Appendix G

Traffic Assessment

Traffic Assessment

For

St Patrick's Primary School

Dudley Street, Macksville

August 2010

de Groot & Benson Pty Ltd

Traffic Assessment

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St Patrick's Primary School

Dudley Street, Macksville

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1 INTRODUCTION

St Patricks Primary school is to be located at the eastern end of Dudley Street, Macksville NSW.

Access to the site is currently by a partially sealed access road namely Dudley Street. This road is a "No Through" and connects only with East Street. East Street connects to Boundary Street in the south and River Street in the north. More notably, it connects with Partridge Street which is approximately 100m north of Dudley Street; Partridge Street connects directly with the Pacific Highway via traffic lights.

This report looks at the suitability of the existing intersections in place along the main route from the Pacific Highway and the St Patricks Primary school.

Proposed development

It is envisaged that the school will cater for a student population of up to 400 children and 30 associated teachers and support staff.

Surveys from the existing school indicate that approximately 90% of the student population will use the local bus services to access the school. The remainder will primarily be driven by parents.

Being conservative we have assumed all traffic will use the Pacific Highway / Partridge Street / East Street / Dudley Street route to access the site.

2 EXISTING TRAFFIC CONDITIONS

2.1 EXISTING ROAD NETWORK

2.1.1 Dudley Street

Dudley Street is characterised by a 4m wide rural type partially sealed road.

Dudley Street intersection, looking east

2.1.2 East Street

Currently East Street services the 54 residences and connects to Boundary Road in the south and River Street in the north. The current speed limit along East Street is 50km/h and is characterised by a nominal 8m wide kerb and guttered roadway.

The intersection with Dudley Street is a standard T type intersection with no merging lanes present for any either entering or exiting Dudley Street.

East Street / Dudley Street intersection, looking south

The intersection grade is level, and the approach from both East Street and Dudley Street is level as well.

The intersection between East Street and Partridge Street is also level and the approaches from both streets are flat as well.

East Street, looking north to the Partridge Street Intersection

2.1.3 Partridge Street

Partridge is a kerb and guttered residential street with a minimum width of 11m. The eastern end of the roadway is a T intersection with East Street, the western end is a T intersection with the pacific highway. The highway intersection is controlled by traffic lights.

Partridge Street, looking east to the East Street Intersection

Partridge Street is used as the main egress from the Gumma area (traffic from Gumma Road is directed into east Street and then into Partridge Street to allow northbound access to the Pacific Highway.

Partridge Street, looking west to the traffic lights at the Pacific Highway Intersection

2.1.4 Pacific Highway / Partridge Street Intersection.

This intersection is controlled by traffic lights and is characterised by:

- The north bound highway lane has a right turn lane and a through lane. The right turn lane is controlled by a right turn signal on the traffic lights.
- The south bound lane has 2 through lane with the left hand lane also being used for left turns into Partridge Streets\
- Partridge Street has two lanes for traffic travelling westwards' one for left turn movements and the other for right turn movements. There is a left turn arrow operating on the traffic lights which allows left turn movements whilst the right turn indicator is red.

The views of the lights from the different traffic directions is shown below:

Partridge Street, looking west to the traffic lights at the Pacific Highway Intersection

Pacific Highway, looking north to the traffic lights at the Partridge St Intersection

Pacific Highway, looking south to the traffic lights at the Partridge St Intersection

2.2 TRAFFIC VOLUMES

2.2.1 Local Traffic

Traffic volumes were calculated using the Road's and Traffic Authorities (RTA) Guide to Traffic Generating Developments. For residential areas, a value of 10 cars per lot per day was assumed with a 10% concentration at peak periods.

East Street

The total number of cars calculated to be using East Street was deemed to be 530 cars per day with a peak period concentration of 53 cars per hour. These peak periods would occur it is determined between 8-9am and 3-4pm.

Dudley Street

The current volume of traffic on Dudley road is negligible as it currently services:

- an existing dwelling / farm
- Seven Day Adventist school. It currently has 24 students and 3 teachers / aides. The principal advises that all students are driven to/ from school by family members

We would estimate that at peak times, the traffic volume along Dudley Street would be:

- AADT - 60 vehicles per day
- Peak Hour – 24 vehicles /hour

Partridge Street

A traffic count was undertaken at the intersection of the Pacific Highway and Partridge Street. The results are contained in Appendix B.

The peak results are summarised below:

- Partridge Street;
    - Left turn onto the Pacific Highway - 44 v/hr
    - Right turn onto the Pacific Highway – 95 v/hr
- Pacific Highway South
    - Right turn into Partridge Street – 43 v/hr
- Pacific Highway North
    - Left turn into Partridge Street – 80 v/hr

2.2.2 Pacific Highway Traffic

The recent Environmental Assessment for the proposed Pacific Highway upgrade estimated traffic volumes in the Macksville area. (Warrell Creek to Urunga - Upgrading of the Pacific Highway – Chapter 17 – Traffic and Transport – January 2010 by SKM).

This report found that the 2007 AADT traffic volumes were:

- Pacific Highway , south of Bald Hills Road – 10,400 vpd
- Pacific Highway , south of Florence Wilmott Drive – 12,400 vpd
- Heavy vehicle usage accounted for up to 19% of traffic volume
- The average growth rate was about 2.1% per annum

As these traffic counts exclude the contributions of the residential areas of Macksville, we have assumed a traffic level of 15,000 vpd and a peak traffic of 1,500 vph.

We note that the Pacific Highway is proposed to bypass Macksville to the east and that as a result traffic volumes will significantly decrease through the section of highway under consideration. The report suggested that around 60% of traffic using the highway was through traffic. It is reasonable to expect then that when the bypass is constructed, that local traffic using the current highway will decrease by this amount.

2.2.3 Traffic Growth

Traffic growth has been estimated to be at 2.1% based on the SKM report. This would mean that within 10 years the concentration of traffic on East Street would increase to 678 cars per day and a peak concentration of 68 cars per hour.

There will be minimal traffic growth for the Seven Day Adventist school.

3 TRAFFIC GENERATION FROM DEVELOPMENT

3.1 PROPOSED DEVELOPMENT

The proposed development of the St Patricks Primary School on Dudley Street will greatly affect the traffic levels currently imposed on Dudley Street. The school has been designed to cater for 400 students plus 30 staff.

The school advises the following:

- 82% of the students will travel by bus. Up to 15 buses will be used in delivering the children to school
- 8% will walk to school
- The remaining 10% will travel with their parents

Based on this we

- 10% of student will travel by car with 1.5 students per car, this result in 106 car trips per day
- That each staff member has their own vehicle, this will result in an additional 60 trips per day assuming that there will be approximately 30 staff to cater for the school.
- That the school will be serviced by 15 buses in the morning and afternoon – 60 trips per day.

This increase in traffic does not impact on use of the sporting facilities as sporting field usage is usually on weekends, outside of school hours of Monday to Friday.

Peak traffic generation will occur at the morning and afternoon periods. Both of these scenarios have modelled for to analyse the effects of the school. It is estimated however that the morning peak hour of 8-9am will be the most congested time of the day.

The school traffic generation is as follows:

Average Daily Traffic:

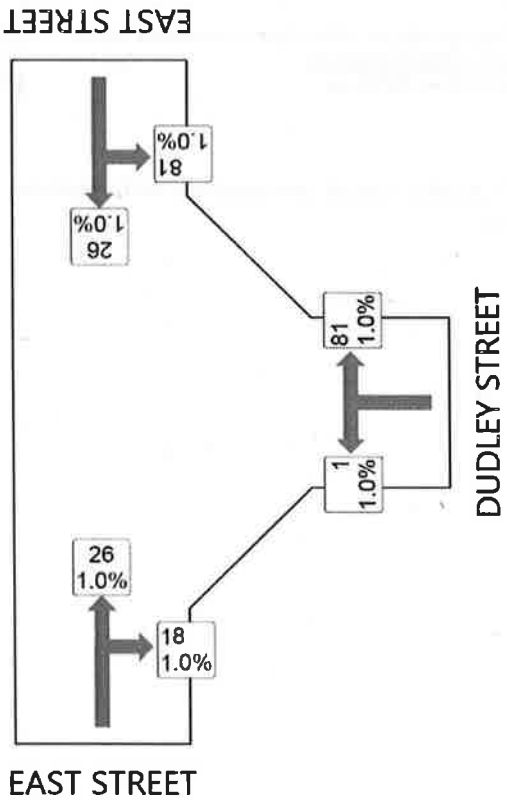
- Pupils (cars and buses) – 166 trips per day
- Staff – 60 trips per day
- Other helpers / parents – 30 trips per day
- Delivery vehicles – 10 trips per day
- Total – 206 trips per day.

Peak hourly traffic

- Pupils (cars and buses) – 83 vph
- Staff – 30 vph
- Other helpers / parents – 30 trips per day – assumed as outside the main peak period.
- Delivery vehicles – 10 trips per day – also outside the main peak period.
- Other helpers / parents – 15 vehicles per hour – also outside the main peak period.
- Delivery vehicles – 1 vehicles per hour
- Total – 114 vehicles per hour.

4 ANALYSIS OF INTERSECTIONS

4.1 EAST STREET AND DUDLEY STREET - SIDRA ANALYSIS



The major impact investigated is the intersection of Dudley Street and East Street. Traffic modelling was carried using the aaSIDRA model to quantify the impact of the development; the existing intersection was used with the only change being that Dudley Street was modelled on its design widths and seal.

The assigned traffic volumes (vph) are shown below. We have assumed that nearly all traffic from Dudley Street turns right into East Street as this is the most critical traffic movement from an intersection capacity standpoint:

Using the Sidra software, the Movement Summary of the East Street / Dudley Street intersection is set out below:

MOVEMENT SUMMARY

Site: East Street and Dudley Street

DUDLEY STREET AND EAST STREET
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: DUDLEY STREET											
1	L	1	1.0	0.117	9.7	LOS A	0.6	4.1	0.29	0.80	40.1
3	R	85	1.0	0.113	9.6	LOS A	0.6	4.1	0.29	0.88	34.7
Approach		86	1.0	0.113	9.6	LOS A	0.6	4.1	0.29	0.88	34.7
East: EAST STREET											
4	L	85	1.0	0.060	5.7	LOS A	0.0	0.0	0.00	0.64	31.7
5	T	27	1.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
Approach		113	1.0	0.060	4.3	LOS A	0.0	0.0	0.00	0.49	39.7
West: EAST STREET											
11	T	27	1.0	0.029	0.4	LOS A	0.2	1.2	0.22	0.00	46.9
12	R	19	1.0	0.029	6.4	LOS A	0.2	1.2	0.22	0.73	42.6
Approach		46	1.0	0.029	2.9	LOS A	0.2	1.2	0.22	0.30	45.1
All Vehicles		245	1.0	0.117	5.9	NA	0.6	4.1	0.14	0.59	38.2

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS A. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

Processed: 11 August 2010 11:16:05 PM
SIDRA INTERSECTION 4.0.19.1104
Project: S:\09\09105 St Patricks Primary School - Dudley Street\Dwgs\09105.sip
8000364, DE GROOT AND BENSON PTY LTD, SINGLE

SIDRA INTERS

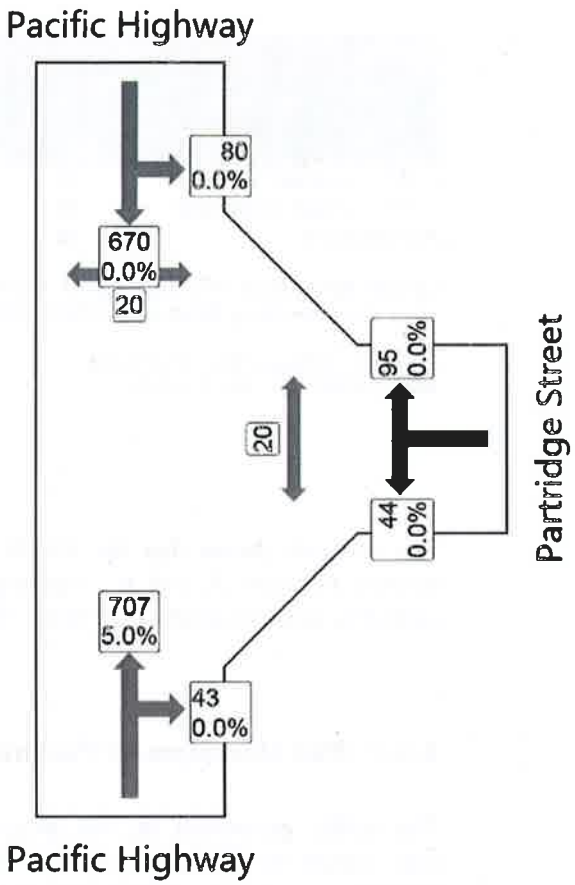
The analysis shows that the East Street / Dudley Street Intersection will perform with Level of Service A after the school is fully developed.

4.2 PARTRIDGE STREET and PACIFIC HIGHWAY - SIDRA ANALYSIS

4.2.1 Existing Intersection Performance

As noted previously, this intersection is a major intersection and the proposed school will significantly increase traffic. However in the longer term, traffic will not be as big an issue as up to 60% of highway traffic will be diverted on the new highway.

The assigned traffic volumes (vph) are shown below. We have assumed that nearly all traffic from Dudley Street turns right into East Street as this is the most critical traffic movement from an intersection capacity standpoint:



Using the Sidra software, the Movement Summary of the Pacific Highway / Partridge Street intersection is set out below:

MOVEMENT SUMMARY

Site: Major 3-way Signals L

Three-way intersection with 3 & 4-lane approaches and slip lanes (Signals)
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pacific Highway											
11	T	744	5.0	0.563	4.8	LOS A	12.4	90.5	0.53	0.48	43.3
12	R	45	0.0	0.069	7.9	LOS A	0.8	5.9	0.71	0.52	18.4
Approach		789	4.7	0.563	5.0	LOS A	12.4	90.5	0.54	0.49	40.5
East: Partridge Street											
1	L	46	0.0	0.088	17.3	LOS B	1.5	10.8	0.77	0.58	16.9
3	R	100	0.0	0.539	30.2	LOS C	4.3	29.9	0.99	0.80	15.1
Approach		146	0.0	0.538	26.1	LOS B	4.3	29.9	0.92	0.73	15.6
North: Pacific Highway											
4	L	84	0.0	0.667	20.2	LOS B	11.7	81.9	0.92	0.82	16.4

5	T	705	0.0	0.667	20.1	LOS B	12.5	87.2	0.92	0.81	32.1
Approach		789	0.0	0.667	20.1	LOS B	12.5	87.2	0.92	0.81	29.3
All Vehicles		1725	2.2	0.667	13.7	LOS A	12.5	90.5	0.75	0.65	31.2

Level of Service (Aver. Int. Delay): LOS A. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across E approach	21	13.3	LOS B	0.0	0.0	0.67	0.67
P3	Across N approach	21	14.7	LOS B	0.0	0.0	0.70	0.70
All Pedestrians		42	14.0				0.68	0.68

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual pedestrian movements: Delay (HCM).

Processed: 12 August 2010 12:02:20 AM
SIDRA INTERSECTION 4.0.19.1104

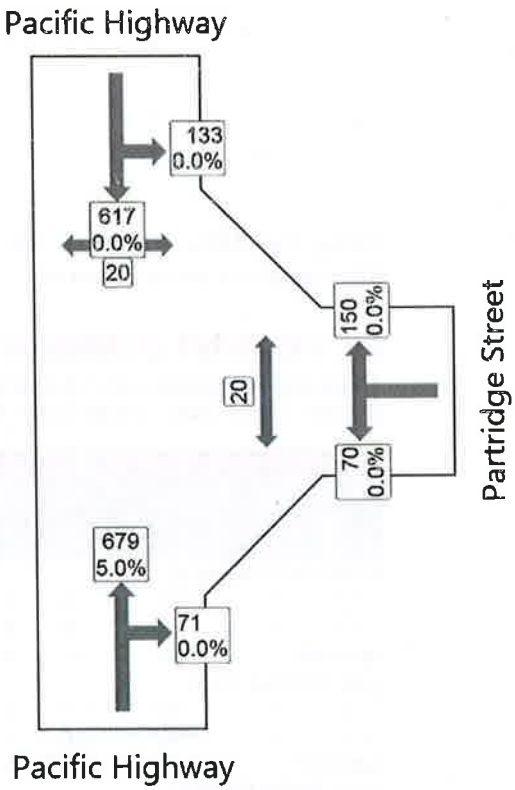
SIDRA INTERS

The analysis shows that the Pacific Highway leg of the intersection performs with a Level of Service between A and B. Partridge Street is slightly worse with LOS's of B and C. This is primarily because of the preference that the traffic lights give to Highway traffic.

4.2.2 Post Development Performance

The traffic generated by the proposed school was added to the intersection. The assigned volumes are shown on the figure to the right.

Using the Sidra software, the Movement Summary of the East Street / Dudley Street intersection is set out below:



MOVEMENT SUMMARY

Site: Post Development - Major 3-way Signals L

Three-way intersection with 3 & 4-lane approaches and slip lanes (Signals)
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pacific Highway											
11	T	715	5.0	0.554	5.2	LOS A	12.3	89.7	0.55	0.50	42.9
12	R	75	0.0	0.111	7.2	LOS A	1.2	8.6	0.69	0.53	18.6
Approach		789	4.5	0.554	5.4	LOS A	12.3	89.7	0.56	0.50	38.5
East: Partridge Street											
1	L	74	0.0	0.140	17.6	LOS B	2.4	17.1	0.78	0.60	16.8
3	R	158	0.0	0.729	31.4	LOS C	6.6	46.2	1.00	1.02	14.9
Approach		232	0.0	0.729	27.0	LOS B	6.6	46.2	0.93	0.89	15.5
North: Pacific Highway											
4	L	140	0.0	0.821	30.3	LOS C	11.8	82.7	1.00	1.15	15.1
5	T	649	0.0	0.821	27.4	LOS B	16.5	115.4	0.99	1.00	28.7
Approach		789	0.0	0.821	27.9	LOS B	16.5	115.4	0.99	1.03	25.0
All Vehicles		1811	2.0	0.821	18.0	LOS B	16.5	115.4	0.80	0.78	27.3

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow	Average Delay	Level of Service	Average Back of Queue Pedestrian	Average Back of Queue Distance	Prop. Queued	Effective Stop Rate
		ped/h	sec		ped	m		per ped
P1	Across E approach	21	14.0	LOS B	0.0	0.0	0.68	0.68
P3	Across N approach	21	14.7	LOS B	0.0	0.0	0.70	0.70
All Pedestrians		42	14.4				0.69	0.69

Level of Service (Aver. Int. Delay): LOS B. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS B. LOS Method for individual pedestrian movements: Delay (HCM).

Processed: 12 August 2010 12:08:07 AM
SIDRA INTERSECTION 4.0.19.1104

SIDRA INTERS

The results of the intersection performance post development are similar to that which occurs at present. The only real difference being that the left turn movement from the Pacific Highway into Partridge Street decreases to an LOS of C.

Whilst this is acceptable, it would be unsatisfactory in the longer term. However, as the highway is to bypass the Macksville township, all these traffic pressures will be significantly relieved.

5 ROAD UPGRADINGS

Dudley Street is little more than a 4m wide rural road.

Given the usage of the road, and that there are no houses accessing Dudley Street, we would propose the following roadworks:

- Dudley Street be upgraded to 7m wide carriageway with 1m shoulders. The pavement depth would be designed to suit the design life as specified by Council (typically 20 years).
- No kerb and guttering (in Dudley Street) would be provided, rather the table drains would be provided on each side of the roadway
- East Street – no works proposed
- Partridge Street – no works proposed.

6 CAR PARKING

Under Council's Nambucca Development Control Plan 2010, the carparking requirements for a school are:

- 1 space per full-time member of staff
- 1 per 100 students for visitor / parent parking.

Based on this, the total number of car spaces required is :

- 30 spaces for full-time members
- 4 for visitor / parent parking.

The total parking requirement for the site is 34 spaces.

7 PEDESTRIAN MOVEMENTS

Because the majority of students access the site by vehicle, there will be limited pedestrian traffic,

Nevertheless, we would propose the construction of a 1.2m wide footpath from the school site along the southern side of Dudley Street till it meets East Street.

8 SUMMARY

Our report found the capacity of the existing intersections and roadways capable of taking the additional traffic generated by the school.

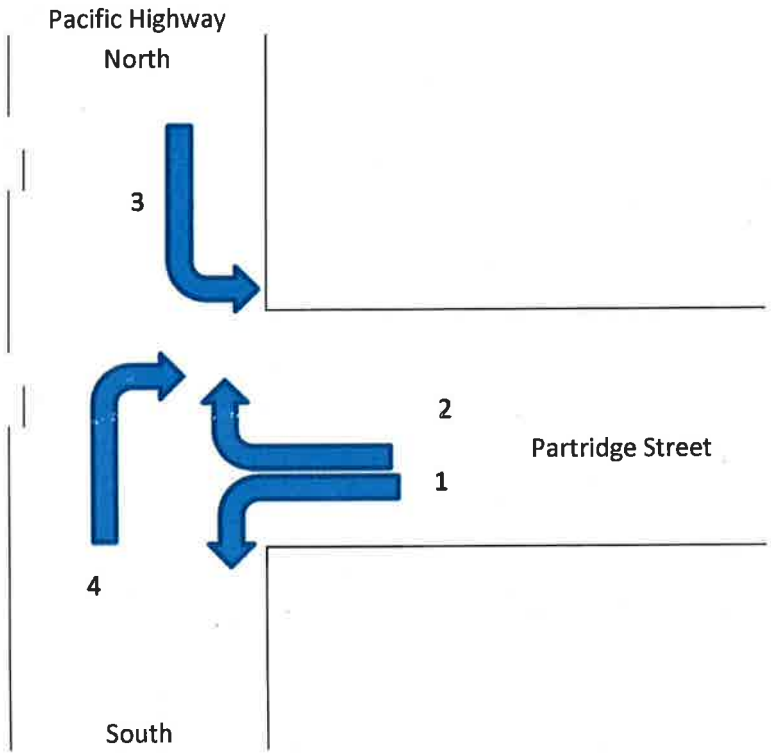
To overcome the shortfall in Dudley Street, the following works are proposed:

- Dudley Street be upgraded to 7m wide carriageway with 1m shoulders. The pavement depth would be designed to suit the design life as specified by Council (typically 20 years).

- No kerb and guttering (in Dudley Street) would be provided, rather the table drains would be provided on each side of the roadway
- A 1.2m wide footpath be constructed on the south side of the carriageway from the school site to East Street
- A minimum of 34 spaces be provided for on-site car parking

APPENDIX A – Traffic Counts

Traffic Assignments:



Site:	Cnr Pacific Highway and Partridge St, Macksville			
	MOVEMENT		Date	10/08/2008
Time:	1	2	3	4
8:05	3	2	9	5
8:10	4	3	7	2
8:15	2	5	5	3
8:20	5	3	3	1
8:25	2	4	6	2
8:30	3	2	7	3
8:35	2	5	6	6
8:40	3	3	5	5
8:45	4	5	3	2
8:50	2	3	5	2
8:55	3	5	7	3
9:00	2	4	5	2
9:05	5	2	6	5
9:10	2	5	3	4
9:15	3	4	8	5
9:20	6	7	8	4
9:25	3	2	5	3
9:30	5	7	3	4
9:35	7	9	2	4
Total	66	80	103	65
Time: hrs	1.50	1.50	1.50	1.50
Rate - v/hr	44.00	53.33	68.67	43.33

Site:	Cnr Pacific Highway and Partridge St, Macksville			
	MOVEMENT		Date	9/08/2010
Time:	1	2	3	4
2:30	2	5	7	3
2:35	3	9	3	1
2:40	1	3	6	6
2:45	8	9	5	2
2:50	4	8	5	0
2:55	3	4	5	2
3:00	3	9	8	1
3:05	4	8	8	1
3:10	3	8	5	1
3:15	2	0	3	5
3:20	1	8	5	3
3:25	3	4	4	0
3:30	7	6	8	3
3:35	2	7	11	4
3:40	2	8	4	7
3:45	2	14	8	6
3:50	2	13	9	3
3:55	1	12	8	6
4:00	1	7	8	5
Total	54	142	120	59
Time: hrs	1.50	1.50	1.50	1.50
Rate - v/hr	36.00	94.67	80.00	39.33