North West Growth Centre and Riverstone Corridor Traffic Study Summary Report

Development of the North West Growth Centre (NWGC) spans three council areas (The Hills, Blacktown and Hawkesbury) and is forecast to include 70,000 dwellings to accommodate 200,000 residents with the prediction to create up to 40,000 jobs.

The Richmond rail line, Garfield Road level crossing of the rail line and the Riverstone precinct are located in the centre of the NWGC and are therefore strategically important to east-west transport movements.

The Garfield Road level crossing contributes to traffic congestion resulting in long delays to traffic on either side of the rail line. These delays are forecast to increase with the expansion of development and traffic volume increases across the NWGC.

As part of the NSW Government's overall infrastructure strategy for Sydney's north-west, Roads and Maritime Services has developed a strategy for the provision of grade-separated road crossings across the rail line. The strategy is the culmination of work by multiple agencies and the community since the mid-1990s.

To assist the development of this strategy, Roads and Maritime commissioned Parsons Brinckerhoff and Clouston Associates to carry out the North West Growth Centre & Riverstone Corridor Traffic Study (the Study). A Working Group consisting of Roads and Maritime, Transport for NSW, NSW Department of Planning & Environment, local council and the NSW Member of Parliament for Riverstone oversaw the preparation of the study.

The study was carried out in two stages:

- **Stage 1**: Consideration of the broader road network needs of the NWGC to determine the number, capacity and location of grade separated road crossings of the Richmond rail line.
- **Stage 2**: A more detailed assessment of the rail crossing options and the timing of infrastructure requirements.

The key purpose of the study is to identify, formulate and assess potential rail crossing alignments and corresponding road network options in the study area between Richmond Road and Windsor Road. Workshops have been carried out with stakeholders to consider the results of the assessment and select preferred locations for grade separated road crossings of the Richmond rail line.
Option selection

As a starting point, this study took a strategic view to assess how many crossings are required to meet the future demands of the NWGC.

Number and capacity of crossings

A preliminary volume-capacity analysis was carried out using the future traffic forecasts of the Sydney Strategic Travel Model (STM) provided by the Transport for NSW Bureau of Transport Statistics. The analysis showed that, four more traffic lanes in each direction crossing the rail line are required between Vineyard and south of Riverstone (between Bandon Road and north of Westminster Street) to efficiently accommodate forecast traffic demand. This analysis took into account the existing overpass at Westminster Street and the planned road crossings at Schofields Road and Burdekin/Townson Roads.

The study considered options of providing these lanes as:

- Two separate crossings with two lanes each way
- One additional crossing with four lanes each way.

The study recommends providing two separate crossing with two lanes each way because this approach would:

- Accommodate forecast demand
- Provide an alternative route if there was a traffic incident in the area
- Reduce travel distance and time for road users.

Option shortlisting

A high-level desktop review was carried out to assess the range of options to provide two additional crossings in the NWGC, north of Westminster Street. A short-list of seven options was developed to take forward for more detailed analysis by considering:

- The results of previous investigations
- Recent changes in land use forecasts for the NWGC
- Input from the Working Group.

The options shortlisted for assessment are illustrated and briefly described in Figure SR.1.

Based on the results of the preliminary analysis, the potential road network solutions assessed included a combination of these options. These network options typically included one alignment option around the Riverstone town centre and another further north as identified in the study.
CROSSING OPTIONS:

**A** Bandon Road: linking to Garfield Road West via Riverstone West precinct “Spine Road”

**A1** Bandon Road: Spine Road to Victoria Street alignment, linking to Richmond Road south of Wianamatta Creek

**A2** Bandon Road: new alignment north of sewage treatment plant and electricity substation, linking to Richmond Road south of Wianamatta Creek

**B** Victoria Street: linking Richmond Road to Windsor Road via Park Road

**B1** Victoria Street: straighter alignment linking Windsor Road to Richmond Road south of Wianamatta Creek

**B2** Victoria Street: straight alignment linking Windsor Road to Richmond Road south of Wianamatta Creek with a new intersection on Windsor Road

**E** Loftus Street: linking to Garfield Road West via Riverstone West precinct ‘Spine’ Road

**H** Loftus Street: straight alignment through to Richmond Road south of Wianamatta Creek

**H1** Loftus Street: alignment through to Richmond Road via Park Road

**I** Garfield Road: grade separation of Garfield Road above the Richmond rail line along the existing alignment of Garfield Road

**J** Castlereagh Street: grade separation of Garfield Road above the Richmond rail line along the existing alignment of Castlereagh Street

**K** Riverstone Road: linking from Windsor Road (at Nelson Road intersection) to Garfield Road West near Penprase Street intersection

**K1** Riverstone Road: realignment to join Garfield Road East near Windsor Road

**Level Crossing**

**Bridge**

Figure SR.1  Shortlisted options for assessment
Assessment of options

Each option was considered on its relative merits and considering the potential impacts on:

- Traffic and transport
- Environment
- Urban design and socio-economics (including construction cost).

Traffic and transport operations

Mesoscopic traffic modelling (using AIMSUN software) was used to test road network options (combinations of rail line crossing alignments) and inform the analysis of the relative merits of each alignment and network option.

Models were developed for the morning and afternoon peak times for the study area, in accordance with traffic modelling guidelines. The study area included the influence of development across the NWGC, but concentrated on the Riverstone and Schofields areas bounded by Richmond Road, Bandon Road, Windsor Road, Old Windsor Road, Sunnyholt Road, Quakers Hill Parkway and the M7 Motorway.

The model incorporated recent changes in land use planning assumptions from the Bureau of Transport Statistics’ Sydney Strategic Travel Model and the most recent information from the Department of Planning and Environment.

The base model analysis:

- Assumed a ‘most likely’ scenario of approximately 70,000 households, a population of 200,000 people and 32,600 jobs within the wider study area for the assumed year of full development – 2036.
- Also assessed the implications of a higher employment scenario (52,500 jobs versus 32,600).
- Included arterial road upgrades for planning purposes and new roads within the NWGC precincts to allow local traffic increases from the NWGC development to be accommodated on the road network.
- Also identified future traffic volumes, mainly on the boundary of the model (Richmond Road, Windsor Road and Quakers Hill Parkway).

A number of other road network options have been analysed within the model to assist in identifying the preferred alignments and to test suggestions made during the stakeholder consultation for the project. These network options have been developed based on the volume-capacity analysis, connection to town centres and employment areas, provision for heavy vehicles and provision for an efficient bus network.

The mesoscopic model results have drawn the following broad conclusions:

- There is a confirmed need for both a northern bypass to provide an alternative route for heavy vehicles and a grade-separated crossing of the Richmond rail line near the Riverstone town centre. This combination reduced traffic volumes on busy southern routes such as Schofields Road and Westminster Road bridge.
- Either Options I or J are preferable from a bus perspective, as they maintain good access to Riverstone Railway Station for interchange and Riverstone town centre. The Riverstone Road, Loftus Street and Victoria Street options would require diversion of bus routes and new bus infrastructure if a Garfield Road or Castlereagh Street alignment was not adopted.
- Targeted heavy vehicle restrictions could be considered in the Riverstone town centre.
Environmental

- An environmental assessment has considered: vegetation; water quality, hydrology and flooding; noise; Aboriginal heritage; non-Aboriginal heritage; socioeconomic; and land use issues.
- A risk assessment from an environmental perspective has been carried out. Option K1 has a lower overall risk, while Options I and J have a slightly higher environmental risk than Option K1 due to the heritage items that may be impacted around the Riverstone town centre.
- Of the northern options, Options A2 and B have a low overall risk, while Options E and H (Loftus Street) were identified with high risk.
- Options K, K1 and J would create a new road corridor and impact new areas, while Option I is generally along the existing Garfield Road alignment.

Hydrology and flood free access

- Options A1, A2, B, H and H1 would require new bridges across Eastern Creek and the tributary of South Creek as well as other structures, which could have the largest impact on flooding upstream.
- Options I and J follow existing roads which include a crossing of Eastern Creek, and would require raising of the road to provide improved flood immunity for the crossing of Eastern Creek. Options K and K1 would require new bridges to cross Eastern Creek and its floodplain.
- All options provide a link between three flood evacuation routes, Richmond Road, Hawkesbury Valley Way and Windsor Road. However, Options I, J and K complement the existing evacuation routes the best and potentially allow for more flexibility to manage traffic volumes out of the floodplain during an evacuation event.

Urban design

- Option J would offer favourable urban design outcomes than other options based on its connectivity within Riverstone town centre, its retention of the existing Riverstone town centre in an essentially intact condition, its central location between Schofields Road and the northern extent of the NWGC. However, Option J would impact a number of residential properties on Castlereagh Street which are not impacted in the existing road reservation.
- Option I has similar benefits to option J, although it would impact Riverstone town centre commercial precinct, potentially lowering the urban design outcome in the short term (until development within the Riverstone town centre can adjust to the new situation).
- Options B and H would also provide reasonable connectivity for Marsden Park to Box Hill and the Riverstone industrial precinct. However, Option B would create a visual impact with an elevated bridge compared to an underpass at Bandon Road on Options A, A1 and A2.
- Other options suffer from varying degrees of reduced overall connectivity and smaller vehicle catchments.

Socio economic affects

- Option A (or its variants) has been identified as the preferred northern option from a socio-economic perspective.
- Option I is the preferred central option over Options J and K, which are outside the existing Garfield Road reservation and would impact on properties that were not otherwise affected.
Value management workshops

Two workshops were held to allow stakeholder participation in the selection of the preferred option(s) for the locations of the grade-separated railway crossings. The workshop involved the State Member for Riverstone, and representatives from:

- Roads and Maritime
- Transport for NSW, including Sydney Trains
- Blacktown City Council
- Hawkesbury City Council (second workshop only)
- NSW Department of Planning and Environment.

The analysis of the traffic modelling was presented, and the workshop participants identified that:

- The northern bypass option should be narrowed to one of Options A, A1 or A2 (Bandon Road) or Options B or B1 (Victoria Street), subject to further discussion and consideration.
- The northern crossing option should be the first crossing to be implemented.
- A second connection to Richmond Road is preferred to merging both routes onto Garfield Road West.
- The preferred Riverstone town centre crossing option is on the Garfield Road corridor (either Alignment I – Garfield Road, or Alignment J – Castlereagh Street). Appropriate restrictions to be considered to reduce heavy vehicle volumes within the Riverstone town centre.

Bandon Road alignment options

Following the Value Management workshops, a new Bandon Road option A2 was developed (shown on Figure SR.2). The new option extended Bandon Road westwards so it:

- Continues past the sewage treatment plant and electricity substation
- Crosses Eastern Creek at a narrow point
- Joins Richmond Road at a new intersection.

A comparison of the three Bandon Road alignment options (A, A1 and A2) was carried out and found:

- Alignment A has higher impact on a non-classified riparian corridor and threatened ecological communities
- Alignments A and (to a lesser extent) A1 rely on delivery of the Spine Road within the Riverstone West Precinct
- Alignment A2 would reduce noise impacts by accommodating traffic remote from future residences on Riverstone Parade
- Alignments A1 and A2 have slightly better economic justification than Alignment A
- Alignments A1 and A2 attract more traffic to the Bandon Road crossing
- Alignment A2 provides the greatest amount of traffic relief to the southern crossings.

Based on these key differences, alignment option A2 (Bandon Road Extension) was identified for more detailed assessment.
Victoria Street alignment options

A comparison of the three Victoria Street alignment options (B, B1 and B2) was carried out and identified that:

- Alignment B concentrates traffic from both the northern bypass option and the Riverstone option at the intersection of Garfield Road West and Richmond Road.
- Alignment B2 creates closely spaced T-intersections on Windsor Road, reducing traffic efficiency on Windsor Road.
- There appears to be no identifiable reduction in the ecological impact of alignment B2 over B or B1 at the eastern connection to Windsor Road.

Based on these key differences, alignment option B1 (Victoria Street with new connection to Richmond Road) was identified for more detailed assessment.
Shortened option list

Following the second Value Management workshop, the list of options to be assessed was shortened to two options each for the northern bypass and Riverstone crossing, as shown in Figure SR.2.

**Figure SR.2** Shortened list of options following the second value management workshop

**CROSSING OPTIONS:**

- **A2** Bandon Road: new alignment north of sewage treatment plant and electricity substation, linking to Richmond Road south of Wianamatta Creek
- **B1** Victoria Street: straighter alignment linking Windsor Road to Richmond Road south of Wianamatta Creek
- **I** Garfield Road: grade separation of Garfield Road above the Richmond rail line along the existing alignment of Garfield Road
- **J** Castlereagh Street: grade separation of Garfield Road above the Richmond rail line along the existing alignment of Castlereagh Street
Bandon Road versus Victoria Street analysis

Following the second Value Management workshop, further analysis of the Bandon Road and Victoria Street options was carried out to select a preferred location for this grade-separated crossing. The results are outlined in Table SR.1.

### Table SR.1 Comparison of Bandon Road and Victoria Street Options

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Option A2 – Bandon Road</th>
<th>Option B1 – Victoria Street</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Driving distance</strong></td>
<td>Travel distance from north of the Windsor Road and Bandon Road intersection to south of the Garfield Road and Richmond Road intersection is approximately 8.4 km. However, the driving distance from south of the Garfield Road and Richmond Road intersection to the existing Riverstone industrial area would be longer (9.0 km).</td>
<td>Travel distance from north of the Windsor Road and Bandon Road intersection to south of the Garfield Road and Richmond Road intersection is approximately 10.1 km. Driving distance from south of the Garfield Road and Richmond Road intersection to the existing Riverstone industrial area would be shorter (6.5 km)</td>
</tr>
<tr>
<td><strong>Topography</strong></td>
<td>Matches the natural topography at Bandon Road. The proposed underpass at Bandon Road has a continuous grade down from the road underpass of the Richmond rail line to the bridge across Eastern Creek.</td>
<td>Option B1 would require a bridge to be constructed across the Richmond rail line and Riverstone Parade. On the western side of this structure: - The fill height would be greater than 16 m immediately west of the Richmond rail line - The natural topography of the land slopes down gradually to Eastern Creek - The earthworks would require significant retaining walls to avoid any batters spilling onto developable areas of the Riverstone West precinct.</td>
</tr>
<tr>
<td><strong>Flooding</strong></td>
<td>Alignment coincides with a narrow point across Eastern Creek, reducing the bridge length.</td>
<td>Further up catchment, therefore slightly reduced flood volume to deal with, but longer bridge crossing due to topography.</td>
</tr>
<tr>
<td><strong>Planned crossings</strong></td>
<td>A Bandon Road underpass has been identified as part of previous precinct planning works.</td>
<td>Providing a new bridge over the Richmond rail line would still require the construction of an underpass at Bandon Road.</td>
</tr>
<tr>
<td><strong>Zoning</strong></td>
<td>The majority of Option A2 travels along areas that are currently having zoning determined.</td>
<td>The length of road west of the Richmond rail line is currently having its zoning determined. There are existing residential property lots located along the B1 corridor east of the Richmond rail line which may have an impact on planning outcomes.</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>There are limited areas of clearing of existing vegetation along Option A2. Reduced visual impact due to underpass.</td>
<td>Vegetation impacts between Riverstone Parade and Windsor Road. Comparable impacts on non-certified riparian corridor and threatened ecological communities between A2 and B1.</td>
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<tr>
<td><strong>Cost</strong></td>
<td>Initial construction costs less than Victoria Street (B1). In combination with Riverstone town centre option, Bandon Road alignments are the most economically justified.</td>
<td>Higher construction costs than Bandon Road alignment, approximately $25 million more than Bandon Road (based on strategic estimates).</td>
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<tr>
<td><strong>Strategic road network</strong></td>
<td>A road along alignment A2 would achieve more equal spacing of higher order roads across the region having regard to the location of Garfield and Schofields Roads.</td>
<td>A road along alignment B1 would be less well spaced in relation to the other higher order roads in the region, but may be better placed in the interim until the Riverstone town centre crossing is upgraded.</td>
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<table>
<thead>
<tr>
<th>Criteria</th>
<th>Option A2 – Bandon Road</th>
<th>Option B1 – Victoria Street</th>
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<tbody>
<tr>
<td>Heavy vehicle</td>
<td>A road along alignment A2 would be well placed to accommodate forecast heavy vehicle</td>
<td>A road along alignment B1 would be well placed to accommodate existing and forecast heavy</td>
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<tr>
<td>routing</td>
<td>origins and destinations through the region.</td>
<td>vehicle origins and destinations through the region.</td>
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<tr>
<td>Land use</td>
<td>A road along alignment A2 would provide accessibility to the existing Riverstone</td>
<td>A road along alignment B1 would provide good accessibility to the existing Riverstone</td>
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<td>industrial area. It would avoid severance of the industrial area in the event of future</td>
<td>industrial area. However, it may limit expansion of the industrial area to the north.</td>
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<td>expansion.</td>
<td>It would affect a large number of properties (264 lots) between Windsor Road and the</td>
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<td>Richmond rail line compared with the Bandon Road options (54 lots).</td>
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<tr>
<td>Noise</td>
<td>Bandon Road alignment introduces a new noise source into a currently undeveloped area.</td>
<td>Victoria Road alignment introduces a new noise source into a currently undeveloped area.</td>
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<td></td>
<td>Bandon Road underpass would suppress noise better than Victoria Street overbridge.</td>
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<tr>
<td>Urban design</td>
<td>Serves Vineyard Precinct well, and provides a convenient alternative for Level Crossing</td>
<td>Potentially favourable urban design outcomes due to higher land use activity within catchment.</td>
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<td></td>
<td>Road assisting with the closure of the level crossing on Level Crossing Road.</td>
<td>Requires an extra crossing at Bandon Road to serve local traffic movement for Vineyard and</td>
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<td></td>
<td>An underpass at Bandon Road would deliver a better visual outcome than an overpass at</td>
<td>Riverstone West precincts.</td>
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<td></td>
<td>Victoria Street.</td>
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<tr>
<td>Constructability</td>
<td>Potentially easier to construct off-line in parallel with existing traffic movements</td>
<td>Requires detours affecting property and street access.</td>
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Based on this analysis and the previous assessments, Bandon Road (Option A2) was selected as the preferred Northern option for further development.

**Garfield Road versus Castlereagh Street**

Roads and Maritime assessed whether to recommend a grade-separated crossing at Garfield Road (Option I) or Castlereagh Street (Option J). The two options are very similar from a traffic flow point of view and most of the other criteria.

The major difference between the two options occurs within the Riverstone town centre:

- Garfield Road (Option I) would require acquisition of the shops on the southern side of Garfield Road
- Castlereagh Street (Option J) would require acquisition of residential properties along the northern side of Castlereagh Street.

There is an existing road corridor to allow for future widening along Garfield Road which is not the case for Castlereagh Street. Following consideration of traffic and transport, environment, urban design and socio economic effects, Garfield Road was selected as the preferred corridor over Castlereagh Street.
Options assessment summary

The study carried out assessments of several options on traffic and transport, environmental, hydrology, urban design and socio economic criteria.

These assessments informed stakeholder consultation and the development of recommendations to progress the future road network planning within the NWGC, as listed in Table SR.2.

Table SR.2 Summary of study recommendations and outcomes of stakeholder consultation

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resolution</th>
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<tbody>
<tr>
<td>Level crossing at Level Crossing Road</td>
<td>Level crossing to be closed as part of the Vineyard Precinct master plan.</td>
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<tr>
<td>Bandon Road level crossing</td>
<td>Level crossing to be closed and replaced by an underpass.</td>
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</tbody>
</table>
| Northern bypass option | Alignment A2 preferred, including:  
  - Upgrading Bandon Road between the railway line and Windsor Road  
  - Constructing a Bandon Road underpass  
  - Extending Bandon Road past the electricity substation and sewage treatment plant  
  - Providing a new connection to Richmond Road to align with an already planned intersection servicing the Marsden Park Precinct. |
| Level crossing north of King Street Riverstone | Level crossing to be closed when access to industrial properties is provided via the Riverstone West spine road. |
| Riverstone town centre level crossing | Upgrade Garfield Road between Richmond Road and Windsor Road.  
  - Provide a grade separated crossing at Garfield Road.  
  - Retain level crossing until a grade separated crossing is provided.  
  - Preferred option retains the use of the Garfield Road corridor (Alignment I).  
  - Encourage heavy vehicles to use either Schofields Road or Bandon Road once those underpasses are open. |
| Westminster Street bridge | Remains in current configuration (i.e. one lane each way).  
  - Consider intersection upgrades either side to accommodate traffic volumes in the interim.  
  - Link Westminster Street with Garfield Road West to provide an alternative route to the Garfield Road level crossing for local traffic. |
| Schofields Road | Future underpass to be constructed as part of Schofields Road upgrade project.  
  - Two traffic lanes in each direction with road reservation to accommodate additional high occupancy lanes in each direction. |
| Townson Road/ Burdekin Road | An overpass with two lanes in each direction will be constructed by Blacktown City Council connecting Townson Road and Burdekin Road. |
Figure SR.3 shows the preferred alignments for the two additional grade-separated railway crossings as determined following the options assessment.

CROSSING ALIGNMENTS:

A2 Bandon Road: new alignment north of sewage treatment plant and electricity substation, linking to Richmond Road south of Wianamatta Creek

I Garfield Road: grade separation of Garfield Road above the Richmond rail line along the existing alignment of Garfield Road

Figure SR.3  Recommended northern bypass and Riverstone crossing alignments
Recommended strategy

The study has recommended the sequence of actions shown in Table SR.3, noting that changes in the rate of development proceeding within the NWGC and funding available could alter the projected timing for these road upgrades.

Table SR.3  Recommended strategy

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Proposed work</th>
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<tr>
<td><strong>Short term</strong></td>
<td>Implement traffic works at Riverstone to boost capacity and minimise delays,</td>
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<td>with the existing level crossing retained.</td>
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<td>Link Westminster Street with Garfield Road West to provide an alternative</td>
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<td>route for local traffic.</td>
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<td><strong>Medium term</strong></td>
<td>Construct the Schofields Road extension to Richmond Road as a four lane</td>
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<td>road.</td>
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<td>Open Bandon Road underpass on alignment A2 to Richmond Road in the west.</td>
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<td>Once Bandon Road is opened to traffic, consider heavy vehicle restrictions</td>
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<td>through the Riverstone town centre with the Garfield Road level crossing to</td>
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<td>remain open until grade separation of the Garfield Road corridor can occur.</td>
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<tr>
<td><strong>Long term</strong></td>
<td>Construct a grade separated crossing of the rail line at Garfield Road and</td>
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<td>then close the level crossing.</td>
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