4. Impact Assessment

4.1 Site Access Arrangements

Entry to the Site is provided at two locations. One access will be from Bruxner Park Road and one from West Korora Road. It is assumed that the entry from Bruxner Park Road would be the main access as most of main roads within the internal road network are linked to that access road connecting to Bruxner Park Road. It is assumed that 70% of traffic will use Bruxner Park Road and 30% will use West Korora Road.

Table 6 is further refined to indicate the distribution of inbound and outbound traffic on the two access intersections with the Pacific Highway. The expected volumes are shown in Table 7.

Table 7 Inbound and Outbound Traffic at the Pacific Highway

	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Percent of trips	20%	80%	80%	20%
Vehicle trips per hours	23	90	90	23
Bruxner Road / Pacific Highway	16	63	63	16
West Korora Road / Pacific Highway	7	27	27	7

4.2 Future Intersection Operation

4.2.1 Development Traffic

As indicated, the Site is expected to generate a maximum of approximately 113 vehicle trips in the peak with 79 vehicle trips through the intersection of Bruxner Road with the Pacific Highway and 34 vehicle trips through the intersection of West Korora Road with the Pacific Highway. Note that no reduction has been applied for internal trips within the development. Considering that there are no existing public transport services and future services are still to be arranged, it is very likely that public transport mode share will be minimal in the short to medium term. Therefore, no reduction has been assumed and hence, this assessment considers for the “worst-case scenario”.

4.2.2 Forecast Traffic on the Pacific Highway

Examination of historical traffic volume data from the RTA for the Pacific Highway gives an annual traffic growth of 5% near the Coffs Harbour city centre and 2.8% further north towards Woolgoolga. It would deemed reasonable to assume that peak hour traffic on the Pacific Highway can potentially grow at average rate equivalent to 3.5 % per annum based on previous data and current trends to traffic. Hence,

for this assessment, the intersection analyses takes into account anticipated future growth in the existing traffic.

The traffic counts conducted for Pacific Highway at the Bruxner Park Road intersection as part of this study recorded a peak volume of 718 vehicles in the northbound approach and 1700 vehicles on the southbound approach during the AM peak and 1466 vehicles in the northbound approach and 766 vehicles on the southbound approach during the PM peak. Inbound traffic using that access in the AM peak will increase traffic on the northbound approach of Pacific Highway by approximately 10 vehicles and 4 vehicles on the southbound approach. While for the PM peak, inbound traffic will increase traffic on the northbound approach by 57 vehicles and on the southbound approach by 6 vehicles. The traffic forecasts for the Pacific Highway are shown in Table 8 and Table 9 below.

Table 8 Traffic Forecast for Pacific Highway at Bruxner Park Road, AM Peak

Pacific Highway@ Bruxner Park Road	2008	2010		2015		2018	
	W/out Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev
NB Lane	718	769	779	913	925	1013	1026
SB Lane	1700	1821	1825	2163	2168	2398	2403

Table 9 Traffic Forecast for Pacific Highway at Bruxner Park Road, PM Peak

Pacific Highway@ Bruxner Park Road	2008	2010		2015		2018	
	W/out Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev
NB Lane	1466	1570	1627	1865	1933	2068	2143
SB Lane	766	821	827	975	982	1081	1088

The traffic counts conducted for Pacific Highway at the West Korora Road intersection as part of this study recorded a peak volume of 707 vehicles in the northbound approach and 1937 vehicles on the southbound approach during the AM peak and 1436 vehicles in the northbound approach and 799 vehicles on the southbound approach during the PM peak. Inbound traffic using that access in the AM peak will increase traffic on the northbound approach of Pacific Highway by approximately 3 vehicles and 8 vehicles on the southbound approach. While for the PM peak, inbound traffic will increase traffic on the northbound approach by 18 vehicles and on the southbound approach by 8 vehicles. The traffic forecasts for the Pacific Highway are shown in Table 10 and Table 11 below.

Table 10 Traffic Forecast for Pacific Highway at West Korora Road, AM Peak

Pacific Highway@ West Korora Rd	2008	2010		2015		2018	
	W/out Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev
NB Lane	707	757	760	900	903	997	1001
SB Lane	1937	2075	2083	2464	2474	2732	2743

Table 11 Traffic Forecast for Pacific Highway at West Korora Road, PM Peak

Pacific Highway@ West Korora Rd	2008	2010		2015		2018	
	W/out Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev
NB Lane	1436	1538	1556	1827	1848	2026	2049
SB Lane	799	856	865	1017	1027	1127	1139

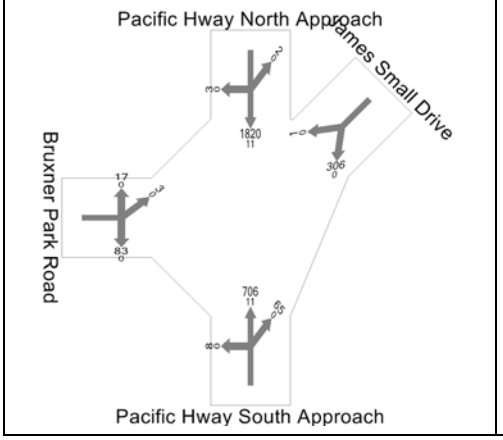
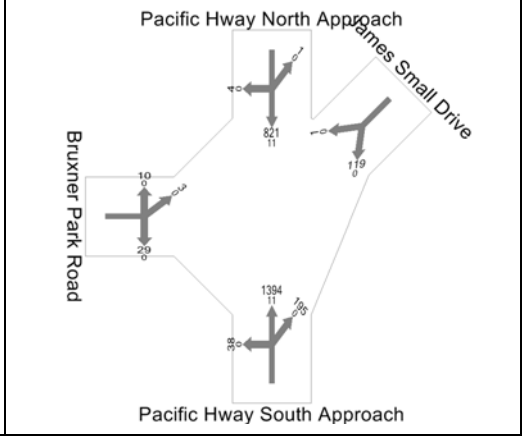
4.2.3 Bruxner Park Road / Pacific Highway Intersection Analysis

With the development traffic and the forecast traffic volumes on Pacific Highway, an assessment of the intersection was undertaken using SIDRA Intersection. The existing operational performance of the intersection suggests that improvement measures should be in place in order to accommodate traffic accessing the Pacific Highway from Bruxner Park Road. The associated delays to vehicles approaching the intersection from Bruxner Park Road indicate that with the yield/give way control, any additional traffic would experience lengthy delays before being able to turn onto the Pacific Highway. It is suggested that signalisation be considered as an option to improve the operational performance at the intersection. The intersection was assessed for the AM peak and PM peak for 2010, 2015 and 2018. Year 2010 is assumed as the opening year of the development.

For the assessment, geometric improvements to the Bruxner Park Road approach to the intersection have been assumed. The Bruxner Park Road approach considered in the assessment provides for a 100-m right turn lane, a through lane and a 50-m left turn lane. Two exit lanes have been assumed in the westbound direction. No changes to the configuration of the Pacific Highway or James Small Drive have been considered.

The future turning volumes at the intersection were initially calculated for 2010 incorporating forecast traffic on the Pacific Highway, James Small Drive and Bruxner Park Road. The volumes are shown in Figure 7.

Figure 7 2010 Future Peak Traffic Volumes

2010 AM Peak Hour Volumes	2010 PM Peak Hour Volumes
	

The 2010 traffic volumes were projected to estimate 2015 and 2018 turning volumes. It is assumed that the same directional split from each of the approaches will remain the same and the traffic growth rate of 3.5% per annum was applied across all legs. No improvements to the intersection have been assumed beyond 2010.

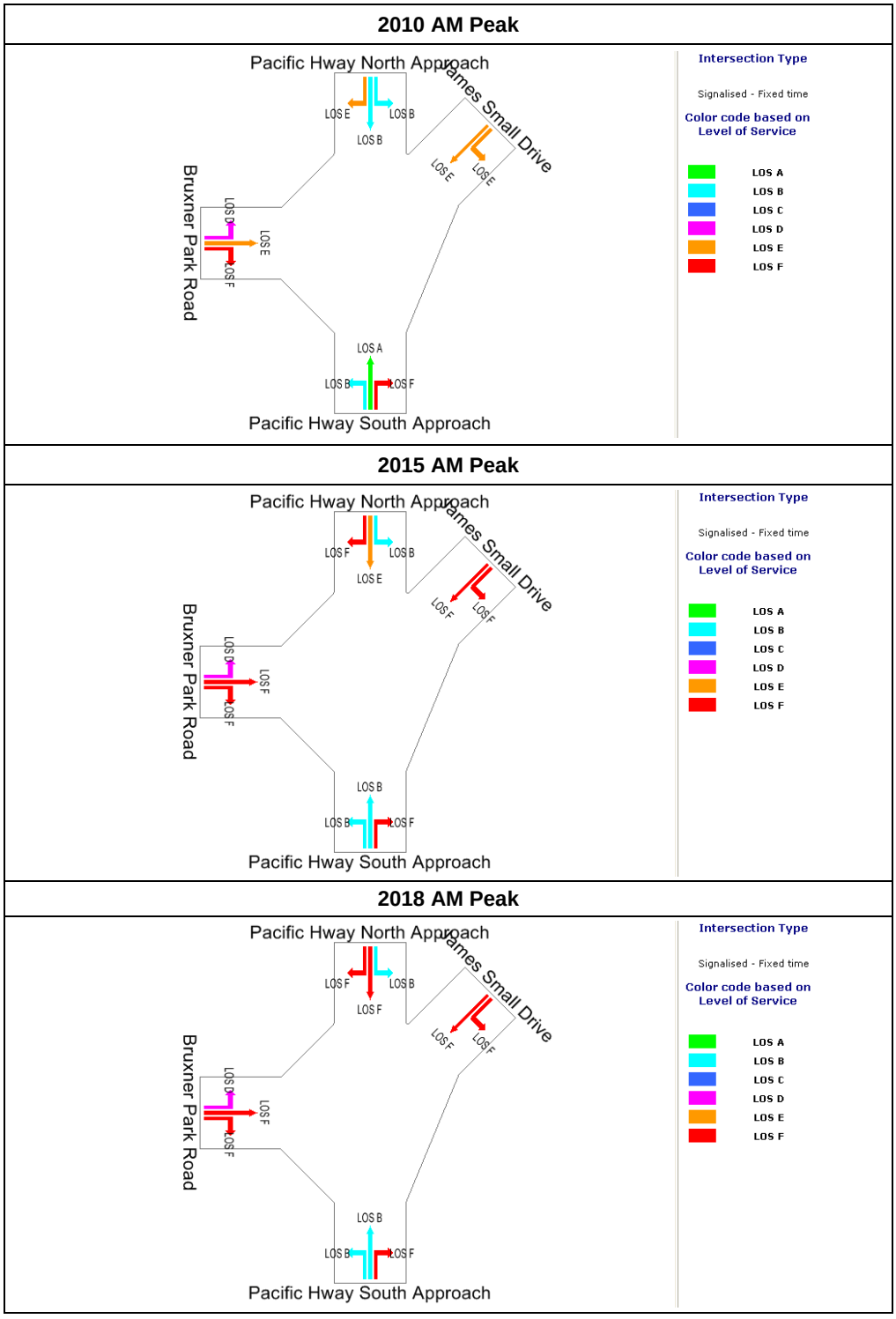
The results of the SIDRA analysis for the Bruxner Park Road / Pacific Highway intersection for the AM peak and PM peak are given in Table 12.

Table 12 Bruxner Park Road / Pacific Highway Intersection, AM peak/PM Peak

Intersection	2010		2015		2018	
	LoS	Average Delay (Seconds)	LoS	Average Delay (Seconds)	LoS	Average Delay (Seconds)
AM Peak	B	26.3	D	52.1	F	128
PM Peak	B	24.5	B	27.8	C	30.8

It is apparent from the table above that further improvements to the intersection should be considered to cater to the future AM Peak traffic beyond 2015. The level of service for each flow direction presented in Figure 8 identifies critical flow movements at the approaches.

Figure 8 Bruxner Park Road / Pacific Highway Operational Performance, Level of Service, AM Peak



From the above, it is evident that improvements on the Pacific Highway will have to be considered to order to improve the operational performance of the intersection.

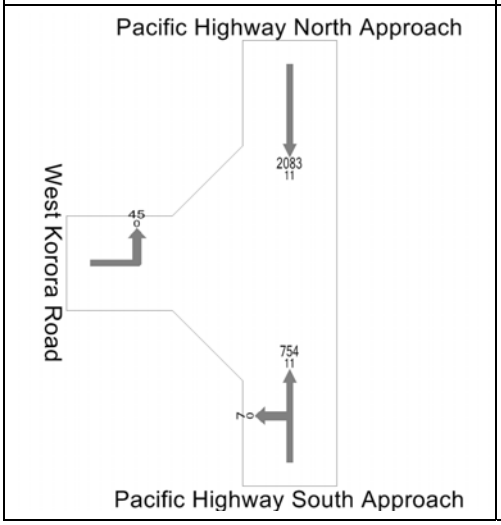
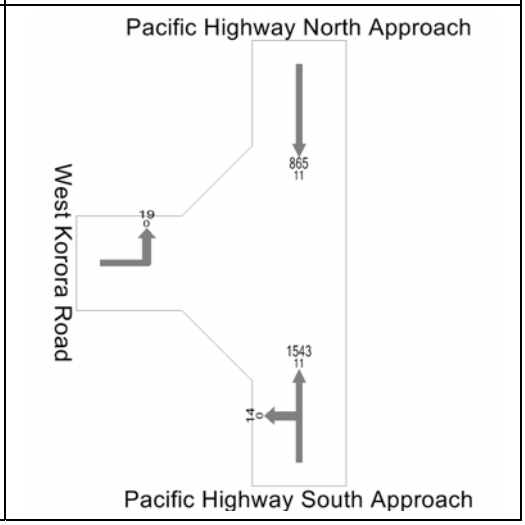
4.2.4 West Korora Road / Pacific Highway Intersection Analysis

Similarly, an assessment of the intersection was undertaken using SIDRA Intersection Analysis. The existing operational performance of the intersection suggests that improvement measures should be in place in order to accommodate traffic accessing the Pacific Highway from West Korora Road. The associated delays to vehicles approaching the intersection from West Korora Road indicate that with the yield/give way control, any additional traffic would experience lengthy delays before being able to turn onto the Pacific Highway. Previous discussions with the RTA have taken place and the option identified is the future closure of the median resulting in a left-in and left-out operation with West Korora Road to improve the operational performance at the intersection. This option was initially tested with the base 2008 volumes and the results indicated that the intersection will operate satisfactorily and will improve the level of service for the approach from West Korora Road. The intersection was further assessed for the AM peak and PM peak for 2010, 2015 and 2018. Year 2010 is assumed as the opening year of the development.

For the assessment, the existing approach layout from West Korora Road is assumed.

The future turning volumes at the intersection were initially calculated for 2010 incorporating forecast traffic on the Pacific Highway and West Korora Road. The volumes are shown in Figure 9.

Figure 9 2010 Future Peak Traffic Volumes

2010 AM Peak Hour Volumes	2010 PM Peak Hour Volumes
	

The 2010 traffic volumes were projected to estimate 2015 and 2018 turning volumes. It is assumed that the directional split from each of the approaches will remain the same and that the traffic growth rate of 3.5% per annum applies across all legs. No improvements to the intersection have been assumed beyond 2010.

The results of the SIDRA analysis for the West Korora Road / Pacific Highway intersection for the AM peak and PM peak are given in Table 12.

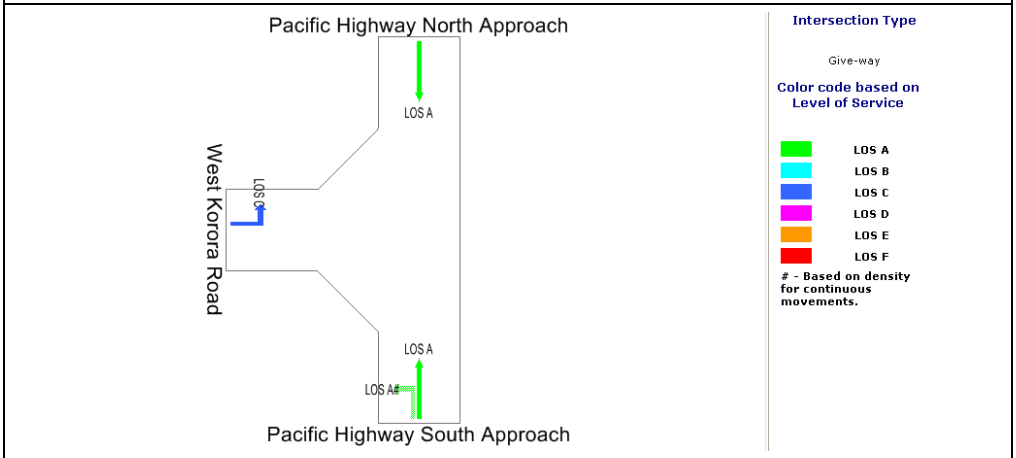
Table 13 West Korora Road / Pacific Highway Intersection, AM peak/PM Peak

Intersection	2010		2015		2018	
	LoS	Average Delay (Seconds)	LoS	Average Delay (Seconds)	LoS	Average Delay (Seconds)
AM Peak	A	13.5	B	15.6	B	17.4
PM Peak	C	33.6	E	60.8	F	109.6

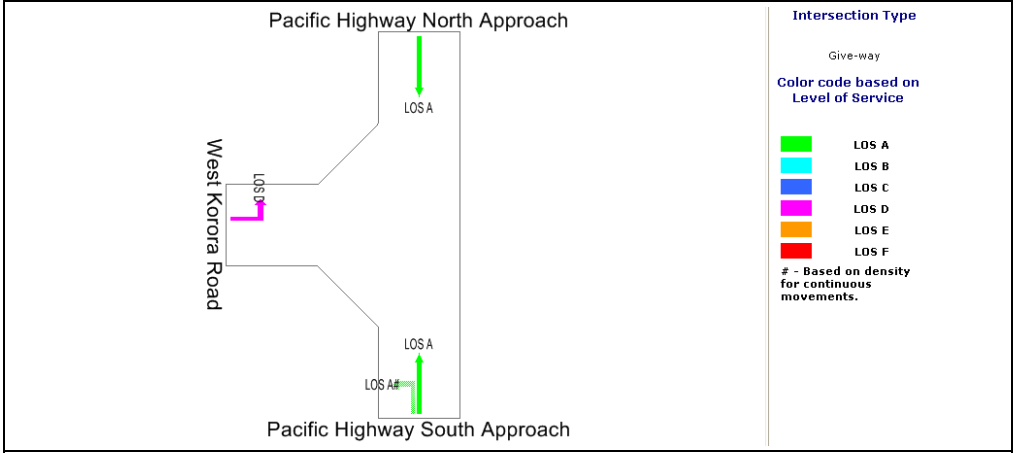
It is apparent from the table above that with the existing configuration, the operational performance of the intersection is expected to deteriorate by 2015 owing to the left turn movement limitations from West Korora to find gaps to merge on the Pacific Highway. Option 1 of adding an approach lane would improve the level of service in 2015 to "D" and suffice for 2015 traffic volumes. However, the level of service for the 2018 will remain at "F". Further tested was Option 2 which entails the provision of a continuous slip lane from West Korora turning left at the Pacific Highway and adding a 100-m turn slot exit lane to provide sufficient distance for merging. This Option 2 configuration improves the level of service to "A". Further improvements to the intersection should be considered to cater for the future AM Peak traffic beyond 2015. The level of service for each flow direction presented in Figure 8 identifies critical flow movements at the approaches.

Figure 10 West Korora Park Road / Pacific Highway Intersection Operational Performance, Level of Service, PM Peak

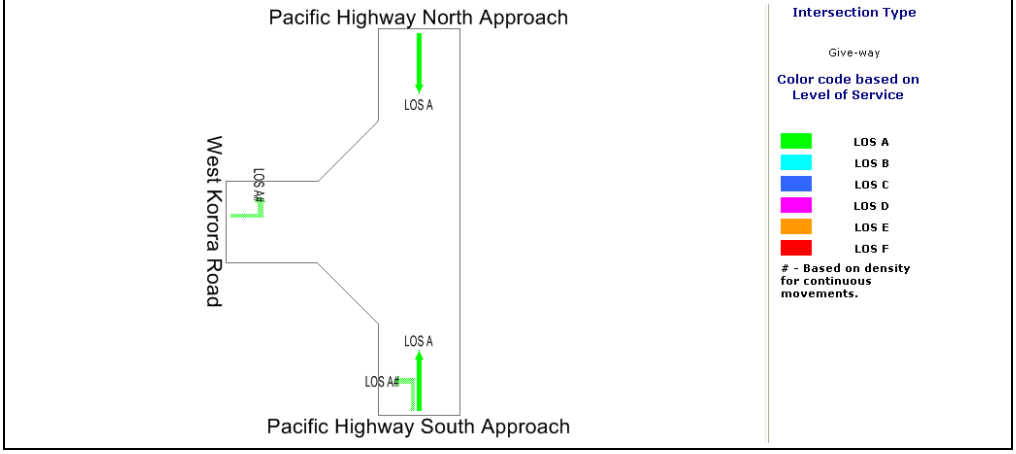
2010 PM Peak (with existing configuration)



2015 PM Peak (with an additional approach lane)



2018 PM Peak (with a continuous slip lane)



4.2.5 West Korora Road / Pacific Highway Intersection Analysis, including Future Traffic from North Coffs Release Area

Following advice from Council, it is anticipated that West Korora Road will also serve as main access for the North Coffs Release Area. This area is comprised of a total of 34 hectares for the proposed development located south along West Korora Road and including the 7.7 hectares of the Big Banana site. Information provided by Council indicated that an estimate of approximately 340 lots will have to be serviced by the West Korora Road.

As no timeframe for the development has been provided, it is assumed for the purpose of this assessment that full development of this area is likely to occur by 2015.

For this scale of development, assuming all 340 lots are single-detached residential units, the associated peak hour traffic translates to an additional 289 vehicle-trips.

Assuming the same directional split of inbound and outbound traffic for the AM peak and the PM peak, the following additional trips are expected to be generated by the North Coffs Release Area.

Table 14 Directional Split of Peak Hour trips

	AM Peak		PM Peak	
	Inbound	Outbound	Inbound	Outbound
Percent of trips	20%	80%	80%	20%
Vehicle trips per hours	58	232	232	58

Inbound traffic using that access in the AM peak will increase traffic on the northbound approach of Pacific Highway by approximately 41 vehicles and 17 vehicles on the southbound approach. While for the PM peak, inbound traffic will increase traffic on the northbound approach by 162 vehicles and on the southbound approach by 17 vehicles.. Hence, the traffic forecasts for the Pacific Highway at West Korora Road intersection is recalculated and shown in Table 15 and Table 16 below.

Table 15 Traffic Forecast for Pacific Highway at West Korora Road with development of North Coffs Release Area, AM Peak

Pacific Highway@ West Korora Rd	2008	2010		2015		2018	
	W/out Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev
NB Lane	707	757	760	900	944	997	1047
SB Lane	1937	2075	2083	2464	2491	2732	2762

Table 16 Traffic Forecast for Pacific Highway at West Korora Road with development of North Coffs Release Area, PM Peak

Pacific Highway@ West Korora Rd	2008	2010		2015		2018	
	W/out Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev	W/out Dev	W/ Dev
NB Lane	1436	1538	1556	1827	2010	2026	2229
SB Lane	799	856	865	1017	1044	1127	1158

From the analysis in Section 4.2.4, it shown that any additional traffic generated by other proposals and above what has been assessed for this development will require improvements to the intersection configuration. With the anticipated traffic from the development of the Pacific Bay Western Lands and the additional traffic from the North Coffs release, Option 2 configuration was initially tested for intersection operational performance. Option 2 provides a continuous slip lane on West Korora Road turning left at the Pacific Highway and a 100-m turn slot exit lane to provide sufficient distance for merging. The results showed that this intersection configuration will operate satisfactorily even with the additional traffic.

4.3 Future Road Link – Coffs Harbour Bypass

The Coffs Harbour Highway Planning Strategy (CHHPS), launched in September 2008 addresses the need to upgrade the Pacific Highway between Sapphire and Woolgoolga while planning for the future traffic needs within the Coffs Harbour urban area. Planning for the CHHPS was part of the 10-year Pacific Highway Upgrading Program funded by the NSW Government from 1996 to 2006. The CHHPS has been developed by the Roads and Traffic Authority (RTA) in consultation with other government agencies, Coffs Harbour City Council (CHCC) and the community. The study area for the CHHPS has been split into two sections as follows:

- Northern (Sapphire to Woolgoolga upgrade) section; and
- Southern (Coffs Harbour bypass).

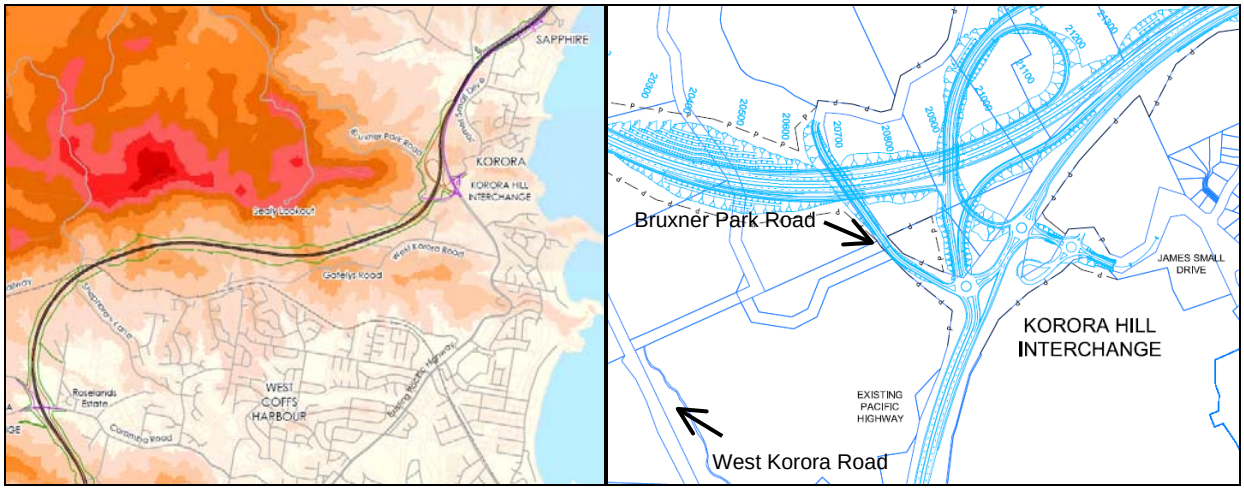
The Coffs Harbour Bypass proposal includes an upgrade of the existing arterial style dual carriageway highway between Korora Hill and the southern end of the Sapphire to Woolgoolga upgrade project to motorway (Class M) standard. Entry and exit to and from the bypass is limited to grade separated interchanges at key locations. These interchange facilities would provide for access to/from the proposed highway, the existing Pacific Highway and/or the local road network. The concept design provides for a total of three interchanges, as follows:

- Southern interchange at Englands Road;
- Central interchange at Coramba Road; and
- Northern interchange at Korora Hill.

It is noted that the northern interchange will have an impact on the future traffic movements forecasted for the proposed Pacific Bay Western Lands since it sits right at the northern boundary of the proposed development and will significantly alter the access connections to the Bruxner Park Road.

The northern interchange at Korora Hill will consist of loading and unloading ramps interacting with existing intersections at James Small Drive and Bruxner Park Road and the proposed local access road through Korora. The proposed layout of the interchange includes a roundabout connecting the northbound unloading ramp and a relocated James Small Drive to the proposed local access road; and a roundabout connecting the north facing ramps to the existing highway south of the interchange, inclusive of connections to the new local access road and to Bruxner Park Road. An optional slip lane for the proposed local access road through the primary roundabout at Bruxner Park Road. This is shown in Figure 11.

Figure 11 Coffs Harbour Bypass and proposed Korora Hill Interchange



It is anticipated that with the Coffs Harbour Bypass there will be a diversion of existing through traffic from the Pacific Highway to the Coffs Harbour Bypass, improved intersection performance at the Bruxner Park Road with the Pacific Highway and improved access connections to the local access roads in the Korora area.

A left-in left-out configuration at the intersection of West Korora Road and the Pacific Highway does not allow for eastbound vehicles on West Korora Road to travel south. However, the provision of a roundabout at the Bruxner Park Road will allow vehicles from the West Korora Road to turnaround and travel in the southbound direction. It is also noted that additional vehicles from West Korora Road may also take the future collector road through the development and join the Pacific Highway from the Bruxner Park Road.

4.4 Pedestrians and Cyclists

The internal roads within the residential development should be connected to the existing road network without compromising pedestrian and cycle access or creating diversions. As there are no established pedestrian and cycle paths in the regional network, appropriate linkages should be identified for future potential development.

To assist in the promotion of sustainable transport modes, and design of public transport routes, opportunities should be developed to ideally reduce walking distances to bus stops and/or encourage cycling within the Site.

5. Conclusions

The proposed development is mainly expected to impact on the access intersections with the Pacific Highway, notably Bruxner Park Road and West Korora Road. The analyses show that the existing intersections will not operate satisfactorily if the existing intersection controls are to remain the same.

With the yield/give way intersection control currently operating at the intersection of Bruxner Park Road with the Pacific Highway, the existing traffic volumes (albeit very minimal) at the intersection are already experiencing considerable delays in finding gaps to enter the traffic flow along the Pacific Highway. Traffic volumes along the Pacific Highway are already considered high in terms of the nominal capacity provided by the highway. It is concluded that in order for the intersection to accommodate future traffic from the proposed development, it will be necessary introduce improvements to the intersection control by signalisation.

For the assessment, geometric improvements to the Bruxner Park Road approach to the intersection have been assumed. The approach layout considered in the assessment provides for a 100-m right turn lane, a through lane and a 50-m left turn lane. Two exit lanes have been assumed in the westbound direction. No changes to the configuration of the Pacific Highway or James Small Drive have been considered.

The SIDRA analysis has indicated that the above changes will suffice for traffic volumes projected up to 2015 and further improvements will be required on the Pacific Highway by 2018.

For the intersection of West Korora Road with the Pacific Highway, the results of the SIDRA Analysis show that a left-in/left-out configuration will improve the operation at the intersection. However, the operational performance of the intersection is expected to deteriorate by 2015 owing to the left turn movement limitations from West Korora Road in terms of sufficient gaps for vehicles to merge on the Pacific Highway. Adding an approach lane would improve the level of service in 2015 to “D” and suffice for 2015 traffic volumes. However, the level of service for the 2018 will remain at “F”. Further tested was the provision of a continuous slip lane from West Korora turning left at the Pacific Highway and adding a 100-m turn slot exit lane to provide sufficient distance for merging. This new configuration will improve the level of service to “A”.

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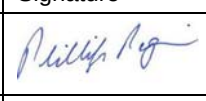
Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
2	S Manahan	M Lyons	*M Lyons*	Phillip Pigram		Mar 09