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Cooks Cove Strategic Transport Study

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A	24-Jun-2016	Draft Report	Andy Yung Associate Director	Original Signed
B	09-Sep-2016	Final Report	Andy Yung Associate Director	Original Signed
C	14-Oct-2016	Final Report	Nick Bernard Principal Transport Planner	

Table of Contents

List of Tables

List of Figures

Executive Summary

In response to actions identified in *A Plan for Growing Sydney*, the NSW Government is currently undertaking investigations into the suitability of various areas within Greater Sydney to support the city's forecast growth. The Department of Planning and Environment approved preliminary investigations into the feasibility of Cooks Cove being nominated as a Priority Precinct following a nomination by Rockdale Council in May 2015. The Department of Planning and Environment has arranged for an initial phase of investigations to determine the capacity within the transport network to support development.

A strategic transport study has been conducted to inform the structure plan process and advise Government on the merit and feasibility of progressing the precinct. The study provides Government with an understanding of the additional transport infrastructure and service upgrades required to cater for potential future growth in this area.

Four land use scenarios have been considered for the purposes of this strategic transport study. Broadly speaking this includes two residential-based scenarios and two employment-based scenarios. All scenarios have the same assumed developable area, which has been estimated by the broader investigation team based on various constraints such as flooding, potential road reserve requirements and airport-related restrictions (e.g. flight paths). If planning for the precinct progresses, these land use scenarios will be further refined to reflect the significant constraints on the transport network to cater for growth in the area.

The key findings of the strategic transport study are:

- Residents will be more reliant on private vehicles to travel compared with development in Arncliffe and Banksia precincts due to the distance to the rail network and major barriers to pedestrian and cyclist access.
- Significant investment in rail infrastructure is required to provide additional and/or spare capacity on the Illawarra Line to accommodate any development in Cooks Cove.
- Significant investment in the road network is required, including a potential motorway connection from the M5 to the south to enable development within Cooks Cove.
- Grade separated walking and cycling infrastructure is required to provide safe access between Cooks Cove and surrounding areas and transit nodes.

Limitations

This strategic transport study has a number of limitations due its preliminary nature and scope of assessment. Further studies are required to fully understand the impact of development in Cooks Cove on infrastructure requirements, including:

- Sensitivity testing if major infrastructure is not delivered i.e. rail and/or motorway
- More comprehensive traffic modelling
- Refined land use scenarios
- Pedestrian access to public transport nodes.

Recommendations

The strategic transport study includes the following recommended actions and improvements (see Table 1) as part of the preliminary transport framework that should be carried out to enable the development of Cooks Cove investigation area.

Table 1 Summary of transport actions and improvements

Walking and Cycling
A direct foreshore bicycle path along the Cooks River with improved connectivity across Muddy Creek.
Connection to Giovanni Brunetti Bridge.
Potential new walking and cycling connections across the Cooks River to enhance complementary land uses with Sydney Airport, and as a potential alternate crossing opportunity to improving the Giovanni Brunetti Bridge crossing.
Treatments that manage key conflicts points at Marsh Street, Princes Highway and West Botany Street through pedestrian enhancements – either by overpasses or improved crossings.
Potentially provide walking and cycling connections into Banksia Priority Precinct via Spring Street.
Opportunities to improve pedestrian amenity and safety within the investigation area and along connections to areas surrounding the investigation area, including transport interchanges such as rail stations and bus stops.
Rail
Improvements to rail infrastructure and services to get more people to and from the Sydney CBD and other key centres on the rail network, such as increasing the number of trains per hour via operational improvements and eventually moving towards Sydney Metro type services.
Improved and enhanced accessibility and connectivity from the investigation area to surrounding rail stations.
Bus
Introduction of bus feeder services to mitigate walking distance / time issues. This could include consideration to connecting to Sydenham – where more passenger capacity exists – instead of local stations.
Increased bus service frequencies to local routes (422).
Introduction of new bus stops at Marsh Street to accommodate access to new and improved suburban bus routes.
Investigation into the need for any bus priority infrastructure to improve reliability.
Roads
The Gateway to the South program to fix two pinch points in the Cooks Cove area – Princes Highway intersections with Railway Road and Forest Road.
Reliance on the delivery of major road infrastructure projects, such as WestConnex, with proposed southern extension from Arncliffe to Kogarah and the proposed F6 Motorway that aims to remove traffic from existing arterial road network and creates capacity for local development traffic to access the regional road network.
Proposed upgrades by others, including Marsh Street widening and Gertrude Street extension, to improve local connectivity and accessibility to the wider network.
Major intersection upgrades on Marsh Street to provide access to the investigation area.
Any other network and intersection upgrades to be identified as part of a detailed traffic impact assessment to support a future proposal.

From this strategic study, it is clear that major rail infrastructure improvements and services are required to support the development growth of the Cooks Cove investigation area. The ability of local development traffic to access the regional road network, including Marsh Street, Princes Highway and the M5 Motorway, is heavily reliant on the delivery of major road infrastructure upgrades, such as the WestConnex and the F6 Motorway projects. The development feasibility of the Cooks Cove investigation area could not be fully realised without investment in these major road and rail infrastructure.

1.0 Introduction

1.1 Background

The Cooks Cove investigation area has been previously investigated and considered for potential redevelopment culminating in the zoning of the site for Trade and Technology, Open Space and Special Uses (road reservation) in 2004.

The location of the investigation area in proximity to key transport nodes make it a desirable location for urban renewal. The Department of Planning and Environment (DP&E) engaged AECOM to undertake an investigation of the Cooks Cove precinct to inform the feasibility of potential development at the site.

DP&E has arranged for an initial phase of investigations to determine the capacity within the transport network to support development. DP&E is working with a number of key stakeholders to undertake a high level land use and transport investigation, developing a high level structure plan and identifying potential yields of different land uses to feed in to a preliminary transport and traffic study.

1.2 Site context

The Cooks Cove investigation area is located in Arncliffe, 10 kilometres south of the Sydney CBD, in proximity to Sydney Airport and Port Botany. The investigation area is contained within the Bayside Council Local Government Area (formerly City of Botany Bay and Rockdale City Councils) and is broadly bounded by Marsh Street and Levey Street to the north, Cooks River and Muddy Creek to the east, Bestic Street to the south and West Botany Street to the west.

The existing land uses within the precinct are dominated by sport & recreational facilities and open space as well as a small area of low density residential dwellings. There are some mixed use commercial and hotel facilities to the north of Marsh Street, supporting the Sydney Airport. The site covers the Kogarah Golf Course and Barton Park, along the foreshores of the Cooks River. The investigation area is illustrated in Figure 1.

- The site's location is generally characterised as follows:
- Approximately 600m from the investigation area boundary to Arncliffe Station, and approximately 1km from the investigation area boundary to Wolli Creek Station. However, there is a lack of connectivity and safe access to these stations. There are also capacity constraints to the current train services along the T4 Illawarra Line.
- Approximately 1km from Sydney Airport International Terminal and 3.5kms from the Domestic Terminal. Sydney Airport employs around 30,000 people on-airport, and employs an estimated 280,000 people directly and indirectly (SACL, 2014).
- Within close proximity to the Botany and South Sydney Industrial and mixed use/ enterprise areas which provide tens of thousands of jobs and augments the employment within the Airport.
- Adjacent the Arncliffe and Banksia Priority Precincts, an area being reviewed for further regeneration and development uplift.

Figure 1 Cooks Cove investigation area

Source: AECOM, 2016

1.3 Purpose of report

The purpose of this report is to outline the results of the preliminary transport and traffic study, undertaken to identify the suitability of developing the investigation area and the strategic transport requirements to inform the initial concept and draft structure plan. The study includes an assessment of existing conditions and outlines a future transport framework, providing advice to Government on the network implications of developing the site.

1.4 Limitations

Due to the strategic nature of the study, there are a number of key assumptions and limitations of this study including:

- The study and traffic assessment were undertaken based on the four potential land use composition options identified only.
- Apart from the key traffic generating land uses, such as residential, commercial and retail uses, the site will also accommodate other land uses such as recreational facilities and a golf course. However these have not specifically been incorporated into the preliminary traffic assessment.
    - These elements are not considered to be large travel generators during peak periods, are likely to be located in parts of the development that are segregated from the 'core' developable area and will likely have separate access arrangements.
    - The consideration to a potential Sports Stadium on the site has been identified, however it was not assessed as part of this preliminary investigation which focusses on the suitability of the site as a Priority Precinct.
- The transport needs and infrastructure requirements were identified based on existing travel patterns and behaviour, current network performance as well as current understanding of future transport network planning and investments only.
- Only a basic preliminary traffic assessment was performed to understand the scale of the road infrastructure likely required to provide access; to determine the forecast traffic performance of key access intersections and ultimately if they form a constraint to development of the investigation area. Further traffic analysis and detailed modelling will be required to provide further understanding of the development impact on the surrounding road network.
- The preliminary traffic assessment is based on traffic forecasts (produced as part of the New M5 Environmental Impact Statement) that assume key infrastructure upgrades will be delivered in the future. The full list of assumed future road upgrades is listed below. The feasibility of the development could be heavily compromised if these infrastructure projects are not delivered.
    - WestConnex program of works, including the New M5 Motorway and the M4-M5 Link projects
    - Sydney Gateway.
    - F6 Motorway, from the New M5 Motorway to President Avenue only.
    - Marsh Street widening.
    - Gertrude Street extension.

2.0 Land use scenario development

Figure 2 represents the conceptual Structure Plan for Cooks Cove. The Structure Plan is not a prescriptive design solution for Cooks Cove, rather identifies key elements that should be considered in further detail during the next stage of the project.

The investigation area for the Cooks Cove precinct comprises a total of approximately 135 hectares of land. A significant amount of this land cannot be built on due to constraints such as infrastructure easements, heritage features and noise contours; which prohibit uses such as residential and educational facilities. The resulting amount of land is considered to be the “developable area” for the precinct, as illustrated in the concept Structure Plan.

The developable area equates to approximately 20 hectares of land with approximately 15 hectares of land available for development and approximately five hectares of land required for streets, footpaths, open space and flood mitigation measures. This area has formed the focus of the strategic transport study.

The site will also accommodate other land uses such as recreational facilities; however these have not specifically been incorporated into the assessment. These elements are not considered to be large travel generators during peak periods, are likely to be located in segregated parts of the development outside the ‘core’ developable area and have separate access arrangements. The consideration to a potential Sports Stadium on the site has been identified; however it was not assessed as part of this preliminary investigation.

Figure 2 Concept structure plan

Developable Area

Sport and Recreation

Source: AECOM, 2016

Four land use scenarios have been considered for the purposes of the strategic transport study as summarised in Table 2. Broadly speaking this includes two residential-based scenarios and two employment-based scenarios. All scenarios have the same assumed developable area, which has been estimated by the broader investigation team based on various constraints such as flooding, potential road reserve requirements and airport-related development restrictions (e.g. flight paths).

- **Option 1** represents a lower development scenario with residential and mixed uses.
- **Option 2** is a commercially driven version of Option 1, in which residential dwellings are traded for office space. This option was a sensitivity test partially driven by the opportunity to utilise potential counter-peak direction transport capacity.
- **Option 3** represents a higher development scenario with residential and mixed uses. This is based on the 5,000 dwellings proposed by previous proposals for the site.
- **Option 4** represents land uses that are allowed under the current zoning and assumes a mix of high traffic generating uses including retail and commercial offices. The retail component represents a shopping centre approximately the scale of Bondi Junction Shopping Centre.

Table 2 Land use scenarios considered as part of the Transport Assessment

Land Uses	Option 1	Option 2	Option 3	Option 4
Residential	3,400 units	2,000 units	5,000 units	-
Primary School	1,000 students	As per Option 1	As per Option 1	-
Hotel	300 rooms			-
Retail – Restaurant	3,000 sqm			-
Retail – Shopping Centre	4,000 sqm			130,000 sqm
Retail – Supermarket	3,000 sqm			-
Retail – Showroom	5,000 sqm			-
Commercial – Office	5,000 sqm	200,000 sqm		300,100 sqm

Source: AECOM, 2016

Options 1, 2 and 3 have a mix of land uses including residential, hotel, commercial, retail and educational uses. From a travel demand generation perspective, the options cover a spectrum of travel demand generation, and also travel directionality.

The ‘shopping centre’ component of the retail in these three options is generally envisaged as slow trade retail – small business retail and services rather than a destination retail centre in itself. The supermarket is envisaged to be a more mid-tier supermarket tenant (e.g. Harris Farm Market) rather than a major chain (e.g. Coles, Woolworths). For Option 4, the retail component would be envisaged as a major retail centre.

3.0 Multi-modal transport network response

A preliminary transport framework has been developed for initial assessment purposes. Inputs to the development of the transport framework included:

- Acknowledgement of the constraints and opportunities in the existing transport network (as defined in Section 3.1 and each of the modal sections in the following chapters of the report).
- Transport projects already under construction, or included within current Government planning documents (as defined in each of the modal sections in the following chapters of the report).
- The land use development scenarios (as defined in Section 2).
- The urban design principles for the Cooks Cove investigation area that address issues of context, connectivity, activity, sport and recreation, open space, natural systems and heritage. These principles have also been used to guide the development of multi-modal connections between the investigation area and the surrounding transport network and infrastructure (as defined in Section 3.2).
- Stakeholder engagement with TfNSW and RMS.

3.1 Existing travel patterns

Transport for NSW (via the former Bureau of Statistics and Analytics) provide a range of Journey to Work (JTW) data on travel patterns and behaviour. JTW data is derived from the five-yearly Census of Population and Housing conducted by the Australian Bureau of Statistics. JTW data identifies trip origins and destinations, as well as journey characteristics such as mode of travel.

Five travel zones defined by Transport for NSW contain the majority of the Cooks Cove investigation area as well as some of the adjacent existing areas, as shown in Figure 3. The JTW data for these zones has been used to gain an understanding of where people near the Cooks Cove investigation area are travelling to and from and what transport mode they are using. Note that the investigation area itself has very few residents and employment destinations.

Figure 3 Travel zones near the Cooks Cove Investigation Area

Source: Transport for NSW 2015

3.1.1 Current travel patterns - local residents

The predominantly residential nature of the area surrounding Cooks Cove to the west and south is evident in the data, with more resident-based trips made from the area compared to worker-based trips to the area.

Of 2,890 employed residents that live in the area, 900 (31 per cent) travel to work in Sydney Inner City, as shown in Table 3. Following Sydney Inner City, the most common JTW destinations are Kogarah-Rockdale (500), Botany (400), Eastern suburbs (140) and Marrickville-Sydenham-Petersham (90).

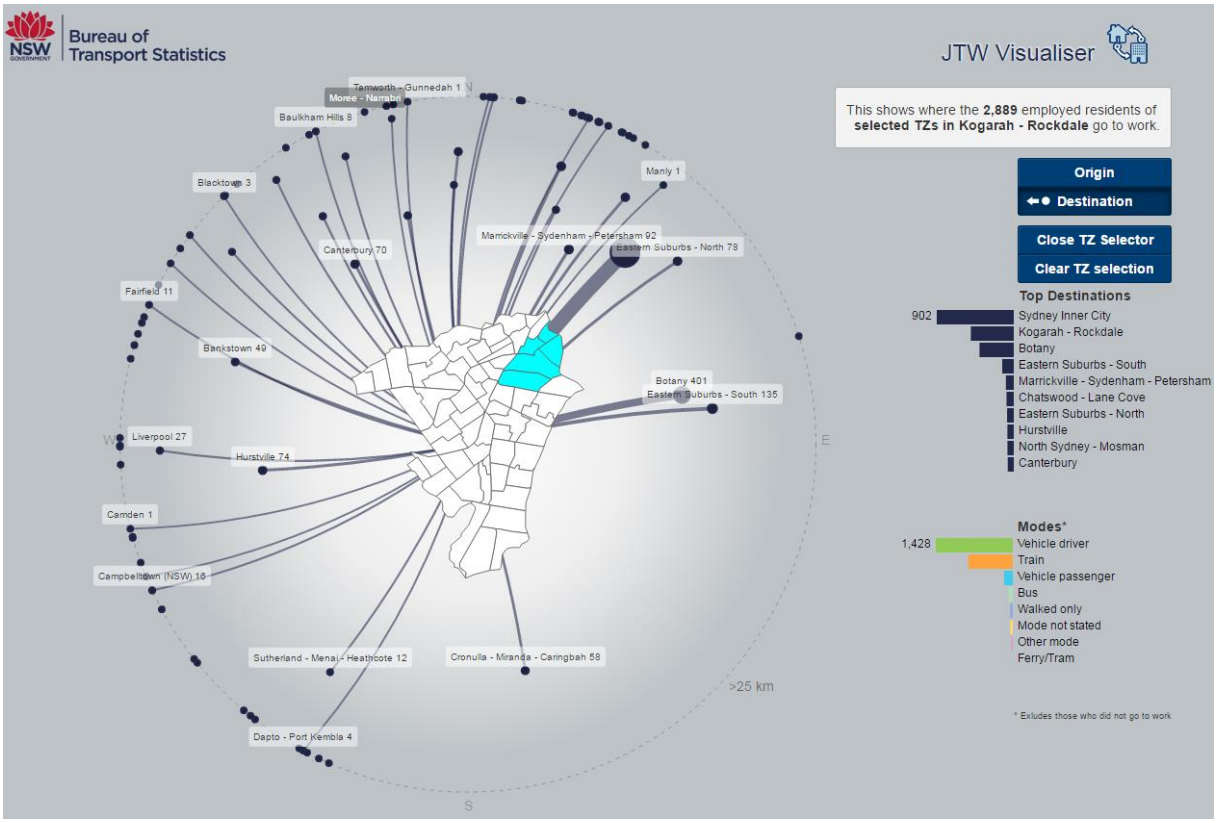
Table 3 Most common JTW destinations for employed residents

Destinations	Trips	Proportion of Trips
Sydney Inner City	900	31%
Kogarah-Rockdale	500	17%
Botany	400	14%
Eastern Suburbs South	140	5%
Marrickville-Sydenham-Petersham	90	3%
Others	860	30%

Source: Transport for NSW, 2015

From this data it is evident that a significant number of employed residents in the area commute to the north and east to access jobs in the Sydney CBD, Sydney Airport and Randwick. This is accompanied by a reasonable portion of trips contained within the southern district (i.e. Kogarah-Rockdale and Sutherland shire).

Figure 4 Current JTW Travel Patterns – Resident Workforce



Source: Transport for NSW, 2015

Private vehicle is the dominant mode of transport for JTW trips for residents of the area surrounding the Cooks Cove investigation area – 1,590 (61 percent) of all JTW trips from the area are by car. Public transport accounts for 34 per cent of all JTW trips, which is almost entirely attributed to train. Walking and other modes of transport (such as cycling) comprise three per cent of all JTW trips. Table 4 shows the breakdown of local residents' JTW trips by mode.

Table 4 JTW mode share for local workers

Origin (Place of Residence)	Trips	Mode Share
Car driver	1,430	54%
Car passenger	160	6%
Car total	**1,590**	**61%**
Train	820	31%
Bus	80	3%
Public transport total	**900**	**34%**
Walked only	50	2%
Mode not stated / other mode	50	2%
Other	30	1%

Note: Excludes those who did not go to work

Source: Transport for NSW, 2015

3.1.2 Current travel patterns - local employees

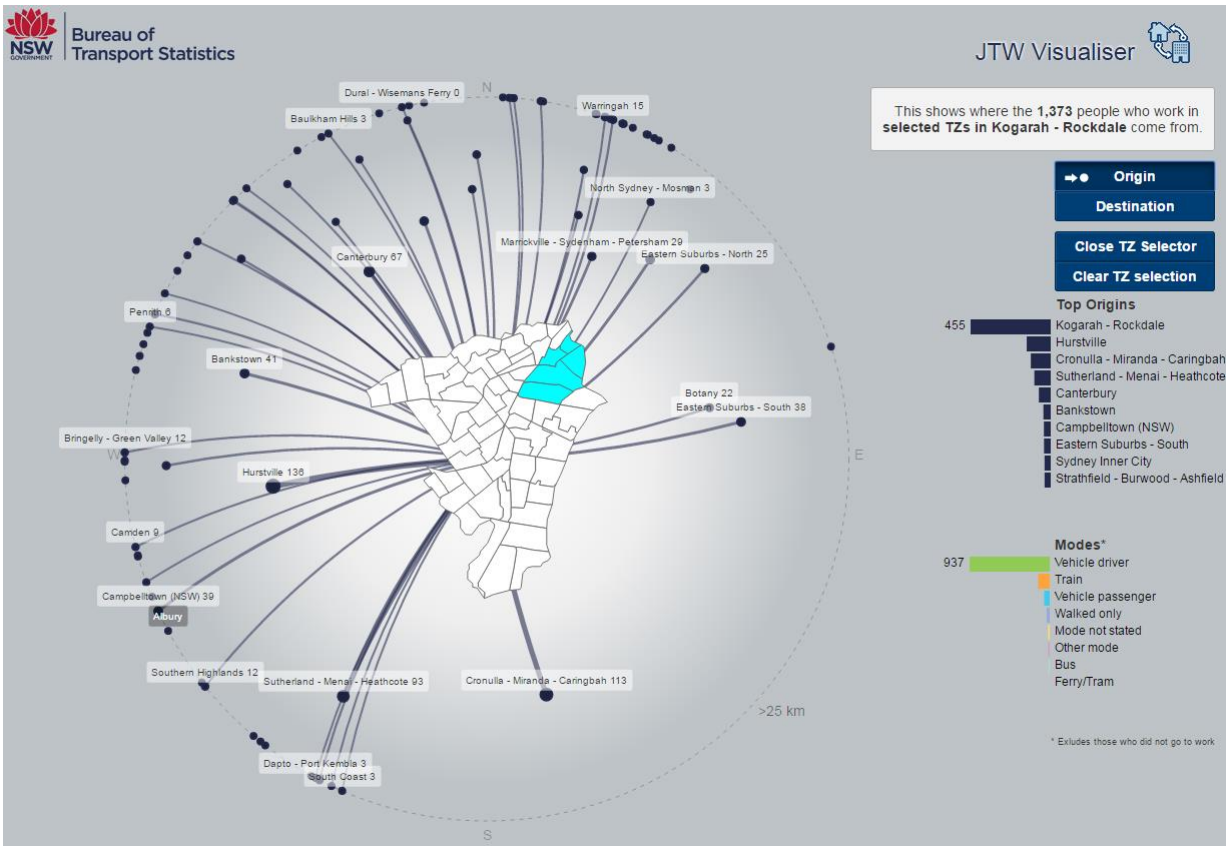
Of 1,370 people that work in the area, 460 live in Kogarah-Rockdale (33 per cent). After Kogarah-Rockdale, the most common JTW origins are Hurstville (140), Cronulla-Miranda-Caringbah (110) and Sutherland-Menai-Heathcote (90). These areas are located to the south of the Cooks Cove investigation area and represent the majority of JTW origins for local workers. Collectively, these four areas account for 58 percent of all local workers, as shown in Table 5.

Table 5 Most Common JTW destinations for local workers

Destination	Trips	Percentage
Kogarah-Rockdale	460	33%
Hurstville	140	10%
Cronulla-Miranda-Caringbah	110	8%
Sutherland-Menai-Heathcote	90	7%
Canterbury	70	5%
Other	510	37%

Source: Transport for NSW, 2015

Figure 5 Current JTW Travel Patterns - Local Employees



Source: Transport for NSW, 2015

Private vehicle is even more so the dominant mode of transport for JTW trips for employees working in the area – 940 (77 percent) of all JTW trips to the area by car. This may be representative of the types of employment available in the area – particularly along the Princes Highway corridor. Public transport only accounts for 12 per cent of all employee JTW trips. Walking and other modes of transport (such as cycling) comprise four per cent of all JTW trips. Table 6 shows the breakdown of local employees' JTW trips by mode.

Table 6 Most Common JTW destinations for local workers

Destination (Place of Work)	Trips	Mode Share
Car driver	940	77%
Car passenger	60	5%
Car total	**1,000**	**82%**
Train	133	11%
Bus	14	1%
Public transport total	**147**	**12%**
Walked only	35	3%
Mode not stated / other mode	18	1%
Other	17	1%

Note: Excludes those who did not go to work

Source: Transport for NSW, 2015

3.2 Guiding design principles

There are six urban design principles that establish a framework within which future development can be considered for the Cooks Cove investigation area. The principles address issues of context, connectivity, activity, sport and recreation, open space, natural systems and heritage. These principles have also been used to guide the development of multi-modal connections between the investigation area and the surrounding transport network and infrastructure. The six principles are:

Principle 1: Define the role of Cooks Cove within its context

The primary purpose of this principle is to articulate a clear vision and defined role for Cooks Cove recognising its strategic location in Sydney. The precinct is uniquely positioned adjacent to Sydney Airport and the two identified priority precincts of Arncliffe and Banksia. Significant changes are occurring in the surrounding context, both from a land use perspective and an aviation perspective, which impact the role Cooks Cove can play in the future. In Sydney, the trend towards vibrant, mixed use precincts optimises activity throughout the day and the week. Cooks Cove can capitalise upon its context to deliver a highly aspirational outcome that meets the strategic planning goals for the precinct.

Principle 2: Create a highly permeable precinct

The Cooks Cove investigation area needs to overcome the existing barriers to access and connectivity into the Cooks Cove precinct. Permeability refers to the directness of links and the density of connections in a movement network. It is defined by the ability of the urban fabric to offer different routes into and through it. In the case of Cooks Cove, this applies to vehicular, bicycle and pedestrian movements within the precinct as well as broader connections to public transport adjacent to the precinct. A high degree of permeability translates to a precinct that is easy for all users to move through.

Principle 3: Deliver a vibrant social heart

This principle is to ensure that Cooks Cove considers the social needs of the people who will live in, work in and visit the precinct. This means creating a clearly identifiable place that is unique and memorable. If Cooks Cove grows into a significant precinct of medium density, the quality of the public domain, open space and community facilities will become increasingly important. There is an opportunity to define a central gathering space which clusters uses such as a community park, civic space, neighbourhood serving retail and community facilities. The clustering of these uses will establish a critical mass that achieves the vibrancy of a successful community.

Principle 4: Establish a new green heart for Rockdale

The Cooks Cove investigation area is proposed to enhance the local and regional open space, sport and recreation offer for the broader Rockdale community. The precinct performs an important role in providing a broad range of sport and recreation facilities for Rockdale and there is an opportunity to reinforce Cooks Cove as the pre-eminent centre for sports excellence in the area. This means significant amenity for those living and working in Cooks Cove with direct access to ovals, playing fields, outdoor multi-purpose courts, regional bicycle trails and even a golf course. An enhanced green heart positions Cooks Cove with a diverse and competitive healthy lifestyle offer.

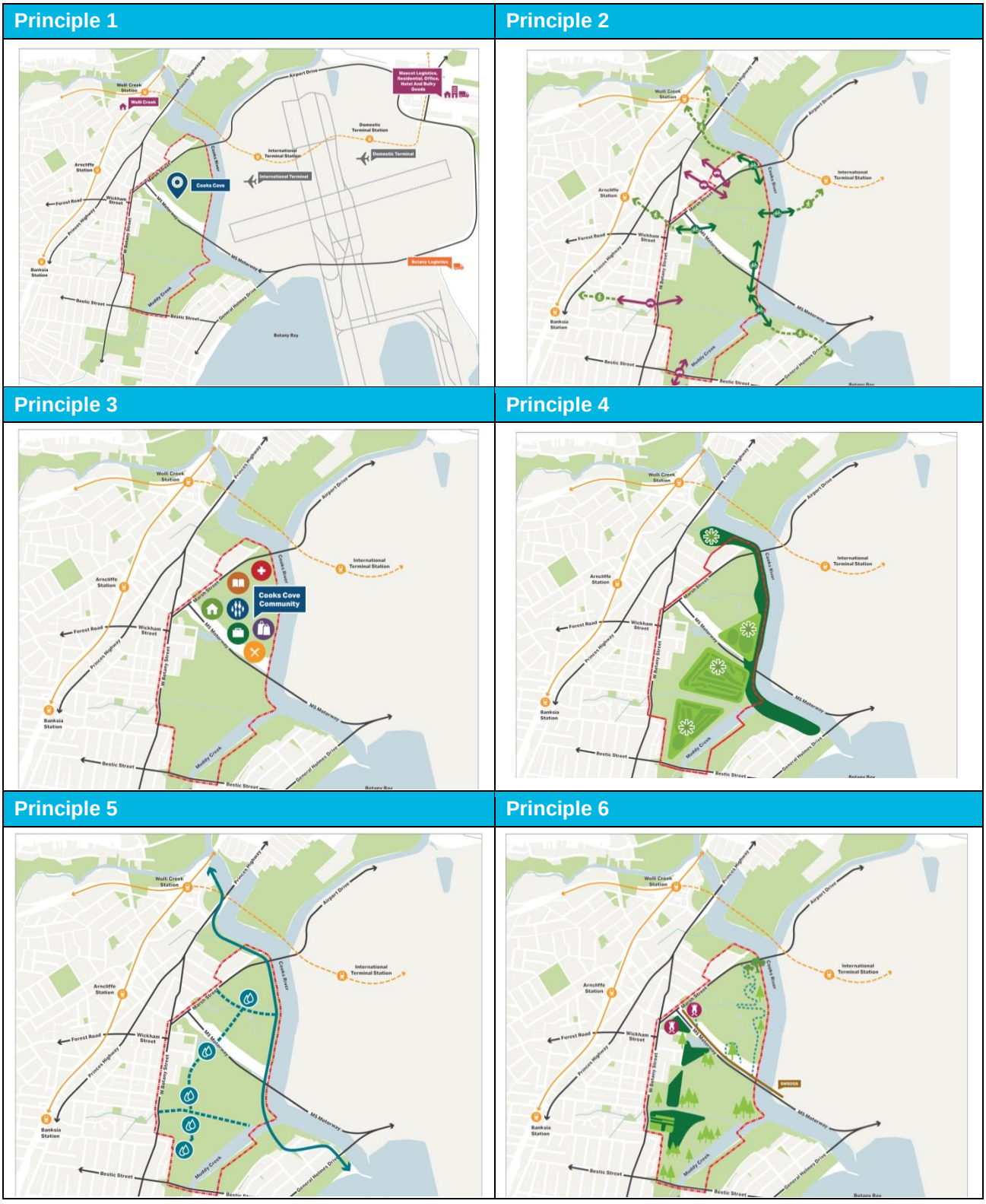
Principle 5: Build upon the existing water narrative

The Cooks Cove investigation area is proposed to leverage the amenity and function of the existing water systems within and adjacent to the precinct to create a distinct identity for Cooks Cove. For this reason, this principle works with the existing water systems of the precinct – the Cooks River, the wetlands and the overland flow paths – to promote a holistic water narrative that is visible and evident to the future residents, workers and visitors of Cooks Cove.

Principle 6: Leverage the natural heritage

The Cooks Cove investigation area is proposed to maximise the existing heritage elements of the precinct that make Cooks Cove distinct and identifiable. This encompasses ecological, environmental and cultural elements which meaningfully contribute to the history of the precinct and its sense of place.

Figure 6 Cooks Cove Urban Design Principles



Source: AECOM, 2016

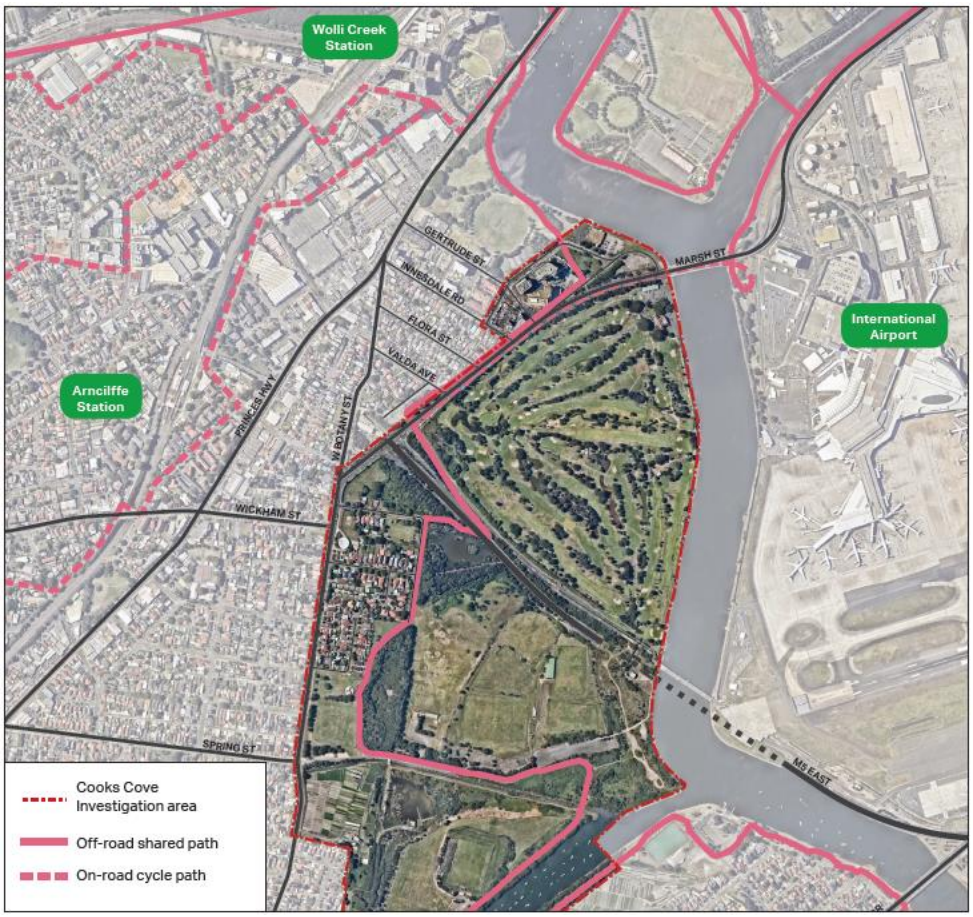
4.0 Walking and Cycling

4.1 Existing network and facilities

The Cooks Cove investigation area forms an important link in the Botany Bay to Homebush Bay regional cycle network, however the existing links through the investigation area are convoluted (refer Figure 7).

Pedestrian access into and out of the investigation area is limited and often without prioritisation when attempting to cross major roads, such as Marsh Street, the M5, West Botany Street. A lack of east-west connectivity is an issue for both pedestrians and cyclists. Additionally, the Princes Highway, Marsh Street and Cooks River present as barriers to walking and cycling movements.

Figure 7 Existing walking and cycling network



Source: AECOM, 2016

Other dedicated pedestrian facilities within the study area include pedestrian crossings at the signalised intersections of:

- Marsh Street / M5 (southern approach)
- Marsh Street / West Botany Street
- Wickham Street / West Botany Street
- West Botany Street / Bestic Street.

Each of the above intersections generally does not have pedestrian crossings on all approaches. Some of the existing pedestrian crossings are constrained to narrow crossings and / or limited storage at the staged crossings. There are also pedestrian safety issues due to the narrow footpaths and proximity to live traffic at high speeds.

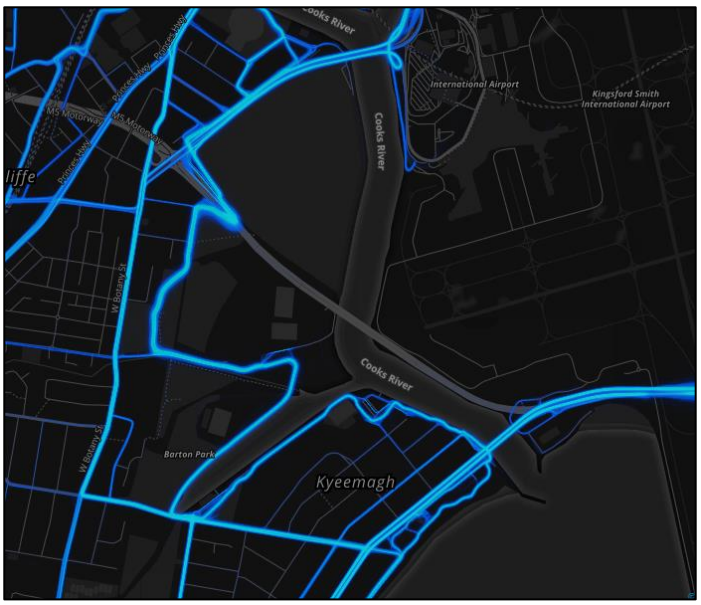
4.2 Existing pedestrian and cyclist movements

The key generators and attractors of pedestrian and cyclist movement close to the vicinity of the Cooks Cove investigation area include:

- The low, medium and high (Wolli Creek) density residential areas offset from the trunk rail and road corridors.
- Education facilities close to the area, including Arncliffe Public School and St Francis Xavier's Catholic Primary School.
- The transport nodes of Wolli Creek, Arncliffe and Banksia rail stations and surrounding shops.
- The increasingly higher density of mixed use and residential areas in the Wolli Creek precinct.
- The employment provided within the Princes Highway corridor precinct. However, vehicle trips rather than pedestrian trips are expected to be generated in this area which is predominantly large scale retail / commercial uses.

To gauge current ridership in the Cooks Cove investigation area, information has been extracted from an application based data source. Strava is a mobile and online application that allows users to track their ride using a GPS device, and upload their data. The data is used to update a website accessible global heat map every hour. Figure 8 shows the heat map for current cycle use in the vicinity of Cooks Cook investigation area. It should be noted that this data is limited by the nature of the users of the app – which are considered to be highly competent riders, rather than recreational cyclists.

Figure 8 Bicycle user heat map



Source: Strava Inc., 2015

The heat map indicates:

- High use of the dedicated cycle facilities across the Cook River and connecting facilities to the east through Cahill Park, Eve Street Cycleway, Bestic Street Cycleway and the Grand Parade.
- A high volume of riders using West Botany Street and Bestic Street as an alternate on-road route between the Princes Highway Cooks River crossing and The Grand Parade.
- Some utilisation of Forest Road and Princes Highway informally on-road.

The combination of the above observations indicates that users want to utilise the more direct routes, despite the risk of interaction with heavier traffic flows. This is also a reflection of the user type and rider skill level. Existing cycle routes serve a proportion of the demand shown, however gaps in cycle infrastructure provision in an east-west direction leaves these cyclists with no viable alternative to the road network.

4.3 Future walking and cycling context

The NSW government has developed a plan - *Sydney's Cycling Future* that supports the integration of cycling into the transport system in order to encourage the future of bike riding in Sydney. There are four principles for guiding delivery of Sydney's Cycling Future:

- Ensure cycling initiatives are based on sound evidence.
- Prioritise cost effective solutions.
- Deliver in collaboration with partners.
- Support a culture of cycling for transport.

The NSW Government will fund the provision of the major missing links in our priority cycle network within five kilometres of major centres. Strategic bicycle routes / corridors have been identified for investigation or development, to provide improved access to major centres and neighbourhood destinations in the vicinity of Cooks Cove investigation area including Wolli Creek and Sydney Airport. The catchment of major centres and the strategic bicycle connections between the centres are shown in Figure 9.

The connection between Cooks Cove and the Sydney Airport is one of the key links that would improve walking and cycling access to the major employment centre. Around half of the 12,000 people that travel to work at Sydney Airport everyday live within cycling distance of the airport.

Previous proposals to accommodate this connection included provision of a new 'clip-on' bridge at the existing Giovanni Brunetti Bridge. However after consultation with RMS it is understood the bridge was determined to be unsuitable to accommodate such a facility. It is understood RMS are re-evaluating the proposal.

Figure 9 Cycle Catchment of Major Centres in the vicinity of Cooks Cove

Source: Sydney's Cycling Future, Transport of NSW (2013)

4.4 Needs and opportunities

A number of walking and cycling connectivity needs have been identified for the investigation area; these are highlighted in Figure 10. The needs for improved walking and cycling connectivity to and from the precinct should also consider the safety of pedestrians and cyclists. Any improvements to at grade crossings to accommodate the increase in pedestrian traffic will also need to consider the impact on the wider regional road network.

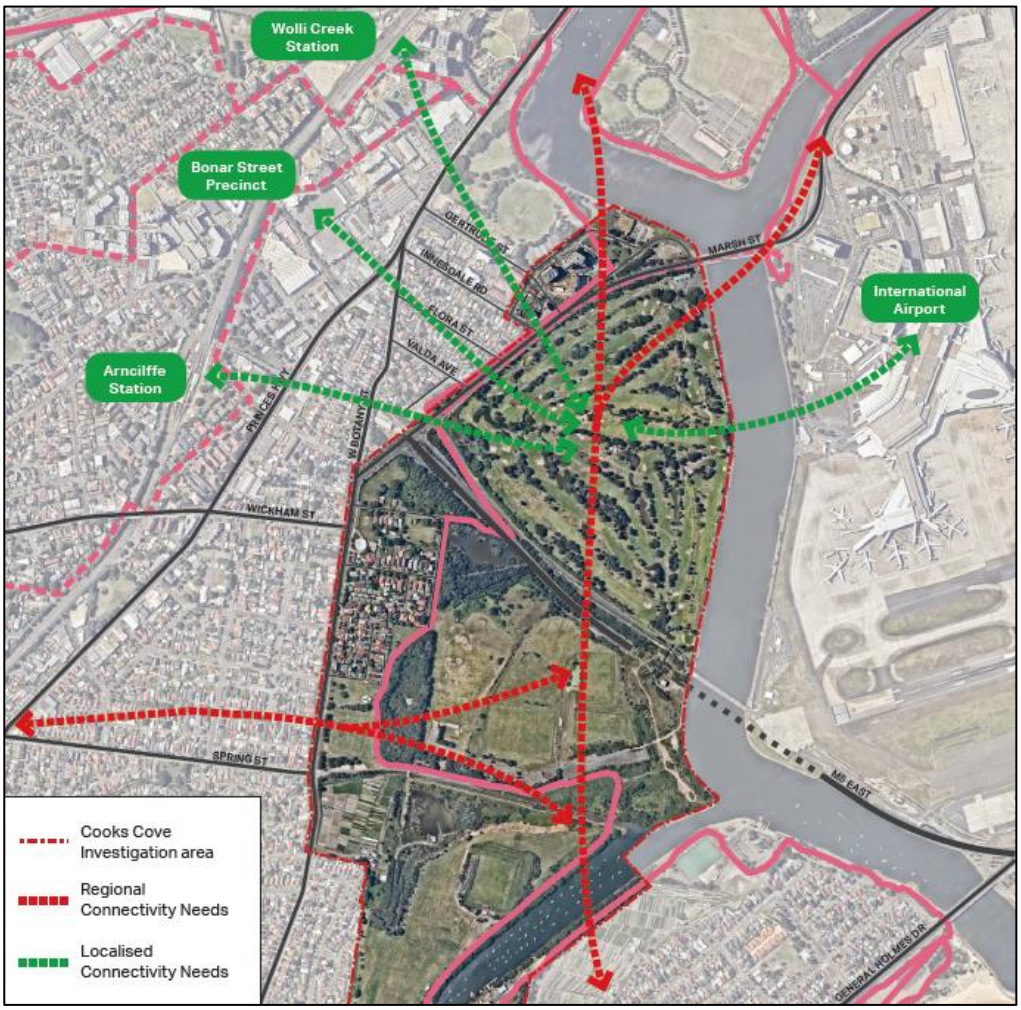
Regional (as shown by the red dotted line):

- Homebush Bay regional cycle facility
- Alexandra Canal Cycleway
- The Grand Parade
- East-west connectivity to areas such as Banksia and beyond (currently poor)

Localised (as shown by the green dotted line):

- Public transport nodes
- Local centres and shops
- Sydney Airport

Figure 10 Walking and cycling connectivity needs



Source: AECOM, 2016

4.5 Conceptual walking and cycling response

A conceptual walking and cycling network is highlighted in Figure 11 that includes:

- A direct foreshore bicycle path along the Cooks River with improved connectivity across Muddy Creek.
- Connection to Giovanni Brunetti Bridge.
- Potential new walking and cycling connections across the Cooks River, to enhance complementary land uses with Sydney Airport, and as a potential alternate crossing opportunity to improving the Giovanni Brunetti Bridge crossing.
- Treatments that manage key conflicts points at Marsh Street, Princes Highway and West Botany Street through pedestrian enhancements - either by overpasses or improved crossings.
- Potential walking and cycling connections into Banksia Priority Precinct via Spring Street.
- Opportunities to improve pedestrian amenity and safety within the investigation area and along connections to areas surrounding the investigation area including transport interchanges such as rail stations and bus stops.

Figure 11 Walking and Cycling Response

Source: AECOM, 2016

5.0 Public transport

5.1 Existing network and services

5.1.1 Rail

Rail is the trunk public transport mode of the southern suburbs of Sydney making up around 30% of local mode share according to JTW data. Figure 12 illustrates the existing rail network in the vicinity of the site.

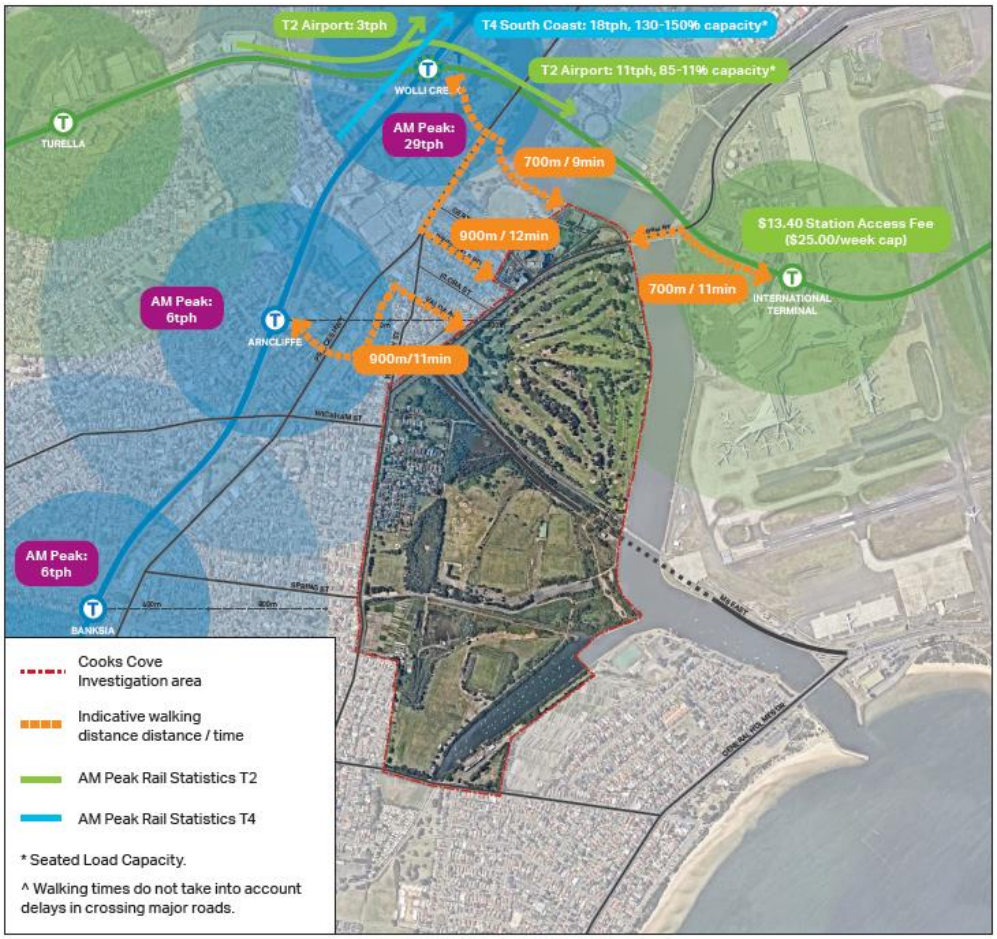
Wolli Creek is the key station for the Cooks Cove investigation area in terms of station facilities / capacity as well as train serviceability and catchment. The area is also supported by Arncliffe and Banksia Stations, though these stations have a lower standard of facilities and serviceability. Walking distances and times to each surrounding station are generally quite long (over 800m and 10 minutes). There is also a lack of connectivity and safe access from the investigation area to these stations.

Wolli Creek Station is serviced by both the T2 Airport Line and the T4 Illawarra and South Coast Line, hence with more frequent train services and capacity. Arncliffe and Banksia Stations are located on the T4 Illawarra Line.

The **T2 Line** provides access between Wolli Creek and the Sydney CBD via Airport, Green Square, Mascot and areas to the south west. The nearest station to the east of Cooks Cove is the International Terminal along the T2 Line. However, ridership of this line is hindered by a station access fee and current access from the Cooks Cove investigation area is restricted by the river.

The **T4 Line** provides rail access to the Sydney CBD, Bondi Junction and each of the centres within the Kogarah, Rockdale and Sutherland Shire areas to the south.

Figure 12 Existing Rail Network

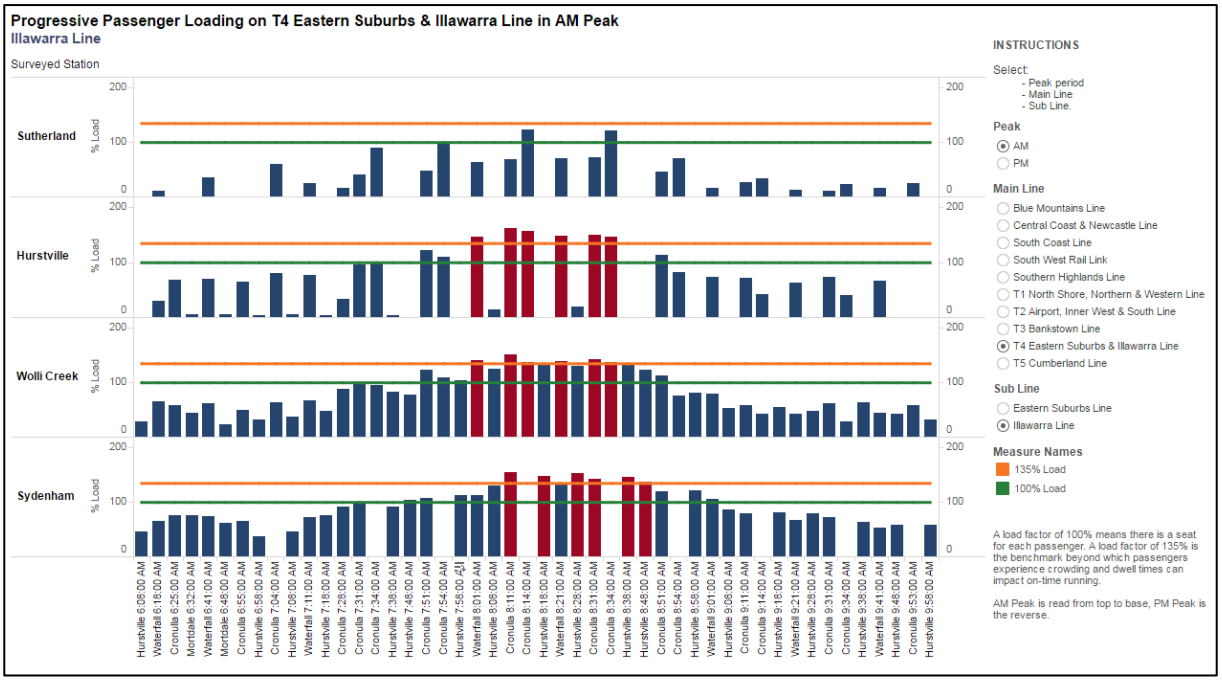


Source: AECOM, 2016

General characteristics of services along the T4 Illawarra and South Coast Lines are as follows:

- Trains operate for 20 hours on a typical weekday in both directions.
- The current capacity of the line is 18 trains per hour, with the line operating at full capacity during the AM peak hour, accommodating:
  - 15 Suburban services (operating between Bondi Junction and either Hurstville, Cronulla or Waterfall).
  - 3 Intercity services (originating to the south in the Illawarra).
- All 20 services stop at Wolli Creek Station.
- Only 6 of the 18 peak hour services stop at Arncliffe and Banksia Stations (i.e. 10 minute average headways). These are the all-stop services between Hurstville and Bondi Junction. The remainder are express services that do not stop between Wolli Creek and Hurstville.
- The services on the line are experiencing passenger loading issues during morning peaks, operating at around 135% of the seated load capacity when the trains arrived at Wolli Creek Station (see Figure 13). This is the level of crowding at which on-time running is impacted due to increased dwell times.
- Loading issues are due to the significant majority of customers (around 90% Arncliffe Station morning peak passengers) accessing areas to the north including the Sydney CBD.

Figure 13 Train loads survey during the AM peak for the T4 Line September 2015



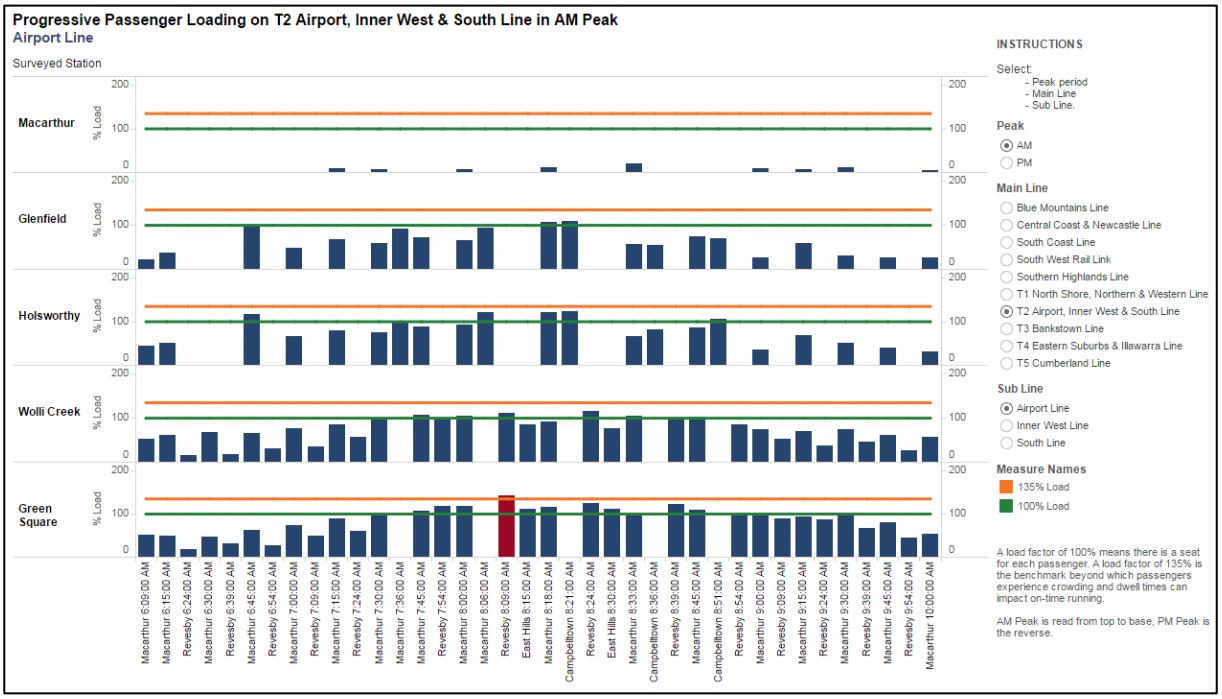
Source: Transport for NSW, 2015

Transport for NSW have identified the need to provide additional capacity on the T4 Line, however a commitment is yet to be made to delivering new infrastructure. This finding presents a constraint not just to the Cooks Cove investigation area, but to urban growth along the T4 corridor on the whole.

General characteristics of services along the T2 Airport Line are as follows:

- Trains operate for 20 hours on a typical weekday in both directions.
- The current capacity of the line is 18 trains per hour, currently accommodating:
  - 14 Suburban services (operating between Town Hall and either Revesby or Macarthur.
  - Only 11 of the 14 services stop at Wolli Creek Station.
- Some services on this line have more available capacity when they arrive at Wolli Creek (see Figure 14), however there are upstream capacity constrains around Green Square which would be exacerbated by additional growth in and around the investigation area.

Figure 14 Train loads survey during the AM peak for the T2 Line September 2015



Source: Transport for NSW, 2015

5.1.2 Bus

The main role the bus mode plays in most of Sydney's south is as a trunk feeder to rail, with a low overall mode share to bus in the area (as the main mode of travel). The other role of buses is to service centres not serviced by rail - to the east towards the Airport and Randwick, west towards Bexley and Campsie and south towards the bayside areas and Taren Point. Figure 15 illustrates the existing bus network and bus stops in the vicinity of the investigation area.

Figure 15 Existing Bus Network

Source: AECOM, 2016

Due to the existing land uses of Cooks Cove investigation area, the existing bus routes only service the western and northern boundaries of the investigation area along West Botany Street and to a lesser extent Wickham Street.

The **400 / 410** is a major regional route that connects Burwood and Rockdale to Sydney Airport, Randwick, UNSW and Bondi Junction. It operates along Wickham Street and Marsh Street (there are no bus stops on Marsh Street).

The **422** bus route provides connections from Rockdale to Sydney CBD via Sydney University, running along West Botany Street. Both of these routes have relatively low frequency in the area, with higher frequency in other areas. This contributes to the existing low mode share seen for buses in the study area (3 per cent).

Approximate bus frequencies for each service during a typical weekday are shown in Table 7. Table 8 shows the first and last bus services for each route on a typical weekday.

Table 7 Typical weekday bus service frequencies

Route	Direction	AM peak	Mid-day off peak	PM peak
400	Eastbound	30min	30min	30min
	Westbound	20min	20min	20min
410	Northbound	30min	Not in service	30min
	Southbound	80min	Not in service	20min
422	Northbound	30min	30min	30min
	Southbound	30min	30min	30min

Source: TripView Lite, 2015

Table 8 Bus service span on a typical weekday

Route	Direction	First service departs	Last service departs
400	Eastbound	Banksia at 5:11am	Arncliffe at 11:23pm
	Westbound	Arncliffe at 5:56am	Banksia at 12:04am
410	Northbound	Rockdale at 6:47am	Arncliffe at 5:53pm
	Southbound	Arncliffe at 8:15am	Rockdale at 6:52pm
422	Northbound	Banksia at 6:22am	Wolli Creek at 6:43pm
	Southbound	Wolli Creek at 6:29am	Banksia at 7:22pm

Source: TripView Lite, 2015

The actual operating frequency of the 400 / 410 service is approximately seven minutes during peak periods; however the limited stops nature of the service results in a service frequency in the vicinity of Cooks Cove investigation area of only around 20 minutes. The reliability of bus services is also impacted by the congestion on the road network in the vicinity of the investigation area.

The 422 also operates more frequently between Tempe and the City, with approximately half those services extending south past the investigation area to Rockdale.

Opal data was also provided by Transport for NSW as part of the Arncliffe and Banksia Priority Precincts study. The data provides details of the number of bus passenger trips getting on or off at bus stops within the area, by hour of day, for most days in 2015 from January through April. The data showed the key destination bus stops below, for tips originating within the Arncliffe and Banksia area.

- Sydney Airport, International Terminal: 2,344 trips (24 per cent)
- Rockdale Station, Railway St: 1,186 trips (19 per cent)
- Sydney Airport, Domestic Terminal (T3). Shiers Av: 851 trips (9 per cent)
- Firth Street near Arncliffe Station: 360 trips (4 per cent)
- Wollongong road catchment: 347 trips (4 per cent)
- Anzac Pde Stand B opp UNSW:332 trips (3 per cent)
- High Street near Clara Street (near Prince of Wales Hospital): 120 trips (1 per cent)

The above destination data demonstrates some consistency with the JTW data, showing that the Sydney Airport is the largest attractor of local bus trips, with most originating from the Banksia Station and Wickham Street bus stops. This perhaps supports the notion that employees accessing the Sydney Airport transfer from rail to bus to avoid the station access fee at airport station terminals. This is followed by other key destination areas in the east such as local trips to the UNSW and Prince of Wales Hospital. Note that the common factor among a majority of the above destinations is that they are on the existing 400/410 routes.

5.2 Future public transport context

5.2.1 Rail future

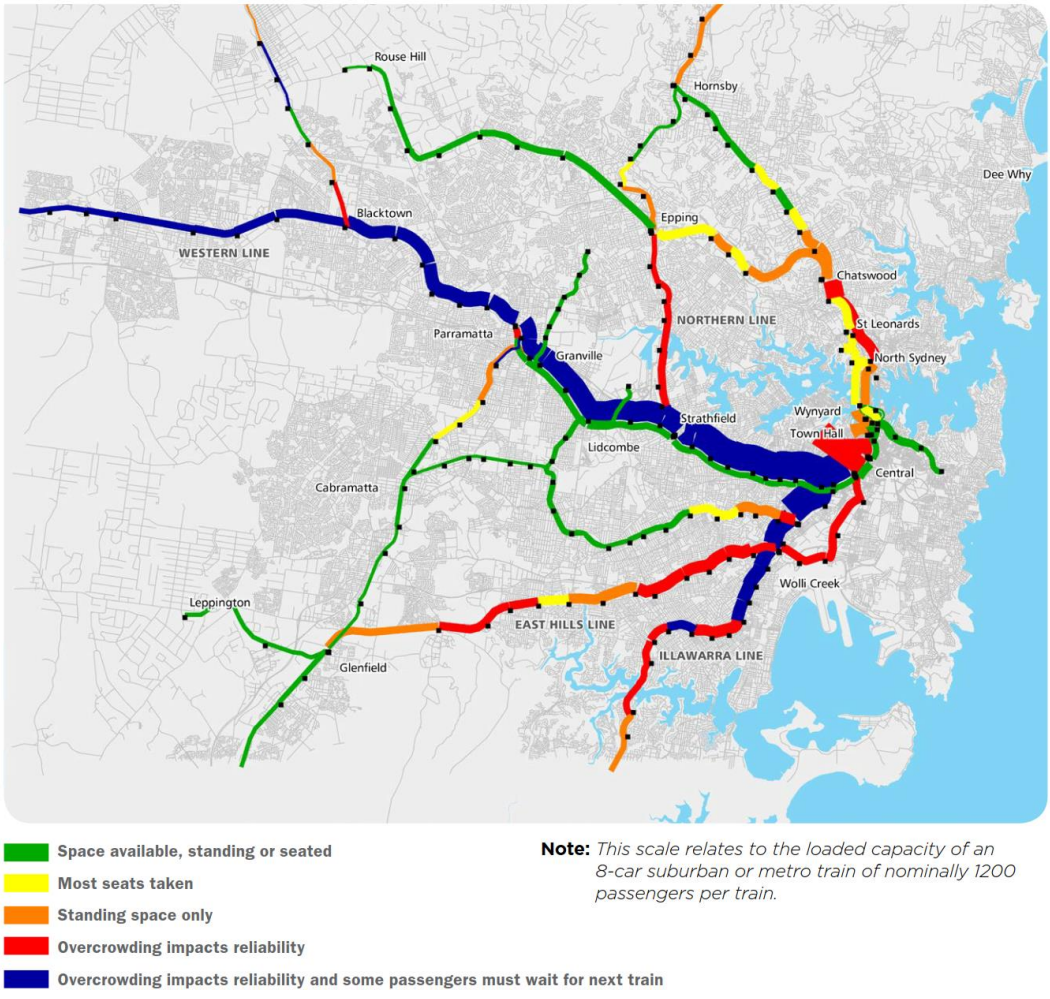
As discussed in Section 5.1.1, the existing services on the T4 Line are experiencing passenger loading issues during morning peaks, operating at around 135% of the seated load capacity when the trains arrived at Wolli Creek Station. The T2 Line is also experiencing loading issues upstream of Wolli Creek and Green Square Station as a result of the significant population growth at these high density residential areas.

The need to add capacity to the line was identified in *Sydney's Rail Future*. Recent patronage forecasting undertaken by Transport for NSW as part of the *Western Sydney Rail Needs Scoping Study* indicates that the Illawarra Line will be one of Sydney's most overcrowded in the long term (see Figure 16).

Sydney's rail system needs to be modernised to meet forecast demand. In line with the approach of focusing specifically on the different needs of customers, *Sydney's Rail Future* identified a three-tiered system to respond to changing customer needs:

- Sydney Metro (formerly Rapid Transit)
- Suburban
- Intercity

Figure 16 Forecast (2051) Sydney train network crowding levels



Source: *Western Sydney Rail Needs Scoping Study: Discussion Paper*, Transport for NSW (2016)

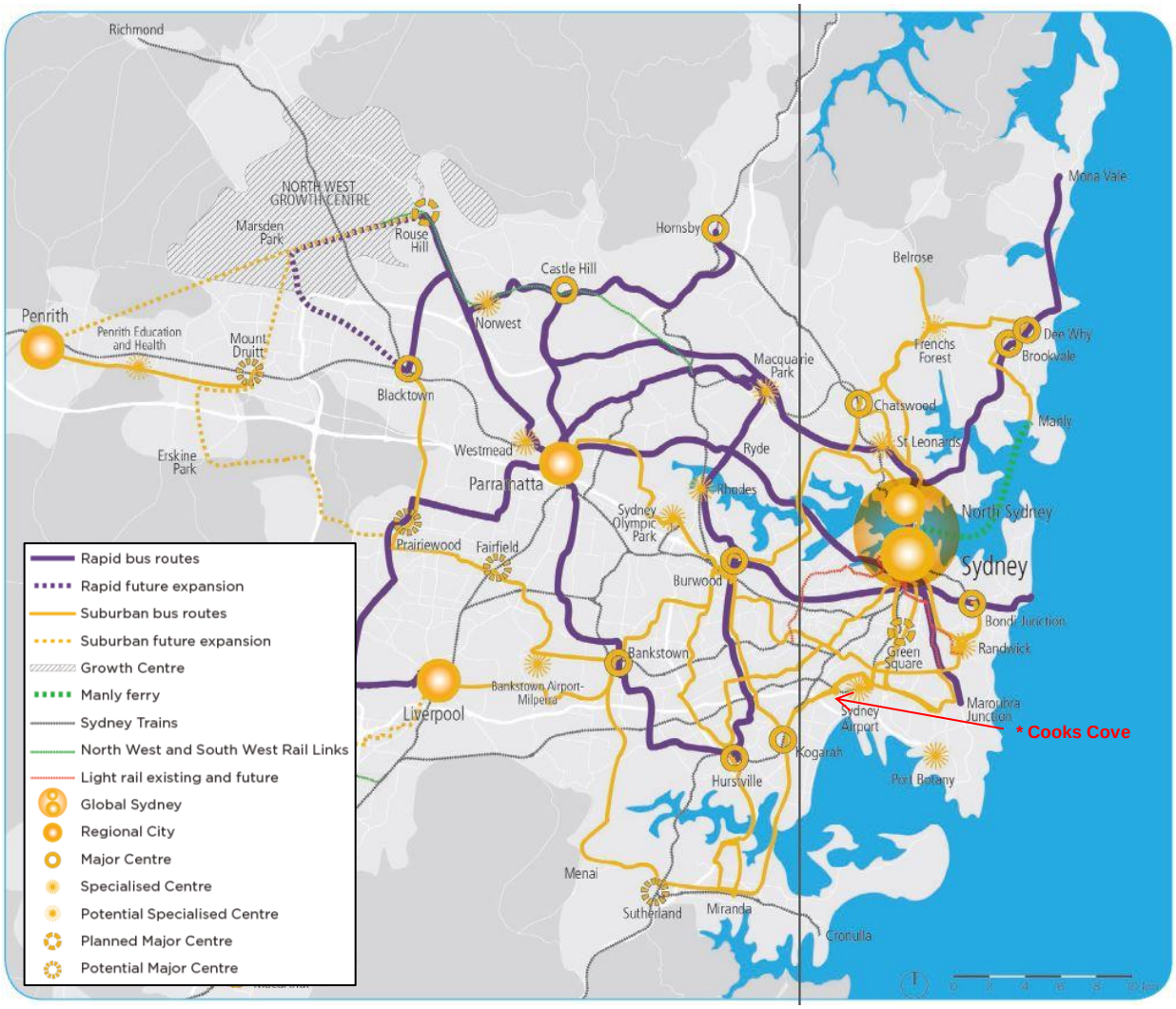
5.2.2 Bus Future

Sydney's Bus Future forms an important part of the Sydney strategic transit network. *Sydney's Bus Future* envisages the rationalisation of bus operations through a route hierarchy (see Figure 17):

- **Rapid routes** – fast, high capacity, 'turn up and go' services between major centres on key corridors.
- **Suburban routes** – mix of timetabled and 'turn up and go' services on cross-metropolitan routes.
- **Local routes** – timetabled services providing connections to key services.

The proposed core bus network for Sydney includes a total of 13 Rapid bus routes and 20 Suburban bus routes. Under the proposed core bus network, a new Suburban route is being planned to go from **Miranda to Bondi Junction via the Airport** which will duplicate the 400 / 410 route in the local area. This service would help meet higher customer demand between Sydney's south and centres such as the Sydney Airport. It would also provide high frequency services and improved accessibility from the Cooks Cove investigation area to the Airport, Eastgardens and Randwick areas.

Figure 17 Sydney's Bus Future new rapid and suburban routes



Source: *Sydney's Bus Future,* Transport for NSW, 2013

5.3 Constraints, needs and opportunities

5.3.1 Constraints

A summary of key public transport constraints in the area include:

- Walking distances and times to the key surrounding stations are long (more than 800m and 10 minutes).
- Safety and amenity issues on access routes to rail stations and bus stops such as narrow footpaths, lack of pedestrian crossings and capacity constraints on staged crossings.
- The T4 / South Coast Lines are experiencing passenger loading issues during peaks and whilst the need for additional capacity has been identified, a strategy is yet to be committed to.
- The T2 Airport Line services have more available capacity at Wolli Creek however there are upstream capacity constrains around Green Square which would be exacerbated by additional growth in and around the investigation area.
- There are no existing bus services directly accessible from the study area due to the current land use.
- The existing bus services along West Botany Street, Marsh Street and Wickham Street are low frequency services only.

5.3.2 Needs and opportunities

A summary of key public transport needs in order to support development in the area include:

- Improvements to rail infrastructure and network capacity to get more people to and from the Sydney CBD and other key centres on the rail network, such as increasing the number of trains per hour via operational improvements and eventually moving towards Sydney Metro type services.
- Improved and enhanced accessibility and connectivity to surrounding rail stations, which will also provide safer routes of access to public transport interchanges including rail stations and bus stops.
- Introduce bus feeder services to enhance connectivity to local rail stations (Arncliffe and Banksia) and interchange stations (Sydenham and Wolli Creek).
- Increase bus service frequencies to local routes (422) and suburban routes (400/410).
- Investigation into the need for any bus priority infrastructure.

5.4 Conceptual public transport response

A conceptual public transport network is highlighted in Figure 18 that includes:

- Enhanced pedestrian crossing facilities at Princes Highway and Marsh Street, RMS have identified grade separation as preferred at both locations.
- Bus feeder services to mitigate walking distance / time issues. This could include consideration to connecting to Sydenham - where more passenger capacity exists - instead of local stations. However, potential congestion on Princes Highway could affect reliability of bus feeder services to Sydenham.
- More frequent local bus 422 services.
- New bus stops at Marsh Street to accommodate access to new and improved suburban bus routes.
- Increased rail capacity through improvements to infrastructure and services.

Figure 18 Public Transport Response

Source: AECOM, 2016

6.0 Road network

6.1 Existing network

The RMS Network and Corridor Planning Practice Notes provide legal road definitions under the administrative classification system. Administrative classifications help define jurisdictional responsibility and the basis for funding responsibility. Under the administrative classification system, a three tier road hierarchy has been developed as seen in Table 9.

Table 9 Road Classification by RMS

Classification	Road Type	Indicative Annual Average Daily Traffic (AADT)
State	Freeways, motorways and arterial roads	>25,000
Regional	Sub-arterial roads	15,000 – 25,000
Local	Collector and local roads	<15,000

Figure 19 illustrates the road network context for the investigation area and the average daily volumes experienced in 2015 for some key roads. The key roads that service the investigation area include:

- M5 East Motorway
- Princes Highway
- Marsh Street - Wickham Street - Forest Road (Arterial Road)
- West Botany Street (Sub-arterial Road)

The M5 East Motorway forms part of the Sydney Motorway network, enabling access between the inner south and south-western Sydney. More local to the study area, it provides access to the Airport and by extension Port Botany. There are two access locations to the M5 within the study area, with an all movements interchange at Marsh Street as well as an east facing exit ramp at the Princes Highway.

The Princes Highway is part of the national highway network, running from Sydney to Port Augusta, South Australia. The highway is three lanes in each direction in the vicinity of the site and carried in the order of 71,450 vehicles per day in 2015. The highway serves as the spine of the trunk road network in the local area for both private vehicles and freight. The highway also provides access to employment within the Princes Highway corridor, comprising predominantly of large-space retail / commercial land use.

Marsh Street is a state road and the primary connections to the Sydney Airport precinct. The road is a key access point for the M5 East Motorway and Sydney's southern suburbs, linking West Botany Street to Airport Drive. Marsh Street is broadly a six-lane road but widens its intersection with the M5 East Motorway.

West Botany Street is mostly a regional road and an alternative north-south route to the Princes Highway between Arncliffe and Brighton-Le-Sands.

6.1.1 Historical and current traffic demand

Traffic volume has been obtained from Roads and Maritime Services (Roads and Maritime) to determine the historical traffic growth in the surrounding area.

Table 10 Historical weekday traffic volumes and growth

Station	Location	Weekday AADT					Average Growth / year
		2011	2012	2013	2014	2015	
23067	Marsh Street 100m south of Rockwell Ave*	51,290	53,820	56,370	56,730	56,030	+1.78%
23001	Princes Highway 200m east of Brodie Spark Drive	66,840	68,290	69,755	69,800	71,450	+1.35%

*Commonly shown on maps as Levey St

Source: Roads and Maritime, 2016

Figure 19 Road Network Context

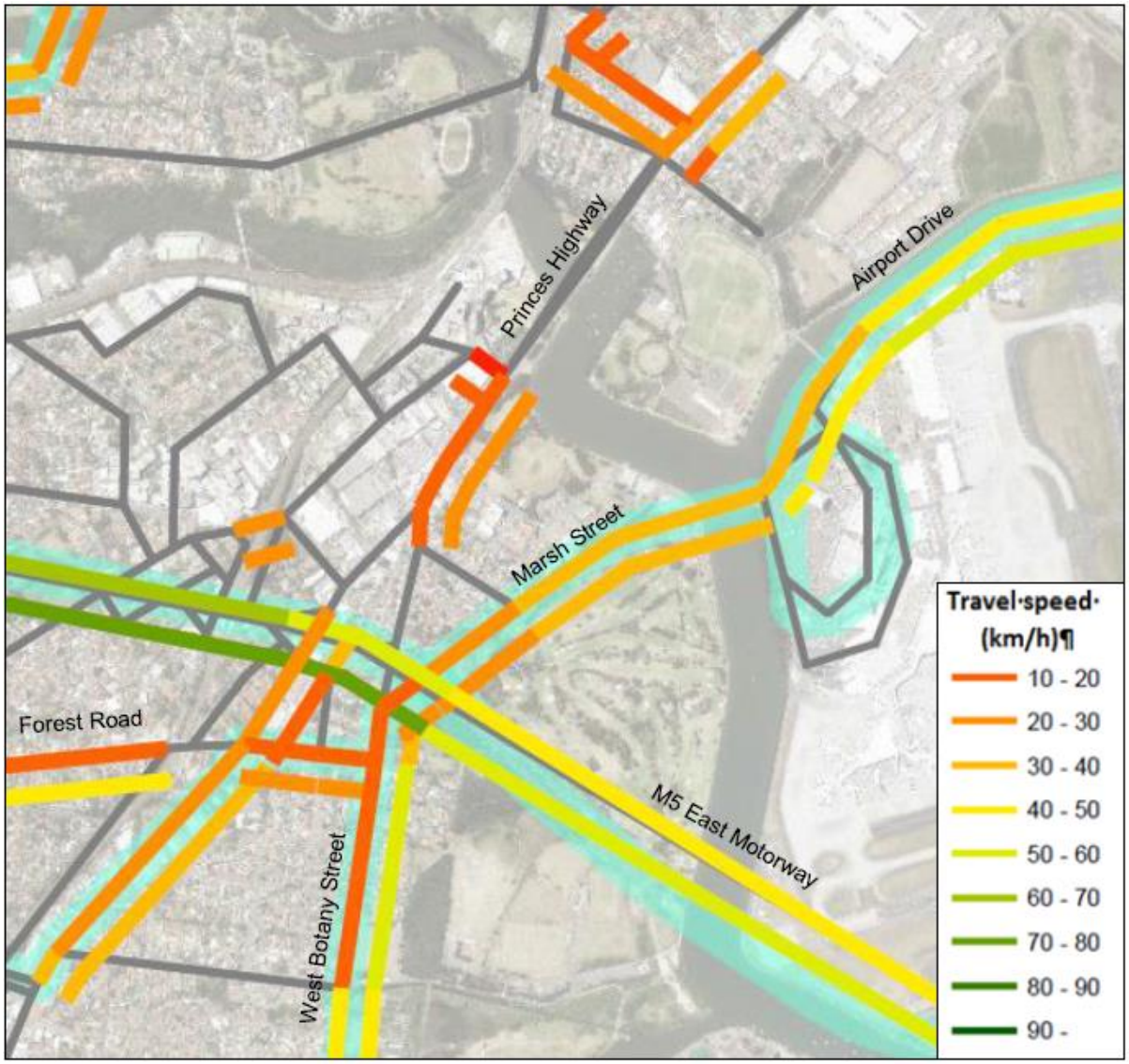
Source: AECOM, 2016 and Roads and Maritime Services 2016

6.1.2 Current network performance

The Cooks River, Sydney Airport land and the M5 Motorway all present constraints to expanding the road network around the site. Peak period capacity issues also present constraints in terms of access into and out of the site. Intelematics travel time data has been used to determine current speeds on key links in the local road network and is illustrated in Figure 20. The following network locations represent critical pinch points in peak periods:

- The Princes Highway corridor, with the key pinch point being at its intersections with Railway Parade and Forest Road
- The signalised intersections of Marsh Street with the West Botany Street and the M5 interchange, with resultant minor queuing to the west along West Botany Street and Wickham Street.
- The M5 interchange at Marsh Street (PM peak only), with queues extending from the westbound on-ramp back up to Marsh Street – both to the east towards the airport as well as to the west along West Botany Street.
- Airport Drive and the International Airport access roads also experience congestion in the morning and evening peaks.

Figure 20 Intelematics travel speed data, AM peak



Source: Transport for NSW

Table 11 and Table 12 present the performance of key roads in terms of travel speed during peak periods. This data was taken from the Roads and Maritime Roads Report website and includes all key roads which were available. The data illustrates that the Princes Highway is the worst performing key road in the vicinity of the investigation area during both peaks, with vehicles running at lower than 50% of the speed limit – below 25km/hr in the AM peak. Marsh Street is the next worst performing road, with vehicles running at an average of 53% of the speed limit – below 40km/hr in the AM peak. The RMS travel speed data also corresponds with the data presented in Figure 20.

Table 11 Key roads performance during AM Peak March – May 2016

Road	Time Period	Average Speed (km/h)	Percentage of Speed Limit
M5 – Casula to Mascot	05:15 – 08:30	64.8	67%
Stony Creek Rd (Marsh St) – Mortdale to Sydney International Airport	05:15 – 07:30	37.0	63%
The Grand Parade (General Holmes Dr) – Sans Souci to Mascot	06:00 – 08:30	47.8	78%
Princes Highway – Haymarket to Arncliffe	06:30 – 09:30	24.8	41%
Princes Highway – Blakehurst to Arncliffe	06:15 – 08:45	21.6	40%

Source: Roads and Maritime Services 2016

Table 12 Key roads performance during PM Peak March – May 2016

Road	Time Period	Average Speed (km/h)	Percentage of Speed Limit
M5 – Casula to Mascot	15:00 – 18:30	66.5	67%
Stony Creek Rd (Marsh St) – Mortdale to Sydney International Airport	16:00 – 19:00	31.5	53%
The Grand Parade (General Holmes Dr) – Sans Souci to Mascot	15:15 – 19:00	38.4	63%
Princes Highway – Haymarket to Arncliffe	15:30 – 18:45	27.7	46%
Princes Highway – Blakehurst to Arncliffe	15:15 – 18:45	19.3	36%

Source: Roads and Maritime Services 2016

These observations and findings indicate that the current road network is at capacity in some key locations of the road network, particularly on Princes Highway. It is considered regional (through) traffic and the Sydney Airport are the major contributors to current congestion in the local road network.

6.2 Future context

A number of road projects that will affect transport conditions in the Cooks Cove area are currently either under investigation, proposed, planned or under construction. They range from minor to major infrastructure projects and are driven by a combination of policy and long-term network planning, or in support of more localised development (i.e. Wolli Creek).

A summary of all relevant road upgrade proposals that could affect transport conditions in the Cooks Cove area are highlighted in Figure 21 and discussed further as follows.

Figure 21 Proposed Road Upgrades

Source: AECOM, 2016

6.2.1 WestConnex, potential Southern Extension, and the F6 Motorway

WestConnex is a 33 kilometre motorway that is intended to link Sydney's west with the Sydney Airport and the Port Botany precinct. Stage 1 of WestConnex (the M4 Widening and M4 East) is currently under construction. Stage 2 of WestConnex, the New M5, has just been given Planning Approval following the submission of the EIS in late 2015. Locally, the New M5 is anticipated to reduce traffic flows on the existing M5, which will likely have traffic operation benefits at the currently congested M5 interchange at Marsh Street.

A potential southern extension from Arncliffe to President Avenue (Kogarah) via the F6 Corridor is currently being investigated by the NSW Government, and would connect the New M5 to the southern suburbs of Sydney and the Illawarra (see Figure 22). It is this southern extension to WestConnex that would yield the most benefit to traffic conditions in the Cooks Cove area. With reduced through-traffic in area along key corridors including the Princes Highway, more road network capacity would be made available for urban uplift and improved State Road accessibility.

In 2014 the NSW Government allocated $11 million to commence investigations to deliver the F6 Motorway. For the purposes of traffic assessment as part of the New M5 EIS it was assumed that the extension to President Avenue (Kogarah) would be operational by 2031, along with the 'full' three stages of WestConnex. This assumption has also been applied for the purposes of this traffic assessment.

However, it should be noted that no funding has been committed by the Government to construct the F6 Motorway. If the extension is not constructed, the Princes Highway will continue to carry significant amount of through traffic and may further constrain the ability of local traffic to access the regional road network including traffic generation by the Cooks Cove investigation area and other urban development along the Princes Highway corridor.

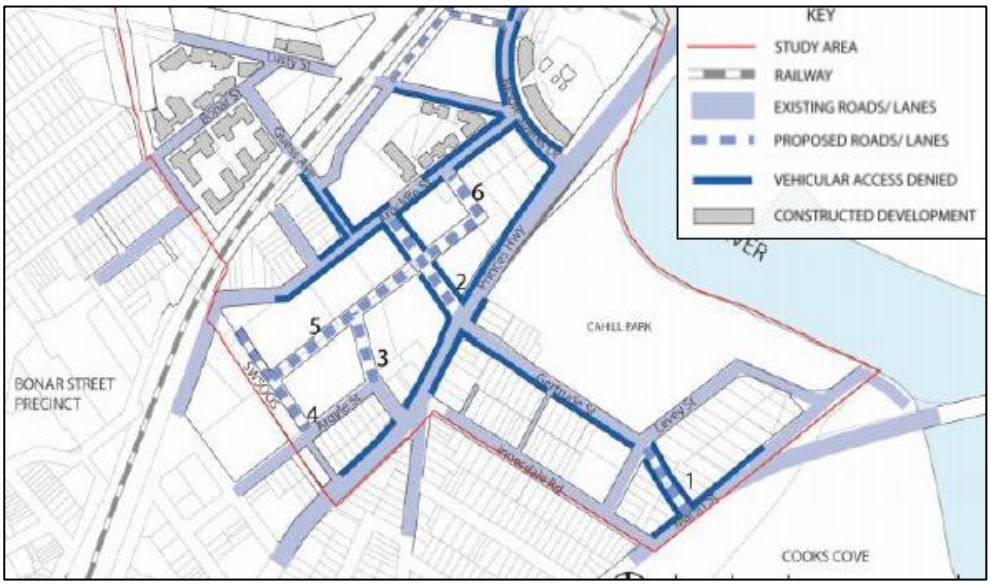
Figure 22 WestConnex and the potential F6 Motorway

Source: Roads and Maritime, 2016

6.2.2 Gertrude Street extension

As identified in the Rockdale DCP 2011 a new link road is proposed from Levey Street (opposite Gertrude Street) to Marsh Street as shown in Figure 23. Gertrude Street extension would extend the existing Gertrude Street to connect to Marsh Street and would potentially provide vehicle access for the study area. It is proposed that Gertrude Street would have limit direct vehicular access from abutting property. It has also been suggested that this link may not be made accessible for private vehicles, but only for pedestrians, cyclists and buses.

Figure 23 Gertrude Street extension



Source: Rockdale DCP 2011

6.2.3 Marsh Street widening

As part of WestConnex enabling works, the construction of the widening of Marsh Street has commenced which includes widening the carriageway to three lanes in each direction between the Cooks River and the M5 Motorway interchange. The project allows for two right turn lanes into the proposed Gertrude Street extension as illustrated in Figure 24. The widening works fulfil an important role in providing access to the motorway network. Any delays that may be introduced with new access intersections on Marsh Street to the Cooks Cove investigation area could have an impact on the reliability and operation of the motorway network.

Figure 24 Marsh Street widening

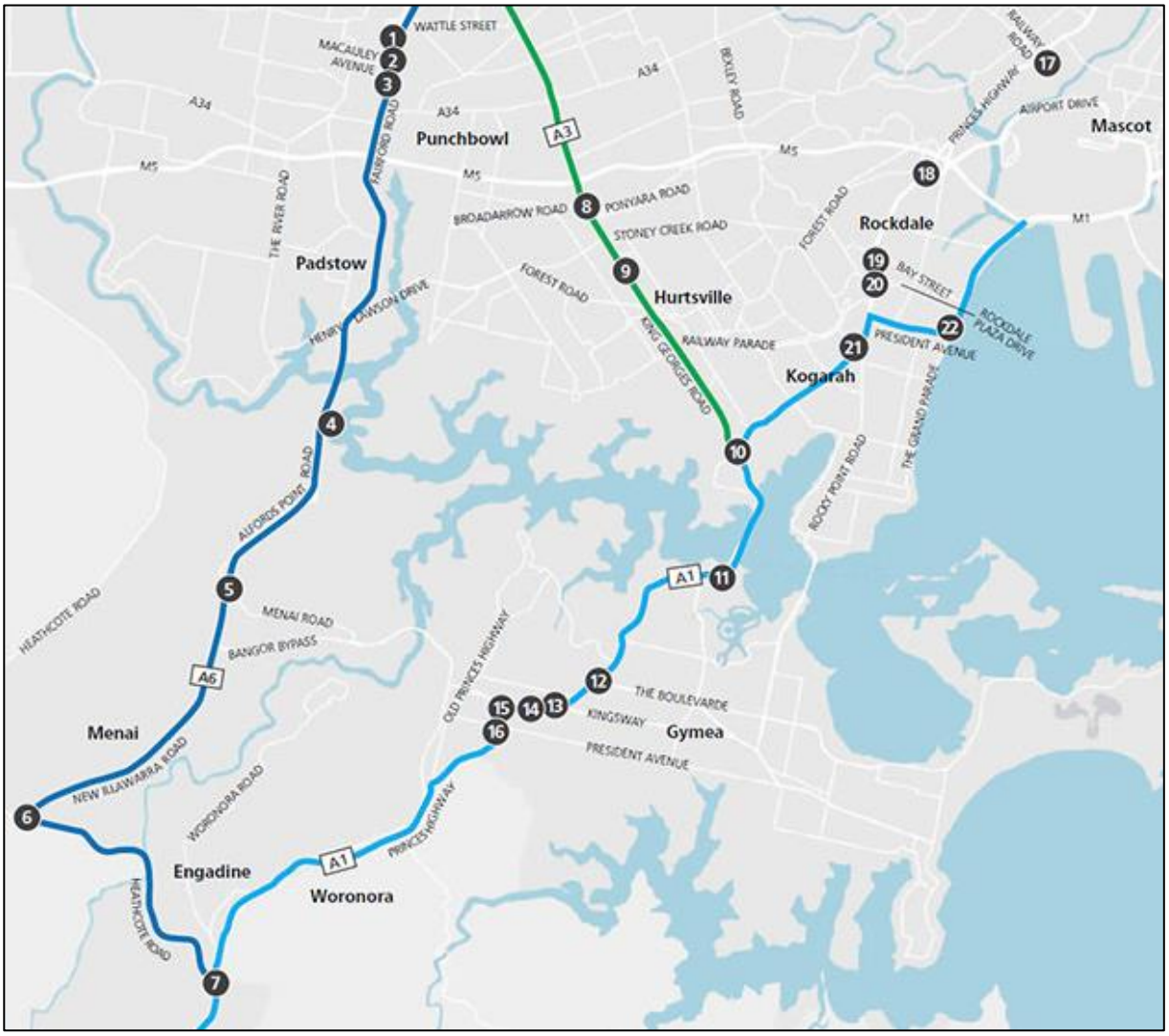
Source: Roads and Maritime Services

6.2.4 Gateway to the South

In *Rebuild NSW: State Infrastructure Strategy 2014 – Update* (Feb 2015), the NSW Government has committed $300 million create a 'Gateway to the South', including $45 million in 2015- 2016 to fix pinch points, which includes the Princes Highway intersections with Railway Road and Forest Road – two key pinch points in the Cooks Cove investigation area (see Figure 25).

The proposed works are currently under investigation and no detail is yet available on the upgrades to these intersections, but any improvements are likely to lead to improved overall traffic performance.

Figure 25 Potential Gateway to the South Pinch Point works



Source: Roads and Maritime Services

6.3 Constraints

A summary of key constraints of the road network in the vicinity of the investigation area include:

- A number of pinch-points exist in the surrounding road network.
- Current road network is at capacity in some key locations of the State Road network, as contributed by regional (through) traffic and the major traffic generators such as the Sydney Airport.
- Reliance on major road projects to relieve congestion in the area surrounding the investigation area. Growth in the investigation area will exacerbate the current situation if these projects are not delivered.
- Uncertainties in the implications of major road network upgrades in the vicinity of Cooks Cove investigation area.
- Additional and upgraded intersections would impact upon the capacity of through traffic on Marsh Street as well as the access to Princes Highway.
- Limited direct access between the investigation area and the Princes Highway.
- Limited access locations can be provided on the existing road network to / from the investigation area.
- The surrounding road network is highly constrained and provides access to critical infrastructure including the M5 Motorway and Sydney Airport. Any development cannot have an impact on access to this critical infrastructure.

6.4 Preliminary traffic assessment

6.4.1 Background and introduction

The project team met with Rockdale City Council (RCC) in December 2015 to confirm that there are two preferred access locations at Marsh Street – at Flora Street and at the proposed extended Gertrude Street. The main role of these access locations is to support the developable (urban-suitable) northern section of the site. Levey Street was also identified as an ideal access given its grade separated crossing under the Giovanni Brunetti Bridge. However its role is perceived as secondary, given its locality in relation to the development and indirectness in connecting to the trunk road network. The preferred location of these accesses is shown in Figure 26.

In April 2016, Transport for NSW requested that preliminary traffic analysis be incorporated into the scope of the broader transport investigation at the two access intersections at Marsh Street with Flora Street and Gertrude Street (extension). The preliminary traffic analysis was undertaken with a view to understand the scale of the intersection required to provide access; to determine the forecast traffic performance of these two intersections and ultimately if they form a constraint to development of the investigation area.

Traffic analysis of the above intersections has been undertaken using software package Sidra Intersection (v6.1). Further analysis still needs to be undertaken, including for the intersections on Princes Highway including more comprehensive traffic modelling analysis. The results of these future studies will influence the final development yields of the investigation area.

Figure 26 Road access locations

Source: AECOM, 2016

6.4.2 Key modelling assumptions

The determination of traffic demand for the purposes of traffic assessment is estimated via four key steps:

1. **Background traffic**: estimating future peak period traffic volumes on the road network without development
2. **Trip generation**: estimating the number of peak period vehicle trips the site will generate
3. **Traffic distribution**: determining origins and destinations of trips on the local road network
4. **Traffic assignment**: determining the routes that vehicle trips will follow to reach origins / destinations

The following key assumptions particularly set the framework for the assessment that has been undertaken:

- The nominated year for assessment is 2036, in accordance with a 20 year planning horizon, by which time (for the purposes of this exercise) it has been conservatively assumed 100% of the ultimate development will be complete and operational.
- Forecast peak period traffic volumes at Marsh Street (Giovanni Brunetti Bridge) are in accordance with those documented in the New M5 EIS, which based on strategic modelling undertaken by Roads and Maritime.
    - A nominal 5% growth was applied to escalate the forecasts from a 2031 to 2036 future year.
    - Note that the base model for these forecasts may include some growth within the Arncliffe and Banksia Priority Precincts; it would not cover the full extent of growth anticipated under the current proposal for these precincts. This growth is anticipated to have more significant impact on flows along Princes Highway than Marsh Street.
- Other background volumes at Gertrude Street and Flora Street were estimated using 2014 SCATS traffic count data and growth rates extracted from the Arncliffe and Banksia AIMSUN model.
- Current available land / width constraints along Flora Street and Gertrude Street (extension) have been incorporated into the assumed intersection geometries for the respective intersections.
- Key infrastructure upgrades to the surrounding road network are delivered, including all stages of WestConnex, Sydney Gateway Project, the F6 Motorway to President Avenue (Kogarah), Marsh Street widening and Gertrude Street extension.
    - It should be noted that the performance of the two access intersections could be worse if some of these infrastructure upgrades are not delivered, especially the projects that are intended to remove through traffic on the existing road network. This could imply that development may be capped at a lower yield in the Cooks Cove investigation area, until these road infrastructure projects are delivered and subject to further traffic analysis.

Other assumptions around traffic generation, distribution and assignment and intersection geometry are discussed as relevant as follows.

6.4.3 Vehicle trip generation

To determine the potential amount of traffic generated as a result of the proposed development, peak hour traffic generation rates were taken from a combination of the Roads and Maritime Services' (RMS) *Guide to Traffic Generating Developments* (2013), including the addendum, and the Institution of Transportation Engineers' (ITE) *Trip Generation* manual. The RMS Guide was used as the primary source. The ITE manual was applied for land use types not documented in the RMS Guide, and for directionality of trips (i.e. entering or exiting). For some land uses, PM peak hour rates were available in the RMS Guide, however corresponding AM peak rates were not available. In these instances, the ITE manual was referred to determine AM peak rates.

The trip rates for residential dwellings is in accordance with that discussed and agreed at an engagement meeting held in December 2015 with RMS, TfNSW and representatives of Rockdale City Council and align with rates calculated at a similar site. The rates for office are based on data collected at sites with similar locality types and access to public transport.

The applied vehicle trip rates for each land use are listed in Table 13.

Table 13 Peak hour vehicle trip rates and directionality

Land uses	AM Peak Traffic Hour			PM Peak Traffic Hour		
	Trip rate	In	Out	Trip rate	In	Out
Residential / unit	0.4 trips	20%	80%	0.4 trips	80%	20%
Hotel / room	0.38 trips	55%	45%	0.4 trips	45%	55%
Retail – Restaurant / 100m^2	*Closed*			5 trips	61%	39%
Retail – Slow trade / 100m^2	1.1 trips	61%	39%	4.6 trips	48%	52%
Retail – Large shopping centre / 100m^2	0.75 trips	61%	39%	3.1 trips	48%	52%
Retail – Supermarket / 100m^2	3.5 trips	61%	39%	11.2 trips	51%	49%
Retail – Showroom / 100m^2	0.55 trips	74%	26%	0.7 trips	39%	61%
Commercial – Office / 100m^2	1.45 trips	83%	17%	1.1 trips	19%	81%
Primary School/ student	Determined using first principles*					

*Student / Staff mode share to car: 65%/90%, Students / Staff per car: 1.5/1.1, Arrival within AM / PM peak hour: 80% / 30%

The assumed vehicle trip rates have been applied to the four land use scenarios as documented in Table 2. The total peak hour trips that are expected to be generated by Land Use Options 1 and 3, derived from the above assumptions, are summarised in Table 14. Note that the below include a self-containment assumption of 10%.

Table 14 Proposed development vehicle trips generated for both AM and PM peak hour for land use Options 1 and 3

Land uses	Option 1				Option 3			
	AM Peak trips		PM Peak trips		AM Peak trips		PM Peak trips	
	In	In	In	In	In			
Residential	245	979	979	245	360	1,440	1,440	360
Hotel	56	46	49	59	As per Option 1			
Retail – Restaurant	0	0	82	53				
Retail – Shopping Centre	24	16	79	86				
Retail – Supermarket	58	37	155	149				
Retail – Showroom	18	6	12	19				
Commercial – Office	54	11	9	39				
Primary School	341	312	117	128				
Sub-total	**797**	**1,407**	**1,483**	**778**	**912**	**1,868**	**1,944**	**893**
Total	**2,204**		**2,261**		**2,780**		**2,837**	

The total peak hour trips that are expected to be generated by Land Use Options 2 and 4, derived from the above assumptions, are summarised in Table 15.

Table 15 Proposed development vehicle trips generated for both AM and PM peak hour for land use Options 2 and 4

Land uses	Option 2				Option 4			
	AM Peak trips		PM Peak trips		AM Peak trips		PM Peak trips	
	In	Out	In	Out	In	Out	In	Out
Residential	144	576	576	144				
Hotel	56	46	49	59				
Retail – Restaurant	0	0	82	53				
Retail – Shopping Centre	24	16	79	86	533	341	1741	1886
Retail – Supermarket	58	37	155	149				
Retail – Showroom	18	6	12	19				
Commercial – Office	2172	434	372	1554	3259	652	559	2331
Primary School	341	312	117	128				
Sub-total	**2,814**	**1,428**	**1,443**	**2,192**	**3,792**	**992**	**2,300**	**4,217**
Total	**4,241**		**3,635**		**4,784**		**6,517**	

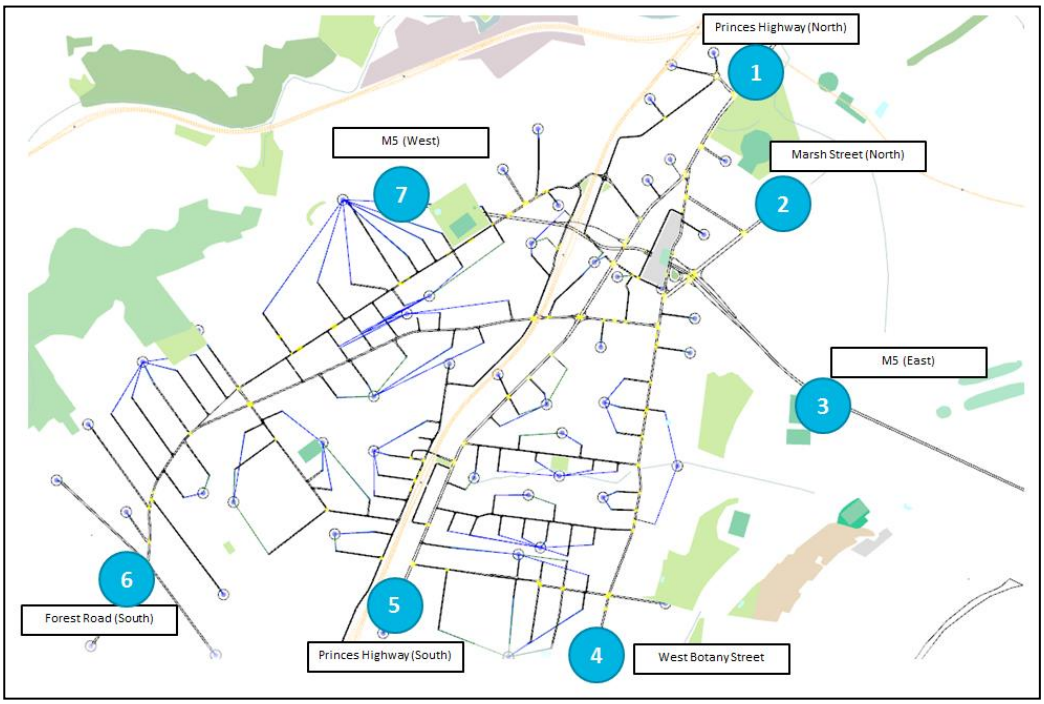
Based on the land use scenarios and trip rates adopted, the trip generation analysis has shown that Land Use Option 1 is expected to generate approximately 2,250 vehicle trips during the peak hours, whilst Option 3 generates an additional 600 resident-based vehicle trips. Option 2 is expected to generate 3,600 to 4,200 peak hour vehicle trips at full development capacity. This represents approximately 60% more trips than Option 1, including a similar number of outbound trips in the AM peak period, and three times the number of inbound trips. Option 4 generates the highest number of trips, including over 6,500 trips in the PM peak hour alone.

It should be noted that these trip rates are based on current travel behaviour, patterns and mode choices which could significantly change over the next 20 years. These rates also do not account for the effectiveness that any specific travel demand management measures may have.

6.4.4 Trip distribution

The trip distribution for the residential component of the development is based on that for selected, predominantly residential, zones with the AIMSUN model developed for the Arncliffe and Banksia Priority Precincts study. Traffic desire lines to/from known residential zones in the model and the trunk road network were established (see Figure 27), and validated against Journey to Work (JTW) data. The data sources were generally consistent, indicating that approximately half of traffic currently leaving local residences is heading north or east across the Cooks River, with the main link facilitating this movement being the Princes Highway comprising approximately a third of trips. Traffic distribution for employees was based on JTW data.

Figure 27 Trip distribution zones in AIMSUN



Source: AECOM, based on outputs from TfNSW's STM

Table 16 Travel distribution, employment

	Princes Hwy (North)	Princes Hwy / West Botany St / Forest Rd (Southwest)	M5 (East)	M5 (West)	Marsh Street (Northeast)
AM Peak Outbound	12%	30%	33%	25%	0%
AM Peak Inbound	19%	51%	15%	14%	1%
PM Peak Outbound	12%	30%	33%	25%	0%
PM Peak Inbound	19%	51%	15%	14%	1%

Source: AECOM, 2016

Table 17 Travel distribution, residential

	Princes Hwy (North)	Princes Hwy / West Botany St / Forest Rd (Southwest)	M5 (East)	M5 (West)	Marsh Street (Northeast)
AM Peak Outbound	33%	38%	15%	11%	4%
AM Peak Inbound	32%	24%	18%	9%	18%
PM Peak Outbound	30%	31%	13%	11%	14%
PM Peak Inbound	33%	31%	20%	9%	6%

Source: AECOM, 2016

6.4.5 Intersection geometry

Assumed intersection geometries for the two main access points are shown in Figure 28 and Figure 29. These configurations are cognisant of the Marsh Street widening project and land availability constraints at the Gertrude and Flora Street approaches. They are assumed to be not spatially constrained on the new approaches that provide access to the Cooks Cove investigation area. As instructed by RMS, no right turns have been permitted from Marsh Street into the development, at its intersection with Flora Street – this has been used as an opportunity to implement (or retain) a staged pedestrian crossing at the location of the current right turn lane. Similarly a staged pedestrian crossing has been provided at the northern leg of the intersection at Gertrude Street. These have been assumed to operate in a simple three-phase arrangement, with priority given to through traffic on Marsh Street.

Figure 28 Proposed intersection layout – Marsh Street / Flora Street

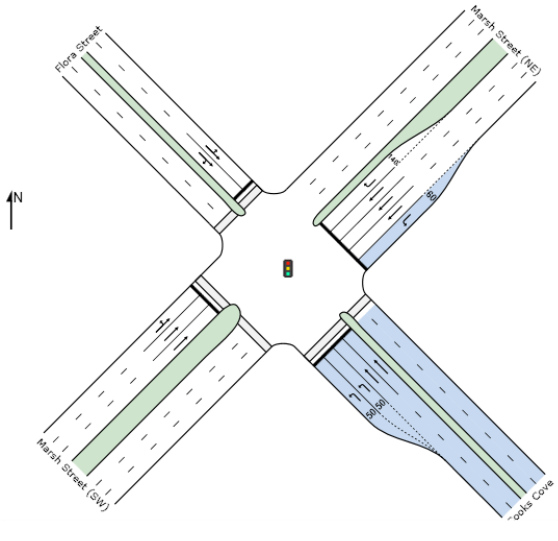
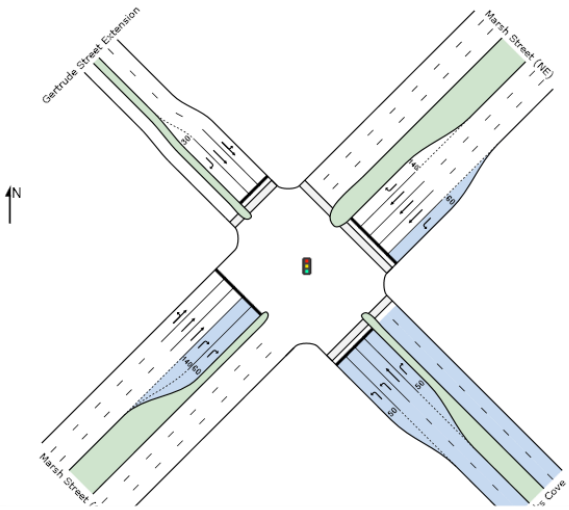


Figure 29 Proposed intersection layout – Marsh Street / Gertrude Street



Source: AECOM, 2016

Note 1: The numbers shown on the intersection layout are storage bay lengths only and do not include taper and deceleration lane lengths.

Note 2: At-grade pedestrian crossings are assumed not required on the approaches between the two intersections as a pedestrian footbridge could be provided at a location between the two intersections.

Note 3: Marsh Street reduces to two lanes after the bridge, which influences capacity and queuing, as well as access to the airport.

It has been suggested that the Gertrude Street extension could be a walk, cycle and bus link only. This has not been modelled for the preliminary analysis. If this was implemented, it is likely that more cars would rely on Innesdale Road and Flora Street to gain access to Marsh Street. The performance of the Marsh Street / Gertrude Street intersection is likely to improve while other nearby intersections such as Marsh Street / Flora Street may be worse off.

In terms of assignment of trips on to the road network, a simplistic method has been applied in which 40% of generated trips were assigned to the Flora Street access, 35% to Gertrude Street and 25% to Levey Street. These splits were agreed at the time of the assessment. However, it is noted that these proportions can vary subject to detailed modelling and the preliminary traffic assessment will be updated to reflect the changes to understand the impacts to the capacity of the accesses.

More detailed modelling will need to be undertaken as part of future assessment stages. There will likely be no need to make such assumptions as part of these future modelling exercises as more detailed modelling software packages that would be used to inform more detailed investigation would automatically assign traffic based on least delay / travel time between each origin and destination.

The above is considered a pragmatically conservative approach but appropriate given the nature of the analysis.

6.4.6 Performance indicators

Key performance indicators for the purposes of this assessment include the Level of Service (LOS), the degree of saturation (DOS) and maximum (95th percentile) queue lengths. The Level of Service is a measure of the overall performance of the intersection, as explained in Table 18. The degree of saturation is the ratio of volume to capacity, where a value over 1 indicates that the intersection is over capacity for at least one of its movements.

Table 18 Level of Service criteria for intersections

Level of Service	Average Delay (sec/veh)	Traffic Signals and Roundabouts	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: Roads and Maritime, 2002

6.4.7 Intersection performance results

A summary of the future intersection performance for each land use options are provided in the tables below.

Table 19 Intersection performances with Option 1

Period	Demand Flow (veh/h)	Level of Service	Degree of Saturation	Ave Delay (sec)	95% Back of Queue (m)
Marsh Street / Gertrude Street					
AM Peak	7,434	B	0.93	20	290
PM Peak	7,581	B	0.90	23	470
Marsh Street / Flora Street					
AM Peak	8,008	B	0.99	26	590
PM Peak	7,912	B	0.98	17	240

Source: AECOM, 2016

Table 20 Intersection performances with Option 2

Period	Demand Flow (veh/h)	Level of Service	Degree of Saturation	Ave Delay (sec)	95% Back of Queue (m)
Marsh Street / Gertrude Street					
AM Peak	8,654	F	1.42	276	2,070
PM Peak	8,155	F	1.10	124	940
Marsh Street / Flora Street					
AM Peak	9,813	F	1.45	281	2,450
PM Peak	8,995	F	1.10	94	1,070

Source: AECOM, 2016

Table 21 Intersection performances with Option 3

Period	Demand Flow (veh/h)	Level of Service	Degree of Saturation	Ave Delay (sec)	95% Back of Queue (m)
Marsh Street / Gertrude Street					
AM Peak	7,750	C	1.02	40	780
PM Peak	7,885	D	1.10	55	680
Marsh Street / Flora Street					
AM Peak	8,484	E	1.10	66	1,070
PM Peak	8,383	D	1.13	51	910

Source: AECOM, 2016

Table 22 Intersection performances with Option 4

Period	Demand Flow (veh/h)	Level of Service	Degree of Saturation	Ave Delay (sec)	95% Back of Queue (m)
Marsh Street / Gertrude Street					
AM Peak	9,021	F	1.70	444	2,510
PM Peak	9,546	F	1.48	355	1,720
Marsh Street / Flora Street					
AM Peak	10,338	F	1.74	454	3,100
PM Peak	11,306	F	1.69	473	2,470

Source: AECOM, 2016

6.4.8 Preliminary traffic assessment summary

For Land Use Option 1, the traffic analysis indicates the two access intersections will have movements that are nearing capacity in 2036, though the overall performance is LOS B. Notwithstanding this, the maximum queues are experienced in the direction of peak traffic (city-bound in the AM and country-bound in the PM). In the AM peak, the queue extends 590m from Flora Street in the direction of West Botany Street. As the distance from Flora Street to West Botany Street is only around 430m, this queue will result in spillback onto West Botany Street and also onto the M5 ramps. Similarly, during the PM peak, queuing extends 470m from Gertrude Street towards the Airport. The length of the queue passes the widened section on Marsh Street, indicating that the real queue length could exceed 470m. This would have an impact upon access to the Airport.

For Land Use Option 3, which includes an additional 1,600 dwellings, it is forecast to generate enough trips for the intersections to go slightly over capacity, with a DOS just over 1. This would generate both increasing delays and queue lengths on Marsh Street which could have impacts to the access to the M5 and the Airport, or further delays to motorists leaving and entering the development at Cooks Cove.

For Land Use Options 2 and 4, significantly higher traffic generation is expected in both AM and PM peak periods due to the increase in commercial development mix. The performance of both access intersections would significantly deteriorate when compared with Land Use Option 1. Both access intersections would greatly exceed their capacities and experience heavy delays, especially on Marsh Street. Queues longer than 2km could be experienced, with serious impacts upon the surrounding road network. Significant delays would also be faced by motorists leaving the development. The delays could be much higher than the average delay presented by the preliminary traffic analysis as the intersection would prioritise the traffic flow along Marsh Street.

From these results, it is clear that development in the investigation area will require significant investment along Marsh Street to achieve acceptable performance, such as grade separation (e.g. flyovers). Additional investment would be required on surrounding roads to reduce the effect of queuing traffic on the access to the M5 and the Airport. Investment should also be placed upon secondary access locations such as Levey Street to reduce the demand on Marsh Street. The adopted software has limitations in assessing intersection coordination and thus the queuing.

Further traffic analysis and detailed modelling will be required to provide further understanding of the development impact on the surrounding road network. Furthermore, it should be reiterated that this analysis is predicated on the delivery of significant other trunk road infrastructure (i.e. WestConnex Southern extension), without which the available capacity to accommodate local development uplift would be further reduced.

6.5 Conceptual road access and network response

The preliminary traffic assessment indicates that only one scenario may be accommodated by the two proposed access intersections, provided that additional investment is placed into nearby intersections. Any additional development would require secondary access locations such as Levey Street or investing in more significant upgrades at Marsh Street.

Roads and Maritime has been engaged regarding access locations for the investigation area and will continue to be consulted to determine the requirements for access points to the investigation area through the next stages of the planning process.

This preliminary analysis indicates a widened **Marsh Street** still has limitations in accommodating development traffic in the long term. It also indicates that the F6 has a strong influence on availability of local road capacity. Ongoing engagement with RMS and TfNSW going forward will be required to manage the road network planning process and outcomes.

The **Princes Highway** has been identified as the main singular 'destination' for traffic leaving the investigation area and further assessment would be required at this corridor to determine impacts and any required upgrades. The need for upgrades along this corridor would be heavily driven by anticipated timing of both Cooks Cove development, and the completion of the Southern Connector.

Notwithstanding the above, the main traffic movements are forecast to be towards the south and the **M5 Motorway** Interchange. The impacts on this intersection and at West Botany Street would require impact assessment along with the broader State road network in the area as part of any future development proposal.

Airport Drive has been shown to represents a relatively low desire line for traffic accessing the development; however any future assessment would still need to be cognisant of interaction with access roads to the International Airport.

7.0 Travel demand management strategies

Sustainable transport and Travel Demand Management (TDM) strategies involve the application of policies, objectives, measures and targets to influence travel behaviour, to encourage uptake of sustainable forms of transport, i.e. non-car modes, wherever possible and to reduce the need to travel and hence reduce overall transport and travel demand and the impacts of new development.

If the Cooks Cove investigation area is to grow in accordance with the principles and achieve world's best practice in planning the development of cities, it is considered that managing transport demand and travel behaviour will be integral to the success of the city's progression.

TDM strategies generally guide all relevant customers (residents, employees and visitors) in changing travel behaviour in the following ways:

- Reduce travel
- Re-mode (consideration of travel via alternative modes)
- Re-time (consideration of travel at alternative times)
- Re-route.

A Travel Demand Management Strategy should be developed and monitored to deliver best practice travel programs and initiatives to manage travel demand. Key initiatives and measures could be developed to:

- **Reduce the need to travel**
  - Planning of mixed-use development with provision for a wider variety of employment types (medical, legal, commercial etc), retail, residential and community services to maximise trip containment within the precinct and surrounds and encourage use of walking and cycling for short trips.
  - Use of the internet and technology to facilitate remote working via smart work hubs with high quality facilities or working from home.
- **Re-mode travel**
  - Walking and cycling:
    - Key design principles to integrate walking and cycling network and facilities into the planning and delivery of new buildings and spaces.
    - A highly permeable and safe pedestrian network throughout the precinct.
    - Dedicated cycle routes that connect to regional cycle routes and major transport hubs.
    - Pedestrian infrastructure e.g. sheltered seating areas.
    - High quality and accessible end-of-trip facilities (centralised cycle hubs, on-street secure bicycle storage, lockers and showers).
    - Free bicycles for residents, employees and visitors to travel within the precinct, to and from other destinations and nearby transport interchanges (e.g. Wolli Creek Station).
    - Promotion of bicycle initiatives e.g. NSW Bicycle Week, Ride to Work Day, free bike check-up events.
    - Facilitating engagement with local Bicycle User / Consultation Groups
  - Public transport:
    - Early provision of efficient and frequent public transport services to establish travel behaviour using public transport.
    - Incentives to use public transport, such as distributing Opal cards with credit pre-loaded.
    - Good quality public transport stops that are accessible, have real-time information, and tailored information with clear mapping.

- Parking measures as a means to encourage alternative modes of travel:
  - A review of parking supply rates and approval procedures for certain development types, to reduce the overall provision of parking with new development.
  - Consider increasing parking rates, fees and parking periods - which may require engagement with parking facility owners / operators.
  - Parking spaces dedicated to electric vehicles.
  - Parking spaces dedicated to car share scheme and community car-share vehicles.

- **Re-time and re-route journeys:**
  - Development of a precinct-specific app that includes:
    - Active and public transport maps.
    - A personalised journey planner.
    - Notifications with latest travel information.
    - Other CBD-related information.
  - Employers to promote and encourage flexible working hours and arrangements.

While it is important to develop a management strategy aimed at managing travel demand and reducing reliance on car travel, it is equally important to monitor and evaluate the effectiveness of individual measures and the need to adjust the measures. The availability of technology such as smartphone applications can be used to collect travel data and monitor travel pattern and behaviour. This is valuable in evaluating the effectiveness of individual measures. A full-time role could be dedicated to operate and monitor the success of these measures, the cost of which may be offset by changes to parking rates.

8.0 Summary

This report has outlined a preliminary transport framework taking into account:

- Acknowledgement of the constraints and opportunities in the existing transport network.
- Transport projects already under construction, or included within current Government planning documents.
- Potential land use development scenarios.
- The urban design principles for the Cooks Cove investigation area that address issues of context, connectivity, activity, sport and recreation, open space, natural systems and heritage. These principles have also been used to guide the development of multi-modal connections between the investigation area and the surrounding transport network and infrastructure.
- Stakeholder engagement with TfNSW including RMS.

Due to the strategic nature of the study, there are a number of key assumptions and limitations of this study include:

- The study and the traffic assessment were undertaken based on the four potential land use options identified only.
- Apart from the key traffic generating land uses, such as residential, commercial and retail uses, the site will also accommodate other land uses such as recreational facilities and a golf course. However these have not specifically been incorporated into the preliminary traffic assessment. These elements of the use of the land are not considered to be large travel generators during peak periods, are likely to be located in other parts of the development and have separated access arrangements. The consideration to a Sports Stadium on the site has been identified, however it was agreed with Government that assessment of its transport needs would not be a critical element of this preliminary investigation which focusses on the suitability of the site as a Priority Precinct.
- The transport needs and infrastructure requirements were identified based on existing travel patterns and behaviour, current network performance as well as current understanding of future transport network planning and investments only.
- Only a basic preliminary traffic assessment was performed to understand the scale of the intersection required to provide access; to determine the forecast traffic performance of these two intersections and ultimately if they form a constraint to development of the investigation area. Further traffic analysis and detailed modelling will be required to provide further understanding of the development impact on the surrounding road network.
- The preliminary traffic assessment assumed key infrastructure upgrades, such as WestConnex Stage 2, F6 Motorway, Marsh Street widening and Gertrude Street extension will be delivered. The feasibility of the development could be heavily compromised if these infrastructure projects are not delivered.

Table 23 provides a list of the actions and improvements which should be carried out to support the development of Cooks Cove. From this strategic study, it is clear that major rail infrastructure improvements and services are required to support the development growth of Cooks Cove Investigation Area. The ability of local development traffic to access the regional road network including Marsh Street, Princes Highway and the M5 Motorway is heavily reliant on the delivery of major road infrastructure upgrades such as the WestConnex and the F6 Motorway projects. Therefore the development feasibility of the Cooks Cove investigation area could not be fully realised, without investment in these major road and rail infrastructure.

Table 23 Summary of transport actions and improvements

Walking and Cycling
A direct foreshore bicycle path along the Cooks River with improved connectivity across Muddy Creek.
Connection to Giovanni Brunetti Bridge.
Potential new walking and cycling connections across the Cooks River, to enhance complementary land uses with Sydney Airport, and as a potential alternate crossing opportunity to improving the Giovanni Brunetti Bridge crossing.
Treatments that manage key conflicts points at Marsh Street, Princes Highway and West Botany Street through pedestrian enhancements - either by overpasses or improved crossings.
Potentially provide walking and cycling connections into Banksia Priority Precinct via Spring Street.
Opportunities to improve pedestrian amenity and safety within the investigation area and along connections to areas surrounding the investigation area including transport interchanges such as rail stations and bus stops.
Rail
Improvements to rail infrastructure and services to get more people to and from the Sydney CBD and other key centres on the rail network, such as increasing the number of trains per hour via operational improvements and eventually moving towards Sydney Metro type services.
Improved and enhanced accessibility and connectivity from the investigation area to surrounding rail stations.
Bus
Introduce bus feeder services to mitigate walking distance / time issues. This could include consideration to connecting to Sydenham - where more passenger capacity exists - instead of local stations.
Increase bus service frequencies to local routes (422).
Introduce new bus stops at Marsh Street to accommodate access to new and improved suburban bus routes.
Investigation into the need for any bus priority infrastructure to improve reliability.
Roads
The Gateway to the South program to fix two pinch points in the Cooks Cove area - Princes Highway intersections with Railway Road and Forest Road.
Reliance on the delivery of major road infrastructure projects such as Westconnex with proposed southern extension from Arncliffe to Kogarah and the proposed F6 Motorway that aims to remove traffic from existing arterial road network and creates capacity for local development traffic to access the regional road network.
Proposed upgrades by others including Marsh Street widening and Gertrude Street extension to improve local connectivity and accessibility to the wider network.
Major intersection upgrades on Marsh Street to provide access to the investigation area.
Any other network and intersection upgrades to be identified as part of a detailed traffic impact assessment to support a future proposal.

9.0 Next steps

The preliminary traffic assessment was performed as part of this study to understand the scale of the intersection required to provide access; to determine the forecast traffic performance of these two intersections and ultimately if they form a constraint to development of the investigation area.

Further traffic analysis and detailed modelling will be required to provide further understanding of the development impact on the surrounding road network. Potential refinement of land use scenarios may be required in response to the findings of this detailed assessment, such that an appropriate development yield and mix can be achieved that can be supported by a sustainable traffic and transport network.