7	LOS F	37.6	285.5	1.00	1.18	1.41	23.5
9	R2	221	10.0	0.407	49.0	LOS D	12.6	96.1	0.84	0.80	0.84	32.9
Approach		1021	10.0	0.968	82.8	LOS F	37.6	285.5	0.93	1.08	1.24	25.5
West: John Renshaw Drive												
10	L2	226	10.0	0.268	29.6	LOS C	9.6	72.9	0.63	0.75	0.63	39.4
11	T1	362	10.0	0.742	70.6	LOS F	13.3	101.1	1.00	0.87	1.08	28.0
12	R2	69	10.0	0.240	64.5	LOS E	4.4	33.8	0.91	0.76	0.91	29.1
Approach		658	10.0	0.742	55.9	LOS D	13.3	101.1	0.86	0.82	0.91	31.2
All Vehicles		5003	10.0	0.985	70.6	LOS F	49.9	410.1	0.79	0.93	1.03	27.8

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Monday, 13 August 2018 4:09:44 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028PM - M1_JRD_WD + Stage 1]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	60	10.0	0.035	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
2	T1	645	10.0	0.801	63.4	LOS E	23.4	178.1	1.00	0.92	1.08	29.6
3	R2	1031	10.0	0.967	95.1	LOS F	50.0	350.1	1.00	1.05	1.35	23.3
Approach		1736	10.0	0.967	80.2	LOS F	50.0	383.8	0.97	0.99	1.20	25.8
East: John Renshaw Drive												
4	L2	1136	10.0	0.655	5.9	LOS A	0.0	0.0	0.00	0.52	0.00	54.4
5	T1	558	10.0	0.952	94.1	LOS F	25.0	190.3	1.00	1.13	1.41	23.8
6	R2	84	10.0	0.331	68.3	LOS E	5.6	42.6	0.94	0.77	0.94	28.1
Approach		1778	10.0	0.952	36.5	LOS C	25.0	190.3	0.36	0.72	0.49	37.6
North: Weakley's Drive												
7	L2	19	10.0	0.011	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	760	10.0	0.975	99.5	LOS F	37.4	283.9	1.00	1.20	1.43	22.9
9	R2	159	10.0	0.293	47.2	LOS D	8.7	66.2	0.80	0.77	0.80	33.4
Approach		938	10.0	0.975	88.7	LOS F	37.4	283.9	0.95	1.11	1.30	24.5
West: John Renshaw Drive												
10	L2	257	10.0	0.289	27.6	LOS B	10.5	79.9	0.61	0.75	0.61	40.3
11	T1	545	10.0	0.931	87.6	LOS F	23.5	178.7	1.00	1.09	1.35	24.8
12	R2	243	10.0	0.956	103.0	LOS F	22.1	167.9	1.00	1.06	1.45	22.3
Approach		1045	10.0	0.956	76.4	LOS F	23.5	178.7	0.90	1.00	1.19	26.6
All Vehicles		5497	10.0	0.975	66.8	LOS E	50.0	383.8	0.75	0.92	0.99	28.6

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Monday, 13 August 2018 4:17:42 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028PM - M1_JRD_WD + Stage 1+M12RT]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	60	10.0	0.035	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
2	T1	645	10.0	0.783	35.6	LOS C	13.1	99.3	1.00	0.94	1.16	38.0
3	R2	421	10.0	0.883	53.4	LOS D	10.4	72.8	1.00	1.04	1.48	31.6
Approach		1126	10.0	0.883	40.7	LOS C	13.1	99.3	0.95	0.96	1.22	35.9
East: John Renshaw Drive												
4	L2	526	10.0	0.304	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
5	T1	558	10.0	0.871	44.3	LOS D	12.6	96.1	1.00	1.04	1.38	34.9
6	R2	84	10.0	0.299	38.7	LOS C	3.0	22.8	0.92	0.76	0.92	36.4
Approach		1168	10.0	0.871	26.6	LOS B	12.6	96.1	0.54	0.79	0.72	41.8
North: Weakley's Drive												
7	L2	19	10.0	0.011	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	760	10.0	0.922	50.1	LOS D	19.0	144.6	1.00	1.16	1.50	33.1
9	R2	159	10.0	0.667	43.8	LOS D	6.3	48.2	1.00	0.85	1.09	34.5
Approach		938	10.0	0.922	48.2	LOS D	19.0	144.6	0.98	1.09	1.40	33.6
West: John Renshaw Drive												
10	L2	257	10.0	0.382	24.8	LOS B	7.3	55.3	0.76	0.78	0.76	41.6
11	T1	545	10.0	0.851	42.6	LOS D	12.0	91.5	1.00	1.01	1.33	35.5
12	R2	243	10.0	0.863	50.3	LOS D	11.0	83.5	1.00	1.02	1.39	32.8
Approach		1045	10.0	0.863	40.0	LOS C	12.0	91.5	0.94	0.96	1.20	36.1
All Vehicles		4278	10.0	0.922	38.3	LOS C	19.0	144.6	0.84	0.94	1.12	36.8

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Monday, 13 August 2018 4:20:04 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028AM -M1_JRD_WD+ Stage 2+ M12RT]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 130 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	521	10.0	0.301	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
2	T1	689	10.0	0.790	53.4	LOS D	21.6	164.0	1.00	0.92	1.08	32.1
3	R2	421	10.0	0.631	58.5	LOS E	13.3	93.2	0.97	0.83	0.97	30.3
Approach		1632	10.0	0.790	39.5	LOS C	21.6	164.0	0.67	0.77	0.71	36.3
East: John Renshaw Drive												
4	L2	316	10.0	0.182	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
5	T1	668	10.0	0.913	71.4	LOS F	24.7	187.7	1.00	1.08	1.31	27.8
6	R2	284	10.0	0.888	74.4	LOS F	20.3	154.6	1.00	0.98	1.28	26.9
Approach		1268	10.0	0.913	55.7	LOS D	24.7	187.7	0.75	0.92	0.98	31.4
North: Weakley's Drive												
7	L2	32	10.0	0.018	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	768	10.0	0.888	63.6	LOS E	27.3	207.7	1.00	1.04	1.23	29.5
9	R2	303	10.0	0.909	77.7	LOS F	22.4	170.4	1.00	1.00	1.32	26.2
Approach		1103	10.0	0.909	65.8	LOS E	27.3	207.7	0.97	1.01	1.22	28.9
West: John Renshaw Drive												
10	L2	247	10.0	0.325	31.1	LOS C	10.1	77.1	0.70	0.77	0.70	38.8
11	T1	413	10.0	0.563	51.0	LOS D	11.9	90.7	0.95	0.79	0.95	32.9
12	R2	152	10.0	0.474	57.4	LOS E	8.7	66.3	0.94	0.80	0.94	30.8
Approach		812	10.0	0.563	46.1	LOS D	11.9	90.7	0.87	0.79	0.87	34.0
All Vehicles		4815	10.0	0.913	50.9	LOS D	27.3	207.7	0.80	0.87	0.92	32.7

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Monday, 13 August 2018 4:25:39 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028PM - M1_JRD_WD + Stage 2+M12RT]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 140 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	159	10.0	0.092	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
2	T1	645	10.0	0.748	54.9	LOS D	20.9	158.9	0.99	0.87	1.02	31.7
3	R2	421	10.0	0.895	83.9	LOS F	17.4	121.5	1.00	0.98	1.33	25.0
Approach		1225	10.0	0.895	58.5	LOS E	20.9	158.9	0.86	0.86	0.99	30.6
East: John Renshaw Drive												
4	L2	526	10.0	0.304	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
5	T1	619	10.0	0.696	52.2	LOS D	19.3	147.0	0.97	0.83	0.97	32.5
6	R2	84	10.0	0.227	54.7	LOS D	4.8	36.2	0.87	0.76	0.87	31.4
Approach		1229	10.0	0.696	32.5	LOS C	19.3	147.0	0.55	0.69	0.55	39.2
North: Weakley's Drive												
7	L2	19	10.0	0.011	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	760	10.0	0.905	71.0	LOS F	30.3	230.0	1.00	1.06	1.25	27.9
9	R2	182	10.0	0.774	73.4	LOS F	12.8	97.2	1.00	0.88	1.13	27.0
Approach		961	10.0	0.905	70.2	LOS E	30.3	230.0	0.98	1.02	1.20	28.0
West: John Renshaw Drive												
10	L2	356	10.0	0.487	37.0	LOS C	17.5	132.9	0.78	0.81	0.78	36.5
11	T1	792	10.0	0.890	67.5	LOS E	29.8	226.7	1.00	1.03	1.21	28.7
12	R2	325	10.0	0.876	74.2	LOS F	24.3	184.6	1.00	0.96	1.21	27.0
Approach		1473	10.0	0.890	61.6	LOS E	29.8	226.7	0.95	0.96	1.11	29.8
All Vehicles		4888	10.0	0.905	55.2	LOS D	30.3	230.0	0.83	0.88	0.96	31.5

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Monday, 13 August 2018 4:27:43 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028AM -M1_JRD_WD+ Stage 3+ M12RT]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	837	10.0	0.483	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
2	T1	689	10.0	0.883	72.9	LOS F	27.5	208.6	1.00	1.01	1.20	27.5
3	R2	421	10.0	0.506	58.9	LOS E	14.3	99.8	0.92	0.82	0.92	30.2
Approach		1947	10.0	0.883	41.0	LOS C	27.5	208.6	0.55	0.76	0.62	35.8
East: John Renshaw Drive												
4	L2	316	10.0	0.182	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
5	T1	864	10.0	1.041	135.5	LOS F	48.3	366.8	1.00	1.38	1.65	18.6
6	R2	284	10.0	1.025	135.1	LOS F	30.2	229.8	1.00	1.15	1.65	18.5
Approach		1464	10.0	1.041	107.4	LOS F	48.3	366.8	0.78	1.15	1.29	21.6
North: Weakley's Drive												
7	L2	32	10.0	0.018	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	768	10.0	1.036	133.6	LOS F	44.5	338.3	1.00	1.35	1.65	18.7
9	R2	383	10.0	1.040	142.7	LOS F	43.3	328.8	1.00	1.17	1.67	17.7
Approach		1183	10.0	1.040	133.2	LOS F	44.5	338.3	0.97	1.27	1.61	18.7
West: John Renshaw Drive												
10	L2	247	10.0	0.282	28.1	LOS B	10.2	77.6	0.61	0.75	0.61	40.1
11	T1	463	10.0	0.558	55.4	LOS D	15.0	114.2	0.94	0.79	0.94	31.6
12	R2	263	10.0	0.949	99.5	LOS F	23.6	179.4	1.00	1.04	1.41	22.8
Approach		974	10.0	0.949	60.4	LOS E	23.6	179.4	0.87	0.85	0.99	30.1
All Vehicles		5568	10.0	1.041	81.5	LOS F	48.3	366.8	0.76	0.99	1.07	25.6

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.

Organisation: INTERSECT TRAFFIC PTY LTD | Processed: Monday, 13 August 2018 4:40:20 PM
Project: C:\Work Documents\Projects\2018\18.048 - Blackhill Industrial Development\Sidra\Black Hill F & F.sip8

MOVEMENT SUMMARY

Site: 101 [2028PM - M1_JRD_WD + Stage 3+M12RT]

M1 Motorway / John Renshaw Drive / Weakleys Drive signals
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: M1 Motorway												
1	L2	252	10.0	0.145	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
2	T1	645	10.0	1.017	123.4	LOS F	33.6	255.5	1.00	1.28	1.60	19.9
3	R2	421	10.0	1.214	277.1	LOS F	35.1	245.7	1.00	1.47	2.38	10.4
Approach		1318	10.0	1.214	150.0	LOS F	35.1	255.5	0.81	1.19	1.55	17.0
East: John Renshaw Drive												
4	L2	526	10.0	0.304	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
5	T1	678	10.0	0.771	59.1	LOS E	23.7	180.4	0.99	0.89	1.04	30.7
6	R2	84	10.0	0.149	43.6	LOS D	4.3	32.7	0.74	0.73	0.74	34.7
Approach		1288	10.0	0.771	36.3	LOS C	23.7	180.4	0.57	0.73	0.59	37.7
North: Weakley's Drive												
7	L2	19	10.0	0.011	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.6
8	T1	760	10.0	1.198	256.5	LOS F	58.3	442.9	1.00	1.75	2.27	11.2
9	R2	205	10.0	1.184	252.4	LOS F	30.4	231.1	1.00	1.40	2.28	11.2
Approach		984	10.0	1.198	250.8	LOS F	58.3	442.9	0.98	1.66	2.23	11.4
West: John Renshaw Drive												
10	L2	448	10.0	0.681	47.1	LOS D	27.2	206.7	0.90	0.86	0.90	33.2
11	T1	1027	10.0	1.210	264.2	LOS F	83.7	636.4	1.00	1.89	2.28	11.0
12	R2	702	10.0	1.240	292.6	LOS F	117.3	891.6	1.00	1.56	2.36	10.1
Approach		2178	10.0	1.240	228.7	LOS F	117.3	891.6	0.98	1.57	2.02	12.3
All Vehicles		5768	10.0	1.240	171.5	LOS F	117.3	891.6	0.85	1.31	1.63	15.4

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.

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