

5. Preliminary environmental assessment

5.1 General

For projects subject to Part 3A of the *Environmental Planning and Assessment Act 1979*, issues that can be mitigated through the use of standard environmental management measures can be identified at an earlier stage in the assessment process through preparation of a Project Application (this document) and addressed in a framework Statement of Commitments (refer *Appendix C*). This allows the Environmental Assessment to focus on the key issues and also recognises that the route selection and concept design processes may have already avoided or reduced the extent of some impacts through, for example, alignment refinements.

In addition, when seeking approval of a proposal as a 'concept plan' it is appropriate that the Environmental Assessment deals with key environmental issues to an appropriate level of assessment based on the available information. The concept approval process provides for the possibility that, as further details of a proposal are developed, additional investigations may need to be would be undertaken.

The following key issues have been identified as the focus for consideration in the Environmental Assessment for the proposed South West Rail Link, as potentially significant impacts could result:

- noise and vibration
- visual
- heritage
- flora and fauna
- flooding and drainage
- traffic, transport, parking and access
- land use and property
- social impacts.

Further discussion of the above key environmental issues is provided in *Section 5.2* below. Other issues are addressed in *Section 5.3*. These other issues would be of more minor consequence and can be managed through appropriate management actions and mitigation measures.

The preliminary environmental and engineering investigations provided in this report are built on the previous studies undertaken principally over the last 5 years.

The South West Rail Link – Environmental Issues Study (Connell Wagner, 2003) forms the main source of information for the preliminary environmental assessment. This study provided an assessment of the southern alignment from the overview report (as described in *Section 3*) and included specialist studies on ecology, noise and vibration, heritage, social impacts, land use and visual/urban design. A mixture of desktop investigations and preliminary field studies were conducted for this study. The relevant results are discussed under the analysis of key issues presented below.

The South West Rail Link alignment is common for both the southern and northern alignment options east of Edmondson Park station area. Therefore, much of the information from the 2003 studies is still relevant. Other information can be extrapolated for the northern alignment. However, there will be a need to undertake more detailed studies in sections where the alignments have substantially changed e.g. Leppington Town Centre, and at the stabling facility.

It is also important to consider that the South West Rail Link is planned as part of the larger urban land release of the South West Growth Centre and many of the issues are interrelated and should not be considered in isolation.

5.2 Key environmental issues

5.2.1 Noise and vibration

Summary of the issue

The proposed South West Rail Link corridor traverses through an area that is still largely rural residential in character. Noise and vibration impacts would result from both the construction of the proposal and the operation of trains along it. Another noise source would be the proposed stabling facility, including noise associated with the maintenance and cleaning of trains.

For existing properties near to the rail corridor, a significant change in the acoustic environment would occur and noise mitigation would be required. Construction noise would result from the operation of construction equipment and vehicle movements for spoil transport and other materials on the local and regional road network. Existing sensitive areas include Denham Court (where the rail corridor would run at the rear of properties along Cassidy Street and Culverston Avenue), residential areas of Glenfield (adjacent to the existing rail corridor along Railway Parade), Horningsea Park, Hurlstone Agricultural School, Glenfield Park School, Leppington Primary School and individual rural residential properties. It is also likely that development would have commenced at Edmondson Park by the time the proposal is constructed; therefore, this new development would also be an existing sensitive area. Some out-of-hours construction work would be required, such as for connections to the South Main and East Hills Lines.

Vibration impacts during construction would need to be considered for higher intensity activities, including piling and rock breaking. The potential for blasting would also need to be considered.

The following operational noise criteria for the new sections of the rail corridor are likely to be applied by the Department of Environment and Conservation, consistent with

Chapter 163 of the *Environmental Noise Control Manual* (Environment Protection Authority 1994):

- L_{Amax} : 80 dBA
- L_{Aeq} : 55 dBA.

The noise assessment would also need to consider the influence of the gradual conversion of rural residential to residential land uses as the South West Growth Centre is developed. Appropriate buffers would need to be considered for the rail corridor, so that noise impacts on new residential areas can be effectively managed and mitigated. Previous work conducted by Richard Heggie and Associates for Connell Wagner (2003d) recommended a 40 metre residential setback from the centre of the corridor as a mitigation measure. Noise mitigation through appropriate urban design would need to be discussed in further detail with the Growth Centres Commission and relevant local Councils.

Modelling conducted by Richard Heggie and Associates as part of the Route Options Report (refer *Appendix B*) indicates that potential noise goal exceedances would occur at future residential development situated at offsets of more than 40 metres from the railway centreline based on the Draft South West sector Structure Plan:

- without noise barriers in place: 150 to 200 residences
- 3.5 metre noise barrier in place: 100 to 150 residences
- 5.0 metre noise barrier in place: 40 to 90 residences.

The requirement for, and use of noise barriers to reduce noise impacts at future urban development needs to be considered alongside other available mitigation measures such as railway alignment design, (e.g. placement of the alignment in cutting where possible), urban design (appropriate acoustic design), through precinct planning of new release areas.

The proposed stabling facility would require detailed attention to address noise impacts from train servicing, including train cleaning, horn testing and other activities. Experience with similar RailCorp facilities has shown that the more significant impacts occur during night-time periods, particularly during the early morning hours when train cleaning and horn testing is carried out prior to the commencement of train operations. This facility would need to be assessed in accordance with the *NSW Industrial Noise Policy* (Environment Protection Authority 2000).

Previous assessment

Preliminary noise assessment was undertaken by Richard Heggie and Associates for the southern alignment as part of the South West Rail Link - Environmental Issues Study (Connell Wagner 2003d). The scope of this investigation included:

- identification of noise sensitivity from existing and proposed future land uses
- noise modelling of four operational scenarios and preparation of maps showing noise contours
- preliminary consideration of mitigation measures.

This work was extended during work for the Route Options Report (see *Appendix B*), to provide a comparison between the northern and southern refined alignments.

Conclusions and need for further assessment

The noise and vibration assessment for the Environmental Assessment would build on the existing work undertaken to date. Consultation with local councils, Growth Centres Commission, developers and the Department of Environment and Conservation would be required to address a range of noise and vibration management measures.

Ambient monitoring would be required at representative locations adjacent to the rail corridor to characterise existing background noise levels.

Noise modelling of the alignment would be undertaken and noise contours developed to enable definition of appropriate mitigation measures. Separate modelling of the train stabling facility would be required.

Noise levels at selected existing sensitive receivers would be predicted to determine compliance with relevant noise criteria. These would include the various education facilities noted above and selected residential receivers.

The most likely noise mitigation approach is a combination of appropriate urban design, treatment of new dwellings as they are developed, buffers and noise barriers. Noise mitigation from appropriate operational management of train servicing and horn testing at the stabling facility would also need to be considered.

Assessment of vibration levels would be required for properties close to the corridor and during construction for higher intensity activities, such as piling and rock breaking and any blasting.

Control over the operational environmental impacts of the railway would be through RailCorp's existing environment protection license.

5.2.2 Indigenous and non-Indigenous heritage

Summary of the issue

There are a number of Indigenous and non-Indigenous heritage sites within the vicinity of the proposed South West Rail Link northern refined alignment, including 42 sites registered on the Department of Environment and Conservation's Aboriginal Heritage Information Management System (AHIMS). Of these, 29 are open camp sites, 4 are scarred trees, 5 are isolated finds, 3 are potential archaeological deposits and 1 is an art site.

The alignment also passes close to an isolated artefact near Cabramatta Creek within Edmondson Park. This artefact was identified as part of a wider area of high archaeological sensitivity in an Aboriginal Heritage Management Plan conducted for the Edmondson Park composite site (AMBS Consulting 2003).

The distribution of most of the registered sites reflects the location of recent infrastructure developments and housing estates (i.e. where assessment work has been

carried out). There are large areas surrounding the proposed South West Rail Link alignment that have not been subject to systematic surveys or recording of Aboriginal history. As such, there are areas that may contain Aboriginal sites, places and objects that are not registered with the Department of Environment and Conservation. Also, there are sites and places that are known to Aboriginal people that are not registered with the Department.

The majority of registered sites are located along the eastern section of the proposed alignment, near the Cabramatta and Maxwell Creeks. The remaining Indigenous sites are situated near Cowpasture Road and the Camden Valley Way.

There are also two claims on the Register of Native Title Claims of relevance to both of the refined alignments. One is in the Camden Local Government Area by the Gundungurra Tribal Council Aboriginal Corporation and the other in both the Camden and Campbelltown LGAs by the Darug Tribal Aboriginal Corporation.

There are 23 historic places in the vicinity of the alignment. These are subject to various listings, including the NSW State Heritage Register, the State Heritage Inventory, various Section 170 of the *Heritage Act 1977* Conservation and Heritage Registers, the Register of National Estate, local environmental plans and the National Trust of Australia (NSW) classifications listing. Sites potentially affected by the proposed alignment include the Hurlstone Agricultural High School, the Sydney Water Supply Upper Canal and its associated heritage items (which include stone and brick culverts, offtake chambers, stop boards, an avenue of pines and a former cottage site). The study area also contains Camden Valley Way and Cowpasture Road some of the earliest roads in Australia and have strong associations with settlement of the colony. Similarly, Denham Court Road viewshed was identified in the Liverpool Heritage Study (Neustein and Associates 1992). Although these items are not listed on any heritage registers, any visual impact on the view corridors would still need to be considered.

Previous assessment

A Working Paper on Indigenous and non-Indigenous heritage was prepared by Austral Archaeology for a previous South West Rail Link alignment in 2003, as part of the South West Rail Link – Environmental Issues Study (Connell Wagner 2003e). This study was effectively a desktop assessment and scoping study with a brief site reconnaissance. The study did not include archaeological field surveys to identify and verify the location of any registered Indigenous and non-Indigenous sites/places, nor did it identify any new or potential archaeological sites. As such, there was no participation or input from Aboriginal or other stakeholder groups.

Conclusions and need for further assessment

A heritage assessment would be required as part of the Environmental Assessment for the proposed South West Rail Link alignment with particular focus on areas of direct and indirect impact on heritage items and areas of archaeological and heritage potential.

An updated search of heritage registers identified the presence of a number of Indigenous and non-Indigenous items in close proximity to the proposed alignment. A revised heritage assessment and statement of impact would, therefore, be required.

Any assessment would need to include an archaeological field survey to locate, identify and assess registered sites, and record any new sites or areas of Indigenous and non-Indigenous archaeological potential. Prior to the commencement of the field surveys, Aboriginal community consultation that meets the requirements of the Department of Environment and Conservation's (2005) *Aboriginal Community Consultation Guidelines* would be necessary. This would involve the placement of advertisements in local and national print media, inviting Aboriginal stakeholder(s) to register their interest. Registered Aboriginal stakeholders would be invited to participate in the project.

Consultation would also be required with the relevant local councils, the NSW Heritage Office, the Department of Environment and Conservation, the National Trust of Australia (NSW), the Sydney Catchment Authority and any other historical interest groups with relevance to the proposal.

Depending on the results of the community consultation, additional research, field surveys, impact assessments and management strategies to mitigate the impacts may need to be prepared.

5.2.3 Flora and fauna

Summary of the issue

The study area contains several remnants of woodland, interspersed with grassed paddocks and urban areas. Three native vegetation communities have been identified within the proposed South West Rail Link alignment, all of which have been listed as endangered ecological communities pursuant to the *Threatened Species Conservation Act 1995 (TSC)* and/or the *Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC) 1999*. These communities include:

- Alluvial Woodland (Sydney Coastal River Flat Forest), which is listed as an endangered ecological community under the *Threatened Species Conservation Act 1995*.
- Shale Plains Woodland (Cumberland Plain Woodland), which is listed as an endangered ecological community under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.
- Shale Hills Woodland (Cumberland Plain Woodland), which is listed as an endangered ecological community under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.

The size and condition of the vegetation remnants varies throughout the site; although some can be considered core habitat with high conservation value, forming part of a regional corridor. The site also contains potential habitat for a range of threatened species of plant and animal, including *Pimelea spicata*, the Cumberland Plain Land Snail and threatened microchiropteran bats.

The proposal is likely to remove 5.6 hectares of native vegetation (endangered ecological communities) and habitats, of which 3.6 hectares are core or support for core habitats, and result in further fragmentation of the remnant bushland habitats, with the potential for a significant impact on biodiversity.

Previous assessment

A number of previous studies looked at the ecology of the general area, including:

- *Preliminary Flora and Fauna Survey of DP807460 and DP 807461 Edmondson Park, New South Wales* (Pelican Environmental Surveys 1999).
- *Flora and Fauna Assessment of Ingleburn Gardens Estate, Ingleburn* (Lesry K Environmental Consultants 1998).
- *Flora and Fauna Opportunities and Constraints Study, Ingleburn Defence Site, Ingleburn* (URS Environmental and Engineering Services 2002).
- *Grassland Assessment Report* (Wildthing Consulting Services 2003).
- *Cumberland Land Snail Survey and Management Report* (Gunninah Environmental Consultants 2001).
- *Edmondson Park Ecological Assessment* (Eco Logical Australia Pty Ltd 2003a).
- *South West Rail Link Environmental Issues Study – Working Paper No. 2 Flora and Fauna* (Connell Wagner 2003c).

There are also a number of more general studies that cover the area including:

- *Native Vegetation of the Cumberland Plain Mapping* (NSW National Parks and Wildlife Service 2002a).
- *Liverpool Council Biodiversity Strategy* (Eco Logical Australia Pty Ltd 2003b).

The existing information relates to the southern reference alignment and studies undertaken for residential developments. Gaps exist in available information for the northern refined alignment that will need to be addressed during preparation of the Environmental Assessment.

Twenty-eight threatened species of plant have been recorded within 10 kilometres of the proposed alignment, or have the potential to occur (see *Appendix B*). However, 16 of these records were derived from the one site at Catherine Field. Furthermore, they are not considered endemic to the study area and are presumed to be cultivated. *Pimelea spicata* was the only species that has been previously recorded within the study area (Department of Environment and Conservation, 2006). The site also has potential habitat for a range of threatened species of plant, including *Acacia pubescens*, *Grevillea juniperina* subsp. *juniperina* and *Pultenaea parviflora*; although none of these species have been recorded on-site.

Potential habitat also exists for a range of threatened faunal species, with five species previously recorded on-site, including the Common Bentwing Bat (*Miniopterus schreibersii*), Large-footed Myotis (*Myotis adversus*), Eastern Freetail Bat (*Mormopterus norfolcensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Cumberland Plain Land Snail (*Meridolum corneovirens*).

It is likely that most of the habitat for threatened floral and faunal species is located within the remnant vegetation.

Conclusions and need for further assessment

The following additional flora and fauna assessment would be undertaken as part of the Environmental Assessment, in accordance with the *Threatened Biodiversity Survey and Assessment Guidelines* produced by the Department of Environment and Conservation (2004) and the draft *Guidelines for Threatened Species Assessment under Part 3A* (Department of Environment and Conservation, 2005).

- Assessment of existing vegetation communities, including endangered ecological communities listed under the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999* (This work would include random meander surveys as well as vegetation quadrats.).
- Preparation of an *Environment Protection and Biodiversity Conservation Act 1999* referral to the Commonwealth Department of Environment and Heritage.
- Plant surveys, including targeted surveys for threatened species (if within the appropriate survey period).
- Fauna surveys focusing on birds, bats and the threatened Cumberland Plain Land Snail.
- Reporting, including assessment of impacts following the *Guidelines for Threatened Species Assessment under Part 3A*, and the development of suitable mitigation measures for the proposal.

5.2.4 Traffic, transport, parking and access

Summary of the issue

The proposed South West Rail Link is an integral component of the South West Growth Centre development, and planning for adjoining development has assumed the railway would be integrated with the planning for the town centres. The presence of the railway was also reflected in the recommended road network and preliminary bus network planning.

It is proposed as part of a bus servicing strategy for the South West Growth Centre to develop bus services that will operate from Liverpool to Leppington (via Edmondson Park) and on to Campbelltown/Macarthur in the longer term. An interim strategy is to provide bus servicing from Liverpool via Edmondson Park to Glenfield or Ingleburn.

During its operation, the South West Rail Link and associated bus feeder services would reduce car dependency and car travel, and ease traffic congestion in the South West Growth Centre. Planning for access to stations, and particularly commuter parking, would need to be carefully considered to minimise any adverse impacts on surrounding communities.

During construction, additional traffic would be generated by construction workers, and the delivery of material to and from construction sites. The most significant impact would occur at Glenfield and Edmondson Park (depending on the timing of the surrounding residential development).

Existing environment and previous assessments

Leppington, Edmondson Park, and other large parts of the South West Growth Centre are currently undeveloped. Bus services through the area are available, but their frequency is limited, especially in the areas south of Camden Valley Way/Bringelly Road. The nearest railway stations are on the South Main Line, at locations like Liverpool, Glenfield and Campbelltown. The car is the primary mode of travel for residents in the region.

TTM Consulting (2003) prepared a report entitled; *Southwest Sydney Urban Expansion Area – Transport Issues and Proposals*, which considered the road network requirements for the South West region based on traffic network modelling. This study assessed the road requirements of the then preferred development plan for the South West Growth Centre. The recommended road network included a network of major roads and streets throughout the existing street network. Bus routes were proposed to operate on any of the principal roads, and dedicated transit lanes were proposed on major roads. A 'premium route' was recommended, which would give access to Liverpool, Narellan and Campbelltown. The recommended road network and premium public transport route was largely adopted in the Metropolitan Strategy and South West Structure Plans.

The *Southwest and Northwest Urban Release Areas – Bus Network Pre-feasibility Study* (PB, 2004) reviewed and outlined bus operations/service requirements for the South West urban release area, and provided cost estimates for the proposed networks. A series of bus routes were proposed as 'strategic corridors' with a main focal point of Leppington, due to its regional importance and location on the proposed South West Rail Link.

The draft *Discussion Paper on Park and Ride Strategy for the South West Sector and the South West Rail Link* (PB, 2006a) is being utilised to estimate the potential rail and park-and-ride demand for the South West, based on existing travel characteristics of similar areas for the short, medium and long term. Commuter parking was recommended in the report at Glenfield, Edmondson Park and Leppington.

Conclusion and need for further assessment

An overview assessment of the planned bus network requirements for the short, medium and long term would need to be undertaken, in consultation with Ministry of Transport, and Growth Centres Commission and would include local bus services, strategic corridors and external network connections. A mode of access review, and estimations of the required size of station interchanges and commuter parking needs would be required as part of the Environmental Assessment. Access and mobility plans would also need to be prepared for the Leppington, Edmondson Park and Glenfield Railway Station precincts. These would include assessment of pedestrian and bicycle access, incorporating consideration of regional bicycle and pedestrian connections.

The NSW Ministry of Transport as the agency responsible for bus servicing in NSW would be closely involved in the development and consideration of the bus network.

Further detailed evaluation of commuter car parking requirements is needed in conjunction with development of the town centre planning in the vicinity of railway stations.

Further assessment of the potential impacts of construction and operational traffic would be required. This would include a detailed traffic, transport and parking assessment, which would identify spoil haulage routes, concentrating on Glenfield and Edmondson Park, where the most significant impacts are expected to occur. Assessment would also include affects of disruption to major and minor roads during construction. e.g. Camden Valley Way crossing.

5.2.5 Flooding

Summary of the issue

The proposed South West Rail Link traverses the following catchments and waterways:

- Georges River Catchment:
 - ▶ Georges River/Bunbury Curran Creek — floodplain in the vicinity of the proposed Glenfield Detention Basin
 - ▶ Cabramatta Creek and various tributaries
- Hawkesbury-Nepean River Catchment:
 - ▶ Bonds Creek and various tributaries
 - ▶ Kemps Creek and various tributaries.

The South West Rail Link would need to be elevated where it crosses the floodplains of the above waterways to meet the 100 year average recurrence interval design standard.

Specific issues include:

- The South West Rail Link would pass through the proposed Glenfield Flood Detention Basin which is under consideration by Campbelltown City Council to mitigate existing downstream flooding problems.
- At the Edmondson Park Railway Station, the vertical alignment of the station box may need to be slightly elevated from the current deep cutting and/or protected against flooding due to the influence of three local catchments.
- The rail corridor would be either on an embankment or raised structure where it crosses floodplain areas, which would have the potential to affect local flood levels and flood hazards. This would be managed through appropriate engineering design.

Previous assessment

Previous flood modelling work has been undertaken by Lyall and Macoun and Webb McKeown and Associates has undertaken some further work on behalf of TIDC with flood data obtained from the local councils. The Webb Mckeown assessment included:

- A preliminary assessment of each proposed waterway crossing to identify any significant hydrologic issues relating to the proposed design.
- An outline of detailed assessments required to quantify potential impacts and identify possible mitigation measures.
- Comparison of the north and south alignment options in relation to their hydrologic implications.
- Assessment of the hydrologic implications of the location and arrangement for the proposed Leppington station and the stabling facility.

Conclusions and need for further assessment

The Environmental Assessment would need to consider the potential impact of increases in flood levels and flood hazards associated with the South West Rail Link where the rail corridor would traverse existing floodplain areas.

Flood modelling would be required to assess the increase in flood levels upstream of bridge crossings and on the various floodplain areas. One dimensional hydraulic modelling would be required to update the earlier HEC-RAS modelling conducted by Lyll and Macoun.

In the vicinity of the Edmondson Park Railway Station, the interaction of flows from three local catchments would need to be assessed. Webb McKeown has advised that a two dimensional hydraulic model would be required.

Further consultation with Campbelltown City Council would be required in relation to the Glenfield Flood Detention Basin.

5.2.6 Visual impacts and urban design

Summary of the issue

The landform in the vicinity of the proposed South West Rail Link corridor ranges from gently undulating to flat. The South West Rail Link would create a dominant visual element in the landscape, particularly where the corridor crosses floodplain areas on fill or bridge structures. Areas of higher elevation, such as the southern areas of Denham Court, would have direct views to the corridor.

The following views would be potentially affected by the proposed development:

- Views to new rail infrastructure and station buildings at Glenfield from residences fronting Railway Parade and nearby approach streets.
- Views along Campbelltown Road, Camden Valley Way, Cowpasture Road and Rickard Road — these roads also have a landscape heritage context.
- Views from Macquarie Field House.
- Views from the Denham Court, particularly for residences on elevated ground.
- Views from areas within the Forest Lawn Memorial Gardens Cemetery.

- Views from areas within the Western Sydney Parklands.
- Views from existing rural residential properties close to the proposed corridor.

Previous assessment

A preliminary assessment of urban design and landscape issues was conducted as part of the Environmental Issues Study (Connell Wagner 2003f). This assessment considered the southern reference alignment and included assessment of landscape character, viewsheds (which were analysed using GIS mapping), areas of visual sensitivity and mitigation measures.

Further urban design work was conducted by Architectus as an input to the Route Options Report (see *Appendix B*). This work provided a comparison between the southern and northern refined alignments and outlined urban design principles in relation to town centre planning.

Conclusions and need for further assessment

For the Environmental Assessment, it is proposed that further detailed evaluation of specific viewsheds and landscape quality be undertaken. This work would include updated viewshed mapping and preparation of photomontages from selected key viewpoints.

The Environmental Assessment would also provide further detail on mitigation measures, including landscaping.

Urban design principles would be developed further in relation to specific sections of the corridor and station precincts. Artists' impressions or photomontages of station treatments would be presented.

5.2.7 Land use and property

Summary of the issue

The predominant land use in the area traversed by the rail corridor is rural residential. This land use will change significantly as the South West Sector develops over the next 20 years. Other land uses adjacent to or close to the corridor are:

- Educational uses — Hurlstone Agricultural High School, Glenfield Park School and Leppington Primary School.
- Residential uses — Denham Court, Horningsea Park and existing residential areas of Glenfield adjacent to existing rail corridor, which would be upgraded between the East Hills Line and south of Glenfield Railway Station.
- Market gardens at Leppington.
- Rural residential.
- The Forest Lawn Memorial Gardens Cemetery.
- The Western Sydney Parklands.

For existing land uses, the South West Rail Link provides benefits in terms of improved access; however there are a number of amenity-related impacts including noise, visual impacts and traffic generation (in the vicinity of stations). These issues have also been identified as key issues for the Environmental Assessment and are discussed in preceding sections.

The proposed stabling facility west of Leppington would occupy an area of approximately 10 hectares. This facility would also require appropriate land-use planning in surrounding areas to ensure that future development is not adversely affected by noise and other amenity issues.

Planning for the South West Rail Link has been integrated into the overall structure planning for the South West Growth Centre. This process will continue, as the refinement of the design for the rail corridor will influence the layout of new town centres at Leppington and Edmondson Park, and changes to the existing town centre at Glenfield. Although the South West Rail Link would have direct land use impacts, it would also potentially provide opportunities for re-development of land adjacent to the rail corridor, which could be incorporated into the overall South West Growth Centre development.

The South West Rail Link is planned to facilitate sustainable land release by providing a catalyst for development adjacent to the rail corridor arising from the improved access. In particular, land surrounding the stations would be attractive for higher density development, and this aspect would need to be appropriately planned and integrated.

A total of 44 properties would be affected by total or partial land acquisition for the northern refined alignment. This comprises 26 privately-owned and 18 government-owned properties. These properties would be purchased in accordance with relevant legislation, specifically the *Land Acquisition (Just Terms Compensation) Act 1991*.

Previous assessment

An overview of land use and community impacts was conducted as part of the South West Rail Link - Environmental Issues Study (Connell Wagner 2003f). This provided a preliminary assessment and considered:

- existing land use and planning controls
- property ownership
- indicative property acquisition
- community profiles
- future land use.

Further consideration of property acquisition was undertaken as part of the Route Options Report in *Appendix B*.

Conclusions and need for further assessment

The assessment undertaken to date has focused on direct property impacts. This work would need to be extended in the Environmental Assessment to consider potential impacts on existing surrounding land uses and the implications of the project in terms of ongoing planning for the South West Growth Centre development. Specifically liaison

with local councils, the Growth Centre Commission and developers to maximise opportunities for integration of rail infrastructure with land-use planning and development.

Survey and mapping of existing land uses would be required along the corridor and in the vicinity of the station precincts to provide baseline information. The greatest potential for land use change would be within the vicinity of the station precincts, with consequent implications for parking, traffic, amenity and businesses. Particular focus would be required at the Glenfield Railway Station, which already has an established neighbourhood centre.

The presence of the corridor would also influence adjacent future land uses. The preliminary noise assessment (see *Section 5.2.1*) recommended buffers on each side of the corridor, with low sensitivity land uses including roads, parklands, playing fields, and commercial or industrial developments.

5.2.8 Social impacts

Summary of the issue

The proposed South West Rail Link would pass through or in close proximity to established residential areas and future urban release areas (Edmondson Park and Leppington). Established areas affected would include Glenfield, Denham Court, , and residential areas along the rail corridor. A total of 44 properties would be affected by total or partial land acquisition for the northern refined alignment. This would comprise 26 privately-owned and 18 government-owned properties.

Community facilities and services are also located near the proposed rail corridor including:

- Educational facilities — Hurlstone Agricultural High School (Campbelltown), Campbelltown House School (Glenfield), Glenfield Park School, Ajuga School (Glenfield), Leppington Public School (Leppington) and William Carey Christian School (Prestons).
- Community/religious facilities — Watch Tower Bible and Tract Society/Jehovah's Witness Kingdom Hall, Forest Lawn Gardens Memorial Cemetery and Lawn Crematorium, Leppington Progress Hall, Outer Liverpool Community Centre, Leppington Bush Fire Brigade and St Mary's Catholic Church (Ingleburn Rd, Leppington).
- Retirement village, low cost, temporary housing - Casa Paloma Caravan Village, Four Lanterns Mobile Van Village, Scalabrin Village Retirement Home.
- Government uses — Department of Defence land at Ingleburn, Valley View and Bardia Villages.
- Heritage items – e.g. Macquarie Fields House.
- Commercial/industrial/agricultural uses — Orchid Nursery on Camden Way, kennels on Jardine Drive, Leppington Inn, Renbury Farm Animal Shelter, Grand Bazaar Markets, Leppington Fruit Market and other shops on Camden Valley Way.

- Recreational uses — Western Sydney Parklands, Tree Valley Golf Course, Pistol Range, Istra Club, W.V. Scott Memorial Park, Adventureland (Camden Valley Way), specific recreational uses.

Social impacts on these areas, including access to community services and facilities may occur during construction and operation of the proposal.

The development of the South West Growth Centre will result in changes to current land-uses and demographics. The South West Rail Link is planned to facilitate this development by providing the planned community with good access to transport.

The planned railway stations would serve the existing community as well as new residents in the Growth Centre. The stations would be the focal point along the alignment, drawing people from within and outside the area. They would most likely develop as 'social hubs'. Therefore, the design and function of the stations, both physically and socially, would be critical. As the stations would act as points for community interaction and wider societal interactions, the community must identify or have an affinity with the stations. The impacts and benefits of the South West Rail Link on land uses, including the residential and business community around the stations, would need to be assessed.

The areas around the proposed rail corridor are projected to grow quickly with a younger population than the rest of Sydney expected. People born overseas and/or from a non-English speaking background will reside in these areas.

Previous assessment

An overview of land use and community impacts was conducted as part of the South West Rail Link - Environmental Issues Study (Connell Wagner 2003f). This provided a preliminary assessment and considered:

- impacts of the corridor and stations
- land use/planning impacts on proposed residential development, access, road network impacts, public transport impacts, and community impacts.

Conclusions and need for further assessment

- Need to take account of the changes planned to the South West Growth Centre and focus on maximising the social benefits of the South West Rail Link as part of this. Social benefits such as reduced travel times, reduced reliance on cars, transport for people with no access to cars (children, elderly etc) would result and should be further considered to maximise beneficial outcomes.
- Issues specific to the impacts of the South West Rail Link are more related to community severance and property values.
- Open space- opportunities for increasing community connectivity- e.g cycleways etc
- Consultation with relevant government agencies including the NSW Department of Health and Growth Centres Commission regarding the maximisation of social benefits of South West Rail Link.

The Environmental Assessment would need to consider the potential impact of the preferred alignment on the existing and future community and stakeholders. As recommended by Connell Wagner (2003f) 'there is a need to predict the form of the demographic composition of any release areas in the area surrounding the South West Rail Link. Subsequently the impacts of the proposed South West Rail Link on current land uses and demographics should be viewed with the intention that future land development in the area will change significantly in the medium and long term'.

The social impact assessment for the Environmental Assessment would predict impacts on local communities around the proposal, and identify what actions would be taken to reduce negative impacts and promote positive ones. Consideration of the biophysical environment and potential biophysical impacts would be included in the social impact assessment. The social impact assessment would identify potential changes in the community or social groups, or to individuals as a result of the proposal, which may be positive or negative.

The assessment would also need to consider and include Indigenous people.

A social profile of affected stakeholder and communities would be prepared. This would also include future population projections, where possible, and the expected community structure and dynamics when the project commences operation.

Stakeholder and community participation would form part of the social impact assessment. In addition it would draw from the broader Environmental Assessment consultation program:

The social impact assessment would identify and evaluate the likely social issues of concern and benefit to each group. This would include impacts or changes relating to:

- community severance
- access impacts, due to the presence of the rail corridor and road closures, and access benefits to other areas in the region
- land use and community impacts at the stations
- land use and community impacts in close proximity to the stabling facility
- social interaction, community cohesion, stability, character, services and facilities, and impacts on community amenity
- regional economy impacts
- property impacts
- impacts on local business
- biophysical impacts that have social impacts.

The impact evaluation would need to take into account measures for managing the impacts. Mitigation measures to be considered would include measures to reduce risks and unwanted effects, while enhancing potential benefits. Recommendations would be made regarding social considerations and further consultation requirements during the detailed design and planning of stations, based on the outcomes of the social impact assessment.

5.3 Other environmental issues

A number of other environmental issues have also been considered for the purposes of this Project Application and Preliminary Environmental Assessment. These issues are expected to be of lesser consequence than the key issues discussed in *Section 5.2*, and/or would be able to be managed through the application of best practice environmental management and proposed management measures and safeguards. Assessment of these other environmental issues is provided in *Table 5.1* and *Appendix C*. No further assessment of these issues is considered necessary as part of the Environmental Assessment.

Table 5.1 Risk assessment of potential impacts and mitigation measures – other issues

Issue	Existing environment	Risk assessment	Management response
Community			
Air quality and greenhouse gases	<p>Limited industrial sources in the vicinity.</p> <p>Local air quality primarily influenced by proximity to major traffic routes and regional pollution in the Sydney basin.</p>	<p>Local air quality impacts (particulates) may result from vehicle/machinery emissions and dust, particularly during the bulk earthworks stage of construction.</p> <p>An increase in carbon dioxide emissions from the combustion of fuels would result from construction, particularly from the movement of spoil by heavy vehicles and construction machinery.</p> <p>There would be potential benefits to local/regional air quality through the provision of public transport into an area that is heavily reliant on private passenger vehicles.</p> <p>As a result, there is likely to be a mode shift from private cars to public transport as a result of the development.</p> <p>This would subsequently result in a reduction in the combustion of diesel and petrol fuels and consequent greenhouse gas production.</p>	<p>Expected manageable level of impact during construction, subject to the application of standard mitigation and best practice construction measures.</p> <p>These would be included in an Air Quality Sub-plan as part of the overall Construction Environmental Management Plan (CEMP) prepared by the construction contractor prior to construction, following approval.</p> <p>The Air Quality Sub-plan would address management of dust during construction, emissions from construction plant and vehicles and other fugitive emissions.</p>
Hazard and risk	<p>The proposed corridor passes through urban, semi-rural and rural areas, as well the environment of an operating railway, several major arterial roads and a freeway.</p>	<p>Hazards and risks during construction would include the conduct of works over/under major arterial roads/freeway and within the operating railway corridor.</p> <p>They would also include activities such as the storage and use of hazardous materials, and use of heavy machinery.</p>	<p>Expected manageable level of impact.</p> <p>Construction issues would be addressed through a Hazards and Risk Management Sub-plan to be developed by the construction contractor prior to construction as part of the overall CEMP.</p> <p>This would include contingency measures to deal with catastrophic accidents and major disruption resulting from the works.</p> <p>The Sub-plan would be subject to ongoing liaison, communication, and rigid enforcement of safety guidelines and procedures of the owners of the major arterial roads and operating railways.</p> <p>An Operational Hazard and Risk and Emergency Management Plan (which may represent an extension of existing plans and procedures to the new infrastructure) would be prepared by RailCorp and</p>

Issue	Existing environment	Risk assessment	Management response
Public safety		There is the potential for security issues arising after hours where there is limited opportunity for passive surveillance particularly at night or during off-peak periods.	<p>prior to commissioning.</p> <p>The Plan would consider the application and extension of existing operating procedures and protocols and design standards to the new infrastructure.</p> <p>Expected manageable level of impact 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, help points at stations, etc.</p> <p>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.</p>
Services and utilities	Large number of existing utilities and services including trunk and reticulation mains for gas and water, and electricity transmission and distribution lines.	<p>Excavation could result in damage to existing services and utilities, causing disruptions to services, inconvenience, or potentially hazardous situations.</p> <p>The Sydney Water Supply Canal is a critical piece of infrastructure crossed by the proposed corridor, which would require specialised protection measures.</p>	<p>Expected manageable level of impact subject to liaison with utility owners, adoption of appropriate design protection measures, and standard construction, occupational health and safety procedures prior to construction commencement.</p> <p>A Utilities and Services Disruption Sub-plan would be developed by the construction contractor following approval, prior to construction.</p>
Physical and biophysical			
Soils and water quality and groundwater	<p>Site typically underlain by Bringelly Shale traversing the South Creek, Blacktown and Luddenham Soil Landscapes.</p> <p>Some of these soil landscapes have high erodibility potential.</p> <p>Topography consists of gently to steeply undulating hills.</p> <p>Existing surface water quality is typical of those in urban and rural areas and subject to adverse human influences.</p>	<p>Potential impacts include soil erosion and sedimentation of nearby waterways during construction, the potential for salinity to affect foundations and in deep cuttings.</p> <p>Saline soil/groundwater conditions would be expected at crossings of major creeks and in cutting.</p> <p>Minimal or no saline groundwater run-off would be anticipated in cuttings, due to expected low permeability.</p> <p>Creek and floodplain crossings would generally be on fill or structure and, therefore, no saline groundwater interaction with the surface would be expected.</p>	<p>Expected manageable level of impact.</p> <p>Further investigation and characterisation of groundwater salinity levels and extent along the corridor is required so that structures can be designed to have the appropriate durability.</p> <p>Specific measures would be included in a Soil and Water Management Sub-plan to be prepared by the construction contractor prior to construction.</p>

Issue	Existing environment	Risk assessment	Management response
	<p>Saline groundwater is likely to be encountered.</p> <p>No acid sulfate soils are likely to be present.</p>		
<p>Waste, energy and demand on resources</p>	<p>N/A</p>	<p>Potential impacts include the generation of various types of construction wastes, increased energy use and increased demand on local and regional resources.</p> <p>It is unlikely that development of the proposal would result in any resource becoming scarce or in short supply.</p>	<p>Manageable level of impact subject to the application of standard environment management measures.</p> <p>These would be included in the CEMP to be prepared by the construction contractor prior to construction.</p> <p>Opportunities would be investigated to maximise re-use of construction spoil, including cut/fill balance during design and other construction and demolition waste.</p>
<p>Contaminated land</p>	<p>Current and former agricultural and defence land uses may have resulted in contamination, including some illegal disposal of wastes including pesticides.</p>	<p>The primary source of concern would be land within the Edmondson Park release area, which was formerly occupied by the Ingleburn Military Camp.</p> <p>The camp was a major infantry training camp for 20 to 40 years and also served as an army hospital and field workshop.</p> <p>There is also the potential for ordnance (artillery) to be buried in this area.</p>	<p>Manageable level of impact expected.</p> <p>A staged program of contamination assessment is proposed, including Phase 1 assessments to identify areas of potential contamination and Phase 2 field investigations to characterise the nature and extent of contamination that may be present.</p> <p>Consultation with Department of Defence to clarify contamination issues and appropriate remediation, where required.</p> <p>These investigations would identify the need for remediation and management of contaminated land that may be present.</p>
<p>Business and economic impacts</p>	<p>The area is predominantly undeveloped with large landholdings being prevalent away from the existing developed area at Glenfield station.</p> <p>Retail/commercial facilities are located in the vicinity of Glenfield station although market gardening is dominant in other areas. Specific</p>	<p>The potential economic impact on specific activities could be either direct or indirect. Direct impacts would occur where for example a property or portion of property is acquired for the railway corridor. Indirect effects might result to properties adjacent to the railway but for which no land needs to be acquired. The economic impact would depend upon the type of activities being conducted and the effect of the railway on those activities. Different effects might result from</p>	<p>Economic impacts during construction would be temporary and are anticipated to relate to issues such as maintaining access to properties and maintaining the visibility of any current operations where drive or walk-by business opportunities are important to the business. As such, these are expected to be manageable. Economic impacts during operation would be specific to the type of activities currently conducted and the environmental effects of the</p>

Issue	Existing environment	Risk assessment	Management response
	<p>facilities in the area of the proposed railway include the Casa Paloma caravan park, Forest Lawn Memorial Garden Cemetary, Western Sydney Parklands, various schools and place of worship.</p>	<p>either the construction or operation of the railway.</p>	<p>railway. Businesses potentially affected would be identified in the Environmental Assessment and a Business Continuity Sub-Plan prepared.</p>

6. Proposed scope of the Environmental Assessment

Table 6.1 outlines the proposed scope of the Environmental Assessment for the proposed South West Rail Link, drawing on the preliminary assessment of key issues in Section 5.2. Studies proposed for completion following submission of the Environmental Assessment are also noted.

Table 6.1 Scope of the Environmental Assessment

Issue	Scope of studies for the Environmental Assessment	Environmental studies not required for concept approval stage
General	<p>Incorporate results of the patronage studies and updated planning for the South West Growth Centre</p> <p>Planning and statutory requirements — expand on assessment included in this report</p> <p>Project description — update and expand on the details in this report, based on ongoing design development; and incorporate more detail on station precincts including public transport interchange arrangements and parking and interfaces with existing railway</p> <p>Construction planning — work sites, outline program, staging, haulage routes, fill sources and temporary traffic arrangements</p> <p>Sustainability considerations including greenhouse gas emissions, etc.</p>	<p>Ongoing design development and impact assessments for station precincts</p> <p>Detailed construction planning</p> <p>Ongoing development of Statement of Commitments during any additional approvals phase</p>
Stakeholder consultation	<p>Develop Stakeholder Consultation Management Plan:</p> <ul style="list-style-type: none"> ▪ Develop stakeholder and community communications strategy ▪ Liaise with key stakeholders <p>Provide outline information of the consultation activities conducted and issues identified.</p>	<p>Ongoing consultation as project develops</p>
Noise and vibration	<p>Ambient noise monitoring</p> <p>Preliminary modelling and development of noise contours for both rail operations and the stabling facility</p> <p>Preliminary modelling of construction noise and vibration</p> <p>Preliminary modelling of vibration due to rail operations</p> <p>Preliminary mitigation measures (including indicative size of any noise barriers and buffers)</p>	<p>Detailed assessment of impacts at specific sensitive receivers</p> <p>Identify the locations of residences where construction noise is expected to exceed relevant criteria</p> <p>Describe impacts of construction noise at these residences and propose specific mitigation</p>

Issue	Scope of studies for the Environmental Assessment	Environmental studies not required for concept approval stage
Visual	<p>Evaluate and map visual and landscape quality along corridor</p> <p>Identify sensitive viewpoints and receptors</p> <p>Prepare photomontages of proposal from selected viewpoints</p> <p>Prepare artist impressions or photomontages of stations</p>	<p>measures</p> <p>Detailed design of noise barriers and other noise mitigation</p> <p>Detailed assessment of construction and operation vibration impacts on identified sensitive receivers</p> <p>Conceptual urban design and landscape plan for rail corridor</p> <p>Conceptual urban design plans for station precincts</p>
Heritage	<p>Literature review and register searches</p> <p>Aboriginal consultation and associated preliminary field surveys to identify sensitive/significant areas</p> <p>Desktop prediction and field-truthing to locate existing sites and determine potential for new sites of high significance</p> <p>Consultation with the Department of Environment and Conservation and the NSW Heritage Office</p> <p>List Indigenous and historical heritage items that would be directly affected by the proposal</p> <p>Identify any potential archaeological deposits that would be directly affected by the proposal</p> <p>Significance assessments</p> <p>Document project-specific management measures</p>	<p>Follow up surveys and detailed studies (salvage excavations, etc.)</p> <p>Follow up consultation with Aboriginal groups</p>
Flora and fauna	<p>Literature review and register searches</p> <p>Targeted surveys for threatened species</p> <p>Follow up threatened species assessments</p> <p><i>Environment Protection and Biodiversity Conservation Act 1999</i> referral in relation to Cumberland Plain Woodland</p> <p>Habitat-based field survey</p> <p>Assessment of the significance of any impacts on threatened species or communities, where possible</p>	<p>Outline a management plan for significant impacts on threatened flora and fauna during construction</p> <p>Develop detailed flora and fauna mitigation measures with defined locations for inclusion in the design</p>
Flooding and drainage	<p>Identify the area where flood behaviour would change as a result of the proposal</p> <p>Identify residences and infrastructure that would be within flood-affected areas</p>	<p>Detailed hydraulic modelling of structures and localised impacts</p>

Issue	Scope of studies for the Environmental Assessment	Environmental studies not required for concept approval stage
Traffic, transport, parking and access	<p>Flood modelling as required to assess changes to flood levels and hazards</p> <p>Assess risks to the project and other infrastructure</p> <p>Describe project-specific flood mitigation measures incorporated in the project design</p> <p>Flood maps for presentation in the Environmental Assessment</p> <p>Establish transport context and regional benefits, including:</p> <ul style="list-style-type: none"> ▪ Consultation with Road and Transport Authority, Ministry of Transport, Growth Centres Commission ▪ overall land use/transport context (Metropolitan Strategy/South West Growth Centre; overall public transport and rail mode share assumptions/benefits) ▪ rail operations — patronage, operating plans, station usage, strategic role (stabling facility, etc.), future extension ▪ bus operations — strategic routes, interchanges ▪ commuter parking ▪ road network — regional road network and traffic volumes, local road traffic volumes in vicinity of stations (based on current and future road layout pattern) ▪ station mode of access, including bus, commuter parking, cycle-ways, bike parking and pedestrian access to station precincts <p>Construction impacts (general):</p> <ul style="list-style-type: none"> ▪ assess for duration of construction ▪ identify work sites and assess local traffic impacts ▪ assess construction traffic movements and impacts on local and regional roads/intersections ▪ identify temporary/permanent road closures and staging ▪ construction impact on rail services (East Hills Line, Main Southern Line, Cumberland Line, Southern Sydney Freight Line) <p>Construction impact (Glenfield Railway Station):</p> <ul style="list-style-type: none"> ▪ access impacts to businesses in station precincts 	<p>Design station precincts/interchanges for Edmondson Park and Leppington</p> <p>Leppington town centre access and mobility plan</p> <p>Local Area Transport Management Plan around Glenfield</p>

Issue	Scope of studies for the Environmental Assessment	Environmental studies not required for concept approval stage
Land use and property	<ul style="list-style-type: none"> ▪ impacts on public transport — temporary arrangements for buses in station precincts ▪ impacts to pedestrian access in station precincts ▪ impacts on commuter parking <p>Survey and map existing land uses along corridor and station precincts</p> <p>Assess land use impacts during construction — work sites, temporary road relocations, parking at station precincts and construction traffic</p> <p>Impacts on Western Sydney Parklands</p> <p>Impact on property values</p> <p>Land use changes in vicinity of station precincts, with specific reference to Glenfield Railway Station</p> <p>Assess against future land use and structure plans for South West Growth Centre — constraints on future urban development potential from corridor and stabling facility</p> <p>Identify land zoned or designated for future development, identify potential impacts on such development and quantify the nature of these impacts</p> <p>Property acquisition — list those properties where there is a partial or full acquisition required; and outline the terms of compensation available</p> <p>Identify impacts on land uses and changes to access for properties severed by the proposal</p> <p>List means of alternative access to be provided</p>	Further detailed assessment of specific property impacts
Social impacts	<p>Identify and profile communities along the corridor (i.e. analyse the existing social conditions within the study area, including the demographic characteristics, populations along the corridor and in the South West Growth Centre, community linkages and social interaction patterns)</p> <p>Identify existing and planned community infrastructure and services, along the rail corridor</p> <p>Examine the proposed development in the context of the issues and needs of specific groups in the community (existing and future)</p> <p>Identify the social changes likely to occur as part of the development of the South West Growth Centre, including traffic movements and the development of new neighbourhood centres and focal points (for both the existing and future community)</p>	Planning of new stations to integrate into the physical and social environment

Issue	Scope of studies for the Environmental Assessment	Environmental studies not required for concept approval stage
Cumulative impacts	<p>Document the changes that would form future development of the South West Growth Centre and the benefits and essential nature of the timely provision of transport infrastructure</p> <p>Evaluate the magnitude, significance and extent of social impacts (positive, negative, tangible and intangible) and identify appropriate potential mitigating measures</p> <p>List concurrent construction works and other projects that could have cumulative impacts with the proposal e.g Southern Sydney Freight Line, Bringelly Road, Camden Valley Way, others.</p>	
Statement of Commitments	<p>Identify potential cumulative impacts on environmental issues</p> <p>Outline standards, procedures, methods and protocols for identifying and managing the environmental impacts of the proposal</p> <p>List monitoring, verification, reporting and communications protocols and responsibilities</p>	

7. Bibliography

AMBS Consulting 2003, *EPCS AHMP final report*

Binary Consultants 2003, *South West Rail Link Operational Requirements Study*

Civitas Partnership et al 2003, *Leppington Rail Link Review Civitas Report, Edmondson Park – Rail Alignment*

Civitas Partnership et al 2004, *Edmondson Park Background Report*

Civitas Partnership et al 2005, *Edmondson Park Background Report Addendum report*

Connell Wagner Pty Ltd 2001, *Leppington Rail Link Rail Design Study*

Connell Wagner Pty Ltd 2003a, *South-west Rail Link Environmental Issues Study Summary Report*

Connell Wagner Pty Ltd 2003b, *SWRL Environmental Issues Study, Working Paper 1, Statutory Approvals Process*

Connell Wagner Pty Ltd 2003c, *SWRL Environmental Issues Study, Working Paper 2, Flora and Fauna*

Connell Wagner Pty Ltd 2003d, *SWRL Environmental Issues Study, Working Paper 3, Noise and Vibration*

Connell Wagner Pty Ltd 2003e, *SWRL Environmental Issues Study, Working Paper 4, Indigenous and Non-Indigenous Heritage*

Connell Wagner Pty Ltd 2003f, *SWRL Environmental Issues Study, Working Paper 5, Land Use and Community Impacts*

Connell Wagner Pty Ltd 2003g, *SWRL Environmental Issues Study, Working Paper 6, Air Quality*

Connell Wagner Pty Ltd 2004, *Railcorp SWRL Edmondson Park Design Review Report*

Connell Wagner Pty Ltd 2005a, *SWRL Alternate Alignments at Denham Court Report*

Connell Wagner Pty Ltd 2005b, *RailCorp Interface of South-west Rail Link*

Connell Wagner Pty Ltd 2006, *SWRL Draft Route Option Study*

Connell Wagner & Hard & Forrester 1994, *Glenfield to Edmondson Park Line*

Creber G and Associates 2004, *Carparking Study Rail Stations from Glenfield to Macarthur*

Department of Environment and Conservation 2005, *Aboriginal Community Consultation Guidelines*

Department of Environment and Conservation 2005, draft *Guidelines for Threatened Species Assessment under Part 3A*

Department of Environment and Conservation 2004, *Threatened Biodiversity Survey and Assessment Guidelines*

Department of Environment and Conservation 2006, *Bionet*

Department of Infrastructure, Planning and Natural Resources 2004, *The Western Parklands Management Vision, Summary Report*

Department of Infrastructure, Planning and Natural Resources 2005, *SWRL Overview Report*

Department of Planning 2005a, *Metropolitan Strategy, Appendix D Transport Strategy for Sydney*

Department of Planning 2005b, *Metropolitan Strategy, City of Cities – A Plan for Sydney's Future*

Department of Planning 2005c, *Planning Report for the South-west Growth Centre*

Department of Planning 2005d, *SWRL Overview Report Submission Summary RevB*

Eco logical Australia Pty Ltd 2003a, *Edmondson Park Ecological Assessment*

Eco Logical Australia Pty Ltd 2003b, *Liverpool Council Biodiversity Strategy*

Environment Protection Authority 1994, *Environmental Noise Control Manual*

Environment Protection Authority 2000, *Industrial Noise Policy*

G Creber and Associates Pty Ltd 2004, *Commuter Carparking Study, Rail Stations from Glenfield to Macarthur*

Geotechnique Pty Ltd 2003, *Liverpool City Council Proposed Future Development*

GHD 2000, *Edmondson Park Public Transport Corridors Study, September*

GHD 2002,

GHD 2003, *Edmondson Park Master Planning Water Cycle Mgt*

GHD and Halcrow 2001, *Glenfield Junction Master Plan*

GHD–Transmark 1994, *Badgerys Creek Airport Rail Link, Investigation of Alternative Route Option*

Gunninah Environmental Consultants 2001, *Cumberland Land Snail Survey and Management Report*

HLA-Envirosciences Pty Ltd 2003, *Edmondson Park Non-Indigenous Heritage Report*

John S Bryan Consulting 2005, *SWRL South-west Rail Link Working paper, Summary of Technical Reports*

Kellogg Brown and Root Pty Ltd 2004, *South-west Sector Public Transport Corridor Study*

Kinhill Engineers 1991, *Badgery's Creek Airport Southern Transport Corridor, Glenfield to Badgery's Creek: Preliminary Route Investigation Study*

Kinhill Engineers 1992, *Glenfield to Hoxton Park Transport Corridor Study*

Lesry K Environmental Consultants 1998, *Flora and Fauna Assessment of Ingleburn Gardens Estate, Ingleburn*

Liverpool City Council and Campbelltown City Council 2005, *Edmondson Park Master Plan*

Maunsell Australia Pty Ltd 2003, *Edmondson Park Transport Study*

National Parks and Wildlife Service 2002a, *Native Vegetation of the Cumberland Plain Mapping*

Neustein and Associates 1992, *Liverpool Heritage Study*

Parsons Brinckerhoff (PB) 2004, *Southwest and Northwest Urban Release Areas – Bus Network Pre-feasibility Study*

Parsons Brinckerhoff (PB) 2006, *Discussion Paper on Park and Ride Strategy for the South West Sector and the South West Rail Link*

Pelican Environmental Surveys 1999, *Preliminary Flora and Fauna Survey of DP807460 and DP 807461 Edmondson Park, New South Wales*

Rail Infrastructure Corporation 2003, *Glenfield Junction Grade Separation Volume 2*

State Rail 1994, *Sydney West Airport Rail Link: Preliminary Route Assessment*

TTM Consulting 2003, *Southwest Sydney Urban Expansion Area – Transport Issues and Proposals*

URS Environmental and Engineering Services 2002, *Flora and Fauna Opportunities and Constraints Study, Ingleburn Defence Site, Ingleburn*

Wildthing Consulting Services 2003, *Grasslands Report*

Appendix A

Notes from the planning focus
meeting

South West Rail Link Minutes of Meeting

Planning Focus Meeting

Date: 15 December 2005
Location: Liverpool Room, Liverpool City Council Administrative Centre
Attendees: Refer attached attendance list
Attachments: None

Issue	Minutes:	Actions
1	Introduction Mike Young opened the meeting and provided a brief overview of the agenda and explained the Planning Approval Process under Part 3A of the Environmental Planning and Assessment Act.	
2	Project presentation David Gainsford, Dean Boston and Greg Marshall presented details of the SWRL project in relation to: <ul style="list-style-type: none">▪ TIDC's role and approach▪ Project Description and design process▪ Environmental issues and approach to preliminary environmental assessment	
3	Questions in relation to presentation	
3.1	Q. Is it a final decision to bridge over the majority of existing infrastructure? (Mark Hitchenson) A. The decision on bridges is unlikely to be changed due to the vertical gradient limitations imposed by train operations	
3.2	Request for an alignment profile (Laurel Cheetham) – TIDC are in the process of reviewing the current alignments and hope to be able to discuss the alignment profiles further when the review has been completed.	TIDC
3.3	Q. Is the project likely to be built in one stage? (Laurel Cheetham) A. The section of the line from Glenfield through to the stabling west of Leppington would likely be built in one stage. The stabling facility itself may be staged as demand requires.	
3.4	Q. Has the final location for the stabling yards been determined? (Mark Hitchenson) A. The location of the stabling yards is being reviewed by Connell Wagner on behalf of TIDC and will be to the west of Leppington Station Q. What is the location of the rail line in relation to the stabling facility? (James Goodwin) A. Options for the stabling yards location and arrangement are currently being evaluated by Connell Wagner on behalf of TIDC. The design will also allow for a future proposed western extension of the SWRL through the middle or along	

Issue	Minutes:	Actions
	the outside edge of the stabling facility.	
3.5	<p>Q. Will the project incorporate road and pedestrian crossings at Leppington Town Centre, given that the final road layout is likely to be significantly different than the present layout? If the station is in a cutting as proposed, there will be a need to accommodate existing and future movement networks. (Mark Hitchenson)</p> <p>A. This would be considered as part of the station precinct urban design. Work on this aspect would commence in early 2006.</p>	
3.6	The potential for contaminated land should be considered as part of the preliminary environmental investigations given past agricultural usage. (Cathy Kinsey)	Note
3.7	Salinity is an important issue for soils and groundwater in the local area particularly when deep cuttings are proposed. The overview report is incorrect in suggesting otherwise. (Cathy Kinsey)	Note
3.8	<p>Q. What is the timeframe for extension to Bringelly? (Mark Hitchenson)</p> <p>A. Reference was made to the former Premier's announcement in June 2005 that the extension to Bringelly was estimated to be completed by 2020.</p>	
3.9	<p>Q. What is the timeframe for a decision on the northern or southern route option? (Tanya O'Brien)</p> <p>A. TIDC is focussing their initial work on comparing the options,.. It is possible that the Environmental Assessment may assess both options. The Concept Approval process allows more flexibility in relation to assessing options and unrefined project definitions.</p>	
3.10	<p>Q. Is the reconfiguration of Glenfield Junction (with the East Hills line) part of this project? (James Goodwin)</p> <p>A. Yes, this is currently part of the project.</p>	
3.11	<p>Q. Are future connections for train travel to Liverpool and Parramatta proposed? (Laurel Cheetham)</p> <p>A. Glenfield interchange will be designed to allow for movements to Liverpool and Parramatta from the SWRL. Demand will dictate how many services travel on this route..</p>	
4.	Participating Authorities Comments	
4.1	<p>Department of Environment and Conservation – James Goodwin</p> <ul style="list-style-type: none"> ▪ A competent assessment of flora and fauna heritage is needed as part of the Preliminary Environmental Assessment. 	Note
4.2	<p>Department of Planning - Rodney Lindsell</p> <ul style="list-style-type: none"> ▪ Integration of the project with existing town centres and future land uses e.g. Leppington and other projects e.g. Southern Sydney Freight Line is critical ▪ The stabling facility location requires careful consideration ▪ It is important to have appropriate development around the station precincts. Reference made to previous DUAP guidelines on integration of transport and land use planning ▪ Provision must be made for a future western extension 	

Issue	Minutes:	Actions
	<ul style="list-style-type: none"> ▪ Over 70 submissions were received to the exhibition of the SWRL overview report. The majority of submissions related to the north vs south alignment issue. There was no significant environmental 'showstopper' issues raised. 	
4.3	Liverpool Council – Milan Marecic	
	<ul style="list-style-type: none"> ▪ Timing of the project and future extension to the west is an important issue for Council, as is the selection of either the northern or southern alignments to reduce uncertainty for potentially affected property owners ▪ Other key issues include the depth of cutting, road connections and location of stabling facility with respect to Leppington Town Centre ▪ A Development Application for the Casa Paloma Caravan Park is currently being assessed by Council. The DA relates to development of demountable houses at the site. ▪ The consultation process with the Denham Court residents is an important issue for Council. 	
4.4	Roads and Traffic Authority - John Hart	
	<ul style="list-style-type: none"> ▪ Integration of the project with the road network is an important issue. Consideration should be given to plans for expansion of the existing road network. ▪ There is a need for interim bus operations to support the project. The RTA, Ministry of Transport and Growth Centres Commission need to coordinate transport arrangements. ▪ Station precincts require careful consideration in relation to 'park and ride', bus facilities and staging of development ▪ A future strategic bus corridor (or other servicing structure) to Leppington for the south west sector will require further investigation. 	
4.5	Campbelltown Council – Cathy Kinsey	
	<ul style="list-style-type: none"> ▪ Council is concerned about potential flooding issues and affect on the Glenfield detention basin that has been under consideration for many years. A study about the detention basin is currently in progress and flood mapping is available. A decision on the detention basin is likely to be made in 2006. Flood flows at Glenfield are significant – around 600 cubic metres per second for the 1 in 100 AEP flood. ▪ Redevelopment of Glenfield Station and parking impacts is a key issue for Council. ▪ Macquarie Fields House includes an historic view corridor to the city. 	
4.6	Camden Council – Mark Hitchenson	
	<ul style="list-style-type: none"> ▪ Potential impacts on Camden Valley Way require careful consideration. This is an historic transport route and site of remnant Cumberland Plain Woodland. The RTA urban design strategy for Camden Valley Way should be referred to which provides information on the existing remnant woodland. ▪ Council is particularly interested in the future extension of the SWRL and the possibility of a southern extension to Oran Park. ▪ Commuter parking provision is an important issue. 	
4.7	Sydney Catchment Authority – Christine Lubanski	
	<ul style="list-style-type: none"> ▪ The upper canal is the key issue for SCA. Specific factors include maintaining the integrity of the canal structure during construction and operation, access roads and historic plantings, Section 60 approval process under the Heritage Act, water quality in relation to potential pollutant spills, and potential vibration impacts 	

Issue	Minutes:	Actions
4.8	Sydney Water – Heidi Gleeson	<ul style="list-style-type: none"> ▪ Affect on existing water and sewerage services requires consideration ▪ Water and sewerage services to Edmondson Park are currently planned for construction from 2007 to 2010 including the possibility of a recycled water pipeline. A final decision on the recycled pipeline is expected to be made in Feb 2006. ▪ DoP has mapping of the proposed new service boundaries.
4.9	RailCorp – Rodd Staples and Naomi Fiegel	<ul style="list-style-type: none"> ▪ The project is important to address existing servicing and congestion issues on the rail network ▪ The stabling facility is an essential part of the project. ▪ The fundamental task of the SWRL is transport. Consideration of access into the new stations is critical ▪ There are four associated Rail Clearways projects in the south west ▪ 4 to 8 rail services per hour are proposed depending on demand ▪ The design is constrained by gradient and curvature issues ▪ Detailed patronage studies are not considered to be needed for the Preliminary Environmental Assessment ▪ The proposed 40 metre corridor width provides for a future four track arrangement. This would provide for both local and express services. ▪ The Preliminary Environmental Assessment should consider potential construction and operational impacts in relation to the Southern Sydney Freight Line.
4.10	Department of Planning (Parramatta Regional Office) – Laurel Cheetham	<ul style="list-style-type: none"> ▪ Need to ensure that people are encouraged to use the facility – design should seek to maximise patronage ▪ The recent strategy review of the Western Sydney Parklands should be considered ▪ A Sub- regional metropolitan strategy for Liverpool is currently being prepared and is due for release in July/August 2006. There is a focus on Liverpool as the main regional centre, which should be considered.
5	Closing Comments – Mike Young	<ul style="list-style-type: none"> ▪ There is a need for ongoing consultation with relevant agencies and the community ▪ Need to look closely at flooding, groundwater, soils and salinity issues and station access ▪ The application for ‘authorisation’ of a concept plan should be lodged at the same time as the Project Application ▪ The Environmental Assessment for the Concept Approval will necessarily focus on key issues. There is likely to be need for further detailed studies and these would be set out in the Conditions of Approval ▪ Agencies are requested to provide succinct input to the Environmental Assessment Requirements so that the compiled document can focus on the key issues.
6	A site inspection was conducted. No minutes of these discussions were taken	

Circulation: TIDC, Study Team, Attendees

Project Application for the South West Rail Link

PFM Meeting Attendance List

Name	Title	Organisation Represented
Mike Young	Team Leader, Transport	DoP
Rodney Lindsell	Transport Strategy	DoP
Sally Nunnerley	Transport Strategy	DoP
Dean Boston	Design Manager	TIDC
Alison Jackson	Public Affairs Officer	TIDC
David Gainsford	Project Approvals Manager, Metro Rail Expansion	TIDC
Ian Curtis	Acting Manager Environmental Planning	Campbelltown City Council
Felicity Saunders	Strategic Environmental Planner	Campbelltown City Council
Cathy Kinsey	Co-ordinator Flood Mitigation and Drainage	Campbelltown City Council
Phil Tolhurst	Manager, City Development	Liverpool City Council
Milan Marecic	Team Leader, Strategic planning	Liverpool City Council
Mark Hitchenson	Accessibility officer	Camden Council
Mick Patterson	Major Projects Development, Interface Projects	Railcorp
Rodd Staples	Manager, Rail Development	Railcorp
Scott De Martino	Transport Planning Manager	Railcorp
Naomi Fiegel	Planning Manager	Railcorp
Andrew Barnett	Design Delivery Manager	Railcorp
Mark Ozinga	Transport Planner	RTA
John Hart	Manager, Multi-modal Planning	RTA
James Goodwin	Regional Operations Manager	DEC
Catherine Barlow	Senior Policy Officer, Transport Planning	MoT
Heidi Gleeson	Environmental Planner	Sydney Water Corporation
Christine Lubanski	Environmental Officer	Sydney Catchment Authority
Tania O'Brien	Senior Strategic Planner	Liverpool City Council
Laurel Cheltham	Senior Environmental Planner	DoP

Appendix B

Route options comparison report



Transport Infrastructure
Development Corporation

South West Rail Link

Route Option Report

Report Prepared by:



Transport Infrastructure
Development Corporation

Date: March 2006
Revision: 1
Status: Final

Commercial in Confidence



TABLE OF CONTENTS

1	EXECUTIVE SUMMARY	1
2	INTRODUCTION	6
2.1	BACKGROUND.....	6
2.2	TERMS OF REFERENCE	7
2.3	METHODOLOGY.....	8
3	STRATEGIC CONTEXT.....	9
3.1	METROPOLITAN STRATEGY	9
3.2	SOUTH WEST GROWTH CENTRE.....	9
3.3	LEPPINGTON TOWN CENTRE	9
4	ROUTES	14
4.1	REFERENCE ROUTES.....	14
4.2	ALTERNATE ROUTE OPTIONS	15
4.3	REVIEW OF ALTERNATE ROUTES	16
4.4	REFINED ROUTES	17
5	COMPARISON OF REFINED ROUTES.....	19
5.1	TECHNICAL AND CONSTRUCTABILITY ISSUES	19
5.1.1	Constructability issues	19
5.1.2	Hydrology and flooding.....	19
5.1.3	Local traffic issues.....	20
5.2	OPERABILITY	20
5.3	ENVIRONMENTAL ISSUES	21
5.3.1	Flora.....	21
5.3.2	Fauna.....	23
5.3.3	Indigenous Heritage	24
5.3.4	Non-indigenous Heritage.....	25
5.3.5	Noise impact	25
5.3.6	Visual Impacts.....	27
5.4	PROPERTY	30



5.4.1	Refined Southern Route.....	30
5.4.2	Refined Northern Route	30
5.5	SOCIAL AND COMMUNITY ISSUES	33
5.6	COST ESTIMATES	34
5.6.1	Construction cost.....	34
5.6.2	Land Acquisition Costs	34
5.6.3	Operating Costs	35
5.6.4	Summary Costs.....	35
5.7	SUMMARY	36
6	KEY FINDINGS.....	38
	References.....	39
	Appendix A Schedule of Specialist Consultants	40



1 EXECUTIVE SUMMARY

INTRODUCTION

In June 2005, the NSW Government announced it would invest \$8 billion over the next 15 years to develop the Metropolitan Rail Expansion Program (MREP). The MREP consists of three projects:

- North West Rail Link (NWRL);
- Redfern to Chatswood Rail Link (RCRL); and
- South West Rail Link (SWRL).

In November 2005, the Transport Infrastructure Development Corporation (TIDC) was directed to undertake the following:

- The necessary technical studies and reviews to confirm and, in some locations, finalise the alignments of the North West and South West Rail Links;
- The necessary technical studies and reviews to finalise and confirm two alignments in the CBD, and determine which of these should, at the appropriate time, be delivered first; and
- For the North West and South West Rail Links, undertake the necessary work and prepare the documentation to a stage sufficient to obtain a Concept Approval.

This report has been prepared to assist in finalising the alignment of the South West Rail Link (SWRL), a proposed new rail line from Glenfield to Leppington in Sydney's south west. The SWRL will include two new stations at Edmondson Park and Leppington and a new stabling facility to the west of Leppington Station.

BACKGROUND

A number of studies have been undertaken since the early 1990s to develop routes for the SWRL. These studies culminated in the development of two alternative routes: a northern route and a southern route (refer Figure 1 below). These routes were described in the South West Rail Link Overview Report which was placed on public exhibition in 2005.

The northern and southern routes as described in the Overview Report share a common alignment between Glenfield and Cabramatta Creek, just west of the proposed Edmondson Park Station. The southern route then travels west from Edmondson Park and passes through the residential area of Denham Court, the southern section of the Forest Lawn Memorial Gardens and through the Casa Paloma Caravan Park to the proposed Leppington Station near Byron Road. The northern route travels north west from Cabramatta Creek, through the northern segment of Forest Lawn Memorial Gardens, through a section of Western Sydney Parklands and then on to the proposed Leppington Station.

Seventy seven submissions were received in response to the public exhibition and raised concerns relating to property, flooding, noise and endangered vegetation impacts. There

were also concerns raised over the planning of Leppington Town Centre and the proposed location of the stabling facility.

TERMS OF REFERENCE

The Terms of Reference for this report are as follows:

1. Undertake a review of the previous studies of the southern and northern route options.
2. Undertake further studies to refine the southern and northern route options.
3. Provide a comparison between the two refined route options against a number of differentiating factors including technical, environmental, social, operability and costs.

REFINEMENT OF ROUTE OPTIONS

The northern and southern routes as described in the Overview Report (referred to in this report as reference routes) have been refined to take into account feedback from public submissions and further planning of Leppington Town Centre. The reference southern and northern routes and the refined southern and northern routes are shown in Figure 1 below.

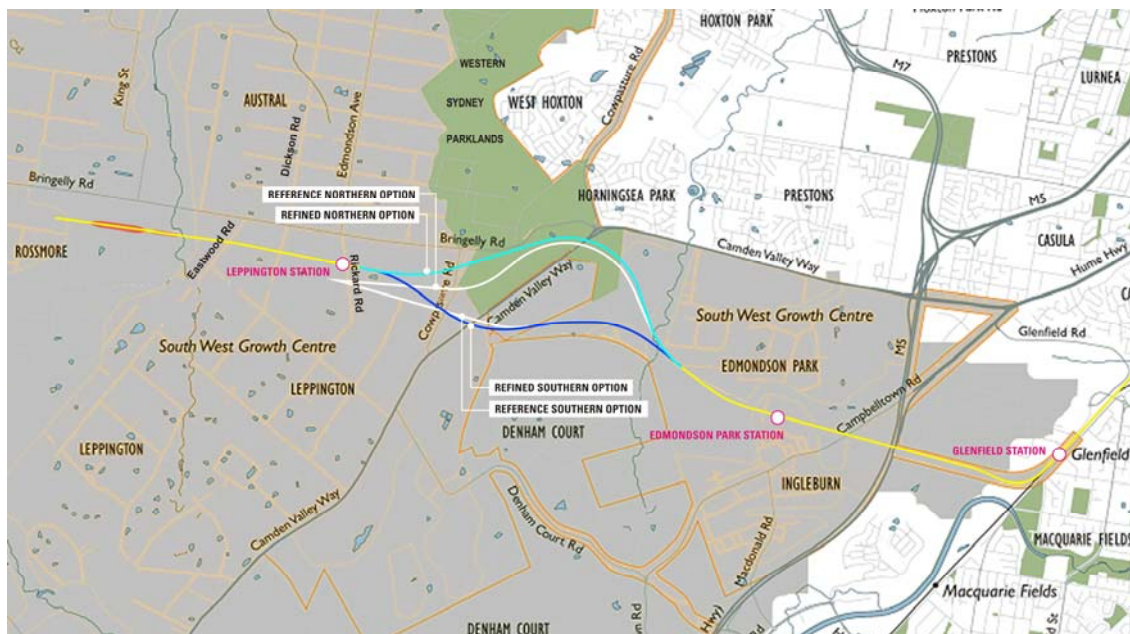


Figure 1: Reference and refined southern and northern routes

Leppington Station and the proposed stabling yard have been located further west than in the reference routes. This is in response to the current urban planning for the new town centre (as shown in the *South West Growth Centre Structure Plan*) and the potential flooding constraints in the area. The stabling yard has been located away from the future Leppington Town Centre.



The refined southern route runs through Denham Court in a cutting and then travels slightly further south than the reference route at the southern end of the Forest Lawn Memorial Gardens before traversing north to the proposed Leppington station.

The refined northern route travels in a northerly direction just before Denham Court, and goes slightly further north than the reference route to avoid impacting the Forest Lawn Memorial Gardens before traversing in a southerly direction through the Western Sydney Parklands to the proposed Leppington Station.

COMPARISON OF THE REFINED ROUTE OPTIONS

A comparative analysis of the refined routes has been undertaken based on the following criteria: technical and constructability, operability, environmental, property, social/community and cost. Key findings are summarised in Table 1 below.

Table 1: Comparison of refined routes

Issue	Refined Southern Route	Refined Northern Route
Technical and constructability:		
Route length and directness	Route is 500m shorter. More direct route through to Leppington.	Route is 500m longer.
Constructability	No substantive difference.	No substantive difference.
Hydrology and flooding	No substantive difference.	No substantive difference.
Local traffic	No substantive difference.	No substantive difference.
Operability:		
Travel times between the two stations	One minute less in both directions (trip to city approx. 50 mins).	One minute longer in both directions (trip to city approx 50 mins).
Environmental:		
Clearing of endangered ecological communities	4.0 hectares	5.6 hectares
Clearing of core/support for core habitat	3.9 hectares	3.6 hectares
Cultural Heritage	Disturbs area of moderate archaeological sensitivity.	Disturbs area of high archaeological sensitivity.
Residences affected by noise	Noise goals exceeded at a greater number of residences (with or without noise mitigation).	Noise goals exceeded at a lower number of residences (with or without noise mitigation).



Visual impact (note: overall visual amenity of area will change with future development)	Impacts on semi-rural character of Denham Court. Impacts where route crosses Camden Valley Way and the Casa Paloma Caravan Park.	Impacts on rural character of Western Sydney Parklands Obscures views of scenic hills at Denham Court from Edmondson Park.
Property:	44 land holdings affected. Full acquisition of 24 privately owned properties required. Partial acquisition of 12 privately owned properties. 8 residential and 4 rural acreage dwellings require demolition. Impact on Forest Lawn Memorial Gardens.	44 land holdings affected. Full acquisition of 13 privately owned properties required. Partial acquisition of 13 privately owned properties. 1 residential and 1 rural acreage dwellings require demolition. Impact on Western Sydney Parklands.
Social and community:	Loss of amenity in low density residential area of Denham Court. Loss of low income housing at Casa Paloma Caravan Park.	Loss of recreational land in precinct 9 (Hoxton Park Ridge) of Western Sydney Parklands.
Capital Cost:	Capital cost of section from Edmondson Park to Leppington is approximately \$11m greater.	Capital cost of section from Edmondson Park to Leppington is approximately \$11m less.
Breakdown:		
- Construction cost	\$88.0m	\$91.0m
- Land acquisition cost	\$84.2m	\$75.5m
- Surplus land resale	-\$7.5m	-\$13.1m
TOTAL	\$164.7m	\$153.4m
Operating and maintenance cost:	Operating and maintenance cost is approximately \$50k less per annum.	Operating and maintenance cost is approximately \$50k more per annum.

KEY FINDINGS

In summary, the refined southern and northern routes are very similar in terms of technical and constructability criteria. There are some differences between the two routes in relation to the other evaluation criteria.

The refined southern route:



- Is 500 metres shorter than the northern route, resulting in a one minute difference in travel time and an annual operation and maintenance cost which is approximately \$50K less than the northern route;
- Has a capital cost which is approximately \$11m greater than the refined northern route;
- Has less overall impact on endangered ecological communities (1.6 hectares less clearing required), but a slightly greater impact on core habitat (0.3 hectares more clearing required);
- Has less impact on cultural heritage;
- Has a greater impact on private property owners, with 24 privately owned properties needing to be fully acquired, with 8 residential and 4 rural acreage dwellings to be demolished; and
- Has a greater impact on residential amenity than the refined northern route, with noise targets being exceeded at a greater number of residences (with or without noise mitigation).

The refined northern route:

- Is 500 metres longer than the southern route, resulting in a one minute increase in travel time and an annual operation and maintenance cost which is approximately \$50K more than the southern route;
- Has a capital cost which is approximately \$11m less than the refined southern route;
- Has a greater overall impact on endangered ecological communities (1.6 hectares more clearing required) but a slightly lower impact on core habitat (0.3 hectares less clearing required);
- Has a greater impact on cultural heritage;
- Has less impact on private property owners, with 13 privately owned properties needing to be acquired, with 1 residential and 1 rural acreage dwelling to be demolished; and
- Has less impact on residential amenity, with noise targets being exceeded at fewer residences than the southern route (with or without noise mitigation).

Selection of a preferred route will depend on the weighting given to each of the criteria used for evaluation.

2 INTRODUCTION

2.1 BACKGROUND

In June 2005, the NSW Government announced it would invest \$8 billion over the next 15 years to develop the Metropolitan Rail Expansion Program (MREP) (refer Figure 2). The MREP consists of three projects:

- North West Rail Link (NWRL);
- Redfern to Chatswood Rail Link (RCRL); and
- South West Rail Link (SWRL).

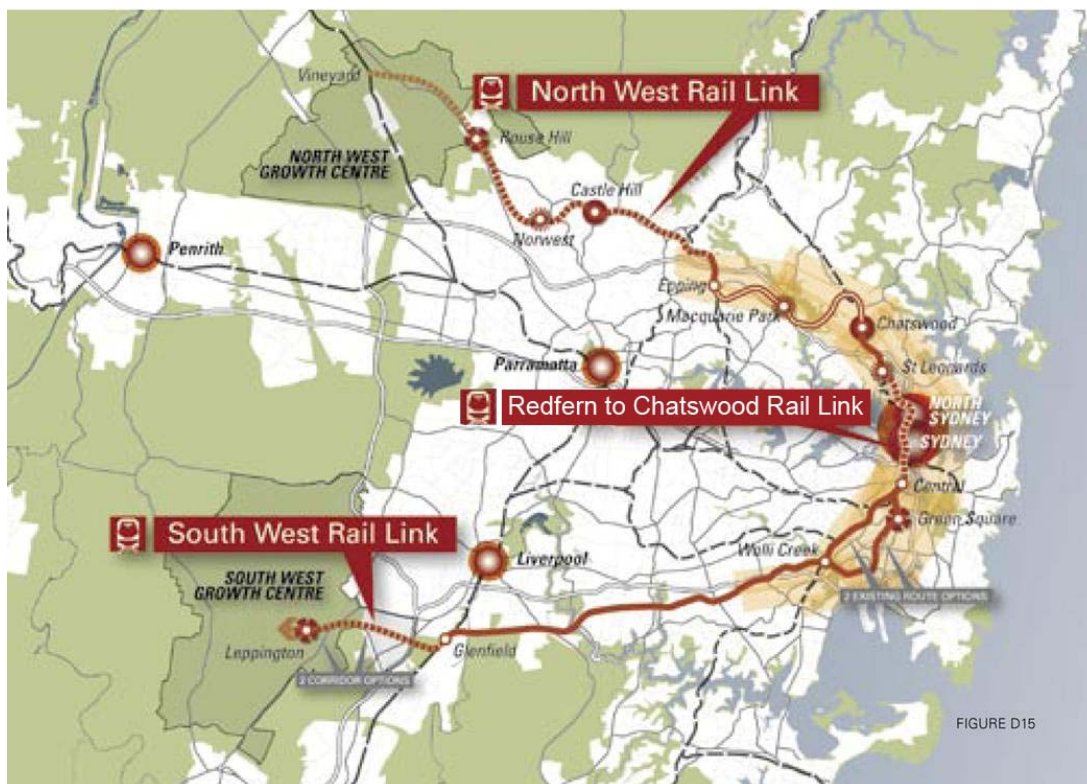


Figure 2: The Metropolitan Rail Expansion Program

In November 2005, the Transport Infrastructure Development Corporation (TIDC) was directed to undertake the following:

- The necessary technical studies and reviews to confirm and, in some locations, finalise the alignments of the North West and South West Rail Links;
- The necessary technical studies and reviews to finalise and confirm two alignments in the CBD, and determine which of these should, at the appropriate time, be delivered first; and



- For the North West and South West Rail Links, undertake the necessary work and prepare the documentation to a stage sufficient to obtain a Concept Approval.

This report has been prepared to assist in finalising the alignment of the South West Rail Link (SWRL), a proposed new rail line from Glenfield to Leppington in Sydney's south west. The SWRL will include two new stations at Edmondson Park and Leppington and a new stabling facility to the west of Leppington Station.

Planning for a railway to service the South West Sector began in the early 1990s and was initially driven by the proposed Badgerys Creek Airport. More recently, planning for the rail line has been driven by planning for new residential development at Edmondson Park and Leppington.

Recent studies have focused on developing concept route options, assessing environmental impacts, and obtaining feedback from the community and stakeholders. These studies are summarised below.

- Leppington Rail Link: Rail Design Study (Connell Wagner, June 2001)

This study reviewed the various routes that had been proposed over a ten year period from the early 1990s and proposed a preferred route. This route is the reference southern route.

- South West Rail Link: Environmental Issues Study (Connell Wagner, July 2003)

This study reviewed the environmental impacts of the reference southern route. The study was released at the time the *South West Rail Link Overview Report* was exhibited in 2005.

- South West Rail Link: Alternative Alignments at Denham Court (Connell Wagner, March 2005)

This report was commissioned in response to concerns regarding the impact of the SWRL on the existing residential area of Denham Court, the Forest Lawn Memorial Gardens and the Casa Paloma Caravan Park. The study suggested three alternatives: a tunnel between Edmondson Park and Leppington; a deep cutting through Denham Court rather than at grade; and an alternative route alignment to the north of the Forest Lawn Memorial Gardens. The alternative alignment to the north is the reference northern route.

- South-West Rail Link Overview Report (Department of Planning, June 2005)

The NSW Government exhibited an Overview Report of the South West Rail Link between June and October 2005 outlining work undertaken to date and identifying a northern and a southern route.

2.2 TERMS OF REFERENCE

The Terms of Reference for this report are as follows:

1. Undertake a review of the previous studies of the southern and northern route options.



2. Undertake further studies to refine the southern and northern route options.
3. Provide a comparison between the two refined route options against a number of differentiating factors including technical, environmental, social, operability and costs.

2.3 METHODOLOGY

TIDC engaged a number of specialist consultants to provide advice on key areas of this report including ecology, heritage, noise, hydrology, urban design, property and engineering (refer to Appendix A for further details). Regular consultant coordination meetings were held to identify key issues and coordinate the report.

Consultants provided input to this report for each of the key areas, with TIDC providing overall coordination and management of the process.



3 STRATEGIC CONTEXT

3.1 METROPOLITAN STRATEGY

The NSW Government's *Metropolitan Strategy City of Cities – A Plan for Sydney's Future* was released in December 2005. It identifies two major growth centres – the North West Growth Centre and the South West Growth Centre (refer Figure 3).

The Metropolitan Rail Expansion Program (MREP) is an integral component of the metropolitan strategy as it will service these growth centres, providing links between the major new growth and employment areas of the metropolitan region.

The proposed South West Rail Link will cater for the South West Growth Centre. Strategic planning for the South West Growth Centre is underway and more detailed local planning is being progressively undertaken by Liverpool and Campbelltown councils for the developing area of Edmondson Park and beyond. The release of land is underpinned by a commitment to ensure that public transport links and services are in place early in the development of these areas.

3.2 SOUTH WEST GROWTH CENTRE

The South West Growth Centre is expected to eventually contain 100,000 dwellings with a population of approximately 270,000 people. Structure planning for the development of this Growth Centre is progressing and represents an opportunity to deliver well-designed urban development integrated with timely provision of transport infrastructure.

A draft Structure Plan indicating the broad pattern of land uses, new roads, environmental areas and town centres was exhibited in June 2005. An amended Draft Structure Plan was on exhibition for community comment from 27 January to 10 March 2006 (refer Figure 4).

A key element of the *South West Growth Centre Structure Plan* is the development of a major town centre based around a new railway station at Leppington. The town centre is proposed to be the principal commercial and retail heart and public transport hub for the new surrounding suburbs, which will ultimately have a population of approximately 270,000 residents. The town centre is intended to accommodate a major shopping centre, a TAFE college, medium density housing (apartments and townhouses), supporting commercial services, community services and recreation facilities.

The alignment for the eastern section of the SWRL between Glenfield and Edmondson Park is planned to be incorporated into amendments to the *Liverpool Local Environmental Plan 1997* and *Campbelltown (Urban Areas) Local Environmental Plan 2002*.

3.3 LEPPINGTON TOWN CENTRE

A key issue in determining the most appropriate route for the South West Rail Link is the location of the proposed Leppington Station / Town Centre.



There is a unique opportunity at Leppington, to plan both the railway and town centre in parallel, to maximise the synergy between the two developments. This will enable the railway through the town to be optimised in terms of alignment and be planned to facilitate the creation of a best practice, transit orientated development, mixed use town centre.

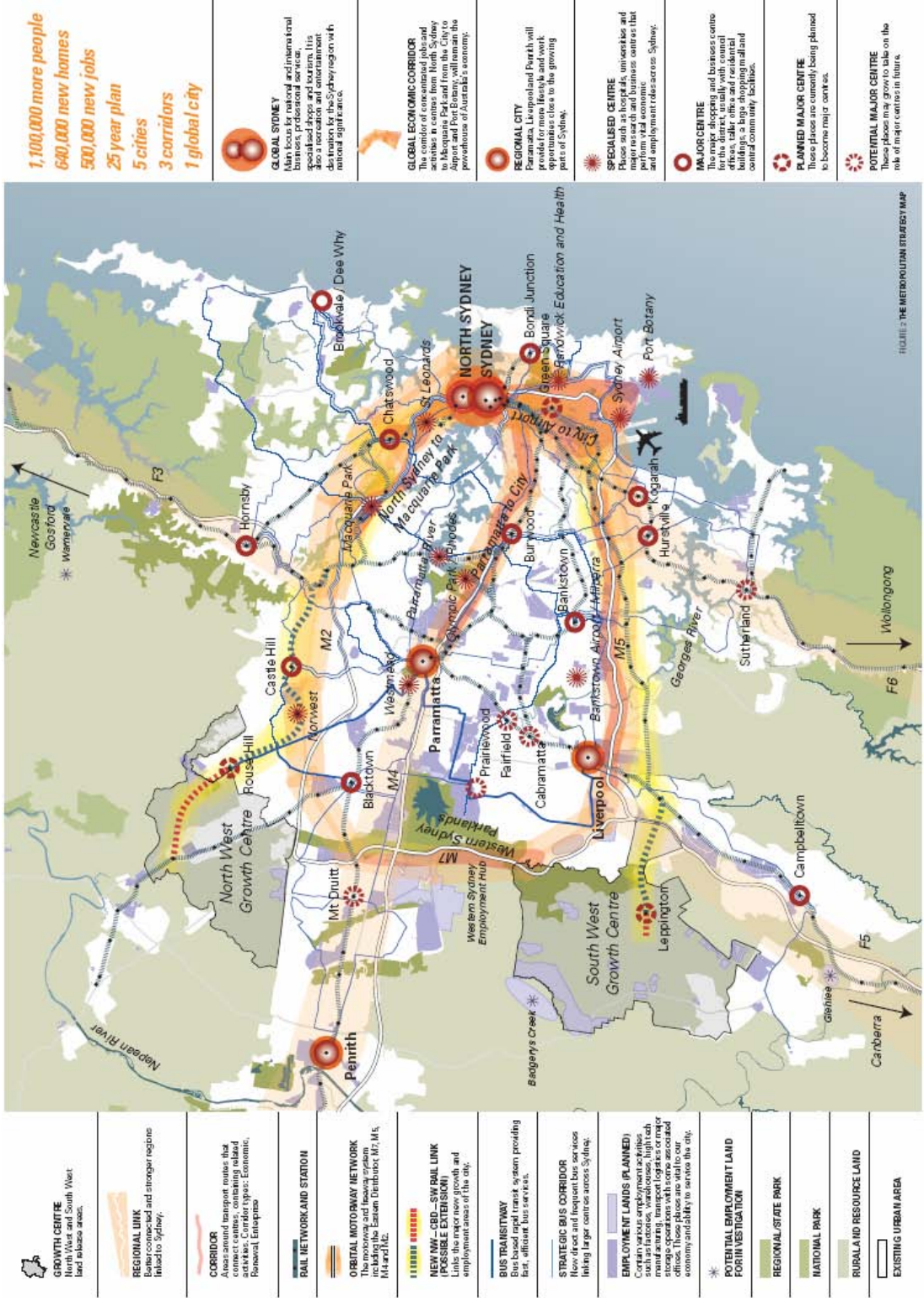


Figure 3 Metropolitan Strategy for Sydney (DoP, Dec 2005)

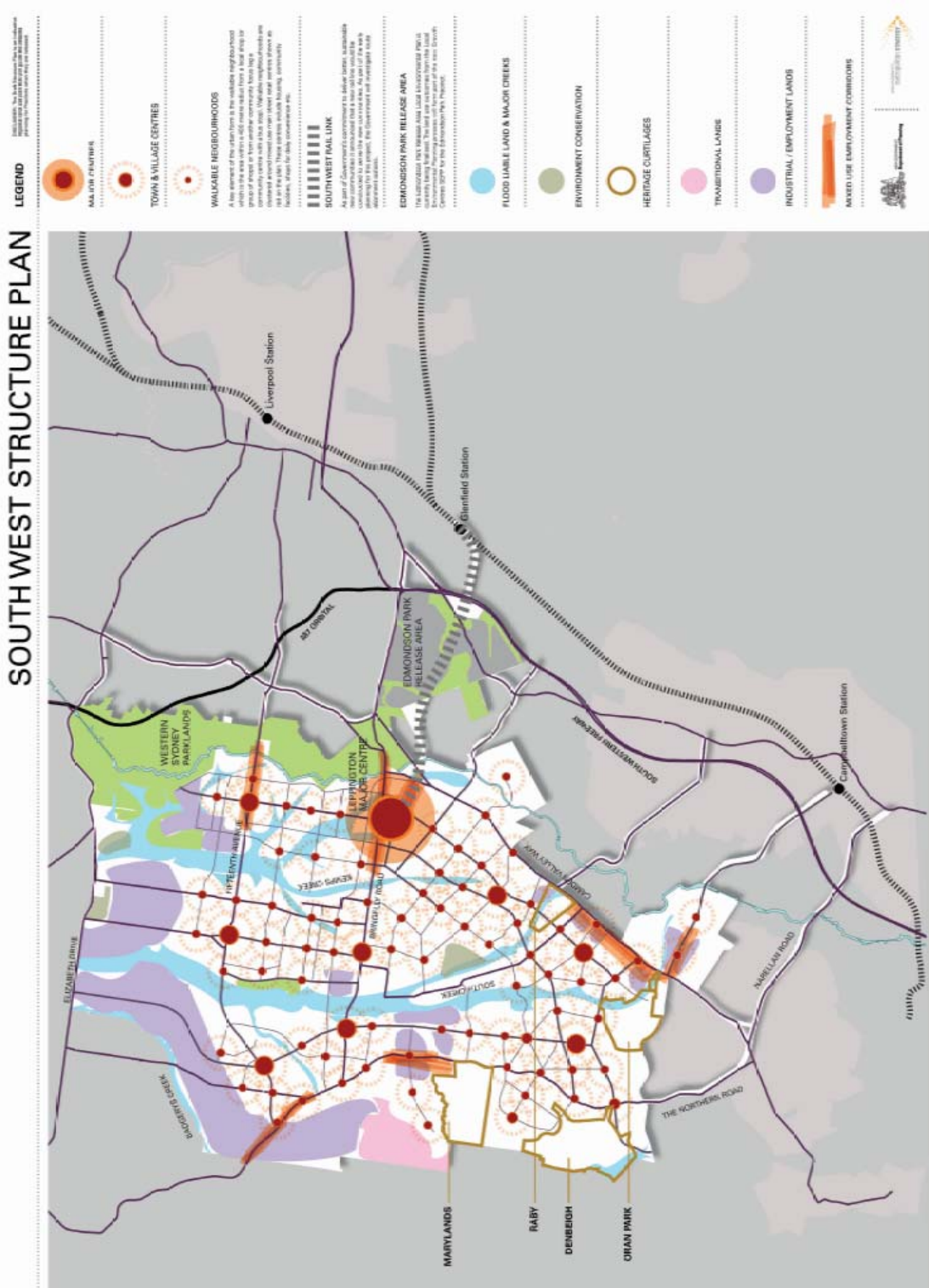


Figure 4 South West Growth Centre Structure Plan



The principles that are important in the early stages of planning a major town centre served by rail are summarised below.

- The major town centre should enjoy good exposure to and connectivity with the new Leppington Rail railway station, as well as main roads such as Bringelly Road, which will be the closest arterial road in the short term for access and exposure to the town centre.
- To function effectively in the long term, the railway station and the town centre must also be efficiently served by upgraded road and bus networks to, from and through surrounding suburbs.
- The rail alignment should facilitate connections between existing and proposed roads, the town centre and the site of the railway station.
- There needs to be sufficiently large areas of land surrounding the rail station to accommodate buildings and activities planned for the town centre (for example, 250ha would accommodate an 800m walking radius).
- The natural features of the land should enable special amenity to be created or reinforced in order to give a strong identity to the town centre (for example, parkland, lake and views).
- Must ensure that the station integrates with planning for the town centre and that appropriate land uses are located adjacent to the rail corridor and stabling area.
- The railway station should be at the heart of the town centre and preferably fully or partially grade separated below ground level from its surrounds in order to facilitate access to and from the station and permit development directly over the station.

The siting of the town centre in Leppington is also constrained by local factors including the northward-flowing watercourses and related potential flood prone land. These constraints have a fundamental influence on the railway station location, the rail alignment and the area available for a future town centre.

Further details on the proposed location of the station and stabling facility are provided in Section 4.4.

4 ROUTES

4.1 REFERENCE ROUTES

A number of studies have been undertaken since the early 1990s to develop routes for the SWRL. These studies culminated in the development of two alternative routes: a northern route and a southern route as illustrated in Figure 5 below (referred to in this report as the reference northern and reference southern route). These routes were described in the South West Rail Link Overview Report which was placed on public exhibition in 2005.

The reference northern and southern routes as described in the Overview Report share a common alignment between Glenfield and Cabramatta Creek, just west of the proposed Edmondson Park Station. The reference southern route then travels west from Edmondson Park and passes through the residential area of Denham Court, the southern section of the Forest Lawn Memorial Gardens and through the Casa Paloma Caravan Park to the proposed Leppington Station near Byron Road. The reference northern route travels north west from Cabramatta Creek, through the northern segment of Forest Lawn Memorial Gardens, through a section of Western Sydney Parklands and then on to the proposed Leppington Station.

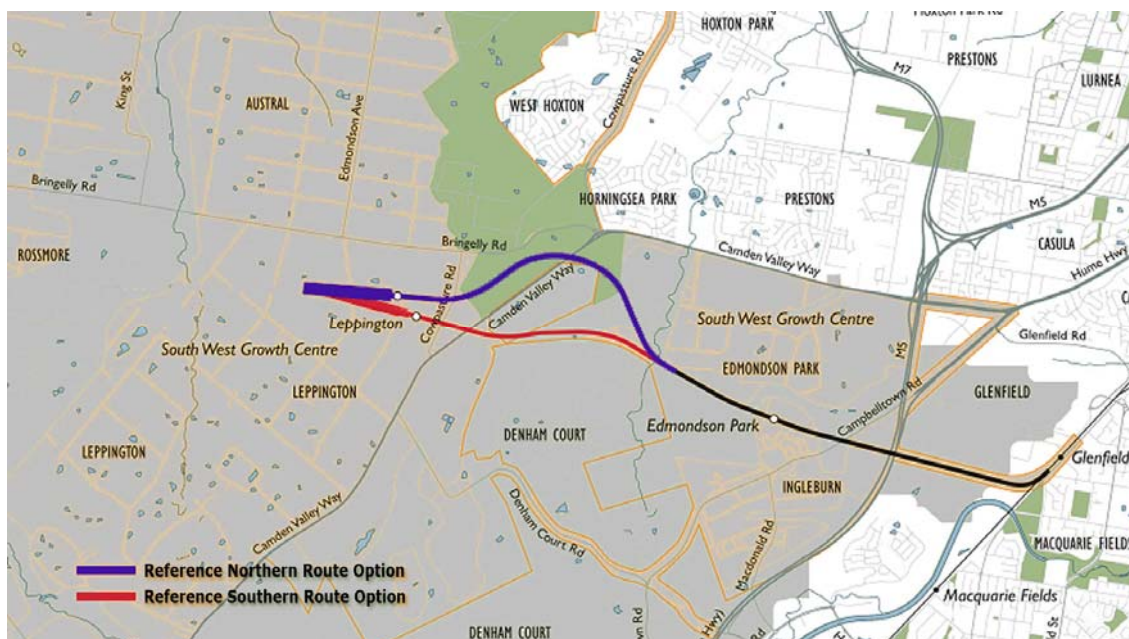


Figure 5: Reference Routes

Seventy seven submissions were received in response to the public exhibition and raised concerns relating to property, flooding, noise and endangered vegetation impacts. There were also concerns raised over the planning of Leppington Town Centre and the proposed location of the stabling facility.

4.2 ALTERNATE ROUTE OPTIONS

In refining the reference routes, four alternate route options from Edmondson Park to Leppington were developed and assessed (refer Figure 6). In all options, Leppington Station and the proposed stabling yard have been located further west than proposed by the reference routes.

The alternate route options were developed taking into account rail operational requirements, issues raised in *Overview Report* submissions, potential flooding constraints and current urban planning for the new Leppington town centre (as shown in the South West Growth Centre Structure Plan).

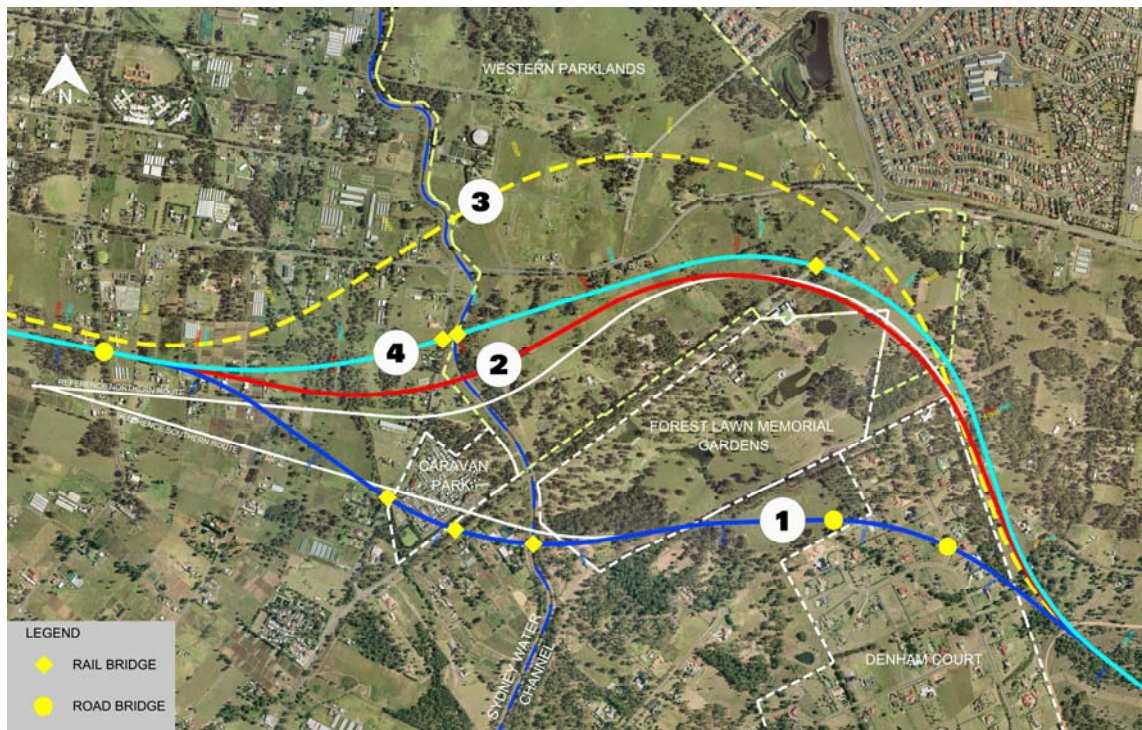


Figure 6 Alternate Routes

OPTION 1

This route option follows the reference southern route through Denham Court in a deeper cutting. It then goes slightly further south than the reference southern route, passing through the southern end of the Forest Lawn Memorial Gardens and the Casa Paloma Caravan Park before travelling north to the proposed Leppington station.

OPTION 1A

This route follows the same alignment as Option 1, however passes through Denham Court in tunnel rather than a cutting.



OPTION 2

This route is similar to the reference northern route but travels slightly further north. It passes north of Denham Court, cuts across the north-east corner of the Forest Lawn Memorial Gardens and into the Western Sydney Parklands, where it deviates from the northern reference route through to Rickard Road. West of Rickard Road, the route follows the corridor common to all of these options to the proposed station and the stabling facility at Leppington.

OPTION 3

This option travels further north than Option 2 to provide a better rail alignment. Though the improved rail alignment allows for greater line speed, it is approximately 800m longer than Option 1 and has a greater number of bridge crossings than the other routes. It also results in greater severance of the Western Sydney Parklands.

OPTION 4

This route travels slightly further north than Option 2, avoiding Forest Lawn Memorial Gardens and then travelling through the Western Sydney Parklands, before moving towards Bringelly Road to join the corridor, common to all of these options, to the proposed station and the stabling facility. The future widening of Bringelly Road would allow for a combined rail and road corridor minimising the impacts on the Western Sydney Parklands.

4.3 REVIEW OF ALTERNATE ROUTES

A review of the alternate route options was undertaken to select the preferred northern and southern routes - referred to as the refined northern and southern routes.

Option 1 was considered to be an improvement on the reference southern route as it had less encroachment on the Forest Lawn Memorial Gardens and a reduced impact on the Casa Paloma Caravan Park. The route includes a deeper cutting through Denham Court to reduce noise and visual impacts.

Option 1A further reduces the impacts on Denham Court residents by the use of a tunnel rather than a cutting. However this would result in a significant additional cost of approximately \$100 million.

Option 2 is only marginally different to the northern reference route with a slightly improved rail alignment. However, as it still cuts across the north-east corner of the Forest Lawn Memorial Gardens it does not provide a significant improvement on the reference northern route.

Option 3 has an improved rail alignment, but severs a larger section of the Western Sydney Parklands and has a greater number of bridge crossings. This option does not align with the proposed widening of Bringelly Road.

Option 4 has an improved rail alignment compared to the reference northern route and completely avoids the Forest Lawn Memorial Gardens. This option also aligns with the proposed widening of Bringelly Road.

Based on this analysis, Option 1 has been identified as the refined southern route and Option 4 has been identified as the refined northern route.

4.4 REFINED ROUTES

In both refined routes, Leppington Station and the proposed stabling yard have been located further west than in the reference routes. The station would be just west of Rickard Road, at the heart of the town centre. The stabling yard has been located away from Leppington Town Centre. This is in response to the current urban planning for the new town centre and the potential flooding constraints in the area (refer Figure 7).



Figure 7 Leppington Town Centre and Indicative Transport Networks

The location and vertical profiles for the refined southern and northern routes are shown in Figure 8 and Figure 10. A detailed comparison of the two refined routes is provided in the next section.

The refined southern route runs through Denham Court in a cutting and then travels slightly further south than the reference route at the southern end of the Forest Lawn Memorial Gardens before traversing north to the proposed Leppington station.

The refined northern route travels in a northerly direction just before Denham Court, and goes slightly further north than the reference route to avoid impacting the Forest Lawn Memorial Gardens before traversing in a southerly direction through the Western Sydney Parklands to the proposed Leppington Station.

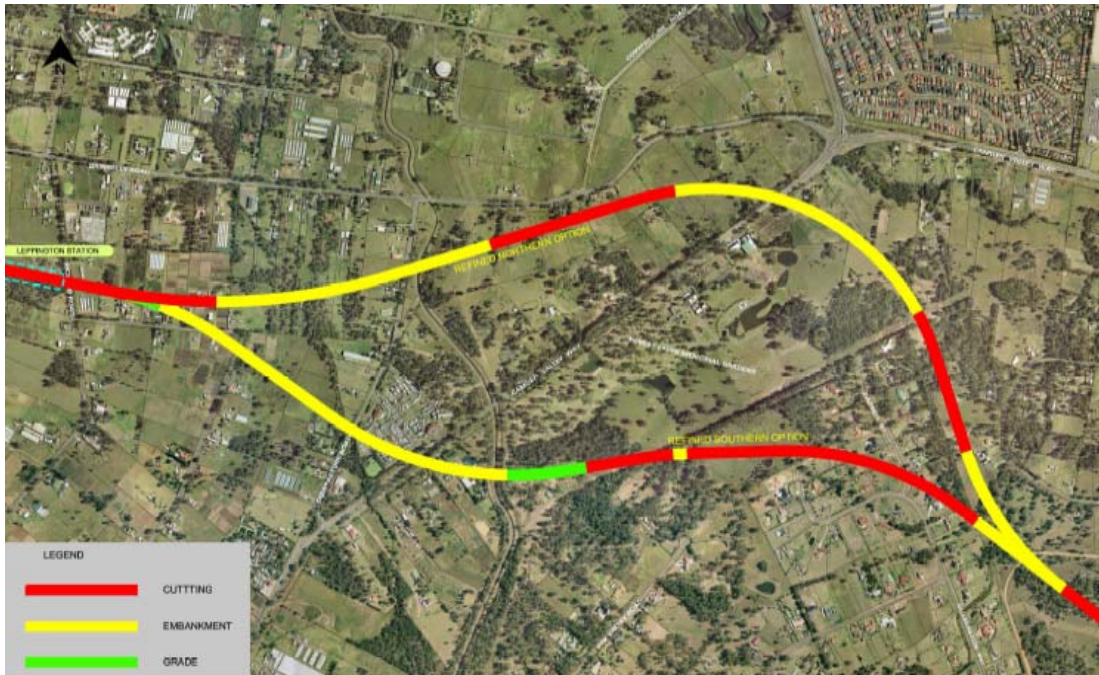


Figure 8 Refined Southern and Northern Routes - location

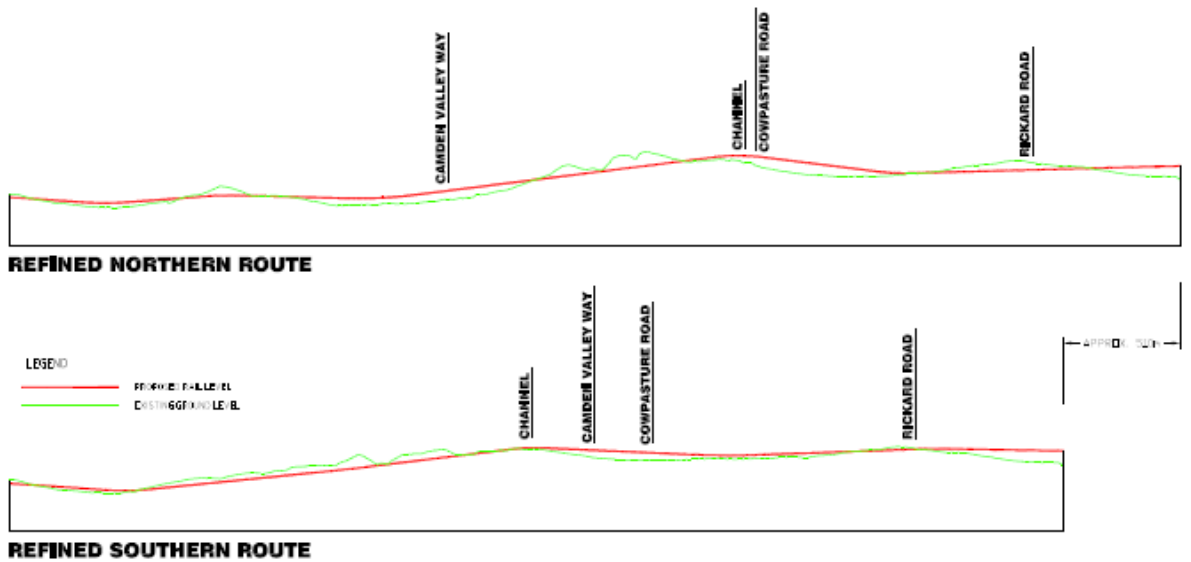


Figure 9 Refined Southern and Northern Routes – vertical profiles



5 COMPARISON OF REFINED ROUTES

A comparison of the two refined routes has been undertaken to identify and assess the differences between the two options. The following issues have been considered:

- technical and constructability issues;
- operability;
- environmental impacts;
- property;
- social / community impacts; and
- capital cost including property acquisition.

5.1 TECHNICAL AND CONSTRUCTABILITY ISSUES

5.1.1 Constructability Issues

The refined southern route is 500m shorter than the northern route and is a more direct route through to Leppington. The refined northern route would require more earthworks to accommodate the railway through the escarpment between the Forest Lawn Memorial Gardens and Bringelly Road. The refined southern route has a greater number of road and bridge crossings and a deep cutting through Denham Court. Overall there is no substantive difference between the two routes.

5.1.2 Hydrology and flooding

From a hydrology perspective both the refined northern and southern routes will cross tributaries to Bonds Creek and Cabramatta Creek. These tributaries generally flow in a northerly direction. For the purposes of this assessment, two types of watercourse crossings were considered:

- Major crossings which drain catchments larger than 40 hectares; and
- Minor crossings which drain catchments smaller than 40 hectares.

Of the minor crossings, those draining catchments less than 3 hectares were ignored for this assessment.

The refined northern route has seven waterway crossings in total, consisting of three minor crossings, and four major crossings. The refined southern route also has seven waterway crossings in total, consisting of four minor crossings, and three major crossings.

In terms of hydrologic impacts, there are only minor differences between the refined northern and refined southern routes. The refined northern route will require one additional major waterway crossing compared to the refined southern route, however, this crossing is rather conventional. The refined southern route contains two waterway crossings located in a cutting and one major crossing that provides marginally adequate clearance above the adjacent floodplain. This crossing is likely to require additional



culvert and channel works in comparison to the equivalent refined northern route crossing.

Neither refined route contains significant flooding constraints and it would appear that all major crossings are sufficiently above the floodplain to provide a suitable level of flood protection. Both options are feasible in terms of potential hydrologic impacts provided that the waterway openings and drainage channels are sized to account for the potential impacts due to blockage, flood impacts on upstream development and, where appropriate, the flood consequences in rarer events.

5.1.3 Local traffic issues

In relation to local traffic issues there are only minor differences which are summarised in Table 2 below. The refined northern and southern routes differ only in a small number of locations.

Table 2 Traffic impacts

Location	Refined Southern Route	Refined Northern Route
Cassidy Street, Denham Court	Deep cutting to permit road bridge.	No impact.
Camden Valley Way	Bridging required.	Bridging required.
Cowpasture Road	Bridging required.	Bridging required.
Byron Road	Intersects with this road twice. Likely road re-alignment required.	Does not intersect this road.
Rickard Road	Severs this road. Bridging required.	Passes beneath Rickard Road in cutting.

5.2 OPERABILITY

Train operations have been simulated along the two routes between Edmondson Park and Leppington stations. The simulations were undertaken to determine the travel time of an eight car Tangara Basin carrying maximum passenger capacity between stations on each route in both directions. The results of the train performance simulations indicate that the travel times between the two stations for the refined southern route are approximately one minute less in both directions than for the refined northern route, which is 500m longer. A one minute time difference on an approximately 50 minute train trip from Leppington to Sydney CBD is considered insignificant.



5.3 ENVIRONMENTAL ISSUES

5.3.1 Flora

Based on Department of Environment and Conservation mapping, the following endangered ecological communities would be directly impacted by the refined routes (refer to Figure 10):

- Shale Plains Woodland – corresponds with the Cumberland Plain Woodland ecological community that is listed as endangered under both the NSW Threatened Species and Conservation Act 1994 (TSC Act) and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act);
- Shale Hills Woodland – also corresponds with the Cumberland Plain Woodland ecological community that is listed as endangered under both the TSC Act and the EPBC Act; and
- Alluvial Woodland (Sydney Coastal River Flat Forest) – corresponds with the River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions that is listed as endangered under the TSC Act.

Within the above vegetation communities, three conservation significance assessment classes have been designated (see Figure 11): core habitat; support to core habitat; and other remnant vegetation.

Table 3 below provides a summary of the total areas of vegetation that would be directly impacted by the need to clear a 40 metre wide corridor for either refined route. It should be noted that additional impacts on vegetation may result from ‘edge effects’ and construction sites and access.

The refined southern route would impact on 4.0 hectares of endangered ecological communities compared with 5.6 hectares for the refined northern route. The refined southern route would impact on 3.9 hectares of area defined as ‘core’ or ‘support for core habitat’ compared to 3.6 hectares for the northern route.

Table 3 Comparative ecological impacts

Factor	Area of direct impact (hectares)	
	Refined Southern Route	Refined Northern Route
Endangered ecological community		
Cumberland Plain Woodland	3.6	4.6
Alluvial Woodland (Sydney Coastal River Flat Forest)	0.3	1.1
Total endangered ecological community clearing required	4.0	5.6

Conservation significance assessment classes

Core habitat	0.4	0.9
Support for core habitat	3.5	2.7
Total core/support for core habitat	3.9	3.6
Other remnant vegetation	0.1	2.0
Total vegetation clearing required	4.0	5.6

Only one threatened species of plant, *Pimelea spicata*, has previously been recorded within the area. This endangered species is listed under both the TSC Act and the EPBC Act. The area of habitat for this threatened species that would be directly impacted by both refined routes is unknown and would require field investigations.

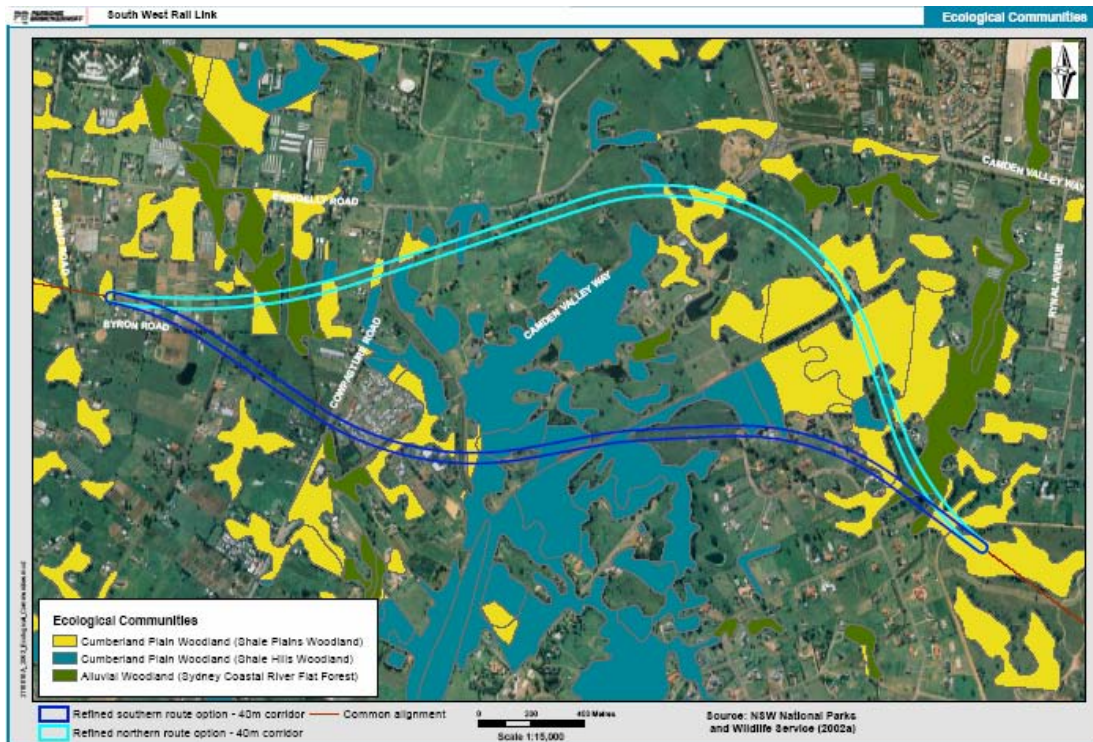


Figure 10 Endangered Ecological Communities

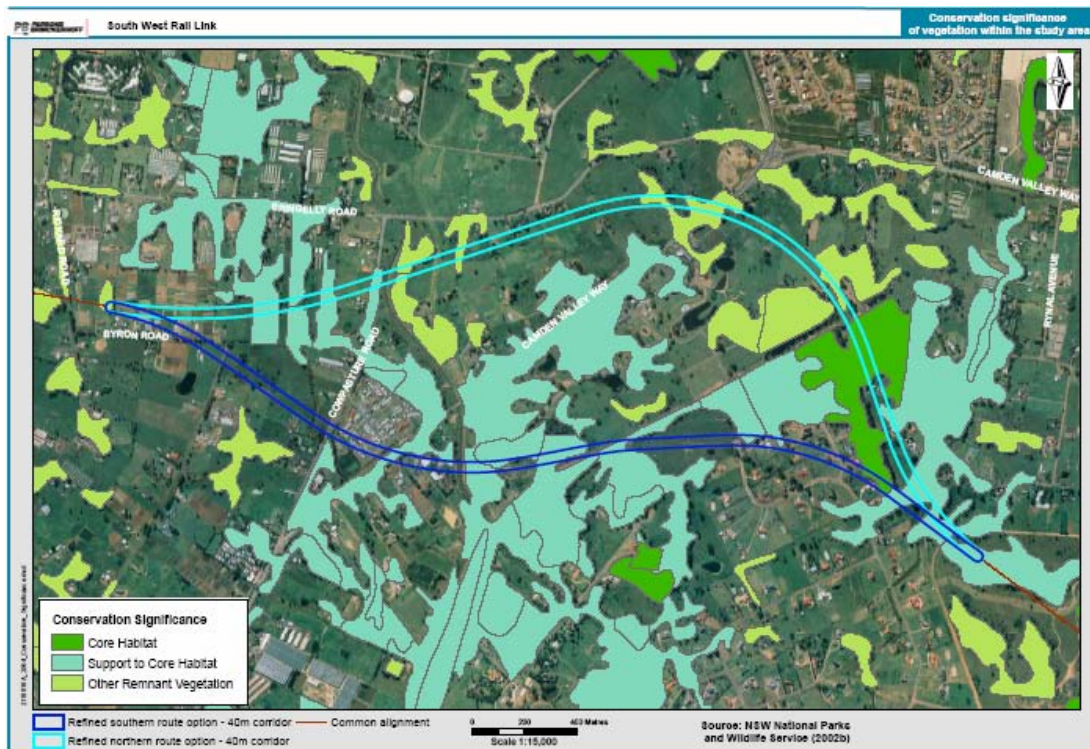


Figure 11 Conservation Significance

The presence along both refined routes of Cumberland Plain Woodland, a nationally listed endangered ecological community, would likely qualify both refined routes as matters of national environmental significance and therefore, the assessment would need to be referred to the Commonwealth Department of the Environment and Heritage.

Both refined routes would also require clearing of endangered ecological communities listed under the TSC Act. The areas of endangered ecological communities requiring clearing are likely to be considered significant and, in accordance with the NSW *Environmental Planning and Assessment Act 1979*, acceptable recovery and threat abatement plans and compensatory habitat arrangements would also need to be discussed with Department of Environment and Conservation. Compensatory habitat arrangements may involve additional land acquisition and additional costs to those discussed in Section 5.6.

5.3.2 Fauna

The following threatened fauna species have previously been recorded in habitat along both the refined routes:

- Bush Stone-curlew (bird) – listed as an endangered species under the TSC Act;
- Cumberland Plain Land Snail – listed as an endangered species under the TSC Act;
- Grey-headed Flying-fox – listed as a vulnerable species under both the TSC Act and the EPBC Act;



- Five species of Microchiropteran bats.

The area of habitat for these threatened species that would be directly impacted by either refined route is unknown and will require field investigations as part of detailed environmental assessment for the preferred route. Similar to flora impacts, if the selected route is considered to have a significant impact on threatened species listed under the TSC or EPBC Acts, then recovery and threat abatement plans would need to be implemented and the assessment referred to the Commonwealth Department of the Environment and Heritage.

The northern route provides a buffer between the existing properties in Denham Court and the rail corridor which could be utilised as a fauna corridor connecting the southern end of the Western Sydney Parklands and regional parks being proposed as part of the Edmondson Park release.

5.3.3 Indigenous Heritage

Indigenous heritage items recorded on the National Parks and Wildlife Service's Aboriginal Heritage Information Management System (AHIMS) in the vicinity of the proposed SWRL alignments include isolated finds, open artefact scatters and a scarred tree (see Figure 12).

Both refined routes are located close to isolated finds near where they cross the Sydney Water Supply Upper Canal. The refined routes would be on embankment at these locations and there is potential for disturbance of these heritage items by earthworks or vegetation removal.

The refined northern route is located close to another isolated find (item EPCS-7) on the high side of Cabramatta Creek within Edmondson Park. This item is not currently recorded on AHIMS but was identified as part of an Aboriginal heritage management plan conducted for the Edmondson Park Composite Site (AMBS 2003). While the site location is considered to possess only a moderate potential for in situ archaeological deposits, the report identifies the site as forming part of a wider area of high archaeological sensitivity due to the low level of disturbance in the area. The area of high sensitivity is intersected by the refined northern route as shown in Figure 13. It also forms part of the area which was deferred under the Draft Edmondson Park LEP.

The refined southern route is also located close to an open artefact scatter (item EPCS8) located on a vehicle access track along the western perimeter of the Edmondson Park LEP area. The same report referred to above considered this location to have a low potential for in situ subsurface archaeological deposits but the surrounding area to be of moderate archaeological sensitivity in which subsurface archaeological deposits are likely to remain intact to some degree.

Knowledge of cultural heritage sensitivity and archaeological remains is less well documented outside of the areas investigated as part of the Edmondson Park LEP investigations. Previous desk top investigations were undertaken as part of the 2003 Environmental Issues Report and indicated that identification of sites was more likely in areas with sloping topography, near water courses and in less disturbed environments.

There are also two claims on the Register of Native Title Claims of relevance to the alignments. One is in the Camden LGA by the Gundungurra Tribal Council Aboriginal

Corporation and the other is both the Camden and Campbelltown LGAs by the Darug Tribal Aboriginal Corporation. These claims potentially affect both routes.

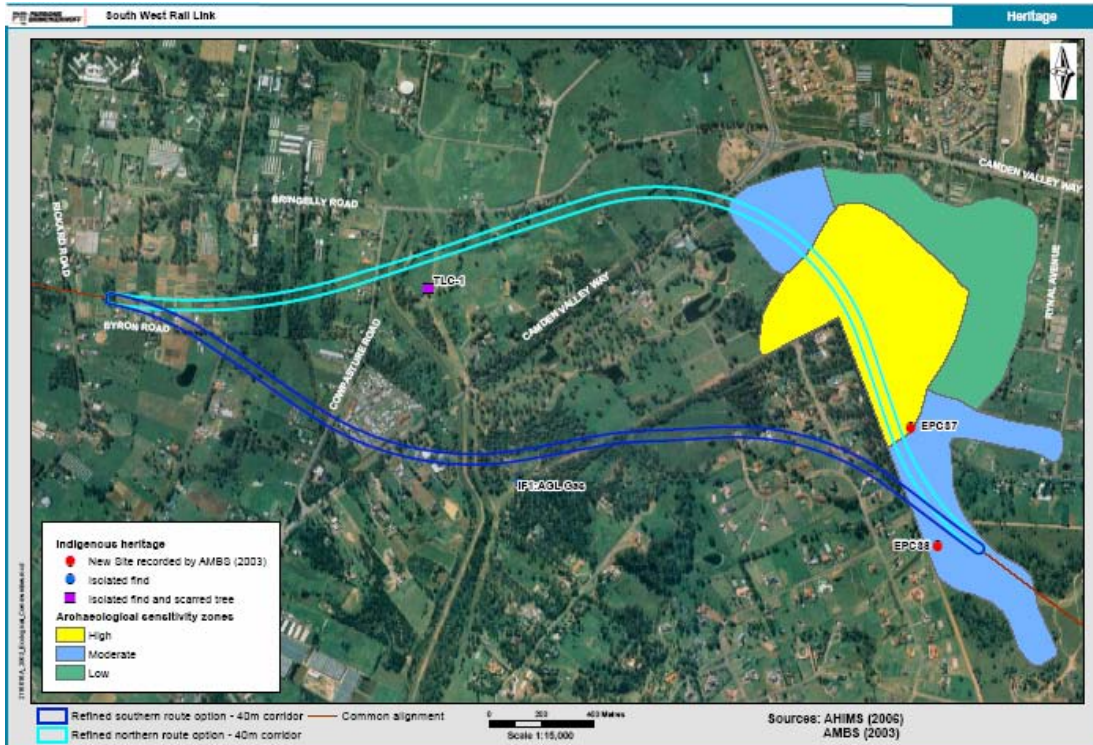


Figure 12 Heritage Sites

5.3.4 Non-Indigenous Heritage

The only non-Indigenous heritage items located close to either refined route is the Sydney Water Supply Upper Canal between Denham Court and Cecil Hills, which is heritage-listed on the Campbelltown and Liverpool LEPs, the State Heritage Inventory, the Sydney Catchment Authority’s Section 170 heritage register and the National Trust Register.

Both refined routes would bridge over the Sydney Water Supply Upper Canal. The refined northern route would have a higher clearance over the canal than the refined southern route. The impacts of the crossing of the canal by each route are likely to otherwise be similar.

While not known to be listed on any heritage registers, it is possible that some of the main roads crossed by the refined routes will have heritage value which relate to their historical function as roads built and used by early settlers. Camden Valley Way, Denham Court Road and Cowpasture Road are likely examples. Background reports also refer to some of these roads as forming important visual corridors and part of the cultural landscape (Austral Archaeology 2003, Clements and Taylor 1992, Landcom 1998). Any impacts from the railway would therefore also constitute impacts on these values (refer to section on visual impacts below for further details).

5.3.5 Noise Impact

A noise assessment has been carried out for two situations:



- Existing situation – Residential receivers as at January 2006, with SWRL operating at ‘start up’ level (128 trains per day); and
- Future situation – Residential receivers as estimated from the NSW Government’s - South West Growth Centre Structure Plan with an assessment of both ‘start up’ and ‘anticipated maximum’ SWRL traffic levels (128 and 400 trains per day respectively).

Previous acoustic studies for the SWRL have recommended a 40m residential setback from the centre of the corridor as the most basic mitigation measure (for example, by planning roads or parkland on either side). Consistent with this advice, the minimum setback for residential receivers was taken as 40m from the centre of the corridor.

It is likely that the Department of Environment and Conservation (DEC) will apply the following noise goals to the SWRL project:

- LA_{max} 80 dBA; and
- LA_{eq}(24hour) 55 dBA.

The assessment of the two situations has been simplified by considering impacted receivers in two groups:

- Receivers with noise goal exceedances; and
- Receivers more generally affected by train noise (taken to be receivers with predicted noise levels greater than 5 dBA below the goals).

While the number of potentially affected properties has been used to provide an impression of the general effect on the community, the number of residential receivers with noise goal exceedances is the overriding concern and is used as the basis for the assessment.

The outcomes of the Future Situation assessment are summarised on Figure 13. The lower value in the table is for ‘start up’ level SWRL traffic, while the upper value is for ‘anticipated maximum’ level SWRL traffic. The refined northern route has less residences with noise goal exceedances in both the ‘no barrier’ and ‘barrier’ situations than the refined southern route.

The planning information available for the Edmondson Park area is broad and preliminary and this limits the detail to which the assessment of impacted residences can be carried out. For the Edmondson Park residential area to the east of Cabramatta Creek, the northern and southern route do not differ and hence the potential impacts will be identical. Both planning and mitigation measures would be used to ensure that potential impacts are managed responsibly and effectively.

The assessment of the Edmondson Park residential area to the west of Cabramatta Creek found that the refined northern route had the least number of potentially affected residences (in the study area). With regard to Edmondson Park however, it is noted that the residences affected by the refined southern route are generally in the already developed Denham Court area and those affected by the refined northern route are generally in the Edmondson Park area where potential impacts would be managed through both development planning and mitigation measures.

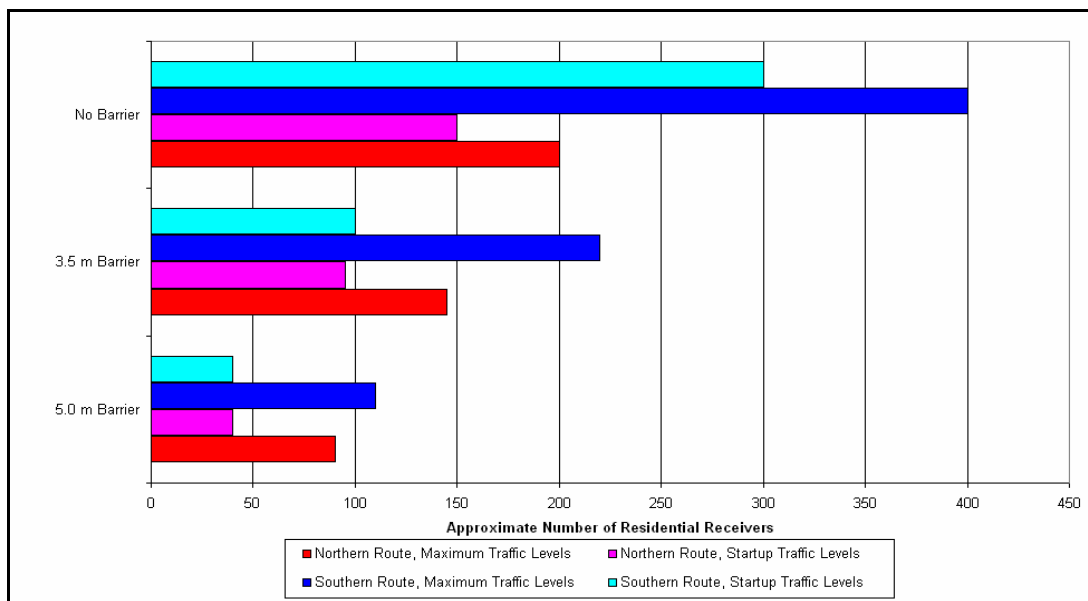


Figure 13 Predicted noise goal exceedances at residential properties

5.3.6 Visual Impacts

i) Refined Southern Route – Visual Impacts

The refined southern route emerges from a cutting on the western edge of Edmondson Park and then back into a cutting through Denham Court. This route would reach its highest elevation east of Camden Valley Way and cross over Cowpasture Road on a declining gradient. Within Leppington, this route generally proceeds on embankment on a declining gradient as far as Byron Road. West of Byron Road, the route would be at the surface and then on embankment at Dickson Road.

The refined southern route is expected to be visible from the following locations:

- the south-western areas of the Forest Lawn Memorial Gardens;
- the Camden Valley Way view corridor - the refined southern route is expected to be visible to traffic travelling between the crest where Camden Valley Way crosses the Sydney Water Supply Upper Canal and the intersection with Cowpasture Road;
- Casa Paloma Caravan Park;
- the Cowpasture Road view corridor; and
- land close to the corridor in Leppington, particularly around Dickson Road.

The refined southern route would impact the semi-rural character of Denham Court. Development in Denham Court is guided by Liverpool City Council’s *Development Control Plan No. 12 – Denham Court*. The Plan recognises the scenic hills of the Denham Court locality as having both a local and regional significance. The Plan contains requirements for dwelling designs to maintain views between dwellings and minimise the intrusion of dwellings on the natural landscape. In accordance with the plan, dwelling designs at

Denham Court have generally capitalised on the large lot sizes and opportunity for rural vistas.

The Denham Court view shed (refer Figure 14) has been recognised in the *Liverpool Heritage Study* (Clements and Taylor 1992) as forming an important part of the cultural landscape. Any visual impacts on the view shed would therefore impact on these values.



Figure 14 Denham Court View shed

The Camden Valley Way was identified in the *Camden Scenic and Cultural Landscapes Study* (Landcom 1998) as a view corridor that forms an important part of the cultural landscape. Any visual impacts caused by the railway on the Camden Valley Way view corridor would therefore impact on the cultural landscape. Cowpasture Road has also been identified as being an important part of the cultural landscape by Austral Archaeology (2003) and any visual impacts to this would similarly impact the cultural landscape.

ii) Refined Northern Route – Visual Impacts

Between Edmondson Park and the Western Sydney Parklands, the refined northern route would proceed through shallow cutting, deep cutting, low embankment and then a further short section of cutting before returning to embankment near the boundary with the parklands. The embankment would gain elevation west of Edmondson Park where it enters the Western Sydney Parklands on the approach to Camden Valley Way. The alignment would continue to gain elevation as it crosses over Camden Valley Way and proceed through the southern portion of precinct 9 of the Western Sydney Parklands, generally adjacent to Bringelly Road.



Within the Parklands, between Camden Valley Way and Cowpasture Road, the alignment would continue on a rising gradient as it transitions from embankment into cutting and then returns to embankment where it reaches its highest elevation immediately east of Cowpasture Road. The alignment would cross over Cowpasture Road on a declining gradient. Within Leppington, the route proceeds on a declining gradient on embankment to just west of Bonds Creek. From west of Bonds Creek, the route is generally level and in cutting under Rickard Road and then on embankment at Dickson Road.

The refined northern route is expected to be visible from the following locations:

- the north western corner of Edmondson Park;
- the Camden Valley Way view corridor - the refined northern route is expected to be visible to traffic travelling between the crest where the road crosses the Sydney Water Supply Upper Canal and the intersection with Bringelly Road and Cowpasture Road (north);
- traffic on Bringelly Road;
- the southern portion of the Western Sydney Regional Parklands; and
- land close to the corridor in Leppington, particularly around Dickson Road.

Where the refined northern route is on embankment in the north-western corner of Edmondson Park, the railway line may obscure views towards the scenic hills at Denham Court to the west.

As mentioned above, the Camden Valley Way view corridor and Cowpasture Road have been recognised in some background reports as forming an important part of the cultural landscape. As for the refined southern route, any visual impacts from the refined northern route on the Camden Valley Way view corridor and Cowpasture Road would impact on the cultural landscape.

The refined northern route would create a visual intrusion through the southern portion of precinct 9 (Hoxton Park Ridge) of the Western Sydney Regional Parklands. The route is expected to obscure views from the parklands towards the west, including views of the scenic hills at Denham Court.

iii) Visual Impact Summary

The visual amenity of the existing areas is generally high based on the open spaces, large lot sizes, existing vegetation and green spaces and limited density and development of residential premises. In the future, the visual amenity of the areas will change substantially as a result of additional residential development, new and expanded roads and other utilities / infrastructure. The SWRL would be a part of this new visual landscape and its visual impact in the future would be reduced compared with the existing situation.

The refined northern route, where it proceeds into a cut as it heads west over the ridgeline, whilst not in the line of sight of the vista along Camden Valley Way will be visible at the Camden Valley Way/Bringelly Road intersection and the Western Sydney Parklands, which will generate some moderately high visual impact. However Bringelly Road is proposed to be widened to a six lane arterial road as it crosses the ridgeline, which will fundamentally change the character of the ridgeline in this location in the future, altering the visual quality of the landscape.



As the refined northern route exits the ridge travelling west the route will be elevated, and will be a prominent feature within the landscape and visual impact will be moderately high.

The refined southern route traverses the ridge where terrain is less significant and prominent and the route will not require as much cut and fill. Thus visual impact will be moderate in comparison. However where the route crosses both Camden Valley Way and the Casa Paloma Caravan Park the exposure and sensitivity of observers will be high, correspondingly generating high visual impact.

In the lower lying land to the west of the ridgeline there are generally negligible differences between the landform in the corridor of each route, and hence the potential different visual impacts generated by each route are low and would not be apparent.

5.4 PROPERTY

The key issue in relation to property is the extent and nature of land ownership (public versus private ownership) of those landholdings that will need to be acquired for the SWRL corridor.

5.4.1 Refined Southern Route

The refined southern route passes through part of the Denham Court low density residential area, the southern edge of the Forest Lawn Memorial Gardens, the Casa Paloma Caravan Park and small rural landholdings (see Figure 15). It crosses a number of roads and the Sydney Water Supply Canal. Further to the west of Camden Valley Way, the land is mainly zoned as 1(b) Rural - small holdings, some of which is used for market gardens. The western end of the route is within the area of land to be used for the future Leppington town centre.

5.4.2 Refined Northern Route

The refined northern route passes through land zoned for future urban development that fronts Jardine Drive, Edmondson Park and Camden Valley Way, Leppington before passing through land owned by the Department of Planning for the development of the Western Sydney Parklands (see Figure 16). Further to the west of Cowpasture Road are small rural landholdings. This route avoids the northern edge of the Forest Lawn Memorial Gardens and crosses a number of roads and the Sydney Water Supply Canal. The western end of the route is within the area of land to be used for the future Leppington town centre.

Overall, the affected properties for both refined routes are predominantly residential or semi-rural acreage allotments. The other major land uses affected are the Forest Lawn Memorial Gardens and the Casa Paloma Caravan Park (refined southern route) and Western Sydney Parklands (refined northern route). Several small market gardens are affected by both routes.

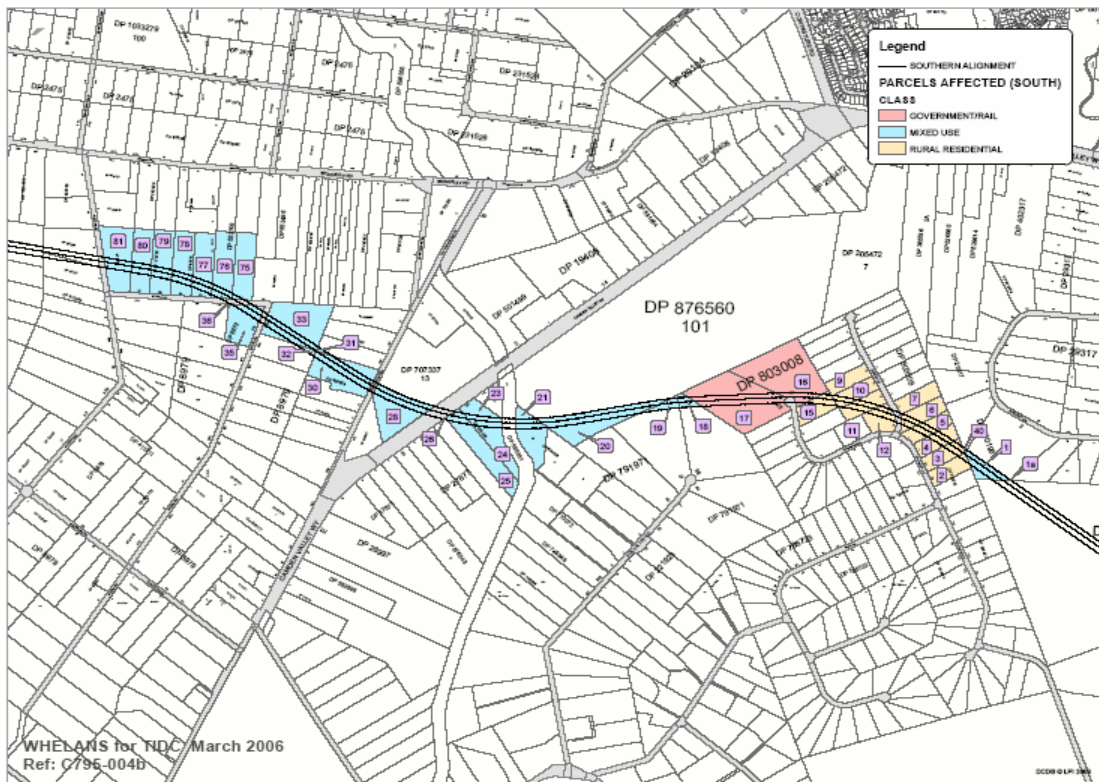


Figure 15 Landholdings Affected by the Refined Southern Route

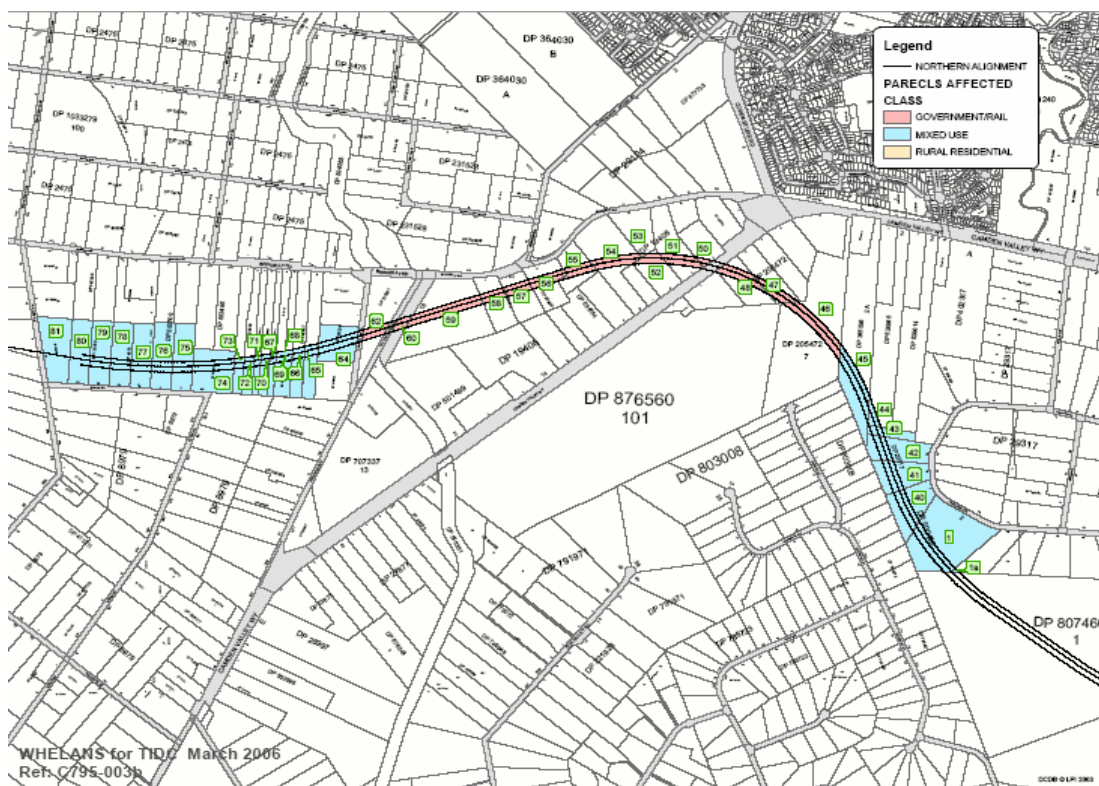


Figure 16 Landholdings Affected by the Refined Northern Route

Private property acquisition has been based on full acquisition except where the land required is a relatively small proportion of a large land holding.

Both refined routes cross publicly-owned land which includes RTA and Council roads, the Sydney Water Supply Canal owned by Sydney Catchment Authority, RailCorp land at Denham Court and land acquired by the Department of Planning for the development of the Western Sydney Parklands.

The table below summarises the number of properties affected by each refined route.


Table 4 Land ownership

Land ownership	Refined Southern Route section	Refined Northern Route section
Privately owned		
: residential	12	0
rural acreage	20	25
quasi commercial	4	1
Total privately-owned	36 (24 whole acquired)	26 (13 whole acquired)
Government owned:		
RailCorp	2	0
Department of Planning	0	13
Sydney Catchment Authority	1	1
Public roads	5	4
Total Government-owned	8	18
Total properties affected	44	44

The refined southern route will require the whole acquisition of 24 privately-owned properties while the refined northern route will require 13 privately-owned properties to be acquired. There would be partial acquisition of the remaining residential properties as the impacts would be less extensive.

The most significant impact on residential properties will occur at Denham Court where development has occurred mainly in the last 10 to 15 years and is characterised by large residences typically on one hectare blocks and the Casa Paloma Caravan Park which provides low cost housing in the area. Both of these areas are impacted by the refined southern route.

5.5 SOCIAL AND COMMUNITY ISSUES

The refined southern route would have adverse affects on the low-density residential character of Denham Court. The amenity of Denham Court would be negatively affected by noise, visual and severance impacts caused by the railway line. Denham Court contains large lot housing in a semi-rural landscape with easy access to local and regional facilities. This route would substantially detract from the character of this locality. The refined southern route would also involve land take and amenity effects at the Casa Paloma Caravan Park and the southern portion of the Forest Lawn Memorial Gardens. It is noted that the Caravan Park is within the South West Growth Centre boundary and would likely be redeveloped as part of that strategic development.

The refined northern route would have adverse affects on the residential properties along the route. The amenity of this area would be affected by noise, visual and severance



impacts caused by the railway line. This route may also have a number of effects on the Western Sydney Parklands which are planned as a key community resource for western Sydney. The alignment would traverse the southern portion of Precinct 9 (Hoxton Park Ridge) of the parklands on an embankment and in a deep cutting through this section. This section of Precinct 9 has been identified in the *Western Sydney Parklands – Management Vision* (DIPNR 2004) as catering for community facilities, active and passive recreation, commercial recreation and tourist facilities. The planning and development of the parklands are at an early stage and there are opportunities to integrate the SWRL into the overall design of the parklands and provide crossings to minimise severance.

5.6 COST ESTIMATES

5.6.1 Construction cost

The construction cost estimate comparison for the routes from Edmondson Park to Leppington stabling facility was based on preliminary design information. This information included the refined southern and northern routes in plan, aerial photos, and preliminary long sections showing existing ground and proposed rail levels.

From this preliminary data, likely bridge and culvert locations and extent, likely cut and fill general arrangements, and locations of utility services and their impacts were determined. Work site access and logistics were assumed to be straightforward and environmental controls were assumed to be typical of a greenfield road/rail project.

In addition to direct costs, allowance has been made for client costs and contractors design, preliminaries, risk and margin (based on recent market experience) to determine the design and construction cost estimate.

The design and construction cost for the Edmondson Park to Leppington section of the refined southern route is estimated at \$79.7 million and for the refined northern route is estimated at \$82.4 million (in 2006 dollars).

5.6.2 Land Acquisition Costs

An assessment has been made of the land acquisition costs associated with the refined southern and northern routes between where the routes diverge at Denham Court and Rickard Road, Leppington. The land costs associated with the SWRL route east of Denham Court and west of Rickard Road are the same and, accordingly, have not been assessed as part of this study. In preparing the estimates, individual properties have been valued taking account of the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991*. This Act makes allowances, where appropriate, to adequately compensate the dispossessed owners for market value, severance, special value, disturbance, solatium and any adverse impact on the residual land if only part of the site is acquired. In this regard, partial or total acquisition has been assumed depending on the impact of the route on individual properties.

The differential values of the individual properties have been estimated. Whole and partial acquisitions have been assumed on a lot-by-lot basis depending on the impact of the alignment and whether properties were broadly classified as residential acreages, for example, Denham Court where it was assumed that properties were totally acquired, or



rural sites and land zoned for future residential subdivision which were assumed to generally be partially acquired. These costs have been summarised in Table 5 below.

In addition to the market value of the land, the estimates make allowance for matters including severance, special value, disturbance, solatium and any adverse impact on residual land where there is partial acquisition of the site. A contingency of 10% has been allowed for unidentified partial interests in the affected properties including such things as leases and ground rents. The estimates also include transaction costs, conveyancing costs and legal costs as detailed in Table 5.

The refined northern route estimate includes \$6.2 million in respect of partial acquisition of the Western Sydney Parklands land held by the Department of Planning.

Table 5 Summary of acquisition costs

Land ownership	Refined Southern Route Section		Refined Northern Route Section	
	Low	High	Low	High
Acquisition costs				
• direct compensation	\$63.2m	\$69.6m	\$57.7 m	\$63.8m
• 10% contingency	\$6.3m	\$6.9m	\$5.7m	\$6.3m
• transaction cost	\$0.2m	\$0.2m	\$0.2m	\$0.2m
• conveyancing costs	\$0.2m	\$0.2m	\$0.2m	\$0.2m
• court action costs	\$7.0m	\$7.0m	\$5.0m	\$5.0m
Total acquisition costs	\$76.9m	\$84.2m	\$68.8m	\$75.5m

5.6.3 Operating Costs

The refined northern route is 500 metres longer than the refined southern route and there will be increased operating and maintenance costs. RailCorp have indicated that this will be approximately \$50k per annum.

5.6.4 Summary Costs

A comparison of the total cost estimates (covering only the relevant section of the rail link) indicates that the refined southern route would cost approximately \$11 million more than the refined northern route (refer to table 6). Land acquisition costs have a differential of approximately \$8 million, whilst resale of surplus land has been estimated at \$7.5million for the refined southern route and \$13.1million for the refined northern route.

RailCorp already owns two sites in Culverston Avenue at Denham Court. It has been assumed for the refined northern route this land would be sold as surplus land which has been valued at the original 1996 purchase price of \$3.4 million.



Table 6 Summary of total cost estimates

Description	Refined Southern Route Section	Refined Northern Route Section
Construction Cost	\$88.0m	\$91.0m
Land Acquisition Cost (High cost figure)	\$84.2m	\$75.5m
Surplus land resale	-\$7.5m	-\$13.1m
Total	\$164.7m	\$153.4 m

5.7 SUMMARY

A comparison of the refined route is summarised in the table below.

Table 7 Comparison of refined routes

Issue	Refined Southern Route	Refined Northern Route
Technical and constructability:		
Route length and directness	Route is 500m shorter. More direct route through to Leppington.	Route is 500m longer.
Constructability	No substantive difference.	No substantive difference.
Hydrology and flooding	No substantive difference.	No substantive difference.
Local traffic	No substantive difference.	No substantive difference.
Operability:		
Travel times between the two stations	One minute less in both directions (trip to city approx. 50 mins).	One minute longer in both directions (trip to city approx 50 mins).
Environmental:		
Clearing of endangered ecological communities	4.0 hectares	5.6 hectares
Clearing of core/support for core habitat	3.9 hectares	3.6 hectares
Cultural Heritage	Disturbs area of moderate archaeological sensitivity.	Disturbs area of high archaeological sensitivity.



Residences affected by noise	Noise goals exceeded at a greater number of residences (with or without noise mitigation).	Noise goals exceeded at a lower number of residences (with or without noise mitigation).
Visual Impact	Impacts on semi-rural character of Denham Court.	Impacts on rural character of Western Sydney Parklands
(note: overall visual amenity of area will change with future development)	Impacts where route crosses Camden Valley Way and the Casa Paloma Caravan Park.	Obscures views of scenic hills at Denham Court from Edmondson Park.
Property:	44 land holdings affected.	44 land holdings affected.
	Full acquisition of 24 privately owned properties required. Partial acquisition of 12 privately owned properties required.	Full acquisition of 13 privately owned properties required. Partial acquisition of 13 privately owned properties required.
	8 residential and 4 rural acreage dwellings require demolition.	1 residential and 1 rural acreage dwellings require demolition.
	Impact on Forest Lawn Memorial Gardens.	Impact on Western Sydney Parklands.
Social and community:	Loss of amenity in low density residential area of Denham Court.	Loss of recreational land in precinct 9 (Hoxton Park Ridge) of Western Sydney Parklands.
	Loss of low income housing at Casa Paloma Caravan Park.	
Capital Cost:	Capital cost of section from Edmondson Park to Leppington is approximately \$11m greater.	Capital cost of section from Edmondson Park to Leppington is approximately \$11m less.
Breakdown:		
- Construction cost	\$88.0m	\$91.0m
- Land acquisition cost	\$84.2m	\$75.5m
- Surplus land resale	-\$7.5m	-\$13.1m
TOTAL	\$164.7m	\$153.4m
Operating and maintenance cost:	Operating and maintenance cost is approximately \$50k less per annum.	Operating and maintenance cost is approximately \$50k more per annum.



6 KEY FINDINGS

In summary, the refined southern and northern routes are very similar in terms of technical and constructability criteria. There are some differences between the two routes in relation to the other evaluation criteria.

The refined southern route:

- Is 500 metres shorter than the northern route, resulting in a one minute difference in travel time and an annual operation and maintenance cost which is approximately \$50K less than the northern route;
- Has a capital cost which is approximately \$11m greater than the refined northern route;
- Has less overall impact on endangered ecological communities (1.6 hectares less clearing required), but a slightly greater impact on core habitat (0.3 hectares more clearing required);
- Has less impact on cultural heritage;
- Has a greater impact on private property owners, with 24 privately owned properties needing to be fully acquired, with 8 residential and 4 rural acreage dwellings to be demolished; and
- Has a greater impact on residential amenity than the refined northern route, with noise targets being exceeded at a greater number of residences (with or without noise mitigation).

The refined northern route:

- Is 500 metres longer than the southern route, resulting in a one minute increase in travel time and an annual operation and maintenance cost which is approximately \$50K more than the southern route;
- Has a capital cost which is approximately \$11m less than the refined southern route;
- Has a greater overall impact on endangered ecological communities (1.6 hectares more clearing required) but a slightly lower impact on core habitat (0.3 hectares less clearing required);
- Has a greater impact on cultural heritage;
- Has less impact on private property owners, with 13 privately owned properties needing to be acquired, with 1 residential and 1 rural acreage dwelling to be demolished; and
- Has less impact on residential amenity, with noise targets being exceeded at fewer residences than the southern route (with or without noise mitigation).



REFERENCES

Selection of a preferred route will depend on the weighting given to each of the criteria used for evaluation.

Austral Archaeology. 2003. *South West Rail Link Environmental Issues Study, Working Paper No. 4, Indigenous and Non-Indigenous Heritage.*

Australian Museum Business Services. 2003. *Edmondson Park Composite Site Master Plan, Aboriginal Heritage Management Plan.*

Clements, A.M. and Taylor, D.M. 1992. Landscape report in Neustein and Associates (eds) *Liverpool Heritage Study.*

Connell Wagner. 2005a. *South West Rail Link: Alternative Alignments at Denham Court.*

Connell Wagner 2005b. *South West Rail Link: Alternative Alignments at Denham Court.*

Department of Infrastructure, Planning and Natural Resources. 2004. *Western Sydney Parklands – Management Vision .*

Lanbcom Associates. 1998. *Camden Scenic and Cultural Landscapes Study.*

NSW Department of Environment and Conservation. 2006. Bionet,
<http://www.bionet.nsw.gov.au/BioNet.cfm>

NSW Department of Infrastructure, Planning and Natural Resources. 2004. *The Western Parklands Management Vision.*

NSW Department of Planning. 2005a. *Infrastructure Report for the North West and South West Growth Centres.*

NSW Department of Planning. 2005b. *South West Growth Centre Planning Report*

NSW Government. 2005a. *Metropolitan Strategy – City of Cities – A plan for Sydney’s future.*

NSW Government. 2005b. *Metropolitan Strategy - South West Structure Plan*

NSW National Parks and Wildlife Service. 2006. *Aboriginal Heritage Inventory and Management System*

National Parks and Wildlife Service 2002a. *Native Vegetation of the Cumberland Plain.*

National Parks and Wildlife Service 2002b. *Guidelines for the Conservation Significance Assessment of the Native Vegetation of the Cumberland Plain, Western Sydney.*

This report has been prepared using input from studies or investigations undertaken for TIDC by the following consultants:



APPENDIX A SCHEDULE OF SPECIALIST CONSULTANTS

This report has been prepared using input from studies or investigations undertaken for TIDC by the following consultants:

Engineering and report preparation	Connell Wagner/TMG
Hydrology	Webb McKeown Associates Pty Ltd
Constructability and cost	Tenix Projects Pty Ltd
Cost overview	Evans & Peck Pty Ltd
Environmental (ecology, cultural heritage, and social/community)	Parsons Brinckerhoff Australia Pty Ltd
Urban design	Architectus Sydney
Noise	Heggies Australia Pty Ltd
Property valuation	Australia Pacific Valuations
Property identification	Whelans Operations Pty Ltd

Appendix C

Framework statement of
commitments

Table C-1 Framework Statement of Commitments

Key issue	Outline of commitments/mitigation measures
Administration	
The activity	The activity will be carried out consistent with the procedures, safeguards and mitigation measures identified in the Environmental Assessment as modified by the submissions report
Compliance	The proponent will ensure compliance with the Conditions of Approval provided by the Minister for Planning. The proponent will prepare a Pre-Construction, and Pre-Operation compliance report and construction compliance reports at six monthly intervals during construction
Environmental impact audits	<p>An environmental audit will be carried out every six months during construction to confirm that appropriate environmental safeguards and mitigation measures are being applied.</p> <p>An environmental impact audit report (construction) will be prepared and submitted to the Director General 3 months following completion of construction.</p> <p>An environmental impact audit report (operation) will be prepared and submitted to the Director General 2 years after commencement of operations.</p>
Communication and consultation	<p>The proponent will:</p> <p>Prepare a Community Involvement Plan before construction commences.</p> <p>A community contact officer will nominated to respond to enquiries from the community during construction.</p> <p>Establish a community and stakeholder consultation plan to liaise with potentially affected residents and businesses. This will include public advertisements of upcoming construction activities and working hours, establishment of a community liaison group(s) and a complaints management system.</p> <p>Establish a Community Liaison Group.</p>
Environmental management	.
Environmental Management Representative	The proponent will appoint an independent Environmental Management Representative (EMR) to advise the Director General and the proponent on compliance with the conditions of approval
Construction management	The proponent will prepare a Construction Environmental Management Plan (CEMP) prior to the commencement of construction works, which outlines the operating conditions and temporary environmental protection measures to mitigate the impact of construction activities. The CEMP will be consistent with the conditions of approval and include the conditions of any licences issued by government authorities.
Operational management	The proponent will prepare, on behalf of RailCorp, an Operational Environmental Management Plan (OEMP) prior to the operation of the rail link, which outlines environmental performance measures, environmental management responsibilities, maintenance and monitoring requirements, mitigation measures and emergency procedures for the SWRL. The OEMP will also include the conditions of any licenses issued by government authorities.
Noise and vibration	<p>The proponent will:</p> <p>Undertake noise and vibration modelling and monitoring prior to construction and at six monthly intervals during construction in accordance with the Construction Noise Management Sub-plan</p> <p>Develop reasonable and feasible mitigation measures to minimise potential noise impacts at sensitive receiver location, in consultation with DEC noise RailCorp</p> <p>Apply best practice construction methods to minimise noise in accordance with</p>

	DEC noise guidelines.
Heritage	The proponent will: Liaise with the relevant Aboriginal groups and other stakeholders. Prepare Heritage Management Sub Plan prior to construction, which outlines appropriate management and mitigation measures
Flora and fauna	The proponent will prepare a Flora and Fauna Management Sub Plan assess impacts on flora and fauna following the <i>Guidelines for Threatened Species Assessment under Part 3A</i> , this will include assessment of suitable mitigation measures.
Traffic, transport, parking and access	The proponent will refine the concept design where necessary to address access arrangements during construction
Flooding	The proponent will: undertake a more detailed flood assessment during detailed design to confirm flooding impacts and locate and size drainage structures.
Visual impacts and urban design	The proponent will prepare detailed urban design / landscaping plans.
Landuse and property	The proponent will consult with Council regarding implementation of appropriate Development Controls within the vicinity of the rail line.
Social impacts	The proponent will ensure that the community involvement plan is implemented and that affected landowners are routinely updated on construction progress.
Air quality and greenhouse gases	The proponent will prepare an Air Quality Sub-plan which would address management of dust during construction of the project.
Hazard and risk	The proponent will address construction issues through a Hazards and Risk Management Sub-plan which will be developed by the construction contractor prior to construction as part of the overall CEMP. The proponent will prepare a Hazard and Risk Management Sub Plan and an Emergency Management Plan to cater for operational hazards and risks.
Public safety	All construction compounds and work areas will be fenced off to limit public access during construction. Where necessary public facilities will be relocated and/or reprovided eg. bus shelters, footpaths, etc. All permanent facilities will incorporate "Safer by Design" principles.
Services and utilities	The proponent will liaise with the relevant utility owners regarding necessary protection measures and prepare a Services and Utilities Disruption Sub Plan to cater for unexpected disruption to utilities and services.
Soils, water quality and groundwater	The proponent will prepare a Soil and Water Management Sub Plan, in consultation with relevant government departments and councils, that is consistent with the principles and practices outlined in the Department of Housing's (1998) <i>Managing Urban Stormwater: Soils and Construction..</i> The Sub-plan would address all areas where significant disturbance of land or stockpiling of soils is likely to occur
Waste, energy and demand on resources	The proponent wil: Adopt standard environmental mitigation measures, which will be included in the CEMP prior to construction. These measures will include procedures for spoil re-use and disposal. Adopt energy efficient work practices.
Contaminated land	The proponent will undertake targeted contamination investigations as required and will dispose of contaminated materials (if found) in an appropriate manner.