Mid Block Carriageway Capacity

The TMAP calculated the mid block carriageway capacity of the local road networks, and found that:

- *Avondale Road, Cleveland Road, Huntley Road and Marshall Mount Road operate at LoS A for mid-block capacity during the peak periods.*
- *Princes Highway between Kanahooka Road and Mount Brown Road is four lane undivided road and operates at LoS A.*
- *Princes Highway between Mount Brown Road and Huntley Road is two lane undivided with clearways and limited access operating at LoS B.*
- *No mid-block capacity issues currently exist within the surrounding road network.*

Public Transport

The TMAP carried out analysis on the efficiency of the existing railway and bus services and their availability to the residents within the study area. The TMAP concluded that the service frequency and timing of bus and rail services does not facilitate easy or convenient intermodal transfers. Because of this, the TMAP suggested that the rail services are unlikely to be viewed by travellers as an attractive mode of transport to reach the site. Unless duplication of the tracks and increased service frequencies are implemented along this section of the rail network, it would be expected that rail will only play a small part in the provision of transport services to this development.

The TMAP considers that the poor service can lead to the following outcomes:

- *The infrequency and irregularity of services is a disincentive to travel, as waiting times can be significant and variable, requiring passengers to plan around the rail timetable.*
- *Infrastructure constraints, including the single track are impediments to any increase in service frequency.*
- *At-grade road crossings are also considered an impediment to increasing service frequency due to the additional delays.*

Proposed Huntley Railway Station

The WDRA program proposed a new railway station adjacent to the Huntley Road bridge over the South Coast railway line. The station is a long term proposal and Railcorp anticipated that the critical point for determining whether the station would be provided or not would be reached in 10-15 years time. On the other hand, the Growth Centres Commission review questioned the need for the Huntley railway station, indicating that it was unlikely that development of the release area would produce sufficient patronage to justify the cost of the station and associated track amplifications.

The TMAP suggested that the subject site would be located between 700m and 1.1km form the station platforms. It concluded that

Provided that frequent services were provided, it would be anticipated walking to and from the railway station would be an attractive option for visitors and in particular employees to the centre.

Bus Services

The existing bus service routes and the time required travelling to the local commercial or employment destinations are shown in **Figure 23**.

The TMAP suggested that the routes are circuitous, especially for through travel between Dapto and Wollongong or Port Kembla.

Figure 23 – Existing Bus Network & Travel Times

(Source: Cardno Eppell Olsen (2009))

Four bus routes currently service the subject site. They travel between Wollongong and Shellharbour, via major suburbs such as Dapto, Warrawong, Kanahooka, Koonawarra, Berkeley and Port Kembla.

The Lake Link service (Routes 37 and 57) provides more direct services along Princes Highway between Wollongong and Oak Flats. The present bus stops are approximately 1km away from the subject site. The TMAP suggested that there is opportunity to divert these services along Huntley Road and Avondale Road to service the subject site. This would provide increased opportunity for direct bus services from a number of different areas with the Wollongong region. This rerouting of bus service can be further discussed and agreed with the Ministry of Transport and the bus operator.

There is also opportunity to reroute routes 33 and 43 services travel south along Princes Highway from Dapto, turning into Avondale Road at Goolagong Street, and pass through Penrose residential area via Penrose Drive before joining Huntley Road. These services could potentially be re-routed via Avondale and Huntley Roads once the site has been developed. If this occurs, residents of Penrose would still remain within close proximity to bus services on Avondale and Huntley Roads.

Pedestrian Infrastructure and Walking Catchment

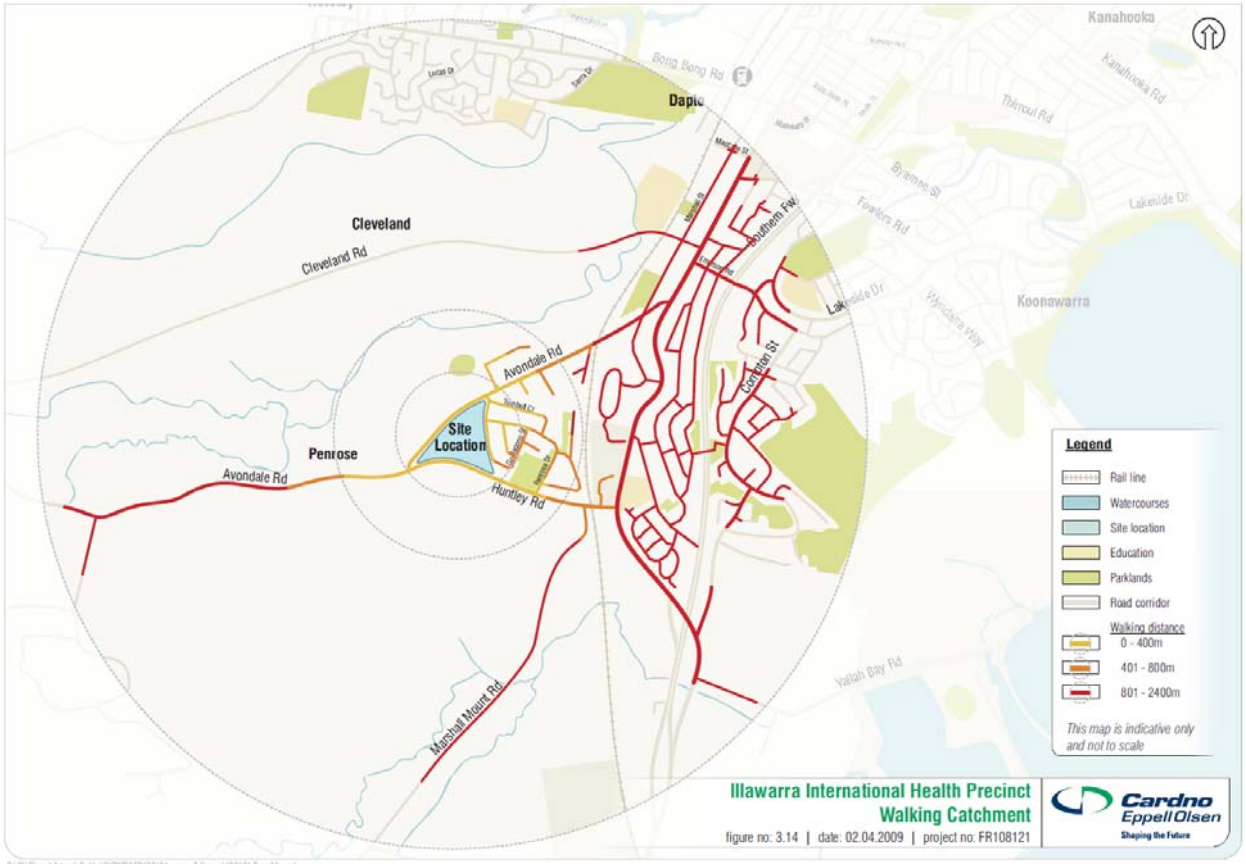
The TMAP provides the following descriptions on the existing pedestrian movements:

- *There are currently no footpaths provided along the roads adjacent to the development site, nor the immediate neighbouring residential streets. The closest footpaths are located on Avondale and Huntley Roads near the Princes Highway – at least 600 metres from the IIHP site. An extension of the existing footpath is presently being constructed on Avondale Road.*
- *There are currently no pedestrian crossing facilities in the vicinity of the site. The closest facilities are the traffic signals on Princes Highway at Mount Brown Road, Cleveland Road and Emerson Road.*
- *The most important walking route in the future will be Huntley Road between the IIHP site and the proposed Huntley Railway Station. This section of Huntley Road is gently undulating, whilst steadily climbing from approximately 36 metres ASL at the station site to 44 metres ASL at the IIHP site.*

In terms of the pedestrian movement from the subject site, **Figure 24** illustrates the pedestrian catchment analysis with walking distances of 400m, 800m and 2.4km. These represent 5 minutes, 10 minutes and 30 minutes walking catchments respectively. The TMAP concluded that:

- *The site is located beyond the 30 minute walking catchment of Dapto town centre and existing railway station.*
- *The proposed Huntley Railway Station is located approximately 10 minutes walk from the site, whilst the Penrose and southern Dapto residential areas are within the 30 minutes walking catchment.*
- *The future linear residential development along Avondale Road to the west of the site will result in additional residences falling within the 30 minute walking catchment.*
- *Penetration from the site towards the Cleveland and Horsley areas is currently poor, due to road and path network connectivity issues. This will become increasingly significant as residential development increases along the Cleveland Road corridor.*
- *Road links are planned as part of the urban release area development which will increase connectivity across the Mullet Creek floodplain.*

Figure 24 – Pedestrian Catchment Analysis



(Source: Cardno Eppell Olsen (2009))

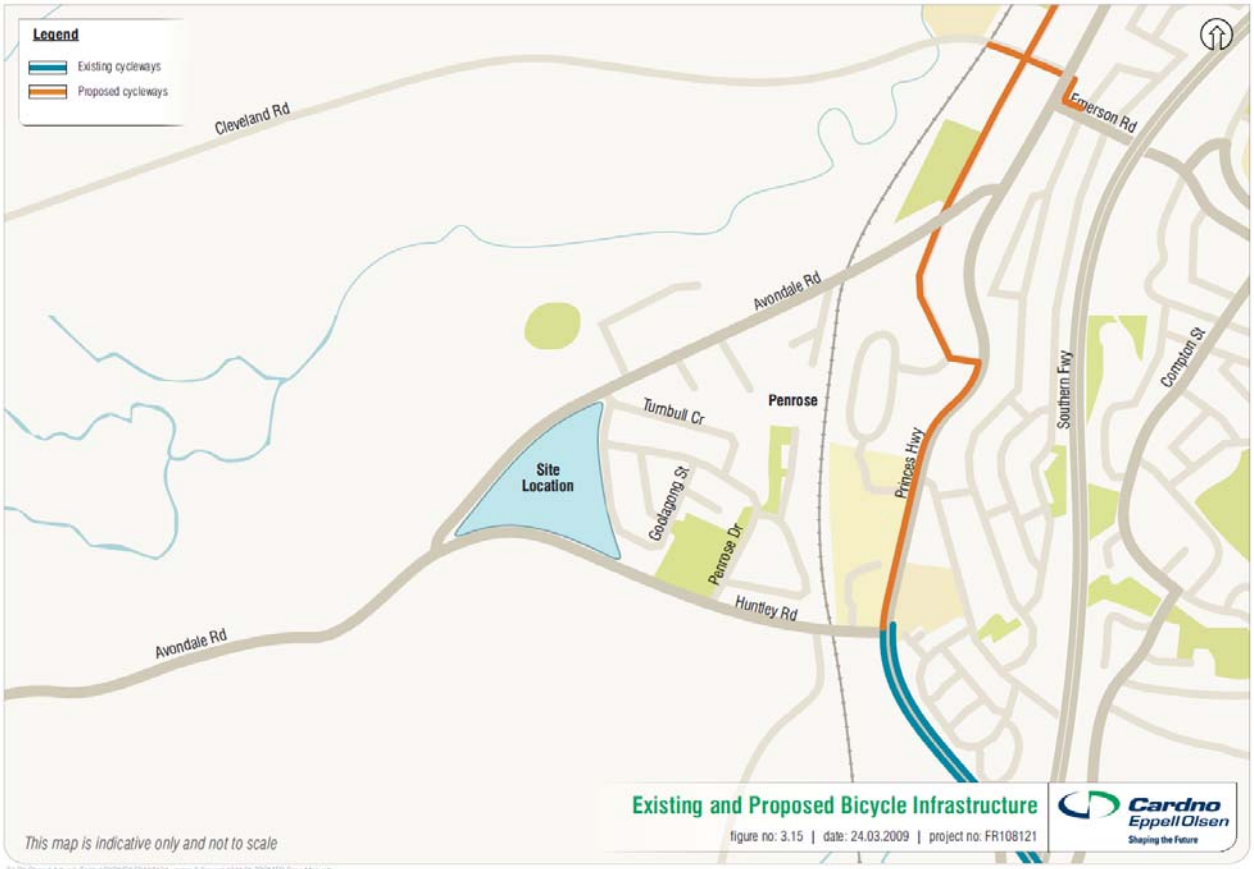
Cycling

Cycling facilities such as dedicated lanes or paths, are not currently provided north of Huntley Road. The only location where cycling route is available is along Princes Highway, between Haywards Bay and Huntley Road. Wide, paved shoulders are provided to facilitate safer cycling along this section of the road. There is proposed cycleway to Dapto Town Centre travels along Amaral Avenue, Marshall Street and Bong Bong Road. This route allows cyclists to avoid heavy traffic along the section of Princes Highway north of Amaral Avenue. This is shown in **Figure 25**.

The TMAP suggests that Avondale Road will be the most important future cycling route, subject to pedestrian and cyclist access across the railway being retained. Between the IIHP site and Princes Highway, Avondale Road has a gentle gradient, steadily climbing towards the Princes Highway.

In terms of cycling catchment, the TMAP shows that the majority of the Dapto residential suburbs (e.g. Koonawarra, Kanahooka and Horsley) are within a 30 minute bicycle ride of the site. The residential areas of Albion Park and Oak Flats are located just beyond a 30 minute bicycle ride from the site. The future Moorland and Avondale villages and the Avondale Heights residential area are located within the cycling catchment, due to the direct alignment of Avondale Road. Horsley could be more accessible to the site by the construction of a road or cycle/pedestrian link across Mullet Creek, eliminating the circuitous route via Dapto town centre. Such a link is planned as part of the WDRA development. These linkages would also bring the future Darkes Road and Bong Bong town centres within the cycling catchment.

Figure 25 – Existing & Proposed Bicycle Infrastructure



(Source: Cardno Eppell Olsen (2009))

6.6.2 Traffic Analysis

The TMAP analyses the following traffic matters as a result of the proposed development and takes into account the staging of the proposal.

- Traffic Generation for 2008, 2016 and 2026 (based on RTA *Guides to Traffic Generating Developments*)
- Traffic Distribution and Assignment for 2008, 2016 and 2026 (using TRACKS Model)
- Public Transport for 2026 (based on the modal share targets required by Ministry of Transport)
- Analysis on the performance of key intersections within the study area based on SIDRA model for the 2008, 2016 and 2026 scenarios
- Car parking requirements (see Chapter 3)
- Road width requirements (see Chapter 3)

6.6.3 Potential Impacts

Intersections Performance

- **2008 Traffic Volumes (current operation without proposed development)**
  - The intersection of Princes Highway and Huntley Road operates at a LoS F as the right-turn movement from Huntley Road into Princes Highway experiences significant delays during the 2008 AM and PM peaks.
  - This intersection will require upgrading regardless of any future traffic generated by this development or other developments in the area.
  - The 2016 and 2026 TRACKS base models show that this intersection will be upgraded to a roundabout intersection.
- **2016 Traffic Volumes**
  - The intersection of Princes Highway and Fowlers Road operates at an overall LoS F in the 2016 AM and PM peaks when upgraded to a four way signalised intersection.
  - This intersection will require further upgrades to accommodate increased traffic volumes.
  - The upgrade is required regardless of any future traffic generated by this development or other developments in the area.
- **2026 Traffic Volumes**
  - The intersection of Princes Highway and Fowlers Road operates at an overall LoS F in the 2026 AM and PM peaks when upgraded to a four way signalised intersection.
  - This intersection will require further upgrades to accommodate increased traffic volumes.
  - This upgrade is required regardless of any future traffic generated by this development or other developments in the area.

Public Transport

The TMAP has undertaken analysis on the impacts on the existing public transport network. The impact assessment is summarised as follows:

- *The 'business as usual' scenario results in a low volume of additional patronage, proportionate to the additional trips generated by the IIHP site, but does not achieve the State Government's objectives of reducing car dependence and increasing the sustainability of the transport network.*
- *Diversion of the present route 33 and 43 bus services to serve the site will be required, as will bus links to the West Dapto Urban Release Area as it develops.*
- *Given the low starting point, both from JTW mode share and service provision perspectives, a mode share target of 25% JTW trips by public transport, would require significant change and investment over the long term. A more realistic goal for JTW would be a mode share of approximately 5% to public transport.*
- *The bus network needs to be enhanced in order to increase the number of potential trip origin and destination combinations, improve travel flexibility and redundancy, improve travel time and integrate seamlessly with rail services. Similarly, rail services need to be increased to complement and seamlessly integrated with the bus network. These works are required regardless of whether the IIHP development proceeds, in order to increase JTW mode share in the Illawarra region as a whole.*
- *Construction of the proposed Huntley Railway Station, in conjunction with an upgrade of rail service frequency, would increase the attractiveness of the public transport network, not only for journeys to and from the IIHP site but also for other trips.*

Active Transport

The TMAP has drawn the following conclusions from the analysis of the future active transport desire lines and catchments:

- *Direct pedestrian and cycle links should be provided between the site and adjacent road network to maximise permeability and consequently catchment area;*
- *Provision should be made for pedestrians and cyclists travelling between the site and the Huntley Railway Station;*
- *Access for pedestrians and cyclists should be retained at the Avondale Road level crossing;*
- *Cyclist facilities should be provided along Avondale Road and Marshall Street to serve as the major connection to/from Dapto Sub-Regional Centre and to maximise permeability across the railway line;*
- *The primary movement corridors in the West Dapto Urban Release Area should provide off-road facilities to cater for pedestrians and cyclists;*
- *Major intersections adjacent to the IIHP site should be signalised to provide safe crossing opportunities for pedestrians and reduce the barrier effect of these roads; and*
- *Pedestrian crossing facilities should be provided to cater for the desire line between the hospital entrance and future development located on the southern side of Huntley Road.*

Sight Distance for Intersection

The site is located in between three roads. It is proposed to locate the access points along all the streets fronting the site. Each proposed location has been checked to ensure it will have adequate Safe Intersection Sight Distances (SISD) and Approach Sight Distance (ASD).

Measurements of SISD and ASD are in accordance with Australian Standard AS/NZS 2890.1:2004. **Table 6.3** outlines the required sight distances based on Avondale and Huntley Roads having a speed of 60km/hr and Goolagong Street having a design speed of 50km/hr

Table 6.3 – Sight Distances for the Intersection of Driveways

Sight Distance Criteria	Required SISD (m)	SISD Provided (m)	Required ASD (m)	ASD Provided (m)
Avondale Road / Huntley Road (60km/hr <4% Grade)	105	>105	60	>105
Goolagong Street (50km/hr <4% Grade)	80	>80	45	>80

Table 6.3 shows that the sight lines related to all the intersections meet requirements. However, there is one section along Huntley Road that has a sight distance slightly below 105m due to a batter located with the site. Once this batter is removed to allow for the Hospital construction the slight line will become greater then the 105m required.

Sight Distances to Pedestrians

Pedestrian traffic volumes have not been counted for the footpath area adjacent to the subject site. The development will meet AS/NZS2890.1:2004 requirements regarding 'sight lines for pedestrian safety' by providing adequate sight lines clear of obstructions. Note that all proposed driveways have sufficient flaring to maintain safe pedestrian sight lines.

6.6.4 Further Assessment & Mitigation

Section 8 of the TMAP report provides recommendations on the potential mitigation measures. The key recommendations that relate directly to the subject site have been incorporated in the Statement of Commitments.

6.7 Ecology

DGR's Requirements

Biodiversity

- *Assess and address any impacts of the development on flora and fauna, including potential indirect impacts such as water quality, and the management of these.*

An ecological assessment has been carried out by BES to assess the potential impacts of the proposed development. The full report is provided in **the separate volume** and the findings are summarised below.

6.7.1 Existing Conditions

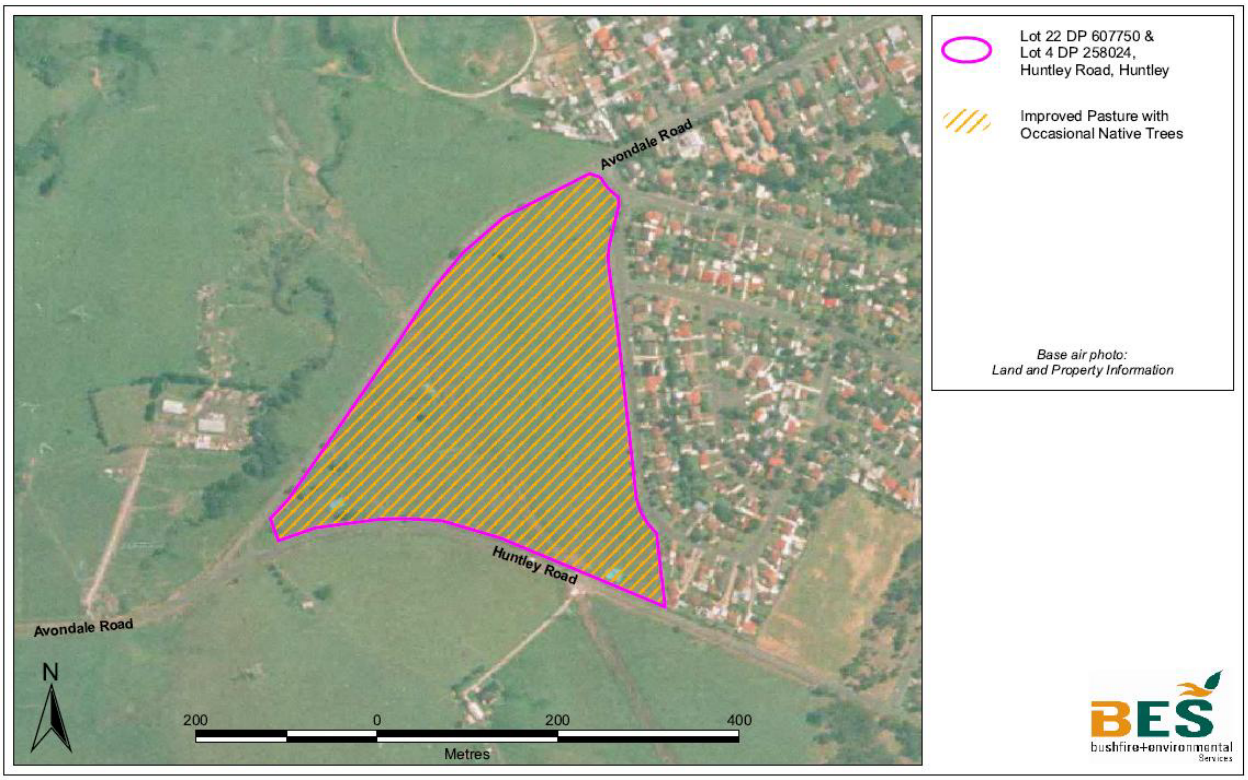
Disturbance

The study area is heavily disturbed with the original native vegetation having long been cleared for grazing and replaced by improved pasture. There are one or two remnant mature trees and a few regrowth native trees and shrubs scattered predominately in the western parts of the study area. The groundcover in the study area is dominated by common exotic pasture grasses, herbs and weeds and continues to be grazed.

Flora

BES found that the study area only supports one vegetation community, Improved Pasture with Occasional Native Trees, which covers the entirety of the study area as shown in **Figure 26**.

Figure 26 – Existing Flora Community



(Source: BES (2009))

A total of 43 flora species were identified within the study area by BES, including 34 exotic species and nine native species. These are documented in Table 3 of the BES report.

Fauna

BES found that the fauna habitats present in the study area are limited as a result of the level of disturbance, and are those generally associated with occasional remnant trees and introduced grasslands.

The study area contains foraging resources in the form of:

- a small amount of blossom associated with the scattered paperbarks;
- a few fleshy fruit-bearing plants i.e. Lantana and Privet;
- a reasonable abundance of seed and herbage for granivores and herbivores in association with the grassy groundcover; and
- a few flowering wattles.

The foraging resources within the study area are insignificant relative to the abundance of similar resources in the locality and would be utilised primarily by a range of common native and exotic fauna such as the common bird species. These species are identified in Table 4 of the BES report.

The foraging substrate provided by the exotic pastures would also include a range of insects and other invertebrates, common reptiles and amphibians that are likely to provide occasional foraging habitat for common native water birds such as the Masked Lapwing *Vanellus miles,* and White-faced Heron *Ardea novaehollandiae.* However, waterbirds that forage in swampy water-covered ground are unlikely to forage in the study area regularly given the absence of such habitats. The study area provides negligible resources for nectarvors and frugivores.