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Sapphire Beach Development Pty Ltd

Report on Sapphire Beach Development

Traffic Study - Additional Investigations

December 2006

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

1.1 Background

GHD has been commissioned by Sapphire Developments Pty Limited to examine traffic and transport issues associated with the construction and post-development operation of the redevelopment of the Pelican Beach Resort at 740-742 Pacific Highway, Sapphire Beach.

This report has been prepared in response to comments received by the RTA Regional Development Committee (RDC) (RTA File No: 110.5395/N00815 06/1755) following the lodgement of the proposed development as a major project (MP No. 06-0148). RTA comments were based on the report "Sapphire Beach Development, Preliminary Traffic Study (August 2006)" (GHD Document Number: 72374) and should be referred to for information regarding existing conditions (including road network characteristics and crash history). A summary of the proposed development is included in Section 2.

A meeting was held at the RTA Northern Region Office in Grafton between the RTA (Greg Sciffer, Lance Vickery, Chris Clarke), GHD (Matthew Shrimpton, Phillip Pigram) and Attentus Properties (Bill Jenner), representing the proponents for the proposed development. This meeting discussed the intersection of the Pacific Highway / Campbells Close and the access road to Pelican Beach Resort and Nautilus Resort in relation to the comments received from the RDC and also the Sapphire to Woolgoolga Pacific Highway Upgrade Project. Details of the upgrade project are included in Section 3.1.

The meeting was also presented with a staging plan of the proposed development for the Pelican Beach Resort site. Details relating to the staged construction are included in Section 3.2.3.

As a result of the discussions, enabling a greater understanding of the project, the RTA has requested additional investigations to be undertaken to enable consideration of the proposal at the RDC meeting in Armidale on Friday 15 December 2006. The scope of work for additional investigations is included in Section 1.2.

1.2 Scope of the Report

The scope for this report, along with the methodology employed, was defined in a memorandum to the RTA dated 30 November 2006 that requested RTA concurrence (GHD Document Number 74320). A subsequent telephone discussion with RTA's Greg Sciffer indicated that the RTA were acceptable to the additional investigations proceeding on that basis.

The scope was to provide additional information, in particular:

- Modelling of the intersection at the completion of each proposed stage of the development with a particular emphasis on queue length (as opposed to level of service); and
- Resolution of school bus movements in the area.

2. Proposed Development

A general description of the proposed development is provided herein. For a more in-depth review of the existing conditions and the proposed development, please refer to the report "Sapphire Beach Development, Preliminary Traffic Study (August 2006)" (GHD Document Number: 72374).

The proposed development would involve the demolition of the existing Pelican Beach Resort. The existing paved access road within the western end of the site would remain as the primary site access.

The proposed development is for the redevelopment of the Pelican Beach Resort to create an upmarket lifestyle resort catering for a mix of both permanent residents and tourists. The redevelopment of the site will be completed in stages with the early stages being built on the lower coastal section of the site. This will be followed by developing up the hill to the flat section adjacent to the Pacific Highway. Construction will be staged over four to six years (approximately 30 apartments, townhouses and/or houses per year).

At completion, it is expected that the development will comprise 124 dwellings, recreational/communal facilities and 260 car spaces. The dwellings will consist of a mixture of apartments, town houses and houses. There will also be extensive areas of open space and retained vegetation on the site.

The houses will be located along the beachfront and consist of 2 storey, 3 bedroom structures. The remainder of the site will consist of 2-3 bedroom town houses and 4 storey apartment complexes.

All apartments, townhouses and houses will have two car spaces and will be connected by a network of internal roads. In addition, there will be 10 visitor spaces provided plus two handicap spaces and a space for a mini-bus.

Figures showing the layout of the site, including pedestrian flow paths and onsite parking are included in Appendix A.

3. Additional Investigations

3.1 Pacific Highway Upgrade – Sapphire to Woolgoolga

The RTA is continuing planning for the upgrade of the Pacific Highway in the vicinity of the proposed Sapphire Beach development. The preliminary concept design indicates that the Sapphire to Woolgoolga section commences approximately 300 metres south of the existing intersection with the access road servicing Pelican Beach Resort and Nautilus Resort. The upgrade would also include the modification of the intersection with the upgraded highway being constructed to the west of the existing alignment. The existing alignment would become a service road upon completion of the highway upgrade. A simplistic depiction of this arrangement, showing terminology used in this report is provided in Figure 3.1.

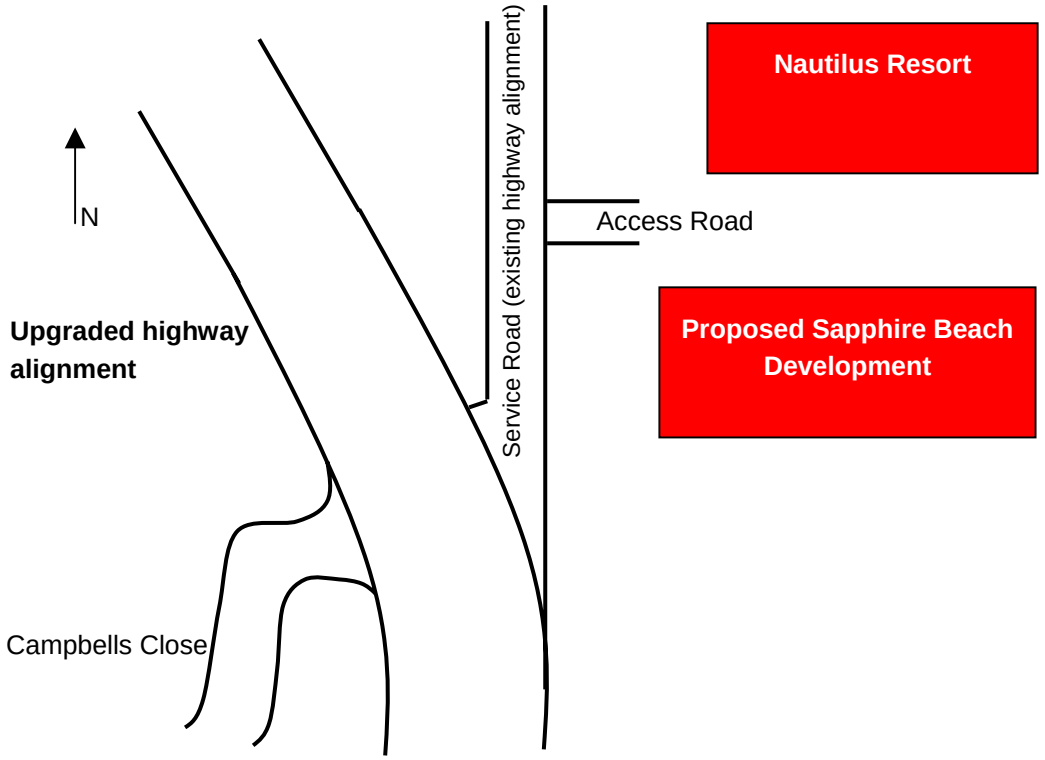


Figure 3.1 Future Highway Arrangement

The preliminary concept design for the upgrade in this vicinity is included in Appendix B. The main features of the proposed intersection are:

- Left in / left out only to Campbells Close from upgraded highway;
- Northbound right turn deceleration lane facilitating at-grade access to the service road;
- Southbound acceleration lane from service road;
- No southbound access (left-in) to service road; and
- No northbound exit (right-out) from service road.

Access to Nautilus Resort and the proposed Sapphire Beach Development would be via the existing access point. It is reiterated that the existing highway would become a service road at this location. The existing intersection will be modified to have the following features:

- Northbound right turn bay into access road to proposed development;
- Southbound access (left-in) to access road to proposed development, however no deceleration/turn bay provided;
- Southbound exit (left-out) from access road, however no acceleration lane/hold bay provided; and
- Northbound exit (right-out) from access road, however no acceleration lane/hold bay provided.

A likely timetable for the completion of the Sapphire to Woolgoolga Upgrade was provided by Chris Clarke (RTA Project Manager) at a meeting on 28 November 2006 and is provided in Table 3.1.

Table 3.1 Likely Timing for Highway Upgrade

Timing	Milestone
December 2006	Part 3A application lodged, awaiting Director-General's requirements for environmental assessment.
Feb – Mar 2007	Environmental assessment commences
Oct – Dec 2007	Project Approval
2009	Call tenders for construction
2011 - 2012	Sapphire to Woolgoolga upgrade project completed

It is noted that the project timing relates to government funding, however it has been adopted for the purposes of this assessment.

3.2 Key Assumptions

The assessment has been based on a number of key assumptions, as detailed below.

3.2.1 Intersection Layout and Parameters

The layout of the intersection of the Pacific Highway / Campbells Close / access road is as shown in Figure 3.2.

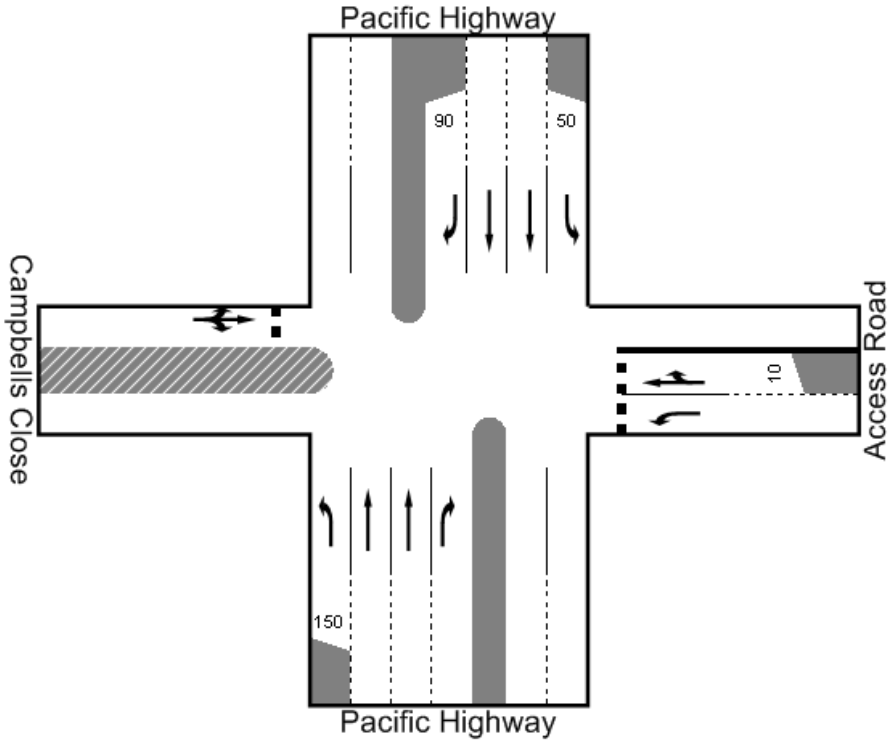


Figure 3.2 Existing Intersection with Pacific Highway

The intersection was set-up in SIDRA as follows:

East Approach (Access Road – servicing Pelican Beach Resort, residential apartments and Quality Resort Nautilus)

- Operates as two lanes on exit (driver behaviour was observed on site):
  - Left lane – L;
  - Right lane – T,R (Short lane – 10 metres);
- Approach travel distance of left lane: 30 metres;
- Approach grade: 1% (slight uphill approach);
- Lane width: 2.8 metres;
- Approach speed: 30 km/h (low speed environment due to alignment); and
- Exit speed: 30 km/h (low speed environment due to alignment).

North Approach (Pacific Highway)

- Approach grade: -2% (downhill approach);
- Right through lane utilisation: 80% (reduced use observed on site due to start of lane approximately 120 metres to the north);
- Approach speed: 100 km/h (sign-posted speed limit);
- Exit speed: 100 km/h (sign-posted speed limit);
- Approach travel distance: 500 metres; and
- Traffic volume growth rate: 3% p.a. (as used in previous studies in the area undertaken by NTPE and Samsa Consulting).

West Approach (Campbells Close)

- Approach speed to: 40 km/h (low speed environment due to alignment);
- Exit speed: 40 km/h (low speed environment due to alignment); and
- Approach travel distance: 500 metres

South Approach (Pacific Highway)

- Approach speed: 100 km/h (sign-posted speed limit);
- Exit speed: 100 km/h (sign-posted speed limit);
- Approach travel distance: 500 metres; and
- Traffic volume growth rate: 3% p.a.

3.2.2 Gap Acceptance Parameters

The gap acceptance parameters adopted are shown in Table 3.2.

Table 3.2 Gap Acceptance Parameters

Type of movement	Critical Gap (s)	Follow-up Headway (s)	Saturation Flow Rate (veh/h)
Minor Road:			
◗ Left Turn	5.0	3.0	1200
◗ Through	6.5	3.5	1029
◗ Right Turn	7.0	4.0	900
Turn from Major Road	4.5	2.5	1440

Source: SIDRA User Guide (Table 11.3) based on AUSTROADS (2002) Urban Road Design Guide.

3.2.3 Construction of the Proposed Development

The developer is proposing to construct the proposed Sapphire Beach Development in four stages following demolition of the site in 2007 (refer to Appendix C for staging plan). The timing of the four stages is shown in Table 3.3

Table 3.3 Proposed Construction Staging

Stage	Approximate Timing for Completion
Stage 1 (north east quadrant)	First half 2008
Stage 2 (north west quadrant)	First half 2009
Stage 3 (south east quadrant)	Second half 2010
Stage 4 (south west quadrant)	First half 2012

Source: Attentus Properties

GHD understands that the development may include a mix of short stay tourist and permanent residential, however the exact proportion is not known at this stage. For the purposes of this assessment the following has been assumed, as shown in Table 3.4.

Table 3.4 Development Type by Stage

Stage	Year of Completion	Development Type	Description	Number
1	2008	Residential	Three bedroom beachfront houses	9
		Residential	Two bedroom apartments	10
		Tourist	Two bedroom apartments	18
2	2009	Residential	Two bedroom apartments	17
		Tourist	Two bedroom apartments	11
3	2010	Residential	Three bedroom beachfront houses	7
		Residential	Three bedroom townhouses	8
4	2012	Tourist	Two bedroom apartments	18
		Residential	Two bedroom apartments	26
			Total	124

Trip generation for the above is provided in Section 3.4.1.

3.3 Assessment Methodology

The following methodology was provided to the RTA for comment on 30 November 2006. Subsequent discussion with Greg Sciffer (RTA Development Assessment Officer) indicated that the RTA was satisfied with the proposed approach, as detailed below:

- Increase the traffic flows from the existing intersection count to represent full occupancy of both Nautilus and Pelican Beach Resort (noting that Attentus have provided occupancy rates at the time the survey was undertaken);
- Determine the contribution of the Pelican Beach Resort development by comparing the number of rooms with the Nautilus development (noting that there will be a contribution by the neighbouring residential apartment development);
- Remove the contribution made by the Pelican Beach Resort – this gives the post demolition scenario; and
- Progressively add the contribution made to traffic volumes following the completion of each stage of the development. The calculation of this contribution includes determining the traffic generation of the residential component by referencing the RTA *Guide to Traffic Generating Developments* and the tourist apartment component as given by the existing contribution to traffic volumes made by the Pelican Beach Resort (on a proportional basis). It is noted that the RTA *Guide to Traffic Generating Developments* does not provide traffic generation rates for this type of tourist development.

3.4 Trip Generation and Assignment for the Proposed Development

3.4.1 Trip Generation

As stated in Section 3.3, the trip generation for the residential component was sourced from the RTA *Guide to Traffic Generating Developments*, while the tourist component was obtained by calculating the trip generation per occupied room at the existing Pelican Beach Resort. The adopted trip generation rates are shown in Table 3.5.

Table 3.5 Trip Generation for Proposed Development

Description	Peak Hour Trip Generation (trips/dwelling)	
	Residential	Tourist
Three bedroom beachfront houses[a]	0.85	0.80
Three bedroom townhouses	0.65	0.80
Two bedroom townhouses / apartments	0.50	0.80

Note:

a – Residential rate adopted as it is higher than tourist rate.

All three bedroom beachfront houses were assigned the 'residential' trip generation rate as it was higher that the 'tourist' rate. Hence there is no difference in terms of peak hour traffic generation if the three beachfront houses were used for permanent residential or short-term tourist development.

3.4.2 Traffic Assignment

The directional split at the intersection was determined from the intersection survey conducted. This is shown in Figure 3.3.

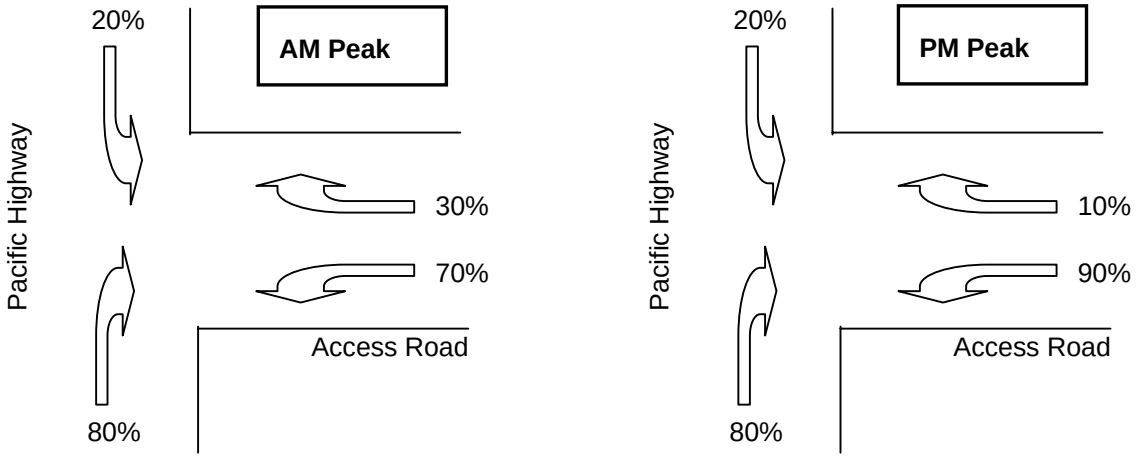


Figure 3.3 Traffic Assignment for Proposed Development

The in / out split for the residential component was based on the standard assumption that the majority of morning peak trips would be outbound, with the reverse during the afternoon peak.

The in / out split for the tourist component was calculated based on the intersection survey conducted, noting that the existing landuses are predominantly tourist.

The in / out split used for the intersection assessment is shown in Table 3.6.

Table 3.6 In / out Directional Split for Proposed Development

	Morning Peak		**Afternoon Peak**	
	In	Out	In	Out
Residential	20%	80%	80%	20%
Tourist	49%	51%	53%	47%

The above has been based on the assumption that the occupants of the residential dwellings would hold daytime jobs. However, it is noted that it is the developer's intention to market the residential component to semi-retired and retired 'sea-changers'. It is likely that this demographic would conduct a reduced number of peak hour trips. Hence the values given in Table 3.6 would return a conservative (worse-case) outcome.

3.5 Predicted Traffic Flows at each Stage of the Development

The traffic volumes at the intersection for each stage of the proposed development are included in Appendix D. The main outcomes are:

- Overall occupancy of Nautilus Resort, the apartment development and Pelican Beach Resort at the time of the intersection survey was 31.75%. Therefore a substantial increase (3.2x) in the traffic volumes resulted when 100% occupancy was assumed;
- Post demolition of Pelican Beach Resort results in a 59.3% reduction in traffic volumes to/from the access road. This represents the size of Pelican Beach Resort when compared to the other two developments that use the access road; and
- Traffic volumes to/from the access road at the completion of the proposed development (2013) are different to the existing scenario assuming 100% occupancy. The percentage differences are shown in Table 3.7.

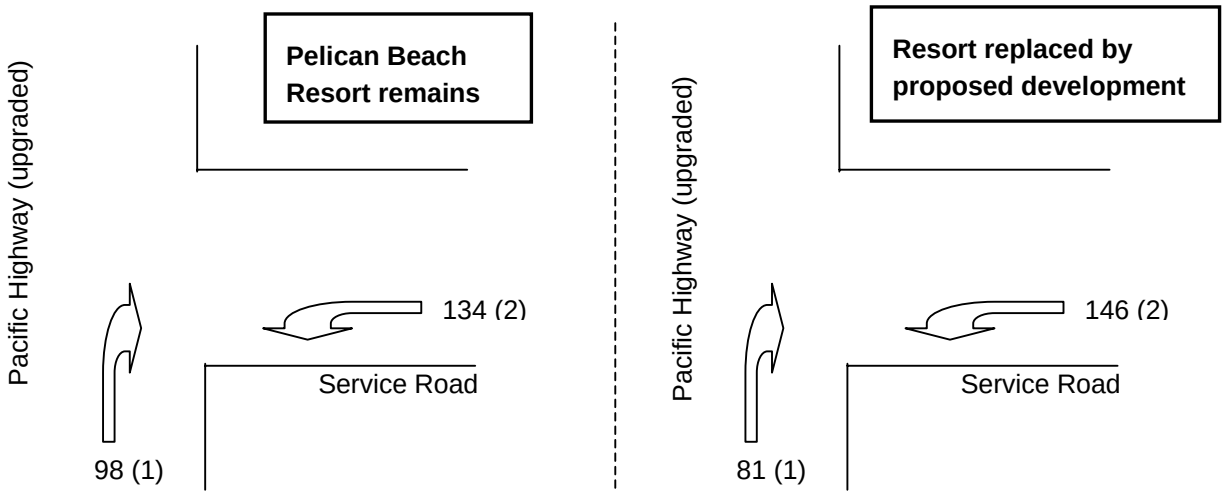
Table 3.7 Difference in Traffic Following Completion of Stage 4

	Difference in traffic volumes to/from access road post Stage 4 when compared to existing situation (100% occupancy)	
	In	Out
AM	-23.7%	20.3%
PM	18.3%	11.3%

The differences in Table 3.7 are largely due to the introduction of a residential component to the development on the site. This results in a higher outbound morning volume and inbound evening volume. It is reiterated that it is likely that the development will be marketed to semi-retired and retired couples who are expected to undertake a reduced number of peak hour trips. Therefore the results in Table 3.7 represent a conservative (worse-case) scenario.

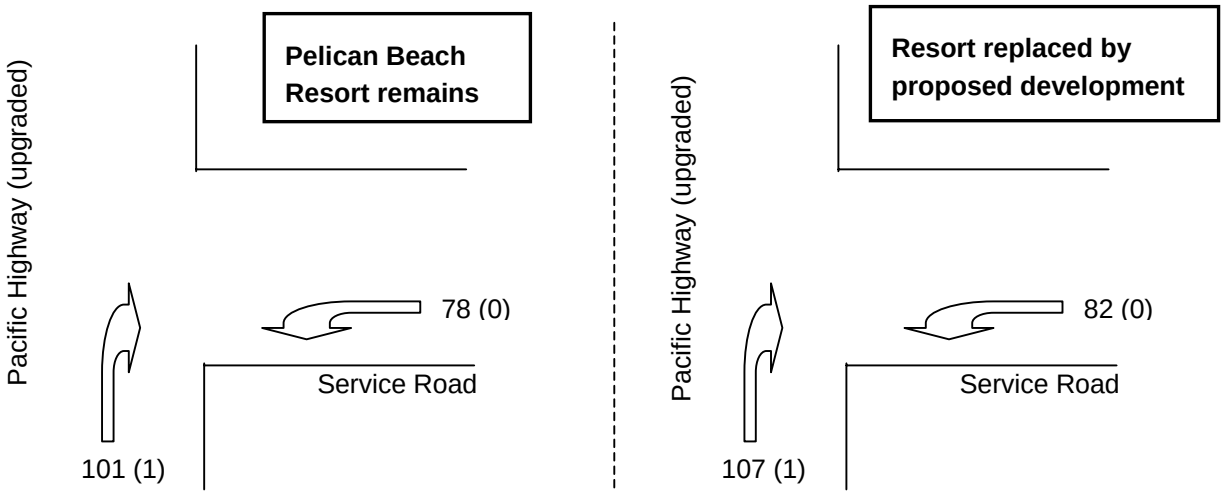
The RTA also supplied predicted turning volumes for the intersection of the upgraded highway and the service road (existing highway alignment). This information was compared to traffic volumes without the proposed development and with the proposed development (traffic numbers were sourced from the Preliminary Traffic Study). The traffic volumes have been updated to include the revised volumes calculated as part of this assessment.

The comparison of intersection volumes without and with the new development are given in Figure 3.4 and Figure 3.5.



Note: Heavy vehicle volumes appear in brackets

Figure 3.4 Comparison of turning movements at future service road intersection in 2012 (AM Peak)



Note: Heavy vehicle volumes appear in brackets

Figure 3.5 Comparison of Turning Movements at Future Service Road intersection in 2012 (PM Peak)

Figure 3.4 and Figure 3.5 show that the proposed development would not have a detrimental impact on the operation of the future intersection of the upgraded highway and the service road. In fact the volumes expected to turn right into the service road during the morning peak is expected to be substantially less. This is due to the residential component of the proposed development (60%) that will most likely have a high outbound component in the morning peak.

3.6 Existing Intersection Performance (SIDRA analysis)

The existing intersection of the Pacific Highway and the access road to Pelican Beach Resort and Nautilus Resort was assessed using SIDRA Intersection software for the morning and afternoon peak for the following stages:

- Existing – based on intersection counts (conducted 1 June 2006);
- Existing – based on 100% occupancy of all development;
- Post demolition of Pelican Beach Resort (2007);
- Following completion of Stage 1 (2008);
- Following completion of Stage 2 (2009);
- Following completion of Stage 3 (2010);
- Following completion of Stage 4 (2012); and
- Ten years following completion of the proposed development (2022).

For the purposes of this assessment, it has been assumed that the upgrade of the highway has not occurred.

The results of the SIDRA modelling are included in Appendix E. A summary of the results, with a particular emphasis on queue length is provided in Table 3.8 and Table 3.9.

Table 3.8 SIDRA Results Summary – AM Peak

	East Approach (Access Road to Nautilus Resort etc.)										West App (Campbells Close)					South App (Pacific Highway)				
	Left					Through / Right					Left / Through / Right					Right				
	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)
Existing – survey	18	0.105	23.6	B	2.8	8	0.907	767.2	F	23.0	7	0.695	594.3	F	16.4	25	0.102	31.9	C	3.0
Existing – 100% occupancy	57	0.334	28.4	B	10.1	26	1.000	521.8	F	30.9^	7	0.891	856.9	F	22.0	71	0.293	36.6	C	9.4
Post Demolition – 2007	34	0.213	27.2	C	6.0	16	1.000	673.7	F	30.9^	7	0.909	881.6	F	22.6	32	0.139	33.7	C	4.0
Stage 1 – 2008	46	0.313	31.9	C	9.1	21	1.000	727.7	F	30.9^	7	1.000	1139	F	28.3	40	0.188	36.2	C	5.5
Stage 2 – 2009	55	0.407	37.3	C	12.1	24	1.000	847	F	30.9^	7	1.000	1359	F	29.3	44	0.223	38.6	C	6.6
Stage 3 – 2010	61	0.492	43.7	D	15.0	27	1.000	1020	F	30.9^	7	1.000	1633	F	30.4	45	0.247	40.9	D	7.3
Stage 4 – 2012	69	0.671	64.5	F	21.8	30	1.000	1621	F	31.0^	7	1.000	2483	F	34.0	53	0.345	48.0	D	10.4
Future – 2022	69	1.000	312.8	F	58.9	30	1.000	63063	F	34.1^	7	1.000	68833	F	82.4	53	1.000	260.5	F	46.0

Notes:

^ Queue length exceeds short lane length of 10m. Actual queue length is likely to be longer.

Table 3.9 SIDRA Results Summary – PM Peak

	East Approach (Access Road to Nautilus Resort etc.)										West App (Campbells Close)					South App (Pacific Highway)				
	Left					Through / Right					Left / Through / Right					Right				
	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)
Existing – Survey	16	0.033	9.1	A	1.0	2	0.440	971.1	F	9.3	5	1.000	1321	F	24.8	20	0.032	21.1	B	1.0
Existing – 100% occupancy	49	0.101	9.5	A	3.1	6	1.000	912.9	F	30.9^	5	1.000	1522	F	28.0	53	0.085	23.7	B	2.8
Post Demolition – 2007	29	0.061	9.5	A	1.9	4	1.000	1653	F	25.8	5	1.000	1611	F	28.5	23	0.038	22.3	B	1.2
Stage 1 – 2008	39	0.085	9.9	A	2.6	5	1.000	1276	F	30.9^	5	1.000	2057	F	30.1	37	0.063	23.3	B	2.1
Stage 2 – 2009	44	0.100	10.3	A	3.0	6	1.000	1668	F	33.5^	5	1.000	2596	F	32.4	44	0.077	24.1	B	2.5
Stage 3 – 2010	45	0.106	10.7	A	3.2	7	1.000	2404	F	37.8^	5	1.000	3331	F	35.5	51	0.092	24.5	B	3.0
Stage 4 – 2012	54	0.137	11.5	A	4.1	8	1.000	4561	F	36.8^	5	1.000	5857	F	45.4	59	0.114	25.4	B	3.7
Future – 2022	54	0.220	18.6	B	6.6	8	1.000	*	F	32.7^	5	1.000	*	F	121.3	59	0.176	29.9	C	5.4

Notes:

^ Queue length exceeds short lane length of 10m. Actual queue length is likely to be longer.

* Delays exceed program's ability to provide result.

An interpretation of the results contained within Table 3.8 and Table 3.9 is provided below for each stage of the proposed development.

3.6.1 Existing – 100% Occupancy (2006)

Right-in and left-out movements to/from the access road perform satisfactorily in both morning and afternoon peak periods. However it is noted that during the morning peak moderate 95% back of queue length for the right-in and left-out approaches of 9.4 metres and 10.1 metres respectively occur. The latter effectively reduces the available deceleration distance from 150 metres to 140 metres.

According to Table 4.8.3 of the RTA's *Road Design* Guide the required deceleration length from 100 km/h to 0 km/h is 155 metres. Vehicles are required to decelerate to a stop as the effective stop rate is 1.0 (see SIDRA output in Appendix E). The reduced deceleration length due to queued vehicles means that motorists would be required to decelerate at a higher rate, or begin deceleration in the right (fast) lane on the northbound approach.

Substantial delays and queue lengths occur for vehicles attempting to turn right onto the highway or across the highway from the access road and those exiting Campbells Close. Site observations noted vehicles undertaking a two-stage movement by yielding in the central median, perpendicular to the direction of highway traffic, to wait for a gap in the opposite direction. This is extremely dangerous and carries potentially fatal consequences in the event of a crash. It is also noted that this was observed outside peak periods for highway traffic and at a time where overall occupancy rates were approximately 35%. Therefore it can be concluded that this type of driver behaviour would increase during peak periods.

3.6.2 Post Demolition (2007)

The demolition of the Pelican Beach Resort results in a substantial decrease in the traffic volumes turning at the intersection. Therefore a substantial decrease in the queue length for vehicles turning left out of the access road and right-in to the access road has occurred. However, due to a 3% increase in highway traffic volumes per year, delays and queue lengths have increased for through/right movements from the access road and for vehicles exiting Campbells Close.

3.6.3 Stage 1 (2008)

Queue lengths increase for all cross carriageway approaches, however these are lower than the existing situation for left out movements from the access road and right-in to the access road. Other queues increase, again due to the ongoing increases in highway traffic volumes.

3.6.4 Stage 2 (2009)

Queue lengths increase for the reasons given for Stage 1. The queue length for the left-out movement from the access road has increased in the morning peak and exceeds the queue length under the existing situation. This is due to the residential component of the proposed development which is likely to have a higher outbound proportion than that observed for the existing tourist land use. However, the 12.9 metre queue length is not considered excessive and does not impact on through highway traffic. It is noted that assuming the occupants of the residential component are semi-retired and retired (as per the planned marketing by the developers) then a reduced queue length would be expected in the morning peak.

The intersection model identifies extremely long delays for through/right movements from the access road and for vehicles exiting Campbells Close. These delays are caused primarily by the ongoing increase in highway traffic. This is supported by the fact that delays exiting Campbells Close have increased substantially without an increase to traffic using Campbells Close. In practice motorists would not tolerate such delays and would choose to accept reduced gaps to enter the traffic stream, increasing the likelihood of a crash occurring.

3.6.5 Stage 3 (2010)

Queue lengths and delay have increased, however the queue length for the right-turn lane into the access road is less than the existing morning peak and approximately equal to the existing afternoon peak. Delays from Campbells Close and through/right movements from the access road are particularly excessive, especially in the afternoon peak.

It is noted that the proposed timeline for the highway upgrade indicates that construction is due to be complete in 2011-12. Through highway volumes indicate the highway upgrade is definitely needed at this time, as evidenced by the large delays and queue length for vehicles attempting to perform cross-carriageway movements from side-roads.

3.6.6 Stage 4 (2012)

Queue length for the right-turn lane into the access road is higher than the existing situation in the morning and afternoon peak periods. High through traffic volumes effectively do not permit exit from Campbells Close or through/right movements from the access road. Access to/from Campbells Close would require restriction to ‘left-in, left-out only’ if the highway has not been upgraded.

3.6.7 Ten years Following Completion of Development (2022)

The intersection effectively fails to operate during morning peak. Left-out, right-in movements to the access road still operates satisfactorily during afternoon peak.

3.6.8 Summary

In summary, the intersection currently operates at a level of service F with considerable queuing on exit from the access road (through and left) and from Campbells Close. These results indicate that the intersection requires upgrading given the existing (pre-development) conditions. The demolition of the Pelican Beach Resort will result in a reduction of traffic flows and hence provide benefits, particularly to the queue length for the right turn into the access road and left turn out of the access road. However the 3% p.a. increase for highway traffic increases the queue length and delay for other cross-carriageway movements.

The staged development of the site results in progressive increases to queue lengths and delays. The queue length for the right turn lane into the access road does not equal the existing situation until 2010 for the afternoon peak. The queue length exceeds the existing situation for the morning and afternoon peaks in 2012. It is reiterated that this is following the planned completion of the highway upgrade. Hence the proposed development will not be detrimental to the performance of the intersection when compared to the existing situation; instead it will provide decreased traffic volumes in the years prior to the planned highway upgrade.

3.7 Future Intersection Performance (SIDRA analysis)

The future intersection of the proposed service road (existing highway alignment) and the access road to Pelican Beach Resort and Nautilus Resort was assessed using SIDRA Intersection software for the morning and afternoon peak for the following:

- 2012 assuming Pelican Beach Resort remains (100% occupancy for all developments); and
- 2012 assuming Pelican Beach Resort is replaced by the proposed development (100% occupancy for all developments).

3.7.1 Key Assumptions

The assessment has been based on a number of key assumptions, as detailed below.

Intersection Layout and Parameters

The intersection has been set-up in SIDRA based on the layout as shown in the Preliminary Concept Design contained in Appendix B as shown in Figure 3.6.

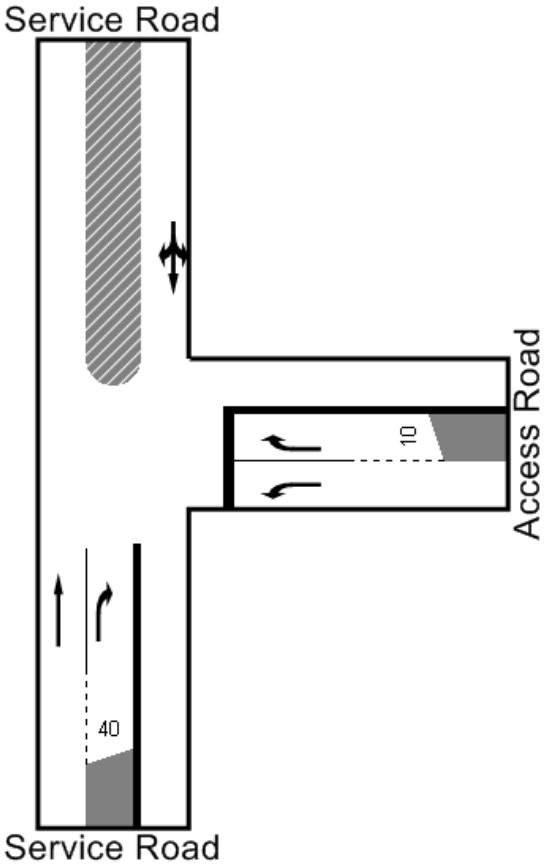


Figure 3.6 Future Intersection with Service Road

The intersection was set-up in SIDRA as follows:

East Approach (Access Road – servicing proposed development, residential apartments, Quality Resort Nautilus)

- One lane exit (it has been assumed line marking will restrict motorists to one lane on exit);
- Approach travel distance of left lane: 30 metres;
- Approach grade: 1% (slight uphill approach);
- Lane width: 2.8 metres;
- Approach speed: 30 km/h (low speed environment due to alignment);
- Exit speed to approach: 30 km/h (low speed environment due to alignment);
- Control: Stop (assumed based on geometry of intersection); and
- Heavy Vehicles: 1%.

North Approach (Service Road)

- Approach grade: -2% (slight downhill approach);
- Approach speed: 60 km/h (assumed service road speed limit);
- Exit speed to approach: 60 km/h (assumed service road speed limit);
- Approach travel distance: 500 metres;
- Control: Priority (through road); and
- Heavy Vehicles: 1%.

South Approach (Service Road)

- Approach speed: 40 km/h (reduced speed assumed due to proximity to intersection with highway);
- Exit speed to approach: 100 km/h (sign-posted speed limit of upgraded highway. Left out at highway with full acceleration lane proposed);
- Approach travel distance: 70 metres (approximate distance from intersection with highway);
- Control: Priority (through road); and
- Heavy Vehicles: 1%.

Intersection Performance (SIDRA Analysis)

The results of the SIDRA modelling are included in Appendix E. A summary of the results is provided in Table 3.10.

Table 3.10 SIDRA Results Summary – Future Intersection Performance

	East Approach (Access Rd to Nautilus Resort etc.)					South Approach (Service Road)				
	Left / Right					Right				
	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)	Dem Flow (veh/h)	Degree of Saturation	Average Delay (s)	Level of Service	95% Back of queue (m)
AM – Pre-development (2013)	84	0.092	8.4	A	3.2	67	0.060	8.8	A	1.9
AM – Post-development (2013)	99	0.106	8.3	A	3.8	48	0.043	8.8	A	1.3
PM – Pre-development (2013)	57	0.054	7.8	A	1.8	50	0.045	8.6	A	1.3
PM – Post-development (2013)	58	0.055	7.8	A	1.9	53	0.047	8.6	A	1.4

As show in Table 3.10 the intersection will operate at a level of service A in 2013. This will occur whether or not the proposed development proceeds.

3.8 Response to RTA Comments

The RTA provided comments to the Department of Planning in relation to the development application for the proposed development (RTA File No: 110.5395/N00815 06/1755). These comments with our response are provided in Table 3.11.

Table 3.11 Response to RTA Comments

RTA Comment	GHD Response
"This section of the Pacific Highway will be upgraded as part of the Coffs Highway Planning Scheme. The RTA can not guarantee that the current standard of the access will be provided in the future. Grade separated interchanges are planned at Split Solitary Road and Korora. Ultimately no right-turns will be permitted into and out of local connections between the interchanges."	Preliminary concept design in vicinity provided by RTA. We note that at-grade right-turn into future service road is being proposed as shown in the Preliminary Concept Design.
"The existing highway will be at capacity by 2011."	We agree with the RTA comment. Our SIDRA analysis at the existing intersection indicates that the highway capacity is governed by the at-grade intersections.
"If the proposed development proceeds prior to the upgrade of the highway it will be fully responsible to mitigate its impacts to the highway at no cost to the RTA."	We note this requirement, however SIDRA analysis indicates that the proposed development does not warrant upgrade to the intersection prior to the planned highway upgrade in 2011-12. The removal of Pelican Beach Resort will provide a reduction in traffic flows and associated benefits prior to the upgrade of the highway. However, the developer is prepared to formalise the two-lane exit to the access road (observed to operate as two-lane exit on site). As detailed below, the developer is also prepared to facilitate the erection of a bus stop and shelter.
"The traffic study indicates either a continuous centrally raised median/u-turn bays or seagull is required to manage right-turning traffic. Both these options will have an impact on Campbells Close."	This traffic assessment supersedes the previous Preliminary Traffic Study (GHD document number: 72374). The main cause of the excessive delays and queuing on the exit to Campbells Close and the through and right movements out of the access road to is the through highway volumes and not the contribution made by the proposed development. Due to intersection movement priorities and volumes, traffic exiting from Campbells Close does not appreciably increase queuing and delays for vehicles exiting the access road. However, it is noted that cross-carriageway movements from Campbells Close are an observed safety concern.

RTA Comment	GHD Response
"Existing left-turn deceleration and acceleration lanes out of the site will need to be upgraded to AUSTROADS standards."	As discussed with the RTA (meeting in Grafton 28/11/06), the existing left-in deceleration lane does not comply with RTA *Road Design Standards* because of site constraints, including property boundaries and terrain. A left-out acceleration lane is currently not provided. This is because of constraints including sight distance over a vertical crest and a cutting approximately 300 metres south of the intersection. The proposed development, while increasing some peak period traffic flows, will not increase overall traffic volumes because the proposed size of the development is less than the existing Pelican Beach Resort it replaces. Hence the upgrade of the deceleration lanes and acceleration lanes is not warranted by construction of the proposed development. Additionally, the construction of these lanes to match the existing alignment does not reflect the preliminary concept design for the highway upgrade. Hence rework in the area would be likely. Crash data assessed, as part of the Preliminary Traffic Study does not indicate an issue with the layout of the intersection. Therefore the current arrangement is assessed to perform satisfactorily.
"Further discussions are required to negotiate the traffic management arrangements and the standard of road works that will be required on the highway so they can be conditioned."	GHD and Attentus met with the RTA on 28 November 2006 to discuss the proposed development and the comments received from the RDC. It is understood that this report will be sufficient to permit the Regional Development Committee to consider the proposed development at its meeting scheduled on Friday 15 December, 2006.
"Consideration must be given to the management of school children's connection to buses. School children should not be permitted to cross a multi-lane highway in a 100 km/h area."	Discussions with Ryans Bus Service indicates that southbound buses (both regular service and school buses) set-down / pick-up just south of the existing intersection on the shoulder. Northbound school buses set-down at Campbells Close. The exact location is not known, however it is likely to be at the intersection with the highway. As previously discussed with the RTA, it is the bus service's responsibility to ensure safe locations for school bus stops. The RTA will negotiate school bus safety with bus operators.

RTA Comment	GHD Response
	The proposed development will be promoted to semi-retired and retired couples, therefore it is likely that only a small number of school-age children, if any, will reside in the development. However, it is noted that the developer proposes to fund the construction of a bus stop and shelter on the eastern side of the highway. Further consultation with the RTA will be required to ensure that its placement fits with the upgrade to the highway at this location.
"Provisions should be made for a shared public cycleway path through the development that connects to the existing or proposed network."	Connection to Coachmans Close to the south will be provided for pedestrians and cyclists. It is understood that this is sufficient to provide a link for a future cycleway.
"Public pedestrian access should be provided by easement or right-of-way to the beach."	A public right-of-way will be provided along the northern boundary of the site, providing pedestrian access to the beach.

4. Key Findings

The key findings of this study are:

- The existing intersection of the Pacific Highway / Campbells Close and the access road servicing Pelican Beach Resort and Nautilus Resort currently operates at level of service F. Substantial queue lengths occur for the right out movement from the access road and on exit from Campbells Close;
- Whilst onsite motorists were observed undertaking the right turn out of Campbells Close as two movements. Upon gaining an acceptable gap in the northbound traffic stream they would proceed to the centre median where they would wait for an acceptable gap in the southbound traffic. There is no hold bay or other facility within the median to facilitate this manoeuvre; hence this practice is very dangerous with potentially fatal consequences in the event of a crash;
- The results of the SIDRA analysis and site observations indicate that improvements to the existing intersection are warranted, independent of the proposed development;
- The Sapphire to Woolgoolga Upgrade Project is due for completion in this section in 2011-12;
- Following the demolition of the existing Pelican Beach Resort, traffic volumes in/out of the access road will decrease by approximately 60%. This results in substantially reduced queue lengths for right-in and left-out of the access road. Queue lengths for other movements generally increase due to increase in through highway volumes;
- The queue lengths for the right turn lane into the access road does not equal the existing situation until 2011 for the afternoon peak. The queue length exceeds the existing situation for the morning and afternoon peaks in 2013. It is reiterated that this is following the planned completion of the highway upgrade;
- The queue length from the access road and Campbells Close increase into the future primarily due to through highway traffic volumes increasing by 3% p.a. These queues do not affect the operation of the through highway traffic;
- Ryans Bus Service set-down / pick-up points are located on the grass verge immediately south of the intersection for southbound services and at the intersection with Campbells Close for northbound services. It is likely that school children living in Campbells Close cross the highway to catch the morning southbound services;
- The developer proposes to fund the construction of a bus stop and shelter on the eastern side of the highway. Further consultation with the RTA will be required to ensure that its placement fits with the upgrade of the highway at this location;
- Following the upgrade of the highway, the intersection of the highway and service road would have similar traffic volumes whether or not the proposed development proceeds;

- Following the upgrade of the highway, the intersection of the service road and access road would operate at level of service A in 2012 whether or not the proposed development proceeds; and
- Given the above, the proposed development would not result in a deterioration of the performance of the existing intersection of the Pacific Highway / Campbells Close and the access road from the existing peak situation prior to the planned highway upgrade in 2011. It is noted that the proposed development would actually reduce the turning traffic volumes at the intersection up to its completion in approximately 2012-13. Hence, no alteration to the layout of the intersection is warranted by the proposed development.

5. Recommendations

Recommendations for upgrade works as a result of the proposed development are contained in Table 5.1.

Table 5.1 Recommended Upgrade Works

Year	Description of Recommended Works	Responsible Party
2007 (prior to demolition works)	Traffic Control Plan (TCP) prepared for construction phase works	Developer
2008 (prior to completion of Stage 1 of proposed development)	Bus stop and shelter provided on eastern side of highway	Developer (in consultation with RTA, Coffs Harbour City Council and Ryans Bus Service
2008 (prior to completion of Stage 1 of proposed development)	Formalisation of two lane exit to access road (though linemarking)	Developer
2011-12	Construction of highway upgrade	RTA

6. References

GHD Pty Ltd “Report on Sapphire Beach Development, Preliminary Traffic Study (August 2006)” (GHD Document Number: 72374)

Northern Transport Planning and Engineering Pty Ltd “Pacific Highway / Moone Beach Road, Intersection Analysis (October 2005)”

Samsa Consulting “Pacific bay Resort Development, Road Network and Traffic Assessment”

Appendix A

Proposed Development

Landscape Masterplan

Open Space & Pedestrian Circulation

Visitor Car Parking & Bus Access/Stops

LEGEND

- start of link to “Coastal Walk” (including signage & seating areas)
- link along public easement to “Coastal Walk”
- resting locations along link to “Coastal Walk” (including level area & seating)
- public picnic & seating area
- “Coastal Walk” signage
- “Coastal Walk”
- link to Coachmans Close
- central pedestrian spine & link to beach
- resting location along central path (including level area & seating)
- communal parkland & recreation facilities
- secondary pathways & walking circuits
- link to beach access & parkland pathway
- beach access

Scale

metres 0 5 10 15 20 25

Sapphire

SK.02 Open Space & Pedestrian Circulation