

HB&B Property Pty Ltd

221 LUDDENHAM ROAD, ORCHARD HILLS –ALSPEC INDUSTRIAL BUSINESS PARK

Traffic Impact Assessment

Final Report

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Final Report

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1 INTRODUCTION

1.1 Background

Arcadis has been engaged by HB&B Property Ltd to undertake a Traffic Impact Assessment for the proposed Alspec Industrial Business Park (AIBP) development at 221-227 & 289-317 Luddenham Road, Orchard Hills.

The proposal is to develop a 125-hectare parcel of land at the above address to accommodate a mix of warehouse, industrial and office land uses. The development is proposed to be completed in three stages, with various road and other infrastructure works required at each stage.

In the preparation of this assessment, the subject site and its surroundings have been inspected, along with developments plans and relevant traffic and parking data have been reviewed and analysed.

1.2 Scope of Report

This report has been structured as follows:

- Section 2 describes the existing conditions in relation to the site, including surrounding land uses, the road network and available transport modes
- Section 3 outlines the key developments and planned transport network changes relevant to the site
- Section 4 describes the proposal as understood by Arcadis
- Section 5 outlines the expected traffic generated by the development and the associated impact on the surrounding road network
- Section 6 outlines the expected parking requirements associated with the proposed development in accordance with local relevant planning policies
- Section 7 provides an assessment of the access and internal design aspects of the proposal.

1.3 Assumptions

This report has been based on the following documents and assumptions:

- Traffic forecasts for Luddenham Road were extracted from a model that was based on land use forecasts from LU2016 V1.51 and demand matrices from Strategic Transport Model V3.62) as provided by Transport for NSW.
- Widening of Luddenham Road to two lanes in each direction has been assumed, as agreed following discussions with Penrith City Council on 29 June 2020.

2 EXISTING CONDITIONS

2.1 Site Location and Context

The subject site is located on Luddenham Road, south of Patons Lane, in Orchard Hills. Located approximately 30 kilometres west of Parramatta CBD, the site is irregular in shape, with split frontages across both Luddenham Road and Patons Lane.

The site location is shown in Figure 2-1.

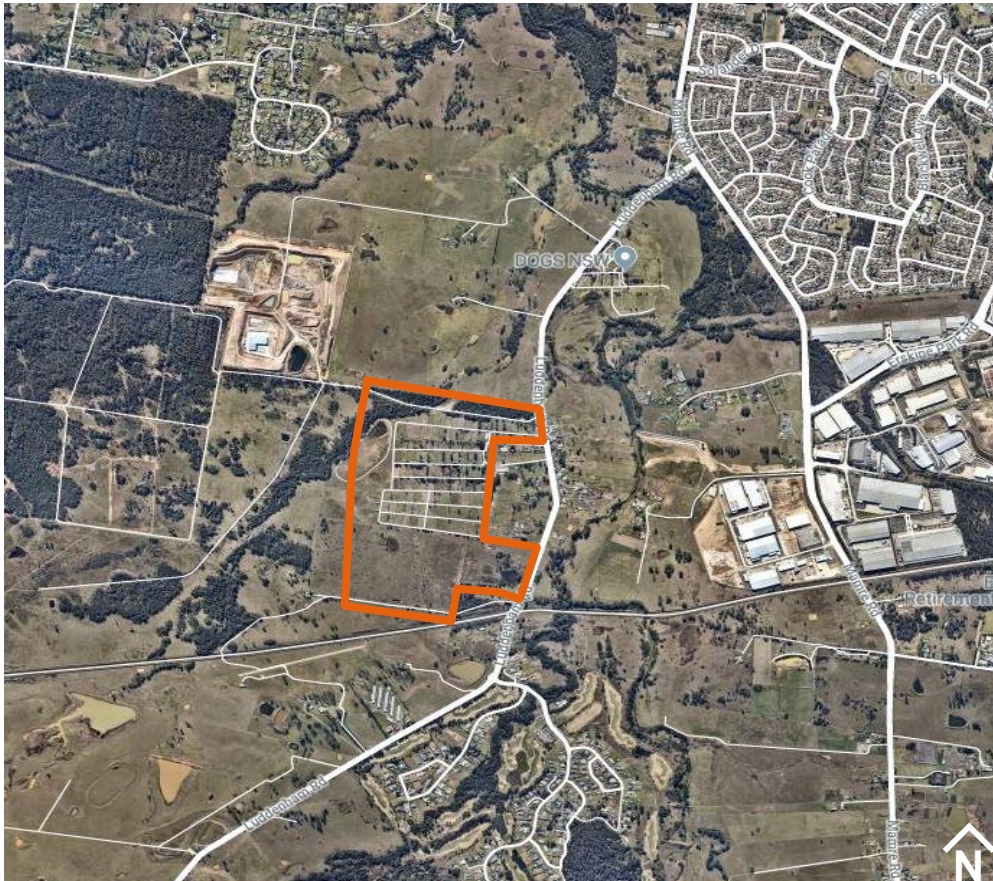


Figure 2-1 Site Location

2.2 Planning Zones

As shown in Figure 2-2, the subject site is located in a Rural Landscape Zone (RU2). The region surrounding the site is a mix of Environmental Conservation (E2) and Rural Landscape Zone (RU2). To the east of Mamre Road, the more common land uses are General Industrial (IN1) and Low Density Residential (R2).

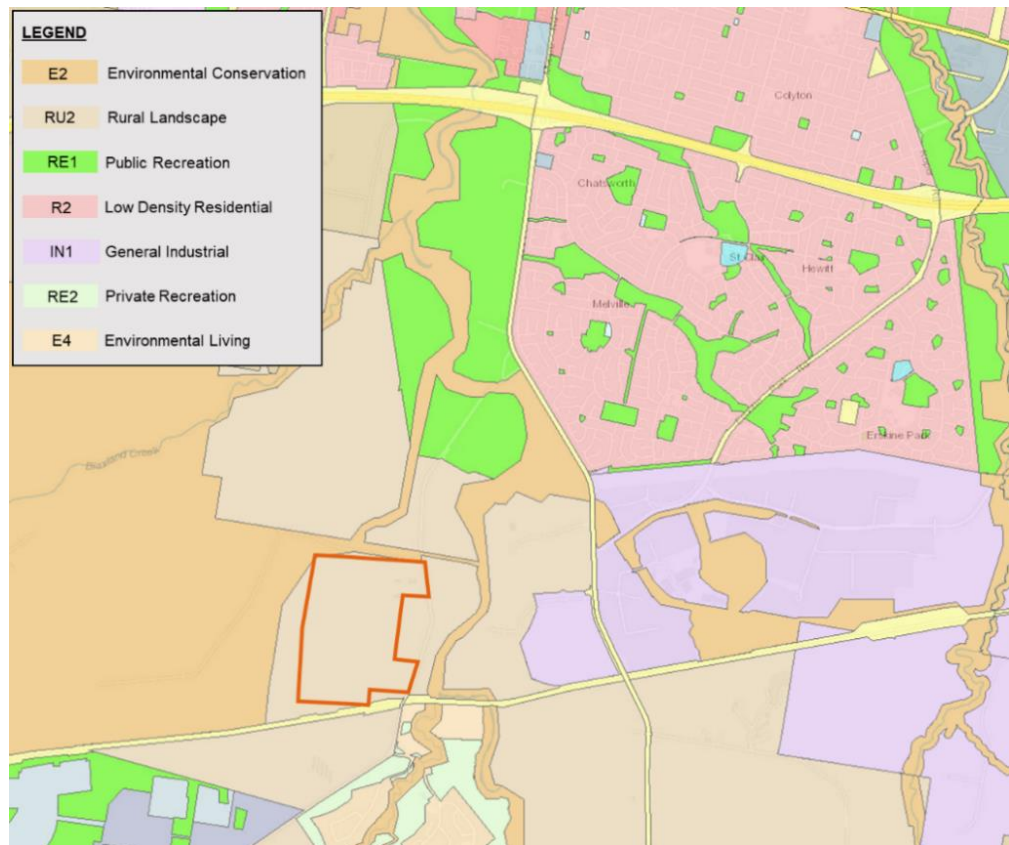


Figure 2-2 Land Zoning Map (Source: ePlanning Spatial Viewer - NSW Planning Portal)

2.3 Road Network

A summary of the key roads influenced by the development application is provided below:

Luddenham Road

Luddenham Road is a regional road under the control and management of Penrith Council. Near the site, Luddenham Road is aligned in a general north-east/south-west direction. It is a two-way road configured with a 2-lane, 7-metre-wide carriageway, set within an approximately 21-metre-wide road reserve.

Luddenham Road carries approximately 3,000 vehicles per day and has a posted speed limit of 80 km/h.

Photos of Luddenham Road in the vicinity of the site are provided in Figure 2-3 and Figure 2-4.



Figure 2-3 Luddenham Road, facing north



Figure 2-4 Luddenham Road, facing south

Patons Lane

Patons Lane is a local road under the control and management of Penrith Council. Near the site, Patons Lane is generally aligned in an east/west orientation. It is a two-way road configured with a 2-lane, 6.6-metre-wide carriageway with 1.2-metre-wide sealed shoulders on both sides of the road, set within a road reserve that is approximately 19 metres wide.

Patons Lane carries approximately 150 vehicles per day and has a posted speed limit of 50 km/h.

Photos of Patons Lane in the vicinity of the site are provided in Figure 2-5 and Figure 2-6.



Figure 2-5 Patons Lane, facing west



Figure 2-6 Patons Lane, facing east

Mamre Road

Mamre Road is a state road under the control and management of Roads and Maritime Services (RMS). Within the context of the study area, Mamre Road is aligned in a north/south orientation and is currently configured as a 2-lane undivided carriageway, set within a 45-metre-wide road reserve.

Mamre Road carries approximately 15,000 vehicles per day and has a posted speed limit of 80 km/h. Mamre Road passes through the Western Sydney Priority Growth Area and provides connections to the Western Sydney Employment Area (WSEA), making it a key route for regional trips.

Photos of Mamre Road close to the intersection with Luddenham Road are shown in Figure 2-7 and Figure 2-8.



Figure 2-7 Mamre Road, facing north (Source: Google Earth)



Figure 2-8 Mamre Road, facing south (Source: Google Earth)

Elizabeth Drive

Elizabeth Drive is a state road under the control and management of Roads and Maritime Services (RMS). It is aligned in an east/west orientation and carries approximately 11,000 vehicles per day.

Elizabeth Drive is configured as a 2-lane undivided carriageway with unsealed shoulders and is set within a 35-metre-wide road reserve. The speed limit is posted as 80 km/h in both directions of travel. To the east, Elizabeth Drive connects to the Westlink M7 Motorway and to the west it connects with The Northern Road.

Photos of Elizabeth Drive near the intersection with Luddenham Road is shown in Figure 2-9 and Figure 2-10.



Figure 2-9 Elizabeth Drive, facing east
(Source: Google Earth)



Figure 2-10 Elizabeth Drive, facing west
(Source: Google Earth)

2.4 Public Transport

A review of the public transport available in the vicinity of the site indicates that there are three bus services (Routes 775, 776 and 779) that operate in the St Clair / Erskine Park area to the north east of the site. No bus services connect past the site to the south.

Overall, the area is currently underserved by public transport. However, the level of service provision reflects the low travel demands of the locality.

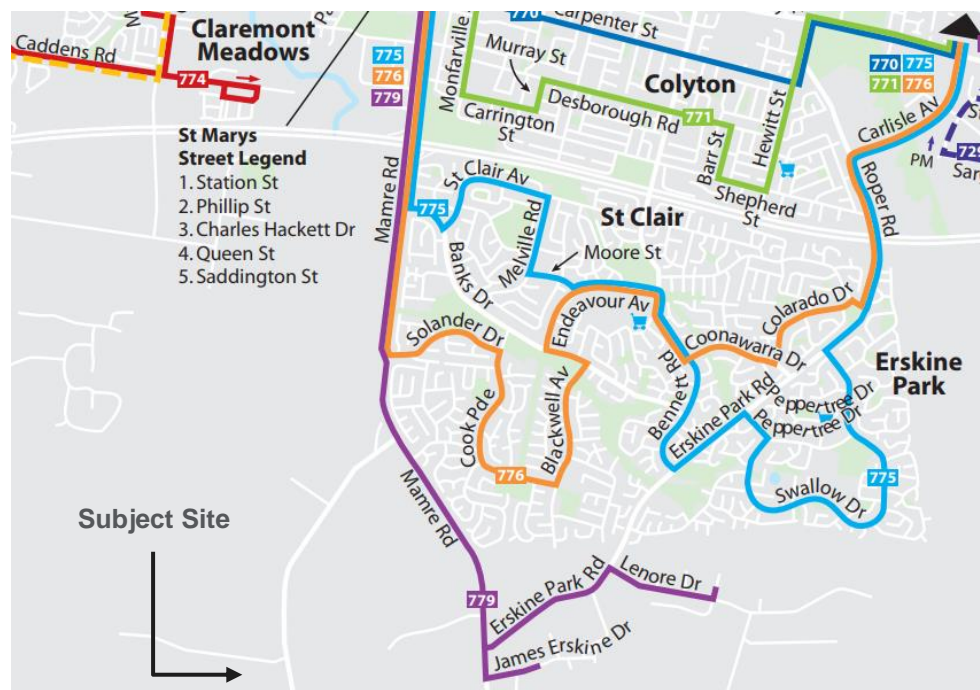


Figure 2-11 Current Public Transport Network – Orchard Hills area

2.5 Active Transport

There is currently limited pedestrian or cyclist infrastructure provided in the vicinity of the site, mainly due to the nature of land use in the vicinity and the limited demand for such facilities at present.

2.6 Road Safety

Historical crash data has been evaluated as part of this assessment to obtain an understating of current road safety characteristics and trends for:

- Luddenham Road between Mamre Road and Elizabeth Drive
- The intersection of Mamre Road and Luddenham Road to the north of the site
- The intersection of Elizabeth Drive and Luddenham Road to the south of the site.

Crash statistics for the area has been obtained for the years 1 January 2014 to 31 December 2018. This data was used to determine the main factors contributing to crashes at the locations identified above.

Luddenham Road

A summary of the crash statistics for crashes occurring along Luddenham Road is provided in Table 2-1.

Table 2-1 – Crash history along Luddenham Road for the five-year period between 2014-2018

Crash Severity	Year				
	2014	2015	2016	2017	2018
Non-causality	-	3	1	-	-
Minor/other injury	1	-	1	1	-
Moderate injury	2	1	1	1	1
Serious Injury	4	1	1	1	1
Fatal	-	-	-	-	-
TOTAL	7	5	4	3	2

The crash data revealed:

- A total of 21 crashes occurred along the length of Luddenham Road between Mamre Road and Elizabeth Drive over a five-year period between 2014 and 2018, averaging 0.002 per day or 4.2 per year
- 71 per cent of the crashes resulted in an injury, and there were no fatalities recorded
- 57 per cent involved vehicles travelling off the road and hitting an object resulted in an injury, and there were no fatalities recorded
- 10 per cent were multi-vehicle crashes
- 52 per cent of crashes occurred in dusk or darkness conditions
- 14 per cent of crashes involved vehicles striking animals while travelling along the roadway.

The crash statistics indicate that a relatively high number of crashes involved vehicles colliding objects after veering off the roadway. Any future upgrade to Luddenham Road should address this trend and related safety issues.

Intersection of Mamre Road and Luddenham Road

A summary of the crash statistics for crashes occurring at the intersection of Mamre Road and Luddenham Road is provided in Table 2-2.

Table 2-2 – Crash history at the intersection of Mamre Road and Luddenham Road for the five-year period between 2014-2018

Crash Severity	Year				
	2014	2015	2016	2017	2018
Non-causality	-	1	-	1	-
Minor/other injury	-	-	-	-	-
Moderate injury	-	-	-	-	1
Serious Injury	-	-	-	-	-
Fatal	-	-	-	-	-
0	0	1	0	1	1

The crash data revealed:

- A total of three crashes occurred at the intersection of Mamre Road and Luddenham Road over a five-year period between 2014 and 2018, averaging 0.002 per day or 0.6 per year
- 34 per cent of the crashes resulted in an injury, and there were no fatalities recorded
- 100 per cent were multi-vehicle crashes involving vehicles travelling from adjacent directions
- 34 per cent of crashes occurred in poor visibility or darkness conditions
- 75 per cent of crashes involved vehicles travelling from adjacent directions

The crash statistics indicate that, while the overall frequency of crashes is low, the majority of crashes involved a vehicle colliding with another vehicle travelling in an adjacent direction. The proposed upgrade of Mamre Road will include upgrading the intersection with Luddenham Road to a fully signalised intersection, which will look to address this trend and related safety issues.

Intersection of Elizabeth Drive and Luddenham Road

A summary of the crash statistics for crashes occurring at the intersection of Elizabeth Drive and Luddenham Road is provided in Table 2-3.

Table 2-3 – Crash history at the intersection of Elizabeth Drive and Luddenham Road for the five-year period between 2014-2018

Crash Severity	Year				
	2014	2015	2016	2017	2018
Non-causality	-	-	-	-	-
Minor/other injury	-	-	-	-	-
Moderate injury	-	-	1	-	1
Serious Injury	-	1	1	-	-
Fatal	-	-	-	-	-
TOTAL	0	1	2	0	1

The crash data revealed:

- A total of four crashes occurred at the intersection of Elizabeth Drive and Luddenham Road over a five-year period between 2014 and 2018, averaging 0.002 per day or 0.8 per year
- 100 per cent of the crashes resulted in an injury, and there were no fatalities recorded
- 100 per cent were multi-vehicle crashes
- Zero per cent of crashes occurred in poor visibility or darkness conditions
- 75 per cent of crashes involved vehicles travelling from adjacent directions.

The crash statistics indicate that, while the overall frequency of crashes is low, the majority of crashes involved a vehicle colliding with another vehicle travelling in an adjacent direction. The proposed upgrade of Elizabeth Drive will include improvements to this intersection, which will look to address this trend and related safety issues.

3 FUTURE DEVELOPMENT AND ROAD NETWORK CHANGES

The area and road network around the site are expected to undergo significant changes over the next 20 years to support the growth of the broader the Greater Penrith to Eastern Creek (GPEC) Growth Area, Western Sydney Employment Area (WSEA) and the Aerotropolis. This section outlines the key land use and road network changes within proximity to the site.

Figure 3-1 highlights the location of these projects in relation to the subject site.

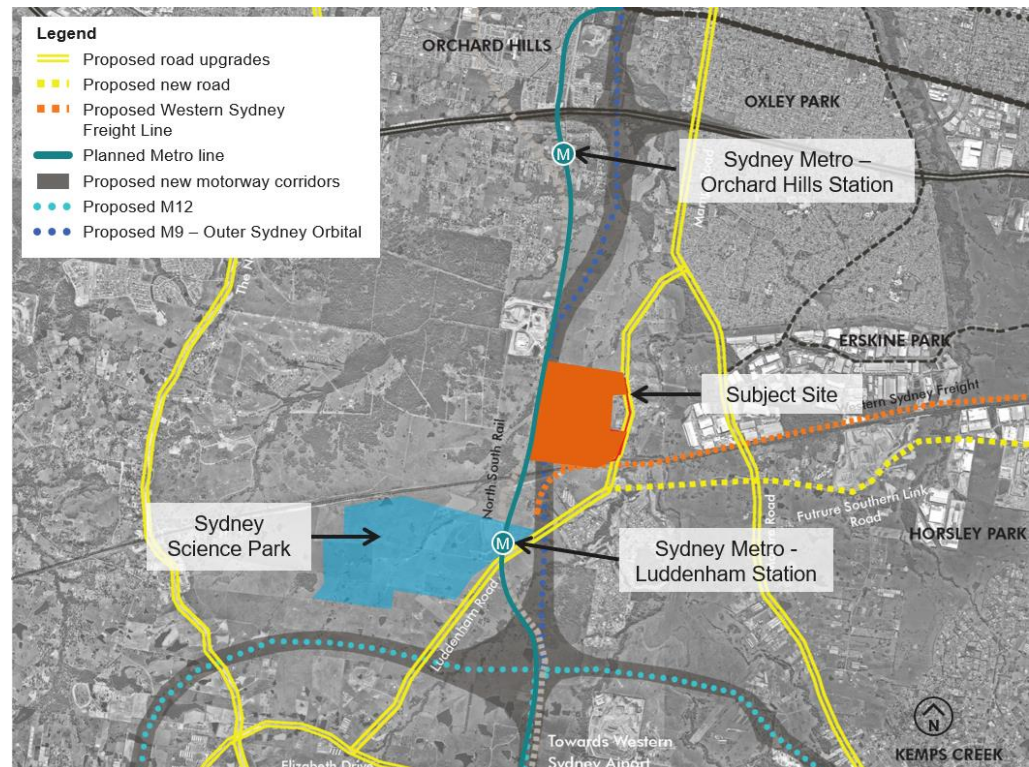


Figure 3-1 Proposed Transport Network – Orchard Hills area

3.1 Key developments and land use changes

The site is in proximity to a number of region and city shaping development opportunities that will shape economic activity and movement into the future. These will attract significant freight, logistics, advanced manufacturing, health, education and science activities and jobs that will direct investment across the metropolitan area.

Key projects that will influence demands around the subject site include:

- **The Western Sydney Airport** is a committed new international airport in Badgerys Creek. Set to open in 2026, the airport will serve passenger and freight operations and is expected to generate over 30,000 jobs from airport operations by 2060.
- **The Sydney Science Park** is a proposed new specialised centre comprising of a range of research and development, employment, education, retail and residential uses located at 565-609 Luddenham Road, Luddenham, approximately 2.5 kilometres south of the subject development.

3.2 Transport network improvements and changes

The Australian and NSW governments are progressively planning for and funding the delivery of a broad range of transport infrastructure improvements across the Greater Western Sydney region. These projects are intended to support an integrated

transport solution for the region and capitalise on the economic benefits from developing the new Western Sydney airport and the broader land use changes across the area.

Key infrastructure upgrades in relation to the subject site include:

- **The Sydney Metro – Western Sydney Airport**, a new metro railway connecting the new Western Sydney International Airport with the Greater Western Sydney, which provides connection to the existing Sydney Trains suburban T1 Western Line. The new rail line consists of six stations, including one at Luddenham which is around 1 kilometre south of the subject site and one at Orchard Hills 3 kilometres north of the subject site. The station will serve a future employment, research and knowledge-based employment precinct, along with a mixed-use residential development. The Luddenham Station will provide an interchange with future bus and active transport networks.
- **The Outer Sydney Orbital**, which will provide for a future north south motorway and freight rail line to support the growth of Western Sydney and the distribution of freight across Sydney and regional NSW. The recommended alignment runs directly adjacent to the subject site, and it is expected that some portion of land would be acquired for Outer Sydney Orbital project in the future.
- **The M12 motorway** project will provide direct access between the Western Sydney Airport at Badgerys Creek and Sydney's motorway network, connecting the M7 Motorway, Cecil Hills and The Northern Road, Luddenham. The link forms a key part of the Western Sydney Infrastructure Plan, a joint initiative of the Australian and NSW governments to fund a \$4.1 billion road and transport program for Western Sydney.
- **The Mamre Road upgrade**, which will provide an additional lane in each direction for the 10-kilometre section between the M4 Motorway and Kerrs Road, as well as a wide central median for the provision of an additional traffic lane in the future. Preliminary designs indicate the intersection of Luddenham Road and Mamre Road, will be converted to traffic signals as part of this project. The NSW Government has committed \$220 million to upgrade Stage 1 of these work between the M4 and Erskine Park Road.
- **The Elizabeth Drive Upgrade**, which will provide an additional lane in each direction between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham, with future provision for additional lanes. Preliminary designs indicate the intersection of Luddenham Road and Elizabeth Drive, will be converted to traffic signals as part of this project.
- **The proposed Western Sydney Freight line**, which will be a dedicated freight rail line running from the future Outer Sydney Orbital near Luddenham to the M7 Motorway. This new freight line will allow the transport of goods by rail across Western Sydney, linking growing industrial areas and distribution centres. The current rail alignment is to the south of the subject site.
- **The potential upgrade of Luddenham Road**, which will provide an additional lane in each direction along the length of Luddenham Road between Mamre Road and Elizabeth Drive, with future provision for additional lanes. This initiative has been identified in broader infrastructure planning assessments for the region.

4 DEVELOPMENT PROPOSAL

4.1 Proposed Development

The proposal is to develop a 125-hectare parcel of land at 221-227 and 289-317 Luddenham Road, Orchard Hills to accommodate a mix of warehouse and office land uses. The development includes a total of 14 lots amounting to a total land take of approximately 71-hectares.

An indicative land use mix for each stage is provided in Table 4-1.

Table 4-1 Indicative land use mix for stages of development

Stage	Land Use	Total Building GFA (m ²)
Stage 1 (2023)	Warehouse	170,560
	Office	8,200
	Total	178,760
Stage 2 (2024)	Warehouse	142,723
	Office	8,100
	Total	150,823
Stage 3 (2025)	Warehouse	66,741
	Office	4,200
	Total	70,941
Warehouse (Total)		380,024
Office (Total)		20,500
Total GFA		400,524

A copy of the proposed development masterplan considered as part of this assessment is provided in Appendix A.

4.2 Proposed access and parking

The industrial park is proposed to be accessible via two locations (Figure 4-1):

- Patons Lane (located along the northern boundary of the subject site)
- A potential secondary access point on Luddenham Road (located along the eastern boundary of the subject site).

The intersection of Luddenham Road and Patons Lane, currently operating as priority-controlled, will be a critical intersection that services trips to and from the development. As a result, this assessment considers the potential upgrade of Luddenham Road and Patons Lane to a roundabout or signalised intersection.

If a secondary access point is required, access can also be provided onto Luddenham Road as part of the Stage 3 works. As a result, vehicular access into the industrial park during the development in Stages 1 and 2 will be permitted through Patons Lane only. The current master plan indicates that most of the access into the individual lots will be provided through the internal road network of the industrial park.

The internal road network of the industrial park includes a 20.6m wide road reserve, accommodating a 3.5 metre wide traffic lane in each direction, two 3.0 metre wide parking lanes and 3.8 metre wide verges along each side of the road reserve (as shown in Figure 4-2).



Figure 4-1 Site access locations

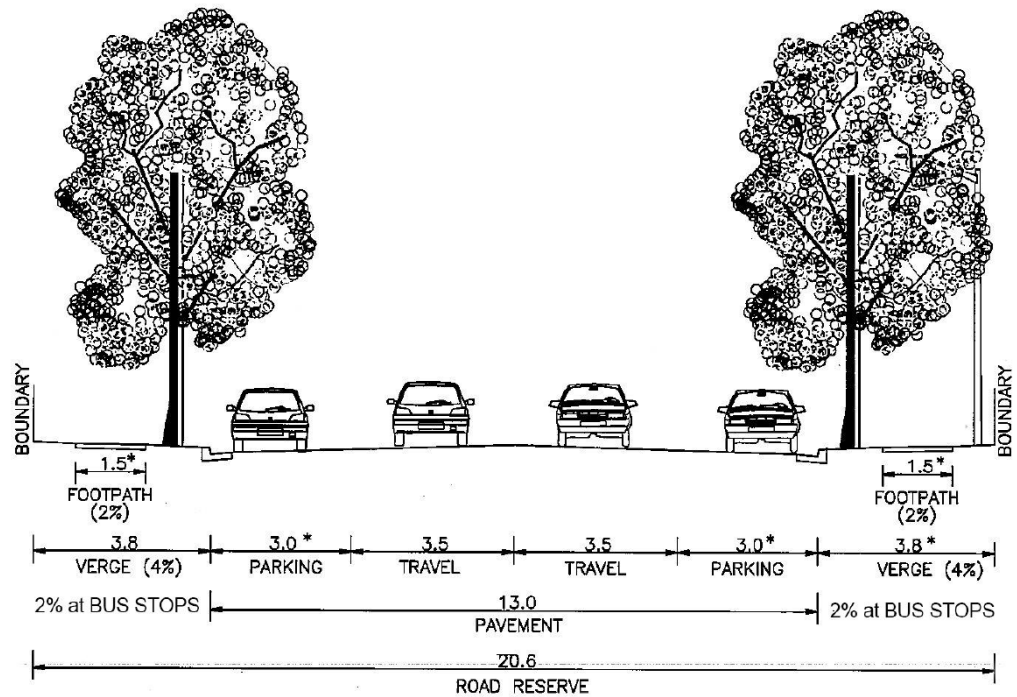


Figure 4-2 Industrial Road cross-section (Source: Penrith Development Control Plan)

The design of the internal access road proposes a loop within the industrial park allowing for appropriate circulation to cater for large truck movements. The road will provide adequate access for construction vehicles during the staging developments, as well as local traffic movements associated to the generating industrial facilities.

The site access, car park, loading and unloading areas shall be designed to comply with the Penrith DCP and the relevant Australian Standards.

4.3 Proposed Development Staging

To facilitate in the orderly development of the site and limit issues associated with its construction and generated traffic, a 3-stage development has been proposed. The indicative development staging is in line with the objectives and controls outlined in the Penrith DCP.

The proposed development staging plan, illustrated in Figure 4-3, will be staged as follows:

- **Stage 1** – to be completed (and fully generating) by 2023. The roundabout at Patons Lane will be constructed, providing access into the industrial development for both industrial-based trips and construction activity in future stages. Construction of the internal road network road, kerb and driveways completed for Stage 1 lots.
- **Stage 2** – to be completed (and fully generating) by 2024. All construction traffic associated with Stage 2 works will access the site via Patons Lane, mixing with the industrial based trips from Stage 1 and Stage 2 developments.
- **Stage 3** – to be completed (and fully generating) by 2025. If required, the secondary access along Luddenham Road will be completed and open for vehicle trips to and from the industrial precinct as part of this stage. The industrial development is assumed to be completed and fully generating by 2025.

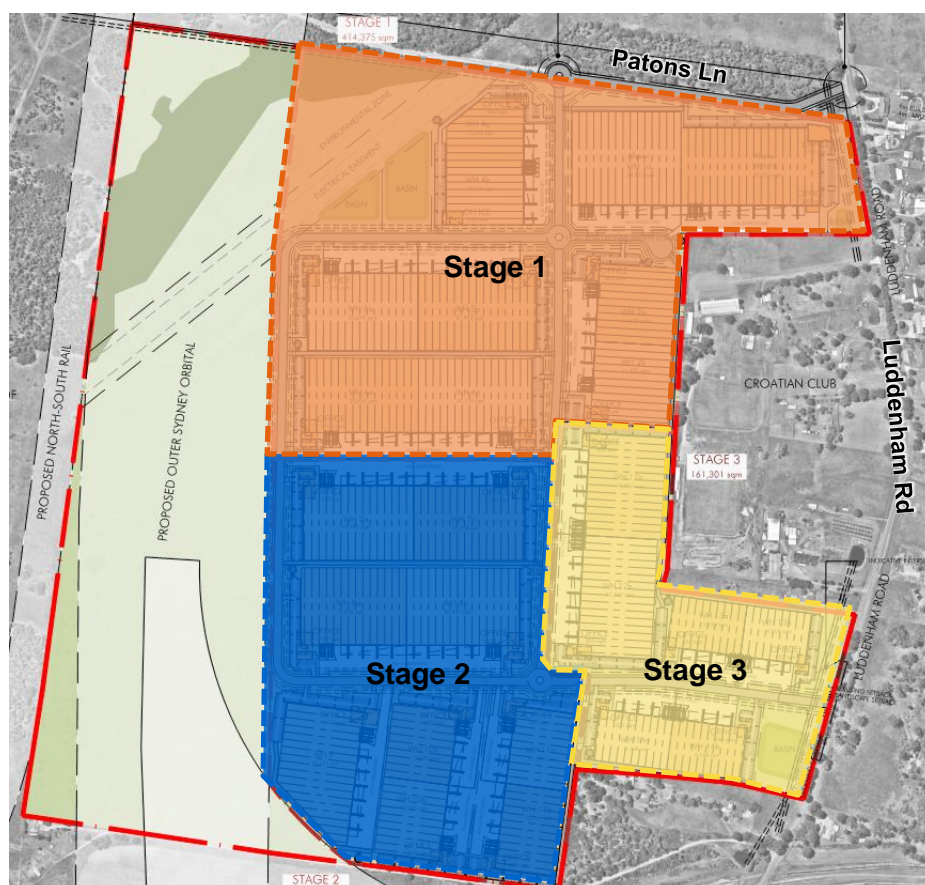


Figure 4-3 Proposed development staging

5 TRAFFIC IMPACT ASSESSMENT

An assessment of the likely traffic impact has been completed to understand the implications of the proposed development and the associated staging on the performance of the surrounding network. This considers the impact of the proposed development at the completion of each of the stages, as well as an ultimate state scenario 10 years after the completion of Stage 3.

5.1 Traffic Generation

Traffic generation rates for the proposed development have been derived from specific data collected as part of the updated *RMS Guide to Traffic Generating Developments* (October 2002) and associated updates. Rates from similar developments with regards to size and location have been calculated and considered as the most appropriate rates for this assessment.

The RMS Guide Update provides the following rates:

- 0.422 trips per 100m² GFA (total building, warehouse + office) during the morning peak hour
- 0.389 trips per 100m² GFA during the evening peak hour
- 2.10 trips per 100m² GFA per day.

Table 5-2 summarises the application of these rates to the Proposal's development yield across each stage.

Table 5-1 Traffic Generation Summary

Stage	Area (m ²)	AM Trips	PM Trips	Daily Trips
Stage 1 (2023)	178,760	757	699	3,756
Stage 2 (2024)	150,823	639	590	3,170
Stage 3 (2025)	70,941	302	278	1,492
TOTAL	400,524	1,698	1,567	8,418

In the morning peak hour, heavy vehicles make up 3.4 per cent of warehouse traffic and in the afternoon peak hour, heavy vehicles make up 4.1 per cent of warehouse.

5.2 Background Volumes

Broader Traffic Volumes

Background traffic volumes for Patons Lane and Luddenham Road were derived from TfNSW traffic forecasting modelling for the morning peak period (7am to 9am) and the afternoon peak period (4pm to 6pm) for 2019, 2021, 2026 and 2031. These forecasts were provided from a model that was based on land use forecasts from LU2016 V1.51 and demand matrices from Strategic Transport Model V3.62. These volumes were factored by 0.55 to estimate peak hour volumes.

The background volumes were checked for consistency with:

- Sydney Science Park Luddenham Planning Proposal Transport and Traffic Assessment (GTA, 2013)
- Orchard Hills Waste and Resource Management Facility - Traffic and Parking Assessment (Dellara, 2010).

This process included growth attributed to new development within the area for each time period, as well as factors that may influence growth along each external road. Given the rapid growth within the surrounding area, it is important to note that key upgrades to road corridors may reduce the traffic through Luddenham Road.

For the ultimate state scenario in Year 2035, it has been assumed that the background traffic would increase by 2.5 percent per annum for 10 years after the completion of Stage 3. By this stage, the traffic volumes will be approaching the capacity of the intersections on the road network and this will limit the volume within the peak hours. Peak spreading will be more of an issue, with peak delays spreading over longer durations.

Local Traffic Volumes

To assess the overall impact of traffic on the performance of Patons Lane and Luddenham Road, traffic generated by the Patons Lane Resource Recovery Centre (RRC) has been included in this assessment. Based on the number of employees proposed at the RRC, it has been estimated that it will generate 45 trips in each of the peak hours.

It is also noted that there will be additional traffic load from the Croatian Club (located at the east of Lots 2 and 12 of AIBP) to the internal road system of AIBP. Access to and from the club is provided through internal road system after completion of Stage 3, which allows the access directly onto Luddenham Road to be closed, in accordance with the direction provided by Penrith City Council. During Stage 1 and 2 of the development, access to the club would remain via Luddenham Road.

Based on the traffic generation rates, allowance has been made for 150 vehicles to access the club during the afternoon peak hour, heading inbound. It has been assumed that traffic generation of the club during morning peak hour will be negligible.

5.3 Traffic Distribution

To account for peak traffic directional flows, the following assumptions were made for traffic generated by the various components of the proposed development:

- In the AM peak, 80 per cent of traffic generated by the proposal travelled inbound to the site, and 20 per cent outbound
- In the PM peak, 60 per cent of traffic generated by the proposal travelled inbound to the site, and 40 per cent outbound.

The directional distribution and assignment of traffic generated by the proposed development will be influenced by several factors, including:

- The future transport and road configuration in the vicinity of the site: the dominant freeway in the area is the M4 in the north, but the importance of the southern areas will be increasing with the proposed M12 and the development of the broader Aerotropolis (Northern Gateway Precinct).
- The distribution of residential, commercial, and other land use development in the surrounding areas
- The likely distribution of employee's places of residence in relation to the site
- The configuration and staging of the access points to the site.

In consideration of the above, the following distribution and assignments were adopted in this assessment:

- To/ from Luddenham Road north (towards Mamre Road) = 70 per cent
- To/ from Luddenham Road south (towards Elizabeth Drive) = 30 per cent.

Table 5-1 summarises the turning movements that result from the generation and distribution of trips during the AM and PM peak periods.

Table 5-1 Turning movement demands (at the completion of Stage 1, Stage 2 and Stage 3)

	AM Peak	PM Peak
Stage 1 (2023)		
Stage 2 (2024)		
Stage 3 (2025)		

5.4 Modelling Approach and Assessment Criteria

The assessment of the performance of the intersections were tested using SIDRA Intersection 9.0. Unless otherwise specified, the default model parameters were adopted for the intersection models. All traffic models were modelled as a 'Network' site in SIDRA 9.0.

The operational performance of the intersection was evaluated by assessing the average vehicle delay and the corresponding **Level of Service** (LOS). The average vehicle delay and level of service were assessed in accordance with the Austroads Guide to Traffic Management – Part 3 and is summarised in Table 5-2.

Table 5-2 - LOS Criteria for Intersection Capacity Analysis

Level of Service	Average Delay per Vehicle (sec/veh)		Description of intersection operation
	Traffic Signals	Roundabouts	
A	$d \leq 10$	$d \leq 10$	Good operation
B	$10 < d \leq 20$	$10 < d \leq 20$	Good with acceptable delays & spare capacity
C	$20 < d \leq 35$	$20 < d \leq 35$	Satisfactory
D	$35 < d \leq 55$	$35 < d \leq 50$	Operating near capacity
E	$55 < d \leq 80$	$50 < d \leq 70$	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode
F	$80 < d$	$70 < d$	Unsatisfactory and requires additional capacity.

Source: AustRoads Guide to Traffic Management Part 3

Degree of Saturation (DoS) is equal to the *demand to capacity ratio* for each traffic movement, with the overall intersection DoS defined as the highest DoS of all individual movements calculated at the intersection. For various intersection controls, the following DoS ratings are defined in Table 5-3.

Table 5-3 - Degree of Saturation (SIDRA 8.0)

Degree of Saturation (DoS)	Rating
$\text{DoS} < 0.6$	Excellent
$0.6 < X < 0.7$	Very good
$0.7 < X < 0.8$	Good
$0.8 < X < 0.9$	Acceptable
$0.9 < X < 1.0$	Poor
$X > 1.0$	Very poor

The intersection traffic performance targets established for this assessment include:

- An overall intersection level of service (LoS) D or better
- A degree of saturation (DoS) of
 - Less than 0.85 for roundabouts
 - Less than 0.90 for signalised intersections.

5.5 Road Network Impacts

The following intersections were assessed as part of this traffic impact assessment:

- Luddenham Road and Patons Lane
 - For Stages 1 to 3, a 2-lane roundabout with two lanes on each approach was assessed
 - For the ultimate state scenario, a fully signalised intersection with two right-hand turn lanes into Luddenham Road was assessed. This intersection treatment was also assessed as a design alternative for Stage 3
- Patons Lane and Site Access Road
 - For Stages 1 to 3 and the ultimate state scenario, a 2-lane roundabout with 2 lanes on the east and south approaches and 1 lane on the west approach.

The assessed configurations are provided in Figures 5-1 and 5-2.

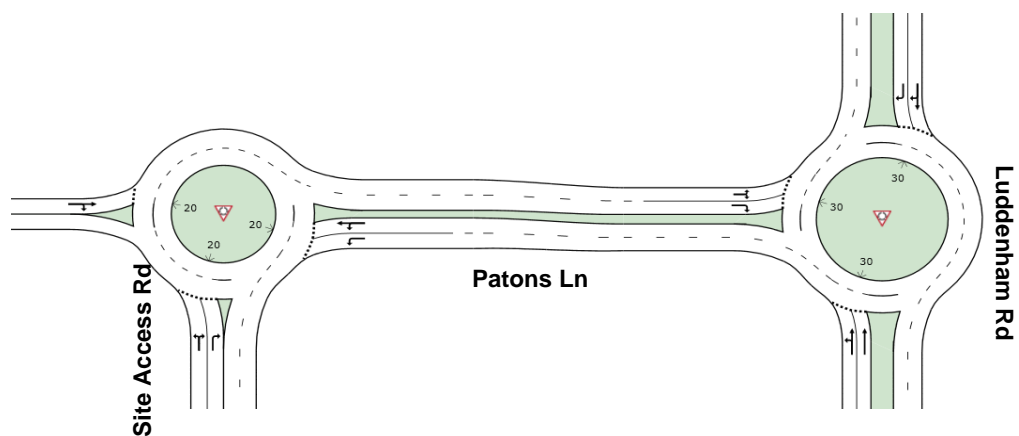


Figure 5-1 - Assessed intersection layout (Stages 1-3)

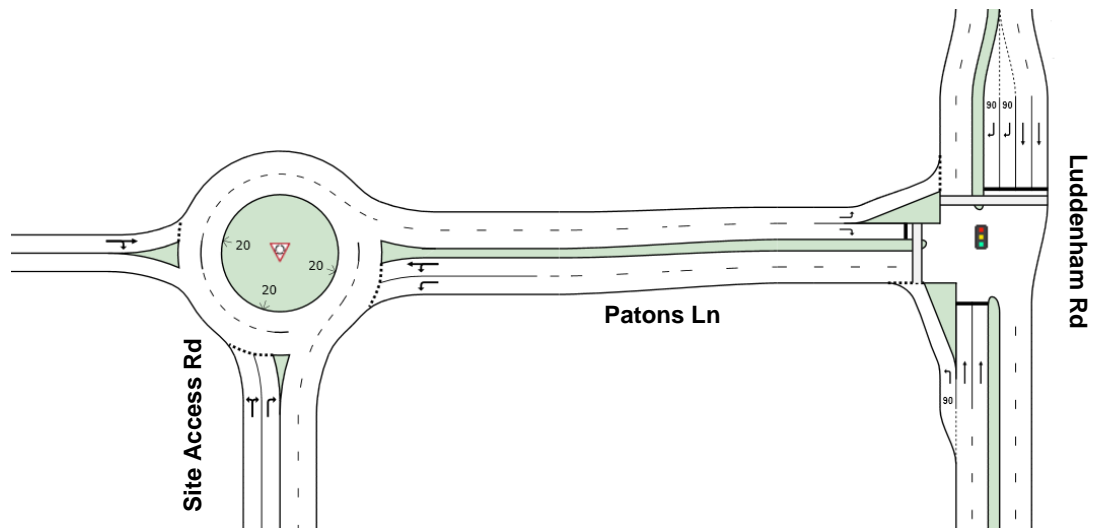


Figure 5-2 – Traffic signals at Luddenham Road and Patons Lane (ultimate state scenario and the alternate Stage 3)

For the purposes of this assessment, Luddenham Road has been assessed as a four-lane, two-way road (two lane in each direction).

The AM and PM Peak intersection performance results at each stage of the development is summarised in Table 5-4 and Table 5-5..

Table 5-4 - AM Peak Intersection Results

Intersection	Stage	Intersection Treatment	Volume	DoS	LOS
Patons Lane / Site Access A Road	Stage 1 (2023)	Roundabout	830	0.21	A
	Stage 2 (2024)		1,470	0.37	A
	Stage 3 (2025)		1,770	0.44	A
	Ultimate State		1,770	0.44	A
Luddenham Road / Patons Lane Intersection	Stage 1 (2023)	Roundabout	1,610	0.33	A
	Stage 2 (2024)		2,270	0.46	A
	Stage 3 (2025)		2,590	0.53	A
	Ultimate State		3,610	>1	E
	Alternate Stage 3 (2025)	Signalised intersection	2,590	0.55	C
	Ultimate State		3,610	0.89	C

Table 5-5 - PM Peak Intersection Results

Intersection	Stage	Intersection Treatment	Volume	DoS	LOS
Patons Lane / Site Access A Road	Stage 1 (2023)	Roundabout	770	0.14	A
	Stage 2 (2024)		1,570	0.30	A
	Stage 3 (2025)		1,640	0.30	A
	Ultimate State		1,640	0.30	A
Luddenham Road / Patons Lane Intersection	Stage 1 (2023)	Roundabout	1,360	0.25	A
	Stage 2 (2024)		2,180	0.38	A
	Stage 3 (2025)		2,480	0.45	A
	Ultimate State		3,820	0.943	B
	Alternate Stage 3 (2025)	Signalised intersection	2,480	0.50	C
	Ultimate State		3,820	0.691	C

The assessment identified that the Patons Lane and Site Access Road intersection meets both the traffic performance criteria for capacity and delay across all stages of the project, including the ultimate state scenario.

For the Luddenham Road and Patons lane intersection, the two-lane roundabout is expected to perform well during across the Stage 1, 2 and 3 scenarios. However, in the ultimate state scenario (2035), the increase in background traffic volumes along Luddenham Road will likely lead to poor performance of the roundabout in the AM peak, as this arrangement will not meet the traffic performance criteria or the required LOS. This indicates that the roundabout configuration will not accommodate the forecasted background traffic volumes along Luddenham Road.

When assessing a signalised intersection under the Stage 3 demand scenario and the ultimate state scenario, the traffic signals at Luddenham Road and Patons Lane will meet all traffic performance criteria for capacity and delay.

The SIDRA outputs of this assessment can be found in Appendix B.

Further development of the ultimate scenario may be required including a review of the forecasted volumes given the likelihood of key road corridor upgrades that may be completed by 2035.

5.6 Traffic impact of the broader precinct development

Beyond the subject site, there is potential for 186,000sqm of adjacent land to be developed to accommodate a similar mix of warehouse and office land uses. Table 5-6 outlines the likely additional floor area and associated trip generation potential of the additional development, assuming a development scale like the development proposed on the subject site.

Table 5-6 Likely additional traffic demand associated with the potential additional development in proximity to the subject site

Stage	Area (m ²)	AM Trips	PM Trips	Daily Trips
Potential Additional Development	93,138	+ 300	+ 280	+ 1,500

Adopting a similar traffic distribution to that outlined in Section 5.3, the additional development would generate an additional 240 inbound trips in the AM peak, and 120 outbound trips in the PM peak. Should the additional development occur at a similar timeframe to Stage 3 of the subject site's development (i.e. in 2025), it is anticipated that this increase in traffic would be accommodated safely at the intersections of Patons Lane / Site Access Road and Luddenham Road / Patons Lane.

Further assessments of demands and traffic patterns for the ultimate scenario are required to understand the likely traffic volumes along Luddenham Road, and the subsequent degree of impact the potential additional development on the intersection of Luddenham Road and Patons Lane.

5.7 Traffic Analysis Summary and Mitigating Measures

The assessment identified that the intersection of Patons Lane and the primary Site Access Road is anticipated to operate satisfactorily at a LOS of C or better as a roundabout.

However, the intersection of Patons Lane and Luddenham Road is expected to experience increased demand as the development progresses and traffic patterns in the area change over time. In particular, the high traffic volumes turning right into Patons Lane will face increasing conflicts with northbound volumes on Luddenham Road during the peak periods.

Further investigation of the potential road infrastructure upgrades will be required to understand the impact of the upgrades to Mamre Road to the north, Elizabeth Drive to the south, and the Outer Sydney Orbital corridor to the east of the site on traffic volumes along Luddenham Road. There is potential for background volumes along Luddenham Road to change, resulting in changes in distribution that impacts the direction of movement to and from the site.

The southern secondary access point from the development (Site Access B Road) onto Luddenham Road has the potential to reduce demands at the intersection of Luddenham Road and Patons Lane, particularly if there is a higher distribution of movements travelling to and from areas south of the site. This may alleviate the need for additional upgrades to the intersection, as well as increase the resilience of the road network within and around the development by providing alternative route options to properties within the development.

If constructed, the southern access point should be designed as an all-movement priority-controlled intersection, with a potential configuration provided in Figure 5-3. The provision and design of any turning lanes from Luddenham Road into the site access road would need to be considered as part of any future design process.

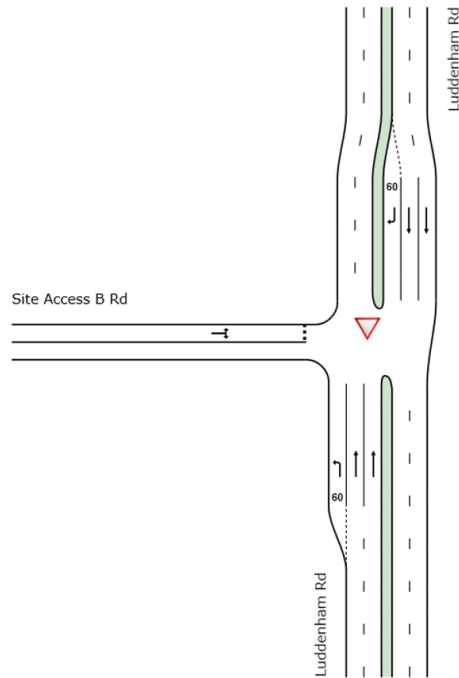


Figure 5-3 – Luddenham Road South Access

There are also opportunities to increase capacity at the Luddenham Road and Patons Lane intersection, by providing additional lanes on the southbound and northbound approaches. This should be considered as part of any further investigation into the future design of the intersection.

6 CAR PARKING ASSESSMENT

6.1 Proposed Parking Provisions

The Penrith Development Control Plan (DCP) specifies the rates and requirements for the provision of vehicle parking, with Table C10.2 setting out the car parking rates across the municipality. The minimum requirements stipulated in the Penrith DCP aims to ensure that the development functions efficiently and there is limited impact on street parking and congestion.

The car parking requirements for warehouse developments outlined in the Penrith DCP are:

- 1 space per 100 m² of warehouse GFA (including associated office GFA)

An assessment of the parking requirements for the proposed development is provided in Table 6-1.

Table 6-1 – Parking requirements

Land Use	Area (m ²)	Parking Rate	Parking Requirement (Spaces)
Stage 1 (2023)	178,760		
- Warehouse	170,560	1 space per 100m ² GFA	1,708
- Office	8,200	1 space per 100m ² GFA	82
Stage 2 (2024)	150,823		
- Warehouse	142,723	1 space per 100m ² GFA	1,431
- Office	8,100	1 space per 100m ² GFA	81
Stage 3 (2025)	70,941		
- Warehouse	66,741	1 space per 100m ² GFA	669
- Office	4,200	1 space per 100m ² GFA	42
TOTAL			4,013

In the current masterplan, a total of 4,037 car spaces will be provided across the entire development. This exceeds the expected parking demand generated by the proposal.

6.2 Accessible (Disabled) Parking

As outlined in Part C10 of the Penrith Developmental Control Plan (DCP), accessible parking is to be provided in accordance with the *Disability (Access to Premises – Buildings) Standards 2010* from the Building Code of Australia and *Australian Standard AS 2890*.

The accessible (disabled) parking requirements in the *Disability (Access to Premises – Buildings) Standards* states for offices (Class 5) and warehouses (Class 7) should be provided at the rate of one space for every 100 carparking spaces or part thereof.

Accessible (disabled) spaces within the industrial development are to be designed in accordance with the *Australian Standard AS 2890.6 for accessible (disabled) parking*. These parking spaces shall be designed with minimum dimensions of 2.4-metre width and 5.4-metre length with an aisle width of 5.8 metres.

For the proposal to meet the requirements stipulated in the Penrith DCP, the development will be required to provide at least 41 accessible (disabled) parking spaces.

6.3 Bicycle Parking

Regarding bicycle parking and end-of-trip facilities, the Penrith Development Control Plan (DCP) permits commercial developments that provide employment for 20 people or more, bicycle parking is to be in secure and accessible locations, and provided with weather protection, in accordance with AS2890.3:1993 Bicycle Parking Facilities.

The following associated facilities are to be provided:

- Change and shower for cyclists and are to be conveniently located close to the bicycle storage areas
- Where the building is to be strata-titled, the bicycle storage facilities and shower/change facilities are to be made available to all occupants of the building.

In terms of overall bicycle parking provision, the Penrith DCP supports the application of the rates specified in Planning Guidelines for Walking and Cycling (NSW Government 2004). In summary, the bicycle parking provision should adhere to the following rates for Industry and Warehouse land uses:

- 3 to 5 per cent of staff (for staff)
- 5 to 10 per cent of staff (for customers/ visitors).

According to the economic analysis conducted by Urbis¹ the development is expected to generate up to 3,730 direct jobs. For the purposes of this assessment, the rates should apply to the typical number of employees working at any one time. As the proposal is developed, appropriate bicycle parking and storage will be provided in accordance with the Penrith DCP. Given the site of the site, there is ample area available to cater for the bicycle parking provision.

6.4 Parking Summary

The industrial development currently includes a provision of a total of 4,037 car spaces, which meets the parking requirement of 4,013 car spaces outlined in Section 6.1. At least 41 accessible (disabled) parking spaces should be provided from the 4,037 car spaces proposed. The bicycle parking rates required to meet the requirements specified in the Penrith DCP have been outlined in this report and will be accommodated during the proposal development.

In summary, the parking demand generated by the land uses will be met on-site and will meet the requirements set out in the Penrith Development Control Plan (DCP).

¹ *Economic Analysis to Underpin the Planning Proposal to Rezone 21-227 & 289-317 Luddenham Road, Orchard Hills (Dated 30th of June 2020)*

7 ACCESS AND INTERNAL DESIGN ASSESSMENT

The current masterplan proposes a network of three public roads and one private road within the proposed development. The public roads include:

- A north-south road that connects to Patons Lane (Site Access A Road)
- An east-west road that connects to Luddenham Road (Site Access B Road)
- A road that provides a circuit connection between the intersection of Site Access A Road and the private road to the north, and Site Access A Road and Site Access B Road to the south.

All public roads are expected to be designed within a 20.6-metre-wide road reserve in accordance with the specifications outlined in the Penrith DCP. It is recommended that the private road be designed to accommodate an 8m carriageway as a minimum, with no on-street parking permitted. The internal access roadways are to be designed to ensure that the swept path of the design vehicle will be able to safely navigate in and out of the industrial development.

AS 2890.1 *Off-street car parking* provides guidance on driveway access into the development, warehouses and car parking spaces. In particular, the current masterplan indicates driveway access into a car park directly from Patons Lane (Figure 7-1). In this instance, a dedicated auxiliary lane into the driveway may be suitable to separate the vehicles entering the carpark and vehicles that continue westbound.

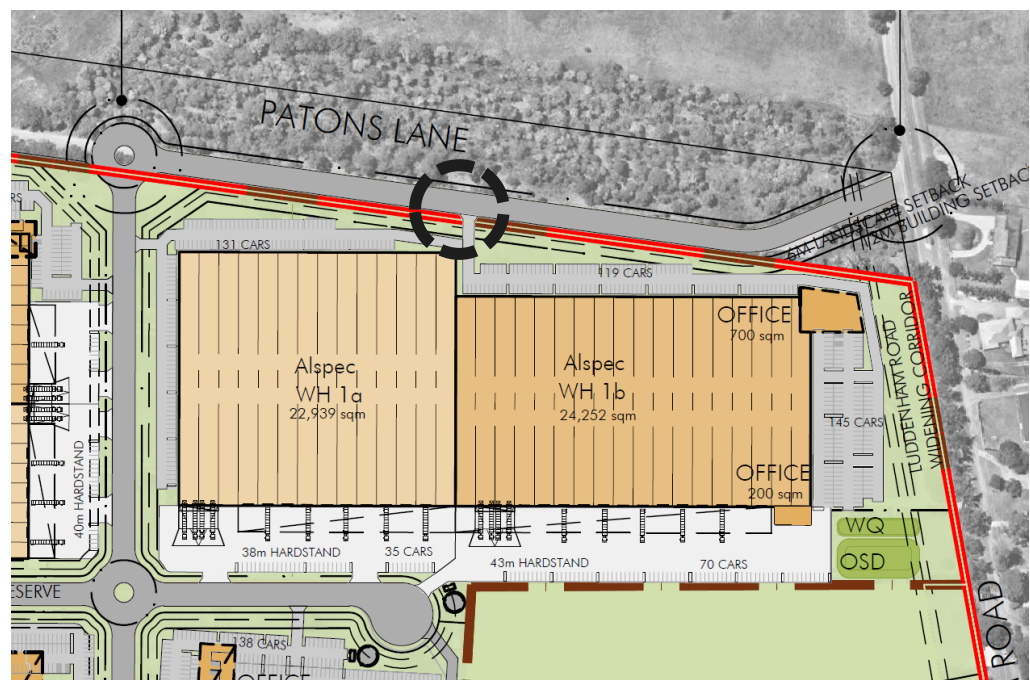


Figure 7-1 - Driveway access from Patons Lane

Two internal intersections are provided within the site, with both proposed to be constructed as roundabouts (Figure 7-2). A cul-de-sac configured as a court bowl provides access into the properties along the private road. All driveways, except the one highlighted above, are serviced within the internal road network.



Figure 7-2 - Proposed internal road network

Regarding the provision for pedestrian walkways, the road reserve width is sufficient to accommodate footpaths along both sides of the road in accordance with the requirements of the Penrith DCP. Pedestrian connectivity to the external network will be provided, with the potential to connect into a future bus route along Patons Lane or Luddenham Road.

Given the nature of the land use development, majority within the industrial and wholesale sectors, the internal roads proposed as part of this development is appropriate. The internal roundabouts connect the access roads within the development to the main roads, Patons Lane and Luddenham Road. It is expected that this arrangement will be able to service both passenger vehicles as well as larger industrial and warehouse vehicles safely and efficiently.

8 CONCLUSION

The proposal plans to develop a 125-hectare parcel of land at 221-227 and 289-317 Luddenham Road, Orchard Hills to accommodate a mix of warehouse and office land uses. The development includes a total of 13 lots amounting to a total land take of approximately 71-hectares.

The key findings of this assessment are:

- The surround area is expected to undergo significant change over the next 30 years with the construction and opening of the Western Sydney Airport, and supporting developments in the local area. The transport network is also expected to undergo significant change with the construction and upgrading of key roads around the development.
- The proposal involves the development of a 125-hectare parcel of land at the above address to accommodate a mix of warehouse, industrial and office land uses. The development is proposed to be completed in three stages, with various road and other infrastructure works required at each stage.
- Access to the site will be provided via Patons Lane, which will require the upgrade of the adjacent intersection at Luddenham Road. The intersection of Luddenham Road and Patons Lane plays a critical role in servicing the traffic generated by the development
- While the Luddenham Road and Patons Lane intersection operates satisfactorily as a roundabout across Stages 1, 2 and 3 of the development, modelling demonstrates the additional background traffic growth to 2036 reduces the performance below desired standards of operation.
- The intersection of Patons Lane and Luddenham Road is anticipated to operate satisfactorily at a LOS C or greater as a signalised intersection across Stages 3 of the development, and within the ultimate state scenario.
- Modelling of the Patons Lane and the primary Site Access Road demonstrates that the intersection operates satisfactory at a LOS C or greater as a roundabout treatment across Stages 1, 2 and 3 of the development, and within the ultimate state scenario.
- The traffic demands associated with the potential development of the surrounding land (including the Croatian Club site adjacent to the subject site) is expected to be accommodated safely with the proposed upgrades of the intersections of Patons Lane / Site Access Road and Luddenham Road / Patons Lane.
- There is potential for an additional secondary access point off Luddenham Road (south). The provision of this access reduces the intensity of movement at the intersection of Luddenham Road and Patons Lane, and increase the resilience of the road network within and around the development by providing alternative route options.
- Any future design of the intersection of Patons Lane and Luddenham Road should include a detailed analysis of the anticipated changes to the road network, with the upgrades to Mamre Road to the north, Elizabeth Drive to the south, and the Outer Sydney Orbital corridor to the east of the site.
- The provided car parking meets the anticipated demands generated by the site. Provisions for accessible parking and bicycle parking will be accommodated during further development of the proposal.
- The internal configuration of the site has been designed in accordance with Council's DCP and the relevant Australian Standards.

It is therefore concluded that the Proposed Warehouse development at the subject site of 221 Luddenham Road, Orchard Hills, is supportable on traffic planning grounds.

APPENDIX A DEVELOPMENT DRAWINGS

Aspec Industrial Business Park	
3-Sep-21	SK022f
TOTAL SITE AREA (m²)	1,466,103
AIBP Total Site Area	1,253,713
Additional Land Total Site Area	212,390
Constraints (m²)	SITE AREA (m²)
Outer Sydney Orbital	360,412
Western Sydney Freight (eadd. overlaps)	6,089
Electrical Easement (eadd. overlaps)	23,335
Enviro. Management & Basins (incl. severed land)	84,259
Luddenham Road Widening Corridor (eadd. overlaps)	21,238
Road Reserves	79,755
CONSTRAINTS TOTAL	575,088
TOTAL DEVELOPABLE AREA (m²)	891,015
STAGE 1 AREA (m²) (incl. internal constraints)	414,375
LOT 1 - Aspec	
Landtake area	87,227
Total Warehouse	47,191
Total Office	900
Total Building Area	48,091
Lot FSR	0.55:1
Carparking Achieved	500
LOT 3	
Landtake area	50,784
Total Warehouse	25,934
Total Office	1,600
Total Building Area	27,534
Lot FSR	0.54:1
Carparking Achieved	275
LOT 4	
Landtake area	38,022
Total Warehouse	19,806
Total Office	1,300
Total Building Area	21,106
Lot FSR	0.56:1
Carparking Achieved	214
LOT 5	
Landtake area	69,993
Total Warehouse	39,795
Total Office	2,200
Total Building Area	41,995
Lot FSR	0.6:1
Carparking Achieved	420
LOT 6	
Landtake area	64,905
Total Warehouse	37,834
Total Office	2,200
Total Building Area	40,034
Lot FSR	0.62:1
Carparking Achieved	402
STAGE 2 AREA (m²) (incl. internal constraints)	284,749
LOT 7	
Landtake area	65,202
Total Warehouse	36,917
Total Office	2,200
Total Building Area	39,117
Lot FSR	0.6:1
Carparking Achieved	392
LOT 8	
Landtake area	65,988
Total Warehouse	37,822
Total Office	2,200
Total Building Area	40,022
Lot FSR	0.61:1
Carparking Achieved	400
LOT 9	
Landtake area	41,001
Total Warehouse	20,521
Total Office	1,100
Total Building Area	21,621
Lot FSR	0.53:1
Carparking Achieved	217
LOT 10	
Landtake area	42,726
Total Warehouse	23,744
Total Office	1,300
Total Building Area	25,044
Lot FSR	0.59:1
Carparking Achieved	251
LOT 11	
Landtake area	45,585
Total Warehouse	23,713
Total Office	1,300
Total Building Area	25,013
Lot FSR	0.55:1
Carparking Achieved	251

STAGE 3 AREA (m²) (incl. internal constraints)	373,736
LOT 12	
Landtake area	29,711
Total Warehouse	16,032
Total Office	800
Total Building Area	16,832
Lot FSR	0.57:1
Carparking Achieved	168
LOT 13	
Landtake area	32,111
Total Warehouse	16,595
Total Office	800
Total Building Area	17,395
Lot FSR	0.54:1
Carparking Achieved	174
LOT 14	
Landtake area	35,902
Total Warehouse	17,217
Total Office	1,300
Total Building Area	18,517
Lot FSR	0.52:1
Carparking Achieved	187
LOT 15	
Landtake area	35,583
Total Warehouse	16,897
Total Office	1,300
Total Building Area	18,197
Lot FSR	0.51:1
Carparking Achieved	186
ADDITIONAL LAND	
Landtake area	186,275
Total Warehouse	87,549
Total Office	5,588
Total Building Area	93,138
Lot FSR	0.5:1
Carparking Achieved	935
Total Landtake	891,015
Total Warehouse Area	467,567
Total Office Area	26,088
Total Building Area	493,656
Site FSR	0.55:1
Total Car Parking	4,972
Required Car Parking	4,937



ISSUED FOR INFORMATION

APPENDIX B SIDRA ASSESSMENT

STAGE 1 (2023) SIDRA OUTPUTS

SITE LAYOUT

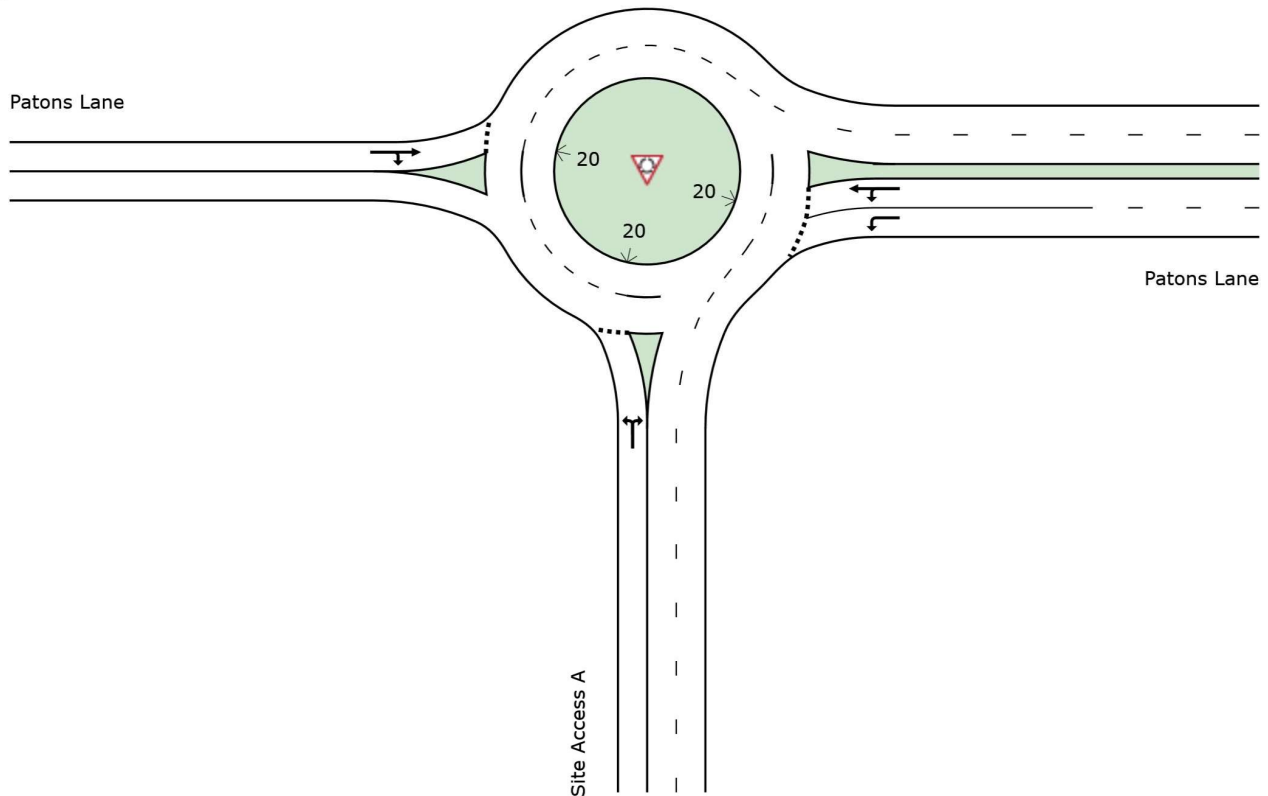


Site: [Patons Ln/Site Access A (Stage 1 - 2023) - AM Peak]

Site Category: -
Roundabout



Patons Lane



Patons Lane

Site Access A

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Project: C:\Users\tlaz4352\OneDrive - ARCADIS\Luddenham Road TIA\F-Reports\SIDRA Modelling\Luddenham Road TIA_All Stages.sip8

MOVEMENT SUMMARY

Site: [Patons Ln/Site Access A (Stage 1 - 2023) - AM Peak
(Site Folder: General)]

■ □ Network: N101 [AM Peak -
Stage 1 (2023) (Network Folder:
General)]



Site Category: -
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total HV veh/h	%				[Veh. veh	Dist] m				
South: Site Access A														
3	R2	150	3.0	150	3.0	0.057	9.0	LOS A	0.1	0.6	0.15	0.62	0.15	41.6
Approach		150	3.0	150	3.0	0.057	9.0	LOS A	0.1	0.6	0.15	0.62	0.15	41.6
East: Patons Lane														
4	L2	610	3.0	610	3.0	0.208	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.0
5	T1	50	50.0	50	50.0	0.208	4.5	LOS A	0.0	0.0	0.00	0.48	0.00	54.9
Approach		660	6.6	660	6.6	0.208	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.2
West: Patons Lane														
11	T1	20	10.0	20	10.0	0.019	4.8	LOS A	0.0	0.2	0.26	0.43	0.26	51.0
Approach		20	10.0	20	10.0	0.019	4.8	LOS A	0.0	0.2	0.26	0.43	0.26	51.0
All Vehicles		830	6.0	830	6.0	0.208	5.1	LOS A	0.1	0.6	0.03	0.51	0.03	51.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\New Project.sip9

MOVEMENT SUMMARY

Site: 1212 [Patons Ln/Site Access A (Stage 1 - 2023) - PM Peak (Site Folder: General)]

Network: N101 [PM Peak - Stage 1 (2023) (Network Folder: General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Site Access A														
3	R2	280	3.0	280	3.0	0.097	8.8	LOS A	0.2	1.1	0.09	0.63	0.09	41.9
Approach		280	3.0	280	3.0	0.097	8.8	LOS A	0.2	1.1	0.09	0.63	0.09	41.9
East: Patons Lane														
4	L2	420	3.0	420	3.0	0.137	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.0
5	T1	20	50.0	20	50.0	0.137	4.5	LOS A	0.0	0.0	0.00	0.49	0.00	54.9
Approach		440	5.1	440	5.1	0.137	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.1
West: Patons Lane														
11	T1	50	10.0	50	10.0	0.053	5.3	LOS A	0.1	0.6	0.35	0.50	0.35	50.3
Approach		50	10.0	50	10.0	0.053	5.3	LOS A	0.1	0.6	0.35	0.50	0.35	50.3
All Vehicles		770	4.7	770	4.7	0.137	6.0	LOS A	0.2	1.1	0.05	0.54	0.05	49.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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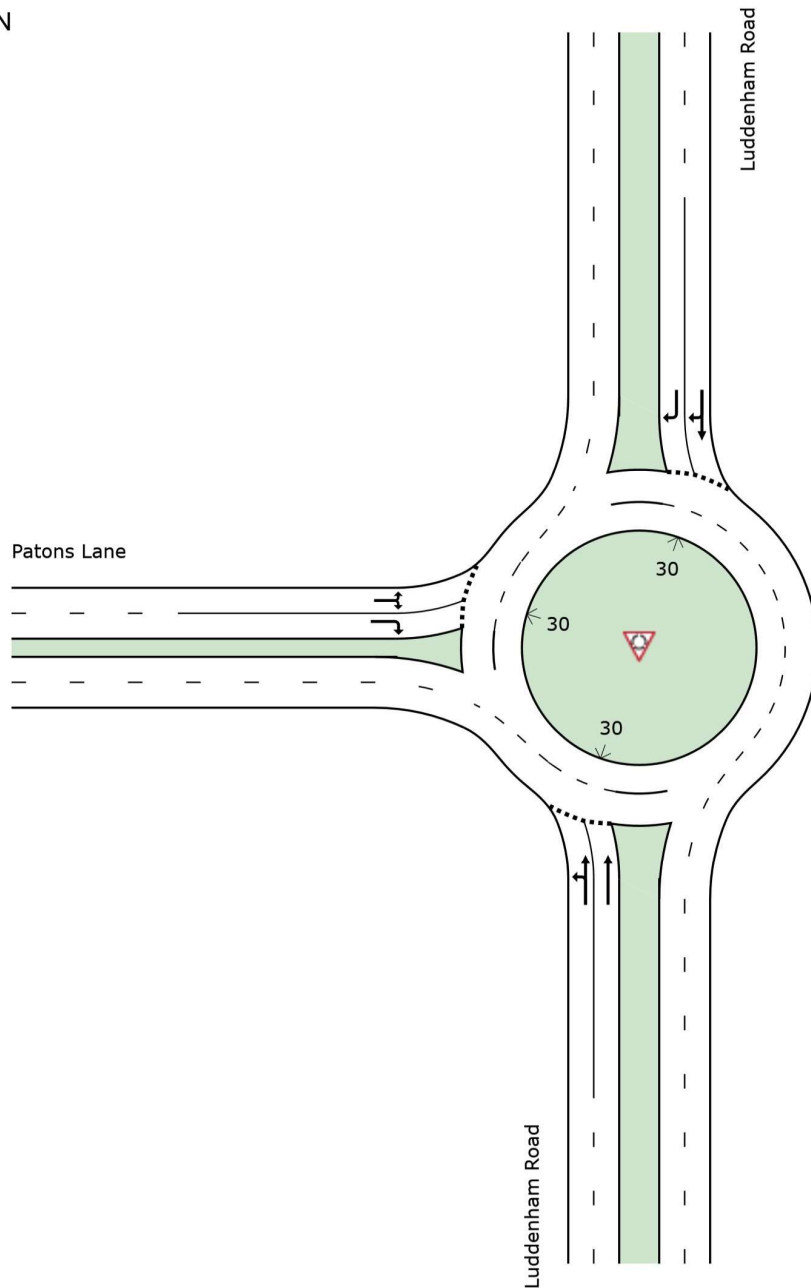
Project: C:\PROJECT\LUDDENHAM ROAD\New Project.sip9

SITE LAYOUT



Site: [Luddenham Rd/Patons Ln (Stage 1 - 2023) - RBT - AM Peak]

Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: [Luddenham Rd/Patons Ln (Stage 1 - 2023) - AM Peak
(Site Folder: General)]

■ □ Network: N101 [AM Peak -
Stage 1 (2023) (Network Folder:
General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	180	2.0	180	2.0	0.257	5.6	LOS A	0.6	4.3	0.55	0.59	0.55	53.3
2	T1	350	7.0	350	7.0	0.257	5.9	LOS A	0.6	4.3	0.56	0.59	0.56	56.5
Approach		530	5.3	530	5.3	0.257	5.8	LOS A	0.6	4.3	0.55	0.59	0.55	55.7
North: Luddenham Road														
8	T1	500	8.0	500	8.0	0.327	3.8	LOS A	0.9	6.6	0.21	0.35	0.21	57.9
9	R2	420	3.0	420	3.0	0.305	9.5	LOS A	0.8	5.6	0.21	0.59	0.21	46.3
Approach		920	5.7	920	5.7	0.327	6.4	LOS A	0.9	6.6	0.21	0.46	0.21	54.3
West: Patons Lane														
10	L2	110	17.0	110	17.0	0.104	5.0	LOS A	0.2	1.6	0.46	0.56	0.46	53.5
12	R2	50	1.0	50	1.0	0.056	10.8	LOS B	0.1	0.7	0.47	0.67	0.47	53.6
Approach		160	12.0	160	12.0	0.104	6.8	LOS A	0.2	1.6	0.46	0.59	0.46	53.5
All Vehicles		1610	6.2	1610	6.2	0.327	6.2	LOS A	0.9	6.6	0.35	0.52	0.35	54.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\New Project.sip9

MOVEMENT SUMMARY

Site: 1211v [Luddenham Rd/Patons Ln (Stage 1 - 2023) - PM Peak (Site Folder: General)]

Network: N101 [PM Peak - Stage 1 (2023) (Network Folder: General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist m				km/h
South: Luddenham Road														
1	L2	130	2.0	130	2.0	0.252	4.9	LOS A	0.6	4.2	0.46	0.51	0.46	53.6
2	T1	440	7.0	440	7.0	0.252	5.1	LOS A	0.6	4.2	0.47	0.51	0.47	56.8
Approach		570	5.9	570	5.9	0.252	5.0	LOS A	0.6	4.2	0.47	0.51	0.47	56.3
North: Luddenham Road														
8	T1	430	8.0	430	8.0	0.297	3.9	LOS A	0.8	5.7	0.27	0.37	0.27	57.6
9	R2	290	3.0	290	3.0	0.229	9.6	LOS A	0.5	3.9	0.26	0.60	0.26	46.0
Approach		720	6.0	720	6.0	0.297	6.2	LOS A	0.8	5.7	0.27	0.46	0.27	54.6
West: Patons Lane														
10	L2	200	17.0	200	17.0	0.197	5.4	LOS A	0.4	3.1	0.52	0.63	0.52	53.2
12	R2	80	1.0	80	1.0	0.098	11.3	LOS B	0.2	1.2	0.51	0.73	0.51	53.4
Approach		280	12.4	280	12.4	0.197	7.1	LOS A	0.4	3.1	0.52	0.66	0.52	53.3
All Vehicles		1570	7.1	1570	7.1	0.297	5.9	LOS A	0.8	5.7	0.39	0.51	0.39	55.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\New Project.sip9

STAGE 2 (2024) SIDRA OUTPUTS

SITE LAYOUT

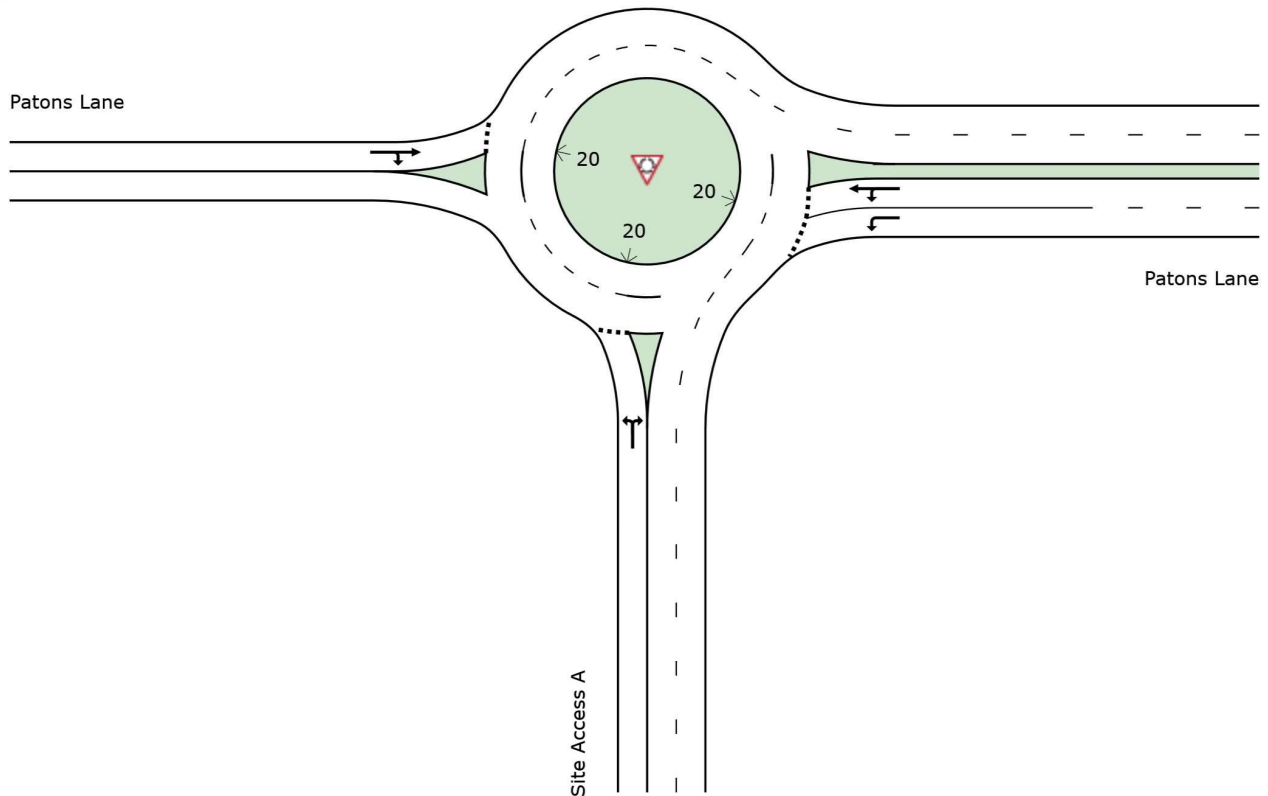


Site: [Patons Ln/Site Access A (Stage 1 - 2023) - AM Peak]

Site Category: -
Roundabout



Patons Lane



Patons Lane

Site Access A

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Project: C:\Users\tlaz4352\OneDrive - ARCADIS\Luddenham Road TIA\F-Reports\SIDRA Modelling\Luddenham Road TIA_All Stages.sip8

MOVEMENT SUMMARY

Site: [Patons Ln/Site Access A (Stage 2 - 2024) - AM Peak
(Site Folder: General)]

Network: N101 [AM Peak -
Stage 2 (2024) (Network Folder:
General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Site Access A														
3	R2	280	3.0	280	3.0	0.104	9.0	LOS A	0.2	1.2	0.15	0.62	0.15	41.5
Approach		280	3.0	280	3.0	0.104	9.0	LOS A	0.2	1.2	0.15	0.62	0.15	41.5
East: Patons Lane														
4	L2	1120	3.0	1120	3.0	0.365	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.0
5	T1	50	50.0	50	50.0	0.365	4.5	LOS A	0.0	0.0	0.00	0.49	0.00	54.9
Approach		1170	5.0	1170	5.0	0.365	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.1
West: Patons Lane														
11	T1	20	10.0	20	10.0	0.021	5.3	LOS A	0.0	0.2	0.35	0.48	0.35	50.3
Approach		20	10.0	20	10.0	0.021	5.3	LOS A	0.0	0.2	0.35	0.48	0.35	50.3
All Vehicles		1470	4.7	1470	4.7	0.365	5.1	LOS A	0.2	1.2	0.03	0.52	0.03	51.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\New Project.sip9

MOVEMENT SUMMARY

Site: 1212 [Patons Ln/Site Access A (Stage 2 - 2024) - PM Peak (Site Folder: General)]

Network: N101 [PM Peak - Stage 2 (2024) (Network Folder: General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Site Access A														
3	R2	520	3.0	520	3.0	0.177	8.8	LOS A	0.3	2.1	0.09	0.63	0.09	41.9
Approach		520	3.0	520	3.0	0.177	8.8	LOS A	0.3	2.1	0.09	0.63	0.09	41.9
East: Patons Lane														
4	L2	770	3.0	770	3.0	0.246	4.2	LOS A	0.0	0.0	0.00	0.50	0.00	53.0
5	T1	20	50.0	20	50.0	0.246	4.5	LOS A	0.0	0.0	0.00	0.49	0.00	54.9
Approach		790	4.2	790	4.2	0.246	4.2	LOS A	0.0	0.0	0.00	0.50	0.00	53.1
West: Patons Lane														
11	T1	50	10.0	50	10.0	0.060	6.1	LOS A	0.1	0.6	0.45	0.58	0.45	49.5
Approach		50	10.0	50	10.0	0.060	6.1	LOS A	0.1	0.6	0.45	0.58	0.45	49.5
All Vehicles		1360	3.9	1360	3.9	0.246	6.0	LOS A	0.3	2.1	0.05	0.55	0.05	49.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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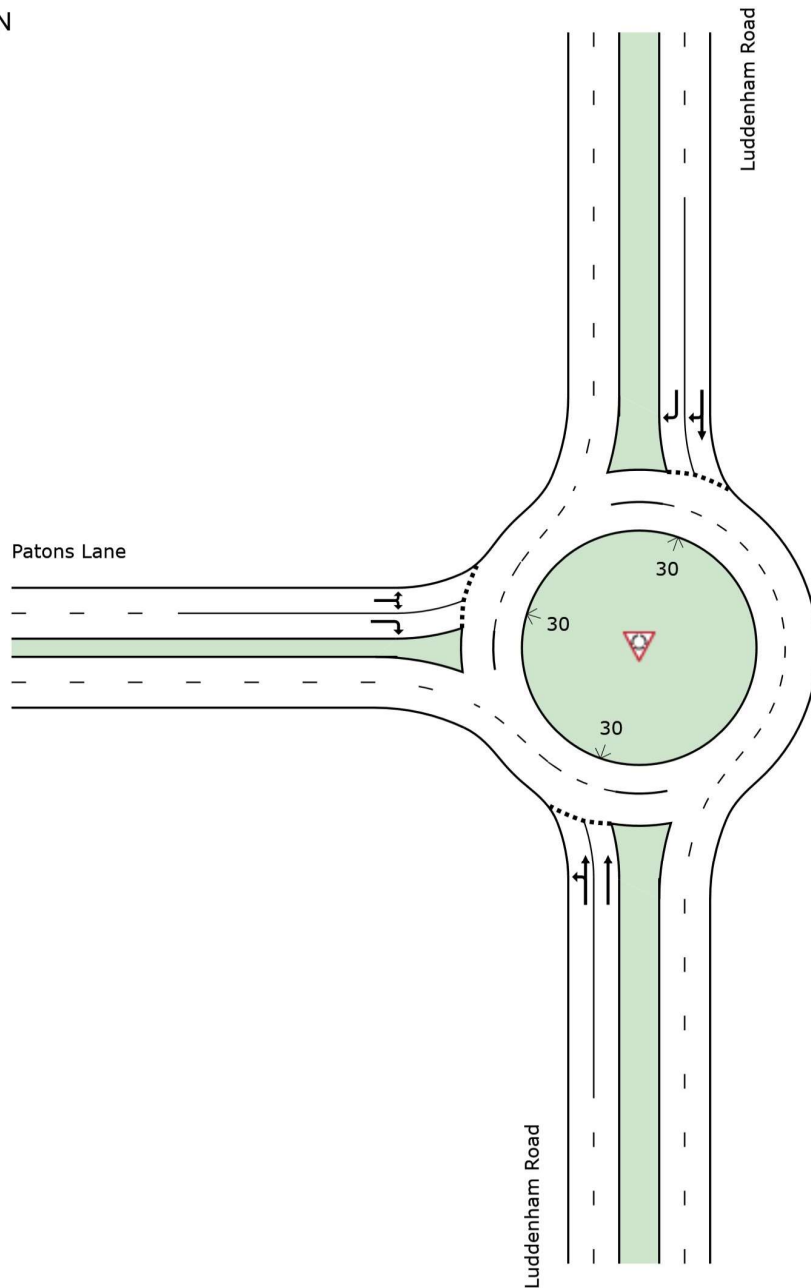
Project: C:\PROJECT\LUDDENHAM ROAD\New Project.sip9

SITE LAYOUT



Site: [Luddenham Rd/Patons Ln (Stage 1 - 2023) - RBT - AM Peak]

Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: [Luddenham Rd/Patons Ln (Stage 2 - 2024) - AM Peak
(Site Folder: General)]

Network: N101 [AM Peak -
Stage 2 (2024) (Network Folder:
General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	340	2.0	340	2.0	0.412	7.0	LOS A	1.0	7.1	0.71	0.80	0.74	52.6
2	T1	360	7.0	360	7.0	0.412	8.0	LOS A	1.0	7.1	0.72	0.82	0.78	55.8
Approach		700	4.6	700	4.6	0.412	7.5	LOS A	1.0	7.1	0.72	0.81	0.76	54.6
North: Luddenham Road														
8	T1	510	8.0	510	8.0	0.455	4.0	LOS A	1.4	10.6	0.32	0.45	0.32	56.6
9	R2	780	3.0	780	3.0	0.455	9.7	LOS A	1.4	10.6	0.33	0.56	0.33	46.5
Approach		1290	5.0	1290	5.0	0.455	7.5	LOS A	1.4	10.6	0.32	0.52	0.32	52.2
West: Patons Lane														
10	L2	200	17.0	200	17.0	0.193	5.2	LOS A	0.4	3.4	0.52	0.60	0.52	53.2
12	R2	80	1.0	80	1.0	0.095	11.1	LOS B	0.2	1.3	0.51	0.70	0.51	53.5
Approach		280	12.4	280	12.4	0.193	6.9	LOS A	0.4	3.4	0.52	0.63	0.52	53.3
All Vehicles		2270	5.8	2270	5.8	0.455	7.4	LOS A	1.4	10.6	0.47	0.62	0.48	53.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\New Project.sip9

MOVEMENT SUMMARY

Site: 1211v [Luddenham Rd/Patons Ln (Stage 2 - 2024) - PM Peak (Site Folder: General)]

■□ Network: N101 [PM Peak - Stage 2 (2024) (Network Folder: General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	230	2.0	230	2.0	0.355	5.9	LOS A	0.8	6.1	0.63	0.66	0.63	52.9
2	T1	450	7.0	450	7.0	0.355	6.3	LOS A	0.8	6.1	0.64	0.64	0.64	56.1
Approach		680	5.3	680	5.3	0.355	6.2	LOS A	0.8	6.1	0.64	0.65	0.64	55.3
North: Luddenham Road														
8	T1	440	8.0	440	8.0	0.383	4.4	LOS A	1.1	8.0	0.42	0.46	0.42	56.6
9	R2	540	3.0	540	3.0	0.383	10.1	LOS B	1.1	8.0	0.43	0.61	0.43	45.7
Approach		980	5.2	980	5.2	0.383	7.6	LOS A	1.1	8.0	0.43	0.54	0.43	52.4
West: Patons Lane														
10	L2	360	17.0	360	17.0	0.364	5.8	LOS A	0.8	6.8	0.61	0.68	0.61	52.8
12	R2	160	1.0	160	1.0	0.195	11.5	LOS B	0.4	2.7	0.57	0.76	0.57	53.3
Approach		520	12.1	520	12.1	0.364	7.5	LOS A	0.8	6.8	0.60	0.71	0.60	53.0
All Vehicles		2180	6.9	2180	6.9	0.383	7.1	LOS A	1.1	8.0	0.53	0.62	0.53	53.5

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

STAGE 3 (2025) SIDRA OUTPUTS

SITE LAYOUT

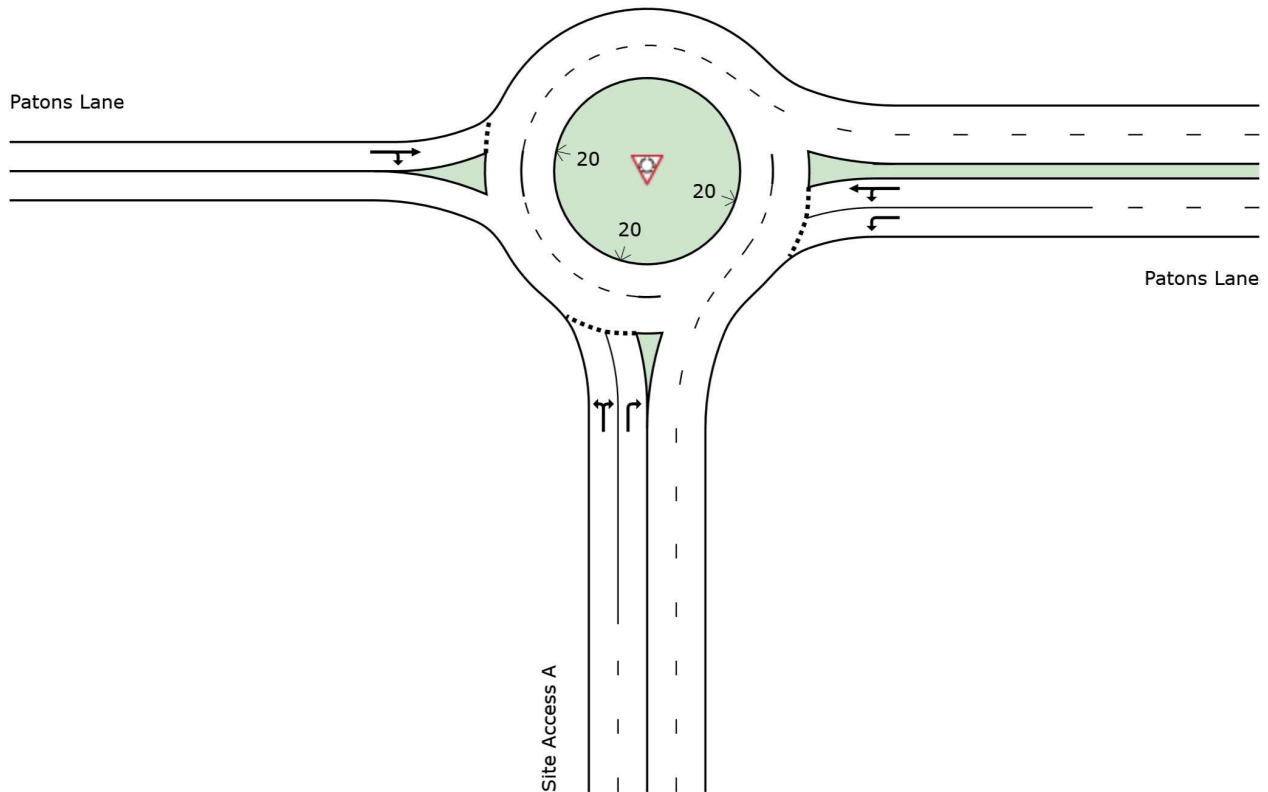


Site: [Patons Ln/Site Access A (Stage 3 - 2025) - AM Peak]

Site Category: (None)
Roundabout



Patons Lane



Patons Lane

Site Access A

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Project: C:\Users\tlaz4352\OneDrive - ARCADIS\Luddenham Road TIA\F-Reports\SIDRA Modelling\Luddenham Road TIA_All Stages.sip8

MOVEMENT SUMMARY

Site: [Patons Ln/Site Access A (Stage 3 - 2025) - AM Peak - Original (Site Folder: General)]

Network: N101 [AM Peak - Stage 3 (2025) - Original (Network Folder: General)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Site Access A														
3	R2	340	3.0	340	3.0	0.125	9.0	LOS A	0.2	1.4	0.15	0.62	0.15	41.5
Approach		340	3.0	340	3.0	0.125	9.0	LOS A	0.2	1.4	0.15	0.62	0.15	41.5
East: Patons Lane														
4	L2	1360	3.0	1360	3.0	0.439	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.0
5	T1	50	50.0	50	50.0	0.439	4.5	LOS A	0.0	0.0	0.00	0.49	0.00	54.9
Approach		1410	4.7	1410	4.7	0.439	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.1
West: Patons Lane														
11	T1	20	10.0	20	10.0	0.022	5.5	LOS A	0.0	0.2	0.38	0.50	0.38	50.1
Approach		20	10.0	20	10.0	0.022	5.5	LOS A	0.0	0.2	0.38	0.50	0.38	50.1
All Vehicles		1770	4.4	1770	4.4	0.439	5.1	LOS A	0.2	1.4	0.03	0.52	0.03	51.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\Luddenham Road_v2.sip9

MOVEMENT SUMMARY

Site: 1212 [Patons Ln/Site Access A (Stage 3 - 2025) - PM Peak - Original (Site Folder: General)]

Network: N101 [PM Peak - Stage 3 (2025) - Original (Network Folder: General)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Site Access A														
3	R2	630	3.0	630	3.0	0.213	8.8	LOS A	0.4	2.7	0.10	0.62	0.10	41.9
Approach		630	3.0	630	3.0	0.213	8.8	LOS A	0.4	2.7	0.10	0.62	0.10	41.9
East: Patons Lane														
4	L2	940	3.0	940	3.0	0.298	4.2	LOS A	0.0	0.0	0.00	0.50	0.00	53.0
5	T1	20	50.0	20	50.0	0.298	4.5	LOS A	0.0	0.0	0.00	0.49	0.00	54.9
Approach		960	4.0	960	4.0	0.298	4.2	LOS A	0.0	0.0	0.00	0.50	0.00	53.1
West: Patons Lane														
11	T1	50	10.0	50	10.0	0.063	6.5	LOS A	0.1	0.7	0.48	0.62	0.48	49.3
Approach		50	10.0	50	10.0	0.063	6.5	LOS A	0.1	0.7	0.48	0.62	0.48	49.3
All Vehicles		1640	3.8	1640	3.8	0.298	6.0	LOS A	0.4	2.7	0.05	0.55	0.05	49.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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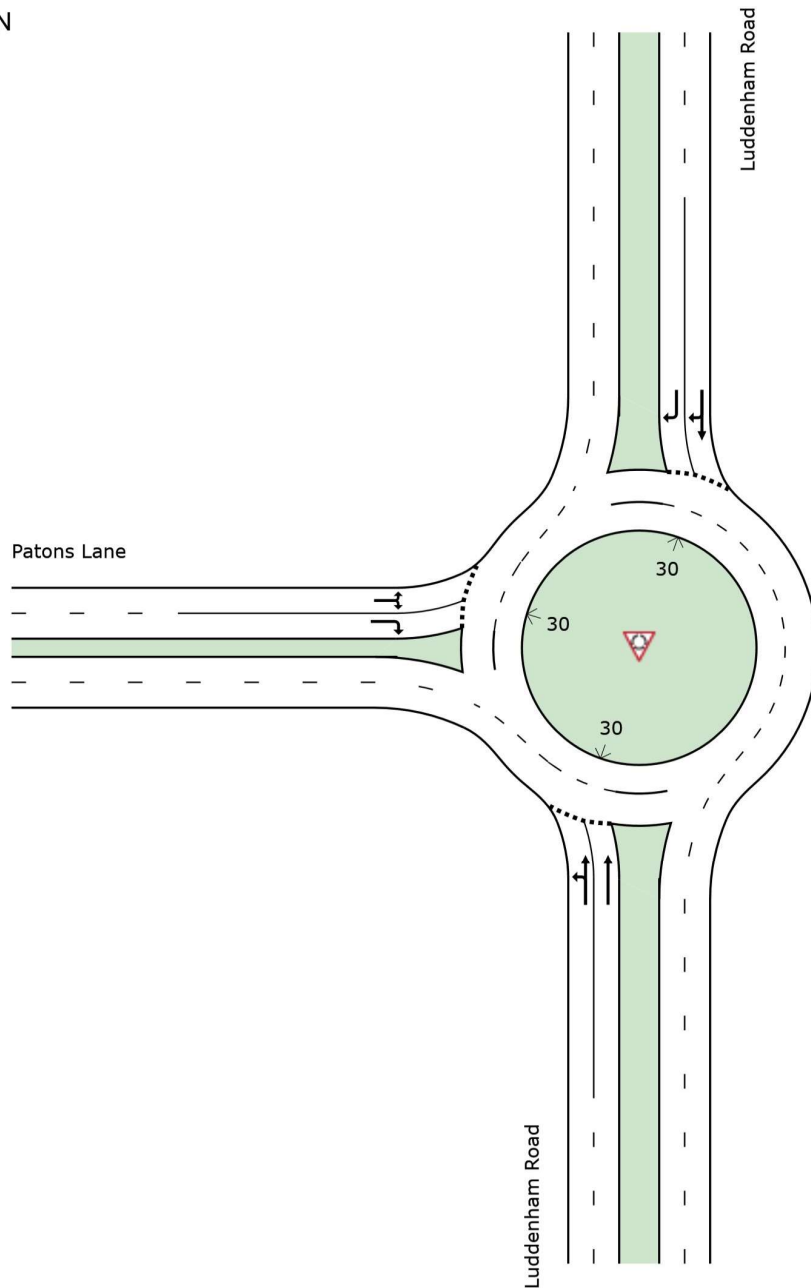
Project: C:\PROJECT\LUDDENHAM ROAD\Luddenham Road_v2.sip9

SITE LAYOUT



Site: [Luddenham Rd/Patons Ln (Stage 1 - 2023) - RBT - AM Peak]

Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 1211v [Luddenham Rd/Patons Ln (Stage 3 - 2025) - RBT
- AM Peak - Original (Site Folder: General)]

Network: N101 [AM Peak -
Stage 3 (2025) - Original
(Network Folder: General)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	410	2.0	410	2.0	0.511	8.7	LOS A	1.5	10.5	0.80	0.94	0.96	51.3
2	T1	370	7.0	370	7.0	0.511	10.2	LOS B	1.5	10.5	0.80	0.94	1.00	54.5
Approach		780	4.4	780	4.4	0.511	9.4	LOS A	1.5	10.5	0.80	0.94	0.98	53.1
North: Luddenham Road														
8	T1	520	8.0	520	8.0	0.529	4.2	LOS A	1.8	13.5	0.39	0.49	0.39	56.1
9	R2	950	3.0	950	3.0	0.529	9.9	LOS A	1.8	13.5	0.41	0.57	0.41	46.2
Approach		1470	4.8	1470	4.8	0.529	7.9	LOS A	1.8	13.5	0.40	0.54	0.40	51.4
West: Patons Lane														
10	L2	240	17.0	240	17.0	0.235	5.4	LOS A	0.5	4.4	0.56	0.62	0.56	53.1
12	R2	100	1.0	100	1.0	0.119	11.2	LOS B	0.2	1.7	0.53	0.71	0.53	53.4
Approach		340	12.3	340	12.3	0.235	7.1	LOS A	0.5	4.4	0.55	0.65	0.55	53.2
All Vehicles		2590	5.6	2590	5.6	0.529	8.2	LOS A	1.8	13.5	0.54	0.68	0.59	52.2

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

MOVEMENT SUMMARY

Site: 1211v [Luddenham Rd/Patons Ln (Stage 3 - 2025) - RBT - PM Peak - Original (Site Folder: General)]

Network: N101 [PM Peak - Stage 3 (2025) - Original (Network Folder: General)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist m				km/h
South: Luddenham Road														
1	L2	280	2.0	280	2.0	0.418	6.5	LOS A	1.0	7.5	0.70	0.74	0.72	52.6
2	T1	460	7.0	460	7.0	0.418	7.2	LOS A	1.0	7.5	0.71	0.74	0.75	55.9
Approach		740	5.1	740	5.1	0.418	6.9	LOS A	1.0	7.5	0.71	0.74	0.74	54.9
North: Luddenham Road														
8	T1	450	8.0	450	8.0	0.445	4.6	LOS A	1.3	9.9	0.49	0.51	0.49	56.1
9	R2	660	3.0	660	3.0	0.445	10.4	LOS B	1.3	9.9	0.50	0.62	0.50	45.5
Approach		1110	5.0	1110	5.0	0.445	8.0	LOS A	1.3	9.9	0.49	0.58	0.49	51.6
West: Patons Lane														
10	L2	440	17.0	440	17.0	0.451	6.1	LOS A	1.2	9.3	0.67	0.73	0.68	52.6
12	R2	190	1.0	190	1.0	0.237	11.7	LOS B	0.5	3.4	0.60	0.78	0.60	53.2
Approach		630	12.2	630	12.2	0.451	7.8	LOS A	1.2	9.3	0.65	0.74	0.66	52.8
All Vehicles		2480	6.9	2480	6.9	0.451	7.6	LOS A	1.3	9.9	0.60	0.67	0.61	53.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\Luddenham Road_v2.sip9

SITE LAYOUT

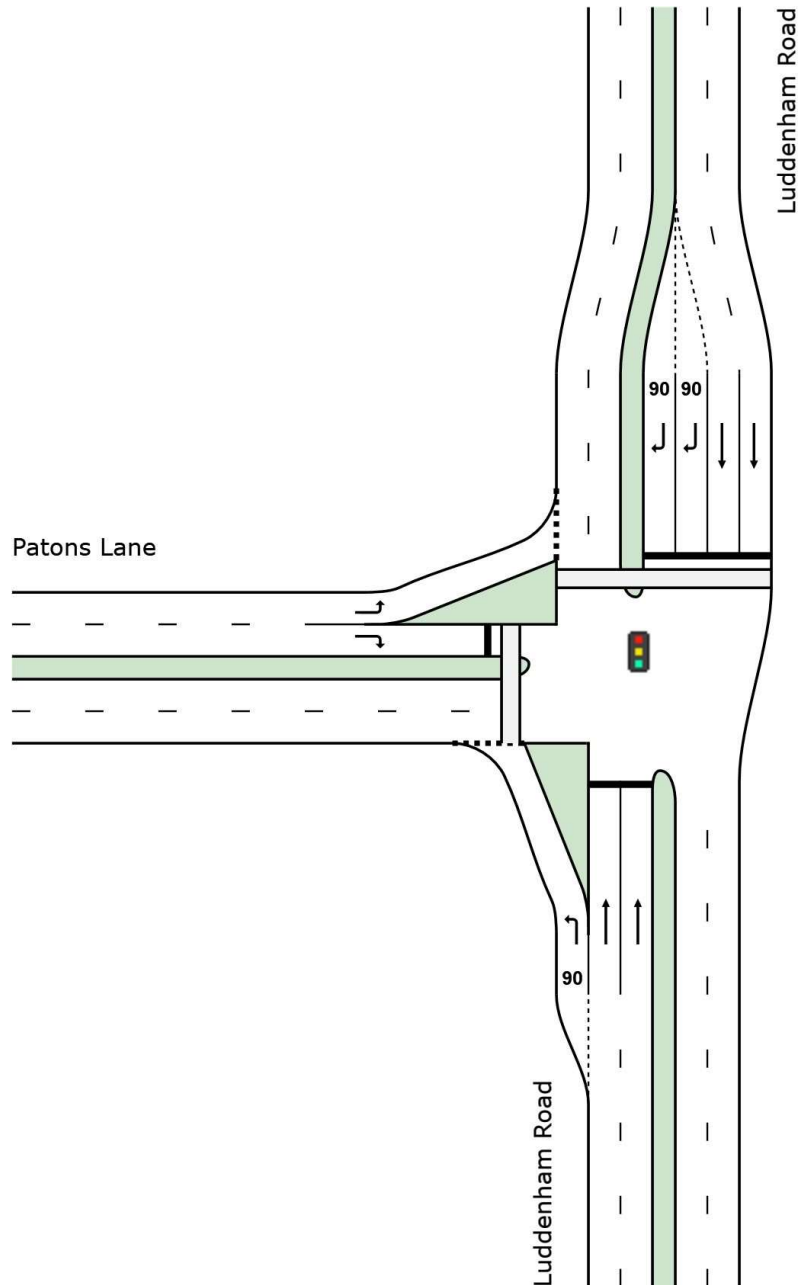


Site: [Luddenham Rd/Patons Ln (Stage 3 - 2025) - SIG - AM Peak]

2021 AM signalised


Site Category: (None)

Signals - Fixed Time Isolated



MOVEMENT SUMMARY

 Site: [Luddenham Rd/Patons Ln (Stage 3 - 2025) - SIG - AM Peak - Original (Site Folder: General)]

 Network: N101 [AM Peak - Stage 3 (2025) - Signals - Original (Network Folder: General)]

2021 AM signalised

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total HV] veh/h	%				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	410	2.0	410	2.0	0.414	12.7	LOS B	6.4	45.9	0.61	0.76	0.61	48.0
2	T1	370	7.0	370	7.0	* 0.545	41.1	LOS D	5.2	38.3	0.96	0.79	0.96	39.8
Approach		780	4.4	780	4.4	0.545	26.2	LOS C	6.4	45.9	0.78	0.77	0.78	42.8
North: Luddenham Road														
8	T1	520	8.0	520	8.0	0.196	5.1	LOS A	2.6	19.2	0.36	0.31	0.36	56.4
9	R2	950	3.0	950	3.0	* 0.550	25.9	LOS C	10.1	72.5	0.77	0.81	0.77	32.7
Approach		1470	4.8	1470	4.8	0.550	18.5	LOS B	10.1	72.5	0.62	0.63	0.62	43.4
West: Patons Lane														
10	L2	240	17.0	240	17.0	0.183	7.4	LOS A	1.3	10.5	0.25	0.62	0.25	51.3
12	R2	100	1.0	100	1.0	* 0.316	45.7	LOS D	2.7	18.9	0.92	0.77	0.92	36.4
Approach		340	12.3	340	12.3	0.316	18.6	LOS B	2.7	18.9	0.45	0.66	0.45	44.7
All Vehicles		2590	5.6	2590	5.6	0.550	20.9	LOS C	10.1	72.5	0.65	0.68	0.65	43.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
North: Luddenham Road											
P3	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	79.3	45.5	0.57
West: Patons Lane											
P4	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	71.2	35.0	0.49
All Pedestrians		100	44.3	LOS E	0.1	0.1	0.94	0.94	75.2	40.3	0.53

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1211 [Luddenham Rd/Patons Ln (Stage 3 - 2025) - SIG - PM Peak - Original (Site Folder: General)]

Network: N101 [PM Peak - Stage 3 (2025) - Signals - Original (Network Folder: General)]

2021 AM signalised

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	280	2.0	280	2.0	0.233	8.9	LOS A	2.4	16.9	0.36	0.66	0.36	51.0
2	T1	460	7.0	460	7.0	* 0.488	34.9	LOS C	5.9	44.1	0.91	0.76	0.91	41.9
Approach		740	5.1	740	5.1	0.488	25.1	LOS C	5.9	44.1	0.70	0.72	0.70	44.1
North: Luddenham Road														
8	T1	450	8.0	450	8.0	0.179	6.5	LOS A	2.5	18.5	0.40	0.34	0.40	55.5
9	R2	660	3.0	660	3.0	* 0.499	32.5	LOS C	7.7	55.4	0.83	0.81	0.83	29.3
Approach		1110	5.0	1110	5.0	0.499	22.0	LOS C	7.7	55.4	0.66	0.62	0.66	42.0
West: Patons Lane														
10	L2	440	17.0	440	17.0	0.355	8.3	LOS A	3.5	28.2	0.35	0.66	0.35	50.5
12	R2	190	1.0	190	1.0	* 0.486	43.7	LOS D	5.1	35.9	0.93	0.80	0.93	37.0
Approach		630	12.2	630	12.2	0.486	19.0	LOS B	5.1	35.9	0.53	0.70	0.53	44.5
All Vehicles		2480	6.9	2480	6.9	0.499	22.1	LOS C	7.7	55.4	0.64	0.67	0.64	43.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
North: Luddenham Road											
P3	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	79.3	45.5	0.57
West: Patons Lane											
P4	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	71.2	35.0	0.49
All Pedestrians		100	44.3	LOS E	0.1	0.1	0.94	0.94	75.2	40.3	0.53

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

ULTIMATE SCENARIO (2035) SIDRA OUTPUTS

SITE LAYOUT

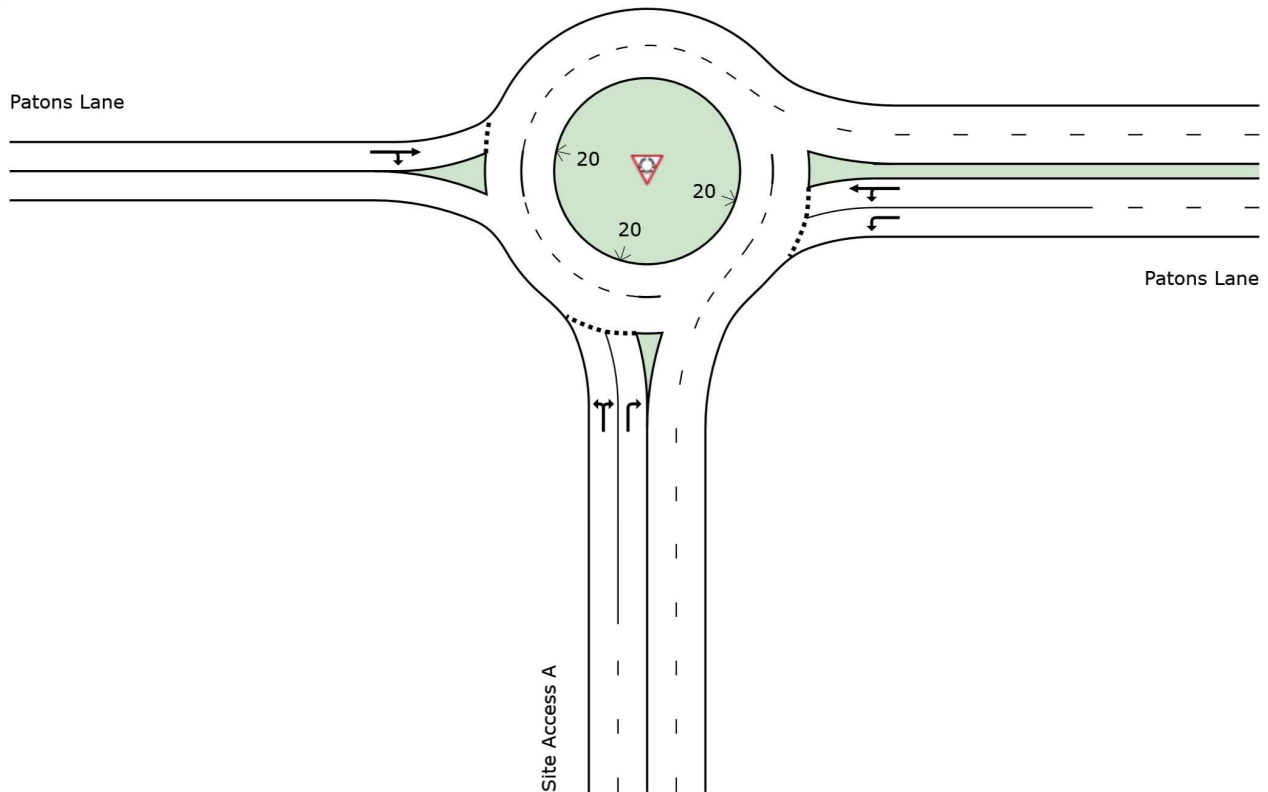


Site: [Patons Ln/Site Access A (Stage 3 - 2025) - AM Peak]

Site Category: (None)
Roundabout



Patons Lane



Patons Lane

Site Access A

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Project: C:\Users\tlaz4352\OneDrive - ARCADIS\Luddenham Road TIA\F-Reports\SIDRA Modelling\Luddenham Road TIA_All Stages.sip8

MOVEMENT SUMMARY

 **Site: 1212 [Patons Ln/Site Access A (Ultimate State - 2035) - AM Peak - Original (Site Folder: General)]**

 **Network: N101 [AM Peak - Ultimate State (2035) - Original (Network Folder: General)]**

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Site Access A														
3	R2	340	3.0	340	3.0	0.125	9.0	LOS A	0.2	1.4	0.15	0.62	0.15	41.5
Approach		340	3.0	340	3.0	0.125	9.0	LOS A	0.2	1.4	0.15	0.62	0.15	41.5
East: Patons Lane														
4	L2	1360	3.0	1360	3.0	0.439	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.0
5	T1	50	50.0	50	50.0	0.439	4.5	LOS A	0.0	0.0	0.00	0.49	0.00	54.9
Approach		1410	4.7	1410	4.7	0.439	4.2	LOS A	0.0	0.0	0.00	0.49	0.00	53.1
West: Patons Lane														
11	T1	20	10.0	20	10.0	0.022	5.5	LOS A	0.0	0.2	0.38	0.50	0.38	50.1
Approach		20	10.0	20	10.0	0.022	5.5	LOS A	0.0	0.2	0.38	0.50	0.38	50.1
All Vehicles		1770	4.4	1770	4.4	0.439	5.1	LOS A	0.2	1.4	0.03	0.52	0.03	51.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\Luddenham Road_v2.sip9

MOVEMENT SUMMARY

Site: 1212 [Patons Ln/Site Access A (Ultimate State - 2035) - PM Peak - Original (Site Folder: General)]

■ □ Network: N101 [PM Peak - Ultimate State (2035) - Signals - Original (Network Folder: General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total HV] veh/h	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Site Access A														
3	R2	630	3.0	630	3.0	0.212	8.8	LOS A	0.4	3.0	0.10	0.62	0.10	41.9
Approach		630	3.0	630	3.0	0.212	8.8	LOS A	0.4	3.0	0.10	0.62	0.10	41.9
East: Patons Lane														
4	L2	940	3.0	940	3.0	0.298	4.2	LOS A	0.0	0.0	0.00	0.50	0.00	53.0
5	T1	20	50.0	20	50.0	0.298	4.5	LOS A	0.0	0.0	0.00	0.49	0.00	54.9
Approach		960	4.0	960	4.0	0.298	4.2	LOS A	0.0	0.0	0.00	0.50	0.00	53.1
West: Patons Lane														
11	T1	50	10.0	50	10.0	0.064	6.5	LOS A	0.1	0.7	0.48	0.62	0.48	49.3
Approach		50	10.0	50	10.0	0.064	6.5	LOS A	0.1	0.7	0.48	0.62	0.48	49.3
All Vehicles		1640	3.8	1640	3.8	0.298	6.0	LOS A	0.4	3.0	0.05	0.55	0.05	49.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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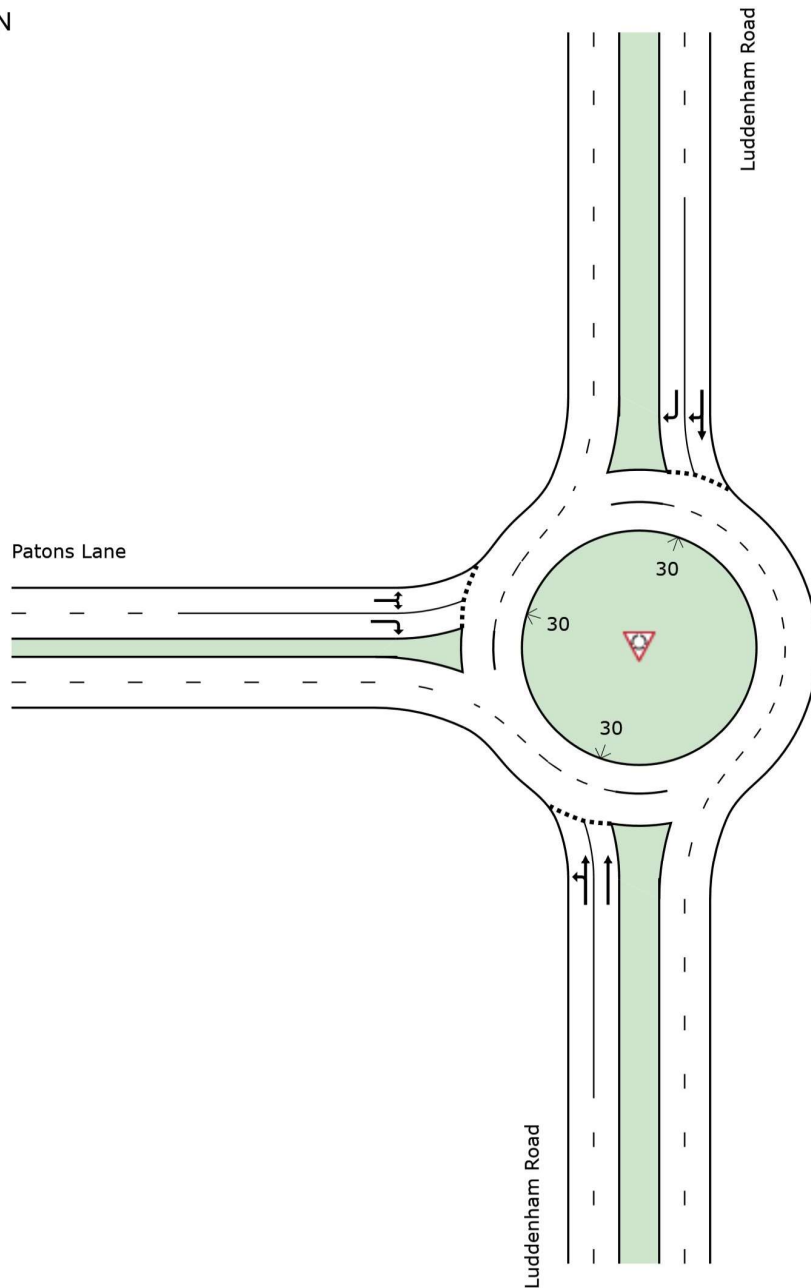
Project: C:\PROJECT\LUDDENHAM ROAD\Luddenham Road_v2.sip9

SITE LAYOUT



Site: [Luddenham Rd/Patons Ln (Stage 1 - 2023) - RBT - AM Peak]

Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 1211v [Luddenham Rd/Patons Ln (Ultimate State - 2035)
- RBT - AM Peak - Original (Site Folder: General)]

Network: N101 [AM Peak -
Ultimate State (2035) - Original
(Network Folder: General)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Luddenham Road														
1	L2	410	2.0	410	2.0	1.086	108.4	LOS F	26.3	191.2	1.00	3.46	7.42	19.3
2	T1	1110	7.0	1110	7.0	1.086	111.3	LOS F	26.3	191.2	1.00	3.29	7.15	25.7
Approach		1520	5.7	1520	5.7	1.086	110.5	LOS F	26.3	191.2	1.00	3.34	7.22	24.2
North: Luddenham Road														
8	T1	800	8.0	800	8.0	0.634	4.3	LOS A	2.8	20.6	0.49	0.45	0.49	56.3
9	R2	950	3.0	950	3.0	0.634	10.1	LOS B	2.8	20.6	0.51	0.58	0.51	45.3
Approach		1750	5.3	1750	5.3	0.634	7.4	LOS A	2.8	20.6	0.50	0.52	0.50	52.1
West: Patons Lane														
10	L2	240	17.0	240	17.0	0.391	7.8	LOS A	0.9	7.6	0.84	0.93	0.89	51.8
12	R2	100	1.0	100	1.0	0.207	13.6	LOS B	0.4	3.0	0.78	0.92	0.78	52.3
Approach		340	12.3	340	12.3	0.391	9.5	LOS A	0.9	7.6	0.82	0.93	0.86	52.0
All Vehicles		3610	6.1	3610	6.1	1.086	51.0	LOS E	26.3	191.2	0.74	1.74	3.37	33.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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Project: C:\PROJECT\LUDDENHAM ROAD\Luddenham Road_v2.sip9

MOVEMENT SUMMARY

Site: 1211v [Luddenham Rd/Patons Ln (Ultimate State - 2035)
- RBT - PM Peak - Original (Site Folder: General)]

■□ Network: N101 [PM Peak -
Ultimate State (2035) - Original
(Network Folder: General)]



Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	280	2.0	280	2.0	0.482	7.2	LOS A	1.4	10.0	0.75	0.80	0.82	52.2
2	T1	560	7.0	560	7.0	0.482	8.0	LOS A	1.4	10.0	0.75	0.83	0.85	55.7
Approach		840	5.3	840	5.3	0.482	7.7	LOS A	1.4	10.0	0.75	0.82	0.84	54.8
North: Luddenham Road														
8	T1	550	8.0	550	8.0	0.486	4.7	LOS A	1.5	11.5	0.52	0.49	0.52	56.2
9	R2	660	3.0	660	3.0	0.486	10.5	LOS B	1.5	11.5	0.53	0.64	0.53	45.2
Approach		1210	5.3	1210	5.3	0.486	7.8	LOS A	1.5	11.5	0.52	0.57	0.52	52.0
West: Patons Lane														
10	L2	440	17.0	440	17.0	0.482	6.8	LOS A	1.3	10.5	0.72	0.82	0.78	52.4
12	R2	190	1.0	190	1.0	0.255	12.1	LOS B	0.5	3.7	0.64	0.83	0.64	53.1
Approach		630	12.2	630	12.2	0.482	8.4	LOS A	1.3	10.5	0.70	0.82	0.74	52.6
All Vehicles		2680	6.9	2680	6.9	0.486	7.9	LOS A	1.5	11.5	0.64	0.71	0.67	53.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

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

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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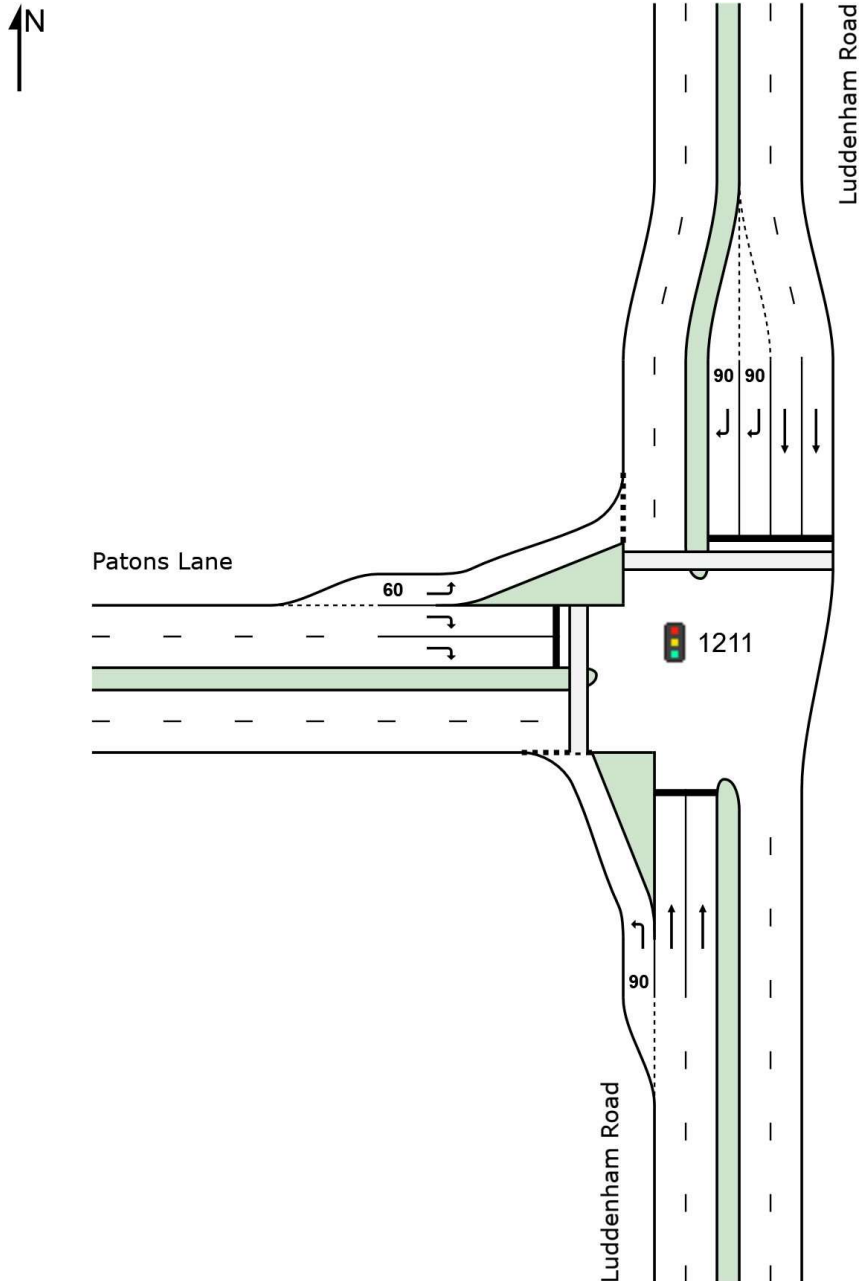
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SITE LAYOUT

 Site: 1211 [Luddenham Rd/Patons Ln (Ultimate State - 2035) - SIG - AM Peak]

Site Category: (None)

Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 1211 [Luddenham Rd/Patons Ln (Ultimate State - 2035) - SIG - AM Peak - Original (Site Folder: General)]

Network: N101 [AM Peak - Ultimate State (2035) - Signals - Original (Network Folder: General)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	410	2.0	410	2.0	0.348	13.8	LOS B	4.9	35.1	0.50	0.74	0.50	47.3
2	T1	1110	7.0	1110	7.0	* 0.892	45.2	LOS D	20.0	148.3	0.98	1.06	1.22	38.5
Approach		1520	5.7	1520	5.7	0.892	36.8	LOS D	20.0	148.3	0.79	0.97	1.03	39.9
North: Luddenham Road														
8	T1	800	8.0	620	8.0	0.301	5.6	LOS A	3.2	23.6	0.37	0.32	0.37	56.3
9	R2	950	3.0	950	3.0	* 0.862	50.0	LOS D	15.4	110.9	1.00	0.96	1.20	23.1
Approach		1750	5.3	1750	5.3	0.862	29.7	LOS C	15.4	110.9	0.72	0.68	0.83	38.7
West: Patons Lane														
10	L2	240	17.0	240	17.0	0.245	15.0	LOS A	3.3	26.5	0.51	0.70	0.51	45.7
12	R2	100	1.0	100	1.0	* 0.158	44.3	LOS D	1.3	9.1	0.89	0.73	0.89	36.8
Approach		340	12.3	340	12.3	0.245	23.6	LOS C	3.3	26.5	0.62	0.71	0.62	42.0
All Vehicles		3610	6.1	3610	6.1	0.892	32.1	LOS C	20.0	148.3	0.77	0.81	0.89	39.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
North: Luddenham Road											
P3	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	79.3	45.5	0.57
West: Patons Lane											
P4	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	73.9	38.5	0.52
All Pedestrians		100	44.3	LOS E	0.1	0.1	0.94	0.94	76.6	42.0	0.55

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 1211 [Luddenham Rd/Patons Ln (Ultimate State - 2035) - SIG - PM Peak - Original (Site Folder: General)]

Network: N101 [PM Peak - Ultimate State (2035) - Signals - Original (Network Folder: General)]

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Luddenham Road														
1	L2	280	2.0	280	2.0	0.233	8.9	LOS A	2.4	16.9	0.36	0.66	0.36	51.0
2	T1	560	7.0	560	7.0	* 0.512	32.1	LOS C	7.0	52.2	0.89	0.75	0.89	43.0
Approach		840	5.3	840	5.3	0.512	24.4	LOS C	7.0	52.2	0.71	0.72	0.71	44.7
North: Luddenham Road														
8	T1	550	8.0	550	8.0	0.207	5.2	LOS A	2.7	20.5	0.36	0.31	0.36	56.4
9	R2	660	3.0	660	3.0	* 0.499	32.5	LOS C	7.7	55.4	0.83	0.81	0.83	29.4
Approach		1210	5.3	1210	5.3	0.499	20.1	LOS C	7.7	55.4	0.62	0.58	0.62	43.7
West: Patons Lane														
10	L2	440	17.0	440	17.0	0.373	9.1	LOS A	4.2	33.6	0.40	0.68	0.40	49.9
12	R2	190	1.0	190	1.0	* 0.300	45.5	LOS D	2.5	17.9	0.92	0.77	0.92	36.5
Approach		630	12.2	630	12.2	0.373	20.1	LOS C	4.2	33.6	0.56	0.70	0.56	43.9
All Vehicles		2680	6.9	2680	6.9	0.512	21.4	LOS C	7.7	55.4	0.63	0.66	0.63	44.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
North: Luddenham Road											
P3	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	79.3	45.5	0.57
West: Patons Lane											
P4	Full	50	44.3	LOS E	0.1	0.1	0.94	0.94	73.9	38.5	0.52
All Pedestrians		100	44.3	LOS E	0.1	0.1	0.94	0.94	76.6	42.0	0.55

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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