

## 5. The Route Options

### 5.1 Description of the Route Options

#### 5.1.1 Project Sections

Four options were developed as an outcome of the route options development process. The options are shown in Figure 5.1 and described below. An overview of the process used to develop these options is provided in Section 5.2.

The project is divided into four separate sections, (Sections A to D) as described in Table 5.1 and as shown on Figure 5.1. Within sections A and D there are lengths where all of the route options share the same corridor. These common corridors are shown on Figure 5.1.

The preferred route for the upgrade may be any combination of these options.

**Table 5.1 Project Sections**

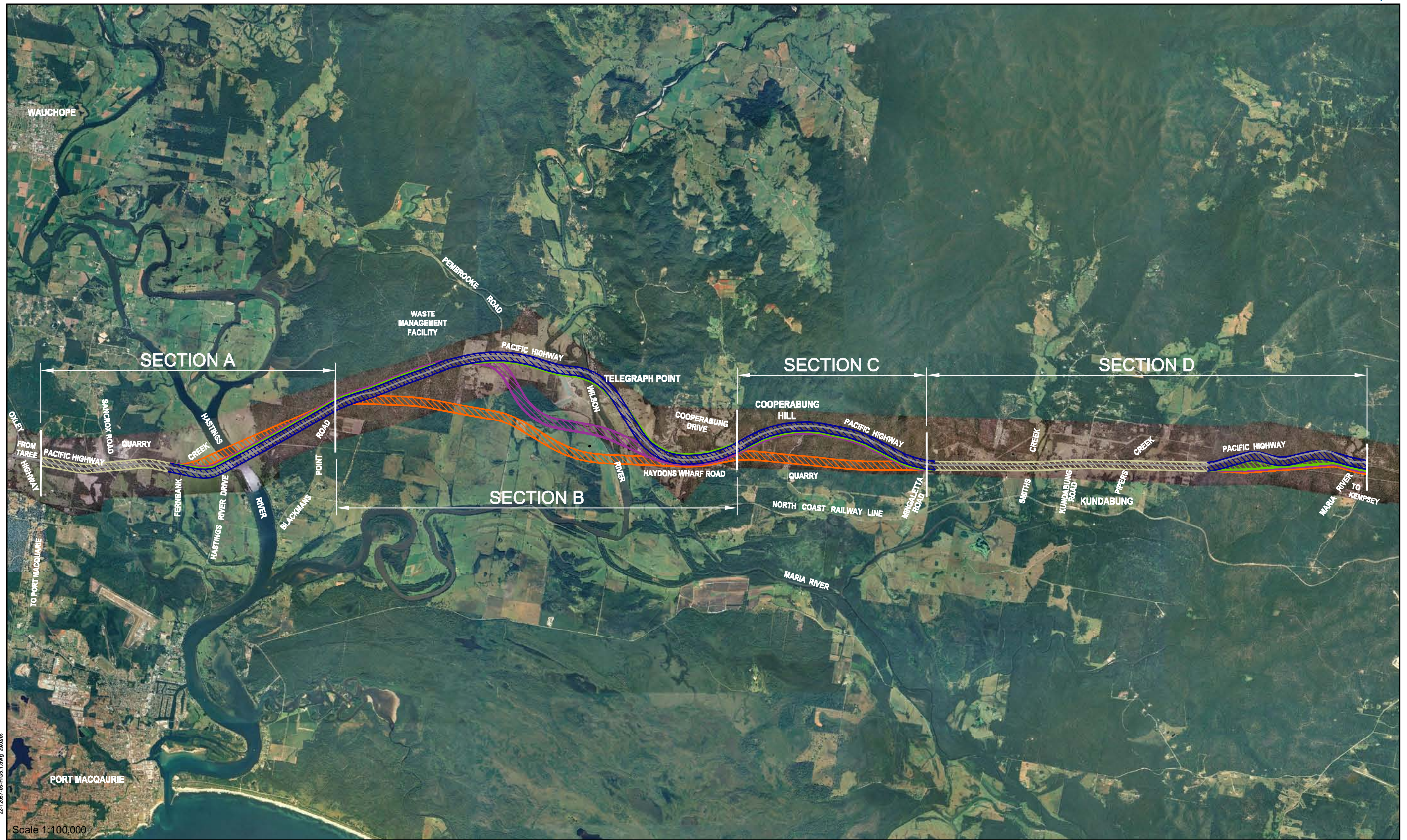
Section	Description
A	700 metres north of Oxley Highway interchange to Blackmans Point Road. Key features within this section include agricultural, industrial and shipyard businesses, the Hastings River and its floodplain with potentially sensitive ecological communities, Cairncross State Forest and Rawdon Creek Nature Reserve.
B	Blackmans Point Road to Cooperabung Drive. Key features within this section include the village of Telegraph Point, which extends both north and south of the Wilson River, waste management and recreational facilities, the Wilson River and floodplain including SEPP 14 wetland, North Coast Railway, Cairncross State Forest and Rawdon Creek Nature Reserve.
C	Cooperabung Drive to Mingaletta Road. Key features within this section include Cooperabung Hill, Yarrabee quarry, Cooperabung Creek Nature Reserve, Ballengarra State Forest and the old Pacific Highway.
D	Mingaletta Road to Maria River. Key features in this section include the village of Kundabung, the Maria River, Maria River State Forest and Kumbatine National Park.

The following descriptions note, where applicable, that local access roads will be required. Detailed investigations (environmental, community and engineering) have not been completed for the suggested local access roads. Those investigations will be undertaken during the concept design phase for the preferred route.

Proposed grade separated interchange locations are yet to be finalised and would depend on the location of the preferred route and the interaction with the adjacent Kempsey to Eungai project.

Route options were also investigated to the east of Telegraph Point. These options lie outside the study area designated for the project in November 2004. The feasibility of these options was investigated after requests from sections of the Telegraph Point community.

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22-12007-06-FIG5.1.dwg 25/01/06

Scale 1:100,000

		<p><b>LEGEND</b></p> <table border="0"> <tr> <td></td> <td>Blue option</td> <td></td> <td>Purple option</td> <td></td> <td>Green option</td> <td></td> <td>Orange option</td> <td></td> <td>Common corridor for all options</td> </tr> </table>		Blue option		Purple option		Green option		Orange option		Common corridor for all options
	Blue option		Purple option		Green option		Orange option		Common corridor for all options			
<p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geodetic Datum of Australia 1994 Grid: Map Grid of Australia, Zone 56</p>		<p>Spatial layers courtesy of Port Macquarie - Hastings Shire Council, Kempsey Shire Council, NSW Department of Environment and Conservation, NSW Forests, NSW Department of Lands and NSW Roads and Traffic Authority</p>										



## 5.1.2 Blue Option

### Section A

The project starts 700 metres north of the Oxley Highway interchange. The existing alignment in this section is generally suitable for the 110 km/h design speed and the upgrade would be a duplication of the existing alignment for most of this section. Duplication would occur on the west side of the existing alignment until the right hand bend north of Sancrox Road, with the existing carriageway used for southbound traffic. A major box culvert structure north of Sancrox Road would require duplication for the new carriageway.

From the right hand bend north of Sancrox Road the duplication would switch to the east until the left hand bend adjacent to Hastings River Drive. This left hand bend would be flattened to meet design standards and to provide for 110 km/h design speed. The existing bridge crossing Fernbank Creek could be rebuilt to meet SM1600 loading standards and design cross-section, and a new bridge would be provided for the southbound carriageway.

The existing Dennis Bridge over the Hastings River would be retained for southbound traffic however the bridge does not conform to SM1600 loading standards or design cross section and cannot be expanded to three lanes (future upgrade to three lanes each way). A new bridge of similar length to the existing bridge would be built upstream (west) of the Dennis Bridge for northbound traffic and would maintain existing navigational clearances. The existing shipyard and marine precinct either side of the Dennis Bridge on the south bank would impose constraints on the design and property acquisition on the west side would be required.

From the Hastings River to Blackmans Point Road, duplication would be on the west side with the existing carriageway catering for southbound traffic. Minor encroachment upon Cairncross State Forest and Rawdon Creek Nature Reserve may occur.

The Hastings River floodplain on both sides of the Dennis Bridge require special construction techniques to address the soft soil conditions.

Under a Class A scenario, an underpass would be provided for the Sancrox Road / Fernbank Creek Road intersection with the Pacific Highway. No access to the Pacific Highway is proposed at this intersection. A local access road would be provided from Sancrox Road to the Bushland Drive / Styles Road intersection for access to the Oxley Highway from existing properties in this vicinity. It is anticipated that the planned upgrade of the Oxley Highway, east from the Pacific Highway, would lead to the Oxley Highway being the preferred access to Port Macquarie.

An at-grade intersection (possibly seagull type) would be provided at the Blackmans Point Road intersection and a left in / left out only treatment at Glen Ewan Road intersection. The length of acceleration and deceleration lanes at the Glen Ewan Road intersection would have to be carefully considered due to the close proximity to the Hastings River bridge. All private accesses throughout this section would only have left in / left out access to the highway.

In addition to the above for a Class A scenario, a full grade separated interchange would be required in the vicinity of Hastings River Drive. Due to the soft soil issues on the Hastings River floodplain and visual impacts, the proposed interchange may be positioned between Hastings River Drive and Fernbank Creek Road. Hastings River Drive would require realignment to the proposed interchange location as well as a possible local access road connection between the grade separated interchange and Fernbank Creek Road. It is likely that Glen Ewan Road would access the highway via this grade separated interchange.

Construction staging will be a major issue throughout this section, particularly at all intersections.

Under a Class M scenario, the Blackmans Point Road intersection would be restricted to a left in deceleration / left out acceleration arrangement. Local, private and state forest access to the highway in this area would be rationalised. Local access roads would link these accesses to the intersection at Blackmans Point Road.

## **Section B**

North from Blackmans Point Road, a new realignment would be required for approximately 1.5 km to achieve a 110 km/h design speed standard. This realignment would generally be on the eastern side of the existing alignment and a minor encroachment upon Cairncross State Forest would occur.

Beyond the realigned section, duplication occurs for approximately 1.2 km to the Bill Hill Road / Cairncross Waste Management facility intersection on the western side of the existing alignment with the existing carriageway utilised for southbound traffic. Beyond Bill Hill Road, the duplication continues on the eastern side of the existing alignment. The east side duplication continues past Pembroke Road, across the Wilson River and through Telegraph Point at Rollands Plains Road.

For approximately two kilometres on the southern approach to the Wilson River bridge, the existing alignment crosses the Wilson River floodplain. Soft soil conditions are likely across the floodplain and existing major box culvert drainage structures will require duplication for the new carriageway. Duplication of the existing alignment across the floodplain would require special construction techniques.

The existing Wilson River bridge is approximately 560 metres in length and crosses the Wilson River, North Coast Railway and Rollands Plains Road. This bridge would be retained in the Blue option for northbound traffic, however the bridge does not conform to the design cross section and loading and cannot be expanded to three lanes. A new three-lane bridge would be required for the southbound carriageway.

The existing bridges north of Telegraph Point over the old Pacific Highway and Cooperabung Creek could be rebuilt to meet SM1600 loading standards and the design cross section and new bridges constructed for the northbound carriageway.

The Blue option has a major impact on the village of Telegraph Point. Existing properties with dwellings on the eastern side of the highway would be impacted upon by the duplication. Due to the proximity of residential properties to the proposed alignment, there would be issues relating to air and noise quality, in addition to significant property acquisition required throughout Telegraph Point on the eastern side of the highway. There are also high rock cuttings on both sides of the highway through Telegraph Point and although the large rock cutting on the western side would not be affected by this option, the rock cutting on the eastern side would require considerable widening.

At Rollands Plains Road, the duplication continues but the new carriageway crosses to the western side and continues on the west side for the remainder of Section B to Cooperabung Drive intersection.

The Blue option would also impact on existing residential areas south of the Wilson River in the vicinity of Moorside Drive. It is anticipated that noise attenuation measures would be required along the highway near the Pembroke Road intersection and through the main settlement of Telegraph Point immediately north of the river. In addition, there are known non-indigenous heritage items in the vicinity of Telegraph Point.

There are numerous local and private access points to the Pacific Highway from south of Moorside Drive, through Telegraph Point, both north and south of the Wilson River and through to Cooperabung Drive. In a Class A arrangement, at-grade access to the highway would be limited by the provision of left in / left out or seagull intersection treatments.

Seagull intersection treatments would be provided at the intersection to the Waste Management facility and at Moorside Drive, Pembroke Road, Rollands Plains Road and Cooperabung Drive. All other intersections and private accesses would be left in / left out only.

Under the Class M scenario, a possible grade separated interchange may be provided in the vicinity of Moorside Drive and Rollands Plains Road intersections. The issues at Telegraph Point of property acquisition and rock cuttings would provide constraints on the arrangement of an interchange in the vicinity of Rollands Plains Road. Provision of new local access roads connecting local roads to the interchange would also be required.

### **Section C**

Through Section C, the Blue option is a duplication of the existing alignment. The duplication continues from Section B at Cooperabung Drive on the western side, switching to the eastern side in the vicinity of Yarrabee Road and continues in this arrangement to Mingaletta Road. A major consideration for this section is Cooperabung Hill, which rises from a level of approximately 30 metres (AHD) to a level of 100 metres (AHD). The vertical curve through Cooperabung Hill would be lowered approximately 11 metres to achieve a 110 km/h design speed and this would necessitate the widening of the existing rock cuttings through this area.

There are several major box culverts that would require duplication for the new carriageway from Yarrabee Road to Mingaletta Road.

The alignment passes through Cooperabung Creek Nature Reserve and Ballengarra State Forest. A concentration of koala road kills through the Ballengarra State Forest area indicates an important movement corridor for koalas in this area and would require particular attention to alleviate impacts on wildlife. The old Pacific Highway (via Yarrabee Road intersection) is an accredited Confederation of Australian Motor Sport (CAMS) hill climb track and the duplication on the eastside at this location is close to this facility.

In a Class A scenario the local road access points within this section would be restricted to a left in / left out arrangement, except for Yarrabee Road and Mingaletta Road where a seagull treatment may be applied.

Under a Class M scenario, a left in deceleration / left out acceleration arrangement would be provided at the Yarrabee Road intersection.

## Section D

The duplication of the existing alignment continues through this section on the eastern side, along the Kundabung straight to Ravenswood Road. Between the end of the Kundabung straight and the Maria River, realignment on the east side of the existing highway is required using flatter curves to achieve a 110 km/h design speed. At Maria River the realignment connects to the southern end of the existing section of dual carriageway.

New bridges would be required for the southbound carriageway at Smiths Creek and Pipers Creek. The existing bridges could be rebuilt to meet SM1600 loading standards and design cross section. The Smiths Creek bridge if reconstructed would provide for flood immunity for the 100 year ARI flood level. At Maria River, a new bridge is required for the northbound carriageway adjacent to the existing low level timber bridge. Existing major box culverts would require duplication where necessary through this section.

North of Kundabung straight, the existing alignment passes between Kumbatine National Park and Maria River State Forest. The realignment in this section would encroach upon the Maria River State Forest where there is a known koala movement corridor as indicated by a concentration of road kills and this would require particular attention to alleviate impact on wildlife.

The existing rest area facility opposite Smiths Creek Road would require reconstruction due to the east side duplication. The rest area facility south of Maria River may be retained pending further investigation into its suitability for the Class M scenario. If this existing rest area is retained access to the rest area would be constructed as part of the realignment.

Consideration of noise attenuation would be required in the vicinity of the Kundabung straight where a number of residences could be exposed to increased road traffic noise.

In a Class A arrangement, seagull intersection treatments would be provided at Kundabung Road, Smiths Creek Road and Ravenswood Road (south) and all other local access points and private accesses would be left in / left out only. Alternatively, the provision of a local access road would rationalise the number of accesses.

Access to the Maria River State Forest and Kumbatine National Park may be maintained by providing left in / left out arrangements at some of the existing access points.

Under a Class M scenario a grade separated interchange may be provided in the vicinity of Kundabung Road. New local access roads would be required both east and west of the alignment, to connect existing local roads and private properties to the interchange.

### 5.1.3 Green Option

#### Section A

The Green option is the same as the Blue option through to Fernbank Creek, at which point realignment further to the west than the Blue option occurs. The proposed realignment crosses the Hastings River upstream of the existing Dennis Bridge and two new bridges would be required for the northbound and southbound carriageways. The new river crossing would maintain navigational clearance and would be located approximately five metres upstream from the existing bridge. The Dennis Bridge and approaches would be used as a local access road for local traffic.

Existing rural property and businesses on the west side of the existing highway would be affected by the realignment and new river crossing and property acquisition will be required.

North of the Hastings River, the realignment is angled back to join the Blue option in the vicinity of Blackmans Point Road. Property acquisition will be required for the realignment through this section.

Under a Class A scenario, the Green option is the same as the Blue option except that Dennis Bridge is retained as a local access road.

The possible grade separated interchange options for the Class M scenario are the same as the Blue option.

#### Section B

The Green option is the same as the Blue option through this section.

#### Section C

The Green option is the same as the Blue option through this section.

#### Section D

The Green option is the same as the Blue option until the northern end of the Kundabung straight. From the end of the Kundabung straight through to Maria River a straighter realignment has been adopted. At Maria River the realignment connects to the southern end of the existing section of dual carriageway.

This realignment has a greater impact on the Maria River State Forest than the Blue option. Wildlife crossings would also need to be considered as mentioned previously with the Blue option.

The existing Pacific Highway would be retained as a local access road between Ravenswood Road and Old Coast Road at Maria River.

#### **5.1.4 Purple Option**

##### **Section A**

The Purple option is the same as the Green option through this section.

##### **Section B**

The Purple option is the same as the Blue option from Blackmans Point Road to Moorside Drive. From Moorside Drive the Purple option bypasses Telegraph Point to the east via a realignment through a large vegetated area identified to have endangered ecological communities, south of the ski park facility and then east of the ski park facility to Hacks Ferry Road. The realignment is across the floodplain of the Wilson River and several major culvert crossings would be required. Consideration of the difficult soft soil conditions would be necessary. Substantial property acquisition and vegetation clearing would be required through this section to the Wilson River crossing. The alignment in this area lies outside the study area set for the project in November 2004.

From Hacks Ferry Road, the new alignment crosses the Wilson River at Dalhunny Island, which is approximately 1.5 km east (downstream) of the existing bridge at Telegraph Point. Two new bridges are required at Wilson River and at the North Coast Railway, on the north side of the Wilson River. The new bridges would require the necessary clearances beneath at Wilson River and for the North Coast Railway. These proposed bridges are the longest of all route options being approximately 700 metres in length (existing bridge approximately 460 metres). This crossing at this location would impact on SEPP 14 wetland on Dalhunny Island. The existing Wilson River bridge and section of existing highway through Telegraph Point would be retained as a local access road.

After crossing the North Coast Railway the new alignment joins the Blue option in the vicinity of Haydons Wharf Road and is the same as the Blue option for the remainder of Section B through to Cooperabung Drive.

The Purple option bypasses Telegraph Point, however some rural residences would be subject to increased traffic noise and noise attenuation would have to be considered.

Under a Class A arrangement the Purple option would use the existing Pacific Highway and Wilson River bridge as a local access road to the new alignment. Seagull type intersections would be provided at Bill Hill and at Haydons Wharf Road where the new alignment rejoins the existing Pacific Highway. Local access would be provided via these intersections.

In the Class M scenario, a grade separated interchange may be located in the vicinity of Moorside Drive. Local access roads and existing highway through Telegraph Point would be connected via new local access roads to the interchange.

##### **Section C**

The Purple option is the same as the Blue option through this section.

##### **Section D**

The Purple option is the same as the Green option in this section.

### 5.1.5 Orange Option

#### Section A

The Orange option is the same as the Blue option to approximately 400 metres south of Fernbank Creek. It then deviates to the west of the existing alignment by approximately 400 metres and crosses the Hastings River before continuing on a straight alignment to Blackmans Point Road. The new crossing of the Hastings River would require new bridges for both carriageways and would maintain existing navigational clearances. Two new bridges are required at Fernbank Creek.

The existing highway from Fernbank Creek up to and including Blackmans Point Road, including Fernbank Creek Bridge and Dennis Bridge, would be used as a local access road.

The Orange option has minimal impact on the existing shipyard and marine precinct adjacent to Dennis Bridge, however it introduces potential land use conflicts with agricultural land as it deviates from the existing highway alignment. The alignment has a minor impact on Cairncross State Forest and Rawdon Creek Nature Reserve on the west side in the vicinity of Blackmans Point Road and also brings the highway closer to some rural properties.

The crossing of Hastings River is located close to and downstream of a bend in the river. Geomorphological investigation would be required to determine bank and riverbed stability and incorporated into the bridge design where required.

Under a Class A scenario, a grade separated interchange may be provided between Fernbank Creek Road and Fernbank Creek. A new local access road connection would be required to connect the interchange to Hastings River Drive. The existing intersection of the Pacific Highway with Hastings River Drive would be retained as a local access connection to the existing Pacific Highway and Hastings River Drive.

#### Section B

At Blackmans Point Road, the Orange option follows a realignment to the east through to Haydons Wharf Road. The Orange option crosses over the existing highway north of Blackmans Point Road. As the new carriageways depart from the existing highway, they pass through Cairncross State Forest, cross over Bill Hill Road and emerge from the forest to pass east of Moorside Drive, and the ski park facility.

For more than three kilometres, the Orange option crosses the Wilson River floodplain. Several major culvert structures would be required across the floodplain, possibly aligned to existing floodplain channels. Consideration of soft soil conditions in this area would be necessary. There would be significant private property acquisition, in addition to acquisition of state forests. The alignment in this area lies outside the study area set for the project in November 2004.

The existing Wilson River bridge and the Pacific Highway would be retained as a local access road throughout this section.

The alignment bypasses Telegraph Point as it continues in a northerly direction and crosses the Wilson River at the southern end of Dalhunny Island before crossing the North Coast Railway and Haydons Wharf Road. The new bridges over the Wilson River are approximately 2.4 km downstream from the existing bridge at Telegraph Point and would maintain clearance for vessels passing beneath, however shorter bridge structures than the Purple option would be required.

North from the Wilson River the Orange option crosses Haydons Wharf Road and runs largely parallel to the existing highway to the end of Section B. The Orange option would require property acquisition in this area and would expose new properties to increased traffic noise. New bridges are required over Haydons Wharf Road and Cooperabung Creek.

Access to the new alignment from side roads and other accesses would be via the existing Pacific Highway, which would be retained as a local access road.

Class M conditions would exist along the majority of this section at project opening.

### **Section C**

The alignment for the Orange option continues from the commencement of Section C, approximately 200 metres to the east of the existing highway at Cooperabung Drive in a straight alignment to Mingaletta Road at the southern end of the Kundabung straight. The alignment passes through Ballengarra State Forest and extensive rock cuttings would be required through Cooperabung Hill. The alignment is approximately 500 metres west of the Yarrabee quarry.

The alignment crosses Barrys Creek in three places and other minor watercourses, and all of these crossings would require box culvert structures for both new carriageways. In addition, bridges would be required where the new alignment crosses Yarrabee Road and Mingaletta Road.

Evidence of a koala movement corridor on the existing highway alignment suggests that wildlife crossings would need to be considered, as with the other options.

For a Class A scenario, local access to the new alignment would be via the existing Pacific Highway, which is retained for this purpose. At-grade intersections for connection to the new alignment could be provided at the limits of the section, at Cooperbung Drive in the south and Mingaletta Road in the north.

Under a Class M scenario, the existing Pacific Highway would also act as a local access road, servicing Yarrabee Road and Mingaletta Road areas. However, access to the new alignment will only be via grade separated interchanges.

### **Section D**

The Orange option is the same as the Green option through this section.

## 5.2 How Were the Options Developed?

### 5.2.1 Overview

The upgrade was to be generally by duplication however a review of the existing highway has shown that duplication may not be appropriate in sections of the study area. A duplicated alignment would still require considerable reconstruction of the existing highway and:

- ▶ Have potential impacts on the community including severance and access issues;
- ▶ Cause delays and access difficulties during construction; and
- ▶ May not be cost effective in the long term when compared to a new alignment.

Therefore, the approach adopted was a Class M scenario being developed in the first instance to ensure the ultimate suitability of the design. Consideration of possible deviations and the re-use of the existing highway as a local access road was undertaken to maximise the re-use of the existing asset and to aid rationalising accesses. The benefits of this philosophy are improved safety and better operations. Once Class M corridors were developed, condensed Class A layouts were developed for comparison purposes to determine the option that provides for the upgrade with minimal impact and maximum cost effectiveness.

To aid in this process, the Infrastructure Corridor Analysis (INCA) model was utilised. This model was developed specifically for corridor selection studies (refer to Section 5.2.2 for more detail on INCA). INCA is run in a Geographical Information System (GIS) and has assisted in the identification of viable corridor options which minimised both social and environmental impacts.

The process to identify these corridors can be divided into five main stages:

- ▶ Identification of issues;
- ▶ Collection of data on environmental and social issues that are sensitive to the construction and operation of a road and creation of constraint mapping;
- ▶ Assigning sensitivity values for each environmental and social issue;
- ▶ Selection of the least impact corridor option derived from the constraint mapping; and
- ▶ Field investigation to verify broad suitability of corridors developed by INCA.

Once viable corridor options were developed, engineering alignments were fitted to these corridors. Further assessment will then be undertaken within the GIS software to rate the alignments in the route options assessment phase. This rating will be done in parallel with the assessment criteria rating, value management workshops and the community displays.

In response to requests from sections of the Telegraph Point community, the study team has also investigated the feasibility of route options to the east of Telegraph Point. These options are located outside the November 2004 study area.

### 5.2.2 Infrastructure Corridor Analysis (INCA)

INCA is a route planning software package that quantitatively assesses and evaluates the complex environmental and social issues that are associated with locating linear infrastructure.

The INCA software uses standard overlay techniques to prepare the constraint mapping. Models available in INCA have been used to assist with the identification of viable corridor options based on the environmental, economic and social data collected during the study.

Essential features of the INCA modelling include:

- ▶ A systematic, multidisciplinary approach;
- ▶ A rational and documented method of decision analysis;
- ▶ A quantitative assessment of impacts; and
- ▶ An approach that is flexible enough to allow regional and site specific analysis.

Selection of the optimum route takes into account all constraints while keeping the road to a reasonable length.

The benefit of this approach is that weightings for each factor can easily be changed. In this case placing different weightings on a variety of issues identified several route alignments, many of which were common to others.

INCA provides output mapping showing areas of least resistance and viable corridor options for use in developing engineering alignments.

### 5.2.3 Engineering Route Development

Once the constraint mapping and viable corridor options were developed, further work was undertaken to develop viable route corridor options. The viable corridors must be able to fit a road with an alignment suitable for 110 km/h travel speeds. These speeds require large radius curves both horizontally and vertically to allow the driver to negotiate the road safely.

The broad alignments were initially developed by hand using large-scale topographic maps and scale drawing implements. The broad alignments were developed considering the INCA output, community and stakeholder input, and all the known constraints.

Once an alignment was developed horizontally, the viability of the option was assessed vertically using MX road design software. This enabled the study team to assess grades, particularly with respect to heavy vehicle performance and estimate earthworks volumes for cost estimating purposes.

It should be noted that these initial investigations have not completely fixed an alignment but simply ensured the feasibility prior to further assessment. Within the route option corridors there is flexibility for refinement after further investigations and consultation in the subsequent stages of the project development process.

#### 5.2.4 Issues and Constraints

The initial investigations and community involvement identified that the social, built environment and environmental issues associated with the construction and operation of the highway include impacts on:

- ▶ Visual and landscape domains;
- ▶ Native vegetation and flora;
- ▶ National parks and wetlands;
- ▶ Surface waters and flooding;
- ▶ Existing land uses;
- ▶ Existing infrastructure; and
- ▶ Indigenous and non-indigenous heritage areas.

The key constraints identified within the study area include:

- ▶ Access from private property, businesses and local roads;
- ▶ Stoney Park and Watersports Complex – it is a significant operation with considerable capital investment;
- ▶ Cooperabung Hill – the topography of this part of the study area presents some significant challenges in meeting the project design criteria;
- ▶ Hastings River and Wilson River floodplains – the floodplain will provide challenges in overcoming flooding and soft soil issues and will dictate the form of the upgrade in this area;
- ▶ Heritage sites – the various cultural heritage sites that have been identified should be avoided if possible;
- ▶ National parks / conservation areas – these reserves should be avoided if possible;
- ▶ SEPP 14 wetlands– these reserves should be avoided if possible; and
- ▶ Project start and end points and the study area – these constrain the route options.

Analysis of these issues and constraints was initially undertaken using INCA.

### 5.3 Summary of Characteristics of Route Options

A broad summary of the key characteristics of each route option in each of the sections of the study area is contained in Tables 5.2 to 5.5. Where applicable, the data within the tables has been updated since the publication of the *Oxley Highway to Kempsey Route Options Development Report* in October 2005 as a result of additional investigations.

The characteristics include:

- ▶ Engineering and Operational;
- ▶ Community; and
- ▶ Environmental.

**Table 5.2 Characteristics of all Route Options – Section A**

<b>Section A</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
<b>Engineering and Operational</b>				
Total length (km)	8.4		8.2	
Length of Major Bridges (m)	120		120	
Major cuts (>5m depth in rock)	No		No	
Length of route to be constructed on floodplain (km)	2.3		1.8	
Number of Interchanges (Class M)	1		1	
Number of bridges	8		8	
Significant public utility constraints	Optic Fibre crossings Water Main may require relocation Potential sewer upgrades may cross the highway at Fernbank Creek Road			Optic Fibre crossings Water Main may require relocation Potential sewer upgrades may cross the highway at Fernbank Creek Road
Preliminary Cost Estimate – Class A (\$M)	167	209	217	182
Preliminary Cost Estimate – Class M (\$M)	224	229	237	194

<b>Section A</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
<b>Community</b>				
Potential noise impact (measured by weighted noise impact)	79	82	82	86
Does the option sever communities?	No			No
Approximate area of potential property acquisition (ha)	46	51		57
Number of properties potentially affected by acquisition	45			43
Impact to state forest, national park or nature reserve?	Yes (strip acquisition from Cairncross State Forest and Rawdon Creek Nature Reserve)			Yes (minor severance of Cairncross State Forest and strip acquisition from Rawdon Creek Nature Reserve)
Impacts on known Aboriginal Heritage?	No impacts to listed heritage. All options traverse areas of cultural sensitivity			
Impacts on known Non-Aboriginal Heritage?	No			No
<b>Environmental</b>				
Impact to SEPP 14 wetlands?	No			No
Extent of vegetation clearing (ha)	45			58
Extent of endangered ecological community clearing (ha). Areas are based on field investigations generally north of Fernbank Creek only.	17			15
Impact to NPWS designated wildlife corridors	Yes (widening of existing cleared corridor along edge of one regional wildlife corridor, and widening of existing cleared corridor through one sub-regional wildlife corridor)			

**Table 5.3 Characteristics of all Route Options – Section B**

<b>Section B</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
<b>Engineering and Operational</b>				
Total length (km)	12.0		11.8	11.0
Length of Major Bridges	88		88	88
Major cuts (>5m depth in rock)	Yes		No	No
Length of route to be constructed on floodplain (km)	5.4		3.3	2.5
Number of Interchanges (Class M)	1		1	1
Number of bridges	9		9	9
Significant public utility constraints	Fibre Optic network Electrical Infrastructure Underground water main		Fibre Optic network Electrical Infrastructure Underground water main	Fibre Optic network Electrical Infrastructure Underground water main
Preliminary Cost Estimate – Class A (\$M)	184		238	212
Preliminary Cost Estimate – Class M (\$M)	223		255	222
<b>Community</b>				
Private property noise impact (measured by weighted noise impact)	290		129	55
Does the option sever communities?	Continues existing severance of Telegraph Point (north and south)		Option avoids Telegraph Point (north, and divides Telegraph Point (south)	Option avoids Telegraph Point (north and south)

<b>Section B</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
Approximate area of potential property acquisition (ha)	46		83	84
Number of properties potentially affected by acquisition	79		55	28
Potential impact to state forest, national park or nature reserve?	Yes (strip acquisition from Cairncross State Forest and Rawdon Creek Nature Reserve)		Yes (strip acquisition from Cairncross State Forest and Rawdon Creek Nature Reserve)	Yes (major severance of Cairncross State Forest and strip acquisition from Rawdon Creek Nature Reserve)
Impacts on known Aboriginal Heritage?	No		No	No (an open camp site listed on DEC register occurs approximately 200m east)
Impacts on known Non-Aboriginal Heritage?	No (a number of locally listed heritage items occur in Telegraph Point)		No	No
<b>Environmental</b>				
Impact to SEPP 14 wetlands?	No		Yes. Approx. 1 ha. (severance of SEPP 14 wetland on Dalhenty Island)	Yes. Approx. 1 ha. (severance of SEPP 14 wetland on northern bank of Wilson River)
Extent of vegetation clearing (ha)	49		68	50
Extent of Endangered Ecological Communities clearing (ha)	7		28	31
Impact to NPWS designated wildlife corridors	Yes (widening of existing cleared corridor along edge of one regional wildlife corridor)			

**Table 5.4 Characteristics of all Route Options – Section C**

<b>Section C</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
<b>Engineering and Operational</b>				
Total length (km)		5.3		5.1
Length of Major Bridges (m)		0		0
Major cuts (>5m depth in rock)		Yes		Yes
Length of route to be constructed on floodplain (km)		0.2		0.01
Number of Interchanges (Class M)		0		0
Number of bridges		3		3
Significant public utility constraints		Optic Fibre infrastructure Electrical infrastructure		Optic Fibre infrastructure
Preliminary Cost Estimate – Class A (\$M)		51		75
Preliminary Cost Estimate – Class M (\$M)		66		77
<b>Community</b>				
Potential noise impact (measured by weighted noise impact)		13		6
Does the option sever communities?		No		No

<b>Section C</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
Approximate area of potential property acquisition (ha)		15		61
Number of properties potentially affected by acquisition		12		8
Potential impact to state forest, national park or nature reserve?	Yes (strip acquisition from Ballengarra State Forest and possible minor strip acquisition from Cooperabung Creek Nature Reserve)			Yes (major severance of Ballengarra State Forest)
Impacts on known Aboriginal Heritage?	No			Yes (potential ceremonial site near Cooperabung Hill)
Impacts on known Non-Aboriginal Heritage?	No			No
<b>Environmental</b>				
Impact to SEPP 14 wetlands?	No			No
Extent of vegetation clearing (ha)	38			67
Extent of Endangered Ecological Communities clearing (ha)	18			27
Impact to NPWS designated wildlife corridors	Yes (widening of existing cleared corridor along edge of one regional wildlife corridor)			Yes (creation of new cleared corridor through one regional wildlife corridor)

**Table 5.5 Characteristics of all Route Options – Section D**

<b>Section D</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
<b>Engineering and Operational</b>				
Total length (km)	11.9		11.7	
Length of Major Bridges (m)	0		0	
Major cuts (>5m depth in rock)	No		No	
Length of route to be constructed on floodplain (km)	1.7		1.7	
Number of Interchanges (Class M)	0		0	
Number of bridges	15		15	
Significant public utility constraints	Impact to Fibre Optic, Electricity Services		Impact to Fibre Optic, Electricity Services	
Preliminary Cost Estimate – Class A (\$M)	113		129	
Preliminary Cost Estimate – Class M (\$M)	139		164	
<b>Community</b>				
Potential noise impact (measured by weighted noise impact)	101		101	
Does the option sever communities?	Yes. All options continue existing severance of Kundabung community.			

<b>Section D</b>				
<b>Characteristics</b>	<b>Blue Option</b>	<b>Green Option</b>	<b>Purple Option</b>	<b>Orange Option</b>
Approximate area of potential property acquisition (ha)	100	103		
Number of properties potentially affected by acquisition	56	56		
Potential impact to state forest, national park or nature reserve?	Yes (strip acquisition from Maria River State Forest & possible minor strip acquisition from Kalateenee State Forest)	Yes (minor severance of Maria River State Forest & possible minor strip acquisition from Kalateenee State Forest)		
Impacts on known Aboriginal Heritage?	No impacts to listed heritage. All options traverse an area of cultural sensitivity around Maria River.			
Impacts on known Non-Aboriginal Heritage?	All options impact on Maria River (northbound) bridge, which has been assessed as being of State heritage significance.			
<b>Environmental</b>				
Impact to SEPP 14 wetlands?	No	No		
Extent of vegetation clearing (ha)	76	77		
Extent of endangered ecological community clearing (ha)	None known subject to further detailed investigations during concept design.			
Impact to NPWS designated wildlife corridors	Yes (creation of a new cleared corridor through one regional wildlife corridor, and widening of existing cleared corridor through one regional and one sub-regional wildlife corridors)			