3 Description of the proposal

This chapter describes the proposal, the design parameters and criteria, the major design features, the construction method and associated infrastructure and activities.

3.1 The proposal

Roads and Maritime proposes to upgrade about 11.5 kilometres of the Princes Highway between Schofields Lane (south of Berry) and Cambewarra Road, Bomaderry. The proposal would provide a four-lane divided highway (two lanes in each direction) with median separation.

The proposal is one of a series of upgrades to sections of the Princes Highway which aims to provide at least a four-lane divided highway between Waterfall and Jervis Bay Road, Falls Creek. This would improve road safety and traffic efficiency, including for freight, on the NSW South Coast.

Key features of the proposal are shown in Figure 1-1, Figure 3-1, Figure 3-2 and Figure 3-3. These would include:

- Upgrade of the existing highway, including widening from two lanes to a four-lane divided highway (two lanes in each direction) with median separation (wire rope barriers generally, or concrete barriers where space is constrained, such as at bridge locations).
- Provision for widening of the highway (if required in the future) to six lanes within the road corridor between Schofields Lane and around Pestells Lane.
- Tie-in to the Berry bypass to the north of the proposal.
- Grade-separated facilities at:
  - Jaspers Brush Road and Strongs Road.
  - Morschels Lane and Devitts Lane.
- A grade-separated half-interchange at:
  - Pestells Lane and Meroo Road.
- Protected right turn bays at:
  - Mullers Lane (northbound).
  - Croziers Road (southbound).
  - At the u-turn facility between Strongs Road and Turners Lane at about chainage 23200 (northbound).
  - Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (southbound).
  - Lamonds Lane (northbound).
  - Boxsells Lane (southbound).
  - South of Abernethys Lane at about chainage 28590 (northbound).

1 Unlike a standard grade separated interchange which has full length on-ramps and off-ramps, a grade separated facility has deceleration lanes to a connecting road that links to an overpass or underpass. Grade separated facilities have been used along the Pacific Highway and are informally referred to as Type S interchanges.
• U-turn facilities at 2:
  - Croziers Road (to travel northbound).
  - Between Strongs Road and Turners Lane at about chainage 23200 (to travel southbound).
  - Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (to travel northbound).
  - Lamonds Lane (to travel southbound).
  - South of Abernethys Lane at about chainage 28590 (to travel southbound).
• A large cutting at Strongs Road, Jaspers Brush of around 300 metres long and up to a maximum of ten metres deep in addition to various smaller cuttings along the proposal.
• Eight bridges over waterways 3:
  - Creek crossing No. 1 – Unnamed drainage line at chainage 19350, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 2 – Unnamed drainage line at chainage 19800, a single span concrete structure around 33 metres long and four metres high.
  - Creek crossing No. 3 – Flying Fox Creek, a single span concrete structure around 18 metres long and seven metres high.
  - Creek crossing No. 4 – Jaspers Brush Creek, a three span concrete structure around 44 metres long and six metres high.
  - Creek crossing No. 5 – Wileys Creek, a five span concrete structure around 76 metres long and five metres high.
  - Creek crossing No. 6 – Tandingulla Creek, a three span concrete structure around 44 metres long and three metres high.
  - Creek crossing No. 7 – Tullian Creek, a three span concrete structure around 44 metres long and five metres high.
  - Creek crossing No. 8 – Abernethys Creek, a three span concrete structure around 76 metres long and two metres high.
• Major drainage and flood mitigation structures:
  - O’Keefes Lane culvert – ten cell box culvert, with each cell around 2.5 metres wide, 1.5 metres high and about 70 metres long at chainage 21130.
  - Flood mitigation bridge – located just south of O’Keefes Lane at about chainage 21200, a three span concrete structure around 45 metres long and 3.5 metres high.
  - Pestells Lane culvert – eight cell box culvert, with each cell around 2.5 metres wide, 1.5 metres high and about 130 metres long (between chainages 28020 and 28150).
  - Morschels Lane culvert – five cell box culvert, with each cell around 2.5 metres wide, 2.1 metres high and about 60 metres long at chainage 25070.
  - Overflow channel – around 300 metre long channel located upstream of the alignment to allow flood waters to follow the existing drainage path (between chainages 22320 and 22650).
• A northbound heavy vehicle inspection bay at Jaspers Brush, staffed as needed and locked when not in use.
• Modifications to the connections between local roads and the highway, including Strongs Road, Jaspers Brush Road, Morschels Lane, Devitts Lane, Pestells Lane, Meroo Road and Abernethys Lane.

2 The u-turn facility within the proposal area at Mullers Lane (northbound) has been approved under Part 3A of the EP&A Act as part of the Foxground and Berry bypass project.
3 Existing waterway crossings at Flying Fox, Jaspers Brush and Abernethys creeks are all currently spanned by bridges. These three bridges would be replaced as part of the proposal. The remainder of the new bridges would be constructed at the locations of the existing culverts.

Princes Highway upgrade – Berry to Bomaderry
Roads and Maritime Services
Review of environmental factors
• Physical modifications to about 16 existing property accesses.
• Relocation and formalisation of existing southbound bus stops at Mullers Lane, Jaspers Brush Road, Morschels Lane and Lamonds Lane and existing northbound bus stops at Boxsells Lane, Croziers Road and Strong Road. Bus stops would be relocated to sites where there is provision for safe vehicular access, set down and pick up.
• Removal of the current southbound bus stop adjacent to Croziers Road.
• Ancillary operational facilities, including permanent detention basins and stormwater treatment facilities.
• Tie-in with the existing highway at the Cambewarra Road / Moss Vale Road roundabout.

Temporary construction ancillary facilities, including construction compounds, stockpile sites, haulage roads and sediment basins would be established and operated for construction and located as shown on Figure 1-1, Figure 3-1, Figure 3-2 and Figure 3-3.

3.2 Design parameters

The proposal would provide a minimum four lane carriageway arterial style highway with a posted speed of 100 kilometres per hour (reducing to 70 kilometres per hour near Bomaderry at Chainage 29100, just south of Abernethys Lane) and two lanes in each direction. A median incorporating wire rope barriers, or concrete barriers where space is constrained, would be provided to separate opposing traffic.

The proposal would achieve 1 in 100 year flood immunity for through movements on the highway and would allow for future widening to three lanes in each direction, including on bridges.

The description of the proposal presented in this review of environmental factors represents the proposal concept design. Sufficient flexibility has been provided in the design to allow for its refinement during detailed design. The final design may therefore vary from the concept design presented in this chapter.

3.2.1 Design criteria

Table 3-1 presents the design criteria for the proposal. This information represents the standard to which the proposal would be designed and constructed.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Highway alignment and cross section</strong></td>
<td></td>
</tr>
<tr>
<td>Design speed</td>
<td>Horizontal 110 kilometres per hour</td>
</tr>
<tr>
<td></td>
<td>Vertical 100 kilometres per hour</td>
</tr>
<tr>
<td>Minimum “K” value&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Crest 66</td>
</tr>
<tr>
<td></td>
<td>Sag 33.4&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Stopping sight distance</td>
<td>Reaction time 2.5 seconds</td>
</tr>
<tr>
<td></td>
<td>Horizontal 210 metres</td>
</tr>
<tr>
<td></td>
<td>Vertical 175 metres</td>
</tr>
<tr>
<td>Horizontal radius</td>
<td>On line upgrade minimum 600 metres</td>
</tr>
<tr>
<td></td>
<td>Off line construction minimum 750 metres</td>
</tr>
<tr>
<td>Upgrade lanes (in each direction)</td>
<td>2&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ramps</td>
<td>1</td>
</tr>
<tr>
<td>Climbing lanes</td>
<td>Loss of truck speed to 40 kilometres per hour and LoS D 20 years after construction</td>
</tr>
<tr>
<td>Grade</td>
<td>Desirable maximum 6 per cent&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Absolute maximum 8 per cent</td>
</tr>
<tr>
<td></td>
<td>Minimum in cutting 0.5 per cent</td>
</tr>
<tr>
<td>Pavement type</td>
<td>Low noise pavement</td>
</tr>
<tr>
<td>Lane width (including interchange ramps and auxiliary lanes)</td>
<td>3.5 metres</td>
</tr>
<tr>
<td>Shoulder width</td>
<td>Nearside (outside) 2.5 metres</td>
</tr>
<tr>
<td></td>
<td>Offside (median) minimum 1 metre</td>
</tr>
<tr>
<td>Median width&lt;sup&gt;e&lt;/sup&gt; – No right turn bay</td>
<td>With wire rope barrier 5 metres</td>
</tr>
<tr>
<td></td>
<td>With concrete barrier 2.6 metres</td>
</tr>
<tr>
<td>Median width&lt;sup&gt;e&lt;/sup&gt; – Right turn bay treatment required</td>
<td>10 metres</td>
</tr>
<tr>
<td>Clearance to boundary</td>
<td>Minimum 6 metres</td>
</tr>
<tr>
<td>Flood immunity</td>
<td>1 in 100 year storm event for new structures. A minimum of 1 in 20 year storm event if an existing structure can be utilised subject to structural capacity adequate for new design life.</td>
</tr>
<tr>
<td>Batters</td>
<td>Fill &lt; 1.5 metres high – 4:1 (maximum slope)</td>
</tr>
<tr>
<td></td>
<td>Fill &gt; 1.5 metres high – 2:1 (maximum slope)</td>
</tr>
<tr>
<td></td>
<td>Cut 2:1 or flatter – 7 metres maximum between benches</td>
</tr>
<tr>
<td></td>
<td>Cut steeper than 2:1 – 10 metres maximum between benches</td>
</tr>
</tbody>
</table>
### Criteria and Requirement

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design vehicle highway</td>
<td>25 metre B-double</td>
</tr>
<tr>
<td></td>
<td>12.5 metre single unit truck (emergency vehicle u-turn bays which will be utilised by emergency vehicles only)</td>
</tr>
<tr>
<td></td>
<td>19 metre semi-trailer (access u-turn bays)</td>
</tr>
<tr>
<td>Design vehicle local road</td>
<td>19 metre semi-trailer (unless designated a B-double access)</td>
</tr>
<tr>
<td>Design vehicle – property access</td>
<td>12.5 metre single unit or 19 metre semi-trailer (farm residence and paddock access by negotiation with the land owner and depending on land use)</td>
</tr>
<tr>
<td>Provision for buses</td>
<td>Bus access to main alignment and offline bus stops at certain interchanges and local road junctions.</td>
</tr>
</tbody>
</table>

## Bridges

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside shoulder</td>
<td>2 – 3 metres (to match approach shoulder width)</td>
</tr>
<tr>
<td>Median shoulder</td>
<td>Minimum 1 metre</td>
</tr>
<tr>
<td>Vertical clearance – over highway</td>
<td>5.3 metres</td>
</tr>
<tr>
<td>Vertical clearance – over regional and local roads</td>
<td>4.6 metres</td>
</tr>
</tbody>
</table>

**Notes:**

a. The K value is a geometric design term used to determine the length of vertical curvature along a road between two varying grades.

b. Refers to sag vertical curves which, when viewed from the side, are concave upwards. This is used to determine headlight and comfort criteria.

c. Provision for future widening on the outside would be included.

d. No criteria apply regarding maximum length of grade.

e. Measured edgeline to edgeline.

### 3.2.2 Engineering constraints

Engineering constraints that would potentially impact the design and construction of the proposal include:

- Ground conditions, such as acid sulfate soils (ASS) and soft soils.
- Flooding and drainage.
- Relocation of major public utilities.

These constraints are summarised below and assessed in detail in Chapter 6.

### Ground conditions

The proposal would cross an area between the Shoalhaven floodplain and the lower reaches of the Cambewarra Range. Potential constraints associated with this topography include actual ASS, potential acid sulfate soils (PASS) and soft soils.

The construction footprint for the proposal (see Figure 1-1) is located within areas of land that have been mapped by the NSW Office of Environment and Heritage (OEH) (the then Department of Land and Water Conservation (DLWC)) in 1997 as having no known occurrence of actual ASS. Actual ASS are present at varying depths to the east of the proposal, outside of the construction footprint.
Several sections in the construction footprint of the proposal have been identified as having PASS being present. PASS are located mostly along existing and historical creek lines near the proposal, such as the Broughton Creek floodplain. Disturbance to PASS would be avoided where feasible and reasonable.

Soft soils have limited resistance to loads, and as such, roads constructed on soft soils, without ground improvement works, risk ongoing maintenance as a result of differential ground settlement. The presence and depth of soft soils are the most prominent in the vicinity of the Broughton Creek and Shoalhaven River floodplains. In areas of soft soils, ground improvements would be undertaken to provide sufficient stability for construction and to provide long-term durability.

Further details regarding ground condition constraints are provided in Section 6.11.

Flooding and drainage
During a 1 in 100 year ARI flood event, the existing highway is overtopped by floodwaters at 21 of the 28 waterway crossing locations. The depth of water which overtops the existing highway at these locations ranges from between 0.01 metres to 0.59 metres.

The proposal has been designed to achieve flood immunity during the 1 in 100 year ARI flood event. In order to achieve this, potential changes to flood levels at the South Coast Railway, houses, farm infrastructure and agricultural land need to be considered and minimised. Flooding constraints, impacts and mitigation measures are discussed in further detail in Section 6.5.

Major public utilities
The major public utilities located near the proposal include the Eastern Gas pipeline, Optus and Telstra fibre optic cables, water and sewer networks and electricity transmission and distribution lines. Where any of these utilities cross the construction footprint of the proposal, reinforcement or relocation would be undertaken. Any such activities would be undertaken in consultation with the relevant authorities. Further details of the required public utility adjustments have been provided in Section 3.5.

3.3 Major design features

3.3.1 Route alignment from north to south

Figure 1-1, Figure 3-1, Figure 3-2 and Figure 3-3 show the alignment and key features of the proposal from north to south.

Figure 3-1 provides an overview of the proposal between the Schofields Lane and the Jaspers Brush Road / Strongs Road grade-separated facility. At the northern end, the proposal would tie-in to the Foxground and Berry bypass, it would then consist of widening the existing alignment to accommodate an additional lane in each direction. In this section, the proposal would generally be constructed on fill embankments with cuttings located near Croziers Road and the Jaspers Brush Road / Strongs Road grade-separated facility.

The local roads, Andersons Lane and O'Keefes Lane would be restricted to left-in / left-out access. U-turn facilities and protected right turn bays would be provided at Mullers Lane and Croziers Road. The u-turn facility at Mullers Lane would be constructed separately as part of the Foxground and Berry bypass project, however the protected right turn bay would be constructed as part of the proposal. An overpass would be constructed to connect Jaspers Brush Road and Strongs Road over the main highway alignment as part of the Jaspers Brush Road / Strongs Road grade-separated facility. The grade-separated facility would provide for all turning movements.

A northbound heavy vehicle inspection bay would be located in Jaspers Brush just north of O'Keefes Lane. This would be built on fill embankment.
Figure 3-2 provides an overview of the proposal from just south of the Jaspers Brush Road / Strongs Road grade-separated facility to the Morschels Lane and Devitts Lane grade-separated facility. In this section, the proposal would consist of widening the existing alignment to accommodate an additional lane in each direction. There would be short transitions between sections of cut and fill embankments with the Morschels Lane / Devitts Lane grade-separated facility being constructed on fill embankment.

Turners Lane would be restricted to left-in / left-out and Morschels Lane and Devitts Lane would be joined via an underpass under the main highway alignment as part of the Morschels Lane / Devitts Lane grade-separated facility. The grade-separated facility would provide for all turning movements. Two u-turn facilities and protected right turn bays (one north bound and one southbound) would be constructed between Strongs Road and Turners Lane at about chainage 23200 and chainage 24050. A bus stop would be provided at Morschels Lane as part of the Morschels Lane and Devitts Lane grade-separated facility.

Figure 3-3 provides an overview of the proposal from just south of the Morschels Lane and Devitts Lane grade-separated facility to the Cambewarra Road / Princes Highway roundabout and includes the Pestells Lane / Meroo Road grade-separate half-interchange. The half-interchange would provide for all turning movements. In this section, the proposal would consist of widening the existing alignment to accommodate an additional lane in each direction. The proposal would generally be constructed on fill embankment with small sections of cut located just south of the Morschels Lane / Devitts Lane grade-separated facility, just north of Abernethys Lane and through Bomaderry on the approach to the Cambewarra Road / Princes Highway roundabout.

A u-turn facility and protected right turn bay would be provided at Lamonds Lane and a protected right turn bay would also be provided at Boxsells Lane. Pestells Lane would be bridged over the main highway alignment as part of the half-interchange and would connect to Meroo Road at a roundabout just north of Fletchers Lane. Abernethys Lane would be restricted to left-in / left-out access and a u-turn facility and protected right turn bay would be provided just south of Abernethys Lane.

Approaching Bomaderry, the speed limit would be reduced to 70 kilometres per hour at about Chainage 29100, just south of Abernethys Lane and there would be a distinct transition from a rural landscape to an urban environment. The proposal through this section would likely include lighting along the alignment, kerbed shoulders and other street furnishings and plantings. There would be no tie-in at the southern extent of the proposal as the highway alignment would connect directly to the existing Cambewarra Road roundabout.
MUST READ INFO:
SAME FILE AS "BBU DETAILS OF THE PROPOSAL" + "BBU OVERVIEW OF PROPOSAL ZONING" (Difference: In "overview" file lane markings are switched off and layer "midian" switched on. In the "zoning" file the cuts and fills, waterways, railway and roads are also switched off. In the detailed file all lane markings are switched on but "midian" switched off) NOTE: ANCILLARY SITES LAYER ADDED TO FIGURE 1-1 + figure 3-1 to 3-3 ONLY!

Figure 3-1 Key features of the proposal
Morschels Lane and Devitts Lane grade separated facility

Right turn in and u-turn bay

A local road underpass at Morschels Lane and Devitts Lane

Figure 3-2 Key features of the proposal
MUST READ INFO:
SAME FILE AS "BBU DETAILS OF THE PROPOSAL" + "BBU OVERVIEW OF PROPOSAL ZONING" (Difference: In "overview" file lane markings are switched off and layer "midian" switched on. In the "zoning" file the cuts and fills, waterways, railway and roads are also switched off. In the detailed file all lane markings are switched on but "midian" switched off) NOTE: ANCILLARY SITES LAYER ADDED TO FIGURE 1-1 + figure 3-1 to 3-3 ONLY!

LEGEND
- Upgraded highway
- Access roads
- Existing Princes Highway
- Highway tie-in
- Local roads
- South Coast Railway
- Potential operational water quality basins and construction sediment basins
- Bridges, overpasses and underpasses
- Potential construction ancillary facilities
- Potential construction ancillary facility site number
- Embankment, fill
- Embankment, cut
- Chainage
- Construction footprint (The construction footprint does not show structures for architectural noise treatment or flood treatments, which are to be determined during detailed design in consultation with the property owners.)

Aerial photography is dated 2009. Aerial photography under licence to Roads and Maritime by Land and Property Information (LPI)

Figure 3-3 Key features of the proposal
3.3.2 Road corridor widening

The proposal would generally follow the alignment of the existing Princes Highway. Widening would occur on one or both sides of the existing alignment. The proposal has been designed in accordance with the Austroads Design Guides and design development has incorporated subsequent design guide updates where relevant.

The proposal would include two 3.5 metre wide traffic lanes in each direction. Northbound and southbound lanes would be separated by a five metre wide central median, incorporating a one metre wide inner shoulder. The outer shoulder would be a minimum of 2.5 metres wide, increasing to three metres wide when a safety barrier is provided (allowing for safe utilisation by cyclists). An outer verge would also be provided and would generally be one metre wide.

3.3.3 Cut and fill

The proposal is located in an area of moderately undulating terrain necessitating a series of cuttings and fill embankments to accommodate the proposal. The cuttings and embankments would provide a flatter alignment, improving general road safety and safety at interchanges and junctions by improving sight and stopping distances.

Eight fill embankments and three cuttings would be required that would be greater than one metre in height and depth and over 100 metres in length. Table 3-2 and Table 3-3 provide estimates of these fill and cut embankments (precise details would be subject to detailed design). The specified depths relate to the centreline of the road and may vary across the cross section. All embankments and cuttings are shown on Figure 3-1, Figure 3-2 and Figure 3-3. Fill batters would be generally sloped at 2:1 horizontal to vertical. Cut batters would vary from 1:1 to 2:1 or steeper, depending on ground conditions, stability requirements and property acquisition constraints.

<table>
<thead>
<tr>
<th>Chainage</th>
<th>Length (metres)</th>
<th>Maximum depth (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19200 - 19450</td>
<td>250</td>
<td>2.5</td>
</tr>
<tr>
<td>19600 - 19900</td>
<td>300</td>
<td>4.0</td>
</tr>
<tr>
<td>20320 - 21600</td>
<td>1280</td>
<td>6.0</td>
</tr>
<tr>
<td>23720 - 24470</td>
<td>750</td>
<td>7.0</td>
</tr>
<tr>
<td>24940 - 25310</td>
<td>370</td>
<td>9.0</td>
</tr>
<tr>
<td>25580 - 26700</td>
<td>1120</td>
<td>5.0</td>
</tr>
<tr>
<td>27250 - 27740</td>
<td>490</td>
<td>2.8</td>
</tr>
<tr>
<td>28020 - 28500</td>
<td>480</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chainage</th>
<th>Length (metres)</th>
<th>Maximum depth (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20060 – 20280</td>
<td>220</td>
<td>6.0</td>
</tr>
<tr>
<td>24520 – 24910</td>
<td>390</td>
<td>4.5</td>
</tr>
<tr>
<td>25350 – 25540</td>
<td>190</td>
<td>3.2</td>
</tr>
</tbody>
</table>

The typical cross sections (embankment and cutting) that have been adopted for the proposal are shown in Figure 3-4 and Figure 3-5.
3.3.4 Junctions and interchanges

The proposal would include the following unsignalised junctions and interchanges:

- Two grade-separated facilities.
- One grade-separated half-interchange.
- Seven protected right turn bays.
- Five u-turn facilities.
Jaspers Brush Road and Strongs Road

The grade-separated facility at Jaspers Brush Road and Strongs Road would cater for all traffic movements entering and exiting the highway in northbound and southbound directions. Available traffic movements are shown in Figure 3-6.

Southbound traffic would access and exit the highway via an at-grade, left-in / left-out intersection at Jaspers Brush Road. Jaspers Brush Road would be realigned to form a perpendicular junction with the highway as part of the proposal. Northbound traffic would access and exit the highway via an at-grade left-in / left-out intersection at Strongs Road.

A link road would be provided over the highway between Jaspers Brush Road and Strongs Road. This overbridge would utilise an existing local road reservation, and would allow for all traffic movements between the two junctions. The overbridge would also be able to take advantage of the height difference between the road and the top of the cutting, which would minimise the amount of earthworks and structure required for the provision of the grade separation.

Locating a grade separated facility here maximises the use of the surrounding topography to minimise the earthworks and structures required. This is an advantage not provided at other local roads where the topography is a lot flatter, such as Croziers Road to the north.

Morschels Lane and Devitts Lane

The grade-separated facility at Morschels Lane and Devitts Lane would cater for all traffic movements entering and exiting the highway in northbound and southbound directions. Available traffic movements are shown in Figure 3-7.

The junction of Morschels Lane and the highway would be realigned around 80 metres east of the existing junction. The realigned Morschels Lane would provide an at-grade, left-in / left-out junction with the highway for southbound traffic.
The junction of Devitts Lane and the highway would be realigned around 80 metres west of the existing junction. The realigned Devitts Lane would provide an at-grade, left-in / left-out junction with the highway for northbound traffic.

Morschels Lane would connect to Devitts Lane via an underpass under the highway. This underpass would allow for all traffic movements (including trucks up to 4.6 metres in height) between the two junctions.

![Figure 3-7 Morschels Lane and Devitts Lane grade-separated facility](image)

**Pestells Lane and Meroo Road**

The grade-separated half-interchange at Pestells Lane and Meroo Road would cater for all traffic movements entering and exiting the highway in northbound and southbound directions. Available traffic movements are shown in Figure 3-8.

The interchange would consist of an at-grade, left-in / left-out junction of Meroo Road and the highway. This junction would provide access and egress to and from the highway for southbound traffic. New northbound on-ramps and off-ramps would connect to the realigned Pestells Lane at a new roundabout.

A link road would utilise an existing local road reservation, and would connect the new roundabout on Pestells Lane to a new roundabout on Meroo Road, which would be located near the junction of Meroo Road and Fletchers Lane. The link road would connect the two roundabouts via an overbridge over the highway. The new roundabout on Meroo Road would be located about 500 metres south of the intersection of Meroo Road and the highway. This link road would enable all traffic movements in northbound and southbound directions.
Figure 3-8 Pestells Lane and Meroo Road grade-separated half-interchange

Protected right turn bays and u-turn facilities

- Protected right turn bays would be provided at:
  - Mullers Lane (northbound).
  - Croziers Road (southbound).
  - Between Strongs Road and Turners Lane at about chainage 23200 (northbound).
  - Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (southbound).
  - Lamonds Lane (northbound).
  - Boxsells Lane (southbound).
  - South of Abernethys Lane at about chainage 28590 (northbound).

- U-turn facilities at:
  - Croziers Road (to travel northbound).
  - Between Strongs Road and Turners Lane at about chainage 23200 (to travel southbound).
  - Between Strongs Road and Turners Lane at about chainage 24050, adjacent to Silos Winery (to travel northbound).
  - Lamonds Lane (to travel southbound).
  - South of Abernethys Lane at about chainage 28590 (to travel southbound).
The u-turn facilities would enable access to properties located between the grade-separated half-interchanges and facilities. These properties would be restricted to left-in / left-out only access. Protected right turn bays would be provided to enable access to a u-turn facility from the opposite carriageway or to provide access to some local roads. A typical configuration of a u-turn facility and protected right turn bay is provided in Figure 3-9. All u-turn facilities are shown on Figure 3-1, Figure 3-2 and Figure 3-3.

Certain u-turn facilities would also include a bus stop allowing school and local bus services to drop off and pick up passengers safely. U-turn facilities would be designed to cater for 19 metre semi-trailers.

The u-turn facility at Mullers Lane would be constructed as part of the separate Foxground and Berry bypass project, which has been approved under Part 3A of the EP&A Act.

3.3.5 Local roads

A number of local roads and junctions would be modified by the proposal. Access to local roads would generally be limited to left-in / left-out access although some local roads would connect to the upgraded highway at a protected right turn bay or a grade-separated facility or half-interchange. Where u-turn facilities are proposed on a local road, a protected right turn bay would also be provided to allow for access from the opposing carriageway.

At the proposed junctions and interchanges a portion of the adjoining local roads would be repaved and may also be regraded. This would vary in length depending on the requirements of the junction or interchange. Proposed modifications to local roads and junctions along the highway are outlined in Table 3-4. Local roads such as Andersons Lane, O’Keefes Lane and Turners Lane would be limited to left-in / left-out access but additional changes to these roads would not be required. Changes would not be required to Boxsells Lane but a protected right turn lane would be provided.
### Table 3-4 Description of changes to local roads and junctions

<table>
<thead>
<tr>
<th>Local road</th>
<th>Description of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Croziers Road</td>
<td>Construction of a u-turn facility (for southbound traffic to travel northbound) and a bus stop facility.</td>
</tr>
<tr>
<td>Jasper Brush Road</td>
<td>Realignment of the existing junction with the highway about 60 metres west. Construction of a new junction with the link road that bridges over the highway and connects with Strongs Road. Construction of a bus stop facility (refer to Figure 3-6).</td>
</tr>
<tr>
<td>Strongs Road</td>
<td>Construction of a new junction with the new link road (utilising an existing local road reservation) bridging over the highway connecting to Jaspers Brush Road. Construction of a bus stop facility (refer to Figure 3-6).</td>
</tr>
<tr>
<td>Morschels Lane</td>
<td>Connection of Morschels Lane to Devitts Lane under the upgraded highway. Construction of junction with the link road that connects to the highway. The junction of the link road and the highway would be about 80 metres east of the existing junction of Morschels Lane and the highway. Construction of a bus stop facility (refer to Figure 3-7).</td>
</tr>
<tr>
<td>Devitts Lane</td>
<td>Connection of Devitts Lane to Morschels Lane under the upgraded highway. Construction of junction with the link road that connects to the highway. The junction of the link road and the highway would be about 80 metres west of the existing junction of Devitts Lane and the highway (refer to Figure 3-7).</td>
</tr>
<tr>
<td>Lamonds Lane</td>
<td>Construction of a u-turn facility (for northbound traffic to travel southbound) and a bus stop facility.</td>
</tr>
<tr>
<td>Pestells Lane</td>
<td>Closure of the existing junction with the highway. Construction of a new roundabout on the western side of the highway connecting to the on-ramps and off-ramps. The upgrade and realignment of Pestells Lane bridging over the highway and connecting with Meroo Road at a roundabout east of the highway (refer to Figure 3-8).</td>
</tr>
<tr>
<td>Meroo Road</td>
<td>Construction of a roundabout at the junction with Pestells Lane (refer to Figure 3-8).</td>
</tr>
<tr>
<td>Abernethys Lane</td>
<td>Realignment of the junction with the highway to about 100 metres west of the existing junction.</td>
</tr>
</tbody>
</table>

#### 3.3.6 Bridges

The proposal would involve the construction of 13 new bridges, including 10 highway bridges (including one local road underpass), two local road overpasses and one on-ramp bridge. The highway bridges would include eight bridges over waterways, a flood mitigation bridge near O'Keefes Lane and a bridge over Devitts Lane / Morschels Lane. These bridges are summarised in Table 3-5.

The construction of all bridges would require the demolition and replacement of the existing bridge structures. Each highway bridge has been designed in accordance with consideration of the ‘Bridge Aesthetics: Design Guidelines to Improve the Appearance of Bridges in NSW’ (RTA, 2003).

All highway bridge structures would be constructed to allow for the provision of an additional third lane on the highway (if required in the future) in each direction. This would be accommodated by reducing shoulder widths on the highway should additional capacity be required. Overbridges would be constructed with an abutment set back that could accommodate a third lane (if required in the future) on the highway in each direction.
### Table 3.5 Proposed bridge structures

<table>
<thead>
<tr>
<th>Chainage (kilometres)</th>
<th>Description</th>
<th>Typea</th>
<th>Number of spansa</th>
<th>Length (metres)a</th>
<th>Width (metres)a</th>
<th>Maximum height (metres)a</th>
<th>Piersa</th>
</tr>
</thead>
<tbody>
<tr>
<td>19350</td>
<td>Creek crossing 1 – unnamed drainage line</td>
<td>Pre-tensioned concrete plank</td>
<td>3</td>
<td>45.7</td>
<td>25 to 28</td>
<td>5.3</td>
<td>2</td>
</tr>
<tr>
<td>19800</td>
<td>Creek crossing 2 – unnamed drainage line</td>
<td>Simply supported super Tb</td>
<td>1</td>
<td>33</td>
<td>30</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>20550</td>
<td>Flying Fox Creek crossing</td>
<td>Simply supported super Tb</td>
<td>1</td>
<td>27.2</td>
<td>29.5</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>21200</td>
<td>Flood mitigation bridge near O’Keefes Lane</td>
<td>Pre-tensioned concrete plank</td>
<td>3</td>
<td>45.7</td>
<td>30 to 34.5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>21450</td>
<td>Jaspers Brush Creek crossing</td>
<td>Pre-tensioned concrete plank</td>
<td>3</td>
<td>45.7</td>
<td>25</td>
<td>7.5</td>
<td>2</td>
</tr>
<tr>
<td>24300</td>
<td>Wiley Creek crossing</td>
<td>Pre-tensioned concrete plank</td>
<td>5</td>
<td>78.2</td>
<td>30 to 31.2</td>
<td>7.5</td>
<td>4</td>
</tr>
<tr>
<td>26600</td>
<td>Tandingulla Creek crossing</td>
<td>Pre-tensioned concrete plank</td>
<td>3</td>
<td>45.7</td>
<td>28.8</td>
<td>6.5</td>
<td>2</td>
</tr>
<tr>
<td>27800</td>
<td>Tullian Creek crossing</td>
<td>Pre-tensioned concrete plank</td>
<td>3</td>
<td>45.7</td>
<td>29.8</td>
<td>6.5</td>
<td>2</td>
</tr>
<tr>
<td>27800</td>
<td>Tullian Creek crossing (northbound on-ramp)</td>
<td>Pre-tensioned concrete plank</td>
<td>3</td>
<td>45.7</td>
<td>7.5</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>28600</td>
<td>Abernethys Creek crossing</td>
<td>Pre-stressed concrete plank</td>
<td>3</td>
<td>47.2</td>
<td>29.9</td>
<td>5.5</td>
<td>2</td>
</tr>
<tr>
<td>180 (Strongs Road)</td>
<td>Strongs Road highway overpass</td>
<td>Simply supported voided deckb</td>
<td>1</td>
<td>52</td>
<td>13</td>
<td>5.5</td>
<td>0</td>
</tr>
<tr>
<td>280 (Pestells Lane)</td>
<td>Pestells Lane highway overpass</td>
<td>Steel girders with reinforced concrete slab</td>
<td>1</td>
<td>57.8</td>
<td>13</td>
<td>5.5</td>
<td>0</td>
</tr>
<tr>
<td>25130</td>
<td>Devitts Lane highway underpass</td>
<td>Simply supported super Tb</td>
<td>1</td>
<td>34.2</td>
<td>25</td>
<td>4.6</td>
<td>0</td>
</tr>
</tbody>
</table>

*a. The details provided in this table are based on the concept design for the proposal and may be subject to change during detailed design.*

*b. A type of precast concrete bridge girder.*
3.3.7 Property access

Existing levels of accessibility would be maintained for all properties, although some properties would experience modified access to and from the Princes Highway under the proposal. A central wire rope median barrier would be installed along the highway and would limit property access to left-in / left-out movements only. The median barrier would provide considerable safety benefits in line with the proposal objectives by preventing right turn movements across traffic. Property owners affected by changed access arrangements have been consulted throughout the development of the proposal.

Motorists wishing to turn right from their properties would be required to turn left onto the upgraded highway and perform a u-turn at the nearest half-interchange, grade-separated facility or u-turn facility (detailed in Section 3.3.4). Figure 3-10 shows the property access arrangements and expected traffic movements required to access the upgraded highway. Detailed changes to property access are provided in Section 6.9.
Property accesses between Mullers Lane and Strongs Road grade separated facility

From Properties north of Strongs Road to Mullers Lane accessed via northbound carriageway.
To Princes Highway southbound.
Traffic circulation Requires northbound travel on the Princes Highway and U-turn at Mullers Lane.
Maximum additional travel (typical conditions) 2.15km (2.1 minutes).

From Properties from Mullers Lane to Jaspers Brush Road.
To Princes Highway northbound.
Traffic circulation Requires southbound travel on the Princes Highway and U-turn at either Croizers Road or Strongs Road grade separated facility.
Maximum additional travel (typical conditions) 4.25km (3.7 minutes).

Property accesses between Strongs Road grade separated facility and Morschels Lane grade separated facility

From Properties north of Devitts Lane to Strongs Road accessed via northbound carriageway.
To Princes Highway southbound.
Traffic circulation Requires northbound travel on the Princes Highway and U-turn at U-turn facility or Strongs Rd grade separated facility.
Maximum additional travel (typical conditions) 3.3km (2.7 minutes).

From Properties south of Morschels Lane to Pestells Lane grade separated half-interchange.
To Princes Highway northbound.
Traffic circulation Requires southbound travel on the Princes Highway and U-turn at either U-turn facility or Morschels Lane grade separated facility.
Maximum additional travel (typical conditions) 3.35km (2.8 minutes).

Property accesses between Morschels Lane grade separated facility and Pestells Lane grade separated half-interchange

From Properties north of Pestells Lane to Morschels Lane grade separated facility accessed via northbound carriageway.
To Princes Highway southbound.
Traffic circulation Requires northbound travel on the Princes Highway and U-turn at Lamonds Lane or Morschels Lane grade separated facility.
Additional travel 4km (3.1 minutes).

From Properties south of Pestells Lane to Pestells Lane grade separated half-interchange.
To Princes Highway northbound.
Traffic circulation Requires southbound travel on the Princes Highway and U-turn at Pestells Lane grade separated half-interchange.
Additional travel 5.6km or 3.3km (4.4 minutes).

Property accesses between Pestells Lane grade separated half-interchange and Cambewarra Road

From Properties from Cambewarra Road to Pestells Lane accessed via northbound carriageway.
To Princes Highway southbound.
Traffic circulation Requires northbound travel on the Princes Highway and U-turn at U-turn facility or Pestells Lane grade separated half-interchange.
Maximum additional travel (typical conditions) 2.5km (2.8 minutes).

From Properties south of Pestells Lane grade separated half-interchange to Cambewarra Road.
To Princes Highway northbound
Traffic circulation Requires southbound travel on the Princes Highway and U-turn at Cambewarra Road.
Maximum additional travel (typical conditions) 3.8km (2.5 minutes).

Figure 3-10 Property access arrangements
3.3.8 Drainage structures

**Drainage structures**

The proposal would include 27 transverse drainage locations, including both pipe and box culverts and bridges (bridges are detailed in Section 3.3.6). All existing drainage structures would be replaced and upgraded to satisfy the proposal design requirements to provide flood immunity in the 1 in 100 ARI flood event.

Cuttings, embankments, bridges and pavements would each have drainage systems to collect surface water runoff. These would comprise gutters, pits, berms, catch drains, swales and pipes. Surface drainage at bridges would be collected and conveyed longitudinally to the main highway drainage system rather than discharging directly into the receiving waterway.

Major drainage structures would be required at O'Keefes Lane at chainage 21130 and at Morschels Lane at chainage 25070. The structures at O'Keefes Lane would include a box culvert of around ten cells, with each cell around 2.5 metres wide, 1.5 metres high and about 70 metres long. The structures at Morschels Lane would include a box culvert of around five cells, with each cell around 2.5 metres wide, 2.1 metres high and about 60 metres long.

Major drainage structures at the Pestells Lane and Meroo Road grade-separated half-interchange would include eight box culverts running north to south under the interchange, each around 2.5 metres wide, 1.5 metres high and 130 metres long. An easement would be acquired for the land required for drainage into and out of these culverts.

Major drainage works would also be required between chainage 22320 and 22650, just south of Strongs Road, where a 300 metre long and around 13 metre wide channel would be constructed upstream of the alignment to allow flood waters to follow the existing drainage path.

The final design and configuration of the culverts, scour protection measures and drainage systems would be confirmed during the detailed design phase of the proposal. The likely area required for the construction of all drainage infrastructure, including scour protection measures and any channel works, has been included in the construction footprint for the proposal.

**Permanent water quality basins**

Runoff would be discharged to water quality basins and associated grass swales that have been proposed at various locations along the length of the proposal. All water quality basins would be included within the construction footprint for the proposal and have been sized as part of the concept drainage design to meet the operational water quality targets outlined in Section 6.4. The locations of the basins are shown on Figure 3-1, Figure 3-2 and Figure 3-3 and have been based on avoiding and protecting sensitive receiving environments such as local waterways. The potential locations for these basins have been assessed as part of the proposal however the locations would be confirmed during the detailed design phase of the proposal. Further details and assessment of the basins are provided in Section 6.4.

3.3.9 Emergency facilities

Three emergency cross over facilities would be provided as part of the proposal at the following locations:

- Between Mullers Lane and Croziers Road.
- Between Strongs Road and Turners Lane.
- Between Lamonds Lane and Pestells Lane interchange.
Emergency cross over facilities would allow for contra-flow arrangements to be put in place by emergency services in the case of a major traffic incident blocking flow in one direction and are not intended for routine maintenance use. It is likely that the wire rope median barrier used in these areas would include provision for these facilities and the most appropriate arrangement would be considered during detailed design.

The ‘Sandtrack’ would also remain available as an alternative route during major incidents, as currently identified in the Incidence Response Plan for HW1 Princes Highway within Shoalhaven City Council Boundaries (RTA, 2010).

3.3.10 Heavy vehicle inspection bay

A northbound heavy vehicle inspection bay would be located at Jaspers Brush adjacent to the northbound carriageway (between chainage 21000 and 21200). It would be staffed as needed and locked when not in use. The heavy vehicle inspection bay would consist of a paved area of around 3250 square metres in area (excluding the on-ramps and off-ramps) and would provide four inspection bays with a length of 100 metres and a width of 15 metres.

The heavy vehicle inspection bay would be divided from the main carriageway by a concrete barrier. Lockable gates would be installed on the acceleration and deceleration lanes leading to and from the heavy vehicle inspection bay to limit access when not in use. When staffed, parking would be accommodated within the footprint of the paved area.

When operational, the highway speed limit would be reduced to 80 kilometres per hour through the use of variable speed limit signs. There would be no permanent structures such as buildings, toilets or shade structures constructed at the site.

3.3.11 Street furniture

Indicative details of street furniture that would be provided as part of the proposal are described in Table 3-6. The location and design of these elements would be finalised during detailed design.

<table>
<thead>
<tr>
<th>Table 3-6 Street furniture</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item</strong></td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
</tr>
<tr>
<td><strong>Safety barriers</strong></td>
</tr>
<tr>
<td><strong>Line marking</strong></td>
</tr>
<tr>
<td><strong>Traffic signs</strong></td>
</tr>
</tbody>
</table>
**Item**  | **Indicative description**  
--- | ---  
Fencing  | Fencing would be provided along the boundary of the road reserve and private land to demarcate land ownership. Temporary security fencing may be utilised during the construction period and would be removed on completion of construction works. Where possible, the use of barbed wire would be minimised in accordance with Roads and Maritime’s ‘Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects’ (RTA, 2011).

3.4 **Construction activities**

The construction footprint for the proposal would be expected to vary between 25 metres and 65 metres wide. This excludes grade separated facilities and half-interchanges where the width would be a maximum of around 780 metres at the Pestells Lane and Meroo Road grade-separate half-interchange.

3.4.1 **Work methodology**

The methods that would be used for the construction of the proposal would be conventional techniques generally utilised on major road projects. These techniques would be adapted to suit the environmental and social constraints of the proposal.

Indicative pre-construction activities, construction activities and plant and equipment required during construction are detailed in **Table 3-7**. The final construction methodology would be determined by the construction contractor prior to the commencement of construction. The methodology would be detailed in the construction environmental management plan (CEMP) along with the management measures that would be employed to mitigate the construction impacts detailed in **Chapter 6**.

**Table 3-7**  
**Indicative pre-construction and construction activities**

<table>
<thead>
<tr>
<th>Component</th>
<th>Typical activities</th>
<th>Typical plant, equipment and materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site establishment</td>
<td>Fencing of the road corridor. Implementation of initial environmental safeguards. Establishment of construction site facilities and access. Additional surveys and geotechnical investigations, as required. Installation of temporary traffic controls and line marking.</td>
<td>Fences, portable sheds, portable toilets and fuel storage tanks.</td>
</tr>
<tr>
<td>Relocation/ protection of services</td>
<td>Consultation with relevant service providers on service relocation. Relocation or protection of services.</td>
<td>Trucks, cranes, excavators, elevated work platform vehicle, backhoes, trenchers and small equipment.</td>
</tr>
<tr>
<td>Component</td>
<td>Typical activities</td>
<td>Typical plant, equipment and materials</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Site preparation</td>
<td>Installation of site sediment and erosion controls and pollution management measures (to be undertaken prior to clearing and grubbing activities). Vegetation clearing and grubbing. Processing (including recycling) of various materials for use in fencing or landscaping activities. Stripping and stockpiling of topsoil for reuse. Construction of internal haulage and access routes within the construction footprint of the proposal. Adjustment of some property accesses.</td>
<td>Trucks, bulldozers, scrapers, excavators, backhoes and small equipment.</td>
</tr>
<tr>
<td>Earthworks and bridge construction</td>
<td>Removal and stockpiling of spoil and unsuitable material. Earthworks and movement of materials along the alignment from cutting to fill embankment areas. Ground improvements for soft soils. Batter treatments. Bridge construction, including abutments and delivery of pre-cast elements and installation of piers.</td>
<td>Piling rigs, trucks, bulldozers, excavators, scrapers, graders, water carts, compactors, rollers, rock crushing equipment and elevated work platform vehicle.</td>
</tr>
<tr>
<td>Drainage</td>
<td>Preparation of construction diversion drains and sedimentation basins. Construction of road drainage structures, including culvert upgrades and permanent sediment basins.</td>
<td>Concrete pumps, cranes, excavators, trucks, trenching equipment, small equipment and elevated work platform vehicle.</td>
</tr>
<tr>
<td>Pavements</td>
<td>Construction of pavement layers including selected material, sub-surface drainage, sub-base and base layers and surfacing.</td>
<td>Trucks, graders, water carts, compactors, trenching equipment, bitumen sprayers, asphalt paver, vibratory rollers and rubber-tyre rollers.</td>
</tr>
</tbody>
</table>
### Component

<table>
<thead>
<tr>
<th>Component</th>
<th>Typical activities</th>
<th>Typical plant, equipment and materials</th>
</tr>
</thead>
</table>

### 3.4.2 Construction hours and staging

**Construction hours**

Construction would generally be undertaken during standard construction hours, these are:

- 7am to 6pm Monday to Friday.
- 8am to 1pm Saturday.
- No work Sundays and public holidays.

Out of hours works would also be required. Work outside of standard construction hours would be undertaken in accordance with approvals and notification requirements of any Environmental Protection Licence (EPL) for construction of the proposal and in accordance with the Interim Construction Noise Guidelines (DECCW, 2009).

Specific activities that may be required are described in Table 3-8. Certain temporary construction ancillary facilities would be utilised out of standard construction hours to support these activities. Compounds that may need to be used out of standard construction hours are sites 4, 5, 6, 11, 12, 13, 15, 16 and 17 (refer to Figures 3-1, 3-2 and 3-3).

A Construction Noise Management Plan and Community Involvement Plan would be prepared to provide a framework for managing out of hours work. This would be implemented in conjunction with the Environment Protection Licence for the proposal, and would ensure appropriate notification periods are utilised. All feasible and reasonable mitigation measures would be implemented to ensure that the potential for adverse impact on the local community is minimised.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of tie-ins and temporary traffic facilities, and completion of temporary diversions and traffic switches.</td>
<td>Completing or installing these items at night when traffic flows on the Princes Highway are lower would minimise disruption to regional and local traffic and minimise any potential safety conflict between construction personnel and traffic.</td>
</tr>
<tr>
<td>Bridge girder placement where bridges cross operating roadways.</td>
<td>During construction, bridge girders would be placed across operating roadways. Due to the potential safety risks to road users and construction personnel associated with operating over the existing alignment, these works would need to be undertaken at night when there are lower traffic flows. Avoiding peak periods would also minimise the disruption to traffic.</td>
</tr>
<tr>
<td>Delivering large pre-cast concrete components, such as bridge girders.</td>
<td>To minimise disruption to highway and local traffic flows.</td>
</tr>
<tr>
<td>Concrete cutting</td>
<td>Concrete sampling for quality control purposes requires cutting of cores from the concrete pavement. Depending on the hardening rate of the concrete, core sampling may require cutting any time within four and 24 hours after the concrete pavement is laid. Roads and Maritime specifications state the timing requirements for concrete sampling after it has been laid and this may need to be undertaken outside normal construction hours. Certain construction compounds would also need to be operational during this period to support these activities. These would be limited to the sites detailed above.</td>
</tr>
<tr>
<td>Concrete pouring/curing</td>
<td>Similar to the requirements for concrete cutting, Roads and Maritime has specifications for the placement of concrete that relate to temperature and rainfall. Specifically, concrete pouring and curing cannot occur when the temperature is below 5°C or above 38°C, and concrete, when curing, cannot be exposed to rain. Average temperatures for the region do not fall below or above these temperatures, however the frequency of rain events may require more intensive concrete pour/curing activity during periods of good weather.</td>
</tr>
<tr>
<td>Utility adjustments</td>
<td>Utility adjustments typically need to be undertaken during out of hours work periods to minimise the impact on consumers, road traffic and ensure the safety of workers involved.</td>
</tr>
</tbody>
</table>
| Refuelling operations and maintenance                                   | To maximise the plant and machinery operations during the recommended standard hours, and thus reduce the overall duration of the proposal, refuelling operations and maintenance of plant and machinery are proposed at:  
  - 5am to 7am Monday to Saturday.  
  - 6pm to 9pm Monday to Friday.  
  - 1pm to 9pm Saturday. |

**Construction duration**

Construction of the proposal is expected to take around two years and would be expected to commence in 2017.
3.4.3 Earthworks

Total fill volume is estimated to be 707,650 cubic metres and total cut volume 320,000 cubic metres. Of the 707,650 cubic metres of fill material required an estimated 288,000 cubic metres of material would be sourced from the site, requiring an additional 419,650 cubic metres of fill from off site. The remaining 32,000 cubic metres of cut material would likely be unsuitable for reuse on site and would require disposal or reuse in landscaping or similar (refer to Section 6.14 for further details).

Soft soils and potential acid sulfate soils

As discussed in Section 3.2.2, ground improvements would be required to ensure areas of soft ground are sufficiently stable for the construction of the proposal. Ground improvements would limit the differential settlement of the ground and ensure the long-term durability of the completed road. There are a number of methods that can be applied to address this issue, and it is possible that a combination of methods would be applied. These could include:

- Removal of the unsuitable alluvial soils and replacement with a suitable fill to remove the soft soils.
- Preloading or surcharging of embankments. Preloading refers to the placement of a temporary embankment that is of equal or greater weight than the final structure to cause the compression of the soft soils ahead of the construction of the project. Surcharging refers to placement of an additional load on top of what is required for an embankment to make allowance for soil settlement following construction.

The methods applied to treat areas of soft soil and the time taken to treat the soft soils would be determined during the detailed design. It would also be considered in the context of corresponding areas of PASS (refer to Section 6.11). The presence of ASS and/or PASS would be determined during geotechnical investigations undertaken during detailed design. Should ASS and/or PASS be identified they would be managed in accordance with the RMS ‘Guidelines for the Management of Acid Sulfate Materials: Acid Sulfate Soils, Acid Sulfate Rock and Monosulfidic Black Ooze’ (RTA, 2005).

Ground improvement works would typically commence during the earthworks and bridge construction stage of the project. However, the staged treatment of soft soils and the monitoring of soil settlement may be required over the duration of the construction period. This would depend on the findings of further geotechnical work that would be undertaken to inform the detailed design.

3.4.4 Source and quantity of materials

Construction materials

Construction of the proposal would require various materials and pre-cast elements including, but not limited to, the following:

- General fill (of varying quality) for use in earthworks.
- Pavement materials, including verge material and road base and sub-base.
- Materials for lining drainage channels.
- Aggregate for use in concrete and asphalt.
- Sand for use as backfill around pipes and for asphalt and concrete.
- Cement and concrete.
- Bitumen.
- Steel for use in reinforcement of bridges and structures.
- Wood for use in formwork and other temporary structures.
- Safety barriers, signage and other road furniture.
• Lighting poles and lamps.
• Geotextiles and geofabrics.
• Fencing.
• Utility materials.
• Topsoil.
• Water.
• Pre-cast pits, pipes, culverts, and headwalls for drainage works.
• Pre-cast bridge girders, decks, piles, and abutments.

Material sources
The NSW South Coast region has plentiful resources of hard rock that is easily accessible for concrete and asphalt production. Major regional quarries and batch plants are located to the North at Shellharbour, Dunmore, Albion Park, Bombo and to the south at Nowra. The region is also well served by major asphalt and concrete suppliers.

Where possible, fill material would be sourced from excess spoil from nearby projects such as the Foxground and Berry bypass project. This would minimise the amount of fill required to be brought to site. It would also minimise haulage distances and reduce the volume of waste generated during construction of other projects such as the Foxground and Berry bypass project. Potential waste types expected to be generated by the proposal and the proposed measures for the management of this waste is provided in Section 6.14.

Water requirements
Water would be required during the construction of the proposal for dust control as well as general construction activities. The priority with which water would be sourced would be as follows:

• Recycled effluent from the Nowra Sewage Treatment Plant and the Berry Sewage Treatment Plant (in accordance with Roads and Maritime policy and guidance for the use of reclaimed water).
• Surface water, sourced from on-site detention basins.

If required, potable water supplied by Shoalhaven City Council could also be used.

3.4.5 Traffic management and access
The proposal would generate an increase in construction vehicles travelling to, from and within the proposal on the existing Princes Highway and local roads. It is estimated that the proposal would generate around 100 heavy vehicle movements per day and 130 light vehicle movements per day.
A traffic management plan would be prepared in accordance with Roads and Maritime's ‘Specification D&C G10 Traffic Management' (Roads and Maritime 2011) and Roads and Maritime’s ‘Traffic Control at Worksites Manual Version 4' (Roads and Maritime 2011) and implemented as part of the construction environmental management plan for the proposal. The traffic management plan would be prepared and updated for each stage of construction works. As detailed in Section 6.1 the plan would include:

- Signage and notification requirements.
- Lane possession approval process during periods of online construction.
- Traffic control devices such as temporary traffic signals.
- A local and regional communication strategy.
- Strategies to respond to any changes in road safety (including on the ‘Sandtrack').

Haulage routes

Mass haulage of materials would be undertaken within the construction footprint for the proposal where possible, generally utilising the existing or upgraded highway. Where the highway cannot be used, internal haul routes would be established within the construction footprint once the alignment is cleared of vegetation. Internal haul roads would link excavation sites and temporary construction ancillary facility sites to the various work areas. Controlled construction traffic entry and exit points would be minimised and the use of the existing highway would be restricted at peak hours, especially during holiday periods. This may require the introduction of temporary traffic management measures. Traffic impacts associated with the haulage of materials have been assessed in Section 6.1.

3.4.6 Temporary construction ancillary facilities

Construction of the proposal would require the establishment and continued use of temporary construction ancillary facilities for the duration of the construction period. These facilities would include site compounds for administration and construction support, as well as stockpile sites.

Potential locations for temporary construction ancillary facilities have been selected and are shown in Figures 3-1, 3-2 and 3-3. The selection of these sites was based on the criteria presented in Table 3-9 and the potential environmental impacts associated with the facilities are assessed in detail in Chapter 6.

<table>
<thead>
<tr>
<th>Table 3-9</th>
<th>Selection criteria for temporary construction ancillary facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selection criteria</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Located within the proposal alignment or directly adjacent to the proposal.</td>
</tr>
<tr>
<td>Site ownership, in order of preference:</td>
<td></td>
</tr>
<tr>
<td>- Sites to be located on land owned/acquired by Roads and Maritime.</td>
<td></td>
</tr>
<tr>
<td>- Sites that can be leased from Council.</td>
<td></td>
</tr>
<tr>
<td>- Sites that can be leased from private owners.</td>
<td></td>
</tr>
<tr>
<td><strong>Access</strong></td>
<td>Safe and easy access onto the local/regional/state road network.</td>
</tr>
<tr>
<td>Access points distanced from other residences (to avoid conflicts) where reasonably practicable.</td>
<td></td>
</tr>
</tbody>
</table>
### Selection criteria

<table>
<thead>
<tr>
<th><strong>Size</strong></th>
<th>Preferred minimum area required for each type of ancillary facility, which includes sufficient space for each facility’s needs as well as the necessary environment protection controls (for example, erosion and sediment control).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Utilities</strong></td>
<td>Compound sites can be easily serviced with electricity and potable water. Stockpile sites can be easily serviced / supplied with an appropriate quality and quantity of water.</td>
</tr>
<tr>
<td><strong>Future land capability</strong></td>
<td>Restrict activities to those that would not have a permanent impact on the productivity of Class 1, 2 and 3 agricultural land.</td>
</tr>
<tr>
<td><strong>Ecology (aquatic and terrestrial)</strong></td>
<td>Requiring no substantial vegetation clearing (unless required for project alignment) with sites to have low conservation significance for flora and fauna. No removal of Endangered Ecological Communities (EECs), unless area is to be cleared for the highway footprint.</td>
</tr>
<tr>
<td><strong>Non-Aboriginal heritage</strong></td>
<td>Areas of moderate to high non-Aboriginal heritage significance and areas of cultural significance would be avoided. Only those sites that have negligible or a low likelihood of non-Aboriginal heritage significance would be used as ancillary facilities.</td>
</tr>
<tr>
<td><strong>Aboriginal cultural heritage</strong></td>
<td>Where feasible and reasonable, ancillary facilities would be located within areas of negligible or low Aboriginal archaeological sensitivity. Where location of ancillary facilities within areas of low Aboriginal archaeological sensitivity is not feasible and reasonable, ancillary facilities may be located within areas of moderate predicted Aboriginal archaeological sensitivity. Ancillary facilities would not be located in areas of moderate-high Aboriginal archaeological sensitivity. Direct impacts to items of Aboriginal cultural significance (three fig trees outside the construction footprint but within the buffer zone) would be avoided (eg they would be fenced off or otherwise protected). These items would also be included in the CEMP. A staged approach for the selection of ancillary facilities was adopted as follows:</td>
</tr>
<tr>
<td></td>
<td>- Where feasible and reasonable, ancillary facilities would be located within areas of negligible or low Aboriginal archaeological sensitivity.</td>
</tr>
<tr>
<td></td>
<td>- Where location of ancillary facilities within areas of low Aboriginal archaeological sensitivity is not feasible and reasonable, ancillary facilities may be located within areas of moderate predicted Aboriginal archaeological sensitivity.</td>
</tr>
<tr>
<td></td>
<td>- Ancillary facilities would not be located in areas of moderate-high Aboriginal archaeological sensitivity, provided such locations are outside of the design footprint.</td>
</tr>
<tr>
<td></td>
<td>- Direct impacts to items of Aboriginal cultural significance (three fig trees outside the construction footprint but within the buffer zone) would be avoided (eg they would be fenced off or otherwise protected). These items would also be included in the Cultural Environmental Management Plan.</td>
</tr>
</tbody>
</table>
**Selection criteria**

**Water quality and flooding**

A minimum of 50 metres from the nearest waterway (excluding temporary water crossings).

Sites must be above the 1 in 100 year flood level unless a contingency plan to manage flooding issues is prepared and implemented.

**Amenity (noise, visual and air)**

Wherever possible, sites are to be separated from the nearest residences by at least 200 metres unless it can be demonstrated that there would be no adverse noise, visual and air quality impacts / or noise and vibration criteria and air quality criteria is not exceeded beyond the property boundary (subject of envelope assessment). This would exclude sites where private land has been leased and an agreement has been negotiated with the property owner in relation to proximity, noise and other amenity impacts for the construction period or the duration of the lease.

At all other sites, by determining a set of criteria to be met at all times at the site boundary, the contractor is provided with the necessary flexibility to be able to operate equipment or carry out works anywhere within the site boundary, without exceeding the legislated noise levels at the nearest sensitive receptor. In essence the question asked is ‘what is the maximum noise level allowable at a property boundary which still maintains the required level of amenity at the nearest sensitive receptor?’ This will vary at different locations and depending on the nature of the ancillary facility proposed. Possible alternative – reduced distance for sites that will have infrequent activity or will not be operated out of standard construction hours.

**Topography**

Located on relatively level ground.

Where feasible and reasonable, stockpile sites would not be established on slopes greater than 2:1.

**Compound sites**

Two types of compound are required for the proposal:

- Administration compounds which would be the centre for works coordination and communication and would include employee and visitor parking.
- Construction compounds which would vary in size and provide a supporting role to the administration compounds. They would be used to safely store machinery and materials to be used in the works.

Potential compound sites would be located in areas identified on Figure 1-1 and Figures 3-1 to 3-3 as potential construction ancillary facilities.
Site compound establishment activities may include:

- Erection of site fencing.
- Establishment of erosion and sediment control measures at site perimeter downstream.
- Clearing and levelling of the site (to achieve flat or at least 0.5 per cent to facilitate drainage).
- Construction of hard stand areas, consisting of compacted road base (or similar). This would include dedicated hard stand areas for plant and equipment, areas for plant inspection and maintenance, and a wash down area.
- Construction of offices and storage sheds. Dwelling houses would be used (if appropriate and suitable) to supplement office space but would not negate the need for temporary buildings. The office buildings and storage sheds would comprise of prefabricated or purpose built temporary buildings.
- Construction of crib sheds for construction workers separate to the site offices – Including briefing rooms, lunch rooms, rest areas inside and outside, amenities etc.
- Temporary utilities connections would be established, if not pre-existing.
- Car parking for staff and visitors for Administration compounds, and parking for staff at other compounds.
- Establishment of waste collection areas i.e. skip zones and wheelie bins etc.
- Establishment of bunded storage areas for small quantities of fuels, chemicals etc. (It has been assumed that plant would be refuelled out on the job by a mobile fuel vehicle and large quantities of fuel would not be stored on site).
- Sewerage storage and pump out facility if no sewerage connection can be made.

Stockpile sites

Stockpile sites would be used for the temporary storage of materials delivered to the construction site or generated from within the construction site. Materials would likely include, but would not be limited to, the components of concrete and asphalt and stripped topsoil and mulch for use in final landscaping work. Any potential fill to be used on the proposal sourced from the Foxground and Berry bypass project or other projects would be stockpiled at these sites.

Site establishment activities for all stockpile sites would include the erection of site fencing and establishment of sediment and erosion control measures. The sites would be managed in accordance with the ‘Stockpile Site Management Procedure’ (Roads and Maritime, 2011). Potential stockpile sites would be located in areas identified on Figure 1-1, Figure 3-1, Figure 3-2 and Figure 3-3 as potential construction ancillary facilities.

Sediment detention basins

Sediment detention basins would be required during construction to minimise erosion and sediment runoff from the site following the clearance of vegetation. Basins would be excavated at low-lying areas adjacent to the formation, close to natural watercourses, and may be incorporated as a permanent part of the drainage works.

All sediment detention basins would be sized in accordance with the requirements of ‘Managing Urban Stormwater; Soils and Construction’ Volume 1 4th Edition (Landcom, 2004) and ‘Volume 2D – Main Road Construction’ (DECCW, 2008).

Potential locations for sediment basins have been identified and the final number and location for sediment basins would be determined during detailed design. Temporary construction sediment detention basins may be constructed at the proposed location(s) of the operational water quality basins. These temporary sediment detention basins could be converted into permanent operational water quality basins if appropriate.
Details of the temporary erosion and sediment controls would be included in the erosion and sediment control plan, within the Construction Environmental Management Plan (refer to Section 6.4, Section 6.5 and Section 6.11).

### 3.5 Public utility adjustment

The major public utilities located near the proposal include the Eastern Gas pipeline, Optus and Telstra fibre optic cables, water and sewer networks and electricity transmission and distribution lines. The major utilities near the proposal are shown on Figure 3-11.

The Eastern Gas pipeline and the Optus and Telstra fibre optic cables would not be impacted by the proposal.

A 33 kV transmission line, which crosses the highway at Croziers Road, would require relocation due to the change in the vertical alignment of the highway at this location. An 11 kV distribution line is located along the length of the highway and around five kilometres of this line would be impacted by the proposal. This cable would require relocation outside the clear zone of the duplicated highway. Any works would be undertaken in consultation with Endeavour Energy.

A water main is located between the South Coast Rail line and the eastern side of the proposal. The main traverses the construction footprint for the proposal in a number of locations between Jaspers Brush Road and Meroo Road with various utility mains crossing the highway to service properties on the western side of the highway. This main would require protection or relocation where impacted by the proposal. These activities would be undertaken in consultation with Shoalhaven Water.

The Meroo telephone exchange is located directly adjacent to the southbound carriageway of the proposal, just south of Turners Lane. While the proposal would not directly impact the exchange, access to the exchange would be affected. An access track between Turners Lane and the exchange would be constructed outside the road reserve as part of the proposal. Access changes to the exchange would be undertaken in consultation with Telstra.
Figure 3-11 Major utilities near the proposal.

Source: Alinta 2007, Optus 2007, Telstra 2007, Ryders Creek

The representation of the Eastern Gas pipeline shown on this map was based on data supplied by Alinta Asset Management (AAM). AAM makes no representation as to the accuracy of the pipeline shown on this map.
3.6 Property acquisition

The proposal has been designed to minimise the impacts of land acquisition and limit the severance of private properties. Where possible, widening would be undertaken to one side of the existing alignment in order to limit property acquisition.

The proposal would require the acquisition of about 46 hectares of land. This would affect 66 private properties or properties owned by Roads and Maritime or Shoalhaven City Council. The majority of property acquisition would consist of strip acquisition of larger agricultural lots but would also include acquisition affecting a number of smaller lots (further details are provided in Section 6.9). The total area of land acquired by Roads and Maritime may change during the detailed design phase of the proposal. Consultation with affected property owners has occurred during all stages of the proposal and would continue during the detailed design stage.

Where partial acquisitions are required, Roads and Maritime would realign private property fencing as part of the preliminary construction work.

All acquisitions would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the ‘Land Acquisition Guide’ (RTA, 2011).