



Traffic Impact Assessment

**State Significant Development
Curl Curl North Public School
Playfair Road, North Curl Curl**

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1. Introduction

TRAFFIX has been commissioned by the Department of Education to undertake a Traffic Impact Assessment (TIA) in support of a State Significant Development (SSD) relating to the upgrade/redevelopment of Curl Curl North Public School, located on the corner of Playfair Road and Abbott Road, North Curl Curl. This DA proposes an expansion of the existing junior (primary) school to cater for a total of 1000 students and 76 staff. The current student and staff population are 920 and 70 respectively.

The objective of this subject traffic assessment is to assess the traffic impact of the redevelopment of the school when accommodating the additional students and teaching staff in response to projected enrolment growth in and around North Curl Curl school catchment.

The development is situated in the Northern Beaches Council (formerly Warringah Council) Local Government Area and has been assessed under that Council's controls. As the proposal is for a public school and is considered a State Significant Development (SSD), assessment has also been undertaken with regard for the relevant policies of the Department of Education with input sought from the Roads and Maritime Services (RMS) and Transport for New South Wales (TfNSW). This report documents the findings of our investigations and should be read in the context of the Environmental Impact Statement (EIS) as per Secretary's Environmental Assessment Requirements (SEARs) prepared separately. The report is structured as follows:

- Section 2: Describes the site and its location;
- Section 3: Documents existing traffic conditions;
- Section 4: Describes the proposed development;
- Section 5: Assesses the parking requirements;
- Section 6: Assesses traffic impacts;
- Section 7: Discusses access and internal design aspects;
- Section 8: Discusses a Sustainable (Green) travel plan;
- Section 9: Discusses Traffic Management during the construction phase;
- Section 10: Provides detail of consulting with State agencies; and
- Section 11: Presents the overall study conclusions.



2. Location and Site

Curl Curl North Public School (site) is situated within North Curl Curl and is bounded by Playfair Road to the west and Abbott Street to the south. The site combined is legally known as Lot 1 in DP 731454 and Lot 286 in DP 752038. The northern and eastern frontages are bounded residential properties zoned as R2 Low Density Residential. It is located approximately 1.5 kilometres south of the Northern Beaches Council (Dee Why branch) and 13.5 kilometres north-east of the Sydney CBD.

The site is irregular in configuration having a total site area of approximately 27,982 m². It currently accommodates the Curl Curl North Public School, as well as residential property situated at the northern and eastern boundary of the site. It has a western frontage to Playfair Road of approximately 219 metres, a southern frontage to Abbott Road of approximately 134 metres, a northern boundary of 105 metres. The eastern property boundary is irregular with a combined length of approximately 220 metres.

Vehicular access to the site is provided via a vehicular crossing off Playfair Road servicing the on-site car parking area and waste collection area. There existing carpark has a capacity for 21 car spaces including one (1) disabled parking space that are line-marked and adjacent to the library building. There is also an existing driveway off Abbott Road towards the south eastern corner near the current playground / green space area. However vehicular entry via this driveway off Abbott Road into the school is banned evident by 'No Entry' signs erected and closed gate, therefore it can be assumed that this is for emergency access.

A Location Plan is presented in **Figure 1**, with a Site Plan presented in **Figure 2**. Reference should also be made to the Photographic Record presented in **Appendix A**, which provides an appreciation of the site and the road environment in proximity to the site.



Figure 1: Location Plan



Figure 2: Site Plan



3. Existing & Future Traffic Conditions

3.1 Road Network

The road hierarchy in the vicinity of the site is shown in **Figure 3**, with the following of particular interest:

-  **Griffin Road:** a classified Secondary Road (SR 2102) under a 'Regional Road' administrative class to the east of the site that traversing in a north-south direction and forms a connection to Pittwater Road (State/Main Road 159) via continuation as Dee Why Parade in north and Oliver Street to the north. Griffin Road is subjected to a 50 km/h posted speed limit. The road has an on-road bike lane in both directions and footpath on both sides and is serviced by Sydney Buses. The carriageway is approximately 13 metre wide, carrying a single lane of traffic in both directions and primarily permits unrestricted parallel kerbside parking on both sides. Abbott Road and Pitt Road (via Playfair Road) are connected to Griffin Street to the west, providing access to the school.
-  **Pitt Road:** an unclassified regional road (7346) traversing in an east-west direction between Robertson Road (east of Griffin Road) in the east and continues as Abbott Road in the west. Pitt Road is subject to a 50km/h posted speed limit however, '40km/h School Zone' speed restrictions apply between 8:00-9:30am and 2:30-4:00pm on school days in the section between Delaigh Avenue and Ross Street. The road has a 12 wide carriageway width, carrying a single lane of traffic in each direction and primarily permits unrestricted parallel kerbside parking on both sides of Pitt Road. The road provides access to the school via Playfair Road and connects to other road with access to the school, notably Abbott Road, Ross Street and Griffin Road.
-  **Abbott Road:** an unclassified regional road (7346) that is part of the road network between the junction of Griffin Road and Warringah Road traversing in an east-west direction between proposed Harbord Road in the west and Griffin Road in the east. Abbott Road is subject to a '40km/h High Pedestrian Activity' posted speed limit in the section between junction of Pitt Road and Griffin Road, this is compounded with '40km/h 8:00-



9:30am and 2:30-4:00pm School Zone' speed restrictions signage and line-marking applying on school days in sections closer to the school. Abbott Road has a carriageway width of 11.4 metres, carries a single lane of traffic in both direction and permits parallel (primarily on the northern kerbside) and 90 degree angled (adjacent John Fisher Park) predominately unrestricted on both sides of the road. Abbott Road currently accommodates pedestrian access and will formalise additional pick-up and drop-off facilities to the school, noting that the proposed upgrade will have its main school entrance on Abbott Road. Furthermore, the school's on-site (staff) carpark will be relocated to the Abbott Road frontage opposite the Curl Curl Youth and Community Centre.

 Playfair Road:

a local road which runs in a north-south direction between Pitt Road to the north and Abbott Road to the south. Playfair Road has a carriageway width of 10.4 metres, carrying a single lane of traffic in both direction and permits unrestricted parallel kerbside parking on both sides with the exception of 'bus zone', 'no parking' restrictions and 'no stopping' restrictions associated with the 'Children's Crossing' (north of Lillie Street) applying during school peak times (8.30am-9.30am; 3pm-4pm) on school days. Playfair Road is also subjected to a '40km/h High Pedestrian Activity' posted speed limit between junction of Pitt Road and Abbott Road, this is compounded with '40km/h 8:00-9:30am and 2:30-4:00pm School Zone' speed restriction signage and line-marking applying on school days. Playfair Road currently accommodates pedestrian access via three (3) school entrances on Playfair Road, special school bus services/zones, pick-up/drop-off facilities and vehicular access to the existing on-site car parking and waste servicing areas. The school bus zones and pick-up/drop-off facility (restrictions) will be retained as per proposed upgrade to the school.

 Ross Street:

a proposed local road which generally runs in a north-south direction between Pitt Road to the north and Abbot Road to the south-east. Ross Street has a carriageway width of 10.1 metres, carrying a single lane of traffic in both direction and permits parallel unrestricted kerbside parking on both sides. Ross Street is subjected '40km/h High Pedestrian Activity' posted speed limit similarly to surrounding streets, near the



school. There is pedestrian school access on Ross Street via a laneway between No. 17 and No. 19 Ross Street which will be retained as per proposed upgrade. Currently, no formalised pick-up and drop-off facility is provided on Ross Street and likewise will not be proposed under the upgrade plans.

It can be seen in **Figure 3** below, that the site is conveniently located with respect to the sub-arterial and collector road network servicing the region. It is therefore able to effectively distribute traffic onto the wider road network, minimising traffic impacts on local residential streets.

The existing intersection performance is discussed in **Section 3.4** of this report.

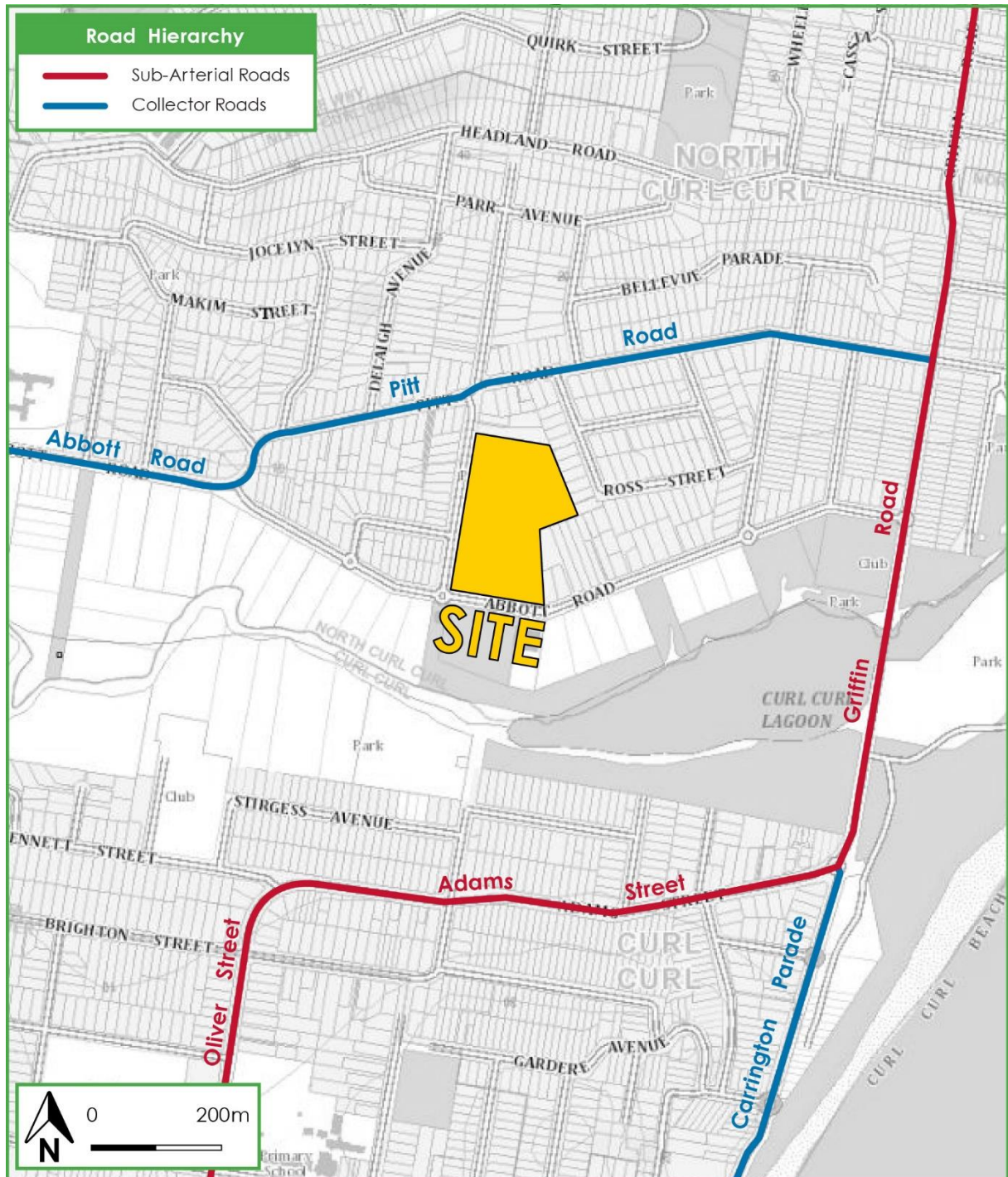


Figure 3: Existing Road Hierarchy



3.2 Public Transport

The site is generally serviced by buses, refer to **Figure 4** existing bus services (excludes school services). There are four (4) State Transit bus route/services operating from twelve (12) bus stops within 600 metres of Curl Curl North Public School. These services and accessibility to urban centres are summarised in **Table 1** and shown in **Figure 4**, below.

Table 1: State Transit Bus Services Near School

Bus Route Number	Bus Route	Urban Centres Serviced	Service Attributes (Weekdays)	Bus Stop Closest School
159	Manly Wharf to Dee Why	Dee Why, North Curl Curl, Brookvale, North Manly, Manly	From Dee Why to Manly Wharf: First bus starts at 8:35am, then 9:01am From 10:14am the frequency is hourly until the last service at 4:01pm From Manly Wharf to Dee Why: First bus starts at 9:20am, then 9:37am From 10:07am the frequency is hourly until the last service at 4:40pm	Pitt Road at Playfair Road (within 200m of School)
E76	Dee Why to City	Dee Why, North Curl Curl, Brookvale, North Manly, Manly Vale, Cremorne, Neutral Bay, City	From Dee Why to City: First bus starts at 5:45am Last bus at 8:01am Frequency of 8min-41min From City to Dee Why: First bus starts at 4:28pm Last bus at 7:28pm Frequency of 30min	Pitt Road at Playfair Road (within 200m of School)
E77	Dee Why to City	Dee Why, North Curl Curl, Brookvale, North Manly, Manly Vale, Cremorne, Neutral Bay, City	From Dee Why to City: First bus starts at 6:14am Last bus at 8:48am Frequency of 20min-30min From City to Dee Why: First bus starts at 4:38pm Last bus at 7:38pm Frequency of 30min	Pitt Road at Playfair Road (within 200m of School)
136	Manly to Chatswood	Manly, Queenscliff, Freshwater, Curl Curl,	From Manly to Chatswood: First bus starts at 5:48am Last bus at 8:07pm Frequency of 10min-55min	Griffin Road at Abbott Road (within 600m of School)



		North Curl Curl, Dee Why Narraweena Beacon Hill Frenchs Forest Forestville Killarney Heights Roseville Chase Castle Cove Chatswood	From Chatswood to Manly: First bus starts at 6:13am Last bus at 9:09pm Frequency of 10min-45min	
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Additionally, there are three (3) School Special Bus Services that utilises the existing School Bus Zone (facilitating pick-up/drop-off of student patrons) adjacent to the school on Playfair Road which will be retained, details of the school bus services are summarised in **Table 2** overleaf.



Table 2: School Special Bus Services

Bus Route Number	Route	Service Attributes	
682	St John's School, Freshwater to Griffin Rd & Pitt Rd, North Curl Curl	3:13 pm	St John's School, Freshwater
		3:16 pm	Harbord Primary School
		3:21 pm	Griffin Rd & Pitt Rd, North Curl Curl
		3:24 pm	Playfair Rd, Curl Curl North Public School
		3:33 pm	Griffin Rd & Headland Rd
		3:40 pm	Griffin Rd & Pitt Rd, North Curl Curl
757	Curl Curl North Public School to Manly Wharf	3:18 pm	Playfair Rd, Curl Curl North Public School
		3:25 pm	Harbord Primary School
		3:26 pm	St John's School, Freshwater
		3:31 pm	Stella Maris School, Manly
		3:40 pm	Manly Wharf
759	Pitt Rd & Playfair Rd to Curl Curl North Primary	Morning (AM)	
		8:49 am	Pitt & Playfair Rds, North Curl Curl
		8:54 am	Wheeler Pde & Headland Rd, Dee Why
		9:04 am	Griffin Rd & Pitt Rd, North Curl Curl
		9:06 am	Playfair Rd, Curl Curl North Public School
	Curl Curl North Public School to Griffin Rd & Headland Rd	Afternoon (PM)	
		3:20 pm	Playfair Rd, Curl Curl North Public School
		3:31 pm	Wheeler Pde & Headland Rd, Dee Why
		3:38 pm	Griffin Rd & Headland Rd, North Curl Curl

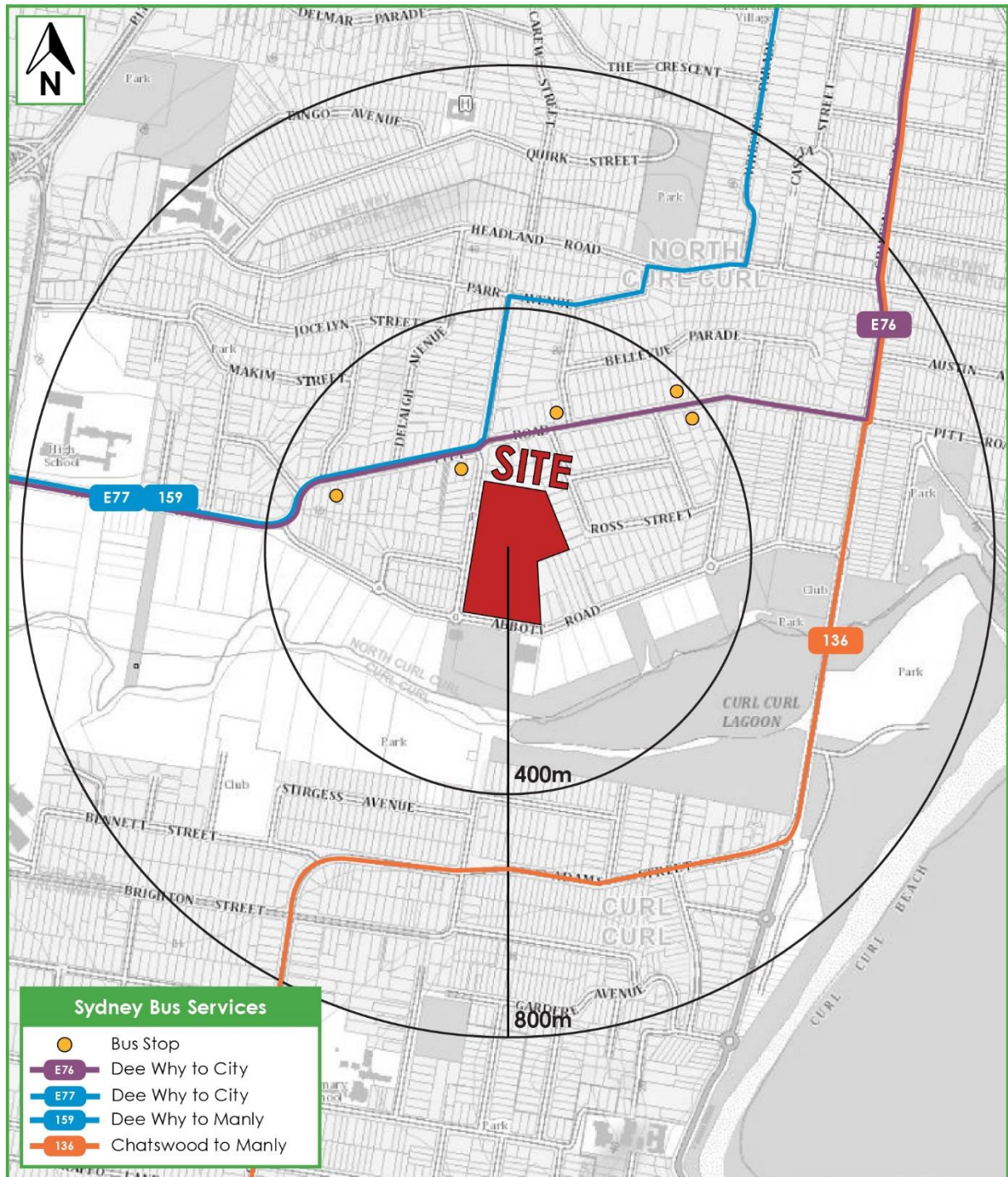


Figure 4: Existing Public Transport (Bus) Network



3.3 Existing School Catchment Area

Curl Curl North Public School on Sydney's Northern Beaches is located at Playfair Road, North Curl Curl. The current school catchment area boundaries, is shown below in **Figure 5**. The catchment area is under 1.2 kilometres radius of the school.

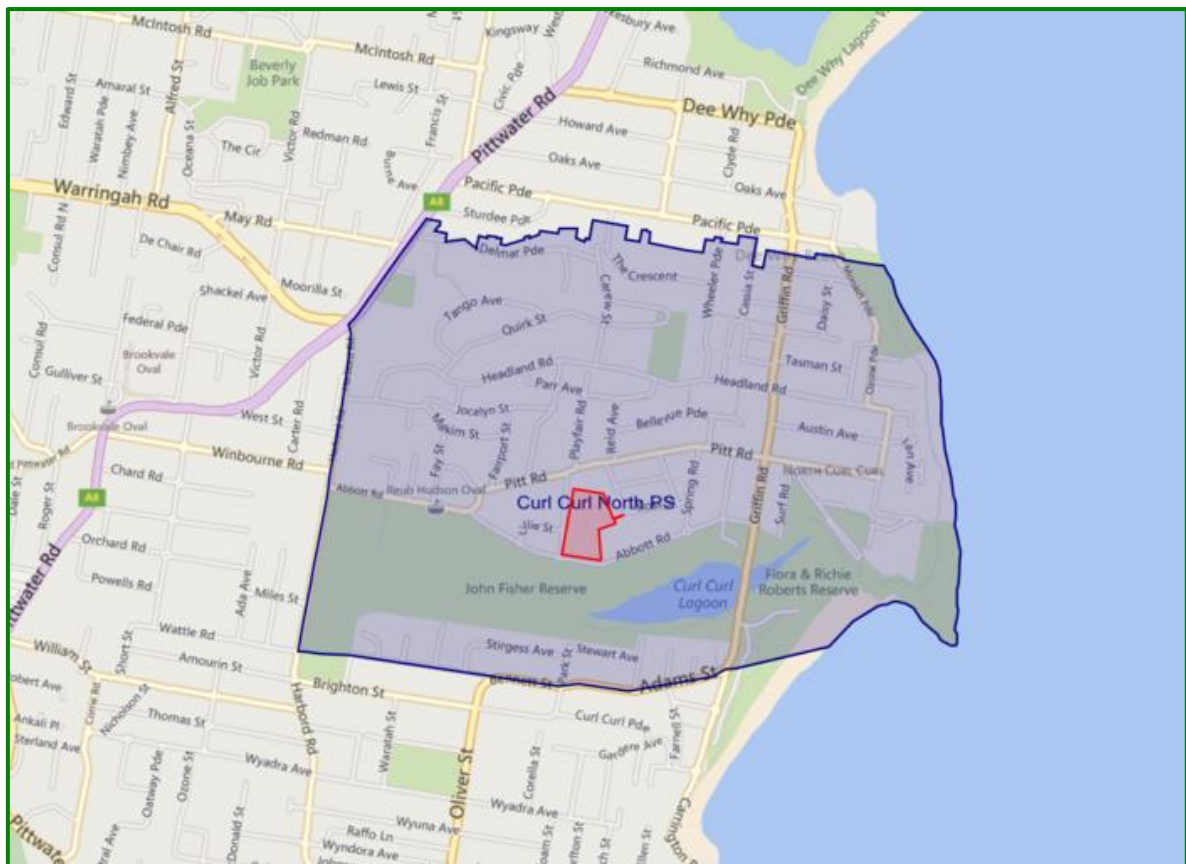


Figure 5: Curl Curl North Public School Catchment Area

The catchment extents are summaries as follows:

- ⑦ Northern Extent: Streets south side of but not including Pacific Parade and Sturdee Parade, Dee Why.
- ⑦ Southern Extent: Northern side of Adams Street and Bennett Street, Curl Curl.



- ➡ Eastern Extent: Pacific Ocean
- ➡ Western Extent: Eastern side of Pittwater Road and Harbord Road, Curl Curl/Brookvale/Dee Why

3.4 Existing Walking and Cycling Routes

The existing site is located in close proximity to local walking and cycling routes which are details in **Figure 6** overleaf. Playfair Road and Abbott Road which border the site provide bicycle friendly roads which link to on-street dedicated cycle lanes on Griffin Road, Carrington Parade and Adams Street. The on-street dedicated cycle lanes provide links to Dee Why, Curl Curl, Freshwater and Manly Beach.

Many streets surrounding the school are provided with pedestrian facilities. It is noteworthy that only the southern side of Abbott Street and northern side of Pitt Road are provide with pedestrian footways. However, both streets are provided with pedestrian crossings in close proximity to the intersection with Playfair Road. Playfair Road is provided with a pedestrian footpath along the eastern side between Pitt Road and Abbott Road.

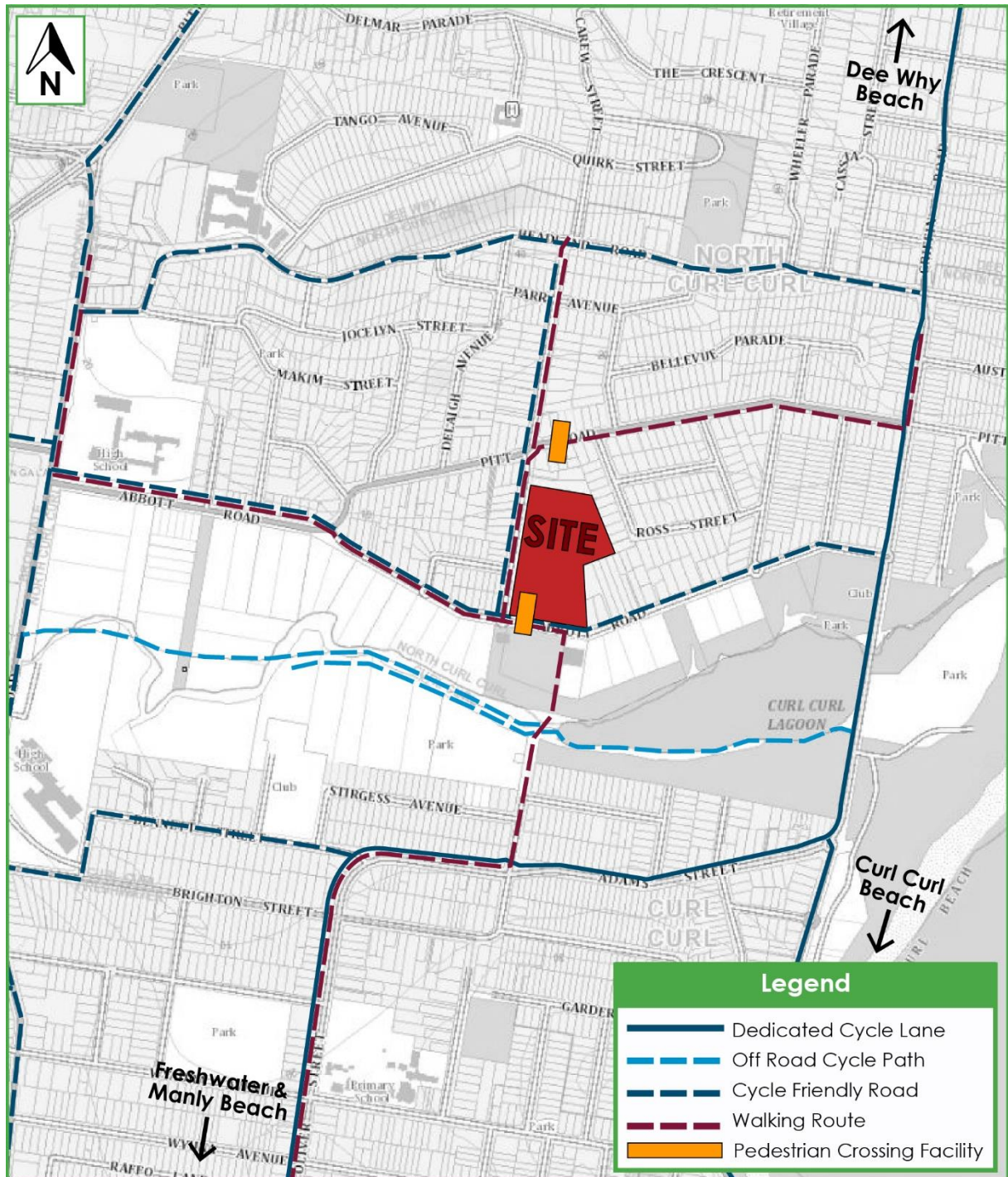


Figure 6: Existing Walking and Cycling Routes surrounding the North Curl Curl Public School



3.5 Existing Travel Modes & Site Traffic Generation

As a means of assessing the travel modes and traffic generation of the existing (and proposed) school, online travel mode questionnaire surveys were prepared by TRAFFIX and distributed by the school to all staff and parents / carers (with children in Kindergarten to Year 6).

The online survey was open for responses for a one week period from 14th to 22nd March 2017. A sample response rate representing approximately 7% of students and 64% of staff was completed. The survey included a range of questions which were primarily aimed to gain baseline data on average car occupancies and travel modes in the morning and afternoon to understand the existing travel habits in order to evaluate the future traffic impacts of the development. The key results of these surveys are discussed in the following sections.

Table 3 below shows the existing travel modes of both staff and students during the AM and PM school peak periods.

Table 3: Existing Travel Modes – AM and PM School Peak Periods

Travel Mode	AM Peak		PM Peak	
	Staff	Student	Staff	Student
Car Driver	92.9%	0%	92.9%	0%
Car Passenger	4.7%	72.7%	4.7%	66.7%
Public Transport	0%	0%	0%	6%
Other (Walking & Cycling)	2.4%	27.3%	2.4%	27.3%

It is evident from the table above that 92.9% of staff drive to / from the school. The results also show that 72.7% of students are dropped-off by car to the school in the morning, with 66.7% of students being picked-up by car in the afternoon. No students utilise public transport in the morning, however in the afternoon 6% of students use public transport (by bus) on their journey home. Furthermore, a considerable proportion i.e. 27.3% of students travel to and from the school using other modes of transport mostly walking but also by bicycle. Further insight into the travel modes for staff and students is discussed below.



3.5.1 Staff

The results of the travel questionnaires completed by a sample of the staff at Curl Curl North Public School are outlined in the **Table 4** to **Table 9** below.

Table 4: Staff Sample Survey Results - Mode Share

Travel Mode	Number of Staff (Average- To/From School)	Proportion of Staff
Car Driver	39	92.9%
Car Passenger	2	4.7%
Walk	1	2.4%
Public Transport	0	0
Cycle	0	0
TOTAL	42	100%

Table 5: Staff Sample Survey Results – Private Vehicle Occupancy

Private Vehicle Occupancy	Number of Staff Vehicle (Arrivals)	Proportion
1	37	94.9%
2	2	5.1%
3	0	0
TOTAL	39	100%

Table 6: Staff Sample Survey Results – AM Arrivals

Arrival Time	Number of Staff (Arrivals)	Proportion
Before 7:00am	2	4.8%
7:00am – 8:00am	20	47.6%
8:00am – 9:00am	19	45.2%
9:00am – 10:00am	0	0
Other (12:00pm)	1	2.4%
TOTAL	42	100%

Table 7: Staff Sample Survey Results – PM Departures

Departure Time	Number of Staff (Departures)	Proportion
Before 3:00pm	1	2.4%
3:00pm – 4:00pm	7	16.7%
4:00pm – 5:00pm	20	47.6%
5:00pm – 6:00pm	14	33.3%
TOTAL	42	100%



Table 8: Staff Sample Survey Results – Parking Location

Location	Number of Staff Vehicles	Proportion
School Carpark (On-Site)	23	59%
Surrounding Street (On-Street)	15	38.5%
Curl Curl Youth and Community Centre (Off-Street)	1	2.6%
TOTAL	39	100%

Table 9: Staff Sample Survey Results – Distance From School

Where Staff Travel From	Distance (km)	Number of Staff	Proportion
Allambie Heights	3	3	7%
Avalon	15	2	5%
Beacon Hill	4	4	10%
Belrose	8	1	2%
Brookvale	2	1	2%
Collaroy (incl. Plateau)	3.5	3	7%
Cromer	4	1	2%
Curl Curl	1	2	5%
Curl Curl South	1	1	14%
Dee Why	1.5	6	12%
North Curl Curl	1	5	5%
Fairlight	3.5	2	2%
Freshwater	2.5	1	2%
Glenhaven	27	1	2%
Manly	3.5	1	2%
Mona Vale	10	1	2%
Mosman	8.5	1	2%
Narrabeen	5	1	2%
Neutral Bay	10	1	2%
Seaforth	5	1	2%
St Ives	12	1	2%
Wheeler Heights	4	1	2%
Wollstonecraft	12	1	2%
TOTAL		42	100%



The key findings are summarised as below:

- ➊ 92.9% of staff at the school travel via car as a driver.
- ➋ 59% of staff who drove parked within the school carpark on-site.
- ➌ 94.9% of staff that travel via car to school travel alone and 5.1% travel with a passenger. This is shown in **Table 4** and **Table 5** which suggests the overall staff vehicle occupancy is 1.05.
- ➍ For the purpose of reviewing trip arrival patterns, 45.2% of staff arrived at the school between the hours of 8:00am - 9:00am and 16.7% of staff depart the school between the hours of 3:00pm - 4:00pm. These are the highest hourly period proportion.
- ➎ 79% of staff travel up to 5km to get to work.

3.5.2 Students

The result of the travel questionnaires completed by a sample of the students at Curl Curl North Public School are outlined in the **Table 10** to **Table 15** below.

Table 10: Student Sample Survey Results – AM Modal Share

Travel Mode	Number of Students (Average- To School- AM)	Proportion of Students
Car Passenger	48	72.7%
School Bus	0	0%
Public Transport	0	0%
Cycle	2	3%
Walk	16	24.2%
TOTAL:	66	100%



Table 11: Student Sample Survey Results – PM Modal Share

Travel Mode	Number of Students (Average- From School- PM)	Proportion of Students
Car Passenger	44	66.7%
School Bus	2	3%
Public Transport (Bus)	2	3%
Cycle	1	1.5%
Walk	17	25.8%
TOTAL	66	100%

Table 12: Student Sample Survey Results – Private Vehicle Occupancy

Private Vehicle Occupancy	AM		PM	
	Number of Students (Vehicle Arrivals)	Proportion	Number of Students (Vehicle Departures)	Proportion
1	12	40%	12	42.9%
2	18	60%	16	57.1%
3	0	0%	0	0%
4	0	0%	0	0%
TOTAL	30	100%	28	100%

Table 13: Student Sample Survey Results – AM Car Arrivals

Arrival Time	Number of Students (Car Arrivals)	Proportion
Prior to 7:30am	0	0%
7:30am - 8:44am	7	14.6%
8:45am - 9:09am	41	85.4%
9:10am – 9:30am	0	0%
After 9:00am	0	0%
TOTAL	48	100%



Table 14: Student Sample Survey Results – PM Car Departures

Departure Time	Number of Students (Car Departures)	Proportion
Prior to 3:10pm	0	0%
3:10pm – 3:29pm	37	84.1%
3:30pm – 3:49pm	0	0%
3:50pm – 4:19pm	0	0%
4:20pm – 5:00pm	5	11.4%
After 5:00 pm	2	4.5%
TOTAL	44	100%

Table 15: Student Sample Survey Results – Distance from School

Where Students Travel From	Distance (km)	Number of Student	Proportion
Curl Curl	1	7	11%
North Curl Curl	1	34	52%
Dee Why	1.5	18	27%
Brookvale	1.5	2	3%
Narraweena	2.5	1	2%
Collaroy	3	2	3%
Beacon Hill	4	2	3%
TOTAL		66	100%

The key findings are as follows:

- ➊ The highest mode of travel for students arriving to school in the morning is via private car, with 72.7% of students as car passengers. Similarly, private car is the highest mode of travel for students departing the school in the afternoon but less than arrivals, with 66.7% of students as car passengers.
- ➋ The remaining proportion of student travel is via bus, cycling or walking. Active transport particularly walking is second highest mode of travel for students, at over 25% (quarter) for both morning arrivals and afternoon departures.
- ➌ In the morning, the average car occupancy for students arriving at the school was 1.6.
- ➍ Of these students that arrived at the school by car, 100% arrived between the peak period of 8:00am-9:00am, which equates to 60 vehicle trips with 30 car arrivals and 30 car departures for the existing sample student population during the morning peak hour period.



- ➊ In the afternoon, the average car occupancy for students departing the school was 1.57
- ➋ Of these students that departed the school by car, 84.1% left during the peak period of 3:00pm-4:00pm which equates to 56 vehicle trips with 28 car arrivals and 28 car departures for the existing sample student population in the peak hour period in the afternoon. The remaining percentage is assumed to consist of children attending after-school care service, whom would depart after 4:00pm (a before-school care service also operates).
- ➌ 100% of surveyed students travel less than 4km to get to school with 67% living with 1.5km of the school. 1.5km is equivalent to a 20 minutes' walk which is an acceptable walking distance for older students (above year 4).

The above trip rates are therefore utilised in assessing the traffic generation of the proposed development, which is discussed in further detail in **Section 6**.

3.6 Existing Intersection Performance

Traffic count surveys and intersection performance testing has been undertaken to assess the existing network conditions using the SIDRA modelling software program. The SIDRA model produces a range of outputs, the most useful of which are the Degree of Saturation (DOS) and Average Vehicle Delay per vehicle (AVD). The AVD is in turn related to a level of service (LOS) criteria. These performance measures can be interpreted using the following explanations:

DOS - the DOS is a measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DOS approaches 1, it is usual to attempt to keep DOS to less than 0.9. When DOS exceeds 0.9 residual queues can be anticipated, as occurs at many major intersections throughout the metropolitan area during peak periods. For intersections controlled by roundabout or give way/stop control, satisfactory intersection operation is generally indicated by a DOS of 0.8 or less.

AVD - the AVD for individual intersections provides a measure of the operational performance of an intersection. In general, levels of acceptability of AVD for individual intersections depend on the time of day (motorists generally accept higher delays during peak commuter periods) and the road system being modelled (motorists are more likely to accept longer delays on side streets than on the main road system).



LOS - this is a comparative measure which provides an indication of the operating performance of an intersection. The following **Table 16** provides a recommended baseline for assessment as per the RMS Guide:

Table 16: Traffic Model Performance Criteria

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

A summary of the modelled results are provided in **Table 17** below. Reference should also be made to the SIDRA outputs included in **Appendix B** which provide detailed results for individual lanes and approaches.

Table 17: AM & PM Peak Hour Intersection Performances

Intersection Description	Control Type	Model	Period	Degree of Saturation	Intersection Average Delay (sec)	Level of Service
Pitt Road / Playfair Road	Stop Control (Two-way)	Existing	AM	0.084	10.7	A
			PM	0.056	11.3	A
Abbott Road / Playfair Road	Roundabout	Existing	AM	0.107	3.6	A
			PM	0.140	3.8	A

* Note: All SIDRA results reported for priority controlled intersections relate to the movement with the highest delay, in accordance with the RMS Guide to Traffic Generating Developments.



It can be seen from **Table 17** above, that the two existing intersections are operating with low delays and a Level of Service of A during the critical AM and PM peak period. These are existing operations and the impact of the proposed school will be assessed on the net impact which is discussed in detail in **Section 6** of this report.



4. Description of Proposed Development

A detailed description of the proposed development is provided in the Environmental Impact Statement prepared separately. In summary, the development for which approval is now sought comprises the following components:

- ➊ Demolition of all existing buildings mostly in the northern section of the School's site except two (2) existing buildings.
- ➋ Construction of new buildings including the following aspects:
 - Classrooms
 - Staff and administration building
 - Library
 - Landscaping
 - Playground
 - Hall
- ➌ The provision of 17 off-street car parking spaces (including one (1) accessible car space). All entry and exit movements to this car park are to occur via a new vehicular crossing located on Abbott Road towards the south-eastern corner.
- ➍ The overall objective of the above development is to increase the student/staff capacity from its current level of 920 to 1000 students and from 70 staff to 76 staff. This represents an increase of 80 students and six (6) staff which is equivalent to a minor percentage increase of 8.7% and 8.6% respectively.
- ➎ There are will be five (5) pedestrian accesses to the School including the main entrance designated on the Abbott Road frontage towards the south-western corner. The other three (3) pedestrian entrances will be on the Playfair Road boundary and the existing access from Ross Street will be retained.



The parking requirements and traffic impacts arising from the development are discussed in **Sections 5 and 6** respectively. Reference should be made to the plans submitted separately to Council which are presented at reduced scale in **Appendix C**.



5. Parking Requirements

5.1 Parking Assessment

5.1.1 Council Requirement

Northern Beaches Council's DCP (specifically former Warringah Council DCP 2011) requires parking rates (on-site) for educational establishments as outlined in **Table 18**, below. The numbers are based on the proposed staff and student capacity.

Table 18: Council Parking Rates and Provision

Type	Number	Council Parking Rates	No. Spaces Required
Former Warringah Council			
Staff	76	1 space / staff member	76
Students (Kindergarten – Year 6)	1000	Adequate provision for student parking	0
a drop off/ pick up area	8 (44.4m) existing	Adequate space should be provided	3 based on 80 student increase (refer to 5.1.6)
Bus standing area	51m existing	Adequate space should be provided	51m (no change)
Totals			79

It can be seen from **Table 18** above, that with 76 proposed staff members and 1000 students (Kindergarten to Year 6), there is a requirement to provide a total of 76 car parking spaces when assessed against the Council's DCP. However, the Department of Education has policies that are contrary and stipulates on-site parking requirements for government schools are to be kept a minimum, which are discussed further below.

5.1.2 Department of Education Policy (DoE)

The Department of Education (DoE) has its own set of guidelines in the relation to provision of parking for staff within educational facilities. The Department's Educational Facilities Standards and Guidelines (EFSG) actively encourages the use of sustainable means of transport. A copy of the EFSG has been included in **Appendix D**. Section PS610.17 Services Zone states:



“In order to ensure that the available site area for teaching, learning and play is maximised, to enable community use and to encourage the use of sustainable means of transport to and from the school, on school site parking should be kept to a minimum.”

Furthermore, The Motor Vehicle Policy for NSW Government Agencies v13.0.14 April 2014, **Section 4.8** does not entitle parking spaces for private use vehicles. A copy of the Motor Vehicle Policy for NSW Government Agencies v13.0.14 April 2014 has been included in **Appendix E**. The document states:

“For 100% private use vehicles (whether owned, novated or 100% Departmental or Agency packaged) are not entitled to a parking space on Government leased or owned premises.”

5.1.3 Parking Provisions

The school currently provides a total of 21 parking spaces for the existing 70 staff. The parking space are provided on-site and accessed via Playfair Road. The proposed upgrade to the school will result in an increase of six (6) employees. In response to the Northern Beaches Council parking requirements, the proposed development seeks to provide 17 car parking spaces including one (1) accessible parking space. The proposed car parking space will be accessed on Abbott Road via a new vehicular crossover near the south-eastern boundary. The overall parking provision for Curl Curl North Public School is supported for the following reasons:

- ➊ There is a high capacity of on-street parking particularly on the southern side of Abbott Road adjacent to John Fisher Park between Pitt Road and Griffin Road, able to accommodate staff parking that would not impact on the amenity of the street in a manner that would be considered unacceptable. Additionally, majority of staff (66.7%) based on sample staff survey response, depart school prior to 5:00pm and would not conflict with the typical commuter travelling home to find parking on residential streets, surrounding the school.
- ➋ Parking occupancy surveys conducted on a school weekday which is attached in **Appendix G**, and discussed in **Section 5.1.4** confirm that there are low occupancies and there is capacity in surrounding streets which include Abbott Road, Playfair Road, Ross Street and Lillie Street to support the proposed parking provision. Noting that there is a nominal increase of up to three (3) staff.
- ➌ Parking occupancy surveys conducted on a school weekday, confirm that there are low occupancies and there is capacity in surrounding streets which include Abbott Road, Playfair Road, Ross Street



and Lillie Street to support the proposed parking provision. Noting that there is a nominal increase of up to six (6) staff.

- ② The conservative car parking provision of one (1) space per staff member appears to be idealistic, however this generous rate only encourages the use of single occupied private car usage and inherently increases motor vehicle traffic congestion particularly on quiet local streets. It also leads to further car dependency with its associated negative impacts as observed across Sydney.
- ② Limiting parking has the potential to reduce trip rates by private vehicle. A person's decision to drive is influenced by the availability of parking at the destination and availability of alternative transport modes. Restriction of parking, along with the promotion of other sustainable modes such as walking, cycling and public transport (in which Oran Park has been master planned for), may sway a potential motorist away from using the car in favour of alternatives.
- ② Facilities catering for motorists inherently diminish access for pedestrians and cyclists. Driveways into car parks and car parks themselves, create barriers to the free movement of pedestrian and cyclists, increasing the stress and danger associated with walking and cycling. A smaller parking provision creates opportunities to improve pedestrian and cycling connectivity for the Curl Curl North Public School for the wider community.
- ② The degree to which supply induces demand, as mentioned above, the availability of parking at the destination influences the decision whether to drive or take an alternative mode. There are efficiency gains in providing for something less than peak demand – a car park remaining empty for the majority of the time is a waste of resources.
- ② Parking provision for each employee, undermines commitments to sustainable travel habits as there are no 'constraints' making it harder to promote staff to change to alternative sustainable transport modes notably active transport (walking and cycling) and public transport as it would be less competitive and less convenient, considering a scenario where on-site parking space is available for all staff. Providing incentives to encourage sustainable travel habits is important however, without any constraints, it will not be as effective.
- ② As discussed in earlier **Section 3.5.1, Table 9**, based on the staff sample survey responses, it is apparent that up to 79% of existing staff reside within 5km of the Curl Curl North Public School and are also Northern Beaches Council residents. Distances of up to 5km is considered an ideal and comfortable distance for bicycle commuting and there opportunities to increase the active transport modal share based on further commitment to the Warringah Bike Plan (2010). It is evident under the Warringah Bike Plan which is also under review, that there are a range of bike routes and



infrastructure priorities that will improve cycling and walking connectivity to the school. The Bike Plan has been included in **Appendix F** for reference to existing and proposed priority routes.

- ② The provision of 17 off-street parking spaces is considered to be the maximum provision that can be feasibly provided on the site whilst achieving the urban design outcome of maximising outdoor playing space for children which is a state government priority.
- ② The reduction of four (4) off-street parking spaces will influence the travel modes of existing drivers to the school.
- ② In consideration of the DoE policies and commitment to a Green Travel Plan (discussed in **Section 8**) it is considered that the proposed parking arrangement will accommodate the requirements.

Furthermore, there were concerns raised about the potential staff overflow parking on Abbott Road adjacent the John Fisher Netball Courts / Curl Curl Sports Centre. However, this is considered irrelevant based on the assumption that netball games or sports field use mostly occurs outside school hours and school days. Therefore, the prospect of staff parking on Abbott Road adjacent the park would not interfere or have minimal impact on the function of the playing fields. Nevertheless, there is apparent spare capacity for on-street parking on surrounding streets that would not interfere with the amenity of residents or cause any inconvenience. If the event whereby it becomes an issue, staff can always be instructed to park in areas further away from the school.

5.1.4 On-Street Parking Analysis

As abovementioned, the redevelopment of the school will be deficient of on-site car parking provision in accordance to Council's DCP, and there are concerns raised by Council that the 'overflow' parking demand will have a negative impact on the surrounding local streets. As such, a parking occupancy survey was undertaken by Trans Traffic Survey on Tuesday, 28th March 2017 between 7:00am and 5:00pm (correlating to standard weekday work hours) with hourly intervals on streets surrounding the school and within a 400m radius. The streets include: Playfair Road, Abbott Road (Spring Road – Pitt Road), Lillie Street and Ross Street. A summary of the overall parking occupancy levels is shown below in **Chart 1**, with the full results provided in **Appendix G**.

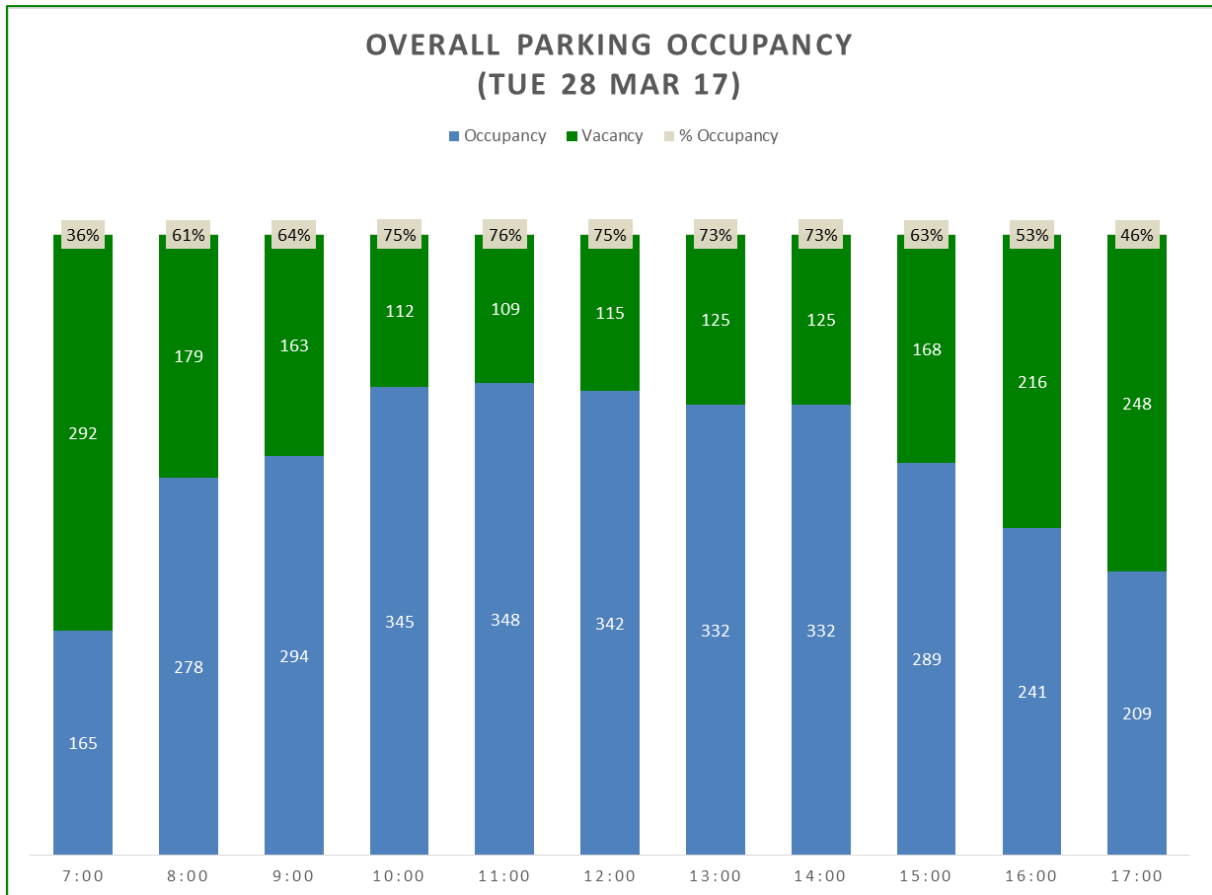


Chart 1: Overall On-Street Parking Occupancy (Tuesday, 28 March 2017)

It can be seen from **Chart 1** above, that the maximum parking demand/occupancy is 76% at 11:00am, this represents 348 parked vehicles and 109 vacant spaces available on streets surrounding the school which is within 400m radius of the site. Before 10:00am and from 3:00pm onwards the parking occupancies are below 65% equivalent to (vacancies over 160 spaces). It drops to below 50% occupancy after 5:00pm. Based on the results, the potential increase in parking demand regardless of the on-site parking provision deficiency, can be accommodated for and will have minimal impact on the amenity of residents in the area, also given that the peak parking demand is only during school hours and days.



5.1.5 Existing Pick-Up and Drop-Off Arrangement

The school's current pick-up/drop-off arrangement is on Playfair Road, with a combined 44.4 metres of 'No Parking 8:30am – 9:30am School Days' restrictions equivalent to 8 spaces (taking 5.5m car length) adjacent the school, on the eastern side of Playfair Road between the existing 'children's crossing' and junction of Abbott Road/ Playfair Road.

Reference should be made to **Appendix H** for the existing signage plan containing existing parking restrictions surrounding the school on Playfair Road and Abbott Road.

5.1.6 Proposed Pick-Up and Drop-Off Arrangement

The Northern Beaches Council DCP requires adequate pick-up/set-down area on site, however it is proposed that all additional pick-up/drop-off spaces will be provided on-street on Playfair Road as per existing arrangement. This is considered acceptable given the detrimental impact associated with the provision of on-site pick-up/drop-off facilities on the valuable on-site area that are better allocated for teaching, learning and play as per DoE policies.

Additionally, in reality the provision of on-site pick-up/drop-off does not guarantee efficient operation and may actually adversely impact on the safety of children. This is based on the expected concentration of cars entering and leaving the school grounds across footpaths (active frontages) surrounding the school via driveways, that would be in direct conflict with the high pedestrian activity during school peak periods. There will be reliance on parents to drive safely and be cautious when entering and exiting driveways across footpaths; this is not an ideal outcome considering the ambiguity around right-of-way across driveways and unpredictability of pedestrians particularly children; it may also cause queuing on-street overflowing from on-site pick-up/drop-off provisions. The better outcome is to reduce vehicular access points on-site to prevent conflicts between pedestrians and cars. Therefore, it is considered safer and more practical to retain pick-up and drop-off arrangement on-street as per existing operations.

It is inevitable that all schools that have on-street pick-up and drop-off arrangements experience a period of 'disorder' during the peak times, considering the concentration of cars and this can be managed with coordination. The provision of on-site pick-up and drop-off facilities (without taking a significant amount of valuable site area) does not necessarily improve efficiency or safety and would not outweigh the benefits of retaining on-site area for teaching and playgrounds, considering that pick-up



and drop-off only occurs twice a day during a small period (up to 15 minutes) in the morning and afternoon and is not critical to overall benefit the redevelopment of the school offers.

TRAFFIX have been commissioned by the Department of Education in the past, to complete Traffic Impact Assessments on over five (5) primary schools across Sydney. In our experience it is considered that the satisfactory operational rate for pick-up and drop-off parking is one (1) space per 30 children. Therefore, with an anticipated increase in student population of 80, it is considered that an additional three (3) on-street pick up and drop off spaces would be sufficient to manage the influx of private vehicles in peak periods. It is worth noting that this rate is more conservative, given that there are only eight (8) pick-up and drop-off spaces provided on Playfair Road that currently facilitates drop-off and pick-up for up to 920 students (current student population).

There is an existing 'Children's Crossing' with associated part-time 'No Stopping' restrictions midblock on Playfair Road, near north of Lillie Street. Upon observation, it is apparent that the existing Children's Crossing is not functioning as it is intended to, this based on the following morning observations:

- The Children's Crossing flags were up, however there was no supervision and drivers were unsure with the road rules associated with Children's Crossing and did not stop, likely due to the ambiguity surrounding the operation of Children's Crossing;
- Some parents were using the 'No Stopping 8:30am-9:30am 3:00pm-4:pm School Days' zones associated with the Children's Crossing for dropping off;
- There is no kerb ramp or pram ramp on either side of the crossing point, making it non-compliant and unsafe as it is not clear that it is a crossing point;
- The crossing point is 5.8m-6.1m wide, however according to the RMS technical directions TDT 2002/12c this dimension is not compliant with the RMS technical directions;
- The Children's Crossing location is not within pedestrian desire lines because pedestrians coming from all directions of the school do not need to cross at Children's Crossing's current location because the desired walking route will be crossing at the junction of Abbott Road and Playfair Road and junction of Pitt Road and Playfair Road; and
- The children's crossing only captures students that happen to live in Lillie Street or if parents are parking in Lillie Street to walk students into school from Lillie Street. Hence, why there were very



low numbers of students crossing at the Children's Crossing which explains the lack of supervisors and lack of awareness from road users to stop at the stop lines for children to cross.

In summary, the current Children's crossing is unsafe, non-compliant in some design aspects and underutilised. Furthermore, the removing the existing Children's Crossing and its associated 'No Stopping' restrictions would free up kerb space that could be converted for the use of additional drop-off and pick-up spaces. This would provide more of benefit as it improves the operation of pick-up and drop-off by providing additional spaces without gaps, as oppose to the Children's Crossing's current lack of use and ambiguity. It is noteworthy, that there is an authorised School Crossing officer that supervises the zebra pedestrian crossing at the intersection of Pitt Road near Playfair Road, where majority of students are walking from.

It is therefore recommended and proposed that the existing Children's Crossing and associated parking restrictions be removed and be replaced with 'No Parking 8:30am-9:30am 3:00pm-4:00pm' restrictions, as per proposed signage plan displayed in **Appendix H**. The signage plan proposes 12 additional pick-up and drop-off spaces on the eastern side of Playfair Road on top of the existing eight (8) spaces or 44.4 metres of 'No Parking 8:30am-9:30am School Days' zone. This will result in a total of 20 car spaces or 109.3 metres of pick-up and drop-off spaces that will be posted with the updated 'No Parking 8:30am-9:30am 3:00pm-4:00pm School Days' restrictions which also covers the PM period. This exceeds the requirements of pick-up and drop-off facilities and is capable of fulfilling the future demands of the school, especially as that the student population is only increasing by 80 students or 8.7%. As previously mentioned the school currently has 920 students, operates with eight (8) existing morning drop-off spaces and as expected the proposed additional 12 spaces catering for both drop-off/pick-up will provide a drastic improvement and outweighs the recommended removal of the existing Children's Crossing which currently takes up 55.9 metres or 10 kerbside spaces.

Note that the proposed pick-up / drop-off areas also includes sections that are across driveways/vehicular crossovers. This utilisation of driveways to facility pick-up and drop-off is legal under the NSW Road Rules as driveways essential functions as 'No Parking' restrictions, whereby a driver is permitted to stop their car across a driveway to pick-up and drop-off provided it is under two (2) minutes and the driver can be within three (3) metres of the car.



5.1.7 Recommended Measures to Assist With Parking Demand Reduction

The following recommendations are made to meet the needs of staff, students and parents of the school.

- ➊ The deployment of supervisors to monitor and coordinate parent pick-up and drop-off areas, in regards to duration.
- ➋ School student registration scheme. Each car to display a number/the children's name on the windscreen to allow traffic controller/supervisors to match children with their car as it approaches the pick-up area.
- ➌ Staggering start times for AM peak periods. Drop-off schemes are usually more difficult to manage but can be implemented as guidelines to reduce congestion during AM peak periods. Simple scheme include having older students arrive earlier during the AM period. For families with students in different years, the drop-off time for all students should be the same as the eldest student.
- ➍ Staggering finish times in the PM peak periods for pick-up to distribute and dilute traffic volumes. This includes deployment of supervisors and monitoring arriving vehicles with parents allocated with a name tag which is positioned in the driver's front windscreen. Supervisors using CB radio communication to inform each other of approaching parents and prepare the respective child for collection.
- ➎ Provision of informative/advertising material (posters) along the school boundary i.e. Playfair Road and Abbott Road informing parents of the Road Rules associated with 'No Parking' restrictions, these being:
 - Two (2) minute duration for car to stand
 - The driver must be within three (3) metres of the vehicle
- ➏ Parent Re-Education Policy

Typically, audits of school operations for pick-up and drop-off facilities result in the need to implement managed solutions. It is recommended that in addition to the 'Traffic Management Policy' advised above, effective enforcement of the time period is to be considered in conjunction. This would require additional volunteers to monitor the facilities during peak periods.



Walking school bus program

The walking bus is a concept where a group of children walk to school with one or more adults. The walking school bus alleviates safety concerns that some parents may have with their child/ren walking alone to school. These programs can change mind-set and encourage active travel habits outside school for both adults and children. A walking school bus has huge potential for Curl Curl North Public School given the School's catchment is under 2km radius and majority of students living in Curl Curl (North/South).

Workplace Travel Plans (WTP) and Active Travel Guide (ATG)

Workplace Travel Plans (WTP) can be issued to teachers before the first day of work and Active Travel Guides (ATG) can be provided to students and parents on the first day of school or advertised throughout the year. Early issue and promotion of these documents is essential in establishing alternative sustainable travel habits early on.

WTPs and ATG provides information on travelling to and from Curl Curl North Public School. It shows parents, staff and students and the wider school community on how to get to and from school with an emphasis on sustainable forms of transport, notably walking, cycling and public transport.

It is noteworthy that Curl Curl North Public School currently has an Active Travel Guide (ATG) which is included in **Appendix I** in addition to the prepared Workplace Travel Plan (WTP) for reference. Furthermore, there are multiple school special bus services operating at the school, and this was discussed earlier in **Section 3.2, Table 2**.

Car sharing/pool scheme

Car sharing schemes can be encouraged for both parents/students and staff. Parents should be encouraged to car-pool multiple students to alleviate congestion during pick-up and drop-off periods. Initiatives should be implemented for staff whereby off-street parking spaces are only available for vehicles transporting two (2) or more staff to work.

There are also websites and apps that facilitate car sharing that are supported by Transport for NSW such as <http://www.sydneycarpool.org/> where workplaces/organisations can sign up.



5.2 Accessible Parking

The Northern Beaches DCP does not provide a rate for the provision of accessible car parking. Accordingly, this has been assessed having regard for the Building Code of Australia (BCA) which recommends that educational establishments (Class 9b Structures) provide accessible parking at a rate of 1 space per 100 parking spaces or part thereof.

The development is proposing 17 car parking spaces including the provision of one (1) accessible parking space, therefore satisfying the minimum requirements of the BCA. It is noteworthy that the new disabled parking spaces have been designed in accordance with AS 2890.6 (2009) *Part 6: Off-street parking for people with disabilities*.

5.3 Bicycle Parking

The Northern Beaches Council's DCP provides a bicycle parking rate for students but not staff. In this regards to staff, we have assessed with consideration of the *Planning Guidelines for Walking and Cycling (2004)*, the requirements for students and staff are as follows:

- 📍 Students: 1 per 5 students over Year 4, (facility protected from weather)
- 📍 Long Term Use: 3-5% Staff (2-4 spaces)
- 📍 Short Term Use: 5-10% Staff (4-8 spaces)

Application of the above rates results in the school requiring between 6-12 bicycle parking spaces for staff taking into account the 76 staff (proposed). Assuming that there is an even split in school year population between kindergarten and Year 6, Year 5 and 6 would make up 286 out of 1000 students (i.e. 2 / 7 of 1000), therefore the bicycle requirement for students would be 57 bicycle spaces.

Based on the above, we recommend providing 69 bicycle spaces (57 plus 12) this would cover the lieu of on-site car parking spaces and promotes cycling to school.

All bicycle spaces provided within the site shall be located in a weather protected area, such as under an awning or bike room and designed to satisfy the requirements of AS 2890.3 (2015) or in accordance with the manufacturer's specifications.



5.4 Bus Set-down and Pick-up Arrangement

The Northern Beaches Council DCP specifies a requirement for an on-site bus standing and turning area. However, there is already three (3) school special bus services operating and utilising the existing 51m of 'Bus Zone 8.30am-9.30am, 3pm-4pm School Days' restrictions on Playfair Road adjacent the school near the north-western boundary. The existing bus zone is capable of standing four (4) buses at a time, based on a standard bus being 12.5m long. It is envisaged that this existing bus standing arrangement provided on-street is sufficient to accommodate the requirements of local bus operators and the school for current and future use. Also noting that the student population will only increase by 80 students which is a 9% increase overall.

The three (3) existing bus services are:

- ➡ Route 682 – PM Service
- ➡ Route 757 – PM Service
- ➡ Route 759 – AM and PM Service

The above existing bus school special services in addition to the additional Sydney buses services is considered sufficient to cater for future demands noting the nominal increase in student numbers. Notwithstanding, the proposed 'bus zone' arrangement (which is the same as existing) has capacity for a fourth school bus service particularly in the PM period if considered necessary.

Further details of bus services are discussed earlier in **Section 3.2** with reference from <http://www.sydneybuses.info/>.

5.5 Servicing & Emergency Access

Garbage servicing is to be undertaken from within the proposed loading/waste collection area accessed via a driveway off Playfair Road. It will operate outside of school hours. The waste collection vehicle will reverse into the site and exit the site in a forward direction. As such the proposed design meets the minimum requirements of the design standard AS2890.2.



The loading area has been assessed using swept path analysis in accordance with AS 2890.2 (2002), with the use of a 9.25 metre heavy rigid vehicle (11.5m turning radius wall to wall), considered to be a typical garbage truck. These swept paths are provided in **Appendix J** for reference and the assessment demonstrates that satisfactory access will be achieved with a 5.80m wide vehicular crossing (driveway) turning right or left into the site in a forward direction and exit in a forward direction left or right. Therefore, waste servicing will satisfactorily operate with the proposed arrangement and driveway. This has no impact on safety and servicing waste trucks will still be able to exit turning in either direction.

Furthermore, the proposed vehicular crossing off Playfair Road abovementioned to facilitate on-site waste servicing can also be used as drop-off/pick-up, as according to the Road Rules driveways function exactly like 'No Parking' restrictions, where by a vehicle is permitted to stop across a driveway (or driver must within 3m of the vehicle) for dropping off or picking up passengers for no longer than 2 minutes. This further supports the proposed removal of the Children's Crossing, as discussed earlier in **Section 5.1.6**.

The existing vehicular crossover on Playfair Road that currently provides access to staff parking, will be retained for emergency vehicle access. However, all vehicular accessed to the school on Playfair Road and Abbott Road are available for emergency vehicles when the event arises.



6. Traffic Impacts

6.1 Trip Generation

The *RMS Guide to Traffic Generating Developments* does not nominate a specific generation rate for schools, therefore the anticipated traffic generation is to be calculated using surveys. As discussed in **Section 3.4**, extensive surveys were undertaken of Curl Curl North Public School to establish appropriate traffic generation rates based on results from travel mode questionnaire of existing staff and students. The surveys establishes the following trip rates associated with staff and students in the AM (8:00am-9:00am) and PM (3:00pm-4:00pm) peak periods, which is also summaries in **Table 19** and **Table 20**:

➊ Student drop off vehicles during AM Peak (8:00am-9:00am):

- 836 vehicle trips (418 in, 418 out)

➋ Staff vehicles during AM Peak:

- 65 vehicles (65 in, 0 out)

Existing Combined: 901 vehicle trips (483 in, 418 out)

➌ Student drop off vehicles during PM Peak (3:00pm-4:00pm):

- 658 vehicle trips (329 in, 329 out)

➍ Staff vehicles during PM Peak:

- 11 vehicles (0 in, 11 out)

Existing Combined: 669 vehicle trips (329 in, 340 out)

Note: The above rates are based on survey results indicating 100% students and 45.2% staff arrive during the 8:00am-9:00am AM peak; and 84.1% students and 16.7% staff leave during the 3:00pm-4pm PM peak. Car occupancies have also been factored in based on survey results.



Application of these rates to the proposed increase of 80 students and six (6) staff results in the following additional traffic generation:

75 vehicle trips (39 in, 36 out) during the 8:00-9:00am peak hour

59 vehicle trips (29 in, 30 out) during the 3:00-4:00pm peak hour

It is important to note that the above extrapolated traffic generations are based on existing modes of travel to and from the school, obtained from surveys with the results representing 7% (or 66) of the current student population and 60% (or 42) of the current staff population. Therefore, the above calculated traffic generation can be regarded as a 'worst case' scenario. It is considered that the PM peak occurs outside the normal commuter peak periods, regardless both AM and PM peaks have been modelled.



Table 19 Travel Mode Breakdown for proposed increase in Staff and Students at Curl Curl North Public School AM peak period.

Morning Arrival	No.	Car			Public Transport (Bus)		Walk		School Bus		Cycle	
		%	No. People	No. Cars	%	No. People	%	No. People	%	No. People	%	No. People
Existing												
Students	920	72.7%	669	418*	0%	0	24.2%	223	0%	0	3%	28
Staff	70	97.6%	68	65**	0%	0	2.4%	2	0%	0	0%	0
Proposed Increase												
Students	1000	72.7%	727	454*	0%	0	24.2%	242	0%	0	3%	30
Staff	76	97.6%	74	70**	0%	0	2.4%	2	0%	0	0%	0
Difference												
Students	80	72.7%	58	36*	0%	0	24.2%	19	0%	0	3%	2
Staff	6	97.6%	6	6**	0%	0	2.4%	0	0%	0	0%	0
Worst case scenario trips for proposed School during AM Peak:												
TOTAL Student Trip Increase					58	TOTAL Staff Trip Increase					6	
Student Car Occupancy*:					1.6	Staff Car Occupancy**:					1.05	
% of Students arriving between 8:00am-9:00am:					100%	% of Staff arriving between 8:00am-9:00am:					45.2%	
# vehicles arriving/departing during AM Peak:					36	# vehicles arrivals during AM Peak:					3 (rounded up)	



Table 20 Travel Mode Breakdown for proposed increase in Staff and Students at Curl Curl North Public School PM peak period.

Afternoon Departure	No.	Car			Public Transport (Bus)		Walk		School Bus		Cycle	
		%	No. People	No. Cars	%	No. People	%	No. People	%	No. People	%	No. People
Existing												
Students	920	66.7%	614	391*	3%	28	25.8%	237	3%	28	1.5%	14
Staff	70	97.6%	68	65**	0%	0	2.4%	2	0%	0	0%	0
Proposed Increase												
Students	1000	66.7%	667	425*	3%	30	25.8%	258	3%	30	1.5%	15
Staff	76	97.6%	74	70**	0%	0	2.4%	2	0%	0	0%	0
Difference												
Students	80	66.7%	53	34*	3%	2	25.8%	21	3%	2	1.5%	1
Staff	6	97.6%	6	6**	0%	0	2.4%	0	0%	0	0%	0
Worst case scenario trips for proposed School during PM Peak:												
TOTAL Student Trip Increase					53	TOTAL Staff Trip Increase					6	
Student Car Occupancy*:					1.57	Staff Car Occupancy**:					1.05	
% of Students arriving between 3:00pm-4:00pm:					84.1%	% of Staff arriving between 3:00pm-4:00pm:					16.7%	
# vehicles arriving/departing during PM Peak:					29	# vehicles departing during PM Peak:					1 (rounded up)	



6.2 Traffic Distribution

To estimate the distribution of the additional vehicle trips associated with the expansion of the school, the surveys (questionnaire) previously discussed that were completed by existing students and staff also contained data that would be used to establish the directional split of traffic when arriving or departing the school. The projected directional split is as follows for students and staff:

② Student AM/PM Drop-off Directional Split:

- 75% enter into Playfair Road from Pitt Road (westbound, left-turn in) and exit Abbott Road (eastbound, left-turn)
- 25% enter into Playfair Road from Pitt Road (eastbound, right-turn in) and exit Abbott Road (westbound, right-turn)

② Staff Directional Split:

- 100% enter into Playfair Road from Pitt Road (eastbound, right-turn in) and exit Abbott Road (westbound, right-turn)

Note a maximum of three (3) additional trips from staff (calculated for AM peak), is marginal.

The trip distribution and volumes are based on the assessed net increases during the AM and PM peak period which are tabulated in **Table 19** and **Table 20**, above. In summary the net increases are:

② Vehicles arriving / departing during AM Peak (8:00am-9:00am):

- 36 parent car arrivals and departures
- Three (3) staff car arrivals
- Total 39 inbound car movements, 36 outbound car movements

② Vehicles arriving/departing during PM Peak (3:00pm-4:00pm):

- 29 parent car arrivals and departures



- One (1) staff car departures
- Total 29 inbound car movements, 30 outbound car movements

Traffic distributions calculated above that were established from the survey of traffic modes and presumptions, combined with the AM/PM peak vehicle trips results in following traffic distribution shown in **Figure 7** and **Figure 8** for the AM and PM peak periods below.

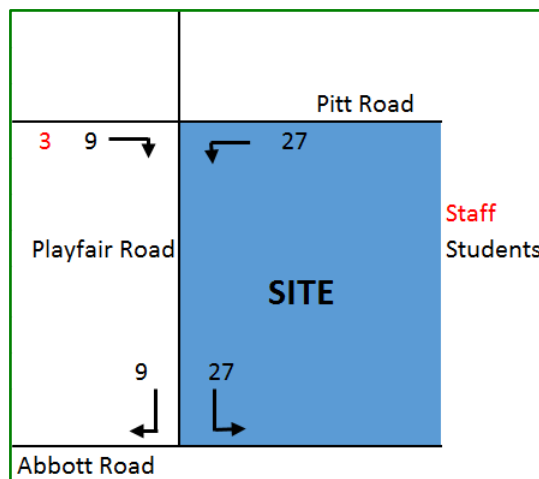


Figure 7: Traffic Distribution during AM Peak Period for Curl Curl North Public School

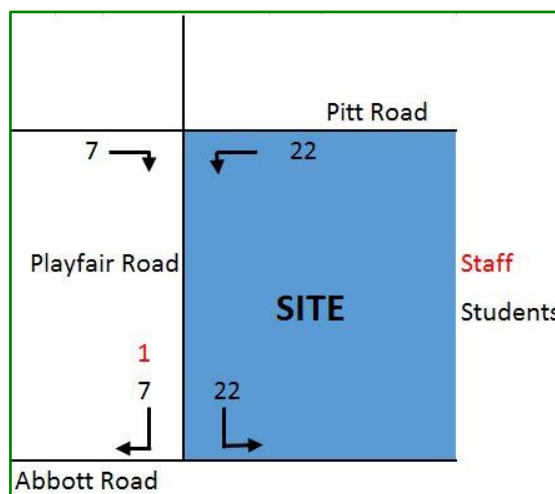


Figure 8: Traffic Distribution during PM Peak Period for Curl Curl North Public School



6.3 Peak Period Intersection Performances

To ascertain the impact of the proposed redevelopment of the school in regards to traffic generation and distribution on the local network, modelling was undertaken at key intersections (Pitt Road/Playfair Road/Abbott Road) to assess the base scenario i.e. the exiting conditions on the local road network. The modelling has focused on the 8:00am-9:00am for the AM peak period and 3:00pm-4:00pm for the PM peak period. However, it worth mentioning that the AM peak period is more critical due to the PM period not coinciding with the commuter peak hour (generally 5:00-6:00pm).

A summary of the modelled results for existing conditions was discussed previously in **Section 3.6** and additionally shown in **Table 17**. As previously discussed the two existing key intersections are operating with low delays and a Level of Service of A during critical AM and PM peak period.

TRAFFIX has modelled the critical intersections with the proposed future staff/student traffic generation, derived from travel modes survey data collected from staff and students of Curl Curl North Public School. The results of SIDRA model on the additional development traffic generation, is shown below in **Table 21**. Furthermore, the SIDRA outputs for both existing and future results are also included in **Appendix B** which provide detailed results for individual lanes and approaches.

Table 21: AM and PM Peak Hour Intersection Performances – Existing plus Future

Intersection Description	Control Type	Period	Scenario	Degree of Saturation	Intersection Average Delay (sec)	Level of Service
Pitt Road / Playfair Road	Stop Control* (Two-way)	AM	Existing	0.084	10.7	A
			Future	0.087	10.9	A
		PM	Existing	0.056	11.3	A
			Future	0.058	11.4	A
Abbott Road / Playfair Road	Roundabout	AM	Existing	0.107	3.6	A
			Future	0.109	4	A
		PM	Existing	0.140	3.8	A
			Future	0.144	4.1	A

* Note: All SIDRA results reported for priority controlled intersections (Stop Control for this case) relate to the movement with the highest delay, in accordance with the RMS Guide to Traffic Generating Developments.



It can be seen from **Table 21** that all key intersections are expected to operate satisfactorily with the proposed additional development traffic and maintains a Level of Service of A during the critical AM and PM peak periods. The results also indicate that the proposed development would have only minor impacts on the operation of the key intersection during the AM and PM peak periods, thus it will continue to operate with acceptable delays with spare capacity.

It is therefore evident that the additional traffic volumes generated by the proposed development will be accommodated by the existing road network with no additional upgrades required. The traffic impacts of the redevelopment of the school on the external road network are therefore considered acceptable.

In addition, it is pertinent to note that this analysis assumes the existing travel mode splits are to be maintained, and as such represent a 'worst case' analysis. With improved public transport facilities and the encouragement of alternative modes of transport the school can expect to further minimise impact on the intersections within the local network.



7. Access & Internal Design Aspects

7.1 Vehicular Access

7.1.1 Staff Parking Area (Abbott Road)

The development proposes an access driveway to serve the proposed on-site car park. This includes a 5.5 metre wide entry-exit driveway onto Abbott Road, on the southern frontage of the site. The proposed arrangements satisfy the Category 1 Driveway requirements of AS 2890.1 (2004) and are considered acceptable.

7.1.2 Servicing (Waste Collection) Area (Playfair Road)

Furthermore, the development proposed a separate vehicular access with a 5.8m wide combined entry/exit on Playfair Road and this also complies with AS 2890.1 (2004). In accordance AS 2890.2 (2002) swept path analysis has been undertaken of the proposed arrangements with the use of a garbage truck design vehicle (9.25 metre rigid vehicle with an 11.5 metre minimum turning circle radius wall to wall). This analysis confirms satisfactory access and compliance with the above standards, with relevant swept paths provided in **Appendix J** for reference.

7.1.3 Emergency Access (Playfair Road)

The existing vehicular crossover on Playfair Road that currently provides access to staff parking, will be retained for emergency vehicle access. However, all vehicular accessed to the school on Playfair Road and Abbott Road are available for emergency vehicles when the event arises.

7.2 Internal Design

The proposed changes to the internal parking arrangements comply with relevant sections of AS 2890.1 (2004), AS 2890.2 (2002), AS 2890.3 (2015) and AS 2890.6 (2009), with the following considered noteworthy:



7.2.1 Parking Modules

- ② All staff parking spaces shall be designed in accordance with a Class 1A User and provided with a minimum space length of 5.4m, a minimum width of 2.4m and a minimum aisle width of 5.8m.
- ② The disabled parking space proposed is designed in accordance with AS 2890.6 (2009). The space is provided with a clear width of 2.4m and located adjacent to a minimum shared area of 2.4m, between the two spaces.
- ② All spaces located adjacent to obstructions of greater than 150mm in height are provided with an additional width of 300mm.
- ② Dead-end aisles are provided with the required 1.0m aisle extension in accordance with Figure 2.3 of AS 2890.1 (2004).

7.2.2 Other Considerations

- ② Appropriate visual splays are to be provided on the driveway onto Abbott Road in accordance with the requirements of Figure 3.3 of AS 2890.1 (2004).

In summary, the proposed changes to the internal parking arrangements comply with relevant sections of AS 2890.1 (2004), AS 2890.2 (2002) and AS 2890.6 (2009). It is however envisaged that a condition of consent would be imposed requiring compliance with these standards and as such any minor amendments considered necessary (if any) can be dealt with prior to the release of a Construction Certificate.

7.3 Pedestrian Access

The redeveloped Curl Curl North Public School, will have five (5) pedestrian accesses/entrances. The main pedestrian entrance will be from Abbott Road in the same alignment with the existing raised 'wombat' pedestrian crossing on Abbott Road east of Playfair Road (roundabout) intersection. Three (3) other pedestrian entrances are from Playfair Road (western boundary), with one between the admin and library building, on between the hall and OOSH and the third at the existing gate adjacent to the northern playing field. The fifth pedestrian access is off Ross Street near its north-eastern boundary which is being retained. Reference should be made to the architectural plans provided in **Appendix C**. It is anticipated that most children will continue to use the school entrances along Playfair Road. The pedestrian entry on Abbott Road is a formal entry, more likely to be used by visitors to the school and



staff walking from the car park. For this reason, it is anticipated that Playfair Road will continue to be best positioned as the designated children's pick-up / drop-off frontage.

It is also proposed that the existing Children's Crossing will be removed permanently as discussed earlier in the report, due to its unsafe operation (ambiguity and lack of supervision), underutilisation, and undesirable location in terms of pedestrian desire lines /volumes, which warrants its removal. In lieu of the Children's Crossing, it would be more beneficial that it be replaced with the proposed parking restrictions to facilitate additional pick-up/drop-off spaces, as shown in **Appendix H**. The removal of the crossing will be subject to The Northern Beaches Council Traffic Committee and it is considered that a Condition of Consent would impose this requirement.



8. Green Travel Plan

8.1 Staff

A sustainable Travel Plan is a work place plan developed to make it easier for employees to get to and from work and reduce reliance on private vehicle and parking spaces. Such a plan typically includes support for walking, cycling, car pooling and public transport use. It is an important part of managing the transport demand generated by a development.

The travel plan should be based on the findings of the Transport Assessment Study and be prepared with reference to the Premiers Council for Active Living and section titled Workplace Travel Plan (WTP) Resource.

As previously mentioned in **Section 5.1.7**, a comprehensive Workplace Travel Plan (WTP) is considered to be the most effective travel planning measure to encourage employees to travel by alternative means other than by private car. A draft Workplace Travel Plan has been prepared and is also attached in **Appendix I**, similarly to the active travel guide (ATG). The WTP/ATG provides relevant transport and access information that would be relayed to school employees. In addition, the school proposes bicycle parking within the car park in order to encourage additional cycle trips with employees safe in the knowledge that secure bike parking is available. This WTP/ATG information that would be provided to staff includes:

- Local bus facilities and network maps;
- Local cycle route maps; and
- Information on car-pooling schemes

The development of a WTP/ATG is encouraged to promote alternative modes of transport however it is highly noteworthy that such a document is generally more effective for new developments. Whilst Council's objective to reduce private vehicle usage is acknowledged, it is clear that if no parking was provided on site, then staff would continue to utilise the on-street parking in the area. Therefore, the travel targets in this case must be uniquely tailored to encourage alternative modes of transport. In this regard, it is recommended that a car pool scheme be considered by the school. Carpooling can be an



effective method reducing the impact of private vehicle usage. As an additional incentive off-street staff parking can be allocated to vehicles transporting two (2) or more staff members to and from work. Travel Mode data gathered indicates that there is a current staff car occupancy of 1.05 people. By developing such a scheme, the school will actively attempt to reduce vehicular reliance.

8.2 Students/Parents

A comprehensive Travel Access Guide (TAG) also known as Active Travel Guide (ATG) is considered to be the most effective travel planning measure to encourage travel by alternative means other than private car for visitors to the subject development. A Travel Access Guide can be developed by schools to distribute to students, parents and visitors. The TAG provides relevant transport and access information. In addition, the school proposes bicycle parking within the site for visitors in order to encourage additional cycle trips and to provide safe storage and comfort in the knowledge that secure bike parking is available. This TAG information that would be provided to students, parents and visitors includes:

- Local bus facilities and network maps;
- Local cycle route maps
- Information regarding a walking school bus
- Information regarding staggered pick up and drop off times; and
- Cycle initiatives and events

The development of a TAG / ATG is encouraged to promote alternative modes of transport however it is highly noteworthy that such a document is generally more effective for new developments. Whilst Council's objective to reduce private vehicle usage is acknowledged, it is clear that if no pick-up and drop-off locations were provided on-site, then parents would continue to utilise the on-street parking in the area. Therefore, the travel targets in this case must be uniquely tailored to encourage alternative modes of transport.

As discussed in **Section 5.1.7**, the School already has an Active Travel Guide (ATG) prepared and this is also attached in **Appendix I**. The ATG with its continued promotion particularly for new



students/parents, will further reduce traffic impacts of the school and increase participation in active travel modes of transport to school providing all round benefits, aligning with DoE policies.



9. Construction Traffic Management (CTMP)

A detailed construction Traffic Management Plan (CTMP) will be prepared and submitted to Council separate to this Development Application. The below commentary addresses the overall management principles for the site during the construction process as a preliminary CTMP. It is noted that the preparation of a detailed CTMP report would require significant input from the appointed builder and would heavily rely upon the construction methodology which at this point cannot be confirmed. The proposed development would however adhere to the general CTMP principle that are provided for information purposes:

Truck Routes

The truck routes utilised for the construction of the development would utilise the arterial road network where possible. A copy of those routes would be provided to all drivers prior to attending the site and all trucks serving the site will do so via the proposed route only. The proposed truck routes are recommended so that all vehicles could access the site in a forward direction and likewise the vehicle could also exit the site in a forward direction. The route is therefore recommended to ensure that no reverse manoeuvres on the public roadway.

With regard to the access locations that are nominated for the site, a swept path analysis assessment should be undertaken demonstrating forward entry and forward exit manoeuvres with all reverse manoeuvres to occur on site.

Truck Size and Volumes

The maximum size of vehicles and frequency of construction delivery vehicles will be documented in the detailed CTMP report however it is anticipated that a maximum vehicle size of 12.5m HRV is generally feasible and should be included in the aforementioned swept paths. The anticipated truck volumes should be estimated and discussed in the Preliminary Construction Management Plan.



Contractor Parking

Contractors will be encouraged to either use public transport or ride share to/ from the site noting that the current layout of the school would allow for some off-street parking until future buildings are erected. This parking would of course be restricted for construction employees who car pool to reduce the impact and this can be further detailed subject to the detailed CTMP which will be undertaken at CC stage.

Traffic Plans (if necessary)

Traffic Control Plans will be designed in accordance with the RMS Traffic Control at Worksites Manual and AS 1742.3. The TCP's would primarily relate pedestrian control to ensure appropriate safety measures are implemented.

Swept Path Analysis

Swept Path Analysis should be undertaken for each construction stage demonstrating forward entry and exit during all construction stages. All entry and exit movements will be monitored by certified traffic controllers.

Accordingly, it is anticipated that a standard condition of consent would be imposed requiring a site specific CTMP be provided for this development application. The CTMP will be designed in accordance with the above principles and the draft CTMP would be issued to Council and State authorities at a later stage for consideration and review.

Notwithstanding, it is proposed that access into the school site for construction related vehicles will be via Playfair Road at its existing driveway, as it is the most appropriate access location for construction vehicles for all stages of construction, due to majority of buildings being towards the southern end of the site, towards Abbott Road. Also due to run-off concerns, access via Abbott Road would not be appropriate. Staff will be required to park surrounding streets, which will be temporary during the construction period. Parking occupancy surveys reveal that there will be sufficient on-street parking to cater for the demands of staff and construction worker parking, with impact that would not be considered unacceptable on the amenity of the surrounding streets and residents.



10. Consultation

Input has been received from the following relevant state government agencies to help inform the traffic assessment with the issues raised being addressed in this report. Copies of all correspondence discussed below have been included in **Appendix K** for reference.

Council

Northern Beaches Council Road Assets Manager provided further input on the proposals for the redevelopment of Curl Curl North School as part of the pre-DA minutes for the meeting held on 7 February 2017. The comments were primarily regarding DCP Control C3. Parking Facilities and pressing the requirement for adequate on-site car parking spaces for staff. This has been addressed in **Section 5** for the report.

Further correspondence from Council was received in response to the Prelodgement Meeting (PLM2017/0001) which was undertaken with Council on 7 February 2017. In summary the traffic and parking concerns of Council are as follows:

- Travel mode percentages indicate 93% of staff will drive to the site equating to 65 staff. The development proposes 16 off-street parking spaces. Therefore 49 staff parking spaces are considered to be provided on public roads. From the on-street parking analysis provided in Section 5.1.4 of this report it is evident that at peak demand 109 on-street parking spaces are available in streets surrounding the school. Therefore it is considered that the parking demands of the school with existing travel mode splits can be readily accommodate with the proposed provision of parking and on-street capacity. Notwithstanding, the school has developed a Workplace Travel Plan to further promote alternative modes of travel and reduce reliance on private vehicle use. To provide detailed analysis of future travel modes of staff of the school significant input would be required from the facility operator. It is envisaged that the Department of Planning would condition the development to provide an Operational Traffic Management Plan (OTMP) which is developed by a qualified Traffic Engineer in conjunction with input from the School's Principal. An OTMP would be required to be submitted to Council at the CC stage.
- For Council to implement bike route connections to the school, the school is required to contribute to a shared path on Playfair Road. It is highly noteworthy that provisions for bicycle parking within developments is considered to be the most substantial measure to encourage



active travel. There is no requirement for developments to provide links between the site and existing cycling networks to promote active travel.

- Council requires pedestrian crossing facilities to be maintained on Playfair Road with the removal of the existing pedestrian crossing. The provision of a pedestrian refuge island would reduce the provision of on-street pick up and drop off parking proposed for the school. It is considered that the removal of the pedestrian crossing would be subject to Traffic Committee approval and

Transport for New South Wales (TfNSW)

There has been correspondence between Department of Education (DoE) requesting for TfNSW input on the draft Secretary's Environmental Assessment Requirements (SEARs). In response the Principal Manager, Land Use Planning and Development Freight, Strategy and Planning, Mark Ozinga highlighted the following traffic discussions points to the SEARs in a letter dated 4 April 2017:

- Proposed bicycle parking facilities and appropriate locations
- Details of proposed construction vehicle access arrangements at all stages of construction
- Assessment of cumulative impacts associated with construction (if any)
- Inclusion of truck routes, quantity, hours of operation and traffic control measures during demolition and construction activities

The above as per SEARs is discussed in this report and furthermore in the construction traffic management plan (CTMP) report, however as a builder is not appointed yet the details will be limited.

Additional comments were received from TfNSW in its letter dated 13 October 2017. That correspondence required:

- The removal of the Children's crossing to be subject to Council and RMS input which can be achieved through the Traffic Committee which this SSD will be conditioned to
- Consideration the relocation of pick-up and drop off parking and bus zones to be considered for pedestrian desire lines to the pedestrian entrances of the school. This comment has been addressed in Section 7.3 of this report.



Roads and Maritime Services (RMS)

RMS has reviewed the submitted draft SEARs from a letter from DoE dated 10 March 2017. In response letter dated 23 March 2017 from Pahee Rathan, Senior Land Use Planner, RMS has no further requirements for inclusion to the current SEARs.



11. Conclusion

In summary:

- ➊ The proposed redevelopment of the Curl Curl North Public School will be catering for an additional 80 students and six (6) staff. This represents an increase of 8.7% and 8.6% in student and staff population respectively. It is evident that this is a minor change compared to other NSW School redevelopments and expectedly will create minimal impacts and can be accommodated for, whilst providing a better outcome for the community with the improved school facilities and design.
- ➋ The proposed development is expected, in the worst case (based on our assessment), to generate an increase total of 75 vehicle trips (39 in, 36 out) during the 8:00-9:00am peak hour and 59 vehicle trips (29 in, 30 out) during the 3:00-4:00pm peak hour based on travel modes obtained from survey data. Noting that the survey participation rate accounted for only 7% (66) of students and 60% (42) staff. Notwithstanding, the anticipated modelled performance of the two (2) critical intersections have retained a Level of Service A.
- ➌ The proposed site provides a total of 17 off-street car parking spaces including a single accessible space for staff use. Council requirements for off-street car parking and the Department of Education's Policies for Facility Guidelines, the Motor Vehicle Policy for NSW Government Agencies and the Crown Employees' Salaries and Condition Award indicate that off street parking should not be provided for staff. The proposed car parking provision is therefore considered acceptable under these circumstances and supports sustainable transport objectives by creating 'constraints'. Furthermore, it is apparent (from the parking survey results) that there is high level of on-street capacity on surrounding streets to accommodate staff parking which will not interfere (no coinciding sporting events during school days and hours) or if anything cause minimal impact (within acceptability) with the amenity of the surrounding streets and residents.
- ➍ In addition, it is proposed to provide an additional 12 pick-up and drop-off parking spaces, on Playfair Road increasing it from the existing eight (8) drop-off parking spaces. This results in a total of 20 pick-up and drop-off parking spaces which is more than capable of facilitating future demand of the school. This is subject to the recommended removal of the existing Children's Crossing on Playfair Road, which currently operates unsafely and is underutilised thus, its removal to facilitate additional pick-up/drop-off spaces would benefit the school and the community.



- ② The existing Bus Zone for set-down of 51 metres will be retained on Playfair Road and is sufficient to accommodate future demand, noting that three (3) school special buses currently operate there, and only an additional 80 students or 8.7% is anticipated for the future growth of the school.
- ② The proposed access and parking arrangements comply with the relevant sections of AS 2890.1 (2004), AS 2890.2 (2002), AS 2890.3 (2015) and AS 2890.6 (2009). The proposed arrangements have also been assessed using Vehicle Tracking software, which confirms satisfactory operation.

It is therefore concluded that the proposed development is supportable on traffic planning grounds and will operate satisfactorily.



Appendix A

Photographic Record



View looking east on Abbott Road showing Raised Zebra Crossing



View looking east on Abbott Road showing existing driveway with no access from street





View of the Abbott Road and Playfair Road Roundabout Intersection



View on Ross Street of laneway access to the school





View looking east on Pitt Road and Playfair Road intersection



View of Children's Crossing on Playfair Road with no kerb ramps





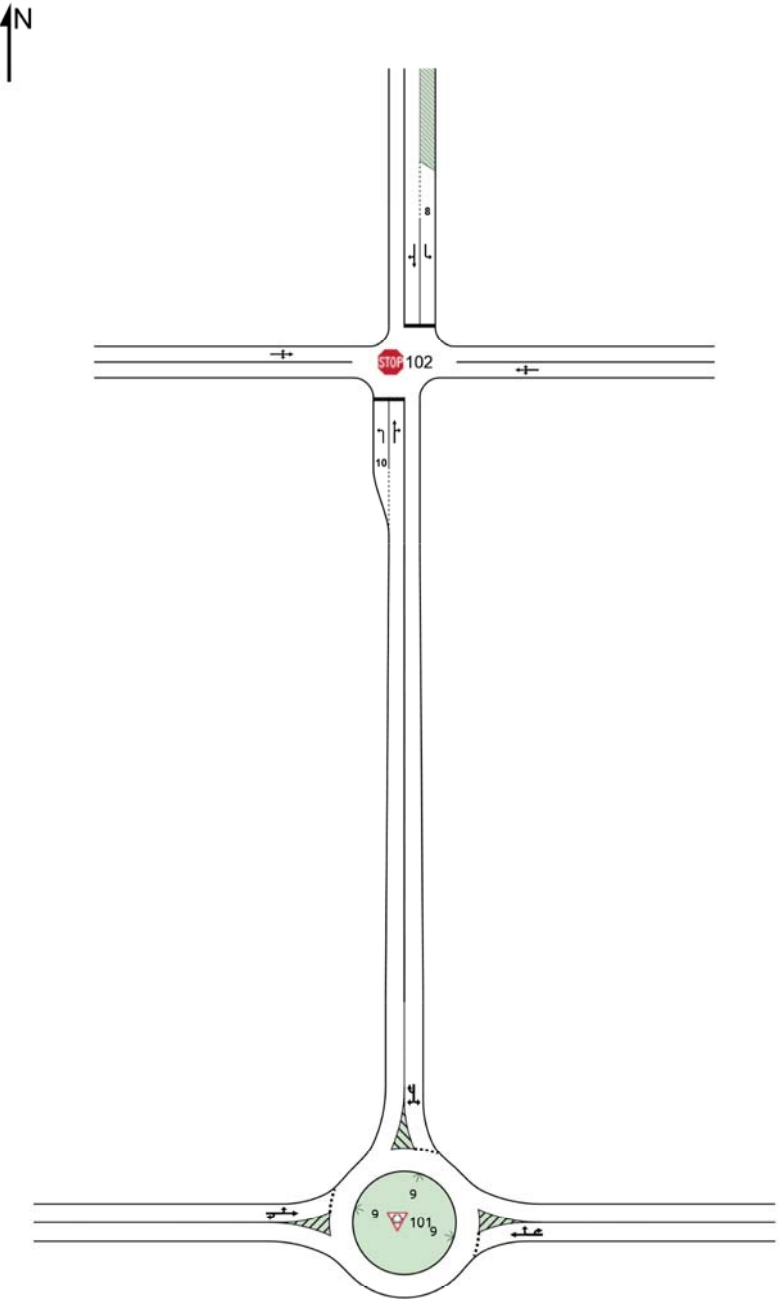
Appendix B

SIDRA Outputs – Existing & Future Results

NETWORK LAYOUT

Network: N101 [1. Playfair Road EX AM]

New Network



SITES IN NETWORK

Site ID	Site Name
101	1. Abbott Road and Playfair Road EX AM
102	2. Pitt Rd Playfair Rd EX AM

MOVEMENT SUMMARY

 Site: 102 [2. Pitt Rd Playfair Rd EX AM]

 Network: N101 [1. Playfair Road EX AM]

Pitt Road and Playfair Road
Existing Road AM
Stop (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV %	Arrival Total	Flows HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		veh/h	%	veh/h	%	v/c	sec		veh	m			
South: Playfair Road S													
1	L2	16	0.0	16	0.0	0.014	7.7	LOS A	0.1	0.4	0.35	0.84	37.5
2	T1	13	0.0	13	0.0	0.041	9.4	LOS A	0.1	1.0	0.49	0.95	33.8
3	R2	13	0.0	13	0.0	0.041	9.9	LOS A	0.1	1.0	0.49	0.95	36.0
Approach		41	0.0	41	0.0	0.041	8.9	LOS A	0.1	1.0	0.43	0.91	36.3
East: Pitt Road East													
4	L2	43	0.0	43	0.0	0.172	3.6	LOS A	0.2	1.3	0.05	0.09	39.4
5	T1	263	1.2	263	1.2	0.172	0.1	LOS A	0.2	1.3	0.05	0.09	39.7
6	R2	20	0.0	20	0.0	0.172	4.1	LOS A	0.2	1.3	0.05	0.09	39.5
Approach		326	1.0	326	1.0	0.172	0.8	NA	0.2	1.3	0.05	0.09	39.7
North: Playfair Road N													
7	L2	15	0.0	15	0.0	0.012	7.2	LOS A	0.0	0.3	0.24	0.86	37.0
8	T1	17	0.0	17	0.0	0.084	9.6	LOS A	0.3	2.1	0.50	0.98	28.5
9	R2	32	10.0	32	10.0	0.084	10.7	LOS A	0.3	2.1	0.50	0.98	36.4
Approach		63	5.0	63	5.0	0.084	9.6	LOS A	0.3	2.1	0.44	0.95	35.7
West: Pitt Road W													
10	L2	19	16.7	19	16.7	0.109	4.3	LOS A	0.3	2.3	0.19	0.13	39.4
11	T1	136	6.2	136	6.2	0.109	0.3	LOS A	0.3	2.3	0.19	0.13	39.5
12	R2	34	0.0	34	0.0	0.109	4.6	LOS A	0.3	2.3	0.19	0.13	39.1
Approach		188	6.1	188	6.1	0.109	1.5	NA	0.3	2.3	0.19	0.13	39.4
All Vehicles		619	2.9	619	2.9	0.172	2.4	NA	0.3	2.3	0.16	0.24	39.1

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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Project: \\192.168.3.1\data\Synergy\Projects\17\17.069\Modelling\17.069m01v01 TRAFFIX Playfair Road Network Model.sip7

MOVEMENT SUMMARY

 Site: 104 [4. Pitt Rd Playfair Rd EX PM]

 Network: N102 [2. Playfair Road EX PM]

Pitt Road and Playfair Road
Existing Road P
Stop (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV %	Arrival Total	Flows HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		veh/h	%	veh/h	%	v/c	sec		veh	m			
South: Playfair Road S													
1	L2	32	3.3	32	3.3	0.027	7.5	LOS A	0.1	0.8	0.29	0.86	37.6
2	T1	25	0.0	25	0.0	0.084	9.6	LOS A	0.3	2.0	0.50	0.98	33.6
3	R2	26	0.0	26	0.0	0.084	10.1	LOS A	0.3	2.0	0.50	0.98	35.9
Approach		83	1.3	83	1.3	0.084	9.0	LOS A	0.3	2.0	0.42	0.93	36.3
East: Pitt Road East													
4	L2	29	3.6	29	3.6	0.130	4.0	LOS A	0.2	1.7	0.11	0.10	39.2
5	T1	181	5.2	181	5.2	0.130	0.2	LOS A	0.2	1.7	0.11	0.10	39.6
6	R2	23	9.1	23	9.1	0.130	4.5	LOS A	0.2	1.7	0.11	0.10	39.3
Approach		234	5.4	234	5.4	0.130	1.1	NA	0.2	1.7	0.11	0.10	39.6
North: Playfair Road N													
7	L2	16	0.0	16	0.0	0.014	7.6	LOS A	0.1	0.4	0.32	0.85	36.9
8	T1	15	0.0	15	0.0	0.056	9.5	LOS A	0.2	1.4	0.51	0.97	28.4
9	R2	17	12.5	17	12.5	0.056	11.3	LOS A	0.2	1.4	0.51	0.97	36.3
Approach		47	4.4	47	4.4	0.056	9.5	LOS A	0.2	1.4	0.45	0.93	35.5
West: Pitt Road W													
10	L2	23	9.1	23	9.1	0.155	4.0	LOS A	0.3	2.3	0.12	0.09	39.6
11	T1	225	2.8	225	2.8	0.155	0.2	LOS A	0.3	2.3	0.12	0.09	39.7
12	R2	33	6.5	33	6.5	0.155	4.4	LOS A	0.3	2.3	0.12	0.09	39.4
Approach		281	3.7	281	3.7	0.155	1.0	NA	0.3	2.3	0.12	0.09	39.6
All Vehicles		645	4.1	645	4.1	0.155	2.7	NA	0.3	2.3	0.18	0.26	39.1

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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Project: \\192.168.3.1\data\Synergy\Projects\17\17.069\Modelling\17.069m01v01 TRAFFIX Playfair Road Network Model.sip7

MOVEMENT SUMMARY

 Site: 101 [1. Abbott Road and Playfair Road EX AM]

 Network: N101 [1. Playfair Road EX AM]

Abbott Road and Playfair Road
Existing AM
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV %	Arrival Total	Flows HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Abbott Road East													
5	T1	106	0.0	106	0.0	0.107	2.8	LOS A	0.5	3.8	0.17	0.42	37.8
6	R2	25	0.0	25	0.0	0.107	5.6	LOS A	0.5	3.8	0.17	0.42	36.4
6u	U	7	0.0	7	0.0	0.107	6.8	LOS A	0.5	3.8	0.17	0.42	38.9
Approach		139	0.0	139	0.0	0.107	3.5	LOS A	0.5	3.8	0.17	0.42	37.7
North: Playfair Road N													
7	L2	36	0.0	36	0.0	0.067	3.2	LOS A	0.3	2.2	0.22	0.51	37.1
9	R2	38	0.0	38	0.0	0.067	5.8	LOS A	0.3	2.2	0.22	0.51	36.2
9u	U	5	0.0	5	0.0	0.067	7.0	LOS A	0.3	2.2	0.22	0.51	33.7
Approach		79	0.0	79	0.0	0.067	4.7	LOS A	0.3	2.2	0.22	0.51	36.6
West: Abbott Road West													
10	L2	14	0.0	14	0.0	0.064	3.0	LOS A	0.3	2.2	0.15	0.35	32.6
11	T1	65	4.8	65	4.8	0.064	2.6	LOS A	0.3	2.2	0.15	0.35	38.4
12u	U	1	0.0	1	0.0	0.064	6.8	LOS A	0.3	2.2	0.15	0.35	38.0
Approach		80	3.9	80	3.9	0.064	2.7	LOS A	0.3	2.2	0.15	0.35	38.1
All Vehicles		298	1.1	298	1.1	0.107	3.6	LOS A	0.5	3.8	0.17	0.42	37.5

Site Level of Service (LOS) Method: Delay (RTA NSW). 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.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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Project: \\192.168.3.1\data\Synergy\Projects\17\17.069\Modelling\17.069m01v01 TRAFFIX Playfair Road Network Model.sip7

MOVEMENT SUMMARY

 Site: 103 [3. Abbott Road and Playfair Road EX PM]

 Network: N102 [2. Playfair Road EX PM]

Abbott Road and Playfair Road
Existing PM
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV %	Arrival Total	Flows HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Abbott Road East													
5	T1	135	3.1	135	3.1	0.140	3.0	LOS A	0.8	5.4	0.23	0.42	37.6
6	R2	32	0.0	32	0.0	0.140	5.8	LOS A	0.8	5.4	0.23	0.42	36.2
6u	U	6	0.0	6	0.0	0.140	7.0	LOS A	0.8	5.4	0.23	0.42	38.8
Approach		173	2.4	173	2.4	0.140	3.6	LOS A	0.8	5.4	0.23	0.42	37.5
North: Playfair Road N													
7	L2	36	5.9	36	5.9	0.092	3.7	LOS A	0.5	3.3	0.31	0.55	36.7
9	R2	57	1.9	57	1.9	0.092	6.2	LOS A	0.5	3.3	0.31	0.55	35.6
9u	U	8	0.0	8	0.0	0.092	7.4	LOS A	0.5	3.3	0.31	0.55	33.1
Approach		101	3.1	101	3.1	0.092	5.4	LOS A	0.5	3.3	0.31	0.55	36.0
West: Abbott Road West													
10	L2	18	0.0	18	0.0	0.116	3.0	LOS A	0.6	4.3	0.17	0.36	32.3
11	T1	125	3.4	125	3.4	0.116	2.6	LOS A	0.6	4.3	0.17	0.36	38.3
12u	U	5	0.0	5	0.0	0.116	6.8	LOS A	0.6	4.3	0.17	0.36	37.8
Approach		148	2.8	148	2.8	0.116	2.8	LOS A	0.6	4.3	0.17	0.36	38.1
All Vehicles		422	2.7	422	2.7	0.140	3.8	LOS A	0.8	5.4	0.23	0.43	37.3

Site Level of Service (LOS) Method: Delay (RTA NSW). 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.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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Project: \\192.168.3.1\data\Synergy\Projects\17\17.069\Modelling\17.069m01v01 TRAFFIX Playfair Road Network Model.sip7

MOVEMENT SUMMARY

 Site: 202 [6. Pitt Rd Playfair Rd EX + FU AM]

 Network: N101 [1. Playfair Road EX + FU AM]

Pitt Road and Playfair Road
Existing + Future AM
Stop (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV %	Arrival Total	Flows HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		veh/h	%	veh/h	%	v/c	sec		veh	m			
South: Playfair Road S													
1	L2	16	0.0	16	0.0	0.014	7.7	LOS A	0.1	0.4	0.35	0.84	37.5
2	T1	13	0.0	13	0.0	0.042	9.7	LOS A	0.1	1.0	0.50	0.95	33.6
3	R2	13	0.0	13	0.0	0.042	10.3	LOS A	0.1	1.0	0.50	0.95	35.9
Approach		41	0.0	41	0.0	0.042	9.1	LOS A	0.1	1.0	0.44	0.91	36.2
East: Pitt Road East													
4	L2	75	0.0	75	0.0	0.189	3.8	LOS A	0.2	1.4	0.05	0.16	40.8
5	T1	263	1.2	263	1.2	0.189	0.3	LOS A	0.2	1.4	0.05	0.16	40.3
6	R2	20	0.0	20	0.0	0.189	4.3	LOS A	0.2	1.4	0.05	0.16	40.5
Approach		358	0.9	358	0.9	0.189	1.2	NA	0.2	1.4	0.05	0.16	40.4
North: Playfair Road N													
7	L2	15	0.0	15	0.0	0.012	7.2	LOS A	0.0	0.3	0.24	0.86	37.0
8	T1	17	0.0	17	0.0	0.087	10.1	LOS A	0.3	2.2	0.51	0.99	28.3
9	R2	32	10.0	32	10.0	0.087	10.9	LOS A	0.3	2.2	0.51	0.99	36.3
Approach		63	5.0	63	5.0	0.087	9.8	LOS A	0.3	2.2	0.45	0.96	35.7
West: Pitt Road W													
10	L2	19	16.7	19	16.7	0.120	4.8	LOS A	0.4	3.1	0.25	0.18	40.1
11	T1	136	6.2	136	6.2	0.120	0.7	LOS A	0.4	3.1	0.25	0.18	40.0
12	R2	47	0.0	47	0.0	0.120	4.9	LOS A	0.4	3.1	0.25	0.18	40.1
Approach		202	5.7	202	5.7	0.120	2.1	NA	0.4	3.1	0.25	0.18	40.1
All Vehicles		664	2.7	664	2.7	0.189	2.8	NA	0.4	3.1	0.17	0.29	39.7

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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Project: T:\Synergy\Projects\17\17.069\Modelling\17.069m01v01 TRAFFIX Playfair Road Network Model.sip7

MOVEMENT SUMMARY

 Site: 204 [8. Pitt Rd Playfair Rd EX + FU PM]

 Network: N102 [2. Playfair Road EX + FU PM]

Pitt Road and Playfair Road
Existing + Future Road PM
Stop (Two-Way)

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV %	Arrival Total	Flows HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		veh/h	%	veh/h	%	v/c	sec		veh	m			
South: Playfair Road S													
1	L2	32	3.3	32	3.3	0.027	7.5	LOS A	0.1	0.8	0.29	0.86	37.6
2	T1	25	0.0	25	0.0	0.087	9.8	LOS A	0.3	2.1	0.51	0.98	33.5
3	R2	26	0.0	26	0.0	0.087	10.4	LOS A	0.3	2.1	0.51	0.98	35.8
Approach		83	1.3	83	1.3	0.087	9.1	LOS A	0.3	2.1	0.43	0.94	36.2
East: Pitt Road East													
4	L2	57	1.9	57	1.9	0.145	4.0	LOS A	0.2	1.8	0.10	0.18	40.8
5	T1	181	5.2	181	5.2	0.145	0.4	LOS A	0.2	1.8	0.10	0.18	40.3
6	R2	23	9.1	23	9.1	0.145	4.8	LOS A	0.2	1.8	0.10	0.18	40.5
Approach		261	4.8	261	4.8	0.145	1.6	NA	0.2	1.8	0.10	0.18	40.4
North: Playfair Road N													
7	L2	16	0.0	16	0.0	0.014	7.6	LOS A	0.1	0.4	0.32	0.85	36.9
8	T1	15	0.0	15	0.0	0.058	9.8	LOS A	0.2	1.4	0.52	0.98	28.2
9	R2	17	12.5	17	12.5	0.058	11.4	LOS A	0.2	1.4	0.52	0.98	36.3
Approach		47	4.4	47	4.4	0.058	9.6	LOS A	0.2	1.4	0.45	0.93	35.5
West: Pitt Road W													
10	L2	23	9.1	23	9.1	0.162	4.3	LOS A	0.4	3.0	0.15	0.12	40.0
11	T1	225	2.8	225	2.8	0.162	0.3	LOS A	0.4	3.0	0.15	0.12	39.9
12	R2	42	5.0	42	5.0	0.162	4.5	LOS A	0.4	3.0	0.15	0.12	39.9
Approach		291	3.6	291	3.6	0.162	1.2	NA	0.4	3.0	0.15	0.12	39.9
All Vehicles		682	3.9	682	3.9	0.162	2.9	NA	0.4	3.0	0.19	0.30	39.5

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

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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MOVEMENT SUMMARY



Site: 201 [5. Abbott Road and Playfair Road EX + FU AM]



Network: N101 [1. Playfair Road EX + FU AM]

Abbott Road and Playfair Road
Existing + Future AM
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV	Arrival Total	Flows HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		veh/h	%	veh/h	%	v/c	sec		veh	m			
East: Abbott Road East													
5	T1	106	0.0	106	0.0	0.109	2.8	LOS A	0.6	3.9	0.19	0.42	37.7
6	R2	25	0.0	25	0.0	0.109	5.7	LOS A	0.6	3.9	0.19	0.42	36.3
6u	U	7	0.0	7	0.0	0.109	6.9	LOS A	0.6	3.9	0.19	0.42	38.9
Approach		139	0.0	139	0.0	0.109	3.6	LOS A	0.6	3.9	0.19	0.42	37.6
North: Playfair Road N													
7	L2	67	0.0	67	0.0	0.100	4.0	LOS A	0.5	3.5	0.22	0.54	43.1
9	R2	48	0.0	48	0.0	0.100	6.7	LOS A	0.5	3.5	0.22	0.54	39.9
9u	U	5	0.0	5	0.0	0.100	8.1	LOS A	0.5	3.5	0.22	0.54	37.7
Approach		121	0.0	121	0.0	0.100	5.2	LOS A	0.5	3.5	0.22	0.54	41.9
West: Abbott Road West													
10	L2	14	0.0	14	0.0	0.064	3.0	LOS A	0.3	2.2	0.15	0.35	32.6
11	T1	65	4.8	65	4.8	0.064	2.6	LOS A	0.3	2.2	0.15	0.35	38.4
12u	U	1	0.0	1	0.0	0.064	6.8	LOS A	0.3	2.2	0.15	0.35	38.0
Approach		80	3.9	80	3.9	0.064	2.7	LOS A	0.3	2.2	0.15	0.35	38.1
All Vehicles		340	0.9	340	0.9	0.109	4.0	LOS A	0.6	3.9	0.19	0.44	39.2

Site Level of Service (LOS) Method: Delay (RTA NSW). 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.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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Project: T:\Synergy\Projects\17\17.069\Modelling\17.069m01v01 TRAFFIX Playfair Road Network Model.sip7

MOVEMENT SUMMARY

 Site: 203 [7. Abbott Road and Playfair Road EX + FU PM]

 Network: N102 [2. Playfair Road EX + FU PM]

Abbott Road and Playfair Road
Existing + Future PM
Roundabout

Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Total	Flows HV %	Arrival Total	Flows HV %	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		veh/h	%	veh/h	%	v/c	sec		veh	m			
East: Abbott Road East													
5	T1	135	3.1	135	3.1	0.144	3.0	LOS A	0.8	5.5	0.25	0.43	37.6
6	R2	32	0.0	32	0.0	0.144	5.8	LOS A	0.8	5.5	0.25	0.43	36.1
6u	U	6	0.0	6	0.0	0.144	7.1	LOS A	0.8	5.5	0.25	0.43	38.8
Approach		173	2.4	173	2.4	0.144	3.7	LOS A	0.8	5.5	0.25	0.43	37.4
North: Playfair Road N													
7	L2	63	3.3	63	3.3	0.128	4.3	LOS A	0.7	4.6	0.32	0.57	42.0
9	R2	69	1.5	69	1.5	0.128	7.0	LOS A	0.7	4.6	0.32	0.57	38.6
9u	U	8	0.0	8	0.0	0.128	8.3	LOS A	0.7	4.6	0.32	0.57	36.2
Approach		141	2.2	141	2.2	0.128	5.8	LOS A	0.7	4.6	0.32	0.57	40.4
West: Abbott Road West													
10	L2	18	0.0	18	0.0	0.116	3.0	LOS A	0.6	4.3	0.17	0.36	32.3
11	T1	125	3.4	125	3.4	0.116	2.6	LOS A	0.6	4.3	0.17	0.36	38.3
12u	U	5	0.0	5	0.0	0.116	6.8	LOS A	0.6	4.3	0.17	0.36	37.8
Approach		148	2.8	148	2.8	0.116	2.8	LOS A	0.6	4.3	0.17	0.36	38.0
All Vehicles		462	2.5	462	2.5	0.144	4.1	LOS A	0.8	5.5	0.25	0.45	38.5

Site Level of Service (LOS) Method: Delay (RTA NSW). 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.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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

Network Model Accuracy Level (largest change in degree of saturation for any lane): 0.0 %

Number of Iterations: 3 (maximum specified: 10)

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Appendix C

Reduced Plans