



CIVIL ENGINEERING REPORT:
TRAFFIC IMPACT ASSESSMENT REPORT

LAHC - Bellambi

PREPARED FOR
McIntosh & Phelps
Level 2, 17 Federation Road
Newtown NSW 2042

Ref: SY202330 – CC03
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Date: 11.05.2022

Traffic Impact Assessment Report

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
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1. Introduction

1.1 Background

Northrop Consulting Engineers (NCE) has been engaged by McIntosh & Phelps (MP) to prepare a Traffic Impact Assessment Report on the potential influence of the redevelopment of 67 – 69 Pioneer Road and 28 – 30 Bramsen Street for the purpose of the Part 5 Application submission.

1.2 Study Objectives

This Traffic Impact Assessment Report is to address the criteria within the approved proposals from NCE to MP SY202330_aC01_1, SY202330_aC02_1, SY202330_aC03_1 and SY202330_aC04_1.

This Traffic Impact Assessment Report will detail the below:

- Existing site details;
- Adjacent roads, public transport and active travel facilities;
- Existing travel data provided by the local authority;
- Proposed development details;
- Parking requirements and parking spaces provided;
- Traffic generation and potential transport impacts;
- Analysis of the intersection of Pioneer Road and Bramsen Street;
- Design aspects including site access and internal car parking areas; and
- References to the Wollongong Development Control Plan available at the time of this report and other documents as provided by MP.

1.3 Development Locality

The new site is located at the corner of Pioneer Road and Bramsen Street.

Figure 1 shows the general site within the Bellambi area and Figure 2 shows the site-specific location.

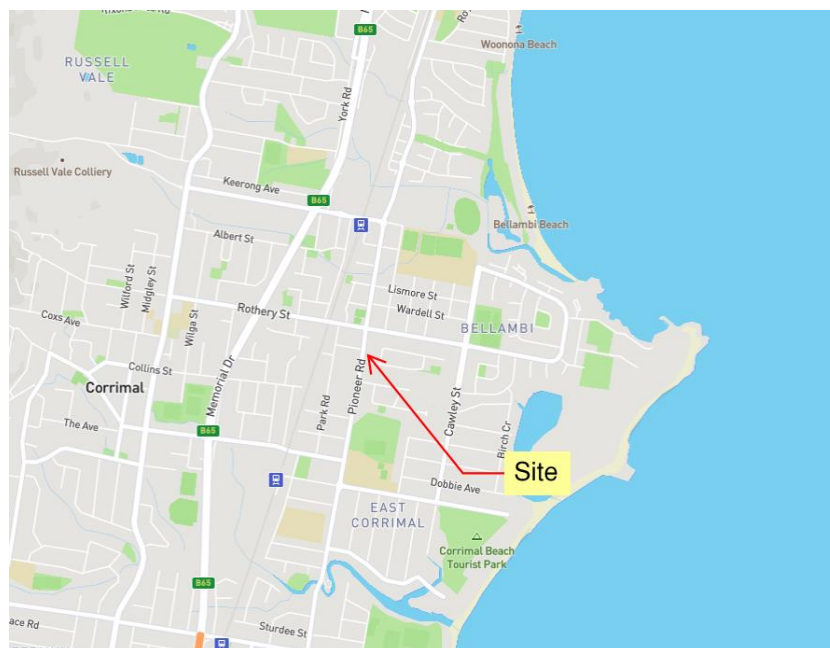


Figure 1 Site Locality (NSW Government Transport for NSW, NSW Road Network Classifications)

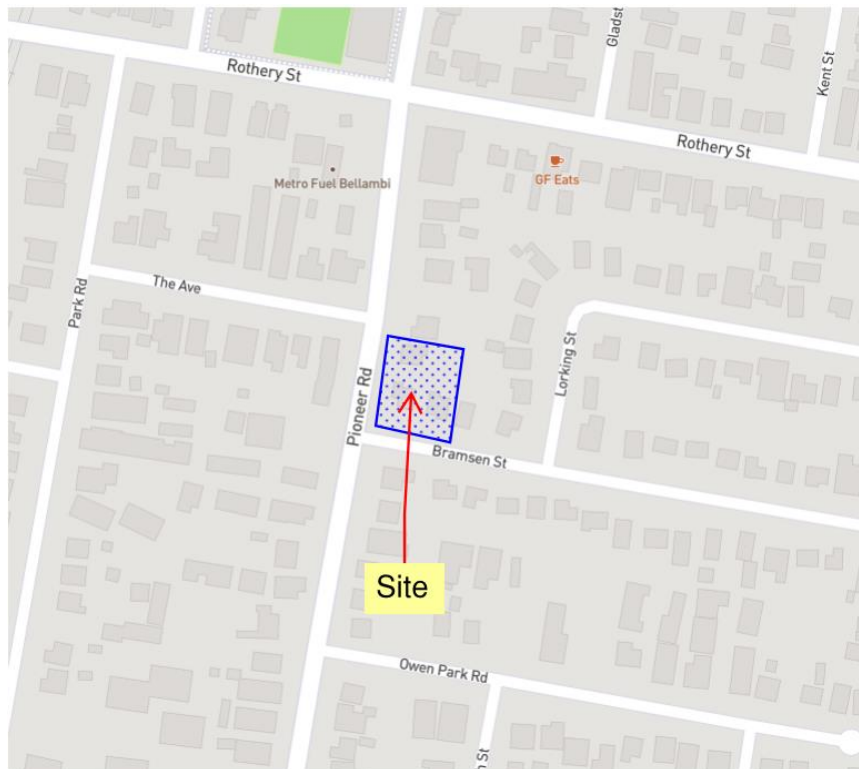


Figure 2 Site Specific Location (NSW Government Transport for NSW, NSW Road Network Classifications)

The site currently contains residential dwellings with street frontages to both Pioneer Road and Bramsen Street. Observations undertaken on 01/04/2021 indicated that the residential dwellings are inhabited.

For the purpose of this Traffic Impact Assessment Report, the key roads identified are:

- Bramsen Street;
- Lorking Street; and
- Pioneer Road between Rothery Street and Owen Park Road.

These roads have been highlighted in Figure 3.

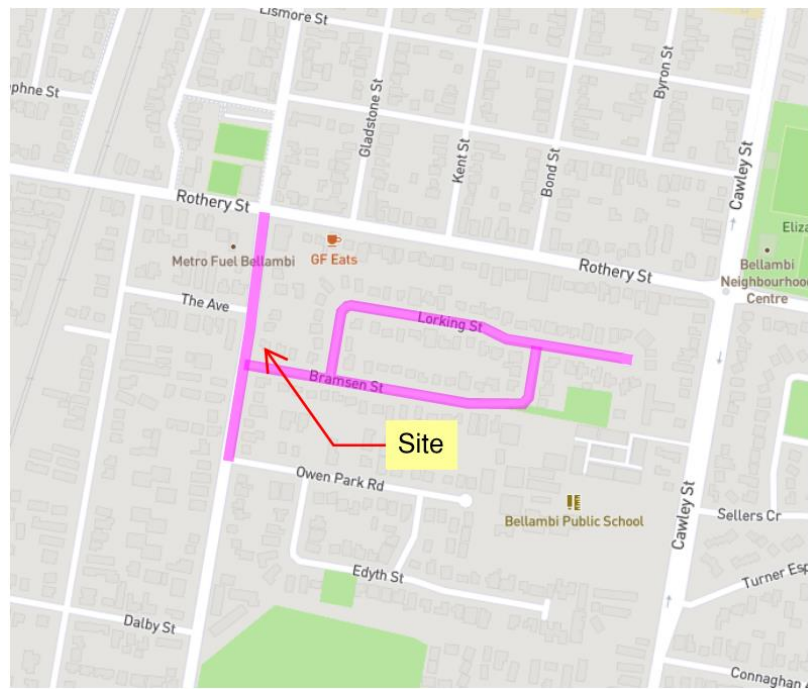


Figure 3 Locality of Key Roads

1.4 Brief Description of the Proposed Development

The redevelopment will involve the construction of a multi-unit development containing 18 dwellings. The development is proposed to have 1 access driveway off Bramsen Street and onsite residential parking.

1.5 Public Consultation

NCE were advised by MP that NSW Government Planning, Industry and Environment department issued a “notice of proposed new housing in your neighbourhood” letter to residents in the area.

After the submission of the letter to residents, there were responses from residents in regards to the development of this site.

In line with the approved proposals SY202330_aC02_1 and SY202330_aC03_1, this report outlines the current performance of the intersection of Bramsen Street and Pioneer Road and the impacts the development will have on the intersection. It is assumed that other items raised during the public consultation will be covered by others.

1.6 References

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

- AS2890.1:2004 Parking Facilities Part 1: Off-street car parking;
- AS2890.6:2009 Parking Facilities Part 6: Off-street parking for people with disabilities;
- NSW Land and Housing Corporation Design Standards 2014 Rev 1;
- Email titled “LAHC Bellambi & Peakhurst – Traffic Advice” from McIntosh and Phelps dated 18/03/2021 which contained:
 - An attachment email “FW: CHRP Tranche 2 – Gate 1 Signoff and Prelim Notification Letters” from McIntosh & Phelps dated 18/03/2021;
 - A drop box link containing:
 - A report titled “Project Review Gate 1 – Advice to Project Manager” by City Plan for the Peakhurst site (not relevant for the Bellambi Site); and
 - A report titled “Project Review Gate 1 – Advice to Project Manager” by City Plan for the Bellambi site;
- Wollongong Development Control Plan 2009;
- State Environmental Planning Policy (Housing) 2021;
- State Environmental Planning Policy (Transport and Infrastructure) 2021;
- RTA Guide to Traffic Generating Developments (2002);
- NSW Government Transport Roads and Maritime Services Guide to Traffic Generating Developments Updated Traffic Surveys TDT 2013/04a; and
- Other documents as referenced.

2. Existing Conditions

The following sections detail the existing conditions of the area.

2.1 Site Access

Access to the current residential dwellings at 67 and 69 Pioneer Road and 28 and 30 Bramsen Street is by the driveway for each dwelling.

2.2 Existing Traffic Conditions

2.2.1 Road Hierarchy

The road hierarchy has been reviewed in accordance with the NSW Government Transport for NSW – NSW Road Network Classifications.

The NSW Road Network Classifications identifies the State Roads, Regional Road and Local Roads.

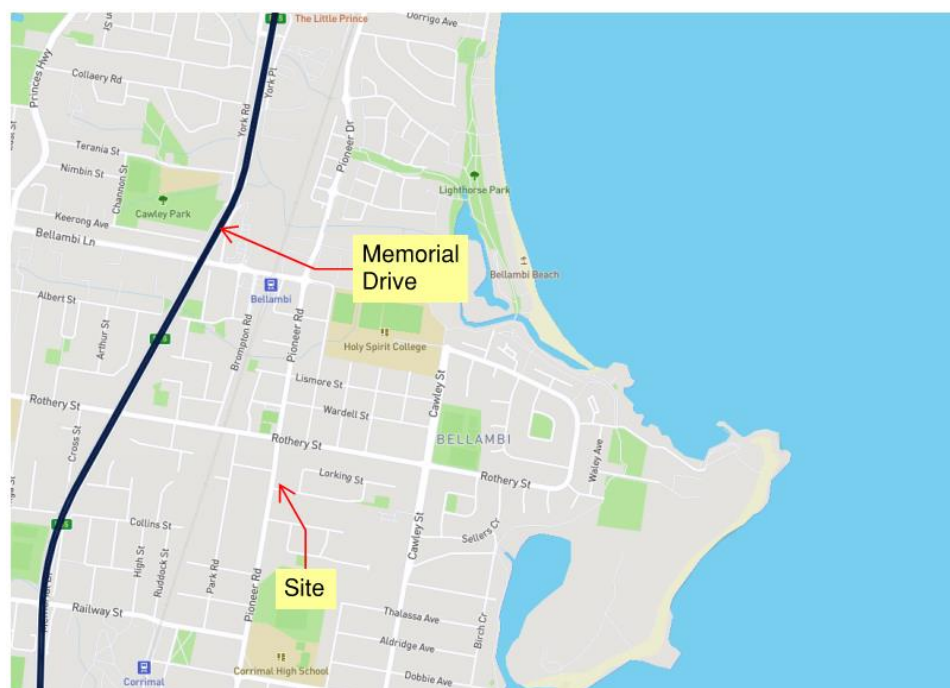


Figure 4 Extract from the NSW Road Network Classifications Map with Marked Up Site Locality

Figure 4 identifies that all roads except Memorial Drive are Local Roads. Memorial Drive is classified as a State Road and is the main road between Wollongong and Bulli.

2.2.2 Road Conditions, Traffic Management and Parking Control

A summary of road conditions, traffic management and parking control of the key roads are as follows:

- Bramsen Street
 - Road Conditions:
 - Bramsen Street is a two – way two – lane road with no defined line marking for the lane widths;
 - Bramsen Street has an approximate carriageway width of 6.5m; and
 - Bramsen Street has a speed limit of 50km/hour except during school zone durations;

- Traffic Management:
 - Bramsen Street meets Pioneer Road and Lorking Street at T intersections as the minor road in a give – way configuration; and
 - Bramsen Street has local area traffic management in the form of a gateway indicated by “dragons teeth” line marking as well as the school zone speed limit painted onto the road;
- Parking Control:
 - On the North and West verges of Bramsen Street adjacent 6 Bramsen Street, there are No Stopping signs located near the tangents of the corner; and
 - On the East and South verge of Bramsen Street close to the tangents of the corner located along Bramsen Street to adjacent 7 Bramsen Street and Bellambi Public School, there are signs indicating no parking on school days between 8:00am – 9:30am and 2:30pm – 4:00pm.
- Lorking Street:
 - Road Conditions:
 - Lorking Street is a two – way two – lane road with no defined line marking for the lane widths;
 - Lorking Street has an approximate carriageway width of 6.5m; and
 - Lorking Street has a speed limit of 50km/hour except during school zone times;
 - Traffic Management:
 - Lorking Street meets Bramsen Street at two T intersections. At one T intersection Lorking Street is the major road in a give – way configuration and at the other T intersection Lorking Street is the minor road in a give – way configuration;
 - Parking Control:
 - There are no parking controls along Lorking Street.
- Pioneer Road (between Rothery Street and Owen Park Road):
 - Road Conditions:
 - Pioneer Road is generally a two – way two – lane road with line marking between Rothery Street and Owen Park Road. Pioneer Road widens to 4 lanes near the intersection of Rothery Street;
 - Pioneer Road has an approximate carriageway width of 12m up to where it widens near Owen Park Road;
 - Lane widths on Pioneer Road are approximately 3m wide; and
 - Pioneer Road has a speed limit of 50km/hour;
 - Traffic Management:
 - Pioneer Road meets The Avenue, Bramsen Street and Owen Park Road at T intersections as the major road;
 - Pioneer Road meets Rothery Street at a four-leg signalised intersection;
 - Parking Control:
 - Bus Zone between 7am and 7pm signs are on both side of the road directly adjacent to the site;
 - No parking and no stopping signs are located at various driveways and near the intersection with Rothery Street;
 - ½ hour parking between 8:30am and 6:00pm Monday to Friday and 8:30am – 12:30pm Saturday signs located adjacent the convenience stores in the Southbound direction; and
 - There are edge lines separating the kerb side parking with the traffic lanes.

2.2.3 Current and Proposed Works

From observations along the key roads, as defined in Section 1.3 of this report, on 15/11/2021, no major developments requiring Roads and Maritime Services (RMS) approval were observed to be currently under construction.

2.2.4 Traffic Flows

2.2.4.1 Key Intersections

For the purpose of this study, the key intersection which commentary has been provided include:

- The intersection of Bramsen Street and Lorking Street; and
- The intersection of Bramsen Street and Pioneer Road.

2.2.4.2 Traffic Observations

Traffic observations were undertaken on 16/11/2021 at the intersection of Bramsen Street and Pioneer Road. Observation times were completed based on a traffic survey provided by Wollongong City Council for Pioneer Road from 24/06/2016 to 01/07/2016.

An observation at approximate 8:15am – 8:30am indicated:

- Traffic was generally free flowing;
- There were delays for vehicles exiting Bramsen Street (two vehicles for approximately twenty seconds each)

An observation at approximately 5:25pm – 5:40pm indicated:

- Traffic was generally free flowing; and
- There were delays for vehicles turning into Bramsen Street from Pioneer Road South or from vehicles turning out of Bramsen Street (total of three vehicles delayed for between approximately twenty and thirty seconds each).

Due to the negligible number of delays observed at the intersection of Bramsen Street and Pioneer Road, and the number of vehicles using the intersection of Bramsen Street and Lorking Street in comparison to the number of vehicles using the intersection of Bramsen Street and Pioneer Road; it can be inferred that the delays at the intersection of Bramsen Street and Lorking Street are negligible in nature.

2.2.4.3 Traffic Volumes

Matrix Traffic and Transport Data (Matrix) were engaged to complete a traffic survey at the intersection of Pioneer Road and Bramsen Street. The traffic survey undertaken used tubes to obtain traffic volume data. The survey was completed from 12/11/2021 to 18/12/2021.

The traffic survey has identified that the weekday morning peak for the intersection for the surveyed week occurred between 8:00am – 9:00am.

The traffic survey has identified that the weekday afternoon peak for the intersection for the surveyed week occurred between 3:00pm – 4:00pm.

For the purpose of this study, we are also looking at the weekday evening peak for the intersection occurring between 5:00pm – 6:00pm.

A summary of the traffic volumes is in Table 1.

Table 1 Traffic Volumes

Road	Direction	Average Weekday Daily	Average Weekday AM Peak	Average Weekday Afternoon PM Peak	Average Weekday Evening PM Peak
Bramsen Road Between Pioneer Road and Lorking Street	Eastbound	345	44	31	22
	Westbound	345	40	28	25
Pioneer Road Between The Avenue and Bramsen Street	Northbound	4,279	440	402	237
	Southbound	3,534	245	301	271
Pioneer Road Between Bramsen Street and Owen Park Road	Northbound	4,338	455	398	319
	Southbound	3,500	256	299	271

2.2.4.4 Current Traffic Generation

The Guide to Traffic Generating Developments Updated Traffic Surveys TDT 2013/04a was reviewed to estimate the current traffic generation for the site.

The Low Density Residential – Survey Details is part of Appendix A of the Guide to Traffic Generating Developments Updated Traffic Surveys TDT 2013/04a. The survey details include results from the suburb of Farmborough Heights in the Wollongong City Council. It would be assumed that residents from Farmborough Heights would display similar travel behaviour to those of Bellambi.

The traffic generation rates as per the Guide to Traffic Generating Developments Updated Traffic Surveys TDT 2013/04a are:

- 0.61 vehicle trips per dwelling per peak period (peak periods are 8:00am – 9:00am and 3:00pm – 4:00pm; and
- 5.16 vehicle trips per dwelling per day.

As there are four dwellings on the proposed site, the estimated traffic generation is as follows:

- 4 dwellings x 0.61 vehicle trips per dwelling per peak period = 3 vehicle trips per peak period; and
- 4 dwellings x 5.16 vehicle trips per dwelling per day = 21 vehicle trips per day.

2.2.4.5 Daily and Peak Period Heavy Vehicle Flows

The current dwellings on the proposed site do not generally generate heavy vehicle movements.

However, heavy vehicles may use the roads to access other destinations.

2.2.4.6 Performance of the Intersection of Bramsen Street and Pioneer Road

The intersection of Bramsen Street and Pioneer Road has been modelled using SIDRA Intersection 9 and the results on Friday 12/11/2021 from the traffic survey undertaken by Matrix which had the greatest number of vehicle movements through the intersection during the peak periods.

With the aim of addressing public consultation matters, we have modelled the following peak periods:

- Peak AM period from 8:00am – 9:00am which coincides with both the standard am peak period for the area and part of the Bellambi Public School drop off;
- Peak PM afternoon period from 3:00pm – 4:00pm which coincides with the PM School Zone 40km/hour speed limit timing; and
- Peak PM evening period from 5:00pm – 6:00pm which represents a typical period for drivers to be returning from work.

Due to the nature of the traffic survey, where possible a 50/50 split for vehicle movements from Bramsen Street to Pioneer Road North or South has been assumed, else a split as close to this as reasonably practical has been used. Turning movements from Pioneer Road to Bramsen Street have been based from this assumption. The percent of heavy vehicles has been extracted from the traffic survey.

For the model:

- We have added 16 vehicle movements to the intersection to balance the number of incoming vehicles against the number of outgoing vehicles for the Peak AM period from 8:00am – 9:00am;
- We have added 4 vehicle movements to the intersection to balance the number of incoming vehicles against the number of outgoing vehicles for the Peak PM afternoon period from 3:00pm – 4:00pm; and
- We have added 1 vehicle movements to the intersection to balance the number of incoming vehicles against the number of outgoing vehicles for the Peak PM evening period from 5:00pm – 6:00pm.

Bunching has been applied to the model for the Northern and Southern legs of Pioneer Road based on the SIDRA Intersection User Guide (October, 2020).

Pedestrians have not been modelled for the purpose of this report.

This report will be focusing on the key intersection performance measures of Level of Service, Degree of Saturation, Queuing and Delay. The SIDRA Glossary of Road Traffic Terms (March 2020) defines the key intersection performance measures as in line with the intent of the following:

- Level of Service (LOS) – An index of the operational performance on a given roadway, traffic lane, approach, intersection, route or network, based on measures such as delay, degree of saturation, density, speed, congestion coefficient, speed efficiency or travel time index during a given flow period. This provides a quantitative stratification of a performance measure that represent quality of service, measured on a scale A to F, with LOS A representing the best operating conditions from the traveller's perspective and LOS F the worst.
- Degree of Saturation (DOS) – the ratio of arrival (demand) flow rate to capacity during a given flow period.
- Queuing – The forming of a line of delayed vehicles.
- Delay – The additional (excess) travel time experienced by a vehicle or pedestrian relative to a base travel time, e.g. the free-flow travel time.

Figure 5 illustrates the LOS of the intersection based on the SIDRA Intersection 9 model results for the three periods modelled.

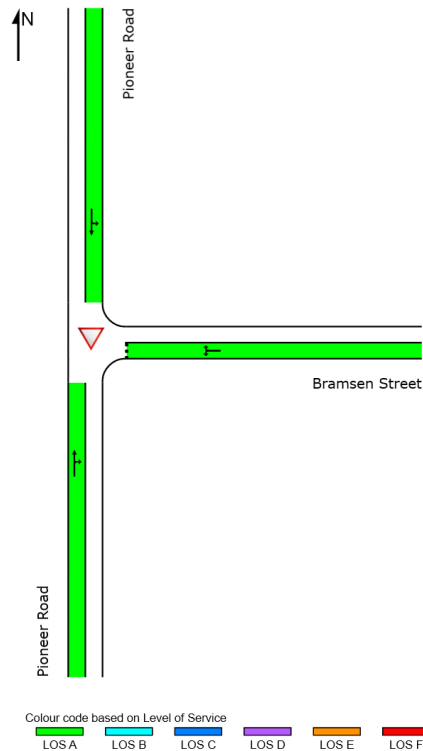


Figure 5 LOS Summary of the Intersection of Bramsen Street and Pioneer Road

Figure 5 illustrates the intersection is operating at the highest LOS at all legs for all periods. This is further seen through the results shown in Table 2.

Table 2 Intersection of Bramsen Street and Pioneer Road Base Conditions

Leg	Road Name	Period	LOS	DOS	Queuing (95 th Percentile m)	Delay (Average s)
North	Pioneer Road	AM Peak	A	0.244	0	0.3
		PM Afternoon Peak	A	0.346	0	0.3
		PM Evening Peak	A	0.248	0	0.2
South	Pioneer Road	AM Peak	A	0.289	2	0.6
		PM Afternoon Peak	A	0.257	0	0.0
		PM Evening Peak	A	0.189	1	0.4
East	Bramsen Street	AM Peak	A	0.080	2	8.3
		PM Afternoon Peak	A	0.049	1	8.9
		PM Evening Peak	A	0.031	1	7.5

Table 2 shows that the intersection is operating satisfactory with a LOS of A. The queuing represented in the model is reflective of that seen during site observations – i.e., negligible queueing.

Delays experienced by vehicles as provided by the results were less than those observed by up to approximately 23 seconds. Possibilities for the difference include:

- The random behaviour assumed by the model compared to the arrival of vehicles at the time of the observations; and
- The position of the give way line at the time of this report for Bramsen Street and the line of site to oncoming vehicles from the give way line on Bramsen Street.

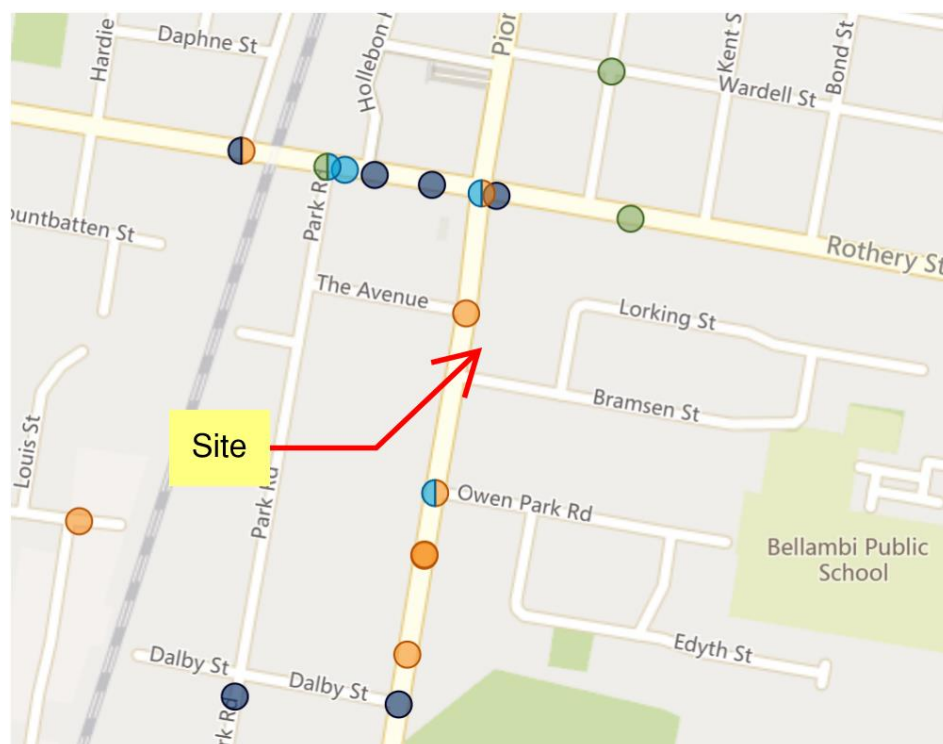
Review of the intersection layout and lines of site to oncoming vehicles is not part of the scope of this study nor does the proposed development have any influence on the line of site or layout of the intersection. Further study of this intersection may need to be completed by the intersection asset owner/road authority.

2.2.5 Traffic Safety

2.2.5.1 Accident History within the area

Existing accident data was obtained from the NSW Government Transport for NSW Centre for Road Safety Website (accessed 11/05/2022).

The accident data available for the area of Wollongong was for 2016 – 2020. A marked up extract of the site-specific area is as per Figure 6.



Degree of crash ● Fatal ● Serious Injury ● Moderate Injury ● Minor/Other Injury ● Non-casualty (towaway)

Figure 6 Accident Data (Extract from the NSW Government Transport for NSW Crashes Map)

Figure 6 shows no accidents on Bramsen Street nor Lorking Street. There have been no accidents recorded at the intersection of Bramsen Street and Pioneer Road.

2.2.6 Parking Supply and Demand

2.2.6.1 On-street Parking Provision

On-street parking is available within the area.

Regulatory parking signs were observed on Pioneer Road near the development and on a section of Bramsen Street.

2.2.6.2 Off-street Parking Provision

Off-street parking was available in each dwelling.

Each property had parking availability for numerous cars however in a general tandem arrangement (i.e. parking one car behind another). Cars were observed on 01/04/2021 to park on landscaped areas within the property boundary to overcome the tandem parking arrangement as per Figure 7.



Figure 7 Cars Parked across Landscaped Area

2.2.6.3 Current Parking Demand

Off-street and on-street parking was observed on 01/04/2021.

The off-street parking was related to the existing dwellings in the area. It was observed that people (assumed to be living in or visiting the dwelling) parked in the dwellings.

The on-street parking was observed at the same time as the traffic flows, namely:

- Approximate 8:20am – 8:35am; and
- Approximately 6:10pm – 6:25pm.

The on-street parking was observed to be busier in the evening than in the morning.

The approximate amount of parking used in the evening was:

- 15% utilisation on Bramsen Street;
- Less than 5% utilisation on Lorking Street; and
- Approximately 70% utilisation on Pioneer Road.

Figure 8, Figure 9 and Figure 10 show illustrate the extent of parking on each corresponding road.



Figure 8 Bramsen Street Evening Parking Observations



Figure 9 Lorking Street Evening Parking Observations



Figure 10 Pioneer Road Evening Parking Observations

2.2.7 Public Transport

2.2.7.1 Rail Station Location and Services

The site is located within proximity to both Bellambi Rail Station and Corrimal Rail Station.

The site is approximately 842.5m walk from Bellambi Rail Station.

The site is approximately 1,008.3m from Corrimal Rail Station.

Figure 11 illustrates the location of the site in proximity to the Rail Stations.



Figure 11 Location of Site in Proximity to Bellambi Rail Station and Corrimal Rail Station (Extract from Six Maps)

2.2.7.2 Bus Stop Locations and Services

Premier Illawarra's buses generally service the area of Bellambi.

There are a number of services which travel through Bellambi connecting it to Northern and Southern Suburbs as well as the Wollongong Interchange.

The services travelling through Bellambi have bus stops located near the site. The closest bus stops to the site are Pioneer Road before The Avenue (Northbound) and Pioneer Road after the Avenue (Southbound).

Figure 12 is an extract from the Transport Buses Wollongong and Shellharbour bus network map (accessed 06/12/2021) showing the approximate location of the bus stops near the site in proximity to the approximate location of the site.

It is noted that the bus stops shown in Figure 12 are adjacent the site.

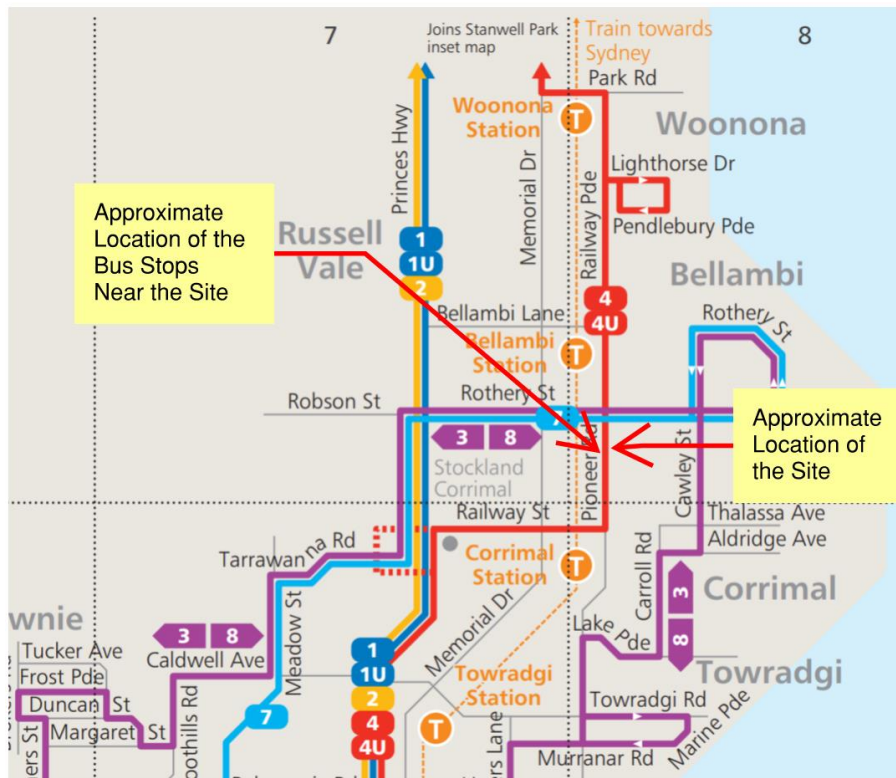


Figure 12 Bus Stop Locations

2.2.8 Pedestrian and Cycle Network (Active Travel Facilities)

During the observations on 01/04/2021, it was observed that there were no obvious cycle routes near the site.

The Wollongong Cycling Strategy 2030 Map indicates the site is near cycling routes to be investigated as well as routes suggesting by the public.

The site is close to the pre-existing cycle routes along Memorial Drive (the main road to the West of the site linking the suburbs along the coast North of Wollongong in the Wollongong City Council) and a route along the coast line (to the East of the site) which runs from Thirroul to Windang.

There is pedestrian connectivity from the site to the bus stops, local convenience shops (located on the corner of Pioneer Road and Rothery Street) and the Bellambi and Corrimall Rail Stations (Corrimall Rail Station path connectivity stops prior to Murray Road which leads to the station).

3. Proposed Development

3.1 Development Description

The development is a multi-unit development containing 18 dwellings comprising of 8 x 1 bedroom dwellings and 10 x 2 bedroom dwellings. The development is proposed to have 1 access driveway off Bramsen Street and onsite residential parking.

3.2 Access

3.2.1 Driveway

Driveway access to the proposed development is off Bramsen Street.

Refer to Section 3.3 in regards to the compliance of the driveway to the applicable standards and development control plan.

A turning path plan (Drawing Number 202330 DA_C09.81 Rev 4) has been prepared for the site illustrating a B85 vehicle traversing the driveway including through the narrow section of the driveway. Refer to the attachments for Drawing Number 202330 DA_C09.81 Rev 4.

3.2.2 Service Vehicle Access

NCE has been informed by MP that there will be no service vehicle access to the block.

Garbage is to be collected from the street front. Dwellings have access to their “bins” from their lobby.

Removalist vans/trucks are to load/unload from the street.

3.3 Compliance to Relevant Standards

As part of this Traffic Impact Assessment Report, we have assumed:

- The parking is User Class 1A – residential (AS2890.1 Table 1.1); and
- 16 car parking spaces have been provided.

The following sections go through the review of the documents.

3.3.1 AS2890.1:2004 Parking Facilities Part 1: Off-street car parking

- Carpark dimensions check:
 - All parking bays have been noted to be at least 5.4m long and 2.4m wide. The aisle width is 6.2m (refer Figure 2.2).
- Blind aisles:
 - The aisle is classified as a blind aisle. The client has inferred that the car park is not open to the public and hence, no turn around bay has been included however a 1m aisle extension has been allowed for (refer to Clause 2.4.2.c).
- Wheel stops:
 - Wheel stops have been provided to prevent vehicles parking over the footpaths and landscape areas (refer to Clause 2.4.5.1). The civil engineer is to determine and detail the final position of the wheel stops as part of the detailed design phase of the works.
- Gradients within parking modules:
 - It is assumed gradients will be confirmed by others as part of the detailed design for the works (refer to Clause 2.4.6).

- Layout design of circulation roadways:
 - The roadway has allowed for an extra 300mm for each wall/barrier/kerb greater than 150mm high along the roadway in addition to the road width. The one-way road width is 3.0m wide and complies with the standard. However, refer to Section 3.3.7 of this report for the commentary on the two-way road width. Refer to Clause 2.5.2.
- Access driveway location:
 - Access driveway for the block is more than 6m from the tangent point of an intersection and therefore this aspect is compliant (refer to Figure 3.1).
- Site distances at access driveways:
 - Site observations confirm that safe sight distances are achieved at the location of the driveway on 01/04/2021 (note no cars were parked blocking site distance at the time of the observations (refer to Figure 3.2).
 - Site distances for pedestrians align with the intent of the standard (refer to drawing A101 issue 1 by MP dated 09/02/2022) assuming drivers will exit the driveway on the Eastern side and the sight triangle is to the footpath rather than the property boundary (refer to Figure 3.3).
- Gradients of access driveways:
 - It is assumed gradients will be confirmed by others as part of the detailed design for the works (refer to Clause 3.3).
- Queuing areas:
 - An analysis using steady state queuing in line with Austroads Guide to Traffic Management Part 2 (2020) has been completed in lieu of AS2890.1's criteria for queuing (refer to Clause 3.4). Assuming there are 32 vehicles movements in the hour, the likelihood of a queue greater than 1 car occurring is less than 16% (assuming the driveway to the car park service's 1 vehicle per 45 seconds which is conservative).
- Driveway width:
 - The driveway is approximately 5.5m at the location of the boundary to 6m into the block which is in line with the standard (refer to Clause 3.2.2). It is noted that the driveway then reduces to a width of 3.0m and then expands to 6.2m for the car park aisle. Refer to drawing A101 issue 1 by MP dated 09/02/2022).

3.3.2 AS2890.6:2009 Parking Facilities Part 6: Off-street parking for people with disabilities

- Parking spaces dimensions:
 - Disabled parking and shared parking spaces are 2.4m wide and 5.4m long and are in line with the standard (refer to Clause 2.2.1).
 - A bollard has been positioned in the shared space (0.8m from centre of bollard to parking aisle located centrally in the parking spot) (refer to Figure 2.3).
 - It is assumed gradients will be confirmed by others as part of the detailed design for the works (refer to Clause 2.3).
- Space identification:
 - Space identification has been identified on architectural drawing A101 issue 1 by MP dated 09/02/2022 and is to be installed as per AS2890.6 during construction (refer to Refer to Figure 3.1).
- Space delineation:
 - Space delineation has been shown on the architectural drawing A101 issue 1 by MP dated 09/02/2022. However, it will need to be installed as per AS2890.6 during construction (refer to Clause 3.2.A).
 - Shared space delineation has been shown on the architectural drawing A101 issue 1 by MP dated 09/02/2022. However, it will need to be installed with strips 150mm to 200mm wide with spaces 200mm – 300mm between stripes during construction (refer to Clause 3.2.B).

3.3.3 NSW Land and Housing Corporation Design Standards

- Off street car park provision:
 - Car park design has been completed in line with the intent of AS2890.1 (refer to Clause B2.2a).
 - It is assumed that vehicle hardstand areas will be specified by others (refer to Clause B2.2a).
- The risk to children is minimized through the following:
 - Passing bay provided when entering the block (refer to Clause B2.2b).
 - A separate pedestrian access has been provided to enter the block/car park (refer to Clause B2.2b).
 - Lighting is to be allowed for to enable visibility to drivers entering and existing the driveway – assumed to be complete by others as part of the detailed design (refer to Clause B2.2bb).
 - Vehicles enter and exit onto the street in a forward direction. This will need to be communicated to residents by the property manager.

3.3.4 Project Review Gate 1 – Advice to Project Manager

- Section 3 – Site constraints and other issues:
 - Cars can enter and exit the development in a forward direction.

3.3.5 State Environmental Planning Policy (Transport and Infrastructure) 2021

- The traffic generation development does not need to be referred to Transport for NSW (refer to Schedule 3).

3.3.6 State Environmental Planning Policy (Housing) 2021

- The number of car parking spaces exceed the required 14 car parking spaces by 2 as per this State Environmental Planning Policy (refer to Chapter 2, Division 6 and Section 3.4 of this report).

3.3.7 Wollongong Development Control Plan 1

Items listed in the following related to chapter E3 of the development control plan.

- The car park is to be designed in accordance with AS2890.1 – refer to previously mentioned comments in Section 1 (refer to Clause 7.7.1).
- We assume that the civil engineer will take into the considerations as listed in section 7.13 of chapter E3 when designing the carpark.
- Directional signage is to be put in place to control which vehicles have right of way through the one-way area (refer to Clause 7.7.7).
- The landscape architect is to make comment in regards to the landscaping for the car park (refer to Clause 12).
- The required bicycle and motorcycle parking have been provided in accordance with Schedule 1 – refer to Section 3.4.

Items listed in the following related to chapter B1 of the development control plan.

- Access/Driveway Requirements:
 - The driveway cross over is 5.5m wide which is as per AS2890.1 (5.5m width required) and is between the limits of 4m – 6m as per Table 1 of chapter B1.
 - The driveway width has a minimum width of 3m as per Table 1 of chapter B1. It is noted this 3m width is at the one way section of the driveway which tapers to 5.5m towards the boundary and 6.2m towards at the parking area meeting the intent of Table B1.

3.4 Parking

3.4.1 Car Parking

The required number of car parking spaces for the proposed development has been calculated based upon the State Environmental Planning Policy (Housing) 2021. It is noted that the proposed development is not in an accessible area.

The parking generation rates as per the State Environmental Planning Policy (Housing) 2021 are:

- 0.5 car parking spaces per 1 bedroom dwelling; and
- 1.0 car parking spaces per 2 bedroom dwelling.

Noting there are 8 x 1 bedroom units and 10 x 2 bedroom units, the total required car parking would be 14 car parking spaces.

The proposed development provides 16 car parking spaces inclusive of 2 disabled car parking spaces.

3.4.2 Motorcycle Parking

The State Environmental Planning Policy (Housing) 2021 is silent on motorcycle parking and hence, the Wollongong Council Development Control Plan 2009 has been referred to.

The Wollongong Council Development Control Plan 2009 advises 1 motorcycle parking space be provided for every 15 dwellings.

The proposed development provides 2 motorcycle spaces to meet this requirement.

3.4.3 Bicycle Parking

The State Environmental Planning Policy (Housing) 2021 remains silent on bicycle parking and hence, the Wollongong Council Development Control Plan 2009 has been referred to.

The Wollongong Council Development Control Plan 2009 advises 1 bicycle space per 3 dwellings be provided for residents and 1 bicycle per 12 dwellings be provided for visitors.

The proposed development provides 8 bicycle spaces for residents and visitors in the form of bike racks.

4. Impact of Proposed Development

4.1 Traffic Generation

The proposed traffic generation has been based on the Guide to Traffic Generating Developments Updated Traffic Surveys TDT 2013/04a.

It has been assumed that the proposed site has similar characteristics to the Wollongong site surveyed in regards to driver behaviour per unit.

The traffic generation rates to be used to equate the traffic generated from the development are as follows:

- AM Weekday Peak Vehicle Trips per Unit = 0.67;
- PM Weekday Peak Vehicle Trips per Unit = 0.22;
- Daily Weekday Vehicle Trips per Unit = 4.78;
- Saturday Peak Vehicle Trips per Unit = 0.78; and
- Saturday Daily Trips per Unit = 3.67.

The traffic generation for the proposed development is as per Table 3.

Table 3 Traffic Generation

Day	Time	Generation Rate	Number of Units	Generated Trips
Weekday	AM Peak	0.67	18	13
Weekday	PM Peak	0.22		4
Weekday	Daily	4.78		86
Saturday	Daily Peak	0.78		15
Saturday	Daily	3.67		67

4.2 Traffic Distribution

Traffic distribution to and from the development has been assessed based upon the position of the main roads near the site and likelihood of vehicles driving to particular locations.

From Bramsen Street, it could be estimated that 50% of vehicles would travel North along Pioneer Road and 50% of vehicles would travel South along Pioneer Road. From Pioneer Road, the vehicles would distribute into the road network either onto Memorial Drive or into another section of the road network.

From Pioneer Road, it is likely that most drivers will be likely to travel West to Memorial Drive due to the number of businesses and likely destinations East of Memorial Drive.

4.3 Traffic Impact

The intersection of Bramsen Street and Pioneer Road has been modelled using SIDRA Intersection 9 with the generated traffic from the proposed development based on the model described in Section 2.2.4.6 of this report.

For the purpose of modelling the intersection, it has been assumed that during peak periods, there will be 50% vehicles leaving the proposed development and 50% vehicles arriving to the proposed development.

It has also been assumed that 50% of the generated traffic movements will be to or from the North of Bramsen Street and 50% of the generated traffic movements will be to or from the South of Bramsen Street.

Pedestrians have not been modelled for the purpose of this report.

The PM afternoon peak and PM evening peak traffic generated have both adopted the PM peak generated trips in line with Table 3.

Figure 13 illustrates the LOS of the intersection based on the SIDRA Intersection 9 model results for the three periods modelled.

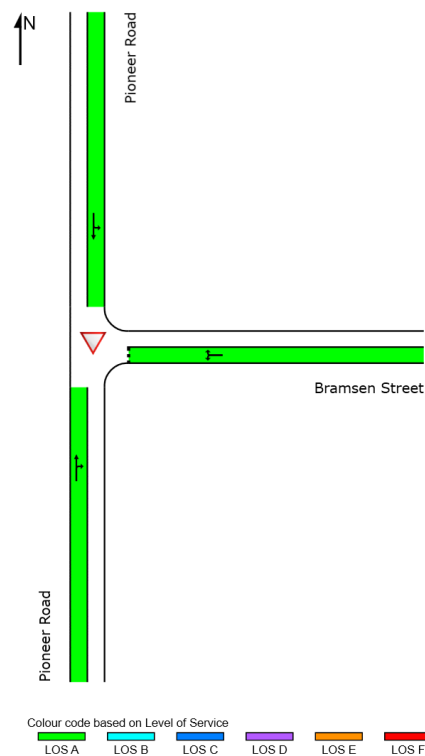


Figure 13 LOS Summary of the Intersection of Bramsen Street and Pioneer Road

Figure 13 illustrates the intersection is operating at the highest LOS at all legs for all periods. This is further seen through the results shown in Table 4.

Table 4 Intersection of Bramsen Street and Pioneer Road Base Conditions

Leg	Road Name	Period	LOS	DOS	Queuing (95 th Percentile m)	Delay (Average s)
North	Pioneer Road	AM Peak	A	0.246	0	0.4
		PM Afternoon Peak	A	0.347	0	0.3
		PM Evening Peak	A	0.249	0	0.2
South	Pioneer Road	AM Peak	A	0.292	3	0.7
		PM Afternoon Peak	A	0.258	0	0.1
		PM Evening Peak	A	0.190	1	0.4
East	Bramsen Street	AM Peak	A	0.092	2	8.4
		PM Afternoon Peak	A	0.053	1	8.9
		PM Evening Peak	A	0.034	1	7.5

As the number of car parks as per the State Environmental Planning Policy (Housing) 2021 is lower than that of the Wollongong Council Development Control Plan 2009, it would be assessed that the traffic generation as per this assessment would be conservative.

Table 4 demonstrates that once the proposed development is in operation, the intersection still has capacity to absorb more vehicles.

With the additional of traffic generated from the proposed development, there is a negligible increase in the DOS and Delay for particular legs in particular periods when compared with the November 2021 conditions as per Section 2.2.4.6 of this report.

4.4 Parking Impact

As per Section 3.4.1 of this report, the proposed development provides more car parking spaces than required.

The proposed development also provides motorcycle and bicycle parking facilities in addition to the requirements of the State Environmental Planning Policy (Housing) 2021.

Section 2.2.6 of this report identified that at the time of the observations by NCE, there was on-street parking available near the site which could be used for visitor parking if needed.

4.5 Construction Traffic Management Plan

Northrop Consulting Engineers have not been engaged to include any construction traffic management plan commentary. Northrop Consulting Engineers advise this will need to be considered prior to the commencement of construction.

Any construction traffic management plans should be prepared in accordance with RMS and Wollongong City Council Requirements by a suitably qualified and experienced Temporary Traffic Management Specialist and approved by relevant authorities.

The site does not present any issues outside of standard development challenges.

4.6 Assessment of Traffic Noise

Report SY202330-01-AUR01 Rev 8 has been prepared by Northrop Consulting Engineers. This report includes an assessment of Traffic Noise.

5. Conclusion

Northrop Consulting Engineers (NCE) has been engaged by McIntosh & Phelps (MP) to prepare a Traffic Impact Assessment Report on the potential influence of the redevelopment of 67 – 69 Pioneer Road and 28 – 30 Bramsen Street for the purpose of the Part 5 Application submission.

This Traffic Impact Assessment Report has detailed the below:

- Existing site details;
- Adjacent roads, public transport and active travel facilities;
- Existing travel data provided by the local authority;
- Proposed development details;
- Parking requirements and parking spaces provided;
- Traffic generation and potential transport impacts;
- Design aspects including site access and internal car parking areas; and
- References to the Wollongong Development Control Plan available at the time of this report and other documents as provided by MP.

The report has identified:

- There are bus stops located adjacent to the site and rail stations approximately 1km away from the site;
- Observations of the traffic as per this report has identified that the key roads identified in this report have capacity for the generated traffic for the development;
- Modelling of the intersection of Bramsen Street and Pioneer Road with SIDRA Intersection 9 in its condition as of November, 2021 demonstrates that the intersection adjacent the proposed development operating satisfactory with a LOS of A;
- Modelling of the intersection of Bramsen Street and Pioneer Road with SIDRA Intersection 9 in its condition as of November, 2021 with the generated traffic from the proposed development demonstrates that the intersection adjacent the proposed development has the capacity for the generated traffic from the proposed development development;
- The parking conditions generally meet the intent of AS2890.1, AS2890.6 and the other documents as listed;
- Additional parking has been provided on the site in excess of the State Environmental Planning Policy (Housing) 2021;
- There is on-street parking available (as per the observations outlined in this report) for visitor parking; and
- A construction traffic management plan for the development is to be undertaken by others.

Attachments

NEW HOUSING DEVELOPMENT
67 - 69 PIONEER ROAD
28 - 30 BRAMSEN STREET
BELLAMBI NSW 2518

DRAWING LIST

ARCHITECTURAL

A001	COVER SHEET & LOCATION PLAN	NTS
A002	SITE ANALYSIS - BROAD SCALE CONTEXT	1:2500
A003	SITE ANALYSIS - IMMEDIATE CONTEXT	1:250
A004	DEMOLITION PLAN	1:200
A005	SITE PLAN	1:200

A101	FLOOR PLAN - GROUND FLOOR	1:100
A102	FLOOR PLAN - LEVEL 1	1:100
A103	ROOF PLAN	1:100

A201	ELEVATIONS - BRAMSEN STREET & PIONEER ROAD	1:100
A202	ELEVATIONS & SECTIONS	1:100
A203	ELEVATIONS & SECTIONS	1:100
A204	STREETSCAPE ELEVATIONS	1:100

A301	PHOTOMONTAGE 1	NTS
A302	PHOTOMONTAGE 2	NTS
A303	PHOTOMONTAGE 3	NTS

A401	EXTERNAL FINISHES SELECTIONS	NTS
------	------------------------------	-----

A501	SHADOW DIAGRAM - 21 JUNE 09:00	1:200
A502	SHADOW DIAGRAM - 21 JUNE 12:00	1:200
A503	SHADOW DIAGRAM - 21 JUNE 15:00	1:200
A504	SOLAR ACCESS PLANS - GROUND FLOOR	NTS
A505	SOLAR ACCESS PLANS - LEVEL 1	NTS
A506	VIEW FROM SUN	NTS
A507	SOLAR ACCESS SUMMARY TABLE	NTS

A601	LANDSCAPE PLAN	1:200
A602	LANDSCAPE PLAN	1:100
A603	PLANTING SCHEDULE	1:100

A701	GROSS FLOOR AREA	1:200
A702	DEEP SOIL ZONE / LANDSCAPED AREAS	1:100
A703	COMMUNAL OPEN SPACE PLAN	1:100

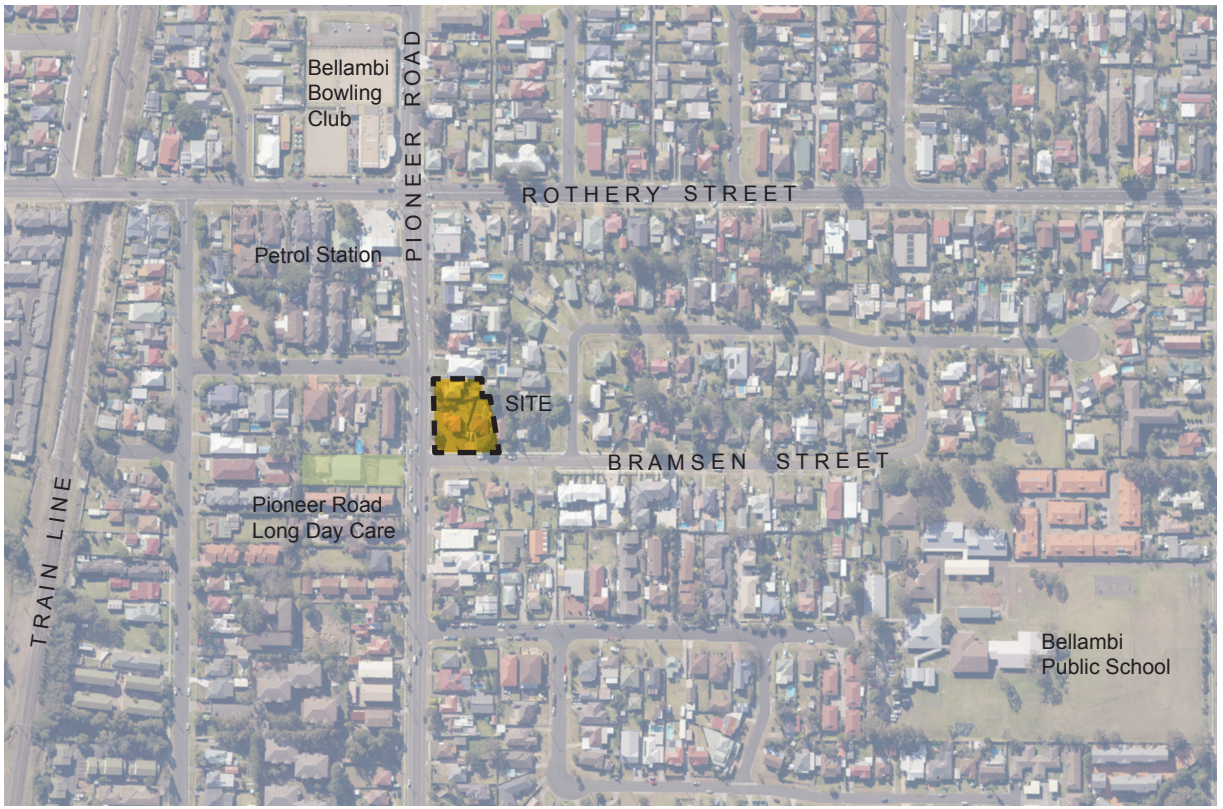
CIVIL ENGINEERING

C01.01	COVER SHEET	NTS
C02.01	SEDIMENT AND SOIL EROSION CONTROL PLAN	1:200
C02.11	SEDIMENT AND SOIL EROSION CONTROL DETAILS	NTS
C03.01	CUT AND FILL PLAN	1:200
C04.02	SITeworks AND STORMWATER MANAGEMENT PLAN	1:200

SURVEY

~	DETAIL AND LEVEL SURVEY, LOTS 36, 37, 38 & 39 IN DP35989	1:200
~	GPS ROUTE SURVEY	1:2500

SCALE @ A1



LOCATION PLAN

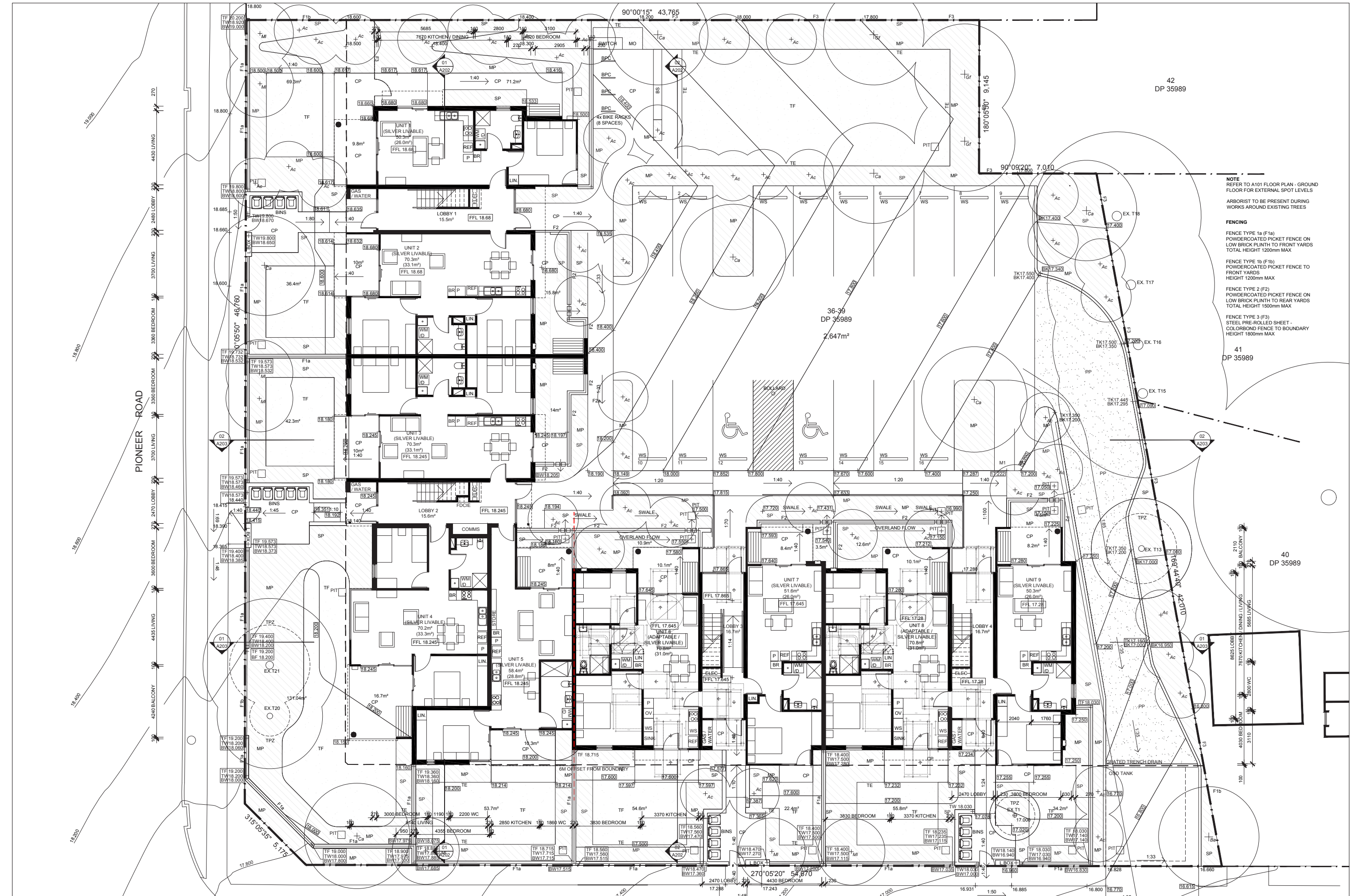


VIEW LOOKING NORTHEAST FROM PIONEER ROAD

DEVELOPMENT DATA

LOCALITY / SUBURB	Bellambi							
STREET ADDRESS	67-69 Pioneer Road and 28-30 Bramsen Street							
LOT & DP	Lots 36, 37, 38, 39 / DP 35989							
SITE AREA (m ²)	2,647							
EXISTING LOTS	4							
PROPOSED GFA (m ²)	1283							
DWELLING #	8 x 1 Bed 10 x 2 Bed = 18							
DWELLINGS	Number	Type*	No of Bedrooms		Area*(m ²)	POS		
					Balcony	External	Total	
	1	Ground	1	Silver Livable	50.3	9.8	140.5	150.3
	2	Ground	2	Silver Livable	70.3	10.0	53.5	63.5
	3	Ground	2	Silver Livable	70.3	10.0	56.3	66.3
	4	Ground	2	Silver Livable	70.1	16.7	132.6	149.3
	5	Ground	1	Silver Livable	58.4	18.3	56.6	74.9
	6	Ground	2	Adaptable / Silver Livable	70.8	10.1	65.5	75.6
	7	Ground	1	Silver Livable	51.6	8.4	27.3	35.7
	8	Ground	2	Adaptable / Silver Livable	70.8	10.1	68.4	78.5
	9	Ground	1	Silver Livable	50.3	8.2	39.1	47.3
	10	1st	1	General H	50.3	9.1	0.0	9.1
	11	1st	2	General H	72.4	10.0	0.0	10.0
	12	1st	2	General H	72.4	10.0	0.0	10.0
	13	1st	2	General H	70.1	16.0	0.0	16.0
	14	1st	1	General H	58.4	17.7	0.0	17.7
	15	1st	2	General H	73.0	10.0	0.0	10.0
	16	1st	1	General H	51.6	8.0	0.0	8.0
	17	1st	2	General H	73.0	10.0	0.0	10.0
	18	1st	1	General H	50.3	8.0	0.0	8.0
Dwellings total					1,134.4			
GFA					1,282.7	excludes stairs		

NO. DWELLINGS	Control	Requirement	Proposed
HEIGHT	HSEPP	60 dwellings or less	18
HEIGHT	HSEPP	Wollongong LEP	9.0m
FSR	HSEPP	Wollongong LEP	0.485:1
FSR	SLUDG	SLUDG	0.492:1
LANDSCAPE AREA	SLUDG	30% of the site area = 794 m ²	949.8 m ² = 36.0% (soft landscaping only)
DEEP SOIL	SLUDG	15% of the site area and minimum dimension of 3m and it is preferable that 2/3 is at the rear 15% = 397 m ² 2/3 x 397m ² = 265m ²	691.3 m ² total = 26.0% 201 m ² at rear
PARKING	HSEPP	Non-accessible 0.5 x 8 (no. 1 Beds) = 4 1 x 10 (no. 2 Beds) = 10	14 required 16 provided
CEILING HEIGHT	SLUDG	8m or less	6.15m (Unit 16)
SOLAR ACCESS	SLUDG	Living rooms and POS for a minimum 70% of dwellings receive minimum 3hrs direct sunlight between 9am and 3pm at mid-winter	72% x units receive minimum 3hrs direct sunlight between 9am and 3pm at mid-winter
NUMBER OF STOREYS	Wollongong DCP	Maximum 2 storeys	Complies
SETBACK	Wollongong DCP	Front Street Setback 6m from front property boundary. Balconies, front courtyard and other building extrusions may be setback up to 900mm closer than the requirement front or secondary setback.	6m
		Secondary Street On corner allotments a minimum 3m to secondary street frontage from the dwelling façade must be provided.	6m
		Side and Rear Setback minimum: 0.8 x ceiling height	Northern boundary: Ceiling height 6130 x 0.8 = 4904mm Side setback = 4640mm 264mm non-compliance Eastern boundary complies: Ceiling height 5880 x 0.8 = 4704mm Side setback = 5330mm
		minimum where balconies or window of living areas façade the rear boundary at the first floor and above: 1.0 x ceiling height	NA



NOTE
REFER TO A101 FLOOR PLAN - GROUND FLOOR FOR EXTERNAL SPOT LEVELS

ARBORIST
TO BE PRESENT DURING WORKS AROUND EXISTING TREES

FENCING

FENCE TYPE 1a (F1a)
POWDERCOATED PICKET FENCE ON LOW BRICK PLINTH TO FRONT YARDS
TOTAL HEIGHT 1200mm MAX

FENCE TYPE 1b (F1b)
POWDERCOATED PICKET FENCE TO FRONT YARDS
HEIGHT 1200mm MAX

FENCE TYPE 2 (F2)
POWDERCOATED PICKET FENCE ON LOW BRICK PLINTH TO REAR YARDS
TOTAL HEIGHT 1500mm MAX

FENCE TYPE 3 (F3)
STEEL PRE-ROLLED SHEET - COLORBOND FENCE TO BOUNDARY
HEIGHT 1800mm MAX

41
DP 35989

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LEGEND

AC	ASBESTOS	CP	CONCRETE PAVING	FL	FINISHED FLOOR LEVEL	MS	METAL SHEET	TE	TIMBER DECK
AD	ADJUSTABLE	CR	CURB	FR	FRAID FLOOR	MP	METAL PLATE	TF	TIMBER FLOOR
AL	ALUMINUM	CS	CEMENT RENDER	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR
AS	ASBESTOS	CR	CURB	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR
AS	ASBESTOS	CR	CURB	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR
AS	ASBESTOS	CR	CURB	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR
AS	ASBESTOS	CR	CURB	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR
AS	ASBESTOS	CR	CURB	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR
AS	ASBESTOS	CR	CURB	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR
AS	ASBESTOS	CR	CURB	GA	GALVANIZED	MP	METAL PLATE	TF	TIMBER FLOOR

REVISION

NO.	DATE	COMMENT
1	08.02.22	REF

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CITY PLAN
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CLIENT
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12 GURDY ST, PARRAMATTA NSW 2150

Planning, Industry & Environment

Scale
SCALE @ A1
1:100
SCALE @ A2
1:200
DRAWN
WP/GM
APPROVED TO ISSUE
William Phelps ARN 6675

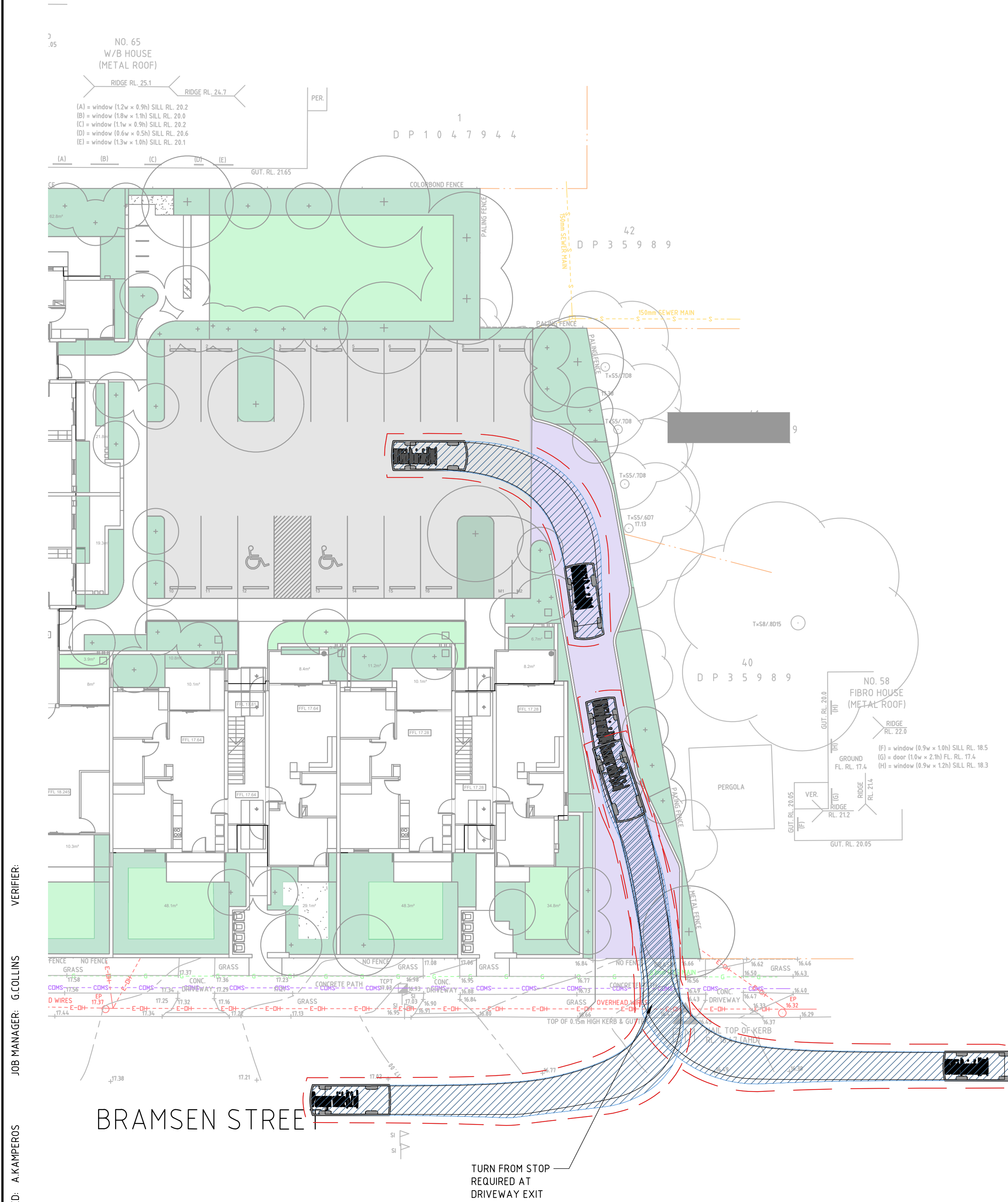
PROJECT
67 - 69 PIONEER ROAD
28 - 30 BRAMSEN STREET
BELLAMBI NSW 2518
DRAWING TITLE
FLOOR PLAN - GROUND FLOOR

CONTRACT NUMBER
0000000

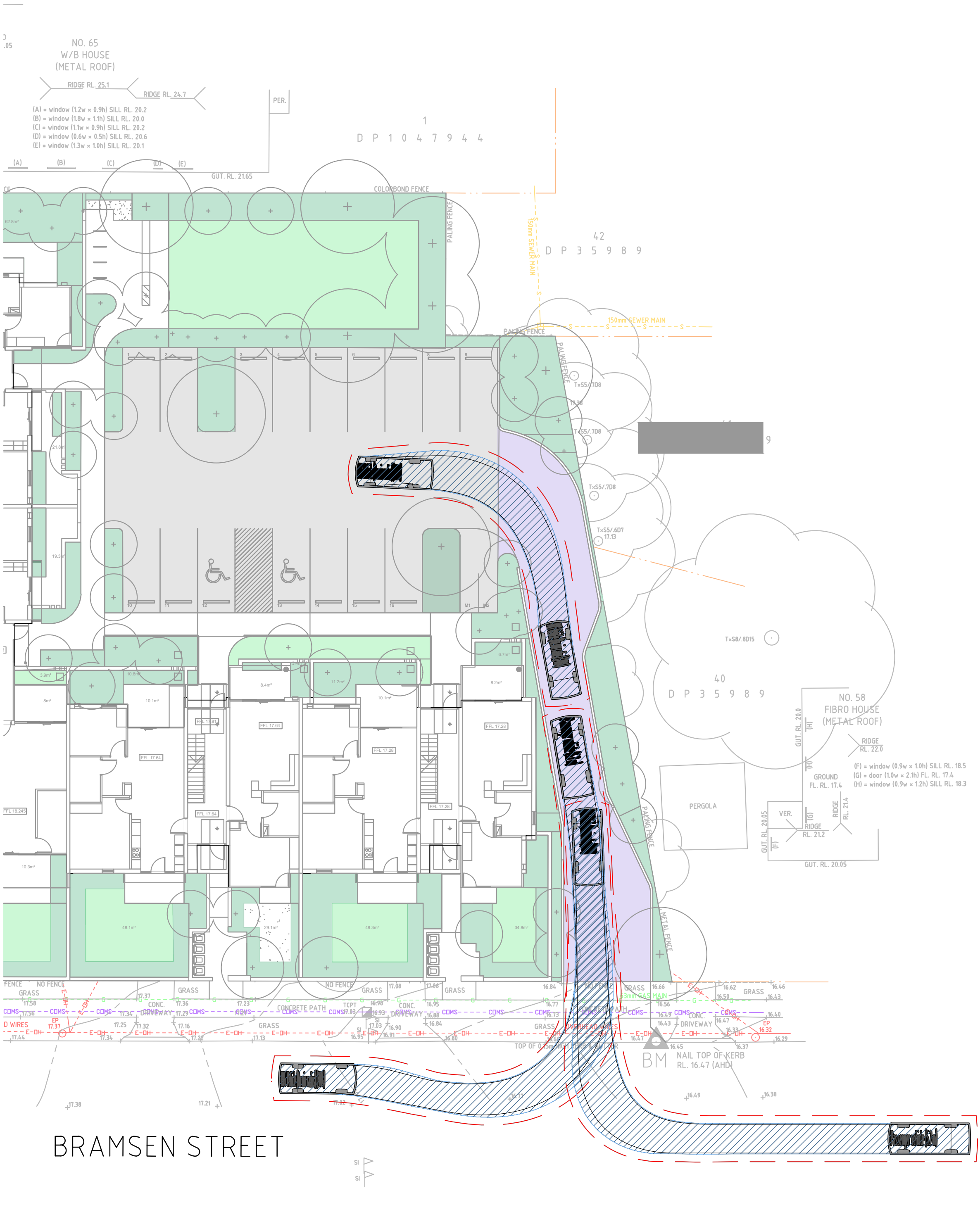
SHEET NO
A101

ISSUE
1

VERIFIER: G. COLLINS
JOB MANAGER: A. KAPPEROS
DESIGNED: A. KAPPEROS
DRAWN: A. KAPPEROS



PLAN A: DRIVEWAY EXIT TO BRAMSEN STREET



PLAN B: DRIVEWAY ENTRY FROM BRAMSEN STREET

VEHICLE MOVEMENTS

FORWARD MOVEMENT

VEHICLE BODY

VEHICLE WHEELS

VEHICLE VERTICAL CLEARANCE (0.3m FROM BODY)

REVERSE MOVEMENT

VEHICLE BODY

VEHICLE WHEELS

VEHICLE VERTICAL CLEARANCE (0.3m FROM BODY)

VEHICLE PROFILE

4.91

0.92 2.8

B85 VEHICLE (8m MIN RAIDUS) (2004)

OVERALL LENGTH	4.910m
OVERALL WIDTH	1.870m
OVERALL BODY HEIGHT	1.421m
MIN BODY GROUND CLEARANCE	0.159m
TRACK WIDTH	1.770m
LOCK-TO-LOCK TIME	4.00s
CURB TO CURB TURNING RADIUS	5.750m
TRAVELLING SPEED	10 km/h

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR INFORMATION	AK	-	GC	25.03.21
02	ISSUED FOR REVIEW	AS	-	GC	07.04.21
03	ISSUED FOR GATE 2 REVIEW	AK	-	GC	02.07.2021
04	ISSUED FOR REF SUBMISSION	AK	-	GC	17.01.22

CLIENT

NSW **Land & Housing Corporation**

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ARCHITECT

McINTOSH&PHELPS

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SCALE 1:200@A1

0 2 4 6 8 10m

NORTHROP

Sydney

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PROJECT

67 - 69 PIONEER ROAD & 28 - 30 BRAMSEN STREET, BELLAMBI

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

TURNING PATH PLAN

JOB NUMBER

202330

DRAWING NUMBER

DA_C09.81

REVISION

04

DRAWING SHEET SIZE = A1

MOVEMENT SUMMARY

▼ Site: 101 [Site1 2021 8:00 - 9:00 Base Bramsen Street and Pioneer Road (Site Folder: General)]

Bramsen Street and Pioneer Road

Site Category: Base Year

Give-Way (Two-Way)

Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% 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: Pioneer Road														
2	T1	462	2.0	511	2.0	0.289	0.2	LOS A	0.3	2.3	0.07	0.03	0.07	59.1
3	R2	23	2.0	25	2.0	0.289	8.1	LOS A	0.3	2.3	0.07	0.03	0.07	56.7
Approach		485	2.0	536	2.0	0.289	0.6	NA	0.3	2.3	0.07	0.03	0.07	59.0
East: Bramsen Street														
4	L2	24	3.0	27	3.0	0.080	6.3	LOS A	0.3	2.0	0.51	0.71	0.51	43.9
6	R2	24	3.0	27	3.0	0.080	10.4	LOS A	0.3	2.0	0.51	0.71	0.51	40.4
Approach		48	3.0	53	3.0	0.080	8.3	LOS A	0.3	2.0	0.51	0.71	0.51	42.5
North: Pioneer Road														
7	L2	24	2.0	27	2.0	0.244	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
8	T1	397	2.0	439	2.0	0.244	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.4
Approach		421	2.0	465	2.0	0.244	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.3
All Vehicles		954	2.1	1054	2.1	0.289	0.9	NA	0.3	2.3	0.06	0.07	0.06	57.9

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

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

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

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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

Queue Model: SIDRA Standard.

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: T:\2020 Jobs\202330 - LAHC Peakhurst and Bellambi\E-Design Calculations\I-Traffic\Bramsen Street and Pioneer Road.sip9

MOVEMENT SUMMARY

▼ Site: 101 [Site1 2021 8:00 - 9:00 Development Bramsen Street and Pioneer Road (Site Folder: General)]

Bramsen Street and Pioneer Road

Site Category: Proposed Design 1

Give-Way (Two-Way)

Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% 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: Pioneer Road														
2	T1	462	2.0	511	2.0	0.292	0.3	LOS A	0.4	2.7	0.08	0.03	0.08	59.0
3	R2	26	2.0	29	2.0	0.292	8.1	LOS A	0.4	2.7	0.08	0.03	0.08	56.6
Approach		488	2.0	539	2.0	0.292	0.7	NA	0.4	2.7	0.08	0.03	0.08	58.9
East: Bramsen Street														
4	L2	27	3.0	30	3.0	0.092	6.3	LOS A	0.3	2.4	0.52	0.71	0.52	43.9
6	R2	28	3.0	31	3.0	0.092	10.5	LOS A	0.3	2.4	0.52	0.71	0.52	40.4
Approach		55	3.0	61	3.0	0.092	8.4	LOS A	0.3	2.4	0.52	0.71	0.52	42.4
North: Pioneer Road														
7	L2	27	2.0	30	2.0	0.246	5.6	LOS A	0.0	0.0	0.00	0.04	0.00	56.4
8	T1	397	2.0	439	2.0	0.246	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.4
Approach		424	2.0	469	2.0	0.246	0.4	NA	0.0	0.0	0.00	0.04	0.00	59.2
All Vehicles		967	2.1	1069	2.1	0.292	1.0	NA	0.4	2.7	0.07	0.07	0.07	57.6

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

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

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

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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

Queue Model: SIDRA Standard.

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: T:\2020 Jobs\202330 - LAHC Peakhurst and Bellambi\E-Design Calculations\I-Traffic\Bramsen Street and Pioneer Road.sip9

MOVEMENT SUMMARY

▼ Site: 101 [Site1 2021 3:00 - 4:00 Base Bramsen Street and Pioneer Road (Site Folder: General)]

Bramsen Street and Pioneer Road

Site Category: Base Year

Give-Way (Two-Way)

Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% 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				
						v/c	sec							km/h
South: Pioneer Road														
2	T1	443	2.0	490	2.0	0.257	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	59.9
3	R2	1	2.0	1	2.0	0.257	9.7	LOS A	0.0	0.1	0.00	0.00	0.00	57.3
Approach		444	2.0	491	2.0	0.257	0.0	NA	0.0	0.1	0.00	0.00	0.00	59.9
East: Bramsen Street														
4	L2	19	3.0	21	3.0	0.049	7.4	LOS A	0.2	1.3	0.57	0.72	0.57	43.6
6	R2	9	3.0	10	3.0	0.049	12.1	LOS A	0.2	1.3	0.57	0.72	0.57	40.0
Approach		28	3.0	31	3.0	0.049	8.9	LOS A	0.2	1.3	0.57	0.72	0.57	42.7
North: Pioneer Road														
7	L2	27	2.0	30	2.0	0.346	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
8	T1	571	2.0	631	2.0	0.346	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.4
Approach		598	2.0	661	2.0	0.346	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.3
All Vehicles		1070	2.0	1183	2.0	0.346	0.4	NA	0.2	1.3	0.02	0.03	0.02	58.8

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

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

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

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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

Queue Model: SIDRA Standard.

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: T:\2020 Jobs\202330 - LAHC Peakhurst and Bellambi\E-Design Calculations\I-Traffic\Bramsen Street and Pioneer Road.sip9

MOVEMENT SUMMARY

▼ Site: 101 [Site1 2021 3:00 - 4:00 Development Bramsen Street and Pioneer Road (Site Folder: General)]

Bramsen Street and Pioneer Road

Site Category: Proposed Design 1

Give-Way (Two-Way)

Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% 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: Pioneer Road														
2	T1	443	2.0	490	2.0	0.258	0.0	LOS A	0.0	0.3	0.01	0.00	0.01	59.9
3	R2	2	2.0	2	2.0	0.258	9.7	LOS A	0.0	0.3	0.01	0.00	0.01	57.2
Approach		445	2.0	492	2.0	0.258	0.1	NA	0.0	0.3	0.01	0.00	0.01	59.9
East: Bramsen Street														
4	L2	20	3.0	22	3.0	0.053	7.4	LOS A	0.2	1.4	0.57	0.73	0.57	43.6
6	R2	10	3.0	11	3.0	0.053	12.1	LOS A	0.2	1.4	0.57	0.73	0.57	40.0
Approach		30	3.0	33	3.0	0.053	8.9	LOS A	0.2	1.4	0.57	0.73	0.57	42.6
North: Pioneer Road														
7	L2	28	2.0	31	2.0	0.347	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	56.5
8	T1	571	2.0	631	2.0	0.347	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.4
Approach		599	2.0	662	2.0	0.347	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.3
All Vehicles		1074	2.0	1187	2.0	0.347	0.5	NA	0.2	1.4	0.02	0.04	0.02	58.8

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

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

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

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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

Queue Model: SIDRA Standard.

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: T:\2020 Jobs\202330 - LAHC Peakhurst and Bellambi\E-Design Calculations\I-Traffic\Bramsen Street and Pioneer Road.sip9

MOVEMENT SUMMARY

▼ Site: 101 [Site1 2021 5:00 - 6:00 Base Bramsen Street and Pioneer Road (Site Folder: General)]

Bramsen Street and Pioneer Road

Site Category: Base Year

Give-Way (Two-Way)

Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% 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: Pioneer Road														
2	T1	308	2.0	340	2.0	0.189	0.1	LOS A	0.1	1.0	0.05	0.02	0.05	59.4
3	R2	11	2.0	12	2.0	0.189	7.8	LOS A	0.1	1.0	0.05	0.02	0.05	56.9
Approach		319	2.0	353	2.0	0.189	0.4	NA	0.1	1.0	0.05	0.02	0.05	59.3
East: Bramsen Street														
4	L2	10	3.0	11	3.0	0.031	6.3	LOS A	0.1	0.8	0.49	0.66	0.49	44.4
6	R2	11	3.0	12	3.0	0.031	8.6	LOS A	0.1	0.8	0.49	0.66	0.49	41.1
Approach		21	3.0	23	3.0	0.031	7.5	LOS A	0.1	0.8	0.49	0.66	0.49	43.0
North: Pioneer Road														
7	L2	10	2.0	11	2.0	0.248	5.6	LOS A	0.0	0.0	0.00	0.01	0.00	56.7
8	T1	419	2.0	463	2.0	0.248	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.7
Approach		429	2.0	474	2.0	0.248	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.6
All Vehicles		769	2.0	850	2.0	0.248	0.5	NA	0.1	1.0	0.03	0.03	0.03	58.8

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

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

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

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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

Queue Model: SIDRA Standard.

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

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

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MOVEMENT SUMMARY

▼ Site: 101 [Site1 2021 5:00 - 6:00 Development Bramsen Street and Pioneer Road (Site Folder: General)]

Bramsen Street and Pioneer Road

Site Category: Proposed Design 1

Give-Way (Two-Way)

Design Life Analysis (Final Year): Results for 5 years

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% 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				
						v/c	sec							km/h
South: Pioneer Road														
2	T1	308	2.0	340	2.0	0.190	0.2	LOS A	0.2	1.1	0.05	0.02	0.05	59.4
3	R2	12	2.0	13	2.0	0.190	7.8	LOS A	0.2	1.1	0.05	0.02	0.05	56.9
Approach		320	2.0	354	2.0	0.190	0.4	NA	0.2	1.1	0.05	0.02	0.05	59.2
East: Bramsen Street														
4	L2	11	3.0	12	3.0	0.034	6.3	LOS A	0.1	0.9	0.49	0.66	0.49	44.4
6	R2	12	3.0	13	3.0	0.034	8.7	LOS A	0.1	0.9	0.49	0.66	0.49	41.1
Approach		23	3.0	25	3.0	0.034	7.5	LOS A	0.1	0.9	0.49	0.66	0.49	43.0
North: Pioneer Road														
7	L2	11	2.0	12	2.0	0.249	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	56.7
8	T1	419	2.0	463	2.0	0.249	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.7
Approach		430	2.0	475	2.0	0.249	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		773	2.0	854	2.0	0.249	0.5	NA	0.2	1.1	0.04	0.04	0.04	58.7

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

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

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

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

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

Queue Model: SIDRA Standard.

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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