Huntingwood West
Transport Management and Accessibility Plan

Bungarribee Precinct, Western Sydney Parklands

Landcom

15 September 2006

MAUNSELL | AECOM

Transport Management and Accessibility Plan

Prepared for

Landcom

Prepared by

Maunsell Australia Pty Ltd
Level 11, 44 Market Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8295 3600 F +61 2 9262 5060 www.maunsell.com
ABN 20 093 846 925

15 September 2006

20018906.00

Quality Information

Document	Transport Management and Accessibility Plan
Ref	20018906.00
Date	15 September 2006
Prepared by	Jane Tyler
Reviewed by	Sigrid Sanderson

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	13/07/2006	Draft Report	Sigrid Sanderson Manager, Planning & Advisory	Original signed
B	18/07/2006	Draft Report	Sigrid Sanderson Associate Director, Planning & Advisory	Original signed
C	29/08/2006	Final Report	Sigrid Sanderson Associate Director, Planning & Advisory	Original signed
D	15/09/2006	Final Report – minor edits	Sigrid Sanderson Associate Director, Planning & Advisory	15/9/06

Table of Contents

Executive Summary

Maunsell has been commissioned by Landcom to prepare a Transport Management and Accessibility Plan (TMAP) for the Huntingwood West site. The Huntingwood West site falls within the Bungarribee Precinct Project for the Western Sydney Parklands development.

This report forms the second phase of the masterplanning process and follows earlier work undertaken by Maunsell to establish the existing position of the site and current traffic conditions in the area.

The site identified for development is currently mostly vacant land located between the Great Western Highway and the M4 motorway. There are a small number of dwellings on the site, inhabited by short lease tenants.

It is intended that this TMAP will form one of the supporting documents for a Masterplan being prepared by Architectus on behalf of Landcom. The TMAP will:

- Define the transport impacts stemming from development of the site; and
- Develop a package of measures that will assist in meeting the performance measures.

The recommendations of this study are reflected in the package of measures developed for the site which include:

- Provision of a vehicular site access at Brabham Drive/ Huntingwood Drive;
- Provision of a vehicular site access from the Great Western Highway to the west of Rudders Lane (including closure of Rudders Lane);
- Diversion of existing and/ or future bus services to call at the site;
- Provision of connections to the existing and proposed cycle network; and
- Workplace travel plans to promote sustainable travel.

1.0 Introduction

1.1 Study Purpose

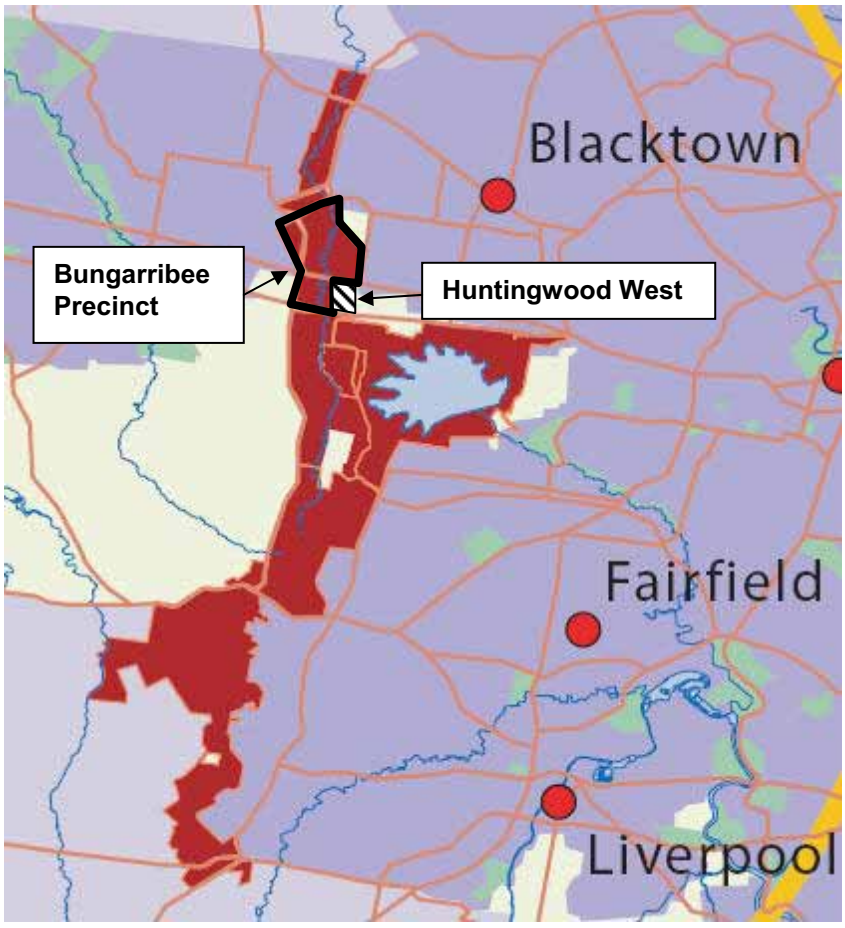
Maunsell has been commissioned by Landcom to prepare a Transport Management and Accessibility Plan (TMAP) for the Huntingwood West site adjacent to the Bungarribee Precinct within the Western Sydney Parklands.

This report has been prepared in accordance with guidelines for TMAPs to support a Part 3a application to the Department of Planning for rezoning of the site for commercial uses. This study builds on the Phase 1 analysis completed by Maunsell In January 2006, determining traffic issues that require consideration throughout the rezoning and master planning process and proposing appropriate mitigation measures for identified issues.

1.2 Background

Figure 1.1 illustrates the location of the Huntingwood West site in relation to the Bungarribee Precinct and the Western Sydney Parklands as a whole.

Figure 1.1: Location of the Site in Relation to Western Sydney Parklands



Source: DIPNR, 2004

Phase 1 of the study determined that the majority of the existing transport network performs at an acceptable level of service, with the exception of the Doonside Road / Great Western Highway

intersection. Over the next 15 years it is expected that the region surrounding the study area will experience significant growth, resulting in increased transport demands. This would have a considerable impact on the performance of the existing road network.

Key recommendations identified in Phase 1 of the study, include:

- Further investigations to be undertaken to identify mitigation measures for the intersections that are forecast to experience reduced levels of service in the future. Consultation should be undertaken with the NSW Government to confirm proposals for such intersection improvements;
- Access arrangements should be confirmed with the assistance of other team members to minimise conflicts with flora, fauna and / or heritage constraints;
- The Ministry of Transport should be consulted as the sites are planned;
- Opportunities to integrate the sites with adjacent cycle routes and pedestrian paths should be investigated and confirmed with relevant planning authorities;
- The constraints analysis will help to confirm the site yields, which will affect the traffic generation of the sites. Further traffic advice should also be provided into the site planning/master planning processes to ensure a high quality outcome; and
- Workplace travel planning principles should be considered for the Huntingwood West development.

Tasks undertaken in the preparation of this TMAP have addressed each of these recommendations.

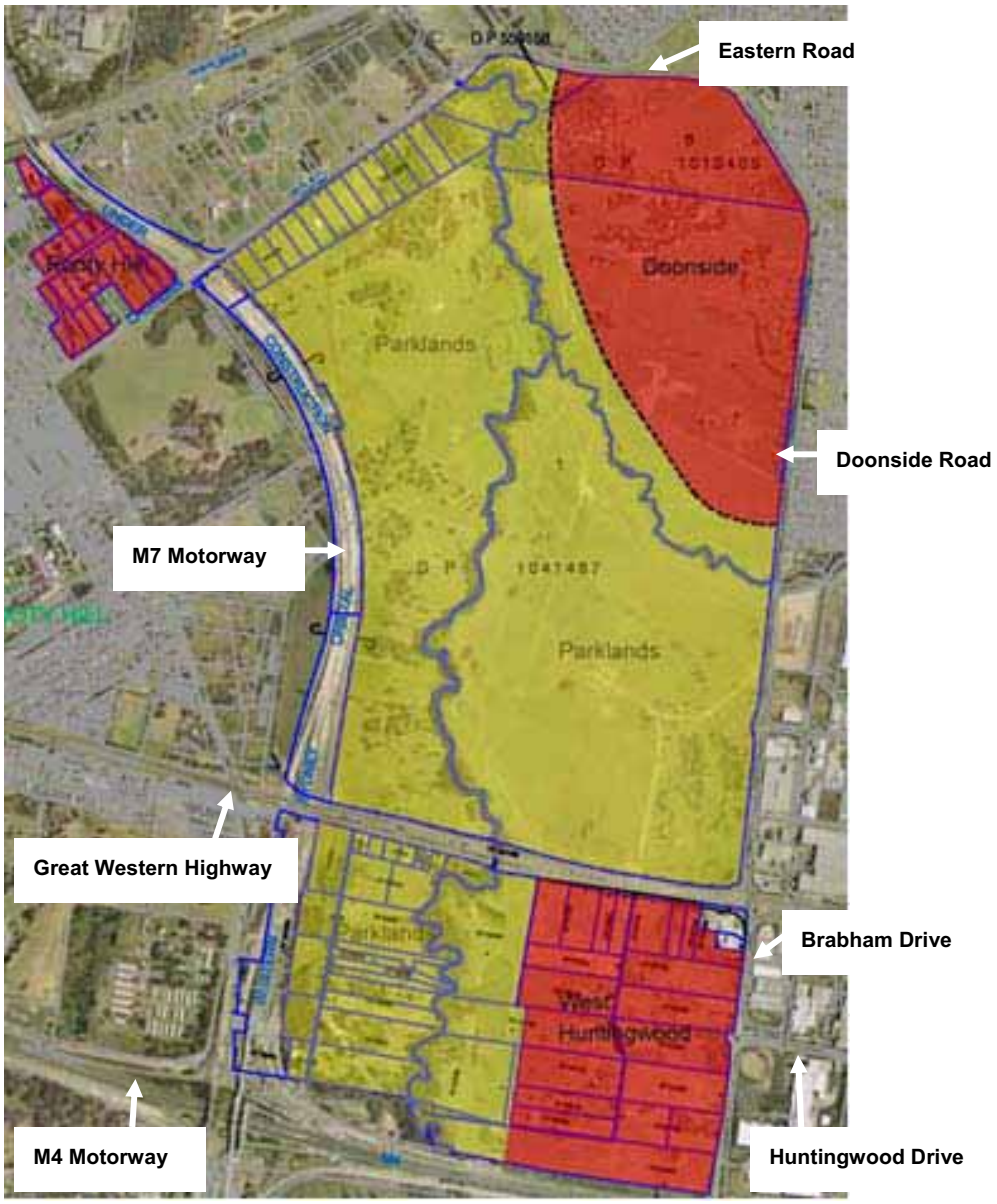
1.3 The Study Area

Figure 1.2 illustrates the position of the Bungarribee Precinct development sites relative to the surrounding transport network. The precinct is located in Blacktown LGA.

The Doonside residential site is to the north east of the precinct, bordered by Doonside Road and Eastern Road. Doonside rail station is the nearest heavy rail station and is approximately 1 kilometre walk distance from the centre of the site.

The Huntingwood West industrial site is to the south east of the site and is bordered by the Great Western Highway, the M4 Motorway and Brabham Drive. The site is in close proximity to the East Huntingwood industrial area which is located on the east side of Brabham Drive. The site is approximately 3.5 kilometres walk distance from Doonside rail station or approximately four kilometres from Rooty Hill rail station.

Figure 1.2: Location of the Site in Relation to the Local Transport Network



Source: Maunsell 2006

1.4 TMAP Process

This report forms the second stage of the TMAP process and is one of a series of supporting specialist studies being undertaken to support the development of a Development Control Plan.

The framework for TMAPs is defined as having six stages:

a) Project Context – outline the strategic context, set objectives and targets / performance criteria (**Sections 2 and 3**);

b) The Project – describe the site and proposed development (**Section 4**);

c) Initial Transport Assessment – outline technical assumptions and assess existing travel patterns (**Section 5**);

d) Transport Assessment of Proposal – estimate travel demand and mode split (**Section 6**), capacity/policy implications, testing of options (**Section 7**);

e) TMAP and Agreement – confirmation of the package of measures (**Section 8**), costing and apportionment (**Section 9**); and

f) Review of TMAP and Agreement – this stage follows at time of development application and at an appropriate future date (usually in the order of two years). This stage is beyond the scope of this study.

2.0 Strategic Context

2.1 Introduction

The strategic context of the study area is governed by three frameworks, being:

a) State and Regional planning policies;
b) Local planning policies; and
c) The local transport context.

This section provides an overview of the main aspects of each these frameworks and its relevance to the study area. A discussion of the objectives of the TMAP and targets / performance criteria is also provided.

2.2 State and Regional Context

Metropolitan Strategy

The Metropolitan Strategy for Sydney was released by the NSW Government in December 2005. *City of Cities — A Plan for Sydney's Future* is a broad framework for delivering strong and sustainable growth and to secure Sydney's place in the global economy.

The Plan is a strategic document that outlines a vision for Sydney over the next 25 years; the challenges we face, and the directions we will follow to address these challenges and to achieve the vision. It is the start of a process to bring the State Government, local government, stakeholders and the community together to discuss, review and then make decisions to guide the future of Sydney's economy, environment and communities

City of Cities — A Plan for Sydney's Future supports continuing economic growth while balancing social and environmental impacts. It is based on anticipated population, economic and demographic trends. The Plan has been developed with five aims that have been identified to achieve a more sustainable city. These are:

Enhance Liveability – by ensuring a diverse choice of housing for an ageing and changing population, close to services, while protecting the character of our suburbs and communities.

Strengthen Economic Competitiveness – strengthening Sydney's long–term economic prosperity by increasing the city's and region's competitiveness in globalised markets, and sharing the benefits across the city.

Ensure Fairness – providing fair access to jobs, services and lifestyle opportunities by aligning services close to where people live, and by providing access to high quality transport.

Protect The Environment – protecting Sydney's unique environmental setting and reducing the city's use of natural resources and production of waste.

Improve Governance – improving the quality of planning and decision making, and giving the community confidence in its institutions.

The Strategy includes priorities for planning and responsibilities of each level of Government, including investment priorities and a context for decision-making by Local Government and the private sector. The Strategy is not a single policy document, but rather a dynamic action strategy based on a series of key directions – including the announced Land Releases in North West and South West Sydney, Centres Renewal, Key Corridor Revitalisation Plans (Parramatta Road, Sydney Airport – CBD), Metropolitan Water Plan, Rail Clearways and Bus Reform.

Funding is integral to the planning of the new metropolitan strategy. The Government is committed to identifying innovative sources of funding to pay for the infrastructure required to support the growth of the region. The funding and apportionment of the package of measures identified through this TMAP process is discussed in more detail in **Section 9**.

The systematic release of land in the South West and North West growth centres aims to increase the quality of the growth areas by encouraging a mix of land uses and hence improving the accessibility of residents to amenities and employment. This in turn would contribute to achieving ecologically sustainable development (ESD) objectives.

The proposed planning for these release areas proposes to provide:

- Improved public transport, including frequent buses linking with the rail system. Proposals in the North West sector include the duplication of the Richmond railway line to Schofields, which will commence in the first five years of the release of the Metropolitan Strategy;
- A range of land uses to provide the right mix of houses, jobs, open and recreational space and green spaces;
- Easy access to major town centres with a full range of shops, recreational facilities and services along with smaller village centres and neighbourhood shops;
- Employment opportunities available locally and within the region, reducing the demand for transport services into the Sydney CBD and reducing travel times;
- Streets and suburbs, which are planned so that residents can walk to shops for their daily needs;
- A wide range of housing choices to provide for varying needs and incomes. Single residential dwellings on their own block of land will be provided as well as smaller, lower maintenance homes, units and terraces for older people and young singles or couples; and
- Conservation land in and around the development sites will help to protect the region's biodiversity and provide clean air for Western Sydney.

Rail Clearways Plan

The Rail Clearways Plan is a NSW Government initiative to improve the reliability of the CityRail network. The program of works to separate Sydney rail routes into five clearways will be completed by 2010 at an estimated cost of one billion dollars. By removing the congestion in the network that causes delays, CityRail will be able to operate more reliable and frequent services with reduced passenger crowding, with the capacity to increase services as demand grows into the future.

As mentioned within the Metropolitan Strategy summary, a specific project that may benefit passengers travelling on the Western Line and catching a train from Blacktown, Doonside or Rooty Hill is the Quakers Hill to Schofields duplication. The Western Line Richmond branch is a single track route and therefore suffers congestion. A double track will be constructed by 2010 to improve reliability and reducing passenger crowding.

Action for Bikes

Action for Bikes 2010 was released in September 1999 as an accompanying document to Action for Transport 2010. Action for Bikes seeks to increase levels of cycling in Sydney through a four step plan that includes improving the bike network, making it safer to cycle, improving personal and environmental health, and raising community awareness.

A key innovation of Action for Bikes is the development of rail trails, such as the Liverpool-Parramatta rail trail, by the RTA in co-operation with rail agencies.

Draft SEPP 66: Integrating Land Use and Transport

The release of a draft State Environmental Planning Policy (SEPP) on integrated land use and transport planning in 2001 is indicative of the Government's heightened focus on this issue. It is likely that increasing densities, providing public transport, walking and cycling infrastructure and developing travel demand management programs will be critical in the delivery of the Metropolitan Strategy.

The policy represents an integrated approach to urban management and transport planning and is particularly relevant to the future development of the Bungarribee Precinct. The package emphasises the importance of effectively integrating land use and transport planning in order to improve urban environments.

Review of Bus Services in New South Wales ('Unsworth' Review)

The stated objective of the Unsworth Review was "to examine, and make recommendations to improve, the provision of bus services in New South Wales."

The main outcomes of the Review were recommendations for changes to bus operations and licensing (bus reform), contract boundaries and a network of strategic corridors between Centres. The strategic routes will be 'fast, frequent, direct, convenient' links to regional centres. Bus priority measures are suggested to reach these goals but are subject to benefit / cost analysis.

Four routes were included to link Blacktown to other major centres as follows:

- 1 Penrith – Blacktown (northern route)
- 2 Penrith – Blacktown (southern route)
- 3 Blacktown – Castle Hill
- 4 Blacktown – Parramatta

Route 2 may pass the Huntingwood West site via Brabham Drive and Huntingwood Drive, although the final location of the strategic corridors will not be finalised until patronage modelling has been completed by the Ministry of Transport and consultation with Councils and the community has been undertaken. This is scheduled for 2007/8.

State Infrastructure Strategy

The State Infrastructure Strategy marks a new direction for the planning and delivery of infrastructure in the next 10 years for New South Wales's six broad regions — Sydney, the Central Coast, the Hunter, the Illawarra and the South East, the North Coast and Inland New South Wales.

In the 2006-07 financial year, the New South Wales Government will invest almost $10 billion in infrastructure, 32% of which will be transport related. Over the next four years it will increase the State's capital spend by 45 per cent over the previous four years. This record investment is about delivering infrastructure for New South Wales that sets it up to manage its projected population growth. The Strategy is explicitly designed to meet the growing demand for infrastructure, which will remain at very high levels over the next decade as the population grows.

The State Infrastructure Strategy also marks a new direction by linking the four year Budget cycle and the 25 year regional plans, including the Sydney Metropolitan Strategy. Furthermore, the integrated nature of this Strategy will allow the private sector, public sector agencies, local councils and the wider community to make decisions based on the NSW Government's priorities and timing for major infrastructure projects.

These infrastructure priorities illustrate the connections between infrastructure planning and long–term planning strategies, including:

- Sydney Metropolitan Strategy — City of Cities;
- A Plan for Sydney's Future;
- Metropolitan Water Plan 2006;
- North West and South West Growth Centres; and
- Draft Regional Strategies for the Far–North Coast, Lower Hunter and the South Coast.

2.3 Local Planning Context

Historical Development

The Western Sydney Parklands encompass the former Eastern Creek, Horsley Park and Hoxton Park open space / special uses corridors, identified in the Sydney Region Outline Plan (SROP) of 1968. The SROP predicted that the required amount of open space would triple by the end of the century, which led to a significant program to acquire 15,000 hectares of open space in Sydney.

In 1974 the boundaries of the Eastern Creek and Hoxton Park corridors were confirmed and controls on the lands in local planning schemes were introduced. The Department of Planning and its predecessors were given the responsibility to acquire the parklands, which would provide a physical break from surrounding development. The parklands were acquired for environmental protection and for major public utilities and special uses in Western Sydney.

By 1978 about 70 percent of the Western Sydney Parklands corridor was publicly owned. In 1989 the area around Eastern Creek was gazetted under State of Environmental Planning Policy (SEPP) No. 29 - Western Sydney Recreation Area, which led to the approval of Eastern Creek Raceway. A number of sporting facilities are located within the parklands, which were constructed for the 2000 Sydney Olympic Games, for the rowing, shooting, equestrian, baseball, softball and mountain biking events.

The Sydney Regional Environmental Plan (SREP) No. 31 was in produced in response to the sudden residential development encroaching on the boundaries of the parklands' corridor. SREP 31 considers issues associated with balancing and evaluating development within the parklands, providing the framework to balance the wide range of land use objectives.

SEPP 59 and the Major Projects SEPP

The Bungarribee Precinct of the Western Sydney Parklands is located adjacent to the Western Sydney Employment Hub. The hub was the subject of State Environmental Planning Policy 59 (SEPP 59) but is in the process of absorption to the Major Projects SEPP following an announcement by the Department of Planning in December 2005. The purpose of the Major Projects SEPP is to consolidate planning for growth in the areas adjacent to the M4 Motorway and M7 Motorway.

The Western Sydney Employment Hub will include 10 precincts of varying size as shown in **Figure 2.1**:

- 1: Former Wonderland Precinct (59ha, 3,000 jobs);
- 2: Eastern Creek Precinct (645ha, 12,000 jobs);
- 3: Huntingwood Precinct (76ha, 1,000 jobs);
- 4: The Raceway Precinct (26ha, 350 jobs);
- 5: Huntingwood West (61ha, 750 jobs);
- 6: Ropes Creek Precinct (190ha, 1,600 jobs);
- 7: Erskine Park Employment Area (500ha, 5,000 jobs);

- 8: Lands South of the Sydney Water Pipeline (656ha, 8,000 jobs);
- 9: Quarantine Station (22ha, 300 jobs); and
- 10: Greystanes Employment Lands (215ha, 4,000 jobs).

Precinct 5: Huntingwood West is the subject of this TMAP. Details of Precincts 3, 4 and 9 are included in this report at **Section 2.4** and **Section 7.2**.

Figure 2.1: Key Sites in Western Sydney Employment Hub

Source: NSW Department of Planning, 2005

State of the Environment

Blacktown Council has developed a State of Environment Plan, which is aimed to contribute Corporate Management Plans via a "Priority Action Table" summarising the major actions for Council.

Actions identified in the Priority Action Table that are relevant to this study include:

- Implementation of the *Eastern Creek Land Use and Employment Study*, which includes industry attraction and developing strategic partnerships with relocating industry;
- Inclusion of transport-related actions in Council's Blacktown Greenhouse Action Plan;
- Working with the Department of Planning to develop a regional plan for Western Sydney;
- Monitoring future development of the Blacktown LGA and align this development with the principles of Ecologically Sustainable Development (ESD);
- Working with the Western Sydney Regional Organisation of Councils (WSROC) to develop a Greater Western Sydney Regional Planning Framework;

- At Stage 1 of the development of an integrated transport plan, review component of Metropolitan Strategy that relates to public transport options such as cycle paths and pedestrian access with traditional transport modes;
- Continue to monitor the impact of construction of the Westlink M7 on the existing transport network and local communities; and
- Continue to monitor the impact of construction of the T-Way Network on the existing transport network and communities.

Local Land Release Areas

In December 2004, the State Government released an innovative plan, which outlines the future of land releases in the North West and South West of Sydney. For the North West Sector, the plan proposes 60,000 dwellings to be released over the next 25 to 30 years.

As a consequence of Bringelly and North West Sector release areas, the population surrounding the study area would increase by approximately 400,000 residents. The demographics of the projected population would comprise a large proportion of young people and children. Therefore there would be a growth in demand for recreational and sporting parklands facilities in the area.

2.4 Previous Planning

Eastern Creek Precinct Local Traffic Study – ARUP, July 2005

The Eastern Creek Precinct is identified in SEPP 59: Central Western Sydney Economic and Employment Area for the purpose of establishing new employment land to promote economic growth in the area. The precinct is split into the following stages of development.

- Lot 11: Approximately 58 hectares of land comprising the former Sydney Wonderland site.
- Stage 1: Approximately 28 hectares of land adjacent to Wallgrove Road and Wonderland Drive.
- Stage 2: Approximately 12 hectares of land located to the east of the Stage 1 and Lot 11 sites.
- Stage 3: Approximately 598 hectares of land bounded by the M4 Motorway to the north, Stages 1 and 2 to the east, the Sydney Water Supply Pipeline to the south (including Austral Bricks) and the subject site to the west.

Blacktown City Council commissioned consultants ARUP to undertake a traffic study for the Eastern Creek sites so that the impact of development of the entire precinct could be understood.

A traffic model was constructed to develop a road network that could manage the large volumes of traffic that will be generated by the site.

The Eastern Creek site is identified as Precincts 1 and 2 within **Figure 2.1**.

East Huntingwood Transport Management and Access Plan – SKM, October 2004

The Huntingwood Precinct is bordered by the Great Western Highway, the Western Motorway (M4), Brabham Drive and designated parklands to the east. This area is designated under SEPP 59.

A portion of the precinct (known as Huntingwood Estate) has already been developed as a light industrial area, with a significant proportion of distribution warehouses and some offices. The 76 hectare eastern portion of the precinct is still to be developed as an industrial area.

Consultants SKM developed a Traffic Management and Access Plan for the site and considered that it would likely generate 630 trips in the morning peak hour. The TMAP reports the results of a NETANAL

model which distributed traffic across the road network in the vicinity of the site. The model indicates that the majority of traffic from the site would be distributed to the regional road network via the M4 Motorway and to Blacktown City Centre via Reservoir Road, Flushcombe Road and the Prospect Highway. Minimal traffic is expected to travel in the vicinity of the Huntingwood West site.

The East Huntingwood site is identified as Precinct 3 within **Figure 2.1**.

Erskine Park Employment Area DCP and Section 94 Plan

Erskine Park Employment Area covers a gross area of 540 hectares and a developable area of 276 hectares. Erskine Park Employment Area is bounded by Erskine Park residential area and transmission lines to the north, Ropes Creek to the east, the Water Supply Pipeline to the south and Mamre Road to the west.

It is anticipated that an ultimate employment target of between 6,000 to 8,000 jobs will be met when the area is fully developed between 2016 and 2021. The Development Control Plan and Section 94 Contributions Plan for Erskine Park came into force on 3 January 2003. In 2003, Council approved the first development applications on the estate including subdivision, road access construction and the first industrial building.

Erskine Park Employment Area is zoned for employment generating development located with easy access to the M4 Motorway and M7 Motorway. Planning of the site has also made provision for an arterial link through the estate linking the estate to SEPP 59 lands and to the proposed Westlink M7. The strategy for the provision of the proposed link road is referred to as the 'Lenore Road Link'.

Other committed developments in the vicinity of the Huntingwood West site have not yet completed traffic and transport studies, such as the Investa development near the Raceway.

The Erskine Park site is identified as Precinct 8 within **Figure 2.1**.

3.0 The TMAP

3.1 TMAP Objectives

There are no set performance measures that need to be achieved through the TMAP process. However, to date TMAPs have tended to include a mode shift target because, despite the limitations of this indicator, it is able to be monitored through the five yearly census data. In line with NSW Government policy, the objectives of the TMAP include:

- Providing an integrated transport network between modes and land uses;
- Providing a choice of travel mode by developing a comprehensively accessible transport network;
- Providing a safe and secure transport network;
- Providing a system that is efficient and equitable;
- Providing a system that is sustainable;
- Supporting the local economy; and
- Providing a healthy environment.

The TMAP objectives are compatible with Landcom's Sustainability Policy, which aims to:

- Deliver sustainable quality of life
- Conserve resources
- Protect biodiversity; and
- Minimise pollution.

The TMAP objectives are consistent with the wider planning context, for example, the Metropolitan Strategy, which does not set any travel targets but does support reduced car travel.

Consideration of the following factors in peoples' travel choice is crucial to successfully reaching these objectives:

- The availability of alternative modes;
- The competitiveness of public transport against private car travel;
- Local accessibility to non-car modes;
- Quality of the pedestrian environment; and
- The availability of parking.

3.2 Targets / Performance Criteria

To monitor the success in reaching the TMAP objectives, suitable performance indicators and targets must be formulated. Suitable performance indicators may include service delivery, local accessibility and competitiveness of public transport. Targets for these indicators would assist in meeting the recommendations of Government policy, but that some form of mode shift target should also be established together with a recommendation of suitable intersection performance.

Service Delivery

In July 2004, the Ministry of Transport replaced the 1991 Minimum Service Level (MSL) requirements with Service Planning Guidelines. The July 2004 guidelines have been updated and were re-released in June 2006. They will be subject to further ongoing periodic reviews.

The Service Planning Guidelines reflect the NSW Government focus on delivering an integrated network of bus services that utilise strategic corridors. The guidelines are also intended to enable greater flexibility for operators to target resources at existing and potential demand, and allow the

provision of flexible 'demand responsive' routes and timetables for services in low demand area and at low demand times.

In terms of coverage, 90 percent of households should be within 400 metres of a bus route or rail station during commuter peaks and day times. During night-time periods 90 percent of households should be within 800 metres of a bus route or rail station. For the ten percent of households not serviced by regular route services or areas without sufficient patronage to sustain 60-minute frequencies, flexible alternatives may be considered. There are no guidelines for coverage for places of employment, however, it is reasonable to set the same target as for households.

Target: 90 per cent of businesses within 400 metres of a bus route

Local Accessibility

Local accessibility can defined as a permeable network. An appropriate target for local accessibility is to aim for 85 percent of residents to live within an actual 400-metre walk distance of a public transport stop, rather than a 400-metre 'crow-fly' distance. It is recognised that people are prepared to walk further than 400 metres to a public transport services, but that they tend to dislike walking as far as 400 metres from a public transport stop.

Target: 90 per cent of businesses within 400 metres of a bus route

Competitiveness of Public Transport

A review of the strategic modelling undertaken by Maunsell in support of the mode choice modelling in this study suggests that travel speeds for car journeys are likely to increase over the next ten years as congestion increases across the metropolitan area.

Target: Maintain bus journey times with priority measures

Mode Split Target

The existing mode split proportions of commercial areas surrounding the site are a fair indication of the likely travel characteristics if commercial land uses were developed with no additional transport infrastructure.

Although freight transport and trips by employees and visitors through the day are not represented, the journey to work mode split is a clear indicator from the Census that can be used to monitor progress towards a target of reducing car use.

Journeys to work will be a significant proportion of daily travel to the site and progress towards reducing demand on transport networks will benefit the movement of freight and other commercial needs.

Target: 10% mode shift from car (as driver).

Road Network Performance Targets

The capacity of an urban road network is controlled by the capacity of the intersections within that network. Average delay is commonly used to assess the actual performance of intersections, with Level of Service used as a simple index. A summary of the Level of Service index is shown in **Table 3.1**.

Table 3.1: Level of Service Criteria for Intersections

Level of Service	Average Delay / Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity; requires other control mode
F	>70	Roundabouts require other control mode	At capacity; requires other control mode

Source: Guide to Traffic Generating Developments, RTA 1993

Level of Service D is accepted by the RTA as an absolute minimum design criteria. However, the RTA also use capacity constraint as a demand management technique. That is, additional capacity at intersections is not provided at certain intersections to dissuade drivers from that route.

Target: It is recommended that intersections in the range of influence around the precinct are ameliorated to the Level of Service prior to development, where the development decreases the Level of Service of D or below.

Freight Movements

A high proportion of heavy vehicles within general traffic volumes reduce capacity of the roads and intersections. Reducing the number of freight vehicles using the road network, reduces the freight vehicle kilometres and therefore fuel use and greenhouse emissions.

Target: Design site accesses and internal roads to accommodate B-doubles.

4.0 The Project

4.1 Overview

This section provides a brief description of the development proposal considered in this assessment.

Two sites have been identified as being suitable for development within the Bungarribee Precinct: Doonside, for residential uses and Huntingwood West, for commercial uses. The results of constraint studies have been consolidated by Architectus, the sites' masterplanners, resulting in the following approximate developable areas:

- Doonside - 55 hectares
- Huntingwood West - 56 hectares

This TMAP considers the commercial site at Huntingwood West. The Doonside residential site is considered as a committed development. The commercial site masterplan has been developed by Architectus as a concept plan without predetermining the actual commercial business types that may use the site. The development yield is not known and trip generation estimates in **Section 5** rely on the typical trip rates of 15 trips per developable hectare, suggested to be appropriate by Blacktown Council during consultation for this study.

The main access to the site is via the Brabham Drive roundabout. A secondary access is proposed from the Great Western Highway. **Figure 4.1** illustrates the concept plan 'Option 3 – Small Lots' devised by Architectus.

Figure 4.1: Huntingwood West Concept Plan

Source: Architectus 2006

At the detailed design stage, Austroads Turning Path Templates (2006) should be used to determine adequate swept paths for trucks that will serve the industrial site at Huntingwood West. A preliminary examination of the aerial photograph of Blacktown using the templates suggests that the existing Huntingwood estate has been designed to accommodate B-doubles and the Brabham Drive access roundabout will accommodate a B-double travelling between five and 15 kilometres per hour. The site is bordered by B-double permit routes.

5.0 Initial Transport Assessment

5.1 Introduction

This section provides a more thorough review of existing transport conditions in the study area. It considers the analysis undertaken by Maunsell in 2005 which has been updated to include post M7 opening conditions.

5.2 Walking

Pedestrian facilities within the study area are limited due to the rural nature of the area, however facilities are provided throughout the surrounding outer areas. The majority of roads bordering the Bungarribee Precinct have paved footpaths on at least one side of the roadway suitable for all users, including Eastern Road (shown in **Figure 5.1)**, Knox Road, Great Western Highway, Doonside Road, Rooty Hill Road and Bungarribee Road.

Figure 5.1: Existing pedestrian pathway in Doonside (Eastern Road looking west)

Source: Maunsell, 2005

In locations where a paved footpath has not been provided a clear and compacted grassed area is available for pedestrians to walk along in a reasonably safe manner as shown in **Figure 5.2.**

Figure 5.2: Non-paved pedestrian pathway (Brabham Drive)

Source: Maunsell, 2005

The signalised intersections surrounding the study area provide pedestrian crossing facilities on the majority of the junction legs enabling safe crossing of the roadway.

The three roundabouts located north of the Doonside (residential) release area at Eastern Road/Knox Road; Eastern Road/Doonside Road; and Doonside Road/Bungarribee Road have limited pedestrian crossing facilities, besides the median(s) provided at each of the junction legs. The limited provision of pedestrian crossing facilities in this area is of some concern in providing (and promoting) a safe walking environment between the proposed development areas and the existing surrounding facilities.

5.3 Cycling

As shown in **Figure 5.3** there are an increasing number of cycle facilities in the Blacktown area, with a recent 50/50 funding agreement with the RTA. Blacktown City Council commissioned a review of the 1994 bike plan for the City of Blacktown in 2002 to determine cyclists needs and priorities for action. The Department of Planning are involved with cycle route development in the area, with the planning of a recreational trail within the Western Sydney Parklands.

Cycle paths leading towards the study area include:

Regional Routes:

- M4 Motorway
- M7 Motorway

Existing Recreational Route

- Nurragingy Recreation Area

Long Term Recreational Routes

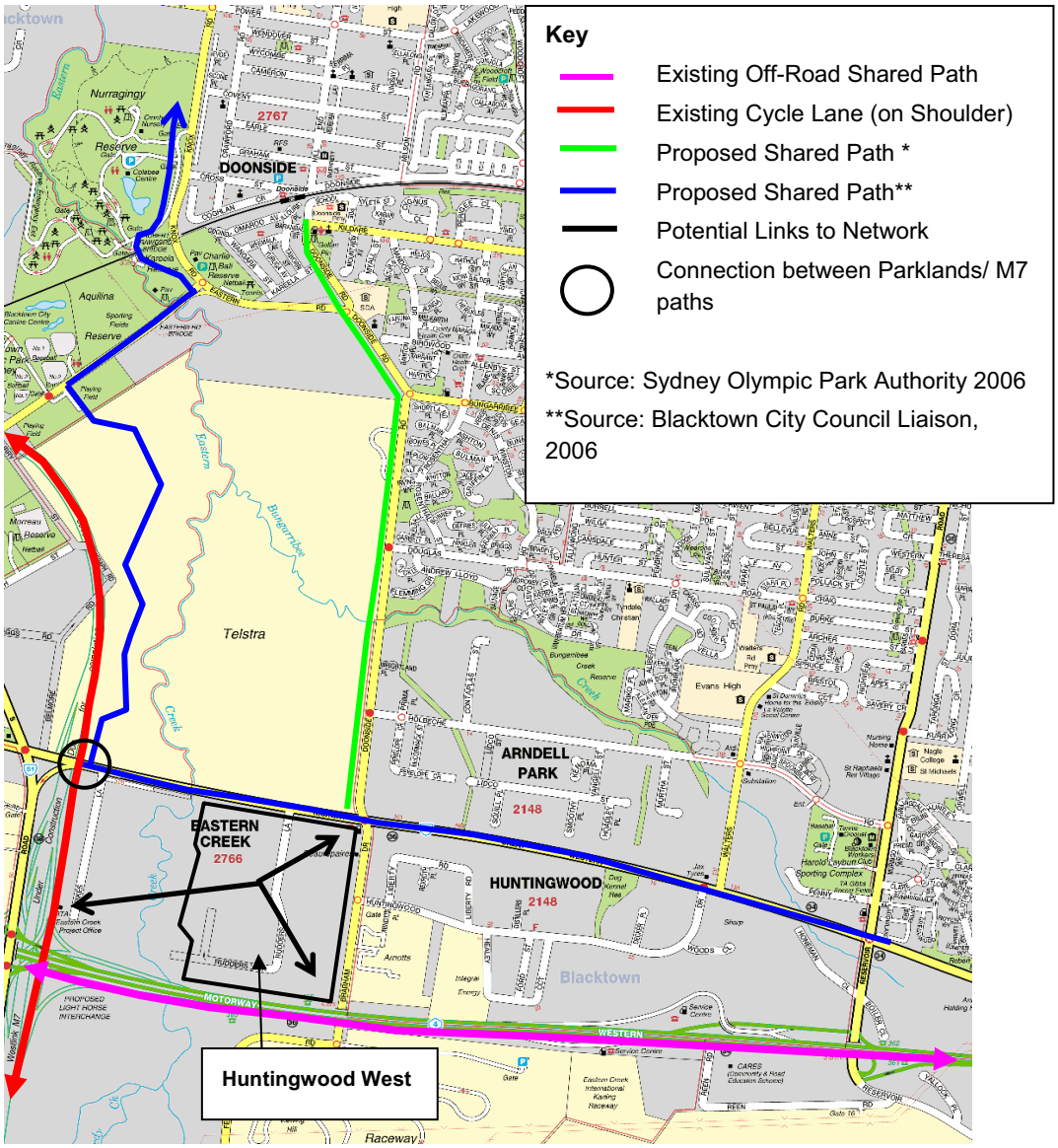
- Eastern Creek between Great Western Highway and Richmond Road. This route links to another cycle route which provides access to the Parklands north-east of Douglas/Doonside Road and Featherdale Wildlife Park.
- Western Sydney Parklands recreational trail

Other Proposed Routes

- Blacktown Council plans to implement a shared path running from Doonside rail station to the Huntingwood industrial areas.

The RTA has also developed a 10-year bicycle plan 'Action for Bikes – Bike Plan 2010, NSW[1]' to be completed in 2010. A proposed route that may provide a connection within the vicinity of the study area is the Penrith-CBD Rail Trail (proposed completion year 2010).

Figure 5.3: Cycleway Network



Source: Maunsell, 2006

[1] September 1999

Bike lockers are provided near the railway stations, similar to that shown in **Figure 5.4** at Doonside station. The number of lockers is limited, however their provision does promote and facilitate patrons who live within the area to cycle to the train station.

Figure 5.4: Bike lockers at Doonside Railway Station

Source: Maunsell, 2005

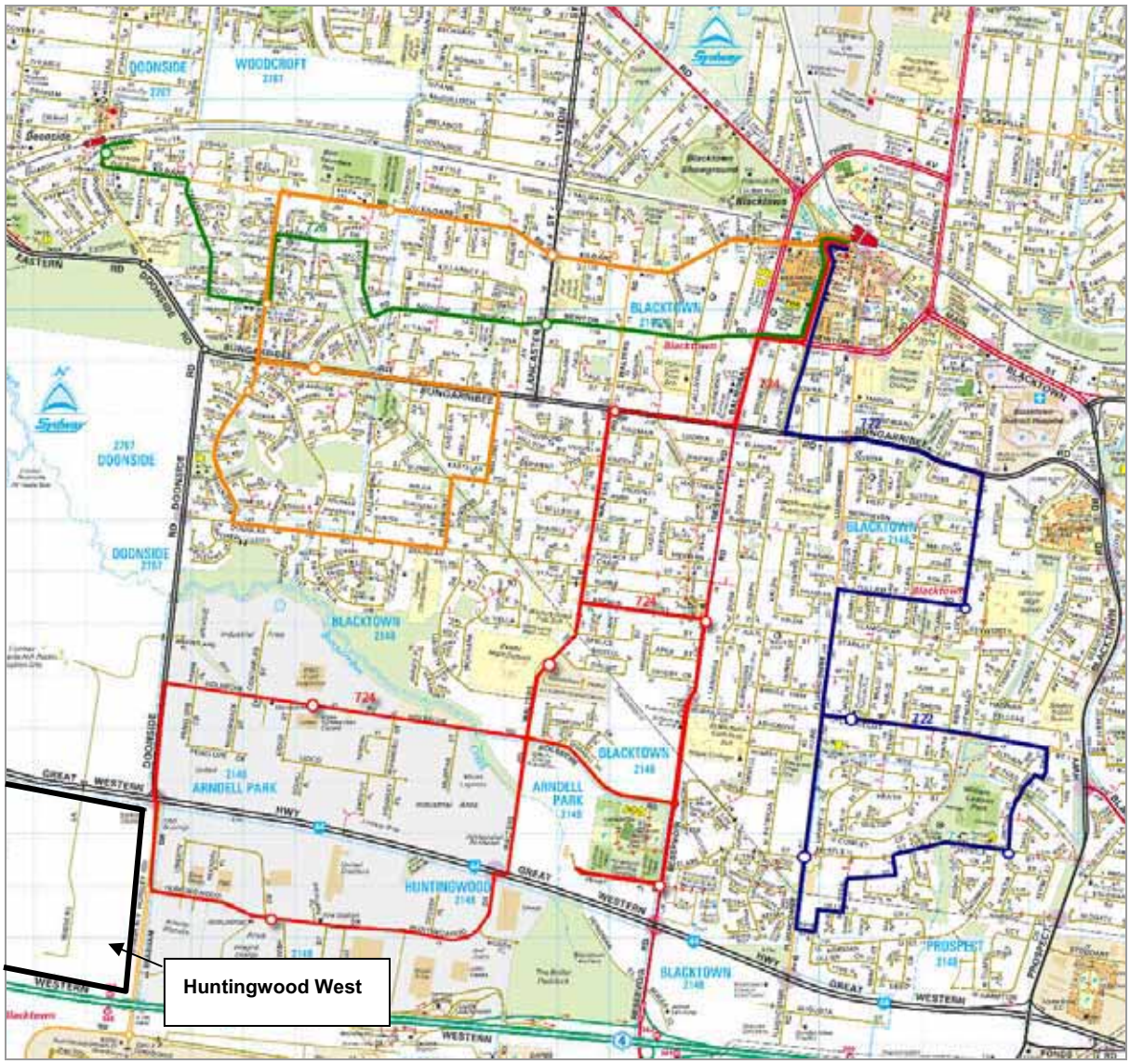
5.4 Bus Services

Bus services to the Bungarribee Precinct are currently limited to roads that either run along sections of the Parklands Boundary or the surrounding road network.

Buses form a very small proportion of travel within the surrounding study area at around 2% of total Journey to Work movements.[2] Services in the area are predominately provided by Busways. Several services are provided to the east of the study area within the Huntingwood and Blacktown suburbs as shown in **Figure 5.5** and to the west within the Rooty Hill suburb as shown in **Figure 5.6**.

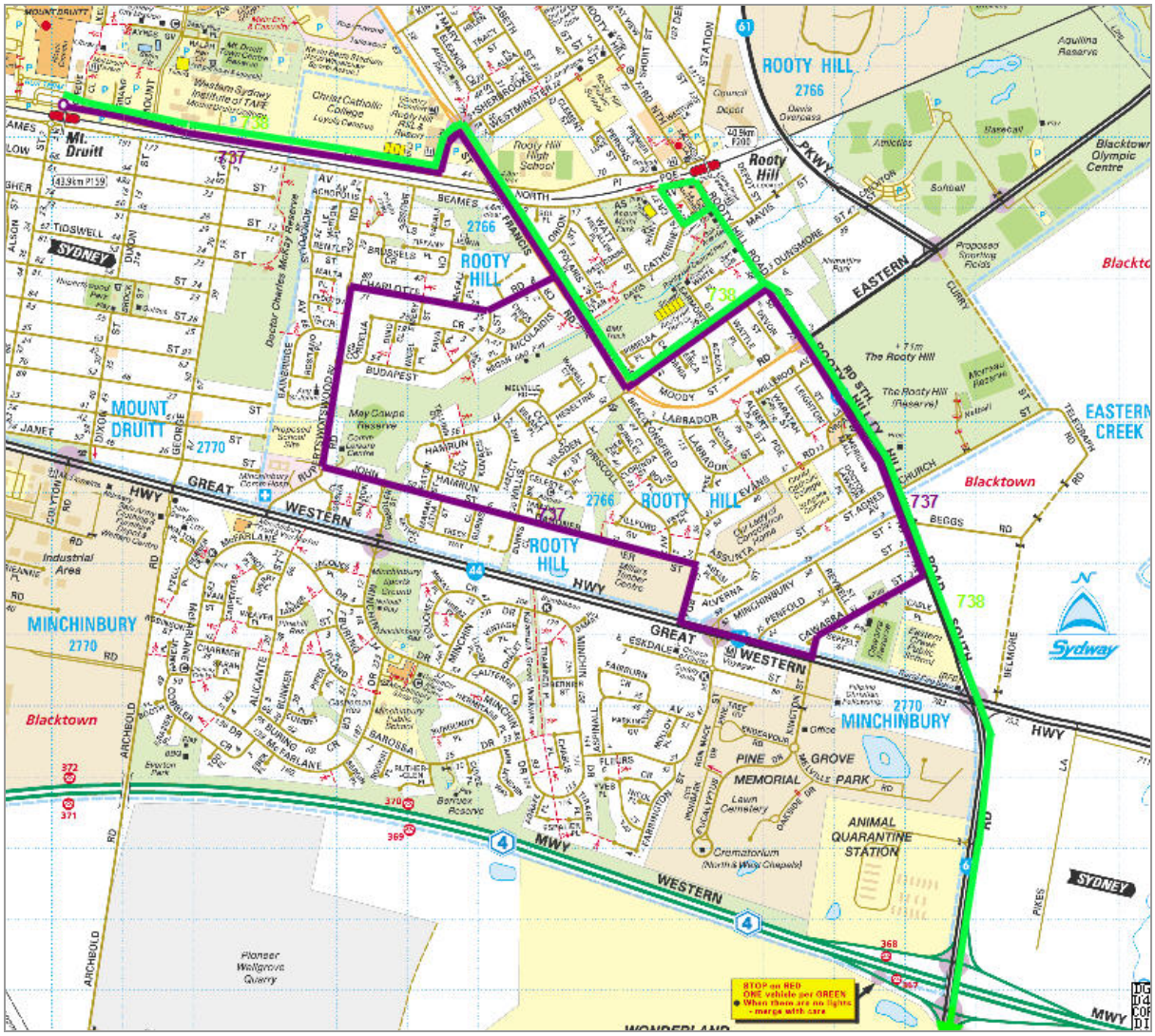
[2] 2001 Journey to Work Data, Blacktown South East and Blacktown South West SLA

Figure 5.5: Bus Routes east of the Study Area



Source: Maunsell, 2005 (from Busways, September 2005)

Figure 5.6: Bus Routes west of the study area



Source: Maunsell, 2005 (from Busways. September 2005)

Table 5.1 provides a summary of the bus services, including route and peak and off-peak frequency. Services terminating at stations are timed to meet respective train services. Weekend services are more limited. There are currently no bus priority measures along the road network surrounding the study area. Service 724, the closest route to the Huntingwood West site, is highlighted.

Table 5.1: Bus Routes Servicing Western Sydney Parklands

Number	Route	Weekday Peak Frequency	Weekday Off-Peak Frequency	Sat / Sun Pub. Hol. Frequency
722	Blacktown to Prospect	16	30	30
724	**Blacktown to Arndell Park**	**25 - 30**	**30**	**30**
725	Blacktown to Doonside (Douglas Road)	15	30	30
726	Blacktown to Doonside Station via Monash Road	30	60	60
737	Mt Druitt to Eastern Creek via Rooty Hill (loop)	30	30	60
738	Mt Druitt to Eastern Creek Industrial Park	Irregular Services		Nil

Source: Busways, April 2006

5.5 Rail Services

Rooty Hill and Doonside stations are located relatively close to the Huntingwood West site and although they may be beyond walking distance for some employees, they are well within typical cycle distances. Rooty Hill station is located approximately four kilometres north-west of the Huntingwood West site near the Rooty Hill Road/ Eastern Road intersection. Doonside station is located approximately 3.5 kilometres from the site near the Doonside Road/ Eastern Road intersection. Blacktown station is accessed via the 724 feeder bus service.

CityRail services to the study area are provided by the Western Line, which terminates at Emu Plains. A summary of currently timetabled CityRail services connecting Mount Druitt, Doonside and Blacktown stations to the city during the morning peak period is shown in **Table 5.2**, while the average frequency of rail service to each of these stations can be gauged from **Table 5.3**.

Table 5.2: AM Peak City-bound Rail Service Arrival Times (0700 to 0900 Hours)

→ Direction of Travel →			
Mount Druitt	**Doonside**	**Blacktown**	**Central**
7:01	7:07	7:12	7:53
7:13	-	7:21	7:56
7:27	-	7:35	8:11
7:12	7:18	7:23	8:14
7:31	7:37	7:43	8:23
7:44	-	7:52	8:26
7:53	-	8:01	8:41
7:42	7:48	7:53	8:44
8:02	8:08	8:13	8:56
8:14	-	8:22	9:00
8:11	8:17	8:23	9:14
8:33	8:39	8:44	9:26
8:42	8:48	8:53	9:44
9:16	9:22	9:28	10:13

Source: www.cityrail.info, April 2006

Table 5.3: Summary of AM Peak Period Rail Amenity

Station	Mount Druitt	Doonside	Blacktown	Central
Number of services 0700-0800	6.5	4	6.5	5.5
Average time between services	12 minutes	14 minutes	8 minutes	9 minutes

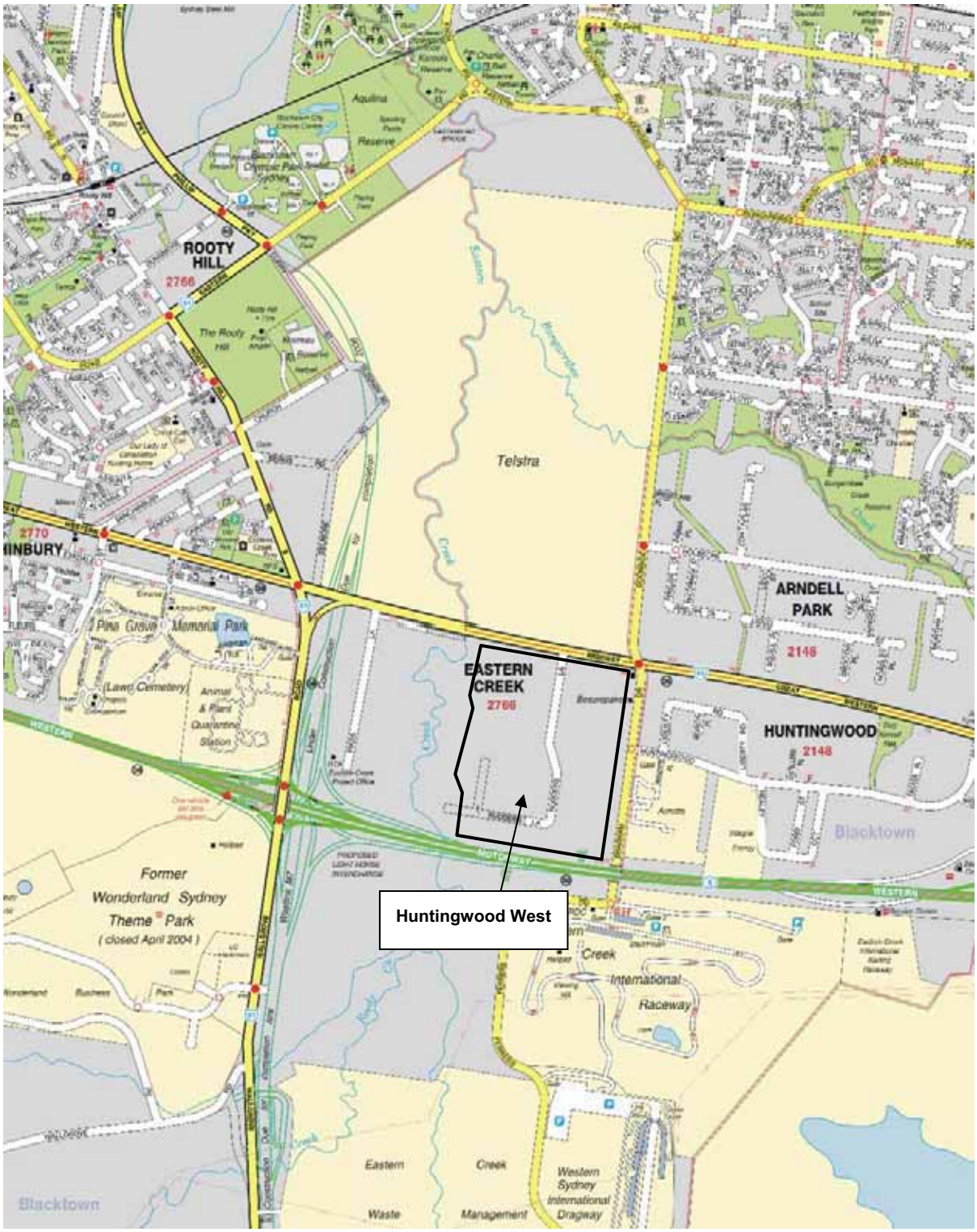
Source: www.cityrail.info, April 2006

5.6 Road System

5.6.1 Local Roads

The nearest public roads to the site include Doonside Road, Brabham Drive to the east, Eastern Road to the north-west, Rooty Hill Road South, Wallgrove Road to the south-west, M4 motorway to the south and Great Western Highway which runs through the site. The proximity to the freeway network is one of the key advantages of the site to service freight movements. The surrounding road network is shown in **Figure 5.7**.

Figure 5.7: Road Network



Source: Sydway

5.6.2 Motorways, Highways and Main Traffic Routes

The following classified roads are owned and maintained by the RTA.

M4 Motorway

The M4 Motorway connects Strathfield and Penrith, and is a key east-west link between suburbs in the east, including the Sydney CBD and suburbs in the west, including Penrith. The M4 is a classified State Road, with traffic volumes exceeding 70,000 Annual Average Daily Traffic (AADT). The speed limits along the route range from 90 to 100 kilometres per hour.

The M4 forms the southern boundary of the study area. The interchange at Wallgrove Road provides sufficient access to the Western Sydney Parklands.

M7 Motorway

The M7 Motorway provides a link between the M2 Motorway in the north and the M5 Motorway in the south, completing Sydney's orbital road network. The M7 runs parallel with Wallgrove Road, forming western boundary of Western Sydney Parklands.

The M7 intersects with the M4 and the Great Western Highway, providing access from the northern and southern suburbs.

Great Western Highway

The Great Western Highway is the key east-west link between the Sydney CBD and the western suburbs. A number of regional and local roads are accessed by the Great Western Highway including Rooty Hill Road South, Doonside Road to the north, Wallgrove Road and Brabham Drive to the south. The Great Western Highway is a classified State Road, with traffic volumes exceeding 30,000 AADT. The speed limits along the route range from 60 to 80 kilometres per hour.

Wallgrove Road

Wallgrove Road connects Rooty Hill in the north to Cecil Park in the south. Wallgrove Road is a classified State Road, consisting of four lanes and a speed limit of 80 kilometres per hour. Traffic volumes along the route range from 20,000 AADT north of the Great Western Highway and 40,000 AADT north of the M4 Motorway.

Between the M4 and the Great Western Highway, Wallgrove Road runs adjacent to the western edge of the Western Sydney Parklands. Its intersection with the Great Western Highway consists of an at-grade signalised intersection. The M4 / Wallgrove Road intersection is grade-separated.

Rooty Hill Road

Rooty Hill Road connects Rooty Hill in the south to Oakhurst in the north. Rooty Hill Road is a classified State Road, consisting of four lanes and a speed limit of 70 kilometres per hour. Traffic volumes on Rooty Hill Road are around 20,000 AADT.

Between Eastern Road and the Great Western Highway, Rooty Hill Road runs parallel to the western edge of the Western Sydney Parklands. Its intersections with the Great Western Highway and Eastern Road intersections are both at-grade, signalised intersections.

5.6.3 Regional Roads

The following classified roads are owned and maintained by Blacktown Council, with funding assistance from the RTA.

Eastern Road

Eastern Road runs between Rooty Hill Road and Bungarribee Road. Eastern Road is a classified Regional Road, consisting of four lanes and a speed limit of 70 kilometres per hour. Traffic volumes range between 24,500 AADT north of Rooty Hill Road and 19,600 AADT south of Knox Road.

Eastern Road lies north of the Western Sydney Parklands and the Doonside residential release area. Eastern Road's intersections with Knox Road and Doonside Road consist of two-lane roundabouts, and its intersection with Rooty Hill Road is an at-grade, signalised intersection.

Doonside Road

Doonside Road runs between Bungarribee Road and the Great Western Highway, east of the Western Sydney Parklands and Doonside residential release area. Doonside Road is a classified Regional Road, consisting of four lanes and a speed limit ranging between 60 and 70 kilometres per hour. Traffic volumes on Doonside Road are approximately 24,000 AADT.

Doonside's intersection with the Great Western Highway is an at-grade, signalised intersection. The intersection with Bungarribee Road consists of a two-lane roundabout.

Brabham Drive

Brabham Drive runs between the Great Western Highway and the M4. Brabham Drive lies east of Huntingwood West employment release area. The route is a classified Regional Road consisting of four lanes, with a speed limit of 70 kilometres per hour. Traffic volumes along Brabham Drive are around 18,000 AADT. The intersection with the Great Western Highway is an at-grade, signalised intersection.

5.6.4 Existing Intersection Performance

The intersection analyses undertaken in Phase 1 of the study involved traffic volume counts prior to the opening of the M7 Motorway. An analysis of the existing intersections surrounding the study area was carried out to incorporate traffic volumes associated with the recent opening of the M7 Motorway.

Following is a summary of intersection controls at the key intersections surrounding the study area.

Signalised Intersections

- Great Western Highway and Doonside Road (Node 1);
- Great Western Highway and Rooty Hill Road South (Node 2);
- Rooty Hill Road South and Eastern Road (Node 3); and
- Doonside Road and Douglas Road (Node 6).

Roundabouts

- Eastern Road and Knox Road (Node 4);
- Doonside Road and Bungarribee Road (Node 5);
- Brabham Drive and Huntingwood Drive (Node 8); and
- Knox Road and Power Street (Node 9).

Tables 5.4 and **5.5** summarise the results from the aforementioned intersection analyses using aaSIDRA 2.1 for the AM and PM peak hours respectively. The intersections highlighted yellow in the tables indicate the intersections that have inadequate levels of service, that is lower than level of service C.

Table 5.4: 2006 Weekday Morning Peak Period Intersection Performances

Intersection	Degree of Saturation	Average Delay (sec/veh)	Level of Service
1: Great Western Highway / Doonside Road	1.0	61.0	E
2: Great Western Highway / Rooty Hill Road	0.7	27.3	B
3: Rooty Hill Road South / Eastern Road	0.7	30.3	C
4: Eastern Road / Knox Road	0.7	9.7	A
5: Doonside Road / Bungarribee Road	0.7	12.7	B
6: Doonside Road / Douglas Road	0.7	14.1	B
8: Brabham Drive / Huntingwood Drive	0.5	8.2	A
9: Knox Road / Power Street	>1.2	145.5	F

Source: Maunsell, 2006

The roundabout at Knox Road/ Power Street is already failing during the morning peak due to unbalanced flows on entry arms. This could be the result of changes in traffic patterns following the opening of the M7 Motorway and associated interchanges. The subsequent review of traffic associated with the proposed development has found that it contributes less than two per cent of traffic to the total at the Knox Road/ Power Street intersection. Therefore, as the impact of this development would be negligible it has been excluded from further assessment.

The Great Western Highway / Doonside Road intersection is also reporting a level of service that is operating near capacity. The M7 Motorway opened to traffic in December 2007 and may still be in a 'ramp up' period, so traffic patterns may be subject to further change.

Table 5.5: 2006 Weekday Evening Peak Period Intersection Performances

Intersection	Degree of Saturation	Average Delay (sec/veh)	Level of Service
1: Great Western Highway / Doonside Road	0.8	41.0	C
2: Great Western Highway / Rooty Hill Road	0.8	31.8	C
3: Rooty Hill Road South / Eastern Road	0.7	31.4	C
4: Eastern Road / Knox Road	0.7	9.7	A
5: Doonside Road / Bungarribee Road	0.6	10.1	B
6: Doonside Road / Douglas Road	0.6	12.5	B
8: Brabham Drive / Huntingwood Drive	0.6	9.5	A
9: Knox Road / Power Street	0.9	21.2	C

Source: Maunsell, 2006

No significant problems are experienced with the intersections during the evening peak period.

Table 5.6 illustrates a spreadsheet analysis of the link flow capacities by direction on the road network in the vicinity of the site in the existing situation and following the addition of developments already committed to the area. The committed developments will be completed over a number of years, but for this analysis they are added to the estimated 2016 flows to assess the residual capacity on the links. The table indicates that capacity remains on all links within the network with the exception of the Great Western Highway, which would already appear to be operating above capacity in 2006.

The committed developments included within the table are:

- Eastern Creek
- Esrkine Park
- Investa/ Raceway
- East Huntingwood

- Doonside Residential Development

Further details and assumptions relating to the traffic generated by these sites are included in **Section 7**.

Table 5.6: Local Road Network Link Flows: AM Peak Period

Link	2006		2016*		2016 plus Committed Developments **	
	Veh	V/C	Veh	V/C	Veh	V/C
Doonside Road (N of Douglas Road) Northbound	570	0.30	630	0.33	650	0.34
Doonside Road (N of Douglas Road) Southbound	1,120	0.59	1,240	0.65	1,470	0.77
Eastern Road (West of Knox Road) Eastbound	960	0.50	1,060	0.56	1,130	0.59
Eastern Road (West of Knox Road) Westbound	580	0.31	640	0.34	970	0.51
Rooty Hill Road South (N of GWH) Northbound	520	0.29	580	0.32	690	0.38
Rooty Hill Road South (N of GWH) Southbound	840	0.46	920	0.51	1,660	0.92
Great Western Highway (E of Brabham Drive) Eastbound	2,070	1.09	2,280	1.20	2,420	1.27
Great Western Highway (E of Brabham Drive) Westbound	670	0.35	750	0.39	1,100	0.58
Brabham Drive (N of Site Access) Northbound	410	0.21	450	0.24	450	0.24
Brabham Drive (N of Site Access) Southbound	1,130	0.59	1,250	0.66	1,290	0.68

Veh = vehicles

V/C = Volume to Capacity Ratio

Notes: Capacities based on Austroads Part 2: Roadway Capacity

* Estimated based on historical growth rates

** Please refer to Section 7.

5.7 Summary

The key strengths of the existing transport networks in the vicinity of the site include:

- The proximity of the motorway network which removes trips from local roads including Doonside Road.
- The opening of the M7 motorway has resulted in a decrease in traffic flow on certain links within the local network.
- The site is adjacent to an extensive cycle way network, both existing and proposed.

This review of existing transport conditions has noted a number of weaknesses in the local area, including:

- The opening of the M7 motorway has resulted in an increase in traffic flow on certain links within the local network including Rooty Hill Road South and Eastern Road.
- Certain intersections are close to or at capacity, including the roundabout at Knox Road and Power Street.
- The rail station is not within walking distance; journeys by train must also include a bus trip.

- The site is within walking distance of only a small part of the Blacktown residential area.

These strengths and weaknesses will provide ample opportunity for leverage towards a package of measures through this TMAP process.

6.0 Travel Demand

6.1 Introduction

Trip generation depends on many variables. This section provides a summary of the forecasting approach used to determine the number of trips travelling by each mode of transport. This review has considered both the morning and evening peak periods.

6.2 Existing Travel Behaviour

A review of the Census 2001 Journey to Work data for Blacktown South East SLA indicates that:

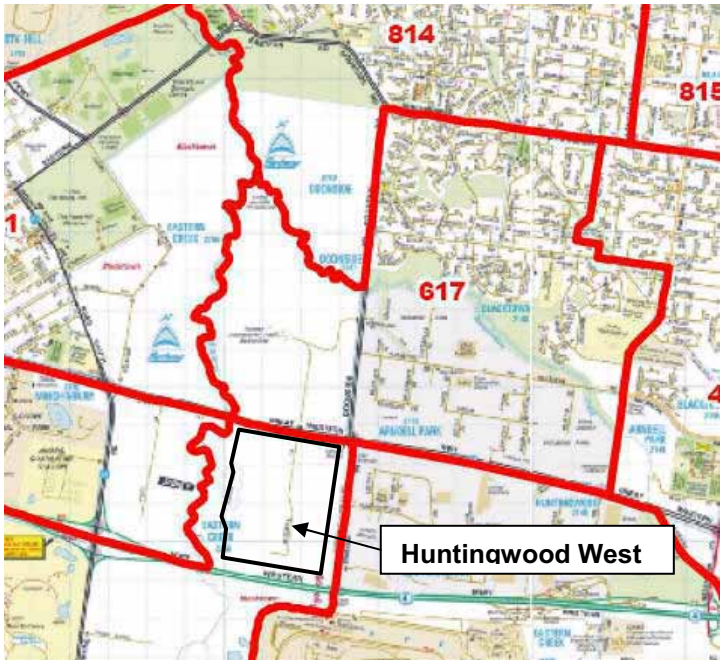
- 72 per cent of trips to the SLA are made by car
- 18 per cent of trips to the SLA are made by train
- 2 per cent of trips to the SLA are made by bus
- 8 per cent of trips to the SLA are made by other modes (e.g. walking and cycling)

At a more detailed level, a review of the Census 2001 Journey to Work data for travel zone 617 adjacent to the site including the Arndell Park industrial estate indicates that:

- 90 per cent of trips to the zone are made by car
- 2 per cent of trips to the zone are made by train
- 1 per cent of trips to the zone are made by bus
- 7 per cent of trips to the zone are made by other modes (e.g. walking and cycling)

An analysis of the trip distribution from the 2001 journey to work database was undertaken based on Travel Zone 617 (tz617), for commercial uses (using trips into tz617). This zone, located immediately to the north east of the site, is a developed area with similar employment land uses to that proposed for the Huntingwood West site. It is therefore considered likely to display similar trip making characteristics to the development site.

Figure 6.1: Surrounding TPDC Travel Zones



This information highlights the high dependence on car travel to work in the study area and it is a challenge to this TMAP to offer practical alternatives to the car to inspire mode shift.

Reasons for the high car dependence could be the result of lack of alternatives, for example, if an employee works industrial shifts and starts or finishes work at unsociable hours when little transport is available or security is an issue. However, Section 5 investigated the public transport provision and found it to offer regular services at daytime start and shift ends. Therefore, the dependence on the car could be due to reasons such a perception of low provision or interchange issues. It is likely that from the majority of destinations, an employee would be required to make at least a two leg public transport trip to reach the site.

In summary, the high proportion of car users provides a large base of employees that can be worked with to promote alternatives to the car.

6.3 Travel Demand

Following discussions with Blacktown Council in May 2005, an AM peak hour trip rate of 15 vehicle trips per developable hectare has been adopted. Thus, for a development of 56 developable hectares, 840 peak hour trips would be generated.

This trip rate is expected to be high since the industrial estate is likely to operate with shift work patterns or early start times so that employees may not need to travel in the usual morning and evening peak hours. However, since the uses of the site are not confirmed, the trip rate is adopted as a worst case scenario.

The 2001 Census Journey to Work data mode splits have been applied to the data to obtain trips by other modes as well as the car, as shown in **Table 6.1**. After a mode shift from car to sustainable modes of ten per cent, the number of employees travelling by car decreases and the number travelling by other modes, including as a car passenger, increases.

Table 6.1: AM Peak Huntingwood West Trip Generation: All Modes

Mode	Without Mode Shift		With Mode Shift	
	Mode Share	Employee Trips	Mode Share	Employee Trips
Car driver	83%	840	73%	739
Car passenger	7%	71	14%	162
Train	2%	20	2%	20
Bus	1%	10	1%	10
Cycle	3%*	30	4%*	50
Walk	4%*	40	4%*	50
Total	100%	1012	100%	1012

Source: Maunsell 2006

* Assumed split of 'other modes'

On the basis of rate of 15 vehicles trips per developable hectare and the mode shares exhibited by employees at a neighbouring site, total employees at the site are estimated at 1,102. Landcom expects 800 employees to be accommodated on the site, so this assessment tests a worse case.

In the AM peak it is assumed that there will be some counterflow to the large numbers of employees entering the site as visitors or service vehicles leave the site, so a split of 85 per cent / 15 per cent has been applied to the generated traffic.

6.4 Mode Choice

The determinates used to assess mode choice within a mode choice model are travel time, travel cost and amenity (comfort, reliability and security). As an example: rail provides a more competitive choice to destinations such as the city where parking congestion makes car trips unattractive.

Maunsell has constructed mode choice models for previous TMAPs, using 2001 Journey to Work data to develop a generalised cost mode choice logit model that replicates observed journey to work mode splits (generally to within 5-10%) to major destinations in the Sydney metropolitan area from south east Blacktown. In all cases, the effect of increasing congestion on the road network has the effect of causing a minor mode shift of a few per cent since car journey times increase over train trips.

The mode choice model can be used to test measures within a TMAP that will decrease the generalised cost of public transport in comparison to car trips. Measures would include increasing bus or train frequency, or reducing walk time to the route. Policy measures or improvements to the quality of walking or cycling trips cannot be tested in the model.

To determine the likely mode choice shift as a result of other measures within a TMAP, it is possible to examine the success rates of previous projects. Projects to bring travel behaviour change using individualised marketing in Western Australia have resulted in differing success rates, ranging from four per cent reduction in car trips to 14 per cent. However, when the details of the study areas are compared, an outer suburb with poor public transport links, records a four percent reduction in car trips. The high mode shift results are recorded in inner city areas with good public transport provision.

Travel plans for workplaces have been adopted for a number of years in the United Kingdom. Research into the success of workplace travel plans and the reasons for success have been research by the UK Department for Transport. An examination of 21 workplaces that adopted travel plans showed a range of car use decreases from five per cent to 66 per cent. These figures are equivalent to a percentage point mode shift of between three per cent and 52 per cent.

To achieve a mode shift of between five and ten percent, it would be necessary to implement a range of measures, including those that improve the perception of public transport and that cannot be measured in a simple mode choice model. A comprehensive package of measures has been identified in **Section 8** to ensure the targets specified in this TMAP are met.

6.5 Trip Distribution

Trip distributions reflect the range of external origins of employees of a development site. Trip distribution patterns are influenced by wealth, employment patterns, the accessibility of regional employment zones and the cost and amenity of surrounding transport networks. Distribution patterns change relative to these variables over time.

The trip distribution undertaken by residents in tz617 for commercial uses is summarised in **Table 6.2.** These proportions have been used as a proxy to distribute trips to the local road networks for the commercial development.

Table 6.2: 2001 Journey to Work Destinations for Commercial Uses

Location	Total	Proportion
Penrith	480	17%
Blacktown – South East	425	15%
Blacktown – South West	314	11%
Blacktown – North	228	8%

Location	Total	Proportion
Baulkham Hills	167	6%
Fairfield	149	5%
Holroyd	133	5%
Parramatta	129	4.5%
Liverpool	117	4%
Hawkesbury	103	3.5%
Blue Mountains	93	3%
Campbelltown	72	2.5%
Bankstown	55	2%
Hornsby	37	1%
Ryde	30	1%
Ku-ring-gai	30	1%
Auburn	29	1%
Camden	27	1%
Wollondilly	28	1%
Other	220	7.5%

Source: Journey to Work data, 2001

In order to apply the distribution to the network, it is necessary to make assumptions about the route that the employees would take through the study area. This is conducted using gravity model principles, where the driver would take the shortest route. Where route length is similar, trips have been divided between the routes.

The Journey to Work trip origins for the purposes of this study can be translated into the road on which the trip enters the study road network. These are based on the assumptions of route choice given in the previous paragraph and are summarised in **Table 6.3**.

Table 6.3: Journey to Work Origins at Extent of Study Road Network

Trip Origin	Percentage of Trips	Number of Vehicle Trips
M4 East	12.0%	89
M4 West	20.0%	148
M7 North	6.0%	44
M7 South	19.0%	140
Great Western Highway East	5%	37
Great Western Highway West	5%	37
Francis Road	5%	37
Knox Road	6%	44
Power Road East	3%	22
Power Road West	3%	22
Bungarribee Rd	11%	81
Douglas Rd	5%	37
Total	**100%**	**739**

Source: Journey to Work data, 2001

7.0 Impact Assessment

7.1 Introduction

This Section discusses the future traffic and transport scenarios, considers the impact of the Huntingwood West development on the local network and assesses potential improvements that may ameliorate the impact, particularly in relation to local intersections.

The main purpose of this section is to compare the 2016 Base Scenarios to the 2016 Design Scenarios (with development) to determine the particular impacts of the development on the surrounding traffic and transport networks.

The Western Sydney Employment Hub includes ten key employment sites which may create around 36,000 jobs. These developments will have a significant impact on the road and public transport networks in the vicinity of the site and therefore those developments in the vicinity of the Huntingwood West site are included in the Base Scenario impact assessment.

7.2 Local Developments

The following paragraphs summarise the details of the committed local developments in the vicinity of the Huntingwood West site. This information has been used to estimate a number of generated trips and the distribution of these trips through the study network. These trips, when added to the background traffic, form Base Scenario 1 for the impact assessment.

Eastern Creek Precinct

The Eastern Creek Precinct is expected to develop some 700 hectares, generating 8,700 vehicle trips in the AM peak hour and 10,000 vehicle trips in the PM peak hour. Traffic modelling undertaken as part of the Eastern Creek Precinct Local Traffic Study[3] assumed that development would be complete by 2016.

Examination of the model output and report reveals that the impact of the generated traffic is expected to be distributed beyond the limits of the recommended network improvements. The model network included the Rooty Hill South Road/ Wallgrove Road/ Great Western Highway intersection that also falls within the Huntingwood West study network. **Table 7.1** reproduces data regarding the performance of this intersection from the Eastern Creek Precinct Local Traffic Study.

Table 7.1: Hill South Road/ Wallgrove Road/ Great Western Highway Intersection Performance

	AM Peak		PM Peak	
Performance Measure	**2002**	**2016***	**2002**	**2016***
Level of Service	E	F	E	F
Average Delay	60 seconds	230 seconds	56 seconds	189 seconds

Source: Eastern Creek Precinct Local Traffic Study (Arup, 2005)

*including development and recommended network improvements

The performance of the Rooty Hill South Road/ Wallgrove Road/ Great Western Highway intersection is expected to deteriorate dramatically by 2016. However, improvements to ameliorate it have not yet been investigated.

[3] ARUP, July 2005

Erskine Park Employment Area

The Erskine Park Employment Area has 276 hectares of developable land. Using the traffic generation rate of 15 vehicles per hectare of development during the weekday peak period, this site would generate approximately 4,140 vehicle trips. It is assumed that the development will be complete by 2016.

It has been assumed that the majority of the generated traffic will travel via the motorway network in a similar fashion to the Eastern Creek Precinct traffic. A minor proportion of traffic will impact the Huntingwood West study network as it travels via Wallgrove Road.

East Huntingwood Precinct

This precinct consists of 76 hectares of development. Using the traffic generation rate of 15 vehicles per hectare of development during the weekday peak period, this site would generate approximately 1,140 vehicle trips.

An examination of the Census 2001 Journey to Work data for the existing Huntingwood site would suggest that only a minor proportion of trips to the site will originate from the west and travel in the vicinity of the Huntingwood West site.

Investa Raceway Site

This site consists of 26 hectares of development. Using the traffic generation rate of 15 vehicles per hectare of development during the weekday peak period, this site would generate approximately 350 vehicle trips.

The majority of the developable land on the site is to the east, suggesting that the majority of generated traffic will enter the road network via Reservoir Road rather than Brabham Drive. However, a minor proportion of the traffic is expected to be distributed along Brabham Drive and therefore past the access to the Huntingwood West site. An examination of the Census 2001 Journey to Work data for the existing Huntingwood site, which is suitable for application to the Raceway site, would suggest that only a minor proportion of trips to the site will originate from the west and travel in the vicinity of the Huntingwood West site.

Bungarribee Precinct Land Uses, Western Sydney Parklands

Concept planning of the Bungarribee Precinct of the Western Sydney Parklands is progressing, to the stage that certain land uses for the site are being discussed. It is likely that a leisure or educational facility may be developed.

The impact on the AM peak hour flows on the surrounding network of these types of facility will be minor. Leisure uses are not likely to experience peak demand at this time and educational visitors are likely to arrive by coaches after the AM Peak. Staff may arrive during the morning peak, but these volumes are not expected to be significant when distributed through the network.

Doonside Residential Development, Western Sydney Parklands

Planning is being undertaken for Doonside residential site adjacent to the Bungarribee Precinct of the Western Sydney Parklands. The site developable area is 55 hectares which has been assumed to equate to accommodate approximately 750 dwellings, of which around 90 per cent could be detached homes and the remainder attached homes, being either terraces or apartments.

Trip rates for these types of dwellings have been extracted from the Guide to Traffic Generating Developments (RTA, 2002) and applied to the lot numbers as shown in **Table 7.2**.

Table 7.2: Doonside Residential Development Trip Rates

Dwelling Type	Yield (Number of lots)	Trip Rate	Generated Trips (Peak Hour)
Apartment	34	0.50	19
Terrace	35	0.65	24
Detached	675	0.85	574
Total	**750**	**-**	**617**

It was assumed that 15 per cent of trips would be travelling to the site and 85 percent to the site in the morning peak hour. The trips were distributed to destinations based on the Census 2001 Journey to Work data. The trips were applied to the appropriate route through the surrounding road network using gravity model principles. Current masterplanning for the site includes site accesses that connect via existing intersections at Doonside Road/ Eastern Road, Doonside Road/ Bungarribee Road and Doonside Road/ Douglas Road.

7.3 Traffic Impacts and Opportunities

7.3.1 Traffic Assessment

A review of the 2006 traffic count data has established that the peak loading on the road network in the vicinity of the Huntingwood West site occurs during the AM peak between 7.30am and 8.30am. Therefore, this traffic assessment focuses on the AM Peak and considers the impact of employees trips to work.

Peak levels of traffic demand have been estimated using a strategic spreadsheet model. Four scenarios have been developed within the model:

- Base Scenario 1 – existing traffic counts factored to likely 2016 flows (at a rate of one percent per year) plus estimates of all committed development trips as described previously;
- Base Scenario 2 – existing traffic counts factored to likely 2016 flows (at a rate of one percent per year) plus committed development traffic relating to the proposed Doonside residential development only;
- Design Scenario 1 – Base Scenario 1 plus Huntingwood West development trips; and
- Design Scenario 2 – Base Scenario 2 plus Huntingwood West development trips.

Since the capacity of a network is limited by the delays caused by intersections in the network, this traffic assessment considers improvements to intersections only and does not consider mid-block improvements.

At the current time there are no published plans to improve the intersections in the surrounding area to accommodate the impacts of the Western Sydney Employment Hub. Therefore, the impact assessment applies the 2016 flows from each of the four Scenarios to the existing 2006 layout.

A number of assumptions have been made both in the total trips generated by these developments and the distribution of the trips through the network. In addition, this analysis does not take into account re-routing by vehicles to alternative less congested routes. The spreadsheet model indicates that traffic arriving at the site from the M4 and M7 motorways will be significant, creating a heavy right turn movement at the Great Western Highway / Doonside Road intersection. As a consequence,

Intersection 1 reports a poor level of performance in each of the Scenarios and therefore measures to alleviate this delay are proposed in later sections.

Intersection assessments were conducted using aaSIDRA v2.1. **Tables 7.3** to **7.6** summarise the results of the analysis for each Scenario in turn.

Table 7.3: 2016 Base Scenario 1 Weekday Morning Peak Period Intersection Performances

Intersection	Vehicles (veh / hour)	Degree of Saturation	Average Delay (sec / veh)	Level of Service
1: Great Western Highway / Doonside Road	5,487	1.1	>150	F
2: Great Western Highway / Rooty Hill Road	7,220	1.1	116.0	F
3: Rooty Hill Road South / Eastern Road	3,585	1.0	90.8	F
4: Eastern Road / Knox Road	4,499	0.9	11.1	B
5: Doonside Road / Bungarribee Road	3,634	>1.2	81.3	F
6: Doonside Road / Douglas Road	2,679	0.9	32.6	C
8: Brabham Road / Huntingwood Drive	2,346	0.5	8.7	A

Source: Maunsell, 2006

With reference to the existing performance shown in **Table 5.4, Table 7.3** illustrates that the impact of other committed developments, and natural traffic growth, in the vicinity of the Huntingwood West site, would significantly reduce the Level of Service at several local intersections, causing many to fail. Level of Service F is recorded at five of the eight intersections, with the worst performing being Doonside Road/ Bungarribee Road.

Intersection 'failures' are generally recorded due to the poor performance of individual approaches or single movements at the intersection. This can be due to a number of factors, including lack of capacity, minimal green time at traffic signals and / or high traffic demand from an opposing movement, therefore limiting exit opportunities. Experience has shown that often a right turn with high traffic demand is the key movement that will determine the failure of an intersection.

A number of the intersections fail significantly in the Scenario shown in **Table 7.3**. Analysis of the results identifies the following movements that perform worst at each of these intersections:

1. Through movements on Great Western Highway from both directions and through and right turns from Doonside Road.
2. Through movement from Great Western Highway (west) and right turn from Wallgrove Road.
3. All movements from Rooty Hill Road (north), left turn from Eastern Road and right turns from Rooty Hill Road (south) and Francis Road.
5. Both movements from Bungarribee Road.

Following this initial analysis, the performance of each intersection was tested where only base 2016 flows (i.e. factored from 2006) and Doonside residential flows are added. The results of this Scenario, presented in **Table 7.4**, show that intersection 1 is likely to fail regardless of further committed development.

Table 7.4: 2016 Base Scenario 2 Weekday Morning Peak Period Intersection Performances

Intersection	Vehicles (veh / hour)	Degree of Saturation	Average Delay (sec / veh)	Level of Service
1: Great Western Highway / Doonside Road	5,026	1.0	81.1	F
2: Great Western Highway / Rooty Hill Road	5,499	0.9	37.9	D
3: Rooty Hill Road South / Eastern Road	2,924	0.9	36.7	D
4: Eastern Road / Knox Road	4,102	0.8	10.6	A
5: Doonside Road / Bungarribee Road	3,261	1.0	30.3	C
6: Doonside Road / Douglas Road	2,535	0.8	28.9	C
8: Brabham Road / Huntingwood Drive	2,309	0.5	8.7	A

Source: Maunsell, 2006

A review of intersection 1 in this Scenario shows that failure is due to the poor performance of the same individual movements listed above.

2016 Design Scenario 1 applies the Huntingwood West development trips to the potential flows from all other developments. This level of flow defines a worst case scenario for future traffic demand and consequently a number of intersections are again likely to fail. The results from this Scenario are given in **Table 7.5.**

Table 7.5: 2016 Design Scenario 1 Weekday Morning Peak Period Intersection Performances

Intersection	Vehicles (veh / hour)	Degree of Saturation	Average Delay (sec / veh)	Level of Service
1: Great Western Highway / Doonside Road	6,371	>1.2	>150	F
2: Great Western Highway / Rooty Hill Road	7,741	1.1	120.4	F
3: Rooty Hill Road South / Eastern Road	3,610	1.1	105.9	F
4: Eastern Road / Knox Road	4,478	0.9	11.1	B
5: Doonside Road / Bungarribee Road	3,934	1.0	32.2	C
6: Doonside Road / Douglas Road	2,885	0.9	29.4	C
8: Brabham Road / Huntingwood Drive	4,752	0.9	17.6	B

Source: Maunsell, 2006

The same four intersections as reported for Base Scenario 1 fail in this Scenario. These failures can again be attributed to the individual turning movements that were detailed previously, albeit in this Scenario they are reporting a reduced level of performance.

In order to establish a better understanding of the likely impacts of the Huntingwood West development on its own, expected flows generated from this site were applied to the 2016 base data and the committed development at Doonside only. Consequently lower traffic flows were applied to the intersection models and as expected improved levels of service were recorded at the intersections. These results are presented in **Table 7.6**.

Table 7.6: 2016 Design Scenario 2 Weekday Morning Peak Period Intersection Performances

Intersection	Vehicles (veh / hour)	Degree of Saturation	Average Delay (sec / veh)	Level of Service
1: Great Western Highway / Doonside Road	5,763	1.1	>150	F
2: Great Western Highway / Rooty Hill Road	5,889	0.9	51.5	D
3: Rooty Hill Road South / Eastern Road	2,961	0.9	37.3	D
4: Eastern Road / Knox Road	4,190	0.9	10.6	B
5: Doonside Road / Bungarribee Road	3,700	0.9	18.3	B
6: Doonside Road / Douglas Road	2,742	0.8	26.7	C
8: Brabham Road / Huntingwood Drive	3,015	0.9	17.2	B

Source: Maunsell, 2006

Comparison between **Tables 7.4 and 7.6** illustrates that the Huntingwood West development will have an impact on most of the local intersections, although this is marginal in most cases. Intersections where the impact is greatest are highlighted in yellow.

Further to the comments above, failure of intersection 1 was to be expected. Intersection 2 is reported as being at capacity and so improvements should be investigated. The individual turning movements that are contributing to these poor levels of performance are the same as those detailed previously.

Improvements to the two worst performing intersections from Design Scenario 2 are considered in the **Section 7.3.2**.

7.3.2 Intersection Improvements

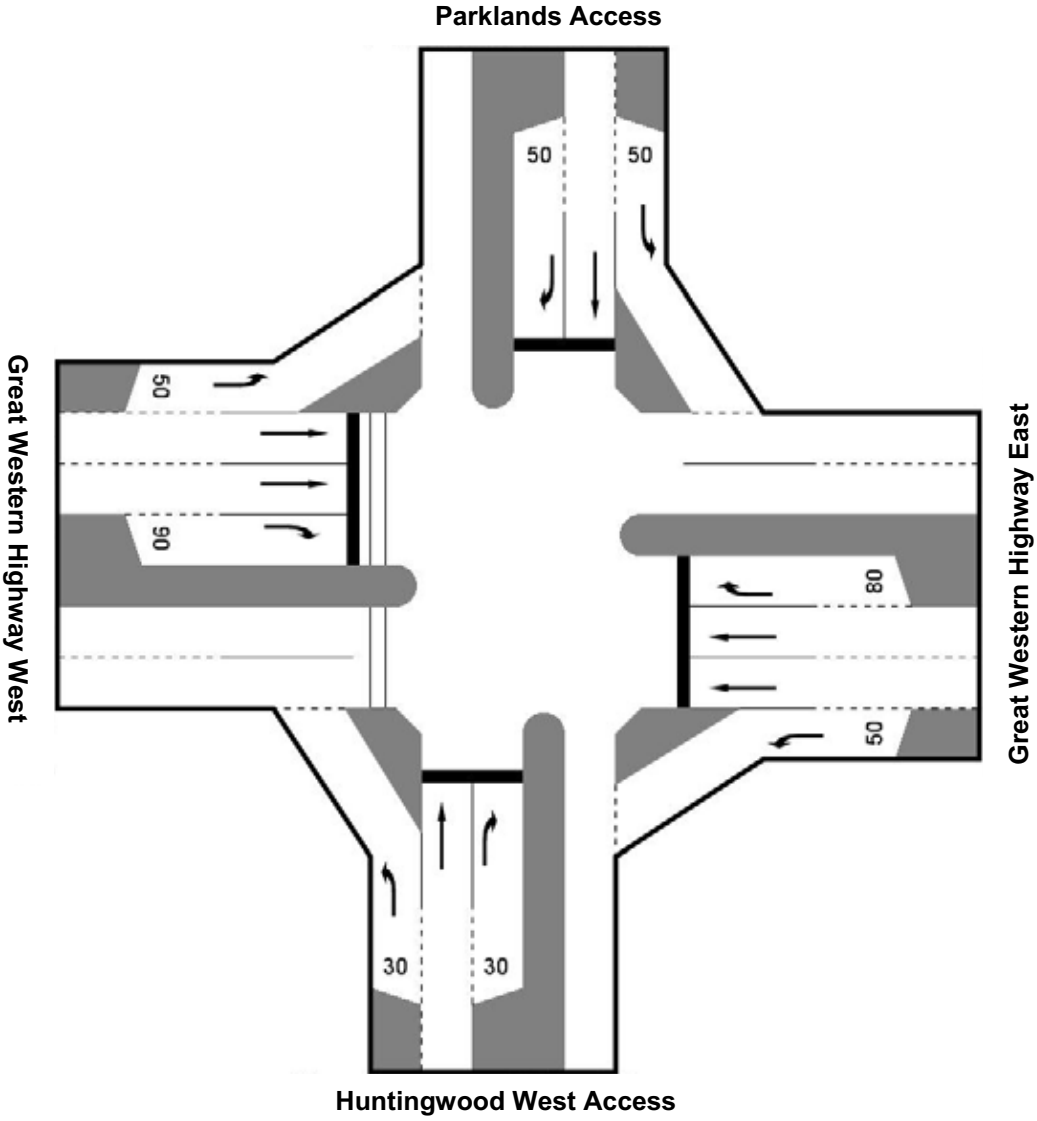
Improvements to the four worst performing intersections were undertaken as follows:

- 1. Great Western Highway / Doonside Road: Alter line marking to separate through and right turn movements from Doonside Road and Brabham Drive and provide a new access from Great Western Highway to relieve right turn movement
- 2. Great Western Highway / Rooty Hill Road South: Improve signal phasing

In order to ameliorate the heavy right turn movement at the Great Western Highway / Doonside Road intersection, a concept design for a site access from the Great Western Highway has been developed. This access would replace the existing Rudders Lane left in-left out access with a full signalised intersection to the west. An intersection in this location has the potential to also serve the Parklands. This access has been agreed in principle with the RTA at a meeting in August 2006.

The concept design for the intersection is illustrated by **Figure 7.1**. The intersection would be located at a distance of 400 metres or more from the nearest signalised intersection in both directions and so would not be expected to directly impact operations. The intersection would be designed to accommodate B-doubles and service vehicles as well as commuting employees.

Figure 7.1: Great Western Highway/ Access Intersection Layout



Source: Maunsell, 2006

Table 7.7 illustrates the effect of the improvements on intersection performance. The Level of Service is shown to improve significantly for Intersection 1 when compared to the 2016 Base Scenario 2 results as shown in **Table 7.4**. Intersection 2 perform satisfactorily following amelioration. The new access intersection from the Great Western Highway performs satisfactorily under a diamond signal phasing arrangement and a maximum cycle time of 140 seconds.

Table 7.7: 2016 Design Scenario 2 Weekday Morning Peak Period Intersection Performances, including intersection improvements

Intersection	Degree of Saturation	Average Delay (sec/veh)	Level of Service
1: Great Western Highway / Doonside Road	1.0	79.6	E
2: Great Western Highway / Rooty Hill Road	0.9	40.2	D
X: Great Western Highway/ Rudders Lane	0.9	29.8	C

Source: Maunsell, 2006

The improved designs take in to account the primary movements that are occurring at the intersections and apply the signals phasings accordingly. Intersection 1 continues to report poor performance on a number of individual movements but these are on the movements with lowest levels of flows, from Great Western Highway (east) and the right turn from Brabham Drive. Intersection 2 reports a good level of service for every individual movement.

An assessment of intersection performance under Design Scenario 2 was undertaken with and without the Great Western Highway access and is reported in **Table 7.8**. The table shows that by providing the additional intersection, average vehicle delay is reduced at the Great Western Highway/ Doonside Road intersection by 7 seconds.

Table 7.8: 2016 Design Scenario 2 Weekday Morning Peak Period Intersection Performances: Comparison of with and without Great Western Highway access

Intersection	Degree of Saturation	Average Intersection Delay (sec/veh)	Level of Service
1: Great Western Highway / Doonside Road (without Great Western Highway / Access Road intersection)	1.1	86.1	F
1a: Great Western Highway / Doonside Road (with Great Western Highway / Access Road intersection)	1.0	79.6	E

Source: Maunsell, 2006

7.4 Pedestrians Impacts and Opportunities

The site will generate walking demands both within the site and to and from the site. This would include trips to:

- Food retailers serving the industrial employees;
- The parklands for lunchtime recreation;
- Bus stops; and/or
- Home.

The Huntingwood West site is between three and four kilometres of the residential areas to the north around Douglas Road and Bungarribee Road so there is some potential for employees to walk to work. These opportunities will be improved by provision of direct and secure walking routes.

7.5 Cycling Impacts and Opportunities

Cycling mode splits are expected to remain low for journey to work trips to the Huntingwood West site. However, improvements to cycle facilities and networks around the site offer opportunities to increase the mode share. The site is within cycle commuting distance for a number of communities within Blacktown.

It is likely that between one and four per cent of trips will be made by bicycle. At the upper end, this would create 40 cycle trips to the site during the AM peak hour.

Planned improvements to the cycle network will accommodate these cyclists, and any mode shift to cycling, but it should be ensured that the connection is provided from the cycle network to the site.

Sufficient secure cycle parking, lockers and change facilities on the employment site should be provided to cater for cyclists.

7.6 Bus Impacts and Opportunities

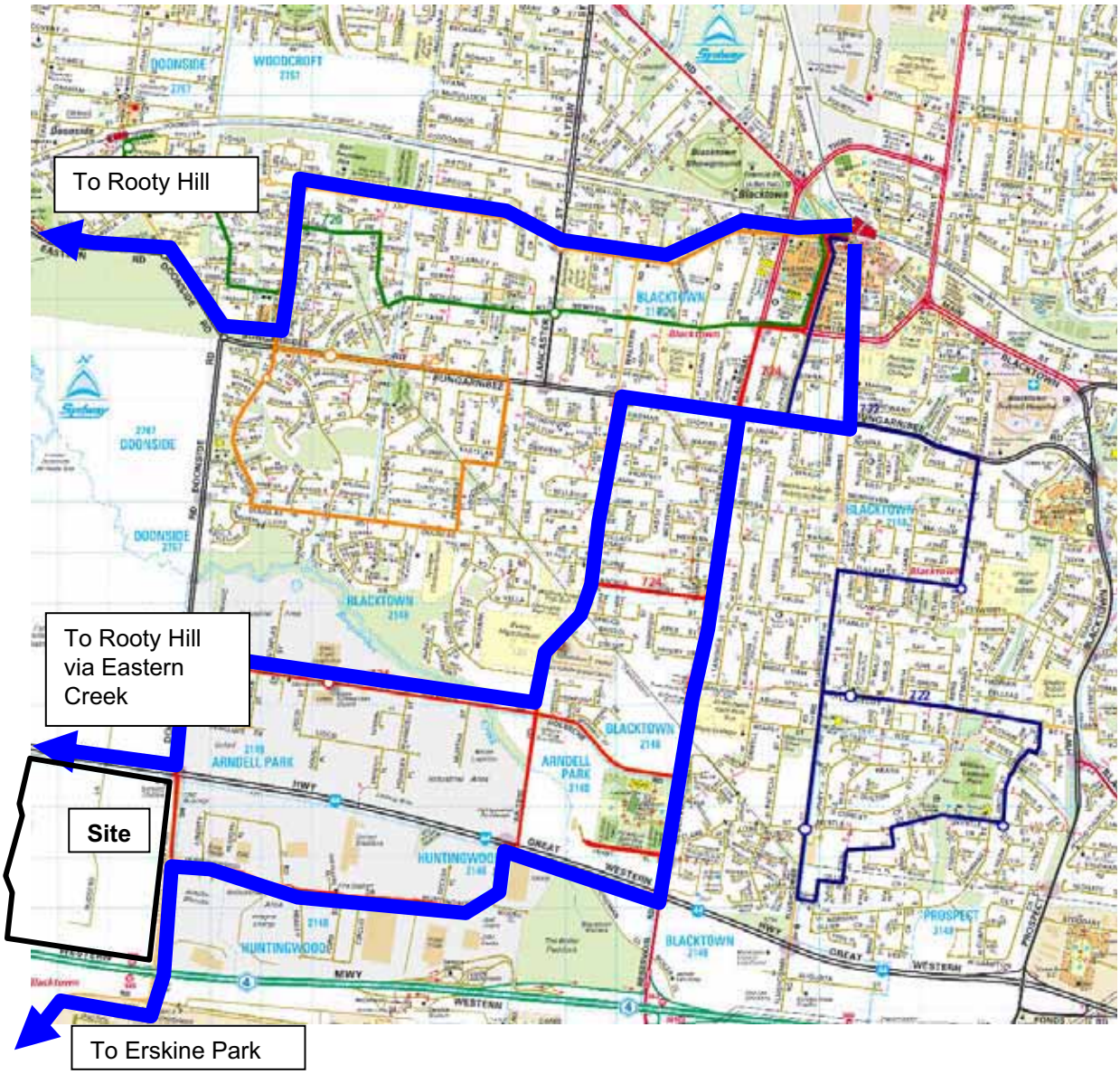
Consultation with the Ministry of Transport has revealed that new bus routes to meet growing demand in the Western Sydney Employment Hub area are in the planning stages. These have not been evolved to the stage of consultation with operators and the community but they can be used as an indication of future provision.

Upon full development, the Huntingwood West site is expected to generate 30 bus trips during the morning peak hour. This level of patronage is not sufficient to support a new bus service for the site.

However, the opportunity exists to divert an existing route to serve the site. Route 724 currently serves the existing Huntingwood industrial estate and could potentially be diverted to travel through the site. Public transport measures are explored in further detail in **Section 8**.

Potential also exists for employers to provide shuttle transport for employees to neighbourhood centres or their home address. This is particularly relevant to this site as employees working shifts could start or finish work at unsociable hours. Public transport use at these times will be limited due to lack of or the perception of a lack of public transport or security issues.

Figure 7.2: Huntingwood West Potential Bus Provision



Source: MOT, 2006

7.7 Rail Impacts

Upon full development, the Huntingwood West site is expected to generate 20 rail trips during the morning peak hour. These would be accommodated across the four peak hour train services that call at Doonside station or the eight peak hour services that call at Blacktown station.

These rail trips include a walk and/or bus trip to the station. For the purposes of this assessment, it is assumed that the rail users will catch a bus to Blacktown station. These trips are included within the walking and bus impacts in earlier paragraphs.

7.8 Conclusion

The findings of the impact assessment indicate that a package of measures will be required to mitigate the traffic impacts of the Huntingwood West development. These are:

- Great Western Highway / Doonside Road: alter line marking to separate through and right turn movements from Doonside Road and Brabham Drive and provide a new access from Great Western Highway to relieve right turn movement
- Great Western Highway / Rooty Hill Road South: Improve signal phasing

A range of measures will be required will also be supplement these infrastructure improvements in order to meet the sustainability objectives of this TMAP. The comprehensive package of measures is detailed in **Section 8**.

8.0 Package of Measures

8.1 Introduction

This section discusses the package of measures recommended for implementation in the vicinity of the site. The driving force behind the package will be the implementation of work place travel plans on the Huntingwood West site to encourage mode shift. This mode shift will be enabled by supporting initiatives, addressing:

- Infrastructure needs – including measures to improve walking, cycling and public transport opportunities, while maintaining private vehicle access; and
- Service needs – providing sufficient services to promote a higher public transport mode split.

Planning principles that would guide the provision of high quality infrastructure are also included. At this stage of the TMAP, the approach is independent and holistic so that the most appropriate package of measures is developed.

8.2 Travel Behaviour Change

The key aim of a Workplace Travel Plan for a development site is to discourage use of the private car and or greater use of more sustainable modes such as walking, cycling and public transport. Car sharing is encouraged where it is unlikely that sustainable modes will be attractive. It will enable all employees and visitors to have a greater choice and flexibility in how they travel to the site each day and how they travel during the day.

If the site is developed by one occupant, then a single travel plan would be developed. If there is multi-occupancy of the site, individual employers can develop in-house measures (in particular marketing, and travel reduction) and facilities such as cycle parking and showers.

Prior to occupation of the Huntingwood West site, a travel plan framework should be developed. This would apply to the entire site regardless of the number of occupants and outline the following:

- A review of existing on-site facilities and access to information on travel to the site (that will be provided);
- A review of the existing transport services available in the local areas covering bus, and rail modes as well as a review of the local pedestrian and cycle networks;
- Draft Travel Survey with timescale for when this will be conducted;
- Timescale for development of recommended initiatives; and
- Draft details of future monitoring and review.

Within three months of the first occupation of site, a travel survey should be conducted. The results of the travel survey will be analysed and used to determine if measures are required to cater for existing demand and also encourage modal shift away from the private car. The measures will be dependent on the needs of the employees, that is, their journey to work.

Table 8.1 illustrates some of the measures that could be incorporated into a Travel Plan to encourage mode shift that would be appropriate for the Huntingwood West site.

Table 8.1 Suggested Workplace Travel Plan Measures

Travel co-ordinator	This will be a key appointment. Each new site within the Western Sydney Employment Hub will need to promote mode shift to fulfil conditions of development. It may be that the RTA employs a Travel co-ordinator to oversee Travel Plans at each of these sites. Alternatively the role can be shared by the facilities management, HR, finance, marketing departments of each site occupant.
Parking management	Designated Parking or Needs based parking permit system: Reallocation of car park or permit system to prioritise use e.g. for mobility impaired, car sharers, business need, those with no access to alternate modes.
Public transport improvements	Improvements to frequency or hours of operation.
	Offer subsidies to public transport season ticket holders in the first year of implementation of the Travel Plan
	Offer equivalent benefits to public transport users as to car leasers.
Car pooling	Establish car share / car pool schemes
	Guaranteed Ride Home – if the designated driver goes home sick, the employee who shared the trip is given a cabcharge voucher to get home.
	Car share priority spaces
Improved cycle facilities	Introduce an interest free loan for the purchase of a train or bus ticket, bicycle/equipment, waterproof clothing
	Bicycle User Group
	Bicycle repair facilities
	Shower, changing facilities, Bicycle storage
	Discounts at Retailers
Walking	Discounts at Outdoor Clothing Retailers
Travel reduction	Work pool cars – for business travel
	Video conferencing facilities
	Provision of on site food retailers, banking, post box, internet facility for those who do not work with a desktop computer.
Marketing	Introduce prize draw/lottery scheme to encourage travel by means other than single occupancy vehicle
	Develop a well designed web page on the intranet
	Develop a well designed Travel Plan booklet for staff and visitors
	Provide Travel Plan Noticeboards at strategic locations such as main building entrances and canteens
	Promotional events – car free day, bike to work day
	Ongoing travel plan marketing

Source: Maunsell 2006

Within six months of occupation the full travel plan must be developed and include;

- Results of the Staff Travel Survey;
- Recommended travel plan measures including how they will be adopted;
- Agreed procedure and timescales for implementation; and
- Details of future TP monitoring and review.

Full implementation will then proceed.

It is expected that the key to travel behaviour change, and therefore a decrease in vehicle trips, for the Huntingwood West site would be to initiate a car sharing scheme. In addition, the excellent cycle path network in the vicinity of the site should be promoted.

8.3 Infrastructure

This section discusses the infrastructure that is required to underpin the service and policy initiatives. The infrastructure package has been tailored to improve sustainable transport, while maintaining satisfactory levels of private car performance.

Walking and Cycling Infrastructure

Internal roads within Huntingwood West will connect to the existing street network so that footpaths are connected without creating diversions. This will provide a direct route for employees to facilities such as take away food retailers or bus stops. It also provides a direct route for employees of the existing industrial areas to the Parklands during breaks.

Roundabouts are not recommended within the development site. The site access will connect to the existing roundabout at the Huntingwood West, however there will be no school children or elderly persons attempting to cross at this location and no safety problems for pedestrians are envisaged. Pedestrians will be able to cross without significant diversion from desire lines.

Connections to pedestrian and cycle paths, such as those adjacent to the M7 and M4 and the proposed Parklands cycle path, will be provided where appropriate. There is the opportunity for the developer to provide a contribution to the construction of a shared path proposed by Blacktown Council which would connect Huntingwood to Doonside station. This could enable construction of the path prior to the site opening.

Rail Infrastructure

The Clearways programme is a project that will upgrades the Sydney rail network that will benefit rail users from increases in reliability and capacity. A specific project that may benefit passengers travelling on the Western Line and catching a train from Blacktown, Doonside or Rooty Hill is the Quakers Hill to Schofields duplication. The Western Line Richmond branch is a single track route and therefore suffers congestion. A double track will be constructed by 2010 to improve reliability and reducing passenger crowding.

An improvement to rail infrastructure in the local area is in progress at Blacktown Station. The customer lift facilities are being improved at the station and bus interchange to improve reliability, increasing the attractiveness of a trip by rail for passengers with restricted mobility or families with pushchairs. Works are programmed for completion by the end of June 2006.

Bus Infrastructure

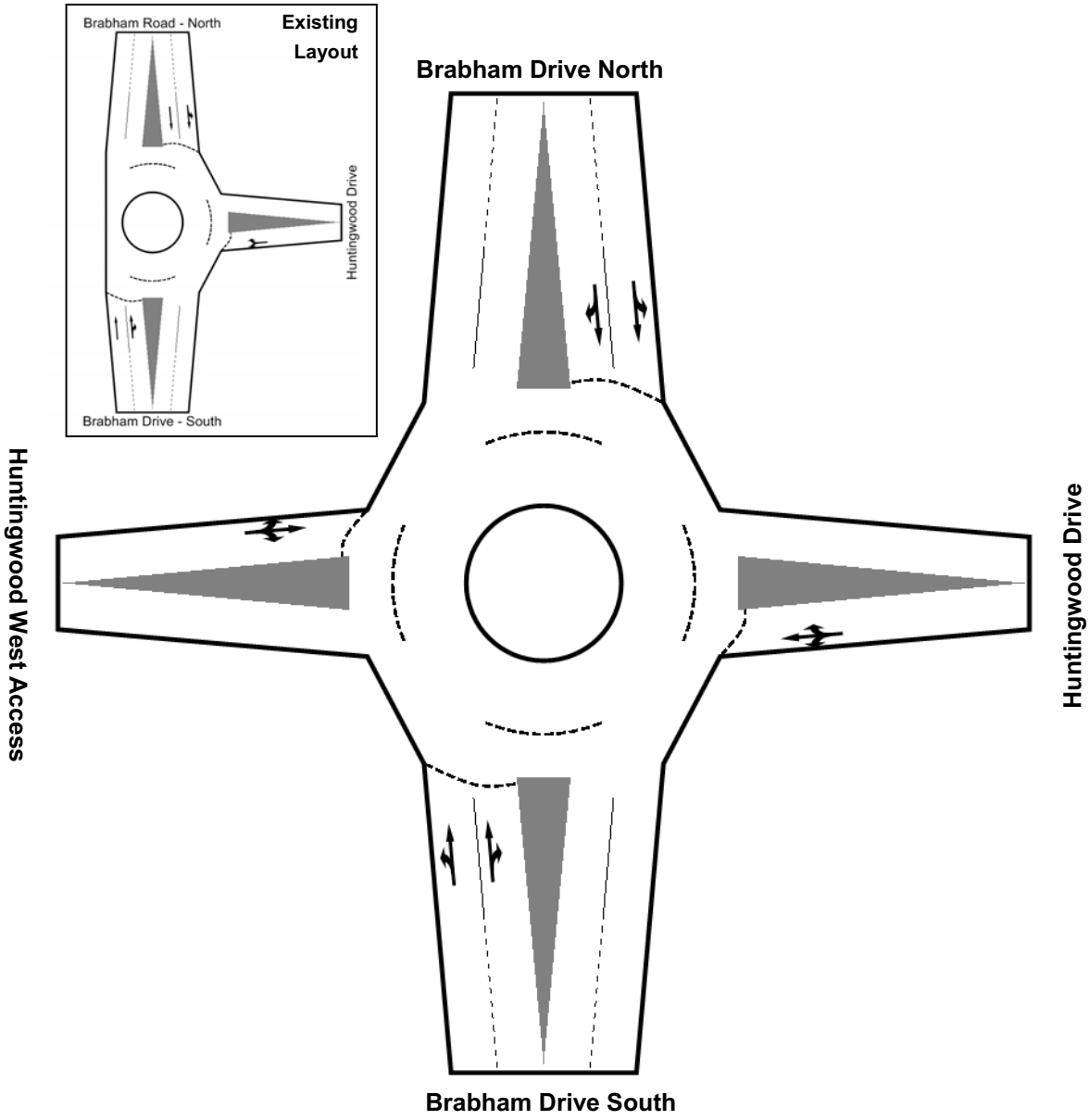
To accommodate employees travelling by bus, in the short term it is proposed that a bus stop for Service 724 from Blacktown to Huntingwood West is introduced on Brabham Drive. This will provide a bus route within 400 metres of approximately half of the site employees. The bus shelter should provide a shelter in case of bad weather.

Road Network Infrastructure

Major upgrade works will be required to accommodate traffic volumes generated by the Western Sydney Employment Hub. However, the measures within this TMAP address only the traffic volumes generated by the Huntingwood West site so as not to attempt to redesign the Western Sydney road network, which is not within the scope of this TMAP.

The main site access will be provided via a connection to the existing roundabout at Brabham Drive/ Huntingwood Drive. The suggested intersection arrangement is illustrated by **Figure 8.1**. A preliminary assessment of swept paths suggests that this intersection could accommodate B-double trucks.

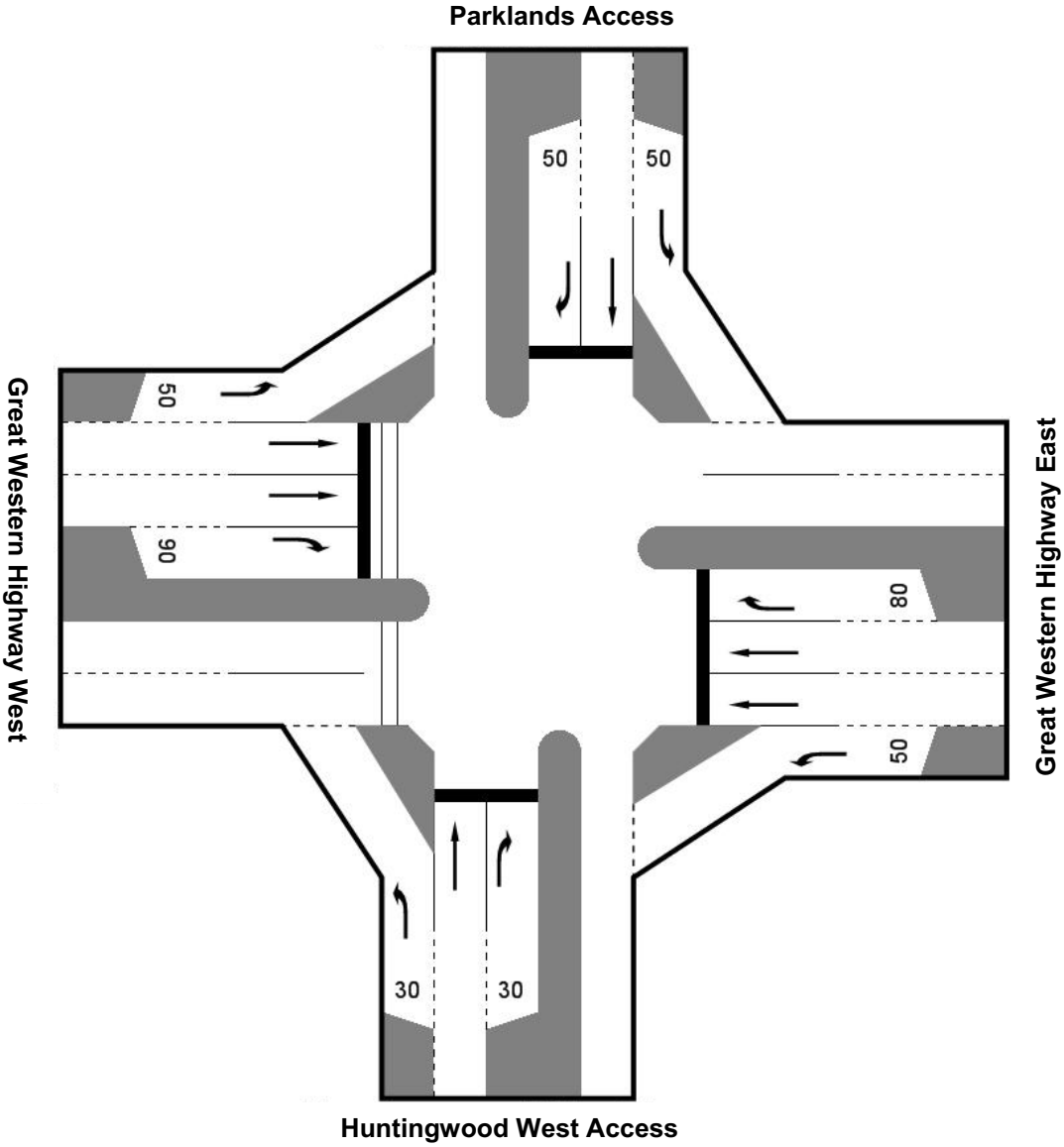
Figure 8.1: Proposed Brabham Drive Access Road Layout



Source: Maunsell 2006

A secondary access is proposed via the Great Western Highway. The suggested intersection arrangement is illustrated by **Figure 8.2**.

Figure 8.2: Proposed Great Western Highway Access Layout



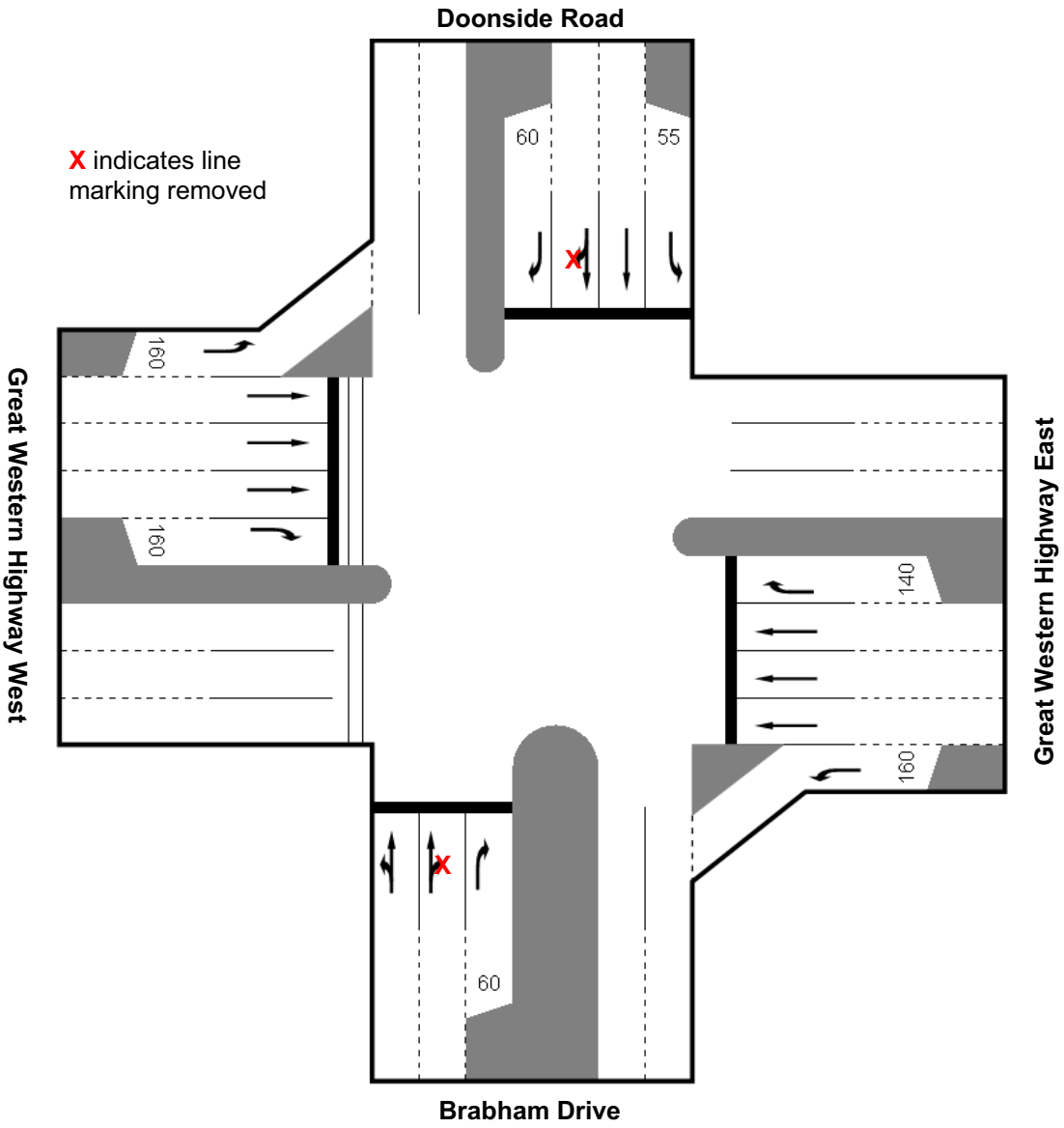
Source: Maunsell

Other intersection improvements have been tested, including signalisation of roundabouts, alterations to phasing arrangements and line markings. The improvements tested are summarised as follows:

- Great Western Highway / Doonside Road: Alter line marking to separate through and right turn movements from Doonside Road and Brabham Drive.
- Great Western Highway / Rooty Hill Road South: Improve signal phasing.

Figure 8.3 illustrate the proposed line marking for the Great Western Highway / Doonside Road intersection.

Figure 8.3: Great Western Highway/ Doonside Road: With proposed changes to line markings



Source: Maunsell 2006

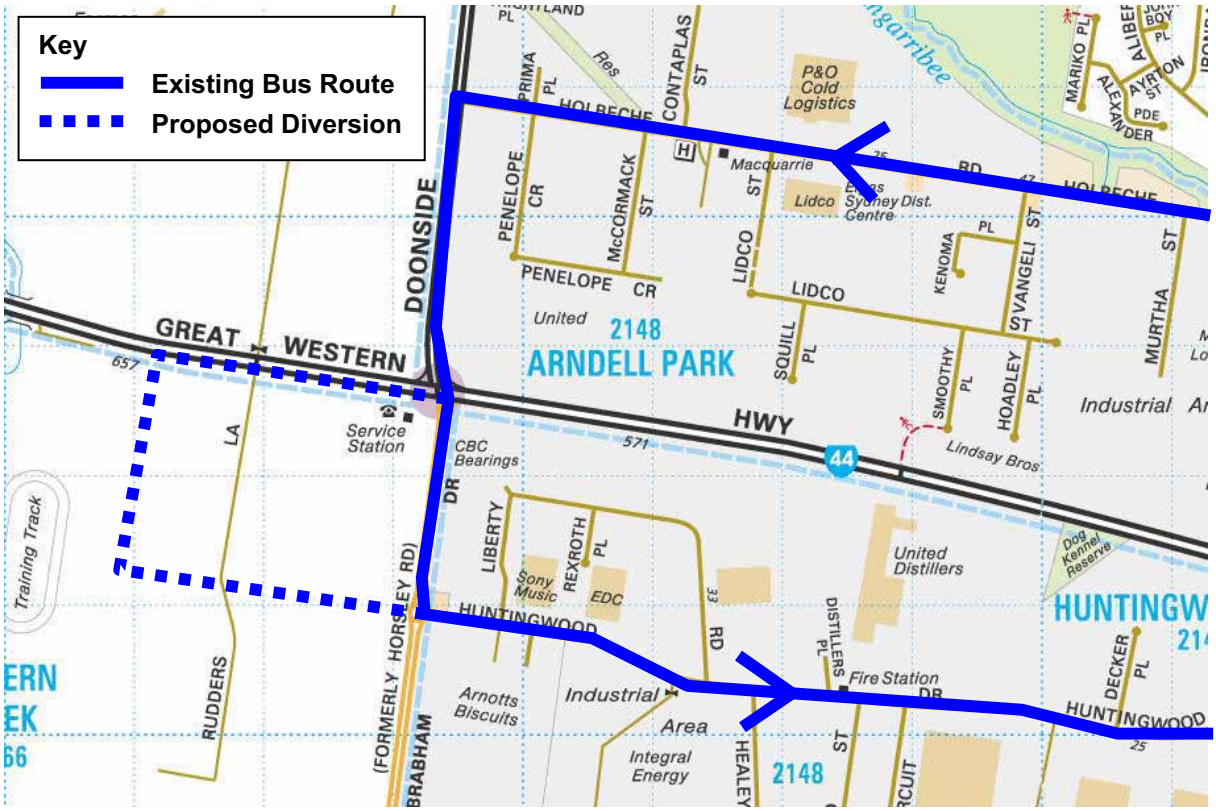
8.4 Service Responses

Bus Services

The study area falls within Contract Area 1, scheduled for review by the Ministry of Transport under NSW Bus Reform in 2007/2008. Therefore, improvements to bus services to serve the site are considered to be medium term measures.

The opportunity exists to divert the existing service 724 for less than two kilometres through the Huntingwood West site via the Great Western Highway access and the Brabham Drive roundabout. The potential disbenefit of this route is that the bus would encounter a right turn movement at the Great Western Highway intersection. (see **Figure 8.4**). This loop arrangement would also function with the existing left in left out arrangement at Rudders Lane or at another location on the Great Western Highway.

Figure 8.4: Bus Service Measures



Source: Maunsell 2006

Negotiations between the operator and the Ministry of Transport will take place to determine the best way to serve the Huntingwood site as a whole, given that it is expanding over a large area to both the east and west.

New services drafted by the MoT but not yet negotiated with operators or put to community consultation are shown in **Figure 7.2**. It may be appropriate to redirect the service along the Great Western Highway via the Huntingwood West site.

Rail Services

There are no scheduled changes to rail services that may benefit the site and encourage mode shift.

8.5 Planning Principles

In order to create high quality pedestrian and cycling environments there are a number of general principles that should be considered and applied when planning and designing facilities. These include:

- ***Permeability*** – pedestrians and cyclists should be able to move conveniently through the study area by ensuring that all key origins and destinations are well connected. Large sites, developments and buildings should not present unacceptable barriers to movement.
- ***Priority*** – high priority should be given to pedestrian and cycle movements on key routes, through measures such as short wait times at signalised crossing points.
- ***Continuous*** – pedestrian and cycle routes should be continuous, with connected foot/cycle paths, crossing facilities and entry points.

- ***High quality*** – pedestrian and cycle facilities should at least meet design standards. Footpaths should include provision for people with disabilities. Designs should at least meet the standards expressed in Austroads Guide to Traffic Engineering, Part 13: Pedestrians and Part 14: Bicycles.
- ***Integration*** – walking and cycling should be integrated with other modes (particularly bus and train services) through the provision of obvious, safe and convenient pedestrian/cycle access paths to interchange areas, as well as secure cycle storage facilities.
- ***Legibility*** – the local environment should be easy for pedestrians and cyclists to 'read' so that they can easily find their way – street names should be clearly visible and clear signage should be provided including key destinations and distances.
- ***Capacity*** – pedestrian and cycle paths should be designed to provide ample space for both travelling and waiting pedestrians and cyclists.
- ***Pleasant*** – streetscapes should be designed to high urban design standards that provide interesting pedestrian and cycle routes, free of litter and fear of crime. Appropriate lighting should be provided on all routes. Greater levels of pedestrian and cyclist activity will assist in these regards.

The following principles relate well to the design of pedestrian facilities and should be incorporated into the design of the plan:

- ***Comfortable*** – pedestrian paths should be comfortable to walk on. Walking surfaces should be free of obstructions and provide a smooth surface (with no broken paving).
- ***Crossing facilities*** – appropriate at-grade pedestrian crossing facilities should be provided on desire lines. Consideration should be given to reducing the road width at these locations. Grade separated crossing facilities should be avoided where possible.
- ***Facilities*** – appropriate facilities should be provided within the footpath area, including regular seating, rubbish bins and maps. Design of facilities should be coordinated with the overall urban design theme and care should be taken when placing facilities to ensure that footpaths are not obstructed.
- ***Access to car parks*** – pedestrian access between car parks and local attractions should be considered to ensure that safe, convenient and obvious routes are provided, including pedestrian routes within car parks.

The following principles relate well to the design of cyclist facilities and should be incorporated into the design of the plan:

- ***Segregated facilities*** – cyclists should generally be provided with segregated on-road facilities, with clear cycle lanes, advance stop lines and other priority treatments. Particular care needs to be taken if cycle lanes and on-street parking are to be integrated.
- ***Storage Facilities*** – appropriate storage facilities should be provided at work. Storage facilities should provide for both long and short term storage of cycles and related equipment. Design should be such that storage is not only secure and provides weather protection, but also conveys a sense of high priority for the treatment of cycles and cyclists.
- ***Intersection Treatments*** – appropriate facilities should be provided for cyclists at intersections and at locations where cyclists have to move between on and off-street paths and vice versa to ensure safe and convenient access. These locations are typically the most difficult and confusing areas of the network for both cyclists and other road users.

The following principles relate well to the design of shared pedestrian / cyclist facilities and should be incorporated into the design of the plan:

- ***Separate*** - in general, facilities should be provided separately for pedestrians and cyclists, taking into account the different needs of these two groups.
- ***Consultation*** - where opportunities for shared off-road routes are identified (such as the Doonside Road facility), paths should be carefully planned with wide consultation at an early stage to ensure suitability of the route and the proposed facilities. Once implemented, use of the route should be monitored and changes made if problems arise.

8.6 Package of Measures

This chapter has described in some detail a proposed package of measures for implementation in and around the Western Parklands site. The package has been designed as an integrated package, requiring implementation of all measures if the objective of increasing public transport use, walking and cycling is to be achieved.

The analysis undertaken to supplement this TMAP in **Section 6.4** suggests that a mode shift of 5 per cent could be achieved through the implementation of this integrated package of measures. **Table 8.2** provides a summary of the recommended measures developed as part of this TMAP.

Table 8.2: Summary of Package of Measures

Area	Measure	Detail
Travel Behaviour Change	Workplace Travel Plans	Site framework: Provide a framework for employers to produce travel plans to encourage mode shift
		Individual Workplace Travel Plans
Infrastructure	Road Network	Site Access Brabham Drive
		Site Access Great Western Highway
		Improve peak hour phasing at intersections
		Alter line marking at Doonside Road/ Great Western Highway
	Bus	Introduce bus stop to Brabham Drive
	Pedestrian/ Cycle	Connections to existing pedestrian and cycle facilities
		Doonside Road shared path
Transport Services	Bus	Divert existing or future bus service to pass by or through the site

Source: Maunsell, 2006

9.0 TMAP Agreement

This section identifies the funding mechanisms available to the proponent and consent authority, including probable costs, available funding options and apportionment of funding and delivery responsibility.

9.1 Introduction

Costs have been provided for each of the infrastructure package measures by the cost estimating consultants YSCO Geomatics, with the exception of the bus stop on Brabham Drive. YSCO Geomatics have estimated costs on the basis of road network upgrade measures suggested by Maunsell.

For the new bus stop, travel behaviour and service measures, Maunsell has formed an opinion of probable cost.[4]. The probable cost is indicative at this preliminary stage and may have a confidence level of between +/-30 per cent and +/-50 per cent.

Upon agreement of the package and an associated scope of works for each measure, a more thorough scrutiny of likely costs can be undertaken if appropriate within the context of the planning process.

9.2 Cost Summary

The costs provided by YSCO Geomatics and details of the probable cost calculations are included at **Appendix A**. It is noted that the cost for the Great Western Highway access intersection is estimated at the lowest possible cost to construct.

Table 9.1 includes costs for measures that are internal to the site or provide direct access to the site and are expected to be funded by the proponent. **Table 9.2** includes costs external to the site on the surrounding road and transport networks. These costs are expected to be funded in part by the proponent via a levy.

[4] Opinion of probable costs are made on the basis of best judgment as an experienced and qualified engineering consultant, familiar with the construction industry As Maunsell is not a qualified Quantity Surveyor, nor does it employ quantity surveyors, Maunsell cannot and will not guarantee that any tenders or actual costs will not vary from this opinion of probable cost.

Table 9.1: Summary of Cost Options: Internal to Site and Access

Area	Measure	Probable Cost
Travel Behaviour Change	Site framework: Provide a framework for employers to produce travel plans to encourage mode shift	$15,000
Infrastructure	Site Access Brabham Drive	*$250,000
	Site Access Great Western Highway	*$2,354,050
	Connections to existing pedestrian and cycle facilities	$245,700
Total		**2,864,750**

Source: Maunsell, 2006, except *YSCO Geomatics, 2006

Table 9.2: Summary of Cost Options: External to Site

Area	Measure	Probable Cost
Travel Behaviour Change	Travel Plan Co-ordinator (10 years salary)	$546,000
Infrastructure	Improve peak hour phasing at intersections	Negligible
	Alter line marking at Doonside Road/ Great Western Highway	Negligible
	Introduce bus stop to Brabham Drive	$10,000
	Doonside Road shared path	$889,200
Transport Services	Divert existing or future bus service to pass by or through the site (over 5 years)	$74,200
Total		**$1,519,400**

Source: Maunsell, 2006, except *YSCO Geomatics, 2006

The total cost for external measures could be in the region of $1.5 million. On the basis of a developable area of 56 hectares, this is equivalent to $27,100 per hectare.

9.3 Timing

The likely timing for each of the elements of the package are shown in **Table 9.3.** The timing has been developed with consideration of the following factors:

- Businesses are likely to begin to occupy the site in 2008/9.
- Certain measures need to be in place prior to occupation in an effort to encourage preferred travel habits.
- All required funding may not be available during one year and must be programmed.
- The study area falls within Contract Area 1, scheduled for review by the Ministry of Transport under NSW Bus Reform in 2007/2008.

Table 9.3: Suggested Timing

Area	Measure	Timing
Travel Behaviour Change	Workplace Travel Plan Framework	With first DA submitted
	Workplace Travel Plans	Commence three months after occupation by business
Infrastructure	Access intersections	Prior to first occupation
	Other intersection improvements	Prior to full occupation
	Pedestrian/ Cycle Connections	Prior to first occupation
	Doonside Road shared path	Prior to first occupation
	Bus Stop Brabham Drive	Prior to first occupation
Transport Services	Bus Service	Following review of Bus Contract Area One

Source: Maunsell, 2006

10.0 Conclusions

10.1 Introduction

The Huntingwood West site provides challenges from the transport perspective since Certain intersections are close to or at capacity, especially the roundabout at Knox Road and Power Street.

Against these challenges, the site is well located in terms of the strategic road network. A large population of car users provides a significant base of employees that can be worked with to promote alternatives to the car.

Building on the work completed in Stage 1 of this TMAP and an assessment of existing traffic conditions in the local area, the implications of the development traffic on the local transport networks has been reviewed to enable a package of measures to be identified that will go some way to achieving NSW Government sustainable planning guidance.

10.2 Key Recommendations

The recommendations of this study are reflected in the package of measures developed for the site discussed in **Section 8**, together with the finding and implementation strategy discussed in **Section 9**.

Key points of this package include:

- Workplace travel plans, to include measures such as car pools, marketing of public transport options, or discounts on cycle equipment.
- Infrastructure improvements to provide easy pedestrian and cyclist access to Doonside via a shared path and connections to existing shared paths such as the M7 cycleway.
- Public transport infrastructure with a minimum provision of a bus stop on Brabham Drive.
- Transport service improvements, including potential to divert a bus route past the site.
- Access to the site via an existing roundabout at Brabham Drive and a new intersection from the Great Western Highway.
- Intersection improvements at key locations.

As a comprehensive package of measures, this will meet the needs of employees and businesses at Huntingwood West, while achieving a mode shift towards public transport.

Appendix A Cost Estimates

Cost Estimates

Opinion of Probable Cost

Measure	Detail	Length (m)	Unit Cost	Unit	Probable Cost	Cost plus Contingency	Total
Shared path	Huntingwood to Doonside Station	3800	$60	per m^2	$684,000	$889,200	$889,200
Connections	Site to M4	300	$60	per m^2	$54,000	$70,200	$245,700
	Site to M7	750	$60	per m^2	$135,000	$175,500	

Travel Plan Framework: $15,000, based on transport consultant fee for 2-3 weeks work

Travel Plan Co-ordinator: $54,600 per year, a total of $546,000 over 10 years.
This is based on the upper end of a Grade 13 salary at Blacktown Council (town planner level), which is reasonable.

Bus Operating Costs: Based on 1.6 kilometres increased service length under the following assumptions:

- 10 round trips per day
- Average running speed 22 km/h
- Variable Operating Cost per km $0.62
- Overhead Cost per km $0.39
- Driver Wages per km $0.92
- Annual Capital Cost per peak bus (over 15 year period) $23,788

YSCO Geomatics Cost Estimates

Brabham Drive Roundabout. Services relocation, re sheeting, splitter island construction, marking etc would conceivably cost about $250,000.

An estimated bill of quantities and costs follows for the Great Western Highway access intersection. he Two water mains and overhead power lines may need to be adjusted during construction, and YSCO has included an allowance for this items in section 7 'Miscellaneous Works'.

HUNTINGWOOD WEST
CROSS ROAD ACCESS TO PARKLAND
ESTIMATED BILL OF QUANTITIES AND COSTS

NO.	DESCRIPTION OF WORK	QTY	UNIT	RATE $	AMOUNT $
1	GENERAL				
1.1	Site establishment, including noticeboards, Superintendents site office, site facilities, setting out of the works, dust control, Public Liability & Insurance of the Works, construction and maintenance of side access tracks, and preparation of a site specific Environmental Management Plan,		Item		$150,000.00
1.2	Provision for traffic management and night works,		Item		$250,000.00
2	CLEARING				
2.1	Clearing of all improvements, trees and scrub from the works area, including grubbing out of stumps, mulching and stockpiling on site,		Item		$30,000.00
3	TOPSOIL				
3.1	Strip topsoil to a depth of 250mm from areas of works areas, and remove from site,	5,000	sq.m	$5.00	$25,000.00
3.2	Replace, spread and compact topsoil, from stock pile, on formed footways, berms and batters of roads to 100mm compacted thickness,	3,000	sq.m	$2.00	$6,000.00
4	BULK EARTHWORKS				
4.1	Excavation by cut to fill in roads, in all classes of material,	3,000	cu.m	$20.00	$60,000.00
PAGE SUBTOTAL					**$521,000.00**

HUNTINGWOOD WEST
CROSS ROAD ACCESS TO PARKLAND
ESTIMATED BILL OF QUANTITIES AND COSTS

NO.	DESCRIPTION OF WORK	QTY	UNIT	RATE $	AMOUNT $
5	DRAINAGE				
5.1	Excavate drainage trenches in all classes of material, including dewatering and disposal of surplus,	1,000	cu.m	$45.00	$45,000.00
5.2	Supply all materials, bed in clean graded sand, lay, joint and backfill RRJRC stormwater pipes,				
	450mm dia "class 2"	250	m	$100.00	$25,000.00
5.3	Supply, place and compact additional approved granular backfill material in drainage trenches under pavements, to subgrade level,	100	cu.m	$50.00	$5,000.00
5.4	Excavate for, supply all materials and construct standard drainage structures including transitions, jointing, step irons etc:				
	a) Standard mild steel grated gully pit with 1.8m kerb inlet,	8	each	$2,500.00	$20,000.00
	b) Headwall to DN375 outlet, including earth formed and turfed inlet/outlet channel,	4	each	$1,500.00	$6,000.00

PAGE SUBTOTAL **$101,000.00**

HUNTINGWOOD WEST
CROSS ROAD ACCESS TO PARKLAND
ESTIMATED BILL OF QUANTITIES AND COSTS

NO.	DESCRIPTION OF WORK	QTY	UNIT	RATE $	AMOUNT $
6	ROADS AND FOOTPATHS				
6.1	Excavate by cut to fill for road pavements in material other than rock, cart surplus to stockpile indicated on the Soil and Water Management Plan,				
	Cut	4,500	cu.m	$12.00	$54,000.00
6.2	Prepare, trim and consolidate to profile:				
	a) Pavement subgrade	4,500	sq.m	$3.00	$13,500.00
	b) Footpaths, berms and batters	2,500	sq.m	$3.00	$7,500.00
6.3	Supply, place and compact road and driveway pavement in layers, subject to subgrade testing, consisting of:				
	c) 150mm compacted thickness DGB 20, base course,	4,500	sq.m	$15.00	$67,500.00
	d) 600mm compacted thickness DGS 40, sub-base course,	4,400	sq.m	$50.00	$220,000.00
6.5	Surfacing of road pavements with 50mm 7% modified SBS bitumen, including reprofiling,	9,000	sq.m	$32.00	$288,000.00
6.6	Surfacing of road pavement with one coat hot bitumen flush seal incorporating pre-coated aggregate,	4,400	sq.m	$7.00	$30,800.00
6.7	Supply all materials and construct standard concrete elements,				
	a) 150 Kerb & Gutter,	500	m	$40.00	$20,000.00
	b) Mountable kerb to splitter islands,	1,000	m	$25.00	$25,000.00
6.8	Supply all materials and construct 150mm thick concrete infills, with F82 mesh to median islands, splitter islands,	1,000	sq.m	$100.00	$100,000.00
PAGE SUBTOTAL					**$826,300.00**

HUNTINGWOOD WEST
CROSS ROAD ACCESS TO PARKLAND
ESTIMATED BILL OF QUANTITIES AND COSTS

NO.	DESCRIPTION OF WORK	QTY	UNIT	RATE $	AMOUNT $
7	MISCELLANEOUS WORKS				
7.1	Make smooth joins with all existing works,	4	Item	$5,000.00	$20,000.00
7.2	Sawcut bitumen, remove existing pavement and dispose of materials off site.	800	sq.m	$50.00	$40,000.00
7.3	Excavate for supply all materials and lower Sydney Water Mains.	1	Item	$50,000.00	$50,000.00
7.4	Supply all materials and adjust Integral Energy OH power.	2	Item	$20,000.00	$40,000.00
7.5	Supply and install Traffic Signals complete and line marking	1	Item	$330,000.00	$330,000.00
7.6	Supply and install timber post and wire boundary fencing,	500	m	$25.00	$12,500.00
7.7	a) Excavate in all classes of material, supply, bed, lay, joint and backfill subsoil drains, in filter sock,	1,000	m	$30.00	$30,000.00
	b) Supply all materials and constructstandard inspection eyes to subsoil drainage lines,	15	each	$100.00	$1,500.00
7.8	Excavate trenches in material other than rock, supply, lay, joint and backfill with sand, UPVC Class 6 Electricity conduits to local Authority standards:				
	6 X 125mm conduits per trench	150	m	$140.00	$21,000.00
PAGE SUBTOTAL					**$545,000.00**

HUNTINGWOOD WEST
CROSS ROAD ACCESS TO PARKLAND
ESTIMATED BILL OF QUANTITIES AND COSTS

NO.	DESCRIPTION OF WORK	QTY	UNIT	RATE $	AMOUNT $
8	SEDIMENT AND EROSION CONTROL				
8.1	Surface stabilisation of areas by turfing:				
	a) Supply and place couch turf, apply light top dressing, maintain, water and mow,	2,500	sq.m	$6.00	$15,000.00
8.2	Supply all materials, erect and maintain silt fencing and remove from site at completion of works,	600	m	$15.00	$9,000.00
8.3	Supply all materials, erect and maintain orange low density polypropylene barrier fencing and remove from site at completion of works,	600	m	$12.00	$7,200.00
8.4	Form and maintain turfed earth diversion banks, minimum 0.3 high,	200	m	$10.00	$2,000.00
8.5	Form turfed level spreader at ends of diversion banks,	100	sq.m	$15.00	$1,500.00
8.6	Supply all materials, erect and maintain straw bale silt barriers and remove from site at completion of works,	300	m	$20.00	$6,000.00
8.7	Construct and maintain site exit washdown area and remove from site at completion of works,	1	each	$10,000.00	$10,000.00
8.8	Construct a bund of impervious material around the area for storage of liquid hydrocarbons or chemicals with minimum 110 percent of materials storage capacity,	1	Item	$2,000.00	$2,000.00
8.9	Provide waste disposal container for collection of all industrial type waste, including provision for regular disposal of accumulated waste,	1	Item	$1,000.00	$1,000.00
PAGE SUBTOTAL					**$53,700.00**
TOTAL ESTIMATED COSTS					**$2,047,000.00**
15 PERCENT CONTINGENCY					$307,050.00
RECOMMENDED BUDGET					$2,354,050.00