

8.4.2 Existing conditions

Existing road network adjacent to the proposed station

The following roads are located immediately adjacent to the proposed station:

- Norwest Boulevard is a 70 km/h divided four lane arterial with a wide, landscaped central median. It is the only arterial access route for most of the Norwest area and is characterised by high commuter peak flows. Major intersections are controlled by two-lane roundabouts. There are limited alternative routes in the area and private vehicle traffic is the major travel mode.
- Brookhollow Avenue is a local street providing access to a number of commercial properties. Parking is allowed on both sides of the road and incorporates some speed control devices in the form of a contrasting pavement and landscaped medians.
- Century Circuit is a local road which provides access from Norwest Boulevard to the Norwest Shopping Centre, indoor swimming centre and commercial properties adjacent to the shopping centre.

The photograph below (**Figure 32**) shows Norwest Boulevard as it appears today in the vicinity of the station site.

Figure 32 Norwest Boulevard adjacent to the proposed Norwest station, looking east (proposed station will be located on right side of the road)



Table 15 shows the details of the roads located immediately adjacent to the proposed Norwest station.

Table 15 Norwest Station – Roads Summary

| Road | Agency Responsibility | Lanes | AADT | 2011 Peak Hour Volume | |
|-----------------|-------------------------|-------|--------|-----------------------|--|
| Norwest Blvd | RMS | 4 | 26,417 | Eastbound | AM 1,033 (9-10am) PM 1,244 (3-4pm) |
| | | | | Westbound | AM 1,451 (8-9am) PM 1,159 (3-4pm) |
| Windsor Rd | RMS | 4 | 34,782 | Northbound | AM 1,544 (7.30-8.30am) PM 1,642 (4.45-5.45pm) |
| | | | | Southbound | AM 2,653 (8-9am) PM 1,706 (4.45-5.45pm) |
| Brookhollow Ave | The Hills Shire Council | 2 | 2,726 | Northbound | AM 205 (8-9am) PM 322 (5-6pm) |
| | | | | Southbound | AM 171 (9-10am) PM 206 (4-5pm) |

Source: RMS AADT Data & NWRL Traffic counts 2011

AADT – Annual average daily traffic

The following intersections are provided on the surrounding road network to the proposed station:

- Norwest Blvd / Windsor Rd (traffic signals) – This signalised T-intersection was recently amplified to provide for three lanes exiting Norwest Boulevard to the south on Windsor Road and two left turn lanes from Windsor Road. Windsor Road is currently a four lane divided carriageway with two through lanes in each direction, two right turn lanes into Norwest Boulevard for the northern approach, and a double left turn for the southern approach. A southbound 'Bus Only' queue jump lane is provided southbound at the intersection.

Norwest Boulevard currently has three right turn lanes and two left turn lanes at the intersection with Windsor Road.

- Norwest Blvd / Columbia Cct / Brookhollow Ave (East) (roundabout) – This intersection is provided with a two-lane roundabout with Norwest Boulevard having two lanes on each approach and Columbia Circuit having a single lane approach and Brookhollow Avenue having two lanes marked for a short distance on approach to the intersection.
- Norwest Blvd / Solent Cct (East) (priority control) – this intersection is a channelised T-intersection with Norwest Boulevard having priority. A right turn bay is provided for traffic turning from Norwest Boulevard into Solent Circuit. Right turns are not permitted out of Solent Circuit.

- Norwest Blvd / Brookhollow Ave(West) / Century Circuit (roundabout) – This intersection is provided with a two-lane roundabout with both Norwest Boulevard approaches and the Century Circuit approach having two lanes. The Norwest Boulevard approaches are marked as a shared left/through and shared through/right with the Century circuit approach having an exclusive right turn lane and a shared left/through/right lane. Brookhollow Avenue is provided with a single lane approach to the intersection.
- Norwest Blvd / Reston Grange / Solent Cct (west) (roundabout) – This intersection is provided with a two-lane roundabout with all approaches having two lanes. The Norwest Boulevard approaches are both marked with a shared left/through lane and a shared through/right lane. Solent Circuit is marked with a right turn lane and shared left/through lane. Reston Grange is provided with two lanes on approach to the intersection without any specific lane allocation.
- Norwest Blvd / Old Windsor Rd (traffic signals) – This is a grade separated intersection with Old Windsor Road providing two lanes in each direction and passing under the intersection. Traffic signals are provided for the turning movements from Old Windsor Road and Norwest Boulevard. The Old Windsor Road off-ramps provide two right turn lanes and two left turn lanes at the intersection for each of the approaches. Norwest Boulevard eastern approach provides a left turn slip lane, two through lanes and a right turn lane. The western approach of Norwest Boulevard provides a left turn slip lane, two through lanes and two right turn lanes.

Adjacent landuses and infrastructure developments

The surrounding landuses to the proposed station are generally commercial/industrial developments. On the northern side of Norwest Boulevard is a local shopping centre, Norwest Marketown, which provides a supermarket, cafes, restaurants and other retail shops. The Hillsong Church and its associated facilities are located immediately to the west of the proposed station site.

Proposed landuse and infrastructure developments

RMS has recently completed widening of Norwest Boulevard at the intersection with Windsor Road to provide three right turn lanes out of Norwest Boulevard and two left turn lanes in from Windsor Road.

RMS has also carried out some preliminary assessments for the future requirements of Norwest Boulevard and the intersections located along its length. This assessment has identified a number of improvements including signalling of key intersections and the provision of additional traffic lanes and bus lanes in the future. It should be noted that these improvements have not been included in any scheduled future works program at the present time and would be subject to further consideration and investigation.

It is understood that Norwest Business Park will expand from its current employment capacity of 20,000 employees to a total capacity of 35,000 employees as a result of increased site densities for new buildings within the business park.

Historical crash analysis

A historical crash analysis has been undertaken for the crashes that occurred between January 2006 and December 2010 within 400m radius of the proposed Norwest station. **Table 16** shows the number of crashes recorded within 100m and 400m from the location of the proposed station site.

Table 16 Norwest Station – Crash Summary

| Distance from the proposed Station (radius) | Number of pedestrian crashes | Total number of crashes |
|---|------------------------------|-------------------------|
| 100m | 0 | 8 |
| 400m | 4 | 29 |

Source: RMS Crash Data 2011

The following observations were made in relation to the crashes that occurred within 400m radius of the proposed Norwest station.

- Out of 29 crashes, the highest number of crashes (15 crashes) occurred on Norwest Boulevard and the details of the crashes that occurred immediately adjacent to the proposed station are provided below:
 - 9 crashes occurred at the Norwest Boulevard / Century Circuit / Brookhollow Avenue intersection. The majority of the crashes (6 crashes) were rear-end type crashes.
 - 3 crashes were reported to occur on Century Circuit including a single pedestrian crash and two crashes related to driveway incidents.

Traffic volumes along Norwest Boulevard are forecast to increase, even without the proposed Norwest station. The proposed improvements to Norwest Boulevard are likely to improve the safety along Norwest Boulevard and the intersections along Norwest Boulevard including Norwest Boulevard / Century Circuit / Brookhollow Avenue intersection. Traffic volumes along Century Circuit are also expected to increase with the proposed Norwest Station. The existing pedestrian safety issues and the safety issues in relation to driveway access would have the potential to remain along Century Circuit with the NWRL operation.

The following measures have the potential to reduce the crashes and/or severity of the crashes immediately adjacent to the proposed Norwest station.

- The proposed improvements to the Norwest Boulevard / Brookhollow Avenue / Century Circuit intersection as part of the Norwest Boulevard upgrade would have the potential to improve the safety at this intersection.
- The design of proposed access to Norwest station needs to include safety management for the existing pedestrian generating developments and the driveway accesses on Century Circuit.

Bus operation

Bus services to Norwest Business Park in the vicinity of the proposed station are currently operated along Norwest Boulevard by Hillsbus and Busways. Hillsbus routes are T62, T64, 613, 618 and 715 (occasional trips) whilst Busways routes are T70 and 745.

The route 613 provides a limited peak service for residents of Bella Vista to the City via Norwest Boulevard / Reston Grange (to the west of the proposed station) and the M2. Route 618 provides a limited contra-peak service from the City to Norwest Business Park via the M2 and Windsor Road.

In addition, the route 614 and 714 terminate on the edge of the Business Park in Reston Grange.

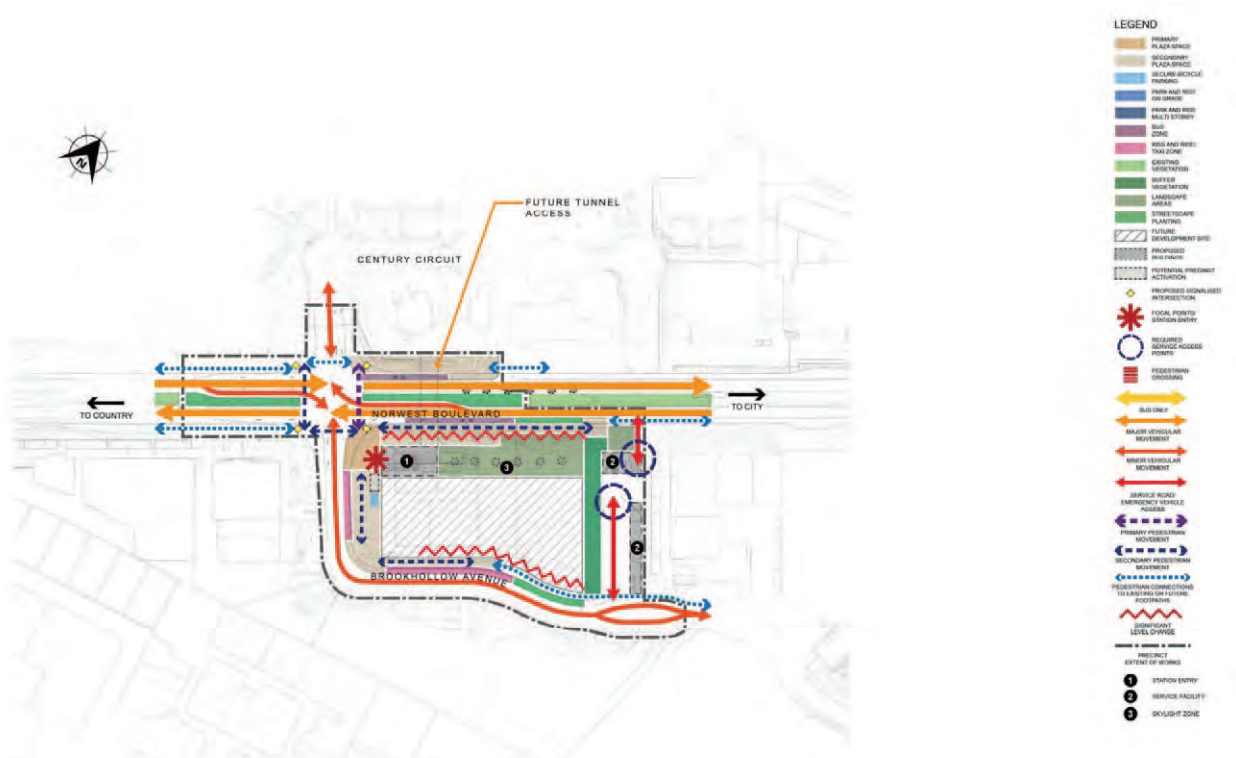
Figure 33 shows existing bus movements adjacent to the proposed Norwest station.

- No park and ride spaces.
- 30 bicycle parking spaces.
- 9 taxi spaces in Brookhollow Avenue.
- 2 bus bays eastbound on Norwest Boulevard.
- 2 bus bays westbound on Norwest Boulevard.

Being already a commercial centre/business park, no formal park and ride facilities will be provided at this station and it is expected that the park and ride patrons from surrounding areas would use either the proposed Bella Vista commuter park where a total of 800 commuter parking spaces will be provided or Showground (600 spaces). Some of the park and ride rail commuters are expected to park on-street in those nearby streets where there are no parking restrictions. Kiss and ride parking spaces have been estimated on the basis of an average 3 minutes dwell time per vehicle during peak periods.

Norwest station's role as an origin station will be moderate. However, bus use for station egress is expected to be important since a relatively high number of station exits are anticipated during the AM peak period due to the employment activities in the surrounding Norwest area. Some of these are located some distance from the station and it is likely that some people will choose to catch a bus passing the station in order to reach their place of work.

Figure 34 Proposed Norwest station layout



NOT FOR CONSTRUCTION

Source: ERSA, 2012

Estimated traffic generation in 2021

Traffic volumes, pedestrian activity and other multi-modal activities will increase around the proposed station precinct. It should be noted that the traffic modelling analysis in this report was undertaken using earlier demand forecasts. Supplementary analysis of future proposals may be required.

Most of the kiss and ride traffic is expected to be generated from within the Bella Vista residential area, and, to a lesser extent, from Crestwood and Glenwood residential areas.

While no commuter parking is to be provided at Norwest station, it is anticipated that some park and ride traffic will be generated from Bella Vista, Glenwood and other areas. There is some on street parking available on the surrounding commercial area street network. However, the impacts will need to be assessed following opening of the project and managed. The advent of the NWRL may also provide a reduction in the need for employees of local businesses to drive and this may be balanced with commuter parking.

8.4.4 Integrating Norwest station

Norwest is a specialised centre and will be more important as a destination for train trips on the NWRL than as an origin, particularly in the longer term. Currently, Norwest Business Park is highly car focused, with a public transport mode split for journey to work of around 3%, more in keeping with an industrial area than a centre.

NWRL will have an important role in providing access to the centre, with passengers using Norwest as a destination representing just over 50% of all customers in 2021 – with arrivals (exits) at the station in the AM peak period expected to outnumber departures (entries).

However, for the centre to achieve higher levels of public transport use, NWRL will need to be supplemented by improved bus services to areas outside the rail corridor. While the lack of a coherent secondary road network in the vicinity constrains bus access, buses operating on Norwest Boulevard will provide an important means of access to the station and also provide a link from the station to commercial premises within the larger business park which may be beyond a comfortable walking distance from the station, eg. Woolworths head office, approximately 1.2 km to the south west.

Norwest station will not have formal park and ride provision and with Bella Vista station to the west providing good supplies of commuter parking, management of parking in Norwest may be required by Council to discourage commuters. However, commuters driving to the station and parking may make use of car spaces vacated by business park workers who have diverted to rail, so the park and ride demand here is not expected to have a noticeable impact. Nonetheless, parking on street will need to be monitored and managed, if necessary, through implementation of appropriate parking management strategies.

The aim will be to encourage customers to access or leave the station by foot in the morning and evening peak periods, so a key objective for the station precinct is to provide safe pedestrian access.

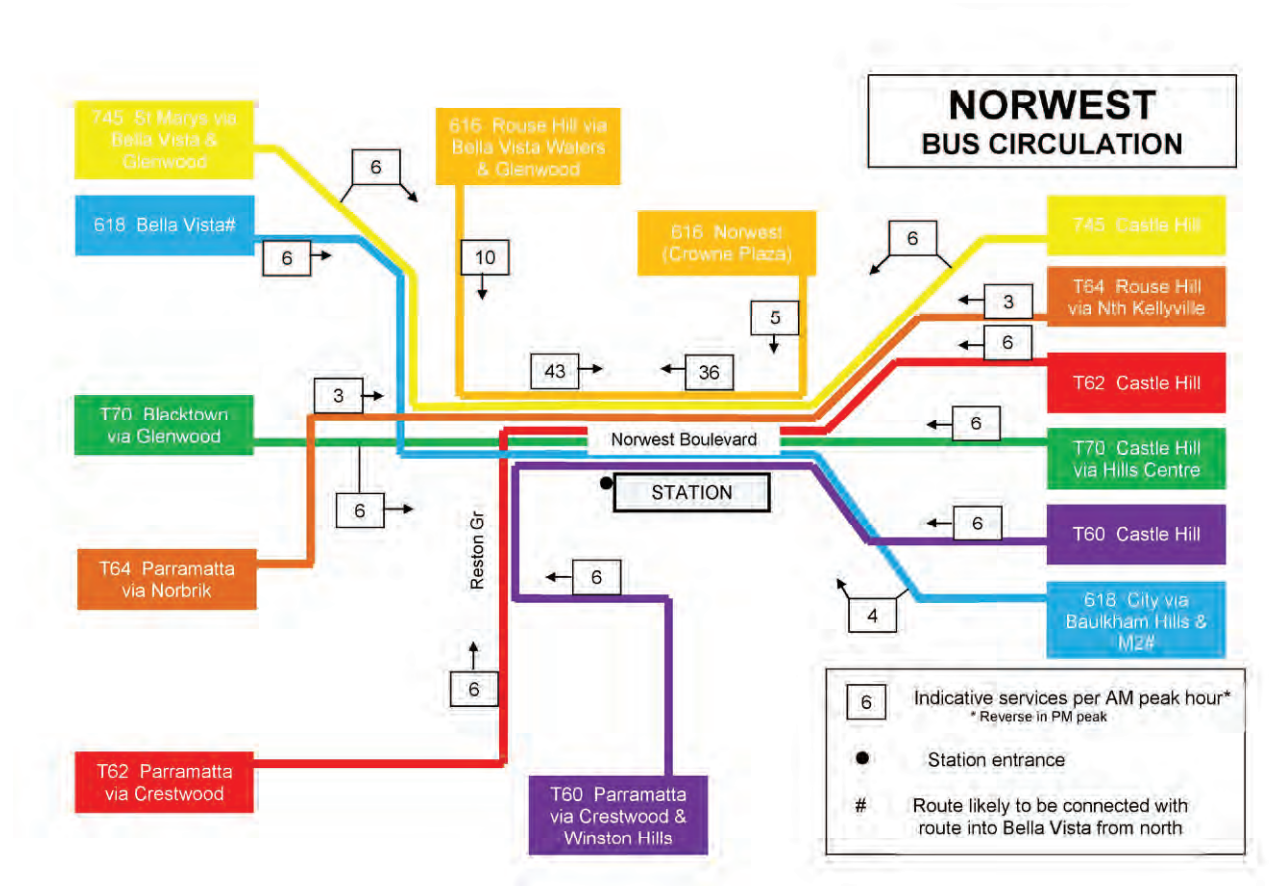
The station will front Norwest Boulevard and provision will be made for at-grade and future grade-separated pedestrian links across Norwest Boulevard.

Norwest Boulevard is the major access route to the business park and the station. It is planned to be upgraded by RMS to increase its width and replace existing roundabouts at intersections, with traffic signals.

While bus stops will be located on Norwest Boulevard (in indented bus bays) to integrate with existing bus routes through Norwest, kiss and ride parking will be located in Brookhollow Avenue. With the future implementation of the Opal card by TfNSW, a fare-free zone or similar could permit route bus

services to be used to help distribute NWRL customers through Norwest business park destinations as explained above. **Figure 35** shows the indicative future bus network serving Norwest station.

Figure 35 Indicative future bus access to Norwest station



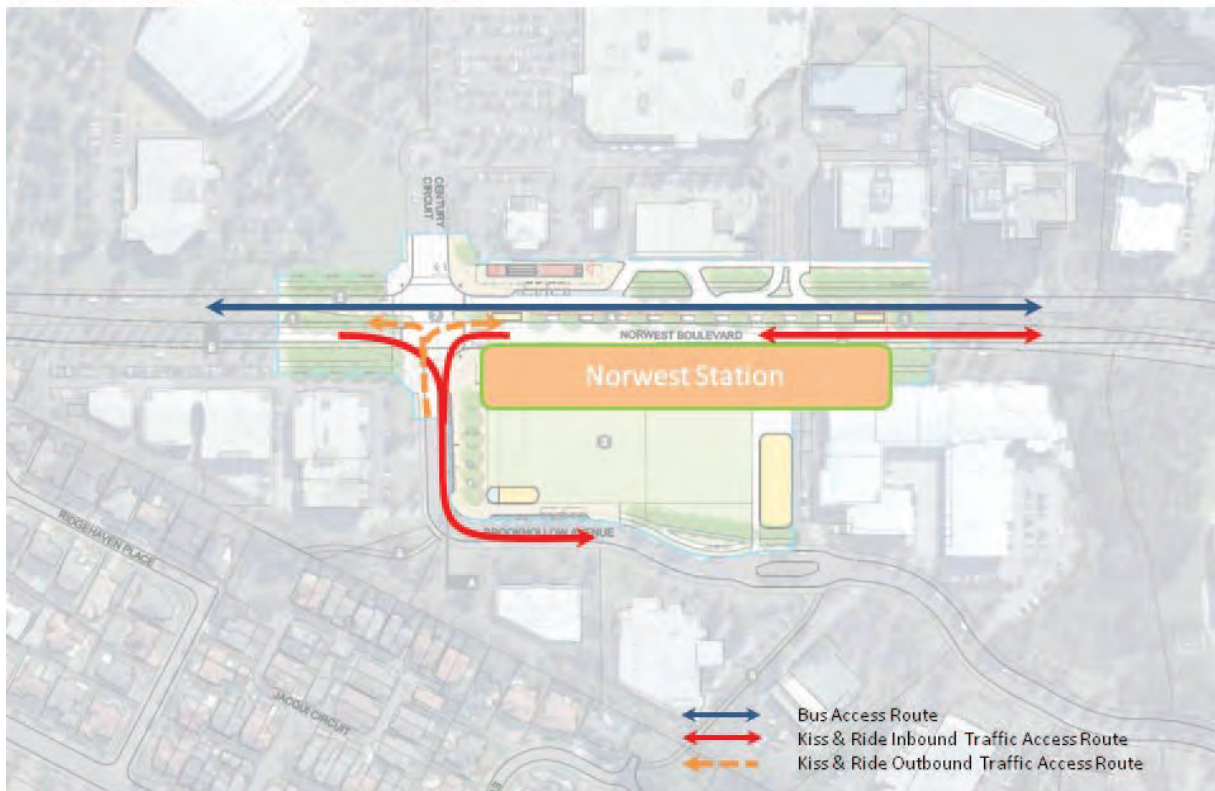
Source: NWRL, 2012

8.4.5 Proposed traffic management facilities

Figure 36 shows provisions for car and bus access to and egress from the station. As the figure shows, Norwest Boulevard will be a key access route (as the secondary street network is poorly developed) for buses and kiss & ride vehicles, with Brookhollow Avenue providing access and egress for taxis and kiss and ride vehicles.

Figure 36 Norwest station traffic access routes

Norwest Station Traffic Access Routes



Source: NWRL, 2012

The proposed Norwest station will include the following traffic management measures in the development and operation of the station. Some work to the intersection will be undertaken by NWRL as part of the precinct works:

- Removal of the roundabout and signalisation of the intersection of Norwest Boulevard / Brookhollow Avenue / Century Circuit.
- Provision of taxi ranks in Brookhollow Avenue near the intersection with Norwest Boulevard.
- Provision of short term parking (kiss and ride) in Brookhollow Avenue.

Right turn bay extensions and other works required to accommodate growth in through and regional traffic may be undertaken by RMS if required.

8.4.6 Preliminary traffic assessment

Background

It should be noted that the traffic modelling analysis in this report was undertaken using traffic generation figures based on earlier demand forecasts. Supplementary analysis of future proposals may be required.

Intersections included within the modelling for the Norwest station are as follows:

- Norwest Blvd / Columbia Cct / Brookhollow Ave (East) (roundabout) – This intersection is provided with a two-lane roundabout with Norwest Boulevard having two lanes on each approach. Columbia Circuit has a single lane approach and Brookhollow Avenue has two lanes marked for a short distance on approach to the intersection.
- Norwest Blvd / Solent Cct (East) (priority control) – this intersection is a channelised T-intersection with Norwest Boulevard having priority. A right turn bay is provided for traffic turning from Norwest Boulevard into Solent Circuit. Right turns are not permitted out of Solent Circuit.
- Norwest Blvd / Brookhollow Ave (West) / Century Circuit (traffic signals) – Traffic signals are proposed to be installed at this intersection. The Norwest Boulevard eastern approach includes two right turn bays, two through traffic lanes and a bus only lane which would be shared with left turning traffic into Brookhollow Avenue. One right turn bay, two through lanes and a bus only lane is provided on the Norwest Boulevard western approach. The Brookhollow Avenue southern approach includes a shared left/through lane and a shared through/right turn lane. A left only lane and shared through/right lane are provided on the Brookhollow Avenue northern approach.
- Norwest Blvd / Reston Grange / Solent Cct (west) (roundabout) – This intersection is provided with a two-lane roundabout with the Norwest Boulevard approaches having two traffic. The Norwest Boulevard approaches are both marked with a shared left/through lane and a shared through/right lane. Solent Circuit is marked with a right turn lane and shared left/through lane. Reston Grange is provided with two lanes on approach to the intersection without any specific lane allocation.

The analysis results are summarised in **Table 17** and indicate:

- The new signalised intersection at Norwest Boulevard / Brookhollow Avenue (west) / Century Circuit is forecast to operate at a satisfactory level of service following the introduction of the NWRL.
- The existing roundabouts on Norwest Boulevard at Reston Grange / Solent Circuit (west) and Brookhollow Avenue (east) / Columbia Circuit (west) are forecast to operate beyond capacity, even without the NWRL. This is due to the significant east-west traffic movements along Norwest Boulevard preventing traffic on the minor arms of the intersections from clearing satisfactorily. Only minor delays are forecast for through traffic on Norwest Boulevard at these intersections. Replacement of these roundabouts with traffic signals would be required to allow movements on these minor arms to operate at satisfactory levels of service.

Table 17 Norwest Station – AM Peak Hour Intersection Performance (2021)

| Location | Without NWRL | | With NWRL | |
|---|--------------|-------|-----------|-------|
| | LoS* | DoS** | LoS* | DoS** |
| Norwest Boulevard / Brookhollow Avenue (east) / Columbia Cct | B | 1.54 | C | 2.12 |
| Norwest Boulevard / Solent Cct (east) | A | 0.64 | A | 0.67 |
| Norwest Boulevard / Brookhollow Avenue (west) / Century Circuit | C | 0.90 | C | 0.93 |
| Norwest Boulevard / Reston Grange / Solent Cct (west) | D | 1.56 | D | 1.51 |

Source: ITLU (2012)

LoS – Level of service; DoS – Degree of saturation

Note: supplementary analysis of future proposals may be required.

* Worst performing lane

** Overall intersection performance

8.4.7 Shared Car Parking

In accordance with the concept plan approval consideration has been given to the opportunities for shared parking with existing facilities located in the vicinity of the proposed Norwest station. Shared parking is publicly and / or privately owned car parking that is used by two or more land uses with peak parking demands that do not coincide. Combining land uses with different peak parking demands results in a demand for parking that is less than the demand generated by separate parking structures intended to serve individual land uses. As a result, more land is made available for other purposes as a given supply of car parking is used more efficiently.

In the case of a heavy rail facility which has its peak utilisation during weekdays between the hours of 6am and 7pm, non conflicting candidate land uses include churches, cinemas, shopping centres, theatres and restaurants.

Table 18 lists candidate uses and their respective peak parking demands.

Table 18 Peak Parking Demands for Candidate Land Uses

| Peak Parking Period: | | |
|----------------------|--------------------|------------------|
| Weekday Peak | Evening Peak | Weekend Peak |
| Offices | Cinema | Churches |
| Factories | Restaurant | Parks |
| Banks | Bars & Dance Halls | Shopping Centres |
| Schools | Auditoriums | |

Some Norwest landowners have informal agreements where car parking facilities are shared where peak utilisations do not coincide. These arrangements have been put in place without Council facilitation. Scope exists to investigate opportunities for NWRL rail patrons to use nearby commercial and industrial car parking facilities in the vicinity of Norwest station for commuter parking.

There are a range of compatible land uses in the Norwest business park within reasonable walking distance to the proposed station location. Existing business / land owners may be willing to make available some existing spaces for use by commuters during agreed times.

8.5 Bella Vista

8.5.1 Background

The proposed Bella Vista station is located to the north east of the Old Windsor Road / Celebration Drive intersection within The Hills Shire Council Local Government Area. The site is currently operating as a bulky goods centre, the Totally Home Centre.

The proposed station would mainly serve the north western part of the Bella Vista business park as well as the existing Bella Vista and Glenwood suburbs and the future developments in the Balmoral Road release area. Total population of these suburbs is approximately 20,000.

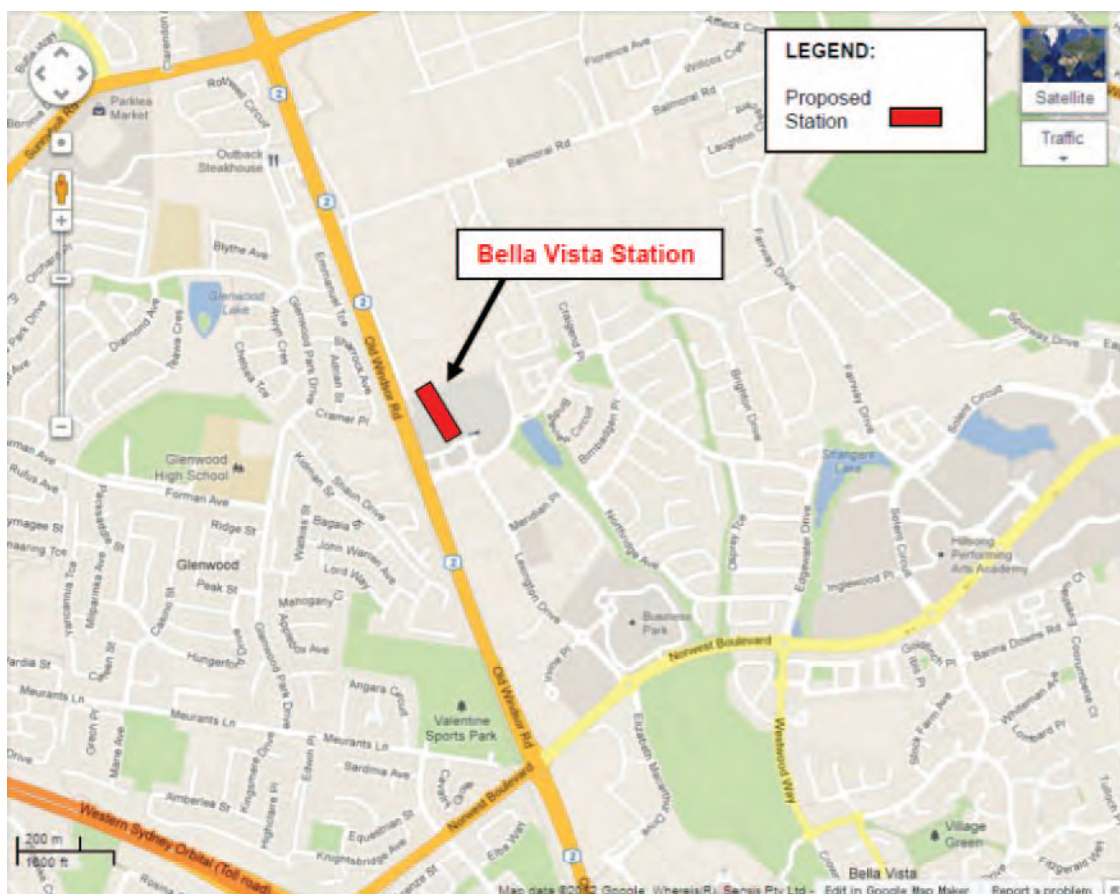
At the present time, the rail patrons of the suburbs in this area need to travel more than 4km to access a railway station, at Seven Hills or Blacktown, or else use T-Way bus services to Westmead or Parramatta stations. The rail patrons accessing these stations need to travel using the road network which is heavily congested during the peak periods.

The proposed Bella Vista station has the potential to reduce the parking demand at Seven Hills and Blacktown stations and would reduce travel time for local residents who are currently using these stations.

Major traffic generating Norwest Business Park developments such as Woolworths and RESMED are located approximately one kilometre from the proposed Bella Vista Railway station. Employees from the Norwest Business Park developments would be encouraged to use the proposed Bella Vista or Norwest stations with the provision of improved connecting bus services passing both stations.

The location of the proposed Bella Vista station is shown in **Figure 37**.

Figure 37 Location of the proposed Bella Vista station



Copyright: Google, 2012

8.5.2 Existing conditions

Existing road network adjacent to the proposed station

The following roads are located immediately adjacent to the proposed station:

- **Old Windsor Road** – This is a 4-lane divided road with an 80km/h speed limit and is classified as a State Road under the care and control of RMS. The North West T-Way is located along the western side of the road south from Celebration Drive and traverses across to the eastern side via a tunnel under Old Windsor Road just north of the Celebration Drive intersection.
- **Celebration Drive** – This is a two-way, two-lane road and is classified as a Collector road serving both retail and commercial land uses in the western section of the Norwest business park. This road is currently maintained by The Hills Shire Council.
- **Lexington Drive** – this is a two-lane two-way road and is classified as a Collector road serving a number of commercial and retail developments along its length and connecting Celebration Drive with Norwest Boulevard. Along with Celebration Drive, Lexington Drive provides an alternative access to the eastern sections of the Norwest Business Park for traffic approaching from the north on Old Windsor Road. This road is currently maintained by The Hills Shire Council.

Table 19 provides information on the existing traffic volumes on roads located immediately adjacent to the proposed Bella Vista station.

Table 19 Bella Vista station – Roads summary

| Road | Agency Responsibility | Lanes | AADT | 2011 Peak Hour Volume | |
|----------------|-----------------------|-------|--------|-----------------------|--|
| Old Windsor Rd | RMS | 4 | 49,004 | Northbound | AM 1,241 (7.45-8.45am) PM 2,261 (4.15-5.15pm) |
| | | | | Southbound | AM 1,771 (7-8am) PM 1,435 (4.30-5.30pm) |
| Celebration Dr | Hills Shire Council | 2 | 14,533 | Eastbound | AM 1,399 (8-9am) PM 602 (12-1pm) |
| | | | | Westbound | AM 506 (11-12am) PM 744 (5-6pm) |

Source: RMS AADT Data & ITLU Traffic counts 2011

AADT – Annual average daily traffic

The following intersections are provided immediately adjacent to the proposed station:

- Old Windsor Rd / Celebration Dr (traffic signals) – This intersection is a channelised T-intersection with Old Windsor Road provided with two through lanes in each direction. The southern approach is provided with two right turn lanes into Celebration Drive. The northern approach is provided with a left turn slip lane and a ‘Bus Only’ queue jump lane at the head of the left turn lane. Celebration Drive is provided with two right turn lanes, a ‘Bus Only’ queue jump lane and a left turn lane at the intersection. Access is also provided to and from the T-Way into Celebration Drive.
- Lexington Dr / Celebration Dr (roundabout) – While the roundabout at this intersection has been designed to operate as a two-lane roundabout, at the present time it effectively only operates as a single lane roundabout as each of the approaches are single lane only. The splitter islands at this intersection also act as pedestrian refuges with pedestrian paths provided.

Adjacent landuses and infrastructure developments

Adjacent landuses include residential developments on the western side of the Old Windsor Road and to the east of the site around Brighton Drive. Commercial/office land uses are located to the south of the site, on the eastern side of the Old Windsor Road. Further commercial development is proposed in the Norwest Business Park, which will increase the employee numbers in the area from a current level of 20,000 to 35,000.

Proposed landuse and infrastructure developments

RMS has also carried out some preliminary assessments for the future requirements of Norwest Boulevard and the intersections located along its length. It has been identified that the current roundabout at the intersection of Lexington Drive and Norwest Boulevard is a constraint on the road system and would require upgrading to traffic signals at some stage in the future.

Any changes to the traffic control of the Norwest Boulevard / Lexington Drive intersection would have an impact on the operation of the Old Windsor Road / Celebration Drive intersection. It should be noted that these improvements have not been included in any scheduled future works program at the present time and would be subject to further consideration and investigation.

Removal of the Totally Home Centre, currently used as an egress route from McDonalds and the adjacent service station, is required to accommodate the Bella Vista station and its facilities. However, the McDonalds outlet and service station are proposed to be retained and appropriate road network access from these businesses will need to be provided.

The development of the station and the provision of the extension of Lexington Drive running parallel to Old Windsor Road will provide the fourth leg to the Celebration Drive / Lexington Drive intersection. This intersection (currently a roundabout) will need to be signalised to manage the traffic and pedestrian movements safely at this intersection.

Historical crash analysis

An historical crash analysis has been undertaken for the crashes that occurred between January 2006 and December 2010 within 400m radius of the proposed Bella Vista station. **Table 20** shows the number of crashes recorded within 100m and 400m radius from the location of the proposed station.

Table 20 Bella Vista Station – Crash Summary

| Distance from the proposed Station (radius) | Number of pedestrian crashes | Total number of crashes |
|---|------------------------------|-------------------------|
| 100m | 0 | 3 |
| 400m | 2 | 35 |

Source: RMS Crash Data 2011

The following observations were made in relation to the crashes recorded within 400m radius of the proposed Bella Vista station:

- Out of 35 crashes, a total of 21 crashes occurred on Old Windsor Road and the details of the crashes are provided below:
 - 7 crashes were reported to occur at the Old Windsor Road / Celebration Drive intersection.
 - 7 crashes occurred between Celebration Drive and Norwest Boulevard on Old Windsor Road.
 - 7 crashes occurred between Celebration Drive and Miami Street on Old Windsor Road.
 - The majority of the crashes (13 crashes) that occurred on Old Windsor Road were rear-end type crashes followed by run-off road crashes (5 crashes).
- Out of 35 crashes, a total of 13 crashes occurred on Lexington Drive between Celebration Drive and 200m south of Meridian Place and the details of the crashes are as follows:
 - Both pedestrian crashes were reported to occur on Lexington Drive.
 - Majority of the crashes (7 crashes) occurring on Lexington Drive are in relation to rear-end type crashes including with right turning vehicles and U-turning vehicles. This is due to the driveway accesses along Lexington Drive

Traffic volumes along Old Windsor Road are expected to increase in the future due to urban growth in the region, even prior to the opening of the proposed Bella Vista Station. The proposed improvements to Norwest Boulevard are likely to improve the safety along Norwest Boulevard and the intersections along Norwest Boulevard including Norwest Boulevard / Lexington Drive intersection.

These improvements would have the potential to reduce the right turn traffic volumes at the Old Windsor Road / Celebration Drive intersection as this traffic would be provided with improved traffic flow for traffic turning from Old Windsor Road at Norwest Boulevard, and to improve the safety at the Old Windsor Road / Celebration Drive intersection.

Traffic volumes along Lexington Drive would increase in the future with further development of the business park and the development of the proposed Bella Vista station. Pedestrian movements and the entry/exit of vehicles to and from developments along this road will need to be carefully managed with the increase in traffic movements along Lexington Drive.

The following measures have the potential to reduce the crashes and/or severity of the crashes immediately adjacent to the proposed Bella Vista station.

- The proposed improvements to Norwest Boulevard, in particular, the potential signalisation of Norwest Boulevard / Lexington Drive intersection as part of the Norwest Boulevard upgrade would have the potential to improve the safety at the Old Windsor Road / Celebration Drive intersection and along Old Windsor Road.
- The proposed extension of Lexington Drive as part of the NWRL project would accommodate some of the traffic generated by the Bella Vista station and would have potential to reduce the traffic and safety impacts on the Old Windsor Road / Celebration Drive intersection and Old Windsor Road.
- The design of proposed access to Bella Vista station needs to include adequate pedestrian facilities and passing facilities along the Lexington Drive extension.

Bus operation

Bus routes in the area of the proposed station are currently largely confined to the North West Transitway which runs adjacent to Old Windsor Road passing under Old Windsor Road in tunnel from west to east almost opposite Celebration Drive. Two services connect from Norwest Boulevard to Lexington Drive and Brighton Drive.

The “Celebration” Transitway stop on the western side of Old Windsor Road, directly opposite Celebration Drive, would continue to operate as normal during the operation of the station.

It is proposed to provide a pedestrian bridge across the T-Way and Old Windsor Road to connect the residential area on the western side of Old Windsor Road to the station precinct. This may also provide a traffic free link between the T-Way stop and Bella Vista station.

In conjunction with this, the provision of 800 car parking spaces for Bella Vista station would also provide the opportunity for T-Way patrons to make use of this car parking.



Figure 29 shows the facilities that will be provided during the operation of the proposed Belle Vue

15.11.2014

- 3 bus bays on the eastern side of the Lexington Drive extension.
- 3 bus bays on the western side of the Lexington Drive extension.

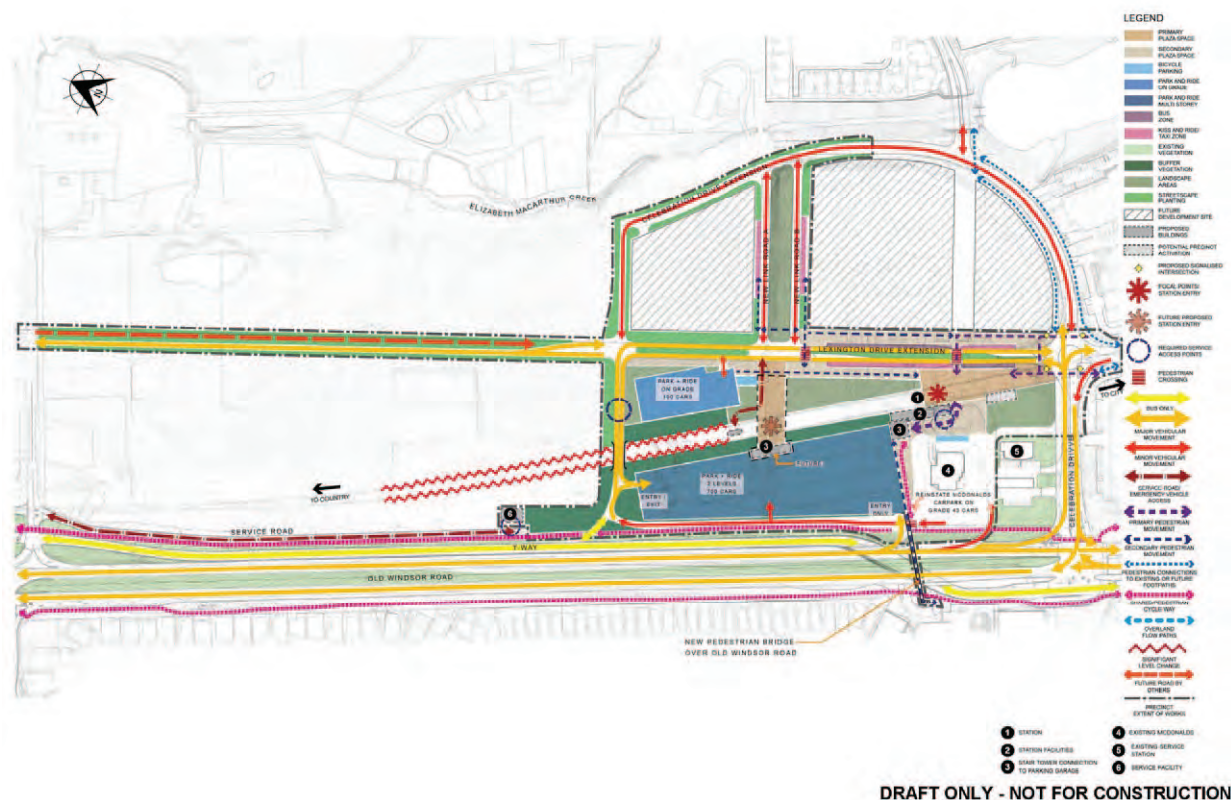
The provision of direct access off Old Windsor Road (southbound) via a dedicated off-ramp is expected to enhance the attractiveness of the commuter car park at Bella Vista. On-street parking would also be available on the Lexington Drive extension north of the station, should the commuter car park be full. Kiss and ride parking spaces would be provided based on an average swell time of 3 minutes per vehicle during peak periods.

The provision of dedicated park and ride spaces is a balance between meeting morning peak hour demand for park and ride and encouraging access by more sustainable modes including bus, walking and cycling. As with most stations on the Sydney rail network, some of those accessing the station by park and ride will park on-street, at distances ranging up to around one kilometre. Where required, NWRL will work with council to develop strategies to manage demand for on-street parking in order to reduce impacts on local residents.

It is anticipated that this level of parking would generate traffic to the station principally from the Glenwood, Balmoral Road and Kellyville areas, with a significant number also accessing the station from as far as Quakers Hill and Acacia Gardens. Those commuters from suburbs west of Old Windsor Road are anticipated to access the station along Sunnyholt Road (for Stanhope Gardens, Acacia Gardens and Quakers Hill) with a smaller volume using Miami Street or Norwest Boulevard.

Local bus services to Bella Vista would provide access from the Balmoral Road release area, Bella Vista and suburbs on the western side of Old Windsor Road such as Glenwood. However, it is expected that, with the proposed supply of commuter parking at this station, car will be the primary means of access to the station. Local bus services will be provided between Bella Vista station and both Kellyville and Norwest stations. Interchange would also be available between NWRL and buses to Blacktown via the Sunnyholt Road T-Way.

Figure 39 Proposed Bella Vista station layout



Source: ERSA, 2012

Estimated traffic generation in 2021

Traffic volumes, pedestrian activity and other multi-modal activities will increase around the proposed station precinct. It should be noted that the traffic modelling analysis in this report was undertaken using earlier demand forecasts. Supplementary analysis of future proposals may be required.

Buses servicing Bella Vista station will be primarily local services, and would operate along the Lexington Drive extension and/or the T-Way (via a short connecting road) and provide connections from the Balmoral Road area and from within Bella Vista to the south and east of the station.

Development of the Balmoral Road release area will increase the potential pedestrian and cycling access to the station. The provision of a grade-separated footbridge over Old Windsor Road will also provide improved access for those residential properties on the western side of Old Windsor Road in Glenwood.

8.5.4 Proposed traffic management facilities

Bella Vista station is one of the designated park and ride sites for the NWRL and it is considered that this will be the major transport mode to the station. As part of the development of the station the following facilities are proposed:

- Construction of a local access road as an extension of Lexington Drive (new road) to the north of Celebration Drive. This road will generally provide one traffic lane and one parking lane in each direction on a divided carriageway. Mid-block pedestrian crossings are proposed to be provided near the station entry. This new road is proposed in order to provide access from areas adjoining

the rail corridor to the stations and for local bus services. It will also provide access for the potential developments that could result from the implementation of the NWRL without needing direct access onto Old Windsor Road.

- Removal of the roundabout and signalisation of the intersection of Celebration Drive and Lexington Drive. In conjunction with this work the eastbound carriageway of Celebration Drive, between Old Windsor Road and Lexington Drive would be widened to provide two lanes. Pedestrian crossings would be provided on all legs. This would affect the egress of vehicles from McDonalds and the adjacent service station as, currently, vehicles can exit either site, turn around at the roundabout and then turn from Celebration Drive to travel northbound or southbound on Old Windsor Road. Alternative options for this traffic could potentially include the following paths:
 - Northbound - left into Celebration Drive, left into the Lexington Drive extension, left into Memorial Avenue to access Old Windsor Road or Sunnyholt Road. Alternatively, left into Celebration Drive, right into Lexington Drive, turn around at the Lexington Drive / Meridian Place roundabout returning to Celebration Drive and then right into Old Windsor Road.
 - Southbound – left into Celebration Drive, right into Lexington Drive and, alternatively, turn around at the roundabout at the intersection of Lexington Drive / Meridian Place to return to Celebration Drive and then left into Old Windsor Road or proceed along Lexington Drive to Norwest Boulevard to enter Old Windsor Road at the grade separated interchange.
- The provision of 800 parking spaces in a multi-storey car park to the west of the rail line. Access to the car park would be via the Lexington Drive extension or directly off Old Windsor Road (southbound).
- The provision of six bus bays on Lexington Drive extension (three on the eastern side and three on the western side), four taxi ranks (two on the eastern side and two on the western side) and 16 short term (kiss and ride) parking spaces to be provided on both sides of Lexington Drive extension close to the station entry.
- New entry to the McDonalds outlet via Celebration Drive. A new car park is to be provided for the McDonalds, possibly on the northern side of the building.

8.5.5 Integrating Bella Vista station

Bella Vista station will function as a major park and ride station, with some 800 car spaces to be provided. South of Celebration Drive is the Bella Vista business park, forming part of the Norwest Business Park.

To the north, the surrounding residential area is currently sparsely developed east of Old Windsor Road, while to the west of Old Windsor Road there are established residential areas with limited road or pedestrian access to the east. Old Windsor Road forms a barrier to station access from the west and a grade-separated pedestrian bridge would link the station to the residential areas west of Old Windsor Road.

The 'Celebration' T-Way stop is located west of Bella Vista station – at this location the T-Way crosses from the east side of Old Windsor Road to the west side, via an underpass and the T-Way stop (catering for routes between Rouse Hill and Parramatta) is located on the west side of Old Windsor Road, south of Celebration Drive. The number of passengers likely to interchange here between NWRL and T-Way is likely to be low and there are no plans to relocate the T-Way stop.

At Bella Vista, the NWRL station access arrangements introduce a new north-south extension of Lexington Drive, eventually providing access to the north through the corridor between Old Windsor Road and NWRL on the west, and Elizabeth Macarthur Creek. This corridor offers a substantial

opportunity for land use change to be influenced by NWRL. This is expected to take place in the medium to longer term 2036 to 2061 period.

The Pre-Concept Design Report shows a potential redevelopment scenario for this corridor to Kellyville station, with an extension of Lexington Drive (new road) acting as a four-lane boulevard with two traffic lanes and two parking lanes. This road would be used for local station access (including local buses accessing the station from the north), would support access to new urban development in the corridor, and would supplement Old Windsor Road by providing an alternative route towards Norwest Business Park.

Bella Vista station will be a destination station as well as an origin. Customers travelling by train to Bella Vista in the morning peak period will represent some 30 per cent of peak period customers in 2021, increasing to around 40% by 2036. Most NWRL customers using Bella Vista as a destination would likely walk to their final destination, and many would have destinations south of Celebration Drive, in the Bella Vista and Norwest business parks.

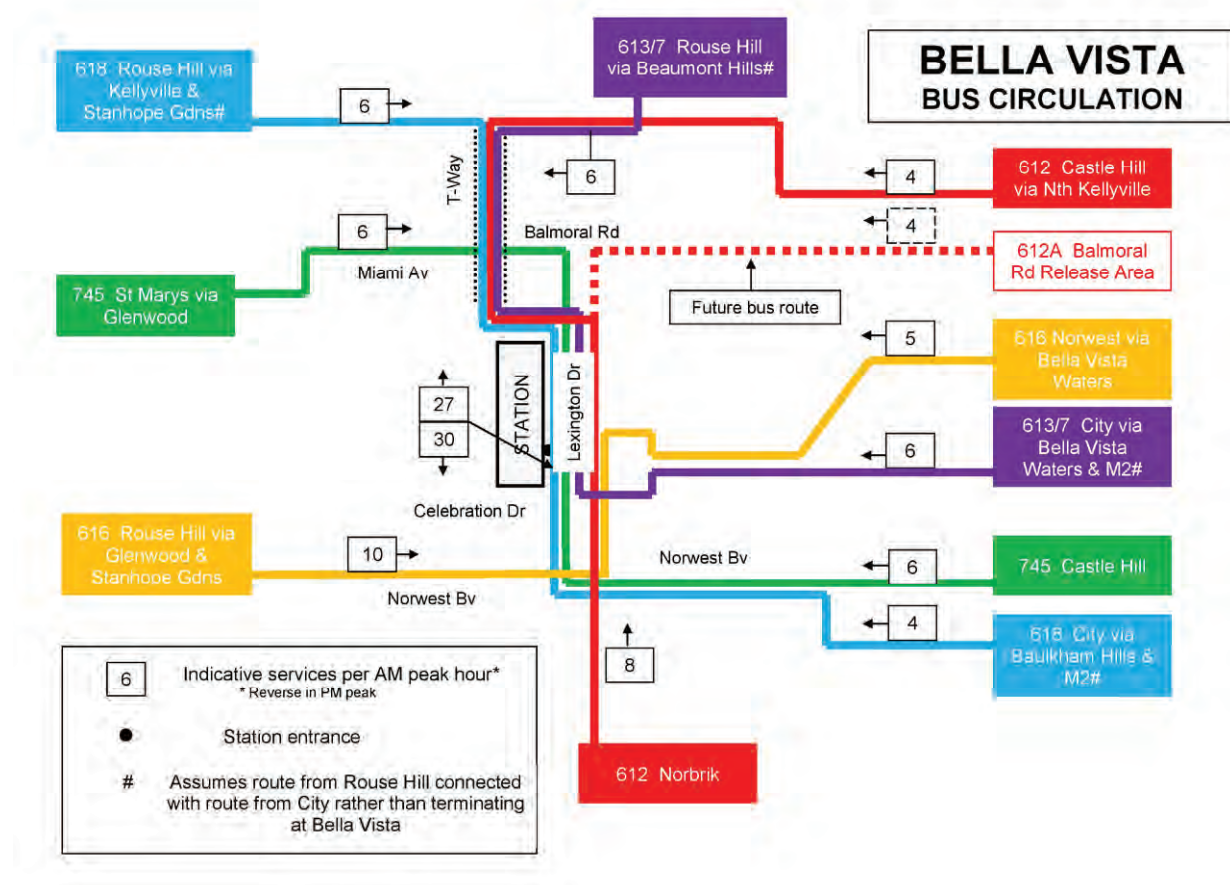
Accordingly, the station precinct master plan proposes the signalisation of the Celebration Drive / Lexington Drive intersection to improve pedestrian access to and from the station. However, some will use buses to access locations more remote from the station such as Woolworths head office (approximately 900m) or RESMED/Norbrik (1.5-2.0km).

Station access and the proximity of the Lexington Drive extension to Old Windsor Road create issues for access and integration, which may require restrictions to some vehicle movements at the intersection of Celebration Drive and Lexington Drive.

Bus stops and kiss and ride parking would be located on the Lexington Drive extension, north of Celebration Drive.

Figure 40 shows the indicative future bus network accessing Bella Vista station.

Figure 40 Indicative future bus access to Bella Vista station



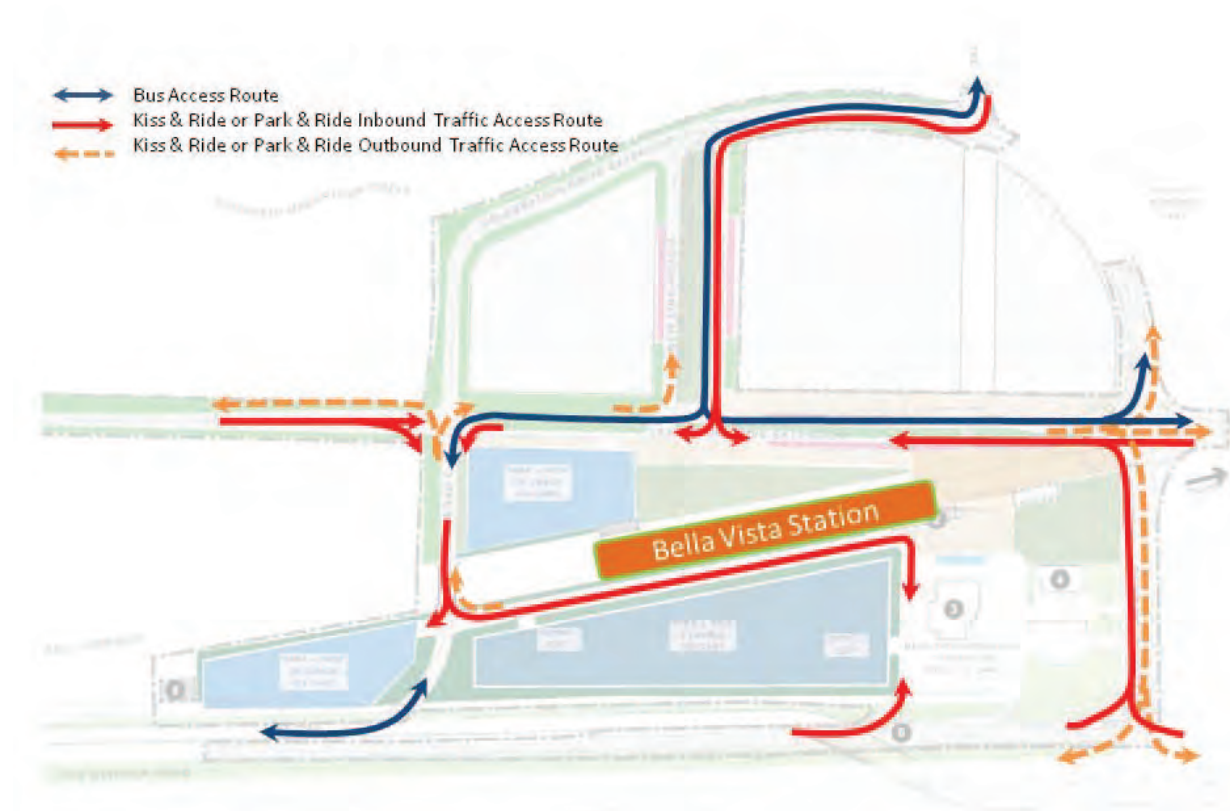
Source: NWRL, 2012

8.5.6 Preliminary traffic assessment

Figure 41 shows provisions for car and bus access to and egress from the station.

Station traffic is expected to approach the station primarily from the north via Lexington Drive extension, or Old Windsor Road and Celebration Drive. Buses will operate north-south on the Lexington Drive extension, using either the T-Way and connecting road, or Balmoral Road.

Figure 41 Bella Vista station traffic access routes



Source: NWRL, 2012

Background

It should be noted that the traffic modelling analysis in this report was undertaken using traffic generation figures based on earlier demand forecasts. Supplementary analysis of future proposals may be required.

In relation to the possible future arrangement of the T-Way in proximity to the intersection of Memorial Avenue and Old Windsor Road, two scenarios were examined:

- Scenario 1 – where a combined T-Way and north-south link road intersection are provided at a location about 70 metres back from the Old Windsor Road stop line; and
- Scenario 2 – where a new T-Way intersection is located adjacent to the Memorial Avenue / Old Windsor Road intersection as is the case today at Samantha Riley Drive.
- Intersections included within the modelling for Bella Vista station were as follows:
- Old Windsor Road / Memorial Avenue / Sunnyside Road – This intersection has been modelled as for the existing intersection configuration and the traffic signal phasing (Scenario 1).
- Old Windsor Road / Balmoral Road / Miami Street – This intersection has been modelled as for the existing intersection configuration (ie. No access between Miami Street and Balmoral Road) and the traffic signal phasing.

- Old Windsor Road / Celebration Drive – This intersection has been modelled as for the existing intersection configuration and the traffic signal phasing.
- Celebration Drive / Lexington Drive / Lexington Drive extension – This intersection has been assessed as a signalised intersection with three lanes on the Celebration Drive approach (a left/through lane and two right turn lanes) and two lanes on each of the remaining approaches.
- Lexington Drive extension / Balmoral Road – This intersection has been assessed as a single lane roundabout.
- Lexington Drive extension / Memorial Avenue – This intersection has been assessed as a signalised intersection with two traffic lanes on each approach, as well as a T-Way lane in each direction along the Lexington Drive extension (Scenario 1).

The key performance indicators for each intersection within the model area are provided in **Table 21**.

Table 21 Bella Vista station – AM Peak Hour Intersection Performance (2021)

| Location | Without NWRL | | With NWRL | |
|--|--------------|-------|-----------|-------|
| | LoS* | DoS** | LoS* | DoS** |
| Old Windsor Rd / Memorial Ave / Sunnyholt Rd (scenario 1) | F | 1.27 | F | 1.43 |
| Old Windsor Rd / Memorial Ave / Sunnyholt Rd (scenario 2) | F | 1.34 | F | 1.31 |
| Old Windsor Rd / Balmoral Rd / Miami St | C | 0.86 | D | 0.90 |
| Old Windsor Road / Celebration Dr | F | 1.32 | F | 1.70 |
| Celebration Dr / Lexington Dr / Lexington Dr extension | C | 0.61 | C | 0.68 |
| Lexington Dr extension / Balmoral Rd | A | 0.21 | A | 0.24 |
| Lexington Dr extension / Memorial Ave | B | 0.67 | B | 0.55 |

Source: ITLU (2012)

LoS – Level of service; DoS – Degree of saturation

Note: supplementary analysis of future proposals may be required. Analysis assumes spine road is in place between Bella Vista and Kellyville stations.

Note: LINSIG analysis is worst case in that it does not take account of the beneficial impacts of the proposed pedestrian bridge across Old Windsor Road.

* Overall intersection performance

** Worst performing lane

The analysis summarised in the Table above indicates that:

- Both the Old Windsor Road intersections with Memorial Avenue / Sunnyholt Road and Celebration Drive are predicted to operate well above their existing capacity. This is the case, both with or without the NWRL indicating that this congestion is primarily a result of general traffic growth.

- In relation to Memorial Avenue, the T-Way adjacent to Old Windsor Road with NWRL slightly improves the intersection operation overall (Degree of Saturation: 131% vs 143%). Note: At that level of congestion, where the intersection is operating significantly beyond capacity, the results should be treated with caution as even small changes can have an impact on the intersection operation. This warrants further consideration and analysis.
- It should also be noted that due to the large size of these intersections (and resulting pedestrian clearance times) the pedestrian requirements are significant in terms of the operation and capacity of these intersections. The modelling for these intersections assumes that all pedestrian crossing phases are being called every cycle.
- Notwithstanding the above, in order to achieve satisfactory performance at these Old Windsor Road intersections, it is likely that a fundamental improvement will be required to provide additional capacity (i.e. through the provision of an additional through lane along Old Windsor Road, for example).
- The Old Windsor Road / Balmoral Road intersection is predicted to operate within but near practical capacity in both scenarios, although it will operate slightly nearer capacity with inclusion of the NWRL rail station at Bella Vista.
- All new intersections formed by the 'new road', including the connection with Celebration Drive / Lexington Drive are predicted to operate well within capacity and to a satisfactory level of service.

8.6 Bella Vista to Kellyville

8.6.1 Background

From Bella Vista to beyond Kellyville, the NWRL is proposed to be largely on viaduct (referred to as "skytrain") within a linear corridor immediately east of Old Windsor Road and the T-Way. The remainder of the largely vacant land extending to Elizabeth Macarthur Creek on the east will be subject to future masterplanning and urban development in the period beyond initial opening of NWRL.

Early planning for the Bella Vista to Kellyville corridor originally provided for a "boulevard" or "spine road" extending the full 2.5 km length as part of a robust street network to both facilitate road access (including buses) to Bella Vista and Kellyville stations, and to support future urban development between the rail corridor and Elizabeth Macarthur Creek to the east.

The preliminary traffic analysis reported in this document assumes a "spine" road is in place between Bella Vista and Kellyville stations. However, in consultation with RMS, the Hills Council and TfNSW, extensive consideration has been given to balancing the need for access to Bella Vista and Kellyville station precincts for park and ride and kiss and ride, access for buses to and between the stations, and the location and potential traffic network implications of intersections between the "spine road" and Balmoral Road, Memorial Avenue and Samantha Riley Drive, with particular reference to the proximity of these intersections to Old Windsor Road. This has resulted in a decision to rationalise the extent of the initial 'day one' road network provided as part of NWRL.

This rationalised 'day one' road network would involve re-evaluating any through linking road in the section beyond Balmoral Road, apart from a short section at Kellyville to facilitate vehicular access to the station and car park. Any decisions on the final form and location of the intervening road network would be made as part of the future masterplanning process for the area.

In order to allow buses to still serve both Kellyville and Bella Vista stations in the interim, use would be made of the existing T-Way between Samantha Riley Drive and Bella Vista, with a short linking

road running east off the T-Way to link with the proposed extension of Lexington Drive north of Bella Vista station, adjacent to the proposed Bella Vista station car park.

Vehicular access to Kellyville would be maintained through a new signalised intersection on Samantha Riley Drive close to Elizabeth Macarthur Creek, a new left-in/left-out intersection on Samantha Riley Drive just east of the rail corridor and short sections of connecting roads.

Access to Bella Vista station would be facilitated by an extension of Lexington Drive north from Celebration Drive, with a car park ingress ramp directly off Old Windsor Road south of Celebration Drive.

Extension of Lexington Drive from Celebration Drive to Balmoral Road would facilitate vehicular (including bus) access between the developing Balmoral Road Release Area and Bella Vista station, Bella Vista Business Park and Norwest. With adjustments to the intersection of Balmoral Road with Old Windsor Road (including consolidation into a single four-way signalised intersection with Miami Street) the Lexington Drive extension would also help to relieve congestion on Celebration Drive and its intersection with Old Windsor Road.

8.6.2 Existing conditions

Existing road network

The key roads along this section of the NWRL are Old Windsor Road, Sunnyholt Road, Memorial Avenue and Balmoral Road. Old Windsor Road, Sunnyholt Road and Memorial Avenue are all classified as State Roads and are under the care and control of RMS. Balmoral Road is a local collector road under the care and control of The Hills Shire Council.

The existing Old Windsor Road / Memorial Avenue / Sunnyholt Road intersection is a major intersection in the regional road network of the north west. Old Windsor Road provides access from the north west toward Parramatta and Sunnyholt Road provides access toward Blacktown. The intersection is congested during peak periods due to the heavy traffic volumes on all legs of the intersection.

The North West T-Way runs parallel, and adjacent to, Old Windsor Road for much of its length and the 'Burns' (Memorial Avenue) T-Way stop is located on the south eastern corner of the intersection with Memorial Avenue / Sunnyholt Road. The T-Way going north transitions from running alongside Old Windsor Road south of the stop, to move approximately 80 metres away from Old Windsor Road to cross over Memorial Avenue at a signalised intersection and then return to run alongside Old Windsor Road northward towards the 'Riley' stop at Samantha Riley Drive.

- Old Windsor Road – Along the section between Celebration Drive and Samantha Riley Drive it is provided with two lanes in each direction, a breakdown/cycle lane in each direction with widening provided at the intersections for turning movements. Turn lanes are provided as follows:
 - At Balmoral Road / Miami Street. This intersection forms an off-set four-way intersection with Old Windsor Road, although the intersection is configured so that cross movements between Miami Street and Balmoral Road, and movements into Balmoral Road from the south, and out of Balmoral Road to the north, are currently prohibited. Southbound, Old Windsor Road is provided with double right turn bays into Miami Street and a left turn lane into Balmoral Road, as well as a left turn slip lane from Balmoral Road. Northbound, Old Windsor Road is provided with a left turn slip lane into Miami Street.
 - Sunnyholt Road / Memorial Avenue. Southbound, Old Windsor Road is provided with a double right turn into Sunnyholt Road and a left turn slip lane into Memorial Avenue. Northbound is

provided with a single right turn lane into Memorial Avenue and left turn slip lane into Sunnyholt Road.

- Memorial Avenue is provided with a single traffic lane in each direction, widening out to provide two through lanes in each direction with a right turn bay and left turn slip lane at the intersection with Old Windsor Road. There are also bus lanes provided in each direction on Memorial Avenue between the T-Way intersection and Old Windsor Road, to facilitate bus movements from the T-Way to Sunnyholt Road and the T-Way to Blacktown.
- Sunnyholt Road is provided with two traffic lanes in each direction. At the intersection with Old Windsor Road it widens to provide two right turn lanes, a bus lane and a left run slip lane at the intersection. A bus lane is also provided on the westbound departure of the intersection, leading into the Blacktown T-Way.
- Balmoral Road is a relatively low volume, 70 km/h narrow two-lane rural road. It connects to Old Windsor Road in the west and Memorial Ave in the east. It is signalised at the intersection with the T-Way and is restricted to left in/left out movements at Old Windsor Road. A service road is also provided off Balmoral Road on the eastern side of the T-Way to provide access to a number of properties to the south.
- The North West T-Way intersects with Memorial Avenue approximately 80 metres east of the intersection with Old Windsor Road. This is a signalised intersection and the T-Way is provided with a single Bus Lane in each direction and left turn slip lanes on all approaches apart from the southbound approach.

Table 22 Bella Vista to Kellyville – Roads Summary

| Road | Agency Responsibility | Lanes | AADT | 2011 Peak Hour Volume | |
|------------------|-----------------------|-------|--------|-----------------------|--|
| Old Windsor Road | RMS | 4 | 49,004 | Northbound | AM 1,466 (7.30-8.30am) PM 1,392 (4.15-5.15pm) |
| | | | | Southbound | AM 1,769 (7-8am) PM 1,552 (4.15-5.15pm) |
| Balmoral Rd | Hills Shire Council | 2 | 872 | Eastbound | AM 16 (7-8am) PM 14 (5-6pm) |
| | | | | Westbound | AM 112 (8-9am) PM 66 (3-4pm) |
| Memorial Ave | RMS | 2-4 | 21,660 | Eastbound | AM 1,406 (8-9am) PM 885 (5-6pm) |
| | | | | Westbound | AM 744 (11-12am) PM 952 (4-5pm) |
| Sunnyholt Rd | RMS | 4 | 39,433 | Eastbound | AM 1,729 (7.45-8.45am) PM 942 (4-5pm) |
| | | | | Westbound | AM 1,018 (7-8am) PM 992 (4.30-5.30pm) |

Source: RMS AADT Data & ITLU Traffic counts 2011 AADT – Annual average daily traffic

Adjacent landuses and infrastructure developments

The western side of Old Windsor Road along this section is primarily residential. On the eastern side of Old Windsor Road the development of the Balmoral Road release area is currently underway. This will see the area which is semi-rural residential be developed as suburban residential area over coming years.

The North West T-Way runs parallel to Old Windsor Road with the 'Balmoral' T-Way stop located on the northern side of Balmoral Road and the 'Memorial' T-Way stop located just south of Memorial Avenue.

Proposed landuse and infrastructure developments

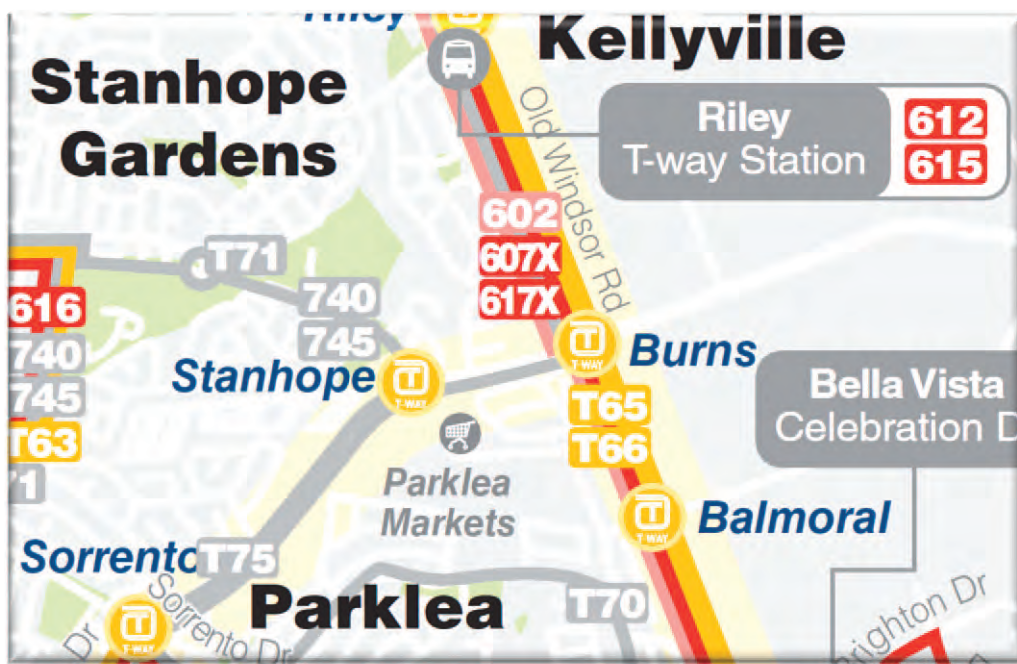
The Balmoral Road release area is currently being developed as a residential area. The future widening of Memorial Avenue to provide two traffic lanes in each direction will occur as a result of this development. Balmoral Road is also expected to be upgraded as development progresses.

Bus operation

Existing bus services operate along the T-Way and Sunnyholt Road. T-Way services provide links from Rouse Hill and Beaumont Hills/Kellyville to Parramatta and the City/North Sydney. In addition, there is a service (T75) which operates between Blacktown and Riverstone via Rouse Hill which uses the Sunnyholt Road T-Way, joining the North West T-Way at the 'Burns' stop and then proceeding north towards Rouse Hill. Refer to the Figure below.

Current bus services operating through the 'Burns' and 'Balmoral' stops include the T65 and T66 services from Rouse Hill to Parramatta, the 602 service from Rouse Hill to North Sydney, the 607X service operating between Rouse Hill and the City, and the 617X service operating between Rouse Hill and the City via Beaumont Hills. In addition, the T75 service operating between Blacktown and Riverstone via Rouse Hill operates along the Sunnyholt Road T-Way, entering the 'Burns' stop on trips to and from Rouse Hill.

Figure 42 Existing bus routes in the vicinity of Memorial Ave / Sunnyholt Rd / Old Windsor Rd



Transitway parking

There is currently a car park area with a capacity of approximately 160 vehicles provided for the 'Burns' T-Way stop. While direct access is available for cars southbound off Old Windsor Road, egress is only available to the south. This poor egress contributes to under utilisation of this particular car park compared with that at the 'Riley' T-Way stop. No parking is currently provided at the Balmoral T-Way stop.

During the major civil construction phase of the project, some of the parking at the Burns T-Way stop may need to be relocated to enable the construction of the NWRL. Scope exists to relocate the Memorial Avenue ('Burns') T-Way car park to Balmoral Road rather than the location to the north of Memorial Avenue shown in **Figure 43**. This could be done early in the construction phase and retained in the operational arrangement. This would avoid traffic issues associated with the proximity of the proposed car park entry to the congested and complex intersection at Old Windsor Rd / Sunnyholt Rd / Memorial Avenue by instead reconfiguring the intersection of Old Windsor Road with Miami Street and Balmoral Road to remove the existing offset arrangement and create a cross intersection to facilitate full access across, to and from Old Windsor Road.

Any relocation of the T-Way car park would need to provide parking for at least 160 cars (equivalent to the current number at 'Burns').

This car parking and access arrangement has yet to be assessed using LINSIG. However, the reconfiguration of the Old Windsor Road / Balmoral Road / Miami Street intersection and relocation of the T-Way car park would help to relieve congestion at the Celebration Drive / Old Windsor Rd, Sunnyholt Rd / Old Windsor Rd / Memorial Ave and Norwest Boulevard / Old Windsor Rd intersections.

Pedestrians and cyclists

The regional cycleway is located on the western side of Old Windsor Road from Bella Vista to past Rouse Hill. In addition, a pedestrian/cycleway is located on the eastern side of Old Windsor Road south from the intersection with Memorial Avenue and west along Sunnyholt Road. Pedestrian crossings are provided on all legs of the Old Windsor Road / Memorial Avenue / Sunnyholt Road intersection, the northern side of the intersection of Old Windsor Road / Miami Street and across the T-Way at Memorial Avenue and Balmoral Road.

8.6.3 Proposed traffic management facilities

Under the proposed rationalised road network, the only new roads to be constructed running parallel to Old Windsor Road between Bella Vista and Kellyville Stations are between Celebration Drive and Balmoral Road, and between Kellyville station precinct and Samantha Riley Drive.

At the point it meets Balmoral Road, the extension of Lexington Drive would operate as a separate intersection east of the T-Way / Balmoral Road / Miami Street / Old Windsor Road intersection. Initial investigations have indicated that the intersection of Lexington Drive (extension) and Balmoral Road, located approximately midway between Old Windsor Road and Elizabeth Macarthur Creek, would operate satisfactorily as a roundabout with a single approach lane on each leg.

Section 8.5.6 outlines the assessment of the traffic conditions at the Lexington Drive extension / Memorial Avenue intersections based on previous proposals for intersections and treatment of the T-Way at this location. The diagram in **Figure 43** describes the arrangement of the T-Way at Memorial Avenue under scenario 2.

Under the rationalised road network, it is now proposed that the T-Way at Memorial Avenue ('Burns') remain in its current configuration.

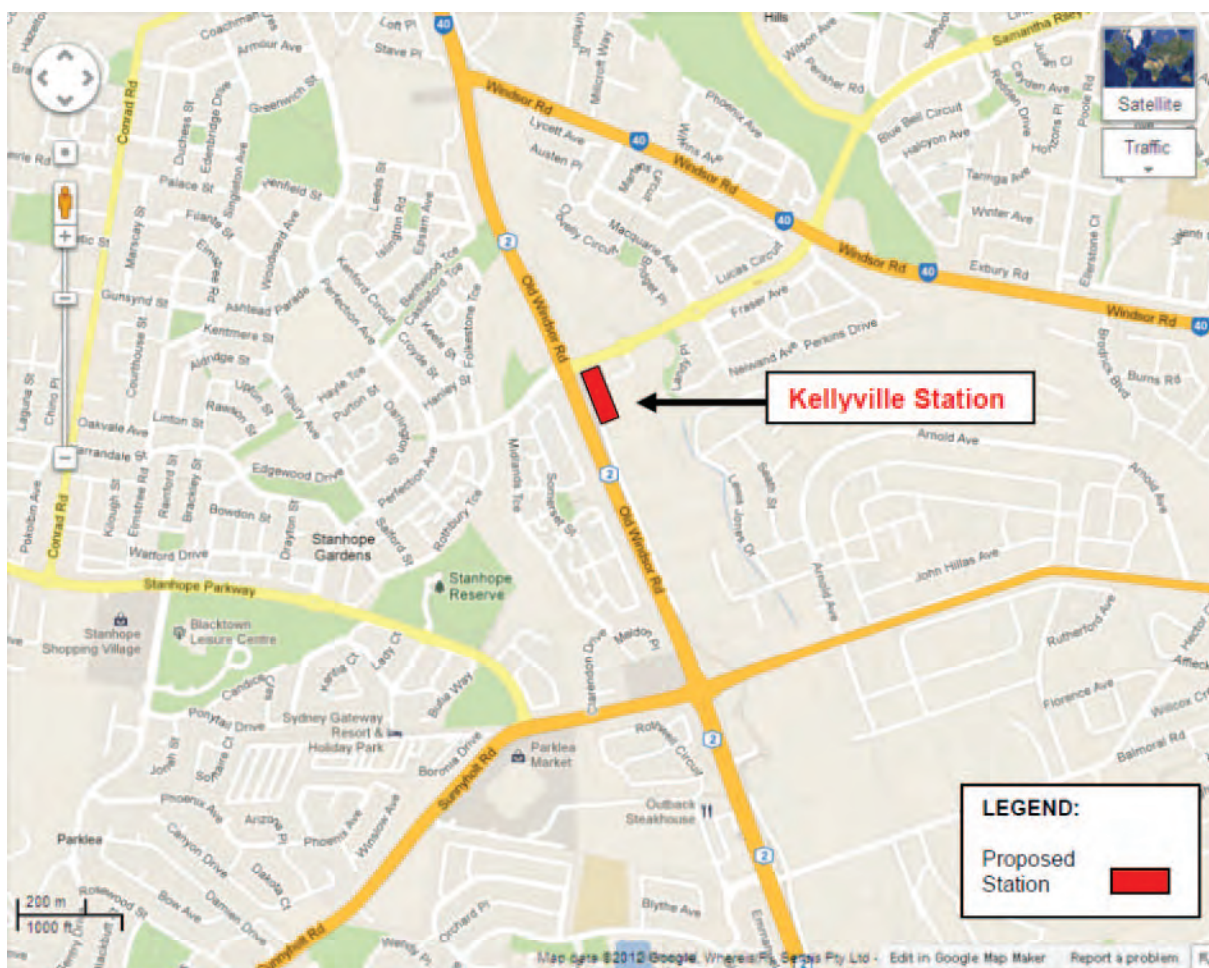


8.7 Kellyville

The proposed Kellyville station is located near the intersection of Old Windsor Road and Samantha Riley Drive, within The Hills Shire LGA. The proposed station would mainly serve the Beaumont Hills, Kellyville and Stanhope Gardens areas which are currently being served by buses. Total population of these suburbs is approximately 23,000 at the present time.

The proposed Kellyville station would reduce the parking demand for Seven Hills, Blacktown and Schofields stations and would reduce travel times for local residents who are currently using these stations. The proposed Kellyville station would also potentially serve some of the residents from the northern section of the Balmoral Road Release area.

Figure 44 The location of the proposed Kellyville station



Copyright: Google, 2012

8.7.2 Existing conditions

Existing road network adjacent to the proposed station

The following roads are located immediately adjacent to the proposed station. Old Windsor Road is classified as a State Road and is under the care and control of the RMS. Samantha Riley Drive is a regional road under the care and control of The Hills Shire Council while Newbury Avenue is a local road under the care and control of Blacktown City Council.

- Old Windsor Road – In the vicinity of the proposed station it is provided with two through lanes in each direction on a divided carriageway, with turn bays provided at intersections.
- Samantha Riley Drive- provides two through lanes in each direction on a divided carriageway.
- Newbury Avenue – provides a single traffic lane in each direction with parking lanes.

In addition to the above roads, the North West T-Way is located west of the proposed station and between the station and Old Windsor Road.

Table 23 provides the details of traffic volumes on the roads located immediately adjacent to the proposed Kellyville station.

Table 23 Kellyville Station – Roads Summary

| Road | Agency Responsibility | Lanes | AADT | 2011 Peak Hour Volume |
|-------------------|-----------------------|-------|--------|--|
| Old Windsor Road | RMS | 4 | 49,004 | Northbound AM 1,466 (7.30-8.30am) PM 1,392 (4.15-5.15pm) Southbound AM 1,769 (7-8am) PM 1,552 (4.15-5.15pm) |
| Samantha Riley Dr | Hills Shire Council | 4 | 13,165 | Eastbound AM 748 (8-9am) PM 627 (6-7pm) Westbound AM 627 (8-9am) PM 672 (5-6pm) |
| Windsor Rd | RMS | 4 | 37,382 | Eastbound AM 673 (7.15-8.15am) PM 593 (5-6pm) Westbound AM 566 (7.45-8.45am) PM 1,056 (5-6pm) |

Source: RMS AADT Data & ITLU Traffic counts 2011

AADT – Annual average daily traffic

The following intersections are located immediately adjacent to the proposed station.

- Old Windsor Rd / Samantha Riley Dr / Newbury Avenue (traffic signals) – This intersection provides the connection from the Stanhope residential area to the west and Kellyville area to the east to Old Windsor Road. The T-Way also crosses Samantha Riley Drive at this point and forms part of the intersection. All approaches to the intersection are divided carriageways with Old Windsor Road providing two through lanes in each direction with two right turn lanes into Samantha Riley Drive and a single right turn lane into Newbury Avenue. The southbound left turn lane from Old Windsor Road is signal controlled to provide for bus movements along the T-Way. The northbound left turn lane from Old Windsor Road is provided as a slip lane.

Samantha Riley Drive has its stop line set back to provide for the T-Way. It is provided with a two-lane left turn, single through lane to Newbury Avenue and single right turn lane.

Newbury Avenue is provided with a left turn slip lane, short through lane to Samantha Riley Drive and right turn lane.

- Windsor Rd / Samantha Riley Dr (traffic signals) – This intersection provides two through lanes on a divided carriageway in each direction along Windsor Road with separate right and left turn lanes at the intersection. Samantha Riley Drive is also provided with two through lanes in each direction on a divided carriageway. The northern approach is provided with a left turn slip lane and a right turn lane. The southern approach is provided only with a right turn lane, the left lane of the through movement also providing for left turn movements.

Adjacent landuses and infrastructure developments

Adjacent landuses are residential on the western side of Old Windsor Road. The eastern side is currently undeveloped.

Proposed landuse and infrastructure developments

Balmoral Road release area is currently being developed. Further to the east, the North Kellyville release area and the future residents in this release area would be within the catchment of the proposed station. A new footbridge proposed over Old Windsor Road will facilitate pedestrian access to and from Stanhope Gardens.

Discussions with RMS officers suggest that the grade separation of the Old Windsor Road / Sunnyholt Road / Memorial Avenue is being considered, although no definite timeframe has been determined.

Historical crash analysis

A historical crash analysis has been undertaken for the crashes that occurred between January 2006 and December 2010 within 400m radius of the proposed Kellyville station. **Table 24** shows the number of crashes recorded within 100m and 400m from the location of the proposed station.

Table 24 Kellyville Station – Crash Summary

| Distance from the proposed Station (radius) | Number of pedestrian crashes | Total number of crashes |
|---|------------------------------|-------------------------|
| 100m | 0 | 17 |
| 400m | 0 | 32 |

Source: RMS Crash Data 2011

The following observations were made in relation to the crashes occurred within 400m radius of the proposed Kellyville station:

- Of the 32 crashes, a total of 22 crashes occurred on Old Windsor Road and the details are provided below:
 - 13 crashes were reported to occur at the Old Windsor Road / Samantha Riley Drive / Newbury Avenue intersection. The majority of the crashes that occurred at this intersection were rear-end type and occurred during lane changing manoeuvres.
 - 6 crashes occurred south of the Old Windsor Road / Samantha Riley Drive / Newbury Avenue intersection whilst 3 crashes occurred north of the Old Windsor Road / Samantha Riley Drive / Newbury Avenue intersection on Old Windsor Road
- Of the 32 crashes, 5 crashes including 4 run off road crashes and a side swipe crash occurred between 200m west of Old Windsor Road and 210m east of Old Windsor Road on Samantha Riley Drive.

- A total of 8 run off road crashes were recorded south of Samantha Riley Drive on Old Windsor Road and east of Old Windsor Road on Samantha Riley Drive.

Traffic volumes along Old Windsor Road and Samantha Riley Drive will increase, even prior to the opening of the station. The rear-end type crashes have the potential to increase along Old Windsor Road.

The following measures have the potential to reduce the crashes and/or severity of the crashes immediately adjacent to the proposed Kellyville station.

- The proposed road layout in the vicinity of Kellyville station, with a signalised full movements intersection on Samantha Riley Drive at the new road close to Elizabeth Macarthur Creek and a left-in, left-out only movements intersection at Samantha Riley Drive and the station access road is designed to accommodate the traffic generated by the Kellyville station and would have potential to reduce the traffic and safety impacts on the Old Windsor Road / Samantha Riley Drive / Newbury Avenue intersection.
- Consideration needs to be given to monitoring travel speed and driver behaviour along Samantha Riley Drive by RMS/The Hills Shire Council.

Bus operation

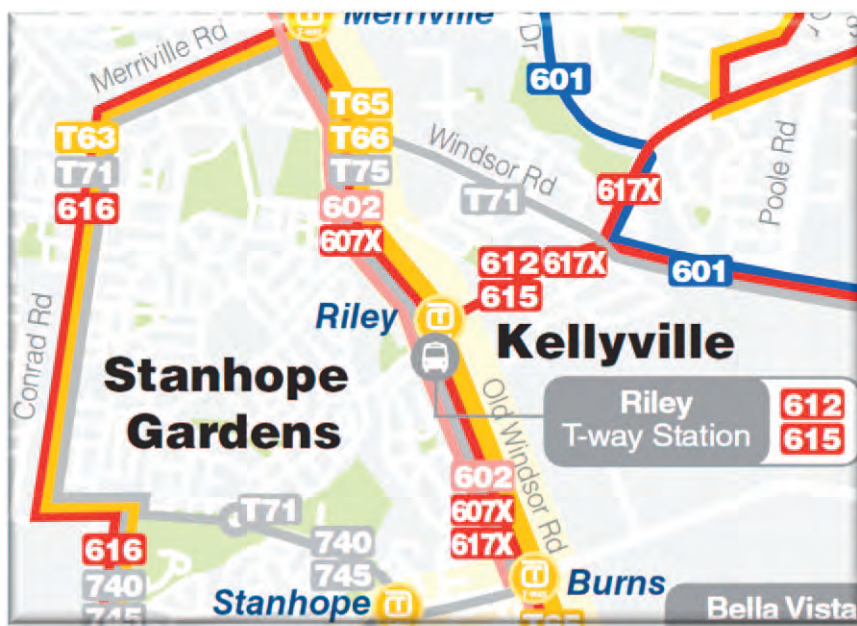
Existing bus services in the vicinity of the proposed station are currently confined to the Transitway and along Samantha Riley Drive. The T-Way will continue to operate once NWRL commences operations, with services focussing on the Rouse Hill to Parramatta and Blacktown corridors. The Riley T-Way stop is located immediately adjacent to the proposed Kellyville station. Current bus routes in the vicinity are given in **Figure 45** below.

Existing T-Way services operating through the 'Riley' stop are the T65 & T66 services to Parramatta, the T75 service between Blacktown and Riverstone via Rouse Hill, the 602 service from Rouse Hill to North Sydney, and the 607 service operating between Rouse Hill and the City. In addition, the 617X service from Beaumont Hills to the City operates along Samantha Riley Drive to the T-Way and then on to the City. The route 612 and 615 services commence their AM peak journeys at the 'Riley' T-Way stop and then proceed along Samantha Riley Drive towards Windsor Road.

Transitway parking

There is currently a car park area with a capacity of approximately 140 vehicles provided for the 'Riley' T-Way stop. This is currently heavily over-subscribed on weekdays. As a result of NWRL construction, some of this parking may be relocated and incorporated into the proposed station commuter parking area with a total of 1,360 spaces to be provided for use by NWRL and T-Way passengers. This will be located both adjacent to, and under, the rail viaduct, north and south of the station, and to the south east of the station on the opposite side of the station access road.

Figure 45 Existing bus routes in the vicinity of the proposed Kellyville station



Source: www.cdcbus.com.au (2012)

Pedestrian and cyclists

There are no major pedestrian generating land uses in the area immediately surrounding the proposed station. Therefore the majority of pedestrian traffic is related to the Transitway bus stop. The regional cycleway is on the western side of Old Windsor Road.

8.7.3 NWRL demand

Figure 46 shows the layout of the proposed Kellyville station. The proposed station would provide the following transport facilities for commuters to cater for 2021 forecast demand:

- 10 kiss and ride spaces
- 1,360 park and ride spaces (includes replacement of T-Way parking)
- 45 bicycle parking spaces
- 4 taxi spaces
- 4 bus bays (total) (utilising existing T-Way stop)

The provision of dedicated park and ride spaces is a balance between meeting morning peak hour demand for park and ride and encouraging access by more sustainable modes including bus, walking and cycling. As with almost every station on the Sydney rail network, some of those accessing the station by park and ride will park on-street, at distances ranging up to around one kilometre. Where required, NWRL will work with council to develop strategies to manage demand for on-street parking in order to reduce impacts on local residents.

Kiss and ride parking spaces have been estimated based on an average 3 minutes dwell time per vehicle during peak periods.

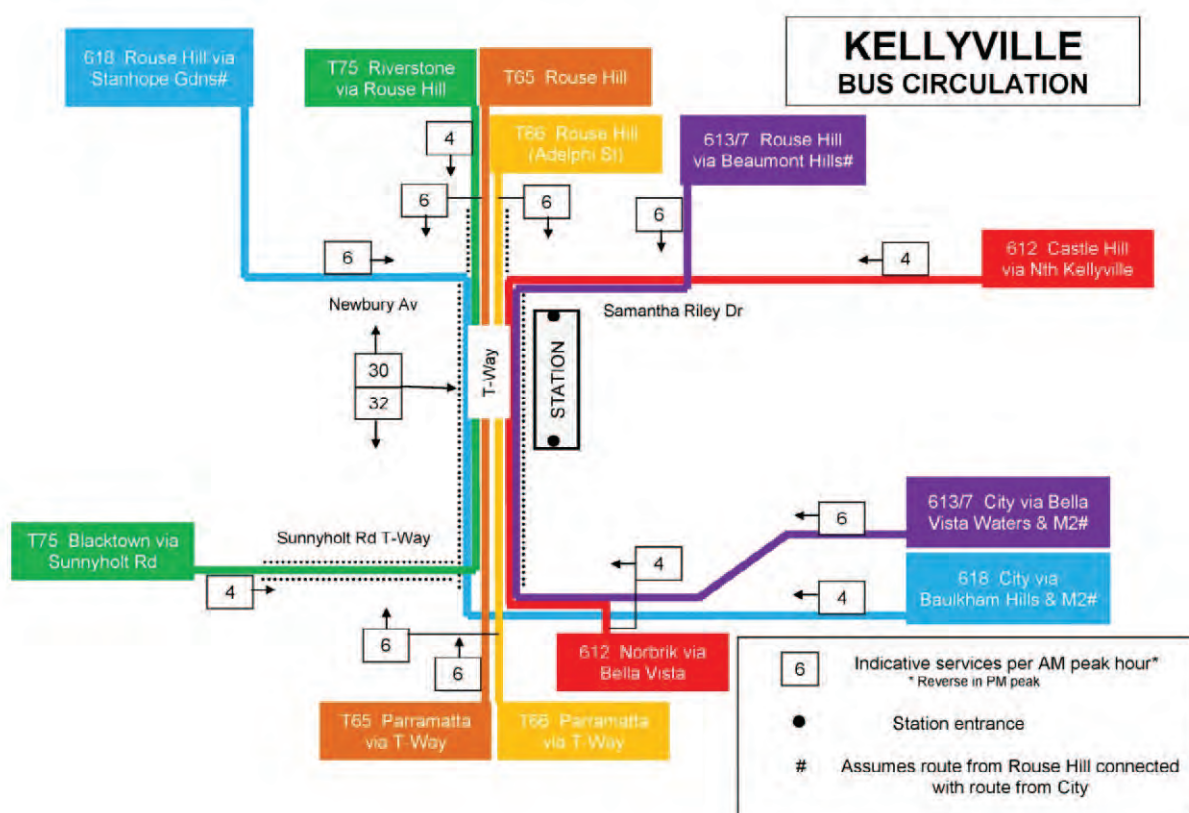
8.7.4 Integrating Kellyville station

Kellyville station will be a major park and ride station, with 1,200 commuter parking spaces located both north and south of Samantha Riley Drive, under the rail viaduct and south east of the station. The station's commuter car park would also incorporate an additional 160 parking spaces associated with T-Way park and ride demand.

This will be one of the largest commuter car parks at any station in the Sydney rail network and will generate substantial commuter traffic movements in peak periods.

Bus will be a relatively minor access mode to the station, although the provision of local bus routes will link residential areas like Beaumont Hills to the north east and Stanhope Gardens to the west, with the station, then continuing to Bella Vista via the existing T-Way. **Figure 47** shows the indicative future bus network accessing Kellyville station.

Figure 47 Indicative future bus access to Kellyville station

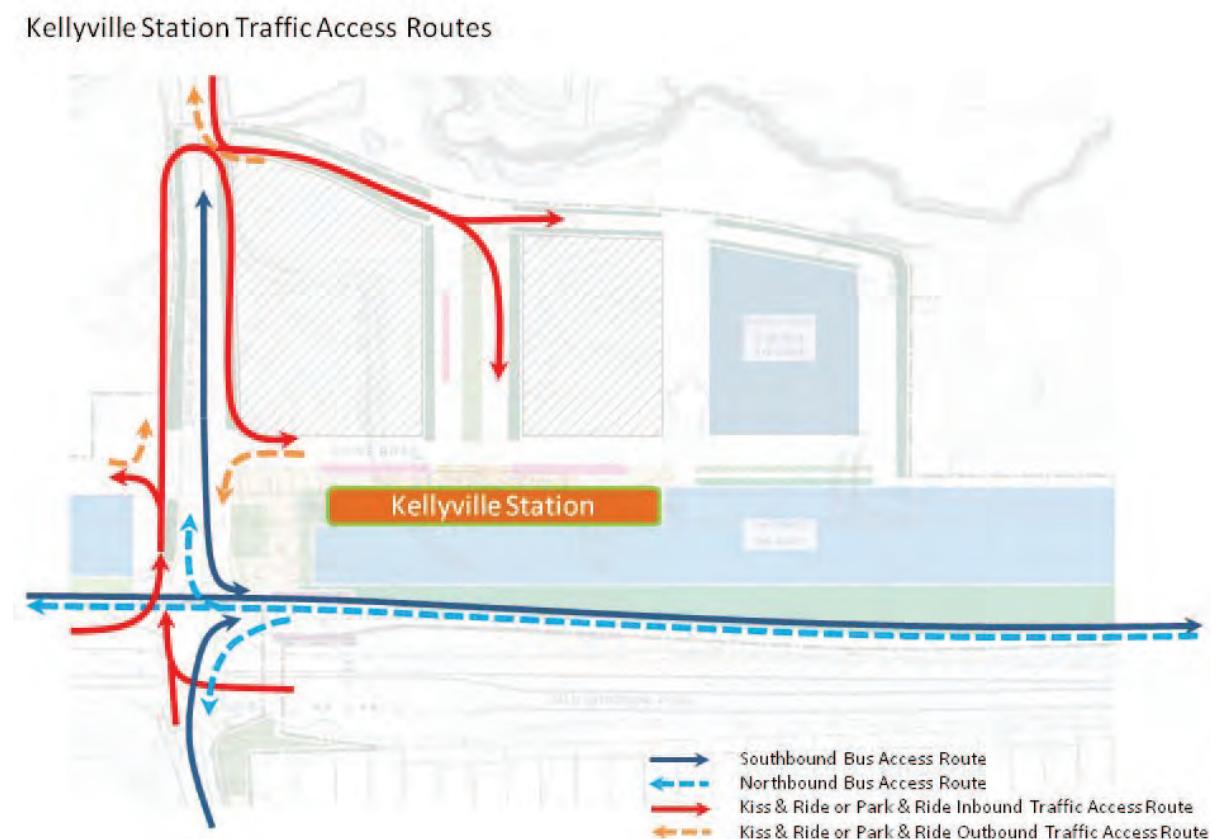


Source: NWRL, 2012

In 2021, more than 15% of station customers are expected to walk or cycle to the station. As with Bella Vista station, Old Windsor Road is a substantial barrier to pedestrian access from the west and a pedestrian bridge over Old Windsor Road is planned to provide safe and convenient access between Stanhope Gardens and the new station.

The location of commuter car parking supplies at Kellyville station, south and north of Samantha Riley Drive, means that, park and ride commuters would approach from a number of directions, including from the north east via Samantha Riley Drive; from the north west and south via Old Windsor Road; and from the west via Newbury Avenue.

Figure 48 Traffic access routes at Kellyville station



Source: NWRL, 2012

While the operation of the station would divert some car trips from the Old Windsor Road corridor as commuters shift from car to train, there will be a concentration of station traffic in the vicinity of Old Windsor Road and Samantha Riley Drive. The proposed restriction of movements at the intersection on Samantha Riley Drive closest to Old Windsor Road to left-in/left-out only is expected to assist in mitigating any negative traffic impacts from vehicles accessing or egressing the station precinct.

8.7.5 Proposed traffic management facilities

Figure 48 above shows provisions for car and bus access to and egress from the station.

A substantial number of park & ride and kiss & ride commuters are expected to access the station from Samantha Riley Drive, from the north and west.

From the north, access to the station would be available either by turning left at the proposed intersection immediately after crossing Elizabeth Macarthur Creek, turning left at the station access road closer to Old Windsor Road.

From the west, traffic would be required to turn right at the intersection immediately before Elizabeth Macarthur Creek. The northern car park, under the rail viaduct, would be accessible from the west by turning left from Samantha Riley Drive immediately after passing under the rail viaduct.

Buses would approach from the west via Newbury Avenue, the north via the T-Way or the east via Samantha Riley Drive and then proceed on to the T-Way stopping at the existing 'Riley' stop to provide interchange with NWRL.

The Riley T-Way stop is retained in its current location and would continue to also serve bus services operating to Blacktown and Parramatta.

Kellyville station is proposed as one of the major park and ride stations for the NWRL with a total parking capacity of around 1,360 vehicles in at-grade and multi-storey car parks. The following traffic management facilities are proposed to be provided:

- Construction of the station access road (new road A), running parallel to Old Windsor Road, off Samantha Riley Drive. The road in the vicinity of the station will provide a single traffic lane and parking lane in each direction. This road would provide only left in and left out access at its intersection with Samantha Riley Drive.
- Provision of traffic signals at the intersection of Samantha Riley Drive and the new road close to Elizabeth Macarthur Creek, providing all movements.
- Kiss and ride and taxi parking would be provided in the station access road. Buses would operate via the T-Way with pick up and set down at the existing T-Way stops.
- Provision of at-grade and multi-storey car parks on both sides of the station access road as well as north of Samantha Riley Drive, under the rail viaduct.
- Provision of a pedestrian bridge across Old Windsor Road linking Stanhope Gardens with Kellyville station and the 'Riley' T-Way stop.

8.7.6 Preliminary traffic assessment

Background

It should be noted that the traffic modelling analysis in this report was undertaken using traffic generation figures based on earlier demand forecasts. Supplementary analysis of future proposals may be required.

Intersections included within the modelling for Kellyville station are as follows:

- Old Windsor Road / Samantha Riley Drive / Newbury Avenue – This intersection has been modelled as for the existing intersection configuration and the traffic signal phasing.
- Samantha Riley Drive / New station road – This intersection has been assessed as a signalised intersection with the western approach on Samantha Riley Drive having two lanes for left and through traffic and two lanes for right turn traffic. The eastbound approach has been modelled with two lanes **[Note this is not the current proposal]**. The analysis results in **Table 25** are worst case in terms of operation of the adjacent signalised intersections.
- Old Windsor Road / Windsor Road – This intersection has been modelled as for the existing intersection configuration and the traffic signal phasing.

No intersection modelling has been undertaken for the intersection of the new station access road with Samantha Riley Drive under the revised configuration as it will be limited to left in / left out movements only. Straight through movements will continue along Samantha Riley Drive.

The key performance indicators for each intersection within the model area are provided in the following table:

Table 25 Kellyville station – AM Peak Hour Intersection Performance (2021)

| Location | Without NWRL | | With NWRL | |
|--|--------------|-------|-----------|-------|
| | LoS* | DoS** | LoS* | DoS** |
| Old Windsor Rd / Samantha Riley Dr / Newbury Ave | F | 1.15 | F | 1.30 |
| Samantha Riley Dr / New station road | A | 0.33 | B | 0.64 |
| Old Windsor Rd / Windsor Rd | B | 0.68 | B | 0.57 |

Source: ITLU (2012)

LoS – Level of service; DoS – Degree of saturation

Note: supplementary analysis of future proposals may be required.

* Overall intersection performance

** Worst performing lane

These modelling results indicate that:

- Of the intersections in the immediate vicinity of the proposed Kellyville station, only the Old Windsor Road / Samantha Riley Drive / Newbury Avenue intersection is predicted to operate beyond its existing available capacity.
- The capacity issue at this intersection is expected to occur irrespective of whether the NWRL is completed, and while the station generated traffic does exacerbate the extent of this congestion, it is clear that the primary cause is the background traffic growth associated with urban growth in the region.
- To improve the operation of this intersection to a more adequate standard, it is likely that additional capacity will need to be provided i.e. by upgrading the intersection arrangement to include a further through lane in each direction on Old Windsor Road, as well as an additional right turn lane on Newbury Avenue.
- The Old Windsor Road / Windsor Road intersection is predicted to operate well within capacity and with a satisfactory level of service.
- The new intersection formed between Samantha Riley Drive and the proposed new station Road (under the modelled configuration) is also predicted to operate satisfactorily for the forecast future traffic volumes.

8.8 Rouse Hill

8.8.1 Background

Rouse Hill Station is located adjacent to the Rouse Hill Town Centre and Windsor Road. This station will operate as a major bus-rail interchange station with no commuter parking proposed. The proposed Rouse Hill Station is located within The Hills Shire LGA. The proposed station would mainly serve Rouse Hill, Beaumont Hills and Kellyville Ridge which are currently being served by buses. Total population of these suburbs are approximately 16,000.

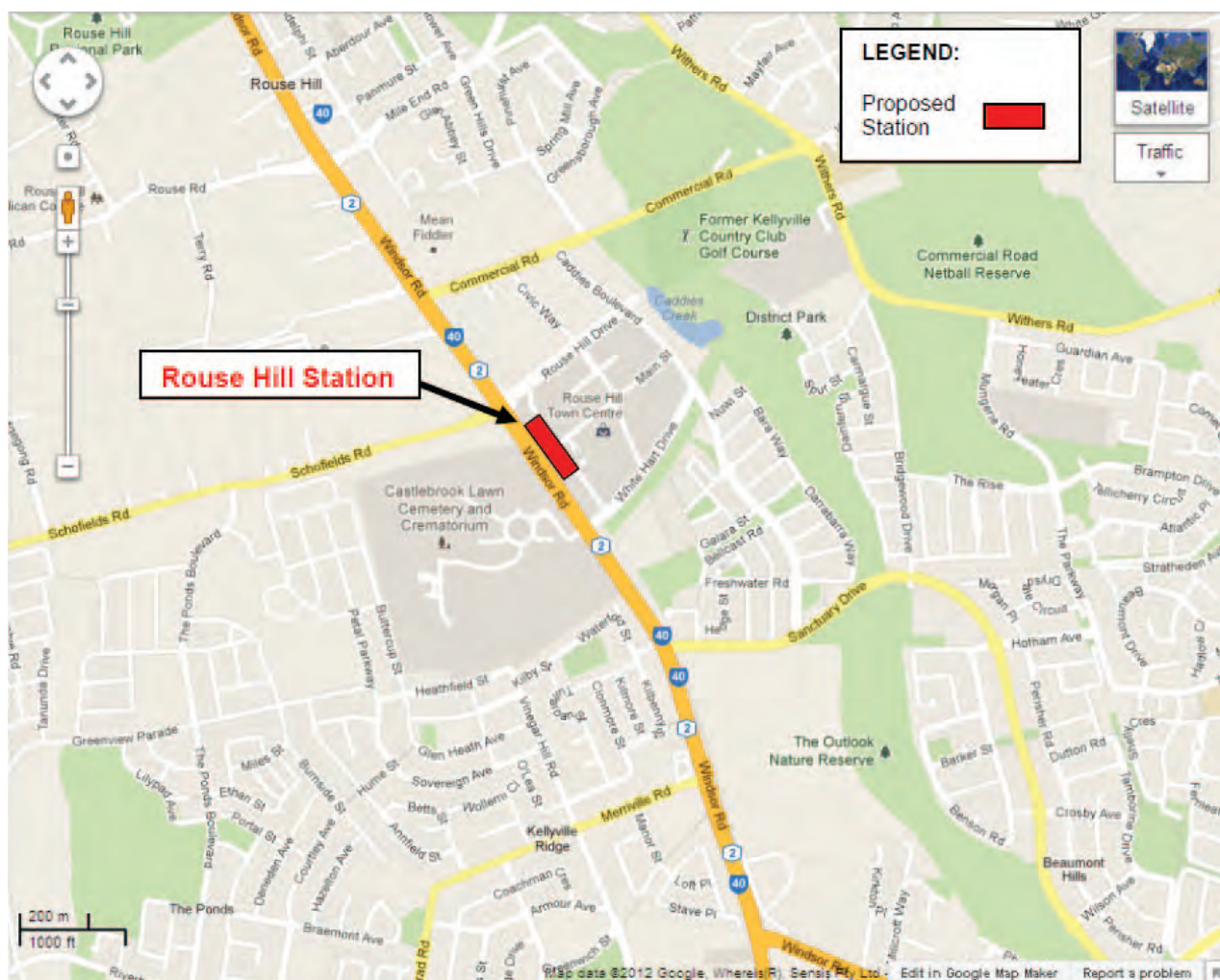
The rail patrons of these suburbs currently need to travel more than 6km to access a railway station and are currently using Seven Hills, Blacktown, Schofields and Riverstone railway stations to access rail services. The rail patrons accessing these stations need to travel using the road network which is heavily congested during the peak periods. The proposed Rouse Hill station would save travel time to local residents who are currently using other stations, as well as acting as a station for the North West Growth Centre towards Box Hill.

The proposed Rouse Hill station would potentially serve residents from Rouse Hill, Beaumont Hills and North Kellyville Release area. Total number of additional dwellings which would be built in The Hills Shire Council by 2031 is 21,500 in addition to the dwellings that would be built as part of the North West Growth Centre. A total of an additional 60,000 dwellings are planned in the North West Growth Centre by 2031. The North West Growth Centre area covers parts of The Hills and Blacktown City LGAs.

Based on Sydney Metropolitan Strategy-North West Subregion, Rouse Hill is classified as a Planned Major Centre which is defined as major shopping and business centre serving immediate subregional residential population usually with a full scale shopping mall, council offices, taller office and residential buildings, central community facilities and a minimum of 8,000 jobs. The Rouse Hill Major Centre would increase the employment by 9,000 additional jobs between 2001 and 2031.

The location of the proposed Rouse Hill station is shown in **Figure 49**.

Figure 49 The location of the proposed Rouse Hill station



8.8.2 Existing conditions

Existing road network adjacent to the proposed station

The following roads are located immediately adjacent to the proposed station:

- Windsor Road - a State Road under the care and control of RMS with two through lanes in each direction on a divided carriageway.
- White Hart Drive - a local road under the care and control of the Hills Shire Council with two lanes in each direction on a divided carriageway. It provides access to a number of car park entrances located on the southern and eastern sides of the Rouse Hill Town Centre.
- Rouse Hill Drive –a Collector Road which has not been declared a public road. It has two lanes in each direction on a divided carriageway. It provides access to car park entrances on the northern side of the Rouse Hill Town Centre.
- Commercial Road – a Collector Road under the care and control of the Hills Shire Council providing access from Windsor Road to the residential developments of Beaumont Hills and Rouse Hill. In the section between Windsor Road and Caddies Boulevard it is provided with two lanes in each direction on a divided carriageway.
- Tempus Street is a local road which has not been declared a public road.

In addition to the above roads, the North West T-Way and bus interchange will be located adjacent to the proposed station as part of the station precinct development.

Table 26 shows the details of the roads located immediately adjacent to the proposed Rouse Hill station.

Table 26 Rouse Hill station – Roads summary

| Road | Agency Responsibility | Lanes | AADT | 2011 Peak Hour Volume |
|---------------|-----------------------|-------|--------|--|
| Windsor Rd | RMS | 4 | 48,001 | Northbound AM 1,598 (8-9am) PM 2,338 (4-5pm) Southbound AM 1,845 (7-8am) PM 1,611 (4.15-5.15pm) |
| White Hart Dr | Hills Shire Council | 4 | 10,820 | Eastbound AM 860 (11-12am) PM 822 (12-1pm) Westbound AM 512 (11-12am) PM 584 (5-6pm) |

| Road | Agency Responsibility | Lanes | AADT | 2011 Peak Hour Volume |
|---------------|-----------------------|-------|-------|--|
| Rouse Hill Dr | Hills Shire Council | 4 | 9,319 | Eastbound AM 612 (9-10am) PM 576 (6-7pm) Westbound AM 695 (11-12am) PM 711 (12-1pm) |
| Commercial Rd | Hills Shire Council | 4 | 5,676 | Eastbound AM 207 (8-9am) PM 308 (6-7pm) Westbound AM 361 (8-9am) PM 282 (3-4pm) |

Source: RMS AADT Data & ITLU Traffic counts 2011

AADT – Annual average daily traffic

The following intersections are located immediately adjacent to the proposed station.

- Windsor Rd / White Hart Dr (traffic signals) – The North West T-Way runs adjacent to this intersection and parallel to Windsor Road. It is incorporated into the traffic signal operation for the intersection. Windsor Road is provided with three through lanes in each direction, two right turn lanes on the southern approach and a left turn lane on the northern approach.

White Hart Drive is provided with two right turn and two left turn lanes at the intersection.

- Windsor Rd / Schofields Rd / Rouse Hill Dr (traffic signals) – Windsor Road is provided with three through traffic lanes and two right turn lanes in each direction at the intersection. The southern approach also has a two-lane left turn into Schofields Road while the northern approach has a single left turn slip lane.

Schofields Road has a left turn lane, two through lanes and two right turn lanes at the intersection.

Rouse Hill Drive has two left turn lanes, a 'Bus Only' lane, two through lanes and a right turn lane on the approach to the intersection.

- Windsor Rd / Commercial Rd (traffic signals) – Windsor Road has two through lanes in each direction at the intersection with a two-lane right turn bay provided for the southern approach and a left turn slip lane for the northern approach. Commercial Road is provided with two right turn lanes and a left turn slip lane at the intersection.

Adjacent landuses and infrastructure developments

The proposed Rouse Hill station is located adjacent to Rouse Hill Town Centre and Windsor Road. White Hart Drive and Rouse Hill Drive are located to the south and north of the proposed station respectively and intersecting with Windsor Road. The landuses located adjacent to the proposed station are commercial and residential.

Proposed landuse and infrastructure developments

Rouse Hill, Beaumont Hills and North Kellyville Release areas are currently expanding and the residents in these release areas would be accessible to the proposed station.

Discussions with RMS officers indicate that future consideration for the intersection of Windsor Road/Schofields Road / Rouse Hill Drive is for grade separation of the intersection. While this is considered a long term possibility, the NWRL preliminary designs have been developed with a view to not precluding any future road grade separation at this location.

Historical crash analysis

A historical crash analysis has been undertaken for the crashes that occurred between January 2006 and December 2010 within 400m radius of the proposed Rouse Hill station. **Table 27** shows the number of crashes recorded within 100m and 400m from the location of the proposed station.

Table 27 Rouse Hill station – Crash summary

| Distance from the proposed Station (radius) | Number of pedestrian crashes | Total number of crashes |
|---|------------------------------|-------------------------|
| 100m | 0 | 18 |
| 400m | 1 | 63 |

Source: RMS Crash Data 2011

The following observations were made in relation to the crashes occurred within 400m radius of the proposed Rouse Hill station:

- Of the 63 crashes, a total of 45 crashes occurred on Windsor Road and the details are provided below:
 - 20 crashes were reported at the Windsor Road / Schofields Road / Rouse Hill Drive intersection. The majority of the crashes (18 crashes) occurred between vehicles turning right from Windsor Road and a vehicle travelling in the opposite direction on Windsor Road and, rear-end type crashes on Windsor Road.
 - 7 crashes occurred at the Windsor Road and White Hart Drive intersection.
 - 9 crashes occurred south of the Windsor Road / Schofields Road / Rouse Hill Drive intersection and 6 crashes were reported to occur to the north of the Windsor Road / Schofields Road / Rouse Hill Drive intersection. Of these 15 crashes, 14 of the crashes were rear-end type crashes.
- 7 crashes occurred on Schofields Road and White Hart Drive. The majority of the crashes (6 crashes) were related to incidents at footpath crossings and driveways.
- 2 crashes were reported to occur on Rouse Hill Drive and these crashes were in relation to u-turning and lane changing manoeuvres.
- 7 crashes occurred on Civic Way including 2 crashes at the Rouse Hill Drive intersection and 5 crashes at the White Hart Drive intersection.
- A single pedestrian crash occurred on Main Street within the Rouse Hill Town Centre.

Traffic volumes along Windsor Road, Rouse Hill Drive and Schofields Road are forecast to increase prior to the commissioning of the NWRL. The rear-end type crashes have the potential to increase with the increase in traffic movements at this intersection. Traffic and pedestrian movements are also expected to increase in the vicinity of the Rouse Hill Town Centre.

The following measures have the potential to reduce the crashes and/or severity of the crashes immediately adjacent to the proposed Rouse Hill Station:

- Any future grade separation of the Windsor Road / Schofields Road / Rouse Hill Drive intersection would reduce vehicular conflict and the risk of collision.
- Where intersections, footpaths, carriageways and ancillary infrastructure have been modified as part of the NWRL design, all efforts have been made to improve road user safety. Pedestrian safety measures such as marked pedestrian crossings along pedestrian desire lines and safe pedestrian path connections between Rouse Hill railway station, T-Way bus stops and the Rouse Hill Town Centre have been designed and located with this in mind.

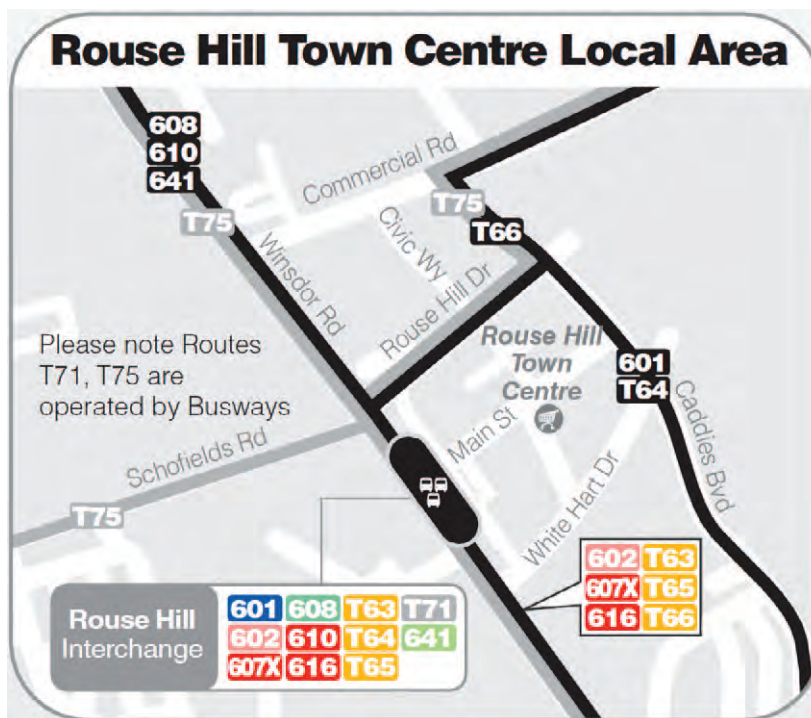
Bus operation

Existing bus services in the vicinity of the proposed Rouse Hill station incorporate T-Way services and services providing access to and from the surrounding residential areas. The T-Way will continue to operate with NWRL including the Rouse Hill T-Way stop which will be fully integrated with the station precinct. Refer to the bus movements Figure overleaf.

Bus services to the Rouse Hill station are expected to increase from current levels. While bus services to the City will be removed, the growth in the areas surrounding, and including, the Rouse Hill Town Centre and particularly in the Growth Centre to the north, will mean the need for new and enhanced services to link to the rail network at Rouse Hill.

As highlighted earlier, Area 20 and the Box Hill release areas will increase the residential population significantly. In addition, services to Parramatta and Blacktown along the North West T-Way would also be expected to increase in the future.

Figure 50 Existing bus routes in the vicinity of the proposed Rouse Hill station



Source: www.cdcbus.com.au (2012)

Pedestrian and cyclists

As a town centre station the area surrounding the proposed train station generates a higher level of pedestrian activity. The key cycle route in the precinct is the shared use path on the western side of Windsor Road. At-grade marked foot crossings are provided on all legs of the intersection of Windsor Road and Rouse Hill Drive. Marked foot crossings are provided on all but the northern legs (across Windsor Road) of the intersections of Windsor Road with White Hart Drive and Commercial Road. There are no pedestrian bridges across Windsor Road in the vicinity of the Rouse Hill station site.

There is a pedestrian desire line between the existing car park to the north of Rouse Hill Drive and the Rouse Hill Town Centre. Most pedestrians have been observed walking across Rouse Hill Drive without using the marked foot crossing at the Windsor Road intersection. Pedestrians cross to the east of the intersection where access is uncontrolled.

8.8.3 NWRL demand

Figure 51 shows the facilities that would be provided during the operation of the proposed Rouse Hill station. The proposed station would provide the following transport facilities for commuters to cater for 2021 forecast demand:

- 25 kiss and ride spaces
- No park and ride spaces
- 40 bicycle parking spaces
- 6 taxi spaces
- 4 bus bays southbound
- 4 bus bays northbound

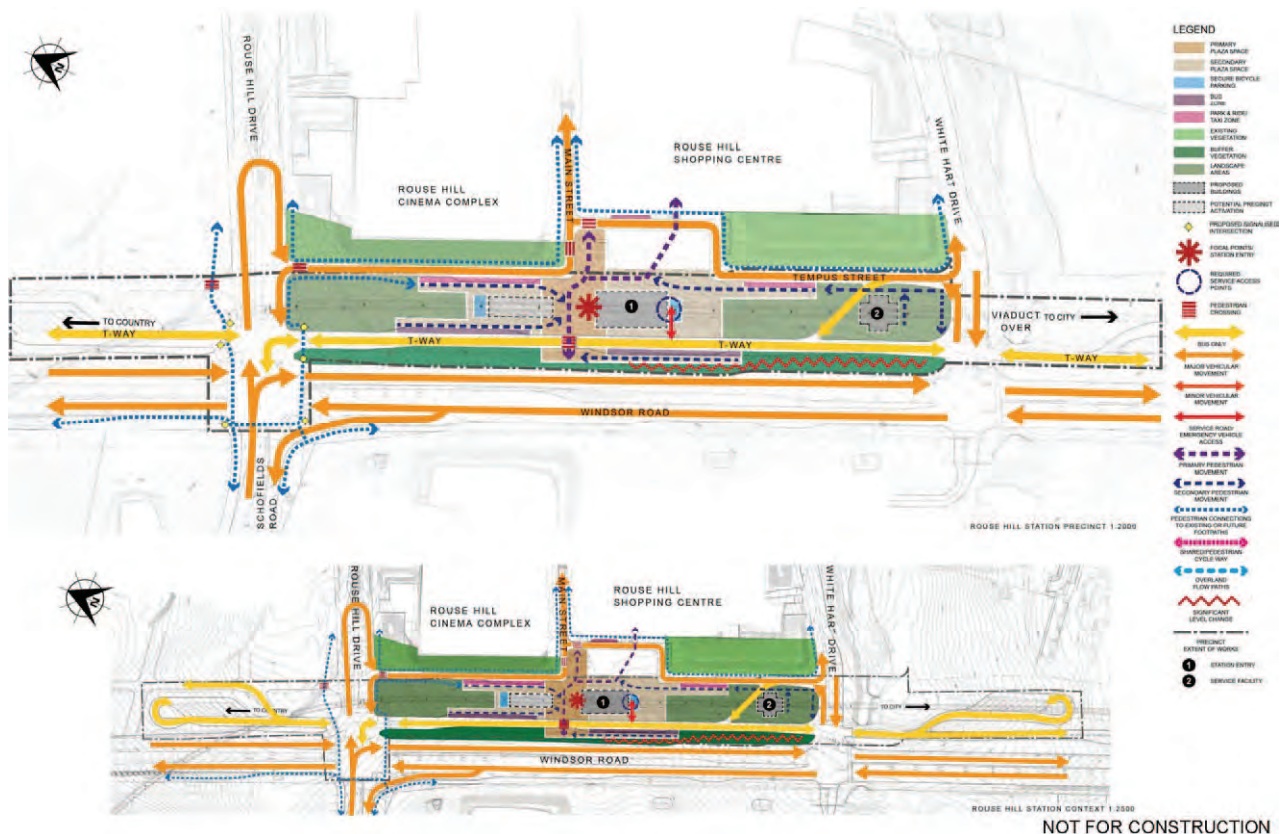
As no park and ride facilities would be provided at this station, it is expected that most park and ride patrons from the Rouse Hill area and the growth centre beyond would use the station car parks at either Cudgegong Road (1,000 spaces) or Kellyville (1,360 spaces). Some of the park and ride rail commuters are also expected to park on-street in nearby residential areas.

Kiss and ride parking spaces have been estimated based on an average 3 minutes dwell time per vehicle during peak periods. Not all kiss and ride drop-offs and pick-ups are expected to happen in the immediate vicinity of the station; however, with some expected to occur within the town centre area, particularly if associated with short term shopping or business.

Rouse Hill acts as a major bus hub for NWRL with high degree of accessibility from surrounding areas. M2 express services would be discontinued from Rouse Hill interchange and these services would be modified to potentially operate as local services.

Park and ride volumes in the immediate vicinity of the station will be minimal as no commuter parking is proposed for the station area itself. Some kiss and ride traffic may be generated from the Merryville Road area; however most of this type of traffic is expected to be generated from the residential areas of Rouse Hill to the east and north of the station.

Figure 51 Proposed Rouse Hill station layout



Source: ERSA, 2012

Bus interchange and layover

Forecasts indicate that a total of nearly 80 bus movements (both directions) are expected to occur within the interchange during the morning and afternoon peak hours. The expected bus layover capacity requirements at Rouse Hill by 2021 are estimated to be between 15 and 20 spaces. The

Rouse Hill station will be integrated with the proposed revised bus interchange layout which comprises a number of key components:

- A linear bus interchange providing for offset indented bus passenger pick up and set down (2 x 4 bays).
- A northern extension of the T-Way across Rouse Hill Drive immediately to the east of the Rouse Hill Drive / Windsor Road intersection.
- Provision of a northern bus layover facility with the capacity for 10-15 buses adjacent to Windsor Road in the area between Rouse Hill Drive and Commercial Road. Provision of a southern bus layover facility with the capacity for 10-15 buses adjacent to Windsor Road, and beneath the NWRL viaduct, in the area immediately south of White Hart Drive.
- Southbound bus pick up and set down using the bays located on the eastern side of the T-Way interchange and northbound bus pick up and set down using the bays located on the western side of the T-Way interchange (nearest to Windsor Road).
- Bus access to and from the T-Way and Windsor Road via the Rouse Hill Drive and White Hart Drive intersection for prescribed movements and subject to satisfactory phasing and signal operation.
- No bus access, layover, pick up or set down via Tempus Street.
- Pedestrian access across the T-Way carriageway midway between the offset bus bays via a zebra crossing.
- Bus layover for northern buses would be as follows: buses access the interchange travelling southbound, passengers alight at eastern bays, bus terminates, bus proceeds southbound to southern layover. At service resumption bus departs southern layover travels northbound to T-Way interchange, passengers board at western bays, bus departs northbound along T-Way.
- Bus layover for southern buses would be as follows: buses access the interchange travelling northbound, passengers alight at western bays, bus terminates, bus proceeds northbound to northern layover. At service resumption bus departs northern layover travels southbound to T-Way interchange, passengers board at eastern bays, bus departs southbound along T-Way.
- Bus shelters, passenger information, CCTV surveillance and hard stand waiting areas.

Estimated traffic generation in 2021

Traffic volumes, pedestrian activity and other multi-modal activities will increase around the proposed station precinct. The vehicular traffic will mainly involve kiss and ride trips and buses.

It should be noted that the traffic modelling analysis in this report was undertaken using earlier demand forecasts. Supplementary analysis of future proposals may be required.

Kiss and ride traffic will be generated primarily from the areas to the north of Rouse Hill and on the eastern side of Windsor Road. The potential catchment for this mode includes the existing residential areas of Rouse Hill toward Annangrove Road and the new release areas of Box Hill in the future and extending as far as Nelson and Oakville. They would generally approach the station precinct via the arterial and collector road system, including Windsor Road, Annangrove Road / Withers Road and Commercial Road. A small volume of traffic would be generated from the Merryville Road area.

Park and ride traffic is unlikely to be significant in the immediate vicinity of the station due to the lack of any formal parking provision for commuters. With no commuter parking to be provided at Rouse Hill, this parking would principally occur on-street, or by incurring the cost of parking within the Town Centre car parks. This traffic is forecast to originate mainly in the northern residential areas of Rouse Hill around the Mile End Road area.

8.8.4 Integrating Rouse Hill station

Rouse Hill station will be located at a major centre – the Rouse Hill town centre. Rouse Hill is, and will, continue to serve as a major bus hub for T-Way and local services to the North West Growth Centre (NWGC), to Parramatta and Blacktown and to surrounding residential areas.

While NWRL will have an important role in bringing workers and shoppers to Rouse Hill Town Centre (in addition to its outbound commuter function) – with NWRL customers using Rouse Hill as a destination representing an estimated 10-15% of station patronage in 2021, increasing to more than 20% in the longer term – buses will also have an important role in serving the Rouse Hill Town Centre because buses will better serve many of the centre's catchment, compared with NWRL.

Based on experiences at other centres, it is expected that 17% to 20% of bus patronage in peak periods will be bound for the centre rather than the station. NWRL will replace M2 express bus services presently operating between Rouse Hill and the City.

Accordingly, the Rouse Hill interchange needs to serve Rouse Hill Town Centre as well as the intermodal needs of station customers bound for other locations.

Although there will be no formal supplies of commuter parking at Rouse Hill station, some NWRL customers may seek to park cars near the station – management of kerbside parking in the centre may be required to deter commuters from occupying parking spaces intended to support the centre's operation.

More than one-third of NWRL customers at Rouse Hill are expected to walk or cycle to the station in the morning peak, with a significant number of customers exiting the station in the same period, with many of those walking to their destination in the town centre.

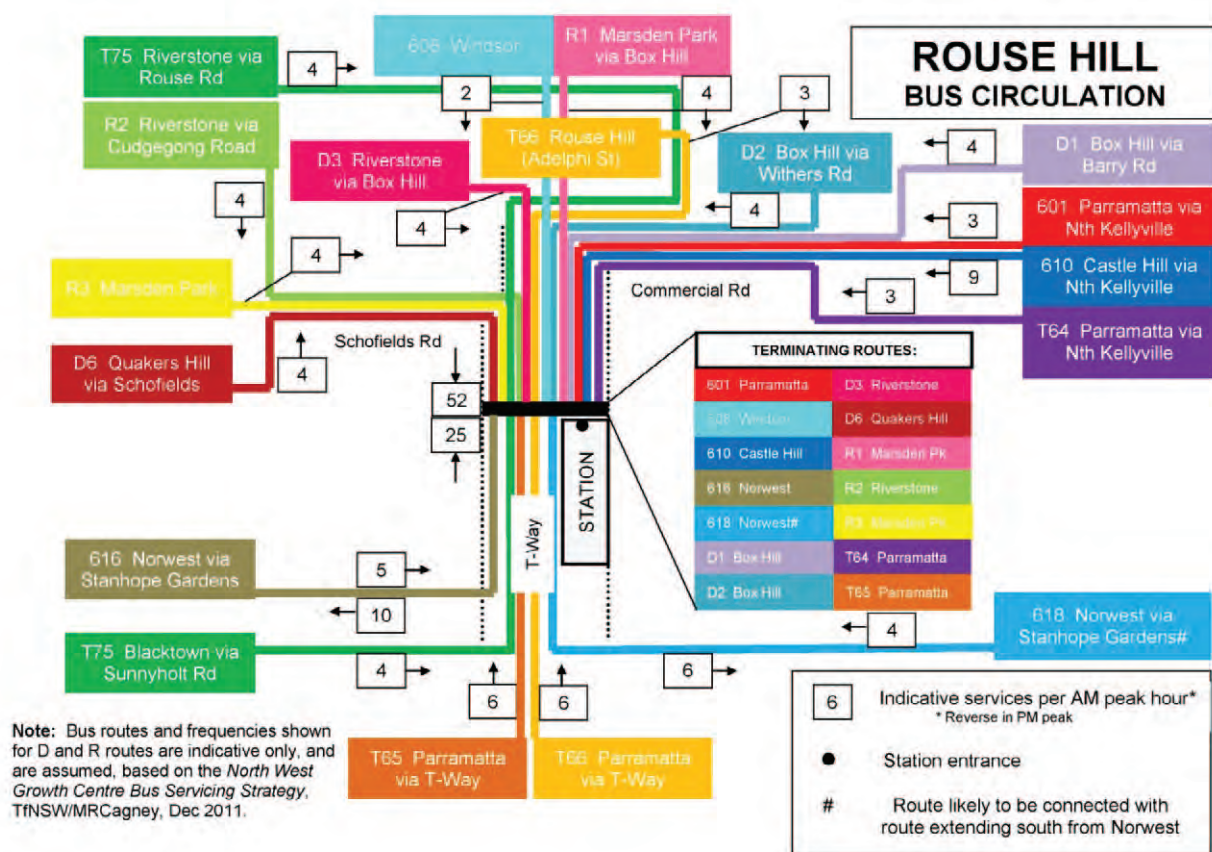
Providing a pedestrian-friendly interchange will be a critical element in the station's success. Scope exists for a future pedestrian bridge over Windsor Road to connect the Northern Frame development with the Area 20 precinct as it develops.

The station precinct master plan features a compact transport interchange, and bus station arrangements that integrate well with the town centre's 'main street' urban design approach. Management of bus movements, while segregated from other traffic movements, is intended to create a 'street style' station precinct which manages the need for bus passengers to cross roadways to access the station, or the town centre.

Extensive bus routes will operate to and from the Rouse Hill station and many of these routes will be extended beyond the station precinct to serve the growing Northern Frame area. Terminating buses, possibly in the Northern Frame area (with off-site layover) will permit a highly compact bus interchange to be created.

Figure 52 shows the indicative future bus network accessing Rouse Hill station.

Figure 52 Indicative future bus access to Rouse Hill station



Source: NWRL, 2012

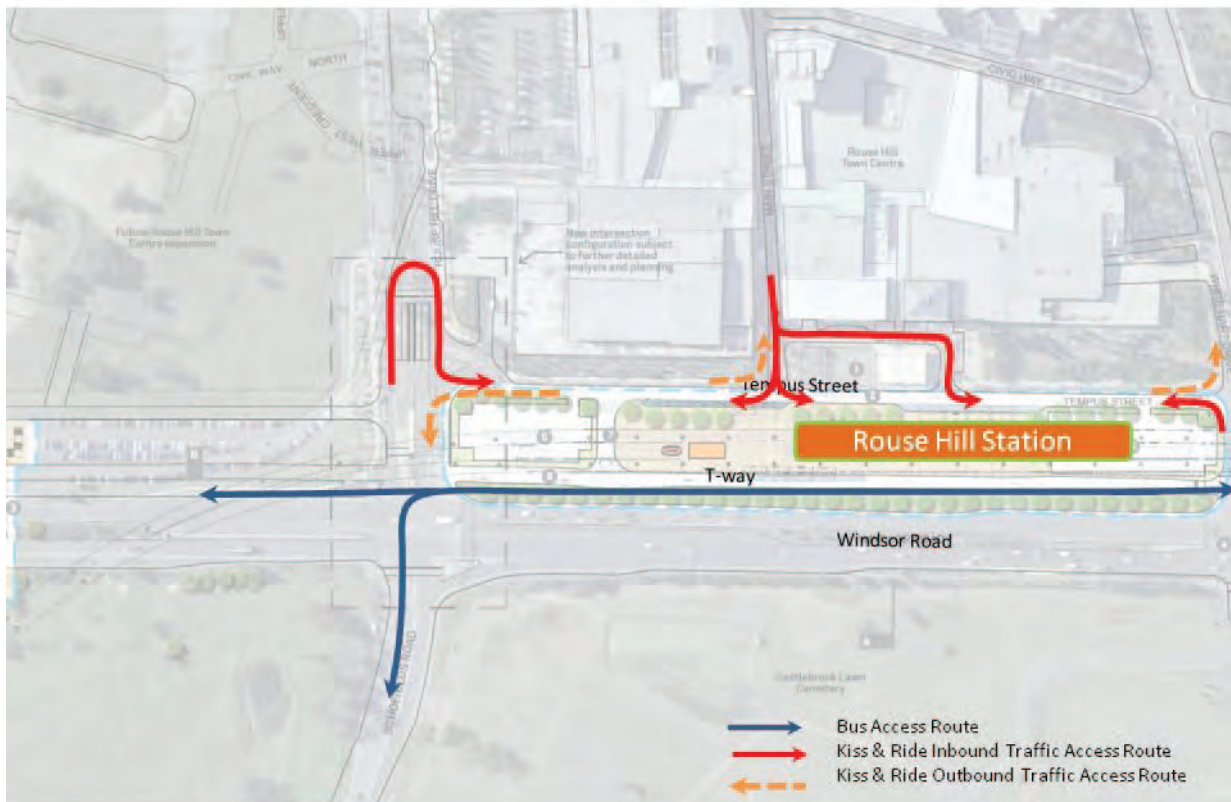
8.8.5 Proposed traffic management facilities

Figure 53 shows provisions for car and bus access to, and egress from, the station precinct.

As the proposed station occupies much of the existing bus interchange area there would be a change in the way buses operate through the centre. Bus services will now move through a linear T-Way interchange to the west of the station entry, between the station and Windsor Road.

It is expected that further development of the Rouse Hill Town Centre will occur to the north of the existing centre in the area referred to as the “Northern Frame” between Rouse Hill Drive and Commercial Road. This would include major changes to Rouse Hill Drive which would provide direct access into the below ground car parks proposed as part of the Town Centre development with the surface road acting as a main street type arrangement with low traffic speeds and high pedestrian priority. This development would mean that bus services operating to the north from the Rouse Hill Interchange would need to follow alternative routes, both to minimise any additional travel distances and to facilitate servicing the town centre extension.

Figure 53 Traffic access routes at Rouse Hill station



Source: NWRL, 2012

Specific changes to the road network at Rouse Hill include:

- Provision of southbound and northbound bus access via a 'Bus Only' T-Way interchange on the western side of the station which connects to the existing T-Way at the intersection with White Hart Drive and continues north through the intersection of Rouse Hill Drive and Windsor Road.
- Tempus Street will continue to operate as a two-way low speed road without bus access. Tempus Street will retain the left in/left out restriction at White Hart Drive and Rouse Hill Drive.
- Provision of a pedestrian crossing across Tempus Street at Market Square to facilitate pedestrian access from the town centre to the station precinct.
- Pedestrian access across the T-Way carriageway midway between the offset bus bays via a zebra crossing.
- The provision of four taxi ranks in Market Lane adjacent to the shopping centre. This location provides easy access for taxis in either direction.
- Extension of the T-Way across Rouse Hill Drive towards Commercial Road to facilitate travel to the north for buses to service the extension of the Rouse Hill Town Centre, Rouse Hill residential areas, Annangrove Road Light Industrial area and beyond to Box Hill as development of that area progresses.
- Provision for kiss and ride access via Tempus Street.

8.8.6 Preliminary traffic assessment

Background

It should be noted that the traffic modelling analysis in this report was undertaken using traffic generation figures based on earlier demand forecasts. Supplementary analysis of future proposals may be required.

Intersections included within the modelling for Rouse Hill station are as follows:

- Windsor Rd / White Hart Dr
- Windsor Rd / Rouse Hill Dr / Schofields Rd
- Windsor Rd / Commercial Rd
- Windsor Rd / Sanctuary Drive

All of the above intersections have been modelled as for the existing intersection configuration and the traffic signal phasing.

The key performance indicators for each intersection within the model area are provided in the following table:

Table 28 Rouse Hill station – AM Peak Hour Intersection Performance (2021)

| Location | Without NWRL | | With NWRL | |
|--|--------------|-------|-----------|-------|
| | LoS* | DoS** | LoS* | DoS** |
| Windsor Rd / Commercial Rd | E | 1.15 | E | 1.19 |
| Windsor Rd / Rouse Hill Dr / Schofields Rd | F | 1.15 | F | 1.14 |
| Windsor Rd / White Hart Dr | D | 0.99 | D | 0.97 |
| Windsor Rd/ Sanctuary Dr | A | 0.68 | A | 0.68 |

Source: ITLU (2012)

LoS – Level of service; DoS – Degree of saturation

Note: supplementary analysis of future proposals may be required.

* Overall intersection performance

** Worst performing lane

The LINSIG modelling does not take account of the lane configuration changes that will be required as a result of any future grade separation at the Rouse Hill Drive / Windsor Road intersection. The LINSIG analysis does not take account of the signal phasing implications of the new T-Way intersection adjacent to the above intersection. Supplementary analysis of future proposals may be required.

The analysis results summarised in the table above indicate that:

- Of the intersections within immediate vicinity of the proposed Rouse Hill station, the intersection with the greatest predicted capacity issues is the Windsor Road / Rouse Hill Drive / Schofields Road intersection, which will operate with a LoS of F, irrespective of the NWRL, indicating unsatisfactory levels of delay. Both the Windsor Road northern approach and the right turn from Schofields Road are also predicted to have a DoS of over 0.9, again irrespective of whether the NWRL is completed.
- It is therefore concluded that the key contributing factor to this congestion is the predicted traffic growth for the Windsor Road corridor itself, and in particular the right turn movement from Schofields Road to Windsor Road.
- A number of potential measures may be available to improve the capacity of the Windsor Road / Schofields Road / Rouse Hill Drive intersection, such as converting a through lane on Schofields Road to a right turn lane, and possibly removing the bus only phase for buses travelling from Rouse Hill Drive (although obviously the removal of this bus priority may be undesirable).
- These measures while providing some improvements to the operation of this intersection are unlikely to provide the fundamental increase in capacity required to allow this intersection to operate in a satisfactory manner. In the longer-term it is quite likely therefore that a grade-separated option may need to be given further consideration.
- The Windsor Road / White Hart Drive intersection is predicted to have a Level of Service of D, both with or without the inclusion of the NWRL, suggesting that this intersection will be near to capacity. The Windsor Road north approach is predicted to operate with a DoS of over 0.9 in both scenarios, while the right turn from Windsor Road south approach into White Hart Lane is also predicted to have a DoS of beyond 0.9 with inclusion of the NWRL. These DoS values suggest these movements will operate beyond practical capacity and may need improvement.
- The Windsor Road / Commercial Road intersection is predicted to operate beyond capacity, irrespective of whether the NWRL scheme is developed. The highest degree of saturation is recorded for the left turn from Commercial Road into Windsor Road southbound, and this movement is also principal contributor to delay at this intersection. Other than the Commercial Road left turn, all other movements are predicted to operate with a DoS value of less than 0.9, indicating satisfactory performance. Consequently, with the potential exception of the Commercial Road left turn slip lane, this intersection is able to accommodate the predicted future demands.
- The Windsor Road / Sanctuary Drive intersection is predicted to operate with an acceptable level of service, while the predicted degree of saturation is also within practical capacity limits.

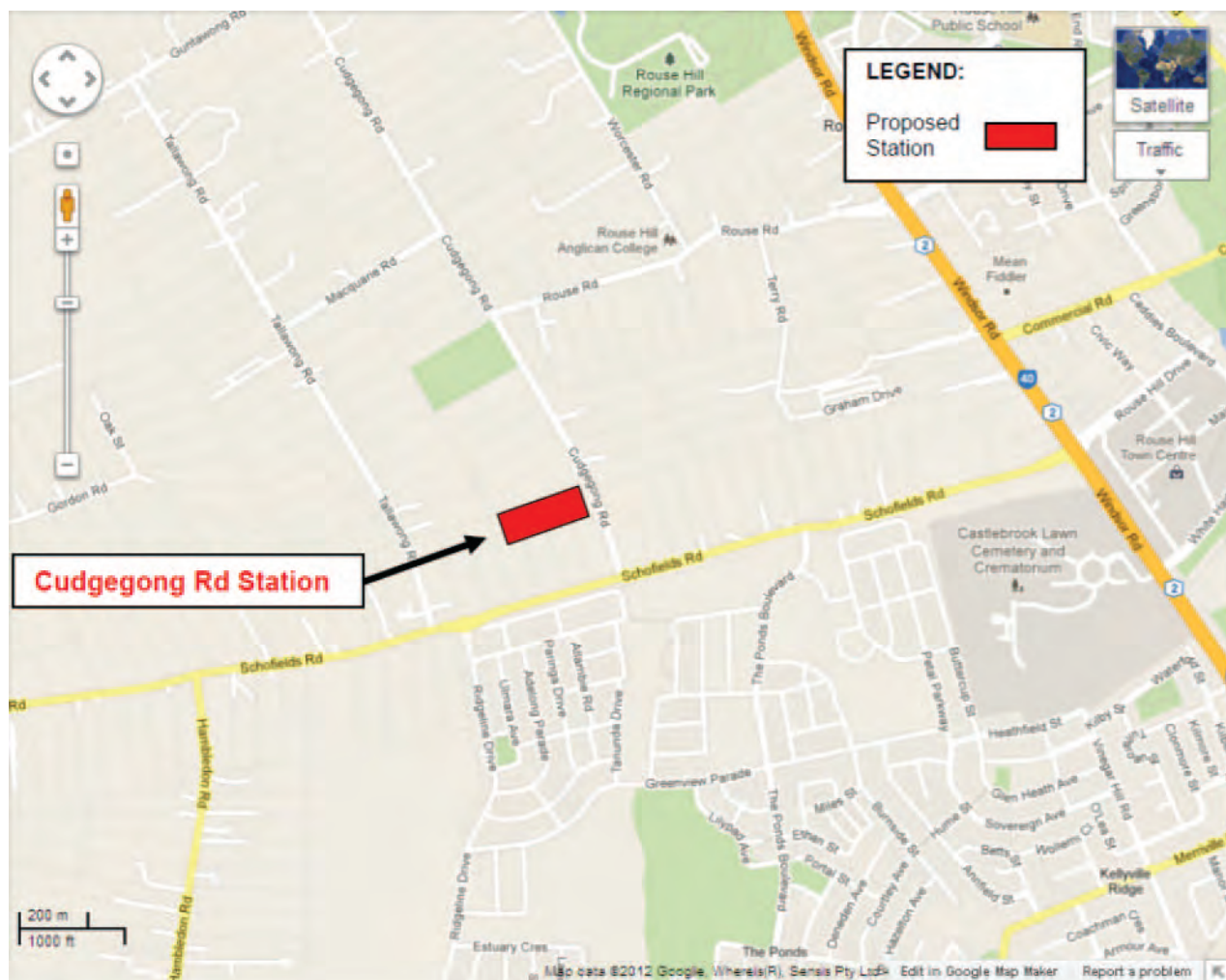
8.9 Cudgegong Road

8.9.1 Background

The proposed Cudgegong Road station is located within the Blacktown City LGA. The proposed Cudgegong Road station will primarily serve the residents of the release areas of North West Growth Centre (NWGC) which includes Riverstone, Marsden Park, Vineyard, Box Hill, Riverstone East, North Kellyville, Alex Avenue and Schofields release areas. Approximately 60,000 new dwellings will be built in the NWGC over the next 25 to 30 years.

The location of the proposed Cudgegong Road station is shown in **Figure 54**.

Figure 54 The location of the proposed Cudgegong Road station



Copyright: Google, 2012

8.9.2 Existing conditions

Existing road network adjacent to the proposed station

Schofields Road is a two-lane arterial road with narrow sealed shoulders and a rural character. It currently carries approximately 11,000 vehicles per day and is signposted as 80 km/h for most of its length, although this is likely to be reduced as residential development occurs to the south (Alex Avenue precinct) and to the north (Area 20). Schofields Road connects to Windsor Road via an all movement signalised intersection.

Tallawong Road and Cudgegong Road are local north-south roads connecting Schofields Road to Guntawong Road. Most intersections in this area are priority controlled at the present time.

Figure 55 Schofields Road, looking east towards Tallawong Road



Table 29 shows the details of the roads located immediately adjacent to the proposed Cudgegong Road station.

Table 29 Cudgegong Road Station – Roads Summary

| Road | Agency Responsibility | Lanes | AADT | 2011 Peak Hour Volume | |
|---------------|------------------------|-------|--------|-----------------------|------------------------------------|
| Schofields Rd | RMS | 2 | 11,594 | Eastbound | AM 571 (9-10am) PM 553 (6-7pm) |
| | | | | Westbound | AM 523 (11-12am) PM 676 (5-6pm) |
| Cudgegong Rd | Blacktown City Council | 2 | 1,461 | Northbound | AM 112 (8-9am) PM 117 (3-4pm) |
| | | | | Southbound | AM 93 (8-9am) PM 97 (3-4pm) |
| Tallawong Rd | Blacktown City Council | 2 | 950 | Northbound | AM 44 (8-9am) PM 73 (5-6pm) |
| | | | | Southbound | AM 63 (7-8am) PM 44 (4-5pm) |

Source: RMS AADT Data & ITLU Traffic counts 2011

AADT – Annual average daily traffic

The following intersections are located near the proposed station.

- Schofields Rd / Cudgegong Rd (priority controlled) – at the present time both Schofields Road and Cudgegong Road are two-lane rural roads with unsealed shoulders. The future development of Schofields Road would see this intersection signalised as part of the upgrade works of Schofields Road.
- Schofields Rd / Tallawong Rd (priority controlled) – both Schofields and Tallawong Roads are two-lane rural roads with unsealed shoulders. The upgrade works for Schofields Road would see this intersection signalised.

Proposed landuse and infrastructure developments

RMS has plans to upgrade Schofields Road from west of Windsor Road to the intersection with Hambledon Road, with construction works expected to substantially commence toward the end of 2012.

The initial stage of construction would provide for two lanes in each direction on Schofields Road on a divided carriageway, with future provision to provide three lanes in each direction. This work will also incorporate the realignment of Tallawong Road to align with Ridgeline Drive on the southern side of Schofields Road approximately 90 metres east of the existing intersection.

Longer term plans include a new connection to Richmond Road and possible grade separation at Windsor Road.

Historical crash analysis

A historical crash analysis has been undertaken for the crashes occurred between January 2006 and December 2010 within 400m radius of the proposed Cudgegong Road station. **Table 30** shows the number of crashes occurred 100m and 400m from the location of the proposed station.

Table 30 Cudgegong Road Station – Crash Summary

| Distance from the proposed Station (radius) | Number of pedestrian crashes | Total number of crashes |
|--|------------------------------|-------------------------|
| 100m | 0 | 0 |
| 400m | 0 | 3 |

Source: RMS Crash Data 2011

The number of crashes that occurred within 400m radius of the site of the proposed Cudgegong Road station is minimal and generally related to the rural nature of the area. A total 3 crashes were reported within 400m of the location of the proposed station including 2 crashes which occurred on Schofields Road and a single crash which occurred on Tallawong Road. These included 2 run-off road crashes and a head on crash.

With the residential development to the south of Schofields Road and the proposed developments in Area 20 to the north of Schofields Road it would be expected that an increase in road crashes would occur, even without the development of the NWRL. Conversely, the improved traffic conditions that will result from the proposed improvements to Schofields Road scheduled to commence in 2012 would improve traffic conditions and safety along the road.

8.9.3 NWRL demand

Figure 56 shows the facilities that will be provided during the operation of the proposed Cudgegong Road station. The proposed station would provide the following transport facilities for commuters to cater for 2021 forecast demand:

- 15 kiss and ride spaces
- 1,000 park and ride spaces
- 45 bicycle parking spaces
- 9 taxi spaces
- 3 bus bays eastbound
- 3 bus bays westbound

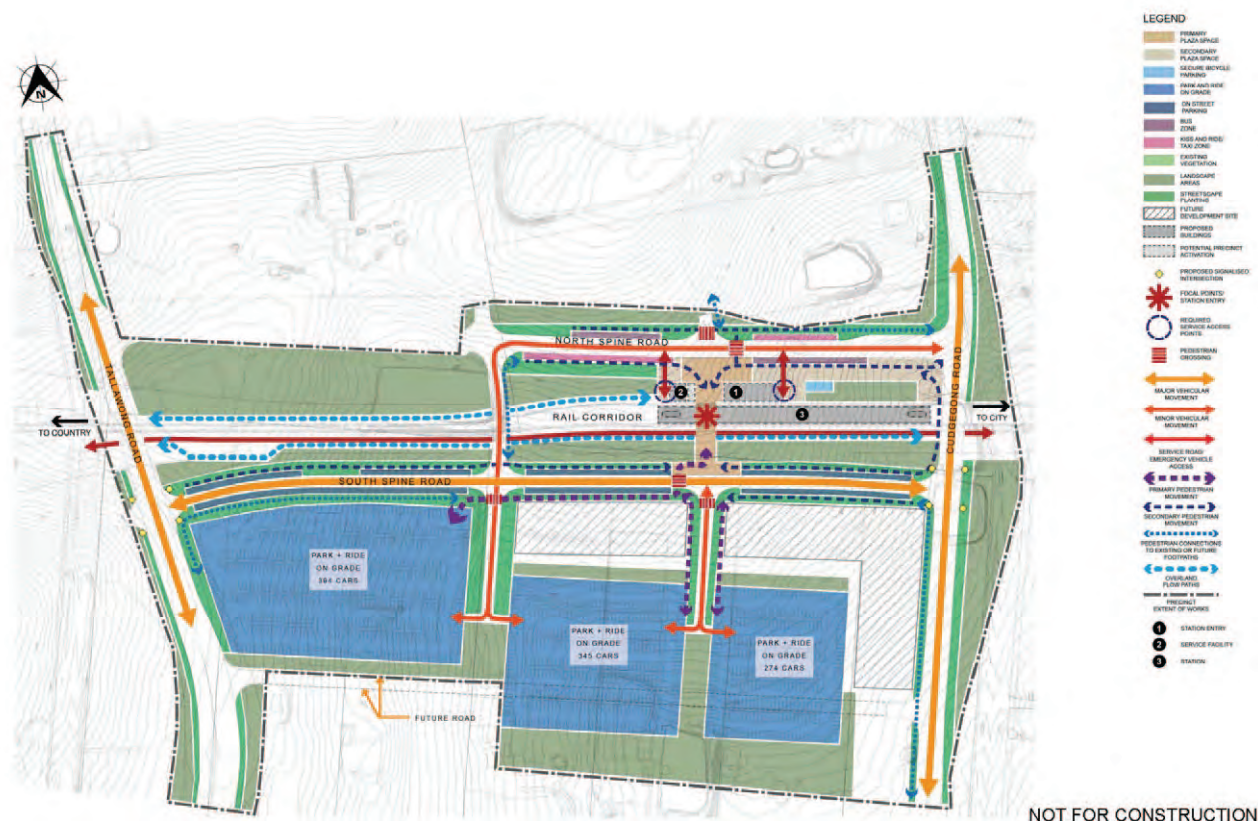
The provision of dedicated park and ride spaces is a balance between meeting morning peak hour demand for park and ride and encouraging access by more sustainable modes including bus, walking and cycling. However, given its strategic location relative to the North West Growth Centre, it is proposed to provide a significant park and ride facility at Cudgegong Road, comprising 1,000 spaces.

In addition to those utilising the dedicated commuter car parking facilities, some of those accessing the station by park and ride will inevitably park on-street, at distances ranging up to around one kilometre, as is the case at almost every station on the Sydney rail system. Where necessary, NWRL will work with council to develop strategies to manage demand for on-street parking in order to reduce impacts on local residents.

Kiss and ride parking spaces have been estimated based on an average 3 minutes dwell time per vehicle during peak periods.

Bus services will be developed based on the *Draft North West Growth Centre - Bus Servicing Strategy* with adjustments to better serve Cudgegong Road station on the way to Rouse Hill.

Figure 56 Proposed Cudgegong Road station layout



Source: ERSA, 2012

Estimated traffic generation in 2021

Traffic volumes, pedestrian activity and other multi-modal activities will increase around the proposed station precinct. It should be noted that the traffic modelling analysis in this report was undertaken using earlier demand forecasts. Supplementary analysis of future proposals may be required.

Kiss and ride traffic will be generated from the residential areas to the south and west of the station and will access the station precinct via Schofields Road and either Tallawong Road or Cudgegong Road. As the area to the north develops, this will also contribute kiss and ride traffic.

The park and ride catchment for Cudgegong station will be extensive, with traffic approaching from the areas to the west and north (as residential development occurs), including Schofields, Riverstone, Marsden Park and Vineyard.

It is not proposed to terminate any buses at Cudgegong Road station and therefore no bus layover facilities are required at this location. These buses will be servicing the residential areas to the north and west of the station and travelling through to Rouse Hill interchange.

8.9.4 Integrating Cudgegong Road station

Cudgegong Road station will be a major park and ride station serving the NWGC (no formal commuter parking will be provided at Rouse Hill station) with 1,000 park & ride spaces at opening of NWRL. The station will be located north of Schofields Road between Tallawong and Cudgegong Roads. These roads will provide access for both kiss & ride and park & ride customers; and a small town centre is expected to develop, mainly on the north side of the station.

East-west access streets will be established on the north and south sides of the station, linking Tallawong and Cudgegong Roads. The station will have its 'front door' to these east-west streets.

Some NWGC bus routes will pass by the station on their way to and from Rouse Hill, operating via the northern east-west station access street and making use of on-street bus stops. Some regional bus routes will operate on Schofields Road. It is not intended that these routes would be diverted to the station (as this would weaken their regional transport function).

Little or no demand for bus to rail interchange is expected from bus services operating along Schofields Road to Rouse Hill, as the walking time to the station (300+ metres away), would exceed the access time to Rouse Hill station if customers stayed on the bus.

Bus would be a relatively minor access mode, with some 2 per cent of NWRL customers expected to access Cudgegong Road station by bus in 2021. Kiss & ride would be more important, with more than 20% of station customers using kiss & ride spaces in the east-west station access streets.

The future scale of commuter demand to the station will be heavily influenced by possible extensions of NWRL beyond Cudgegong Road. Should the line not be extended, commuter demand could increase in the longer term as journey opportunities increase.

Pedestrian access to/from adjoining planned development

Both the Area 20 Indicative Layout Plan (**Appendix A**) and the Cudgegong Road station precinct have been designed with pedestrian accessibility to and from the proposed station in mind.

On the western side of the station precinct pedestrian access will be accommodated as follows:

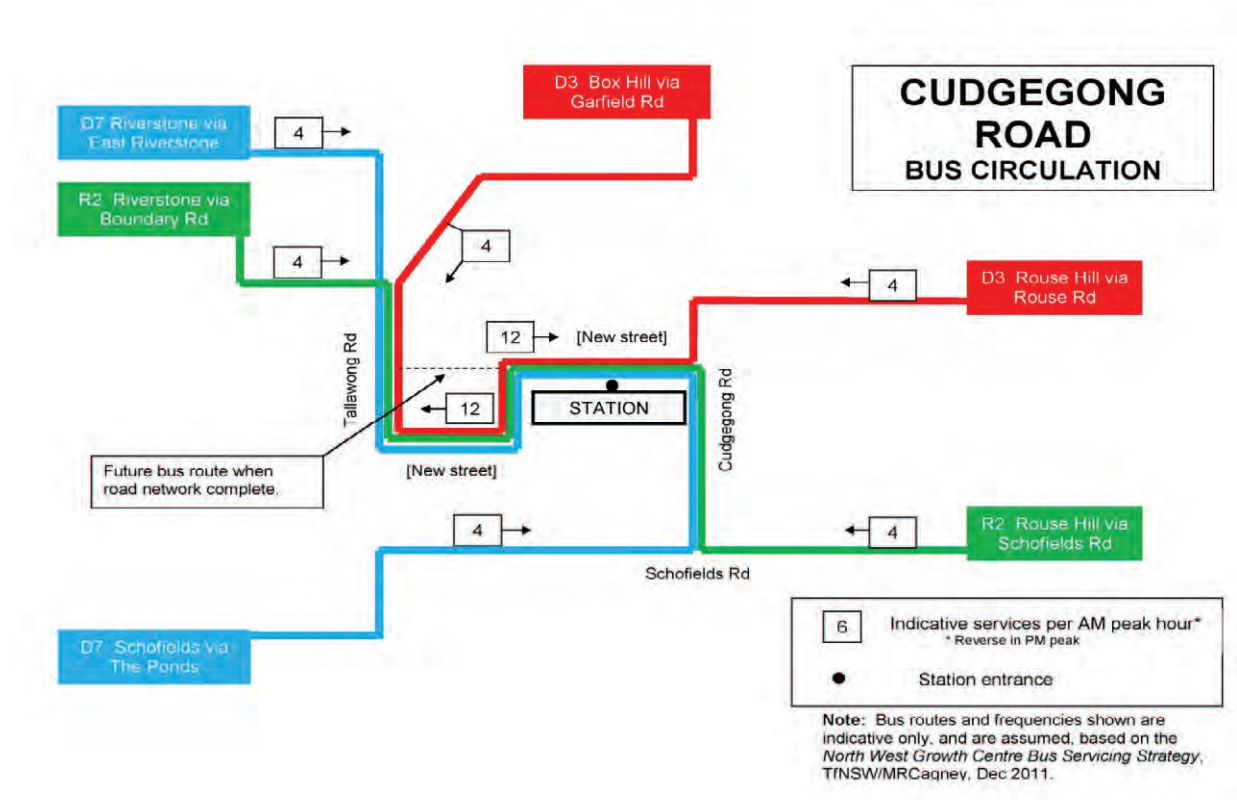
- Southbound along the footpaths on both sides of Cudgegong Road then right into the northern station access road.
- Southbound along the footpaths on both sides of Cudgegong Road then right into the southern station access road via the proposed traffic signals.
- Northbound along the western footpath in Cudgegong Road then left into the southern station access road via the proposed traffic signals.

In addition to these road-based access links there is scope to investigate shared pedestrian and cycle connections between the proposed station and the western precinct within Area 20.

Indicative layout plans for the land on the western side of the proposed rail station have yet to be finalised. It is envisaged that both road-based and dedicated pedestrian and cycle links will be provided to maximise accessibility.

Buses accessing bus interchange – A total of around 24 bus movements (both directions) are expected to occur during morning and afternoon peak hours. **Figure 57** below shows the indicative future bus network accessing Cudgegong Road station.

Figure 57 Indicative future bus access to Cudgegong Road station



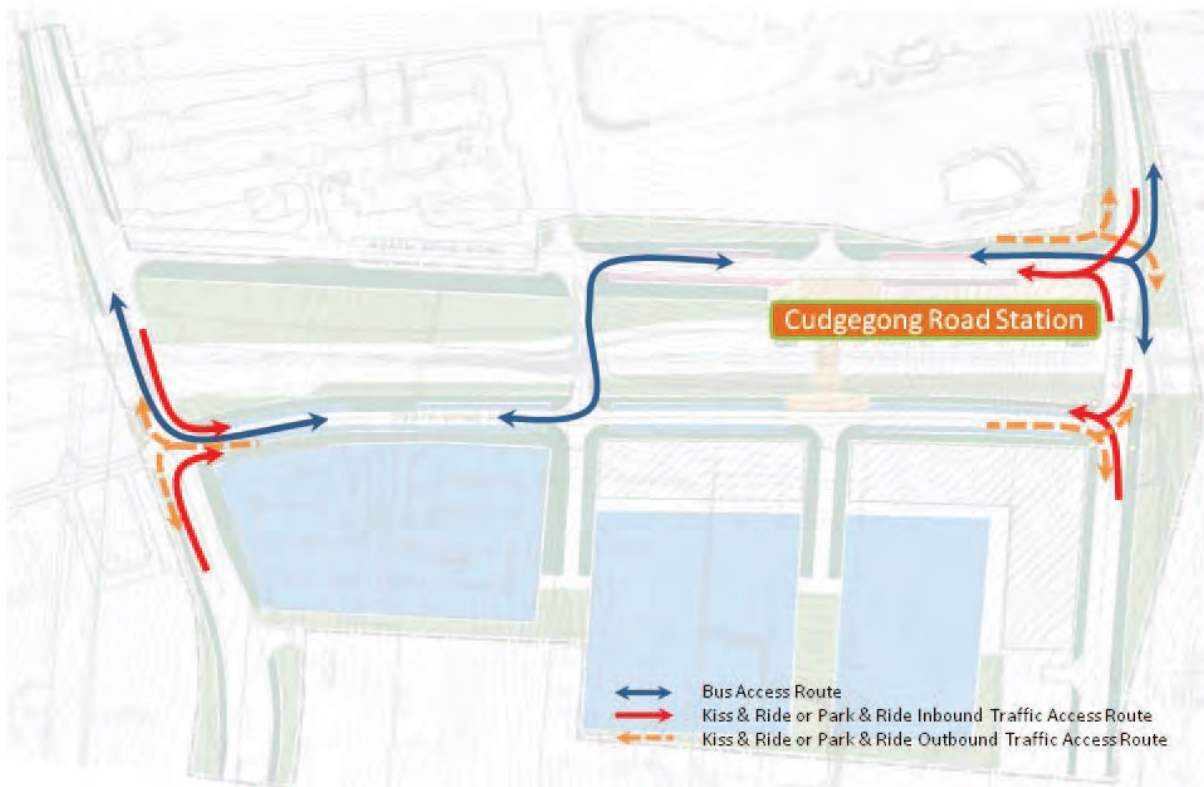
Source: NWRL, 2012

8.9.5 Proposed traffic management facilities

Figure 58 shows provisions for car and bus access to, and egress from, the station precinct.

Figure 58 Traffic access routes at Rouse Hill station

Cudgegong Road Station Traffic Access Routes



Source: NWRL, 2012

Cudgegong Road station is the westernmost station on the NWRL and is located in a developing area. It will perform an important role as both a park and ride station and bus interchange station. The development of a local road system parallel to the rail line and connecting Cudgegong Road and Tallawong Road will provide access to the station and to the proposed car parks north and south of the rail corridor. Bridges will be provided across the rail corridor for both Cudgegong Road and Tallawong Road.

The following traffic management measures are proposed as part of the operation of Cudgegong Road station:

- Widening of Cudgegong Road from Schofields Road to just north of the rail corridor to provide two traffic lanes in each direction.
- Widening of Tallawong Road to provide two traffic lanes in each direction from Schofields Road to north of the rail corridor.
- Provision of local access road either side of the rail corridor, the southern link between Cudgegong Road and Tallawong Road. The northern station access road does not connect to Tallawong Road. These roads to provide one traffic lane and one parking lane in each direction.
- Provision of bus ranks on both the northern and southern sides of the northern access road near the station entry.

- Provision of taxi ranks and kiss and ride spaces on the northern and southern sides of the northern access road, either side of the station entry.
- Provision of traffic signals at the intersection of the southern access road with both Cudgegong Road and Tallawong Road (subject to RMS approval).
- Provision of at-grade car parks to the southern side of the rail corridor, between Tallawong and Cudgegong Roads, with entries and exits via north-south running car park access roads. This will provide for 1,000 off-street commuter parking spaces.

8.9.6 Preliminary traffic assessment

Background

It should be noted that the traffic modelling analysis in this report was undertaken using traffic generation figures based on earlier demand forecasts. Supplementary analysis of future proposals may be required.

Intersections included within the modelling for the Cudgegong Road station are as follows:

- Schofields Rd / Cudgegong Rd (traffic signals) – This intersection is presently priority controlled however the future development of Schofields Road would see this intersection become a signalised T-intersection. The western approach of Schofields Road includes two through lanes and a single left turn slip lane. The eastern approach provides two through traffic lanes and two further right turn bays. A single left turn slip lane and a right only lane are provided on the Cudgegong Road southern approach.
- Schofields Rd / Tallawong Rd (traffic signals) – This intersection is presently priority controlled however the future development of Schofields Road would see this intersection become a signalised four leg intersection. Both the eastern and western approaches of Schofields Road include a single left turn slip lane, three through lanes and a single right turn bay. Left, through and right turn lanes are to be provided on the Tallawong Road southern leg. Four approach lanes are included on the northern leg of this intersection, comprising of two right turn bays, a through lane and left turn lane.
- Cudgegong Rd / Station Access (traffic signals) – This new intersection is a signalised T-intersection with two approaches on each approach. A shared left/through lane and through lane is provided on the Cudgegong Road southern approach, with a through and shared through/right lane provided on the northern approach. Single left and right turning lanes are provided on the western approach of the intersection.
- Tallawong Road / Station Access (traffic signals) – This new intersection is a signalised T-intersection with two approaches on each approach. A shared left/through lane and through lane is provided on the Tallawong Road southern approach, with a through and shared through/right lane provided on the northern approach. Single left and right turning lanes are provided on the eastern approach of the intersection.

Table 31 Cudgegong Road Station – AM Peak Hour Intersection Performance (2021)

| Location | Without NWRL | | With NWRL | |
|----------------------------------|--------------|-------|-----------|-------|
| | LoS* | DoS** | LoS* | DoS** |
| Schofields Road / Cudgegong Road | B | 0.75 | B | 0.72 |
| Schofields Road / Tallawong Road | A | 0.58 | B | 0.77 |
| Cudgegong Road / Station Access | n/a | n/a | A | 0.32 |
| Tallawong Road / Station Access | n/a | n/a | A | 0.15 |

Source: ITLU (2012)

LoS – Level of service; Degree of saturation

Note: supplementary analysis of future proposals may be required.

* Worst performing lane

** Overall intersection performance

The analysis results summarised in the Table above indicate:

- The new traffic signals servicing the station access road at Cudgegong Road and Tallawong Road are forecast to operate well with space capacity in the opening year.
- The Schofields Road / Cudgegong Road intersection approaches capacity in the AM peak hour, with the critical movement being the eastbound through movement on Schofields Road. Provision of an additional eastbound traffic lane (similar to the layout at the adjacent Schofields Road / Tallawong Road intersection) would increase the capacity of the intersection and reduce the DoS to approximately 0.8.

8.10 Tallawong Stabling Facility

8.10.1 Background

The stabling facility at Tallawong Road would be located north of Schofields Road and west of Tallawong Road. This is within the North West Growth Centre, an area of land which has been identified for future urban development.

As the rail system would be closed from about midnight to 4.30am, trains would need to be stored off the running lines in the stabling facility. Trains that are not required during off-peak periods would also be stored within the stabling facility.

The stabling and maintenance facility would assist in maintaining operational reliability by allowing train services to commence on time from Cudgegong Road station. Stabling the majority of trains required to operate the NWRL at or near the end of the line eliminates the need for extended sections of out-of-service or empty train operations.

The Tallawong stabling facility would comprise the following elements:

- Overnight and between-peak stabling of trains.
- Internal train cleaning performed by train presentation staff (includes internal graffiti removal).

- Cleaning on train exteriors.
- Shunting of trains in preparation for departure or to accommodate arriving trains.
- Train preparation (powering up) performed by train crew.
- Division/amalgamation of trains by train crew.
- Rolling stock repairs performed by train technicians.

The stabling facility would also accommodate the needs of emergency services.

Trains would normally be shut down once they have been stabled and would need to be powered up about 60 minutes prior to their scheduled departure time.

Daily internal cleaning of the trains would take place when trains return to the depot after the morning and evening peak periods and also at the end of each day.

Other infrastructure and services in the facility would include:

- Access roads
- Facilities for cleaning and maintenance
- Administration offices and amenities
- Administration building
- Car park
- Landscaping
- Lighting and CCTV
- Fencing

8.10.2 Existing conditions

Schofields Road is currently a two-lane rural standard road with gravel shoulders and varying speed limits. RMS is proposing to undertake improvements works on the section of Schofields Road between Windsor Road and Hambledon Road.

8.10.3 NWRL demand

Access to the site would be restricted to staff and service vehicles. The traffic impacts of these movements are expected to be minimal as train staff generally arrive and depart outside the surrounding road network peaks.

Maintenance staff will generally arrive during the peaks however these staffing numbers have not been determined at this stage.

8.10.4 Proposed traffic management facilities

Access to the stabling facility is proposed to be provided from Tallawong Road. The Tallawong Road access will allow all traffic movements to and from Tallawong Road.

8.11 Service Facilities

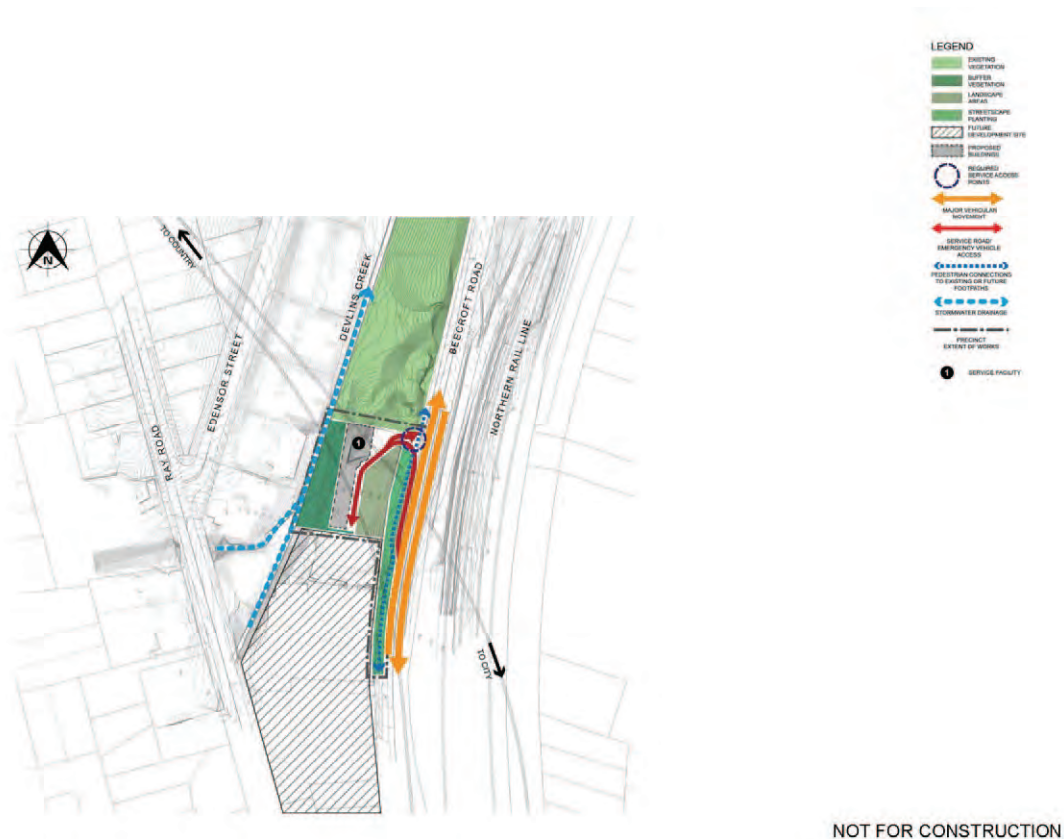
Services facilities would be located at Epping and Cheltenham. Service facilities provide support services such as power and fresh air ventilation which are required for the safe operation of the railway. The facilities also provide emergency access to the rail tunnels.

8.11.1 Epping Services Facility

The Epping Services Facility site would be approximately 3,400m² in area and located to the west of Beecroft Road is shown in **Figure 59**.

The proposed location of the Epping Services Facility sits within a property located on Beecroft Road north of Carlingford Road and south of Devlins Creek. The Epping Services Facility would include a traction power substation, a ventilation and equipment building (within one facility) and an onsite stormwater detention pond. The facility would be fenced and not publicly accessible. The facility would require occasional maintenance access via Beecroft Road and would also be used for rail personnel (not heavy equipment) to access the tunnel during track/tunnel maintenance periods.

Figure 59 Epping Services Facility



Source: ERSA, 2012

8.11.2 Cheltenham Intermediate Services Facility

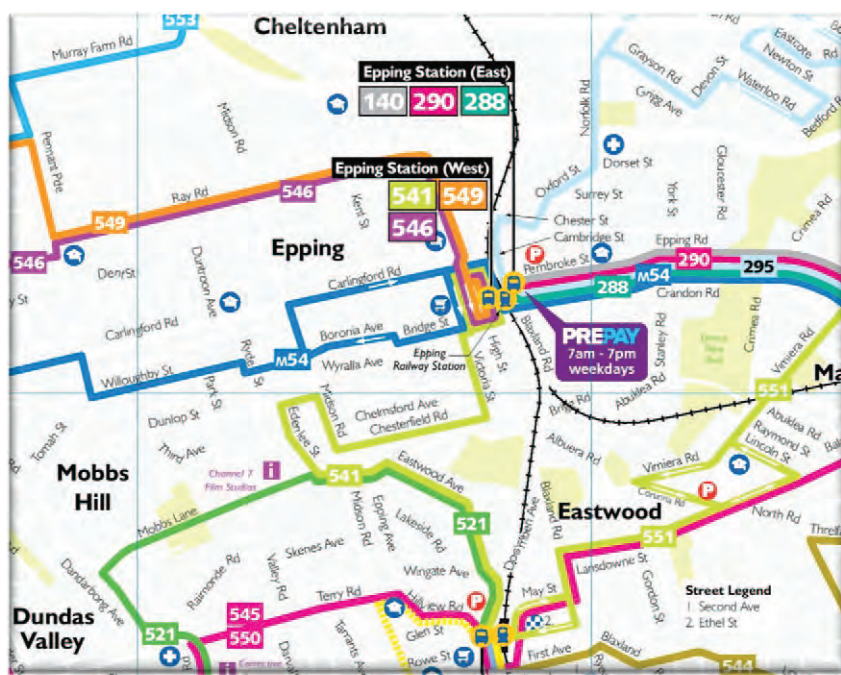
The Cheltenham Intermediate Services Facility would be located adjacent to Cheltenham Oval between Castle Howard Road and the M2 Motorway as shown in the Figure overleaf. The existing oval is in a bushland setting and is accessed from Castle Howard Road, which would be widened and upgraded.

The facility would include emergency access and egress, plant rooms, a sectioning hut, access for maintenance personnel and an onsite stormwater detention pond. It does not include tunnel ventilation equipment or traction power substation. The facility would require occasional maintenance access via local roads and may also be used for rail personnel (not heavy equipment) to access the tunnel during track/tunnel maintenance periods.



8.12 Epping Station Access

Figure 61 Existing bus routes in the vicinity of Epping station



Source: Sydney Buses 2012

The road network around Epping station is already heavily congested at peak times as it is at the junction of four major roads (Epping Road, Blaxland Road, Carlingford Road and Beecroft Road and is at the only road crossing point of the rail line between Eastwood and Cheltenham (apart from the M2). In line with other stations in key centres with constrained road access, no commuter car parking is provided at this location.

With the introduction of the North West Rail Link, Epping will become a more important rail-rail interchange station between services operating north-south on the Northern line, and east-west on NWRL. Because of the increased service frequencies through Epping, it may attract additional station entries from neighbouring areas.

For those using Epping station to access the rail network, the intention is to continue to encourage access either by bus, walking or cycling, rather than by car. As a centre with heavily constrained road access, and in order to discourage access by car at this location, it is not proposed to provide commuter car parking at Epping as part of NWRL project.

While no additional facilities for bus, walking and cycling access are proposed at Epping, this will be monitored by TfNSW after commencement of NWRL operations.

9 Glossary

AADT – Annual Average Daily Traffic (AADT) is the total yearly traffic volume in both directions divided by the number of days in the year.

Arterial Road – Arterial roads predominantly carry through traffic from one region to another, forming principal avenues of communication for metropolitan traffic movements. They are usually part of the classified Main Road system, including highways and freeways. Freeways are those roads having full access control and grade separated intersections, whose primary function is to service large traffic volumes.

AVD – Average Delay per Vehicle (AVD) in seconds that each vehicle incurs in waiting to pass through the intersection during the peak period

BTS – The Bureau of Transport Statistics (BTS) produces employment forecasts at the small area level, across the Greater Metropolitan Area of Sydney (GMA). Together with the BTS Small Area Population Forecasts, they provide the land use inputs to the Sydney Strategic Travel Model (STM).

Collector Road – In an urban area these roads provide the connection from the sub-arterial roads and arterial roads to the local road system.

DoS – Degree of Saturation is the ratio of arrival flow (demand) to the capacity of the intersection during the same period.

FMM – The Sydney Freight Movement Model (FMM) is used to produce heavy vehicle forecasts. The FMM produces estimates of movements of rigid and articulated trucks.

Global Economic Corridor - The global economic corridor links Macquarie Park, Chatswood, St Leonards and North Sydney in the north; Sydney City and Pyrmont- Ultimo, and major research, health and education facilities, residential and industrial areas; and Sydney's two major global gateways Sydney Airport and Port Botany to the south. It contains strong industry clusters in finance and business services, information intensive industries, global and national transport and multimedia.

ITLU – Integrated Transport and Land Use (ITLU) arrangement provides transport infrastructure and services with land uses to reduce private vehicle trips and to encourage sustainable transport.

JTW – Journey To Work (JTW) information on where a person usually works and how they travel to work on census day and this information is collected by Australian Bureau of Statistics every five years.

LINSIG – LINSIG is a software tool which is used to model traffic signals and their effect on traffic capacities and queuing. As well as modelling the effects of traffic signals LINSIG also optimises signal timings to reduce delay or increase capacity at a intersection or group of interlinked intersections.

Local Road – Local roads are the subdivisional roads within a particular developed area. These are used solely as local access roads, but traffic volumes and types of vehicles will depend on the intensity and nature of the development – e.g. residential, commercial, industrial, recreational etc.

LoS – Level of service is a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety. In general there are six levels of service,

designated A to F, with level of service A representing the best operating condition (i.e. free flow) and level of service F the worst (i.e. forced or breakdown flow).

NWGC – The North West Growth Centre (NWGC) is located approximately 35km north west of the City and approximately 15km north west of Parramatta. The growth centre is connected with existing urban development on its southern and eastern boundaries. Adjacent suburbs include Quakers Hill, Kellyville, Rouse Hill, Parklea, Marayong and Kings Park.

NWRL – North West Rail Link

PTPM – The Public Transport Project Model (PTPM) is a module that has been added to the Sydney Strategic Transport Model (STM) to allow for a more detailed assessment of specific public transport projects such as NWRL.

RMS – Roads and Maritime Services, NSW.

SIDRA - Signalised & unsignalised Intersection Design and Research Aid (SIDRA) is a software tool which is used to assess the performance of intersections in terms of Level of Service, Degree of Saturation and Average Delay per vehicle.

STM – The Sydney Strategic Travel Model (STM) is a tool, operated by the Bureau of Transport Statistics (BTS), for projecting travel patterns in the Greater Metropolitan Area of Sydney (GMA) under different land use, transport and pricing scenarios.

Sub-arterial Road – Sub-arterial road connects the arterial roads to areas of development or carrying traffic directly from one part of a region to another. They may also relieve traffic on arterial roads in exceptional circumstances.

TfNSW – Transport for New South Wales.

TOD – Transit Oriented Development (TOD) is a mixed use residential or commercial area designed to maximise access to public transport, and often incorporates features to encourage public transport usage.

Transit mode share – Transit mode share is number of trips or percentage of travellers using the public transport (bus, train, light rail, ferry).

T-Way – Transitway (T-Way) is a bus rapid transitway and are bus-only roads where corridors are available, and bus-only lanes on existing roads

TZ – Travel Zones (TZ) are included in the STM which breaks the GMA into 2,690 travel zones, and further by 128 population segments within each travel zone. These 350,000 segments by travel zone represent over 5 million people in the GMA, and thus involve using averages and simplifying assumptions to predict behaviour and access to the transport system.

10 Bibliography

1. Austroads, *Guide to Road Design - Part 3 – Geometric Design*, 2009
2. Baulkham Hills (The Hills) Shire Council, *Road Hierarchy Study*, Draft, June 2009.
3. Hills Shire Council, *Road Hierarchy Study*, Draft, June 2009.
4. RMS Crash data from January 2006 to December 2010
5. RMS Traffic Volume Data, 2011.
6. Roads and Traffic Authority (2002), *Guide to Traffic Generating Developments*, Sydney.
7. Transport for NSW, *Making Interchange Places Product Strategy*, Draft, 2011.
8. Transport for NSW / MRCagney Pty Ltd, *North West Growth Centre – Bus Servicing Strategy*, Draft report, Dec 2011 Revision.