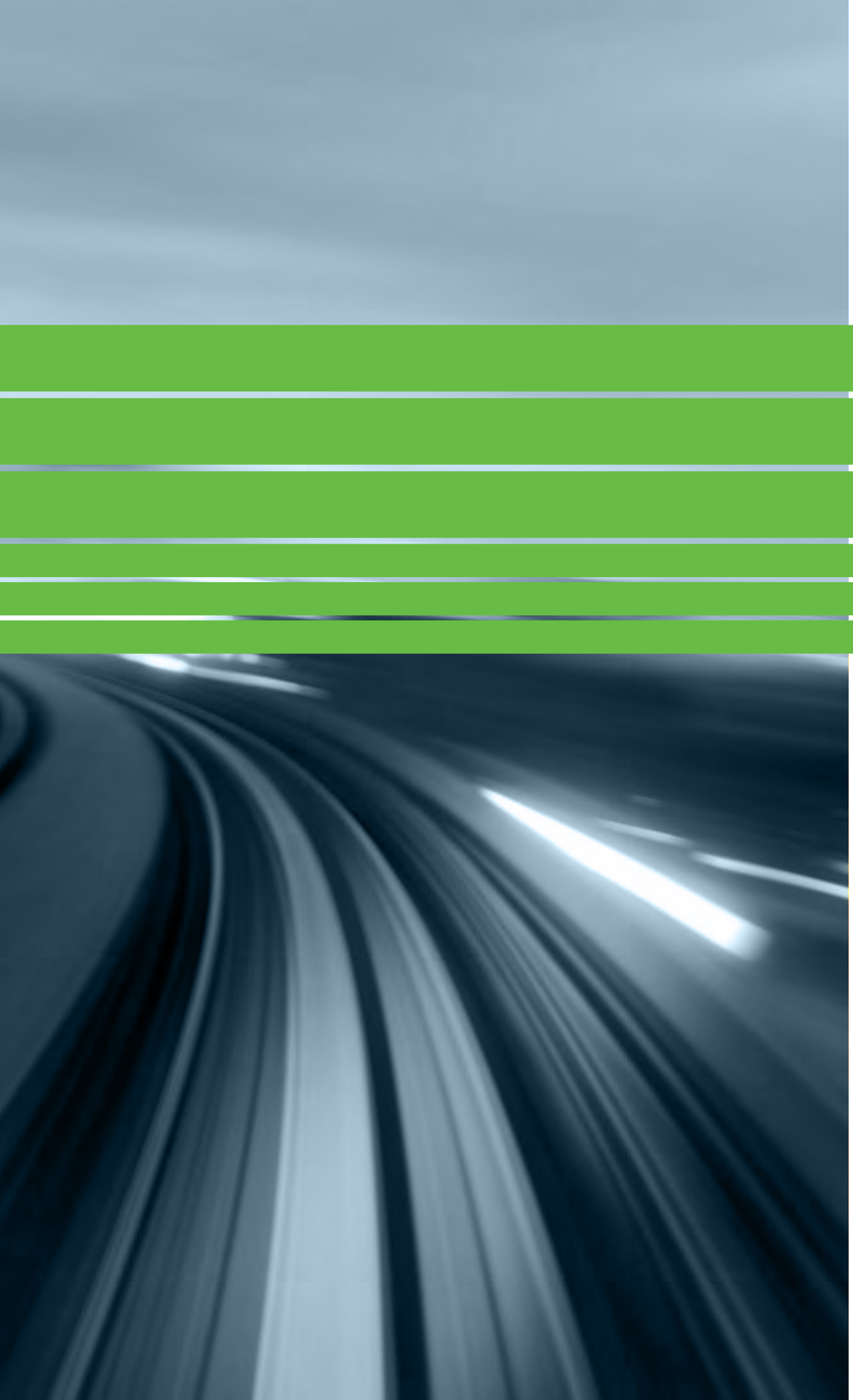

6



6 MODIFICATION OF STAGED INFRASTRUCTURE

RESPONSE TO SUPPLEMENTARY ENVIRONMENTAL ASSESSMENT REQUIREMENTS

6.1 Introduction

The NWRL Concept Plan was approved in May 2008. The Concept Approval is now taken to be a Staged Infrastructure Approval under Part 5.1 of the EP&A Act.

An application to modify the existing Staged Infrastructure approval for NWRL was submitted to the DP&I on 14 December 2011. Since May 2008, following Concept Approval (now Staged Infrastructure approval) of the NWRL, further strategic planning and project development has occurred. This has resulted in modifications to the Staged Infrastructure approval. However, TfNSW will seek final project approvals which are independent of the Staged Infrastructure Approval.

The Department of Planning and Infrastructure has identified supplementary environmental assessment requirements for the modification which are set out in **Table 6.1**. The purpose of this chapter is to describe how these supplementary environmental assessment requirements have been addressed in this EIS.

Table 6.1 Staged Infrastructure Approval Modification – Supplementary Environmental Assessment Requirements

DGR Reference	Description	Addressed
Modification Requirements	The modification assessment shall provide details of the proposed changes to the Staged State Significant Infrastructure approval, including its changes to a heavy rail line, and describe the strategic context of the project in relation to relevant State and regional strategies.	Proposed changes are addressed in Section 6.2. Strategic context is addressed in Section 6.3.
Modification Requirements	The modification shall also address the following matters: Consideration of any changed or additional impacts as a result of the proposed modifications to the Staged SSI approval including those that are related to the proposed Construction and Operation of Stations, Rail Infrastructure and Systems stage, at a conceptual level. Consideration of the Area 20 Precinct proposed land uses, infrastructure and strategies, taking into account Development in special area – Cudgegong Station Area (Appendix 6 – Area 20 Precinct Plan). A discussion of potential extensions of the project beyond Cudgegong Road	Section 6.5 Section 6.14 Section 6.15
Consultation	The modification assessment shall document consultation undertaken with relevant government agencies and the community in its preparation, with a focus on the proposed changes, and how matters raised during consultation have been considered.	Section 6.4

6.2 Proposed modifications

The existing 2008 Staged Infrastructure Approval (former Concept Plan approval) is for the construction and operation of a new electrified passenger rail line between Epping and Rouse Hill, including:

- Six new stations at Cherrybrook, Castle Hill, Hills Centre, Norwest, Kellyville and Rouse Hill.
- Stabling facilities.
- Associated ancillary infrastructure.

Since the Staged Infrastructure approval, further strategic planning and project development has been undertaken, leading to a number of proposed modifications to the approval. The proposed modifications are:

- Change the NWRL project definition as a result of the proposed modifications.
- Relocate Kellyville Station from Burns Road, Kellyville to Samantha Riley Drive, Kellyville.
- Provide for additional stations at Bella Vista and Cudgegong Road, Rouse Hill.
- Make minor changes to the location of the Hills Centre Station.
- Change the NWRL alignment within Area 20 (part of the North West Growth Centre) to a route parallel to Schofields Road as shown in the Area 20 Precinct Planning Package (DP&I, August 2011).
- Incorporate the Skytrain viaduct between Bella Vista and Rouse Hill.
- Locate a train stabling facility in the vicinity of Tallawong Road in the North West Growth Centre.

6.2.1 Modification to the North West Rail Link definition

In March 2008, it was envisaged that the approved Concept Plan (now Staged Infrastructure Approval) would be utilised as part of the next stage of design development for a new Metro rail system for Sydney. A review of the alignment, stabling and stations was required to adapt to the change from a heavy rail system to a metro rail system. However, in February 2010 development of a Metro network for Sydney was deferred, procurement processes terminated, and resources and funding allocated to other projects.

The NWRL announced by the NSW State Government in April 2011 would be a heavy rail line that integrates with the existing Sydney rail networks.

The rail alignment and station locations described in the Staged Infrastructure Approval are consistent with a heavy rail system, including the direct tunnel connection at the Epping terminus of the Epping to Chatswood Rail Link (ECRL) stub tunnels to connect to the existing rail system.

It is therefore proposed to modify the definition of the NWRL in the Staged Infrastructure Approval as follows:

Development for the purposes of the North West Rail Link, being the construction and operation of an electrified passenger rail line between Epping and Rouse Hill, including the following:

a. New stations in Cherrybrook, Castle Hill, Hills Centre, Norwest, Bella Vista, Kellyville, Rouse Hill and Cudgegong Road.
b. Associated ancillary infrastructure, including (but not limited to) train stabling, roads, car parks, bus interchanges, public amenities and inter-modal facilities.

6.2.2 Railway station modifications

The 2008 Staged Infrastructure Approval anticipated the construction and operation of six new stations located within the 60m wide corridor: Cherrybrook Station, Castle Hill Station, Hills Centre Station, Norwest Station, Kellyville Station and Rouse Hill Station. A station at Samantha Riley Drive was safeguarded. The proposed railway station modifications including the provision of two new stations at Bella Vista and Cudgegong Road are described in **Table 6.2**.

Table 6.2 Proposed railway station modifications
(Staged Infrastructure Approval project description show in italics)

Modification	Description
Relocate Kellyville Station from the vicinity of Memorial Avenue to the vicinity of Samantha Riley Drive	*The Burns Road Station provided in the Staged Infrastructure Approval was located to the east of Old Windsor Road and bounded Burns Road (now Memorial Avenue) to the north and Balmoral Road to the south.* *The proposed Kellyville Station would be located south east of the intersection of Samantha Riley Drive and Old Windsor Road, Kellyville. This location was previously safeguarded as an elevated station with (unquantified) park and ride capacity.* Kellyville Station would be an elevated structure and would have a Park and Ride facility to serve North Kellyville, Beaumont Hills, Stanhope Gardens and development within the North West Growth Centre. The station will provide approximately 1,360 park and ride spaces including 160 dedicated to the North-West T-way. Additional provision will be made for bus, taxi, kiss and ride and bicycle facilities.
Provide an additional station at Bella Vista	*The 2008 concept did not provide for a second station within the Norwest Business Park.* Bella Vista Station would be located on Celebration Drive, Bella Vista within the north western precinct of the Norwest Business Park. Bella Vista Station would be an open cut station. The station would be a combination of Park and Ride and a commercial centre destination and would provide additional public transport coverage to the western precincts of the Norwest Business Park which is identified as a Specialised Centre with a job target of 30,000 by 2036. Approximately 800 park and ride spaces would be provided at Bella Vista Station however numbers are being confirmed as part of the ongoing design process. Additional provision will be made for bus, taxi, kiss and ride and bicycle facilities.

Modification	Description
Provide an additional station at Cudgegong Road	*The 2008 concept terminated at Rouse Hill Town Centre (with temporary stabling provided beyond).* The proposed Cudgegong Road Station would be located on Cudgegong Road, Rouse Hill. Cudgegong Road Station would be a shallow cutting station with a park and ride facility serving future growth within the North West Growth Centre. The station will provide approximately 1,000 park and ride car parking spaces with additional provision for bus, taxi, kiss and ride and bicycle facilities.
Minor change to the location of Hills Centre Station	*The 2008 concept located the Hills Centre Station beneath Cattai Creek.* It is now proposed to slightly change the horizontal route alignment at the proposed Hills Centre Station to avoid potential impacts on Cattai Creek and to limit impacts on the Castle Hill Showground. Two alternative locations were proposed, one at Castle Hill Showground (ie, moving the station towards the east) and the other at the adjoining Hills Shire Council depot site fronting Carrington Road (ie, moving the station towards the south). The southern option, i.e. adjoining the Hills Shire Council depot site, has been identified as the preferred option. This would lead to reduced impacts on the existing Castle Hill Showground and better integrate the station with surrounding residential suburbs and with bus services on Carrington Road. The station will provide approximately 600 park and ride car parking spaces with additional provision for bus, taxi, kiss and ride and bicycle facilities.

6.2.3 Alignment modifications

The 2008 Staged Infrastructure Approval for the NWRL identified a temporary train stabling facility adjacent to Windsor Road and within the Area 20 Precinct. This location was determined in part on early expectations that a future corridor beyond Rouse Hill would follow a northerly alignment.

Following additional studies to refine the alignment of the NWRL corridor and provide certainty for new development in the North West Growth Centre, it was determined that the best route to service the North West Growth Centre is an alignment parallel to Schofields Road. A permanent stabling facility would be required at the north western end of the alignment at Tallawong Road. Refer to section 6.3.5 for details on the strategic context.

6.2.4 Vertical alignment modifications

The 2008 Staged Infrastructure Approval for the NWRL only sought approval for a rail alignment within a defined corridor and did not seek approval for a specific vertical alignment. Notwithstanding, the 2008 concept described a combination of elevated concrete bridge sections,

embankment, cuttings and cut and cover concrete structures between Memorial Avenue and Rouse Hill Station.

In response to additional investigations and recent stakeholder input, two additional stations are being planned for and the vertical alignment has been optimised between Bella Vista and Rouse Hill to provide better environmental and land use outcomes as well as value for money.

As noted in **Table 6.2**, there would be additional stations at Bella Vista and Cudgegong Road. From Bella Vista Station westward the alignment would rise from cutting to a viaduct following a revised alignment within land already acquired for the project. The viaduct alignment would be closer to Old Windsor Road for the section of alignment from Bella Vista to Memorial Avenue.

The alignment would continue on an elevated structure from Kellyville Station through Rouse Hill passing over Windsor Road before transitioning to an at-grade and open cut rail alignment through to the Tallawong stabling facility. The length of the proposed viaduct is approximately 4.2km. The modifications to the vertical alignment compared to the Staged Infrastructure Approval are summarised in **Table 6.3**.

Table 6.3 Summary of changes to vertical alignment

Section	Staged Infrastructure Approval – length	Proposed Modifications - length
Epping to Chatswood Rail Link stub tunnels to Balmoral Road Release Area	Approximately 16 km twin bored tunnel	15.5 km twin bored tunnel with Bella Vista Station and tunnel portal located in this section
Celebration Drive to Memorial Avenue	Approximately 1.2 km of cut and cover tunnel	Surface alignment rising to a viaduct
Memorial Avenue to Samantha Riley Drive	Surface alignment approximately 1 km in cutting, then embankment	Viaduct, known as a Skytrain
Samantha Riley Drive to Windsor Road	Approximately 1 km on viaduct	Skytrain continues in this section
Windsor Road to Sanctuary Drive	Surface alignment approximately 1 km in embankment, then cutting	Skytrain continues in this section
Sanctuary Drive to Rouse Hill Town Centre	Approximately 1.4 km of cut and cover tunnel	Skytrain continues in this section – total length is approximately 4.2 km
Rouse Hill Town Centre and through Area 20	Bored tunnel below Windsor Road with the stabling facility in a combination of embankment and cutting	Skytrain continues over Windsor Road, followed by a surface alignment through Area 20

6.2.5 Horizontal alignment modifications

In addition to the horizontal alignment modifications identified in the Area 20 Precinct (Section 6.2.3), modifications to the 2008 concept are also proposed as follows:

- A move to a more southern alignment for a short section between Showground Road and Carrington Road in response to the preferred southern option for the Hills Centre Station described in **Table 6.2**.
- A move to an alignment that abuts the eastern side of the North West T-way, reducing construction impacts and optimising the construction footprint in the Balmoral Road precinct.

6.3 Strategic context in relation to modification

The strategic context for the NWRL project has been established through the Concept Plan Approval. Chapter 2 of this EIS updates the strategic context and identifies NSW 2021 (State Plan) and the metropolitan planning context for Sydney as the key guides to the direction of development in NSW and Sydney.

This planning emphasises access and transport related goals based on attractive public transport integrated with land use, as well as protection and enhancement of local environments and communities.

The following section describes how the proposed modifications to the project align and contribute to this strategic context.

6.3.1 North West Rail Link definition

The proposed modification confirms the definition of the project as a heavy rail line integrated with the existing CityRail network. This provides existing and future development in north west Sydney with better access to CityRail network, increasing the attractiveness and uptake of the rail service.

6.3.2 Relocate Kellyville Station

The relocation of Kellyville station enhances the attractiveness of NWRL, integrates with land use and other transport services and responds to community issues by:

- Providing additional park and ride capacity to serve North Kellyville, Beaumont Hills, Stanhope Gardens and development within the North West Growth Centre.
- Providing for additional interchange with North-West T-way bus services along Windsor Road including North Kellyville and Blacktown services.
- Responding to public submissions to the Project Overview Report calling for the provision of a station at Samantha Riley Drive at upon project opening.

The relocation of Kellyville Station and the addition of Bella Vista and Cudgegong Road Stations would also allow for an additional 1,000 park and ride spaces across the NWRL.

6.3.3 Provide for additional stations at Bella Vista and Cudgegong Road

The addition of Bella Vista Station at the northern end of Norwest Business Park would increase the attractiveness of NWRL for commuters, integrate with existing and potential future land uses as well as with other transport services, and respond to community and stakeholder issues by:

- Providing a rail station within walking distance of an additional 13,600 jobs supporting continued growth of the Norwest Business Park which is a specialised employment centre with a jobs target of 30,000 by 2036.
- Increasing the catchment of residents with good access to the NWRL (within the walking catchment) by approximately 16,000 people.
- Delivering additional park and ride facilities to serve Bella Vista, Kellyville, Beaumont Hills and Stanhope Gardens.
- Providing a catalyst for a high quality development surrounding the new station, comprising a mix of residential and commercial supporting the Balmoral Road release area.
- Allowing a northern extension of the central road spine of the Norwest Business Park, into the Balmoral Road precinct, providing improved local road access.
- Allowing enhanced bus services to operate between Blacktown and Castle Hill via the central spine of both precincts of Norwest Business Park (interchanging with Norwest and Bella Vista stations).
- Addressing stakeholder submissions requesting an additional station located in the Norwest Business Park.

6.3.4 Modifications to location of Hills Centre

The minor modifications to the location of Hills Centre Station would provide better environmental and community outcomes and integrate with land use and existing transport services by:

- Avoiding potential impacts on Cattai Creek
- Limiting impacts on the Castle Hill Showground
- Integrating the station with surrounding residential suburbs
- Integrating with existing bus services on Carrington Road.

6.3.5 Area 20 Precinct alignment modifications

More than 200,000 extra people will move into the North West Growth Centre over the next 40 years, taking the region's population above 600,000.

In 2007, the draft North West Subregional Strategy (Action NW D1.1.2), prepared by the Department of Planning identified the need to investigate options to extend the planned NWRL beyond Rouse Hill Town Centre, possibly connecting to the Richmond Line, and to protect a future corridor if appropriate.

As the NWRL has been developed, options for extending transport beyond Rouse Hill Town Centre into the North West Growth Centre area have also been investigated. These options have included heavy rail, "metro style" rail extensions, bus transitways and increased park and ride spaces on the NWRL.

The assessment of these extension options has concluded that there is merit in extending the NWRL beyond the Rouse Hill Town Centre to provide a new station with park and ride facilities of up 1,200 spaces west of Windsor Road. This would reduce traffic demand on Windsor Road, for commuters driving to work, and those driving to Kellyville Station (which is a park and ride station location proposed for the NWRL). It would also allow for the establishment of a long term train stabling facility compared with only a temporary stabling facility approved as part of the earlier scheme.

As a result of the options evaluation, further investigations were completed to refine a corridor within the North West Growth Centre for future design development and investigation.

This decision was planned for, assessed and publicly exhibited as part of the Area 20 Precinct Planning process undertaken in accordance with the Growth Centres State Environmental Planning Policy.

As discussed further in Section 6.15, Transport for NSW is also investigating long term transport corridors beyond Area 20.

6.3.6 Vertical alignment modifications between Bella Vista and Rouse Hill

The vertical alignment modifications between Bella Vista and Rouse Hill would provide better environmental and land use outcomes as well as value for money, by:

- Limiting the extent of the project on the floodplain and thereby reducing potential flood risks associated with the project
- Reducing the direct impact of the project on land take and severance of land holding
- More efficient use of land by changing the alignment to more closely follow the Windsor Road corridor
- Reducing the length of the alignment in tunnel with related costs savings.

6.3.7 Horizontal alignment modifications

To support the changes described above, minor changes to the horizontal alignment are required between Castle Hill and Hills Centre Stations, from the planned Bella Vista Station to the Old Windsor Road/Windsor Road intersection, and within Area 20.

6.4 Consultation

The approach to consultation for NWRL has been discussed in Chapter 5.

Since December 2011, further consultation has been undertaken with local councils and other key stakeholders which has specifically addressed the proposed changes to the project as identified in the application to modify the Staged Infrastructure Approval. Importantly, local councils and Councillors have been specifically consulted on potential impacts associated with the modifications and the proposed staged assessment approach.

These are also summarised and analysed in Chapter 5.

6.5 Changes to Environmental Impact

The changed or additional environmental impacts associated with the proposed modifications for the Staged Infrastructure Approval at a conceptual level are identified in this section. The Staged Infrastructure Approval addressed environmental impacts during construction and operation. The discussion on changed or additional environmental impacts also addresses construction and operation. However, the information to support operational impacts is preliminary and will be updated in EIS 2 which is currently being prepared.

To determine these changed or additional impacts the following was undertaken:

- Consideration of each modification against a list of environmental categories to identify whether there would be a potential change in environmental impact compared to the approved project.
- Determination of whether the identified potential change in environmental impact is significant and warrant further discussion.

The environmental categories considered include:

- Land use, property and infrastructure
- Traffic, transport, parking and access
- Noise and vibration
- Flora and fauna
- Spoil
- Indigenous Heritage
- European Heritage
- Geology, geotechnical and groundwater
- Hydrology and surface water
- Visual, landscape and urban design
- Social and economic
- Utilities
- Air quality
- General waste management

The modifications would not give rise to significant changes to Indigenous and European Heritage, Geology, Geotechnical and Groundwater, Utilities, Air Quality and General Waste Management.

Table 6.4 identifies changes in environmental impacts associated with the proposed modifications. In areas where there is potential for a significant change in environmental impact further assessment was carried out as discussed in Section 6.6 to Section 6.13. In addition Section 6.14 discusses the proposed modification as it relates to Area 20.

For each key environmental category identified, the following is provided:

- A summary of potential impacts associated with the 2008 Staged Infrastructure Approval.
- Consideration of any significant changes or additional impacts (as identified in **Table 6.3**) as a result of the proposed modifications to the Staged Infrastructure Approval.

Table 6.4 Change in environmental impacts associated with the proposed modifications to the Staged Infrastructure Approval

(✓ = significant change, x = no significant change)

Proposed Modification to the SSI Approval	Environmental Category							
	Land use, property and infrastructure (refer S 6.6)	Traffic, transport, parking and access (refer s 6.7)	Noise and vibration (refer s 6.8)	Flora and fauna (refer s 6.9)	Spoil (refer s 6.10)	Hydrology and surface water (refer s 6.11)	Visual, landscape and urban design (refer s 6.12)	Social and economic (refer s 6.13)
CONSTRUCTION								
Relocate Kellyville Station	x	✓	✓	x	✓	✓	x	✓
Provide an additional station at Bella Vista	✓	✓	✓	x	✓	✓	✓	✓
Provide an additional station at Cudgegong Road	✓	✓	✓	✓	✓	✓	✓	✓
Minor change to the location of Hills Centre Station	✓	x	x	✓	x	✓	x	✓
Area 20 Precinct alignment modifications	✓	✓	✓	✓	✓	✓	✓	✓
Vertical alignment modifications	✓	x	x	x	✓	✓	✓	x
Horizontal alignment modifications	x	x	x	x	x	x	x	x
OPERATION								
Relocate Kellyville Station	✓	✓	✓	x	x	✓	✓	✓

Provide an additional station at Bella Vista	✓	✓	✓	x	x	x	✓	✓
Provide an additional station at Cudgegong Road	✓	✓	✓	x	x	✓	✓	✓
Minor change to the location of Hills Centre Station	x	x	x	x	x	x	x	x
Area 20 Precinct alignment modifications	✓	✓	✓	x	x	✓	✓	✓
Vertical alignment modifications	✓	x	✓	x	x	✓	✓	x
Horizontal alignment modifications	✓	x	x	x	x	x	x	x

6.6 Land use, property and infrastructure

6.6.1 Approved Staged Infrastructure – construction

Key construction land use impacts identified in the approved stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- The assessment identified impacts on Caste Hill Showground buildings and the need to relocate these. It also noted the potential use of the Council Depot Site which would be the subject of further discussion with the Council.
- Changes in land use as a result of the Balmoral Road construction site were also identified, with a change from a rural setting to a construction site for the duration of the construction period, at a time when surrounding areas may be undergoing development.
- The assessment identified the need to integrate the construction of the Rouse Hill station with the requirements of an operating and growing town centre.
- The assessment identified a change in existing rural land uses as a result of the construction of the stabling yard, as well as changes to planned future urban residential land uses. It noted the need to consider how future development plans could accommodate land uses sympathetic to a stabling facility.

6.6.2 Approved Staged Infrastructure – operation

Key operational land use impacts identified in the approved stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- The assessment noted the introduction of new transit oriented land uses at Hills Centre Station and the potential to complement existing and future land uses in the area.
- At Kellyville Station (Burns Road) the introduction of new transit oriented land uses was noted as well as the potential for the station to act as a catalyst for residential and commercial development in the station and pedestrian catchment area.
- The assessment identified a change in existing rural land uses as a result of the provision of the stabling yard, as well as changes to planned future urban residential land uses. It noted the need to consider how future development plans could accommodate land uses sympathetic to a stabling facility.

6.6.3 Modified Staged Infrastructure – construction

Key construction land use impacts identified in the modified stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- The construction footprint for the Hills Centre Station site would require the Council depot, car parks associated with the Hills Centre and part of the Castle Hills showground.
- Construction of Bella Vista Station would require the demolition of the Totally Home Centre bulky goods retail complex.
- The footprint of the Balmoral Road construction site is closer to Old Windsor Road resulting in reduced impact to existing and future residential land uses to the east.
- Surface construction sites to accommodate viaduct construction would have an impact on surrounding residential, rural and commercial land uses.
- Construction of the alignment, station and stabling yard through Area 20 would impact on the existing rural and residential land uses and planned future urban residential land uses.

6.6.4 Modified Staged Infrastructure – operation

Key operational land use impacts identified in the modified stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- The provision of additional stations and changed locations of existing stations provides an opportunity to integrate existing and planned future development with transit provision.
- Area 20 planning should consider how future development plans could accommodate land uses sympathetic to a stabling facility.

6.6.5 Summary of changes to impact

Overall, potential land use impacts during both construction and operation are considered largely positive, including:

- Provision of a new station at Bella Vista Station would require the acquisition of the Totally Home Centre.
- Provision of a new station at Bella Vista and the relocated Kellyville Station, would act as a catalyst for residential and commercial development in the Balmoral Road Release Area, and the integration of these stations with their surrounding land uses.
- Provision of a new station at Cudgegong Road would have a positive impact on facilitating transit orientated development and commercial land uses around the station.

- The proposed change in vertical alignment between Bella Vista and Rouse Hill (approximately 4.2km viaduct) would create new land use opportunities along this section of the rail corridor.
- Change in the horizontal alignment that abuts the eastern side of the North West Transit-way would reduce the footprint required for operation of the project and increase land available for development in the Balmoral Road precinct.

Notwithstanding, some additional property impacts are expected, including:

- The change to the location of the Hills Centre Station would require acquisition of the Council's depot and part of the car park of The Hills Centre.
- The new westerly alignment through the Area 20 precinct, including Cudgegong Road Station would require additional land take in the vicinity of Schofields Road.

These impacts, which arise due to the major civil construction works, are assessed in this EIS. Significant additional property impacts are not anticipated as part of the construction of stations, rail infrastructure and systems.

6.7 Traffic, transport, parking and access

6.7.1 Approved Staged Infrastructure – construction impacts

Key construction traffic impacts identified in the approved stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- **Hills Centre construction site**
  - Access to the site was provided from Doran Drive, which is the main route for accessing the Council Depot, Showground and Hills Centre. The assessment identified a potential impact on the operation of the Doran Drive and Carrington Road intersection as a result of the movement of construction vehicles and identified the need for further assessment.
  - Spoil truck access was provided by an access route directly onto Showground Road. Different estimates of spoil truck movements were provided because of the staged delivery option, which if chosen, would significant increase the number of spoil truck movements at this site.
  - Identified as a potential tunnel support site (spoil removal).

- **Kellyville Station construction site**
  - Servicing of construction activities for this site was provided through the Balmoral Road site with related truck movement reflected in the overall numbers for the Balmoral Road site.
  - Additional traffic from construction activities were estimated to impact on the operations of the Sunnyholt Road/Burns Road and Old Windsor Road junction, but the need for further investigation was identified.
  - Potential impacts on North-West T-way operations were identified at this site.

- **Rouse Hill Station construction site**
  - Significant truck movements associated with spoil removal. Spoil quantities include the station site and spoil from excavations between Rouse Hill and Samantha Riley Drive.
  - Access to the site could be incorporated with the existing signalised intersection of Windsor Road and Schofields Road, which would provide direct access on to Windsor Road. The need for further investigations to identify the impacts on this intersection was identified.

- Construction works would be undertaken beneath the North-West T-Way corridor and the need for temporary deviations around the cut and cover sections was identified, as well as modification of the Rouse Hill T-way interchange to integrate with Rouse Hill Station.

❖ **Rouse Hill Stabling Yard construction site**

- The station would be constructed below the existing T-way interchange requiring relocation of the interchange for the duration of the works.
- Significant truck movements associated with spoil removal.
- Access to the site would be provided through the Rouse Hill/Windsor Road signalised intersection. The need for further investigation into the impact of additional construction traffic on this intersection was identified.

6.7.2 Approved Staged Infrastructure – operational impacts

Key operational traffic impacts identified in the approved stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

❖ **Kellyville Road Station**

- An increase in the number of local traffic movements and potential for congestion, the extent of which would be largely determined by the capacity and access arrangements of the park and ride facility and the design of the future road network

❖ **Rouse Hill Station**

- Given the location of the station beside the Rouse Hill Town Centre, the need to prioritise integration between pedestrian, bus and cycle movements and between land uses and the transport interchange, was identified.

6.7.3 Modified Staged Infrastructure – construction impacts

Key construction traffic impacts identified in this assessment and relevant to the modifications, include:

❖ **Hills Centre construction site**

- Heavy vehicle construction traffic would be concentrated on the new Showground Road access limiting the impact on Carrington Road.
- The four bus routes operating along Showground Road, Carrington Road and Victoria Avenue in the vicinity of the worksites would not need to be re-routed.
- Approximately 200 off-street parking spaces contained in the Hills Centre car park would be lost during construction.
- Identified as a tunnel support site.

❖ **Bella Vista construction site**

- Additional construction traffic would result in an increase in traffic at the Old Windsor Road/Celebration intersection, with a drop in the Level of Service (LOS) in the PM peak (Level of Service is a measure used by traffic engineers to determine the effectiveness of elements of transportation infrastructure. Further information is provided in Chapter 9). At the Lexington Drive/Celebration Drive roundabout, additional traffic would result in a drop in LOS in the PM peak. The provision of two eastbound lanes on the approach to the intersection and replacement of the roundabout with traffic signals would be required as part of the construction works.

- The 522 off-street car parking spaces in the Totally Home Centre would be lost as a result of construction, however, this parking would no longer be required for staff and customer parking when the Centre is closed.

❖ **Kellyville Station construction site**

- Additional traffic as a result of construction activities would result in a drop in LOS at the Old Windsor Road/Samantha Riley Drive intersection in the PM peak.
- A portion of the Riley North-West T-way station car park would need to be relocated to accommodate the construction site.

❖ **Rouse Hill Station construction site**

- The station would be constructed above the existing North-West T-way interchange requiring relocation of the interchange for the duration of the works. It is anticipated that the bus stops would be relocated to the adjoining service road, Tempus Street, with new bus stops established on the eastern side of the street.
- Informal east west pedestrian routes through the existing North-West T-way interchange would be lost during construction. Pedestrians would be redirected via either Rouse Hill Drive or White Hart Drive, a diversion of approximately 200m.

❖ **Schofields Road construction sites**

- Includes an eastern site between Windsor Road and Cudgegong Road and a western site between Cudgegong Road and Hambledon Road. Construction traffic will result in some disruption to local road networks. In addition, construction works are planned to commence in 2012 on an upgrade to Stage 1 of Schofields Road (the eastern section between Windsor Road and Tallawong Road), located in close proximity to the NWRL construction sites.

6.7.4 Modified Staged Infrastructure – operational impacts

Station precinct planning is currently underway with a focus on integrating precincts with surrounding land uses and transport services. Precinct planning will be assessed as part of the second EIS, however, the following initial comments can be made that are relevant to the proposed modifications:

❖ **Hills Centre Station**

- The proposed station location has the potential to service an existing walk up catchment, with potential high take up of public transport in the area. Initial urban design analysis has identified pedestrian access from north across Showground Road and from the employment area to the west as a design issue to be resolved.
- Park and ride facilities will be provided at the station (approximately 600). The impact of commuter traffic on the local road network requires further investigation.

❖ **Bella Vista Station**

- The proposed location is adjoining a key access road (Celebration Drive)
- The station serves an existing walk up residential catchment. Initial urban design analysis has identified pedestrian access from residential areas to west of the station across Old Windsor Road as a design issues to be resolved.
- Park and ride facilities will be provided at the station (approximately 800). The impact of commuter traffic on the local road network requires further investigation.

❖ **Kellyville Station**

- The proposed station adjoins North-West T-way providing opportunity for interchange between transport modes.
- It will serve existing walk up residential and future residential and potentially employment uses. Initial urban design analysis has identified pedestrian access from residential areas to west of the station across Old Windsor Road as a design issues to be resolved.
- Park and ride facilities will be provided at the station (approximately 1,360). The impact of commuter traffic on the local road network requires further investigation in EIS 2.

❖ **Rouse Hill Station**

- The proposed station is located in Rouse Hill Town Centre with street based access and the centre was designed to accommodate the station. It serves existing and future walk up residential and existing and future employment. Improving access across Windsor Road is a challenge. Access across Windsor Road is a design issue to be resolved.
- It adjoins the North-west T-way providing opportunity for interchange between modes.

❖ **Cudgegong Road Station**

- The proposed station is located on Cudgegong Road, a significant link road for the surrounding area.
- The station is located in a greenfield site which is expected to experience strong growth in the next decade, serving as a future walk up residential catchment.
- Further design development will address the issue of access from Area 20 to the east of the station and across Schofields Road.
- Park and ride facilities will be provided at the station (approximately 1,000). The impact of commuter traffic on the local road network requires further investigation in EIS 2.

6.7.5 Summary of changes to impact

Overall, potential construction traffic impacts are considered comparable to those described in the 2008 Staged Infrastructure Approval. The most significant construction impacts would clearly be associated with the major civil construction works, which are further assessed in this EIS, including specific issues such as:

❖ Reduced impact on the Doran Drive/Carrington Road intersection at Hills Centre construction site as a heavy vehicle access would be provided on to Showground Road.

❖ Additional construction traffic as a result of Bella Vista station construction with impacts on nearby road intersections.

❖ Reduced additional construction traffic on Memorial Avenue/Sunnyholt Road/Old Windsor Road intersection as a result of station construction activities no longer being undertaken in this location. The extended viaduct requires a dedicated viaduct pre-cast facility at Memorial Avenue which would lead to increased traffic in this area.

❖ Reduced construction traffic volumes at the Rouse Hill construction site as there would no longer be spoil generation excavation and tunnelling activities owing to the construction of the extended viaduct.

❖ New construction traffic as a result of new construction sites in Schofield Road.

Operational traffic impacts would be addressed in EIS 2, however, the proposed modifications relate to operational traffic by providing additional stations and additional park and ride facilities and opportunities for integration of the project with the North-West T-way.

During operation of the NWRL it is expected that there would be a redistribution of traffic with Cherrybrook, Hills Centre, Bella Vista, Kellyville and Cudgegong stations providing park and ride facilities compared to the 2008 concept. This would have an effect on the regional distribution of traffic. In addition, bus networks would be modified to provide links from surrounding suburbs to the NWRL. The proposed Bella Vista, Kellyville and Cudgegong Road Stations would provide an alternative transport mode to the existing and future residents in the area.

The New Bella Vista Station and the relocated Kellyville Station would provide an opportunity for the rail line to attract existing and future populations from the wider catchment.

The planned addition of Bella Vista and Cudgegong Road Stations provides the opportunity to increase the provision of park and ride spaces by 1,000 (33%) across the NWRL project, targeted towards the western end of the line where projected population growth will generate the greatest demand. Importantly, it also allows parking spaces to be more evenly spread across three stations with good road access (Bella Vista, Kellyville and Cudgegong Road), thereby minimising operational traffic impacts on the surrounding road network compared with the previous provision of parking at only one station in the area, at Kellyville. Furthermore, the addition of Cudgegong Road Station, with 1,000 spaces, means that park and ride commuters from the NWGC beyond Rouse Hill will not be forced to drive along Windsor Road past Rouse Hill to access parking at Kellyville.

6.8 Noise and Vibration

6.8.1 Approved Staged Infrastructure – Construction noise and vibration impacts

A noise assessment was carried out at a conceptual level as part of the 2006 concept environmental assessment. Key construction noise and vibration impacts identified in this assessment, and relevant to the proposed modifications, included:

- At the Hills Centre Station construction site residential receptors were identified approximately 200m to the south. Impacts were predicted to be relatively minor with some exceedances of noise criteria where receptors had line-of-sight to the construction works.
- Construction works at the Balmoral Road site were predicted to impact on residential receptors on the western side of Old Windsor Road, located approximately 100 metres from the site boundary and 300 metres from the proposed tunnel portals. Residential receiver locations in Brighton Drive and Craigend Place (located approximately 100 metres to 150 metres from the tunnel portals and to the east of Windsor Road) were also identified as being potentially impacted by construction works. The assessment identified mitigation measures to substantially reduce the impacts of construction noise and vibration.
- Construction of the stabling facility was predicted to lead to exceedance of noise design goals at sensitive receptors between the facility and Windsor Road (to the east of the facility).

6.8.2 Approved Staged Infrastructure – Operational noise and vibration impacts

Key operational noise and vibration impacts identified in the 2006 noise and vibration assessment included:

- In relation to groundborne noise, the assessment concluded that the track within the tunnels could be designed to comply with the projects design goals. It also indicated that a more detailed assessment of the potential groundborne noise and vibration from the tunnel section would be undertaken at a later stage.
- Between Norwest Business Park and Rouse Hill, the assessment predicted that at certain locations where the track is at-grade, on embankment or on viaduct, noise mitigation in the form of barriers would be required to meet noise goals and residential receiver locations. South of Burns Road, where the project was located within a cut and cover tunnel, no operational airborne noise impacts were predicted.
- Stabling facility:
  - To the east of the stabling facility, noise emissions associated with facility operations, including brake testing and horn testing, were not predicted to have an impact on receptors as a result of their proximity to Windsor Road and existing exposure to road traffic noise emissions.
  - On the western side, facility operations including brake testing and horn testing were predicted to have an impact on sensitive receptors.

6.8.3 Modified Staged Infrastructure – Construction noise and vibration impacts

A detailed assessment of construction noise has been carried out and is documented in Chapter 10.

Key noise and vibration impacts identified in this assessment, and related to the project modifications, include:

- Hills Centre Station construction site: a number of commercial, recreation, and residential receptors were identified in close proximity to the construction site, including the Hills Centre for Performing Arts. Site establishment and station excavation activities are predicted to exceed Noise Management Levels (NMLs) at the Hills Centre for Performing Arts and the residential receptors to the south of the construction works.
- Bella Vista Station construction site and Balmoral Road pre-cast yard: a number of residential and commercial receptors are identified in close proximity as well as a Emmanuel Baptist Church. During site establishment at the station site and station box excavation, high exceedances of NMLs are predicted for the nearest residential receptors to the east, with minor exceedances at residential receptors to the west. During station box construction compliance with the noise criteria is predicted.
- Kellyville Station construction site: five residential receptors are identified in close proximity. Construction noise emissions comply with design goals except for minor exceedances at two receptors during site establishment and earthworks.

- Cudgegong Road Station and Tallawong Stabling Facility construction sites: a number of residential receptors are located in close proximity to the construction sites. Predicted noise levels indicate that during earthworks there would be moderate exceedances of NMLs at most of the surrounding areas. During station construction compliance is predicted at all areas except the area to the north east of the Cudgeong Road Station site.
- Surface track construction sites:
  - Bella Vista Station to Kellyville Station: a number of residential and commercial receptors are located in close proximity to these construction sites. Predicted noise levels indicate that during earthworks there are moderate exceedances of NMLs at the residential receptors which reduce after completion of earthworks.
  - Kellyville Station to Rouse Hill Station: residential, commercial and residential receptors are located in close proximity to these construction sites, as well as a Castlebrook Lawn Cemetery and Crematorium and a primary school. At residential receptors located east of Old Windsor Road between Windsor Road and Samantha Riley Drive, high exceedances of NMLs are predicted during earthworks, piling and viaduct section placement, as these receptors are located in close proximity to the works. At residential receptors east of Windsor Road between Bellcast Road and Sanctuary Drive high exceedances during earthworks, piling and viaduct section placement are predicted, as these receptors are located in close proximity to the works.
  - Rouse Hill Station to Cudgegong Road: commercial and residential receptors are located in close proximity to these construction sites, as well as a Castlebrook Lawn Cemetery and Crematorium. At residential receptors west of Windsor Road and north of the construction sites, high exceedances of NMLs during earthworks, piling and viaduct section placement are predicted, as residences are relatively close to the works.

6.8.4 Modified Staged Infrastructure – Operational noise and vibration impacts

An operational noise model (SoundPLAN Version 7) is being prepared for the project. The outputs of this analysis are indicative as a number of areas of detailed design are still being developed. A more detailed operational noise assessment will be provided in EIS 2.

The viaduct design will result in the tracks being elevated relative to the majority of existing receptors between Kellyville Station and the Rouse Hill area west of Windsor Road. In this situation, existing receptors will receive some shielding from the viaduct structure even in the absence of noise. The noise predictions for existing receptors are highly sensitive to the detailed design of the viaduct. The noise assessment forms an important input to the development of design options to reduce potential noise impacts if required.

The noise impacts of the proposed Tallawong Stabling Facility have been assessed with five residential receptors identified in close proximity to the facility. The key noise issues associated with the stabling facility include:

- Since the stabling facility will house only newer generation trains, the noise impacts of train arrivals at the facility will be minimal. These trains can be stabled powered off without auxiliary equipment operating.
- The worst-case noise impacts of the facility will be concentrated in the early morning period (between 4:00 am and 7:00 am) when trains are preparing to depart the facility and noise criteria are more stringent than during the daytime and evening.

- During train preparation, all auxiliary equipment is conservatively assumed to be operating under full load for up to an hour prior to departure.
- The noise impact assessment indicates that train air-conditioning noise has the potential to result in exceedances of the Industrial Noise Policy intrusiveness noise goals at existing residential receptors in a worst-case scenario between 4:00 am and 7:00 am.
- However, there are a number of factors that indicate that this worst-case scenario will only occur rarely, once a week or less and then only if all trains undergoing preparation require full air-conditioning at the same time. On this basis mitigation of air-conditioning noise is unlikely to be required.
- Noise from brake testing is predicted to exceed the sleep disturbance screening criterion, however the predicted noise levels and the existing noise environment, indicate that brake testing is unlikely to cause awakening reactions at the worst-affected existing receptors.
- Noise from horn soundings at the facility has been identified as having the potential to cause sleep disturbance at nearby residences. A number of mitigation measures or alternate warning systems are being considered including noise barriers, partial enclosures, full enclosures, ground based warning systems and train based warning systems. A more detailed assessment of horn testing noise and proposed mitigation measures will be provided in EIS 2.
- Some specific exceedances may occur in the operational phase of the project between north of Bella Vista and Cudgegong Road Stations. However, several design options are feasible to reduce the potential noise impacts if required.

6.8.5 Summary of changes to impact as a result of modifications

Construction

A number of different receivers would be affected by construction noise and vibration as a result of the proposed modifications. However, the potential impacts remain consistent with those approved in the 2008 Staged Infrastructure Approval. Specific construction issues include:

- The construction site footprint for the Hills Centre station does not change significantly when compared to that shown in the Staged Infrastructure Approval. However, the location of the station and station excavation activities is further to the south within the construction footprint and therefore closer to residential and other receptors in the Carrington Road area.
- The alignment through the Balmoral Road Area, and the Balmoral Road construction site, are located closer to Old Windsor Road and therefore further away from residential receptors in Brighton Drive and Craigend Place.
- Station box excavation activities associated with the new Bella Vista station lead to noise impacts on adjacent residential receptors.
- Relocation of Kellyville Station removes a source of construction impact in this area (south of Burns Road and east of Windsor Road) associated specifically with the construction of the station. However, other construction activities associated with the Memorial Avenue and Balmoral Road construction sites will be a source of noise emissions in this area.
- Station construction activities at the new location for Kellyville Station (east of Windsor Road and south of Samantha Riley Drive) will present a new source of construction noise emission in this area.

- The introduction of new construction sites associated with a westerly alignment through Area 20 and a new station and stabling yard presents new sources of construction noise emissions in this area.
- The relocation of the stabling yard away from a location immediately west of Windsor Road removes a construction noise source in this area
- The extended viaduct between Kellyville Station and Rouse Hill will lead to a change in construction noise impacts associated with piling and viaduct section placement.

It is also noted that various guidelines which form the basis of noise and vibration assessments have changed, leading to the identification of new impacts.

Operation

A preliminary assessment of operational noise and vibration has been undertaken as part of the staged infrastructure modification. This enables a comparison of the operational noise and vibration impacts identified through the concept approval with impacts associated with the modified project. In some cases changes to impacts can be clearly linked to the proposed modifications to the NWRL project. In other cases the identified impacts are as a result of the more detailed assessment currently being undertaken and are not directly comparable to the concept approval assessment.

The viaduct will result in the tracks being elevated relative to the majority of existing receivers. In this situation, existing receivers will receive some shielding from the viaduct structure, even in the absence of noise barriers. The amount of shielding depends on the detailed design of the viaduct structure. For example, at existing receivers below the rail level, a narrower viaduct would provide less shielding than a wider viaduct. For the preliminary assessment, it is assumed that the viaduct edge will be level with the top of the rail as a minimum.

The noise predictions for existing receivers are highly sensitive to the detailed design of the viaduct structure. Several design options are feasible to reduce the potential noise impacts if required.

The detailed design of the viaduct is not available at this stage. A number of conceptual alternatives are under development. However, the design of the viaduct would enable the construction of noise barriers (if required) to mitigate potential exceedances of the noise trigger levels at existing and proposed sensitive receivers.

Operational noise and vibration impacts associated with the stabling yard in the location identified in the 2008 Staged Infrastructure Approval immediately west of Windsor Road would be avoided as a result of its relocation.

The westerly alignment through Area 20 including the elevated alignment over Windsor Road and the introduction of Cudgegong Road Station and Tallawong Stabling Facility, would lead to new operational noise and vibration impacts in this area.

The most significant of these relate to the operation of the stabling facility, including air conditioning units, brake testing and horn testing. In the case of horn testing, a number of mitigation measures or alternate warning systems are being considered.

A more detailed assessment of stabling facility related noise, including horn testing noise, and proposed mitigation measures will be provided in EIS 2.

6.9 Flora and Fauna

6.9.1 Approved Staged Infrastructure – construction impacts

Key construction ecology impacts identified in the approved staged infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Direct impact on Cattai Creek and associated riparian watercourse as a result of station construction activities within Hills Centre Station construction site
- Impact on potential threatened species habitat in the eastern portion of the Balmoral Road construction site.
- Impact on vegetation communities to east of Windsor Road where the viaduct structure returns to grade in the vicinity of Merriville Road.
- Potential impact on threatened fauna and vegetation communities adjacent to the Rouse Hill Stabling Yard.
- Potential impact on vegetation communities as a result of earthworks east of Windsor Road and north of the Old Windsor Road/Windsor Road junction
- Potential impact on vegetation communities east of Old Windsor Road between Balmoral Road and Samantha Riley Drive, as a result of a combination of cut and cover tunnel and earthworks.

6.9.2 Approved Staged Infrastructure – operational impacts

Key operational ecology impacts identified in the approved staged infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Operational noise from the above ground section of the project has the potential to impact on the surrounding environment, however, little is known of the impact of noise on most species. It may disturb birds and mammals, and may result in some roosting and foraging areas close to the alignment becoming unsuitable.
- Changes to the light regime as a result of the operation of the railway may change the way in which fauna use the surrounding area.

6.9.3 Modified Staged Infrastructure – construction impacts

Key construction ecology impacts identified in the modified staged infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- The relocation of the construction works within the Hills Centre construction site avoids impact on Cattai Creek and associated riparian corridor.
- Clearing of vegetation communities from the Bella Vista Station, Balmoral Road and Kellyville Station construction sites with potential impacts on threatened fauna.
- Potential for groundwater discharge from construction of Bella Vista station to Elizabeth Macarthur Creek
- Kellyville Station construction site would be located within the 50m buffer zone for Elizabeth Macarthur Creek, resulting in potential impact to riparian and aquatic habitats unless adequately managed.

- Impact on vegetation communities in Area 20 and Riverstone East precincts within the North West Growth Centre as a result of westerly alignment and construction of Cudgegong Road Station and Tallawong Stabling Facility.
- Impact on potential threatened fauna habitat as a result of construction of Tallawong Stabling Facility.

6.9.4 Modified Staged Infrastructure – operational impacts

Key construction ecology impacts identified in the modified staged infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Operational noise from the above ground section of the project has the potential to impact on the surrounding environment, however, little is known of the impact of noise on most species. It may disturb birds and mammals, and may result in some roosting and foraging areas close to the alignment becoming unsuitable.
- Changes to the light regime as a result of the operation of the railway may change the way in which fauna use the surrounding area.

6.9.5 Summary of changes to impact

Modifications to the Staged Infrastructure Approval would largely reduce ecological impacts compared to the 2008 concept, including through:

- Avoidance of direct impact to Cattai Creek and riparian vegetation as a result of relocation of station construction activities within Hills Centre Station construction site.
- Avoidance of direct impact on areas of vegetation communities and potential threatened species habitat to the east of the Balmoral Road construction site as a result of a narrower site and alignment closer to Old Windsor Road in this area.
- Reduced impact on vegetation communities to east of Windsor Road as a result of extension of the viaduct structure beyond Old Windsor Road/Windsor Road intersection to Rouse Hill.
- Avoidance of impacts on vegetation communities and potential threatened species habitat in the area immediately west of Windsor Road as a result of the relocation of the Rouse Hill Stabling Facility.

However, some additional impacts would occur, including:

- Impacts on vegetation communities and potential threatened species habitat in the Area 20 and Riverstone East precincts of the North West Growth Centre as a result of the westerly alignment and Cudgegong Road Station and Tallawong Road Stabling Facility. It is noted that the majority of this vegetation is certified for development under the Growth Centres Biodiversity Certification Order. A total of 0.50 ha of non-certified existing native vegetation would be impacted upon within Area 20, and will be offset as per the Growth Centres Biodiversity Certification Order requirements.
- Potential increase in operational impacts as a result of a greater extent of the alignment being located above ground with associated light and noise impacts on the surrounding environment.

The most significant ecological impacts would be associated with site preparation (clearing) for the major civil construction works, which are further assessed in this EIS. Residual ecological impacts due to construction of the stations, rail infrastructure and systems is expected to be negligible.

During operation of the project, potential impacts on flora and fauna, ecological communities and ecological processes would remain substantially similar to the 2008 concept.

6.10 Spoil

6.10.1 Approved Staged Infrastructure – construction impacts

Key construction spoil impacts identified in the approved staged infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Total spoil generation was estimated as 3.9 million cubic metres.
- Spoil from the TBM tunnel, cross passages would be substantially conveyed to the Balmoral Road construction site. Cherrybrook and Hills Centre were identified as potential tunnel excavation support sites (spoil removal).
- Excavated spoil from vertical access and ventilation shafts would be removed by truck directly from the respective ground level work sites.
- Excavated spoil from cut and cover sections would be removed by truck directly from construction sites.
- Excess excavated cut over fill for the surface railway construction would be removed by truck directly from the construction sites.
- A limited number of locations for on-site fill areas were identified as were locations for off-site reuse, as well as landfill sites including those that receive contaminated spoil. None of these locations was however confirmed in the approval.
- Average truck movements from removal of spoil from the Balmoral Road construction site would be in the order of 3,640 movements per week.
- Haulage by road was the preferred transport option using key roads that are designated B-double routes.

6.10.2 Modified Staged Infrastructure – construction impacts

Key construction spoil impacts identified in the modified staged infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Total spoil generation is estimated at 2.4 million cubic metres.
- Above ground civil works at Cudgegong Road and Tallawong Stabling Facility would generate spoil and related truck movements in this area.

6.10.3 Summary of changes to impact

Significant benefits with regard to spoil transportation and management are anticipated due to proposed modifications to the 2008 concept, including:

- Reduction in the overall volume of spoil as a result of significant sections of viaduct rather than tunnel.
- Relocation of Kellyville Station would reduce the volume of spoil generated as the station would become an elevated structure.

Some aspects of the modification would result in spoil being generated at different locations, particularly:

- Provision of a new retained open cut station at Bella Vista would generate additional volumes of spoil.
- Spoil related truck movements generated in new project areas in Area 20.

Spoil quantities, transport, management and disposal are primarily associated with the major civil construction works, which are further assessed in this EIS. Construction of the stations, rail infrastructure and systems is expected to produce much less spoil, although mitigation measures and waste management strategies will continue to be applied.

6.11 Hydrology and surface water

6.11.1 Approved Staged Infrastructure – construction impacts

Key construction hydrology and surface water impacts identified in the approved stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Potential impact on Cattai Creek as a result of the station construction activities at Hills Centre Station.
- Potential flood risk and pollution discharge to creek line as a result of the Balmoral Road construction area being located in the Elizabeth Macarthur Creek flood plain.
- At the location of the confluence of Caddies Creek, to the east of Sanctuary Drive, the assessment identifies the risk of flood impact on residential areas to the east as a result of the viaduct impacting on floodplain storage and obstruction to flows associated with piers and abutments.
- Potential flood risk as a result of cut and cover construction across the Tributary 4 creek line, north of the Old Windsor Road/Windsor Road intersection.
- Potential flood risk as a result of cut and cover construction across the Tributary 3 creek line, south of Rouse Hill Station.
- Potential flood risk to areas adjacent to the Rouse Hill Stabling Facility as a result of the station and the cut and cover tunnel being constructed in cutting at Second Ponds Creek.

6.11.2 Approved Staged Infrastructure – operational impacts

Key operational hydrology and surface water impacts identified in the approved stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Potential inundation of the Rouse Hill Stabling Facility and cut and cover tunnel as a result of being located on the edge of the Second Ponds Creek floodplain.

6.11.3 Modified Staged Infrastructure – construction impacts

Key construction hydrology and surface water impacts identified in the modified stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Potential flood risk to Bella Vista Station construction site and tunnel portals as a result of being located adjacent to Elizabeth Macarthur Creek.
- No flood risk predicted at the Balmoral Road construction site.
- The eastern fringe of the Kellyville Station construction site is affected by flooding from Elizabeth Macarthur Creek.
- Temporary works such as access roads to facilitate the construction of the viaduct will have the potential for greater flood impacts in comparison to the permanent structures, albeit the risk

exposure will be for a shorter period of time. Detailed flood risk modelling is being undertaken to inform the design of temporary works such as haul roads in flood prone areas.

- Potential flood risk to the construction to the east of Cudgegong Road because of its proximity to Second Ponds Creek. A bridge is proposed to span Second Ponds Creek with temporary access roads and working pads required to facilitate construction. Based on a detailed flood risk assessment, the bridge is not predicted to have an adverse flooding impact on Schofields Road. The temporary access road will have the potential for significant flood impacts, however, its design is still being developed and will be informed by flood modelling.
- Potential flood risk to the Cudgegong Road and Tallawong Road construction sites as a result of proximity to the First Ponds Creek tributary on the western edge of the site.

6.11.4 Modified Staged Infrastructure – operational impacts

Key operation hydrology and surface water impacts identified in the modified stage infrastructure assessment and relevant to consideration of changes to impacts associated with the modification, include:

- Flood risk assessment for the permanent viaduct structure was undertaken for two locations where the viaduct abutments and pier are located in the floodplain – at the confluence of Caddies Creek to the east of Sanctuary Drive, and Tributaries 3 and 4 located immediately to the east of Windsor Road between Merriville Road and Rouse Hill Station. At the Caddies Creek location, potential flood risk on adjacent residential properties were identified but these can be mitigated through incorporation of appropriate flood protection. No significant impacts were identified for Tributaries 3 and 4.

6.11.5 Summary of changes to impact

Overall, potential hydrology and surface water impacts would be reduced as a result of the proposed modifications, including:

- Reduced risk of impact on Cattai Creek as a result of relocation of station construction activities within the southern section of the Hills Centre Station construction site
- Reduced risk of flood impact as a result of the reduced size of the Balmoral Road construction site and its location closer to Windsor Road and further away from Elizabeth Macarthur Creek.
- Change in flood risk as a result of the new viaduct section beyond Old Windsor Road/Windsor Road intersection replacing sections of cut and cover tunnel. The viaduct abutments and piles present less of a flood risk than the cut and cover tunnel construction, however, there is a significant flood risk from temporary works to support viaduct construction such as haul roads. This risk will be subject to further assessment which will inform the design of temporary works.
- Flood risk related to the Rouse Hill Stabling Facility is removed.

Two additional risks have been identified, which can be adequately managed:

- Potential for flood impact on Bella Vista construction site and tunnel portals because of their location in close proximity to Elizabeth Macarthur Creek
- Potential for flood risks to construction sites at Cudgegong Road Station and Tallawong Stabling Facility including the construction of a crossing over Second Ponds Creek.

Both the major civil construction works and construction of the stations, rail infrastructure and systems would be subject to robust mitigation measures described in this EIS.

6.12 Visual impacts, landscape and urban design

6.12.1 Approved Staged Infrastructure – construction

The key construction impacts identified in the approved staged infrastructure assessment and relevant to the project modifications, include:

- At the Hills Centre construction site, visual and amenity impacts are not considered to be significant.
- The assessment identified the potential impact of construction activities on the existing development in the Balmoral Road area as well as future development forming part of the Balmoral Road Release Area with potential impacts on views from these areas looking east towards the construction site. In some cases views are obstructed by vegetation along Elizabeth Macarthur Creek.
- Loss of amenity as a result of removal of tress was identified as an impact in the Burns Road Area resulting from the construction of the Kellyville Station.
- Visual impact associated with elevated sections of the rail line – on embankment and viaduct – between Kellyville Station and Rouse Hill were identified. The location of the rail line alongside Windsor Road partly mitigates these impacts by locating the project in an existing arterial transport corridor.
- Visual impacts associated with the Rouse Hill Stabling Yard were identified, including potential impacts on future Area 20 development. The location of the yard in close proximity to Old Windsor Road minimised the potential visual impact on future development.

6.12.2 Approved Staged Infrastructure – operation

The key operational impacts identified in the approved staged infrastructure assessment and relevant to the project modifications, include:

- The assessment identified opportunities to integrate existing and future land use with transit at each of the six station locations. The role of Kellyville and Rouse Hill Stations in supporting future land release and development at Balmoral Road Release Area, Rouse Hill Town Centre and Area 20 was also identified.
- The visual impact of the rail line between Kellyville and Old Windsor Road/Windsor Road intersection was assessed as medium due to the rail line being elevated on earthworks and viaduct for parts of this section. The assessment notes a large number of existing residents in the visual catchment zone in close proximity to the route and recommends that their view of the rail line be mitigated by retention of existing vegetation reinforced with new planting.
- The assessment notes that the stabling yard, located in cutting and close to Old Windsor Road, would be mostly disguised from the existing semi-rural landscape and in keeping with the adjoining rail corridor.

6.12.3 Modified Staged Infrastructure – construction

- The relocation of the Hills Centre station results in the main construction activities moving to the southern portion of the construction site and closer to residential areas on Carrington Road. The acoustic shed would become visually dominant from the Ashford Avenue and Carrington Road

areas. It would also dominant views from The Hills Shire Council Administration Centre and Hills Centre for Performing Arts to the east of the construction site.

- Station construction activities associated with Bella Vista Station would lead to visual impact on surrounding receptors. Demolition of the Totally Home Centre changes the views from all directions. The acoustic shed would be visible from Windsor Road as well as rural residential properties to the east.
- The modified alignment and related construction sites are closer to Old Windsor Road through the Balmoral Road area, reducing visual and amenity impacts on existing and future development in the area.
- While Kellyville Station is no longer being constructed in Burns Road, the related amenity impacts due to tree loss are still applicable as the Memorial Avenue pre-cast yard extends into the same area.
- Construction of Kellyville Station at the Samantha Riley Drive location would require a workshop and storage facilities at the south eastern end of the site, with impacts on views from residential areas to the east (Arnold Avenue). This impact would be mitigated by vegetation buffers at Elizabeth Macarthur Creek.
- Extension of the viaduct construction beyond the Old Windsor Road/Windsor Road junction to Rouse Hill will result in visual impact on surrounding areas. This would result from vegetation clearing, site establishment and construction of the viaduct:
    - Residential properties in the vicinity of Sanctuary Drive would experience visual impacts as a result of construction, diminishing with distance from the intersection with Windsor Road.
    - Apartments between Kilbenny Street and Windsor Road would experience a significant change in visual amenity due construction activities.
    - The residential area of Kellyville Ridge has in some locations a broad elevated view to the east across the construction site to Beaumont Hills Beyond. The construction would be visible to this view but partly obstructed by intervening vegetation and buildings.
    - The Merriville Road commercial area including the Ettamogah Pub would experience a considerable change in the amenity of views towards the site as vegetation is removed and replaced by the construction site.
    - Mungerie House is located directly adjacent to the worksite. Due to the considerable change in visual amenity at this location as a result of construction activities, views from Mungerie House would be impacted.
    - Views from the Castlebrook Lawn Cemetery would undergo a noticeable reduction in their character due to the elevated and open nature of the site. These views would include a number of construction sites that would read as one large construction site within a broad panoramic view of 180 degrees.
- Construction at Cudgegong Road station would impact on the visual amenity of residential properties located along Cudgegong, Terry and Schofields Roads as well as receptors in the OK Caravan Park off Terry Road.
- Construction at Tallawong Stabling Facility would impact on the visual amenity of residential properties located along Tallawong Road, particularly from Macquarie Road north west.

6.12.4 Modified Staged Infrastructure – operation

The key operational impacts identified in the modified staged infrastructure assessment and relevant to the project modifications, include:

- The addition of two new stations and changes to the locations of other stations provides an opportunity to further integrate existing and future land uses with transit provision. This is the subject on an ongoing urban design process will be presented and assessed in EIS 2.
- The permanent establishment of the viaduct structure over an extended length between Kellyville and Rouse Hill and the operation of the railway results in visual impacts for a number of receptors along this section.
- Extension of the rail alignment west through Area 20 introduces a source of visual impact into this area.

6.12.5 Summary of changes to impact

Overall, construction impacts would be consistent with the 2008 concept in that (temporary) major construction sites would be required over significant periods of time for both the major civil construction works and construction of the stations, rail infrastructure and systems.

The key changes to visual aspect during construction as a result of the proposed project modifications are likely occur at:

- Residential receptors south of the Hills Centre station along Carrington Road as a result of the relocation of the main construction activity, including acoustic shed, to the southern portion of the site.
- Receptors located in proximity to the Bella Vista Station construction site as a result of station construction activities including the incorporation of an acoustic shed.
- Receptors east and west of Old Windsor Road/Windsor Road between the Old Windsor Road/ Windsor Road junction and Rouse Hill as a result of the extended viaduct construction beyond Old Windsor Road/Windsor Road junction to Rouse Hill.
- Receptors in the Area 20 Precinct as a result of the new alignment, station and stabling yard through this area.

There would be a reduced visual impact on existing (and future) residential areas in the Balmoral Road Release Area because of an alignment and construction site closer to Old Windsor Road.

The new stations and rail infrastructure, particularly the viaduct, would introduce significant change to the visual environment in the following locations:

- receptors east and west of Old Windsor Road/Windsor Road between the Old Windsor Road/ Windsor Road junction and Rouse Hill as a result of the extended viaduct construction to Rouse Hill. Impact to the same receptors as a result of the permanent establishment of the viaduct and train operations.
- receptors in the Area 20 Precinct as a result of the new alignment, station and stabling yard through this area. The introduction of Cudgegong Road Station provides an opportunity to integrate existing and future development with transit provision in this area. These visual aspects were considered and assessed during the Precinct Planning process for Area 20.

It is noted that the planned Bella Vista Station would not be visible to nearby residential areas.

The design and architectural elements of the viaduct are still being developed. However, to mitigate potential visual impacts, clear design principles would be confirmed as part of the assessment of the stations, rail infrastructure and systems. Typical design principles would ensure that the viaduct would:

- be of exceptional architectural and engineering design,
- sit within a landscaped corridor,
- be part of a continuum of spatial experiences heightening the enjoyment of customers and enriching the journey,
- provide a positive contribution to the local landscape
- optimise east / west connectivity across the corridor
- strengthen and enhance the existing landscape patterns experienced along the route.
- use a consistent approach to engineering and architectural components to provide a unified design solution to enhance visual unity and clarity,
- apply anti-graffiti finishes to all masonry surfaces.

6.13 Social and economic

6.13.1 Approved Staged Infrastructure – construction

The key construction impacts identified in the Approved Staged Infrastructure assessment and relevant to the project modifications, include:

- Increase in business activity as a result of demand for goods and services by the construction workforce.
- Disruptions to businesses in the vicinity of the construction sites due to alterations to access arrangements.

6.13.2 Approved Staged Infrastructure – operation

The key operational impacts identified in the Approved Staged Infrastructure assessment and relevant to the project modifications, include:

- Increase in business activity as a result of increased visitation to areas in the vicinity of stations by commuters.
- Increase in business activity as a result of development triggered by the presence of a station and transit service.

6.13.3 Modified Staged Infrastructure – construction

The key construction impacts identified in the Modified Staged Infrastructure assessment and relevant to the project modifications, include:

- The addition of Bella Vista Station involves demolition of the Totally Home Centre with the loss of business premises.
- Construction activities associated with Kellyville Station would potentially result in disruption to local businesses.

- The addition of Cudgegong Road Station will lead to disruption in the vicinity of the construction site, however, the area is predominantly rural residential with no businesses identified.

6.13.4 Modified Staged Infrastructure – operation

The key operational impacts identified in the Modified Staged Infrastructure assessment and relevant to the project modifications, include:

- Increase in business activity as a result of increased visitation to areas in the vicinity of stations by commuters. The addition of two new stations enhances this effect.

6.13.5 Summary of impacts

Overall, potential social and economic impacts are considered comparable to those described in the 2008 Staged Infrastructure Approval. The most significant construction impacts would clearly be associated with the major civil construction works, which are further assessed in this EIS, including specific issues such as:

- Relocation of Kellyville Station and provision of a new station at Bella Vista would potentially impact local businesses in close proximity to the construction sites.
- The change in location of the Hill Centre Station would have the benefit of being located further away from Castle Hill Showground reducing the impact on this facility.
- The modified project would provide an additional station at Bella Vista at the location of the Totally Home Centre, leading to its demolition and impacts on local business.
- During operation, the provision of a new station at Bella Vista would provide access to the northern end of the western precinct of Norwest Business Park, a specialised centre.
- Relocation of Kellyville Station and provision of Cudgegong Road Station would serve as a catalyst for new business opportunities near the stations.

6.14 Consideration of the Area 20 Precinct

Area 20 has been identified for early development in the North West Growth Centre. It is located to the west of the Rouse Hill Town Centre and comprises an area of approximately 245ha. It is anticipated to support about 2,400 dwellings of various types and density, and could accommodate approximately 6,400 people. At present, the site primarily consists of rural land uses and also contains areas of remnant bushland and a creek corridor. Following draft layout plans and community consultation from which the original plans were amended, Area 20 was rezoned for urban development in October 2011. The rezoning provides for:

- The proposed NWRL corridor, railway station, and commuter car park and supporting facilities.
- A village centre to be linked to the railway station.
- A six hectare light industrial area on land near the railway.
- Approximately 19 hectares of local open space for recreation and sports.
- Protection of areas of environmental importance, native vegetation and flood prone land.

A map of the Area 20 Precinct Plan, incorporating the NWRL corridor, is shown in **Figure 6.6**.

The NWRL announcement made by NSW State Government on 12 December 2011 confirmed a viaduct alignment through the eastern portion of Area 20 in the vicinity of Windsor Road and Schofields Road. Current land use zoning in the area assumes an underground rail tunnel with

planned open space and residential development over the rail alignment. As a consequence, ongoing precinct planning for Area 20 would need to respond to the viaduct alignment.

The NWRL Project Team has held a number of meetings with the DP&I regarding the integration of the NWRL with the Area 20 Precinct Plan. An area surrounding the proposed Cudgegong Road station was deferred from the Development Control Plan (DCP) for Area 20 to allow further work to be carried out to integrate the North West Rail Link station with the precinct plan for the area. Further design workshops will be held with TfNSW, DP&I and Blacktown City Council to further develop the precinct planning around the Cudgegong Road station and to revise the alignment of proposed future local streets within the NWRL rail corridor between Rouse Hill and Second Ponds Creek.

6.15 Potential extensions of the Project

The NSW Government must future proof transport for the NWGC to support the growing population, and its transport needs. As planning for the NWGC continues, there is a need to consider the long term travel needs of future residents and to preserve transport corridors today.

TfNSW, working with a number of key Government agencies, has therefore identified two potential future transport corridor options for the Rouse Hill –Schofields –Marsden Park areas. These corridor options are discussed in the Northwest Transport Options Discussion Paper (NSW Government, 2012).

The two identified potential future public transport corridors are:

- Option A – Cudgegong Road to Schofields and Marsden Park: from the end of the NWRL heading west to Schofields Station then further on to Marsden Park, for about 6.8km.
- Option B – Cudgegong Road to Riverstone: from the end of the NWRL heading north west to the Richmond Line south of Riverstone Station, a distance in the order of 3.3km.

A transport mode (heavy rail, bus or light rail) for the corridor has not been determined at this stage. This will be subject to further analysis to ensure the most appropriate mode is selected that best serves the corridor and the region in the longer term.

Any potential extensions of the project beyond Cudgegong Road would be subject to a separate environmental assessment process and are not considered in this EIS.

6.16 Next Steps

Pursuant to section 115ZI of the Environmental Planning & Assessment Act 1979, Transport for NSW is seeking the Minister for Planning & Infrastructure's approval for the modification of the NWRL Staged Infrastructure Approval. The proposed modifications are:

- Change the NWRL project definition as a result of the proposed modifications.
- Relocate Kellyville Station from Burns Road, Kellyville to Samantha Riley Drive, Kellyville.
- Provide for additional stations at Bella Vista and Cudgegong Road, Rouse Hill.
- Make minor changes to the location of the Hills Centre Station.
- Change the NWRL alignment within Area 20 (part of the North West Growth Centre) to a route parallel to Schofields Road as shown in the Area 20 Precinct Planning Package (DP&I, August 2011).
- Incorporate the Skytrain viaduct between Bella Vista and Rouse Hill.

- Locate a train stabling facility in the vicinity of Tallawong Road in the North West Growth Centre.

These modifications are designed to align the Staged Infrastructure Approval with the current description of the NWRL Project and current Government policy. However, TfNSW will seek final project approvals which are independent of the Staged Infrastructure Approval.

Figure 6.1 Approved and Modified Alignments - Epping Station to Pennant Hills Road

Figure 6.2 Approved and Modified Alignments - Pennant Hills Road to Castle Hill Station

Figure 6.3 Approved and Modified Alignments - Castle Hill Station to Norwest Station

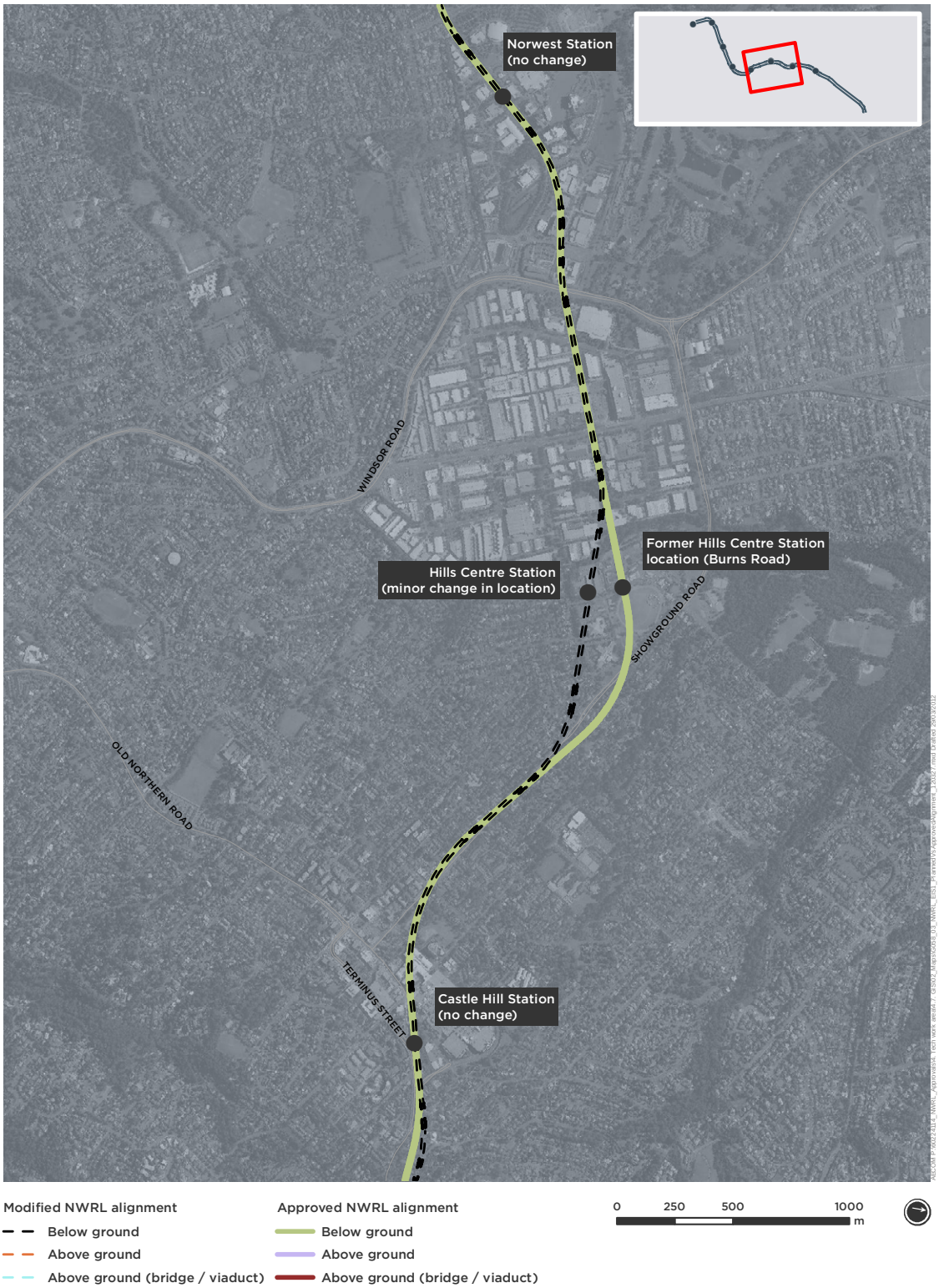


Figure 6.4 Approved and Modified Alignments - Norwest Station to Kellyville Station

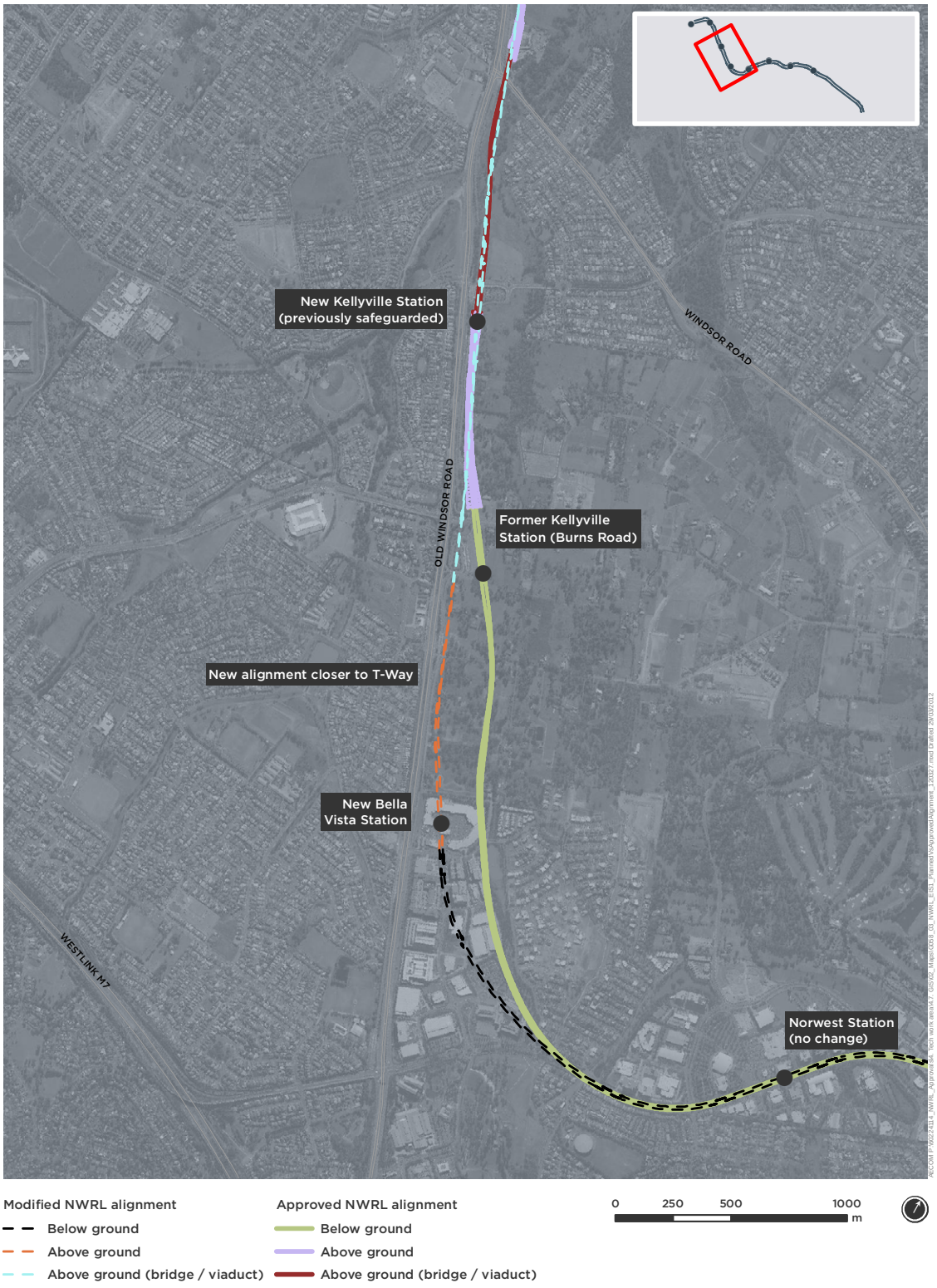


Figure 6.5 Approved and Modified Alignments - Kellyville Station to Tallawong Stabling

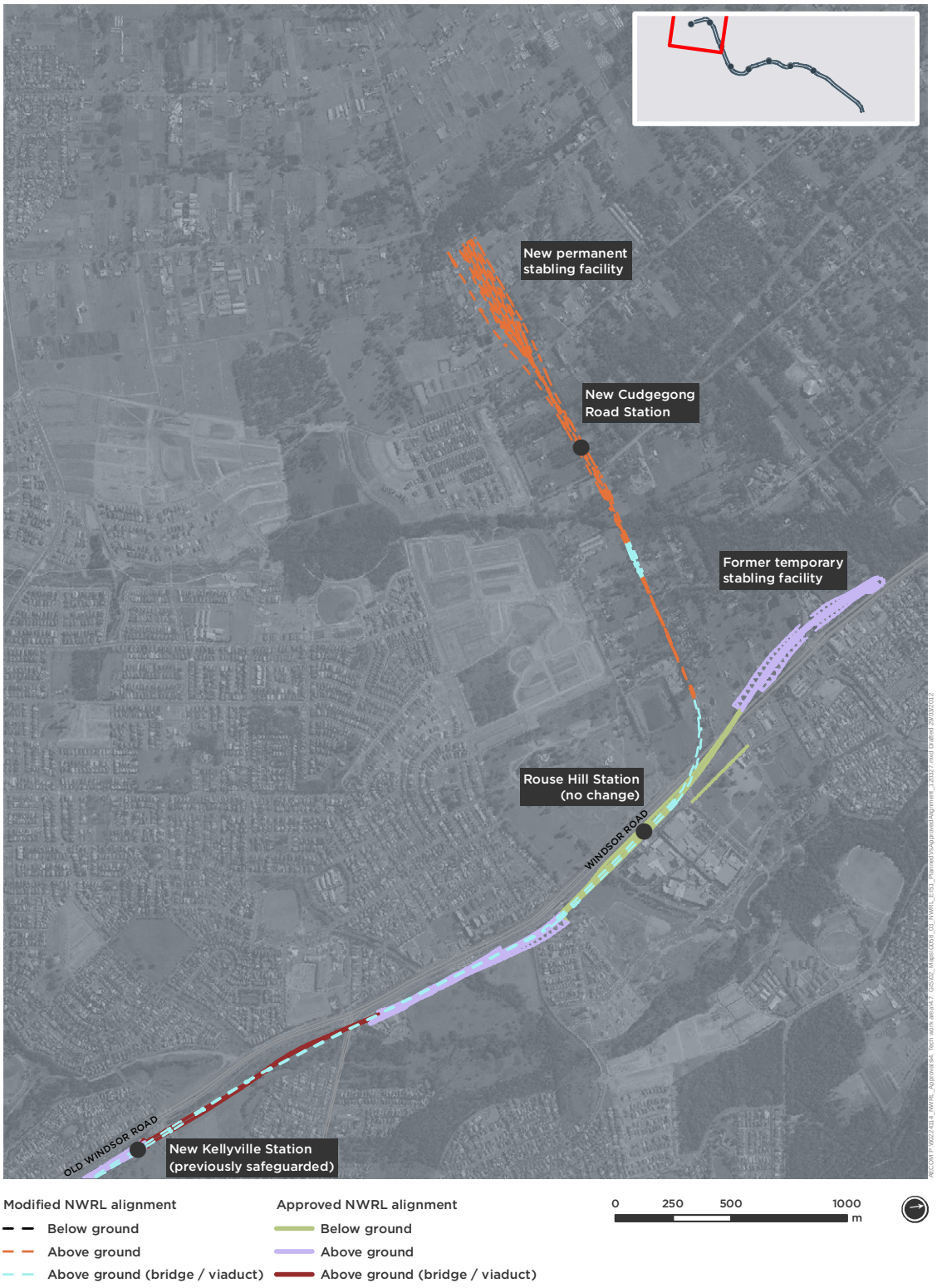


Figure 6.6 Proposed Modification within Area 20 (Source: DP&I)