

## 3. Arterial and motorway standard access strategies

Two highway upgrade scenarios are being considered as part of the project:

- Arterial road standard — (formerly referred to as Class A) two lanes in each direction (median width to accommodate future upgrading to three lanes in each direction), 100 km per hour posted speed, limited access condition roadway with at grade intersections.
- Motorway standard — (formerly referred to as Class M) two lanes in each direction (median width to accommodate future upgrading to three lanes in each direction), 110 km per hour posted speed, controlled access condition roadway with grade separated interchange access.

The upgrade of the highway is expected to be completed in stages to meet traffic growth. Upgrade to arterial road standard may be followed by a subsequent upgrade to motorway standard. Upgrading to each of these road standards may also be completed on a staged basis.

Thus, to minimise future redundant works, it is likely that construction undertaken initially to reach arterial standard be generally consistent with the ultimate motorway standard.

Key requirements for a motorway standard arrangement are:

- The requirement for a continuous alternative route.
- Access to the highway is to occur at interchanges only (no cross carriageway movements permitted).

This section outlines the strategic arterial road and motorway standard arrangements for the highway and adjacent roads. The alignment of the highway is shown in the concept design drawings.

### 3.1 Description of the highway alignment

#### Section A

The project starts at Arrawarra Beach Road, and will generally involve the construction of one new carriageway to the west of the existing highway, retaining the existing highway as a southbound carriageway. There are no private property accesses on the western side of the existing highway.

A grade separated interchange is proposed as part of the Sapphire to Woolgoolga project, and will be located at Arrawarra Beach Road, at the southern boundary of the project.

The upgraded highway deviates to the west in the vicinity of the existing Eggins Close intersection with the highway.

In an arterial road upgrade scenario, access to the proposed highway upgrade from the existing highway will be via the Sapphire to Woolgoolga grade separated interchange located south of Section A and at grade intersections within Section C of the project. Therefore, motorway standard conditions will exist from the onset of the upgrade in section A.

#### Section B

The highway is upgraded by realignment. Travelling north, the preferred route corridor deviates west from the existing highway, crossing Kangaroo Trail Road in cut (overbridge provided for Kangaroo Trail Road), passing to the west of Post Office Lane, across the Corindi River floodplain and bypassing the village of Corindi.

The upgraded highway continues on a new alignment offset from the existing highway by approximately 700 m to the west.

In an arterial road upgrade scenario, access to the proposed highway upgrade from the existing highway would be via the Sapphire to Woolgoolga grade separated interchange located south of Section A and via two at grade intersections within Section C of the project. Therefore, motorway conditions will exist from the onset of the upgrade in Section B.

### **Section C**

The upgraded highway continues on a new alignment offset from the existing highway by approximately 700 m, before rejoining the existing highway in the vicinity of Range Road. The upgraded highway will not impact on the existing disused quarry operation at the base of Dirty Creek Range, and will not impact upon the existing accesses off Hawthorn Close and Flinty Road.

The upgraded highway ascends the Dirty Creek Range within a new cutting achieving a reduced grade of 4.5 per cent over 450 m, and passes over the existing highway by twin bridges at Ch 11,350. The proposed upgrade does not impact upon productive lands of the blueberry farm or the packing shed.

Access to the proposed highway upgrade in an arterial road upgrade scenario, will be provided by two (left in/left out) at grade intersections. These intersections will be located at:

- Range Road (Ch 11,700) for northbound traffic.
- A new connection at Ch 10,800 for southbound traffic.

These intersections will be retained in an upgrade to motorway standard.

### **Section D**

The existing highway in Section D has been identified as generally suitable for the 110 km per hour design speed and includes the recently completed Halfway Creek duplication. A new carriageway will be constructed on the western side of the existing highway from a point 500 m south of Falconers Lane to the southern end of the Halfway Creek duplication. The Halfway Creek duplication will remain as is with little or no work required to this section of the highway. The northern end of the Halfway Creek duplication ends near Lemon Tree Road.

A number of at-grade intersections are required in the upgrade to arterial road standard in order to maintain access to local roads. These are described in Section 3.3 of this report.

A service road will be required in the upgrade to motorway standard. The service road will be constructed on the western side of the highway with access provided via bridges over the proposed highway upgrade at or near McPhillips Road, Grays Road and Lemon Tree Road. This strategy avoids the elbow of Halfway Creek watercourse and the Yuraygir State Conservation Area, which are both located adjacent to the highway on the eastern side.

### **Section E**

At the southern end of Section E the upgrade of the highway involves the construction of 2.6 km of new northbound carriageway on the western side of the existing highway. The existing curve at Ch 21,000 will require reconstruction in order to comply with the Pacific Highway Upgrade Program Design Guidelines.

From 200 m south of Kungala Road up to Wells Crossing, two new carriageways will be constructed in a realignment of the existing highway. The new alignment of the highway generally remains close to the existing highway, with the removal of a number of sub-standard curves.

Between Wells Crossing and Bald Knob Tick Gate Road, the highway upgrade involves the construction of two new carriageways to the east of the existing highway.

In the upgrade to arterial road standard, five intersections will be required in this section to maintain access to local roads. These intersections are discussed in Section 3.3. At each of the intersections, private accesses have been rationalised to reduce the number of accesses to the highway.

In the upgrade to motorway standard, a service road will be constructed on the western side of the highway between Lemon Tree Road at the start of the section and Wells Crossing. One new bridge is required to provide access to Luthers Road. North of Wells Crossing the existing highway will be utilised as an access road.

### **3.2 Grade separated interchanges**

No grade separated interchanges will be constructed as part of this project in the arterial or motorway scenarios. The nearest adjacent interchanges would therefore be located:

- Immediately to the south of the project at Arrawarra Beach Road within the Sapphire to Woolgoolga project. It is likely that the Sapphire to Woolgoolga project (including the grade separated interchange) would be opened to traffic prior to any construction works on the Woolgoolga to Wells Crossing project commencing.
- Approximately 10 km north of Bald Knob Tick Gate Road within the Wells Crossing to Iluka Road project in the vicinity of the Eight Mile Lane intersection (Wooli Road).

The concept design includes provision for a split (at-grade) intersection arrangement involving a “left in/left out” intersection at Range Road on the western side of the highway and a new “left in/left out” intersection on the eastern side of the highway, connecting the new highway with the existing highway near Ch 10,800. This arrangement, which is proposed as part of the arterial road standard upgrade works, will provide similar functionality of a grade separated interchange at a significantly lower cost. The benefits of this arrangement include:

- The distance between interchanges will be reduced, thus reducing the distance travelled on the side road by traffic accessing locations between the proposed intersections.
- The interchange will be located to minimise the distance logging trucks and heavy vehicles from the blueberry farm and Barcoongere Way would have to travel on side roads.
- Traffic travelling north from Corindi will be able to access the highway locally, without the need to travel south to the Arrawarra interchange, then north.

### **3.3 At grade intersections**

An access strategy for the upgrade of the Woolgoolga to Wells Crossing was provided in the document “Pacific Highway upgrade Woolgoolga to Wells Crossing, Highway Access Strategy (GHD 2007)”, and approved by the RTA in August 2007 for an arterial road standard upgrade. This access strategy proposed the location of and treatment of at-grade intersections with the upgraded highway. For further details refer to the Access Strategy Report working paper.

A summary of the approved intersections (and their treatments) is shown in Table 3-1.

For the purpose of this report, “left in and left out only” and “left in and left out with “right in / u-turn” intersections have been classified as ‘Type 1’ and ‘Type 2’:

- Type 1 - Left in: auxiliary lane with 30 m deceleration lane.  
- Left out: slip lane with no acceleration distance.
- Type 2 - Left in: auxiliary lane with 185 m (minimum) deceleration distance.  
- Left out: auxiliary lane with 30 m acceleration distance plus 20 taper.

The right turn deceleration lane for “left in and left out with right in / u-turn” intersections has a minimum length of 185 m.

**Table 3-1 At-grade intersections location and treatment**

Chainage	Road	Side	Treatment
10,850	New service road	East	Left in and left out only (Type 2)
11,690	Range Road	West	Left in and left out only (Type 2)
14,150	Falconers Lane	West	Left in and left out with right in / u-turn (Type 1)
15,250	McPhillips Road	East	Left in and left out with right in / u-turn (Type 2)
15,430	Property access	West	Left in and left out only (Type 1)
16,380	Dunmar Lane	West	Left in and left out (Type 1)
17,820	Grays Close / Rediger Lane	East-West	Closure of the median to prevent cross highway movements, except for right turn in to Greys Road. Left in/Left out for Greys Road and Rediger Close to remain
19,420	Lemon Tree Road <sup>a</sup>	East	Left in and left out only (Type 2)
20,500	Lemon Tree Service Road <sup>a</sup>	East	Left in and left out with right in / u-turn (Type 1)
22,390	Kungala Road	West	Left in and left out with right in / u-turn (Type 2)
23,600	Luthers Road	East	Left in and left out with right in / u-turn (Type 2)
23,730	New service road	West	Left in and left out only (Type 1)
25,600	Parker Road	West	Left in and left out with right in / u-turn (Type 2)
27,250	Bald Knob Tick Gate Road	East	Left in and left out with right in / u-turn (Type 2)

<sup>a</sup> The intersection at Lemon Tree Road has been designed for B-doubles as Lemon Tree Road is a declared B-Double route for a length of 60 m. There is no impact upon the operations of the existing service station.

### **3.4 Alternative options considered in the design**

#### **3.4.1 Alternative options considered for Range Road access**

Options were considered for access to Range Road, including a seagull intersection permitting all movements and also a grade separated interchange. The provision of a seagull intersection still permits cross-highway movements.

A grade separated interchange at Range Road was not preferred for the following reasons:

- Topography does not suit the construction of a grade separated interchange.
- Traffic volumes do not support the need for a grade separated interchange.
- The adopted preliminary intersection layout provides grade-separated movements for a significantly reduced cost when compared to the capital cost of a grade-separated interchange.

The two options developed for the Range Road intersection, along with construction phasing for the adopted preliminary option are included in Appendix B.

#### **3.4.2 Alternative options considered for Grays Road / Rediger Close intersection**

The existing four way intersection at Grays Road / Rediger Close (Ch 17,800) was constructed as part of the Halfway Creek duplication. Several options for this intersection were investigated during the development of the concept design. In summary, the alternative options considered were:

1. Closure of median to create two “left in / left out” intersections.

This option was considered to be the most consistent with the overall design philosophy of the Woolgoolga to Wells Crossing project. It includes the provision of u-turn bays to the north and south of the intersection.

2. Provision of back-to-back “left in / left out with right turn in” intersections.

This option improved accessibility for users of Grays Road and Rediger Close, however it was not preferred due to the likelihood of improper use of the right turn bays to avoid travelling to the nearby u-turn bays.

3. Provision of “left in / left out with right turn in” from the Pacific Highway, northbound, to Greys Road.

This option improved accessibility for users of Grays Road and Rediger Close, however it was not preferred due to the likelihood of improper use of the right turn bays to avoid travelling to the nearby u-turn bays.

4. Retain existing layout

In this option, the existing four-way intersection would be retained. All movements would be permitted for vehicles travelling into and out of Grays Road and Rediger Close including u-turns for highway traffic.

Option 1 was selected for the development of the concept design. Further assessment should be made of the likely traffic movements and intersection arrangement options closer to project construction.

### 3.4.3 Investigation into the reuse of Wells Crossing bridge and northbound carriageway in Section E

The concept design specifies the construction of two new highway carriageways to the west of the existing highway in Section E, to the south of Wells Crossing and two new carriageways to the east of the existing highway north of Wells Crossing. The existing highway will be used as a service road, with access to the highway to be via the at-grade intersection at Luthers road south of Wells Crossing and Parker Road north of Wells Crossing.

The possibility of reusing the existing bridge over the waterway at Wells Crossing and the existing carriageway north of Wells Crossing was considered during the development of the concept design. It was not considered desirable to reuse the bridge at Wells Crossing for the following reasons:

- The structural capacity of the bridge is inadequate for SM1600 loading. It is considered that compliance is “very unlikely even with carbon fibre strengthening works” (GHD Preliminary Structures Planning Report, 2005).
- Currently the bridge is 9.35 m wide, which is less than the 10.5 m required, and would require bridge widening.
- The horizontal curve immediately to the south of the bridge has a radius of 470 m. This is below the minimum of 750 m specified in the Pacific Highway Design Guidelines, and is approximately equivalent to a design speed of 100 km/h. It is not possible to adjust the highway to provide a larger radius curve due to the impacts upon Wells Crossing Flora Reserve and indigenous owned land located immediately to the east.

It was not considered desirable to reuse the existing carriageway north of Wells Crossing as the northbound carriageway due to a number of non-conformances with the Pacific Highway Design Guidelines. These non-conformances are listed in Table 3-2 below.

**Table 3-2 Non conformances of existing highway north of Wells Crossing**

Chainage (approx)	Category and required value for 110km/h	Existing value and equivalent design speed
24,900	Horizontal radius (des 1200 m, min 750 m)	1060 m (110 km/h)
24,900	Horizontal curve length (min 340 m)	325 m
25,200	Vertical curve length (min 150 m)	108 m
25,700	Horizontal radius (des 1200 m, min 750 m)	750 m (110 km/h)
25,700	Horizontal curve length (min 340 m)	160 m
26,200	Vertical crest radius (min 95 k)	54.9 k (90-100 km/h)
26,250	Horizontal curve length (min 340 m)	115 m
26,700	Horizontal radius (des 1200m, min 750 m)	470 m (100 km/h)
26,700	Horizontal curve length (min 340 m)	100 m
27,000	Horizontal radius (des 1200m, min 750 m)	500 m (100 km/h)
27,400	Horizontal radius (des 1200m, min 750 m)	400 m approx (90 km/h)

In addition to the non-conformances, the reuse of the existing highway as the northbound carriageway north of Wells Crossing was not considered desirable as:

- The Parker Road intersection would be a non-standard intersection with a large distance between carriageways. This could result in driver confusion when using the intersection. In addition, a large amount of new pavement would be required for the intersection.
- Access to properties along the western side of the existing highway would need to be rationalised through the construction of an access road. In particular, allowance would need to be made for Bananacoast Towing, which operates a towing service for heavy vehicles including B-doubles.

The proposed alignment of the highway has been set such that the Wells Crossing bridge and the existing carriageway can be used if required during future development of the project.

Depending on funding and staging of the development the existing highway may be used in part or full as the northbound carriageway, either in the shorter term or the longer term.

### 3.5 Arterial standard service roads and access roads

Service roads are defined as providing a connection between the Pacific Highway and local roads, villages and properties. Service roads are sealed roads suitable for accommodating all classes of vehicles except for oversized vehicles and B-doubles. They are designed to local council and / or Austroads standards and generally signposted at 80 km/h. Sections of the existing highway, which are planned to be retained as a service road, may remain as a 100 km/h road.

Access roads are roads that provide access to adjacent private property for residents and service vehicles. Access roads are connected to a local road or a service road. They are generally “no through roads” and will be signposted at either 50 km/h or 60 km/h.

In addition to the program and project objectives, the design intent for service roads and access roads is to:

- Provide safe and convenient access for all adjoining and nearby private and public properties to the highway in the arterial and motorway upgrade scenarios.
- Utilise the existing highway (adjacent realigned sections) and public roads wherever possible.
- Provide a continuous alternate route in a motorway standard upgrade.
- Minimise property acquisition.
- Provide connectivity across and along the highway for local traffic.
- Keep through and local traffic separate as far as possible.
- Encourage through highway traffic to use the highway upgrade.
- Rationalise the number of intersections with the highway in an arterial standard scenario.
- Minimise heavy traffic use of service roads.
- Provide service road and access road strategies in accordance with council local environment plans and strategies.

Details of the proposed service road and access road arrangements for the arterial and motorway upgrade scenarios are discussed in the following sections.

#### 3.5.1 Section A

##### Proposed service road strategy

The service road strategy proposed within Section A involves:

- Reusing Eggins Drive (ie the old Pacific Highway) between Arrawarra Beach Road and Eggins Close as a service road / continuous alternative route on the basis that the old Pacific Highway would be connected to the grade separated interchange planned to be constructed as part of the Sapphire to Woolgoolga project. Eggins Drive will require minor improvements to the road surface due to the increase in traffic volume. Due to the proximity of Eggins Drive to Lorikeet Tourist Park and Darlington Beach Resort, a shared pedestrian and bicycle facility will be provided.
- Constructing a short length (approximately 300 m) of new service road linking Eggins Drive near Eggins Close (Ch 3600) to the existing Highway near Ch 3900. This resulting connection will allow local road traffic from Corindi Beach, Corindi and Red Rock to be connected directly to the Sapphire to Woolgoolga grade separated interchange via the existing Highway and Eggins Drive. As a consequence, the existing at-grade intersection at Eggins Drive / Highway would be closed resulting in no at-grade intersections with the highway in Section A.
- Reusing the existing Highway north of Ch 3900 as a service road.

### **Proposed access road strategy**

The access road strategy proposed within Section A involves:

- The provision of a new connection between Kangaroo Trail Road and Sherwood Creek Road. Vehicles travelling to Sherwood Creek Road would exit the highway at the interchange at Arrawarra Beach Road, then travel over the Kangaroo Trail Road overbridge. The new connection would be located near the western boundary of the Corindi Sewage Treatment Plant.
- The provision of a connection between Nash Road and Sherwood Creek Road on the western side of the highway, through the upgrading of the existing forestry trail.
- Connecting Arrawarra Beach Road at the intersection with the Old Pacific Highway (Eggins Drive) with the Sapphire to Woolgoolga grade separated interchange. As such, the existing intersection of Arrawarra Beach Road / existing Highway will be closed.

### **3.5.2 Section B**

#### **Proposed service road strategy**

The service road strategy proposed within Section B involves:

- Reusing the existing highway as the service road throughout Section B. To the south, access to the highway will be via the grade separated interchange at Arrawarra Beach Road proposed as part of the Sapphire to Woolgoolga project. To the north, access to the highway will be via the dual left in left out intersections in Section C.

#### **Proposed access road strategy**

The access road strategy proposed within Section B involves:

- Constructing a new bridge over the realigned highway at Kangaroo Trail Road (near Ch 4400). A bridge is required to maintain access to the sewage treatment plant as well as properties on Kangaroo Trail Road.
- Construction of an access underpass beneath the highway at Ch 8220. This underpass will be located outside the 100 year average recurrence interval flood extents of Corindi floodplain and connects with a proposed access road running along the western side (and parallel to) the proposed highway upgrade. This access road allows property owners to cross under the highway and maintain access to properties located on the western side of the highway.

### **3.5.3 Section C**

#### **Proposed service road strategy**

The service road strategy proposed within Section C involves:

- From the southern extent of Section C (Ch 9500) to Ch 11,000, the service road will utilise the existing highway. This provides connection for vehicles using Flinty Road, Dirty Creek Road and Barcoongere Way.
- A new service road providing left in/left out access from the southbound carriageway at Ch 10,850 to link with the existing highway.

- A new underpass will then be required to cross to the western side of the proposed highway near Ch 11,400 and connect the existing highway (via a new 500 m long section of service road) to Range Road. Range Road joining the upgraded highway via an at-grade intersection.

#### **Proposed access road strategy**

- An 800m length of access road will be constructed to link between Range Road and Dundoo Reach. This will eliminate the need for an at-grade intersection at Dundoo Reach. The access road will be used as a service road once the highway is upgraded to motorway standard.

### **3.5.4 Section D**

#### **Proposed service road strategy**

There are no service roads proposed in Section D as part of an arterial standard road upgrade.

#### **Proposed access road strategy**

A 1200 m length of access road is proposed on the eastern side of the highway, north from McPhillips Road, to provide access to the properties opposite Dunmar Lane.

### **3.5.5 Section E**

#### **Proposed service road strategy**

- The intersection of Luthers Road with the highway will be moved 650 m to the north of the existing location to provide adequate distance between Luthers Road and Kungala Road.
- North of Wells Crossing, the existing highway will be reused as a service road.

#### **Proposed access road strategy**

- At present four properties to the north of Lemon Tree Road on the eastern side of the highway have direct (all movement) access to the highway. For safety reasons, it is not considered appropriate that these accesses are retained in the arterial road scenario. It is proposed that a 1000 m access road be constructed to provide access to the highway for these properties via the intersection at Lemon Tree Road.
- The existing highway would be utilised as an access road between Ch 23550 and 24050 to provide connection to Luthers Road.
- A 170 m length of access road will be constructed on the western side of the proposed highway at Ch 23,800 to rationalise property accesses.

## **3.6 Motorway standard access strategy**

### **3.6.1 Section A**

There are no changes to the arterial road arrangement for Section A. All access to the new highway is via the grade separated interchange at Arrawarra Beach Road. Local access is maintained via Eggins Drive and the existing highway.

### **3.6.2 Section B**

There are no changes to the arterial road arrangement for Section B. All access to the new highway will be via the grade separated interchange at Arrawarra Beach Road to the south or the twin left in left out accesses near Range Road to the north. Local access will be via the existing highway.

### **3.6.3 Section C**

The “left in / left out” at grade intersections will remain as part of the upgrade to motorway standard. Access to and from the highway will be via these left in left out intersections only. The access road linking Range Road and Dundoo Reach will be upgraded to become the service road. North of Dundoo Reach, construction of a new service road is required on the western side of the highway.

### **3.6.4 Section D**

A new service road is required on the western side of the highway for the whole length of this section.

Two bridges across the highway are required in this section to provide access from the service road to McPhillips Road (Ch 15,100) and Grays Road (Ch 17,700) on the eastern side of the highway. Adjustments to the alignment of McPhillips Road and Grays Road will also be required in order to achieve the most efficient and cost effective design for the bridges.

### **3.6.5 Section E**

A new service road on the western side of the highway is proposed between Lemon Tree Road (Ch 19,500) and Wells Crossing (Ch 24,500). North of Wells Crossing, the existing highway will be utilised as the service road.

Two bridges across the highway are required in this section to provide access from the service road to Lemon Tree Road (Ch 19,500) and Luthers Road (Ch 23,285) on the eastern side of the highway. Adjustments to the alignment of Lemon Tree Road and Luthers Road may also be required in order to achieve the most efficient and cost effective design for the bridges.

To minimise earthwork volumes it is proposed that the bridge at Luthers Road be constructed at Ch 23,285.