

## 3. Need and alternatives

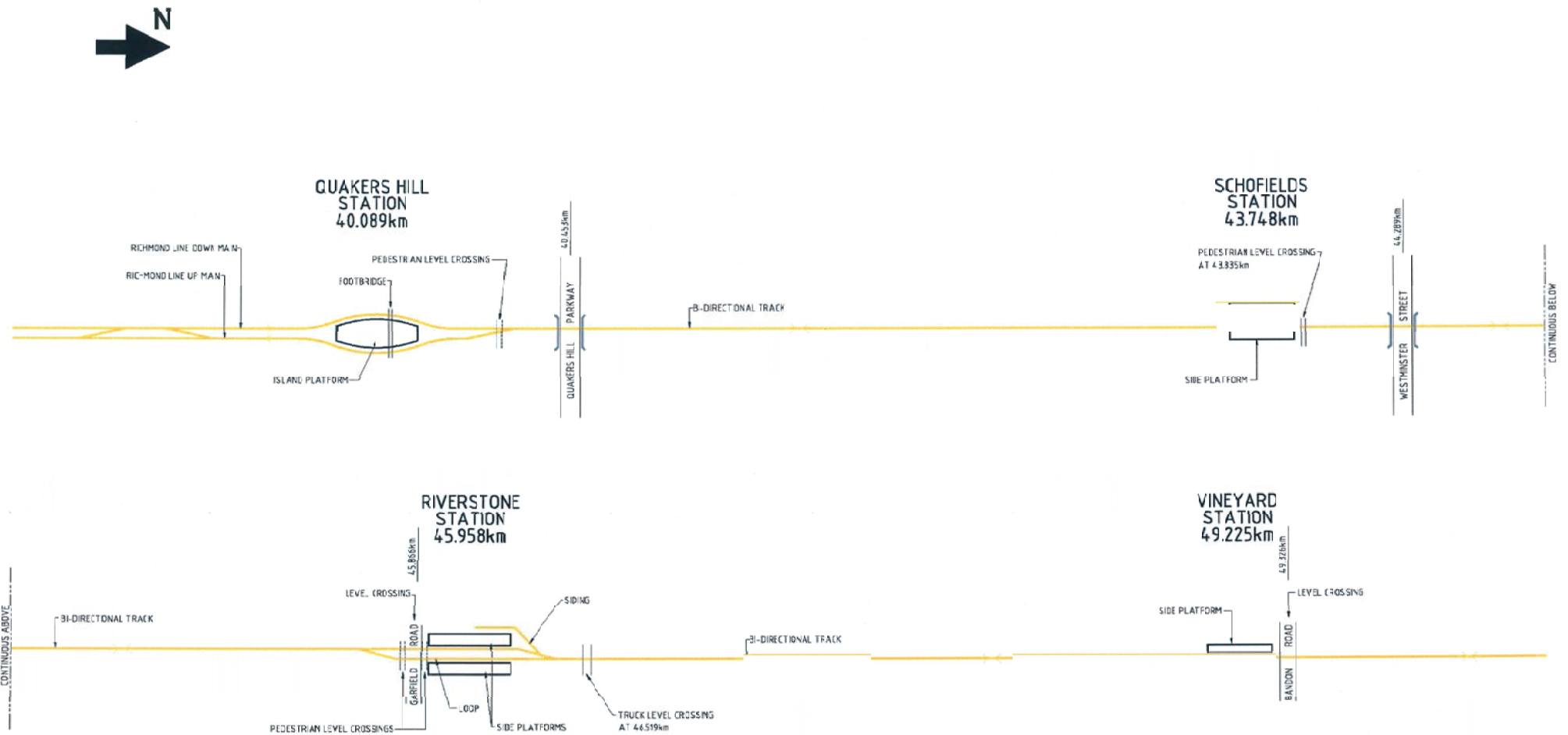
### 3.1 Need for the Project

As discussed in Section 1.1, the current Richmond Branch Line comprises a single track between Quakers Hill and Richmond, apart from a number of passing loops at various stations to provide for train crossings (refer Figure 3-1). The existing track layout restricts the frequency of trains travelling between Richmond and the City, as trains operating in one direction must wait for services in the opposite direction, resulting in a major bottleneck during peak periods. The single track is currently operating at capacity and train services regularly face delays associated with these limitations.

The Richmond Branch Line bisects the North West Growth Centre (refer Figure 1-3) and is a significant feature of the plan for the area — to develop transit-oriented towns located on either side of the existing rail line. Predicted regional growth, particularly growth associated with the North West Growth Centre, will increase the demand for train services, and compound the demand on the current operations. For example, in 2004 there were approximately 600 to 700 patrons per day at Schofields Station. This figure is expected to grow to up to 7,000 patrons by 2020 (Transport Infrastructure Development Corporation 2007).

The duplication of the track, and associated station upgrades, is necessary to:

- increase service frequencies for the existing and future populations of the area
- improve the ability to recover during disruptions through the reduction in single track sections of the Richmond Branch Line
- improve accessibility at some stations through design of easy access provisions and car parking.



**Figure 3-1 Existing track arrangement**

## 3.2 Alternatives

### 3.2.1 Implications of 'doing nothing'

Should the duplication of the rail line between Quakers Hill and Vineyard not proceed, Richmond and City services using the track would remain limited to the existing timetable. With significant population growth in the area expected over the next 25 years, train services would become unsustainable in terms of the capacity and number of services, as well as station infrastructure, such as platform width and parking. With the failure of the transport system to meet the needs of the growing population, commuters would seek alternative transport arrangements, such as private vehicle travel, thereby placing more strain on local and main roads and contributing to increased vehicle emissions.

Failure to provide adequate public transport into and out of the region would also limit the ability of the local population to access a variety of employment opportunities and educational facilities, and would reduce business growth within the area.

Two of the aims of the Growth Centres SEPP are:

- to enable the establishment of vibrant, sustainable and liveable neighbourhoods that provide for community well-being and high quality local amenity,

- to provide for the orderly and economic provision of infrastructure in and to those growth centres.

As the Richmond Branch Line is one of the central transport features of the North West Growth Centre, a failure to upgrade the existing infrastructure would fail to meet the aims of the Growth Centres SEPP and other strategic planning instruments described in Section 2.4.

### 3.2.2 Options development

As described in Section 1.2, the proposal to duplicate the Richmond Branch Line was initially planned as part of Clearway 5 for the North and West Lines, and originally entailed duplication between Quakers Hill and Riverstone (Rail Infrastructure Corporation 2003). A number of location and configuration option studies for duplication of the line have been undertaken, as outlined in the *Quakers Hill to Schofields Duplication Project Definition Working Paper* prepared by TIDC in July 2005 and the *Quakers Hill to Vineyard Duplication Project Definition Working Paper* prepared by TIDC in June 2007 and updated in October 2007, based on RailCorp's Operations and User Requirements report (RailCorp - Transport Infrastructure Development Corporation Integration group 2007), which is 70% complete.

In 2007, a number of technical meetings were held between RailCorp and TIDC to confirm RailCorp's user and operational requirements for the Project, and to discuss the options and a range of potential refinements. These discussions led to the three options described below and assessed in detail in the *Quakers Hill to Vineyard Duplication Options Development Report* (Maunsell 2007a).

### **Option 1**

Option 1 involved the construction of a new track on the Up side of the existing single line track. The new track would become the Up Main and the existing track the Down Main. The main components of Option 1 included approximately 10.1 kilometres of new track, and the construction of new Schofields and Vineyard Stations. Four alternative platform arrangements for Schofields Station were developed including:

- a new Schofields Station:
  - construction of side platforms.
- upgrade of the existing Schofields Station:
  - widening the existing platform to provide an island platform
  - provision of a new island platform
  - provision of new side platforms.

Six alternative platform and track arrangements for Vineyard Station were developed and included:

- a new Vineyard Station:
  - provision of new, straight side platforms and two crossovers on the City side of the station in lieu of a turnback
  - provision of a straight island platform and turnback, located north of Bandon Road.
- upgrade of the existing Vineyard Station:
  - provision of new curved side platforms and two crossovers on the City side of the station in lieu of a turnback
  - provision of a new curved island platform and two crossovers on the City side of the station in lieu of a turnback
  - provision of a curved island platform at the existing station, and a turnback located north of Bandon Road
  - provision of a straight island platform at the existing station, and a turnback located north of Bandon Road.

### **Option 2**

Option 2 involved the construction of a new track on the Down side of the existing single line. This new track would become the Down Main and the existing track the Up Main. The majority of the proposed works would be the same as Option 1, with the exception that this option would have fewer impacts on signalling. Three alternative platform arrangements for Schofields Station and five alternative platform and track arrangements for Vineyard Station (similar to those developed for Option 1) were developed for Option 2.

### **Option 3**

Option 3 was a combination of the first two options, involving the construction of a new track on the Up side between Quakers Hill and Riverstone, and on the Down side between Riverstone and Vineyard. This option would have fewer impacts on the existing signalling between Riverstone and Vineyard. Four alternative platform arrangements for Schofields Station and six alternative platform and track arrangements for Vineyard Station (similar to those developed for Option 1) were developed for Option 3.

A number of other options were also considered as part of the options development process. These other options were not developed further as they all had significant impacts on one or more of the five main evaluation criteria: engineering, environmental, operations, construction staging/program and cost.

### **3.2.3 Identification of a preferred option**

Options 1 to 3 outlined above were assessed based on five broad criteria: engineering, environmental, operational, construction staging and program, and cost. The options were compared based on a multi-factor basis, which highlighted the discriminating characteristics of each.

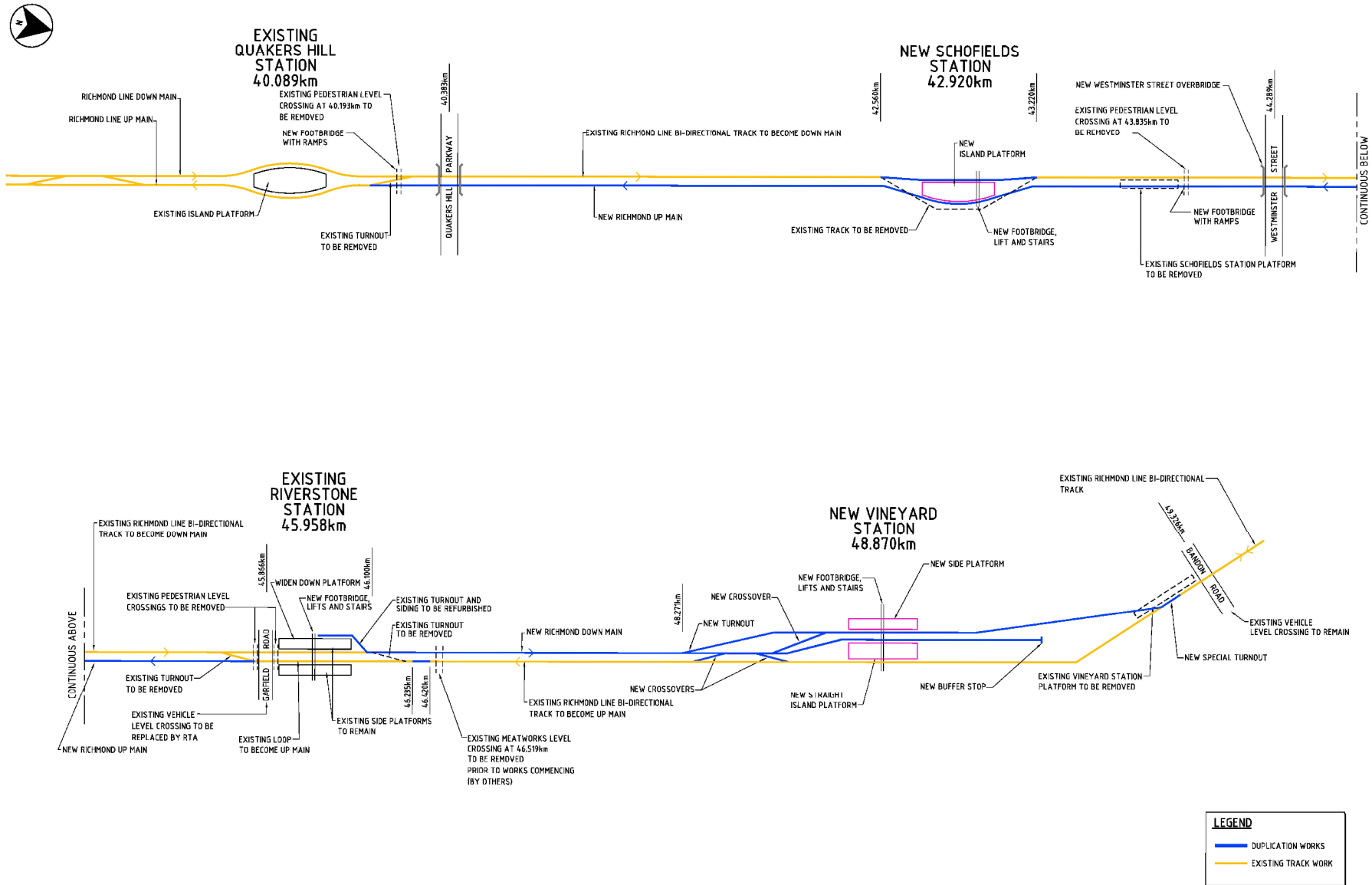
Option 2 would involve additional earthworks and retaining walls, and additional impacts on the existing overhead wiring and 33 kilovolt transmission lines. Option 1 would require additional impacts to the existing signalling and overhead wiring. In terms of engineering constraints, Option 3 was considered to have the least overall engineering impacts.

In terms of environmental impacts, Options 1 and 3 were identified as having marginally greater environmental impacts than Option 2. This was primarily due to noise and vibration impacts to residents between Quakers Hill and Schofields as a result of construction of the track on the Up side much closer to properties.

Option 2 was considered likely to have marginally greater operational impacts than Options 1 and 3 primarily due to the required slewing at Quakers Hill Parkway and on the City side of Riverstone Station.

In terms of construction staging and program, all of the options would require a number of weekend track possessions. Options 2 and 3 would include new track on the Down side from Riverstone which was deemed beneficial as it would line up with the existing loop track at Riverstone Station.

Based on these assessments, Option 3 (refer Figure 3-2) was selected as the preferred option due to its overall engineering, operational and construction staging, and program benefits.



**Figure 3-2 Preferred Option (Option 3) track and station arrangement**

## 4. Description of the Project

### 4.1 Project description

The details of the Project are outlined below. The proposed track and station arrangements are depicted on aerial photographs provided in Appendix A.

The Project would comprise construction and operation of:

- approximately 10.1 kilometres of new track between Quakers Hill (approximately 40.150 kilometres) and Vineyard (approx. 49.320 kilometres), including:
  - track slewing and a new track for the new Schofields Station
  - track, a crossover and turnouts at Vineyard to connect into a new turnback
  - track for the new turnback at Vineyard and a new sliding buffer stop at the end of the new turnback.
- embankments, retaining walls, noise walls and maintenance access tracks, cutting widening, cutting stabilisation, drainage works and services routes for power and water utilities, and landscaping
- new overhead wiring
- new signalling and modifications to the existing signalling system
- bridgeworks and culvert works including:
  - a new two-lane Westminster Street overbridge and removal of the existing overbridge
  - new drainage culverts along the rail corridor
  - drainage culvert modifications.
- a new Schofields Station, including:
  - a new level access island platform
  - booking office
  - station staff amenities and public toilet
  - footbridge
  - a lift and stairs to the street and platform
  - communications and security
  - bus interchange and car parking
  - associated infrastructure works.

- works at Riverstone Station, including:
  - widening of the existing Down platform and provision of level access
  - ensuring the existing Up platform is also *Disability Discrimination Act 1992 (DDA)* compliant
  - a footbridge, two lifts and stairs to the street and platform
  - refurbishment of existing maintenance siding and turnout
  - installation of communications and security systems
  - associated infrastructure works.
- a new Vineyard Station, including:
  - a new level access island platform
  - a new level access side platform
  - booking office
  - station staff amenities and public toilet
  - a footbridge, three lifts and stairs to the street and platform
  - crew facilities, communications and security
  - a bus interchange and car parking
  - associated infrastructure works.
- removal of the level crossing at Quakers Hill and Schofields stations and an alternative pedestrian access way provided
- replacement of the existing Schofields traction substation and upgrading of the existing Vineyard traction substation
- adjustments and protection of utilities
- relocation of existing signalling infrastructure, including signalling supplies and signal huts
- relocation of 33 kilovolt overhead and underground feeders and equipment
- installation of a new regulated 11 kilovolt supply for signalling and station supplies from Quakers Hill to Vineyard
- new low voltage supplies/equipment throughout the Project
- removal of:
  - the existing Schofields and Vineyard Stations
  - the existing pedestrian level crossings at Quakers Hill, Schofields and Riverstone Stations
  - the existing turnout on the northern side of Quakers Hill Station
- acquisition of property at Schofields (for the new Schofields Station and substation upgrade) and Vineyard (for the new Vineyard Station and substation upgrade).

## **4.2 Ongoing design refinements**

Option 3 was selected as the preferred option and has been developed to concept design level. Aerial photographs depicting the main components of the Project are provided in Appendix A. Throughout the planning and design process; the concept design will be subject to ongoing refinement. The design process will be run in parallel with the environmental assessment process and public consultation, ensuring that the design is influenced by opportunities to minimise environmental impacts and mitigate community impacts.

## **4.3 Construction outline**

It is anticipated that the Project would be constructed and operated in one stage to allow for the delivery of the Project by 2012. The original approach was to construct the Project in two stages (Quakers Hill to Riverstone, to be commissioned by 2010 and Riverstone to Vineyard, to be commissioned by 2012), however due to the timing of the replacement of Garfield Road level crossing by the RTA, a one stage delivery is proposed to enable coordination between TIDC and RTA. A one stage delivery will result in less temporary works being required, and thus less cost involved in commissioning and removing the temporary works.

The majority of the works would be carried out adjacent to the existing track, requiring minimal interface between the new and existing infrastructure and operations. The works would be segregated from the 'live' rail by a barrier. However, construction complexities would arise at stations, crossovers and when making connections to 'live' services.

The station works would be undertaken so that the existing Schofields and Vineyard Stations would remain open until the new stations are operational.

## 5. Preliminary environmental assessment

### 5.1 Overview

This Chapter outlines a preliminary assessment of the potential environmental impacts associated with the Project.

The environmental issues associated with the Project have been classified in this Chapter as either 'key' or 'other' issues. The classification was based on the findings of preliminary investigations undertaken for the Project, and experience with other similar projects. The 'key' issues are those issues that are considered to require further investigation, which would be undertaken during the Environmental Assessment preparation process. The 'other' issues are expected to be of lesser consequence than the key issues and would be able to be managed through the application of best practice environmental management, and proposed management measures and safeguards. Further investigation of some of the 'other' issues may be required, and would be undertaken during the Environmental Assessment process. It is expected that these investigations would confirm the current assumptions that the issues can be appropriately managed by standard construction and operational mitigation measures. If unforeseen issues arise based on these investigations, the issues would be further investigated in the Environmental Assessment.

### 5.2 Key environmental issues

#### 5.2.1 Flora and fauna

The preliminary assessment of ecological issues associated with the Project included desk-based searches of relevant literature and databases, and a site inspection on the 20 June 2007 (not within the rail corridor). Results are summarised below.

#### **Existing environment**

##### ***Vegetation communities and fauna habitats***

Vegetation within and adjacent to the Project alignment has been mapped previously as part of the *Native Vegetation Maps of the Cumberland Plain* (NSW National Parks and Wildlife Service 2002).

Three native vegetation communities have been identified within the Project study area (approximately 50 metres either side of the rail corridor), all of which are listed as endangered ecological communities pursuant to either the *Threatened Species Conservation Act 1995* (TSC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These communities are discussed below.

##### ***Shale Plains Woodland (Cumberland Plain Woodland)***

This community was identified along the rail corridor in small fragments close to Quakers Hill, Schofields and north of Riverstone Station (Figure 5-1). Patches of this community along the rail corridor were fragmented, and classified as 'other remnant vegetation' (conservation significance assessment class, NSW National Parks and Wildlife Service 2002). The community ranged in condition from medium to poor. Some fragments identified do not provide core habitat or support for core habitat, and are not classified as a 'critically

endangered' ecological community. One fragment identified north of Schofields Station is classified as 'support for core habitat' (conservation significance assessment class, NSW National Parks and Wildlife Service 2002). This fragment is associated with an unnamed tributary of Eastern Creek, and provides corridor connections to core habitat to the west of the alignment.

***Alluvial Woodland (a sub-unit of Sydney Coastal River Flat Forest)***

Alluvial Woodland was restricted to two unnamed tributaries of Eastern Creek, north of Quakers Hill and Schofields Stations (Figure 5-1). Both fragments of this community are classed as 'other remnant vegetation' (NSW National Parks and Wildlife Service 2002). Patches of this community were fragmented, edge effected (due to occurring along the edges of habitat fragments) and ranged in condition from medium to poor.

***Shale Gravel Transition Forest***

Shale Gravel Transition Forest occurs primarily in association with Shale Plains Woodland. Fragments of this community were identified east of the new Vineyard Station location, in the area proposed for the new car park (Figure 5-1 and Photograph 5-1).

As a result of previous disturbance, there is discontinuity in the age of trees throughout this community. Greater disturbance has occurred to fragments of this vegetation type close to the rail corridor. Whilst some older trees were present, the condition of the understorey and ground cover strata was variable. This is most likely the result of different levels of past disturbance. No tree hollows were observed throughout this vegetation community; however, older trees may provide nesting opportunities for open country and generalist species of birds, and roosting habitat for microchiropteran bats.

The vegetation condition in the area proposed for the new bus interchange and car park at Vineyard Station is classed as 'core habitat' (conservation significance assessment class, NSW National Parks and Wildlife Service 2002).

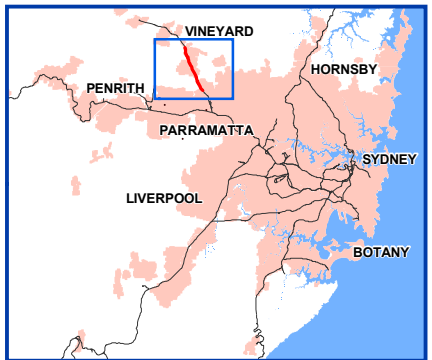
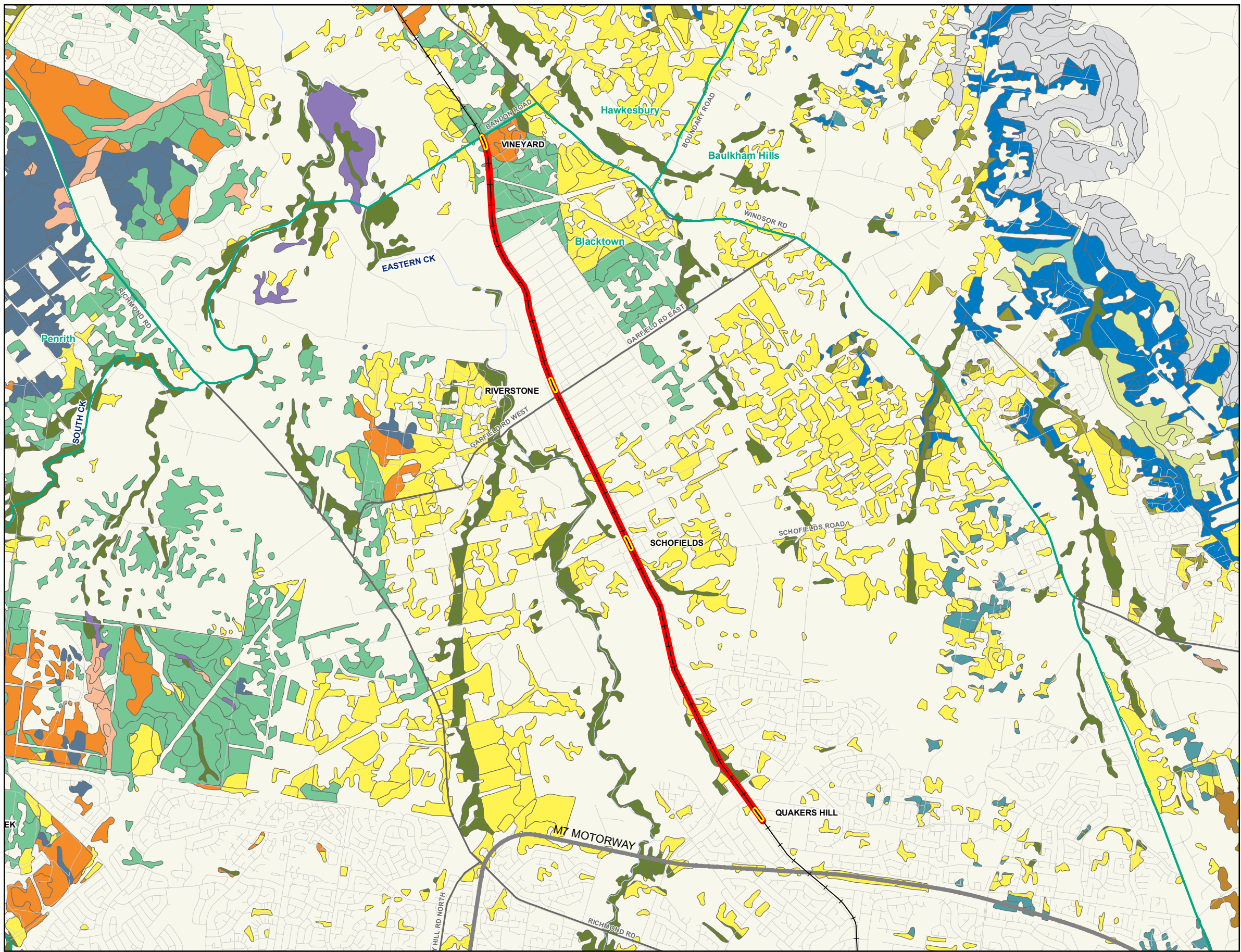


**Photograph 5-1 Shale Gravel Transition Forest: location proposed for car park opposite the new Vineyard Station**

# Quakers Hill to Vineyard Duplication

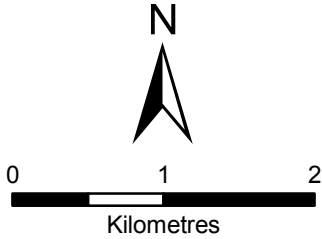


Transport Infrastructure  
Development Corporation



## Legend

- Rail station
  - Rail line
  - Proposed duplication
  - LGA boundary
  - Motorways and tunnels
  - Main roads
  - Secondary road
  - Major watercourse
- Cumberland vegetation**
- Alluvial Woodland
  - Castlereagh Scribbly Gum Woodland
  - Castlereagh Swamp Woodland
  - Cooks River Castlereagh Ironbark Forest
  - Freshwater Wetlands
  - Shale Hills Woodland
  - Shale Plains Woodland
  - Shale Sandstone Transition Forest (High)
  - Shale Sandstone Transition Forest (Low)
  - Shale/Gravel Transition Forest
  - Turpentine-Ironbark Forest
  - Turpentine-Ironbark Margin Forest
  - Unclassified Vegetation
  - Upper Georges River Sandstone Woodland
  - Western Sandstone Gully Forest



Scale 1:50,000 (@ A3)

Projection: GDA94 (MGA94 Z56)

Figure 5.1 Vegetation Communities

### Threatened biodiversity

A desk-based assessment was undertaken to identify threatened biodiversity recorded previously or predicted to occur in the study area. The assessment included searches of the Department of Environment and Climate Change's *Atlas of NSW Wildlife* (Department of Environment and Climate Change 2007a, accessed 17 May 2007) and the Department of the Environment and Water Resources' *Protected Matters Search Tool* (2007).

### Ecological communities

Five threatened ecological communities listed under the TSC Act and/or the EPBC Act have been recorded and/or predicted to occur within the locality (within 10km of the rail corridor) and along the rail corridor (see Table 5-1).

**Table 5-1 Threatened ecological communities predicted to occur in the Project locality**

| Vegetation community name                                | Threatened ecological community name                                                 | Legislative status   |                       | Present along the rail corridor                                                                                                               |
|----------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
|                                                          |                                                                                      | TSC Act <sup>1</sup> | EPBC Act <sup>2</sup> |                                                                                                                                               |
| Shale Plains Woodland                                    | Cumberland Plain Woodlands                                                           | Endangered           | Endangered            | Yes. Present within and along the rail corridor occurring in small patches close to Quakers Hill, Schofields and north of Riverstone Station. |
| Shale/Sandstone Transition Forest                        |                                                                                      | Endangered           | Endangered            | No. Characteristic tree species not recorded.                                                                                                 |
| Turpentine-Ironbark Forest in the Sydney Basin Bioregion |                                                                                      | Endangered           | Critically Endangered | No. Characteristic tree species not recorded.                                                                                                 |
| Shale Gravel Transition Forest                           |                                                                                      | Endangered           | -                     | Yes. Common in the northern part of the alignment close to Riverstone.                                                                        |
| Alluvial Woodland                                        | Swamp Oak Floodplain Forest<br>or<br>Swamp Sclerophyll Forest on Coastal Floodplains | Endangered           | -                     | Yes. Restricted to two unnamed tributaries of Eastern Creek north of Quakers Hill and Schofields Stations.                                    |
| Cooks River Castlereagh Ironbark Forest                  |                                                                                      | Endangered           |                       | Yes. But away from the rail corridor and east of the existing Vineyard Station.                                                               |

Note: 1- Listed under the *Threatened Species Conservation Act 1995*

2- Listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

### Flora

Eighteen threatened species of plant listed under the TSC Act and/or the EPBC Act have been recorded previously, or are predicted to occur, within 10 kilometres of the rail corridor (see Appendix B for species list, habitat requirements and likelihood of occurrence).

Based on the presence of suitable habitat within and along the rail corridor, the following species are likely to occur:

- *Acacia pubescens*
- *Dillwynia tenuifolia*
- *Micromyrtus minutiflora*
- *Grevillea juniperina* subsp. *juniperina*
- *Pimelea spicata*.

Although habitat for threatened species of plant is most likely to occur within the remnant patches of vegetation, some species can occur within highly disturbed and modified vegetation.

### Fauna

Twenty-eight threatened species of animal have been recorded previously, or have the potential to occur, within the locality. Twenty-two of these threatened species are listed under the TSC Act and 15 are listed under the EPBC Act (see Table 5-2).

**Table 5-2 Threatened species recorded or predicted to occur in the Project locality**

| Group         | TSC Act <sup>1</sup> | EPBC Act <sup>2</sup> | Total threatened |
|---------------|----------------------|-----------------------|------------------|
| Frogs         | 5                    | 5                     | 5                |
| Birds         | 6                    | 3                     | 6                |
| Mammals       | 9                    | 6                     | 9                |
| Reptiles      | 1                    | 1                     | 1                |
| Invertebrates | 1                    | 0                     | 1                |
| <b>TOTAL</b>  | <b>22</b>            | <b>15</b>             | <b>28</b>        |

Note: 1- Listed under the Threatened Species Conservation Act 1995

2- Listed under the Environment Protection and Biodiversity Conservation Act 1999.

It is likely that most of the habitat for threatened flora and fauna species within the locality is located within the remnant vegetation along the rail corridor and its associated surrounding areas. The rail corridor and associated areas may provide potential habitat for the Cumberland Plain Land Snail and threatened species of microchiropteran bats.

Full details of species requirements and their likelihood of occurrence are provided in Appendix C.

### Migratory species

Six migratory species of bird have been predicted to occur within 10 kilometres of the rail corridor, based on the Department of Environment and Water Resources' Protected Matters Search Tool (2007a, Appendix C). While migratory species of bird may potentially fly over the site, the site would not be classed as 'important habitat' as defined under the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment and Heritage 2006).

### Summary of potential issues

The Project would potentially result in a range of impacts on existing biodiversity within the proposed construction footprint, as well as potential indirect impacts on biodiversity in the surrounding landscape. The main impact would be associated with the removal of vegetation for the new Vineyard Station car park, as this vegetation is mapped as an endangered ecological community, the Shale Gravel Transition Forest. The southern section of this block is highly modified, providing an easement for overhead powerlines (refer Photograph 5-2); however, the northern part of the block is vegetated.

Other potential impacts include:

- clearing of native vegetation and disturbance of habitats along and within the rail corridor
- changed hydrology
- invasion and establishment of weeds
- invasion and establishment of pest species
- cumulative impacts.

These impacts have the potential to affect the threatened biodiversity recorded previously or considered likely to occur, in the rail corridor and associated areas. The Project would be constructed in an environment characterised by highly fragmented and disturbed vegetation, with little habitat or conservation value. Based on initial investigations, it is unlikely that the Project would have a significant impact on any populations of native plants or animals, such that they would be placed at risk of extinction. However, small populations of threatened species, including the Cumberland Plain Land Snail, may be present and would need to be determined during a detailed site assessment.



**Photograph 5-2 Proposed location for the new Vineyard Station car park**

Note: The southern part of the block has been cleared for overhead power lines, the northern part of the block (left side of the photograph) is vegetated.

### Further assessment proposed

The main impacts of the Project on flora and fauna are likely to be localised and limited to the sections of vegetation removal. Survey and assessment of biodiversity values of the site will be undertaken at the Environmental Assessment stage in accordance with the *draft Guidelines for Threatened Species Assessment under Part 3A* (Department of Environment and Conservation 2005).

The potential presence of threatened species would be primarily determined on the basis of a habitat assessment (rather than targeted surveys) to provide a conservative approach. More detailed site inspections would be undertaken where known or suspected threatened biodiversity is located.

The likely impacts of the Project would be determined with particular attention to the TSC Act and the EPBC Act.

As part of the assessment, consideration will be given to the key thresholds:

- whether or not the Project, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, will maintain or improve biodiversity values
- whether or not the Project is likely to reduce the long-term viability of a local population of the species, population or ecological community
- whether or not the Project is likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction
- whether or not the Project will adversely affect critical habitat.

For species and communities listed under the EPBC Act, significance assessments would be carried out following the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of the Environment and Heritage 2006).

Assessment of the potential impacts of the Project on flora and fauna should also be considered with regards to the draft Growth Centres Conservation Plan (Growth Centres Commission 2007b). The Plan has been developed as the basis for approval of 'biodiversity certification' of the Growth Centres SEPP in accordance with the *NSW Threatened Species Conservation Act 1995*. Biodiversity certification is an approval granted by the Environment Minister for an environmental planning instrument (EPI), such as the Growth Centres SEPP. The purpose of this plan is to establish offsets for any development in the North West (and South West) Growth Centre, thus removing the need to undertake threatened species assessments or species impact statements at the development application stage. These offsets would be embodied in the Growth Centres SEPP.

Assuming that the Growth Centres Conservation Plan is approved prior to the approval of this Project, vegetation clearing for the Project, and any offsets required as a result of the clearing, would be incorporated and assessed as part of the Growth Centres SEPP, and not as part of this Project.

## 5.2.2 Noise and vibration

### Existing environment

The existing acoustic environment of the study area is typical of a low density rural-residential location, with scattered industrial areas. Transport-related noise is the predominant noise source, as the Richmond Branch Line runs through the middle of the Quakers Hill, Schofields and Riverstone town centres, and adjacent to residential developments at a number of locations along the alignment. Schofields town centre is surrounded by residential development and, therefore, fewer intrusive noise sources. Garfield Road, which passes through Riverstone town centre, experiences very high heavy vehicle traffic levels, which also contribute to the town's acoustic environment (refer Photographs 5-3 and 5-4). Vineyard town centre is located to the north-east of Vineyard Station, at a sufficient distance not to be impacted by rail noise. The closest receiver to Vineyard Station, the Vineyard Children's Early Learning Centre, is approximately 75 metres from the existing station, on the corner of Bandon Road and Wallace Road.

Heggies (2007) has prepared a preliminary noise assessment for the Project, the results of which are summarised below.

The closest non-residential noise sensitive receivers were identified in the assessment as:

- Lorna Ford Swim School
- Riverstone Library, Riverstone Parade opposite Riverstone Station
- Riverstone Bowls Club, Riverstone Parade just north of Riverstone Station
- Girl Guides Hall, Railway Terrace (near Elizabeth Street), Riverstone
- Kerry Jones Child Care Centre, 7 Lalor Road, just north of Quakers Hill Station
- Terra Sancta College, Eastern Road, Quakers Hill.

Residential noise sensitive receivers (properties built adjacent to the rail corridor) include properties at:

- Quakers Hill, along Manorhouse Boulevard, and along Reycroft Avenue and Seldon Street
- Schofields, along Lane Grove, Tain Place and Bridge Street.

A map showing these noise sensitive receivers is provided in Appendix A.



**Photograph 5-3 Garfield Road level crossing at Riverstone, facing west**



**Photograph 5-4 Garfield Road at Riverstone, facing east**

### **Future environment**

A key issue for the Project and the noise impact assessment will be the introduction of new communities in close proximity to the Project, as a result of plans for the North West Growth Centre. While the exact location of future urban development is not known at present due to the strategic nature of plans for the Growth Centre, it is likely that urban development, including residential development, will be undertaken on land affected by rail noise from the Project. The current plans for future communities adjacent or close to the Project are discussed in Section 2.4.

## Summary of potential issues

A preliminary review of noise issues was undertaken based on general project assumptions. The overall noise catchment area for the Project was divided into 18 individual catchments based primarily on topography, and the existing railway noise levels at a representative receiver location for each area were predicted using the *Nordic Rail Prediction Method* (Nordic Council of Minister 1996). Based on these levels, the likely increases in noise levels as a result of the Project were calculated.

The *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (IGANRIP) (Department of Environment and Climate Change 2007b) defines airborne noise goal trigger levels to identify locations where further noise assessment is required. For this Project, further assessment should be considered if:

- the predicted future noise levels exceed:
  - $L_{Aeq} = 65\text{dBA}$  (7am-10pm) or  $60\text{dBA}$  (10pm to 7am), (where dBA refers to the weighted sound power level) or
  - $L_{Amax} = 85\text{dBA}$  (at any hour).
- the increase in noise levels exceeds:
  - $L_{Aeq} = 2.0\text{dB}$  in any hour, (where dB refers to the sound power level) or
  - $L_{Amax} = 3\text{dB}$ .

In relation to existing urban development, the preliminary review identified future noise levels along the rail line as likely to exceed the trigger levels for three areas. The relevant receivers within these areas are identified below and indicated in Appendix A:

- residences located in Manorhouse Boulevard, Reycroft Avenue and Seldon Street, Quakers Hill
- residences located in Lane Grove, Tain Place and Bridge Street, Schofields
- rural and industrial properties along the western side of Riverstone Parade between Hobart Street and Victoria Street, Riverstone.

As the land use within Area 3 is a mix of rural and industrial, it is likely that no further noise assessment would be required. In terms of future land use, Area 3 is located within the Riverstone West precinct of the North West Growth Centre. Planning for this precinct is expected to commence within the next four years. If the land were to be rezoned to residential, it is likely that further noise assessment and potentially mitigation would be required.

As part of the preliminary noise review, the existing and future noise levels were also predicted for a sample of non-residential noise sensitive receivers in close proximity to the rail corridor. Receivers for which the trigger levels are likely to be exceeded are:

- Kerry Jones Child Care Centre
- Riverstone Library
- Terra Sancta College.

Based on these preliminary results, it is expected that further noise assessment and potentially mitigation would be required for these properties and the above-mentioned residential properties where predicted future noise levels exceed the IGANRIP trigger levels.

As outlined above, a key issue in relation to noise impacts will be the development of new residential communities under current plans for the North West Growth Centre. As such, the noise assessment for the Project will take account of both the existing and potential future noise receivers in relation to the Project.

Consultation between TIDC and the Growth Centres Commission will be ongoing throughout preparation of the Environmental Assessment to establish assumptions to be made about future urban growth. The Environmental Assessment will address noise impacts in relation to future communities and the timing and potential location of mitigation measures if feasible and reasonable.

### **Further assessment proposed**

For the purposes of the Environmental Assessment, it is proposed that the following studies are undertaken:

- assessment of the extent to which rail noise is a cause of disturbance to residents or other sensitive receivers (e.g. schools)
- assessment of the influence of noise sources other than rail noise in the local environment
- assessment of the extent to which existing background noise levels approach or exceed the trigger levels for daytime or night-time noise exposure in residential areas
- establishment of reasonable and feasible noise goals and mitigation measures based on IGANRIP
- modelling and prediction of construction and operation noise and vibration impacts
- assessment of the need for, and the location of mitigation measures
- determination of indicative construction equipment scenarios
- identifying the applicable construction noise and vibration assessment criteria.

In relation to the North West Growth Centre, where the location of future communities can be determined with sufficient certainty, these will be addressed on the same basis as existing noise sensitive receivers. However, where insufficient precinct planning has occurred, a general approach to noise protection for future development will be developed in consultation with the Growth Centres Commission.

### **5.2.3 Visual amenity**

#### **Existing environment**

The existing visual character of the study area is characterised by the three small town centres of Quakers Hill, Schofields and Riverstone, predominantly single dwelling residential developments and expanses of open, undulating, and primarily agricultural land. An industrial area is located along both sides of Riverstone Parade at Riverstone.

The Richmond Branch Line bisects the Quakers Hill, Schofields and Riverstone town centres and is a significant visual feature of these areas (refer Photographs 5-5, 5-6 and 5-7). Views from the rail corridor are typically of agricultural land and small areas of residential, commercial and some industrial development surrounding the town centres. Between Victoria Street, Riverstone, and Vineyard Station, the rail corridor is built between cleared agricultural land on the western side, and open woodland on the eastern side.



**Photograph 5-5 Quakers Hill Station, facing north**

Note: The town bisected by the railway line



**Photograph 5-6 Schofields town centre**

Note: The Station is located to the left of the photograph



**Photograph 5-7 Riverstone town centre, facing east along Garfields Road**

### **Summary of potential issues**

The key visual amenity issues associated with this Project are:

- the removal of the existing Schofields Station from Schofields town centre
- construction of the new Schofields Station
- construction of the new Vineyard Station
- installation of noise attenuation barriers
- new footbridges at Quakers Hill and Schofields
- pedestrian overpass over Riverstone Station.

These issues, as well as a number of less important issues are discussed below.

The removal of the existing Schofields Station would significantly alter the existing visual amenity of Schofields town centre. At present, the station is the centre point of the town, separating the business centre on the eastern side of the rail line from residential developments on the western side. The removal of the station has the potential to alter the visual 'character' of the town centre and increase views of trains travelling through.

The proposed location for the new Schofields Station currently comprises cleared agricultural land, some farm buildings, and scattered residential properties on the eastern side of Railway Terrace. Whilst it would be located within and adjacent to the existing rail corridor, the new Schofields Station would be a prominent addition to the existing landscape. The provision of station buildings, car parking, platforms, a footbridge, lifts and additional overhead wiring would significantly alter the existing visual amenity of the location.

The proposed location for the new Vineyard Station is characterised by grazing land on the western side of the rail corridor and open woodland with scattered residential properties on the eastern side. Like for the new Schofields Station, the new Vineyard Station would significantly alter the existing visual amenity. Due to the density of vegetation on the eastern side of Riverstone Parade and the distance that homes are set back from the road, it is unlikely that the new station would interrupt the views from these properties. However the

car park is proposed to be located at the front of a residential property at 6 Ashford Road. The construction of the car park would require the removal of mature vegetation that currently shields the property from views of Riverstone Parade and the future station site.

It is anticipated that as part of the plans for the North West Growth Centre, the areas surrounding the proposed new Schofields and Vineyard Station locations will be developed in the future, potentially as medium to high density residential areas. The new stations will be designed in consultation with GCC.

Dependent on the results of the noise assessment, noise mitigation measures may be required. In the event that noise walls are required the potential impacts on visual amenity of the area would need to be assessed. There is the potential to have a significant impact on the visual amenity of the area, particularly for individual properties facing the rail corridor if noise walls are required. There is also the potential for the walls to cause overshadowing of adjacent residential properties, restricting access to sunlight.

As the majority of the new track would be constructed within the existing rail corridor, it is anticipated that the additional track would have a minimal impact on the existing visual environment, as it comprises an expansion of an existing feature of the landscape. Potential visual impacts may be associated with the additional overhead wiring, and the construction of a new substation adjacent to the existing substation at Schofields. Widened railway embankments and cuttings, and lengthened culverts would also change the visual landscape of the rail corridor; however, these changes are expected to be minor, and in keeping with the current land use.

During the construction phase of the Project, residents, train passengers, pedestrians and motorists would be subject to temporary impacts to visual amenity associated with work sites, storage areas, scaffolding and fencing, and construction plant and equipment.

The proposal to replace the existing Garfield Road level crossing at Riverstone would potentially result in a visual impact on the streetscape of the Riverstone Town Centre (depending on the design and location of the replacement). However, replacement of the level crossing would be undertaken by the Roads and Traffic Authority and, as such, falls outside the scope of the Project.

### **Further assessment proposed**

As part of the Environmental Assessment, a visual assessment will be undertaken to evaluate those locations subject to greatest modification, assess the significance of the potential impacts, and outline measures to mitigate these impacts.

In conjunction with the preparation of the Environmental Assessment, urban and landscape design will be undertaken for the Project, with a focus on the station upgrades and associated transport infrastructure.

The visual assessment will identify visual catchments in relation to all new development (including noise walls and the new stations) and will provide an assessment of the urban and landscape designs proposed, including a review of their suitability in the context of the Project.

Where a particularly significant visual change is proposed, graphics would be presented in the Environmental Assessment to assist the community and stakeholders to understand the likely nature of proposed impacts.

## **5.2.4 Traffic and transport**

### **Existing environment**

#### ***Road network***

The major road transport links surrounding the study area are the M7 WestLink and Old Windsor Road. Within the suburbs serviced by the Richmond Line, the primary traffic routes include Quakers Hill Parkway and Hambledon Road in Quakers Hill; Burdekin Road, Railway Terrace and Schofields Road in Schofields; Garfield Road and Riverstone Parade in Riverstone; and Riverstone Parade and Bandon Road in Vineyard.

The Richmond Branch Line is crossed by Quakers Hill Parkway at Quakers Hill (overbridge), Garfield Road at Riverstone (level crossing) and Westminster Street at Schofields (overbridge). An additional service access exists to the Meatworks Industrial Estate at Riverstone.

#### ***Bus transport***

Relevant bus routes within the study area include:

- 751 Blacktown to Quakers Hill via Hambledon Road then Pye Road
- 752 Blacktown to Quakers Hill via Pye Road then Hambledon Road
- 742R Blacktown to Riverstone via Rouse Hill Caravan Park
- 742S Blacktown to Riverstone via Schofields Station
- 746 Riverstone to Box Hill.

#### ***Access to rail stations***

Quakers Hill Station can be accessed from Pearce Road on the north-eastern side, or Railway Road on the south-western side. Commuter parking is available on both sides of the station. The railway line may be crossed by pedestrians at three separate locations: the Quakers Hill Station overbridge, the pedestrian level crossing approximately 150 metres north of the station, or at Quakers Hill Parkway a further 250 metres north of the pedestrian level crossing. Vehicle access across the railway line is only available via Quakers Hill Parkway.

Schofields Station has 42 car parking spaces on the eastern side of the station. Pedestrian access across the railway line is at the pedestrian level crossing at the northern end of the station platform. Vehicle access is via Westminster Bridge, approximately 500 metres north of the station.

Riverstone Station is located at the heavily trafficked intersection of Riverstone Parade and Garfield Road. Pedestrian and vehicle access across the railway line is via the Garfield Road level crossing. This includes pedestrians moving between the two platforms. A car park is located on the eastern side of the station. Garfield Road is the main street of the Riverstone township and caters for high volumes of heavy vehicles passing through Riverstone. Closure of the level crossing to cars sometimes results in traffic queuing either side of the crossing.

Vineyard Station has 10 car parking spaces. The platform is located on the western side of the track and is accessed from Riverstone Parade via the Bandon Road pedestrian and vehicle level crossing. Riverstone Parade and Bandon Road, in the vicinity of Vineyard Station, did not appear heavily trafficked during the site inspection.

### ***Future development of the North West Growth Centre***

Significant traffic growth in proximity to the Project will occur as a result of the development of the North West Growth Centre. The *Richmond Line Road and Rail Crossings Study Draft Report* (Growth Centres Commission 2006b) identified transport corridor planning for the study area. This is proposed to include the upgrade of Schofields Road from a two lane road to a four lane divided road and the westward extension of Schofields Road to Richmond Road, including a new rail crossing over the rail line. Garfield Road east and west would be upgraded to strengthen the existing east-west link between Richmond Road, Riverstone town centre, Windsor Road and Box Hill centre. The replacement of the Garfield Road level crossing was also considered in the report and in a subsequent report, *Supplementary Garfield Road Crossings Analysis Final Report* (Growth Centres Commission 2007c).

### **Summary of potential issues**

During construction of the Project, impacts are expected to primarily relate to the impacts of construction traffic on the local road network, in conjunction with disruption to rail commuter services during track possessions and station works.

During construction, there would be an increase in traffic movements on roads approaching the proposed work sites, including traffic associated with spoil movements and the import of construction materials and workers. Vehicle types would predominantly comprise work utilities, light trucks, heavy vehicles, delivery vehicles and purpose-built machinery. It is expected that the increase in traffic would have particular impacts at Riverstone, where the number of heavy vehicles passing through the town centre is already high.

The Westminster Street overbridge would be constructed under traffic. During this time, traffic delays along Westminster Street, Bridge Street and Railway Terrace could be expected. Temporary traffic signals may be used to maintain bi-directional flow across the overbridge.

During operation, the main issue for the Project would be the development of a design to accommodate future levels of traffic following the development of the North West Growth Centre. While the Project would not, in itself, be a major generator of traffic during operation, the increased train frequencies facilitated by the Project would raise issues of safety and accessibility at all at-grade crossing points. Design of the proposed new stations at Schofield and Vineyard would need to be assessed and designed to accommodate higher levels of commuter traffic in terms of pedestrian accessibility, traffic, parking and public transport.

The Garfield Road vehicle level crossing at Riverstone is a significant issue in terms of the operation of the Project. The duplication of the track would allow for more frequent train services, resulting in more frequent closures of the crossing, which could result in safety impacts and (potentially) unacceptable traffic queuing. As the crossing is already heavily trafficked, the predicted population growth for the area over the next 25 years would contribute further to traffic passing through Riverstone, exacerbating existing conditions.

The vehicle level crossing at Garfield Road is proposed to be replaced by the RTA as a result of a ministerial announcement made by the Minister for Roads on 26 February 2007. Various options available for the construction of a Garfield Road Crossing at Riverstone are currently being investigated by the RTA. The construction of the crossing is anticipated to be completed prior to an increase in services. The design and construction of the crossing will be commissioned by the RTA and will be subject to a separate approval process to this Project. At present, neither the timing, nor the location of this crossing has been determined.

Additionally, RailCorp has proposed the closure of another vehicle level crossing at Riverstone, (the 'Meatworks' level crossing), which is approximately 800 metres north of the town centre. The closure of this crossing, which services the Meatworks industrial estate, would effectively terminate the most effective and direct access to the site for the majority of users. The closure of the crossing is proposed by RailCorp based on safety concerns. The closure of this crossing is not associated with this Project and would be assessed separately by RailCorp.

At present, a reasonable secondary access exists via the Garfield Road level crossing at Riverstone. However, given the impending closure of this crossing, there may be a period, prior to the replacement of the level crossing at Riverstone, when neither of these access arrangements is feasible. Under this scenario, access to and from the site would be via a substantial detour. Traffic travelling from the north along Riverstone parade would be re-routed to the south along Railway Terrace, across the Westminster Street overbridge, along Grange Avenue to the south-west, Carnarvon Road to the north and reconnecting to Garfield Road West. Access to the Meatworks industrial estate would be provided by Richards Avenue, off Garfield Road West. This detour would increase traffic on these local roads.

It is assumed that the pedestrian level crossing at Quakers Hill would only be removed once alternative pedestrian access is available, thereby avoiding impacts to pedestrians accessing both sides of the Quakers Hill town centre.

The relocation of Schofields Station would have significant impacts on pedestrian accessibility for the existing Schofield population. This is discussed further in Section 5.2.8.

There is the potential for a temporary reduction in commuter parking spaces during construction of the Project due to increased construction vehicles parking around the stations. Parking areas may also be fenced off for safety reasons when construction work is being undertaken on the adjacent property. However the number of parking spaces would not be reduced as a result of the Project and would actually be increased for Schofields and Vineyard stations.

Other less significant traffic and transport impacts would include:

- temporary disruptions to train services during construction rail possessions/closedowns (it is expected that there will be approximately 16 weekend possessions available within the construction timeframe - December 2008 to November 2012, however this could change if extended possessions are available). Buses would replace trains at these times.
- it is expected that there will be an upgrade of bus services associated with increased residential development in the area
- roadworks on Riverstone Parade, Vineyard, to create an entry and exit to the new car park and bus interchange. A pedestrian crossing would also be required.

### **Further assessment proposed**

The impacts to traffic and access during construction and operation of the Project are considered to be key issues and would be further investigated during the Environmental Assessment phase. It is proposed that the following would be undertaken:

- preparation of station precinct plans to analyse the before and after operations of each affected station

- assessment of the impacts at the four stations and other locations (such as road bridges and level crossings) in regard to traffic, parking, pedestrians, bus interchange and station access arrangements
- assessment of the traffic impacts of reconstruction of the Westminster Road Bridge, using traffic counts and traffic modelling (A SIDRA analysis would also be conducted to determine the expected delay provided through signal control of the one lane bridge during construction.)
- assessment of cumulative traffic impacts associated with the closure of the Garfield Road and Meatworks vehicle level crossings at Riverstone
- development of key transport mitigation measures to minimise the expected impacts of construction and operation of the Project.

### 5.2.5 Cultural heritage

#### Existing environment

Heritage Concepts (2007) was engaged to undertake a preliminary heritage assessment of for the Project. The relevant heritage databases and listings were searched and the results are listed below in Table 5-3.

The only listed heritage items identified within the study area are Riverstone Station (including other associated station infrastructure), which is listed on the NSW State Heritage Register and RailCorp's S170 Register, and the Quakers Hill footbridge at Quakers Hill Station, which is listed on RailCorp's S170 Register. There were no items listed on the Register of the National Estate, National Heritage List or the Commonwealth Heritage List. No listed Aboriginal heritage sites were located within the study area, although 36 sites have been identified within 2 kilometres of the rail corridor.

**Table 5-3 Results of heritage database searches**

| Register                                                                                               | Listed heritage items identified in the study area                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Register of the National Estate                                                                        | None                                                                                                                                                                                    |
| National Heritage List                                                                                 | None                                                                                                                                                                                    |
| Commonwealth Heritage List                                                                             | None                                                                                                                                                                                    |
| Department of Environment & Climate Change's Aboriginal Heritage Information Management System (AHIMS) | None                                                                                                                                                                                    |
| National Native Title Tribunal                                                                         | None                                                                                                                                                                                    |
| NSW State Heritage Register                                                                            | Riverstone Railway Station and yard group                                                                                                                                               |
| RailCorp Section 170 Heritage and Conservation Register                                                | Riverstone Railway Station and yard group<br>Quakers Hill footbridge                                                                                                                    |
| Blacktown Local Environment Plan                                                                       | Riverstone Railway Station Group<br>Former Riverstone Stationmasters residence                                                                                                          |
| National Trust of Australia (NSW)                                                                      | Riverstone Railway Station Group, which includes the Railway Station and Group, Former Station Master's Residence, Former Railway Barracks and the War Memorial in front of the Station |

### **Summary of potential issues**

The key non-Aboriginal heritage impacts associated with the Project would be associated with the proposed track duplication, platform duplication and level crossing upgrades at Riverstone Station. As the Riverstone Railway Station complex is listed on the NSW State Heritage Register as an item of state significance, assessment of the impact of the Project on its significance will be required. Such assessment will need to address the widening of the existing Down platform, refurbishment of the existing siding, construction of a footbridge over the tracks, and installation of two lifts and stairs to the street and platform, and other associated infrastructure works.

The potential impacts on Aboriginal heritage items would be associated with construction of the new Schofields Station and construction of the new Vineyard Station and car park. These areas are located outside of the rail corridor and within areas identified as Potential Archaeological Deposits (PAD). It is intended that these locations be the primary focus for consultation with the Aboriginal community.

### **Further assessment proposed**

As part of the Environmental Assessment, a Statement of Heritage Impact will be prepared to determine the impacts from the Project on items of heritage significance such as Riverstone Station and any other items that may be identified, such as significant culverts. A conservation management plan may also be required as a basis for the development of appropriate design solutions. The statement of heritage impact would also propose measures to minimise any negative impacts on the significant fabric of the Riverstone Station precinct. If items of heritage significance were identified during construction, work would cease until Aboriginal representatives have assessed the items to DECC's satisfaction.

In terms of the Aboriginal archaeological significance of the study area, an archaeological survey would be undertaken of the Project site, focusing on the Potential Archaeological Deposits located at the proposed new Schofields Station, Vineyard Station and Vineyard Station car park locations. This survey would be undertaken in conjunction with Aboriginal stakeholder groups.

If required, following assessment and consultation, Aboriginal cultural monitoring or cultural salvage of the study area would take place. This would be undertaken by the representatives of the Aboriginal stakeholder groups.

## **5.2.6 Flooding**

### **Existing environment**

The area surrounding the Richmond Line between Quakers Hill and Vineyard is prone to flooding. Eastern Creek runs along the western side of the railway line and has a backwater influence on upstream flood levels from north of Schofields Station to Riverstone Station and then up to Victoria Street, Riverstone. The surrounding catchments typically drain from east to west via culverts along the railway line, which eventually connect into Eastern Creek. The existing flooding issue is governed by the railway culvert crossings headwater levels between Quakers Hill and Schofields Stations. Flood risk areas relating to the Project have not been observed north of Victoria Street, Riverstone (refer to Appendix D for flood maps of the local area).

Culverts along the railway line include reinforced concrete box culverts, single or multiple concrete pipes and brick arches.

### **Summary of potential issue**

As the new track would be constructed within a flood-prone area, there is the potential for the works to exacerbate flooding levels. A flood assessment (Maunsell 2007b) undertaken for the Project identified a number of culvert locations along the existing alignment with less than 500 millimetres of freeboard below the existing rail level for the 50 year and 100 year average recurrence interval (ARI) flood flows. Freeboard refers to the factor of safety above the adopted flood level and the ARI flood is the estimate of the chance of a flood occurring in any one year. Assuming the new track would match the existing rail level, these culverts are proposed to be upgraded or replaced, subject to further design and investigations.

Maunsell (2007b) identified four locations along the alignment where the 100 year flood levels are likely to overtop the existing tracks. At these locations, it is proposed that the culverts need to be replaced, and that the new track matches the existing track levels to ensure that flood levels are not increased by the proposed works.

The proposed new track would be constructed coplanar to the existing track level. The construction of additional embankment filled areas along sections of the alignment could affect existing detention storage levels upstream, if the culverts become blocked. At these locations, further hydraulic modelling is required, along with replacement or extension of the existing structures.

Some of the existing culverts do not meet with current best practice. As such, it is proposed that flood management measures are redeveloped, where necessary, as part of the Project, to ensure full compliance with current best practice. Assessment of these culverts has confirmed that they have no heritage significance.

The new Schofields Station would be constructed 848 metres south of the existing station, and recessed into the hill top. There is the potential for this to affect the existing cross drainage system at this location. As the area surrounding the Richmond Line is planned for future residential development, the area of impervious surfaces surrounding the railway line will also increase, influencing run-off levels.

### **Further assessment proposed**

In conjunction with preparation of the Environmental Assessment, the following investigations would be undertaken:

- detailed flood modelling of high to medium flood risk areas to determine culvert headwater levels and upstream backwater effects
- hydrological modelling for the 50 year and 100 year ARI floods for high to medium flood areas
- investigation of the probable maximum flood (PMF) for the area surrounding the proposed new Schofields Station location. The PMF refers to the flood that can be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in a region
- investigation of the likely future development surrounding the rail corridor
- further assessment of potential impacts and development of mitigation measures to mitigate these impacts.

## **5.2.7 Land use and property**

### **Existing environment**

Land use along the rail corridor is a mix of residential, industrial, commercial and rural uses. Local shops and facilities are clustered around the stations at Quakers Hill, Schofields and Riverstone. Industrial areas are located on the western side of Riverstone Parade between Church Street and Victoria Street (the Meatworks industrial area) and on the eastern side of Riverstone Parade between Hobart Street and Victoria Street. The future plans for the area, as part of the North West Growth Centre, would result in changes in land use along and surrounding the rail corridor (refer Section 2.4).

### **Summary of potential issues**

Most of the Project would be undertaken within the existing rail corridor. As such, no direct land use change would occur. Environmental impacts on land adjacent to the Project would not generally result in any land use change or inability for existing land uses to continue.

However, construction of the Project would require the following land to be acquired:

- cleared agricultural land on the western side of Railway Terrace between Pelican Road and Schofields Road, Schofields, for the new Schofields Station
- a small portion of cleared agricultural land (from the above property) adjacent to the existing substation at Schofields, for the provision of a new substation
- a narrow strip of cleared agricultural land adjacent to and on the western side of the rail corridor between Perth Street and Bandon Road, Vineyard, for the provision of two new tracks, the new Vineyard Station and new maintenance siding
- a section of vegetated land on the eastern side of Riverstone Parade, Vineyard, between Norwood Road and Ashford Road, for the new car park and bus interchange (refer Photograph 5-8). A small shed is located on the land to be acquired, which is located adjacent to a residential block and currently provides visual screening of the road and the future Vineyard Station site.

Given the relatively small area of land to be acquired, and in the context of much wider land use change proposed for the area under plans for the North West Growth Centre, land use and property impacts are not anticipated to be significant.



**Photograph 5-8 Proposed location for the new Vineyard Station car park**

Note: The overhead powerlines are visible in the foreground, the shed is marked

### **Further assessment proposed**

Further assessment would be undertaken to identify property impacts, existing land uses, sensitive adjacent land uses and the likely impact of the construction and operation of the proposal. Mitigation measures would be developed where adverse impacts are identified.

## **5.2.8 Social and economic impacts**

### **Existing environment**

The Richmond Line, between Quakers Hill and Vineyard, services the three local centres of Quakers Hill, Schofields and Riverstone. Development in the area is based around these three centres, with commercial development in the immediate vicinity of the stations and residential development radiating out from the stations. Vineyard Station is located approximately 1 kilometre from the more developed parts of the suburb. Blacktown City Council (2003) has provided profiles of these suburbs based on an amalgamation of data from the 2001 Census of Population and Housing, in which the Blacktown LGA was divided into 38 suburbs.

In 2001, Quakers Hill was ranked as the second largest suburb in the Blacktown LGA, with a population of 22,435 people. More than half of the households were coupled families with young children. The Council study identified high proportions of individuals and households with a high weekly income, strong employment in white-collar occupations, a low unemployment rate and high post-school qualification achievements. The data showed that 89.2% of private dwelling owners in Quakers Hill owned at least one private vehicle (compared to 82.3% in the Blacktown LGA, and 78.8% in Sydney Statistical Division), and 52.5% of these households owned multiple vehicles (compared to 43.4% in the Blacktown LGA and 40.2% in the Sydney Statistical Division).

Based on the 2001 data, Schofields had a population of 4,260 people, with more than 70% of households classified as coupled families (with or without children). A considerable proportion of the population lived alone. The population was assessed as having a relatively high socio-economic advantage in 2001, with relatively high individual and household incomes, comparatively high employment in white-collar occupations, a very low unemployment rate, high post-school qualification achievements and a high owner-occupancy rate. Only 5% of private dwellings were without access to at least one private vehicle.

The population of the Riverstone/Vineyard area in 2001 was 6,565 people, with a relatively large elderly population, reflected in the relatively high proportion of lone person households. The area was classified with a relative socio-economic disadvantage, based on the low proportions of individuals and households earning a high weekly income, comparatively high blue-collar employment, and a relatively low level of post-school qualification achievement. Private vehicle accessibility was rated at 81.4%.

### **Summary of potential issues**

The key social and economic issue associated with the Project is the proposed relocation of Schofields Station. With the exception of the five small businesses located on the eastern side of the rail corridor, the existing Schofields Station is surrounded by residential development. In terms of economic impacts, the relocation of Schofields Station could reduce patronage of these businesses by the removal of rail commuter trade and other pedestrians and vehicles from the current town centre. It would also facilitate the potential for establishment of a new town centre, with competing businesses, around the new station. A number of social impacts would also be expected, including:

- changes to the community 'culture' of Schofields by removing the town focal point and changing the visual amenity of the town centre
- changed access to transportation
- reduced access to services, such as local businesses, if the businesses close or relocate.

The impacts associated with the proposed relocation of Vineyard Station would not be expected to be as significant as at Schofields, as the existing Vineyard Station is already distanced from the urban areas of Vineyard by approximately 800 metres.

The proposed replacement of the existing crossing at Garfield Road by the RTA, as discussed in Section 5.2.4, would have an impact in socio-economic terms, depending on the design and location of the replacement. This would be assessed by the RTA as part of their environmental impact assessment.

The existing level crossing servicing the Meatworks industrial estate at Riverstone would also be closed, effectively terminating the most effective and direct access to the site for the majority of users. The closure of the crossing was proposed by RailCorp prior to the planning of this Project due to current safety issues; however further safety issues associated with the track duplication and increased train frequencies would confirm the need to close the crossing at this location.

The pedestrian level crossings just north of Quakers Hill Station and at Schofields Station would be removed and alternative access provided. The replacement of these crossings could temporarily inconvenience users during construction.

The construction of a commuter car park in front of the residential property at Vineyard has the potential to impact on the property by reducing the visual amenity of the location and increasing noise as a result of cars stopping and starting in proximity to the residence.

Potential increases in travel times during scheduled track possessions during construction would cause temporary inconvenience to the local community. Social impacts may also be incurred in terms of noise, visual and traffic impacts to local residents and businesses. These issues are discussed in more detail in Sections 5.2.2, 5.2.3 and 5.2.4 respectively.

### **Further assessment proposed**

The social and economic impact assessment will further identify the existing communities impacted by the Project and their demography, linkages, interactions and social structures. This will include residential, commercial and industrial areas adjacent to the Richmond Line rail corridor, extending to approximately 400 metres from either end of the Project. The assessment will also consider the stations and catchment areas for rail users.

An assessment will be undertaken of the particular impacts that the construction and operation of the Project may have on local communities, and measures will be formulated to mitigate any adverse impacts. Social benefits, including improvements to accessibility and connectivity, and impacts, such as changes to amenity, severance and construction impacts, will be identified.

Community consultation, including local businesses and other stakeholders, will be undertaken across the Project area (incorporating rail commuters where possible), with focused consultation with those communities most acutely affected by the Project. The outcomes of this consultation will be taken into consideration in determining social and economic impacts.

A qualitative overview of economic impacts on local businesses would also be undertaken.

## **5.3 Other environmental issues**

### **5.3.1 Soils**

A geotechnical desktop study was prepared for the Project (Maunsell 2006a & Maunsell 2007c). The study identified the potential for soil erosion during construction if sites are inadequately managed. The site is typically underlain by the Blacktown soil landscape, which is characterised by moderate erodibility and poor drainage. Vegetation clearing and earthworks could also contribute to erosion and sedimentation.

The section of railway between 300 and 1,000 metres north of Quakers Hill Station is underlain by the South Creek soil landscape, coinciding with the Eastern Creek tributary that crosses the railway in this location. This soil type is highly erodible and subject to frequent flooding, settlement and generally low allowable bearing pressures under structures and embankments. Therefore, there is the potential for flooding, water logging and settlement during construction of this section of the Project.

The study found localised areas of erosion, and evidence of erosion and spalling/fretting of the cut face of existing cuttings. Some localised wet/boggy ground was identified at individual locations at the new Vineyard Station location. The site traverses areas with moderate to high salinity potential, which could present a problem during construction and ongoing maintenance.

Fill material was identified at some locations along the alignment, predominantly in the existing embankments; however, it may also occur on the land surrounding the rail corridor. As the origin and placement of the fill is not known, it is likely that its composition is variable, along with its shear strength, relative density and quality. Issues associated with encountering fill during construction include:

- potential for low allowable bearing pressures under structures and embankments
- potential for large post-construction settlements under structure loading
- excavation difficulties if obstructions in the fill are encountered
- potential requirement for off-site disposal of fill
- potential for perched water to present problems with excavation, compaction and groundwater control.

Based on initial, desktop investigations, there are no significant issues associated with the nature of the substrate in the study area. With appropriate management measures, the impacts associated with erosion of soils, water logging and instability during construction are not considered to be key issues in the development of the Project. These impacts can be managed effectively through engineering controls, such as retaining walls, foundation treatment and construction management measures. This would include erosion and sediment control measures, as detailed in the Landcom publication *Managing Urban Stormwater: Soils and Construction* (2004). Further targeted geotechnical investigations will be undertaken to confirm these preliminary findings and provide input into the detailed design and construction methodology.

### **5.3.2 Water quality and groundwater**

Impacts to water quality and groundwater are not expected to be key issues for the Project. The closest water bodies to the site are:

- Eastern Creek, which is located near West Parade, Riverstone (approximately 200 metres from the rail corridor)
- a tributary of Eastern Creek, which crosses the rail line approximately 400 metres to the north of the Quakers Hill Parkway overbridge
- a tributary of Eastern Creek, approximately 400 metres north of Seldon Street, Quakers Hill
- a perennial lake, which is located adjacent to the proposed Up line, 400 metres north of Seldon Street, between Quakers Hill and Schofields Stations (Maunsell 2006a).

Potential impacts to water quality would be associated with the pollution of stormwater by run-off of sediments, fuels and other materials from the construction site. These impacts can be avoided or managed effectively with the implementation of appropriate construction erosion and sediment control measures, as detailed in the Landcom publication *Managing Urban Stormwater: Soils and Construction* (2004).

The geotechnical desktop study prepared for the Project indicated that the water table is expected to be high between approximately 300 and 900 metres north of Quakers Hill Station (Maunsell 2006a). Groundwater flows from perched groundwater within cuttings were identified between Schofields and Vineyard (Maunsell 2007c). Where the water table is high, groundwater may be encountered during excavation, creating issues associated with compaction and groundwater control. These issues can be effectively managed through the implementation of appropriate mitigation measures, such as disposing of all liquid wastes in accordance with the Department of Environment and Conservation's (1999) *Environmental*

*Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes*, and through engineering controls (refer Section 5.3.1). Further investigation and characterisation of groundwater salinity levels and extent along the corridor would be undertaken so that structures can be designed so as not to exacerbate salinity problems and to have the appropriate durability.

### **5.3.3 Waste, energy and demand on resources**

The production of waste and the consumption of energy and other resources are not considered key issues for the Project. Waste produced during construction would include:

- spoil from excavation and trenching works
- spoil and groundwater that is potentially contaminated
- surplus construction materials
- general domestic waste
- waste from portable on-site toilets at the construction-site compound
- wastewater from dewatering activities such as groundwater (if groundwater is encountered), stormwater and construction site run-off.

The waste produced and encountered on-site would be managed in accordance with the Department of Environment and Conservation's (1999) *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes*. Standard environmental management measures based on these guidelines would be prepared by the construction contractor prior to construction.

### **5.3.4 Contaminated land**

A Phase 1 contamination assessment has been prepared for the Project (Maunsell 2006b & Maunsell 2007d). A Phase 2 assessment will be undertaken and the results incorporated into the Environmental Assessment.

The Phase 1 assessment indicated a number of potential contaminant source areas within the study area and its surrounds (refer to Appendix E for a map of these areas). The potential to uncover contaminated materials on the Project site is considered to be moderate to high. The rail network has been operating since the 1860s and it is likely that the rail corridor was constructed using imported fill materials, potentially coal ash and slag. Potential for contamination within the rail corridor also exists due to the likelihood of minor spillages of lubricants, engine oil or other materials leaking from the trains or spilled during maintenance operations.

Locations within the study area with a moderate to high risk of encountering contaminants during construction were identified as:

- rail embankments and sidings
- high voltage meter panels
- signal huts
- transformers
- site hut/plant room just north of the Quakers Hill pedestrian level crossing
- stormwater drains traversing beneath the rail corridor

- former Schofields stock feed and fertiliser store located adjacent to the existing Schofields Station
- vehicle parking areas adjacent to the rail corridor at Quakers Hill and Schofields
- Rural Fire Brigade located adjacent to the existing Schofields Station
- substation located adjacent to the existing line at Schofields
- agricultural land adjacent to the rail corridor
- Department of Defence land adjacent to the rail corridor between Quakers Hill and Schofields.

Initial investigations of the study area (Maunsell 2006b & 2007d) have determined that the railway corridor is underlain by soils that are not known or expected to be or contain acid sulfate soil materials. A search of the Department of Environment and Climate Change's Contaminated Lands Register (Department of Environment and Climate Change 2007c, accessed 1 May 2007) indicated no records of contaminated land in the study area.

Based on the above investigations, it is expected that contaminated materials may be encountered during construction. If not appropriately managed, there is the potential for contaminants to enter the stormwater system and/or be discharged to local waterways.

With the implementation of appropriate management measures, the excavation, storage and disposal of contaminated materials is not expected to be a key issue for the Project. All materials would be managed and disposed of appropriately in accordance with the relevant legislation and guidelines, including the *Protection of the Environment Operations Act 1997*, the *Waste Avoidance and Resource Recovery Act 2001*, SEPP 55 - Remediation of Land, and the Department of Environment and Conservation's (1999) *Environmental Guidelines: Assessment, Classification & Management of Liquid & Non-liquid Wastes*.

### **5.3.5 Air quality and greenhouse gases**

Impacts to air quality during construction and operation of the Project are not considered key issues and would not require further investigation. There are limited industrial sources in the vicinity and the local air quality is influenced by proximity to major traffic routes and regional pollution in the Sydney basin. During construction, local air quality impacts (particulates) could result from vehicle/machinery emissions and dust generation, particularly during major earthworks operations. An increase in carbon dioxide emissions would also be expected as a result of the operation of machinery and vehicles.

Air quality impacts during construction are expected to be manageable with standard mitigation and best practice construction measures.

It should be noted that improvements to the operation of the duplicated track and access to public transport in the area would provide an alternative transport option to the use of private vehicles, which could result in benefits for local and regional air quality, such as a reduction in the combustion of diesel and petrol fuels and a consequent reduction in greenhouse gas production.

### **5.3.6 Hazard and risk**

The potential hazards and risks associated with construction of the Project are considered manageable and do not comprise significant issues. Hazards and risks during construction would be associated with:

- works conducted within the operating railway corridor (during construction, the works would be segregated from the 'live' rail by a solid barrier)
- works conducted under major arterial roads
- the storage and use of hazardous materials
- the use of heavy machinery.

These issues would be addressed by the construction contractor prior to the commencement of construction.

### **5.3.7 Public safety**

Public safety during construction and operation of the Project is an important issue; however, it is not expected to be a key environmental issue during the planning phase of the Project. Whilst no detailed investigations are proposed during the preparation of the Environmental Assessment, public safety will be managed as a high priority throughout the planning and construction phases.

As a minimum the design and the construction need to comply with RailCorp safety standards. The potential impacts to public safety, such as trespassing and vandalism, are expected to be manageable, subject to the application of NSW Police 'safer by design' principles, including appropriate lighting, fencing of the railway corridor, security measures, installation of surveillance cameras and help points at stations. These would be included as part of the design development process and based on existing similar precautions adopted at other stations in the Sydney railway network. RailCorp's Safety Change Management process would be applied to the Project, and safety assessment, including Safety Case and Risk Determination (SCARD) and Preliminary Hazard Assessment (PHA) workshops would be held during the concept design phase and development of a Safety Assessment Report.

### **5.3.8 Services and utilities**

A number of RailCorp utilities and other public utilities, such as telecommunications systems, overhead power lines and water, sewer and stormwater systems, would need to be relocated during construction of the Project. The overhead powerlines at the proposed new Vineyard Station car park location would be accounted for during the design phase.

The relocation of utilities is not considered a key issue during the planning phase of the Project. The contractor would check the locations of all utilities prior to the commencement of construction.

## 6. Proposed scope of the Environmental Assessment

Table 6-1 outlines the proposed scope of the Environmental Assessment for the Project, drawing on the preliminary assessment of key and other issues described in Sections 5.2 and 5.3.

**Table 6-1 Proposed scope of the Environmental Assessment**

| Issue                    | Proposed scope of Environmental Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General                  | <ul style="list-style-type: none"> <li>Expand on the relevant planning and statutory requirements included in this report.</li> <li>Update and expand the Project description based on ongoing design development.</li> <li>Provide details of construction planning, including identifying work sites, outlining the construction program and staging, identifying haulage routes and fill sources, describing temporary traffic arrangements and stating construction work hours.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Stakeholder consultation | <ul style="list-style-type: none"> <li>Provide information on the consultation activities conducted and issues identified.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Key issues</b>        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Flora and fauna          | <ul style="list-style-type: none"> <li>Survey and assessment of biodiversity values of the site will be undertaken in accordance with the <i>draft Guidelines for Threatened Species Assessment under Part 3A</i> (Department of Environment and Conservation 2005).</li> <li>More detailed site inspections would be undertaken where known or suspected threatened biodiversity is located.</li> <li>The likely impacts of the Project would be determined with particular attention to the <i>TSC Act</i> and the <i>EPBC Act</i>.</li> <li>For species and communities listed under the <i>EPBC Act</i>, significance assessments would be carried out following the <i>EPBC Act Policy Statement 1.1 Significant Impact Guidelines</i> (Department of the Environment and Heritage 2006).</li> <li>Determine the potential for vegetation clearing for the Project, and any offsets required as a result of the clearing to be incorporated and assessed as part of the Growth Centres SEPP, and not as part of this Project.</li> </ul> |
| Noise and vibration      | <ul style="list-style-type: none"> <li>Undertake an assessment of: <ul style="list-style-type: none"> <li>the extent to which rail noise is a cause of disturbance to residents or other sensitive receivers (e.g. schools)</li> <li>the influence of noise sources other than rail noise in the local environment</li> <li>the extent to which existing background noise levels approach or exceed the trigger levels for daytime or night-time noise exposure in residential areas.</li> </ul> </li> <li>Establish reasonable and feasible noise goals and mitigation measures based on IGANRIP.</li> <li>Model and predict construction and operation noise and vibration impacts.</li> <li>Assess the need for reasonable and feasible mitigation measures.</li> </ul>                                                                                                                                                                                                                                                                    |

| Issue                 | Proposed scope of Environmental Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Visual amenity        | <ul style="list-style-type: none"> <li>▪ Determine indicative construction equipment scenarios.</li> <li>▪ Identify the applicable construction noise and vibration assessment criteria.</li> <li>▪ Undertake a visual assessment to evaluate those locations subject to greatest modification, assess the significance of the potential impacts, and outline measures to mitigate these impacts.</li> <li>▪ Identify visual catchments in relation to all new development (including any proposed noise walls and the new stations) and provide an assessment of the urban and landscape designs proposed, including a review of their suitability in the context of the Project.</li> <li>▪ Where a particularly significant visual change is proposed, prepare graphics for presentation in the Environmental Assessment to assist the community and stakeholders to understand the likely nature of proposed impacts.</li> </ul>                                                                    |
| Traffic and transport | <ul style="list-style-type: none"> <li>▪ Prepare station precinct plans to analyse the before and after operations of each affected station.</li> <li>▪ Assess the impacts in regard to traffic, parking, pedestrians, bus interchange and station access arrangements.</li> <li>▪ Assess, using traffic counts and traffic modelling, the traffic impacts of reconstruction of the Westminster Road Bridge. This would also include a SIDRA analysis to determine the expected delay provided through signal control of the one lane bridge during construction.</li> <li>▪ Develop key transport mitigation measures to minimise the expected impacts of construction and operation of the Project.</li> </ul>                                                                                                                                                                                                                                                                                        |
| Cultural heritage     | <ul style="list-style-type: none"> <li>▪ Prepare a Statement of Heritage Impact as part of the Environmental Assessment to determine the impacts from the Project on the Heritage Significance of Riverstone Station. The statement of heritage impact would also propose measures to minimise any negative impacts on the significant fabric of the Riverstone Station precinct.</li> <li>▪ In the event that a major impact is deemed likely, prepare a Conservation Management Plan as a basis for the development of appropriate design solutions.</li> <li>▪ Undertake an archaeological site survey of the Project site, in conjunction with Aboriginal stakeholder groups, focusing on the Potential Archaeological Deposits located at the proposed new Schofields Station, Vineyard Station and Vineyard Station car park locations.</li> <li>▪ If required, following assessment and consultation, undertake Aboriginal cultural monitoring or cultural salvage of the study area.</li> </ul> |

| Issue                                 | Proposed scope of Environmental Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flooding                              | <ul style="list-style-type: none"> <li>▪ Undertake the following studies: <ul style="list-style-type: none"> <li>▸ detailed flood modelling of high to medium flood risk areas to determine culvert headwater levels and upstream backwater effects</li> <li>▸ hydrological modelling for the 50 year and 100 year ARI floods for high to medium flood areas</li> <li>▸ investigation of the probable maximum flood (PMF) for the area surrounding the proposed new Schofields Station location.</li> <li>▸ investigation of the likely future development surrounding the rail corridor.</li> </ul> </li> <li>▪ Undertake further assessment of potential impacts and development of mitigation measures to mitigate these impacts.</li> </ul> |
| Land use and property                 | <ul style="list-style-type: none"> <li>▪ Undertake further assessment to identify property impacts, existing land uses, sensitive adjacent land uses and the likely impact of the construction and operation of the proposal.</li> <li>▪ Develop mitigation measures where adverse impacts are identified.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Social and economic impacts           | <ul style="list-style-type: none"> <li>▪ Further identify the existing communities impacted by the Project and their demography, linkages, interactions and social structures.</li> <li>▪ Assess the particular impacts that the construction and operation of the Project may have on local communities, and formulate measures to mitigate any adverse impacts.</li> <li>▪ Consider the outcomes of community consultation in determining social and economic impacts.</li> <li>▪ Undertake a qualitative overview of economic impacts on local businesses.</li> </ul>                                                                                                                                                                        |
| <b>Other issues</b>                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Soils                                 | <ul style="list-style-type: none"> <li>▪ Undertake further targeted geotechnical investigations to confirm the preliminary findings and to provide input into the detailed design and construction methodology.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Water quality and groundwater         | <ul style="list-style-type: none"> <li>▪ Undertake further investigation and characterisation of groundwater salinity levels and their extent along the corridor so that structures can be designed so as not to exacerbate salinity problems and to have the appropriate durability.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Waste, energy and demand on resources | <ul style="list-style-type: none"> <li>▪ No further investigations required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Contaminated land                     | <ul style="list-style-type: none"> <li>▪ Undertake a Phase 2 contamination assessment for the Project to further determine the extent and nature of any contamination and to assist in the development of any mitigation required during the construction of the Project.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Air quality and greenhouse gases      | <ul style="list-style-type: none"> <li>▪ No further investigations required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Hazard and risk                       | <ul style="list-style-type: none"> <li>▪ No further investigations required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Public safety                         | <ul style="list-style-type: none"> <li>▪ No further investigations required as part of the Environmental Assessment, however public safety will be managed as a high priority during the planning and construction phases.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Services and utilities                | <ul style="list-style-type: none"> <li>▪ No further investigations required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## 7. Conclusion

This Project Application describes the Project to the extent that the concept design and preliminary assessment has been developed to date, and sets out the statutory and strategic context for the Project.

The report also provides a preliminary environmental assessment of the Project, setting out the expected issues associated with construction and operation of the Project, and outlining an indicative scope for the Environmental Assessment to be undertaken in accordance with the assessment and approval process under Part 3A of the EP&A Act. It is anticipated that the preliminary environmental assessment undertaken as part of this Project Application will assist the Director-General with the formulation of environmental assessment requirements for the Project.

The expected environmental issues have been separated into 'key' issues and 'other' issues. The 'key' issues are considered to require further investigation, which would be undertaken during the Environmental Assessment process. The 'other' issues are expected to be of less consequence than the key issues and would be able to be managed through the application of best practice environmental management, and proposed management measures and safeguards. Further investigation of some of the 'other' issues may be required, and is proposed to be undertaken during the Environmental Assessment process.

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