13. Traffic and Transport

Traffic and transport impacts arising from the proposed development have been assessed in accordance with standard Traffic Impact Assessment procedures. The analysis described in this Section includes identification of external road network impacts for both construction and operational cases, link and intersection impacts, access, parking and circulation. The Section also discusses pedestrian and cyclist issues, as well as more general safety and efficiency aspects.

13.1 Surrounding Road Network and Transport Modes

13.1.1 Road Network

The primary traffic carrying route in the vicinity of the site is Shute Harbour Road. This is a declared road under the jurisdiction of the Department of Main Roads (DMR), and is identified as a 'Main Road' (Proserpine-Shute Harbour Road, no. 851) in the State Road Hierarchy. It currently carries approximately 13,000 vehicles per day (vpd) in Cannonvale and Shute Harbour, with an average of just over 5 % heavy vehicles (including buses).

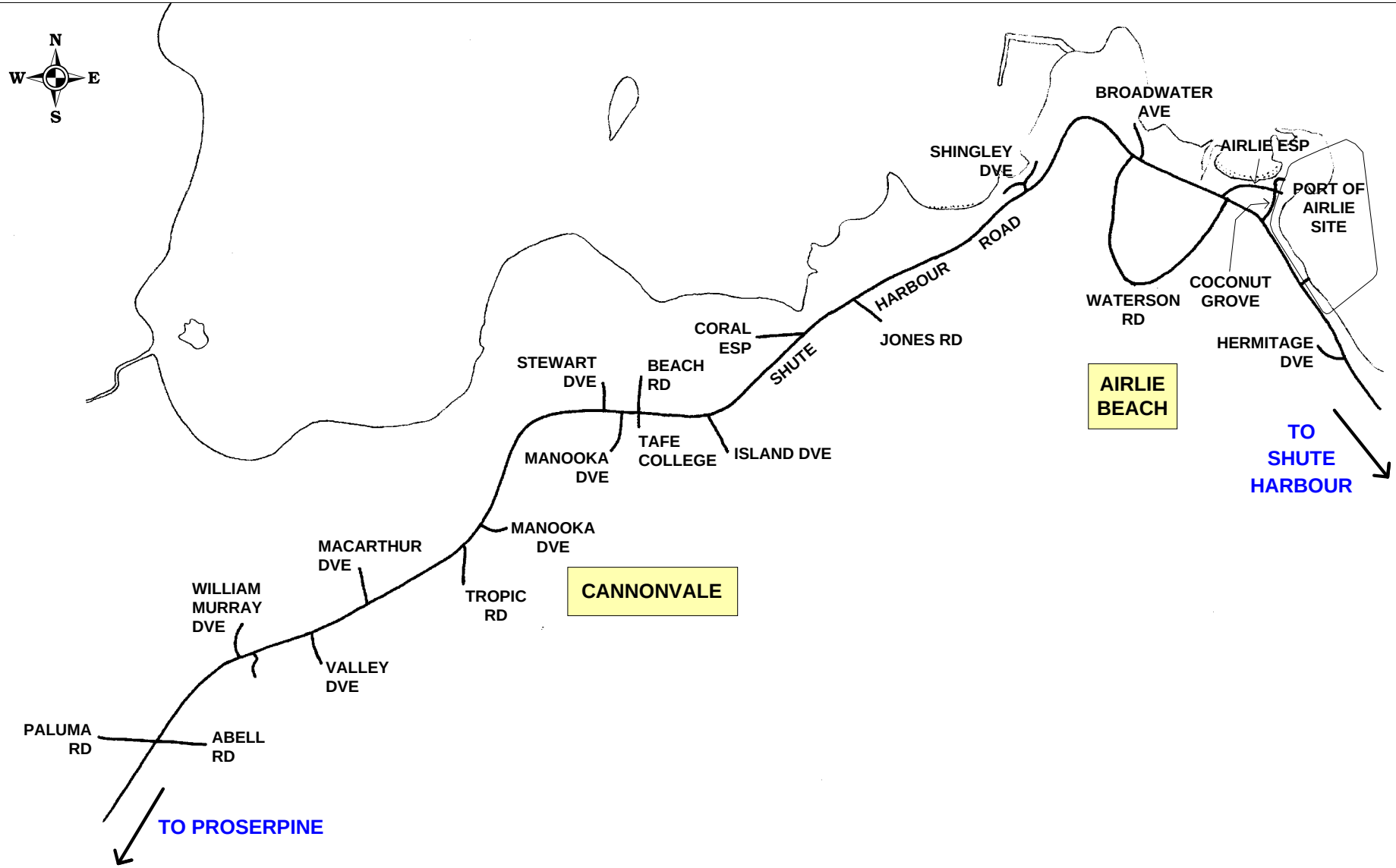
Shute Harbour Road is a two-lane two-way undivided road with a wide carriageway 13 to 14 metres (including shoulders) west of the site. This accommodates parallel parking on both sides in central Airlie as well as manoeuvring room to pass propped right turners at intersections, although turning lanes are generally not marked. Along the development site frontage, the carriageway narrows to approximately 10 metres at the eastern end, with two 3.5 metre running lanes.

At present, all intersections along Shute Harbour Road in the study area are under priority control (for example, 'give way' signage). Future intersection configurations are not yet known, but it is understood that the Whitsunday Shire Council and the Department of Main Roads both prefer roundabout control of intersections to traffic signals in this area, for reasons including visual impact, town atmosphere, and efficient maintenance.

A new 'loop road' has recently been constructed extending Waterson Road across Airlie Creek and north to Shute Harbour Road via the former Harper Street. This provides an alternative route for through traffic bypassing the heart of the Airlie Beach tourist precinct. Recent counts indicate that it is not yet attracting significant through traffic, with daily flows of approximately 2,400 vpd, although at over 8 % of daily traffic the heavy vehicle usage is quite high for this area. At present, Waterson Road remains under the jurisdiction of the Whitsunday Shire Council.

The Port of Airlie site also has frontage to Coconut Grove and can achieve direct access to Airlie Esplanade at its eastern end. These are local streets, under the jurisdiction of the Whitsunday Shire Council, which currently carry approximately 2,000 vpd. (These streets do have a significant transport function, however, with the Airlie Beach Bus Terminal accessed via Airlie Esplanade.)

The site location in relation to the surrounding road network is shown diagrammatically in **Figure 13-1**.



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Site Location

FIGURE 13.1

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13.1.2 Transport Modes

The Airlie Beach Bus Terminal near the Whitsunday Sailing Club serves long distance coaches from Brisbane and Cairns, and transfer services such as minibuses, taxis and cars which deliver or collect coach passengers.

The terminal is currently used by 15 long distance coaches per day from the two major private operators, Premier Motor Service and McCaffertys / Greyhound Pioneer. Most of these are Brisbane - Cairns services, but McCaffertys also runs daily services to and from Cairns which terminate in Airlie Beach. None of the long distance services continue east towards Shute Harbour.

Local bus services are provided by Whitsunday Transit, which runs half-hourly services between Cannonvale and Shute Harbour along Shute Harbour Road as well as night-time routes in Cannonvale and Airlie Beach which travel via Airlie Esplanade.

Other shuttle buses and minibuses associated with tourist accommodation and attractions play a significant role in transport in the area. A 1995 survey conducted in central Airlie, described in the 1997 Veitch Lister Consulting (VLC) document *A Draft Final Report Covering the Development of Mobility Plans for Airlie Beach and Proserpine*, found that minibuses comprised 3.3 % of the daytime traffic flow on Shute Harbour Road, and 71% of total bus numbers.

Of particular significance for this development are the shuttle services delivering tourists to their accommodation upon arrival in the region. This includes visitors arriving via long distance coach or by air to the Whitsunday Coast Airport near Proserpine. Whitsunday Transit also provides coach transfers between Mackay Airport and Airlie Beach, meeting the daily Virgin Blue budget flights.

Minibuses also provide access to the Whitsunday-Shute Harbour Airport in Flame Tree, approximately 3½ km east of the development site. The airport provides small plane facilities for sightseeing flights and connections to Lindeman and Hamilton Islands (although direct longer-distance flights into Hamilton Island Airport account for the majority of air arrivals for the island resorts).

Also significant for this development are the frequent buses connecting with waterborne services at Shute Harbour. The land side mode split at Shute Harbour includes a particularly high share to these connecting bus services, because the cost of the bus transfer is often included in the price of the ferry or cruise ticket.

The ferry terminal at Shute Harbour houses several operators running ferry, cruise or charter services to the Whitsunday Islands. These include both tourist and supply delivery services to the island resorts. The major operator, Fantasea, carries approximately 1,200 ferry and cruise passengers per day on a typical tourist season weekday, and estimates that this accounts for 80% of the Shute Harbour total.

Taxi services in Airlie Beach and surrounding areas are provided by 'Taxis Whitsunday'. There are currently taxi ranks in central Airlie just east of Airlie Creek, at the Whitsunday Shopping Centre in Cannonvale, and at the Shute Harbour ferry terminal.

The 1996 *Whitsunday Tourism Strategy* reported that in 1992 (the latest year for which data is readily available) approximately 13 % of tourists arrived in the Whitsunday region by coach, although this was expected to gradually decline to just over 10 % by 2005. In contrast, air passengers accounted for over 37 % of arrivals in 1992, and this was expected to rise to 56 % over that period.

It is also notable that arrivals by car (private or rental) accounted for approximately 48 % of arrivals in 1992, and that this was expected to fall considerably to 32 % by 2005. Only 5 % of total arrivals were by rental vehicle, and although the number of visitors who hire cars after arriving for use during their stay is unknown it is expected to be relatively low due to the ready accessibility of tourist attractions by other modes, particularly bus and minibus. This reinforces VLC's observation in their 1997 report that less than half of the visitors to Airlie Beach had access to a private car.

Non-motorised modes, including pedestrians and cyclists, are significant for shorter distance trips. Particularly in central Airlie Beach, pedestrian numbers are high. VLC's 1996 *Shute Harbour Road Concept Report* quoted a recent survey revealing approximately 9200 pedestrians crossing Shute Harbour Road between Broadwater Avenue and Coconut Grove during the twelve hour daytime period from 6 am. Approximately 60 % of this demand occurred west of Airlie Creek, with only 12 % east of Airlie Esplanade. Evening pedestrian activity is also expected to be significant in this area, which features a number of dining and entertainment venues.

13.2 Background Traffic Volumes and Future Growth

Traffic volumes for the 'background' case (without the proposed development) have been derived from intersection and link count data provided by the Department of Main Roads, Mackay District. The base data used is quite recent, with most intersection counts in central Airlie conducted in 2002 and only one survey (at Shute Harbour Road / Island Drive, Cannonvale) prior to the year 2000 (in this case 1998). Link volume data on Shute Harbour Road through the study area and hourly, daily and weekly variation factors for the permanent counter near Cannonvale were available up to the end of the year 2001.

Based on the overall 7 year construction period envisaged, with an allowance for pre-construction lead time, the analysis years applicable for this study are 2010 (the year of opening of the final components of the development) and 2020 (the ten year design horizon).

Background traffic volumes have been forecast using an average growth rate of 6.0 % per annum as specified in the Terms of Reference. Discussions with Main Roads indicate that this is considered reasonably conservative with 5 % p.a. suggested as adequate for Shute Harbour Road generally and 3 % p.a. more likely for the sections east of the Airport in Flame Tree.

Forecast volumes in central Airlie have been manually redistributed to suit the anticipated major road network, by identifying 'through traffic' in central Airlie and assigning it to the appropriate major route or routes as the network changes. The network changes also affect certain local access routes which have been similarly adjusted.

The recently completed Loop Road which has extended Waterson Road across Airlie Creek and north to rejoin Shute Harbour Road opposite Airlie Esplanade, via what was previously known as Harper Street, is intended ultimately to be the major through route, bypassing most of the high frontage activity areas of central Airlie. At present this serves a mainly local access function and priority remains with Shute Harbour Road.

When required, the two Shute Harbour Road / Waterson Road intersections will be modified to encourage use of Waterson Road. This will be followed by upgrading of the new route to four lanes. Ultimately, Shute Harbour Road is expected to be diagonally closed at Airlie Esplanade so that Waterson Road-Shute Harbour Road (east) becomes the through route and does not intersect with Airlie Esplanade-Shute Harbour Road (west). The bypassed section will remain open at Shute Harbour Road / Waterson Road and via Coconut Grove, for local access, but is likely to be traffic-calmed and streetscaped to enhance pedestrian amenity and keep speeds low.

DMR have requested that analysis consider usage of Waterson Road by through traffic ranging from 5 % to 25 % (for the interim configurations), and this has been done in the 'year of opening' (2010) analyses. Considering the anticipated traffic growth, the ultimate road network has been assumed to be in place by 2020.

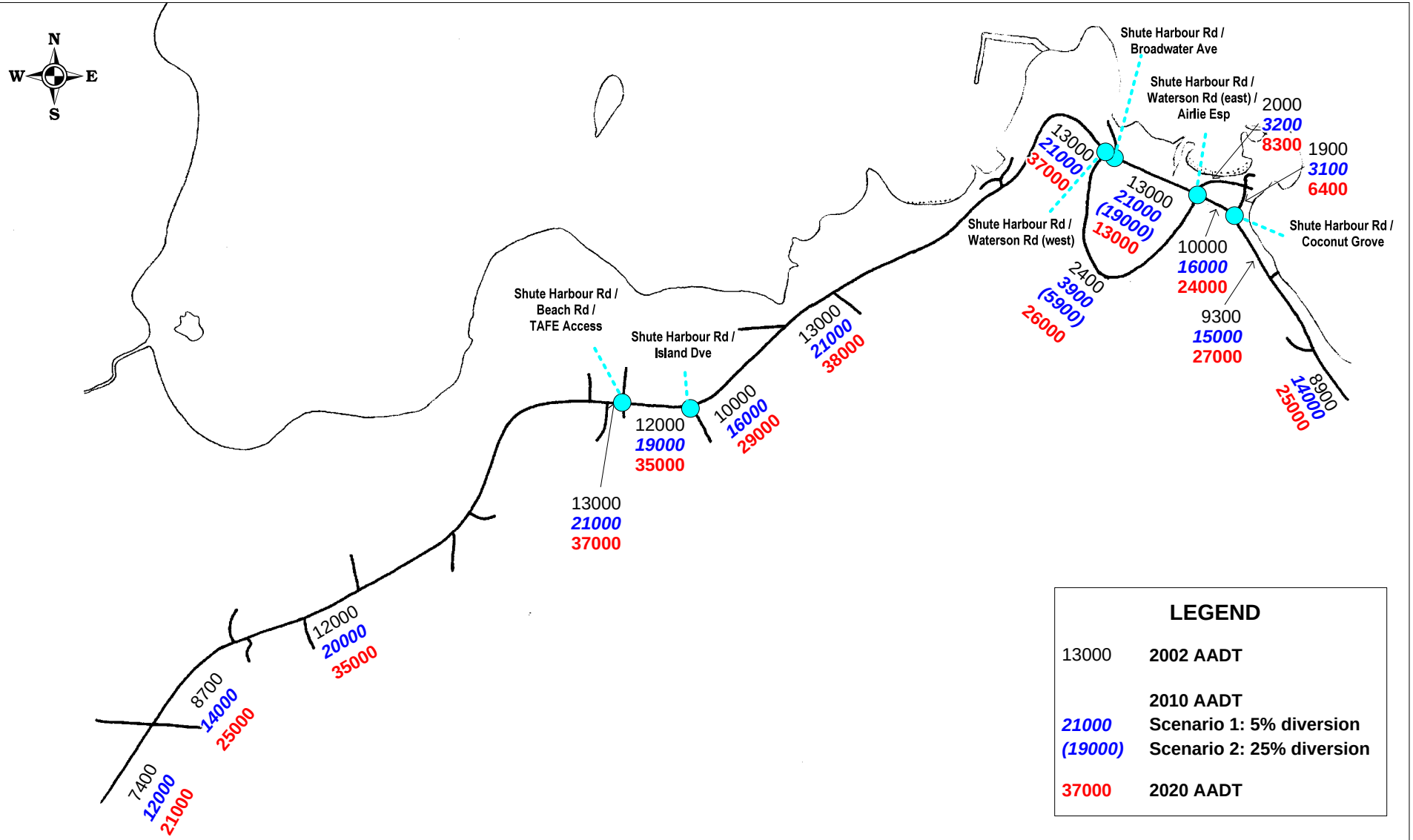
The forecast background traffic volumes for key road links are presented in **Figure 13-2.** Forecast turning movement volumes at the key intersections indicated in **Figure 13-2**, for both the 'year of opening' (2010) and the design horizon year (2020), are presented in **Appendix L-1**.

13.3 Future Infrastructure Requirements

The anticipated future roles of Shute Harbour Road in central Airlie, Waterson Road and Airlie Esplanade are described in **Section 13.2**. It is understood that the various improvement works involved are subject to future change, and that the design and timing of the required elements has not yet been fixed, but they remain the anticipated network forms.

As reported in the 1998 Draft Impact Assessment Study (IAS) which was undertaken for the previous, larger proposal for this site, DMR have advised that the environmental capacity of Shute Harbour Road in its current configuration is considered to be 15,000 vehicles per day (vpd) in the central Airlie Beach tourist area (Burchill 1998). This is taken to apply to the section between Waterson Road (west) and Coconut Grove, which has considerable frontage activity with retail, commercial and entertainment land uses.

The recently opened Waterson Road loop provides an alternative route bypassing most of this area. The bypassed section of Shute Harbour Road is intended to remain a two-lane road, with its through traffic function de-emphasised and ultimately transferred to Waterson Road. Although the volumes shown in **Figure 13-2** indicate volumes of more than 15,000 vpd in this section under either of DMR's specified diversion scenarios, in practice the additional traffic is likely to be directed to Waterson Road either by increasing congestion in the high-activity area or by interventions such as signage or intersection modifications.



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Background Daily Traffic Volumes and Key Intersection Locations

FIGURE 13.2

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The section between Waterson Road (east) and Coconut Grove, however, will remain part of the main through route. As shown in **Figure 13-2**, background volumes (without the proposed development) will exceed the nominated environmental capacity by 2010.

Elsewhere in Airlie Beach and Cannonvale, the capacity of Shute Harbour Road as a two lane road is estimated to be approximately 18,000 vpd, using the Austroads guidelines.

On this basis, the background volumes shown in **Figure 13-2** imply that Shute Harbour Road between Waterson Road (west) and approximately William Murray Drive would need to be widened to four lanes by 2010, except for the section between Coral Esplanade and Island Drive for which the deficiency year would be 2012. To the east of Coconut Grove, the deficiency year would be 2014 west of Hermitage Drive and 2015 further east.

13.3.1 Key Intersection Performance

The SIDRA intersection analysis program has been used to analyse the performance of key intersections with the forecast volumes discussed in **Section 13.2**. The results of the analysis are summarised in **Table 13-1** and **Table 13-2** below.

As mentioned in **Section 13.1.1**, it is understood that both Whitsunday Shire Council and DMR prefer roundabout control of intersections to traffic signals in this area. Accordingly, where priority control does not provide sufficient capacity at an intersection, this study has tested a one or two lane roundabout configuration.

Three lane roundabouts, however, are considerably more difficult for drivers, cyclists and pedestrians to negotiate, as well as requiring very substantial land area and capital investment. Therefore, where analysis indicates that a two lane roundabout would not have sufficient capacity, signalised options have been explored.

As **Table 13-1** shows, works will be necessary at some intersections to provide sufficient capacity for the forecast background traffic flows in 2010. These results indicate that Shute Harbour Road / Waterson Road (east) / Airlie Esplanade and Shute Harbour Road / Island Drive will both require upgrading to a single lane roundabout configuration by 2010.

As **Table 13-1** reports, alternative priority-controlled configurations were tested for Shute Harbour Road / Waterson Road (east) / Airlie Esplanade to suit the current and future relative importance of the approaches, but these were not found to provide sufficient capacity and a roundabout solution was adopted.

Analysis for intermediate years indicates that Shute Harbour Road / Waterson Road (east) / Airlie Esplanade would need to be upgraded by 2006 in Scenario 1 (5 % diversion) or 2007 in Scenario 2 (25% diversion), and Shute Harbour Road / Island Drive would need to be upgraded by 2009.

■ Table 13-1 Intersection Performance, Background Traffic Only : 2010

Scenario	Degree of Saturation[1] { X }	Average Vehicle Delay [s]	Level of Service[2]	Longest Approach Queue [m]
Shute Harbour Road / Coconut Grove				
AM Peak Hour Existing Configuration	0.40	2.0	A	1 E, 4 N, 0 W
PM Peak Hour Existing Configuration	0.64	4.0	A	2 E, 28 N, 0 W
Shute Harbour Road / Waterson Road (east) / Airlie Esplanade : Scenario 1 - 5% via Loop Road				
AM Peak Hour Existing Configuration	0.42	8.6	A	12 S, 24 E, 13 N, 32 W
PM Peak Hour Existing Configuration	1.76	116.8	F	25 S, 53 E, 576 N, 51 W
AM Peak Hour Give Way Control Airlie Esplanade Left In / Left Out	0.45	6.7	A	14 S, 2 E, 1 N, 35 W
PM Peak Hour Give Way Control Airlie Esplanade Left In / Left Out	0.85	9.4	A	44 S, 1 E, 1 N, 56 W
AM Peak Hour Give Way Control, Changed Priority Airlie Esplanade Left In / Left Out	0.65	10.2	B	0 S, 53 E, 1 N, 42 W
PM Peak Hour Give Way Control, Changed Priority Airlie Esplanade Left In / Left Out	0.91	14.8	B	0 S, 211 E, 1 N, 96 W
AM Peak Hour Interim Configuration Single Lane Roundabout	0.42	11.8	B	12 S, 22 E, 5 N, 19 W
PM Peak Hour Interim Configuration Single Lane Roundabout	0.56	12.3	B	15 S, 31 E, 13 N, 27 W
Shute Harbour Road / Waterson Road (east) / Airlie Esplanade : Scenario 2 - 25% via Loop Road				
AM Peak Hour Existing Configuration	0.87	11.0	B	63 S, 18 E, 9 N, 21 W
PM Peak Hour Existing Configuration	1.50	79.7	F	256 S, 37 E, 333 N, 36 W
AM Peak Hour Give Way Control, Changed Priority Airlie Esplanade Left In / Left Out	0.68	11.2	B	0 S, 56 E, 1 N, 33 W
PM Peak Hour Give Way Control, Changed Priority Airlie Esplanade Left In / Left Out	0.89	13.5	B	0 S, 156 E, 1 N, 61 W
AM Peak Hour Interim Configuration Single Lane Roundabout	0.43	12.6	B	19 S, 22 E, 5 N, 20 W
PM Peak Hour Interim Configuration Single Lane Roundabout	0.56	13.0	B	26 S, 32 E, 13 N, 27 W
Shute Harbour Road / Broadwater Avenue : Scenario 1 - 5% via Loop Road[3]				
AM Peak Hour Existing Configuration	0.46	1.3	A	1 E, 4 N, 0 W
PM Peak Hour Existing Configuration	0.54	1.2	A	3 E, 3 N, 0 W

Scenario	Degree of Saturation[1] { X }	Average Vehicle Delay [s]	Level of Service[2]	Longest Approach Queue [m]
Shute Harbour Road / Waterson Road (west) : Scenario 1 - 5% via Loop Road				
AM Peak Hour Existing Configuration	0.46	3.5	A	8 S, 0 E, 7 W
PM Peak Hour Existing Configuration	0.55	3.8	A	12 S, 0 E, 5 W
Shute Harbour Road / Waterson Road (west) : Scenario 2 - 25% via Loop Road				
AM Peak Hour Existing Configuration	0.44	4.8	A	10 S, 0 E, 15 W
PM Peak Hour Existing Configuration	0.50	5.2	A	20 S, 0 E, 11 W
Shute Harbour Road / Island Drive				
AM Peak Hour Existing Configuration	0.68	7.5	A	33 S, 24 E, 8 W
PM Peak Hour Existing Configuration	0.91	11.4	B	73 S, 58 E, 18 W
AM Peak Hour Interim Configuration Single Lane Roundabout	0.55	5.2	A	24 S, 24 E, 33 W
PM Peak Hour Interim Configuration Single Lane Roundabout	0.70	15.3	B	61 S, 47 E, 36 N
Shute Harbour Road / Beach Road / TAFE Access				
AM Peak Hour Existing Configuration	0.54	4.6	A	1 S, 3 E, 19 N, 1 W
PM Peak Hour Existing Configuration	0.52	3.0	A	1 S, 2 E, 17 N, 1 W

Notes:
(1) The degree of saturation (or X value) tabulated is the ratio of demand to available capacity for the most critical movement at the intersection. An X of 0.90 represents a desirable maximum for acceptable operation of signalised intersections, while a maximum X of 0.85 is recommended for roundabouts. For priority intersections an X above 0.80 indicates more formal control is warranted.
(2) Level of Service: A – Excellent; B - Good; C -Satisfactory; D -Tolerable; E – Congested; F – Very Congested
(3) Shute Harbour Road / Broadwater Avenue has only been analysed for Scenario 1. This is the 'worst case' for this intersection since no movement volumes are higher in Scenario 2

■ Table 13-2 Intersection Performance, Background Traffic Only : 2020

Scenario	Degree of Saturation[1] { X }	Average Vehicle Delay [s]	Level of Service[2]	Longest Approach Queue [m]
Shute Harbour Road / Coconut Grove				
AM Peak Hour Shute Harbour Road Widened Give Way Control	0.34	3.0	A	9 E, 10 N, 0 W
PM Peak Hour Shute Harbour Road Widened Give Way Control	0.64	4.2	A	22 E, 31 N, 0 W
Shute Harbour Road / Waterson Road (east) / Airlie Esplanade is no longer an intersection in 2020				
Shute Harbour Road / Broadwater Avenue				
AM Peak Hour Existing Configuration	0.31	2.7	A	2 E, 6 N, 0 W
PM Peak Hour Existing Configuration	0.33	2.4	A	3 E, 3 N, 0 W

Scenario	Degree of Saturation[1] { X }	Average Vehicle Delay [s]	Level of Service[2]	Longest Approach Queue [m]
Shute Harbour Road / Waterson Road (west)				
AM Peak Hour Shute Harbour Road Widened Give Way Control, Changed Priority	6.35	1197.5	F	5 S, 3130 E, 0 W
PM Peak Hour Shute Harbour Road Widened Give Way Control, Changed Priority	10.05	2973.3	F	2 S, 4974 E, 0 W
AM Peak Hour Ultimate Configuration Two Lane Roundabout	0.61	12.7	B	32 S, 11 E, 20 W
PM Peak Hour Ultimate Configuration Two Lane Roundabout	0.72	14.7	B	48 S, 24 E, 20 W
Shute Harbour Road / Island Drive				
AM Peak Hour Two Lane Roundabout	0.64	14.4	B	22 S, 29 E, 40 W
PM Peak Hour Two Lane Roundabout	0.86	20.6	C	74 S, 111 E, 45 W
AM Peak Hour Ultimate Configuration Traffic Signal Control (cycle time 70 seconds)	0.87	26.0	C	67 S, 106 E, 88 W
PM Peak Hour Ultimate Configuration Traffic Signal Control (cycle time 90 seconds)	0.89	31.0	C	125 S, 164 E, 107 W
Shute Harbour Road / Beach Road / TAFE Access				
AM Peak Hour Shute Harbour Road Widened Give Way Control	3.0	222.3	F	78 S, 14 E, 1323 N, 3 W
PM Peak Hour Shute Harbour Road Widened Give Way Control	2.5	94.1	F	159 S, 8 E, 1371 N, 2 W
AM Peak Hour Ultimate Configuration Two Lane Roundabout	0.57	12.5	B	1 S, 22 E, 12 N, 31 W
PM Peak Hour Ultimate Configuration Two Lane Roundabout	0.56	11.9	B	1 S, 30 E, 7 N, 26 W

Notes:
(1) The degree of saturation (or X value) tabulated is the ratio of demand to available capacity for the most critical movement at the intersection. An X of 0.90 represents a desirable maximum for acceptable operation of signalised intersections, while a maximum X of 0.85 is recommended for roundabouts. For priority intersections an X above 0.80 indicates more formal control is warranted.
(2) Level of Service : A - Excellent; B - Good; C - Satisfactory; D - Tolerable; E - Congested; F - Very Congested

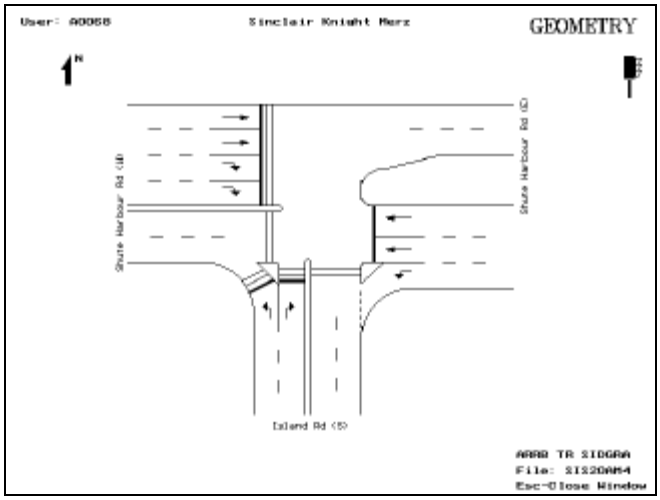
As **Table 13-2** shows, by 2020 it is expected that the key intersections west of the bypassed area of Central Airlie will require upgrading in addition to the widening of Shute Harbour Road to four lanes. Two lane roundabouts would be adequate at Waterson Road (west) and Beach Road. However, if the assumed growth rate is maintained and no alternative access is provided to the Island Drive catchment, roundabout control will just be insufficient for the demands at Shute Harbour Road / Island Drive by 2020, and traffic signals are likely to be necessary either in that year or very soon thereafter. An intersection configuration which would provide sufficient capacity is shown diagrammatically in **Figure 13-3**.

Analysis for intermediate years indicates that Shute Harbour Road / Waterson Road (west) would need to be upgraded from its interim to ultimate configuration as soon as Shute Harbour Road was widened to 4 lanes (nominally required in 2008).

Shute Harbour Road / Island Drive would need to be upgraded from a single lane roundabout by 2011. This indicates only a two year lifespan for the single lane roundabout; it may be preferable to move directly to a two lane roundabout configuration. This could be coordinated with the Shute Harbour Road widening which in this section is nominally required in 2009, the same year as the need for upgrading of the existing priority controlled intersection. A two lane roundabout would be adequate until 2019, but further upgrading would be required by 2020.

Following the four laning of Shute Harbour Road, its intersection with Beach Road and the TAFE Access would need to be upgraded to a two lane roundabout by 2009.

■ **Figure 13-3 Shute Harbour Road / Island Drive Nominal Ultimate Intersection Configuration**



13.4 Port of Airlie Traffic Generation and Distribution - Construction

Heavy vehicle trip generation during the construction stages of the proposed development has been forecast based on the estimated quantities of key construction materials and the construction programme, both outlined in **Section 2**.

Table 13-3 summarises the material quantities and resulting heavy vehicle generation for the first two stages of construction. Here, Stage 1 includes dredging and land reclamation, while Stage 2 includes the construction of site services, infrastructure and the marina itself. Quantities for building construction (Stages 3 and 4) are not yet available, and the potential heavy vehicle impacts in these phases will need to be assessed once design for these elements is further advanced.

These quantities have typically been converted to truck loads using an average payload of 10 m^3, representing a semi-trailer or similar vehicle. However, some items, defined by number or linear measurement, have special payload sizes.
For example, the steel sheet piling and floating pontoons will be delivered in 12 metre sections. A standard vehicle load is expected to contain 10 sections of sheet piling, for an average of 120 linear metres per load, or two pontoon sections for an average of 24 linear metres per load. The marina piles in Stage 2 will be hollow steel tubes approximately 20 metres in length, which are expected to be carried loads of five.

In calculating the required trips numbers for the asphalt deliveries in Stage 2, an average thickness of 50 mm has been assumed, with a standard payload of 10 m^3.

It is understood that no vehicles of larger than semi-trailer size will be used for materials haulage. Delivery of plant and equipment may possibly involve unique loads, but these will be very small in number, occurring only at the beginning and end of the relevant work elements. The ten plant deliveries at the beginning of Stage 2 construction are an example. Any such deliveries with non-standard requirements will be addressed individually during detailed construction planning.

Peak round trips per day have been based on expected construction operations during delivery phases. During each construction element there will be periods of greater and lesser intensity. Overall maximum trips for each stage are estimated based on overlaps between peak activity periods for the various elements set out in **Section 2**.

As **Table 13-3** shows, all significant materials are to be sourced from locations west of the site, giving a heavy vehicle distribution of 100% to/from the west.

■ Table 13-3 Construction Stage Heavy Vehicle Generation

Material	Estimated Quantity	Total Truck Loads	Duration of Activity	Peak Round Trips per day	Source
Stage 1 : Dredging and Land Reclamation (9 Month Period)					
Steel sheet piling	24 000 m	200	4 months	3	Brisbane (Rail to Mackay then road)
Sand	35 000 m^3	3 500	3 months	70	Proserpine and O'Connell Rivers
Rock	25 000 m^3	2 500	6 months	70	Quarries west of Cannonvale
General Fill	35 000 m^3	3 5 00	3 months	70	Quarries west of Cannonvale
Stage 1 Overall		**9 700**		**70**	**at approx 6 loads per hour**
Stage 2 : Site Services, Infrastructure and Marina (6 Month Period)					
Construction Equipment	10 plant	10	1 week	3	Brisbane
Topsoil	3 000 m^3	300	6 months	10	Landscape suppliers west of Cannonvale
Landscaping Supplies	50 deliveries	50	4 months	2	Cannonvale Industrial Area
Pavers and Concrete	6 000 m^3	600	6 months	10	Concrete plant in Cannonvale
Asphalt	10 000 m^2	50	6 months	5	Batching plant in Proserpine
Road Base and Subbase	2 500 m^3	250	6 months	2	Quarries west of Cannonvale
Marina Piles	120 off	24	4 months	3	Brisbane (Rail to Mackay then road)

Material	Estimated Quantity	Total Truck Loads	Duration of Activity	Peak Round Trips per day	Source
Floating Pontoons	3 000 m	125	4 months	2	Cannonvale Industrial Area
Stage 2 Overall		**1 523**		**10**	**at approx 1 load per hour**

Although there will also be a large number of heavy vehicle movements associated with earthworks and waste management within the site, these will be completely contained within the construction area (as discussed in **Section 2.3**) and are therefore not considered here.

The expected maximum workforce on site is approximately 35 persons, of whom most will be housed in the surrounding area and travel to the site using employer-provided minibuses, reducing the trip generation of the site. Approximately 15 parking spaces will be provided on site for staff and visitors.

On this basis, light vehicle generation (cars, utilities, vans and minibuses) for the site during construction is expected to be of the order of 80 trips per day, including worker arrivals and departures, project related visitor trips (eg. inspections) and service trips (eg. couriers, lunch vans). The peak hour light vehicle traffic generation would be approximately 20 trips per hour at the beginning and end of the site working hours.

13.5 Port of Airlie Traffic Generation and Distribution - Operation

The forecast traffic generation from each element of the development and the development as a whole, and the global traffic distribution (between East and West), for the two analysis years 2010 and 2020 are summarised in **Tables 13-4** and **13-5**. **Figure 13-4** identifies the internal zones within the site and the site access points referred to in these tables.

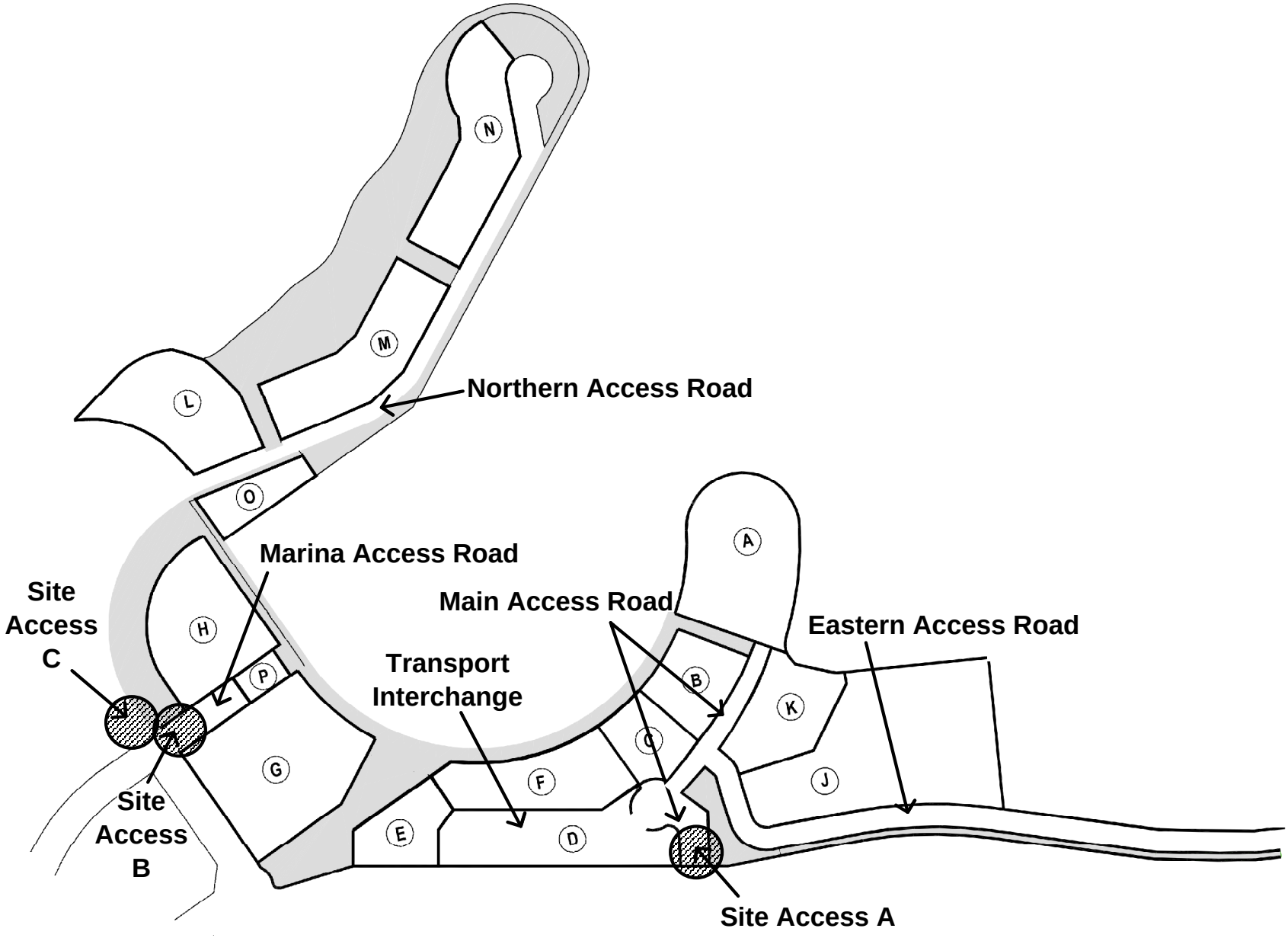
The total new trip generation for the current study, just under 3,200 vehicle trips per day (vpd), is approximately 68% of the previous, larger proposal for this site assessed in the 1998 Draft IAS (The alternative scenario also presented in the Traffic Report contained in the Draft IAS, which included increased commercial, restaurant and retail floor spaces relative to their base proposal, added just over 1,000 vpd to their base version for a total of over 5 700 vpd.(Burchill 1998))

The development is also forecast to attract approximately 1,300 vpd in diverted trips to the Transport Terminal in 2010, rising to approximately 1,700 vpd in 2020. These trips are not relevant to the calculation of external road impacts beyond the immediate area of the site as they would be using the road network even if the development did not proceed. These trips are discussed in point 2 below.

13.5.1 Trip Generation Rates

The trip generation rates applied in this assessment are primarily based on standard industry sources, including Queensland Transport (QT) draft *Transport Assessment Guide* (TAG) and the New South Wales Road and Traffic Authority (RTA)'s *Guide to Traffic Generating Developments*, as well as the rates agreed with DMR during the previous impact assessment process, as described in the 1998 Draft IAS.

The rates obtained from the latter source have been reviewed, in particular considering the lower self-containment expected for many elements of the new, smaller proposal, and some implied elements of its rates (eg. resort staff numbers, non-motorised mode share and self containment) have been explicitly listed in **Tables 13-4** and **13-5**.



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General Site Layout and Access Points

FIGURE 13.4

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The generation rates and adjustments applied for each land use to calculate the external vehicle trip generation for the development are discussed individually below.

It is notable that in all cases, the resulting external vehicle trip proportions are higher than those used in the 1998 traffic study for the previous, larger proposal for this site. This is considered reasonable due to lower self containment within the smaller current proposal.

The non-motorised mode share for most land uses is significant. This is due to the close proximity of the site to central Airlie and the high proportion of mainland visitors staying within a short distance of the site (as discussed under point 2 below). The relatively low proportion of visitors with access to a private car and the widespread use of minibuses for shuttle services between tourist accommodation and attractions, discussed in **Section 13.1**, is also a contributing factor.

1) Tourist Accommodation (Hotel and Serviced Apartments)

These rates have been derived from Eppell Consulting's 1989 study *Resort Traffic Surveys* (RTS), as agreed with DMR and applied in the 1998 Draft IAS for the previous proposal. A 15% non-motorised mode share for local staff is implied in the previous staff car generation rates and is considered reasonable, while 10% has been used for guest trips. The 15% self-containment used has been reduced from the previous study due to the lower commercial, retail and dining floorspaces in the current proposal. The Draft IAS also appears to include a 1% increase in number of service vehicles over Eppell's recommendations, but there is no discussion or justification of this in their report. This implied adjustment is not considered a significant alteration to the RTS recommendations and has not been applied in the current study. (If this factor were applied, it would contribute less than 3 additional trips per day).

2) Transport Terminal

The ferry related trip generation of this element is based on the capacity of the terminal in Zone C which will accommodate a maximum of 4,000 passengers per day.

The self containment figure of 5% for ferry passengers is based on consideration of the number of accommodation units versus the expected ferry patronage. The non-motorised mode share of 25% is based on the visitor numbers in the immediate area (within approximately 500 m of the site) from the 1996 Census as a proportion of the total mainland area visitors. The remaining external vehicle mode trips have been divided equally between cars and buses and converted to vehicle trips using occupancies of 2.5 persons per car and 30 per bus as previously agreed with DMR and applied in the 1998 Draft IAS.

The Transport Terminal is also intended to serve as a central facility for all transport modes within Airlie Beach, and particularly to cater for both long distance and local buses. It is not yet certain whether local bus services which currently travel along Shute Harbour Road past the site will divert into the development as intended, or if for example on-street bus bays close to the site will be provided, or use the Transport Terminal only once Shute Harbour Road has been widened to four lanes. For trip generation and development impact assessment, it is conservative to assume that the local buses will use the on-site facilities, and this has been adopted in the current study.

Existing bus passenger numbers have been estimated assuming an average of 30 passengers per long distance service and 10 per local service use the closest relevant bus stop to the site. Future passenger numbers have been forecast using the 6 % per annum growth rate which also applies to vehicle flows.

This results in conservatively high bus numbers, especially for local services where some of the increased demand is likely to be absorbed by higher passenger numbers per bus at this stop. There may also be increased use of articulated buses (which are already used for some services along Shute Harbour Road) providing increased bus capacity. The forecasts are also likely to be conservative for long distance buses since their mode share of visitor arrivals is expected to slowly decline as mentioned in **Section 13.1**.

Forecast vehicle numbers for the associated transfer modes, which meet coach services and carry visitors to or from their accommodation, have been estimated from the forecast passenger numbers using a mode share of 50 % minibuses, 20 % car or taxi, and 30 % pedestrians, with vehicle occupancies of 5 passengers per minibus and 2 per taxi.

Since local bus and long distance coach passenger numbers are assumed not to be constrained by the terminal capacity and to continue to grow during the study period, the transport terminal trip generation is higher in 2020 than at 'year of opening'. In other words, this analysis assumes that the transport interchange element will be designed to accommodate the projected demand up to the design horizon. All other uses, in contrast, are based on the capacity of the associated buildings (or other facilities) and remain constant throughout the study period, as is the standard approach in traffic impact assessment.

It should be noted that all of the local and long distance buses and associated transfer modes, and the ferry related traffic to and from locations west of the site, are diverted and not new trips. If the development did not proceed, these vehicle trips would still be present on Shute Harbour Road (and other streets as appropriate), associated with the ferry terminal at Shute Harbour (assumed to be upgraded to cater for the projected demand as highlighted in the *Whitsunday Tourism Strategy*), the bus terminal near the Whitsunday Sailing Club, or existing bus stops on Shute Harbour Road.

3) Tourist Retail, Commercial and Restaurant Uses

The retail rates have been taken from the Draft 1998 IAS report - these are considerably higher than the standard references give for a 'shopping centre', but this is considered reasonable given the small size of the retail areas. The Commercial and Restaurant rates have taken from draft QT *Transport Assessment Guide* which quotes these rates from the RTA *Guide to Traffic Generating Developments*. These basic rates were also applied in the 1998 Draft IAS.

Self containment factors for the Commercial and Tourist Retail elements have been retained at the previously agreed levels - these rely mainly on passing trade which is higher in the current proposal due to the larger ferry passenger numbers, and are therefore not affected by the smaller overall size of the current proposal. Self containment of the Restaurant component, on the other hand, has been slightly reduced from 60% to 50% due to the lower residential numbers. Non-motorised mode share is again based on concentration of visitor numbers immediately around the site.

4) Residential Units

These rates are identical to those agreed with DMR for the 1998 proposal. Self containment has been substantially decreased due to the reduced retail and commercial facilities on site. A mode share of 10% non-motorised trips has been assumed which is considered conservative given the variety of services within easy walking distance in central Airlie.

5) Marine Hardstand and Repair

This has been conservatively treated as a stand alone 'light industry'. A public transport mode share of 15 % has been adopted, considering the employment type and the frequency and convenience of local bus services.

Since these buses stop on site at Zone D, and the employee then walks through the site to the industrial area, this component is shown as 'self-containment' for Zone J in **Tables 13-4** and **13-5 -** the local bus trips are counted under the Transport Terminal. A 5% non-motorised mode share, primarily representing cycle trips from Cannonvale and Jubilee Pocket, is considered reasonable given the employment type, topography and the connectivity of the site to surrounding residential areas. Some walk trips may also occur although accommodation in the immediate area is predominantly visitor-oriented rather than permanent residential and thus less likely to be a source of home based work trips.

6) Boat Ramp

Boat ramp generation rates have been calculated from the capacity of proposed facilities, using data from SKM's *Public Boat Ramps North Queensland Strategic Plan, Volume 1 Demand Forecasting* prepared in 1987 for the Department of Harbours and Marine. Although the boat user demand information used to forecast the number of boat ramps required by region is out of date, the relationships between ramp configuration, service rates, level of service, and parking requirements remain relevant.

7) Marina Berths

Marina generation has been set to 1 trips per day per berth, assuming a lower but still significant proportion of bareboat charter vessels and absentee owners compared to the previous report (which used 0.67 trips per day per berth), because of the lower capacity of the marina. Self containment for this element has been conservatively set to zero.

8) Marine Training Academy

The 'marine training academy' is expected to cater for two classes each of approximately 50 students per day. This has been analysed as a tertiary education activity. As such, a relatively low mode share to private car and relatively high use of public transport, walking and cycling is typical. Considering the accessibility of the site by all three of these modes, a 25 % mode share to public transport (tabulated as self-containment, ie walk trips from the local bus stops in Zone D, as described in Point 5 above) and 15 % to non-motorised trips from surrounding areas, is considered reasonable.

If some of these classes are short courses rather than semester-long subjects, they may attract visitors as well as permanent residents, in which case the private vehicle use would fall further and some 'true' self containment (ie. with students staying in Port of Airlie accommodation) may also occur.

For the private vehicle trips calculated, a low vehicle occupancy of 1.2 students per vehicle, and a 'worst-case' peak hour percentage assuming both classes have all-day sessions (arriving and departing in the general road peak hours), have been conservatively assumed.

Staff have been considered separately, with the analysis conservative throughout - a student-staff ratio of 10:1 has been adopted, and all but one of these staff members have been assumed to drive, with a vehicle occupancy of 1.0. The peak hour percentage for staff is slightly lower than for students to reflect post-class activities.

13.5.2 Trip Distribution

The large scale distribution of trips from the site, into eastern or western side interactions, has been based on the geographic distribution of mainland population and visitor numbers from 1996 Census, with consideration of trip purposes for each land use within the development. As **Tables 13-4** and **13-5** show, the resulting west/east proportions for the overall development are very close to the 80/20 split used in the Draft IAS and the Planning Study which preceded it.

On a smaller scale, the distribution within Airlie and Cannonvale has been based on consideration of trip purposes associated with each development land use, and the built-up area, existing land uses, and under utilised areas within side street catchments.

13.5.3 Development Generated Traffic on the External Road Network

Applying the trip generation and distribution methodologies discussed above, the new trips generated by the development (ie not including diverted trips which would be present on the relevant link even if the development did not proceed) affecting key road links in the two analysis years are shown in **Figure 13-5**.

On this basis, the area of influence of the development (defined as the area where the development generated traffic is equal to or greater than 5% of the background traffic in the year of opening, in accordance with DMR's *Guidelines for Assessment of Road Impacts of Development Proposals*) extends from Site Access A along Shute Harbour Road to Tropic Road, Cannonvale. This includes Waterson Road.

In assessing the impact of the development, key intersections have been analysed within the central Airlie Beach tourist precinct, as well as any other intersections in area of influence where any development generated turning movement volume is at least 10 vph. No significant effect is expected where the development generated turning volumes are lower than this.

Note that the development generated volumes west of Waterson Road (west) in 2020 are identical to those in 2010.

Table 13.4 : Port of Airlie Development Trip Generation 2010

Zone	Title	Land Use	Number	Unit	Rate	per	Type	Self-Containment	Non-Motorised Mode Share of External Trips	External Vehicle Trip %	External Vehicle Trips per Day	Peak Hour %	Peak Hour External Vehicle Trips	To/From West	Daily Trips To/From West	Peak Hour Trips To/From West	AM Peak Hour Directional Split (% IN)	AM Peak Hour Trips In	PM Peak Hour Directional Split (% IN)	PM Peak Hour Trips In
Access Via Location A (Direct to Shute Harbour Road)																				
A	**Landmark Hotel**	Accomodation	170	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	91	10%	9	83%	75	7	75%	7	40%	4
			204	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	245	12%	29	85%	208	25	90%	26	30%	9
					0.6	Staff	Service Vehicle	0%	0%	100%	122	10%	12	90%	110	11	50%	6	50%	6
					0.6	Accom Unit	Guest Bus	15%	10%	77%	78	10%	8	83%	64	7	50%	4	50%	4
B	**Harbourfront Serviced Apartments**	Accomodation	26	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	14	10%	1	83%	12	1	75%	1	40%	0
			31	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	51	12%	6	85%	43	5	90%	5	30%	2
					0.6	Staff	Service Vehicle	0%	0%	100%	19	10%	2	90%	17	2	50%	1	50%	1
					0.6	Accom Unit	Guest Bus	15%	10%	77%	12	10%	1	83%	10	1	50%	1	50%	1
C	**Transport Terminal : Water Side**														0	0		0		0
D	**Transport Terminal : Land Side**	Ferry Terminal	2400	Passengers / day	0.8	Passengers	Car (50%)	5%	25%	71%	684	30%	205	75%	513	154	90%	185	25%	51
					0.06	Passengers	Bus (50%)	5%	25%	71%	51	30%	15	75%	38	11	50%	8	50%	8
		Long Distance Coach	700	Passengers / day	0.07	Passengers	Coach	0%	0%	100%	47	7%	3	100%	47	3	50%	2	50%	2
			350	Passengers / day	0.4	Passengers	Minibus	0%	0%	100%	140	7%	9	75%	105	7	50%	5	50%	5
			140	Passengers / day	1	Passengers	Car / Taxi	0%	0%	100%	140	7%	9	75%	105	7	50%	5	50%	5
			210	Passengers / day	1	Passengers	Walk	33%	100%	0%	0	7%	0	75%	0	0	50%	0	50%	0
		Local Buses	1100	Passengers / day	0.2	Passengers	Bus	0%	0%	100%	220	20%	44	50%	110	22	50%	22	50%	22
E	**Harbourfront Mixed Use**	Accomodation	26	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	14	10%	1	83%	12	1	75%	1	40%	0
			31	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	54	12%	6	85%	46	5	90%	5	30%	2
					0.6	Staff	Service Vehicle	0%	0%	100%	19	10%	2	90%	17	2	50%	1	50%	1
					0.6	Accom Unit	Guest Bus	15%	10%	77%	12	10%	1	83%	10	1	50%	1	50%	1
		Tourist Retail	840	m^2 GFA	40	100 m^2 GFA	Car	50%	25%	38%	126	8%	10	75%	95	8	55%	6	45%	5
F	**Harbourfront Mixed Use**	Accomodation	40	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	21	10%	2	83%	17	2	75%	2	40%	1
			48	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	73	12%	9	85%	62	8	90%	8	30%	3
					0.6	Staff	Service Vehicle	0%	0%	100%	29	10%	3	90%	26	3	50%	2	50%	2
					0.6	Accom Unit	Guest Bus	15%	10%	77%	18	10%	2	83%	15	2	50%	1	50%	1
		Tourist Retail	920	m^2 GFA	40	100 m^2 GFA	Car	50%	25%	38%	138	8%	11	75%	104	8	55%	6	45%	5
		Commercial	330	m^2 GFA	10	100 m^2 GFA	Car	25%	0%	75%	25	20%	5	80%	20	4	75%	4	25%	1
J	**Marine Industrial & Hardstand**	Light Industry	5800	m^2 GFA	9	100 m^2 GFA	Car	15%	5%	80%	418	10%	42	85%	355	36	90%	38	10%	4
K	**Public Boat Ramp**	Boat Ramp	69	Launches / Day	2.3	Launch	Car (most w/ trailer)	0%	0%	100%	160	13%	20	85%	136	17	80%	16	35%	7
TOTAL ACCESS A									**TOTAL VEHICLE TRIPS**		**3021**		**467**		**2372**	**356**	**78%**	**364**	**32%**	**149**
									cars, taxis, minibuses		**2514**		**386**		***79%***	***76%***				
									buses, coaches		**318**		**62**							
									service vehicles		**189**		**19**			**In from West**		**278**		**114**
Access Via Location B (From Coconut Grove Road, Opposite Airlie Esplanade)																				
G	**Harbourfront Mixed Use**	Residential Units	58	Units	5	Res Unit	Car	5%	10%	86%	248	10%	25	85%	211	21	20%	5	75%	19
		Tourist Retail	1885	m^2 GFA	40	100 m^2 GFA	Car	50%	25%	38%	283	8%	23	75%	212	17	55%	13	45%	10
		Restaurant	375	m^2 GFA	60	100 m^2 GFA	Car	50%	20%	40%	90	8%	7	75%	68	5	55%	4	45%	3
H	**Harbourfront Residential**	Residential Units	42	Units	5	Res Unit	Car	5%	10%	86%	180	10%	18	85%	153	15	20%	4	75%	14
		Residential Villas	7	Units	8	Res Unit	Car	5%	10%	86%	48	10%	5	85%	41	4	20%	1	75%	4
P	**Marina Access**	Marina	200	Berths	1	Berth	Car	0%	0%	100%	200	13%	25	85%	170	21	80%	20	35%	9
TOTAL ACCESS B									**TOTAL VEHICLE TRIPS**		**1049**		**103**		**854**	**85**	**45%**	**46**	**57%**	**58**
									cars, taxis, minibuses		**1028**		**101**		***81%***	***82%***				
									buses, coaches		**0**		**0**							
									service vehicles		**21**		**2**			**In from West**		**38**		**48**
Access Via Location C (From Coconut Grove Road, North Of Airlie Esplanade)																				
L	**Seaview Residential Tower**	Residential Units	25	Units	5	Res Unit	Car	5%	10%	86%	107	10%	11	85%	91	9	20%	2	75%	8
M	**Seaview Residential Villas**	Residential Villas	16	Units	8	Res Unit	Car	5%	10%	86%	109	10%	11	85%	93	9	20%	2	75%	8
N	**Seaview Residential Lots**	Residential Lots	7	Units	8	Res Unit	Car	5%	10%	86%	48	10%	5	85%	41	4	20%	1	75%	4
O	**Marine Academy**	Tertiary Education	100	Students	1.67	Student	Car	25%	15%	60%	100	50%	50	85%	85	43	80%	40	35%	18
			10	Staff	2	Staff member	Car	5%	5%	90%	18	40%	7	85%	15	6	80%	6	35%	2
TOTAL ACCESS C									**TOTAL VEHICLE TRIPS**		**382**		**84**		**325**	**71**	**61%**	**51**	**48%**	**40**
									cars, taxis, minibuses		**374**		**82**		***85%***	***85%***				
									buses, coaches		**0**		**0**							
									service vehicles		**8**		**2**			**In from West**		**43**		**34**
TOTAL DEVELOPMENT									**TOTAL VEHICLE TRIPS**		**4452**		**654**		**3551**	**512**	**70%**	**461**	**38%**	**247**
									cars, taxis, minibuses		**3916**		**569**		***80%***	***78%***				
									buses, coaches		**318**		**62**							
									service vehicles		**218**		**23**			**In from West**		**361**		**194**
TRANSPORT TERMINAL DIVERTED TRIPS																				
From Shute Harbour Road Only (Ferry Terminal Trips and Local Buses)											**955**		**264**		**661**	**187**		**214**		**81**
From Coconut Grove Road (Long Distance Coaches and Connecting Services)											**327**		**21**		***257***	**17**		**11**		**11**
TOTAL DEVELOPMENT NEW TRIPS											**3170**		**369**		**2633**	**309**		**236**		**156**

Table 13.5 : Port of Airlie Development Trip Generation 2020

Zone	Title	Land Use	Number	Unit	Rate	per	Type	Self-Containment	Non-Motorised Mode Share of External Trips	External Vehicle Trip %	External Vehicle Trips per Day	Peak Hour %	Peak Hour External Vehicle Trips	To/From West	Daily Trips To/From West	Peak Hour Trips To/From West	AM Peak Hour Directional Split (% IN)	AM Peak Hour Trips In	PM Peak Hour Directional Split (% IN)	PM Peak Hour Trips In
Access Via Location A (Direct to Shute Harbour Road)																				
A	**Landmark Hotel**	Accomodation	170	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	91	10%	9	83%	75	7	75%	7	40%	4
			204	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	245	12%	29	85%	208	25	90%	26	30%	9
					0.6	Staff	Service Vehicle	0%	0%	100%	122	10%	12	90%	110	11	50%	6	50%	6
					0.6	Accom Unit	Guest Bus	15%	10%	77%	78	10%	8	83%	64	7	50%	4	50%	4
B	**Harbourfront Serviced Apartments**	Accomodation	26	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	14	10%	1	83%	12	1	75%	1	40%	0
			31	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	51	12%	6	85%	43	5	90%	5	30%	2
					0.6	Staff	Service Vehicle	0%	0%	100%	19	10%	2	90%	17	2	50%	1	50%	1
					0.6	Accom Unit	Guest Bus	15%	10%	77%	12	10%	1	83%	10	1	50%	1	50%	1
C	**Transport Terminal : Water Side**														0	0		0		0
D	**Transport Terminal : Land Side**	Ferry Terminal	2400	Passengers / day	0.8	Passengers	Car (50%)	5%	25%	71%	684	30%	205	75%	513	154	90%	185	25%	51
					0.06	Passengers	Bus (50%)	5%	25%	71%	51	30%	15	75%	38	11	50%	8	50%	8
		Long Distance Coach	1300	Passengers / day	0.07	Passengers	Coach	0%	0%	100%	87	7%	6	100%	87	6	50%	3	50%	3
			650	Passengers / day	0.4	Passengers	Minibus	0%	0%	100%	260	7%	17	75%	195	13	50%	9	50%	9
			260	Passengers / day	1	Passengers	Car / Taxi	0%	0%	100%	260	7%	17	75%	195	13	50%	9	50%	9
			390	Passengers / day	1	Passengers	Walk	33%	100%	0%	0	7%	0	75%	0	0	50%	0	50%	0
		Local Buses	2000	Passengers / day	0.2	Passengers	Bus	0%	0%	100%	400	20%	80	50%	200	40	50%	40	50%	40
E	**Harbourfront Mixed Use**	Accomodation	26	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	14	10%	1	83%	12	1	75%	1	40%	0
			31	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	54	12%	6	85%	46	5	90%	5	30%	2
					0.6	Staff	Service Vehicle	0%	0%	100%	19	10%	2	90%	17	2	50%	1	50%	1
					0.6	Accom Unit	Guest Bus	15%	10%	77%	12	10%	1	83%	10	1	50%	1	50%	1
		Tourist Retail	840	m^2 GFA	40	100 m^2 GFA	Car	50%	25%	38%	126	8%	10	75%	95	8	55%	6	45%	5
F	**Harbourfront Mixed Use**	Accomodation	40	Units	0.7	Accom Unit	Guest Car	15%	10%	77%	21	10%	2	83%	17	2	75%	2	40%	1
			48	*Staff @*	*1.2*	*Accom Unit*									0	0		0		0
					1.3	Staff, + 20	Staff Car	0%	15%	85%	73	12%	9	85%	62	8	90%	8	30%	3
					0.6	Staff	Service Vehicle	0%	0%	100%	29	10%	3	90%	26	3	50%	2	50%	2
					0.6	Accom Unit	Guest Bus	15%	10%	77%	18	10%	2	83%	15	2	50%	1	50%	1
		Tourist Retail	920	m^2 GFA	40	100 m^2 GFA	Car	50%	25%	38%	138	8%	11	75%	104	8	55%	6	45%	5
		Commercial	330	m^2 GFA	10	100 m^2 GFA	Car	25%	0%	75%	25	20%	5	80%	20	4	75%	4	25%	1
J	**Marine Industrial & Hardstand**	Light Industry	5800	m^2 GFA	9	100 m^2 GFA	Car	15%	5%	80%	418	10%	42	85%	355	36	90%	38	10%	4
K	**Public Boat Ramp**	Boat Ramp	69	Launches / Day	2.3	Launch	Car (most w/ trailer)	0%	0%	100%	160	13%	20	85%	136	17	80%	16	35%	7
TOTAL ACCESS A									**TOTAL VEHICLE TRIPS**		**3481**		**522**		**2682**	**389**	**75%**	**391**	**34%**	**176**
									cars, taxis, minibuses		**2754**		**402**		**77%**	*75%*				
									buses, coaches		**538**		**101**							
									service vehicles		**189**		**19**			**In from West**		**292**		**131**
Access Via Location B (From Coconut Grove Road, Opposite Airlie Esplanade)																				
G	**Harbourfront Mixed Use**	Residential Units	58	Units	5	Res Unit	Car	5%	10%	86%	248	10%	25	85%	211	21	20%	5	75%	19
		Tourist Retail	1885	m^2 GFA	40	100 m^2 GFA	Car	50%	25%	38%	283	8%	23	75%	212	17	55%	13	45%	10
		Restaurant	375	m^2 GFA	60	100 m^2 GFA	Car	50%	20%	40%	90	8%	7	75%	68	5	55%	4	45%	3
H	**Harbourfront Residential**	Residential Units	42	Units	5	Res Unit	Car	5%	10%	86%	180	10%	18	85%	153	15	20%	4	75%	14
		Residential Villas	7	Units	8	Res Unit	Car	5%	10%	86%	48	10%	5	85%	41	4	20%	1	75%	4
P	**Marina Access**	Marina	200	Berths	1	Berth	Car	0%	0%	100%	200	13%	25	85%	170	21	80%	20	35%	9
TOTAL ACCESS B									**TOTAL VEHICLE TRIPS**		**1049**		**103**		**854**	**85**	**45%**	**46**	**57%**	**58**
									cars, taxis, minibuses		**1028**		**101**		*81%*	*82%*				
									buses, coaches		**0**		**0**							
									service vehicles		**21**		**2**			**In from West**		**38**		**48**
Access Via Location C (From Coconut Grove Road, North Of Airlie Esplanade)																				
L	**Seaview Residential Tower**	Residential Units	25	Units	5	Res Unit	Car	5%	10%	86%	107	10%	11	85%	91	9	20%	2	75%	8
M	**Seaview Residential Villas**	Residential Villas	16	Units	8	Res Unit	Car	5%	10%	86%	109	10%	11	85%	93	9	20%	2	75%	8
N	**Seaview Residential Lots**	Residential Lots	7	Units	8	Res Unit	Car	5%	10%	86%	48	10%	5	85%	41	4	20%	1	75%	4
O	**Marine Academy**	Tertiary Education	100	Students	1.67	Student	Car	25%	15%	60%	100	50%	50	85%	85	43	80%	40	35%	18
			10	Staff	2	Staff member	Car	5%	5%	90%	18	40%	7	85%	15	6	80%	6	35%	2
TOTAL ACCESS C									**TOTAL VEHICLE TRIPS**		**382**		**84**		**325**	**71**	**61%**	**51**	**48%**	**40**
									cars, taxis, minibuses		**374**		**82**		*85%*	*85%*				
									buses, coaches		**0**		**0**							
									service vehicles		**8**		**2**			**In from West**		**43**		**34**
TOTAL DEVELOPMENT									**TOTAL VEHICLE TRIPS**		**4912**		**709**		**3861**	**545**	**69%**	**488**	**39%**	**275**
									cars, taxis, minibuses		**4156**		**585**		*79%*	*77%*				
									buses, coaches		**538**		**101**							
									service vehicles		**218**		**23**			**In from West**		**376**		**211**
TRANSPORT TERMINAL DIVERTED TRIPS																				
From Shute Harbour Road Only (Ferry Terminal Trips and Local Buses)											**1135**		**300**		**751**	**205**		**232**		**99**
From Coconut Grove Road (Long Distance Coaches and Connecting Services)											**607**		**40**		**477**	**32**		**20**		**20**
TOTAL DEVELOPMENT NEW TRIPS											**3170**		**369**		**2633**	**309**		**236**		**156**

13.6 External Road Impacts - Construction

The estimated traffic generation during construction, for both heavy and light vehicles, has been derived in **Section 13.4**. In capacity terms, the daily and hourly flows anticipated are very small, and no significant operational impact on either links or intersections is expected. However, a substantial number of heavy vehicle trips will be generated during construction and these may have an effect on pavement life.

Based on the current traffic volumes and commercial vehicle (CV) percentages, and assuming a growth rate in total traffic of 6 % p.a., in 2003 Shute Harbour Road would carry between approximately 780 and 560 heavy vehicles per day (hvpd) in Airlie and Cannonvale (the former just west of Waterson Road, the latter east of Coral Esplanade). These would rise 830 hvpd and 600 hvpd respectively in 2004.

Adopting a threshold for assessable pavement impacts of 5 % of background Equivalent Standard Axles (ESA), in accordance with DMR's *Guidelines for Assessment of Road Impacts of Development Proposals*, and an average value of 1.3 ESA per CV, the lowest threshold values become 36 ESA/day in 2003 and 39 in 2004.

Applying a typical ESA:truck ratio of 1.6 for construction traffic, as in the Draft IAS, to the heavy vehicle round trips identified in **Table 13-3**, the peak generation of Stage 1 of construction would be 244 ESA/day in 2003, which would produce assessable impacts throughout this area. On the other hand Stage 2 would generate a maximum of 32 ESA/day in 2004, which does not indicate a need for further assessment. (As noted in **Section 13.4**, construction quantities are not yet available for Stages 3 and 4 and these will need to be assessed later in construction planning.)

Since background traffic volumes generally decrease west of Cannonvale, it is apparent that the area of effect for Stage 1 will extend from the site access point west past the quarry sources to the relevant dredging operation on the Proserpine or O'Connell River.

At a later stage in the design process, once more details of the construction planning are known, a Pavement Impact Assessment quantifying the effect of construction traffic on the maintenance costs and pavement life of the affected road sections will need to be carried out in accordance with DMR's *Guidelines for Assessment of Road Impacts of Development Proposals*. At present, insufficient information is available to proceed with this. However to provide an approximate indication of the scale of the likely costs, and for comparison with the Draft IAS, a simplified calculation using a typical cost per ESA-km has been carried out.

The Department of Main Roads, Mackay advises that in 1986 the relevant rate was 4.5 cents per ESA-km. Using DMR's current Roadworks Input Cost Index (RICI) of 69.14 for 1986-87 and 112.00 for 2002-03, an equivalent rate for Stage 1 construction would be approximately 7.29 ¢ / ESA-km. For this exercise it is assumed that the quarry products are sourced from Mount Marlowe and the sand from Mount Julian, and a rate of 1.6 ESA per loaded truck is used as in the 1998 study.

On this basis Stage 1 construction would add approximately 473 000 ESA-km to Shute Harbour Road heavy vehicle traffic in 2003, which would involve indicative pavement costs of approximately $ 33 200.

Using the RICI to adjust the estimated pavement cost for the previous proposal, taken from the Draft IAS, to 2002-03 equivalent value yields a cost of approximately $ 36 000. This suggests that although the current proposal involves much lower heavy vehicle numbers affecting a longer route, the overall scale of pavement impacts would be similar.

The effect of heavy rain during the wet season in Mackay District on the resistance of pavements to heavy vehicle damage is recognised. The construction schedule for Stage 1 is being developed to ensure that all earthmoving work is completed outside the wet season. This is a major programming imperative, as avoiding the wet season is also important for effective construction. .

At this stage it is envisaged that the site access point for construction vehicles will be at the planned location for Site Access A. A haul road would be provided within the site parallel to Shute Harbour Road and arcing northwards in the western part of the site to provide access between all internal zones and the spoil area to the east without using the surrounding public roads.

Construction traffic would travel along Shute Harbour Road to the construction access. It is envisaged that a temporary priority controlled intersection would be constructed here. With peak hour turning movement volumes of approximately 20 trips into and 10 trips out of the site and vice versa in 2003 (falling in 2004), and all heavy vehicles (as well as most if not all light vehicles) approaching from the west and therefore turning left off Shute Harbour Road, no capacity issues are expected. However, the temporary intersection layout should provide for safe deceleration of trucks approaching along Shute Harbour Road from the east.

The proponent will include as a condition of contract that all heavy vehicle traffic associated with the construction will use the recently completed Waterson Road Loop Road rather than Shute Harbour Road through central Airlie.

13.7 External Road Impacts – Operation

The estimated traffic generation and distribution once the proposed development is fully operational has been derived in **Section 13.5**. The same section also identifies the area where development impacts need more detailed assessment (defined as 5% of background traffic at year of opening), which extends from Site Access A on Shute Harbour Road to Stewart Drive, Cannonvale and includes both Shute Harbour Road and Waterson Road.

In order to quantify the impact of development generated traffic on the road network in this affected area, key links and intersections have been analysed to identify the operating conditions with and without the development, the change in Level of Service, and the change in timing, if any, at which the road element passes 'practical capacity' and nominally warrants upgrading works.

It should be noted that works which are not committed under the current Roads Implementation Program (which expires in 2006) do not have established planned construction dates for use in the calculation of 'Bring Forward Costs' as described in DMR's *Guidelines for Assessment of Road Impacts of Development Proposals*.

Thus, the extent to which the development has been identified as 'advancing' or 'bringing forward' the year in which a theoretical capacity threshold is crossed does not necessarily represent the change in timing of actual construction works.

13.7.1 Link Impacts

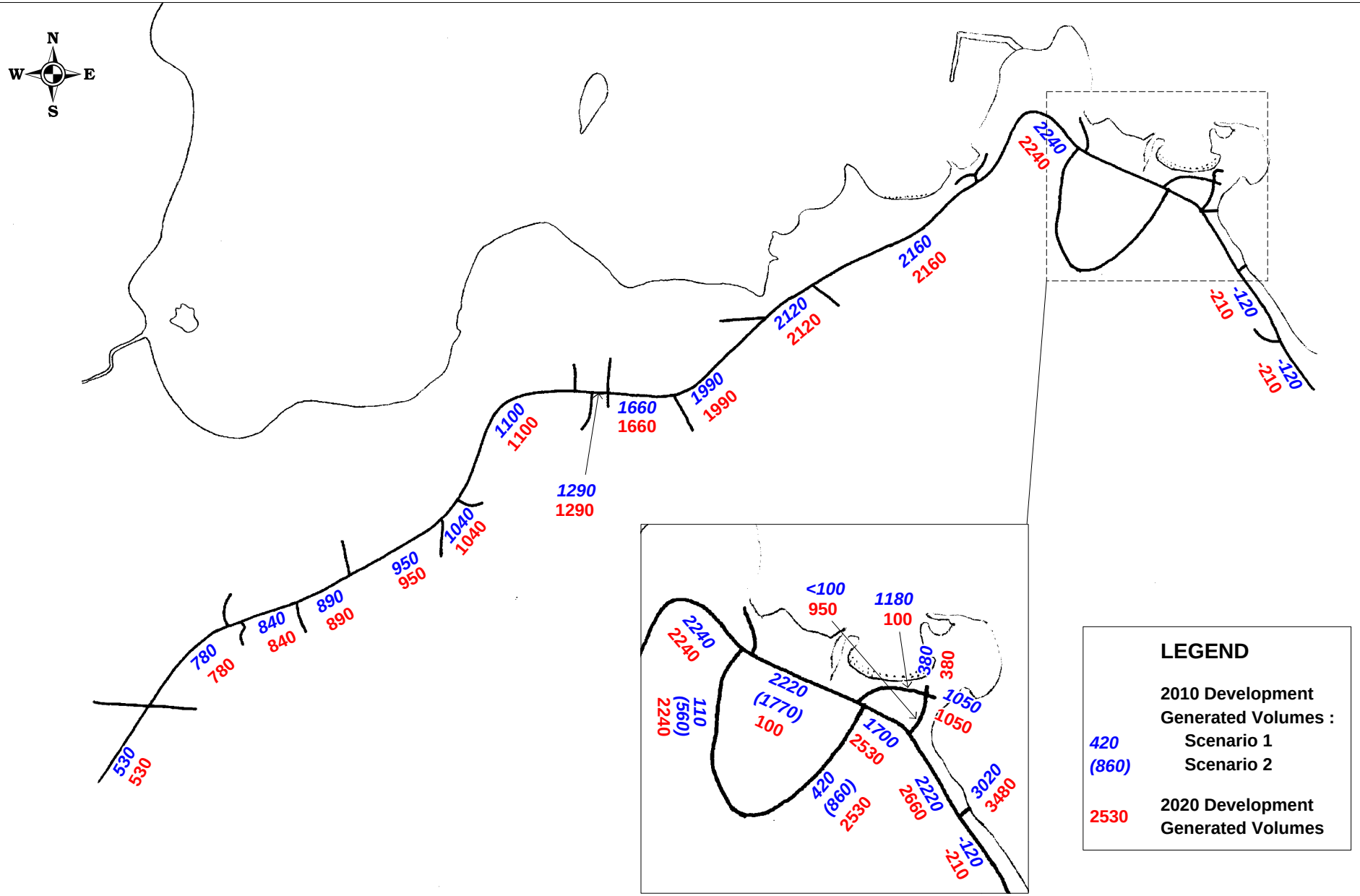
The forecast new link volumes generated by the proposed development (not including diverted trips which would use the relevant link irrespective of the development) are shown in **Figure 13-5**.

The effect of the Port of Airlie development on indicative Levels of Service for key road links in the two analysis years, calculated using the Austroads guidelines, are summarised in **Table 13.6** below.

■ **Table 13-6 Level of Service Impacts on Key Road Links**

Location	Background Only (Without Development)			With Port of Airlie Development		
	Daily Link Volume [vpd]	Level of Service[1] (2 lanes)	Level of Service[1] (4 lanes)	Daily Link Volume [vpd]	Level of Service[1] (2 lanes)	Level of Service[1] (4 lanes)
Analysis Year 2010 (Year of Completion)						
Shute Harbour Road Site Access A to Coconut Grove	15,000	D	B	17,000	D	B
Shute Harbour Road Coconut Grove to Waterson Road (east)	16,000	D	B	17,000	D	B
Shute Harbour Road Waterson Road (west) to approx. Shingley Drive	21,000	E	B	24,000	E	B
Shute Harbour Road approx. Shingley Drive to Coral Esplanade	21,000	E	B	23,000	E	B
Shute Harbour Road Coral Esplanade to Island Drive	16,000	D	B	18,000	D	B
Shute Harbour Road Island Drive to Beach Road	19,000	E	B	21,000	E	B
Shute Harbour Road Beach Road to Tropic Road	21,000	E	B	22,000	E	B
Analysis Year 2020 (Ten Year Design Horizon)						
Shute Harbour Road Site Access A to Coconut Grove	27,000	E	C	28,000	E	C
Shute Harbour Road Coconut Grove to Waterson Road (east)	24,000	E	B	27,000	E	C
Shute Harbour Road Waterson Road (west) to approx. Shingley Drive	37,000	F	D	40,000	F	D
Shute Harbour Road approx. Shingley Drive to Coral Esplanade	38,000	F	D	40,000	F	D
Shute Harbour Road Coral Esplanade to Island Drive	29,000	E	C	31,000	F	C
Shute Harbour Road Island Drive to Beach Road	35,000	F	C	36,000	F	D
Shute Harbour Road Beach Road to Tropic Road	37,000	F	D	38,000	F	D

Note :
(1) Level of Service: A – Excellent; B - Good; C -Satisfactory; D -Tolerable; E – Congested; F – Very Congested



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New Traffic Volumes Generated by Development

FIGURE 13.5

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As the table shows, the Level of Service on most sections of Shute Harbour Road would not be significantly affected by the development. The only exceptions occur in 2020. At this time the Coconut Grove - Waterson Road (east) link would decline from 'Good' to 'Satisfactory' as a result of the development, although the actual change in travel speed encountered would be incremental. As well, in the 'two lane' scenario, the Level of Service on the Coral Esplanade - Island Drive section would worsen from 'Congested' to 'Very Congested', although this is expected to be moot since the threshold of need for road improvements would be crossed well before this stage irrespective of the presence of the development.

The background volumes and link capacities discussed in **Section 13.3** indicate that these development generated volumes would bring forward the year of need for the four laning of Shute Harbour Road in some sections.

Between Coral Esplanade and Island Drive the deficiency year would be brought forward 2 years to 2010 as a result of the development, while between Coconut Grove and Site Access A it would advance 2 years to 2012.

If a nominal staging of the development prior to the year of full opening in 2010 is adopted, a similar check can be made to determine any changes in the timing of infrastructure improvement needs in this period.

For this analysis, the residential mixed use components of the development have been assumed to be constructed in five equal stages from mid 2004 to the beginning of 2009. The transport interchange and marine related activities have been assumed to open in 2005 with the first residential stage. The hotel is assumed to be the final component of the development, opening at the beginning of 2010.

This analysis indicates that several additional sections of Shute Harbour Road would have the need for four laning brought forward by one year by the development prior to 2010 : for the section between approximately Shingley Drive and Coral Esplanade the year of need becomes 2007, for Island Drive to Beach Road it becomes 2008, and for Beach Road to Tropic Road it becomes 2007.

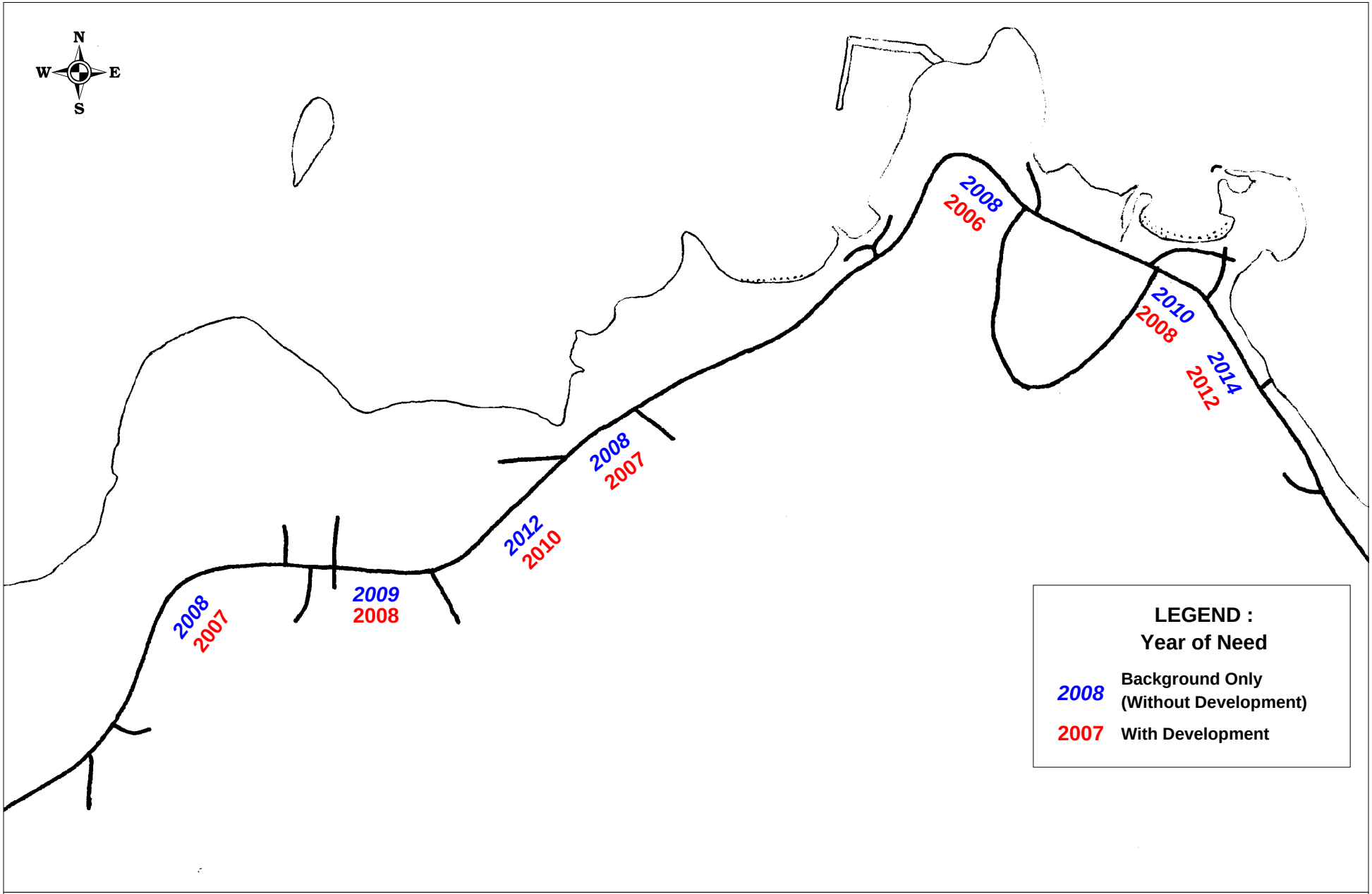
In addition, the year of need is brought forward by two years in two sections : for the section between Coconut Grove and Airlie Esplanade the threshold year becomes 2008, while for Waterson Road (west) to approximately Shingley Drive it becomes 2006.

Overall, then, the deficiency year is brought forward by one year over a total length of approximately 2.3 km, and by two years over a total of approximately 1.7 km.

The development impacts on the year of need for upgrading Shute Harbour Road are summarised in **Figure 13-6**.

13.7.2 Key Intersection Performance Impacts

A range of options for site access were discussed in **Section 3.3.3**. The option presented here is the preferred option and corresponds to Whitsunday Shire Council's preference (see **Appendix L-2**).



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Year of Need for Shute Harbour Road Widening

FIGURE 13.6

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The impact of the proposed development on the performance of key intersections in the area of influence has been analysed using the SIDRA intersection analysis program. The results of the analysis are summarised in **Tables 13-7** and **13-8** below. These also include the performance statistics without the development, from **Tables 13-1** and **13-2**, for ease of comparison.

■ Table 13-7 Development Traffic Effects on Intersection Performance : 2010

Scenario	Degree of Saturation[1] { X }	Average Vehicle Delay [s]	Level of Service[2]	Longest Approach Queue [m]
Shute Harbour Road / Coconut Grove				
AM Peak Hour - Background Only Existing Configuration	0.40	2.0	A	1 E, 4 N, 0 W
PM Peak Hour – Background Only Existing Configuration	0.64	4.0	A	2 E, 28 N, 0 W
AM Peak Hour - With Development Existing Configuration	0.43	1.9	A	2 E, 4 N, 0 W
PM Peak Hour - With Development Existing Configuration	0.77	4.4	A	3 E, 40 N, 0 W
Shute Harbour Road / Waterson Road (east) / Airlie Esplanade : Scenario 1 - 5% via Loop Road				
AM Peak Hour - Background Only Interim Configuration Single Lane Roundabout	0.42	11.8	B	12 S, 22 E, 5 N, 19 W
PM Peak Hour – Background Only Interim Configuration Single Lane Roundabout	0.56	12.3	B	15 S, 31 E, 13 N, 27 W
AM Peak Hour - With Development Interim Configuration Single Lane Roundabout	0.53	12.5	B	15 S, 29 E, 11 N, 28 W
PM Peak Hour - With Development Interim Configuration Single Lane Roundabout	0.70	13.8	B	30 S, 49 E, 22 N, 35 W
Shute Harbour Road / Waterson Road (east) / Airlie Esplanade : Scenario 2 - 25% via Loop Road				
AM Peak Hour – Background Only Interim Configuration Single Lane Roundabout	0.43	12.6	B	19 S, 22 E, 5 N, 20 W
PM Peak Hour – Background Only Interim Configuration Single Lane Roundabout	0.56	13.0	B	26 S, 32 E, 13 N, 27 W
AM Peak Hour - With Development Interim Configuration Single Lane Roundabout	0.57	14.0	B	36 S, 29 E, 11 N, 31 W
PM Peak Hour - With Development Interim Configuration Single Lane Roundabout	0.70	14.9	B	51 S, 49 E, 22 N, 35 W
Shute Harbour Road / Broadwater Avenue : Scenario 1 - 5% via Loop Road[3]				
AM Peak Hour - Background Only Existing Configuration	0.46	1.3	A	1 E, 4 N, 0 W
PM Peak Hour – Background Only Existing Configuration	0.54	1.2	A	3 E, 3 N, 0 W
AM Peak Hour - With Development Existing Configuration	0.56	1.5	A	2 E, 7 N, 0 W
PM Peak Hour - With Development Existing Configuration	0.62	1.3	A	4 E, 4 N, 0 W
Shute Harbour Road / Waterson Road (west) : Scenario 1 - 5% via Loop Road				
AM Peak Hour – Background Only Existing Configuration	0.46	3.5	A	8 S, 0 E, 7 W
PM Peak Hour – Background Only Existing Configuration	0.55	3.8	A	12 S, 0 E, 5 W
AM Peak Hour - With Development Existing Configuration	0.52	3.7	A	12 S, 0 E, 9 W
PM Peak Hour - With Development Existing Configuration	0.63	4.3	A	19 S, 0 E, 8 N
Shute Harbour Road / Waterson Road (west) : Scenario 2 - 25% via Loop Road				

Scenario	Degree of Saturation(1) { X }	Average Vehicle Delay [s]	Level of Service(2)	Longest Approach Queue [m]
AM Peak Hour – Background Only Existing Configuration	0.44	4.8	A	10 S, 0 E, 15 W
PM Peak Hour – Background Only Existing Configuration	0.50	5.2	A	20 S, 0 E, 11 W
AM Peak Hour - With Development Existing Configuration	0.48	5.4	A	14 S, 0 E, 22 N
PM Peak Hour - With Development Existing Configuration	0.70	6.4	A	38 S, 0 E, 17 W
Shute Harbour Road / Island Drive				
AM Peak Hour - Background Only Interim Configuration Single Lane Roundabout	0.55	5.2	A	24 S, 24 E, 33 W
PM Peak Hour - Background Only Interim Configuration Single Lane Roundabout	0.70	15.3	B	61 S, 47 E, 36 N
AM Peak Hour - With Development Interim Configuration Single Lane Roundabout	0.66	13.7	B	31 S, 27 E, 44 W
PM Peak Hour - With Development Interim Configuration Single Lane Roundabout	0.89	19.6	B	141 S, 71 W, 44 W
AM Peak Hour - With Development Ultimate Configuration Two Lane Roundabout	0.36	12.3	B	8 S, 12 E, 16 W
PM Peak Hour - With Development Ultimate Configuration Two Lane Roundabout	0.40	12.6	B	14 S, 19 E, 15 W
Shute Harbour Road / Beach Road / TAFE Access				
AM Peak Hour - Background Only Existing Configuration	0.54	4.6	A	1 S, 3 E, 19 N, 1 W
PM Peak Hour – Background Only Existing Configuration	0.52	3.0	A	1 S, 2 E, 17 N, 1 W
AM Peak Hour - With Development Existing Configuration	0.67	5.4	A	2 S, 5 E, 28 N, 1 W
PM Peak Hour - With Development Existing Configuration	0.75	3.7	A	2 S, 3 E, 25 N, 1 W

Notes:

(1) The degree of saturation (or X value) tabulated is the ratio of demand to available capacity for the most critical movement at the intersection. An X of 0.90 represents a desirable maximum for acceptable operation of signalised intersections, while a maximum X of 0.85 is recommended for roundabouts. For priority intersections an X above 0.80 indicates more formal control is warranted.

(2) Level of Service: A – Excellent; B - Good; C -Satisfactory; D -Tolerable; E – Congested; F – Very Congested

(3) Shute Harbour Road / Broadwater Avenue has only been analysed for Scenario 1. This is the 'worst case' for this intersection since no movement volumes are higher in Scenario 2.

As these results show, the development generated traffic is expected to have only minor impacts on the performance of key intersections. In all cases but one, the configuration required to cater for background traffic in 2010 is readily able to absorb the additional volumes, and the Level of Service remains at least Good.

The exception to this is the intersection of Shute Harbour Road and Island Drive, where the additional traffic imposed by the development results in a single lane roundabout configuration being inadequate by 2010. However, assuming the nominal development staging prior to 2010 discussed above, a single lane roundabout would perform adequately in 2009 with both background and development traffic.

As identified in **Section 13.3.1**, without the development this intersection would need to be upgraded in 2011. This indicates that rather than changing the required intersection configuration, the development would simply advance the year of need for its upgrading to a two circulating lane roundabout by one year (from 2011 to 2010). As well, the development advances the year in which the existing give-way configuration becomes inadequate by one year, from 2009 to 2008. Since the year of need for four laning the adjacent link has also advanced to 2008, the provision of a two lane roundabout could be coordinated with the widening of Shute Harbour Road as suggested in **Section 13.3.1** for the background-only case, with both works occurring one year earlier due to the effects of the development.

Similar analysis using the nominal pre-2010 staging indicates that the development generated traffic would advance the year in which intersection improvements are required by one year (from 2006 to 2005) at Shute Harbour Road / Airlie Esplanade / Waterson Road (east) in Scenario 1, but not in Scenario 2. It would also bring forward the year in which intersection improvements are required at Shute Harbour Road / Beach Road (once the main road is widened to four lanes) by one year to 2008.

■ **Table 13-8 Development Traffic Effects on Intersection Performance : 2020**

Scenario	Degree of Saturation(1) { X }	Average Vehicle Delay [s]	Level of Service(2)	Longest Approach Queue [m]
Shute Harbour Road / Coconut Grove				
AM Peak Hour - Background Only Shute Harbour Road Widened Give Way Control	0.34	3.0	A	9 E, 10 N, 0 W
PM Peak Hour - Background Only Shute Harbour Road Widened Give Way Control	0.64	4.2	A	22 E, 31 N, 0 W
AM Peak Hour - With Development Shute Harbour Road Widened Give Way Control	1.00	9.2	A	15 E, 97 N, 0 W
PM Peak Hour - With Development Shute Harbour Road Widened Give Way Control	0.93	5.9	A	27 E, 43 N, 0 W
AM Peak Hour - With Development Proposed Ultimate Configuration Two Lane Roundabout	0.44	11.3	B	20 E, 8 N, 13 W
PM Peak Hour - With Development Proposed Ultimate Configuration Two Lane Roundabout	0.48	11.6	B	18 E, 10 N, 24 W
Shute Harbour Road / Waterson Road (east) / Airlie Esplanade is no longer an intersection in 2020				
Shute Harbour Road / Broadwater Avenue				
AM Peak Hour - Background Only Existing Configuration	0.31	2.7	A	2 E, 6 N, 0 W
PM Peak Hour – Background Only Existing Configuration	0.33	2.4	A	3 E, 3 N, 0 W
AM Peak Hour - With Development Existing Configuration	0.31	2.8	A	2 E, 6 N, 0 W
PM Peak Hour - With Development Existing Configuration	0.33	2.4	A	3 E, 3 N, 0 W
Shute Harbour Road / Waterson Road (west)				
AM Peak Hour - Background Only Ultimate Configuration Two Lane Roundabout	0.61	12.7	B	32 S, 11 E, 20 W
PM Peak Hour - Background Only Ultimate Configuration Two Lane Roundabout	0.72	14.7	B	48 S, 24 E, 20 W

Scenario	Degree of Saturation[1] { X }	Average Vehicle Delay [s]	Level of Service[2]	Longest Approach Queue [m]
AM Peak Hour - With Development Ultimate Configuration Two Lane Roundabout	0.65	13.0	B	37 S, 12 E, 24 W
PM Peak Hour - With Development Ultimate Configuration Two Lane Roundabout	0.81	15.7	B	68 S, 27 E, 22 W
Shute Harbour Road / Island Drive				
AM Peak Hour - Background Only Ultimate Configuration Traffic Signal Control (cycle time 70 seconds)	0.87	25.9	C	67 S, 106 E, 88 W
PM Peak Hour - Background Only Ultimate Configuration Traffic Signal Control (cycle time 90 seconds)	0.89	31.0	C	125 S, 164 E, 107 W
AM Peak Hour - With Development Ultimate Configuration Traffic Signal Control (cycle time 80 seconds)	0.79	24.4	C	85 S, 110 E, 101 W
PM Peak Hour - With Development Ultimate Configuration Traffic Signal Control (cycle time 100 seconds)	0.87	32.3	C	114 S, 195 E, 109 W
Shute Harbour Road / Beach Road / TAFE Access				
AM Peak Hour - Background Only Ultimate Configuration Two Lane Roundabout	0.57	12.5	B	1 S, 22 E, 12 N, 31 W
PM Peak Hour - Background Only Ultimate Configuration Two Lane Roundabout	0.56	11.9	B	1 S, 30 E, 7 N, 26 W
AM Peak Hour - With Development Ultimate Configuration Two Lane Roundabout	0.61	12.5	B	2 S, 24 E, 12 N, 36 W
PM Peak Hour - With Development Ultimate Configuration Two Lane Roundabout	0.60	12.1	B	1 S, 34 E, 7 N, 28 W

Notes:
(1) The degree of saturation (or X value) tabulated is the ratio of demand to available capacity for the most critical movement at the intersection. An X of 0.90 represents a desirable maximum for acceptable operation of signalised intersections, while a maximum X of 0.85 is recommended for roundabouts. For priority intersections an X above 0.80 indicates more formal control is warranted.
(2) Level of Service : A - Excellent; B - Good; C - Satisfactory; D - Tolerable; E - Congested; F - Very Congested

As in 2010, the results for 2020 indicate that the development generated traffic is expected to have only minor impacts on the performance of key intersections.

Again, in all cases except one the configuration required to cater for background traffic in 2020 is readily able to absorb the additional volumes, although for Shute Harbour Road / Island Drive the signal cycle time would need to be slightly increased, and the Level of Service remains at least Satisfactory. The exception in this case is the Shute Harbour Road / Coconut Grove intersection, which would need more formal control with the development than without it, after Shute Harbour Road is widened to two through lanes in each direction. A two lane roundabout would perform well within capacity and with a Good level of service.

Intermediate year analysis indicates that with the development, Shute Harbour Road / Coconut Grove would need to be upgraded from its present give-way configuration once Shute Harbour Road is widened (nominally by 2008, or 2010 without the development), or in any case by 2011.

Similar analysis indicates that only one of the intersection improvements required at the other key intersections in **Table 13-8** between 2010 and 2020 has its timing changed by the addition of development generated traffic : again it is the intersection of Shute Harbour Road and Island Drive, where the two lane roundabout would need to be upgraded in 2019 rather than 2020.

Table 13-9 below summarises the sequence of upgrades identified for each intersection, and the changes in required timing produced by the development.

■ **Table 13-9 Key Intersection Upgrades and Development Advances**

Intersection	Configuration	Year of Need for Upgrade		Timing Advance due to Development
		Background Only	With Development	
Shute Harbour Road / Coconut Grove	Existing Priority Controlled	2012	2011	1 year
	Priority Controlled, Shute Harbour Rd 4 lanes	OK in 2020	N/A	N/A
	Two Lane Roundabout	N/A	OK in 2020	Layout changed
Shute Harbour Road / Waterson Road (E) / Airlie Esplanade	Existing Priority Controlled	2006 (Scenario 1) or 2007 (Scenario 2)	2005 (Scenario 1) or 2007 (Scenario 2)	1 year (Scenario 1) or None (Scenario 2)
	Single Lane Roundabout	When Ultimate Network Adopted		None
Shute Harbour Road / Broadwater Avenue	Existing Priority Controlled	OK in 2020	OK in 2020	None
Shute Harbour Road / Waterson Road (W)	Existing Priority Controlled	When SHR Widened (nominally 2008)		None
	Two Lane Roundabout	OK in 2020	OK in 2020	None
Shute Harbour Road / Island Drive	Existing Priority Controlled	2009	2008	1 year
	Single Lane Roundabout	2010	2011	1 year
	Two Lane Roundabout	2020	2019	1 year
	Traffic Signals	OK in 2020	OK in 2020	None
Shute Harbour Road / Beach Road / TAFE Access	Existing Priority Controlled	When SHR Widened (nominally 2008, or 2007 with development)		None
	Priority Controlled, Shute Harbour Rd 4 lanes	2009	2008	1 year
	Two Lane Roundabout	OK in 2020	OK in 2020	None

13.7.3 Proposed Access Intersection Configurations and Performance

The performance of the two new intersections at site access points has been analysed using the SIDRA intersection analysis program. The results of the analysis are summarised in **Table 13-10** below.

These results indicate that the proposed roundabouts (initially single lane, but widening to two circulating lanes when Shute Harbour Road is upgraded) would perform well within their capacities, with low delays and at least Good levels of service in both the analysis years.

■ **Table 13-10 External Access Intersection Performance**

Scenario	Degree of Saturation(1) { X }	Average Vehicle Delay [s]	Level of Service(2)	Longest Approach Queue [m]
Analysis Year 2010 (Year of Completion)				
Shute Harbour Road / Site Access A				
AM Peak Hour - With Development Proposed Interim Configuration Single Lane Roundabout	0.50	11.8	B	26 E, 5 N, 14 W
PM Peak Hour - With Development Proposed Interim Configuration Single Lane Roundabout	0.50	13.2	B	25 E, 24 N, 21 W
Airlie Esplanade / Coconut Grove / Site Accesses B and C				
AM Peak Hour - With Development Proposed Configuration Single Lane Roundabout	0.08	7.3	A	2 S, 2 E, 1 N, 3 W
PM Peak Hour - With Development Proposed Configuration Single Lane Roundabout	0.13	7.7	A	3 S, 2 E, 2 N, 5 W
Analysis Year 2020 (Ten Year Design Horizon)				
Shute Harbour Road / Site Access A				
AM Peak Hour - With Development Proposed Ultimate Configuration Two Lane Roundabout	0.47	11.6	B	19 E, 3 N, 10 W
PM Peak Hour - With Development Proposed Ultimate Configuration Two Lane Roundabout	0.50	12.3	B	20 E, 10 E, 16 W
Airlie Esplanade / Coconut Grove / Site Accesses B and C				
AM Peak Hour - With Development Proposed Configuration Single Lane Roundabout	0.14	7.2	A	5 S, 2 E, 1 N, 4 W
PM Peak Hour - With Development Proposed Configuration Single Lane Roundabout	0.30	6.4	A	11 S, 2 E, 2 N, 3 W

Notes:
(1) The degree of saturation (or X value) tabulated is the ratio of demand to available capacity for the most critical movement at the intersection. An X of 0.90 represents a desirable maximum for acceptable operation of signalised intersections, while a maximum X of 0.85 is recommended for roundabouts. For priority intersections an X above 0.80 indicates more formal control is warranted.
(2) Level of Service : A - Excellent; B - Good; C - Satisfactory; D - Tolerable; E - Congested; F - Very Congested

13.8 Alternative Signalised Intersections

As discussed in **Section 13.3.1**, it is understood that both DMR and Whitsunday Shire Council prefer roundabout control to traffic signals for traffic flow and townscape reasons. The access intersections have therefore been identified as roundabouts in the conceptual masterplan, and analysed as such in the first instance.

However, given the high pedestrian and cyclist demands crossing Shute Harbour Road which are anticipated at Coconut Grove and at Site Access A, traffic signal control has also been considered at these two locations. Traffic signals may improve safety for these road user groups, particularly for elderly and mobility impaired pedestrians who find it difficult to select a suitable gap in free flowing traffic. Once Shute Harbour Road is widened to four lanes, and with traffic volumes continuing to increase, the task for pedestrians will become more difficult near the site as well as elsewhere along this major road.

It should be noted that these pedestrian demands do not all result from the proposed development. The existing accommodation, dining and retail premises south of Shute Harbour Road and east of Airlie Esplanade already create pedestrian desire lines in this area. In addition, the existing pedestrian and cycle path extending east from Airlie Beach is on the southern side of Shute Harbour Road so a safe crossing point will be required to connect this facility to central Airlie.

The performance of these two intersections in alternative signalised configurations has been analysed using the SIDRA intersection analysis program. The results of the analysis are summarised in **Table 13-11** below. These include nominal intersection layouts and phasing sequences.

■ **Table 13-11 Alternative Signalised Intersection Performance : 2010**

Scenario	Degree of Saturation[1] { X }	Average Vehicle Delay [s]	Level of Service[2]	Longest Approach Queue [m]
Analysis Year 2010 (Year of Completion)				
Shute Harbour Road / Site Access A				
AM Peak Hour - With Development Alternative Interim Configuration Traffic Signal Control (cycle time 70 seconds)	0.88	28.7	C	186 E, 7 NE, 19 N, 57 W
PM Peak Hour - With Development Alternative Interim Configuration Traffic Signal Control (cycle time 90 seconds)	0.80	25.9	C	112 E, 53 NE, 39 N, 170 W
Shute Harbour Road / Coconut Grove				
AM Peak Hour - With Development Alternative Interim Configuration Traffic Signal Control (cycle time 60 seconds)	0.73	11.5	B	112 E, 9 N, 76 W
PM Peak Hour - With Development Alternative Interim Configuration Traffic Signal Control (cycle time 60 seconds)	0.74	13.6	B	114 E, 32 N, 108 W
Analysis Year 2020 (Ten Year Design Horizon)				
Shute Harbour Road / Site Access A				
AM Peak Hour - With Development Alternative Ultimate Configuration Traffic Signal Control (cycle time 80 seconds)	0.80	27.2	C	157 E, 7 NE, 31 N, 67 W
PM Peak Hour - With Development Alternative Ultimate Configuration Traffic Signal Control (cycle time 90 seconds)	0.90	30.4	C	121 E, 49 NE, 52 N, 189 W
Shute Harbour Road / Coconut Grove				
AM Peak Hour - With Development Alternative Ultimate Configuration Traffic Signal Control (cycle time 70 seconds)	0.78	22.1	C	104 E, 44 N, 105 W
PM Peak Hour - With Development Alternative Ultimate Configuration Traffic Signal Control (cycle time 90 seconds)	0.86	27.4	C	91 E, 67 N, 179 W

Notes:

(1) The degree of saturation (or X value) tabulated is the ratio of demand to available capacity for the most critical movement at the intersection. An X of 0.90 represents a desirable maximum for acceptable operation of signalised intersections, while a maximum X of 0.85 is recommended for roundabouts. For priority intersections an X above 0.80 indicates more formal control is warranted.

(2) Level of Service : A - Excellent; B - Good; C - Satisfactory; D - Tolerable; E - Congested; F - Very Congested

These results indicate that traffic signals could operate effectively at these locations, although queue lengths would be significantly increased (particularly on Shute Harbour Road) and vehicle delays would also increase although a satisfactory level of service could be provided.

The analysis suggests that in both analysis years, no auxiliary through lanes would be required on Shute Harbour Road. Right turning pockets would be needed at both locations, and at Site Access A an auxiliary left turn lane into the site would be beneficial, particularly considering the significant volumes of buses and coaches executing this turn.

At Coconut Grove, a simple two lane approach from the north would be suitable. However, at Shute Harbour Road / Site Access A, the need to control queuing within the site and to accommodate vehicles attempting to exit the lower level carpark would result in a need to control the exits from the upper and lower levels within the site separately. For SIDRA analysis purposes the carpark exit has been identified as the North-East approach.

This is likely to involve extending the lower level exit to Shute Harbour Road as a single lane approach parallel to and abutting the main site access. The main exit would need to be two lane, with at least 55 m storage space available north of the stop line.

The internal layout will be adjusted as required to provide the necessary storage length within the site if traffic signal control is agreed with DMR and Whitsunday Shire Council to be the preferred option for this intersection. The current conceptual masterplan suggests that this could be achieved with relatively minor changes to the internal road alignments.

At Shute Harbour Road, the access road would then be four lanes wide (one northbound and three southbound) divided into three sections and running in two separate phases. If the signalised option is preferred, the intersection layout will be designed to clearly show the separate controls applying to the two site approaches, both to drivers and pedestrians.

In judging the desirability of traffic signals at these locations, the extent of the likely safety benefits (particularly considering the unusual double approach which would result at Site Access A) would need to be balanced against the traffic flow implications. This will be influenced by the control systems planned for other intersections on Shute Harbour Road as well as alternative facilities which may be planned to cater for pedestrians and cyclists crossing this artery in the vicinity of the site as well as in Airlie Beach generally.

13.9 Transport Efficiency

Although the proposed development will unavoidably impose a minor increase in travel time on through traffic, due to changed traffic control on Shute Harbour Road at its intersections with Coconut Grove and Site Access A, the overall effect of the development on transport efficiency is expected to be positive.

The development is strongly oriented towards public transport, walking and cycling, and will encourage increased public transport use through improved facilities and

accessibility. In addition, the relocation of the ferry activities from Shute Harbour close to the heart of the mainland tourist accommodation area is expected to greatly increase the non-motorised mode share for these activities as well as reducing their average vehicle trip length (for example from accommodation in Cannonvale or Jubilee Pocket).

13.10 On Site Access, Internal Circulation, and Parking

13.10.1 On Site Access and Circulation

Within the site, vehicular access is provided via a small number of circulation roads. The major links are shown diagrammatically in **Figure 13-4** which also indicates the nominal road names used for the discussion in this section.

By far the most heavily trafficked of the internal circulation links, carrying approximately 3 500 vpd at its busiest point by 2020, is the Main Access Road. This extends northwards from Site Access A from Shute Harbour Road.

Arriving private vehicle traffic associated with the transport terminal (Zone D) and the residential components of Zones E and F diverges left from this road into the parking level under the transport interchange, while buses, minibuses and taxis as well as traffic for the Hotel, Serviced Apartments, Marine Industrial and Boat Ramp areas (Zones A, B, J and K) continues north to an internal roundabout. This diverge point is located close to Shute Harbour Road and used by a high proportion of unfamiliar drivers, so clear advance signage on the Shute Harbour Road approaches is proposed to assist with driver decision making. The internal roundabout will be designed so as to accommodate sizes and types of buses and heavy vehicles likely to enter the transport terminal.

From the internal roundabout north of the diverge, the public transport interchange lies to the west while the access road continues east and north towards the Hotel, meeting the Eastern Access Road' which serves the Marine Industrial area, Boat Ramp and future development site to the east.

Exiting traffic from most of these zones retraces the entry path, apart from private vehicles from the lower level parking for zones D, E and F, which rejoins the access road via a give-way controlled left turn from the eastern side of the road.

The other two significant circulation roads are the Northern Access Road serving the Seaview residential zones (L, M and N) and the Marine Training Academy (Zone O), and the Marina Access Road serving the Harbourfront zones G and H as well as the Marina (Zone O). The Northern Access Road is expected to carry approximately 400 vpd, while the Marina Access Road will carry approximately 1,000 vpd.

It is anticipated that there will be very little demand for internal vehicle circulation arising from trips between zones within the site (as distinct from parking search patterns experienced in any large carpark, which will be addressed by detailed design). The distance between the internal zones is small, and a network of pedestrian and bicycle paths will be provided throughout the site.

Despite this, it should be noted that the carparking levels beneath the Harbourfront zones (E-H) and the transport terminal (C and D) will be thoroughly interconnected with circulation paths throughout, making it quite feasible to drive between any two zones within the site without using the external road network. For example, drivers from the Harbourfront Residential Villas in Zone H will be able to reach the Marine Industrial Area in Zone J if they wish by travelling through the lower level carpark and emerging onto the Main Access Road from Zone C.

For these reasons, internal circulation is not expected to impose any significant load on the public road network around the site.

The design of the internal access roads and intersections is still in a very preliminary stage. Safety for all road users, as well as operational effectiveness, will be primary considerations in the road design process. At this stage it may be noted that in general, the volumes within the site are low, and no capacity issues are anticipated. Detailed design will ensure that adequate swept paths, queuing space and sight distance are provided at internal site intersections and other critical points within the site (for example access points to charged or access controlled parking areas, and within the Transport Interchange).

The section of the Main Access Road south of the Transport Interchange is of particular interest since the storage space and decision point separations north of Shute Harbour Road are quite constrained. The current concept sketch indicates a storage length of just over 40 metres between the internal roundabout and Shute Harbour Road, which as discussed below is more than adequate for the currently proposed roundabout control at Site Access A.

As noted in **Section 13.8** the internal road layout will be adjusted to increase the storage space as necessary if traffic signal control is preferred.

The design of this section of the Main Access Road will also minimise or avoid weaving, maximise recognition of the diverge north of the entry point, and provide safe sight distance at the lower level exit. All these goals are achievable within the current overall site layout.

A performance check on this section of road has been carried out using the SIDRA intersection analysis program to analyse the two relevant internal intersections - the roundabout just east of the transport interchange, and the give way controlled intersection between the lower level carpark exit and the southbound carriageway of the Main Access Road

The results of the analysis are summarised in **Table 13-12** below.

■ **Table 13-12 Internal Access Intersection Performance : 2020**

Scenario	Degree of Saturation(1) { X }	Average Vehicle Delay [s]	Level of Service(2)	Longest Approach Queue [m]
Internal Access Intersection at Transit Interchange				
AM Peak Hour Proposed Configuration Single Lane Roundabout	0.13	7.7	A	5 S, 1 E, 4 W
PM Peak Hour Proposed Configuration Single Lane Roundabout	0.09	7.2	A	3 S, 3 E, 3 W
Exit from Underground Zone D Carpark to Access A				
AM Peak Hour Proposed Configuration Give Way Control	0.04	0.7	A	1 E, 0 N
PM Peak Hour Proposed Configuration Give Way Control	0.24	2.0	A	7 E, 0 N

Notes:
(1) The degree of saturation (or X value) tabulated is the ratio of demand to available capacity for the most critical movement at the intersection. An X of 0.90 represents a desirable maximum for acceptable operation of signalised intersections, while a maximum X of 0.85 is recommended for roundabouts. For priority intersections an X above 0.80 indicates more formal control is warranted.
(2) Level of Service : A - Excellent; B - Good; C - Satisfactory; D - Tolerable; E - Congested; F - Very Congested

The queue length results for the Shute Harbour Road / Site Access A, from **Table 13.9** are also relevant. For the interim single lane roundabout configuration, in 2010 the PM peak hour 95% back of queue extends northwards for 24 metres, which would be approximately 10 metres north of the carpark exit ramp and indicates intermittent blocking of the ramp. The queueing statistics from SIDRA indicate that the exit ramp would be blocked approximately 30% of the time during this peak hour.

The results in **Table 13-12** suggest that under these conditions the carpark exit would still remain well within capacity, and although queuing on the carpark exit can be expected to increase, no more than three vehicles (approximately 20 m) would be expected under random arrival conditions. However, this can be expected to increase until the Site Access A intersection is upgraded to a two lane roundabout, likely to occur in conjunction with the widening of Shute Harbour Road (nominally required in 2012 with the development in place).

Once Site Access A becomes a two lane roundabout, queuing northward from Shute Harbour Road falls considerably and with the lower level exit estimated to be 14 metres north of the control line at the site exit onto Shute Harbour Road once the approach angle to the Main Access Road is improved (compared to the 10 m queue length identified for 2020 in **Table 13-10**) no blocking would be expected to occur.

Both internal intersections would then operate freely, with very low Degrees of Saturation and excellent Levels of Service, until at least 2020 in the suggested configurations.

Storage space southward from the internal roundabout is more than adequate for the expected demands.

13.10.2 Parking Requirements

Parking requirement calculations for land uses within the development have generally been based on Whitsunday Shire Planning Scheme rates, where available. For land uses with no specified rate in this document, the parking calculations are based on the trip generation methodologies described in **Section 13.5.1**.

For the ferry terminal, the private vehicle parking requirements have been calculated as a proportion of the total daily generation, representing peak accumulation. This proportion has been taken from the 1998 Traffic Study which in turn based its approach on observed behaviour at the Shute Harbour terminal. This yields a peak accumulation of approximately 92 % of the total vehicles visiting the site in a day. This is very high compared to most other land uses, but appears reasonable in this case, since the great majority of ferry and cruise passengers leave the mainland in the morning and do not return until late afternoon or evening, or even a later day.

The parking demand for coaches, buses and taxis at the Transport Terminal has been based on present operations at Shute Harbour and at the existing bus terminal in Airlie Beach, plus consideration of likely ferry and long distance coach services in peak hours based on the trip generation figures.

Parking demand within the Transport Interchange will also be generated by transfer services such as minibuses and taxis connecting tourists from their accommodation to ferries or long distance coaches. For these modes, parking demand associated with consecutive buses or ferries has been assumed to stack if the primary services are within 15 minutes (for coaches) or 10 minutes (for ferries). A longer time has been applied for coaches since more passengers will have luggage to handle.

Parking requirements for the Transport Terminal have been based on forecast passenger numbers by the design horizon year 2020.

Parking requirements for the Marina have been calculated using a rate of 0.4 spaces per berth, which is within the 0.3 - 0.6 spaces per berth specified in Australian Standard AS 3962 - 2001 *Guidelines for Design of Marinas*. This represents a relaxation of 0.2 spaces per berth from Whitsunday Shire Council's standard rates.

A rate in the lower part of Australian Standards' range has been selected on the basis that 70 berths (over one third of the total supply) will be dedicated to charter vessels serving the tourist market, which has low private vehicle availability as discussed in **Section 13.1.2.** In addition, many of the other berths are expected to serve non-resident owners who are likely to arrive in the area by air and transfer to their vessel by taxi.

For all uses other than permanent residential, the resulting parking space numbers have been discounted for self-containment and non-motorised mode share in accordance with the trip generation factors, and where relevant for public transport use. Permanent residential demand, on the other hand, has been conservatively taken as 100 % of standard rates, which assumes that all unit owners will store a vehicle on site irrespective of the mode split for the trips they make. It also assumes a high proportion of visitors to permanent residents will use cars, which is considered conservative in this case.

The resulting parking demands for each zone are presented in **Table 13-13**.

The proposed development provides parking for the Harbourfront and Transport Terminal zones B, C, D, E, F, G, and H in a consolidated lower level carpark of 723 spaces, with an additional 75 spaces in a podium level within Zone G. This carpark also provides longer term parking for the Marina. For short term parking and loading activities associated with the Marina there is a 24-space carpark within Zone P.

The required parking for other land uses will be provided within the relevant zone.

Overall, the proposed parking supply in the development meets the identified requirements, although an additional three car-only 'crew' spaces will be provided at a convenient location near the boat ramp in Zone K during detailed design. In addition, during detailed design the Transport Interchange layout will be refined to maximise efficiency and to provide a convenient location for minibus loading and several taxi feeder spaces.

Loading and servicing facilities will be detailed later in design process, once more detailed information on the operational requirements of the proposed premises is available. All service vehicle manoeuvring will be fully contained within the appropriate sections of the site.

13.11 Pedestrian and Cyclist Facilities

As **Tables 13-4** and **13-5** imply, there will be large numbers of pedestrian trips associated with the proposed development. Although appropriate rates for cyclist demand are not known, bicycle trips are also expected to be significant because of the close proximity of many attractions and the recreational nature of so many tourist related trips.

The primary desire line for these trips is expected to be to and from the high activity area in central Airlie, from the central plaza between zones E and G across Coconut Grove and along Shute Harbour Road. Airlie Esplanade will carry a secondary desire line to and from the west, since it is the most direct route to central Airlie from the northern zones within the site.

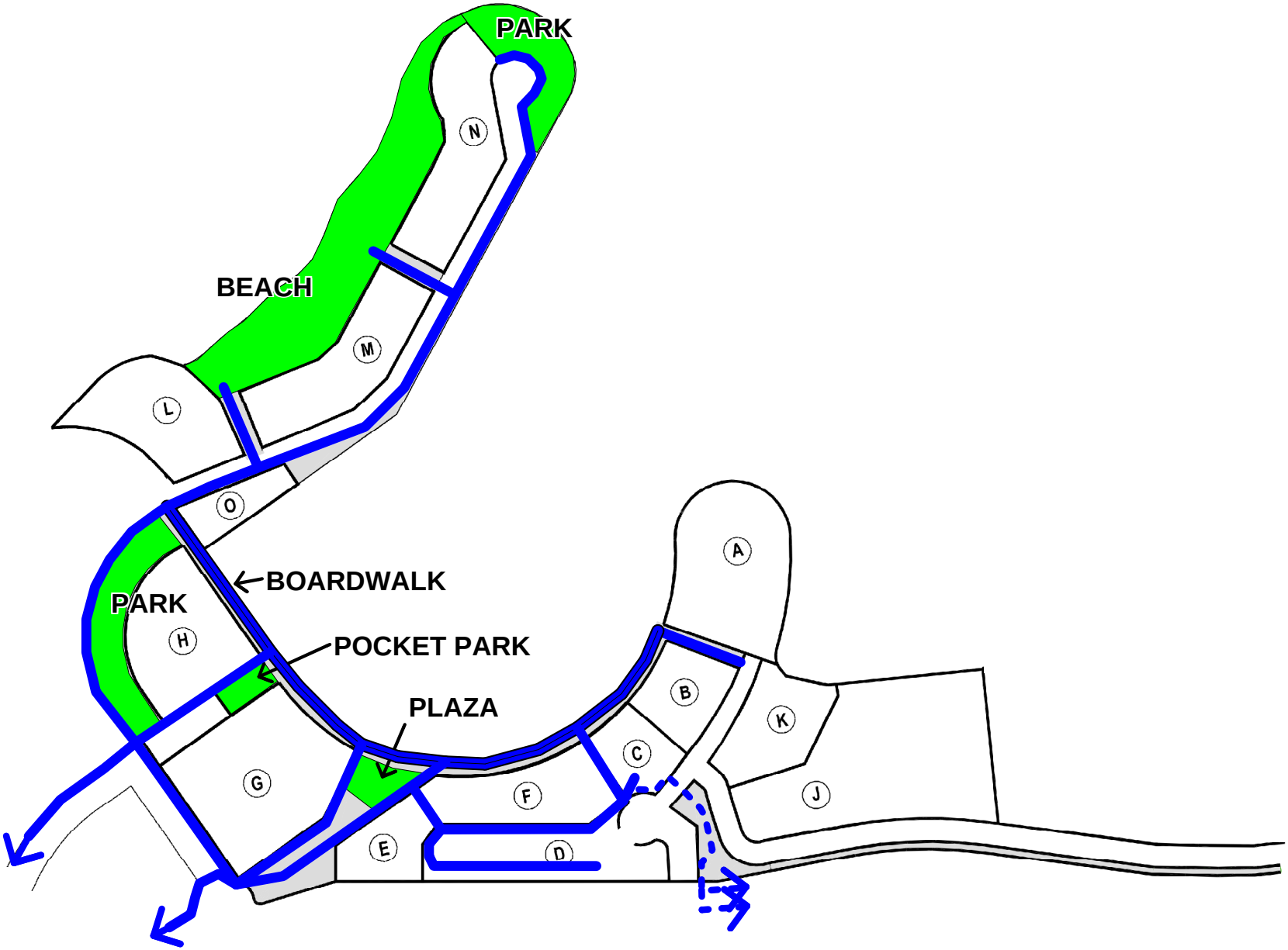
A minor desire line will connect the site at or near the eastern access point with destinations further east, primarily linking to Jubilee Pocket but also serving longer distance recreational trips. This desire line will cross Shute Harbour Road to join the pedestrian and bicycle path on the southern side. (In the future a path may also be provided along the northern side of Shute Harbour Road.)

There will also be large pedestrian flows within the site, particularly between the Harbourfront zones and to and from the Transport Interchange. Some internal bicycle trips may also occur particularly from the Seaview residential areas to Harbourfront zones.

The proposed routes to cater for the anticipated pedestrian desire lines are shown diagrammatically in **Figure 13-7**, while proposed bicycle routes are shown in **Figure 13-8**. These figures include dashed lines showing possible routes to serve eastbound desire lines connecting to the Council pedestrian and cycle path network

Table 13.13 : Port of Airlie Parking Requirements

Zone	Title	Land Use	Number	Unit	Demand Rate	per	Type	Resulting Nominal Parking Demand	Self-Containment	Non-Motorised Mode Share of External Trips	Public Transport	Adjusted Parking Demand (% of Nominal Demand)	Adjusted Parking Requirement
A	**Landmark Hotel**	Accomodation	170	Units	1	Accom Unit	Guest Car	170	15%	10%	35%	50%	85
					0.14	Accom Unit	Visitor Car	25	15%	10%	35%	50%	13
							TOTAL A	**195**				**TOTAL A**	**98**
B	**Harbourfront Serviced Apartments**	Accomodation	16	2 Bed Units	1.5	Accom Unit	Guest Car	24	15%	10%	35%	50%	12
			10	3 Bed (&+) Units	2.0	Accom Unit	Guest Car	20	15%	10%	35%	50%	10
			26	Total Units	0.14	Accom Unit	Visitor Car	4	15%	10%	35%	50%	2
							TOTAL B	**48**				**TOTAL B**	**24**
C	**Transport Terminal : Water Side**												
D	**Transport Terminal : Land Side**	Ferry Terminal	9	Peak hour ferries	2	10 minutes							
			684	Vehicle trips / day	46%	Daily Trips	Car	315				100%	315
					5	Ferry Service	Taxi	10				100%	10
			15	Peak hour vehicle trips	1	Ferry Service	Bus	2				100%	2
		Long Distance Coach	3	Peak hour coaches	1	15 minutes	Coach	1				100%	1
			17	Peak hour vehicle trips	3	Coach Service	Minibus	3				100%	3
			17	Peak hour vehicle trips	3	Coach Service	Car / Taxi	3				100%	3
		Local Buses	20	Peak hour services (each way)	1	Direction	Bus	2				100%	2
							TOTAL CARS	**315**				**TOTAL CARS**	**315**
							TOTAL BUSES	**5**				**TOTAL BUSES**	**5**
							TOTAL MINIBUSES	**3**				**TOTAL MINIBUSES**	**3**
							TOTAL TAXIS	**13**				**TOTAL TAXIS**	**13**
E	**Harbourfront Mixed Use**	Accomodation	15	2 Bed Units	1.5	Accom Unit	Guest Car	23	15%	10%	35%	77%	18
			11	3 Bed (&+) Units	2.0	Accom Unit	Guest Car	22	15%	10%	35%	77%	17
			26	Total Units	0.14	Accom Unit	Visitor Car	4	15%	10%	35%	77%	4
		Tourist Retail	840	m^2 GFA	4	100 m^2 up to 700 m^2	Car	28	50%	25%		38%	11
			806	*m^2 TUA*	10	100 m^2 thereafter	Car	11	50%	25%		38%	5
							TOTAL E	**88**				**TOTAL E**	**55**
F	**Harbourfront Mixed Use**	Accomodation	6	1 Bed Units	1	Accom Unit	Guest Car	6	15%	10%	35%	77%	5
			24	2 Bed Units	1.5	Accom Unit	Guest Car	36	15%	10%	35%	77%	28
			10	3 Bed (&+) Units	2.0	Accom Unit	Guest Car	20	15%	10%	35%	77%	16
			40	Total Units	0.14	Accom Unit	Visitor Car	6				100%	6
		Tourist Retail	920	m^2 GFA	4	100 m^2 up to 700 m^2	Car	28	50%	25%		38%	11
			883	*m^2 TUA*	10	100 m^2 thereafter	Car	19	50%	25%		38%	8
		Commercial	330	m^2 GFA	4	100 m^2 TUA	Car	14	25%	0%		75%	11
			330	*m^2 TUA*			**TOTAL F**	**129**				**TOTAL F**	**85**
G	**Harbourfront Mixed Use**	Residential Units	39	2 Bed Units	1.5	Accom Unit	Guest Car	59				100%	59
			19	3 Bed (&+) Units	2.0	Accom Unit	Guest Car	38				100%	38
			58	Total Units	0.14	Accom Unit	Visitor Car	9				100%	9
		Tourist Retail	1885	m^2 GFA	4	00 m^2 up to 700 m^2 TU	Car	28	50%	25%		38%	11
			1810	*m^2 TUA*	10	100 m^2 thereafter	Car	111	50%	25%		38%	42
		Restaurant	375	m^2 GFA	6.67	100 m^2 TUA	Car	24	50%	20%		40%	10
			360	*m^2 TUA*			**TOTAL G**	**269**				**TOTAL G**	**169**
H	**Harbourfront Residential**	Residential Units	23	2 Bed Units	1.5	Accom Unit	Guest Car	35				100%	35
			19	3 Bed (&+) Units	2.0	Accom Unit	Guest Car	38				100%	38
			42	Total Units	0.14	Accom Unit	Visitor Car	6				100%	6
		Residential Villas	7	Units	2	Dwelling	Car	14				100%	14
							TOTAL H	**93**				**TOTAL H**	**93**
J	**Marine Industrial & Hardstand**	Light Industry	5800	m^2 GFA	2	100 m^2 TUA	Car	116	15%	5%		81%	94
			5800	*m^2 TUA*			**TOTAL J**	**116**				**TOTAL J**	**94**
K	**Public Boat Ramp**	Boat Ramp	69	Launches / Day	0.65	Launch	Car w/ Trailer	45				100%	45
					0.10	Launch	Car	7				100%	7
							TOTAL K	**52**				**TOTAL K**	**52**
L	**Seaview Residential Tower**	Residential Units	16	2 Bed Units	1.5	Accom Unit	Guest Car	24				100%	24
			9	3 Bed (&+) Units	2.0	Accom Unit	Guest Car	18				100%	18
			25	Total Units	0.14	Accom Unit	Visitor Car	4				100%	4
							TOTAL L	**46**				**TOTAL L**	**46**
M	**Seaview Residential Villas**	Residential Villas	16	3 Bed (&+) Units	2.0	Accom Unit	Guest Car	32				100%	32
			16	Total Units	0.14	Accom Unit	Visitor Car	3				100%	3
							TOTAL M	**35**				**TOTAL M**	**35**
N	**Seaview Residential Lots**	Residential Lots	7	Units	2	Dwelling	Car	14				100%	14
							TOTAL N	**14**				**TOTAL N**	**14**
O	**Marine Academy**	Tertiary Education	100	Student car trips per day	50%	Daily Trips	Car	50				100%	50
			18	Staff car trips per day	50%	Daily Trips	Car	9				100%	9
							TOTAL O	**59**				**TOTAL O**	**59**
P	**Marina Access**	Marina	200	Berths	0.4	Berth	Car	80				100%	80
							TOTAL P	**80**				**TOTAL P**	**80**
TOTAL PORT OF AIRLIE DEVELOPMENT							**CARS**	**1539**				**CARS**	**1219**
							BUSES	**5**				**BUSES**	**5**
							MINIBUSES	**3**				**MINIBUSES**	**3**
							TAXIS	**13**				**TAXIS**	**13**



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PORT OF AIRLIE MARINA

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Proposed Pedestrian Links

FIGURE 13.7

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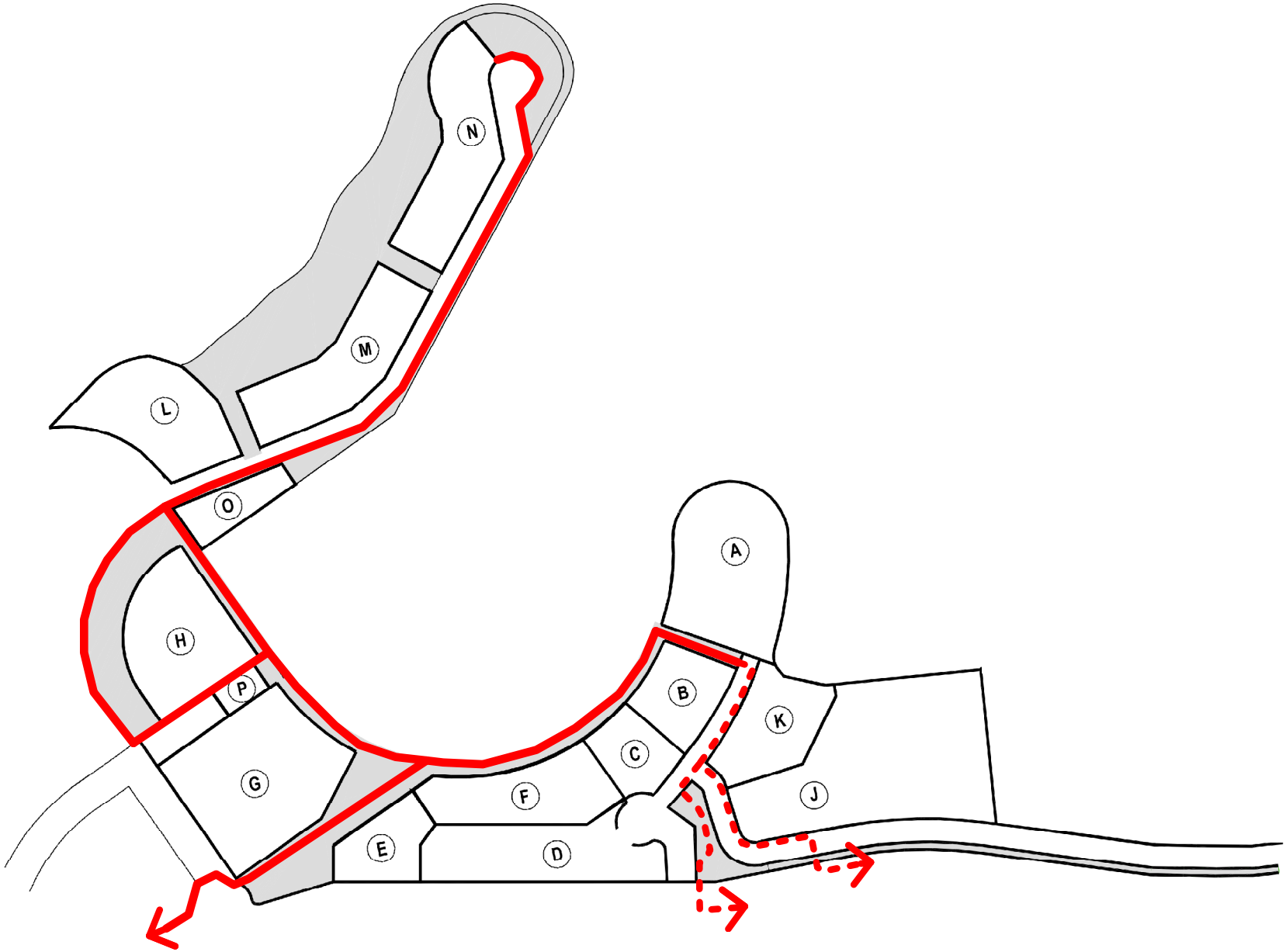

SINCLAIR KNIGHT MERZ

PORT OF AIRLIE MARINA

PORT OF Airlie

Proposed Bicycle Links

FIGURE 13.8

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east of the site. Final design of cycle paths, including means to segregate cyclists and pedestrians if necessary, will be addressed at the detailed design stage.

The forthcoming preliminary design stage will refine aspects such as the separation or integration of bicycles and the exact alignment and layout of the facilities within the site, with particular attention to safety issues, including personal safety.

Outside the site, safe crossing facilities particularly over Shute Harbour Road and to a lesser extent Coconut Grove will be a key issue in the surrounding area irrespective of the development. In the ultimate network configuration, pedestrians in central Airlie should be encouraged to cross Shute Harbour Road west of Airlie Esplanade to avoid conflicts with the main through traffic flow which will be using the Waterson Road loop road to bypass central Airlie. However, significant demand will still exist to cross Shute Harbour Road further east, as noted in **Section 13.8**.

The provision of new roundabouts at Coconut Grove Road and Site Access A is likely to provide some safety benefits, by controlling speed and creating traffic islands which pedestrians could use to stage their crossing. However, after Shute Harbour Road is widened to two through lanes in each direction, traffic signal control at these locations should be considered. This would provide a higher level of safety for pedestrians and cyclists, particularly those with reduced mobility, by positively controlling traffic flow to achieve time separation (and priority over turning traffic, if filtering is permitted) for pedestrians on signalised crossings.

As noted in **Section 13.8,** signals may not be the preferred solution. This form of control would have impacts on traffic flow and complicate the layout of Site Access A. Provision for pedestrians in this section of Shute Harbour Road needs to be considered as part of the wider strategy for pedestrian and traffic control in Airlie Beach.

As discussed in **Section 13.8**, the proposed site layout will accommodate either traffic signal or roundabout control at Site Access A, and the internal alignments will be adjusted as required to suit the preferred option to be agreed with DMR and Whitsunday Shire Coucil.

13.12 Safety

Geometric design throughout the development will be in accordance with safety principles, with particular attention to access points, internal and external intersections, and pedestrian and cyclist crossing points. Some particular safety factors which will be considered in detailed design have been discussed in **Sections 13.10** (internal access and circulation) and **Section 13.11** (pedestrians and cyclists).

13.13 Conclusions and Recommendations

Overall, once complete, the proposed development would generate approximately 3,200 new vehicle trips per day on the external road network, which is a significant contribution. It would also attract approximately 1 300 vpd in diverted trips to the Transport Terminal in 2010, rising to approximately 1 700 vpd in 2020.

To the east of the site, many of the trips diverted from the Shute Harbour ferry terminal are removed from Shute Harbour Road by the development since these trips now continue no further west than the site. This effect counterbalances the diverted ferry-related trips from further east which would otherwise travel eastwards to Shute Harbour but would be directed westwards to the site under the current proposal, as well as the new trips to and from the east generated by the other proposed land uses. The net effect of the proposed development east of the site is thus a small *decrease* in traffic on Shute Harbour Road, as shown in **Figure 13-5**.

The area of influence of the proposed development, in which external road impacts are assessable, thus extends only westwards from the site. In this direction the diverted trips are not relevant to the calculation of external road impacts beyond the immediate area of the site as they would be using the road network even if the development did not proceed.

The area of influence of the development, in traffic terms - defined as the road sections where development generated traffic would be greater than or equal to 5 % of the background (no development) traffic in the opening year - would extend along Shute Harbour Road and Waterson Road from Site Access A to Tropic Road in Cannonvale. However, the impacts of the additional traffic on the performance of road links and key intersections in this area would be minor, and only one change in the interim (2010) or ultimate (2020) configurations would be required to accommodate the development traffic.

This change would affect the intersection of Shute Harbour Road and Coconut Grove, where a give way controlled intersection would not have sufficient capacity to cater for development as well as background traffic once Shute Harbour Road was widened to four lanes. A two lane roundabout would be a suitable configuration, although traffic signals could also operate effectively.

Analysis for intermediate years indicates that the development would, however, result in an earlier year of need for several link and intersection improvements. On Shute Harbour Road, the need for widening to four lanes would be brought forward by one year over a total length of approximately 2.3 km, and by two years over a total of approximately 1.7 km. The affected road sections are shown in **Figure 13-6**. In addition, the year in which intersection improvements are required would advance by one year in several cases. These are summarised in **Table 13-9**.

It should be noted that these changes in 'year of need' do not necessarily represent the change in timing of actual construction works, as used in the calculation of 'Bring Forward Costs' as described in DMR's *Guidelines for Assessment of Road Impacts of Development Proposals*, since projects which are not committed under the current Roads Implementation Program (which expires in 2006) do not have established planned construction dates.

The access and key internal intersections within the site would operate well within capacity and with a good level of service in the proposed configurations. Queue length checks on the main circulation road north of Site Access A indicate that the storage space shown on the concept plan would be more than adequate in 2020.

Prior to the upgrading of Site Access A from a single to double lane roundabout, intermittent blocking of the lower level carpark exit onto the Main Access Road is forecast for the year 2010, leading to increased queuing on the carpark exit ramp. However at this stage the capacity of the ramp would still be sufficient. Once the roundabout is upgraded to two circulating lanes, the carpark exit ramp would operate freely.

All parking and servicing demands will be catered for on site as discussed in **Section 13.9.2**. Pedestrian and cyclist routes will be provided along key desire lines the site and connecting to the surrounding Council network.
Although roundabouts would operate effectively, it is recommended that traffic signal control on Shute Harbour Road at Coconut Grove and at Site Access A be considered in relation to wider planning for traffic and pedestrian management in the area, although the layout of Site Access A would be complicated by this option. As discussed in **Section 13.8**, the proposed site layout will accommodate either traffic signal or roundabout control at Site Access A, and the internal road layout will be adjusted as necessary to suit the preferred option to be agreed with DMR and Whitsunday Shire Council.

During construction, heavy vehicle traffic generation in Stage 1 (dredging and land reclamation) would rise above the 5 % threshold and produce pavement impacts on Shute Harbour Road from the construction access to the relevant existing quarry and dredging operation.

Preliminary calculations using nominal material sources suggest that the pavement costs imposed by the development will be of the order of $ 33 000, similar to those for the previous proposal although less intense over longer road lengths. More detailed calculations in accordance with DMR's *Guidelines for Assessment of Road Impacts of Development Proposals*, based on pavement condition reports and actual materials sources, should be undertaken later in the planning process.