Roads and Maritime Services

Alexandria to Moore Park Project:

Traffic and Transport Assessment Report

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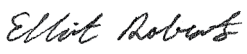
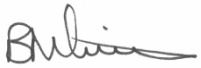
		Signature			

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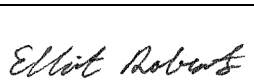
		Signature			
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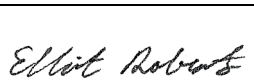
		Signature			
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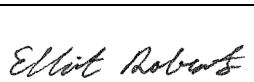
		Signature			
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Executive Summary

Roads and Maritime Services are proposing to deliver intersection upgrades and traffic management measures along the east-west urban road corridor formed by Euston Road, McEvoy Street and Lachlan Street. This Traffic and Transport Report has been prepared to support the Review of Environmental Factors (REF) for the project and provides details of a holistic traffic and transport assessment, with findings summarised as follows.

Existing conditions

Road safety

A review of the crash history yielded that road safety is a substantial issue for this corridor, with recorded crash rates multitudes higher than the Sydney-wide average for a class 3U road.

Place

The corridor lies within several kilometres of the Sydney CBD, strategic centres and local centres, each of which represent substantial destinations within the broader urban setting - and set the bar for high place significance and value. These localised destinations are positioned adjacent the corridor, except for active frontages between Botany Road and Fountain Street along the corridor. This subsequently drives substantial movement of people and goods along and across the corridor.

A strategic level review of transport facilities and operations indicate that one of the key impacts to place is that generated by the current speed of the traffic environment and vehicle volumes along the corridor.

Movement

Broadly, it is considered that the key existing customer groups for movement:

- **Across the corridor** - are a combination of sustainable transport modes (bus, pedestrians, cyclists) accessing the Sydney CBD and surrounds and substantial private vehicle and freight movement at the M1 Eastern Distributor, South Dowling Street, Anzac Parade and Botany Road.
- **Along the corridor** - is predominantly the private vehicle, serving movement between the adjacent LGA's that do not have competitive public transport alternatives, as well as providing connectivity between interfacing local and higher order routes and the motorway network.

Freight, buses, pedestrians and cyclists are key customers at select locations but overall along the corridor generally have lower scale or more localised functions. Parallel routes are available to both the north and south.

The corridor accommodates a majority of the above key movement functions at the intersections that comprise it. Intersections facilitating the highest movement of people and goods, which also represent the locations with the most substantial

performance issues, are those at **South Dowling Street** and **Botany Road**, resulting in poor travel times and reliability for buses, freight and private vehicles.

Future change

The planned transport and urban change in the project area - driven by NSW and Local Government policies, plans and projects - is substantial.

In terms of **place**, the area is the subject of substantial urban renewal activity with local strategic growth areas including the Green Square Urban Renewal Area, Waterloo Metro Quarter, Waterloo Estate, Redfern to Eveleigh and Ashmore Precinct – representing an accumulative planned increase of over 42,000 dwellings within the next 15-20 years. Residential population within travel zones immediately adjacent corridor alone are forecast to increase by 18,000 over the next 20 years. Urban renewal will increase the demand for movement by all modes, as well as need the need for local places. A review of planning documents indicates a precedence for focussing place activity away from the corridor, except for planned continued activation at the west between Pitt Street and Harley Street.

Regarding **movement**, the area is also undergoing substantial change through investment in city-shaping projects such as CBD and South East Light Rail, Sydney Metro City and Southwest, and several motorway projects including WestConnex, Sydney Gateway, M6 Stage 1, Western Harbour Tunnel and Beaches Link – each of which will impact local and regional travel patterns in the area. The New M5 Motorway and the proposed Alexandria Local Area Traffic Management scheme will reinforce traffic movement functions of the corridor in the west in the short term. Plans and projects also bring forecast changes to the bus network, and improvements for cyclists and pedestrians, most of which are still in planning.

The nett effect is a forecast increase in peak period traffic volumes at intersections of 5% to 132% (depending on location and peak) by 2031, resulting in substantial exacerbation in the congestion effects at existing key pinch points as well as creating new ones.

Needs for investment

Table 1 presents a summary of existing or forecast issues driving a need for investment in the A2MP Stage 1 study area, including the project.

Table 1 Summary of needs for investment

Category	Strategic functional requirements	Issue / opportunity	Existing or forecast issue
Road safety	Minimise the risk of serious injuries or fatalities to all road users	• The rate of crash occurrences between Maddox Street and South Dowling Street are multitudes higher than the Sydney benchmark for roads of the same classification	Existing
		• Almost two thirds of all crashes occurred at intersections with some of the highest numbers occurring at South Dowling Street, Elizabeth Street, Botany Road, and Fountain Street	Existing
		• 23 crashes involved pedestrians, 11 of which were located between Fountain Street and Botany Road	Existing
		• Congestion is forecast to substantially increase, increasing the likelihood of congestion-related crash types (rear-ends etc) including those from forced driving behaviour	Forecast
Place	Enabling strong transport connections to the nearby metropolitan, strategic and local centres, particularly by sustainable transport modes	• See below issues and opportunities for Movement – Bus & Light Rail, Cycling and Walking	Existing
	Providing quality transport facilities and amenity at key existing local places and planned significant urban renewal	• Bicycle parking facilities are generally lacking, resulting in share bikes observed lying on the ground or path at various locations	Existing
		• Three stops of poor quality (flagpoles and timetables only) were noted on McEvoy Street near Botany Road and one on Euston Road east of Maddox Street	Existing
		• Planned continued activation of the corridor between Pitt Street and Harley Street may increase pedestrian activity and associated needs for amenity and space beyond the kerb	Forecast
		• Planned substantial urban renewal will increase the demand for all movement modes (see issues below), as well as need for local place (see issues above)	Forecast
Movement – Walking	Facilitate safe and efficient movement of pedestrians across the corridor at Botany Road and Elizabeth Street, as well as between Harley Street, Bowden Street and Fountain Street	• Footpaths between Fountain Street and Harley Street form part of the primary walking network, though only typical footpath widths are provided	Existing
		• Permeability across the corridor is low between South Dowling Street and Bourke Street (430m between crossings), and between Fountain Street and Wyndham Street (410m) between crossings	Existing
		• A forecast increase in residential population of 75,000 to 80,000 people within 1-1.5km of the corridor, and 18,000 people in travel zones immediately adjacent the corridor, over the next 20 years will substantially increase pedestrian activity on footpaths and at intersections	Forecast

Category	Strategic functional requirements	Issue / opportunity	Existing or forecast issue
Movement - Cycling	Facilitate safe and efficient movement of cyclists across the corridor between Harley Street and Bowden Street, as well as provide local connections along Euston Road and Fountain Street	• Euston Road and Fountain Street are identified as part of the planned bike network, and existing facilities at these sections do not adequately facilitate bicycle users	Existing
Movement – Bus & Light Rail	Facilitate safe, efficient and reliable movement of public transport customers across the corridor at Botany Road and Elizabeth Street	• Peak period travel speeds across the corridor are low, and/or average lateness departing stops is high, for existing bus services along each of the key interfacing bus corridors of Botany Road and Elizabeth Street	Existing
		• Average speeds are forecast to drop by 10% to 15% in peak periods by 2021, with most substantial deterioration at city-serving bus corridors such as Botany Road and Elizabeth Street, and for cross-regional services operating along the corridor at the west.	Forecast
Movement – General Traffic and Freight	Facilitate safe, efficient and reliable movement of vehicles accessing the immediately adjacent motorway network at the M1 Eastern Distributor, New M5 Motorway and M4-M5 Link.	• Primary existing performance issues at intersections such as South Dowling Street and Botany Road result in average vehicle speeds along the corridor of less than 20km/h during the AM and PM peaks in both directions, as well as impacting speeds across the corridor	Existing
		• Network changes are forecast to increase peak period traffic demand at intersections by 6% to 113% (depending on location and peak) by 2021, resulting in average speeds across the network being forecast to reduce by a further 20% to 30%. By 2031, additional planned motorway network changes and proposed urban renewal are forecast to further increase peak period traffic demands.	Forecast
		• The corridor's intersection with Elizabeth Street is forecast to worsen from operating at or near capacity, to well above capacity	Forecast

Project benefits and impacts

Road safety

The project is anticipated to improve road safety and reduce risk of serious injuries particularly through:

- Reducing congestion via, and ensuring pedestrian protection at, upgraded intersections
- Reducing the number of priority-controlled right turns.

Place

The project is anticipated to:

- Potentially impact place along the corridor during peak periods through increased traffic throughput, whilst potentially assisting preservation of place on nearby streets through decreased rat-running
- Enhance accessibility to nearby centres and planned urban renewal areas through improved journey time and reliability along and across the corridor
- Impact private vehicle access to local destinations through the implementation of clearways on weekdays and weekends.

Movement

The project is substantially driven by the need to improve movement performance for road transport customers, and is anticipated to improve conditions for:

- **Buses** by improving bus travel speeds by 12% and 3% in the 2021 AM and PM peak hours respectively
- **General traffic** and **freight** by improving average travel speeds by 33% and 15% in the 2021 AM and PM hours peak respectively.

1 Introduction

1.1 Project background

As part of the NSW Government's investment in keeping Sydney moving and improving road safety, Roads and Maritime Services (Roads and Maritime) have led an investigation in to intersection and traffic management improvements at four key intersections within the inner west of Sydney. The four intersections are located on the east-west route that includes Euston Road, McEvoy Street and Lachlan Street. These intersections were identified as part of a previous concept design known as the Alexandria to Moore Park (A2MP) project.

Roads and Maritime are proposing to construct Stage 1 of A2MP (the project), which comprises:

- Intersection upgrades at four locations
  - McEvoy Street and Fountain Street
  - McEvoy Street and Botany Road
  - McEvoy Street and Elizabeth Street
  - Lachlan Street and South Dowling Street.
- New clearways on both sides of the full length of the project
- Right turn bans at most intersections with lower order streets along the east-west route.

In parallel to the development of the A2MP project, the NSW Government through Transport for NSW developed and released *Future Transport Strategy 2056* (or "Future Transport") in 2018, which is underpinned by the Movement and Place framework. Through the lens of this framework, planning and managing a successful road corridor includes appropriate consideration of the strategic significance of the corridor in supporting both safe, efficient and reliable journeys for people and goods while enhancing the liveability and amenity of places. Ensuring the project appropriately responds to the needs of each has also formed a part of more recent challenge reviews of the project.

1.2 Purpose of this report

This Traffic and Transport Report is one of several documents that have been prepared to provide pertinent technical information and analysis required to both inform and append to the Review of Environmental Factors (REF) for the project. The purpose of this report is to provide details of the methodology, assumptions and outcomes from a holistic traffic and transport assessment that has been undertaken to identify existing issues along the project and establish future traffic and transport conditions in the study area with and without the project.

1.3 Structure of this report

This report has been structured into the following sections:

- **Section 2 Strategic context**: places the project with the context of NSW and Local Government plans, policies and projects
- **Section 3 Methodology**: explains the process that has been adopted for the traffic and transport assessment of the project
- **Section 4 Existing conditions**: provides details of existing functions and performance along the project in terms of road safety, places, and movement by key relevant transport modes
- **Section 5 Future conditions without project**: outlines planned changes in transport and land use in the area, and the associated forecast performance without the project
- **Section 6 The project**: describes key elements of the project definition
- **Section 0 Future conditions with project**: provides details of how the project responds to key issues identified, and any opportunities for further investigation
- **Section 8 Construction**: includes a strategic overview of traffic and transport management principles that should be applied during construction
- **Section 9 Summary**: provides a summary of the findings of the traffic and transport assessment.

1.4 Study area

The study area includes the four intersections along the east-west urban road formed by Euston Road, McEvoy Street, Lachlan Street and Dacey Avenue between Alexandria and Moore Park. The intersections are circled in red in Figure 1.

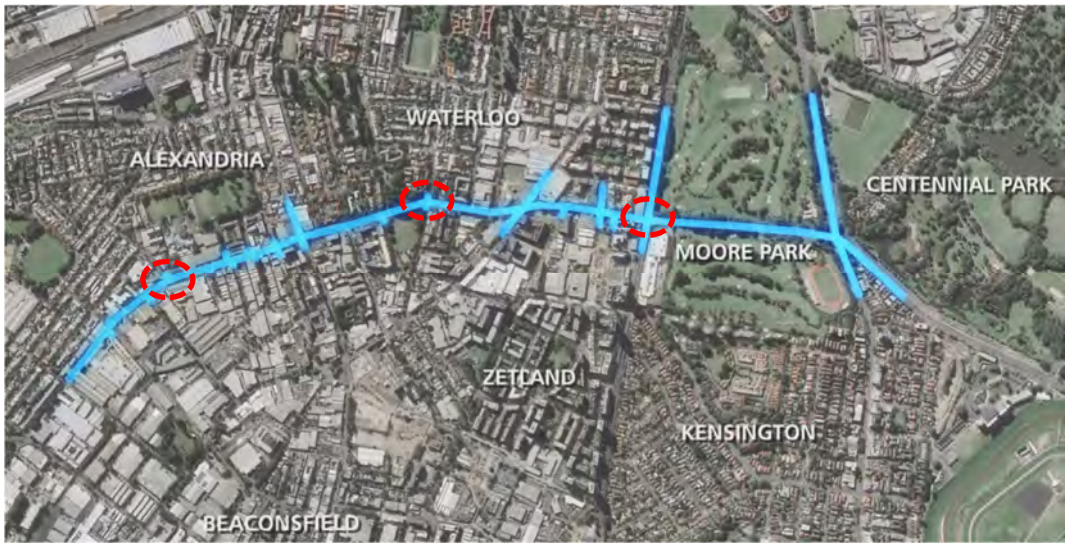


Figure 1 Study area

2 Strategic context

2.1 Plans, policies and projects

A review of plans, policies and projects relevant to the study area has been undertaken, the outcomes are summarised in Table 2. Due to the substantial cumulative amount of planned transport and urban change in the area, relevant information from Table 2 has been consolidated and visualised in Figure 2 - representing the current transport and land use vision for the study area. It is considered the plans and policies set a precedent for strategic functional requirements for the project which range from reinforcement of existing functions to aspirations for future planning and investigation.

Table 2 Review of plans, policies and projects

Plan, policy or project	Relevance
NSW Government	
State Priorities	Three of the 18 state priorities forming the focus of current NSW Government action specifically relate to the safety, travel time and reliability performance of NSW road corridors. These are strategic priorities with related targets which will be enabled via delivery of the more specific plans detailed below.
Greater Sydney Region Plan: A Metropolis of Three Cities (Greater Sydney Commission, 2018)	Presents a vision whereby most residents live within 30 minutes of their jobs, education and health facilities, services and great places. Provides ten directions for the metropolis of three cities with a liveability, productivity and sustainability framework for Eastern Harbour City Vision within which the study area is situated (further relevant detail in items below).
Future Transport Strategy 2056 (Transport for NSW, 2018)	Presents a vision for transport in NSW built around six key desired outcomes. Establishes a framework to guide investment in future transport, including high-level details of both committed initiatives and initiatives for investigation. More relevant details from supporting documents as follows immediately below.
Road Safety Plan 2021 (Transport for NSW, 2018)	Details the NSW Government's commitment to improving safety on our roads. Key relevant extracts include: • Road safety targets for: o **2021** - Reduce road fatalities by at least 30% from 2008–2010 levels (State Priority Target) o **2056** – zero fatalities and serious injuries on our roads • Increase safety for vulnerable road users by providing pedestrian crossings, refuges and traffic calming devices, as well as expanding 40km/h zones in high pedestrian and local areas.

Plan, policy or project	Relevance
Greater Sydney Infrastructure and Services Plan (Transport for NSW, 2018)	Underpins *Future Transport 2056 Strategy*, establishing specific outcomes that customers can expect and identifying the policy, service and infrastructure initiatives to achieve these. The Plan reaffirms the following in relation to the A2MP study area: • The existing and planned motorway network (see planned projects below) are "Priority vehicle corridors" • The vision for "City-serving" transit services crossing the project at Gadigal Avenue, Botany Road, Anzac Parade and Alison Road with "City-shaping" transit services along the existing T8 South Line and under-construction Sydney Metro City and Southwest Line • "Place (associated with Centre)" is planned immediately adjacent the project between Botany Road and Harley Street
East Sydney District Plan (Greater Sydney Commission, 2018)	Presents a metropolitan vision for east Sydney most notably identifying a hierarchy of centres around which to focus our place-based planning, identifying nearby Green Square-Mascot (part of the "Eastern Economic Corridor") and Randwick as strategic centres. The Plan also identifies the need to improve east-west public transport from growth areas such as Green Square and Mascot.
Sydney Green Grid - Central District (The Office of the Government Architect, 2017)	Provides preliminary prioritisation of Green Grid opportunities in terms of their strategic potential to catalyse a new interconnected high performance green infrastructure network which will support healthy urban growth. It identifies the CBD and South East Light Rail corridor (Anzac Parade and Alison Road) and the Bourke Street and George Street Active Transport Links as key project opportunities.
State-significant precincts and projects	
Sydney Metro City and Southwest: Chatswood to Sydenham (Transport for NSW)	15.5-kilometre Metro line from Chatswood, under Sydney Harbour and through Sydney's CBD out to Sydenham, including the completion of a new station at Waterloo immediately to the north of the project. This station represents the catalyst for the Waterloo State- Significant Precincts identified below. The study area also represents one of the 'city-shaping' corridors identified in the *Greater Sydney Infrastructure Plan*.
Waterloo Metro Quarter & Waterloo Estate (Urban Growth NSW)	A 20-hectare urban renewal precinct under investigation that will deliver new homes, shops, community facilities, parks, and open spaces over the next 15-20 years. The precinct immediately abuts the north of the project between Pitt Street and Cope Street. Waterloo Metro Quarter proposes approximately 700 new dwellings. The preferred Waterloo Estate master plan proposes yields of approximately 6,800 dwellings along with supporting retail and service business opportunities. These proposals will increase travel demand along and across the project and propose a new signalised access at the McEvoy Street / Pitt Street intersection. At the time of writing this report, Arup were aware the masterplans for these two sites were being revised. The revised dwelling numbers are assumed to be consistent with the above.
Redfern to Eveleigh (Urban Growth NSW)	As part of the *Central to Eveleigh Urban Transformation Strategy* (along with the Waterloo State-Significant Precincts), the Redfern Station, North Eveleigh and South Eveleigh precincts to the north of the A2MP project are proposed to accommodate uplifts of the following over 15 years: • North Eveleigh: 600-700 dwellings

Plan, policy or project	Relevance
	• South Eveleigh: 400-700 dwellings • Redfern Station: to be determined during detailed precinct planning
Elizabeth Street, Redfern Precinct (Department of Planning & Environment)	Presents the opportunity for the staged redevelopment of the one-hectare government-owned site to social housing. The precinct is undergoing investigation for rezoning through the State-Significant Precinct process, with further details currently not yet available.
Alexandria Park Community School (School Infrastructure NSW)	Delivery of a new school to accommodate growth from approximately 400 students to 1,000 primary school students and up to 1,200 secondary school students. SSDA approval is expected in early 2019, followed immediately by an award of the main works contractor. The project is scheduled for completion in 2022. The redeveloped school will attract an increased number of students (considered vulnerable road users) to the area, particularly between Wyndham Street and Fountain Street.
CBD and South East Light Rail (Transport for NSW)	A new 12km light rail route, featuring 19 stops, from Circular Quay to Moore Park via Central Station, then diverging to each: Kensington and Kingsford via Anzac Parade and Randwick via Alison Road. The project is programmed for completion in early 2020. The project also represents the 'city-serving' transit corridors along Anzac Parade and Alison Road in the *Greater Sydney Infrastructure Plan*.
WestConnex (Roads and Maritime)	The under-construction New M5 Motorway, and approved and appointed M4-M5 Link, will together provide a new motorway network that will change traffic and travel patterns in the area. They converge, along with the Sydney Gateway, at the St Peters Interchange immediately to the south of the study area.
Sydney Gateway (Roads and Maritime)	Represents the key link between the WestConnex motorway network and the Sydney Airport and Port Botany. With an estimated 3.5-year construction program, the likely delivery period would be mid-2020's depending on funding and planning approvals.
M6 Stage 1 (Arncliffe to Kogarah) (Roads and Maritime)	Committed and funded tunnelled motorway connection from the New M5 Motorway at Arncliffe to President Avenue at Kogarah. The Environmental Impact Station (EIS) was lodged in late 2018 and is programmed for completion in 2024. The remainder of the M6 project remains uncommitted and unfunded.
Western Harbour Tunnel and Beaches Link (Roads and Maritime)	This committed project, subject to approvals and funding, includes: • Western Harbour Tunnel (WHT): a new 6.5km, six-lane crossing of Sydney Harbour between Warringah Freeway at North Sydney and the M4-M5 Link interchange at Rozelle • Beaches Link (BL): A new tunnel from the Northern Beaches to the Gore Hill Freeway (Artarmon) and Warringah Freeway (North Sydney) • Warringah Freeway Upgrade: 4km of upgrade works to integrate WHT and BL with the existing motorway network at North Sydney The completed motorway program of works (including WestConnex) would create a western bypass of the Sydney CBD, reducing north-south movement on the existing road network across the study area - particularly at the M1 Eastern Distributor.

Plan, policy or project	Relevance
City of Sydney (Local Government)	
Sydney Development Control Plan (City of Sydney, 2012)	Is the key planning instrument of the City of Sydney (Council). It provides development-related transport policies and further detail around the vision, land use and detailed controls at key locations including those nearby the project (e.g. Lachlan Precinct) whilst also incorporating planning controls for key precincts identified below.
Green Square Urban Renewal Area (City of Sydney, 2013)	A long-term vision for the urban transformation of former under-utilised industrial lands into a total of 30,500 new dwellings, along with supporting retail and commercial uses focussed around it's station-based Green Square Town Centre (GSTC). The study area predominately traverses the northern boundary of the designated area, and through it in small sections. Construction began on GSTC in 2014 and along with surrounding precincts (Epsom, Lachlan, North Rosebery) are at various stages of planning, delivery and occupancy. Continual uplift of the area will increase travel demand along and across the project.
Ashmore Precinct (City of Sydney, 2013)	Proposal to provide dwellings for approximately 6,300 new residents (~3,500 dwellings) by 2025, in a consolidated renewal precinct to the west of the project in the vicinity of Maddox Street and Mitchell Road. A majority of the lots are either under construction, nearing completion or complete.
Southern Employment Lands (City of Sydney, 2012)	Focused on retaining essential employment lands and making space for more businesses and new jobs. The study was undertaken in 2012 and endorsed in 2014. The most substantial forecast intensification of land use is along the south of McEvoy Street between Bowden Street and Botany Road, with low to moderate growth across the rest of the area. The DCP specific area maps reference "Active Edges" along the south of the study area between Botany Road and Bowden Street.
Walking Strategy and Action Plan (City of Sydney, 2018)	Endorsed by Council in March 2017, this Plan outlines how Council will encourage walking by improving wayfinding, encouraging a fine grain street network, creating lively interesting streets, improving ramps and footpaths and slowing down traffic. It identified Botany Road – Regent Street – George Street (CBD) as a north-south pedestrian spine. It also highlights Harley Street, Bowden Road, Fountain Street, Elizabeth Street, Bourke Street, Gadigal Avenue and Anzac Parade as corridors that are part of Council's primary walking network.
Cycling Strategy and Action Plan (City of Sydney, 2018)	Identifies Council's preferred bike network, with the completion of missing links in the network identified as the highest priority. The Plan aligns with green transport links identified within Sydney's Green Grid along Bourke Street, George Street and Anzac Parade. It also identifies the two established east-west routes parallel to the project – one each to the north and south of study area. The Plan reinforces the project's future role in facilitating mostly north-south cross-corridor routes, as well as some local routes along the study area.
Alexandria Local Area Traffic Management Plan (City of Sydney, 2018)	Proposes a series of traffic management measures including turn restrictions at and closures to a series of side streets along the study area between Sydney Park Road and Botany Road. The core focus of the works is to minimise rat-running through the local street network, particularly following the delivery of WestConnex. The proposed changes will reinforce movement functions of higher roads in the area including Euston Road and Mitchell Road. Community consultation of the proposed changes occurred in November 2018 and is subject to

Plan, policy or project	Relevance
	endorsement processes within Council and approval processes with Roads and Maritime.
Eastern Transit Corridor (ETC) (City of Sydney)	The ETC is a proposal to connect Green Square and the Sydney CBD with a high capacity transit service. It represents the 'city-serving' corridor envisioned across the project at Gadigal Avenue in the *Greater Sydney Infrastructure Plan* (Transport for NSW, 2018). It may be developed in two stages where the initial stage may accommodate bus priority access, pedestrian links, cycleways and quality urban design elements. A future light rail alignment is to be protected to enable light rail in the future.
Green Square to Ashmore Connector (City of Sydney, 2018)	Green Square to Ashmore Connector (GS2AC) is a proposed 380m east-west link between the Green Square Town Centre and Bowden Street in Alexandria. It will also link to Botany Road, O'Riordan Street and Bourke Road. Work is expected to be completed by 2020.
Other	
Australian Trade Park (Mirvac)	Redevelopment commenced in January 2016 and will include the delivery of three new buildings for commercial, retail, and community uses. Construction is due for completion by 2020. Mirvac is also seeking development consent for the redevelopment of the adjacent Locomotive Workshop through the submission of two separate SSDAs.

Figure 2 - Transport and land use vision

3 Methodology

This traffic and transport assessment has adopted a methodology that accounts for, and blends the business-as-usual, traffic engineering and modelling-led approach to road network project development and assessment with the movement and place approach to road corridor planning and management. The overarching assessment process and key considerations of the assessment are illustrated in Figure 3.

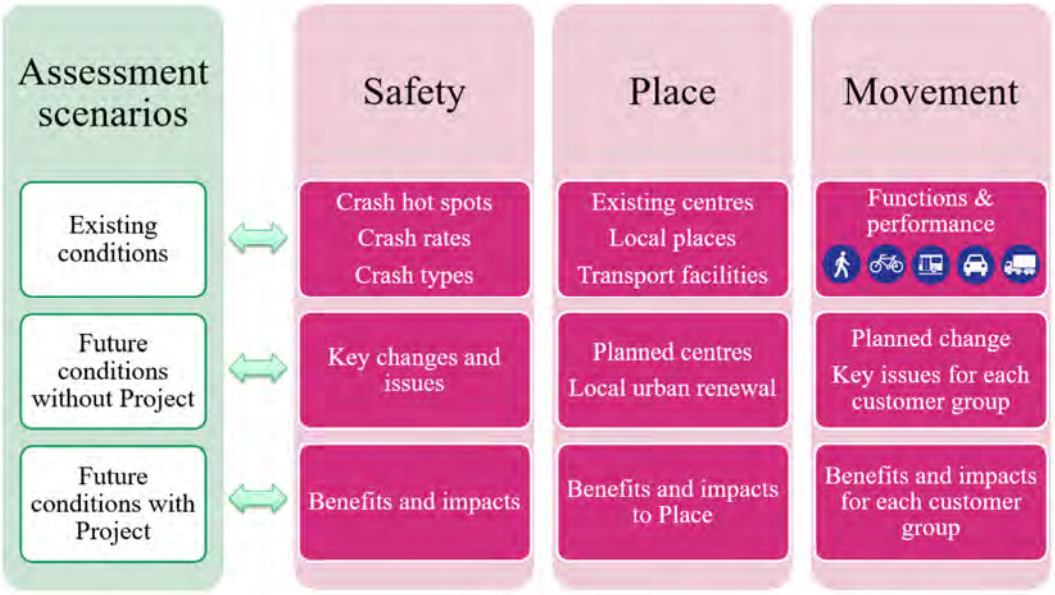


Figure 3 Overarching traffic and transport assessment process

3.1 Traffic and transport modelling

Forecasting future performance of the road network with and without the project has been undertaken using a combination of strategic and operational modelling tools.

Sydney Traffic Forecasting Model (STFM)

A 2014 version of Roads and Maritime's STFM, originally developed by WSP to provide growth forecasts to the operational models, was used to supply estimates of future changes in traffic patterns and demands in the project area. STFM is a link-based traffic assignment model which covers the entire Sydney Greater Metropolitan Area (GMA). The STFM assigns weekday peak period all vehicle (car and commercial) trip matrices, based on demands extracted from the Sydney Strategic Travel Model (STM) - a multi-modal model owned and managed by Transport for NSW that is continuously updated to reflect Government plans and projects for all transport modes, policies, and population and employment forecasts.

Future year AM and PM peak period trip matrices were extracted from STFM for the following scenarios:

- 2016 Existing
- 2021 with and without project
- 2031 with and without project.

Each scenario includes a series of assumptions regarding future transport and land use across the network. Most relevant to the study area, the model includes assumptions regarding the delivery of the planned motorway network in the area, which were consistent with NSW Government planning at the time of initial project development. This included those summarised in Table 3 – which remain consistent with current planning, subject to funding and planning approvals.

Table 3 STFM assumptions on planned motorway network

Project	2021	2031
WestConnex Stage 1 and 2	✓	✓
WestConnex Stage 3	X	✓
Sydney Airport Gateway	X	✓
Western Harbour Tunnel	X	✓
Beaches Link	X	✓
M6 Stage 1	X	✓

Upon Arup's receipt of the STFM models used to estimate future demands for the project, a review was undertaken which considered:

- Changes in land use forecasts and interfacing projects since STFM matrices were extracted during early project development
- Comparisons with forecasts from Roads and Maritime's Sydney Motorway Projects Model (SMPM)
- The network coding of the project in various scenarios.

Operational modelling

Operational modelling has been undertaken to estimate forecast performance of the road network. This modelling encompasses base and future year, with and without project, scenarios for the study area shown in Figure 4. WSP developed the operational models using software package Vissim specifically for the purposes of design development and assessment.

At is noted that any future investigation in to road network performance and upgrade requirements along the study area will include an updated calibration and validation of the model, and traffic demand forecasts will be underpinned by SMPM.

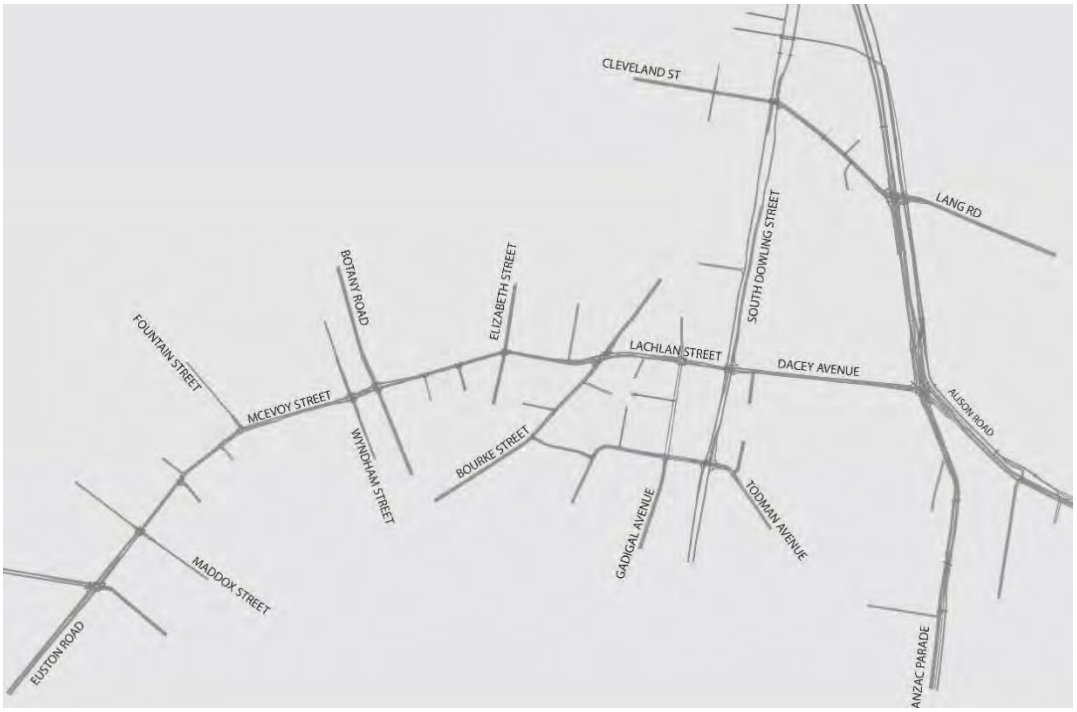


Figure 4 Operational model network

Traffic data

Data representing average dailty traffic profiles within the local road network were derived from traffic surveys carried out between 23 February and 3 May 2016 for the Moore Park and Alexandria areas respectively. Intersection turning movement counts (TMC) were carried out in 2014, 2015 and 2016.

While modelling and calibration was undertaken on 2016 counts, the latest traffic counts undertaken in 2019 indicate that those modelling results are still relevant.

3.2 Assessment metrics

The project's benefits and impacts have been assessed using a variety of quantitative and qualitative means. Each has been discussed briefly in Table 4 with further detail provided as required in relevant sections of this report. It is noted that additional aspects of place associated with urban design and landscape are addressed in the *Urban Design & Landscape Strategy, Landscape Character and Visual Impact Assessment* (October 2019).

Table 4 Overview of assessment metrics

Category	Indicator / Metric	Derivation / Approach
Road safety	Fatal and serious injury crash rates	Current crash rates are quantified for each key segment of the study area based on historic crash data from July 2013 to June 2018. Future changes in road safety are qualified based on an understanding of forecast change in road operating conditions and traffic management of the project.
	Casualty crash rates	
	Crashes per 100 million vehicle kilometres travelled	

Category	Indicator / Metric	Derivation / Approach
	No. crashes involving pedestrians	
Place	Centres	A review of how the project area relates to or serves the hierarchy of (e.g. Local, Strategic, Metropolitan) existing and future centres.
	Local places	A review of how current and planned places abutting the corridor relate to the road, particularly in terms of activation levels.
	Transport facilities	A review to establish how existing facilities (e.g. bus stops, bicycle parking) support place and how road operations (e.g. traffic volumes, speed) impact place.
Movement - Walking	Connectivity	Qualitative based on a review of completeness of footpath and intersection crossing connectivity.
	Footpath crowding	Qualified based on known footpath widths (from survey and design drawings) and understanding of pedestrian demand based on observations and any data available.
Movement – Cycling	Facility	Based on quality of observed facilities along corridor (e.g. dedicated, mixed traffic etc)
	No. of stops	Based on number of traffic signals or other features along corridor that require cyclists to stop.
Movement – Bus & Light Rail	Travel time	Quantified based on average travel speeds across the network as extracted from operational models, for all existing and future scenarios. Existing average speeds between stops also established with Opal data.
	Travel time reliability	Quantified for existing scenario based on average lateness of services at bus stops as established with Opal data. Qualified only for future scenarios based on forecast change in road operating conditions.
Movement – General traffic	Travel speeds	Quantified based on average travel speeds across the network as extracted from operational models and travel time data.
	Intersection delay	Quantified based on average vehicle delays at intersections extracted from operational models, for all existing and future scenarios, and presented as a level of service (LOS) in accordance with Table 5.

Table 5 Level of service criteria for signalised intersections

LOS	Average delay (seconds/vehicle)	Performance description
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; incidents will cause excessive delays
F	>70	Over capacity; excessive delays in typical operation

4 Existing conditions

4.1 Road safety

A review of recorded crash data (provided by Roads and Maritime) for the five years from July 2013 to June 2018 was undertaken to identify any patterns around crash type, location, contributing factors, vulnerable users and to benchmark the project area in terms of crash rates. Key outputs are provided as follows, with supplementary information provided in Appendix E.

4.1.1 Crash severity and types

A total of 320 crashes occurred along in the project area including one fatality, 53 serious injury crashes, 70 moderate injury crashes, 67 minor/other injury crashes, 129 non-casualty crashes, and 23 crashes involving pedestrians. The number of crashes per year reduced substantially between 2013-14 and 2016-17, though this was mostly due to a reduction in non-casualty crashes (see Figure 5).

The key crash categories identified across the project area within this timeframe were: vehicles from same direction (40%), vehicles from adjacent directions (17%) and vehicles from opposite directions (17%). More detailed analysis of crash types (within these categories) revealed that the predominant crash types were rear-end (26%), right-through (15%), cross-traffic (11%) and lane change left/right (6%). Two ‘leaving parking’ and three ‘reversing in lane’ crashes were identified.

A review of the data for crashes relating to vulnerable users yielded a total of 23 crashes involving pedestrians, 11 of which were in the most activated part of the project area between Fountain Street and Botany Road, along with a small cluster at the intersection with South Dowling Street. Site visits also identified several traffic signals that did not have pedestrian protection. It is also noted that a pedestrian fatality also occurred in September 2018, when a pedestrian was struck by a car whilst crossing Lachlan Street near Sam Sing Street

Key observations of the data regarding contributing factors included: 19% of all crashes occurred during darkness, 13% of all crashes occurred when the road surface was wet with 9% while it was raining, 2% noted speeding was involved whilst 3% noted fatigue was a factor.

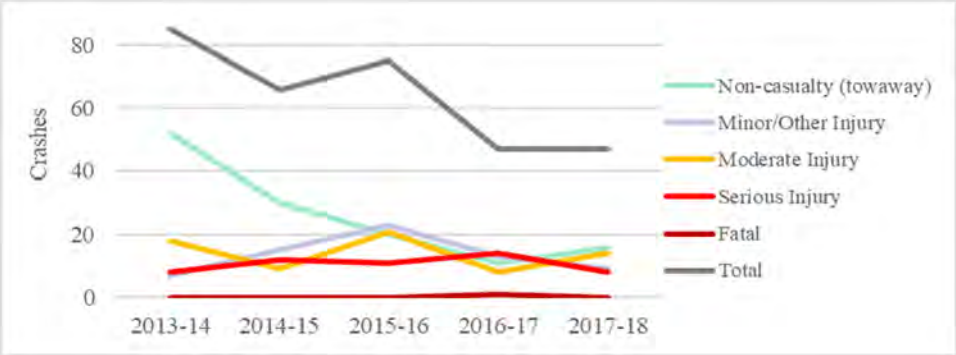


Figure 5 Crash types by year, 2013-2018

4.1.2 Crash hotspots

Figure 6 summarises the key location-specific issues identified based on a review of the crash data, superimposed on to a crash density map. The crash issues identified are considered typical of a corridor with: high vehicular movement and congestion; signalised intersections with filter turn movements; and signalised intersections with shared (though and left/right turn) lanes.

The crash density map visualises key crash hotspots. Almost two thirds of all crashes occurred at intersections, with the highest number of crashes occurring at the intersection with South Dowling Street and Lachlan Street. The map highlights additional hotspots at the intersections with Elizabeth Street, Botany Road and Fountain Street.

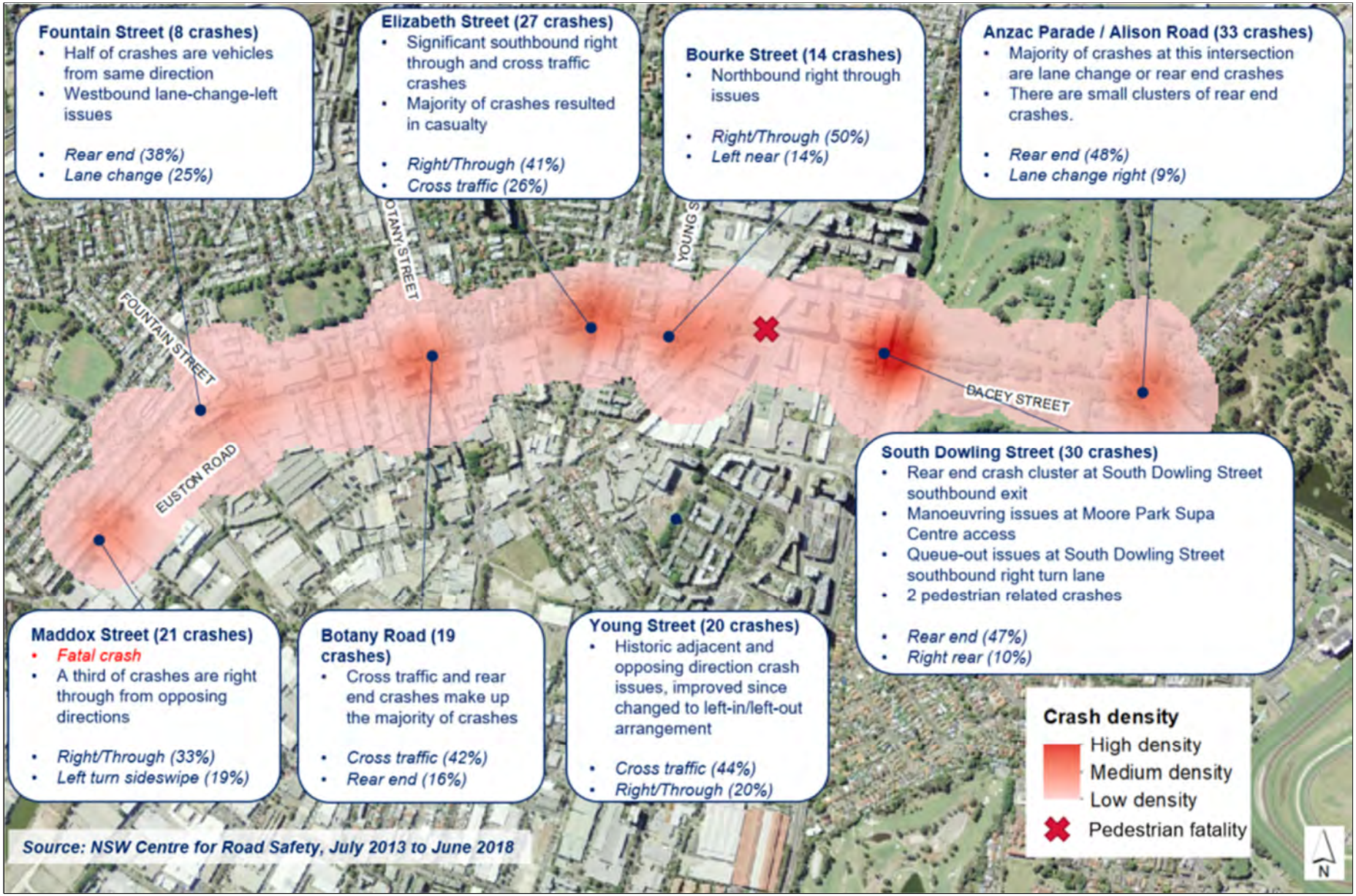


Figure 6 Crash density map and key issues

4.1.3 Crash rate assessment

Crash rates have been determined for each segment of the project area, and for its full length, and benchmarked against class 3U roads across Sydney. Fatal and serious injury crash rates, casualty crash rates, and crashes per 100 million vehicle kilometres travelled (MVKT) have each been determined. The resulting crash rates are summarised in Table 6 and illustrated in Figure 7 . They indicate segments between Maddox Street and South Dowling Street have casualty crash rates multitudes higher than the Sydney average for a class 3U road. The Elizabeth Street to South Dowling Street segment had a particularly high casualty crash rate of 20 crashes per kilometre per year. The results validate that road safety is a substantial issue for the project area.

Table 6 Crash rates by segment, 2013-2018

Segment		Length (km)	Sub network ranking	ADT (vpd)	FSI rate	Casualty rate	Casualties per 100 MVKT
From	To						
Maddox Street	Fountain Street	0.52	3U	24,200	3.5	9.2	105
Fountain Street	Botany Road	0.52	3U	26,200	2.3	10.4	109
Botany Road	Elizabeth Street	0.48	3U	18,600	6.3	13.3	196
Elizabeth Street	South Dowling Street	0.85	3U	16,300	4.2	20.0	336
Average Sydney crash rate for State roads (Class 3U)					**0.7**	**2.6**	**55**

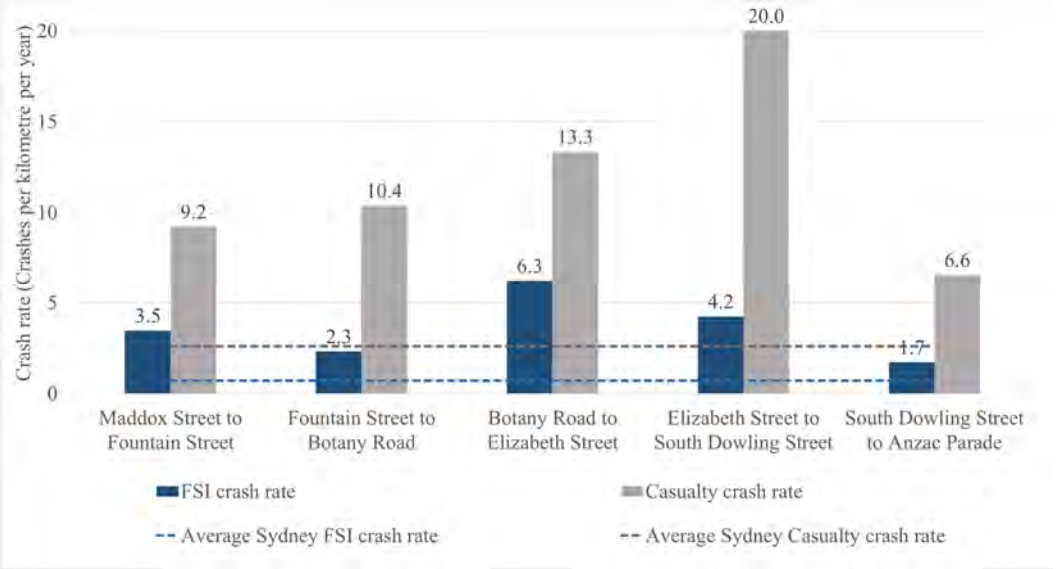


Figure 7 Fatal and serious injury (FSI) and casualty crash rates 2013-2018

4.2 Place

4.2.1 Centres

The project is near key centres that represent significant places within the broader urban setting (see Figure 8). These are predominantly established centres except the most proximate in Green Square (part of the Green Square-Mascot strategic centre), the town centre of which currently remains predominantly under construction approximately 800 metres to the south - and is hence not yet fulfilling its planned destination function. Centres further afield from the project area include the Harbour (Sydney) CBD and the Randwick strategic centre. Local centres are present to the west of the project area including Newtown and Marrickville Metro.

These centres are not considered to result in significant place functions directly adjacent the project area, rather they drive substantial movement along and across the intersections and will form the focus of place-based transport planning into the future, particularly for sustainable transport modes. Green Square is most proximate and the mostly likely to result in future change in place function and is discussed in Section 5.2.1.

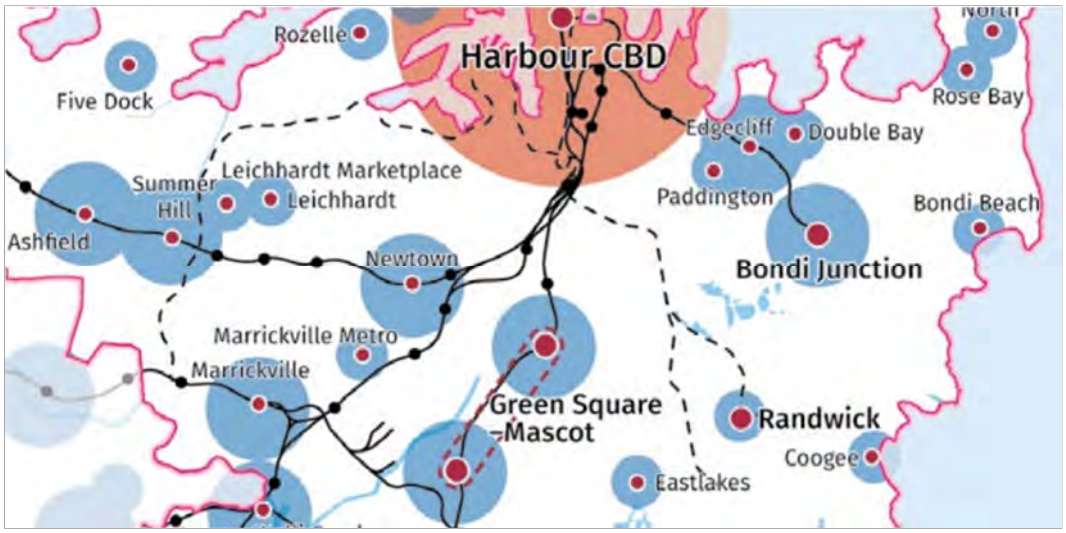


Figure 8 Hierarchy of centres (Source: Eastern City District Plan, GSC, 2018)

Public transport accessibility

Appendix A includes analysis of the accessibility of key nearby centres (Harbour CBD, Randwick, Green Square) by public transport during a typical AM peak period in 2016. Key insights from the data are as follows.

- **Randwick**: The shortest 30-minute range is adjacent the project area to the east (see Figure 9), validating feedback from stakeholders that road network performance in the area is a barrier to bus movement performance
- **Harbour CBD**: The shortest 30-minutes ranges are towards each the inner west, inner east and inner south –those toward the project area are again some

of the shortest, indicating potential road network performance issues exist across or to the north of the intersections

- **Green Square**: The 30-minute is strongly dictated by the T1, T8 and T4 rail corridors that are easily accessible to the Green Square centre. Shortest ranges are towards the southern east suburbs and inner west – further reinforcing east-west movement by public transport in the area is limited.

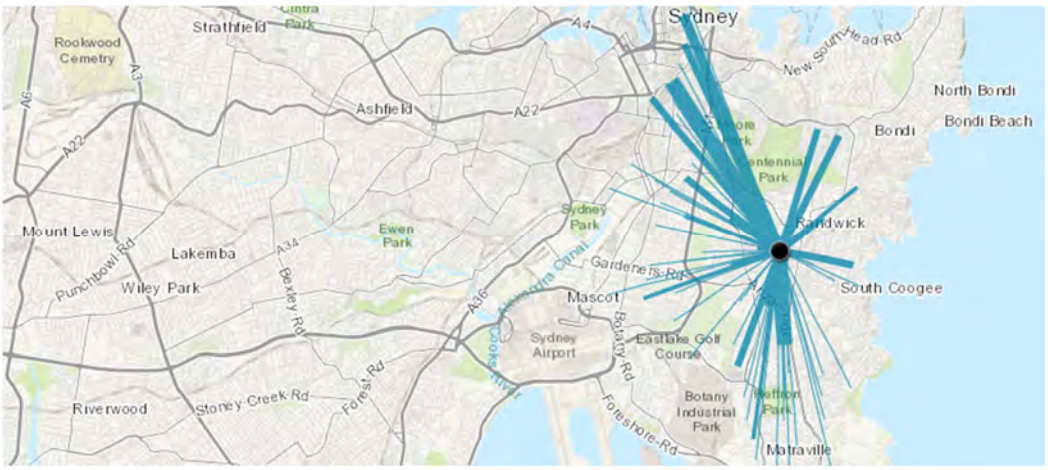


Figure 9 AM peak period 30-minute public transport accessibility catchment of Randwick (Source: UNSW Sydney)

4.2.2 Local places

A summary of the key existing land use zones and types in the project area is provided in Table 7, along with significant place features and observed activation levels. The urban typologies can be broadly summarised in to three segments:

- **East** (Anzac Parade to South Dowling Street): Recreational (Moore Park Golf)
- **Central** (South Dowling Street to Fountain Street): higher density (1-18 story) mixed-use with a stronger presence of shop-top residential particularly towards recently constructed precincts along Lachlan Street
- **West** (Fountain Street to Maddox Street): low to medium density (1-4 story) mixed-use predominantly comprising warehouse and big-box retail, auto repairs, residential.

Overall the abutting land uses are considered to generate relatively low place functions, except for noted active frontages between Botany Road and Fountain Street. Driveway access to properties is also limited, with property access generally provided by connecting lower order streets. The exception is several sites west of Fountain Street that do not have an alternative access street. Lower order streets generally have reasonable access to the east-west project routes (i.e. limited turn restriction).

Table 7 Land use functions and features

Corridor segment		Land use		Significant features	Activation level	Overview of Place significance
From	To	North side	South side			
Maddox Street	Fountain Street	B4 Mixed Use – generally 1-4 storey mixed residential, retail and office	B6 Enterprise – generally industrial, big-box retail, and local business	• Bunnings • Dan Murphy's • Woolworths	Low	Area offset to south plays substantial industrial employment role as part the Southern Employment Lands. Place functions to the north are generally localised to residents & small business and mixed retail. Bunnings is a large generator but a contained site generating mostly vehicular movement. Place functions interacting with the project area itself are considered low (localised).
Fountain Street	Botany Road	B4 Mixed Use – generally 2-7 storey shop-top residential and office	B7 Business Park - generally 1-2 storey mixed retail and local business	• Alexandria Park Community School • Alexandria Park • IGA	Low-Moderate	Place features and functions directly interfacing the project are localised around activated frontages at ground level cafes and retail outlets, and at its interface with higher order activity corridor of Botany Road.
Botany Road	Elizabeth Street	Social and affordable housing, Recreational	B4 Mixed Use, Recreational	• Waterloo Park • McDonalds • Our Lady of Mt Carmel Catholic Primary	Low-Moderate	This segment of the corridor has distinct place 'precincts'. At the west is Waterloo Park – divided by the corridor – which serves as a local recreation and sports facility. Across the north is the Waterloo Estate – an inward oriented housing estate. To the south is the Meriton Tribeca apartment precinct – 'inward facing' design with ground level retail oriented to local streets rather than the corridor.
Elizabeth Street	South Dowling Street	B4 Mixed Use – local business west of Bourke, 10-15 storey shop-top residential to east	B4 Mixed Use – local businesses mixed with high density residential	• Lachlan Precincts • Moore Park View Hotel	Low	West of Bourke: Particularly low activation along north side, predominantly used by isolated local businesses. Slightly higher activation along south with 4-7 storey shop-top apartments. East of Bourke: Precincts are oriented toward Gadigal Avenue and other low order streets rather than along Lachlan Street, though ground level retail provides some activation.
South Dowling Street	Anzac Parade	Recreational	Recreational, B4 Mixed Use	• Supa Centa Moore Park • Moore Park Golf • Centennial Park	Low	The corridor passes through the middle of a golf course – which remains connected via an overpass across the corridor. The Supa Centa is a substantial generator, though is self-contained and considered vehicle-generating rather than pedestrian-generating.

4.2.3 Transport facilities

An assessment of the transport facilities that support direct access to place, and how the management of the road corridor integrates with place, has been undertaken using available data and desktop analysis. The assessment has focussed on evaluating the quality of transport facilities in the project area and the traffic management of the corridor, how they relate to place functions, and identifying any needs for improvement or investment to support local places.

→ **Walking environment**: Traffic volumes are relatively modest for a State road corridor (16,000 to 33,000 vehicles per day). This combined with the recent reduction of the posted speed to 50 km/h means pedestrian amenity has improved for the urbanised area. Natural landscape features provide amenity particularly along Dacey Avenue and along McEvoy Street between Botany Road and Bourke Street, whilst in between the built form provides generally limited activation. The key exception is between Fountain Street and Botany Road which has a degree of ground level retail (e.g. cafes) oriented towards McEvoy Street. Facilities that allow pedestrians to dwell were generally also very limited - to bus stops and some public seating at locations such as Waterloo Oval.

→ **Cycle parking**: Aside from a cluster of easily accessible inverted U-bar spaces at the southeast corner of the Bourke Street intersection and a limited number of signpost-mounted circular bars along the rest of the project area, bicycle parking facilities were generally lacking, resulting in share bikes observed lying on the ground or path at various locations.

→ **Bus stops**: Are generally quite new, of appropriate quality (sheltered with seating) and considered suitable for the scale of services operating. Three stops of poor quality (flagpoles and timetables only) were noted on McEvoy Street near Botany Road and one on Euston Road east of Maddox Street. Stop locations generally align with local places and pedestrian crossings, though there may be opportunities to consolidate stops between Fountain Street and Botany Road.

→ **Loading**: No designated on-street loading zones were identified, with loading facilities limited to ‘no parking’ zones during peak periods and off-street facilities. As activation of the corridor is generally low, and a reasonable amount of off-street parking supply is observed, this allocation of street-space is considered unlikely to cause issues, except perhaps between Fountain Street and Botany Road where off-street loading opportunities and on-street alternatives may be limited.

→ **Car parking**: Peak period directional ‘no parking’ is in operation along the east-west routes between intersections – eastbound in the AM peak and westbound in the PM peak. Otherwise, local places are generally provided with as much kerbside parking as feasible, after accounting for bus zones, mail zones, ‘no stopping’ areas (on approach to / exit from signalised intersections) and gaps at intersections with side streets.

4.3 Movement

The section following presents a summary of data-based trends in the local transport task, as well as an assessment of each movement customer group in terms of key functions fulfilled by each transport mode and the current performance of the network for each mode.

4.3.1 Travel trends - mode share

Travel trends have been analysed using Household Travel Survey data, which includes travel for any kind of purpose, and Journey to Work data, which only covers work (commute) trips.

Details of the data analysis are provided in Appendix F, with key points provided as follows:

- 80% of local workforce utilise sustainable transport modes to access work, with a substantial portion of work destinations located in the Harbour CBD and surrounds
- Car driver is the preferred mode for longer range trips, comprising the remainder of the local workforce trips whilst accounting for the highest number of weekday trips in the adjacent Eastern Suburbs (north and south) area and the second most in Sydney Inner City and Marrickville – Sydenham - Petersham (27%) areas
- All primary travel modes (walking, bus, train, private vehicle) grew substantially in the five years between the respective survey periods - which when combined with above indicates a need to ensure investment in adequate performance for each primary travel mode.

4.3.2 Walking

Context and functions

Walking is the second most popular way of accessing work for locals, and the most popular means for residents performing trips across the Sydney Inner City area. It is an important means of accessing local places such as Sydney Park, Alexandria Park, Centennial Park and the noted other local retail and commercial destinations. When considering that public transport trips also require a linked walking trip, getting around by foot is a key part of the transport task for locals.

Available pedestrian information and count data indicate that pedestrian activity levels at the key intersections vary from low to modest. Observed flows are lowest at the intersections with Elizabeth Street and South Dowling Street– all generally experiencing flows of approximately 150 pedestrians / hr or less during a typical weekday. Pedestrian flows are observed to be higher at the intersections with Botany Road and Fountain Street during the middle of the day – each with cumulative pedestrian flows reaching 250 pedestrians per hour during weekday peak periods.

Performance

A rapid appraisal of the local pedestrian network has been undertaken regarding footpath crowding and connectivity. Each are discussed as follows.

Footpath crowding has been qualitatively assessed based on a review of existing footpath widths between each intersection and available pedestrian information and count data. No footpath crowding issues were identified at a strategic level, however the following are noted:

- Footpaths along are narrowest (1.3m to 1.7m) at the far west of the project area (west of Loveridge Street) where pedestrian activation levels were observed to be lowest
- Footpaths through central sections of the project area (Loveridge Street to South Dowling Street) are generally 1.8m to 2m in width, widening to 3.3m to 3.7m. at active frontages, bus stops and where the full verge has been paved (i.e. building to kerb) as part of new buildings.

Connectivity has been evaluated through determining the number of opportunities to cross north-south at the key intersections - as an indicator of how permeable the east-west routes are to pedestrians - as well as a review of crossing facilities at intersections.

The review of cross-corridor permeability yielded that average spacing of crossings vary substantially, being approximately every 150m between Wyndham Street and Elizabeth Street but more spaced:

- Along Lachlan Street between South Dowling Street and Bourke Street (430 m), where the built form is currently highest
- Along McEvoy Street between Fountain Street and Wyndham Street (410 m), where street activation is also greatest
- To the west of Fountain Street where the demand for crossing is observed to be lower, with signalised crossings available at each Harley Street and Maddox Street.

The review of pedestrian facilities at intersections yielded that crossings are provided at all legs of signalised intersections that form part A2MP Stage 1.

A review of the relationship between pedestrian crossings and bus stops also yielded a reasonable spatial relationship between the two (i.e. no great distances between bus stops and pedestrian crossings).

4.3.3 Cycling

Context and functions

Whilst cycling represents a relatively low portion of the journey to work or local resident-based transport task, however the number of journey to work trips by bike increased by 27% in the five years to 2016, and the terrain in the area is generally quite flat and amenable to cycling (except some relatively modest grades on approach to Elizabeth Street).

Developing cycling infrastructure within 5km of centres and 10km of the Sydney CBD has been a focus of cycling investment and has seen the delivery of key cycling infrastructure and facilities in the area – shown in Figure 10.

The trunk routes for cyclists in the area are those with dedicated (not shared) or separated (off-road) facilities across the corridor at each Anzac Parade, Bourke Street and George Street. Separated facilities are also provided across the corridor at Bowden Street / Harley Street and at South Dowling Street.

Parallel east-west routes and facilities are available through the central and western segments of the corridor. The parallel facility approximately 300 m to the north extends via local streets and off-road paths from Sydney Park Road to Morehead Street providing cyclists with a separated and relatively direct alternative route (to Euston Road, McEvoy Street, Lachlan Street), though this route does not connect directly to South Dowling Street or Dacey Avenue. The facility 150 m-300 m to the south operates via mostly separated facilities and provides an alternate route across the entire Green Square area from Bowden Street to South Dowling Street. These two routes provide cyclists with safer alternatives to the corridor itself, with lower traffic volumes and better facilities, and are more suitable particularly for less confident users.

Available data regarding cyclists is provided in Appendix B and indicates the parallel route to the north at Buckland Street and routes along Bourke Road and South Dowling Street are well used carrying over 400 cyclists each per weekday in 2015-16. A review of Strava data further validates that the parallel route to the north is also well utilised by Strava (generally considered more confident) users, with Dacey Avenue providing connectivity to Centennial Park “loop” – a highly utilised facility by cyclists of all types.

Performance

Performance for cyclists in the project area is considered low considering the following features:

- Limited facilities provided for cyclists
- Traffic volumes ranging from 16,000 to 33,000 vehicles per day
- A posted speed of 50km/hr
- There are on average four traffic signals per kilometre between Maddox Street and South Dowling Street, requiring cyclists to stop regularly.

The east-west movements through the intersections is hence considered generally only suitable for cyclists confident in high speed, highly trafficked conditions, and for those which the movements serve a more direct travel path than the parallel alternative routes. Considering the parallel alternatives and their adjacency to the project, the need for investment into dedicated or separated cycling facilities within the corridor itself is considered relatively low, and investment should continue to focus on these parallel facilities as required and as aligned with relevant plans and policies.

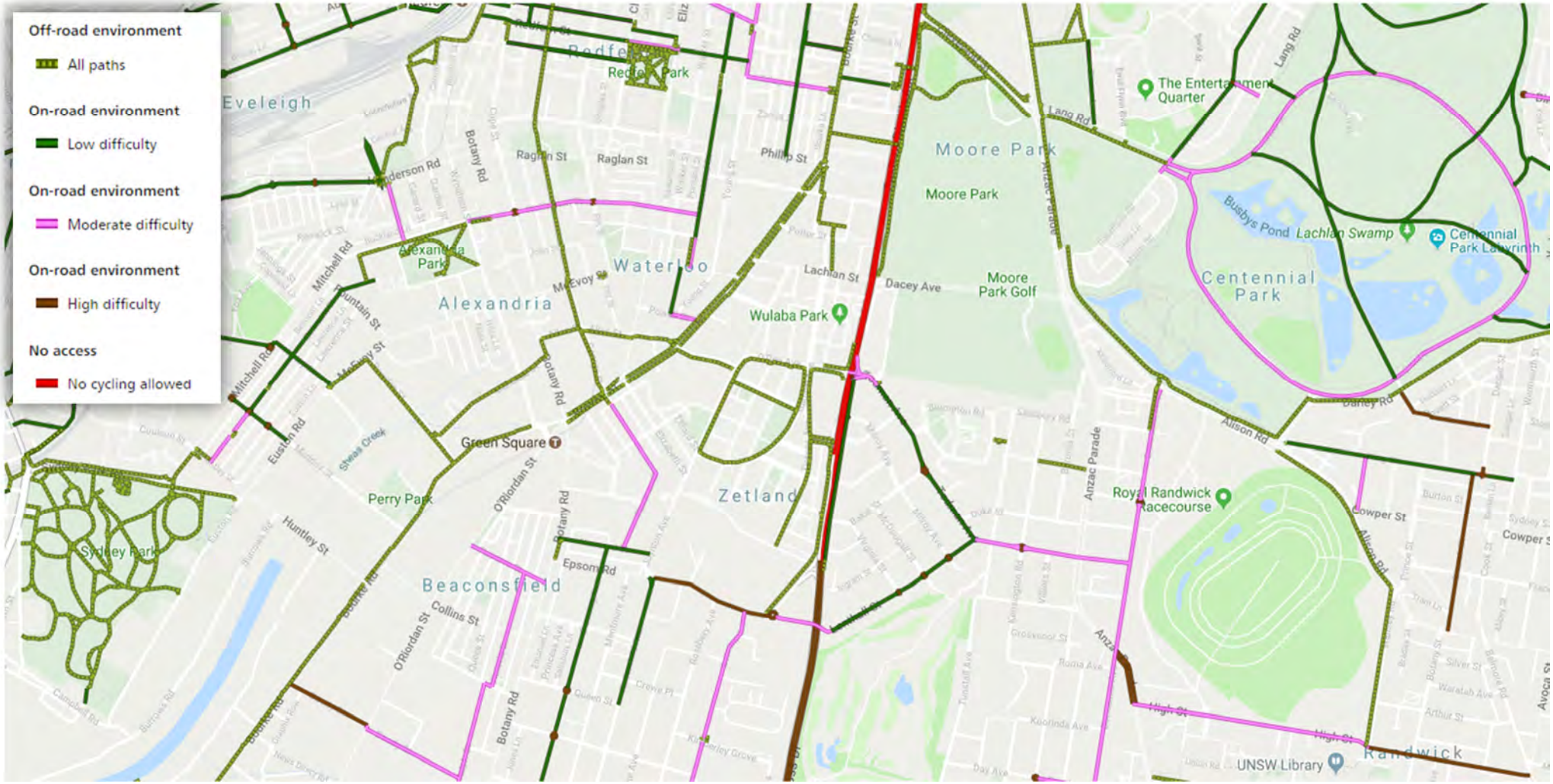


Figure 10 Existing cycle facilities (Source: Cycleway Finder, Roads and Maritime, 2019)

4.3.4 Bus

Context and functions

Bus performs a similar portion of the local (i.e. Sydney Inner City) resident-based transport task to Train, and is the second most popular means of locals accessing work. Local journey to work patronage also grew 16% in the five years to 2016.

The routes servicing the area are shown in Figure 11 and Figure 12. These services range from:

- **City-serving**: providing public transport access to the Sydney CBD for areas not served by rail
- **Centre-serving**: providing public transport access to nearby key centres including Randwick, Green Square, Marrickville and Bondi Junction
- **Local**: services that terminate at nearby local centres and rail stations such as Redfern Station.

The primary bus functions east-west between Maddox Street and South Dowling Street, within the broader bus network context, are to facilitate:

- High public transport passenger movement across the corridor at each Elizabeth Street (3 routes) and Botany Road (2 routes)
- Lower order cross-regional movement along the west of the corridor via the routes that approach Botany Road from the west:
  - 305 Mascot to Redfern
  - 370 Leichardt to Coogee
  - 355 Marrickville to Bondi Junction.

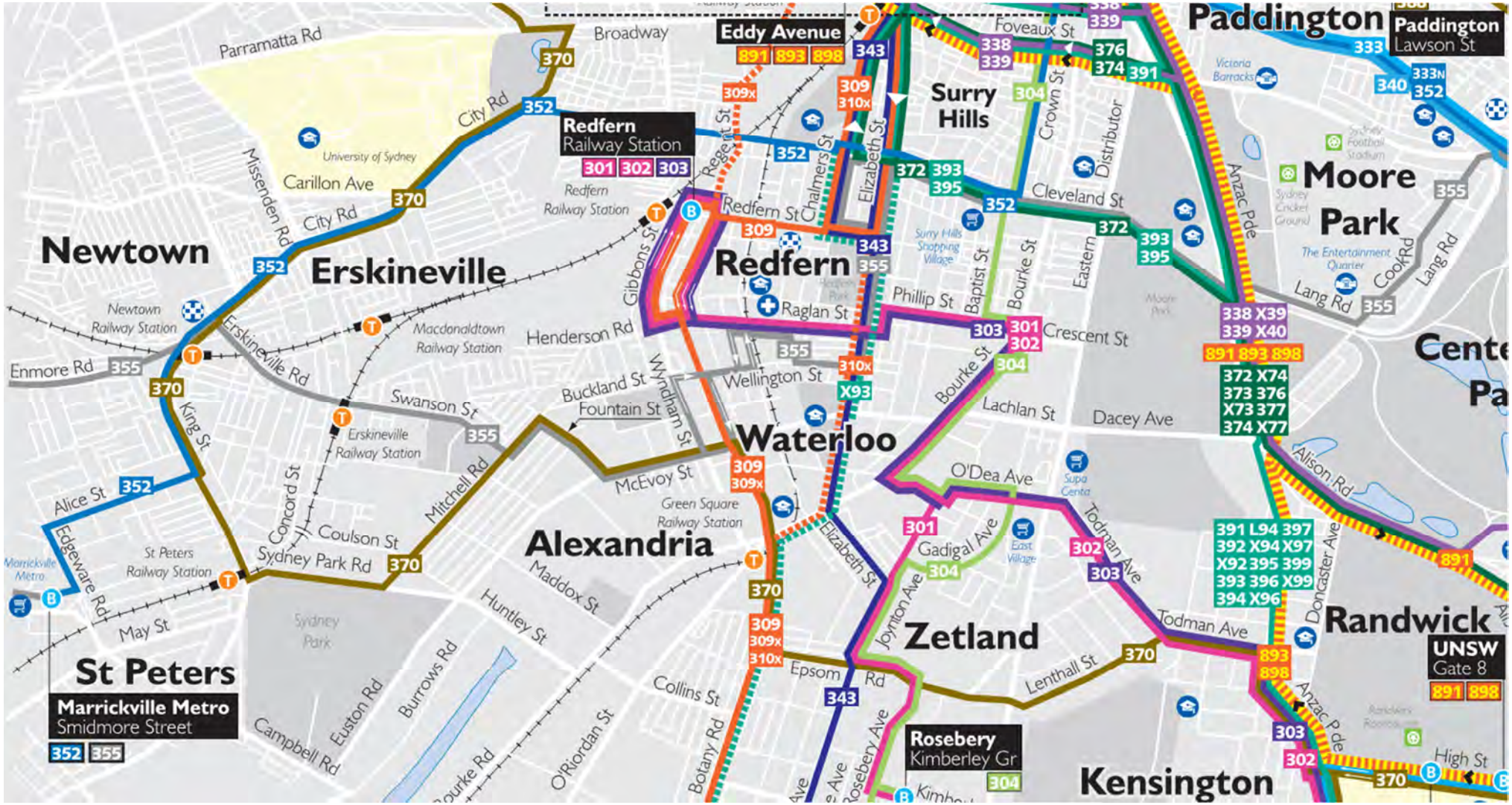


Figure 11 Regional bus map - eastern suburbs (Source: Transport for NSW, 2019)

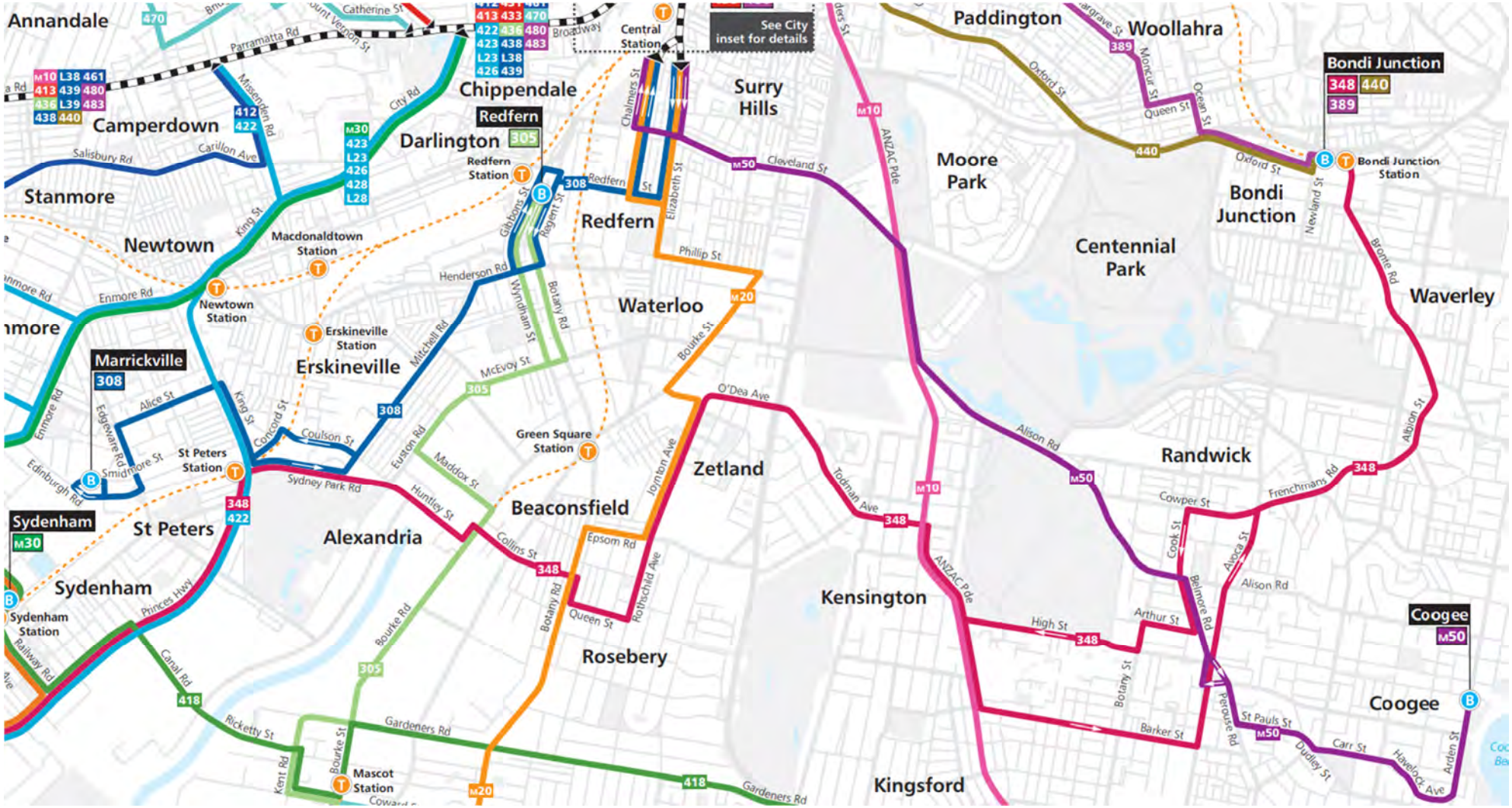


Figure 12 Regional bus map – inner west suburbs (Source: Transport for NSW, 2019)

Opal tap-on and tap-offs showing where local customers are served by bus in the area are shown in Figure 13 and Figure 14 for the AM and PM two-hour peak periods respectively – and were recorded on Tuesday 13th November 2018. Note the data set provided did not include in-transit passenger volumes (for determining passenger line loads). Key observations include:

- Activity at bus stops is higher on roads crossing north-south (Botany Road, and Elizabeth Street) than on the east-west itself
- The busiest bus stops in the morning peak are on McEvoy Street between Wyndham Street and Botany Street
- In the morning peak, bus stops along east-west movements demonstrate a higher proportion of tap-offs compared to tap-ons – reflective of the dominant employment land uses in the Southern Employment Lands, and school, towards the west of the project area
- This is reversed (more tap-ons than tap-offs), for interfacing north-south movements, indicating the primary function of services on interfacing corridors is connecting local residents with employment centres (e.g. Sydney CBD).

Performance

Average travel speeds of buses between bus stops and average lateness of bus services at bus stops (indicator of reliability), morning and afternoon peaks are shown in Figure 15 and Figure 16 respectively. Key observations include:

- West of Wyndham Street, average bus speeds are highest, at 15-30km/h
- AM peak northbound (peak direction) services at Elizabeth Street have an average speed of 15-20km/h – considered reasonable for local services but less so for city-serving services
- AM peak northbound services at Botany Road have an average speed of 11-12km/h, which represents poor performance and a need for improvement
- The average lateness of northbound AM peak services at bus stops along Elizabeth Street is >4.5 minutes, also representing an issue and need for improvement.

Figure 13 Opal tap-ons 7am to 9am (Source: Transport for NSW, 2019)

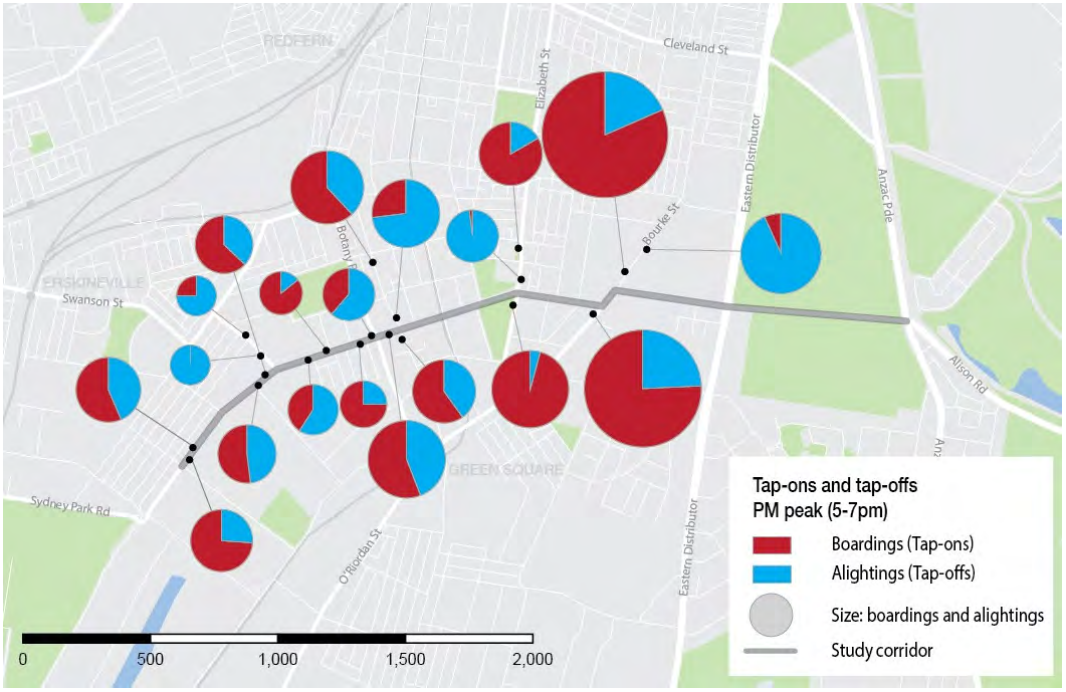


Figure 14 Opal tap-ons 5pm to 7pm (Source: Transport for NSW, 2019)

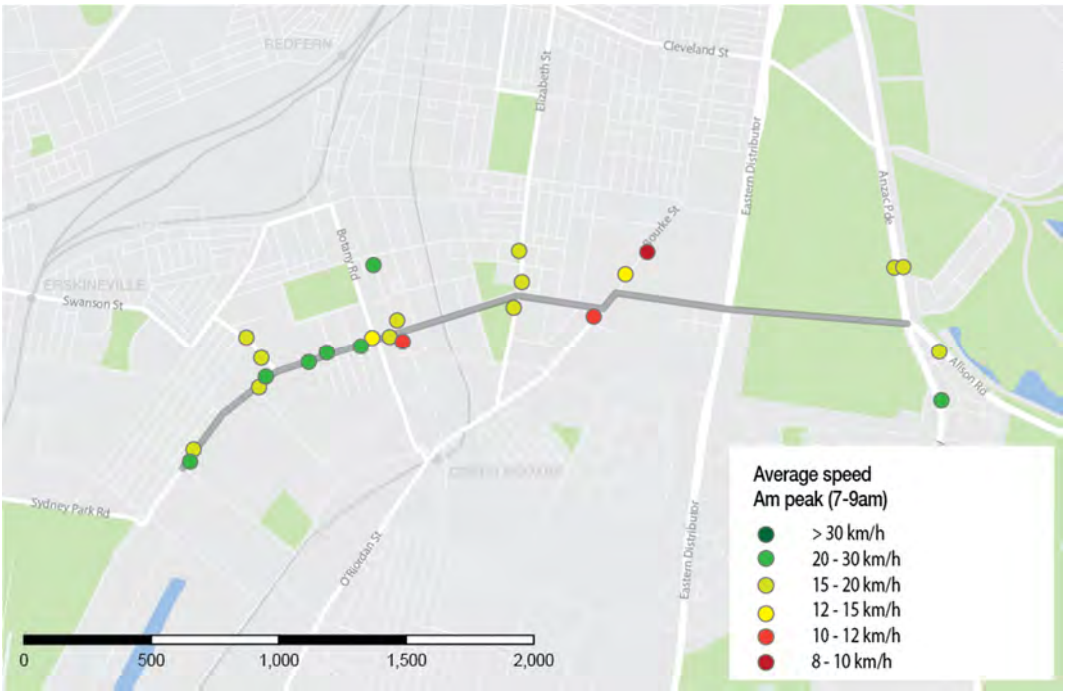


Figure 15 AM peak average bus speed between stops (Source: Transport for NSW, 2019)

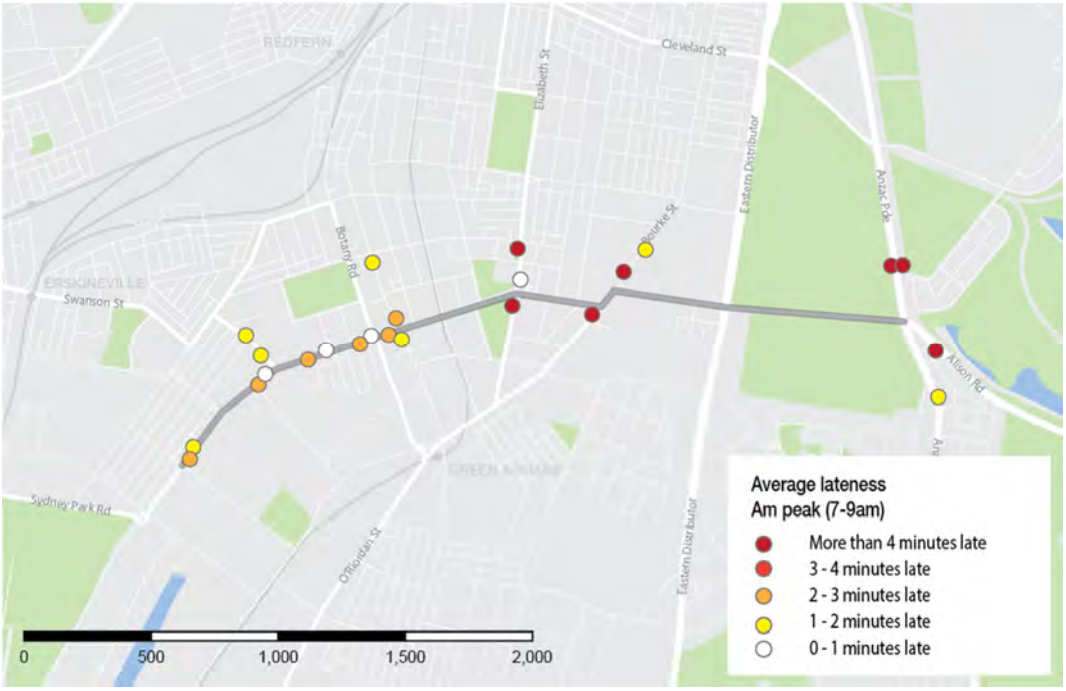


Figure 16 AM peak average lateness departing stop (Source: Transport for NSW, 2019)

4.3.5 General traffic

Context and functions

The route formed by Euston Road, McEvoy Street and Lachlan Street is also designated as a class 3U in the *Network and Corridor Planning Practice Notes* (Roads and Maritime, 2008), and as a Main Road within the *Schedule of Classified Roads and Unclassified Regional Roads* (Roads and Maritime, 2017). The latter is associated with a functional description of connecting other main roads, urban highways and motorways. In line with this description the corridor provides east-west connectivity between the corridors of Anzac Parade / Alison Road, South Dowling Street / M1 Eastern Distributor, Botany Road and Princes Highway – each of which are classified as main roads, urban highways or motorways.

The project is located on one of three east-west State roads across Sydney's inner south, the others are Cleveland Street (1-1.5km to the north) and Gardeners Road (2-2.5km to the south).

Table 8 presents traffic volumes, speeds and functional descriptions of each key segment between intersections, as well as for key interfacing roads. The functional descriptions have been determined through a review of select link analyses extracted from Roads and Maritime's STFM and are provided in Appendix C.

The select link analysis infers the east-west routes and it's interfacing routes serve a range of different functions within the transport network, depending on location. Broadly, it is considered that:

- The corridor facilitates cross-regional east-west connectivity between the Inner West, Inner South and Eastern Suburbs. At the east the corridor's key functions relate to connectivity between the large Eastern Suburbs catchment and the motorway network (M1 Eastern Distributor), whilst at the west the key function relates to last-mile connectivity for longer range trips between the Princes Highway catchment to the south and the corridor study area and surrounds
- The interfacing north-south corridors accommodate substantial movement accessing the Harbour CBD, Sydney Harbour crossings and Sydney Airport radially via each Botany Road, South Dowling Street, M1 Eastern Distributor and Anzac Parade.

Table 8 Road network traffic volumes, speeds, functional descriptions

Segment From	Segment To	Class	AWDT (vpd)	Speed limit (km/h)	Primary functional descriptions
Euston Road, McEvoy Street and Lachlan Street					
Maddox Street	Fountain Street	3U	25,900	60	• Last-mile connection between the substantial southern Princes Highway and the Inner South catchment (via Sydney Park Road, Campbell Street) • East-west cross-regional movement between each Inner West (Marrickville, Enmore), Inner South, and Eastern Suburbs
Fountain Street	Botany Road	3U	26,900	60	
Botany Road	Elizabeth Street	3U	18,400	60	• East-west cross-regional through movement between Inner West and Eastern Suburbs • Last-mile connection between the motorway network (M1 ED) and the Inner South
Elizabeth Street	South Dowling Street	3U	16,200	60	
Primary interfacing corridors					
South Dowling Street (north of Dacey Avenue)		4U	47,200	60	• Collector-distributor for the M1 ED, providing access between motorway network and the Eastern Suburbs and Inner South
M1 Eastern Distributor (at Cleveland Street)		6U	87,000	80	• Key link within Sydney's motorway network, distributing inter-city trips and inter-regional trips between the Lower North Shore, Eastern Suburbs, Western Suburbs and Inner Sydney
Botany Road (south of McEvoy Street)		4U	27,300	50	• North-south connectivity between the Airport precinct and northern surrounds (Mascot, Rosebery) to Inner West destinations (Glebe, Pyrmont) and routes (Victoria Road

Performance

Modelled performance of the road network at intersections is summarised in Table 10, and travel speeds for each the AM and PM peaks are summarised in Table 9 and illustrated in Figure 17 and Figure 18 respectively. As the model is validated against observed performance, the modelled performance closely reflects (and visualises) observations described above.

Travel time surveys undertaken in March and April 2017 and provided by Roads and Maritime indicate that the average vehicle speed ratio (VSR) – the ratio of actual speed to posted speed limit - for end-to-end trips were generally below 30% (18km/h) during the AM and PM peaks for customers travelling in both directions. This validates the modelled ratios presented in Table 9.

The data provided indicates the primary existing performance issues for general traffic are a result of key intersections operating at capacity including primarily at

South Dowling Street and Botany Road – each of which represent interfaces with other higher order movement corridors. Intersections at Fountain Street and Elizabeth Street are also observed to operate near capacity in select peak periods.

Table 9 2016 peak period vehicle speed ratio (VSR) performance

Segment		2016 AM Peak VSR		2016 PM Peak VSR	
Western extent	Eastern extent	Eastbound	Westbound	Eastbound	Westbound
Maddox Street	Fountain Street	43%	29%	14%	37%
Fountain Street	Botany Road	14%	28%	11%	28%
Botany Road	Elizabeth Street	36%	18%	7%	7%
Elizabeth Street	South Dowling Street	7%	63%	5%	61%

Table 10 2016 peak period intersection performance

Intersecting Road	2016 AM Peak Delay (s) | LOS	2016 PM Peak Delay (s) | LOS
Maddox Street	16 | B	28 | B
Fountain Street	22 | B	52 | D
Wyndham Street	52 | D	42 | D
Botany Road	56 | E	94 | F
Elizabeth Street	33 | C	73 | F
South Dowling Street	88 | F	77 | F

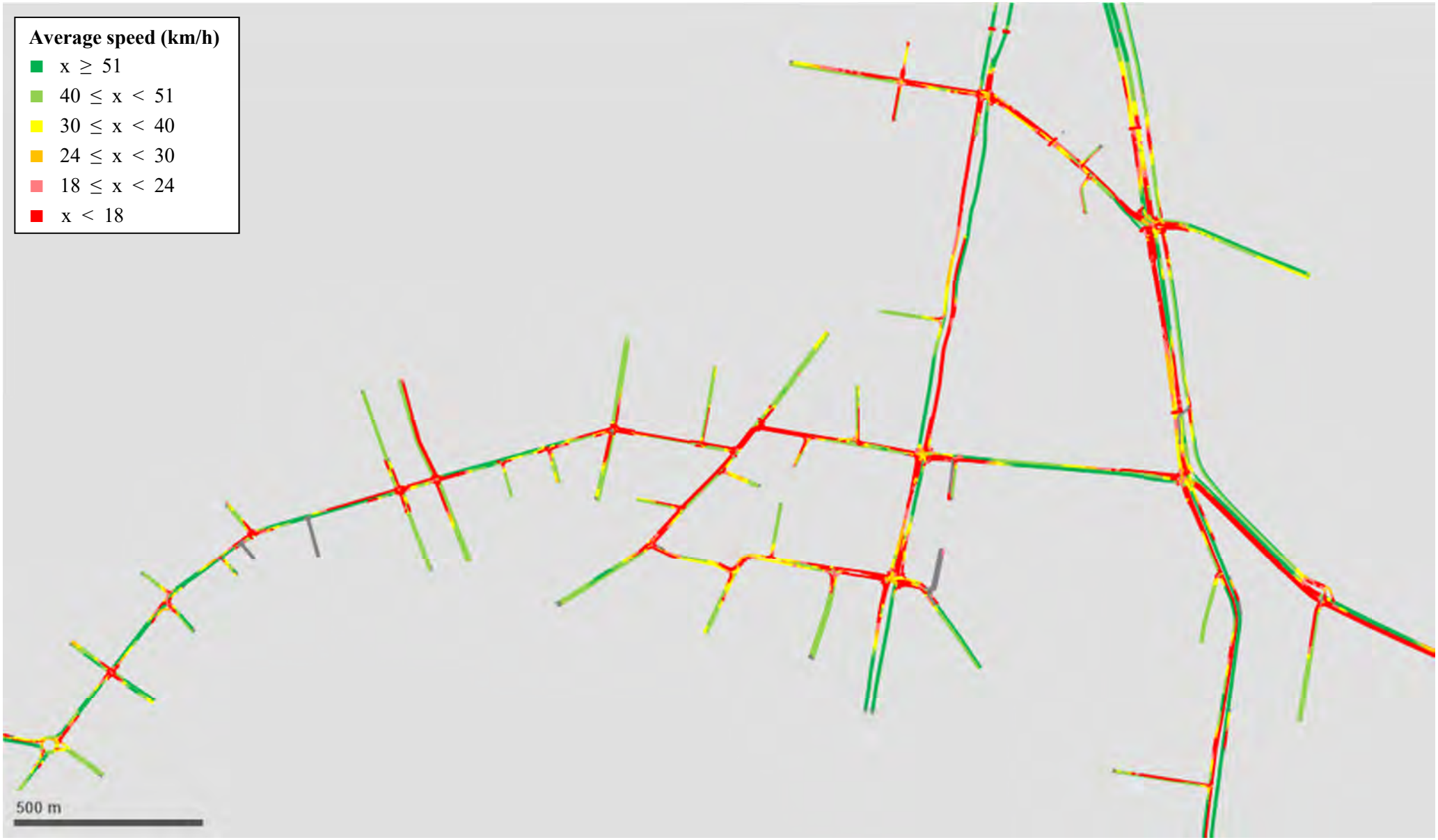

Average speed (km/h)
x ≥ 51
40 ≤ x < 51
30 ≤ x < 40
24 ≤ x < 30
18 ≤ x < 24
x < 18
500 m

Figure 17 2016 AM peak hour road network performance

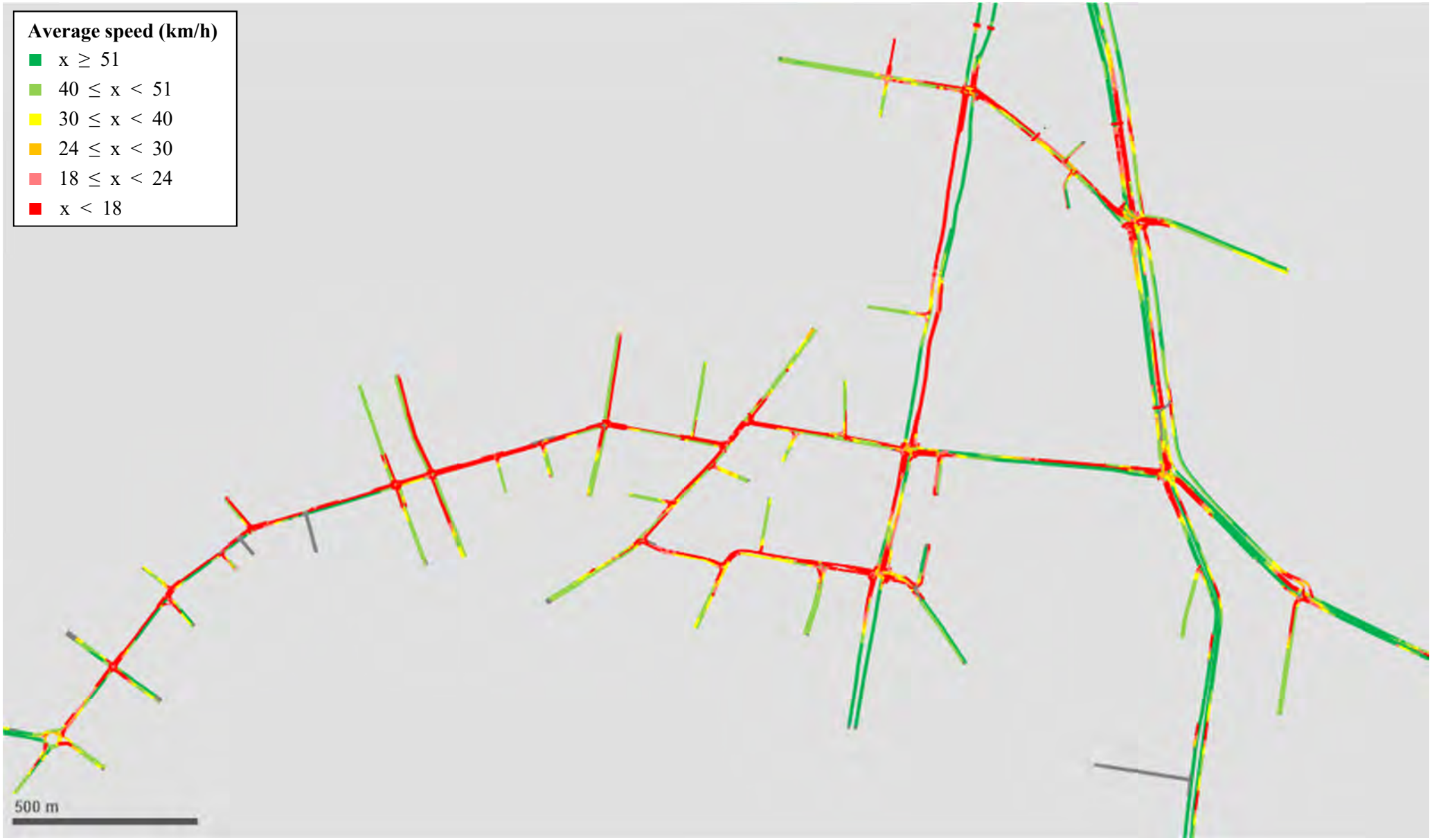


Figure 18 2016 PM peak hour road network performance

4.3.6 Freight

Context and functions

The east-west movements of the intersections are designated as a secondary freight route within Roads and Maritime's Sydney Road Freight Hierarchy[1], forming part of a route which extends via Sydney Park Road to the Princes Highway. The north-south movements at Botany Road and South Dowling Street are tertiary routes – the later also provide connectivity to the M1 Eastern Distributor (secondary route).

Dacey Avenue at the east of the key intersection with South Dowling Street is the only portion of the project that is permitted for use by 25/26m B-Doubles, and both general and higher mass limit (GML and HML) vehicles, as are a majority of the intersecting freight routes. The remainder is only permitted for use by HML short-combination (up to 19m) vehicles.

It is considered the local generators of freight traffic include:

- **Southern Employment Lands** - the predominantly industrial zoned area to the south of the project, west of Botany Road
- **Construction vehicles** – associated with construction of substantial urban development and transport infrastructure in the area (e.g. CSELR, WestConnex)
- **Local businesses** – driving light commercial vehicle movement.

Heavy vehicle traffic data collected in February 2017 is summarised in Table 11, and weekday daily profiles for each vehicle class are presented in Appendix D. The data suggests:

- East-west freight traffic volumes are generally modest and predominantly of the light commercial type (71%), though are highest both in total and as a proportional mix of general traffic at far west along Euston Road and far east along Dacey Avenue
- Heavy vehicle traffic along central segments (Botany Road to South Dowling Street) generally experience less than half the heavy vehicle flows of the above
- Analysis indicates a reasonably flat profile over a typical weekday, with all vehicle classes at all segments generally peaking between 10am and 12pm.

[1] Metropolitan Road Freight Hierarchy on the State Road Network Practice Note (Roads and Maritime, 2008)

Table 11 Heavy vehicle traffic counts (Source: Austraffic, February 2017)

Segment		Light Rigids (Class 3)		Medium & Heavy Rigids (Classes 4,5)		Articulated (Classes 6 to 13)		Total
From	To	vpd	% HVs	vpd	% HVs	vpd	% HVs	**vpd**
Maddox Street	Fountain Street	1,560	68%	600	26%	150	6%	**2,300**
Fountain Street	Botany Road	1,380	70%	480	25%	100	5%	**1,960**
Botany Road	Elizabeth Street	780	74%	230	22%	50	4%	**1,060**
Elizabeth Street	South Dowling Street	610	71%	180	21%	70	9%	**860**
South Dowling Street	Anzac Parade	1,480	74%	380	19%	130	7%	**2,000**

Performance

As freight vehicles share the same road space as cars without priority, the road network operational performance is the same for freight as it is for general traffic (see Section 4.3.5). Key noted operational issue locations in the freight network are at the intersections with South Dowling Street and Botany Road.

Access for freight vehicles moving between the McEvoy Street and Botany Road corridors is constrained due to the right turn bans at each the south and east approach. The other turn bans enforced at intersections of the freight network are those between Anzac Parade to the south and Alison Road.

4.4 Summary

4.4.1 Road safety

A review of the crash history for the project area yielded that road safety is a substantial issue, with crash rates multitudes higher than the Sydney-wide average for a class 3U road.

4.4.2 Significance of place on existing corridor

The McEvoy Street and Lachlan Street lies within several kilometres of each the Sydney CBD, strategic centres and local centres, each of which represent significant destinations within the broader urban setting - and set the bar for high place significance and value. However, each are not considered to result in substantial place functions directly adjacent the project, rather they drive substantial movement of people and goods along and across the key intersections.

Overall the abutting land uses are considered to generate relatively low place functions along the corridor, except for noted active frontages between Botany Road and Fountain Street. Natural landscape features also provide urban amenity particularly along Dacey Avenue and sections of McEvoy Street.

A strategic level review of transport facilities and management indicates that one of the key impacts to place is that generated by the speed of the traffic environment and vehicle volumes.

4.4.3 Significance of Movement on existing corridor

Broadly, it is considered that the key existing customer groups for movement:

- **North-south movements** - are a combination of sustainable transport modes (bus, pedestrians, cyclists) accessing the Sydney CBD and surrounds and substantial private vehicle and freight movement at the M1 Eastern Distributor, South Dowling Street and Botany Road.
- **East-west movements** - is predominantly the private vehicle, serving movement between the adjacent LGA's that do not have competitive public transport alternatives, as well as providing connectivity between interfacing local and higher order routes and the motorway network.
    - Freight, buses, pedestrians and cyclists are key customers at select locations.

The intersections accommodate each of the above key functions at the key intersections that comprise it. Intersections experiencing the highest movement functions, when considering all modes, are those at South Dowling Street and Botany Road. These intersections also represent the locations with the most substantial performance issues, resulting in poor travel times and reliability particularly for each buses, freight and private vehicles.

5 Future conditions without project

The transport and urban future of the study area will be shaped by policies and plans developed at all government levels and summarised in Section 2. These directions will control infrastructure investment and development both spatially and temporally. The outcomes will shape regional growth and travel patterns by route and mode. This chapter describes the planned transformation of the study area, and the associated anticipated impacts on Movement and Place along A2MP Stage 1.

5.1 Road safety

A review of the crash history for the project yielded that road safety is a substantial issue, with crash rates multitudes higher than the Sydney-wide average for a class 3U road. A substantial portion of these crashes are considered typical of a corridor with: high vehicular movement and congestion; signalised intersections with filter turn movements; and signalised intersections with shared (though and left/right turn) lanes with the primary crash types being rear-end (26%), right-through (15%), cross-traffic (11%) and lane change left/right (6%). With substantial increases in forecast traffic demand and congestion (see Section 5.3.4), particularly at key existing network performance and safety hotspots, it is anticipated these crash trends and types will continue to be an issue in the project area.

5.2 Place

5.2.1 Urban renewal

The future density and distribution of population and employment is a major influence on the future transport task and affects the need for local places. The area is the subject of substantial urban renewal activity with varying status – recently constructed (e.g. Green Square – Zetland, Lachlan North), under construction (e.g. Green Square Town Centre), or subject to current or future planning processes. Local strategic growth areas include the Green Square Urban Renewal Area (30,500 dwellings and 6,000 jobs in the Town Centre), Waterloo Metro Quarter and Waterloo Estate (up to 700 and 6,800 dwellings respectively, pending finalisation of masterplan approvals), Redfern to Eveleigh (1,000 to 1,400 dwellings) and Ashmore Precinct (3,500 dwellings). A redeveloped Alexandria Park Community School immediately north of the project will also increase student capacity from 400 to 2,200 students.

These precincts accumulatively represent a planned increase of over 42,000 dwellings in the area along with increases in supporting jobs, retail and education facilities, all within 1 - 1.5 kilometres of the project. The associated plans for each precinct indicate that most of this supply will be delivered within the next 15-20 years, inferring the area will accommodate in the order of an additional 75,000 to 80,000 residents (assuming 1.8 to 1.9 residents per dwelling) by the end of this timeframe. Of these, it is the Waterloo and Green Square precincts that

immediately interact with the key intersections and will most directly influence future Place functions along it.

Green Square

For the Green Square area, the planning documentation reviewed indicates that McEvoy Street and Lachlan Street is being treated as a "major road" in the urban planning and design of the area, with activation focussed toward existing or planned local streets and community / open areas offset from the corridor (rather than projecting place on to the corridor). This approach is demonstrated in the Lachlan Public Domain Strategy (City of Sydney, 2014) for the under-construction Lachlan Precinct which is focussing its ground floor active retail uses and lowest building form around Archibald Avenue in the centre of the precinct 200 m south, with the highest built form containing exclusively non-residential uses placed along the project area itself – serving as a form of buffer between the project and the sensitive receivers experiencing Place within the precinct.

Waterloo

For Waterloo, the focus of place will be the large "village Green" and "Waterloo common" areas proposed in the precinct's centre (as identified in the preferred master plan), as well as surrounding the Waterloo Station itself. Notably for the McEvoy Street and Lachlan Street, one of several "retail and services at street level" frontages are proposed to face the north of McEvoy Street between Botany Road and Pitt Street.

Other Plans

Other references to planned changes to place along the project are as follows:

- "Place (associated with Centre)" is identified in the *Greater Sydney Services and Infrastructure Plan*, on both sides of the corridor, between Botany Road and Harley Street
- In alignment with the above, "Active Edges" are identified in City of Sydney's DCP along the southern side of the corridor from Botany Road to Bowden Street. These are "*proposed for the developments fronting McEvoy Street … to reinforce the existing activity in this location*" (Southern Employment Lands Urban Design Study, City of Sydney, 2014).

These references infer an intent by NSW and Local Government to reinforce activation and place along the corridor to the west of Botany Road.

5.2.2 Population and employment forecasts

A review of current employment and population forecasts was undertaken to ascertain the degree of alignment between proposed growth (above) and that underpinning current transport and land use planning – the TZP16 forecasts sourced from Transport for NSW's Open Data Hub. Population and employment forecasts within local travel zones are presented in Table 12, with travel zones selected for the purposes of the analysis shown in

Figure 19. Figure 20 and Figure 21 illustrate the spatial distribution of forecast change.

The forecasts represent substantial growth of approximately 18,000 (48%) residents immediately adjacent the project over the next 20 years. The most substantial change is forecast in the Waterloo precinct and in the north of the Southern Employment Lands, followed by the Redfern to Eveleigh area. The most populated area by 2036 will be the eastern parts of Green Square and its town centre. Largest employment growth is forecasted to take place in the Green Square Town Centre area, as planned.

Table 12 Forecast population and employment 2016 – 2036 (Source: NSW TZP16)

Year	Estimated population	2016 2036 Total Growth	2016 2036 P.A. Growth	Estimated employment	2016 2036 Total Growth	2016 2036 P.A. Growth
2016	20,100	-	-	13,100	-	
2036	38,200	48%	3.3%	15,300	14%	0.8%

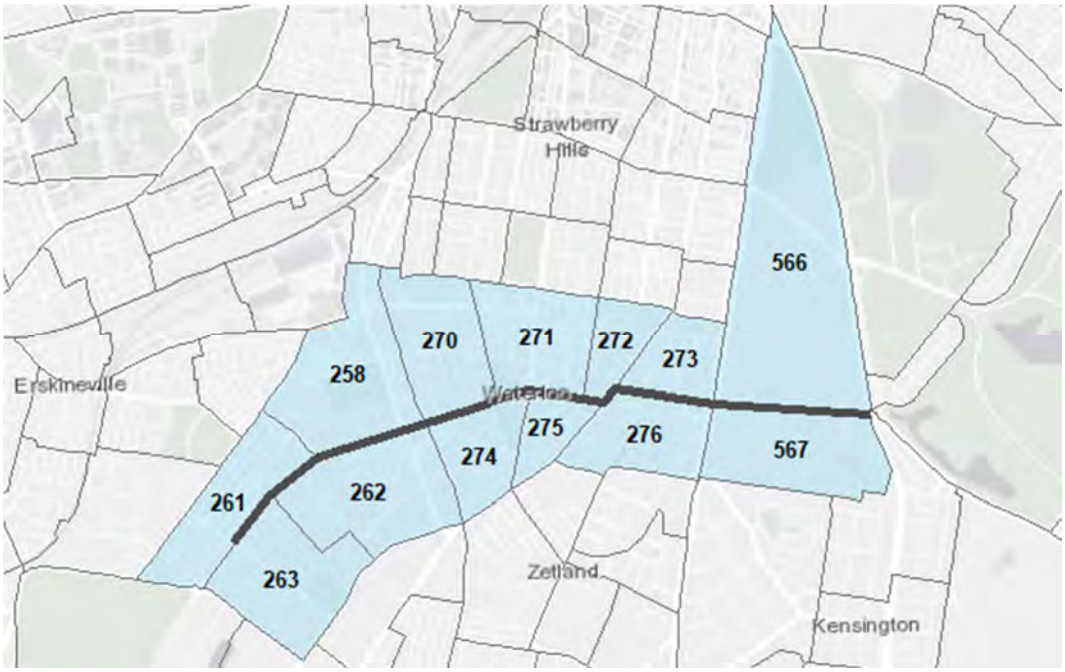


Figure 19 Selected travel zones for population and employment analysis

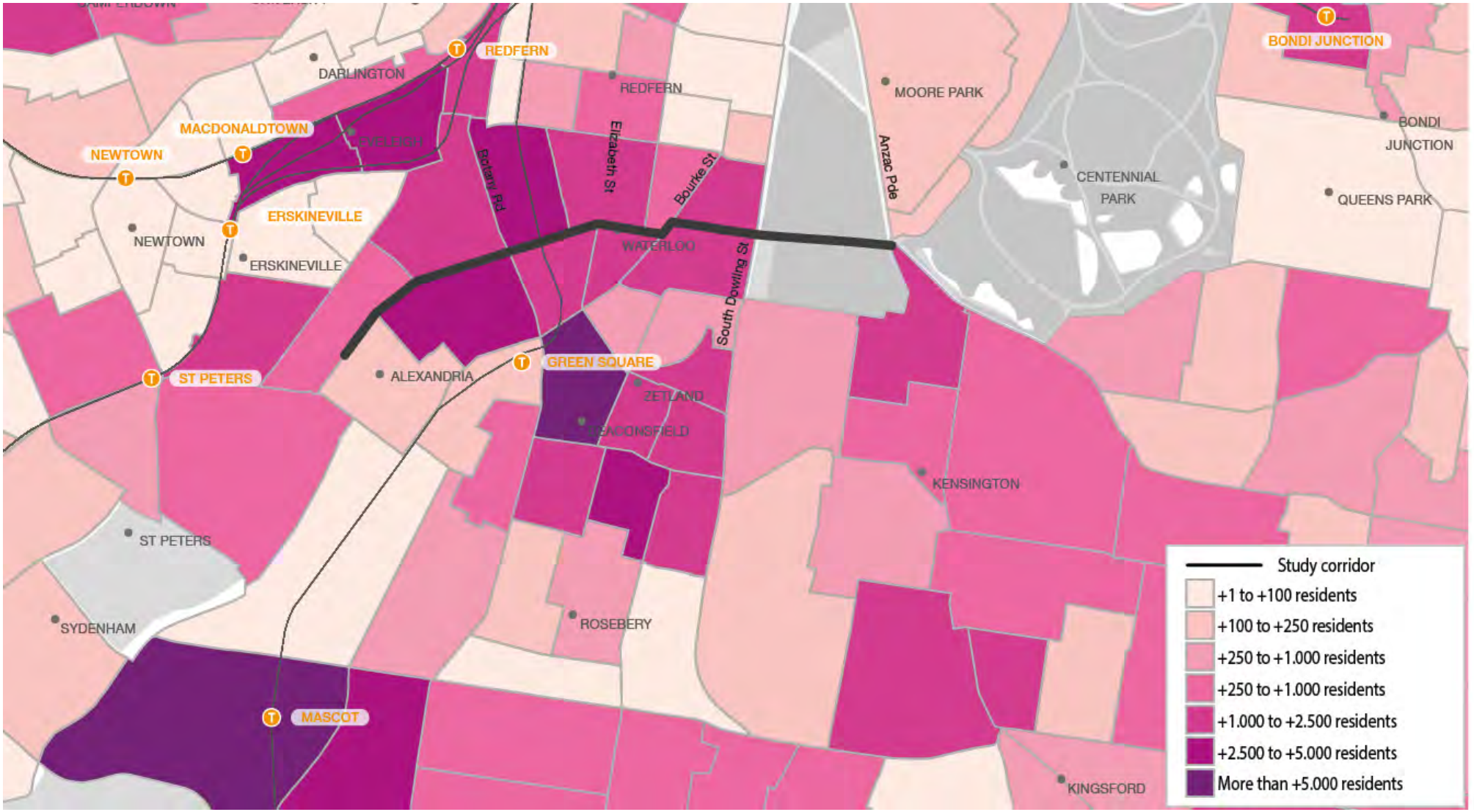


Figure 20 Population change between 2016 and 2036 (Source: NSW TZP16)

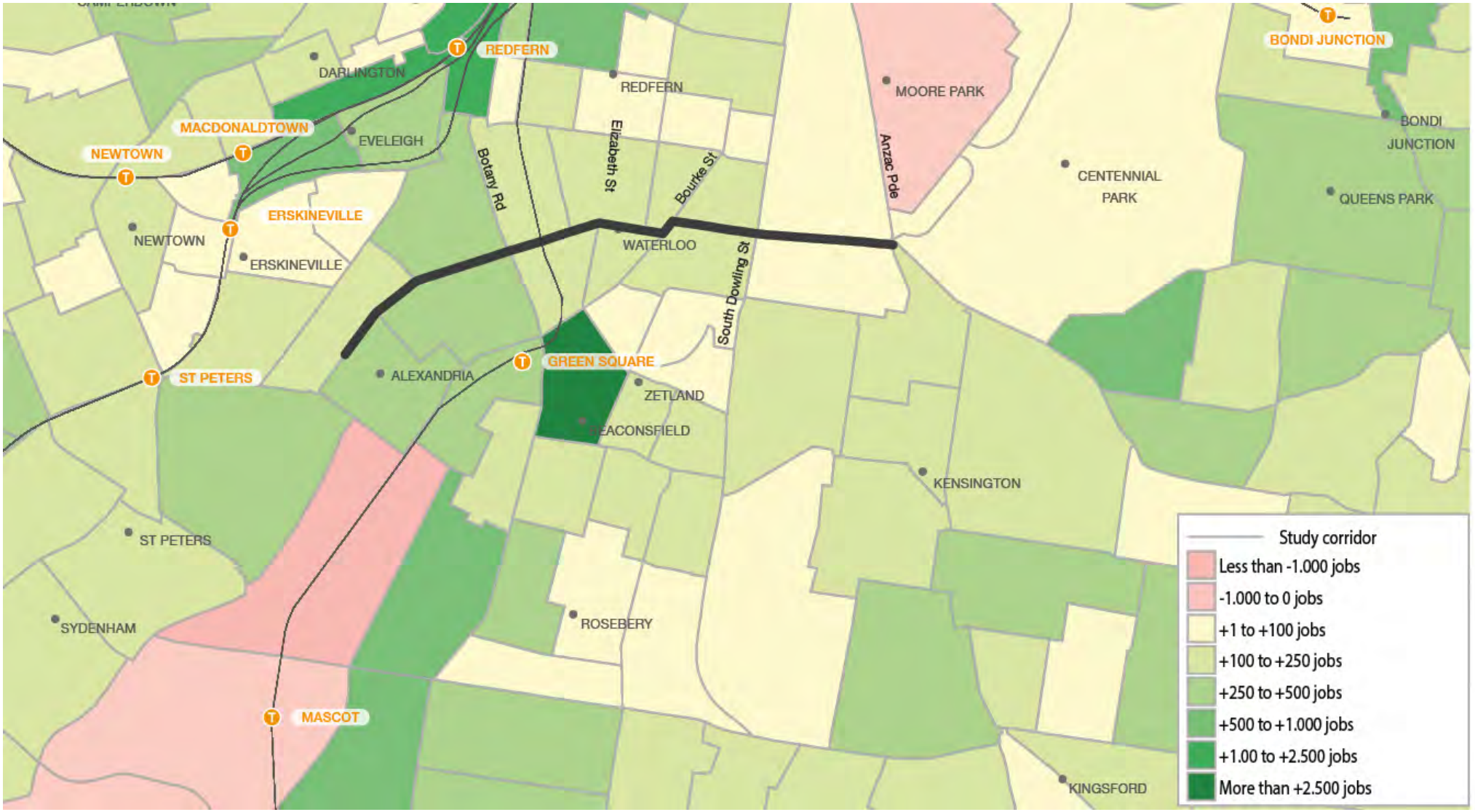


Figure 21 Employment change between 2016 and 2036 (Source: NSW TZP16)

5.2.3 Future significance of Place

Upon review of the information available, it is considered the project lies within an area significant for its planned role in facilitating future population growth in an area that allows the associated transport task to be done efficiently compared to other urban areas of Sydney – through its strategic location relative to existing and planned public transport and active transport links and proximity to a high number of jobs. This growth places an emphasis on the value (and cost) of land in the area, as well as on movement of locals by sustainable transport modes, whilst substantially increasing the need for new places to support a substantially growing community.

Centres form the focus of place-based planning, and the project is in proximity to some key centres to the north (Harbour CBD), east (Randwick), south (Green Square) and west (Newtown, Marrickville Metro). It is considered that the growth of these centres, given the intersections relationship with each, will further grow the movement task along and across the McEvoy Street and Lachlan Street for all transport modes.

Planning of immediately adjacent precincts as part of either Green Square or Waterloo currently focuses on creating places in areas offset from the project, rather than along it. The key exception are the segments of the project area at the west between Pitt Street and Harley Street that are planned to have a role in facilitating place with active frontages. Based on the information available, it is envisaged these are a reinforcement of existing local active frontages, rather than a functional change in scale or type of place.

5.3 Movement

5.3.1 Walking

With the substantial forecast increased number of local residents in the area, and the introduction of a new rail station at Waterloo, pedestrian movement is likely to increase drastically and ensuring the area is walkable and permeable to cross-corridor movement by foot is critical. The *Walking Strategy and Action Plan* (City of Sydney, 2015) is considered the key planning document for walking in the area, focussing future investment, and generally places a focus on north-south walking routes rather than east-west.

Corridors identified as part of Council's primary walking network include connections across the project at Fountain Street, Botany Road and Elizabeth Street. Botany Road is also referenced as the "north south spine" for pedestrians. Facilities along these routes, as they interface with the east-west movements, are generally already of reasonable width and occupy the full available space between the kerb and built form or property boundary, except for links at the west of the project including at Fountain Street and Bowden Street which have more typical footpath widths (1.5m to 2m).

A missing link in this network is connectivity across Lachlan Street at Gadigal Avenue, however Council propose to install a new signalised intersection at this

location in 2020 and will be designed to facilitate its role within the primary walking network by including pedestrian crossings on all legs. The built form along Gadigal Avenue to the north and south has been designed to spatially allow for its role within the pedestrian network as well as for cyclists (local route), public transport (city-serving bus or light rail) and private vehicles (local access). The proposal would improve walking permeability of Lachlan Street, splitting the current 430m between crossings at Bourke Street and South Dowling Street.

Whilst a solution is already proposed to improve Lachlan Street permeability in the form of new traffic signals at Gadigal Avenue, the 410m between crossings at Fountain Street and Wyndham Street may present an issue considering planned future activation of McEvoy Street and Lachlan Street, substantial growth in local residents in abutting Green Square urban renewal precincts, and increased student numbers accessing the redeveloped Alexandra Park Community School.

More broadly there is a strong planning focus on ensuring a high walkability of our roads and streets. Through this lens, and in trying to minimise delays to pedestrians, the cycle times of traffic signals should be reviewed particularly as urban renewal takes place and the number of pedestrians moving through and across the intersections increases.

5.3.2 Cycling

The *Cycling Strategy and Action Plan* (City of Sydney, 2018) is considered the key planning document for cycling in the area, and generally proposes to continue investment in and reinforce the identified established routes – completing missing links or improving facilitates. Key relevant differentiators from the existing network include Euston Road, Fountain Street, Gadigal Avenue, Dacey Avenue and Lachlan Street are identified as part of the local bike network.

Whilst cycling connections will be provided as part of the new signalised intersection at Lachlan Street / Gadigal Avenue, infrastructure-specific solutions for the remainder of these local connections are not yet specified, and until delivered these connections would be performed on-road or on existing facilities.

5.3.3 Bus and Light Rail

Whilst the *Greater Sydney Infrastructure and Services Plan* (Transport for NSW, 2018) lays out a 2056 vision for public transport in the area, the following short and medium term changes for bus were identified through engagement with Transport for NSW bus planning stakeholders in February 2019. The changes are listed in approximate chronological order. Overall it was clear that key existing bus functions in the area are not planned to change substantially and will rather likely be reinforced with increased urban renewal in the area.

- CBD and South East Light Rail (2020)
    - The bus network will be redesigned to integrate with the under-construction CBD and South East Light Rail (CSELR) when complete – programmed for early 2020

  - Whilst CSELR will replace a substantial amount of the service and passenger-carrying functions of existing bus services particularly along Anzac Parade and Alison Road, a substantial bus function is anticipated to remain
  - Details of proposed bus service and fleet changes are yet to be finalised and could not be provided for the purposes of this assessment.

- Waterloo Station (2024)
  - The bus network and fleet may be rationalised when Waterloo Station becomes operational, though no substantial changes are likely.
  - The opportunity may also be taken to 'straighten' certain services in the area that are currently quite convoluted or indirect (e.g. 355 Marrickville to Bondi Junction.

- Urban renewal of Green Square, Waterloo and Central to Eveleigh
  - No changes are currently proposed in response to substantial planned urban renewal in the area, rather increases in services would be investigated in response to increased patronage and bus loadings, noting that kerbside capacity constraints in the Sydney CBD may inhibit the opportunity to do so for city-serving routes.

- Future Transport vision for the Harbour City (2056)
  - Reinforces existing key north-south bus functions in the area, particularly along Botany Road and Anzac Parade as well as identifying a new city-serving route across the corridor at Gadigal Avenue - referred to by Council as the 'Eastern Transit Corridor' (ETC)
    - The ETC will be subject to more detailed investigation only once necessary infrastructure is delivered to enable services to operate.
  - A city-serving corridor via Randwick – Green Square / Mascot – St Peters / Erskineville is also identified, though alignments or corridors to service these centres are subject to further investigation.

More specific to the project, it has been highlighted that McEvoy Street and Lachlan Street fulfils an east-west desire line between the inner west centres of Newtown and Erskineville and the eastern suburb centres of Randwick and Coogee. Transport for NSW has expressed the desire to explore the opportunity for higher order public transport functions along, should travel time and reliability issues improve.

Performance

A total of over 560 bus services are operating in the network during each the AM and PM peak two-hour periods. Forecast average speed of buses in the modelled network are provided in Table 13, which indicate that average speeds will drop by 15-20% in peak periods by 2021. Desirably this is a lower relative decrease in performance to that for general traffic (see Section 5.3.4), as a substantial portion of the bus transport task is undertaken along the Anzac Parade and Alison Road corridors, and the northbound bus priority lane along Anzac Parade is proposed to be retained as part of CSELR works which mitigates some of the effects of poor general traffic performance on buses. Notwithstanding, poor performance is noted

at other key city-serving bus corridors such as Botany Road, Bourke Street, Elizabeth Street and for services operating along the corridor at the west.

Table 13 Forecast average speed of buses without project

Network wide statistic	2016		2021 without project	
	AM peak	PM peak	AM peak	PM peak
Average bus speed (km/h)	14.4	16.5	12.2 (-15%)	13.1 (-21%)

5.3.4 General traffic

Although city shaping projects such as Sydney Metro: Chatswood to Sydenham and CBD and South East Light Rail will deliver substantial public transport improvements in the short term, the intersection function for general traffic in the future is forecast to be most affected by the proposed substantial motorway program of works in inner Sydney. The step change brought about by planned changes in the motorway network is briefly described following and illustrated in Figure 22, Figure 23 and Figure 24[2]. The planned motorway projects in the area include:

- New M5 Motorway (2020)
- M4-M5 Link (2023)
- Sydney Gateway (2023)
- M6 Stage 1 (2024).
- Western Harbour Tunnel and Beaches Link

Select link analysis of the project in 2021, with the New M5 Motorway included, is provided in Appendix C, illustrating the future function of the project.

Increasing pressure on western sections of the project

Traffic at the western end of the project is forecast to increase substantially with the opening of the New M5 Motorway, including the St Peters Interchange, in 2020. The New M5 Motorway is forecast to increase typical weekday traffic along Euston Road (between Maddox Street and Harley Street) by in the order of 70%, with the M4-M5 Link project forecast to add in the order of a further 10%. This impact diminishes eastwards with demand dispersing to Mitchell Road (via Fountain Street) and Botany Road. This will place additional pressure at the intersections with Fountain Street and Botany Road.

The strategic modelling indicates that the New M5 Motorway and M4-M5 Link projects will increase the last-mile connectivity function of the western end of the project (by serving connection between the motorway network and local destinations and routes), but not the end-to-end movement function. Select link analysis of Dacey Avenue shows negligible traffic volumes forecast to traverse

[2] Note the figures shown compare road network scenarios with verse without named motorway projects in the same future year, though do not demonstrate impacts of background growth in traffic from changes in population and employment.

the length of the corridor to access St Peters Interchange - an intuitive finding given the alternate access to the motorway network via South Dowling Street and the Eastern Distributor.

The proposed Alexandria Local Area Traffic Management Plan seeks to help preserve the nearby streets to the north for localised access functions, though will further reinforce pressure on the key intersections.

Relief for north-south corridors because of a new motorway network

Converse to the western section, interfacing north-south corridors east of Botany Road are forecast to experience a relief in traffic levels. This is a result of the New M4-M5 Link, Sydney Gateway, M6 Stage 1 and Western Harbour Tunnel each having a forecast influence on north-south route choices for traffic through inner Sydney - away from the existing M1 Eastern Distributor and nearby parallel urban roads and streets, and on to new motorway links.

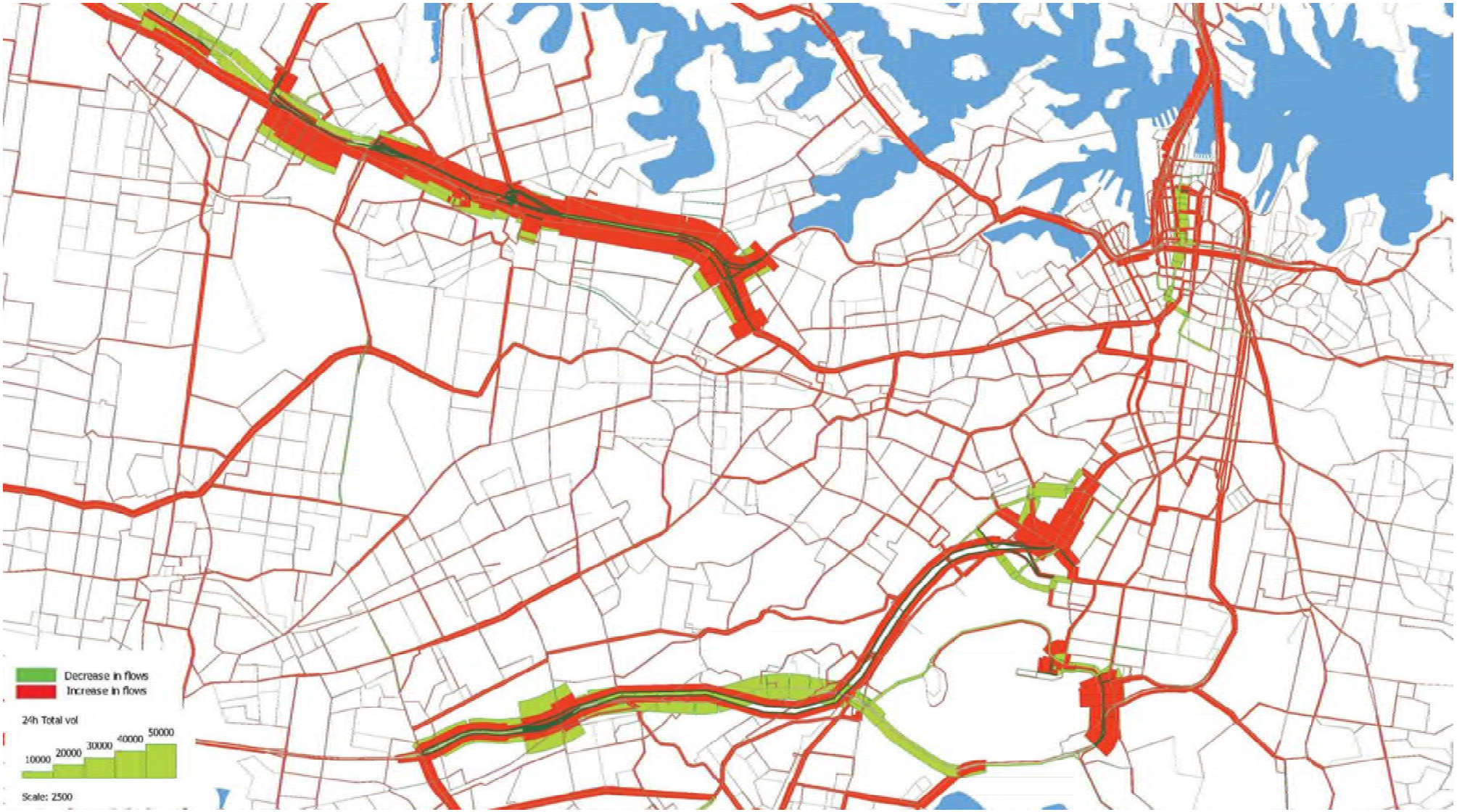


Figure 22 2023 average weekday traffic flows, with verse without WestConnex Stages 1 and 2 (M4-M5 Link EIS, Roads and Maritime, 2017)

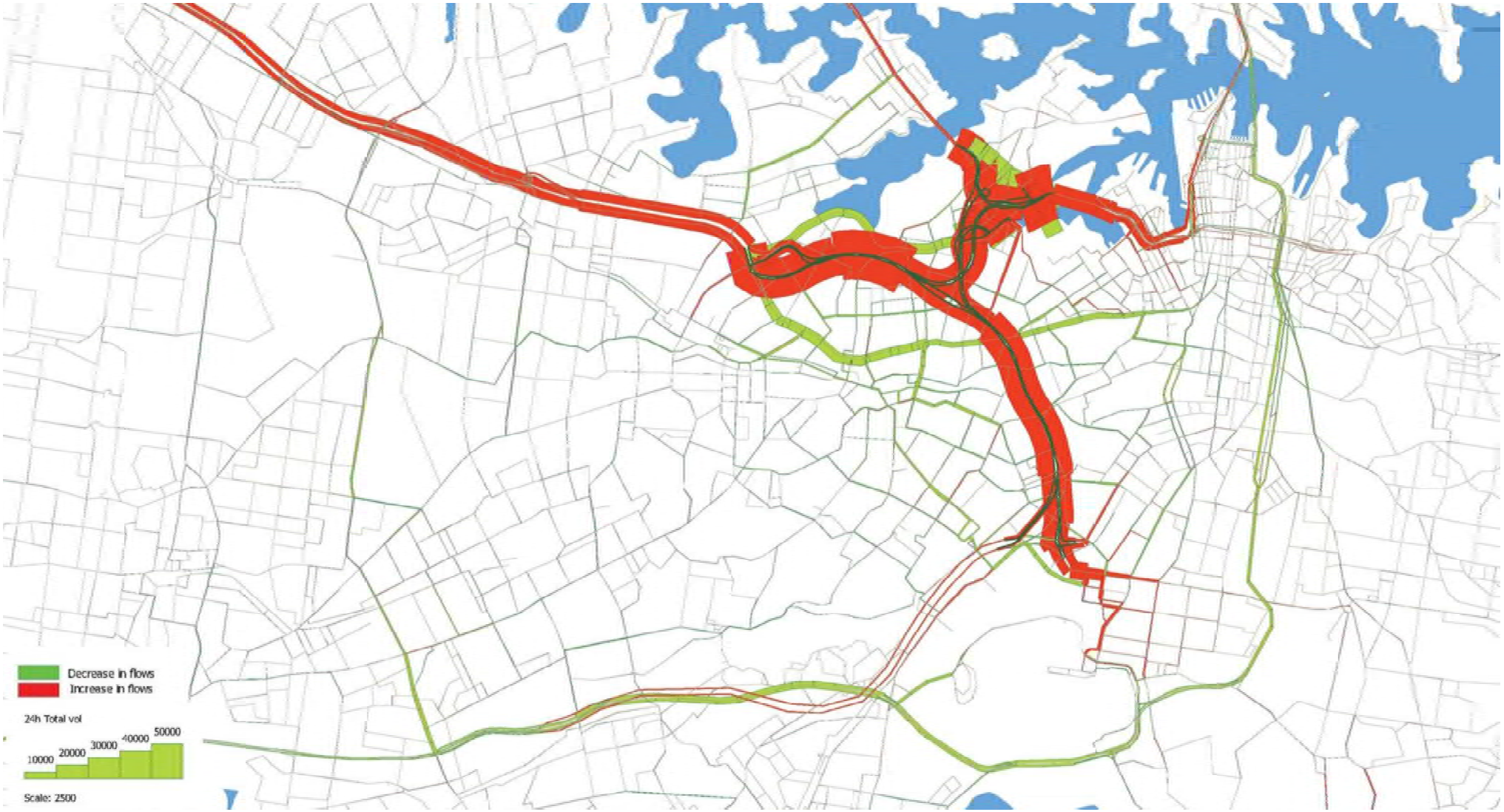


Figure 23 2023 average weekday traffic flows, with verse without M4-M5 Link (M4-M5 Link EIS, Roads and Maritime, 2017)

Figure 24 2033 average weekday traffic flows, with verse without Sydney Gateway, M6 Stage 1, Western Harbour Tunnel and Beaches Link (M4-M5 Link EIS, Roads and Maritime, 2017)

Increased traffic generation from urban renewal

The planned increase of over 42,000 dwellings in the area along with associated jobs, services, retail and education facilities will add substantial demand on the local transport system. Whilst a substantial portion of this is anticipated to be performed by sustainable transport modes, it is also anticipated it will result in a continuation of the current trends of steadily increasing private vehicle trips.

Off-street parking supply is a key mechanism of enabling the private vehicle trip and whilst the mode choice linkage has been observed to be stronger with destination parking supply (e.g. at employment, retail, education, leisure destinations), the origin (e.g. residential) supply remains a key enabler.

The Sydney LEP 2012 identifies the maximum car parking supply rates per apartment dwelling, which vary based on the "Land Use and Transport Integration" category of the land (A, B or C) and the number of bedrooms per apartment. Based on the proposed number of dwellings in each major urban renewal area, their "Land Use and Transport Integration" category, and an assumed mix of apartment types[3], it is estimated that the maximum number of parking spaces that could be supplied with the planned 42,000 additional dwellings in the area (refer Section 5.2.1) is estimated to be in the order of 25,000-30,000. Should this supply be realised, it represents a substantial increase and enablement of private vehicle travel, including on weekends. Provision should be considered both in isolation and accumulatively as development is planned and approved.

Nett effect at key intersections during peak periods

As identified, traffic towards the west of McEvoy Street is forecast to increase substantially because of the motorway program of works, whilst reducing north-south traffic volumes through the central and eastern sections. Although predominantly served by sustainable transport modes, the substantial planned urban renewal is also forecast to increase traffic volumes in the area. The nett effect is a substantial increase in peak period traffic volumes at intersections with Fountain Street and Botany Road, with more modest growth at intersections with Elizabeth Street and South Dowling Street. In noting that it is the peak period volumes at intersections that will be a key driver of the need for capacity (road space), forecast change in peak period traffic volumes through key intersections is provided in Table 14.

These forecasts highlight a substantial increase in peak period demands at several locations, particularly at the far west of McEvoy Street at the intersection with Fountain Street in each of the AM and PM peak. The forecasts indicate most of this growth will be realised with the delivery of the New M5 Motorway. They also indicate a higher relative change in peak periods relative to daily flows – indicating higher relative attractiveness of the tolled motorway network during peak periods relative to off peak periods.

[3] 5% Studios, 35% 1-bedroom apartments, 50% 2-bedroom apartments, 10% 3-bedroom apartments

Table 14 Forecast change in peak period traffic volumes at intersections

Intersecting Road	2016 2021 AM change		2016 2021 PM change		2016 2031 AM change		2016 2031 PM change	
	Veh/hr	%	Veh/hr	%	Veh/hr	%	Veh/hr	%
Fountain Street	+680	37%	+650	31%	+860	+46%	+960	+45%
Botany Road	+460	14%	+540	16%	+590	+18%	+660	+19%
Elizabeth Street	+530	20%	+660	21%	+780	+29%	+980	+32%
South Dowling Street	+360	8%	+260	6%	+770	+18%	+830	+19%

Source: STFM, Roads and Maritime

Performance

The forecast performance of the road network in the 2021 AM and PM peak periods is summarised for intersections in Table 17, and for speeds across the entire modelled network in Table 15 and Figure 25 (AM peak hour) and Figure 26 (PM peak hour). Note that the 2031 without project modelled scenarios were deemed too congested to represent a realistic scenario, and results are hence not reported. As such, 2021 is used as the key reference year for comparing performance with verse without the project.

The results indicate that performance at existing pinch points at the intersections with South Dowling Street and Botany Road will exacerbate, with congestion to spread across the network. The average speed of traffic is forecast to reduce by around 30% in peak periods by 2021.

Table 15 Forecast average speed of all vehicles without project

Network wide statistic	2016		2021 without project	
	AM	PM	AM	PM
Average traffic speed (km/h)*	16.7	19.0	11.4 (-32%)	13.3 (-30%)

** Based on average speeds in the critical second hour of each peak period*

Table 16 2021 peak period vehicle speed ratio (VSR) performance

Segment		2021 AM Peak VSR		2021 PM Peak VSR	
Western extent	Eastern extent	Eastbound	Westbound	Eastbound	Westbound
Maddox Street	Fountain Street	9%	12%	14%	30%
Fountain Street	Botany Road	8%	7%	16%	29%
Botany Road	Elizabeth Street	27%	12%	19%	19%
Elizabeth Street	South Dowling Street	24%	53%	11%	51%

Table 17 Forecast peak period intersection performance without project

Intersecting Road	2016 AM Delay (s) | LOS	2016 PM Delay (s) | LOS	2021 AM Delay (s) | LOS	2021 PM Delay (s) | LOS
Maddox Street	16 | B	28 | B	114 | F	187 | F
Fountain Street	22 | B	52 | D	100 | F	86 | F
Wyndham Street	52 | D	42 | D	114 | F	58 | E
Botany Road	56 | E	94 | F	249 | F	134 | F
Elizabeth Street	33 | C	73 | F	71 | F	82 | F
South Dowling Street	88 | F	77 | F	248 | F	165 | F

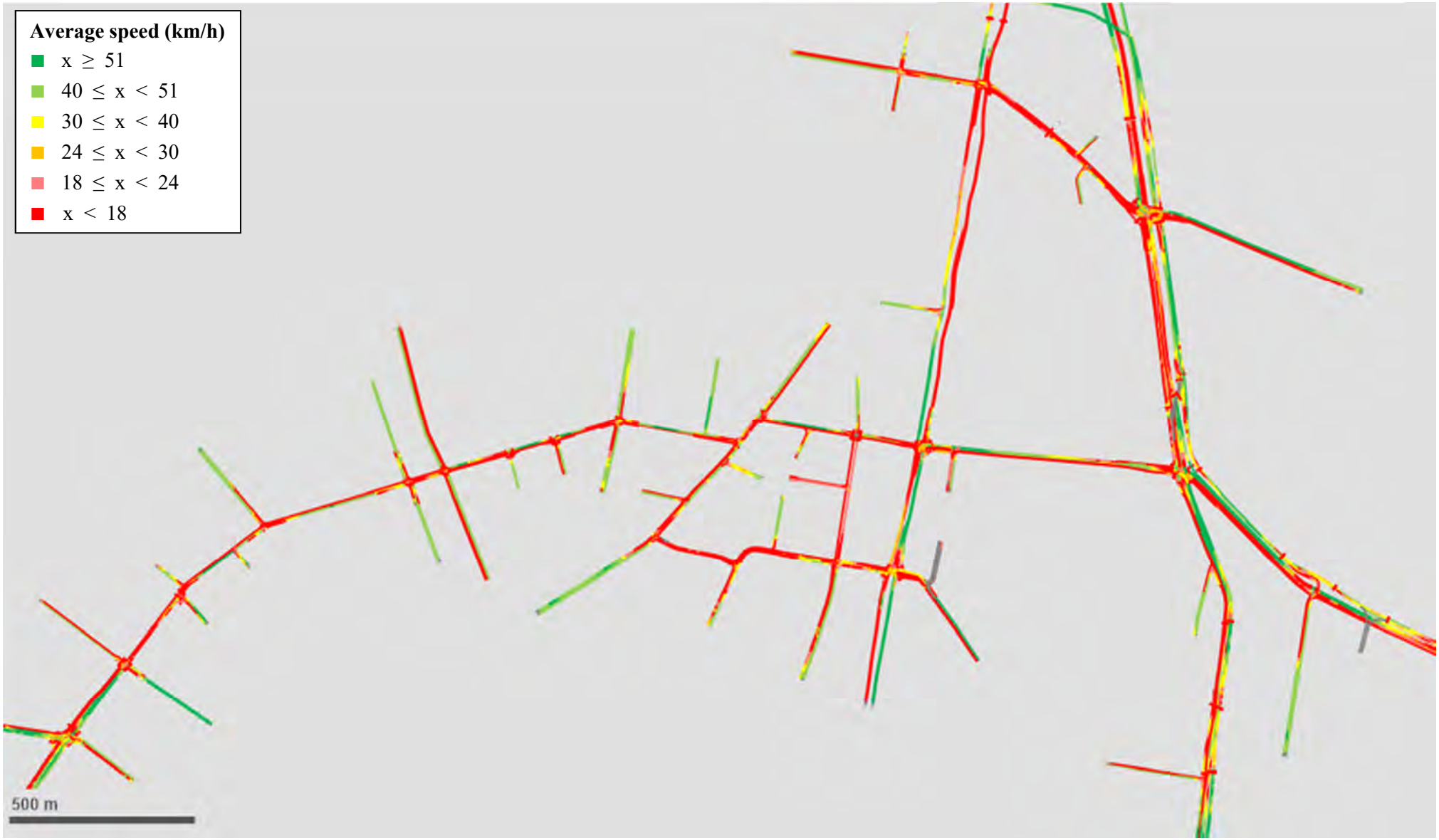


Figure 25 Forecast 2021 AM peak hour road network performance without project

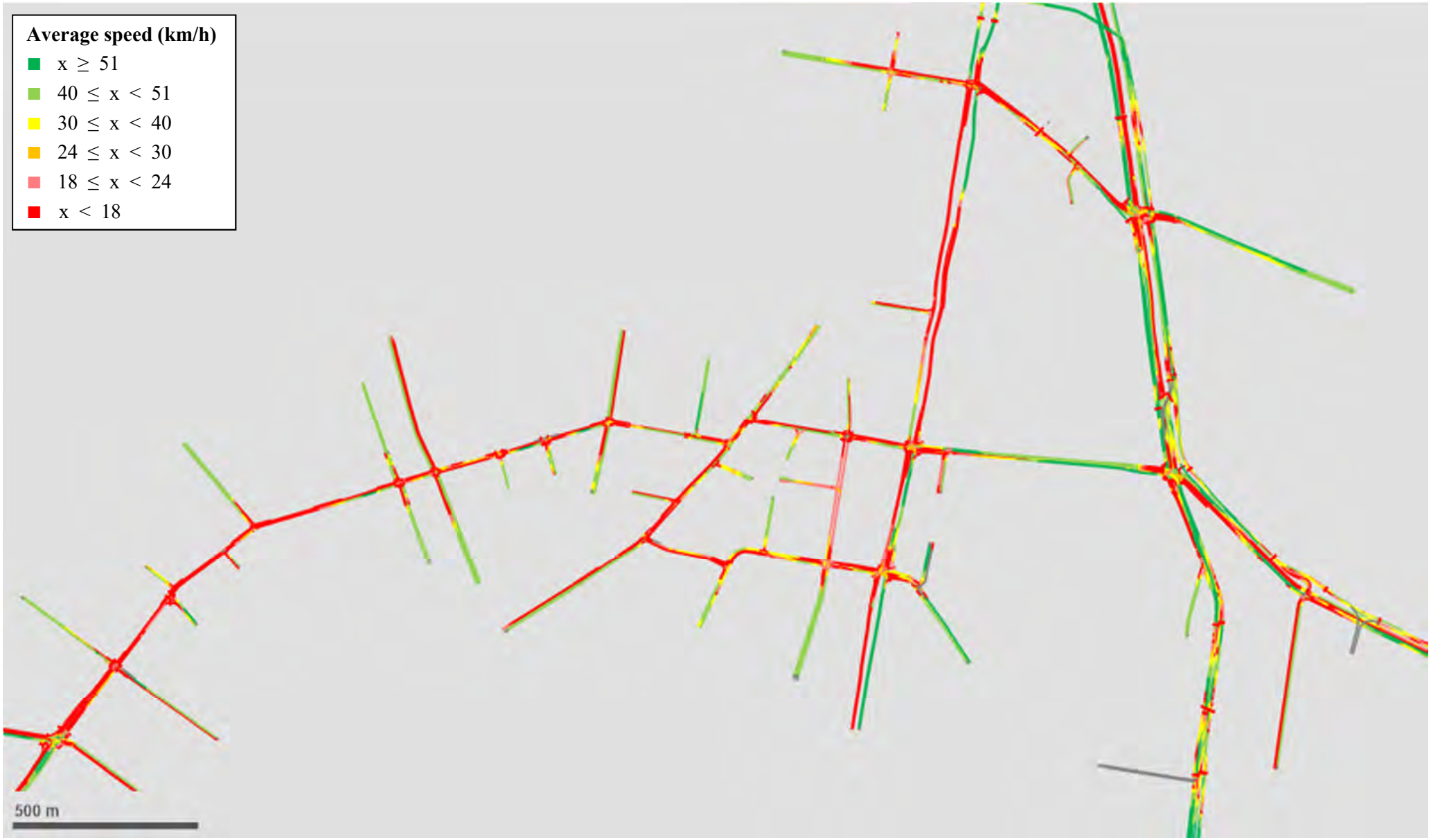


Figure 26 Forecast 2021 PM peak hour road network performance without project

5.3.5 Freight

When complete, New M5 Motorway and M4-M5 Link will each form part of the primary freight network and will be accessible via the immediately adjacent St Peters Interchange, increasing commercial vehicle traffic flows similar to private vehicles – with likely substantially increases in the volume of last mile freight accessing the western end of the project and distributing to either local generators such as the Southern Employment Lands, routes such as Botany Road, or to local urban renewal construction sites.

Beyond the construction and delivery of the New M5 Motorway, M4-M5 Link and Waterloo Station over the short term, construction traffic generated from the planned continual urban renewal of Green Square, Waterloo, Ashmore, Redfern to Eveleigh precincts will likely continue to be substantial in the area for the medium (10 years) and long term (20+ years) as sub-precincts continue to be rezoned, planned and delivered.

Whilst portions of the Southern Employment Lands are being planned for transformation to affordable housing – resulting in a potentially small trade-off from industrial vehicular traffic to localised home-based trips – local planning seeks to preserve a reasonable portion of these lands for their current industrial and employment function and its travel characteristics are likely to remain similar.

Performance

It is anticipated that the performance of the road network for freight will be similar to that forecast for general traffic (see Section 5.3.4), with operational issues at the four intersections with the freight network at South Dowling Street and Botany Road forecast to deteriorate further.

It is worth noting that the impacts of congestion along South Dowling Street on the operation of the M1 Eastern Distributor (a secondary freight route) whilst not captured, should be considered. The modelling indicates that congestion and queues along the South Dowling Street northern approach to Dacey Avenue and southern approach to O'Dea Avenue will exacerbate in the future, likely substantially impacting both general traffic and freight operations along the M1 Eastern Distributor.

5.4 Summary

Table 18 presents a summary of existing or forecast issues driving a need for investment at the key intersections along the east-west rout of McEvoy Street and Lachlan Street. The items included represent the issues that have stemmed from the assessment of 'existing' and 'future without project' scenarios, some of which drive the need for and definition of the project, or may need to be addressed as appropriate by other stakeholders.

Table 18 Summary of needs for investment

Category	Strategic functional requirements	Issue / opportunity	Existing or forecast issue
Road safety	Minimise the risk of serious injuries or fatalities to all road users	• The rate of crash occurrences between Maddox Street and South Dowling Street are multitudes higher than the Sydney benchmark for roads of the same classification	Existing
		• Almost two thirds of all crashes occurred at intersections with some of the highest numbers occurring at South Dowling Street, Elizabeth Street, Botany Road, and Fountain Street	Existing
		• 23 crashes involved pedestrians, 11 of which were located between Fountain Street and Botany Road	Existing
		• Congestion is forecast to substantially increase, increasing the likelihood of congestion-related crash types (rear-ends etc) including those from forced driving behaviour	Forecast
Place	Enabling strong transport connections to the nearby metropolitan, strategic and local centres, particularly by sustainable transport modes	• See below issues and opportunities for Movement – Bus & Light Rail, Cycling and Walking	Existing
	Providing quality transport facilities and amenity at key existing local places and planned significant urban renewal	• Bicycle parking facilities are generally lacking, resulting in share bikes observed lying on the ground or path at various locations	Existing
		• Three stops of poor quality (flagpoles and timetables only) were noted on McEvoy Street near Botany Road and one on Euston Road east of Maddox Street	Existing
		• Planned continued activation of the corridor between Pitt Street and Harley Street may increase pedestrian activity and associated needs for amenity and space beyond the kerb	Forecast
		• Planned substantial urban renewal will increase the demand for all movement modes (see issues below), as well as need for local place (see issues above)	Forecast
Movement – Walking	Facilitate safe and efficient movement of pedestrians across the corridor at Botany Road and Elizabeth Street, as well as between Harley Street, Bowden Street and Fountain Street	• Footpaths between Fountain Street and Harley Street form part of the primary walking network, though only typical footpath widths are provided	Existing
		• Permeability across the corridor is low between South Dowling Street and Bourke Street (430m between crossings), and between Fountain Street and Wyndham Street (410m) between crossings	Existing
		• A forecast increase in residential population of 75,000 to 80,000 people within 1-1.5km of the corridor, and 18,000 people in travel zones immediately adjacent the corridor, over the next 20 years will substantially increase pedestrian activity on footpaths and at intersections	Forecast

Category	Strategic functional requirements	Issue / opportunity	Existing or forecast issue
Movement - Cycling	Facilitate safe and efficient movement of cyclists across the corridor between Harley Street and Bowden Street, as well as provide local connections along Euston Road and Fountain Street	• Euston Road and Fountain Street are identified as part of the planned bike network, and existing facilities at these sections do not adequately facilitate bicycle users	Existing
Movement – Bus & Light Rail	Facilitate safe, efficient and reliable movement of public transport customers across the corridor at Botany Road and Elizabeth Street	• Peak period travel speeds across the corridor are low, and/or average lateness departing stops is high, for existing bus services along each of the key interfacing bus corridors of Botany Road and Elizabeth Street	Existing
		• Average speeds are forecast to drop by 10% to 15% in peak periods by 2021, with most substantial deterioration at city-serving bus corridors such as Botany Road and Elizabeth Street, and for cross-regional services operating along the corridor at the west.	Forecast
Movement – General Traffic and Freight	Facilitate safe, efficient and reliable movement of vehicles accessing the immediately adjacent motorway network at the M1 Eastern Distributor, New M5 Motorway and M4-M5 Link.	• Primary existing performance issues at intersections such as South Dowling Street and Botany Road result in average vehicle speeds along the corridor of less than 20km/h during the AM and PM peaks in both directions, as well as impacting speeds across the corridor	Existing
		• Motorway network changes are forecast to increase peak period traffic demand at intersections by 6% to 113% (depending on location and peak) by 2021, resulting in average speeds across the network being forecast to reduce by a further 20% to 30%. By 2031, additional planned motorway network changes and proposed urban renewal are forecast to further increase peak period traffic demands.	Forecast
		• The corridor's intersection with Elizabeth Street is forecast to worsen from operating at or near capacity, to well above capacity	Forecast

6 The project

Roads and Maritime propose to upgrade four intersections and introduce clearways between the Euston Road / Maddox Street intersection in Alexandria and the Anzac Parade / Alison Road / Dacey Avenue intersection in Moore Park.

The project consists of:

- New clearways on both sides of Euston Road and McEvoy Street between Maddox Street and Bourke Street from 6:00am to 7:00pm Monday to Friday and 9:00am to 6:00pm on weekends
- New clearways at all times along Lachlan Street and Dacey Avenue between Bourke Street and Anzac Parade
- Right turn bans in to Bunnings and most unsignalised local streets
- Improving capacity at the intersections of:
  - Fountain Street and McEvoy Street
  - Botany Road and McEvoy Street
  - Elizabeth Street and McEvoy Street; and
  - South Dowling Street, Lachlan Street and Dacey Avenue
- Minor kerb adjustments at:
  - Stokes Avenue and McEvoy Street
  - Kensington Lane and McEvoy Street
- Landscaping adjustments and replacement tree planting where works are undertaken
- Relocation of utilities and adjustments to traffic signals and street lights
- Property acquisitions, leases and adjustments
- Temporary construction facilities, including site compounds and stockpile sites at:
  - The Roads and Maritime car park on the south-west corner of the McEvoy Street/Stokes Avenue intersection, Alexandria (Site 1)
  - Road reserve at the southern end of Cope Street, Alexandria (Site 2)
  - Road reserve at the southern end of George Street, Alexandria (Site 3)
  - The vacant land (Lot 2 DP800705) at the corner of intersection of McEvoy Street and Bourke Street, Waterloo (Site 4)
  - Lot 1, 2 and 3 DP 76985, Lot 4 DP 86722 and Lot 14 DP80926 on the west corner of the Lachlan Street/Amelia Street intersection, Waterloo (Site 5).

Refer Appendix G for sketches summarising the proposed works for A2MP Stage 1.

7 Future conditions with project

The project is likely to result in a variety of transport benefits and impacts within the study area. Each are highlighted and discussed as relevant in the sections following.

7.1 Road safety

Key safety-related features of the project, their anticipated safety benefits, and any likely impacts are highlighted in Table 19.

Table 19 Road safety features, benefits, impacts

Project safety feature	Safety benefits	Likely impacts
Right turn bans in to Bunnings and most unsignalised local streets	Reduce risk of right turn related crashes at minor intersections.	Accessibility of corridor for local users, though alternative routes are available (see Figure 27).
Intersection upgrades	Reduce congestion-related crash types such as rear-ends, and queue-out issues - particularly noted at South Dowling Street. Reduced risk of continued right-through and left-through same-direction crash issues at shared-movement lanes (where movements are proposed to be separated with added turn lanes). Reduced risk of pedestrian related crashes with provision of pedestrian protection at new traffic signals.	Increased vehicle speeds from operational performance improvements can increase severity of crashes.

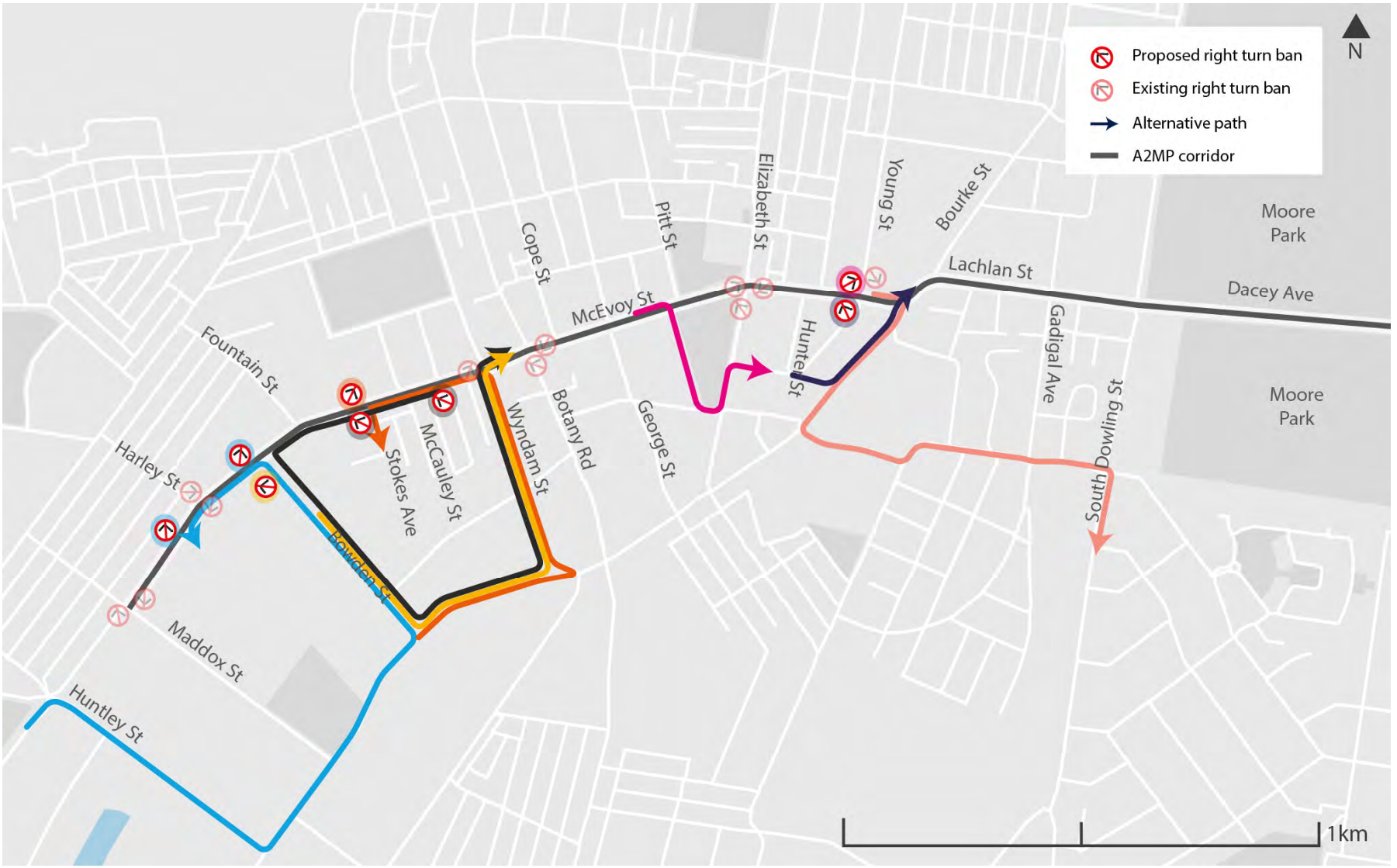


Figure 27 Alternative local access routes available for proposed right turn bans

7.2 Place

7.2.1 Benefits and impacts

Amenity

In providing operational performance improvements, the east-west route may become more attractive, reducing the likelihood of rat-running behaviours and the use of nearby or parallel local streets for through-movement. Through this lens, although the proposed works reinforce movement east-west through the intersections, they also support the preservation of nearby local streets for local uses and places. Further expansion of the 40km/h posted speed limit of nearby local streets would also enhance this effect.

Access to centres

The project will enhance accessibility to centres through improved journey time and reliability of private vehicle and bus customers along and across the intersections. Through the same mechanism, it also supports access to planned urban development in the area.

7.3 Movement

7.3.1 Walking

In terms of ***footpath crowding***, the project proposes to retain predominantly existing footpath conditions at the intersection upgrade sites, except:

- At that northern Botany Road approach to McEvoy Street, at which the existing path will be relocated east with the widening of the roadway, with a similar to existing width proposed
- A new wider footpath will be provided along the southern edge of the realigned McEvoy Street at its intersection with Fountain Street
- Realignment of the existing footpath along the northern edge to the west of Fountain Street, as well as use of an existing wider footpath

In terms of ***Connectivity***, the project will not impact the strategic permeability across corridor, rather reinstating existing connectivity at intersections.

7.3.2 Cycling

A2MP Stage 1 retains existing east-west cycling facilities. The project will also integrate with current and proposed dedicated bike lanes at the intersection with Gadigal Avenue.

Cyclist requirements will also form part of any future investigation into the corridor along Lachlan Street and at Bourke Street.

7.3.3 Bus and Light Rail

Key features of the project for buses include:

- The intersection upgrades interface with key bus routes at Elizabeth Street and Botany Road
- Removal and replacement of bus stops at the intersections with Fountain Street and Botany Road.

A2MP Stage 1 does not propose any changes to the Anzac Parade / Alison Road / Dacey Avenue intersection, including the bus and light rail priority infrastructure provided.

Performance

The resultant forecast average speed of buses in the modelled network with verse without the project are provided in Table 20, which indicates that average speeds will improve by 12% in the AM peak and 3% in the PM peak in 2021.

Table 20 Network-wide statistics for buses with verse without project

Network wide statistic	2021 without project		2021 Stage 1	
	AM peak	PM peak	AM peak	PM peak
Average speed (km/h)*	12.2	13.1	13.7 (+12%)	13.5 (+3%)
Vehicle hours travelled (hrs)^	92	87	85 (-8%)	84 (-3%)

** Based on average speeds in the critical second hour of each peak period*

^ Base on the sum of travel time for all completed and active vehicle trips in the network over the two-hour peak period

7.3.4 General traffic

Clearways

Clearways are proposed as part of the project to improve journey times and reliability, enabling the most efficient use of road space for movement of people and goods including bus, freight and private vehicles. However, in noting the potential impacts of clearways on the accessibility of local places and businesses by private vehicle, as well as to some degree the pedestrian amenity of removing kerbside parking (which can serve as a buffer to general traffic lanes), it is important to establish a need for their implementation and ensure appropriate consideration of impacts and potential mitigation measures.

Parking survey

A parking assessment for the project was conducted by Jacobs in 2018 and is provided as an appendix to the REF. As part of this assessment, weekday and weekend surveys were undertaken to understand the number, type and occupancy of on-street parking both along the corridor and on local side streets. Surveys focused on the corridor between Maddox Street and Bourke Street as “no parking” restrictions are already in place east of Bourke Street. The key findings of the survey identified the following:

- There are approximately 255 on-street parking bays located along the corridor from east of Maddox Street to west of Bourke Street
- "No parking" restrictions during either weekday morning (6:00am to 10:00am) or evening (3:00pm – 7:00pm) peak periods apply to 90% of on-street parking bays
    - An average of 33% and 65% of on-street bays were occupied for a typical weekday and weekend respectively (see Figure 28 and Figure 29).

Figure 28 Weekday on-street parking occupancy

Figure 29 Weekend on-street parking occupancy

Assessment

As identified as part of the current *Sydney Clearways Strategy*[4] the current criteria used in the assessment of potential clearway corridors are:

- Directional traffic flows exceed 800 vehicles per hour per lane (veh/hr/lane)
- Travel speeds are 30km/h or below during peak periods.

The strategy also identifies that, for consistency reasons and to make it easier for road users, clearway hours are standardised across the network and wherever possible the below standard hours are applied:

- Weekday morning (6am – 10am)
- Middle of weekday (10am – 3pm)
- Weekday afternoon (3pm – 7pm)
- Weekend short day (9am – 6pm)
- Weekend long day (8am – 8pm)
- 24 hours across seven days (At All Times).

For the weekend and weekday time "blocks", clearways are considered for the full period if the criteria are met for a portion of the defined period (e.g. if the criteria were met during the AM peak from 7am to 9am, clearways would be considered or recommended from 6am to 10am).

In noting that the operational models do not allow an assessment of current or forecast travels speeds during off-peak periods, an updated assessment has been undertaken based on the traffic volume criteria - using strategic model forecasts derived from STFM. Figure 30 and Figure 31 below show the hours where, for each east-west segment, traffic flows are forecast to exceed the above criteria or approach the threshold (600-800 veh/hr/lane).

The results show that traffic flows meet the criteria west of Botany Road, whilst flows west of Elizabeth Street are consistently maintained above the 'approaching' threshold. Flows between Elizabeth and Bourke Street are lowest, exceeding the 'approaching' in the eastbound direction only hours.

[4] https://www.rms.nsw.gov.au/documents/projects/easing-sydneys-congestion/sydney-clearways/sydney-clearways-strategy-frequently-asked-questions.pdf

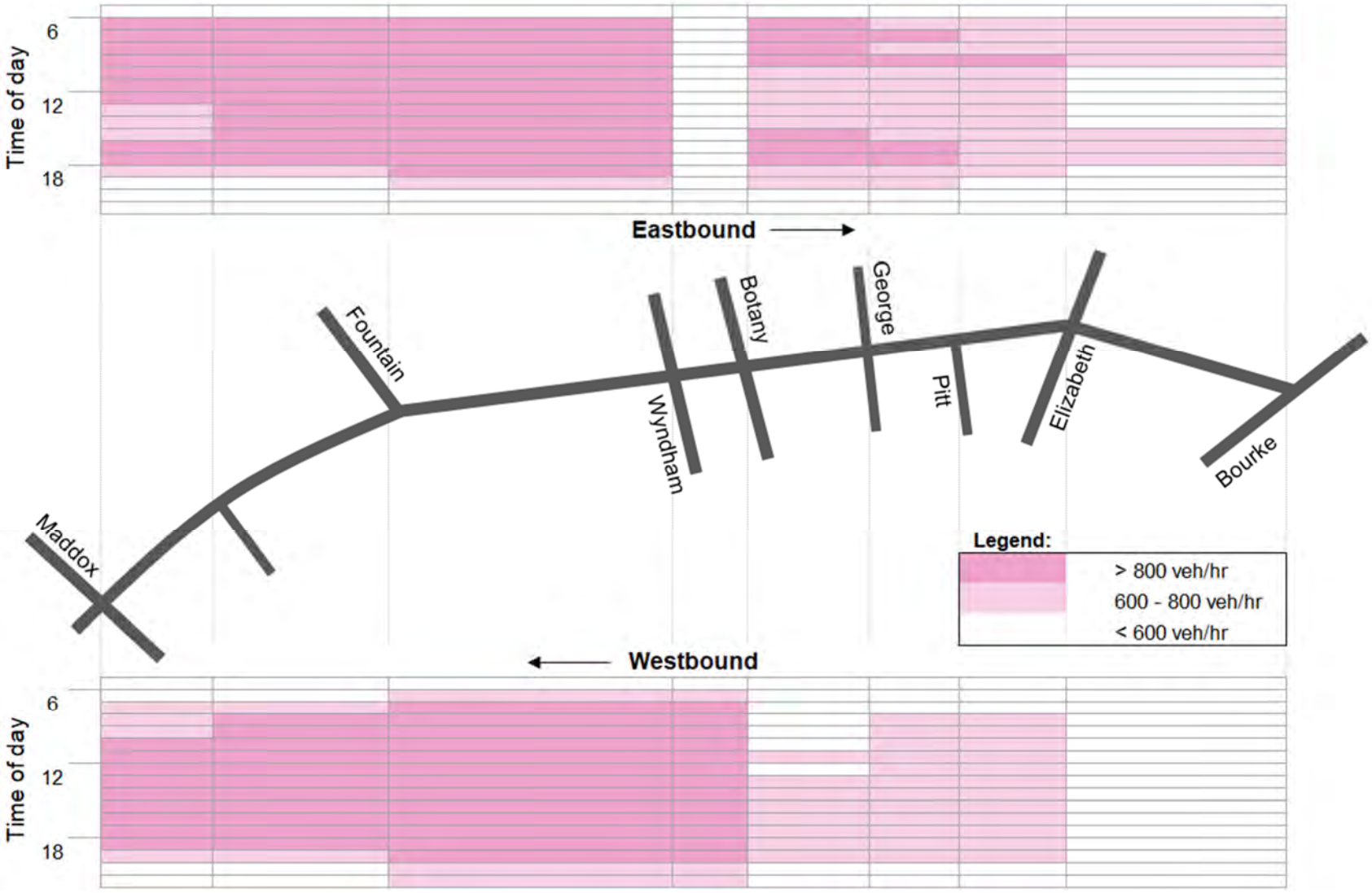


Figure 30 2021 weekday clearways assessment - Maddox Street to Bourke Street

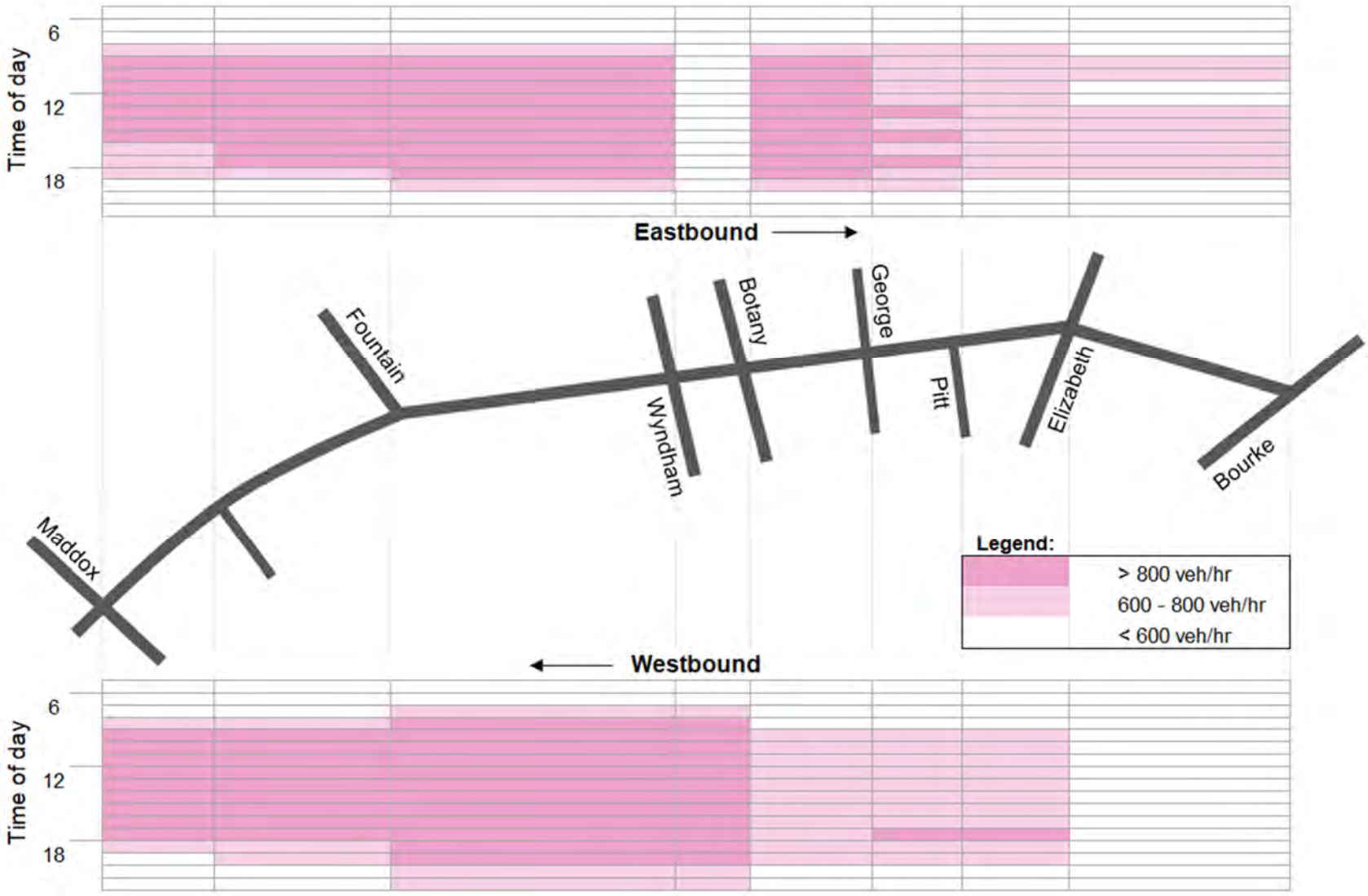


Figure 31 2021 weekend clearways assessment - Maddox Street to Bourke Street

Impacts to on-street parking

Implementing the currently proposed clearway restrictions would impact all 255 on-street parking bays (between Maddox Street and Bourke Street), reducing the availability of on-street parking supply particularly during off-peak periods and on weekends.

The previous parking assessment considered the ability of side streets along the proposal project area to accommodate the vehicles displaced by the proposed clearway restrictions. For the purposes of the review, the corridor between Maddox Street and Bourke Street was divided into segments to allow a more localised understanding of lost supply and displacement opportunities. The severity of the displaced parking was categorised in accordance with Table 21.

Table 21 Parking displacement impact categories

Impact rating	Description
None	All vehicles displaced accommodated by nearby side streets
Minor	< 5 vehicles displaced won't be accommodated by nearby side streets
Moderate	5 – 10 vehicles displaced won't be accommodated by nearby side streets
Substantial	10 – 15 vehicles displaced won't be accommodated by nearby side streets

Table 22 provides an indicative summary of the anticipated parking short falls because of the proposed clearway restrictions. As highlighted, the majority of the corridor is categorised as 'none' or 'minor' in terms of existing capacity to accommodate displaced parking, with the highest limitations at the west of the corridor from Maddox Street to Loveridge Street.

Table 22 Parking displacement assessment

Segment	Northern side	Southern side
Maddox Street – Harley Street	Moderate	Moderate
Harley Street – Fountain Street	Substantial	Moderate
Fountain Street – Loveridge Street	Substantial	Moderate
Loveridge Street – Brennan Street	Minor	Minor
Brennan Street – Wyndham Street	None	Minor
Wyndham Street – Botany Road	None	None
Botany Road – Elizabeth Street	Moderate	None
Elizabeth Street – Kensington Lane	None	Minor
Kensington Lane – Kensington Street	None	Minor
Kensington Street – Morehead Street	Minor	Minor
Morehead Street – Young Street	Minor	Moderate
Young Street – Bourke Street	None	None

Mitigation measures

A review of Table 22 above shows that most on-street parking impacts will likely be focussed west of Wyndham Street. A preliminary review of current parking behaviours along these side streets indicate high utilisation, but minimal parking restriction. As a result, the average duration of stay is relatively high; ranging from approximately 3hrs to 7hrs. The majority of development along this section of the project also have off-street parking supply.

It is recommended that during detailed design a review of how and by who the on-street parking bays are currently being utilised should be conducted. This will provide a clearer snap shot of the role on-street parking for the key segments and assess the parking demand at targeted areas relative to the intended use of the associated land uses. Where impacts to businesses are identified, this should include identification of opportunities to offset lost supply.

Performance

Table 23 presents a comparison of network-wide performance statistics for the 2021 peak periods with and without the project. Travel times between the far east and west extremities of the modelled network, for each key modelled scenario, are also shown in Table 24.

The network-wide statistics show that the average speed of traffic in each AM and PM peak one-hour periods is forecast to increase by over 15-35%. Meanwhile network wide travel times over each two-hour peak period are forecast to reduce by in the order of 12-18%.

Table 23 Network-wide statistics for all vehicles with verse without project

Network wide statistic	2021 without project		2021 Stage 1	
	AM peak	PM peak	AM peak	PM peak
Average speed (km/h)*	11.4	13.3	15.2 (+33%)	15.2 (+15%)
Vehicle hours travelled (hrs)^	6490	6190	5300 (-18%)	5450 (-12%)

** Based on average speeds in the critical second hour of each peak period*
^ Base on the sum of travel time for all completed and active vehicle trips in the network over the two-hour peak period

The end-to-end travel time results also show significant travel time savings for traffic movement along the project. Modelled travel times along McEvoy Street and Lachlan Street are sensitive particularly to signal coordination at the intersections and prioritisation of signal operations (or capacity provided) to east-west movement at key intersections. This has been noted at key intersections such as at the Lachlan Street / South Dowling Street / Dacey Avenue intersection at which priority is provided to north-south movement to prevent motorway operations impacts on the M1 Eastern Distributor.

Table 24 End-to-end travel times along the corridor with verse without project

Direction	Travel time (minutes)					
	AM Peak			PM Peak		
	2016	2021 without project	2021 Stage 1	2016	2021 without project	2021 Stage 1
Eastbound	21:50	29:20	24:30	42:10	47:20	22:00
Westbound	18:20	30:40	18:30	15:40	18:20	17:50

The forecast performance of key intersections with verse without the project is summarised in Figure 32 and Figure 33, whilst modelled speeds for the entire modelled network are shown in Figure 34 and Figure 35.

The results indicate that performance at key existing and forecast pinch points at intersections with South Dowling Street and Botany Road will generally substantially improve, though may remain at capacity.

The modelling results also indicate that with the project, there is an increase in traffic throughput and a resulting increase in peak period traffic demand that can access other nearby intersections that already operate at or near capacity. The result is that intersections along and nearby the project (e.g. the South Dowling Street / Todman Avenue / O'Dea Avenue intersection) may require the focus of future investigation.

Model Scenario:	MADDOX		FOUNTAIN		WYNDHAM		BOTANY		ELIZABETH		SOUTH DOWLING	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
2016 AM Existing Conditions	16	B	22	B	52	D	56	E	33	C	88	F
2021 AM No Project	114	F	100	F	114	F	249	F	71	F	248	F
2021 AM Stage 1	36	C	42	C	71	F	109	F	39	C	125	F

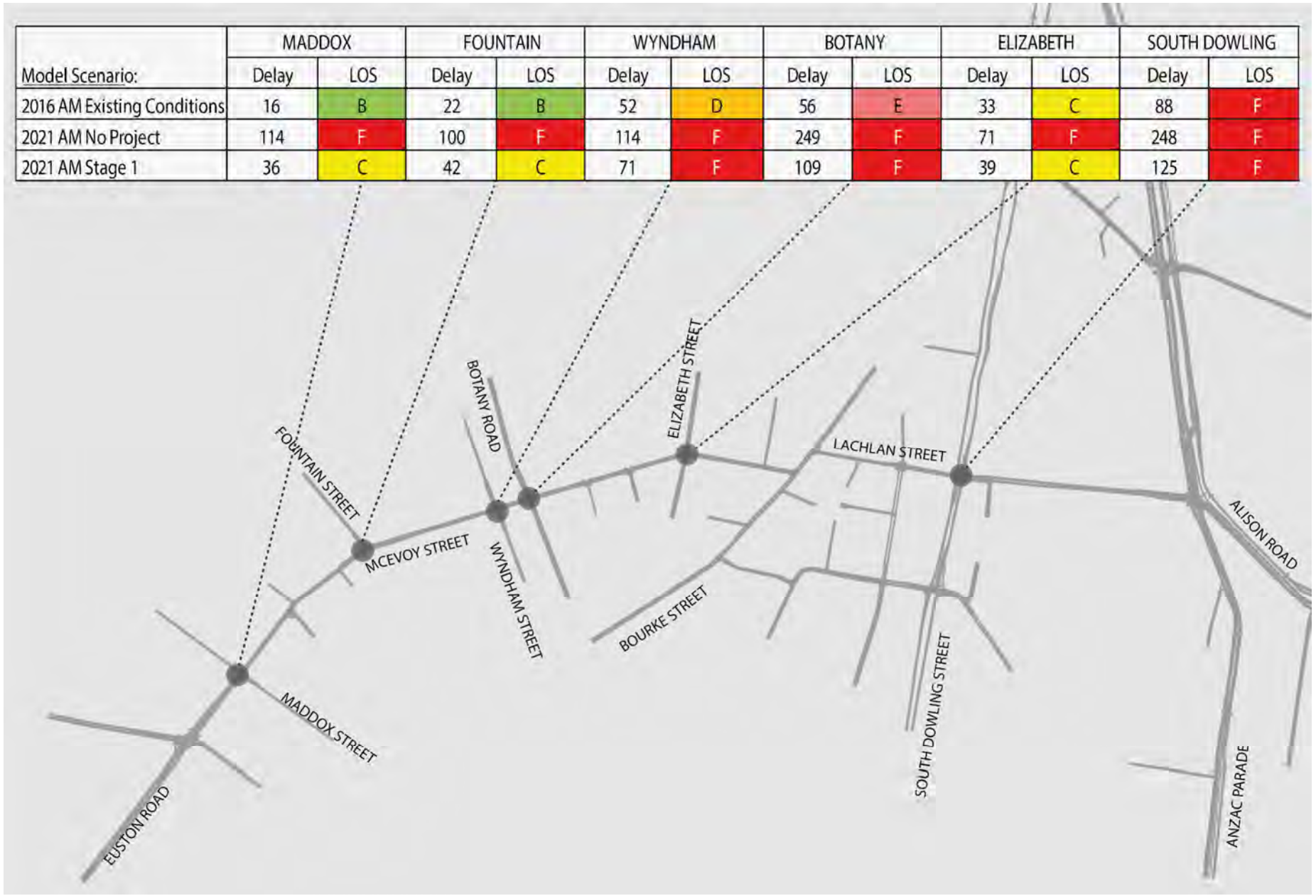


Figure 32 AM peak intersection performance - all scenarios

Model Scenario:	MADDOX		FOUNTAIN		WYNDHAM		BOTANY		ELIZABETH		SOUTH DOWLING	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
2016 PM Existing Conditions	28	B	52	D	42	D	94	F	73	F	77	F
2021 PM No Project	187	F	86	F	58	E	134	F	82	F	165	F
2021 PM Stage 1	43	D	54	D	70	E	138	F	92	F	141	F

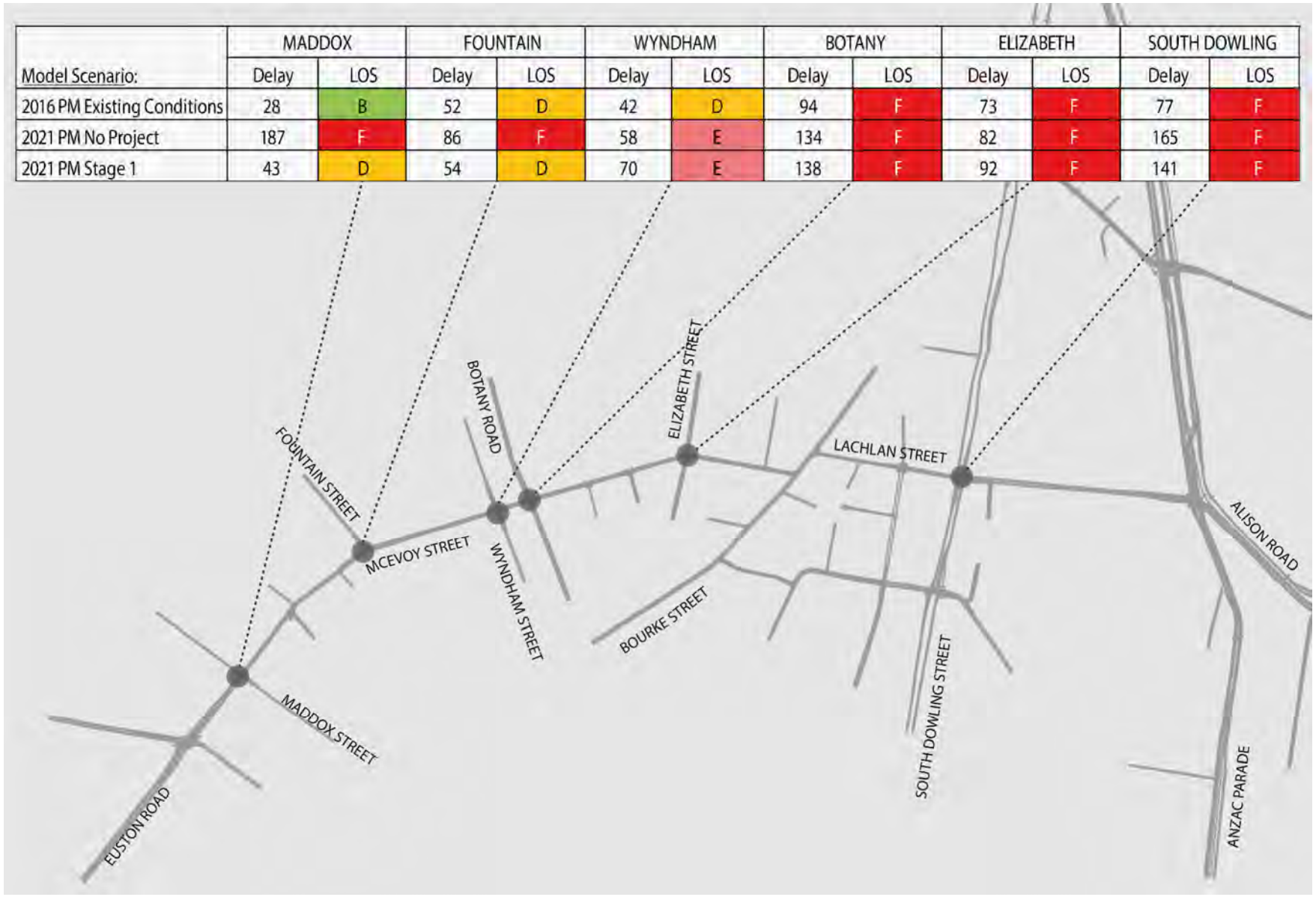


Figure 33 PM peak intersection performance - all scenarios

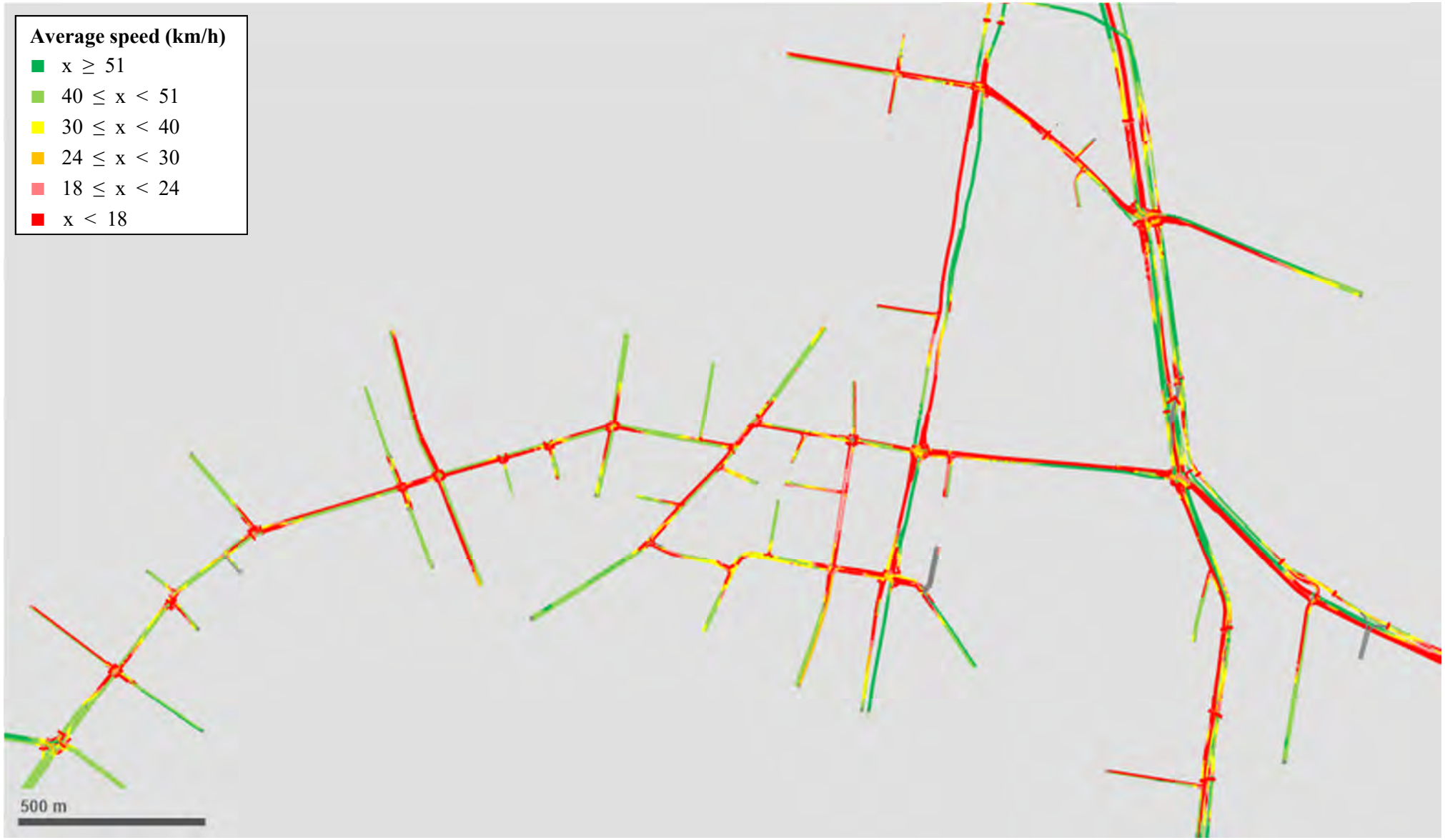


Figure 34 2021 AM peak average speeds with Stage 1

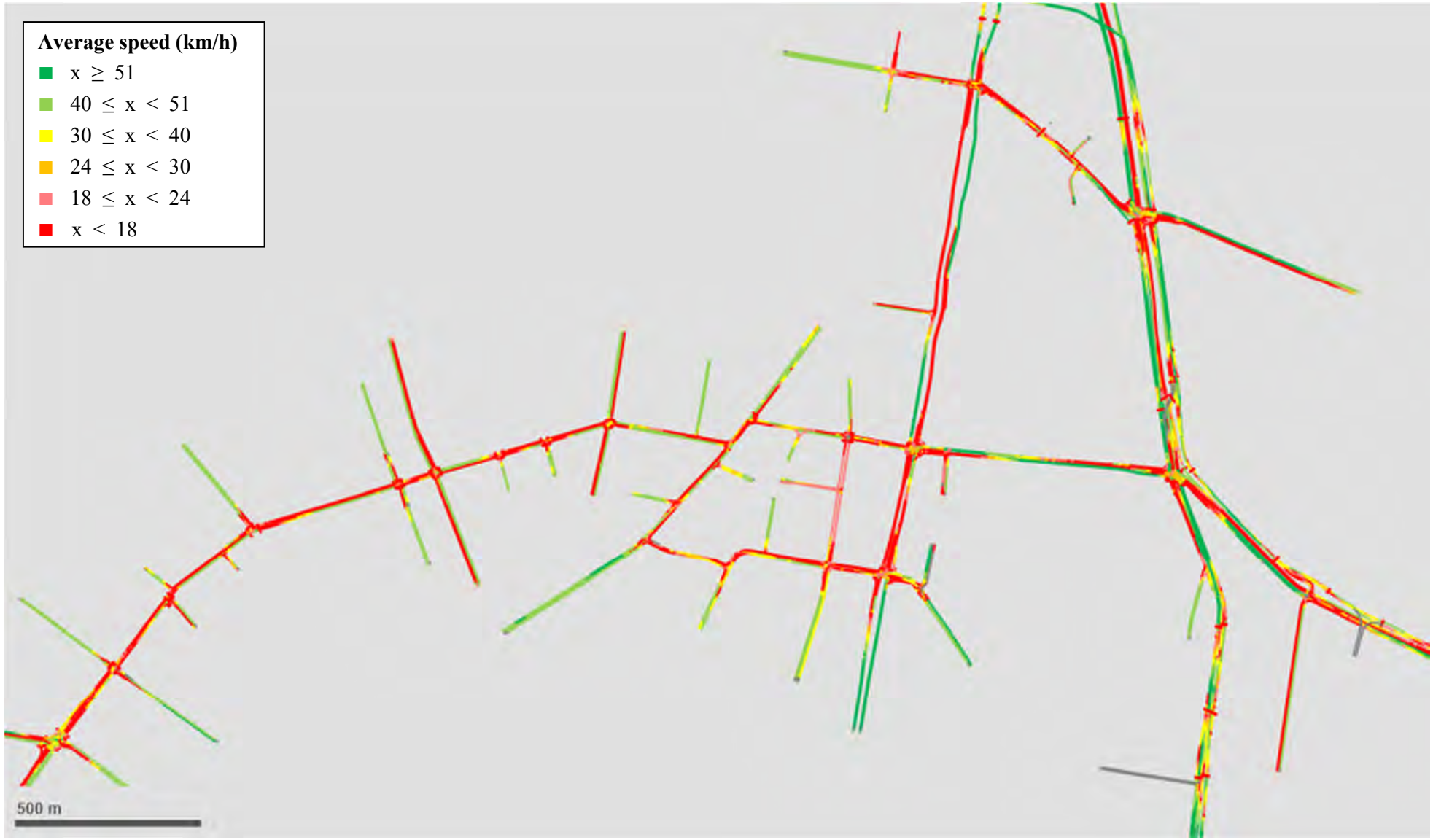


Figure 35 2021 PM peak average speeds with Stage 1

7.3.5 Freight

The project will:

- Enable improved travel times for freight vehicles accessing the motorway network, including to the New M5 Motorway, M4-M5 Link and existing M1 Eastern Distributor
- Improve performance at the interface with the freight route of Botany Road and improve access to the Southern Employment Lands and local urban renewal construction sites
- Improve manoeuvrability for heavy vehicles at upgraded intersections due to improved alignment and swept path provisions, particularly at the intersection with Botany Road (another secondary freight route).

The proposed right turn ban into Bunnings may however impact localised access to the site for delivery vehicles.

8 Construction

Construction activities for the project impact on all road users in the project area. Construction staging diagrams were developed John Holland Group and summarised by Jacobs in the REF. Refer to the construction summary section of the REF.

This section outlines the desirable traffic management principles to be including in the construction staging and program for the project.

8.1 Traffic management principles

Additional principles for traffic management during construction of the proposed works should include:

- Any impacts to traffic capacity at intersections and mid-block near the sites, and disruption to all road users, during the construction period should be kept to a minimum
- Lane widths should not be reduced to less than a desirable minimum of 3.2 metres for through lanes and 3.0 metres for turning lanes
- Speed limits should be reduced to 40km/h approaching and adjacent to construction works
- Any site access traffic movements should adopt a “left-in, left-out” access arrangement, and enter and exit the site in a forward direction, where feasible to minimise impact on traffic flow
- Construction personnel will be encouraged to access the site using public transport
- A limited number of parking bays may be provided on site, however the use of these bays are is to be restricted to essential personnel only
- Access to properties located near the sites should always be maintained , with suitable alternative access arrangements provided otherwise
- Maintain convenient access and circulation for bus and light rail - travel times should be monitored, and mitigation measures implemented as required, during the works to make sure consistent and acceptable travel times are maintained
- Always Provide an appropriate environment for pedestrians
- Pedestrian and cyclist facilities to be maintained throughout the construction period, with suitable alternative arrangements provided otherwise
- Pedestrian movements adjacent to construction activity, across construction access driveways and to/from public transport facilities, will be managed and controlled by an authorised and qualified traffic controller
- Pedestrian warning signs and construction safety signs/devices to be utilised near the site and to be provided in accordance with WorkCover and any applicable legislative requirements

8.2 Construction Stage Traffic Diversions

Temporary impacts to vehicle travel routes are anticipated during the construction of the proposed project. The impacts are expected to occur during night time construction works between the approximate hours of 10:00PM to 4:00AM. During these hours various diversions routes will be used to detour vehicles. A summary of available detour routes of impacted travel movements are shown in Appendix H. These routes have only been assessed for light vehicles. Additional detours routes appropriate for heavy vehicles shall be considered in the construction management plan and implemented through the construction phase services.

Minimal impacts to key bus routes are anticipated due to the hours of construction. If in the temporary case a bus stop needs to be protected from construction works, the Contractor will provide a temporary bus stop with appropriate signage and way-finding along the existing bus route.

9 Summary

This Traffic and Transport Report is one of several documents that have been prepared to provide pertinent technical information and analysis required to both inform and append to the Review of Environmental Factors (REF) for the project. This report provides details of the methodology, assumptions and results from a holistic traffic and transport assessment that has been undertaken to identify existing issues along the east-west route formed by McEvoy Street and Lachlan Street and establish future traffic and transport conditions in the study area with and without the project.

The following presents a summary of the findings of the assessment.

9.1 Road safety

A review of the crash history for the project yielded that road safety is a substantial issue, with crash rates that are multitudes higher than the Sydney-wide average for a class 3U road. With substantial increases in forecast traffic demand and congestion at key operational performance and safety hotspots, it is anticipated these crash trends will continue to be an issue in the future. The project is anticipated to improve road safety particularly through:

- Reducing congestion via, and ensuring pedestrian protection at, upgraded intersections
- Reducing the number of priority-controlled right turns.

9.2 Place

Overall the abutting land uses are considered to generate modest place functions along the project, except for noted existing active frontages between Pitt Street and Harley Street. These are planned to be reinforced as part of planned urban renewal along the McEvoy Street and Lachlan Street.

A strategic level review of transport facilities and management indicates that the greatest impact to place is that generated by the speed of the traffic environment and vehicle volumes.

The project is anticipated to:

- Potentially impact place along the project during peak periods through increased traffic throughput, whilst potentially assisting preservation of place on nearby streets through decreased rat-running
- Enhance accessibility to nearby centres and planned urban renewal areas through improved journey time and reliability along and across the intersections
- Impact private vehicle access to local destinations through the implementation of clearways on weekdays and weekends.

9.3 Movement

A review of transport functions in the study area yielded that the key existing customer groups for movement:

- **North-south movements** - are a combination of sustainable transport modes (bus, pedestrians, cyclists) accessing the Sydney CBD and surrounds and substantial private vehicle and freight movement at the M1 Eastern Distributor, South Dowling Street and Botany Road.
- **East-west movements** - is predominantly the private vehicle, serving movement between the adjacent LGA's that do not have competitive public transport alternatives, as well as providing connectivity between interfacing local and higher order routes and the motorway network.
    - Freight, buses, pedestrians and cyclists are key customers at select locations.

The project accommodates each of the above key functions at the key intersections that comprise it – and these are where the key operational performance issues for all key modes occur both now and forecast.

The project is substantially driven by the need to improve movement performance for road transport customers, and is anticipated to improve conditions for:

- **Buses** by improving bus travel speeds by 12% and 3% in the 2021 AM and PM peak hours respectively
- **General traffic** and **freight** by improving average travel speeds by 33% and 15% in the 2021 AM and PM hours peak respectively.

9.4 Opportunities for further investigation

Opportunities have been identified to further investigate:

- Options to address the remainder of issues and opportunities identified in Table 18
- Options to further improve road network performance of any impacted nearby intersections (e.g. South Dowling Street / Todman Avenue / O'Dea Avenue intersection)
- Undertake a review of how and by who on-street parking bays are currently being utilised to provide further insights to impacts of clearways and appropriate mitigation measures
- Planned activation / interfacing land uses between Pitt Street and Harley Street, to understand impacts of proposed footpath width reductions and inform any necessary local adjustments to project definition
- Allocation of road corridor space along Lachlan Street and at Bourke Street to identify any opportunities to further improve facilities for pedestrians and cyclists
- Investigate the likely form, feasibility and impacts of the proposed Waterloo Precinct access at Pitt Street
- Via consultation with Transport for NSW, the future function of the corridor for higher order bus service service functionality along the corridor
- More broadly, in response to the opportunities raised by the planned motorway network:
    - Investigate the potential for reallocation of road space along key interfacing routes to the north and south of the corridor, particularly noting key bus functions operating across the corridor
    - Review accessibility of the M1 Eastern Distributor (ED), considering opportunities for new or reinstated connectivity, considering substantial forecast traffic reductions and the need for relief along South Dowling Street.

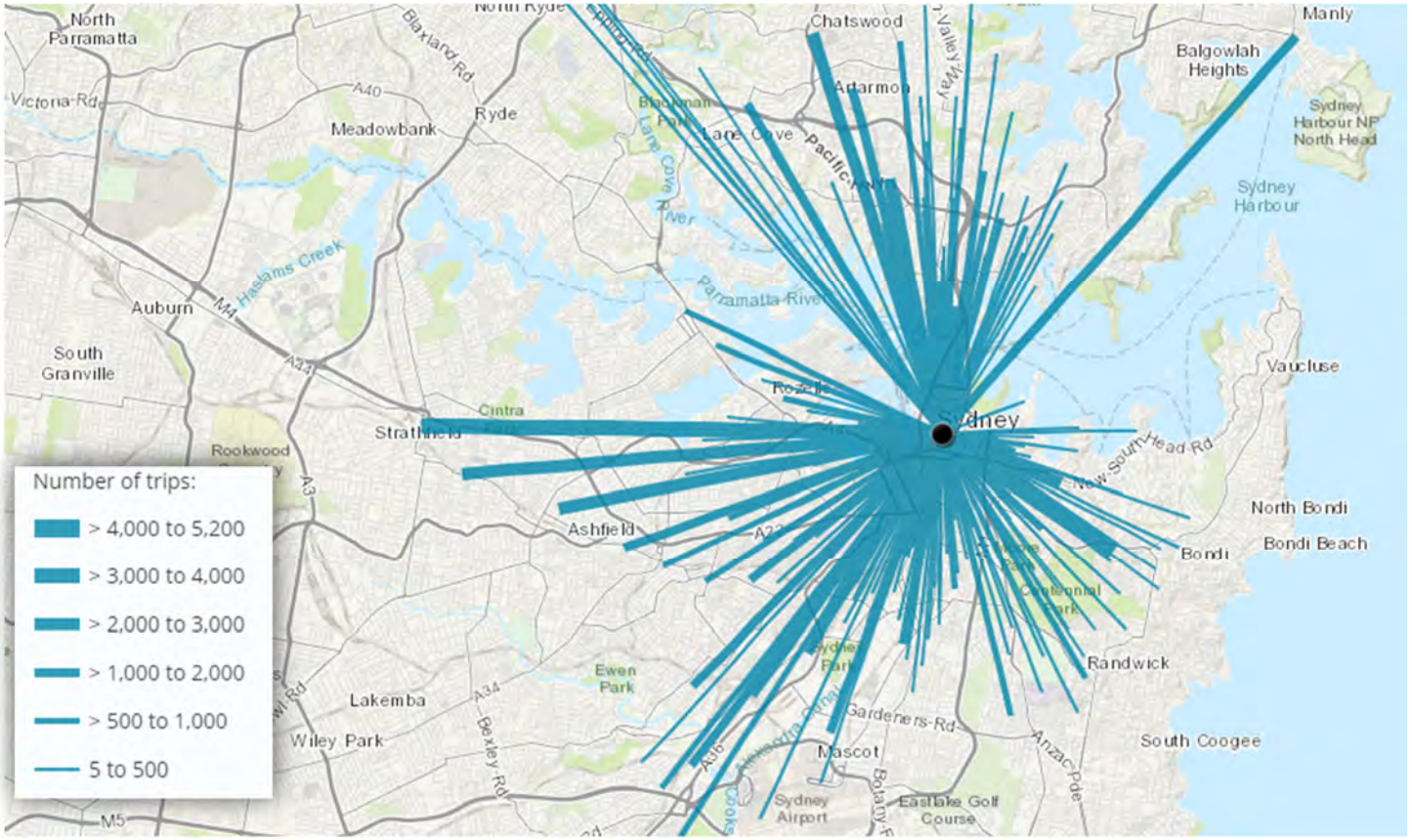
Appendix A

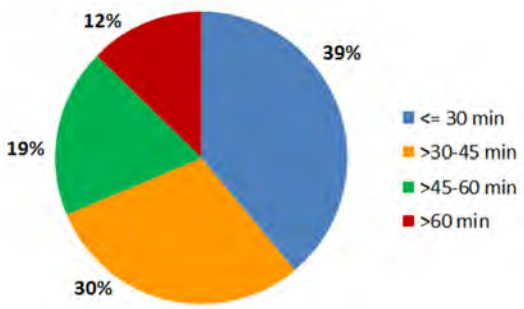
Accessibility of key centres

A1 Accessibility of key centres

Following the increased policy focus on creating the "30-minute city", the University of New South Wales made available some data-based analysis in 2016 which used Opal data to visualise the public transport accessibility of key centres across Sydney. The analysis is based on a typical weekday's data in March 2016 and focuses on the AM peak period (7:00am to 9:30am). Further information on the project and the data used is available on the website[5]. It is noted some public transport services have changed in the area, and road network performance may have also changed since 2016, however the data is still considered likely to provide useful and relevant insights.

[5] https://cityfutures.be.unsw.edu.au/cityviz/30-min-city/





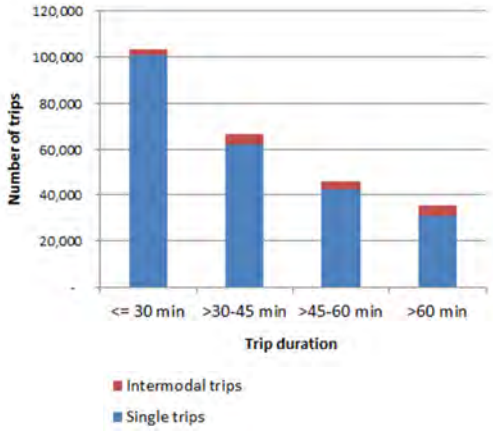
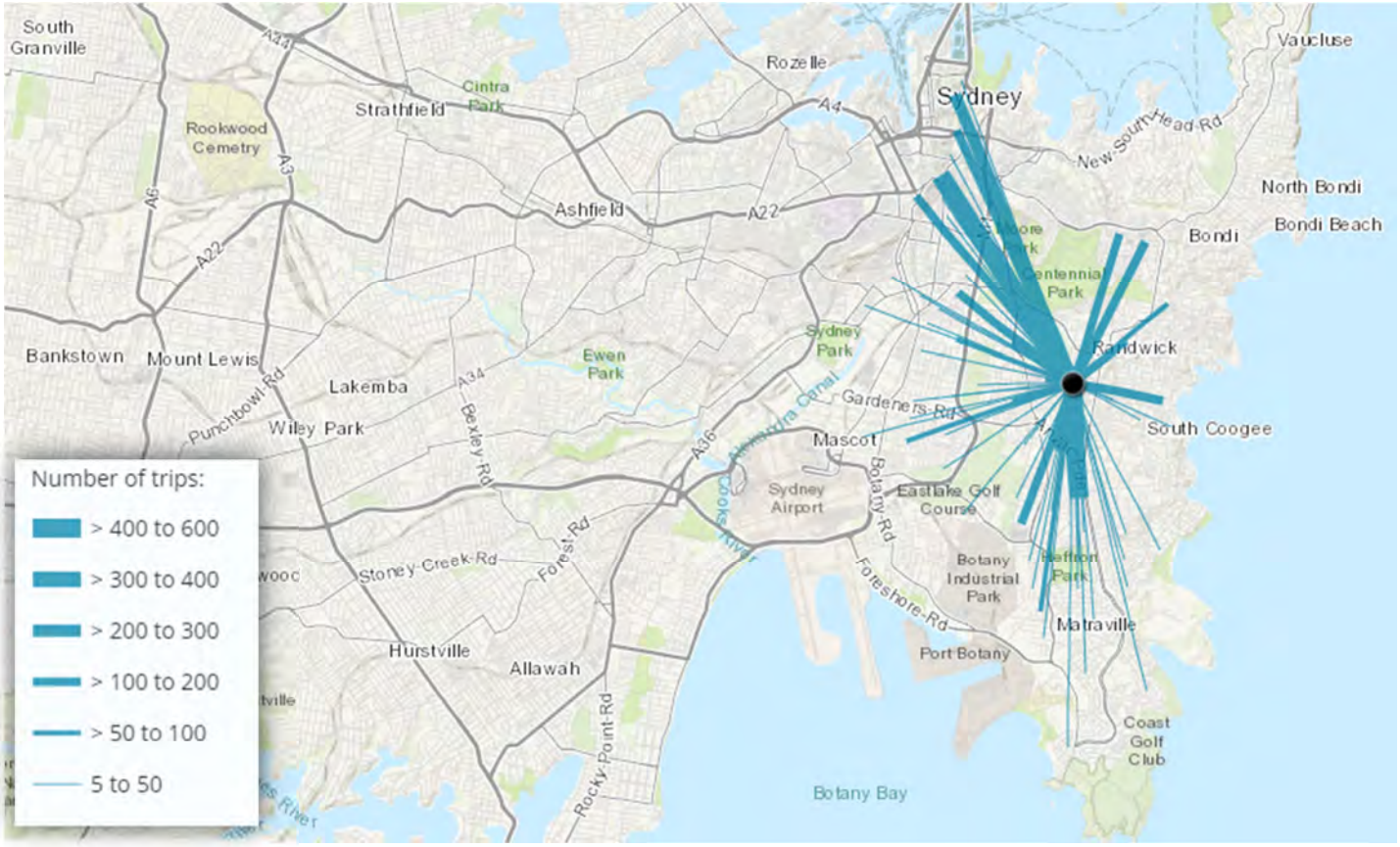
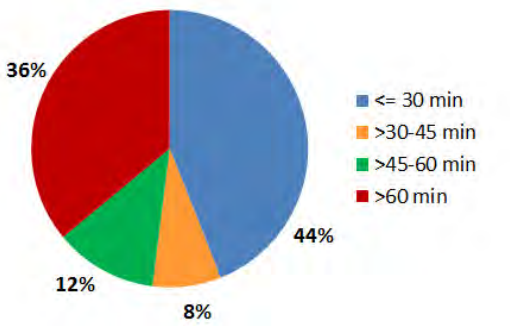


Figure 2016 AM peak 30-minute public transport accessibility: Sydney CBD (Source: UNSW Sydney)

The shortest 30-minute ranges are towards each the inner west, inner east and inner south – each on radial lines served by bus – with the longer ranges serviced by the several rail lines that converge on the CBD, as well as the express ferry to Manly. The radial lines toward the corridor are some of the shortest, indicating potential road network performance issues may exist across and to the north of the corridor (noting the number of services along north-south corridors in the area are quite high).





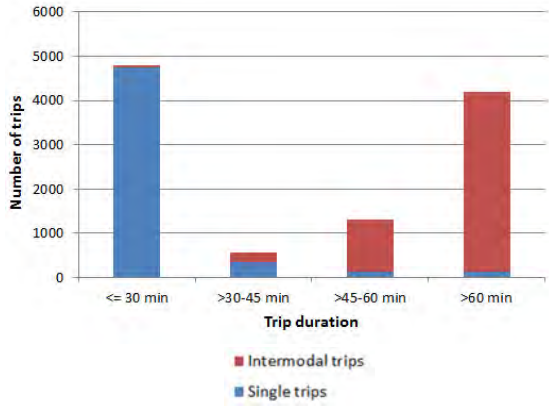


Figure 2016 AM peak 30-minute public transport accessibility: Randwick (Source: UNSW Sydney)

The shortest 30-minute range is towards the project area, validating feedback from stakeholders that road network performance in the corridor area is a barrier to bus movement performance. The longest are towards the city which are served by buses operating along Anzac Parade and Alison Road or the parallel dedicated bus corridor. Randwick has the highest portion of trips >60 minutes however this is likely more associated the more dispersed origins typically associated with students and health employees / visitors – that form a key part of the Randwick transport task – that require use of more than one mode.

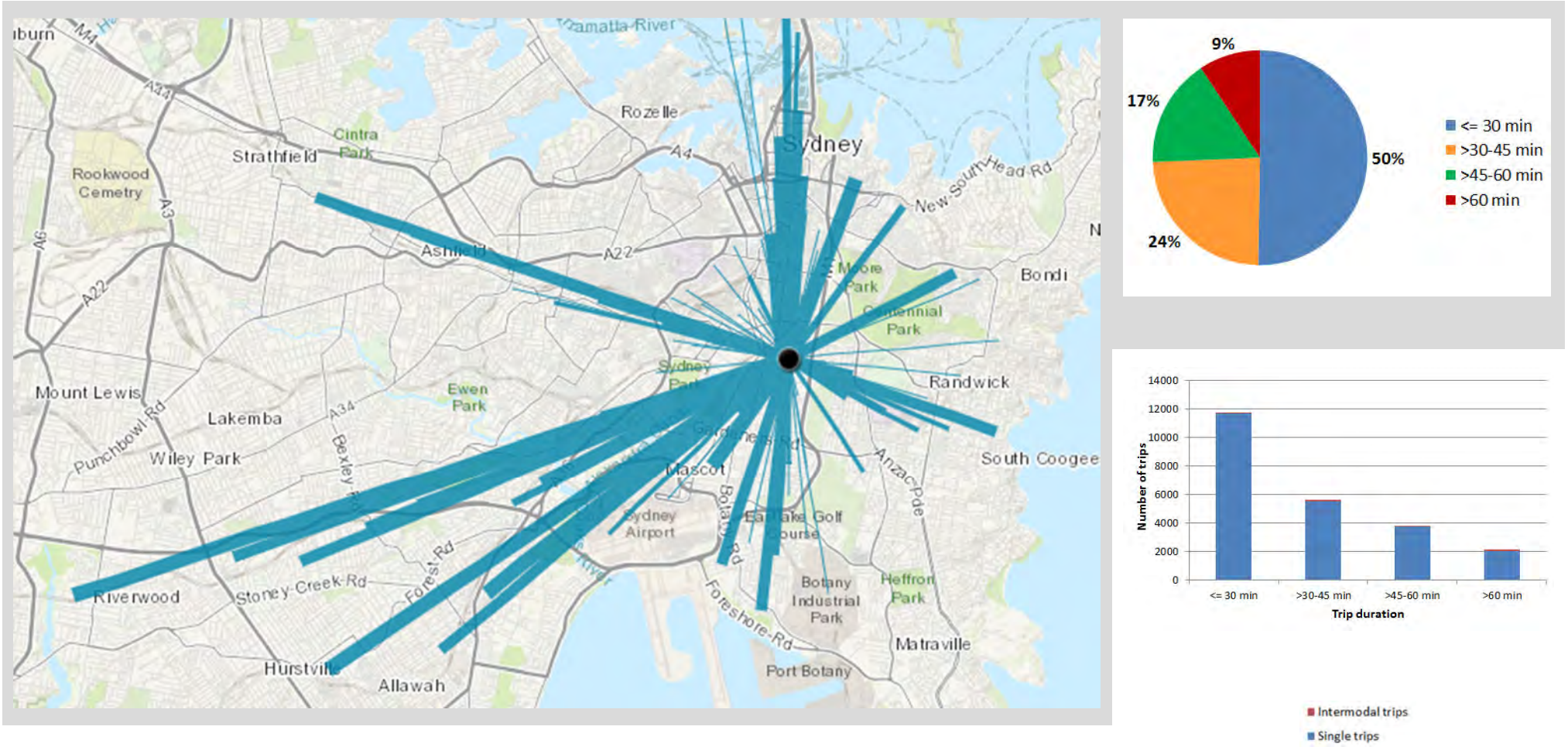


Figure 2016 AM peak 30-minute public transport accessibility: Green Square (Source: UNSW Sydney)

The 30-minute is much more skewed toward the T1, T8 and T4 rail corridors that are easily accessible to the Green Square centre. Shortest ranges are towards the southern east suburbs and inner west – further reinforcing east-west movement by public transport in the area is limited.

Appendix B

Cyclist data

B1 Cyclist data

Table: Cyclist volumes at key intersections (Source: Tracsis, 2015)

Intersecting Road	AM Peak Hour	PM Peak Hour	13 Hour Weekday Total (6am 7pm)
Maddox Street	No count information available		
Fountain Street			
Botany Road			
Elizabeth Street			
Bourke Street	20	10	70
South Dowling Street	0	10	30
Anzac Parade	20	10	150

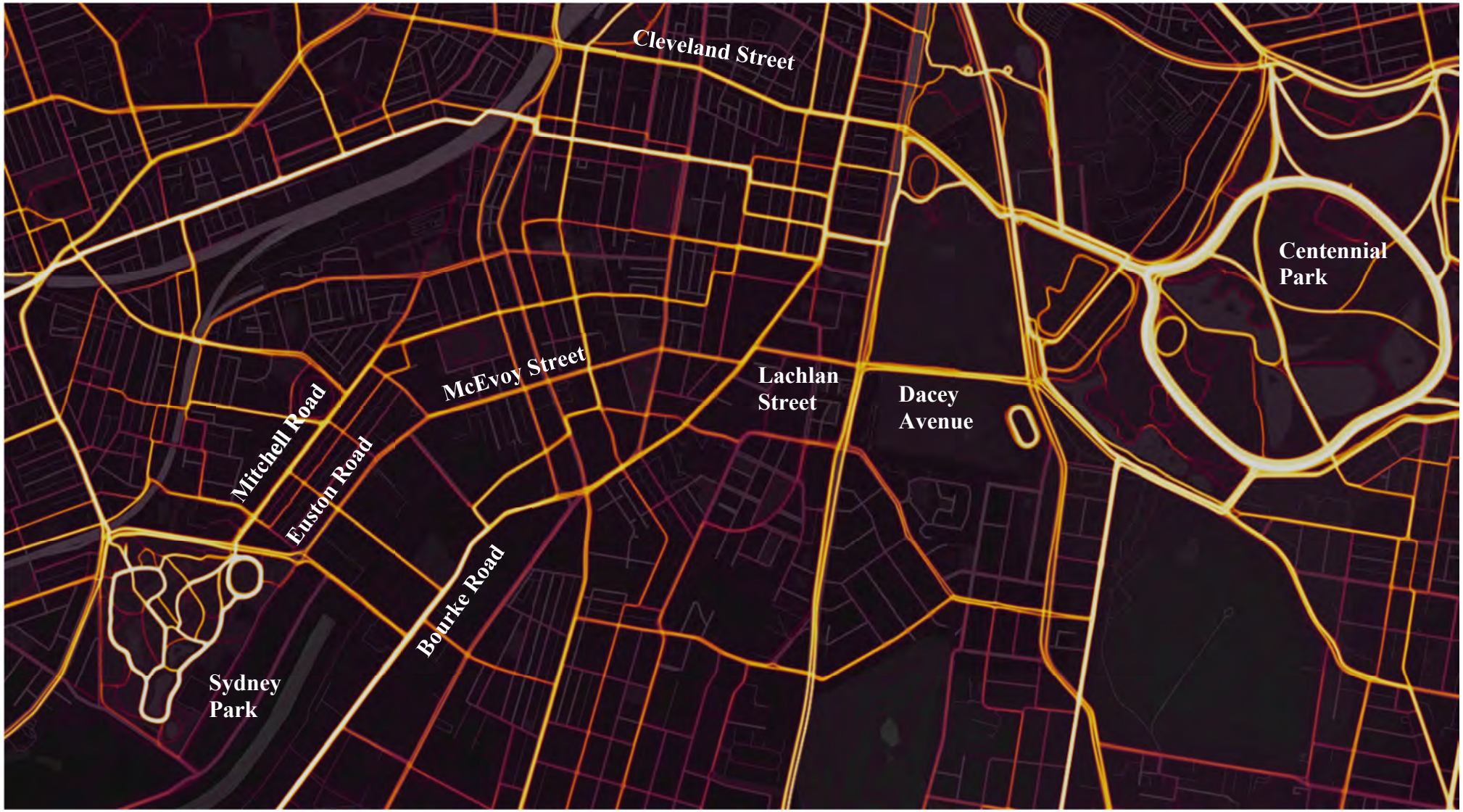


Figure: Strava Heatmap (Source: Strava 2018)

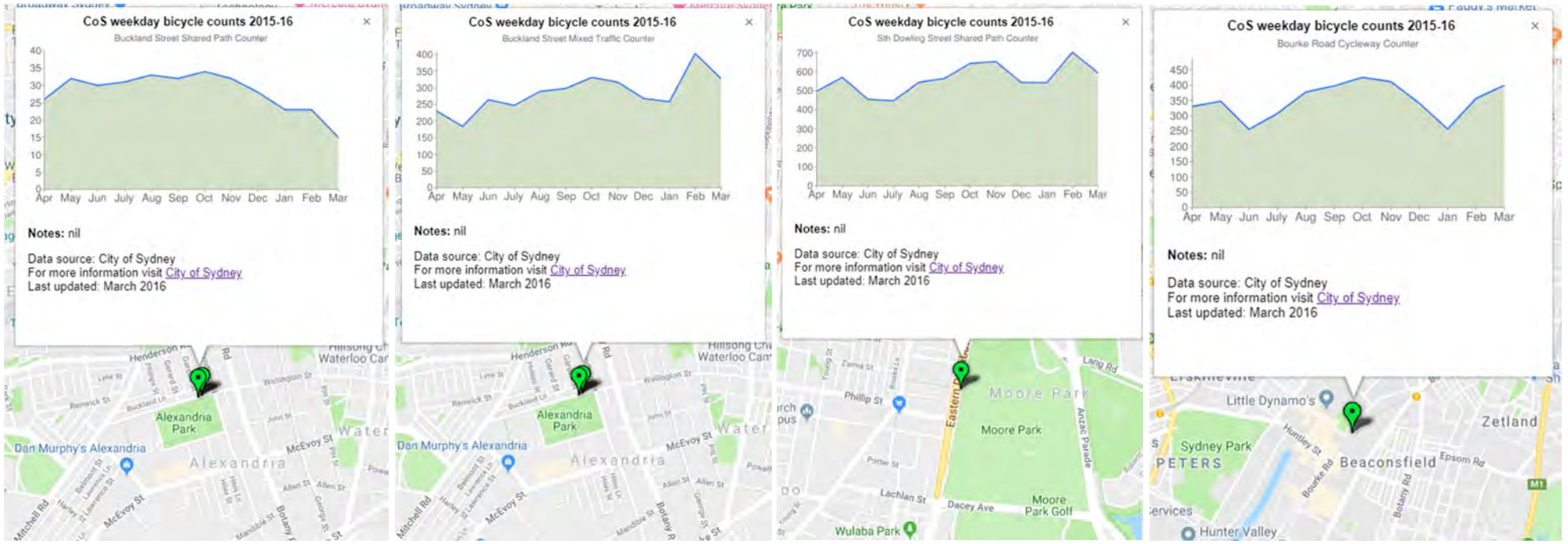
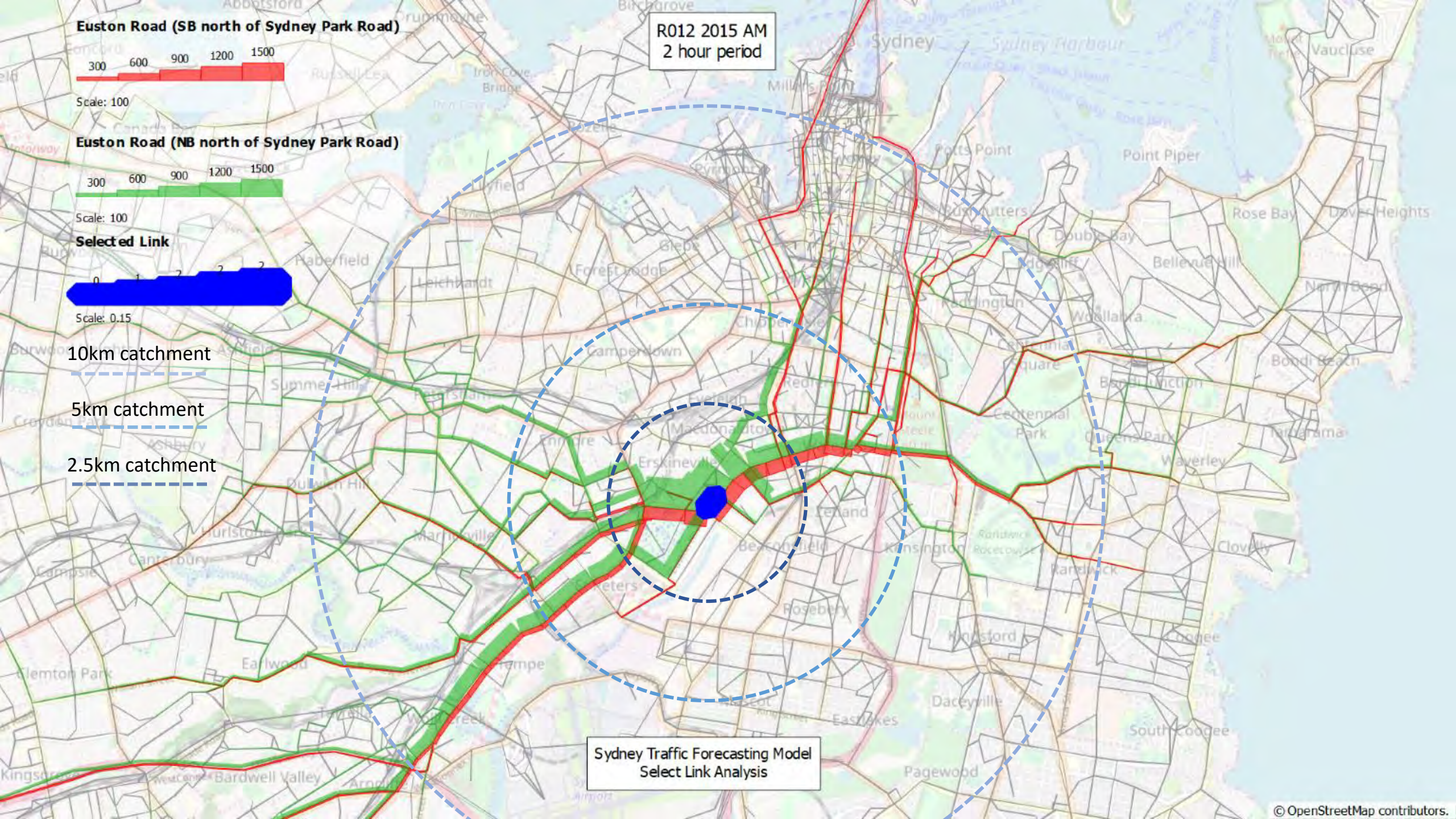


Figure: Weekday cyclist counts at (from left to right) Buckland Street shared path, Buckland Street mixed traffic, South Dowling Street shared path, Bourke Road cycleway (Source: City of Sydney, 2016)

Appendix C

Select link analysis

C1 2015 AM peak select link analysis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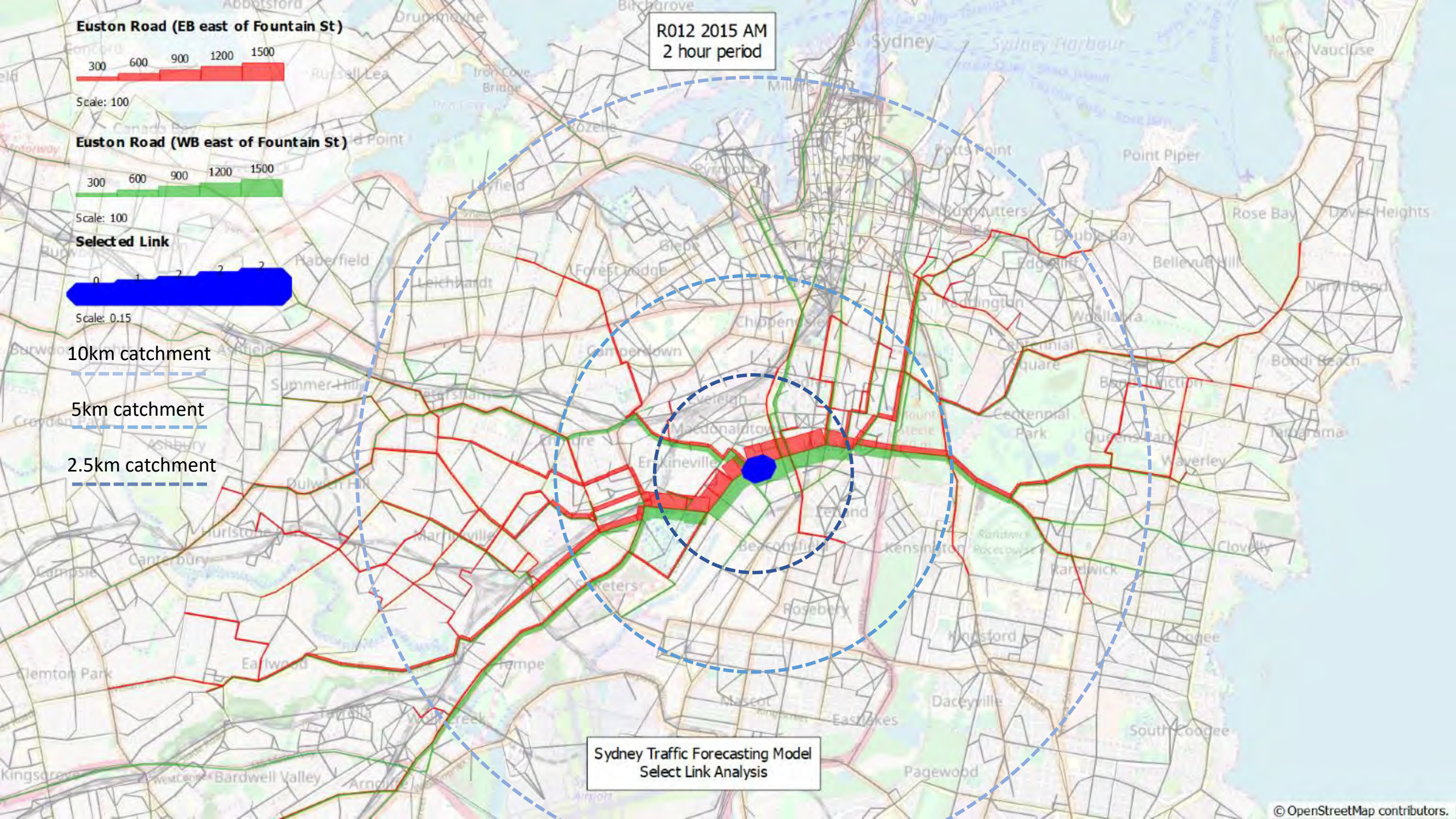
5km catchment
2.5km catchment
R012 2015 AM
2 hour period
Sydney Traffic Forecasting Model
Select Link Analysis
© OpenStreetMap contributors.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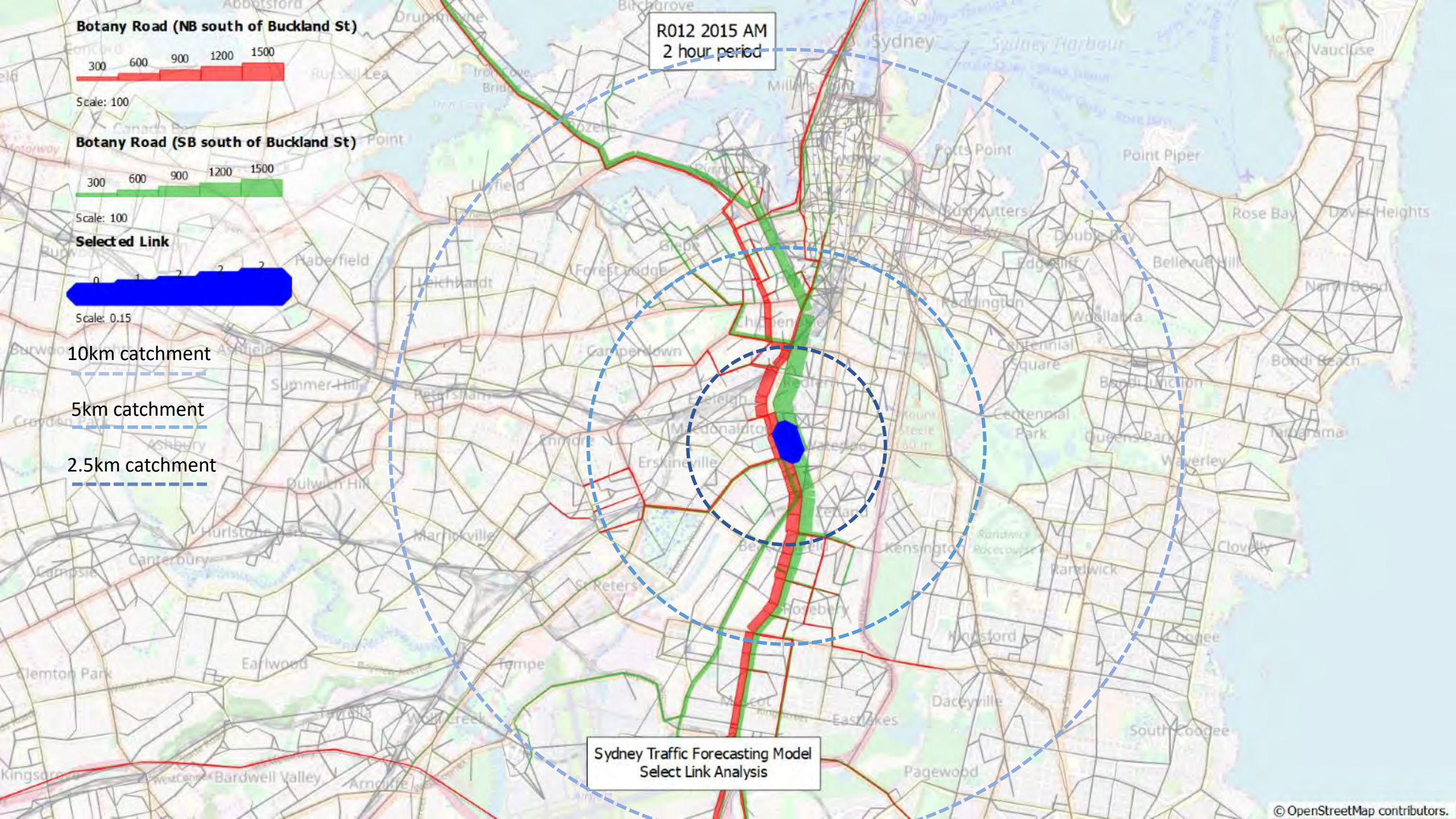
© OpenStreetMap contributors.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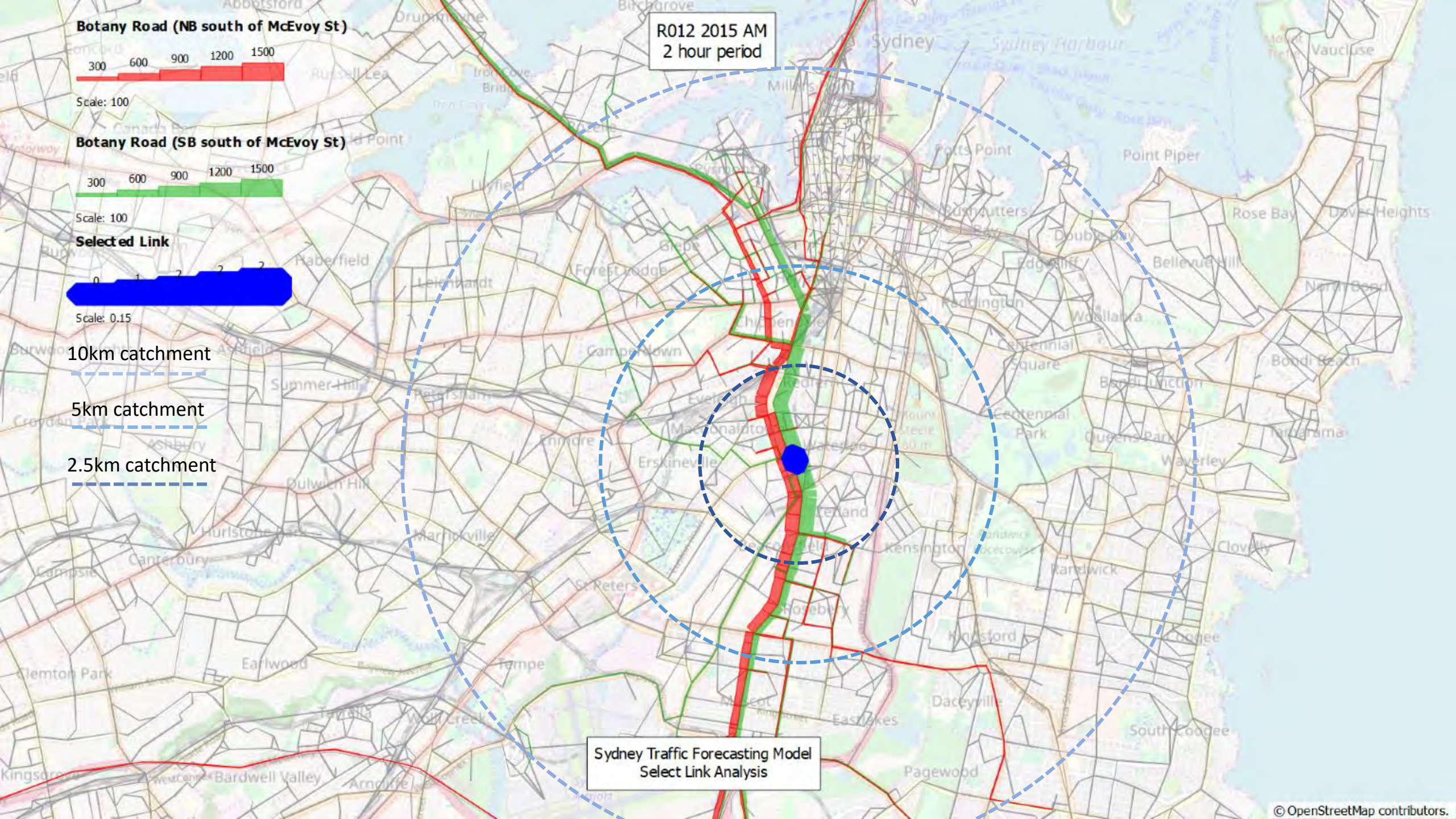
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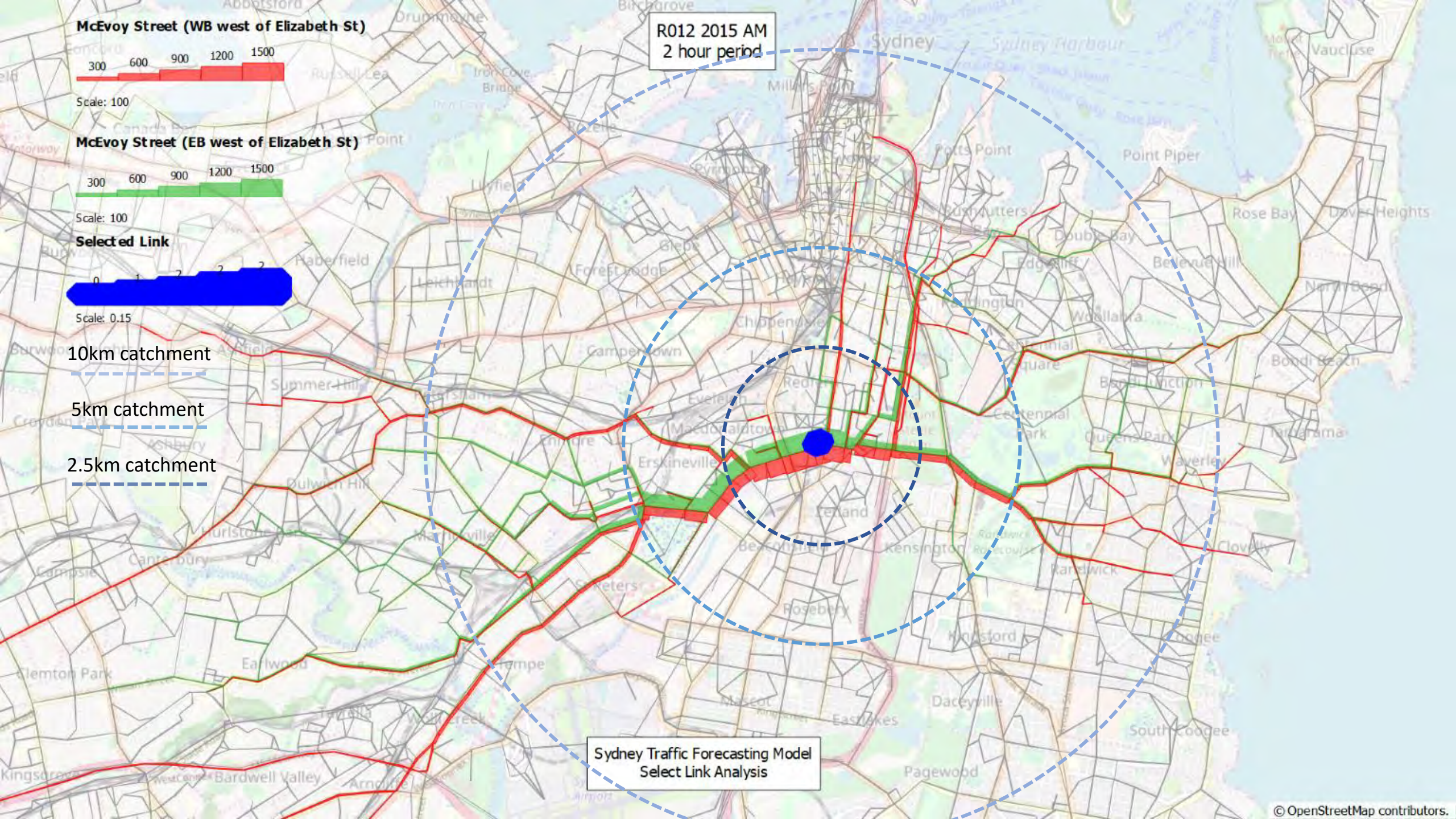
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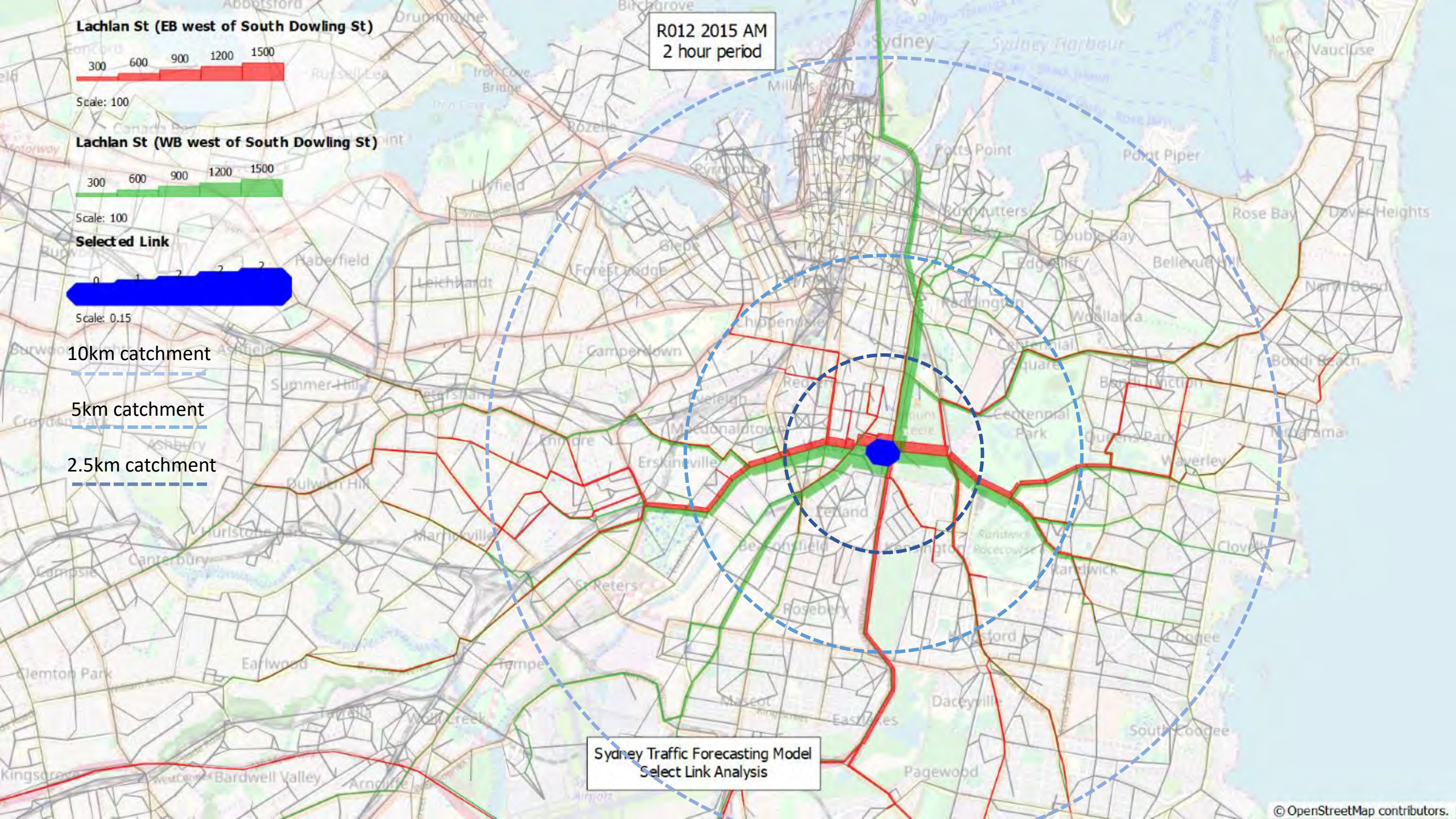
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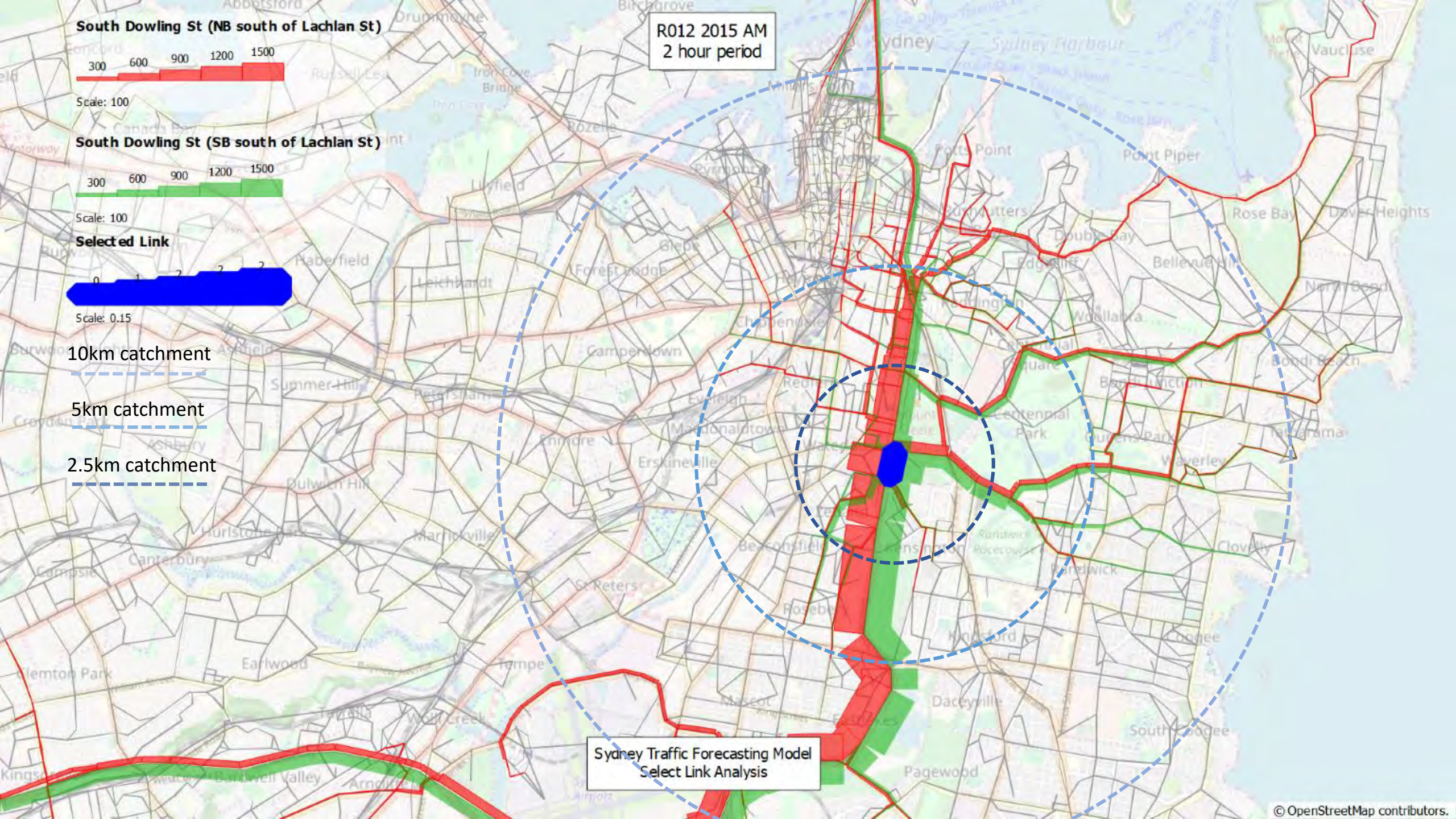
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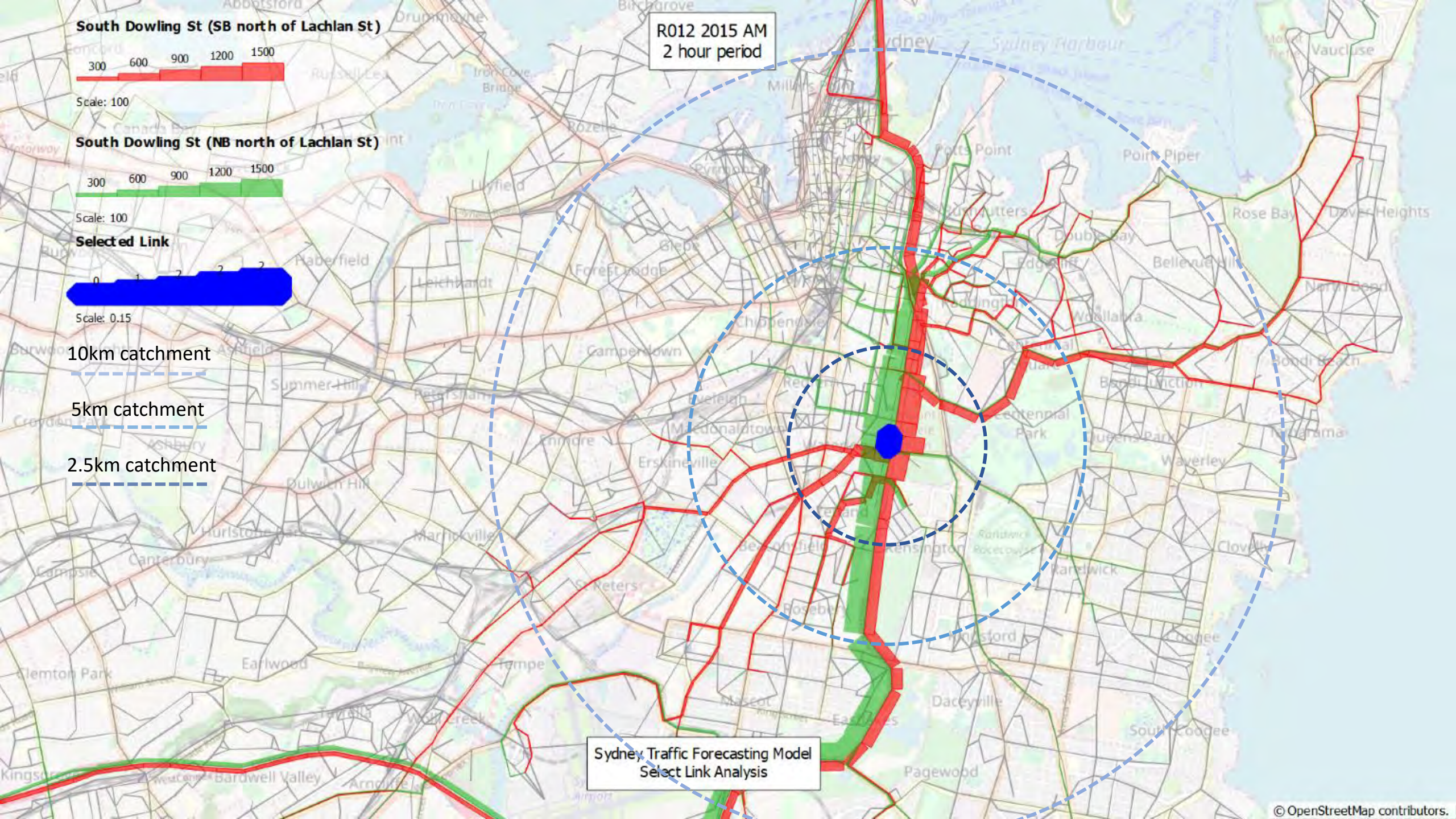
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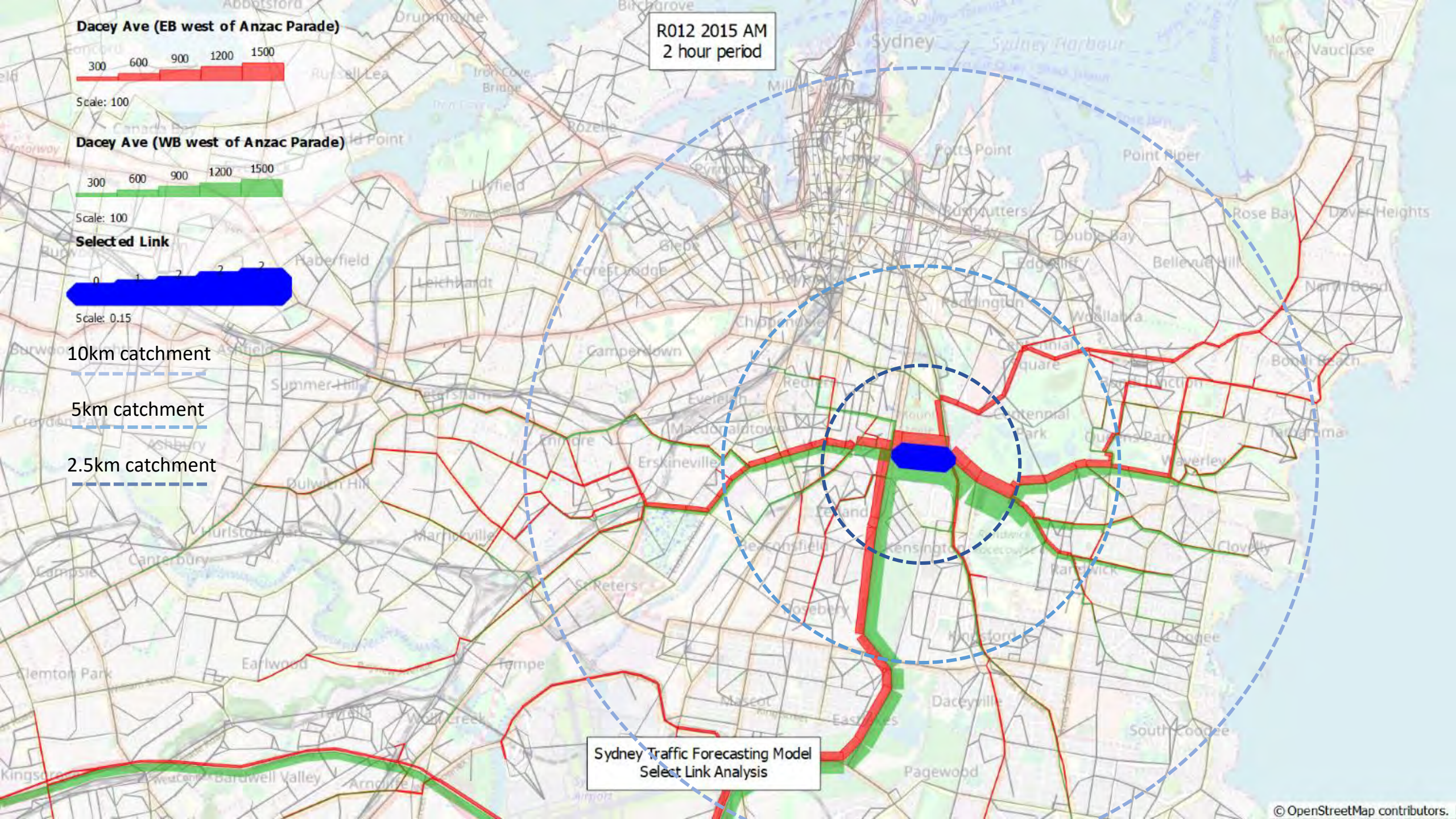
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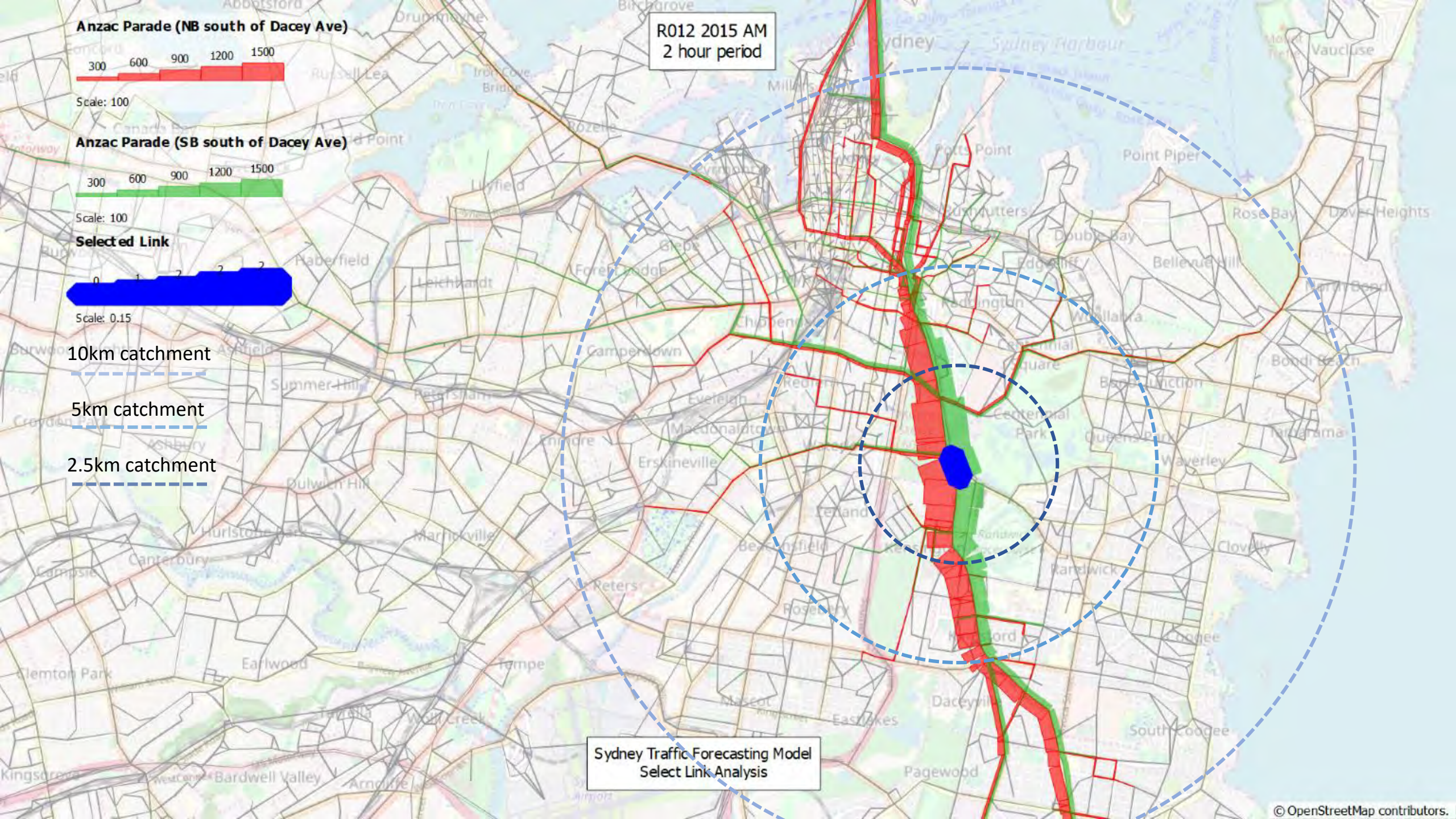
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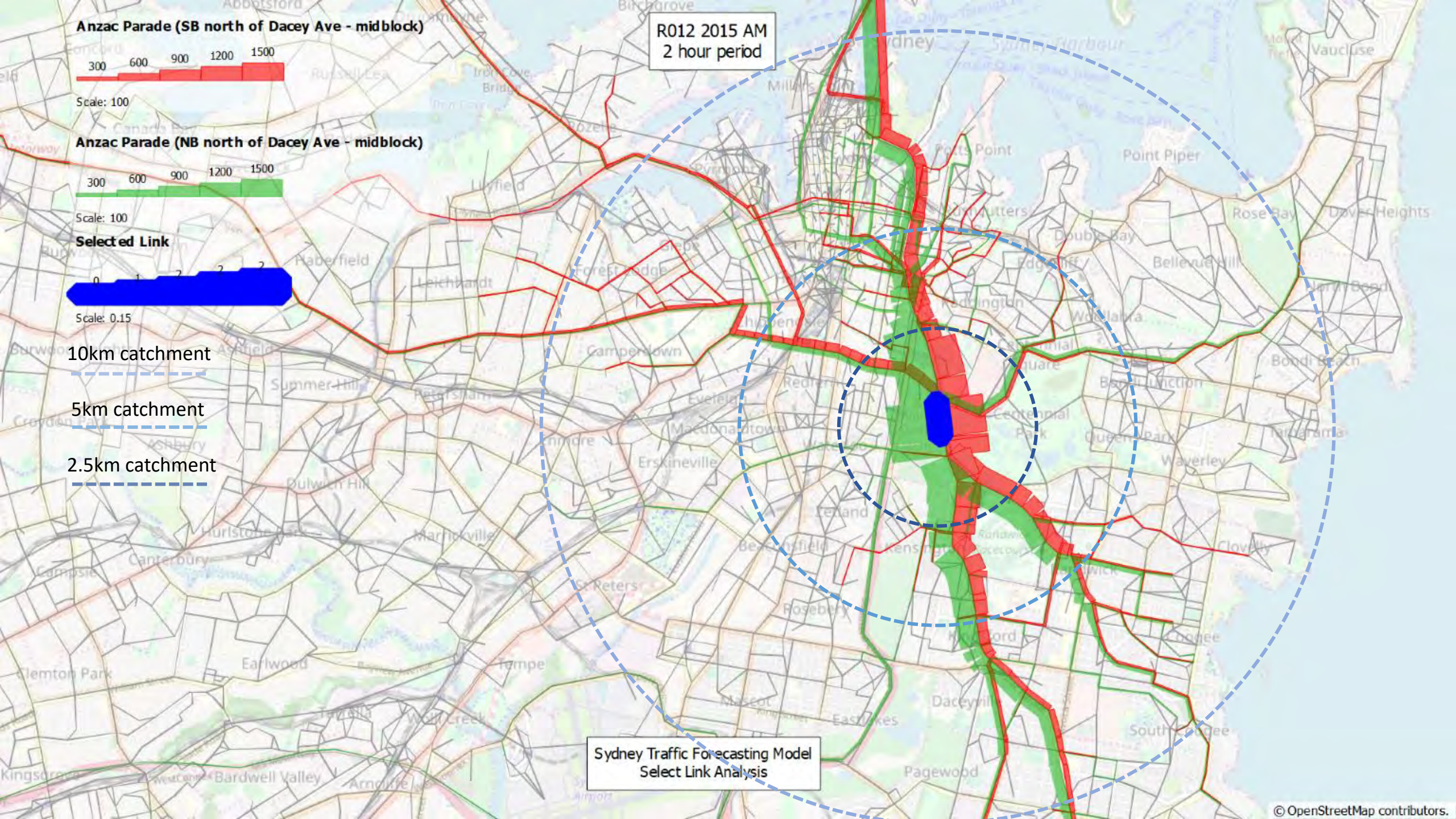
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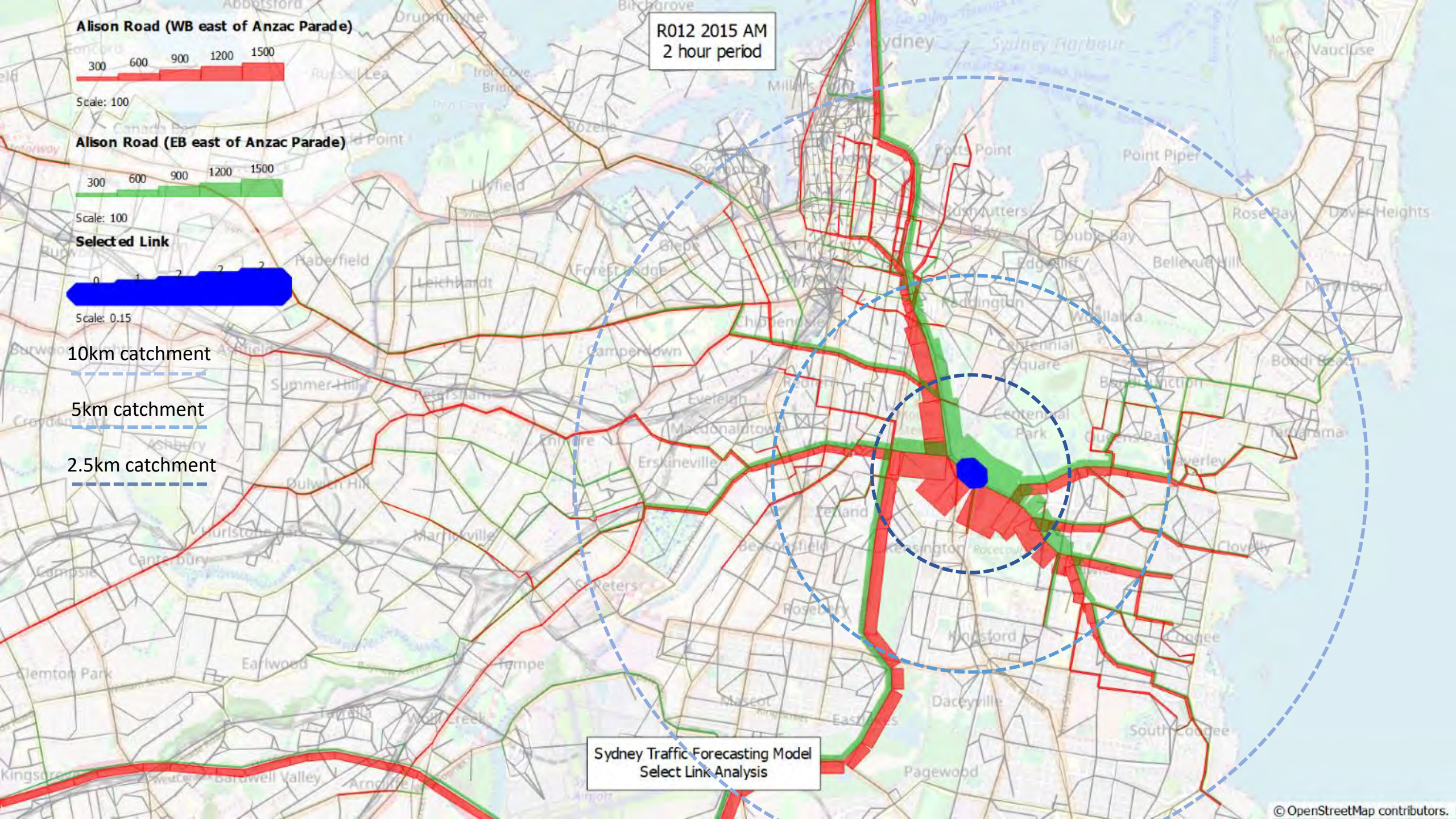
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2 hour period
Sydney Traffic Forecasting Model
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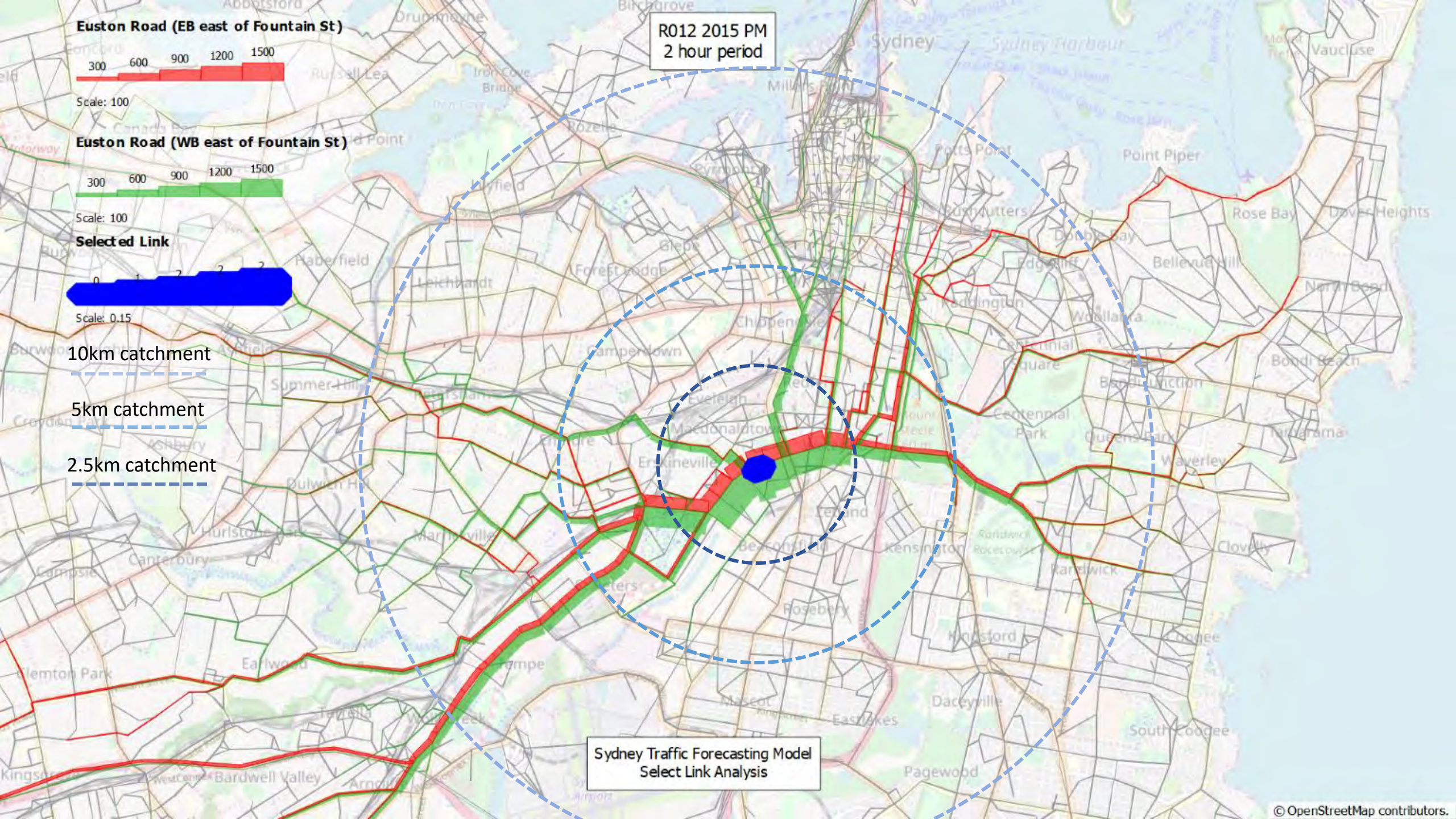
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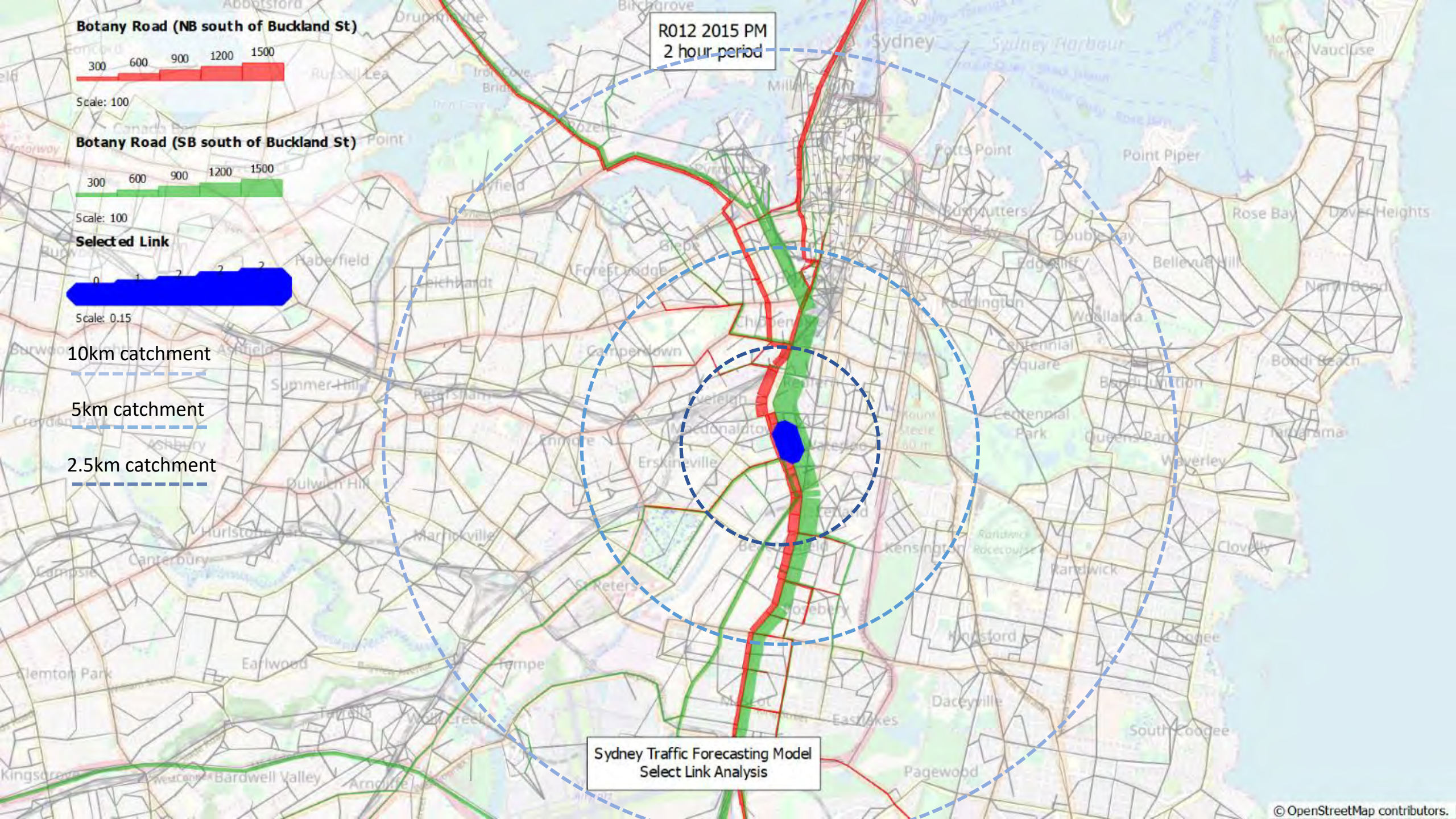
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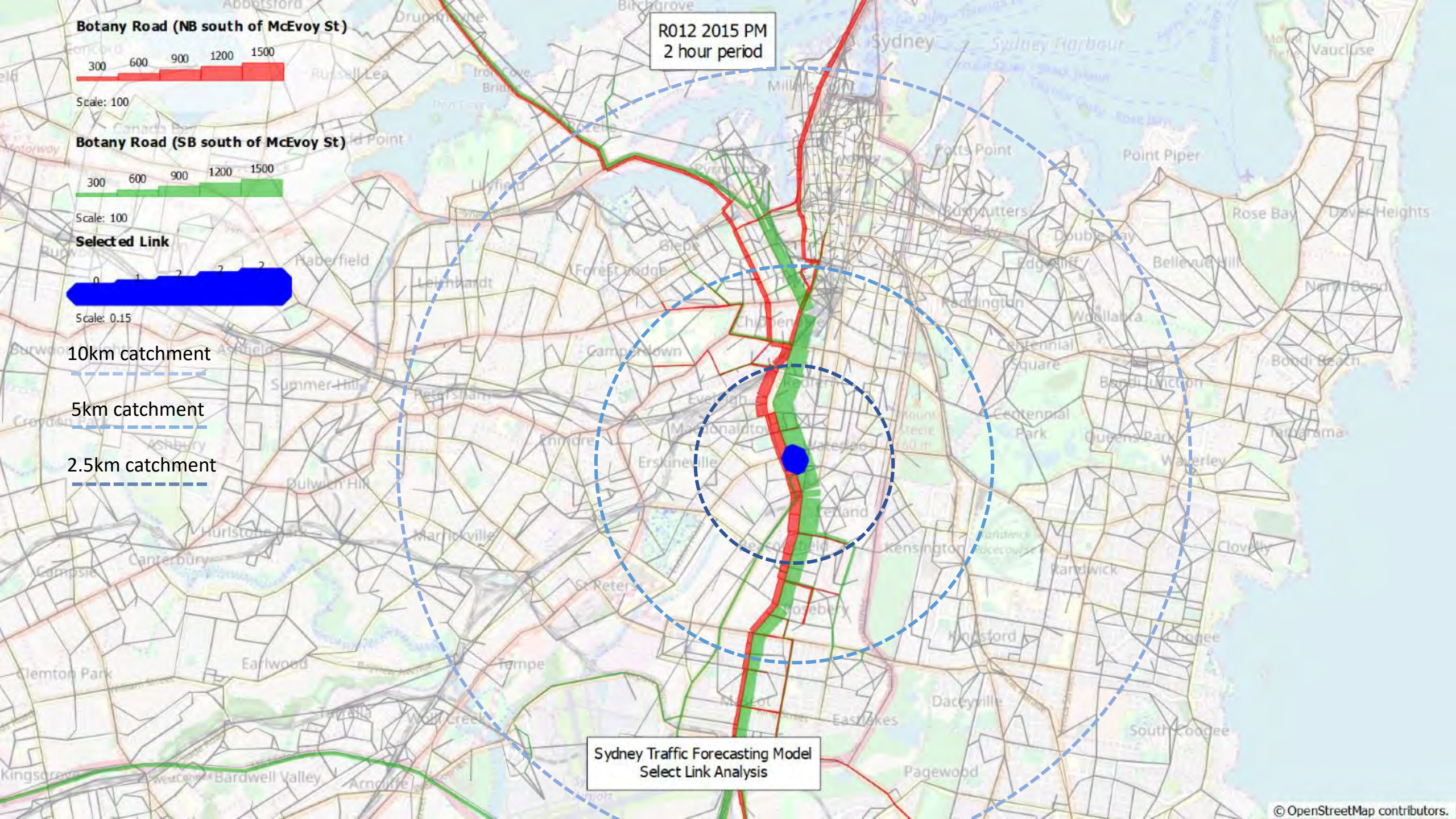
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10km catchment
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2.5km catchment
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2 hour period
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Select Link Analysis
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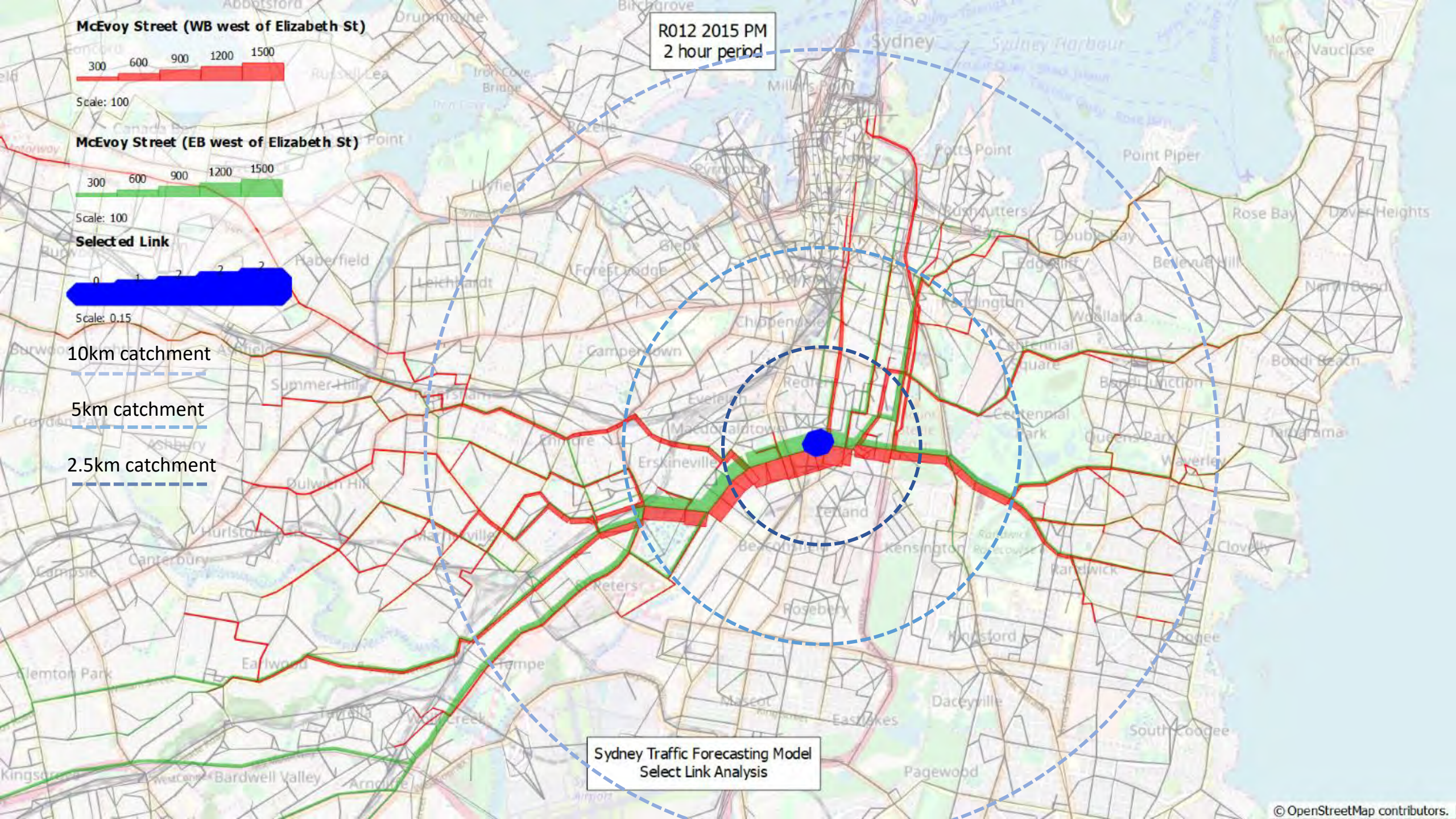
McEvoy Street (WB west of Elizabeth St)
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McEvoy Street (EB west of Elizabeth St)
300 600 900 1200 1500
Scale: 100
Selected Link
0 1 2 2 2
Scale: 0.15
10km catchment
5km catchment
2.5km catchment
R012 2015 PM
2 hour period
Sydney Traffic Forecasting Model
Select Link Analysis
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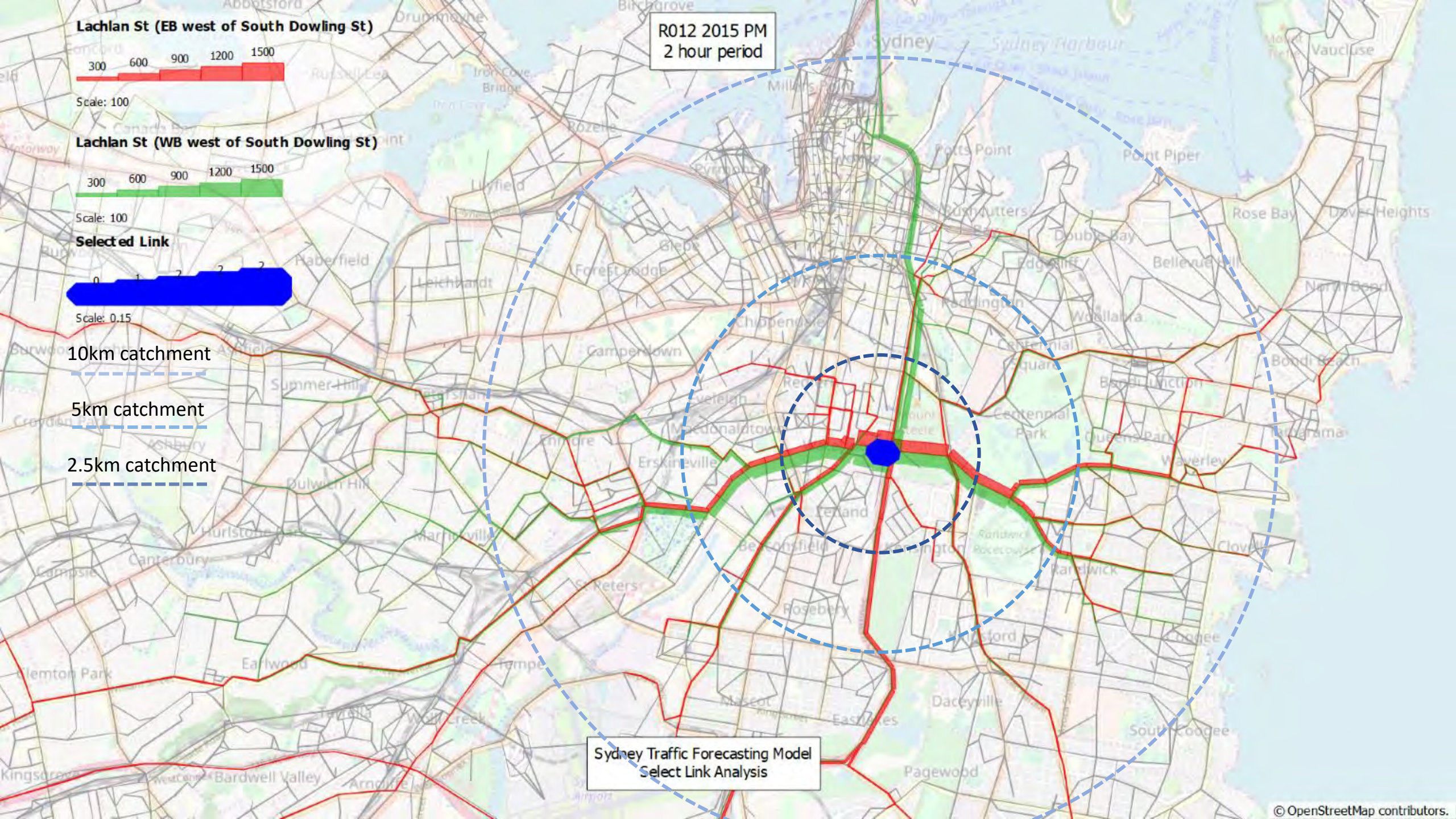
Lachlan St (EB west of South Dowling St)
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Scale: 100
Selected Link
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2 hour period
Sydney Traffic Forecasting Model
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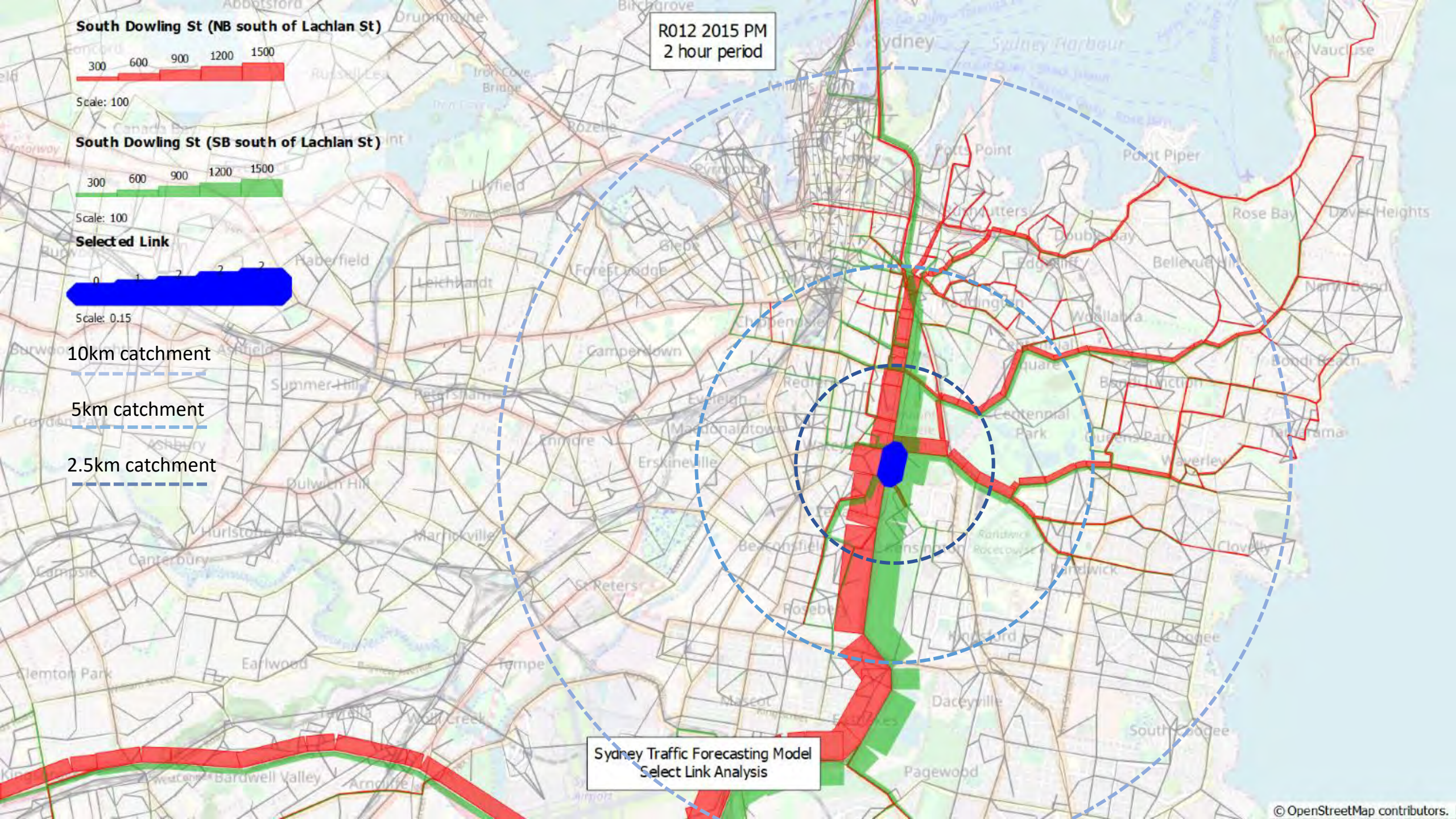
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300 600 900 1200 1500
Scale: 100
Selected Link
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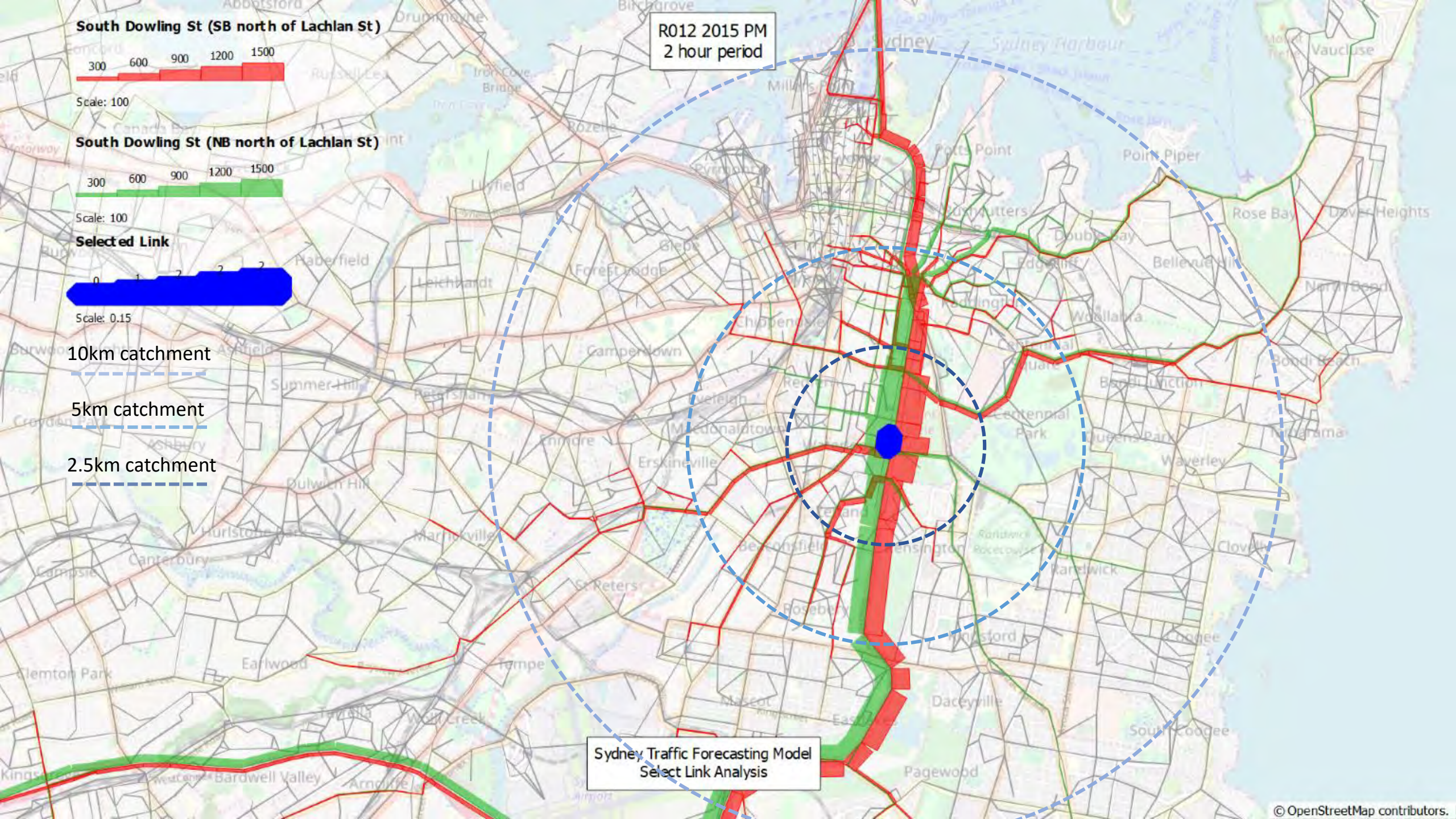
South Dowling St (SB north of Lachlan St)
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Selected Link
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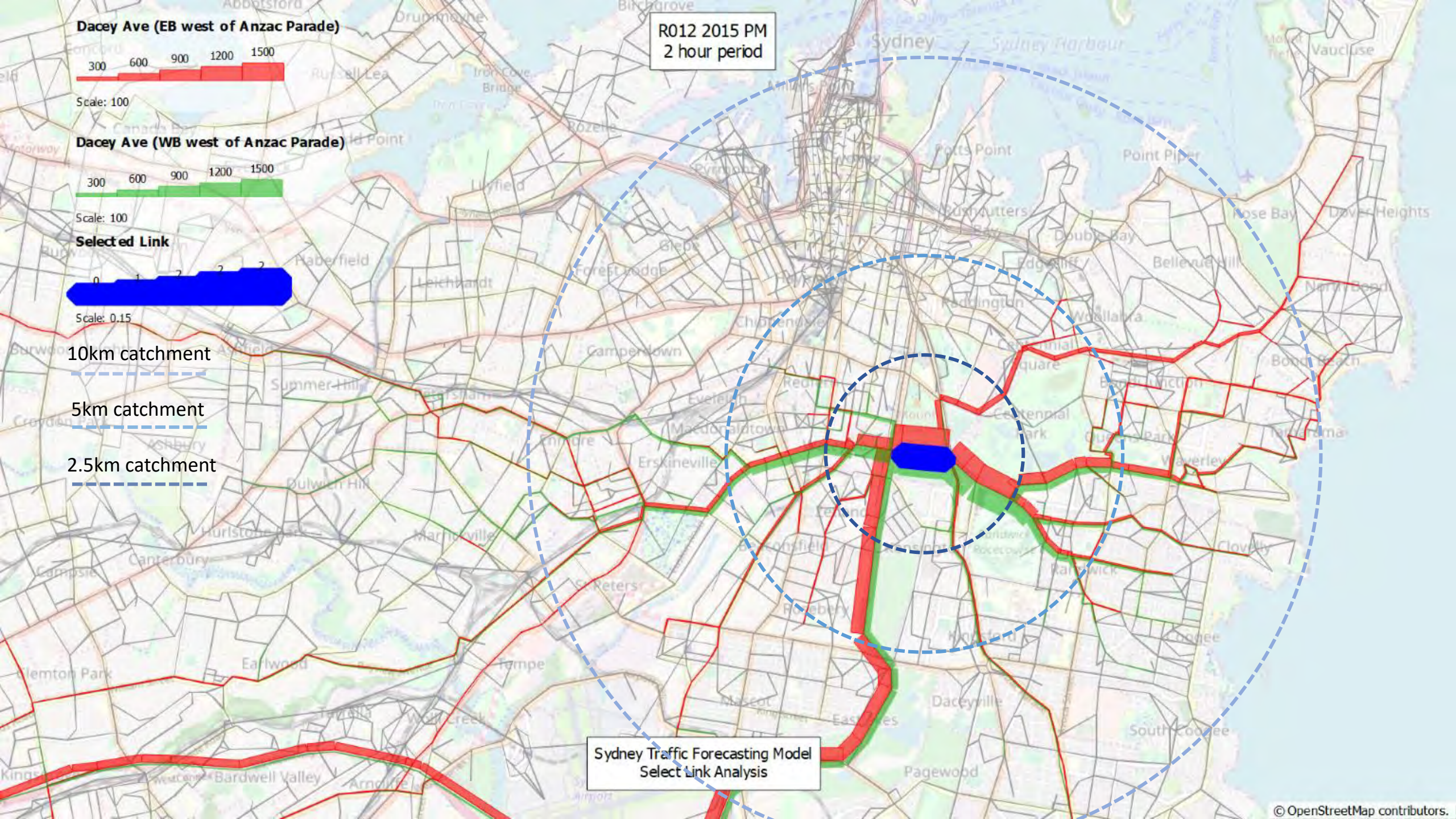
Dacey Ave (EB west of Anzac Parade)
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Dacey Ave (WB west of Anzac Parade)
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Scale: 100
Selected Link
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Sydney Traffic Forecasting Model
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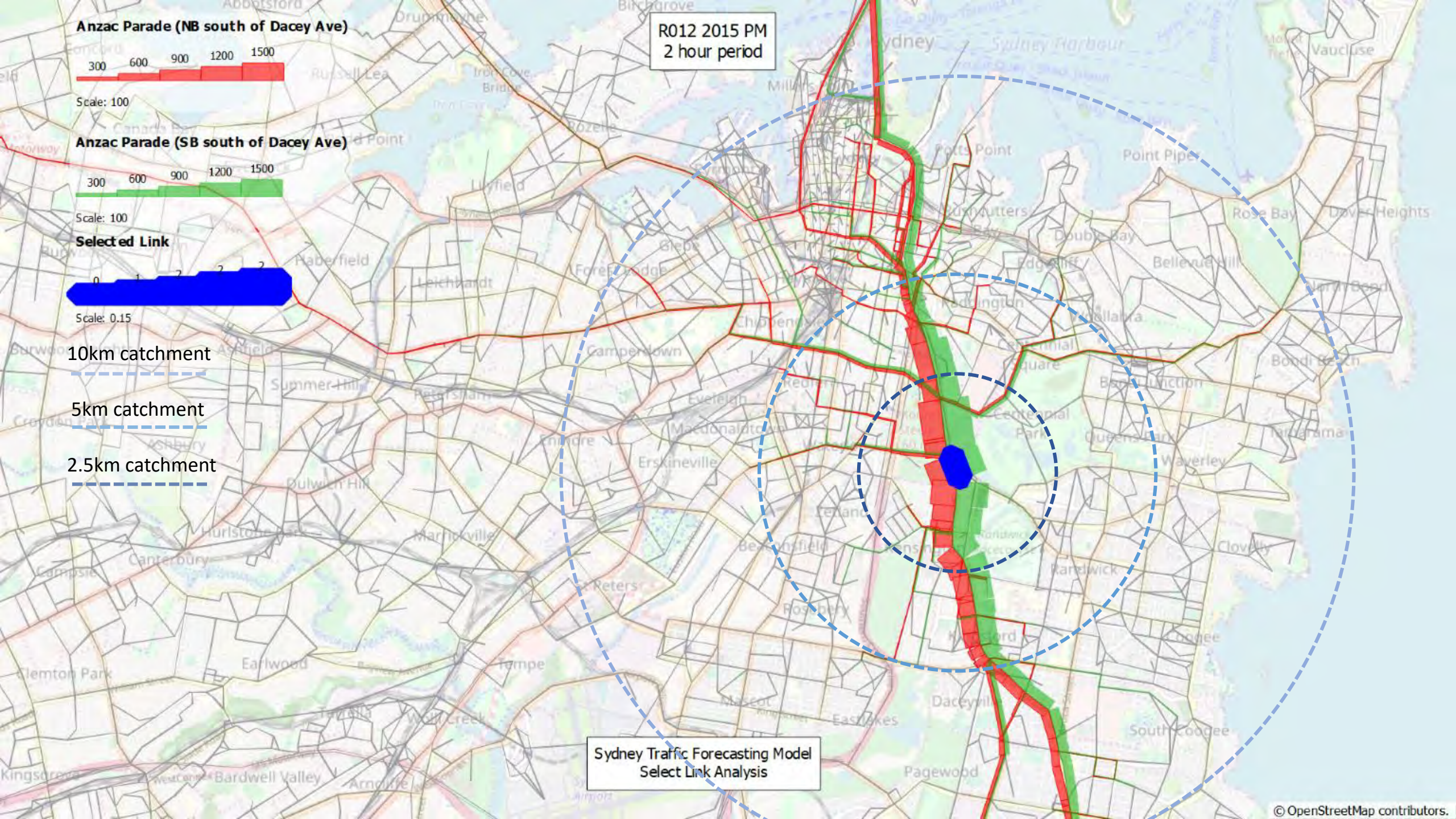
Anzac Parade (NB south of Dacey Ave)
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Selected Link
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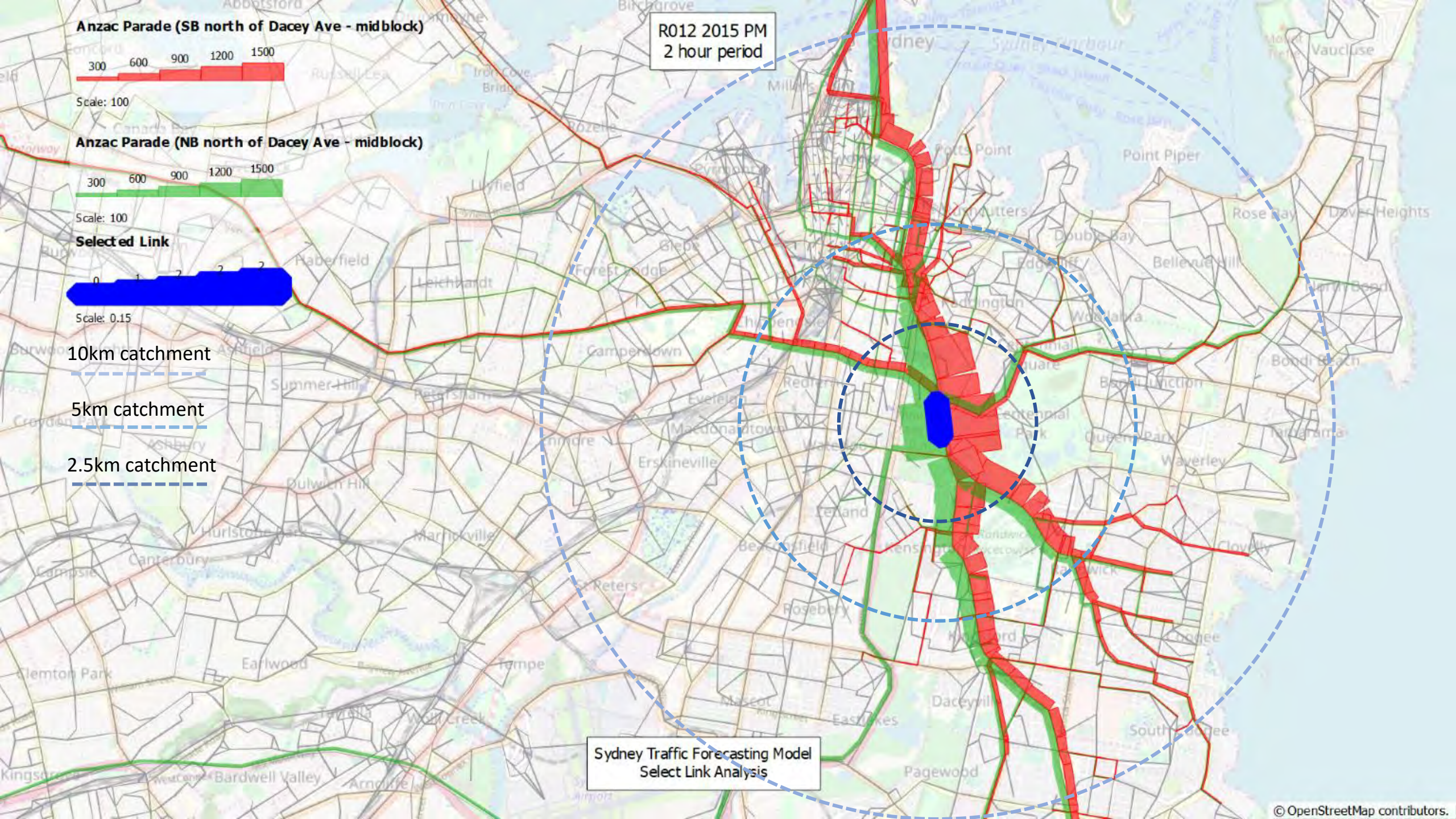
Anzac Parade (SB north of Dacey Ave - midblock)
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Anzac Parade (NB north of Dacey Ave - midblock)
300 600 900 1200 1500
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Selected Link
0 1 2 2 2
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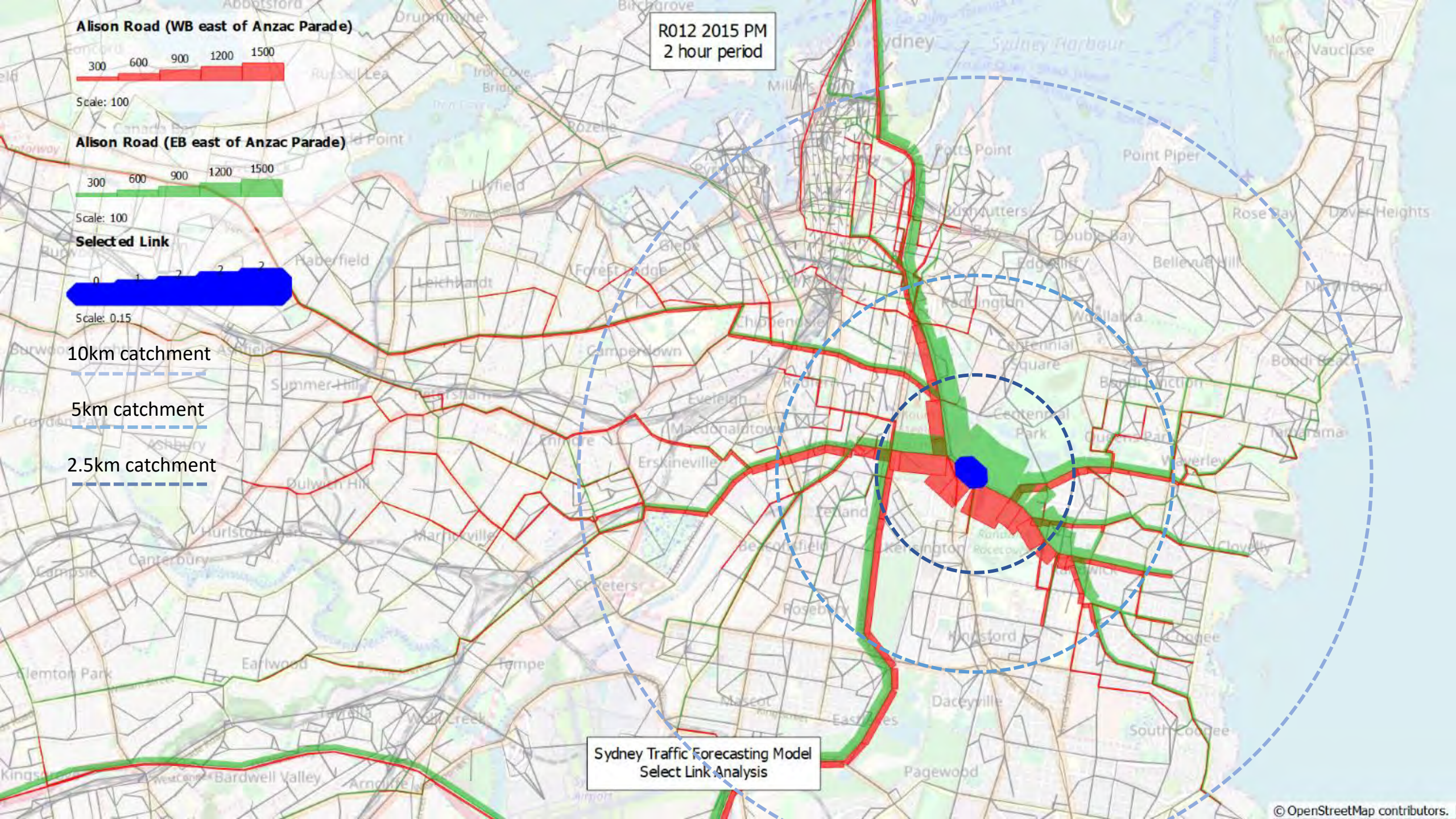
Alison Road (WB east of Anzac Parade)
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Scale: 100
Selected Link
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Scale: 0.15
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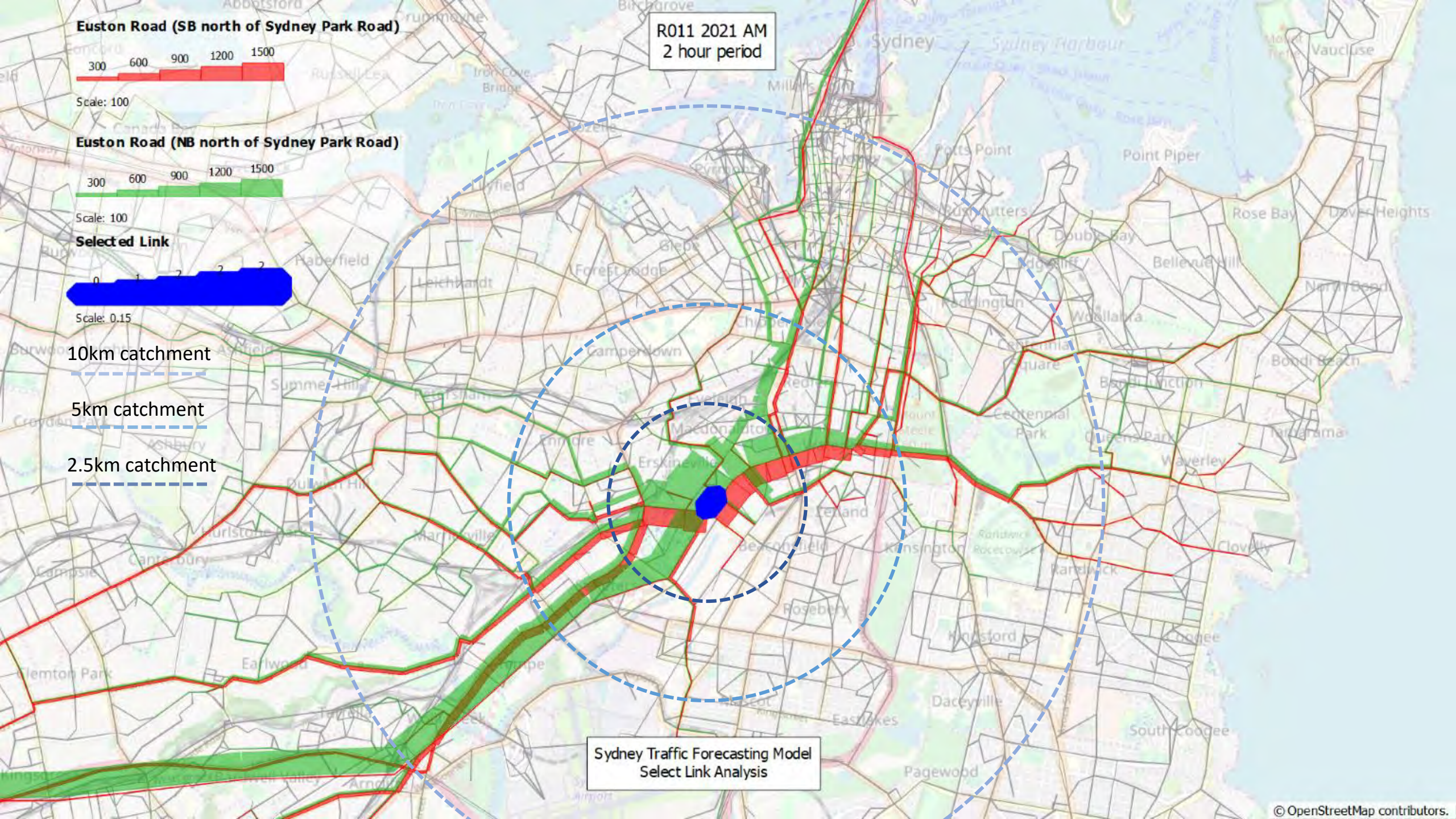
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Scale: 100
Selected Link
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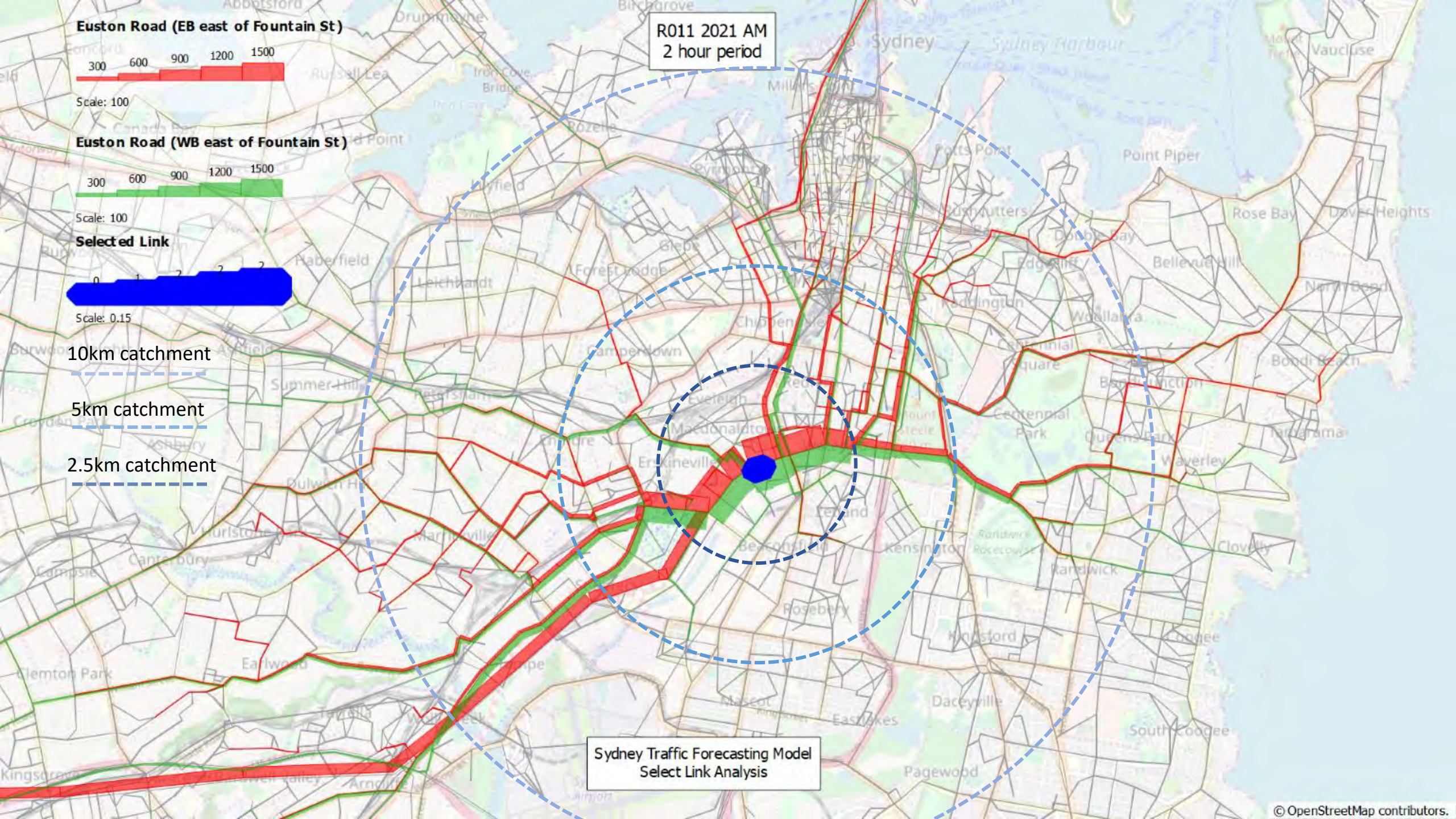
Euston Road (EB east of Fountain St)
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Euston Road (WB east of Fountain St)
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Scale: 100
Selected Link
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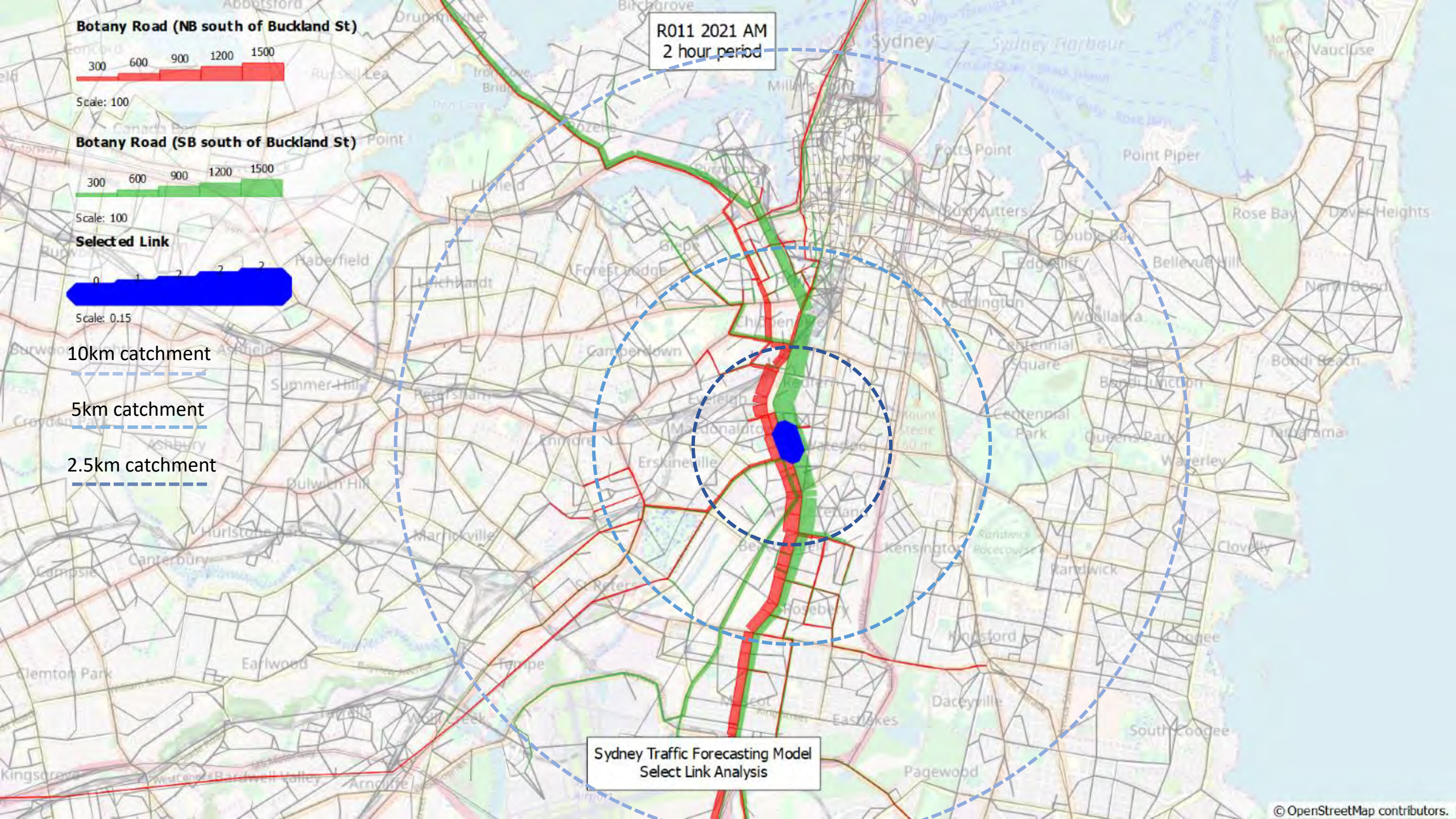
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300 600 900 1200 1500
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Selected Link
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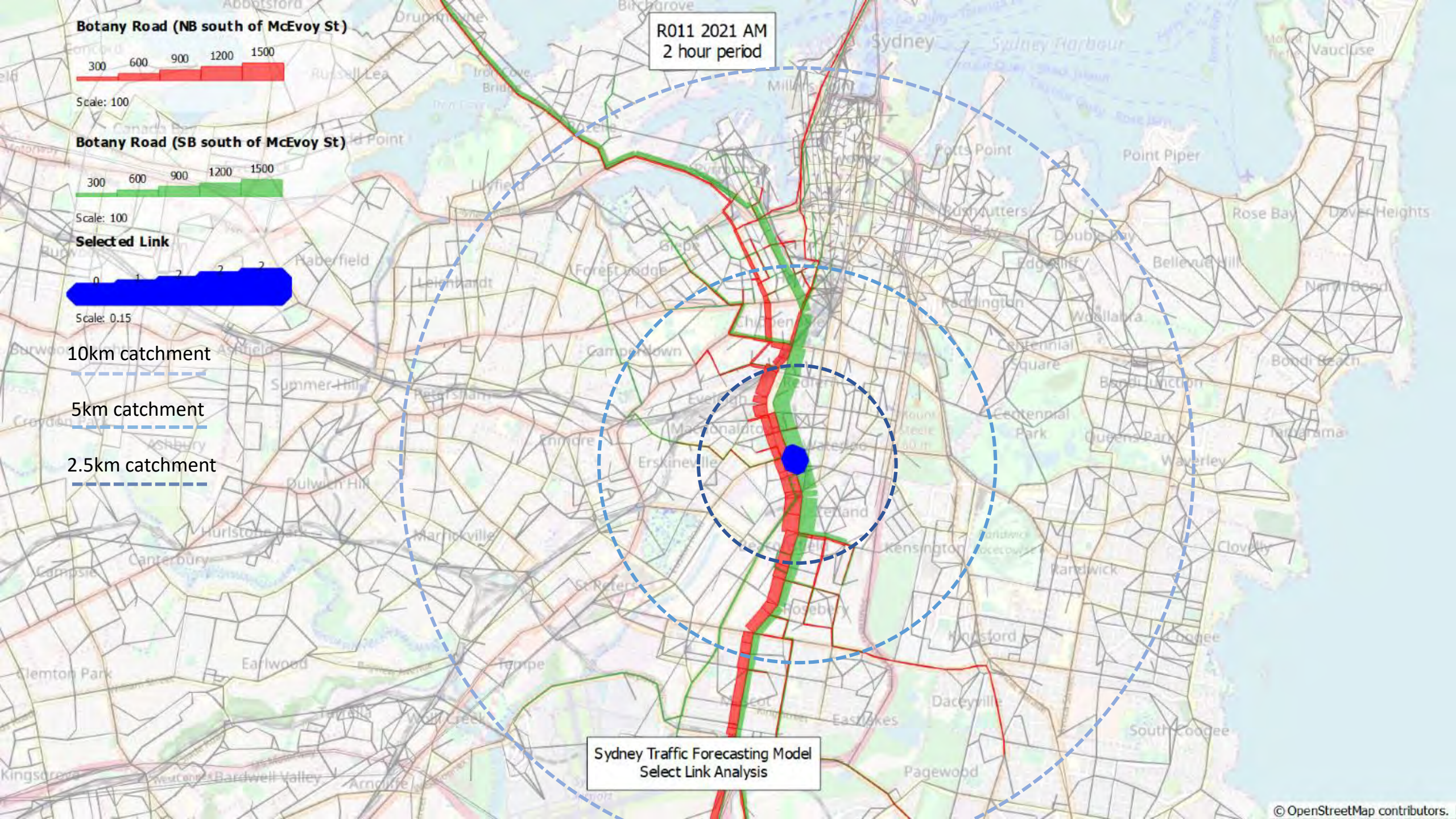
Botany Road (NB south of McEvoy St)
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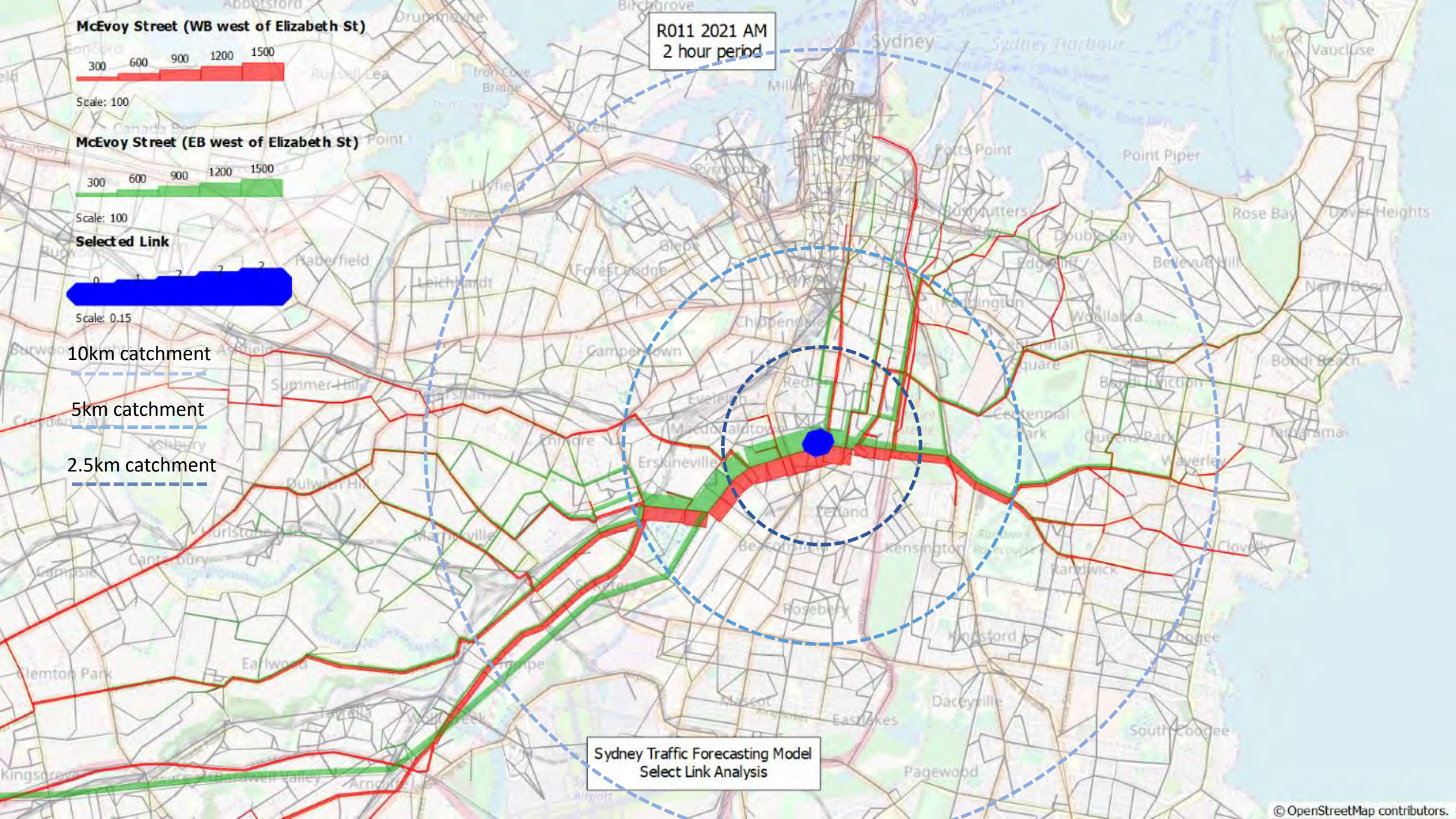
McEvoy Street (WB west of Elizabeth St)
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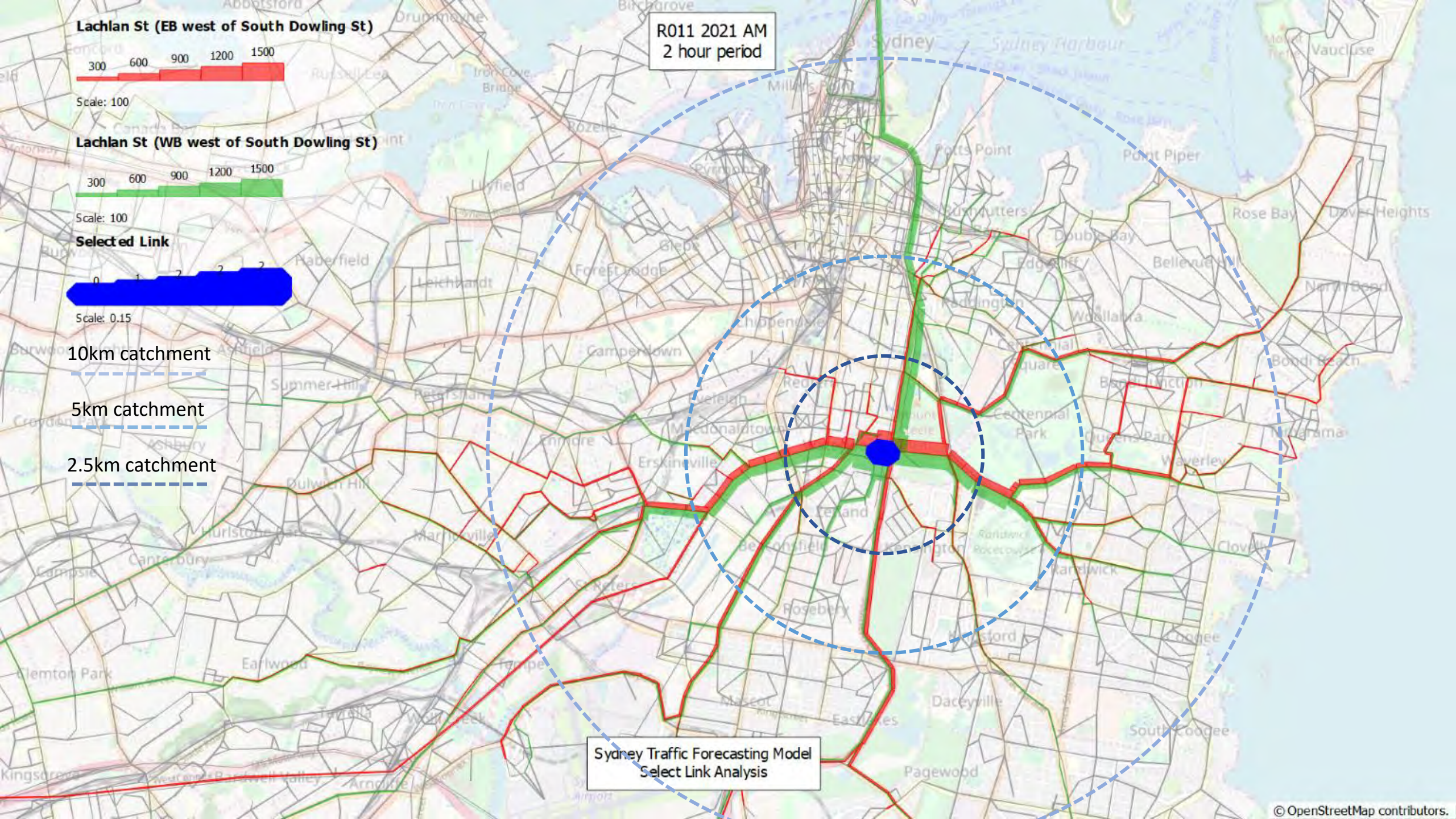
Lachlan St (EB west of South Dowling St)
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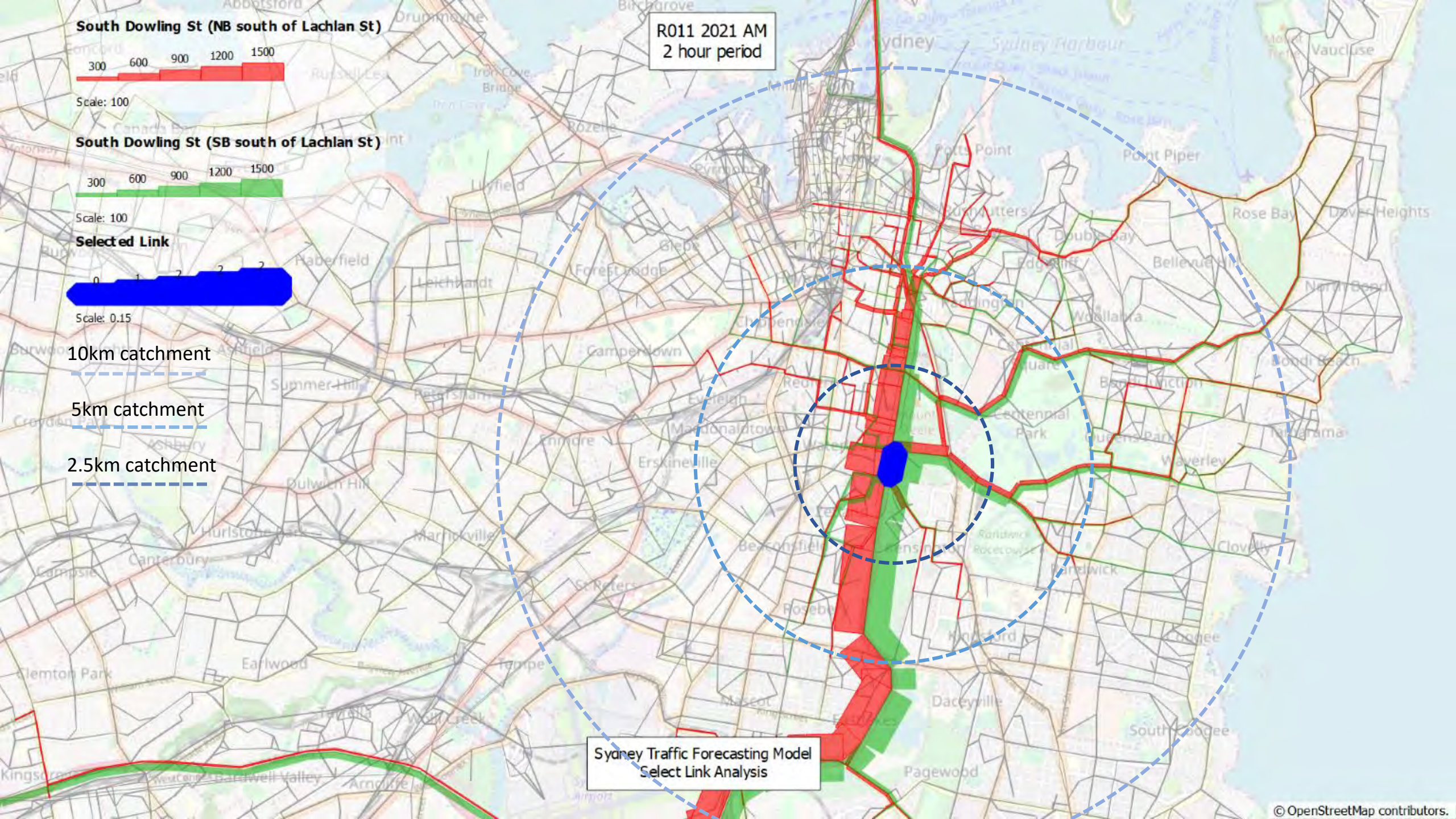
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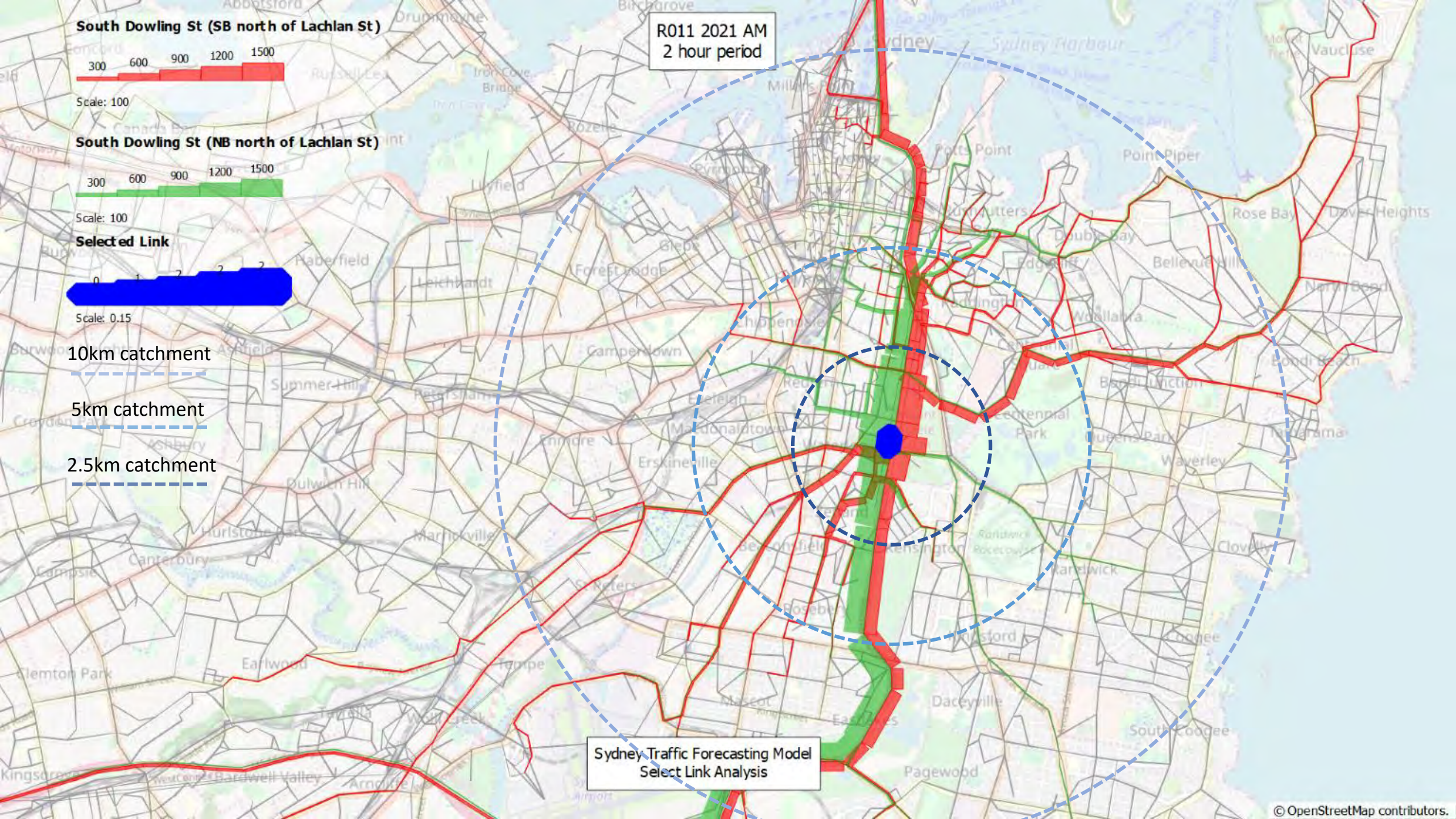
South Dowling St (SB north of Lachlan St)
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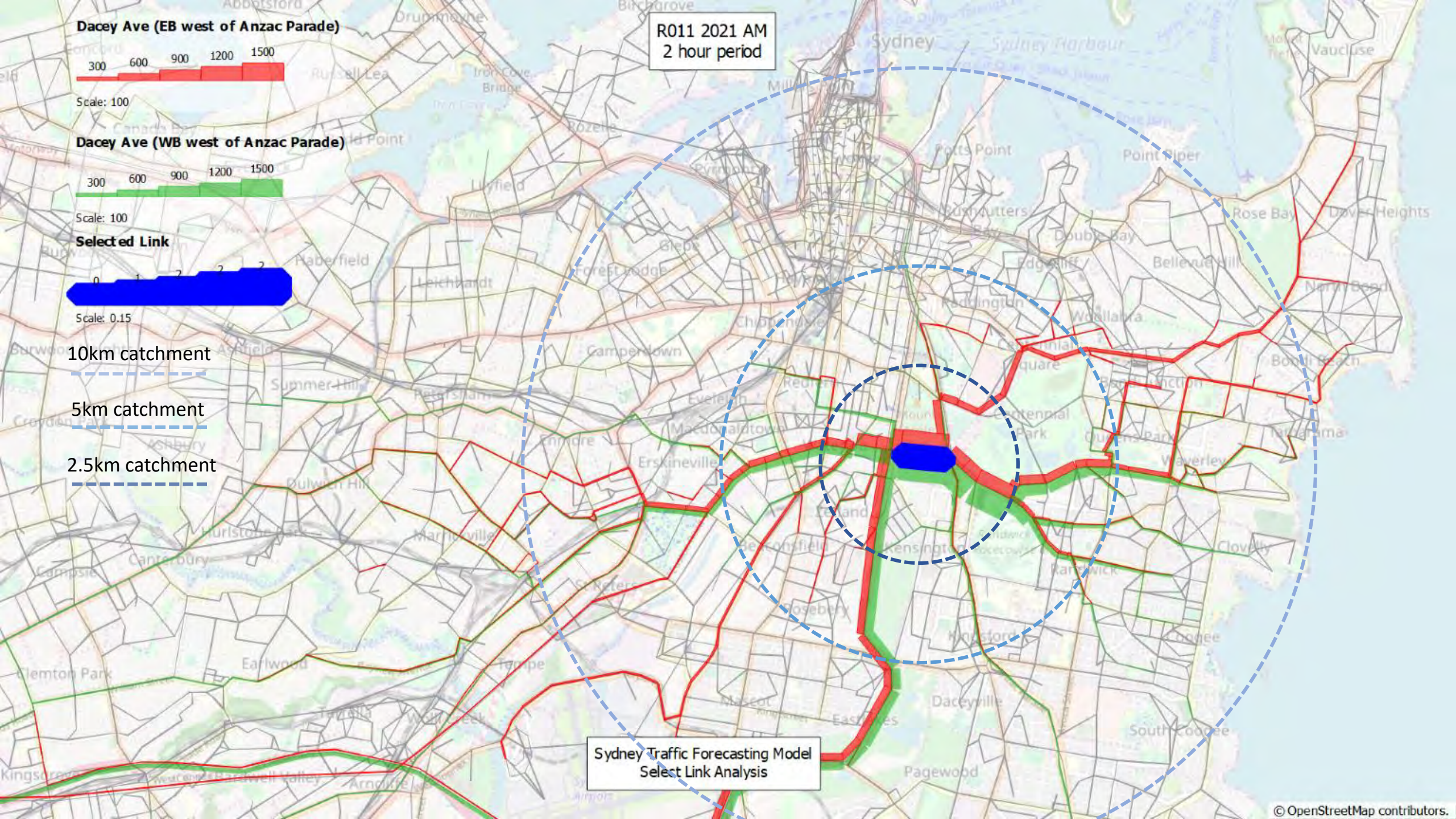
Dacey Ave (EB west of Anzac Parade)
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Scale: 100
Selected Link
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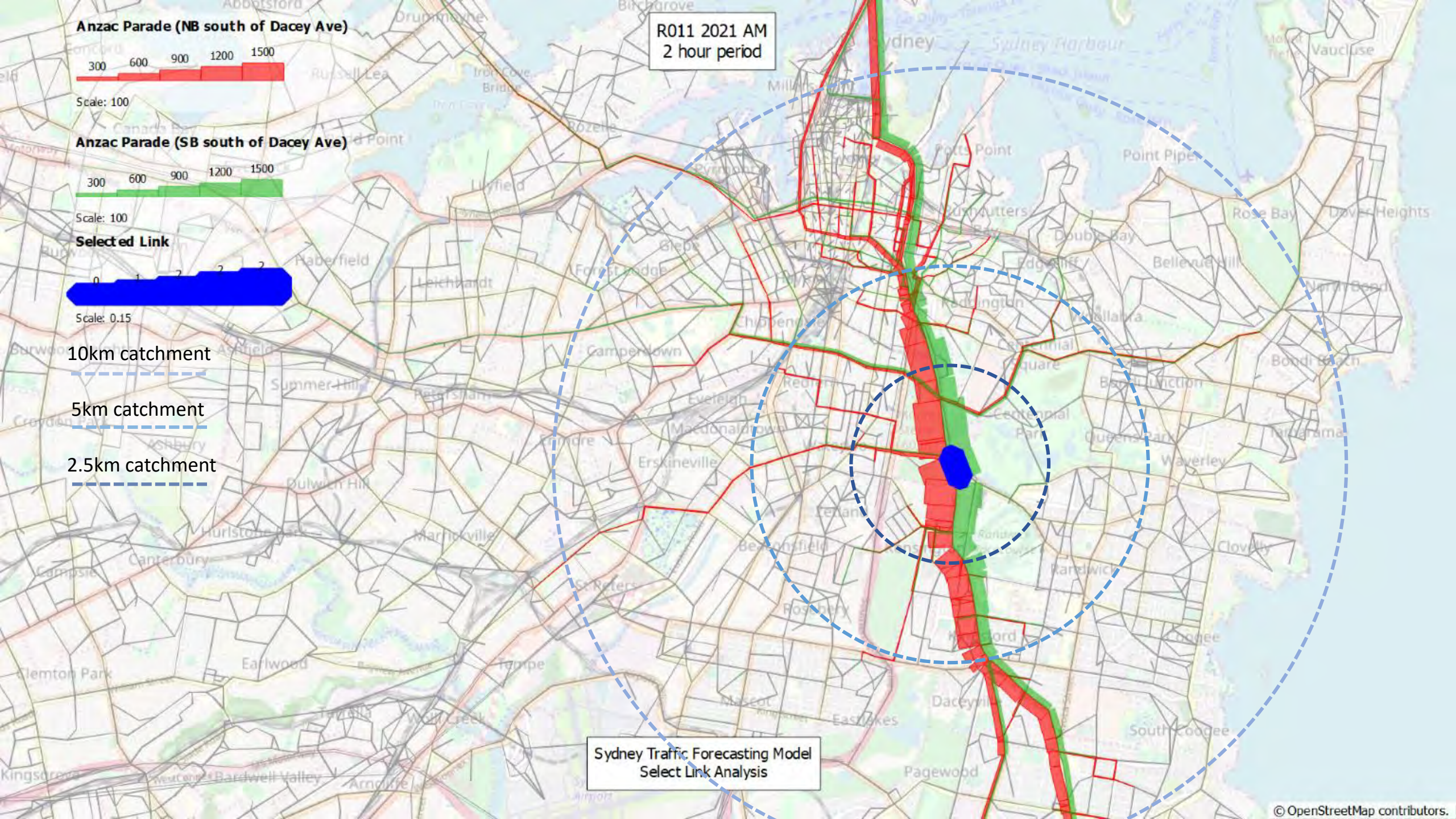
Anzac Parade (NB south of Dacey Ave)
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Scale: 100
Anzac Parade (SB south of Dacey Ave)
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Scale: 100
Selected Link
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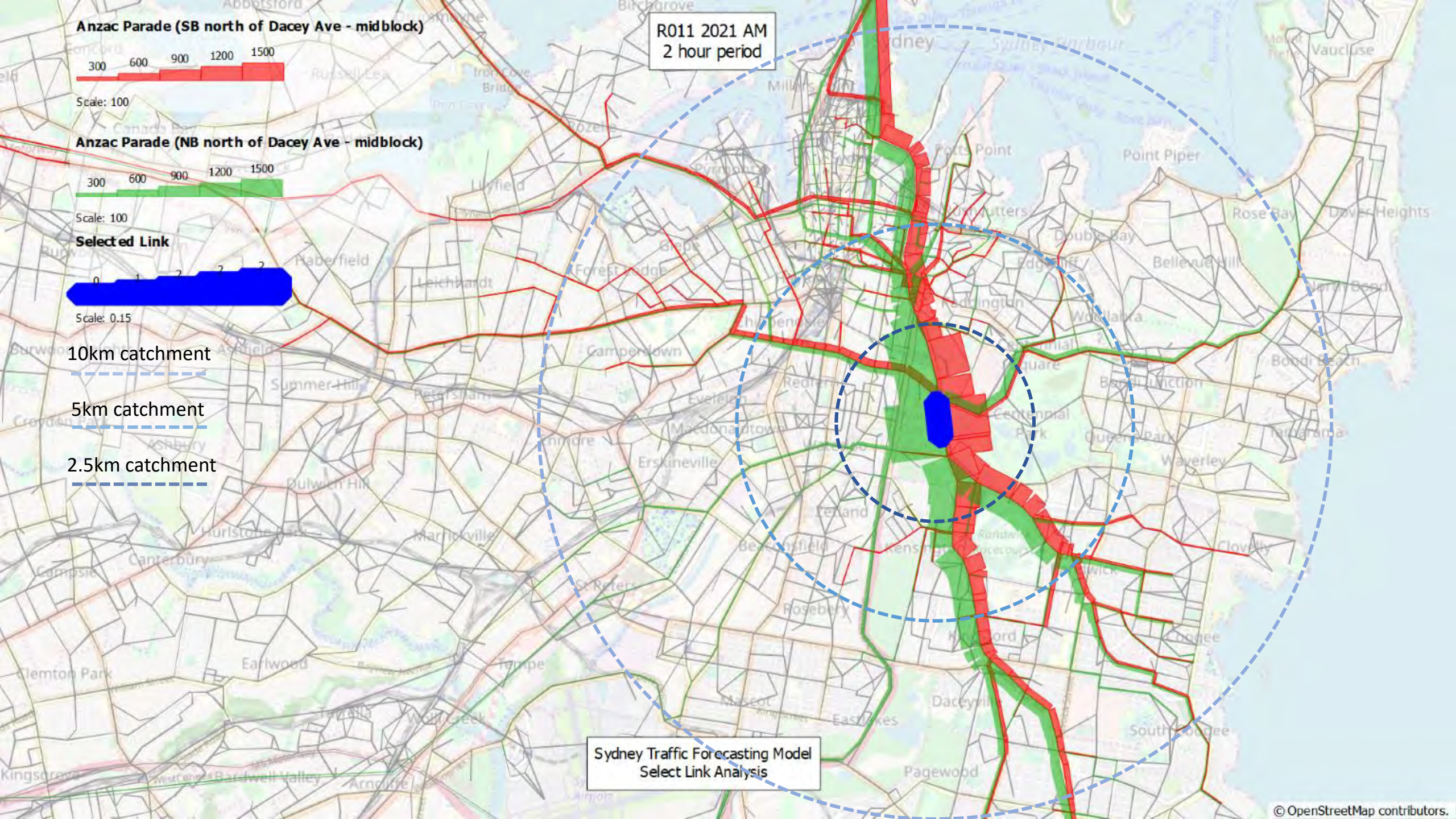
Anzac Parade (SB north of Dacey Ave - midblock)
300 600 900 1200 1500
Scale: 100
Anzac Parade (NB north of Dacey Ave - midblock)
300 600 900 1200 1500
Scale: 100
Selected Link
0 1 2 2 2
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2 hour period
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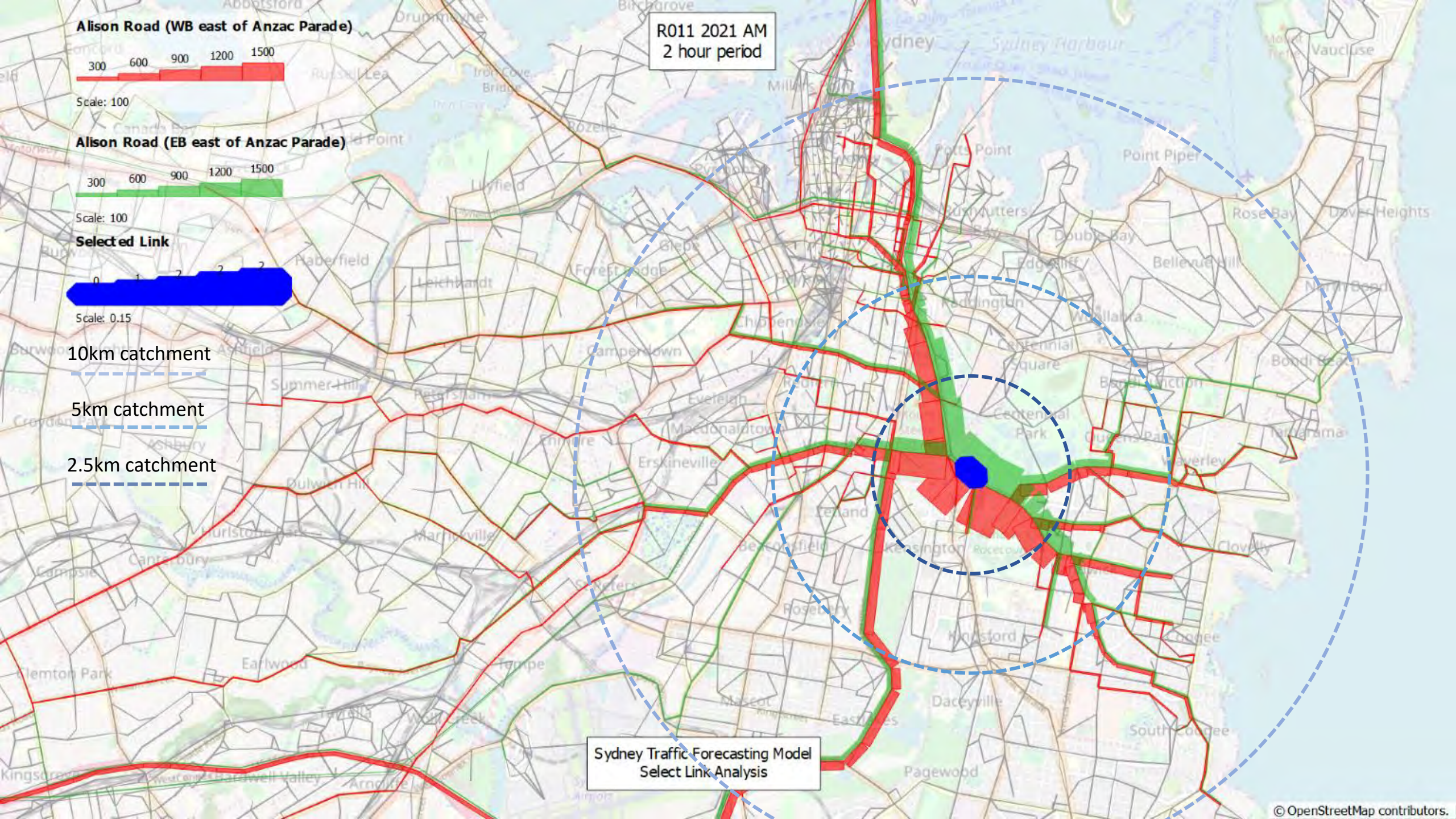
Alison Road (WB east of Anzac Parade)
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Scale: 100
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Selected Link
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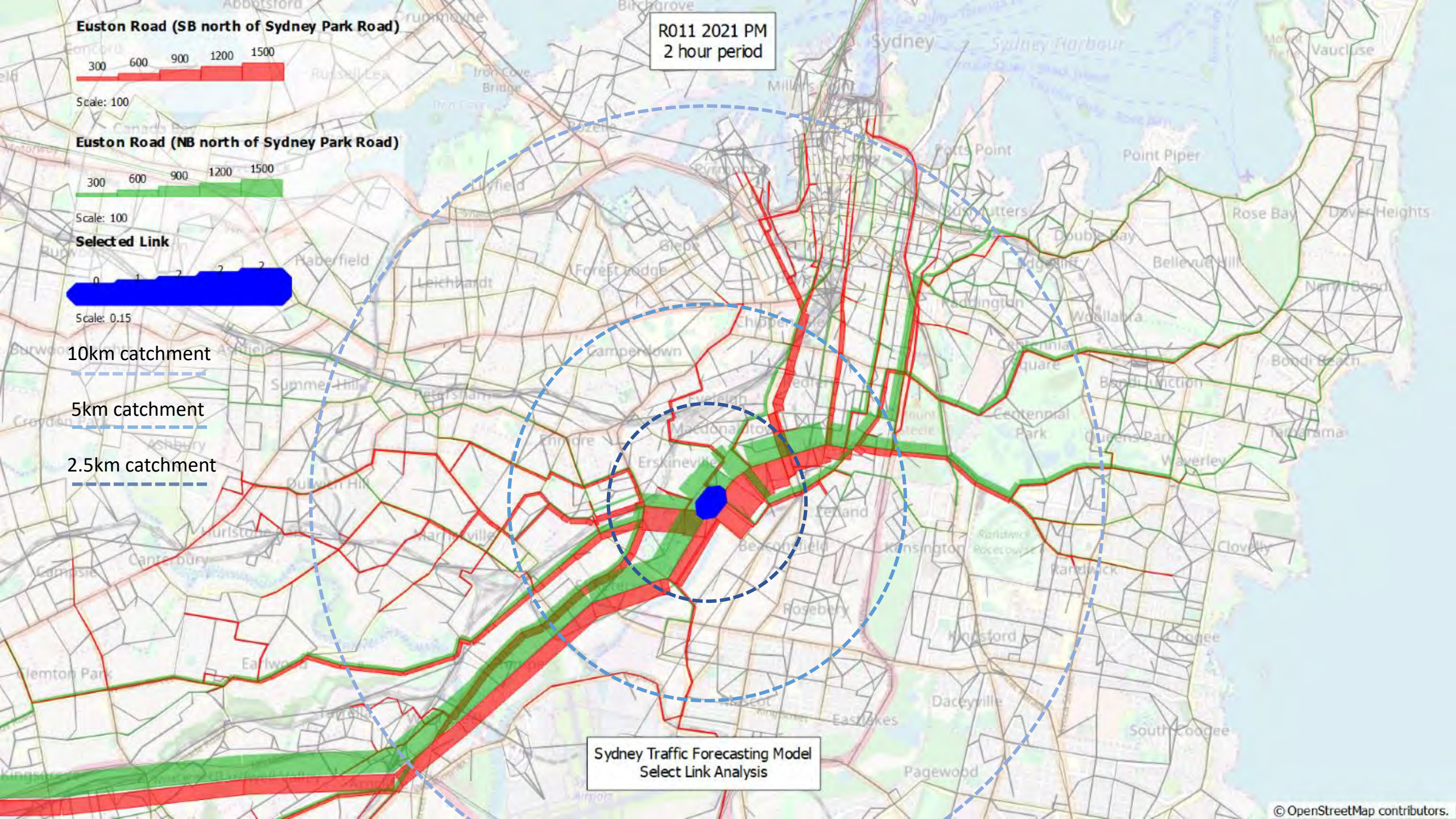
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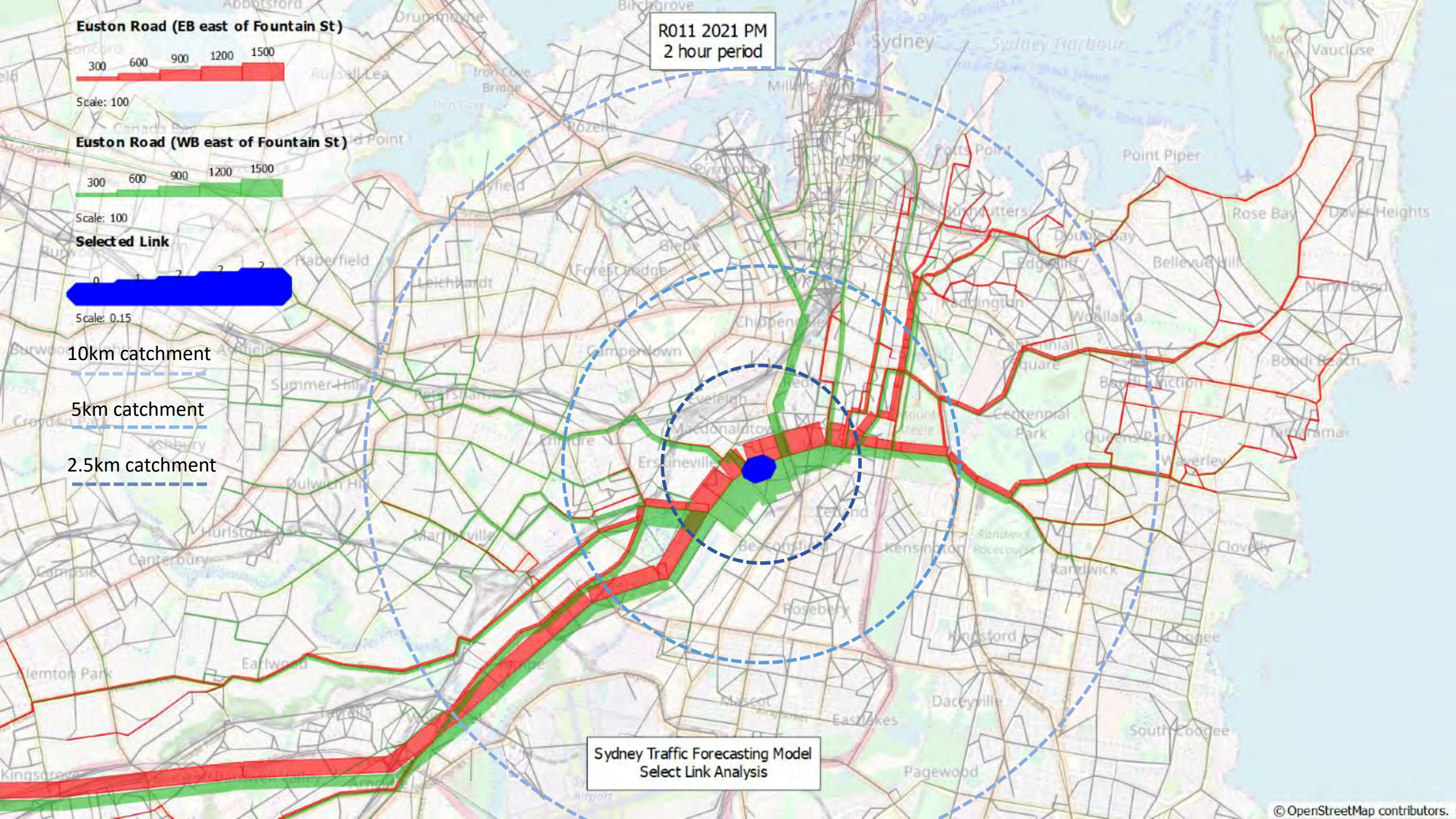
Euston Road (EB east of Fountain St)
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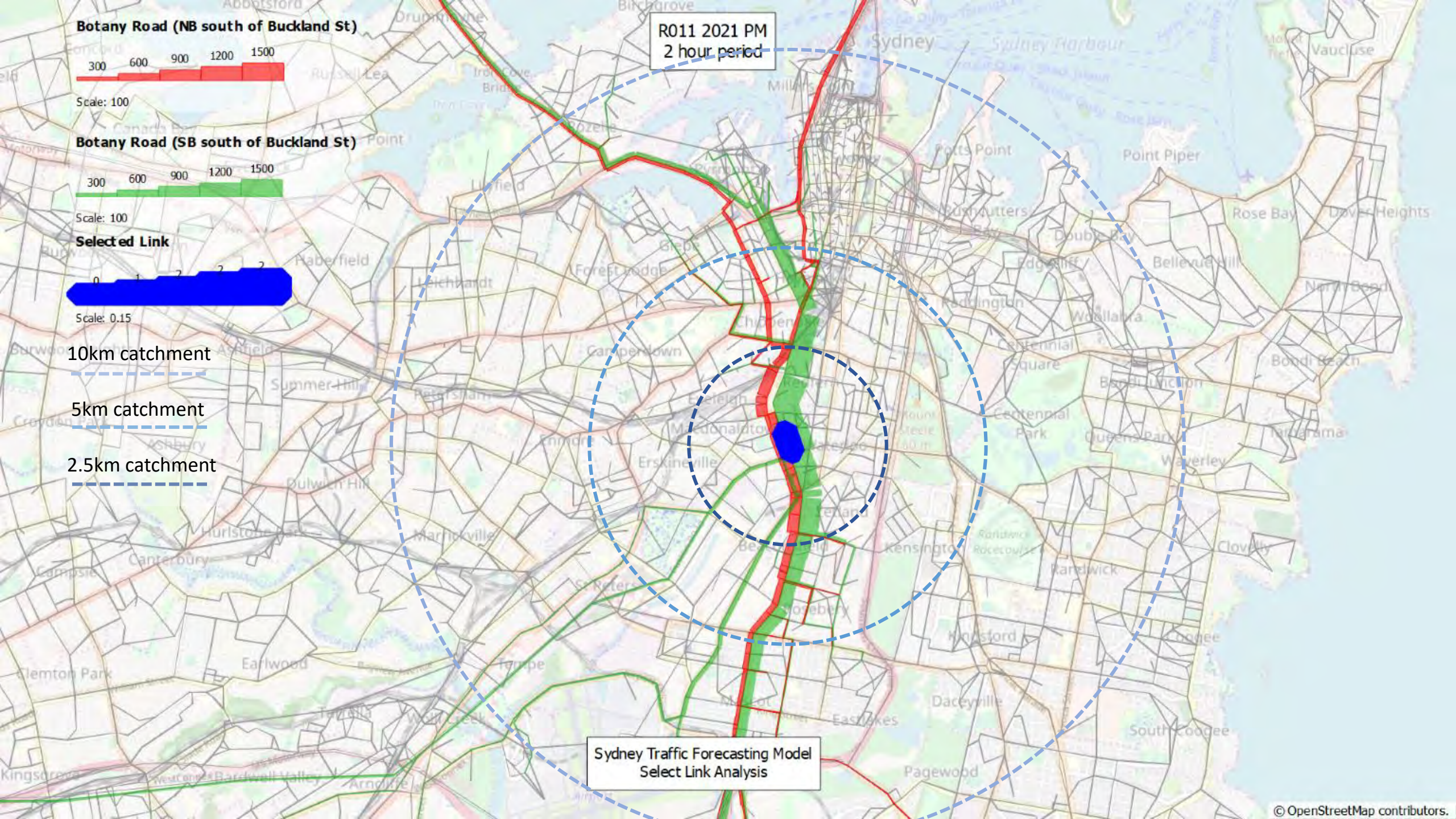
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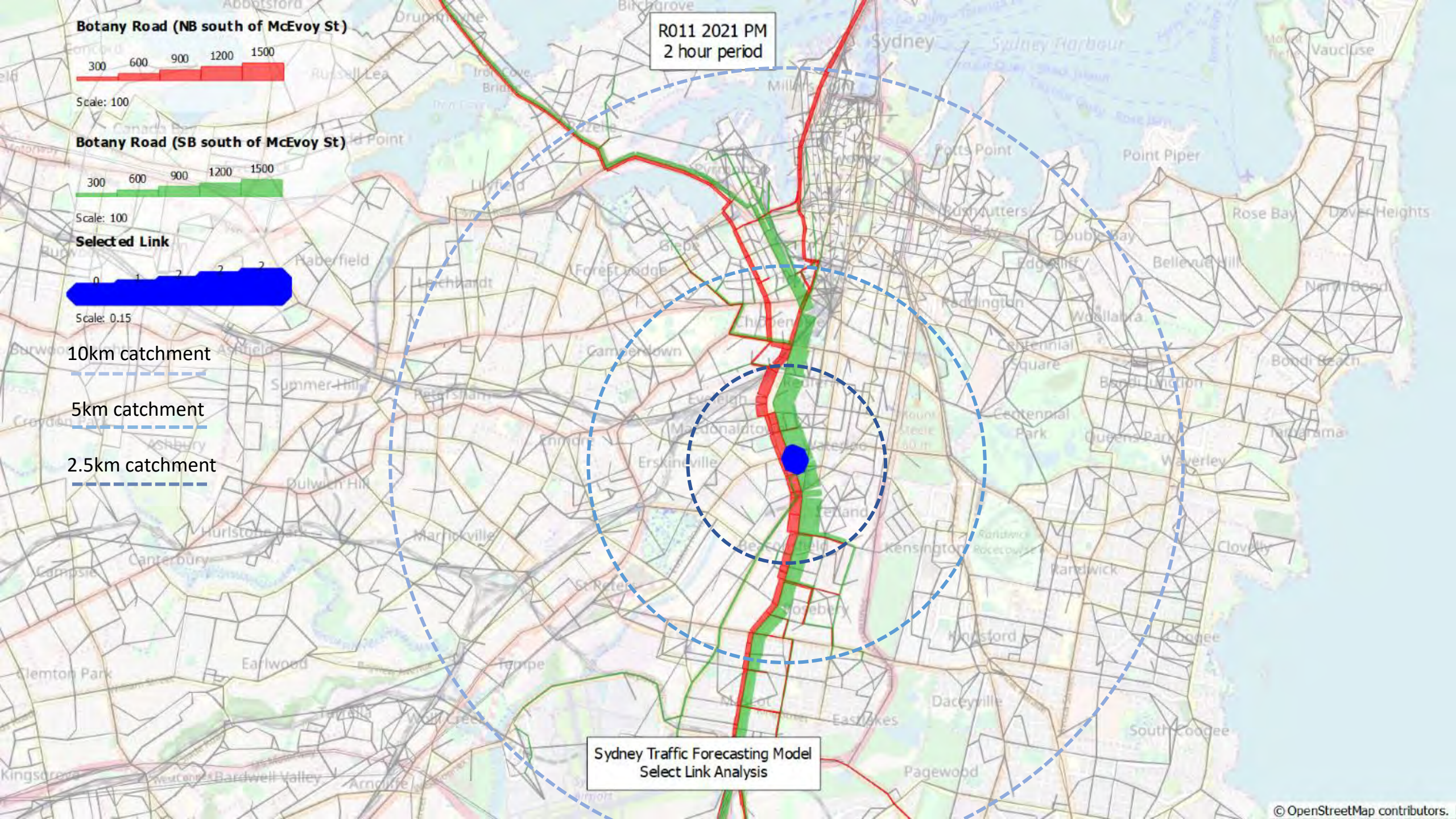
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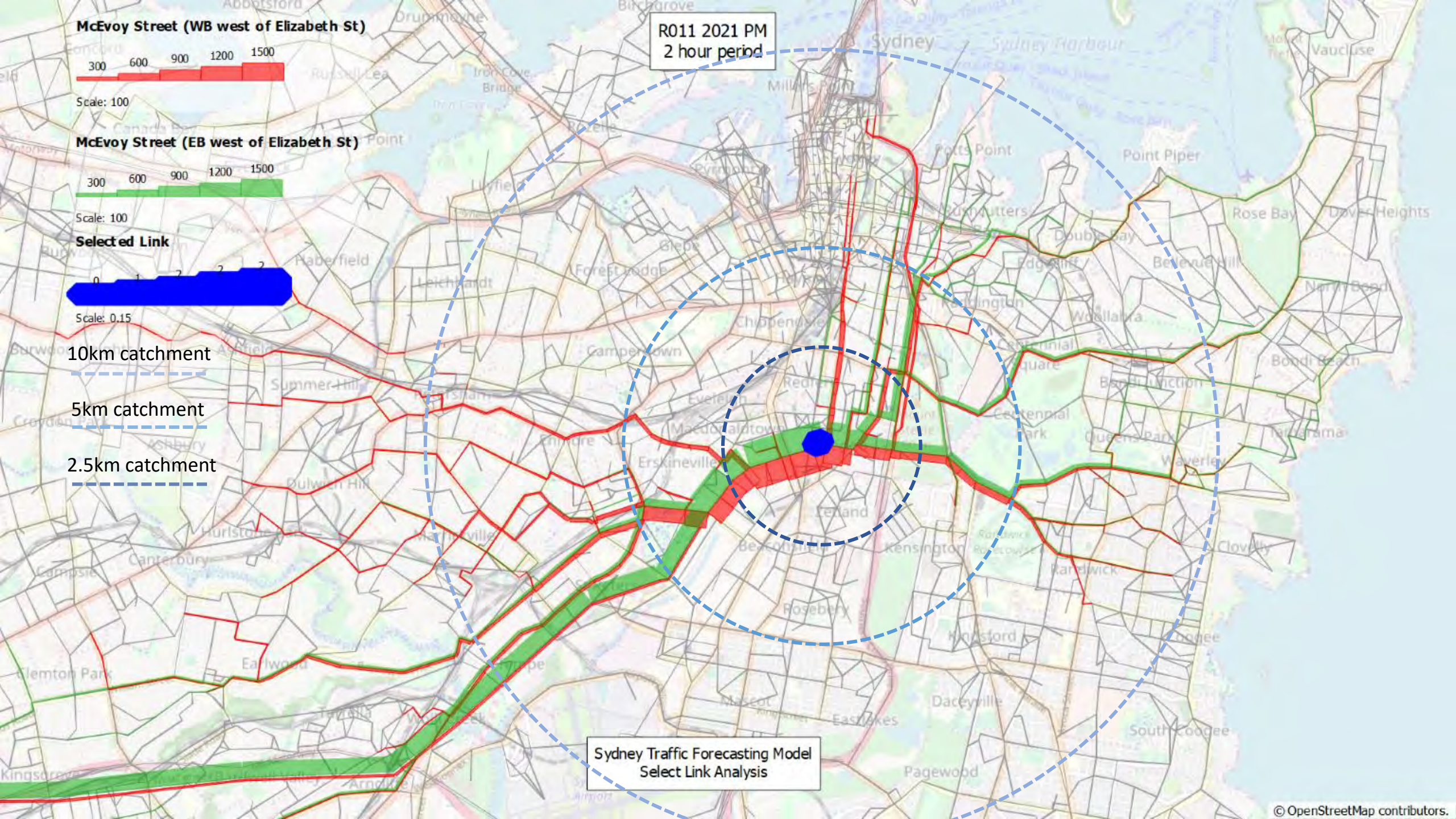
McEvoy Street (WB west of Elizabeth St)
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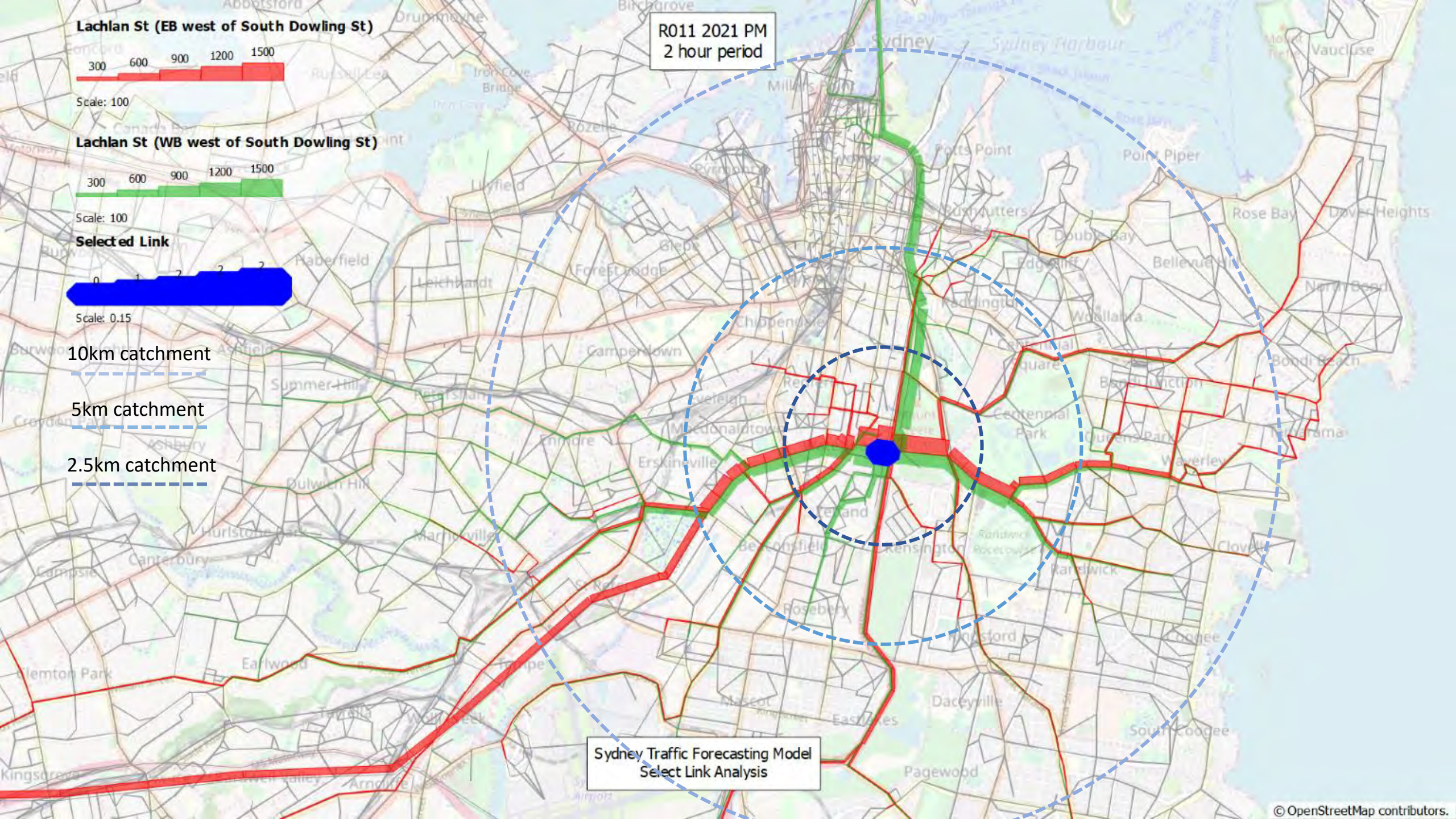
Lachlan St (EB west of South Dowling St)
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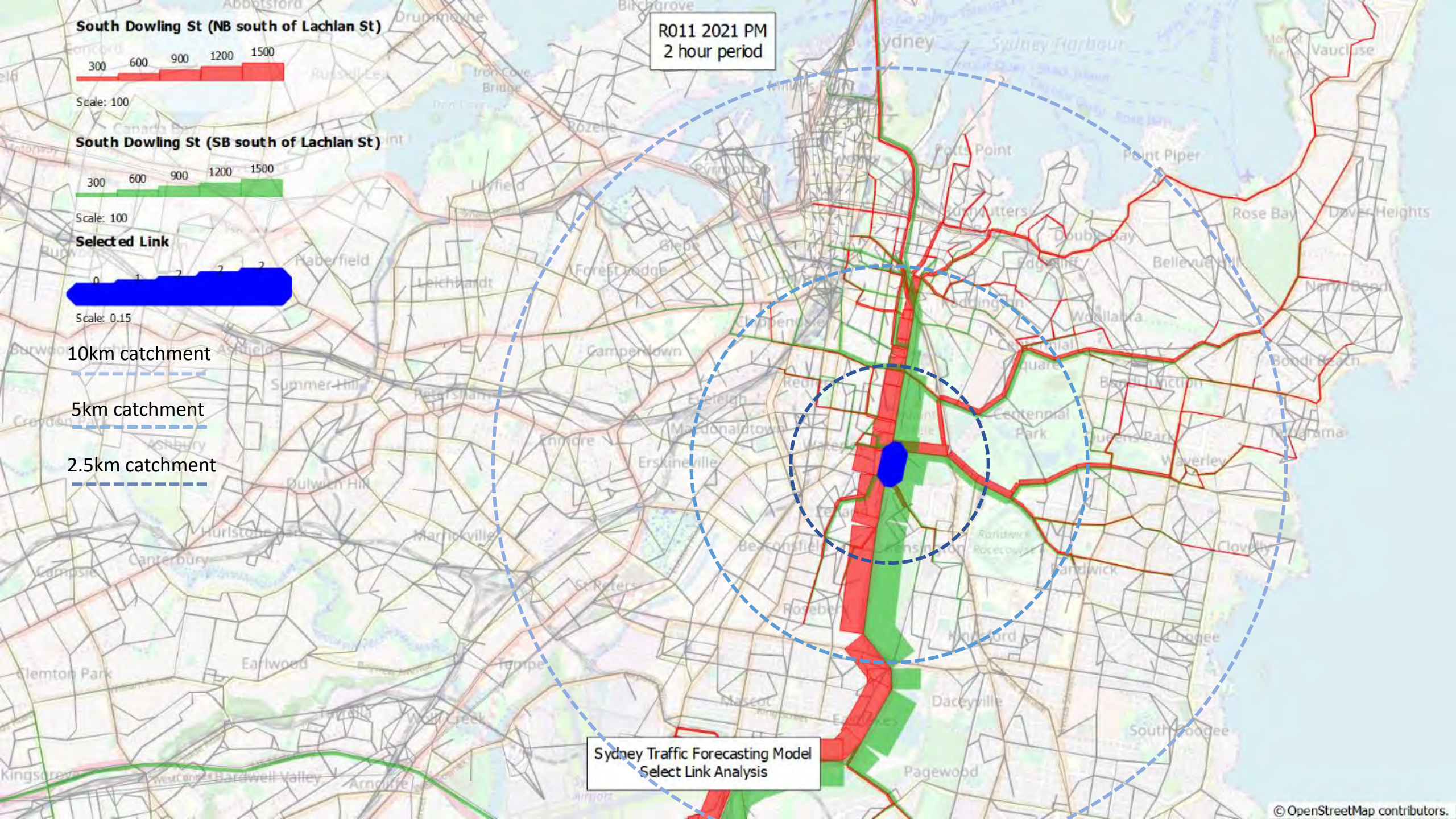
South Dowling St (NB south of Lachlan St)
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Scale: 100
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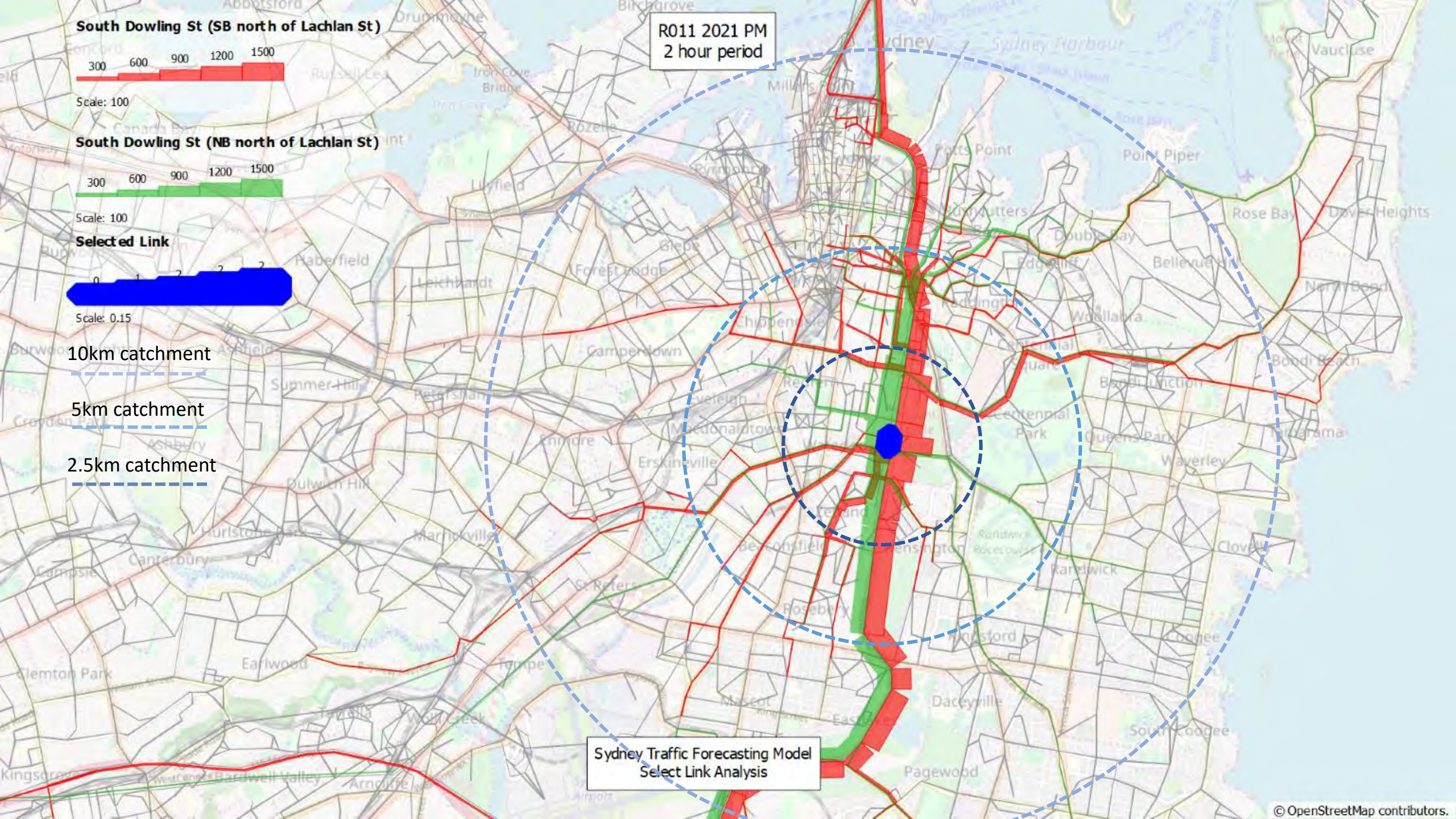
South Dowling St (SB north of Lachlan St)
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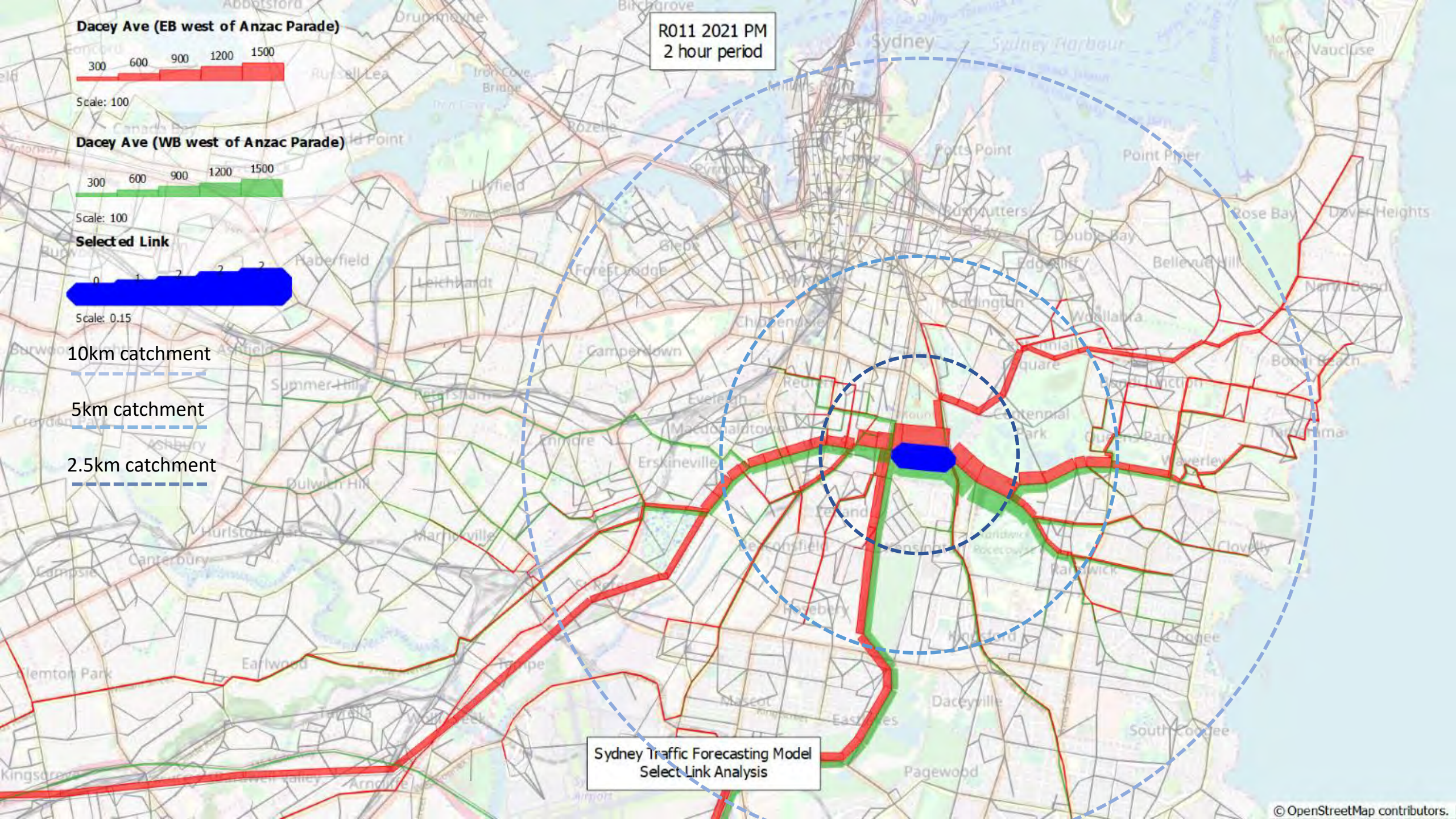
Dacey Ave (EB west of Anzac Parade)
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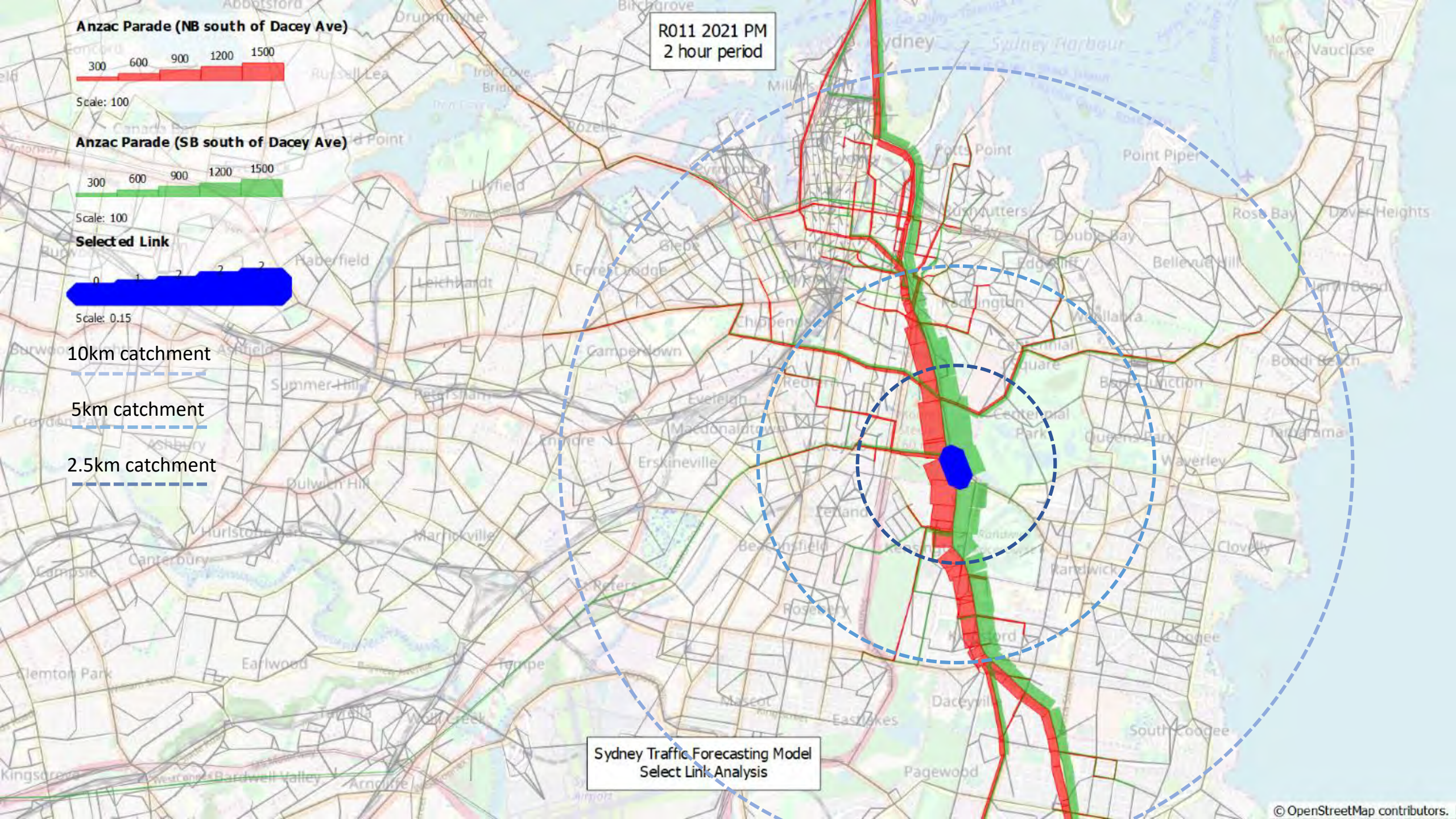
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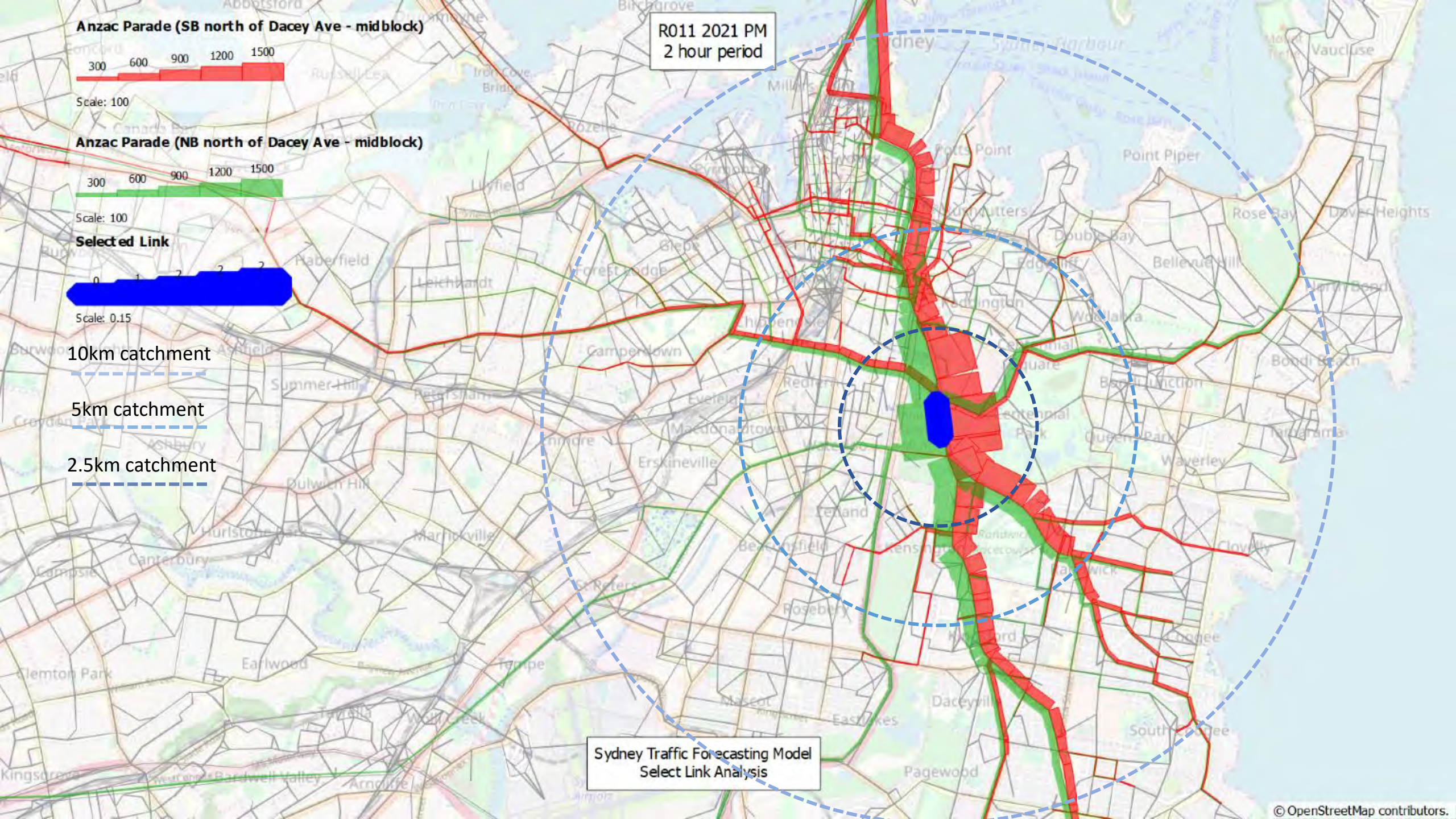
Anzac Parade (SB north of Dacey Ave - midblock)
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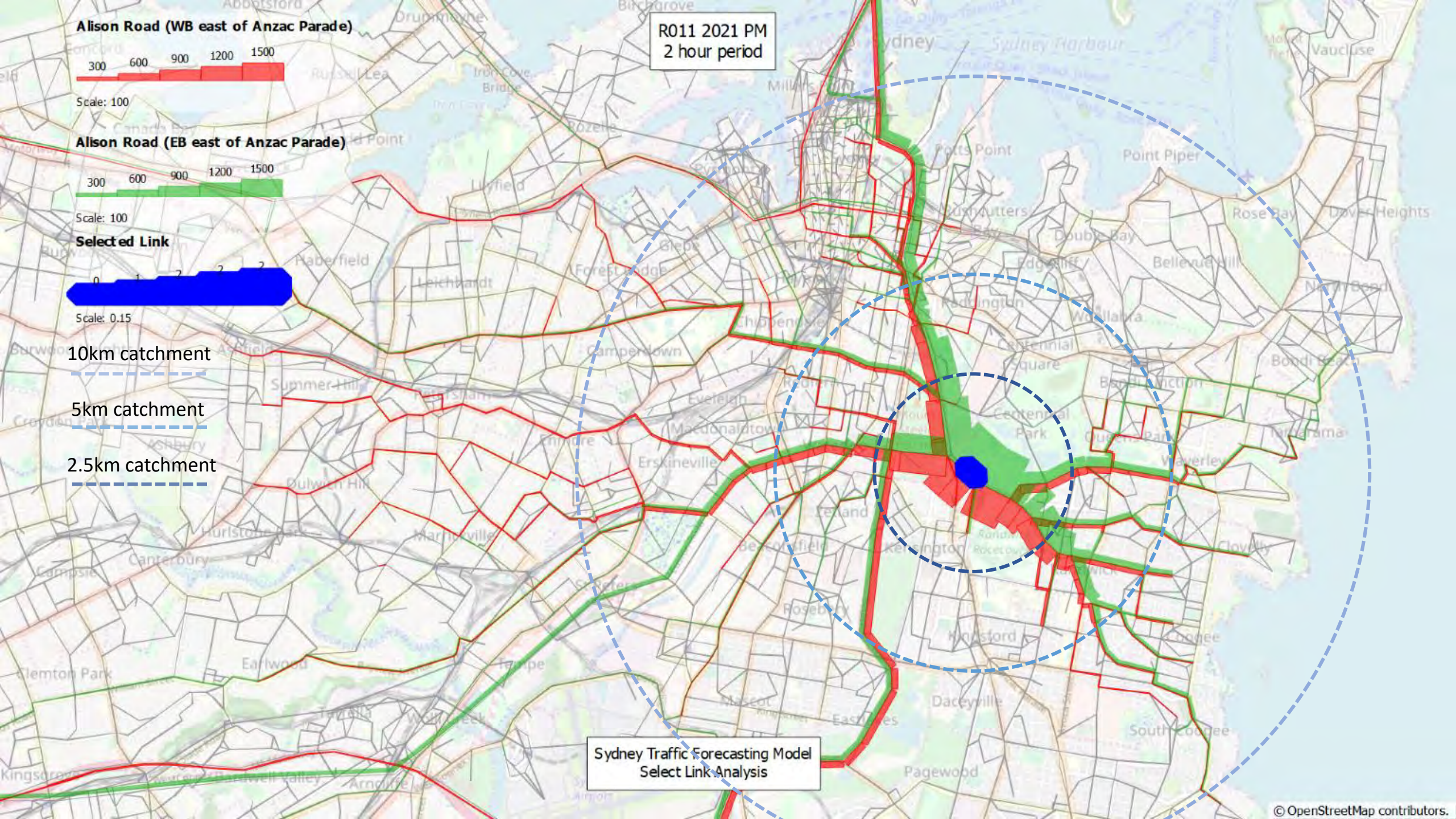
Alison Road (WB east of Anzac Parade)
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2.5km catchment
R011 2021 PM
2 hour period
Sydney Traffic Forecasting Model
Select Link Analysis
© OpenStreetMap contributors.

Appendix D

Freight information and data

D1 Freight hierarchy and vehicle access

Figure: Sydney Road Freight Hierarchy (*Metropolitan Road Freight Hierarchy on the State Road Network*, Roads and Maritime, 2011

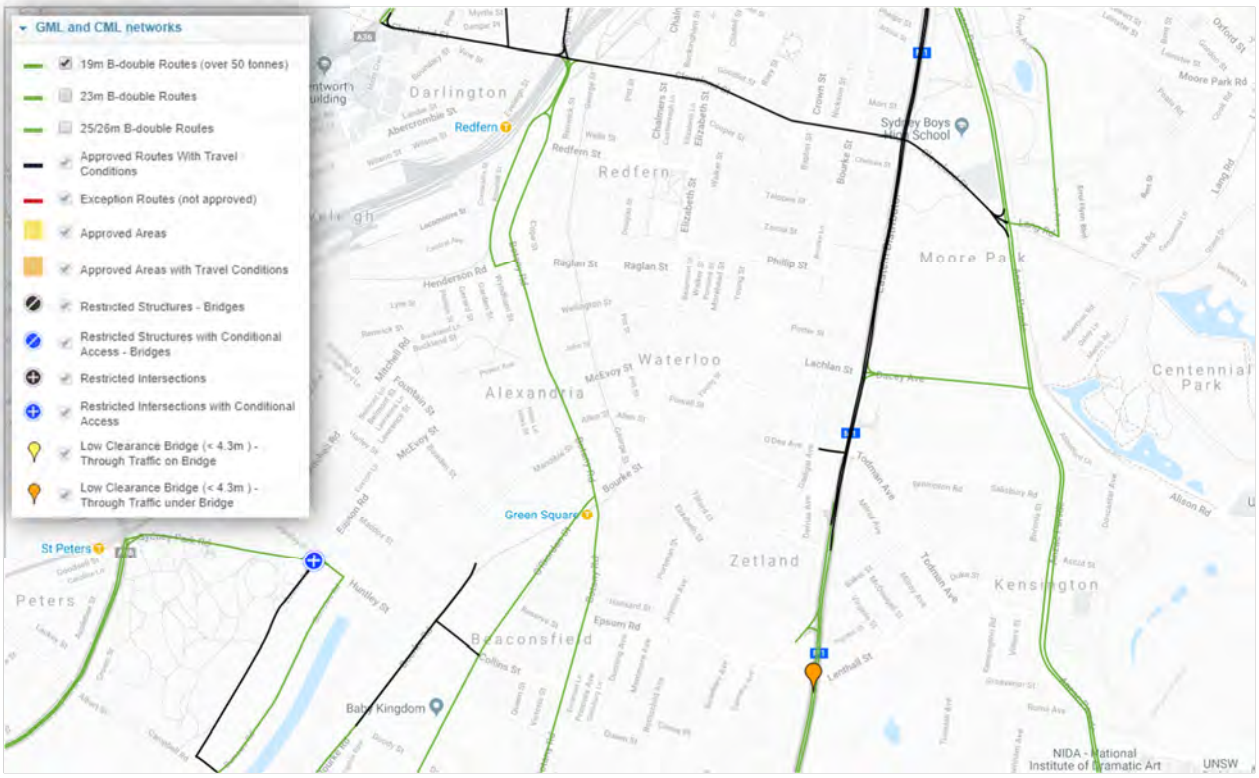


Figure: General Mass Limit and Combined Mass Limit vehicle networks (Roads and Maritime, 2019)

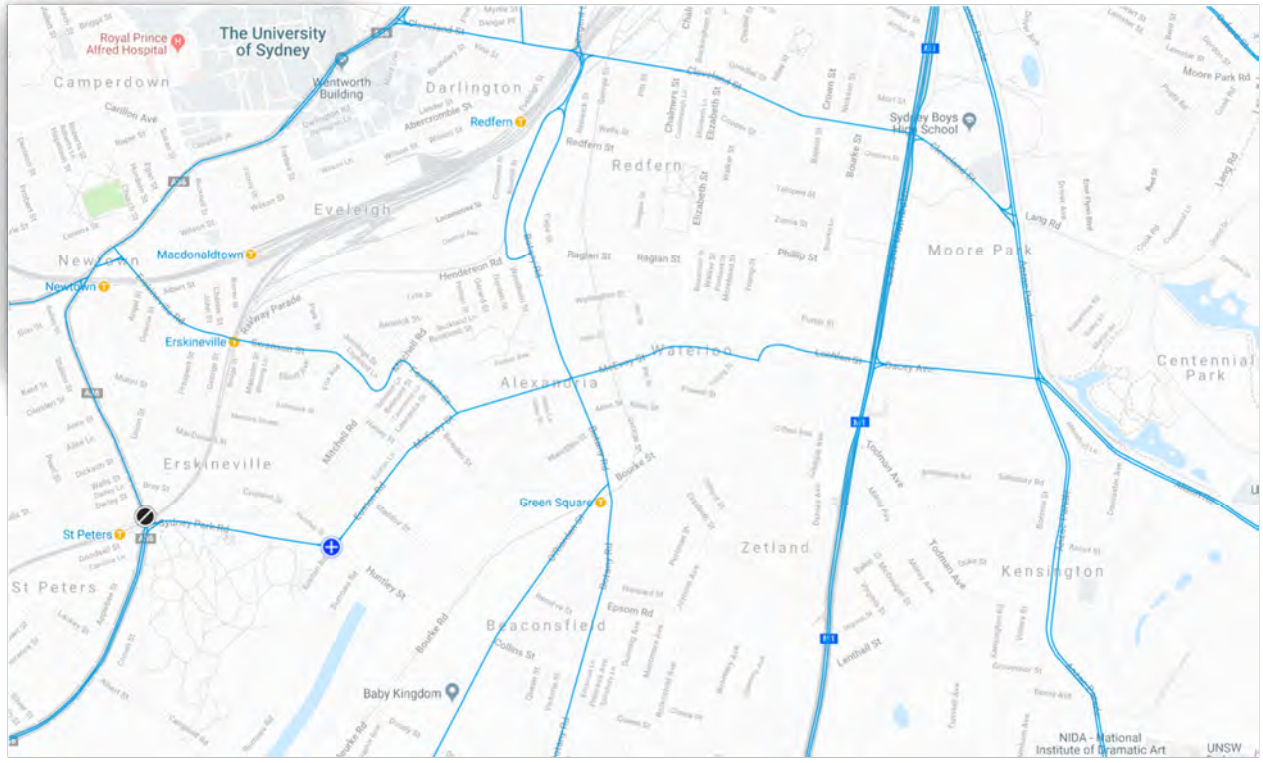


Figure: Higher Mass Limit vehicle networks (Roads and Maritime, 2019)

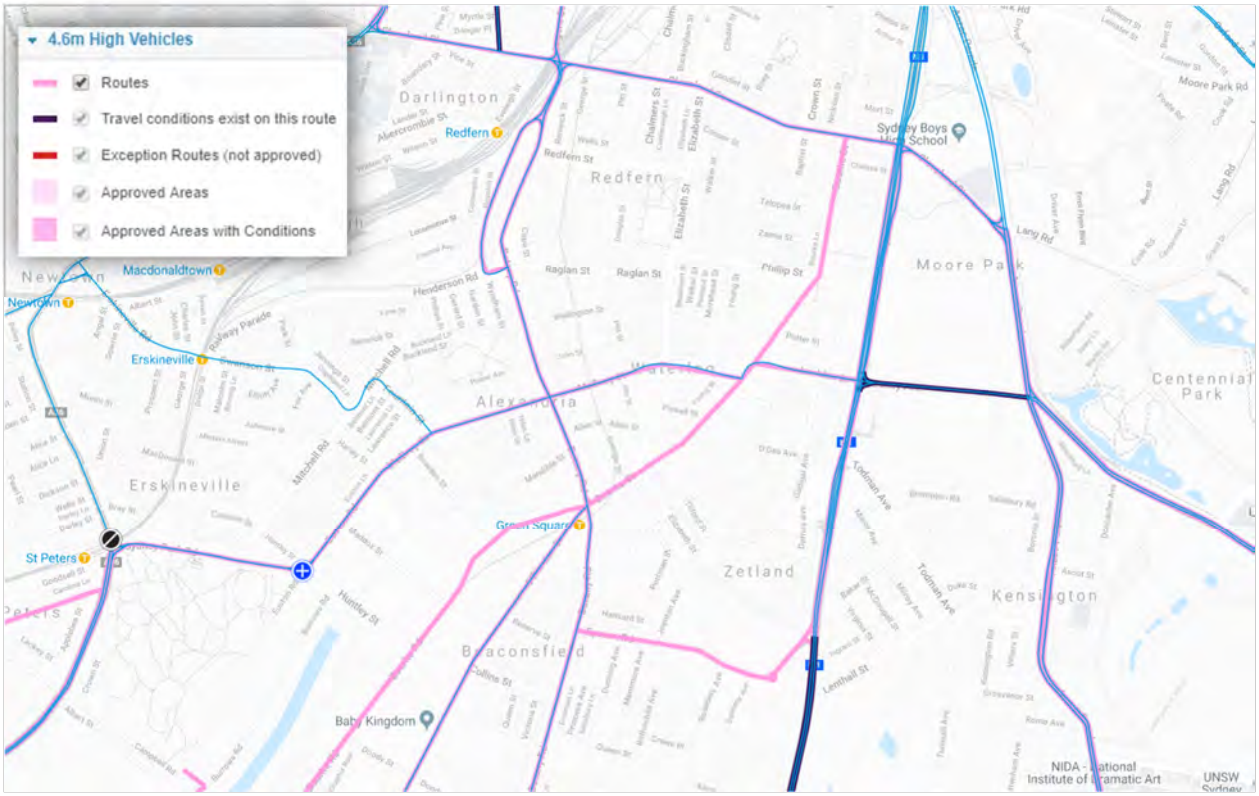
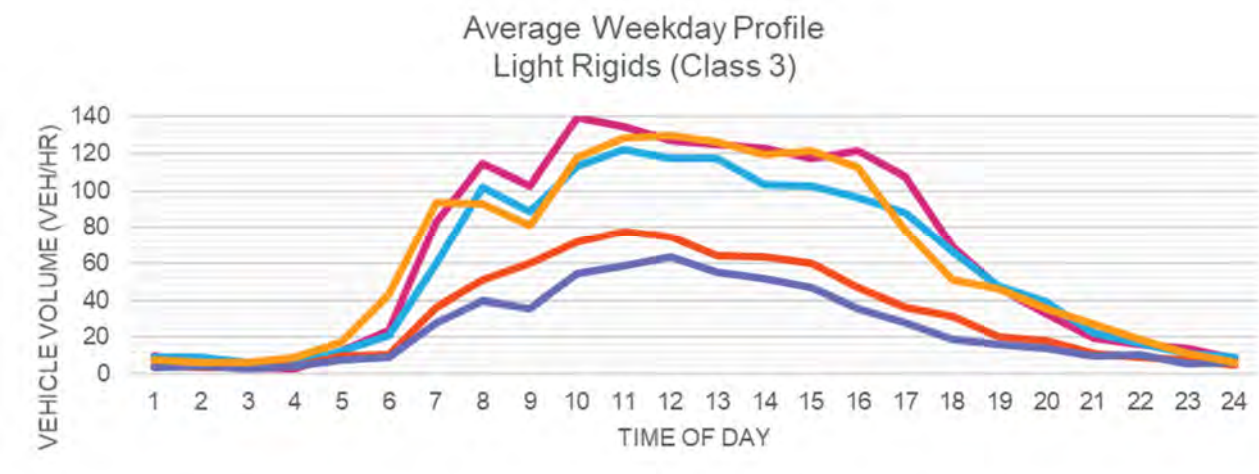


Figure: 4.6m high vehicles networks (Roads and Maritime, 2019)

D2 Freight data



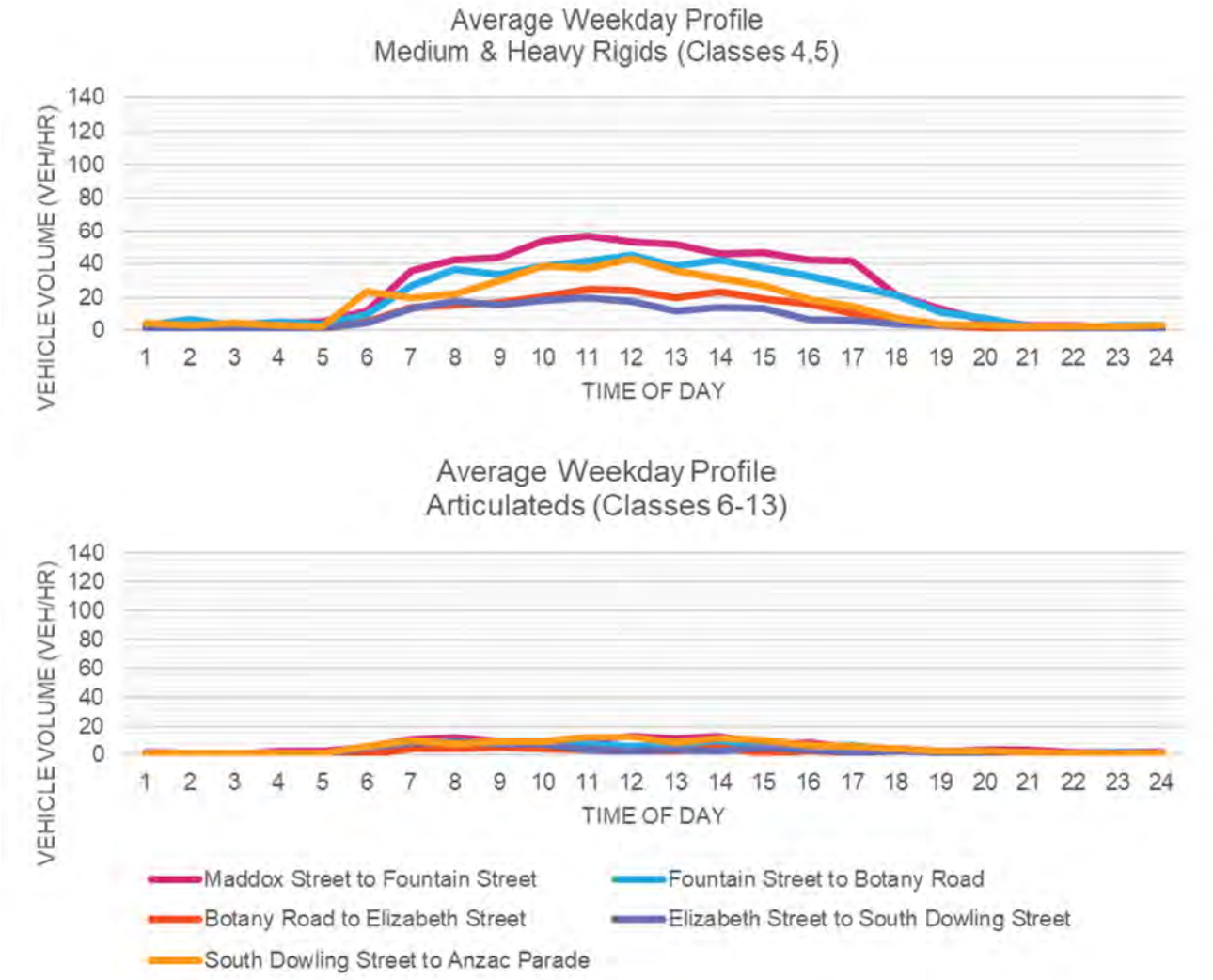


Figure: Weekday freight flow profile by vehicle classification

Appendix E

Crash data

E1 Crash type and severity information

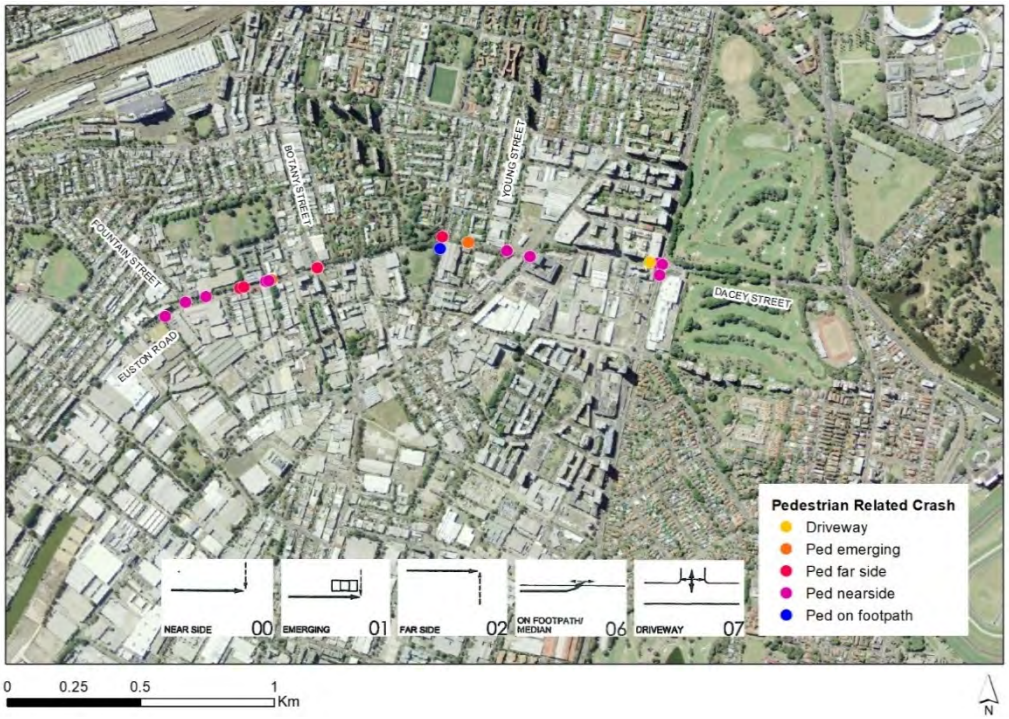


Figure: Pedestrian related crashes

Figure: Parking related crashes (2013-2018)

Figure: Right turn crashes (2013-2018)

Figure: Crashes by severity 2013-2018, Maddox Street to Botany Road

Figure: Crashes by severity 2013-2018, Botany Road to Gadigal Avenue

Figure: Crashes by severity 2013-2018, South Dowling Street to Anzac Parade

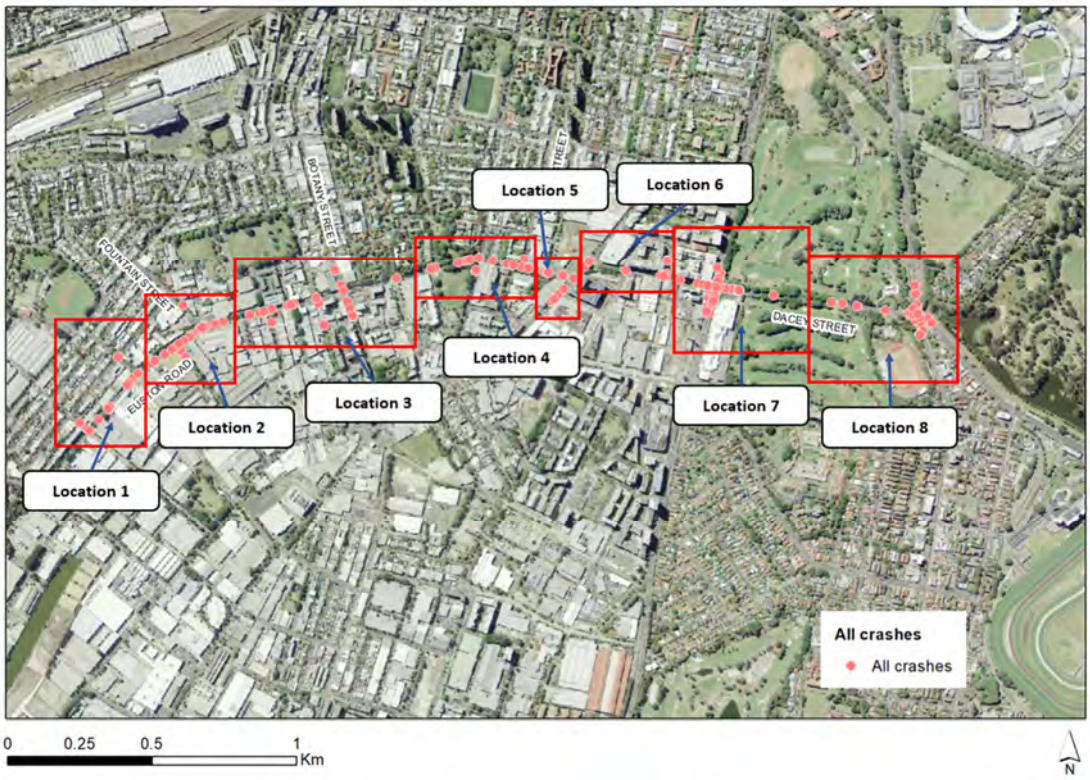


Figure: Defined locations for detailed analysis (see table following)

Table: Detailed crash type and severity summary (2013-2018)

	Maddox Street (Location 1)	Fountain Street (Location 2)	Botany Road (Location 3)	Elizabeth Street (Location 4)	Young Street (Location 5)	Bourke Street (Location 6)	South Dowling Street (Location 7)	Anzac Parade / Alison Road (Location 8)	TOTAL
Total crashes	30	25	52	51	30	20	73	39	320
Type of crashes									
Pedestrian	0	3	8	5	2	0	4	0	22
Vehicles from adjacent directions	6	2	12	12	13	4	4	2	55
Vehicles from opposing directions	11	2	7	16	5	7	2	1	51
Vehicles from same direction	8	12	14	9	6	6	46	28	129
Manoeuvring	0	4	5	1	0	1	8	2	21
Overtaking	1	0	0	2	1	0	0	0	4
On path	1	0	1	1	0	0	1	0	4
Off path, on-straight	3	1	3	5	2	1	7	5	27
Off path, on curve or turning	0	1	1	0	0	1	1	1	5
Passengers & miscellaneous	0	0	1	0	1	0	0	0	2
Severity of crashes									
Fatal	1	0	0	0	0	0	0	0	1
Serious Injury	5	4	12	11	1	4	11	5	53
Moderate Injury	5	6	12	10	10	4	14	9	70
Minor/Other Injury	4	6	0	8	7	3	23	8	59
Non-casualty (towaway)	15	9	20	22	12	9	25	17	129
Other	0	0	8	0	0	0	0	0	8

Appendix F

HTS and JTW data analysis

Travel trends have been analysed using Household Travel Survey data, which includes travel for any kind of purpose, and Journey to Work data, which only covers work (commute) trips.

Household Travel Survey

Figure 36 illustrates the total number of weekday trips made by residents of the entire Sydney Inner City area (see inset), by mode, for each 2012-13 and 2017-18 years. The corridor study area represents only a small portion of this area and includes the Sydney CBD.

Walking (55% mode share) is by far the most common transport mode and grew the most between the two survey years (40%). When including train (8% mode share) and bus (7% mode share), walking forms a part of 70% of trips across the area. Private vehicle remains the second most utilised mode (20% mode share) and grew in use by 12% in the 5 years between survey years. When accounting for trip distances, vehicle kilometres travelled by car drivers accounts for 52% of the transport task and grew substantially (51%) between survey years. Total trip distance by foot, train and bus have also substantially grown (40-60%).

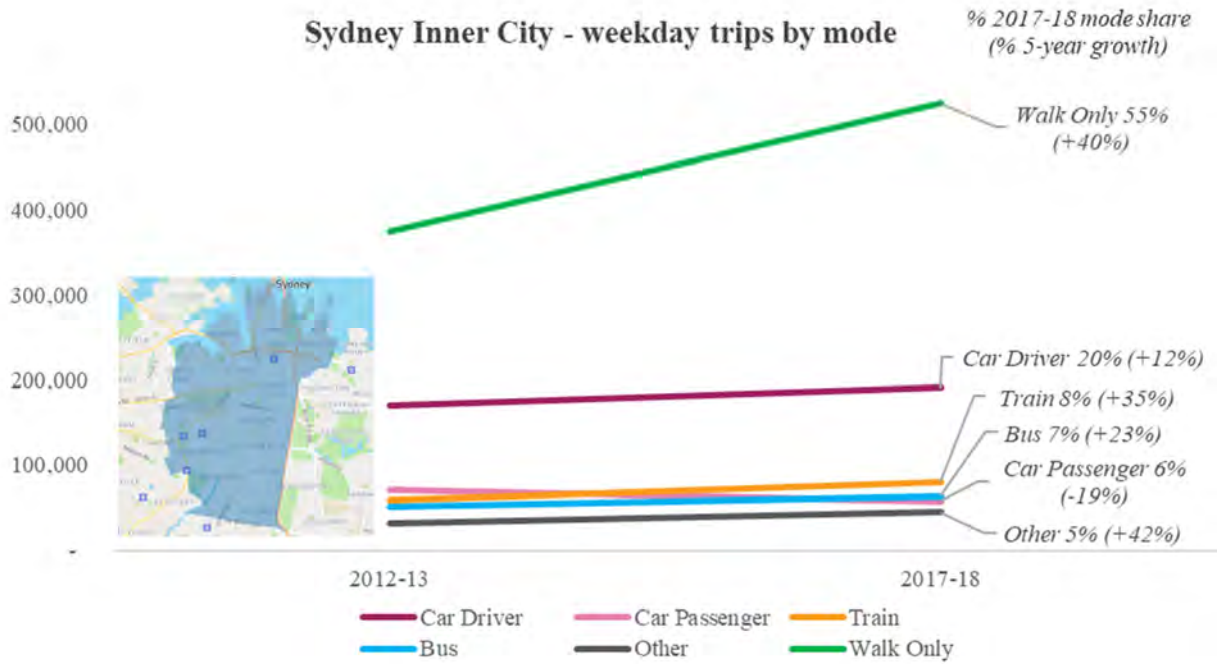


Figure 36 Weekday trips by Sydney Inner City residents (Source: Household Travel Survey)

In regard to residents of the nearby suburbs to the east and west which the corridor serves in particular a general traffic function for (see Section 4.3.5), car driver accounts for the highest number of trips in each the Eastern Suburbs – North (38%) and Eastern Suburbs – South (43%) and the second most in Marrickville – Sydenham - Petersham (27%) areas. Both the number of car driver trips and total car driver trip distance increased in each area by 15% to 32% in the five years to 2017-18. The exception being the number of car driver trips in Marrickville – Sydenham – Petersham which went down 15%, however the total trip distance increased 67%. Across each of the four areas discussed, average trip distance by

car drivers was between 7 kilometres and 12 kilometres – longer than other modes particularly in Sydney Inner City and Marrickville – Sydenham – Petersham.

Journey to work

Figure 37 illustrates the total number of weekday journey to work (commute) trips made by residents of the three local travel zones (see inset), by mode, for each 2011 and 2016.

Analysis of the data indicates the top five work destinations local workforce (55% of total) for are located within five kilometres of the corridor, with the highest number intuitively in the Sydney CBD area. Destination numbers two and three are in the immediate vicinity of the corridor. Trips to the top five work destinations have grown at a much higher pace than local population growth, between 45% and 56%. Destinations for a majority of the remaining 45% of local workforce however, is relatively dispersed.

In terms of mode share of trips, train, bus, walking and car driver are the local's preferred choices of transport mode in accessing work, whilst train trips grew at the fastest rate between 2011 and 2016 – likely an outcome of the NSW Government paying the station access fee on behalf of passengers at the Green Square and Mascot train stations from March 2011 onwards. Bus and private vehicle driver trips also grew by reasonable amounts at 16% and 18% respectively.

Figure 38 the travel distances of the journey to work task for residents of the same three travel zones as well as for the entire Sydney LGA. Again, car drivers performed the substantial portion (64%) of the local's commute task – further indicating it is the preferred mode for, and has the key role in facilitating, medium and long-range trips. For the entire Sydney LGA, the task is performed predominately by train, walking and private vehicle – each performing 25% to 30% of the total task.

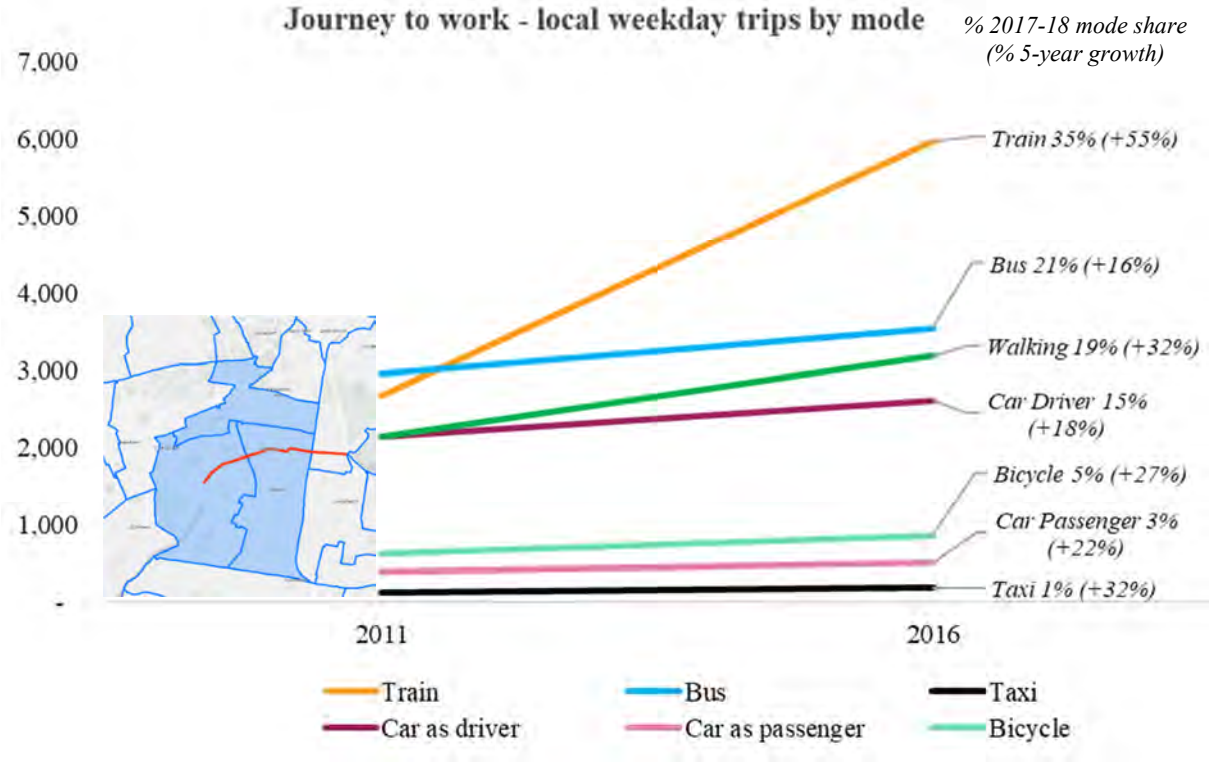


Figure 37 Change in mode share from 2011 to 2016 for three local SA2 zones (Source: Journey to Work)

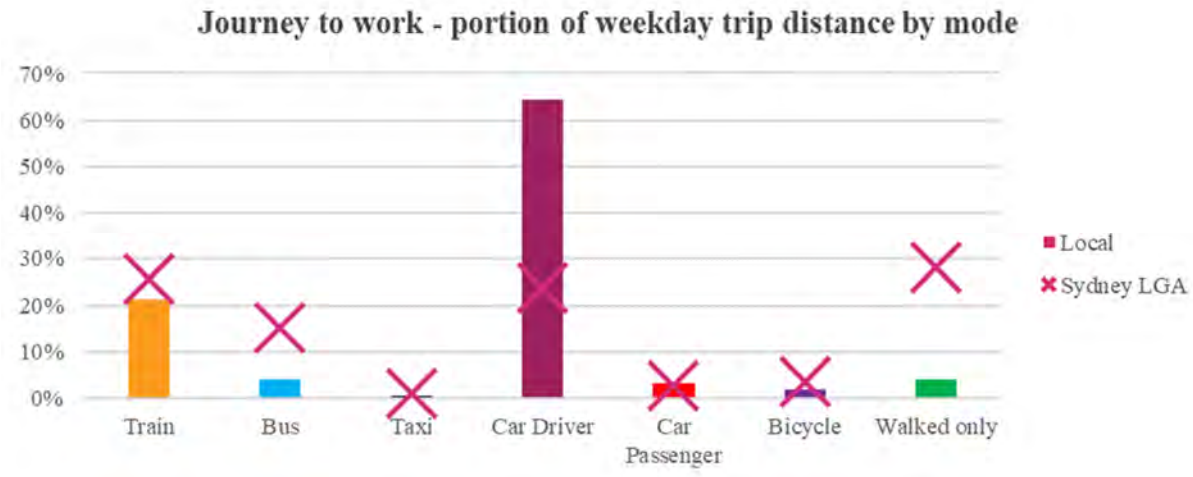


Figure 38 Journey to work trip distance analysis for Sydney LGA and three local SA2 zones (Source: Journey to Work)

Key points

- 80% of local workforce utilise sustainable transport modes to access work, with a substantial portion of work destinations located in the Harbour CBD and surrounds
- Car driver is the preferred mode for longer range trips, comprising the remainder of the local workforce trips whilst accounting for the highest number of weekday trips in the adjacent Eastern Suburbs (north and south)

area and the second most in Sydney Inner City and Marrickville – Sydenham - Petersham (27%) areas

- All primary travel modes (walking, bus, train, private vehicle) grew substantially in the five years between the respective survey periods - which when combined with above indicates a need to ensure investment in adequate performance for each primary travel mode.

Appendix G

Project snapshot at key intersections

This section presents microsimulation modelling results for the four key intersections being modified as part of A2MP Stage 1. The following should be noted when interpreting these results:

- All results presented in the tables within Appendix G are from the VISSIM microsimulation models. Intersection layout diagrams were generated using SIDRA for the purpose of illustrating geometrical configurations in each scenario.

- Significant congestion was observed in the without Project scenario in particular. This resulted in a higher level of latent demand relative to other scenarios, meaning that the recorded throughput volumes displayed in results tables is lower for this scenario. This may also have an impact on the other performance measures presented. For example, Stage 1 performance results at certain locations may appear worse in some cases due to the higher amount of traffic reaching the intersection.

- Queue length results presented in the tables are for the approach with the maximum recorded queue for each scenario. These are shown in more detail in the intersection layout figures. In some cases, the queue length reported by the operational model can be capped if it extends back to an upstream intersection. Where this occurred, queue lengths are denoted with a '+' symbol.

McEvoy Street / Fountain Street

Table 25: Fountain Street AM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
AM	2016	1713	22	B	120
	2021 without Project	2274[1]	100	F	350
	2021 Stage 1	3073	42	C	265

1 - Note: Without Project volumes impacted by latent demand due to upstream congestion.

Table 26: Fountain Street / McEvoy Street AM peak intersection configurations

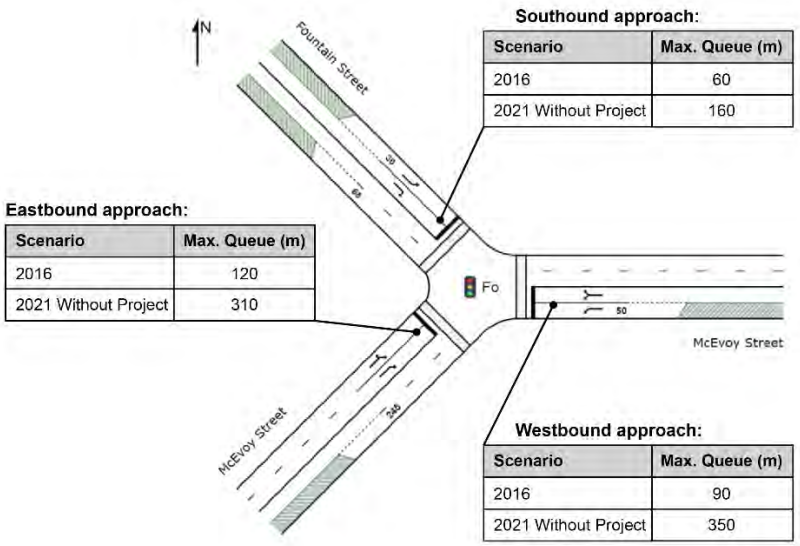
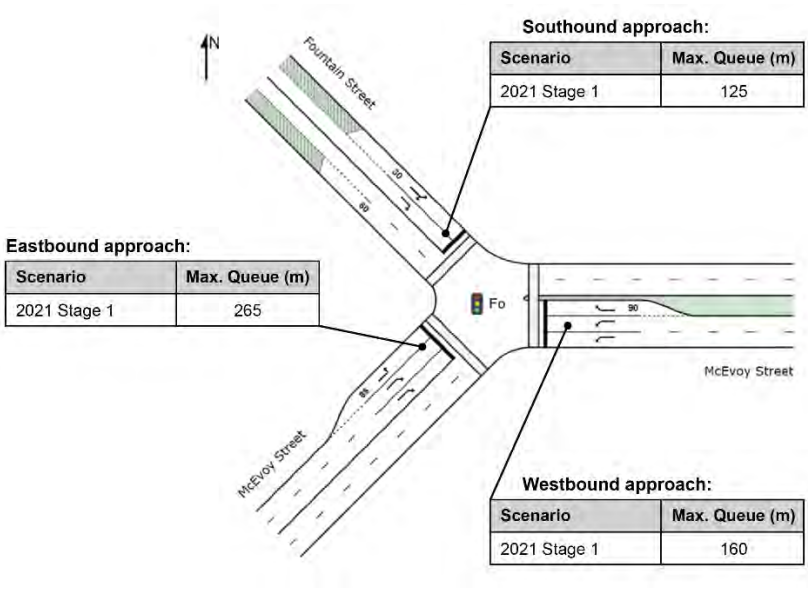
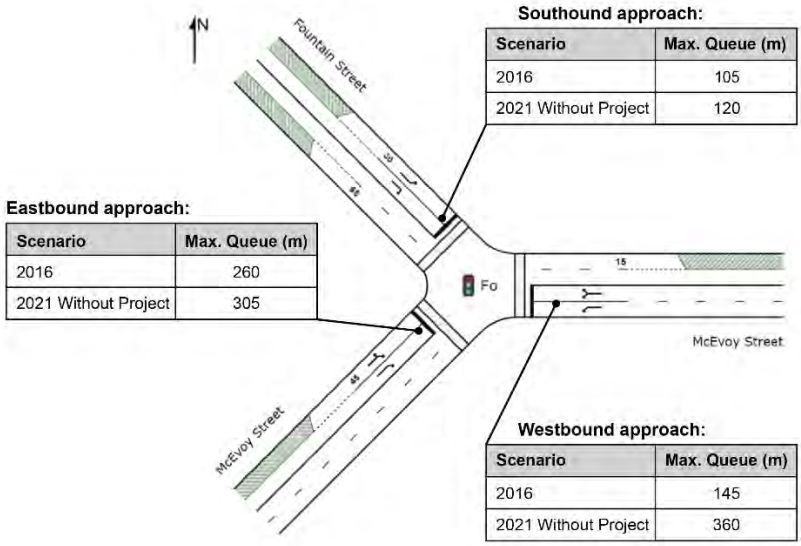
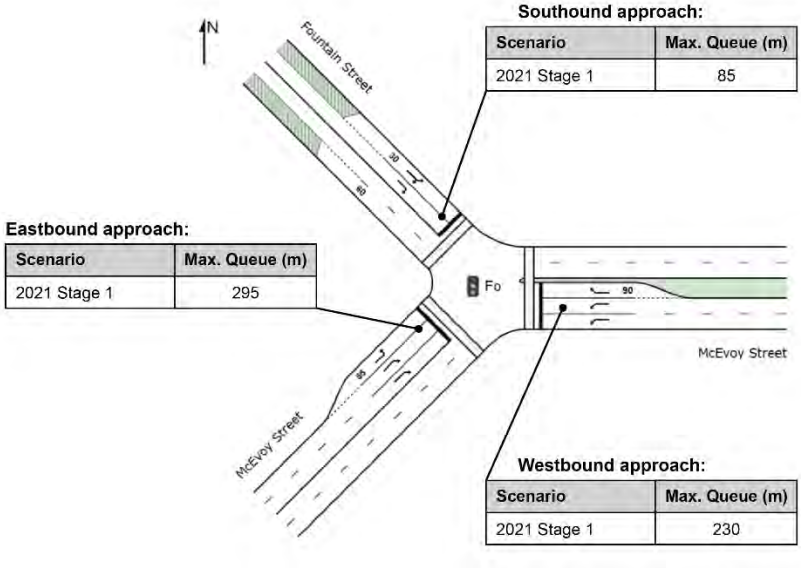
2016 / 2021 without Project	
2021 Stage 1	

Table 27: Fountain Street PM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
PM	2016	1901	52	D	260
	2021 without Project	2571[1]	86	F	360
	2021 Stage 1	3399	54	D	295

1 - Note: Without Project volumes impacted by latent demand due to upstream congestion.

Table 28: Fountain Street / McEvoy Street PM peak intersection configurations

2016 / 2021 without Project	
2021 Stage 1	

McEvoy Street / Botany Road

Table 29: Botany Road AM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
AM	2016	3240	56	E	285
	2021 without Project	3220[1]	249	F	500
	2021 Stage 1	3917	109	F	365

1 – Note: Without Project volumes impacted by latent demand due to upstream congestion.

Table 30: Botany Road / McEvoy Street AM peak intersection configurations

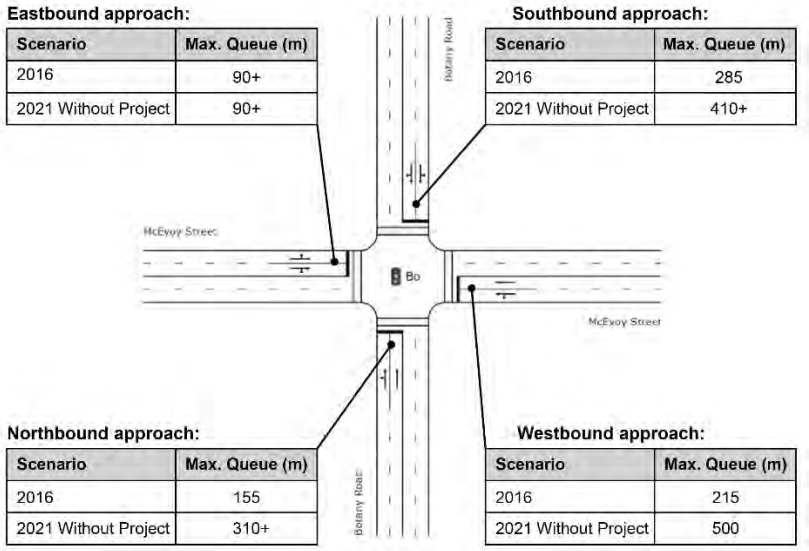
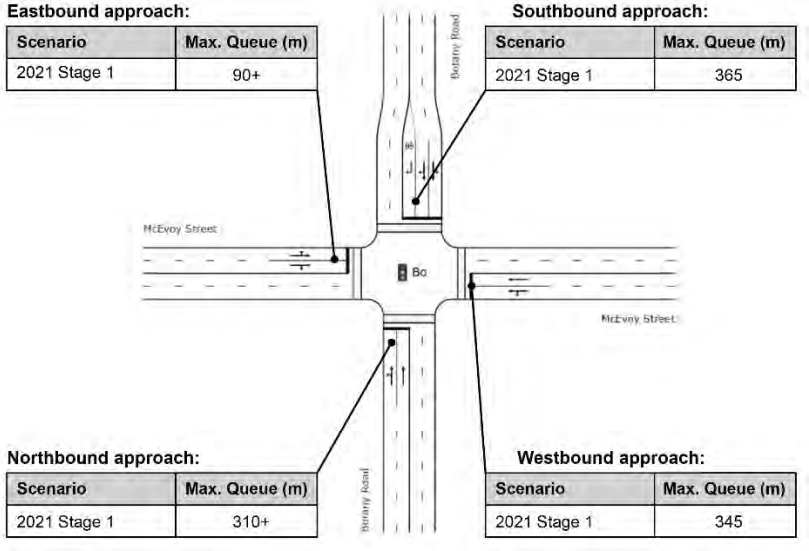
2016 / 2021 without Project	
2021 Stage 1	

Table 31: Botany Road PM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
PM	2016	3243	94	F	430
	2021 without Project	3513[1]	134	F	375+
	2021 Stage 1	4029	138	F	375+

1 - Note: Without Project volumes impacted by latent demand due to upstream congestion.

Table 32: Botany Road / McEvoy Street PM peak intersection configurations

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2021 without Project</td>
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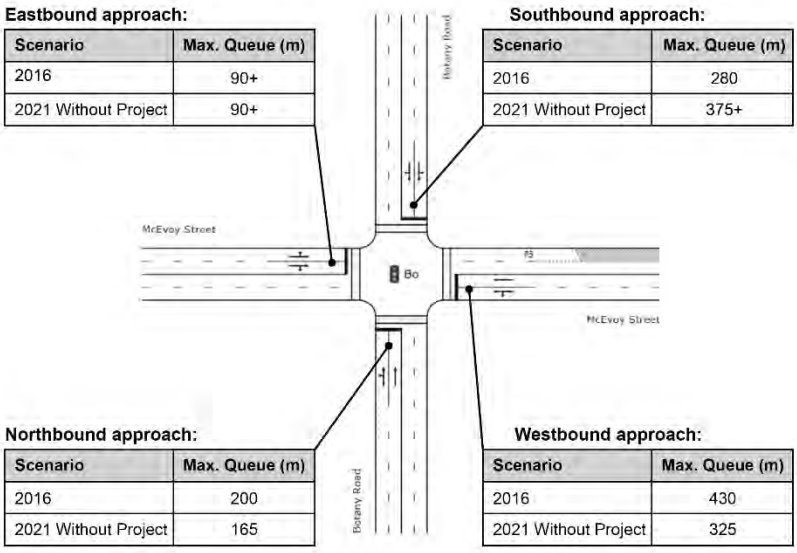

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<td>2021 Stage 1</td>
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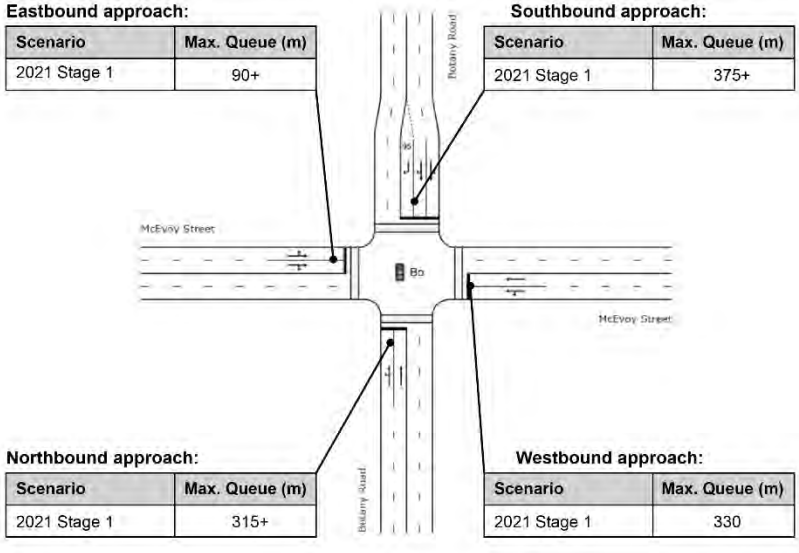

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McEvoy Street / Elizabeth Street

Table 33: Elizabeth Street AM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
AM	2016	2813	33	C	130
	2021 without Project	3133[1]	71	F	430
	2021 Stage 1	3397	39	C	145

1 - Note: Without Project volumes impacted by latent demand due to upstream congestion.

Table 34: Elizabeth Street / McEvoy Street AM peak intersection configurations

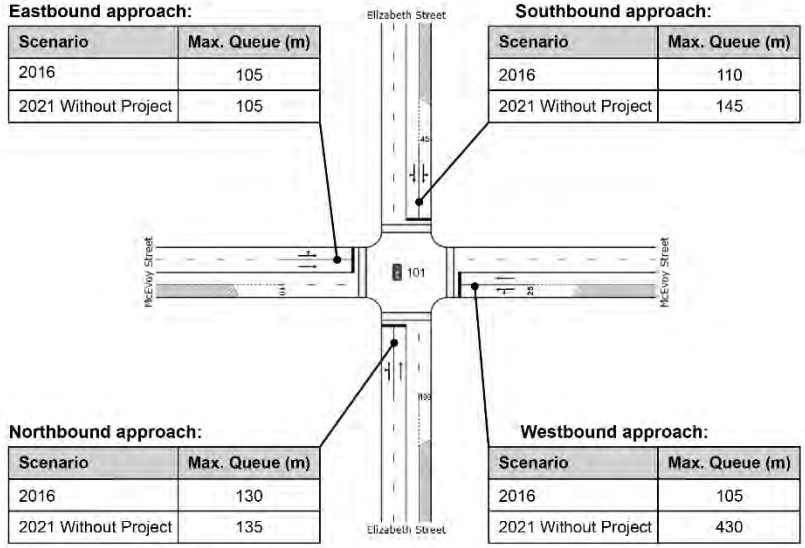
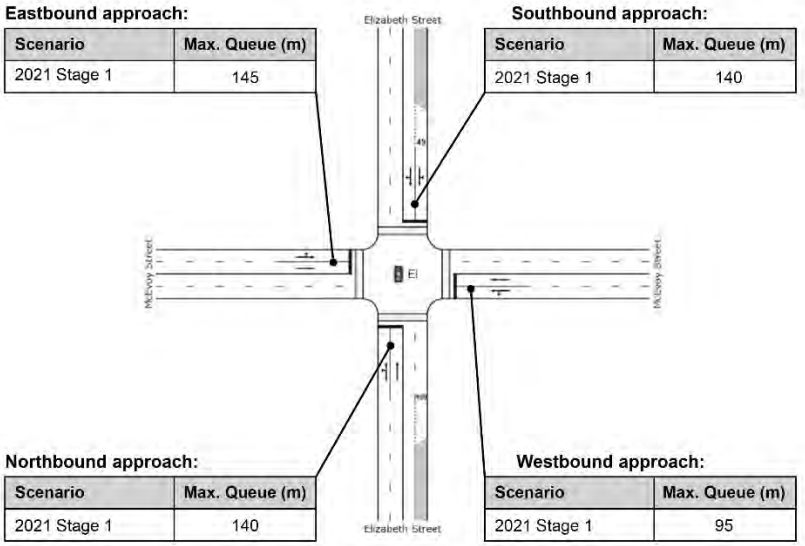
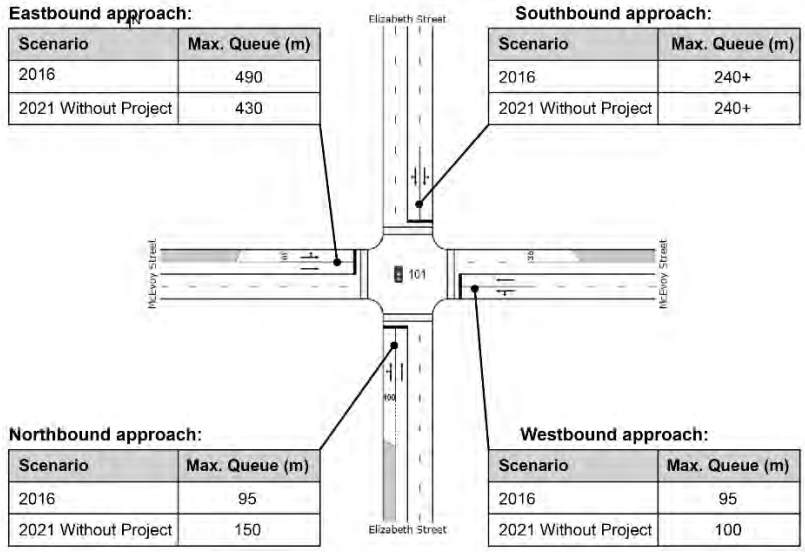
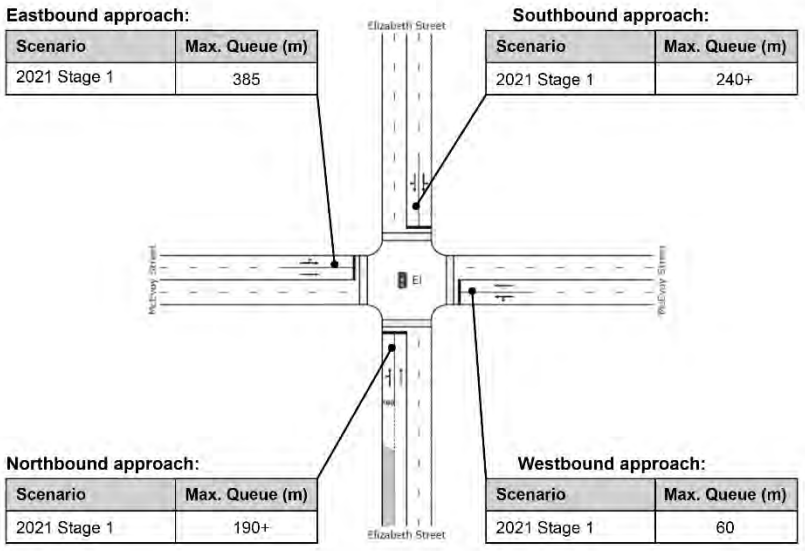
2016 / 2021 without Project	
2021 Stage 1	

Table 35: Elizabeth Street PM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
PM	2016	2837	73	F	490
	2021 without Project	3371[1]	82	F	430
	2021 Stage 1	3868	92	F	385

1 - Note: Without Project volumes impacted by latent demand due to upstream congestion.

Table 36: Elizabeth Street / McEvoy Street PM peak intersection configurations

2016 / 2021 without Project	
2021 Stage 1	

Lachlan Street / South Dowling Street

Table 37: South Dowling Street AM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
AM	2016	4294	88	F	510
	2021 without Project	3674[1]	248	F	500+
	2021 Stage 1	4270	125	F	500+

1 - Note: Without Project volumes impacted by latent demand due to upstream congestion.

Table 38: South Dowling Street / McEvoy Street AM peak intersection configurations

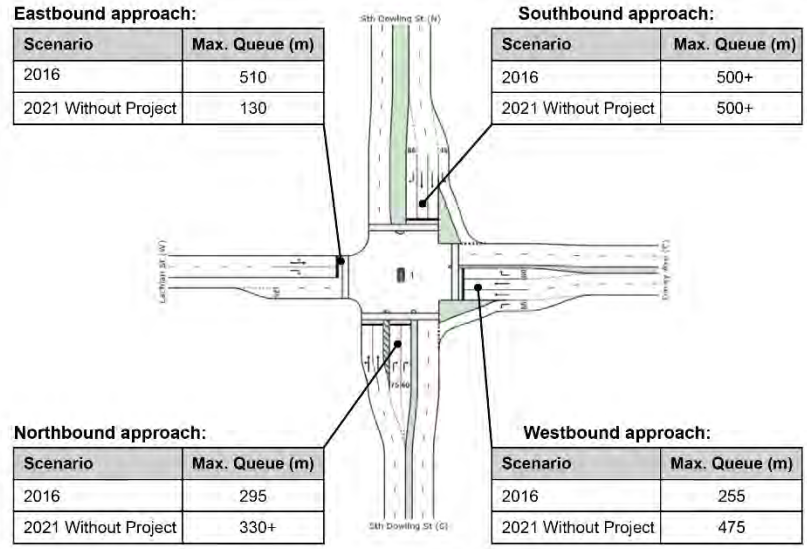
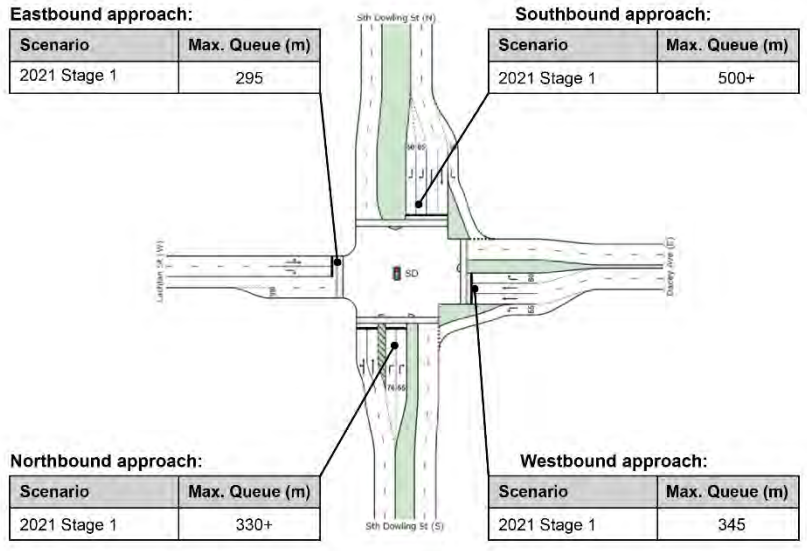
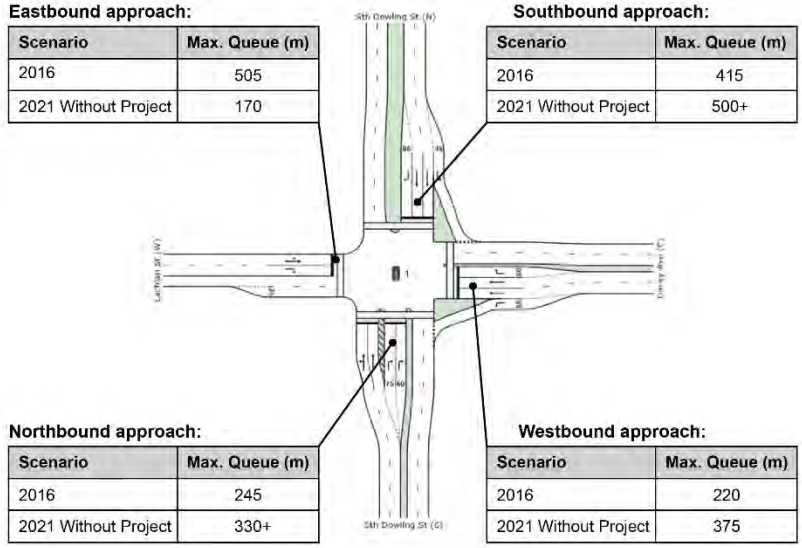
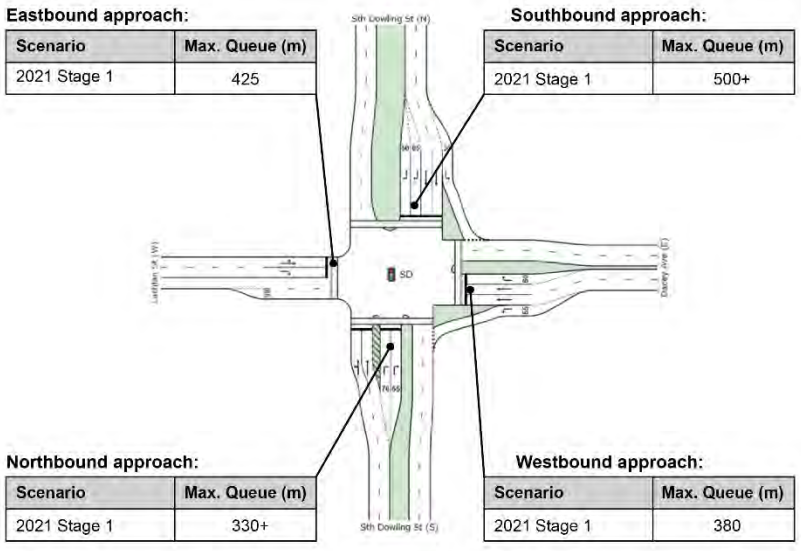
2016 / 2021 without Project	
2021 Stage 1	

Table 39: South Dowling Street PM peak Vissim results

Peak	Scenario	Volume	Ave Delay (sec)	LOS	Max Queue (m)
PM	2016	4642	77	F	500+
	2021 without Project	4524[1]	165	F	500+
	2021 Stage 1	4849	141	F	500+

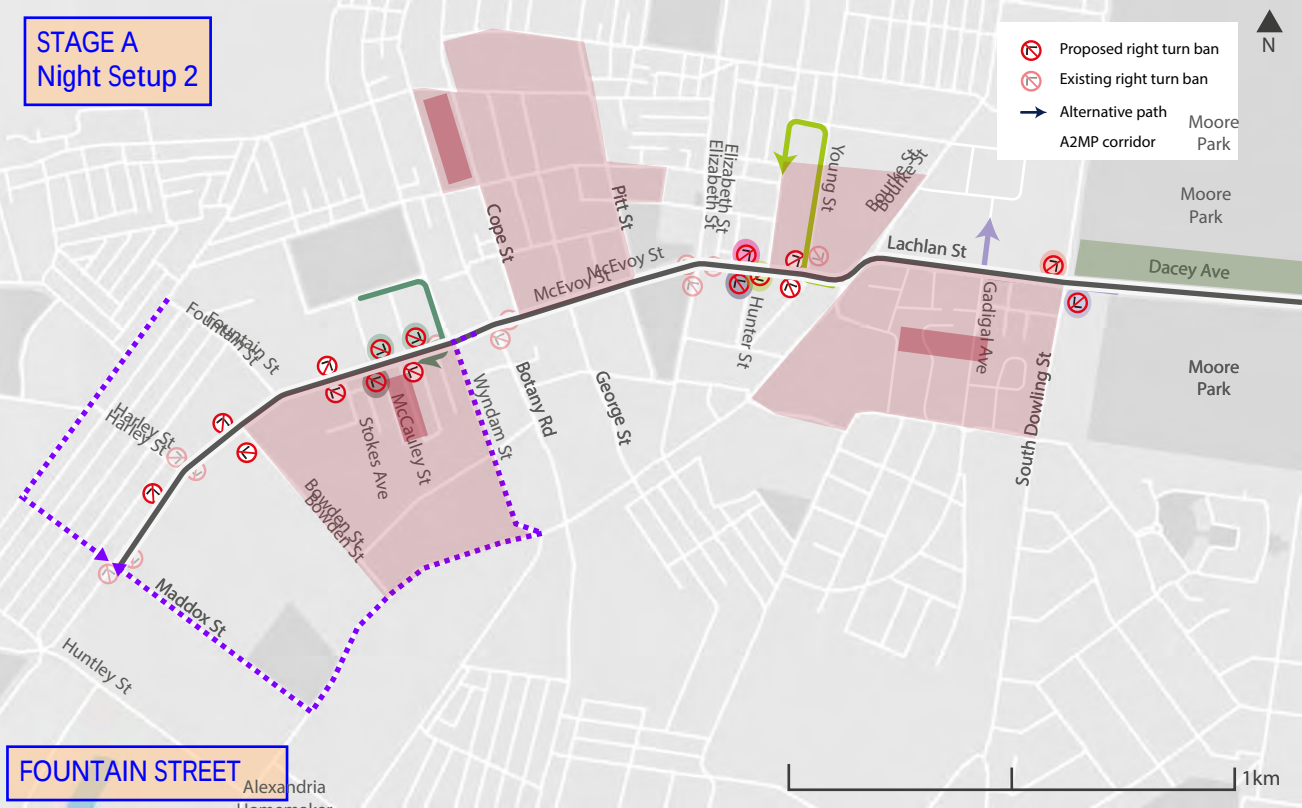
1 - Note: Without Project volumes impacted by latent demand due to upstream congestion.

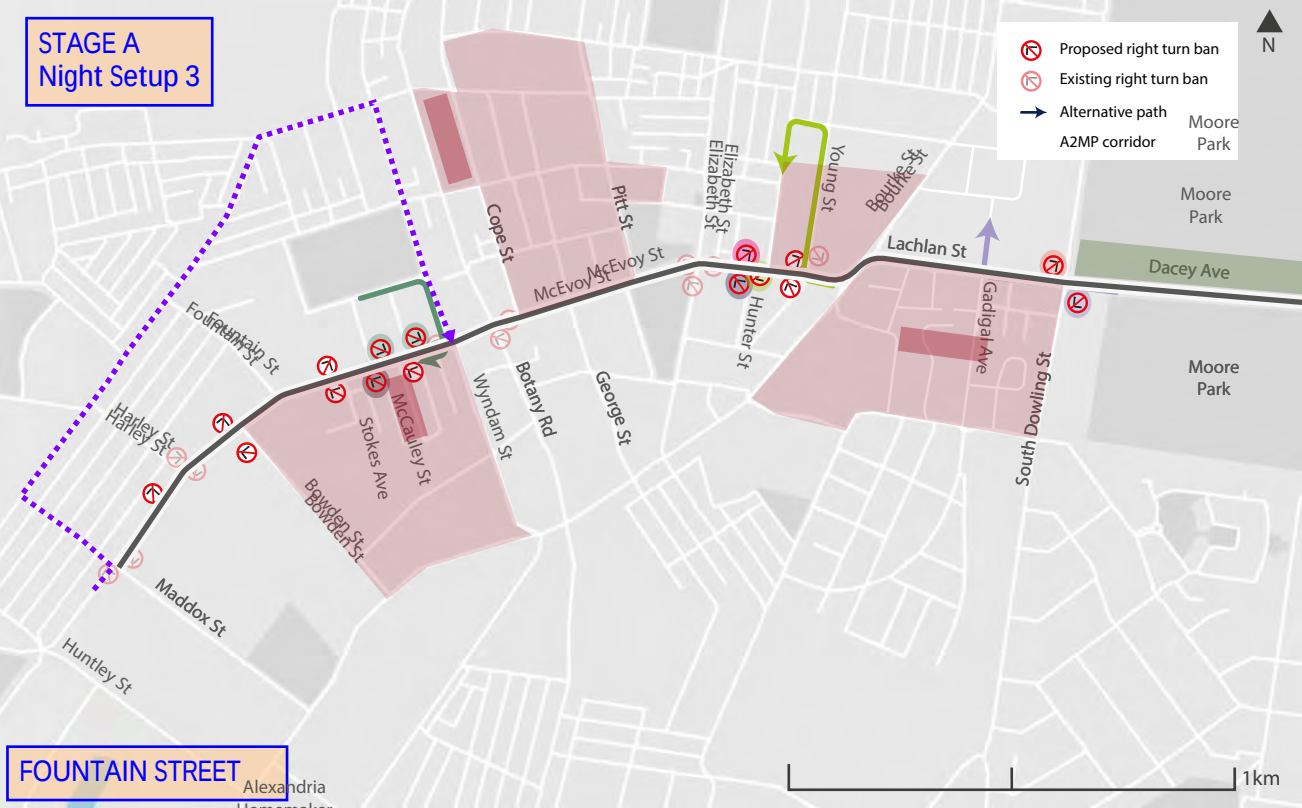
Table 40: South Dowling Street / McEvoy Street PM peak intersection configurations

2016 / 2021 without Project	
2021 Stage 1	

Appendix H

Construction Stage Diversions


STAGE A
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
FOUNTAIN STREET
Alexandria
1km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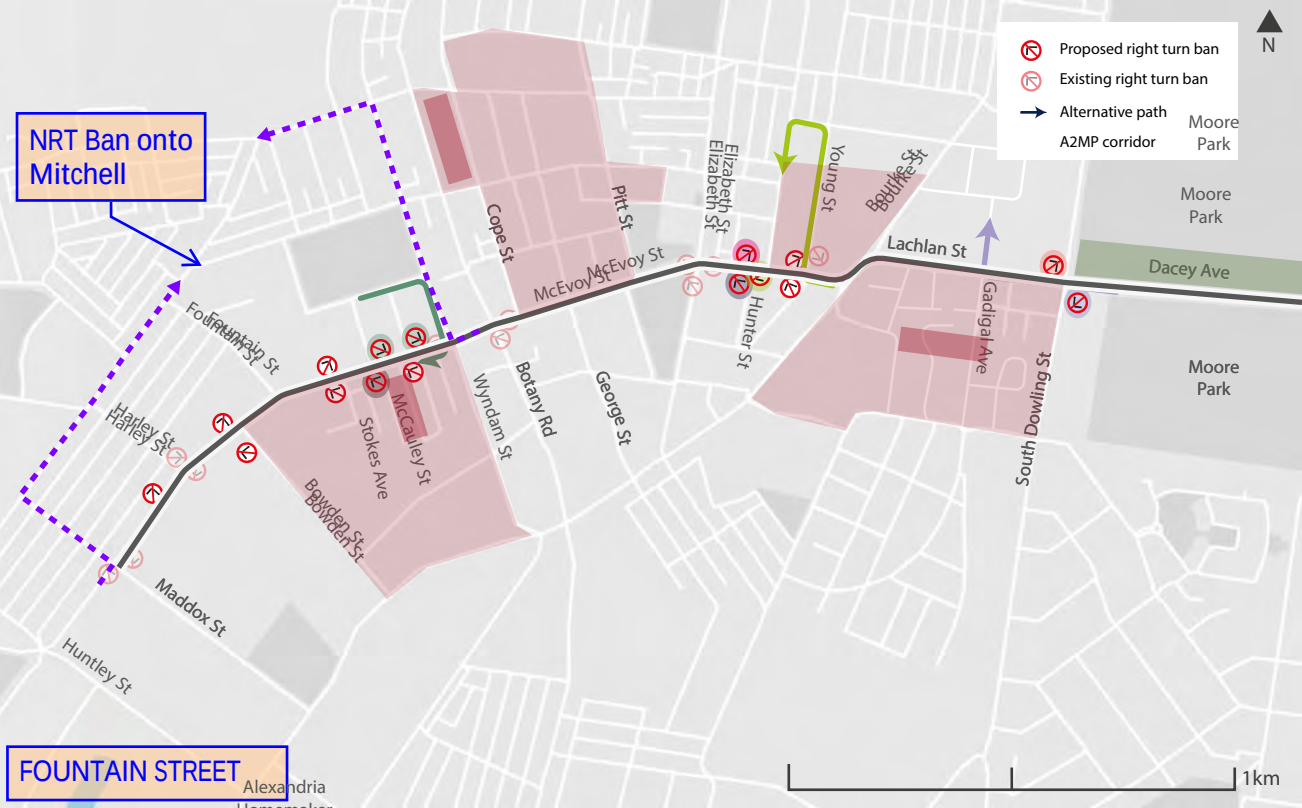
Night Setup 3
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Harley St
Harley St
Fountain St
Fountain St
Maddox St
Huntley St
FOUNTAIN STREET
Alexandria
1km


NRT Ban onto Mitchell
Proposed right turn ban
Existing right turn ban
Alternative path
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McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
Wyndam St
George St
Fountain St
Fountain St
Harley St
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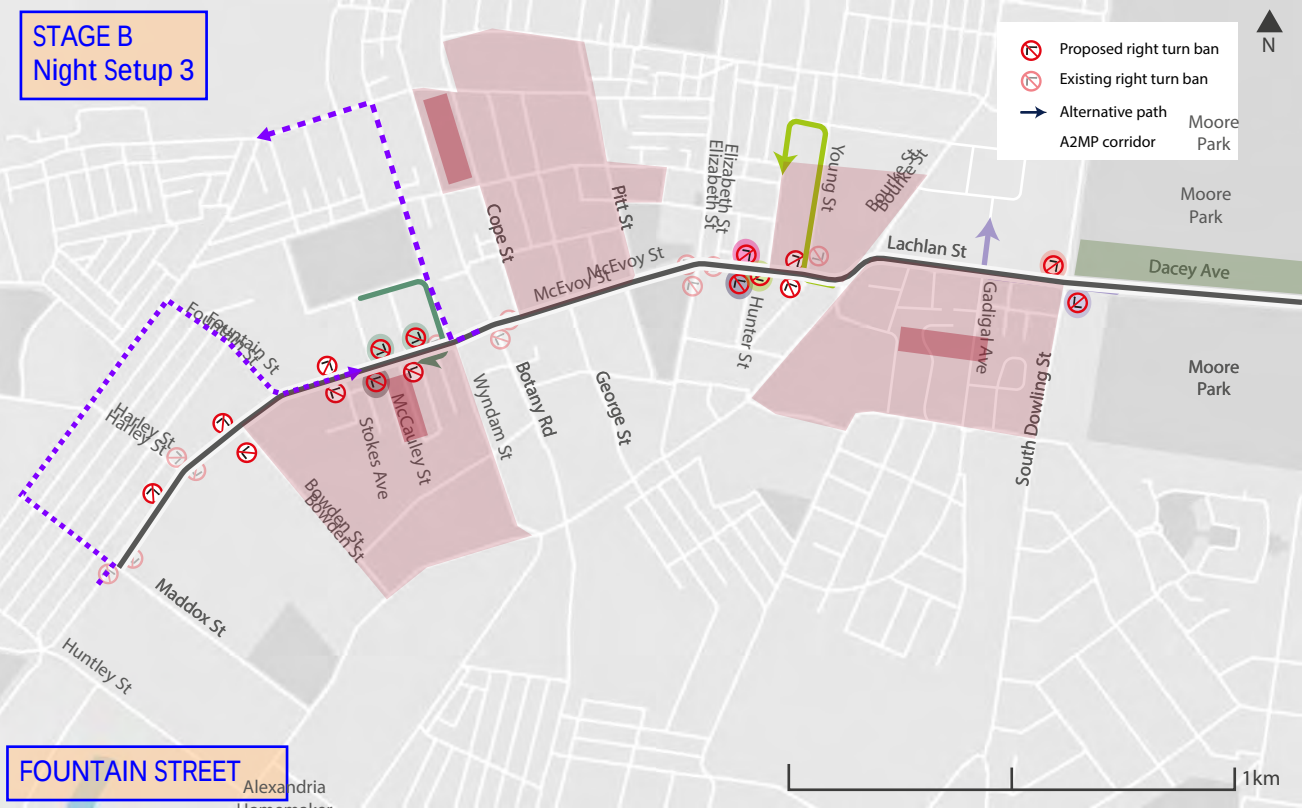
McCauley St
Stokes Ave
Bowden St
Bowden St
Maddox St
Huntley St
1km
FOUNTAIN STREET
Alexandria


STAGE B
Night Setup 3
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
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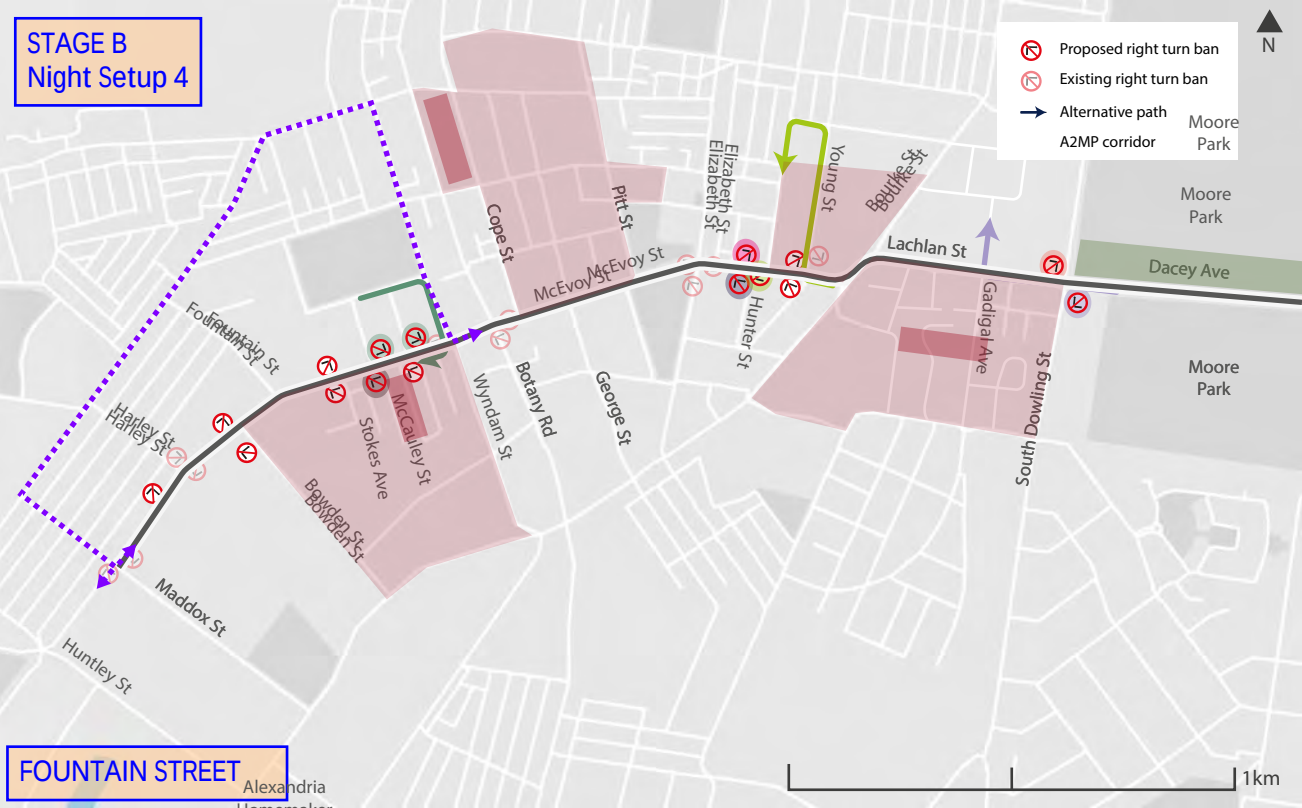
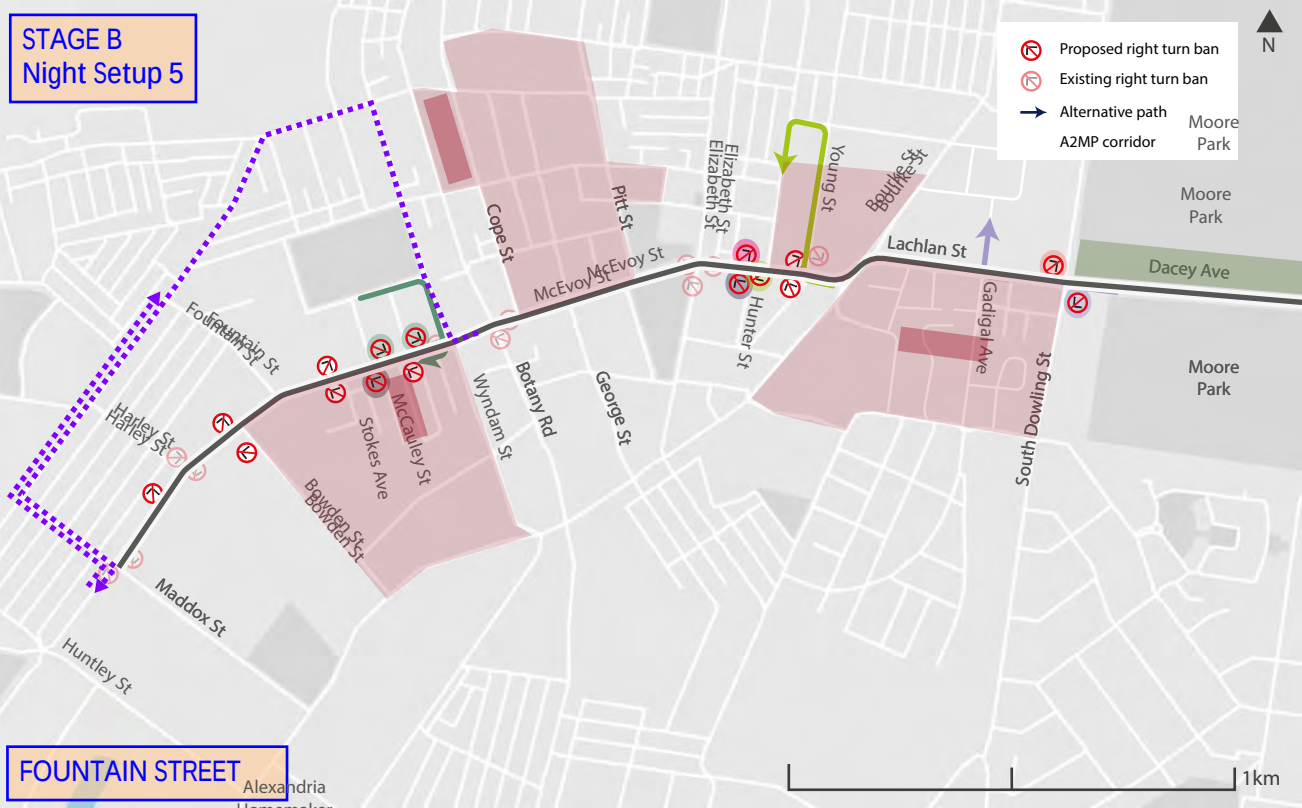
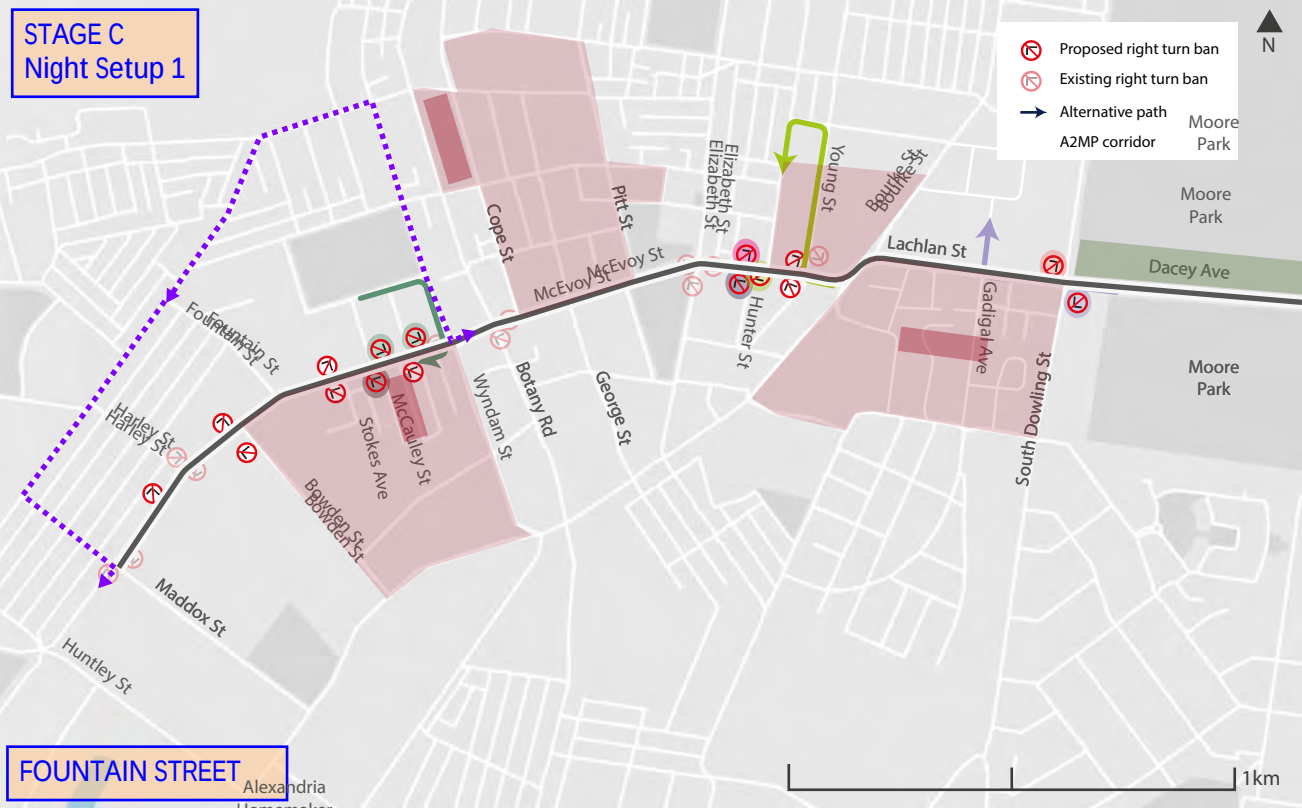
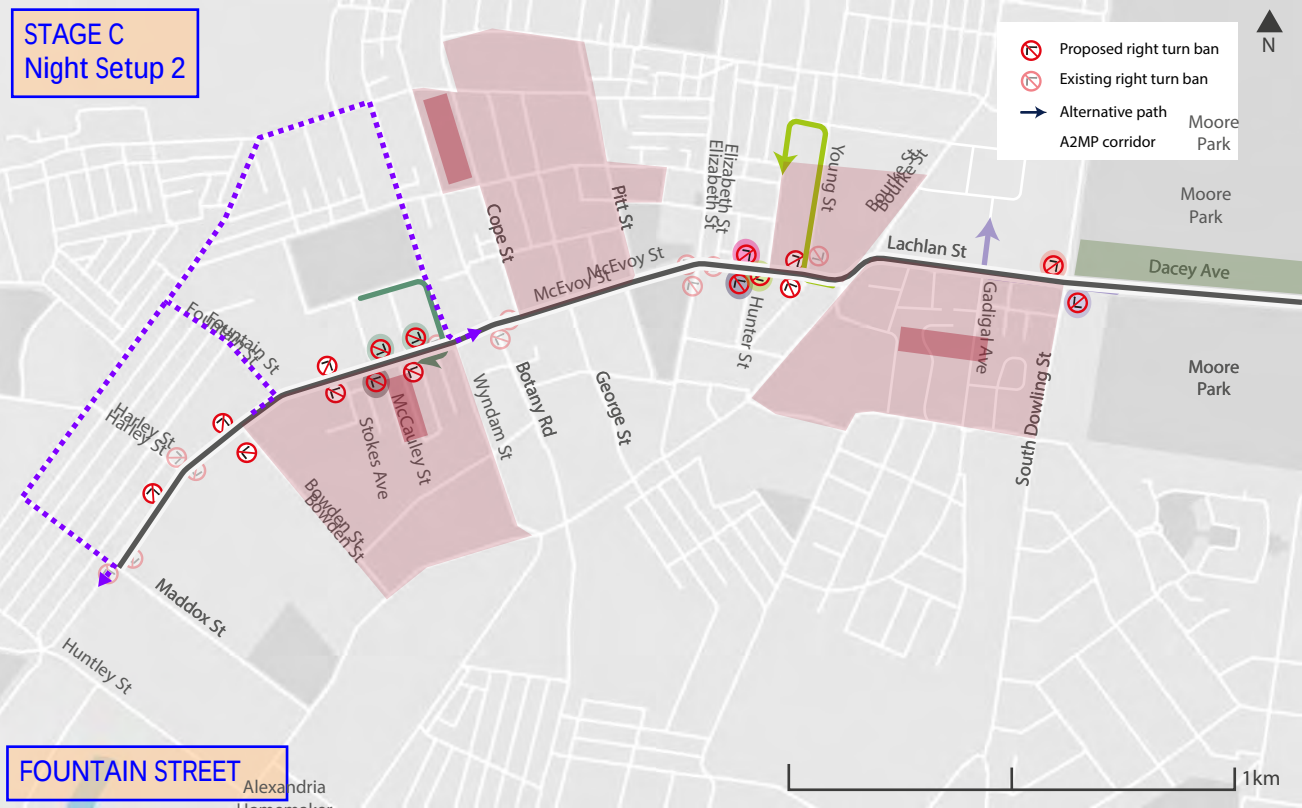
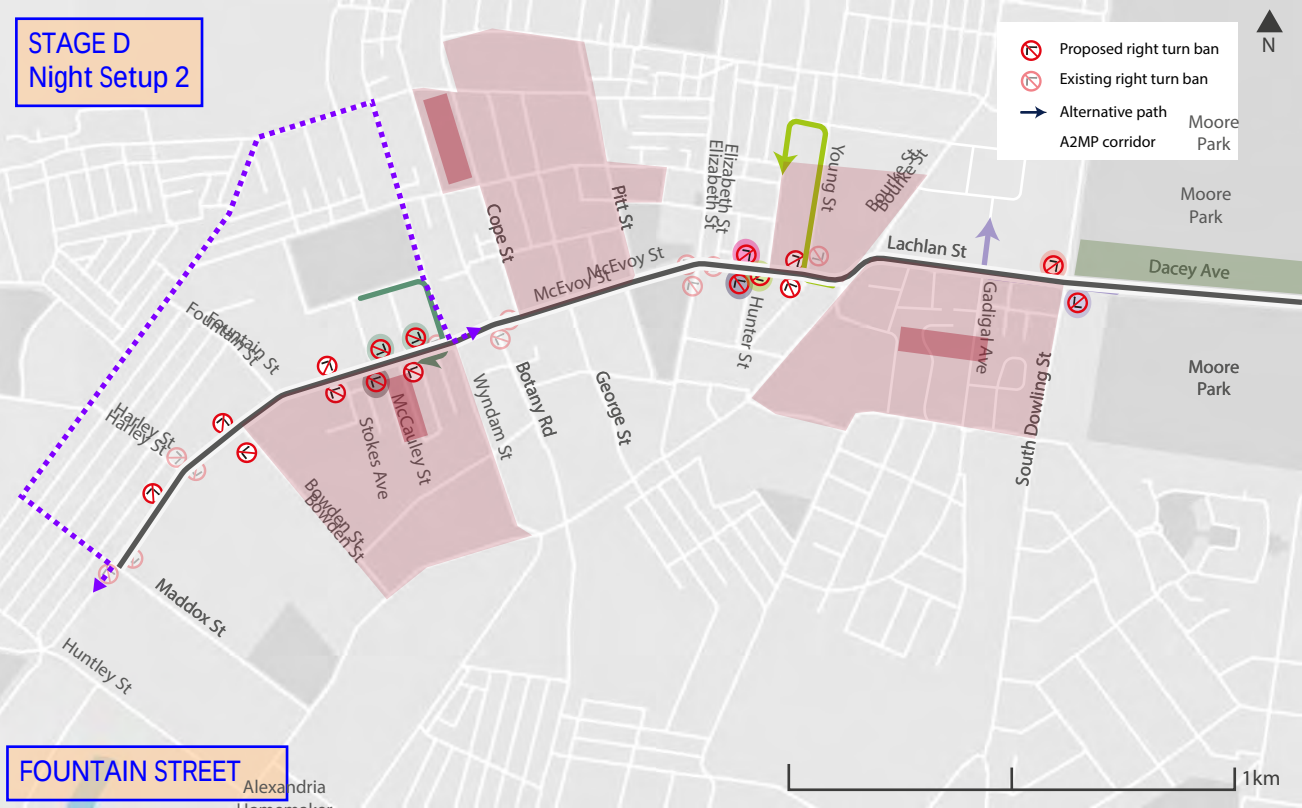
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Alexandria
1km
FOUNTAIN STREET

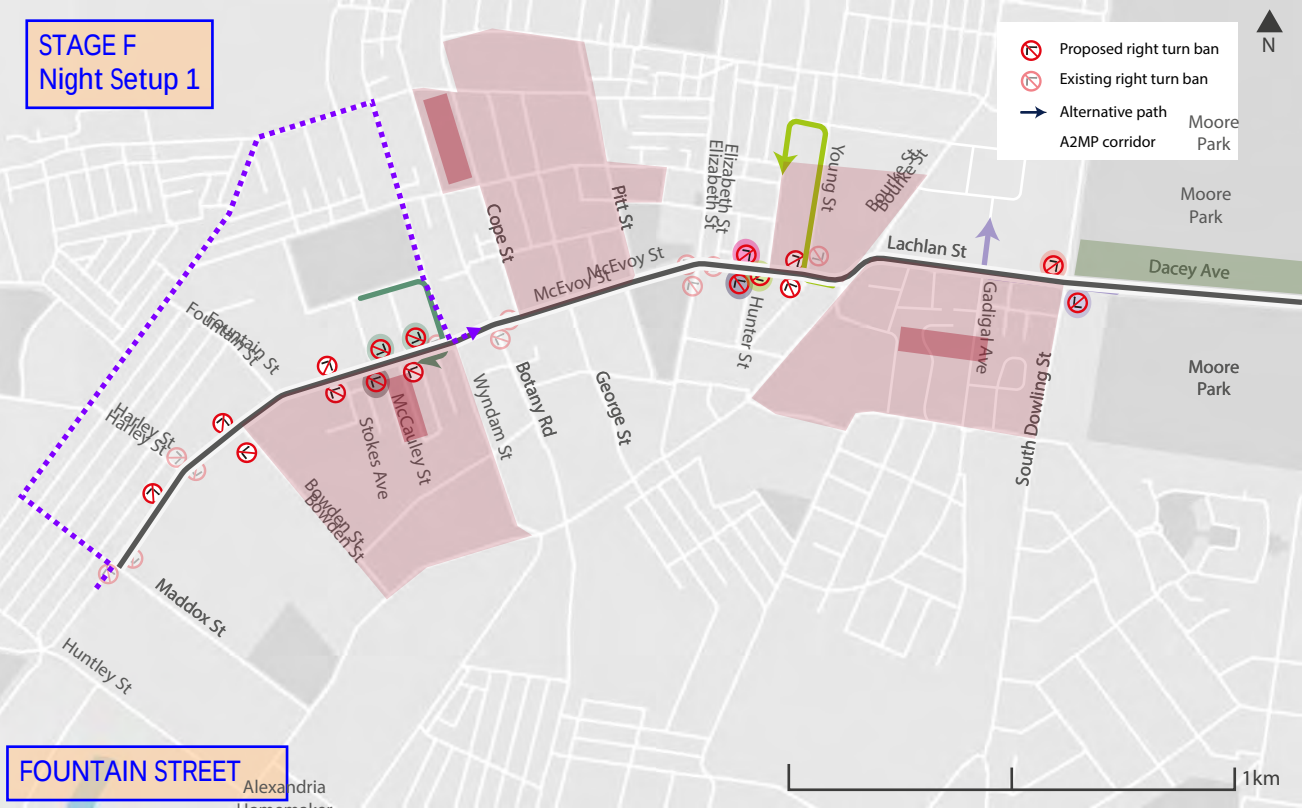

STAGE B
Night Setup 4
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
1km
FOUNTAIN STREET
Alexandria

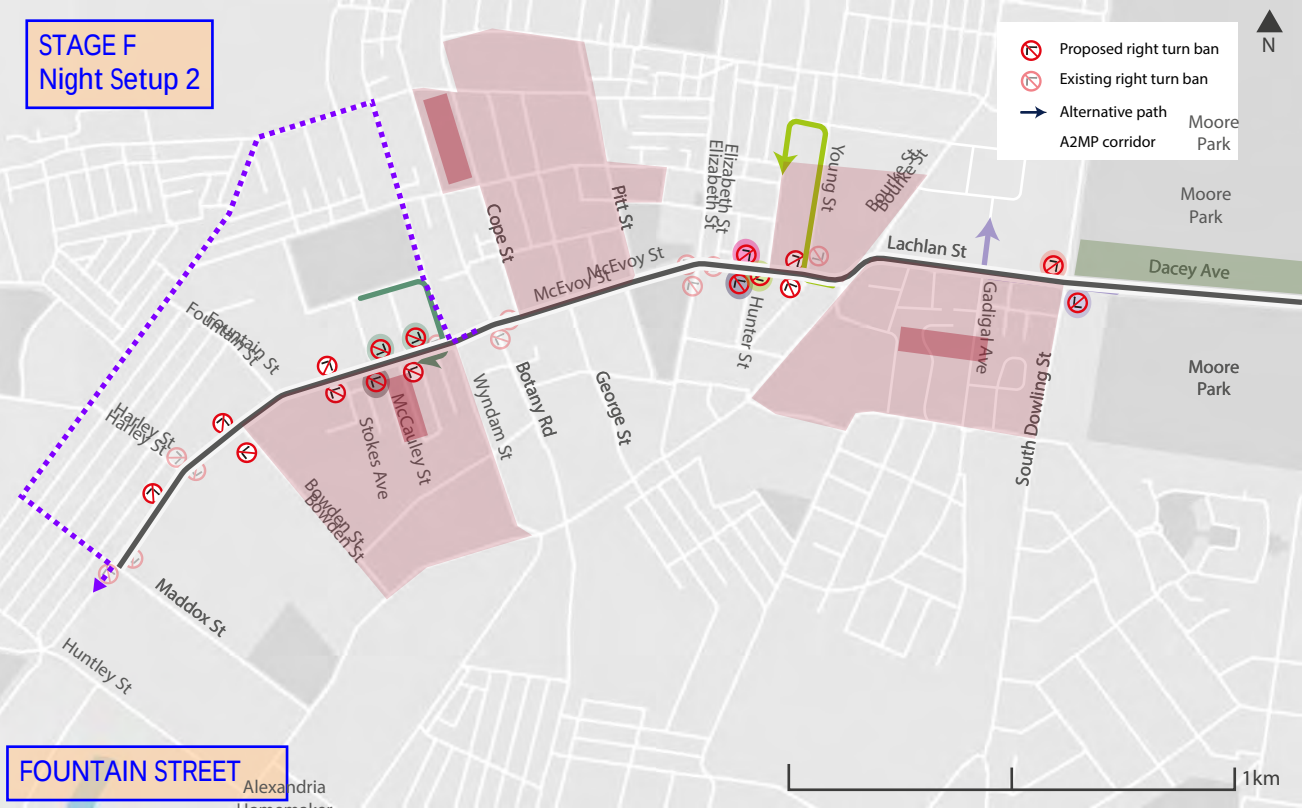

STAGE B
Night Setup 5
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
1km
FOUNTAIN STREET
Alexandria

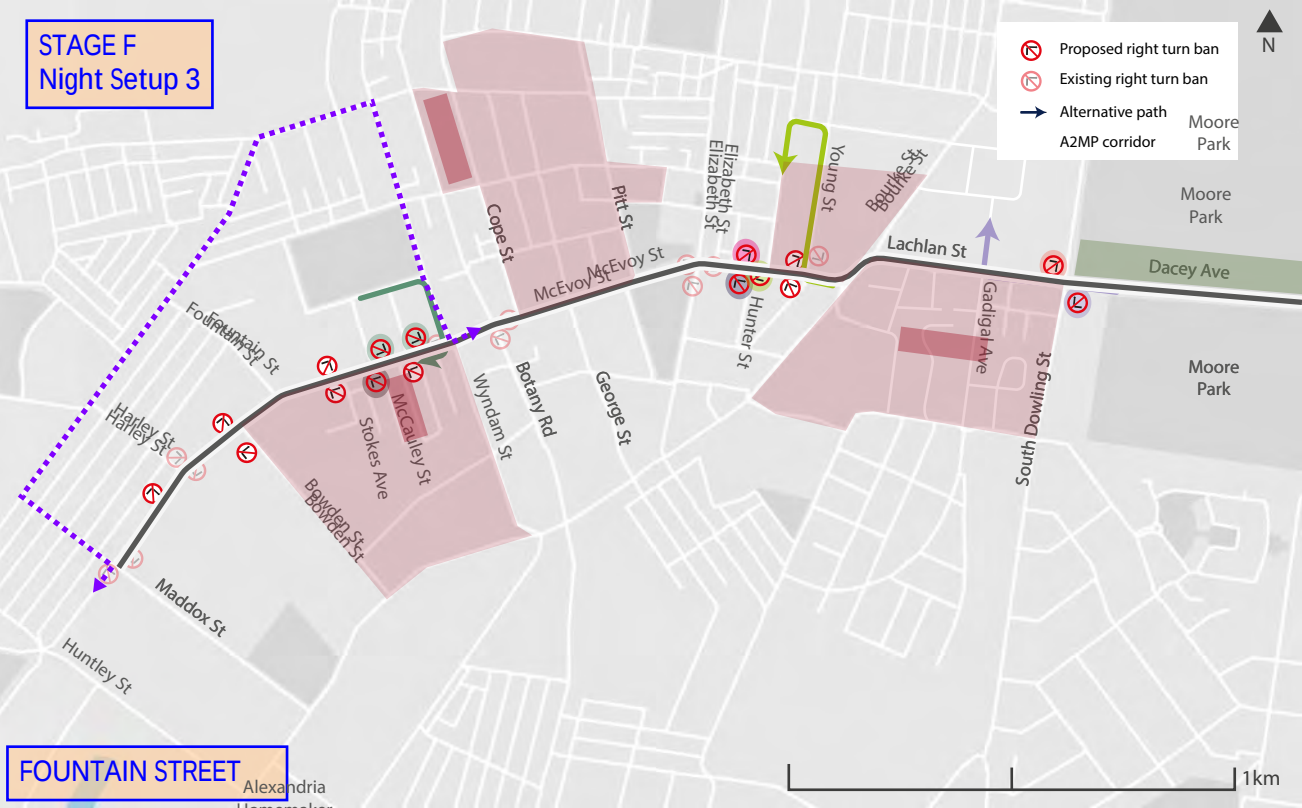

STAGE C
Night Setup 1
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Harley St
Harley St
Fountain St
Fountain St
Maddox St
Huntley St
1km
FOUNTAIN STREET
Alexandria

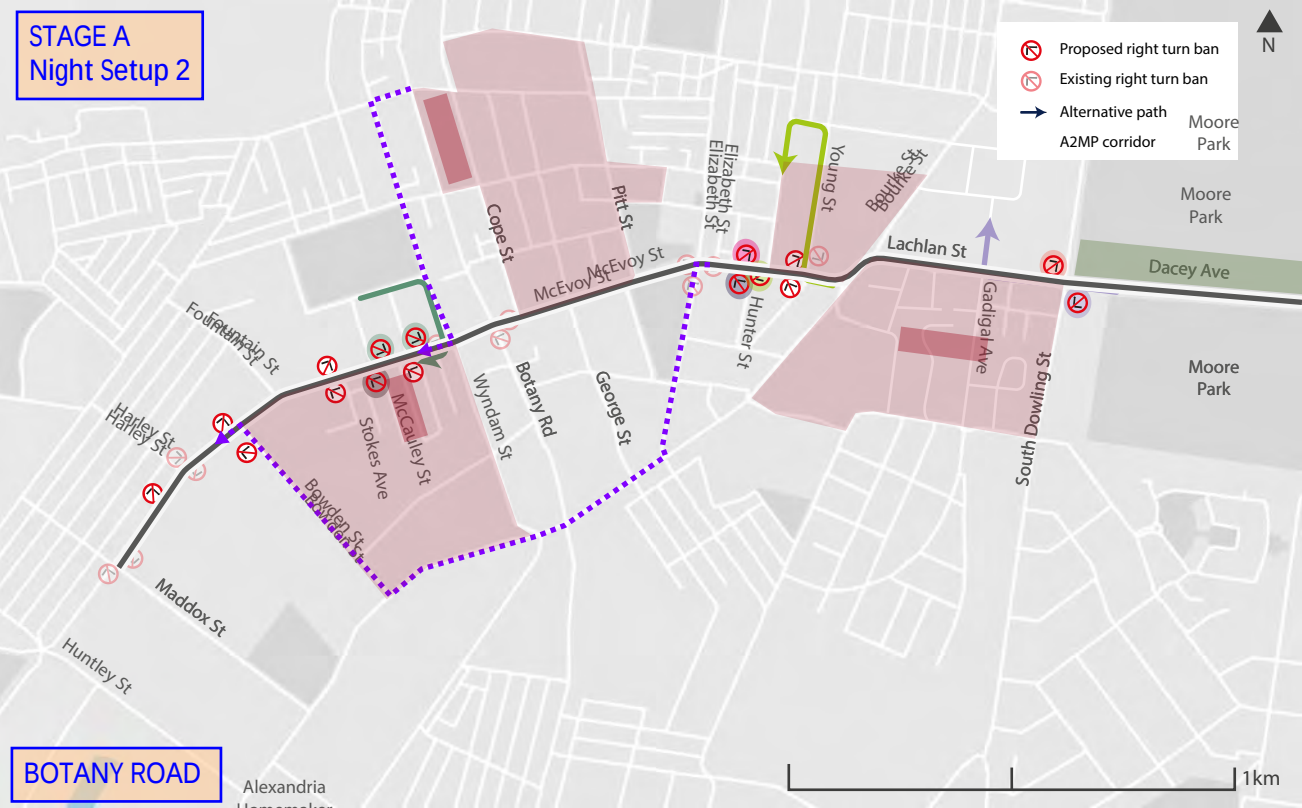

STAGE C
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Alexandria
1km
FOUNTAIN STREET

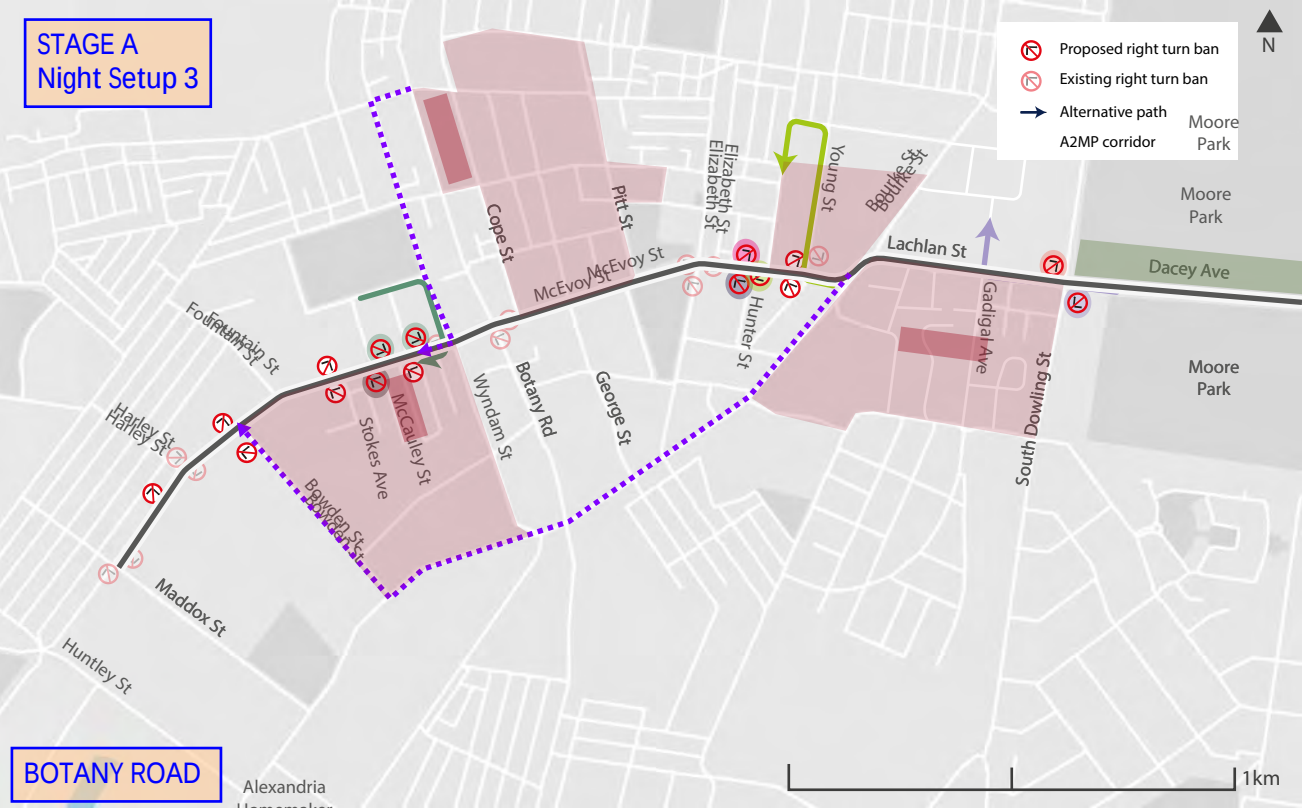

STAGE D
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Harley St
Harley St
Fountain St
Fountain St
Maddox St
Huntley St
1km
FOUNTAIN STREET
Alexandria


STAGE F
Night Setup 1
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
1km
FOUNTAIN STREET
Alexandria


STAGE F
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Harley St
Harley St
Fountain St
Fountain St
Maddox St
Huntley St
Alexandria
1km
FOUNTAIN STREET


STAGE F
Night Setup 3
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
1km
FOUNTAIN STREET
Alexandria

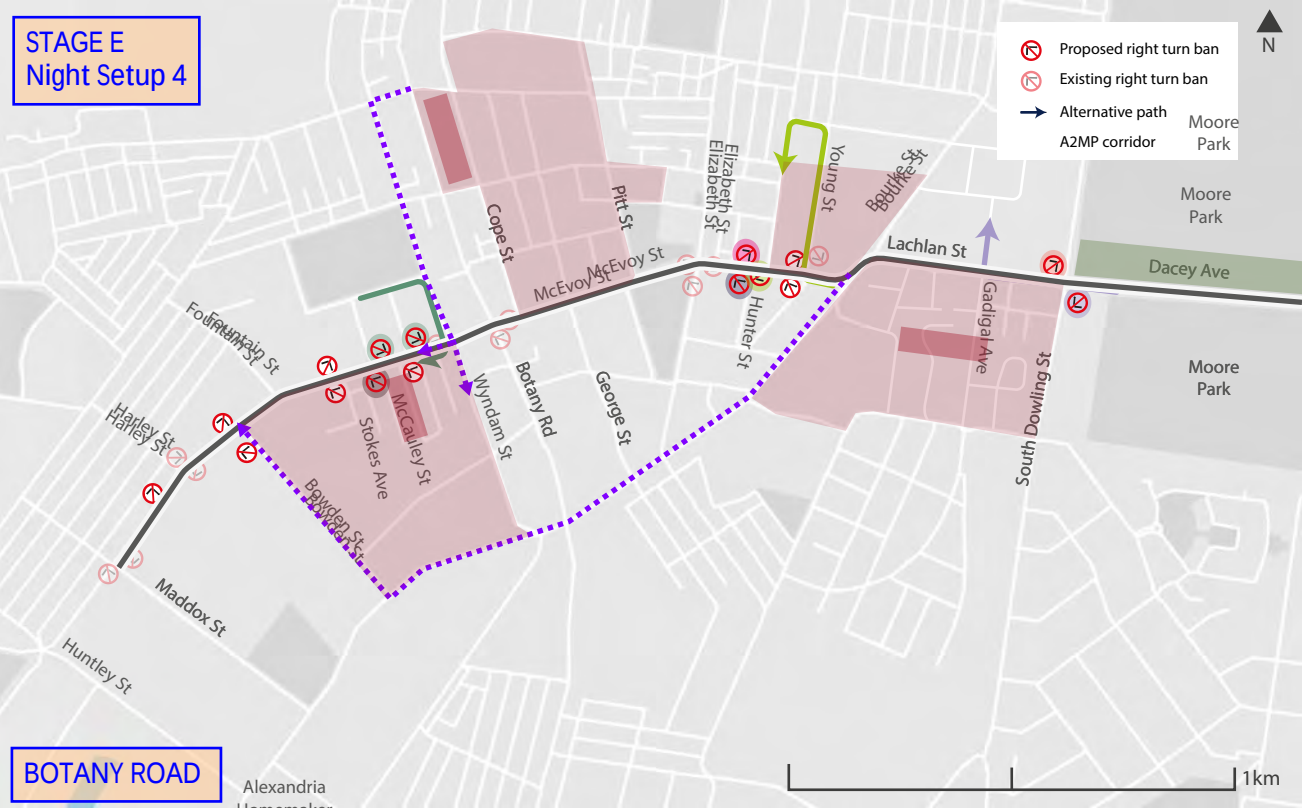

STAGE A
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Fountain St
Fountain St
Harley St
Harley St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
Wyndam St
George St
McCauley St
Stokes Ave
Bowden St
Bowden St
Maddox St
Huntley St
BOTANY ROAD
Alexandria
1km


STAGE A
Night Setup 3
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Alexandria
1km
BOTANY ROAD

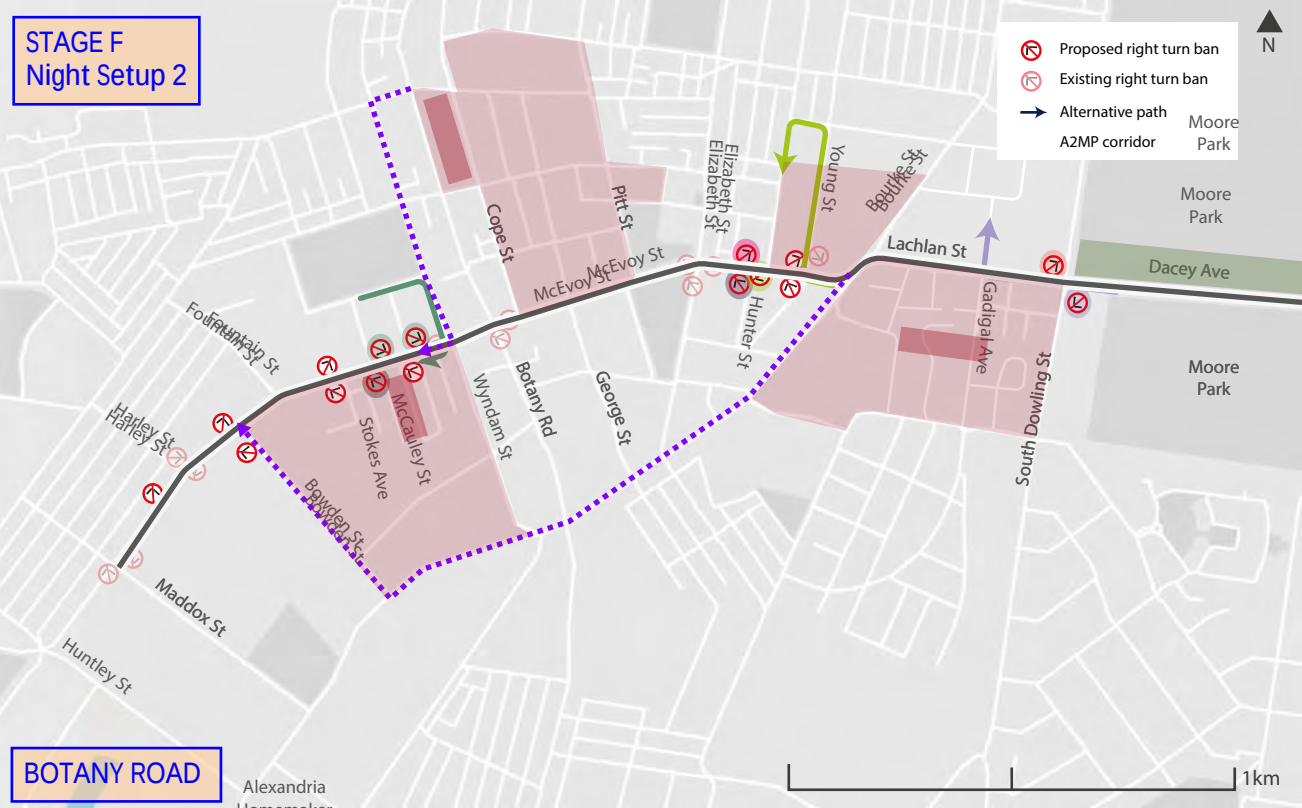

STAGE A
Night Setup 4
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Alexandria
1km
BOTANY ROAD

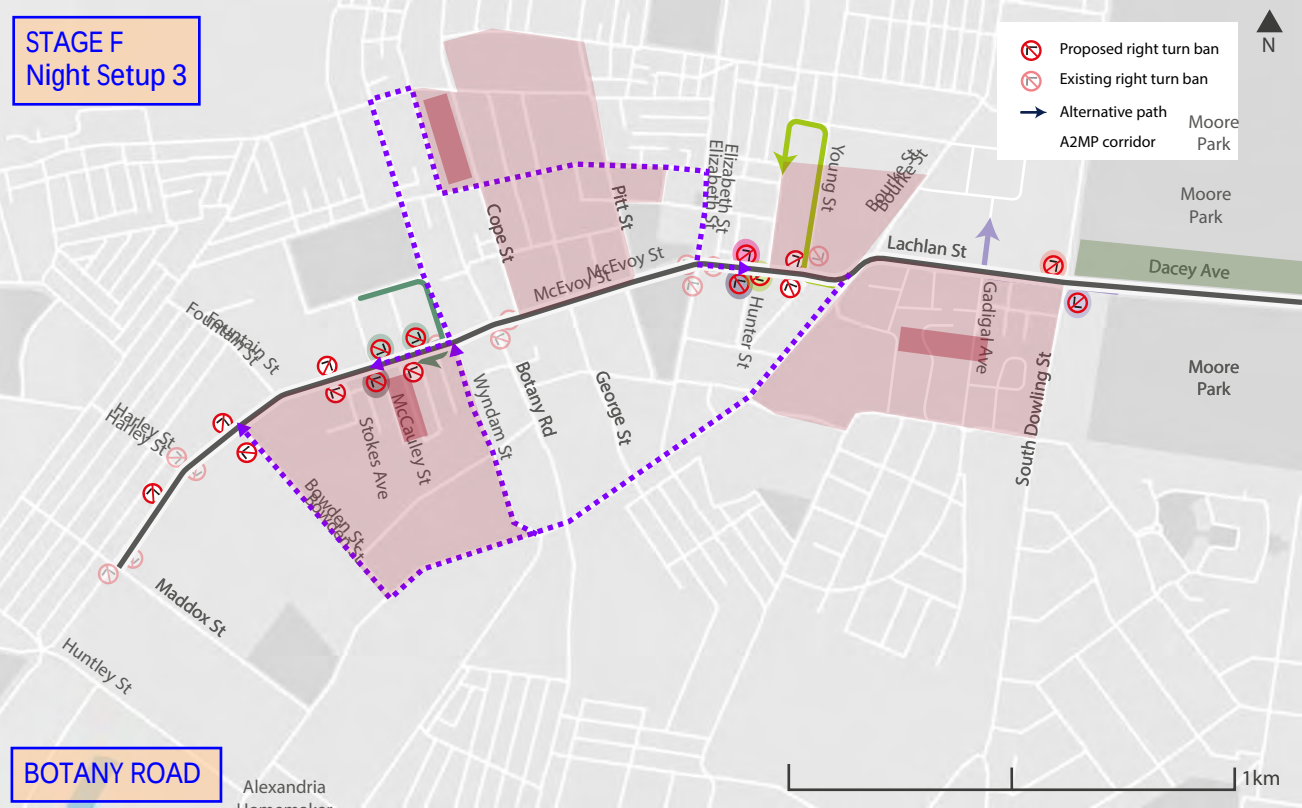

STAGE E
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
BOTANY ROAD
Alexandria
1km

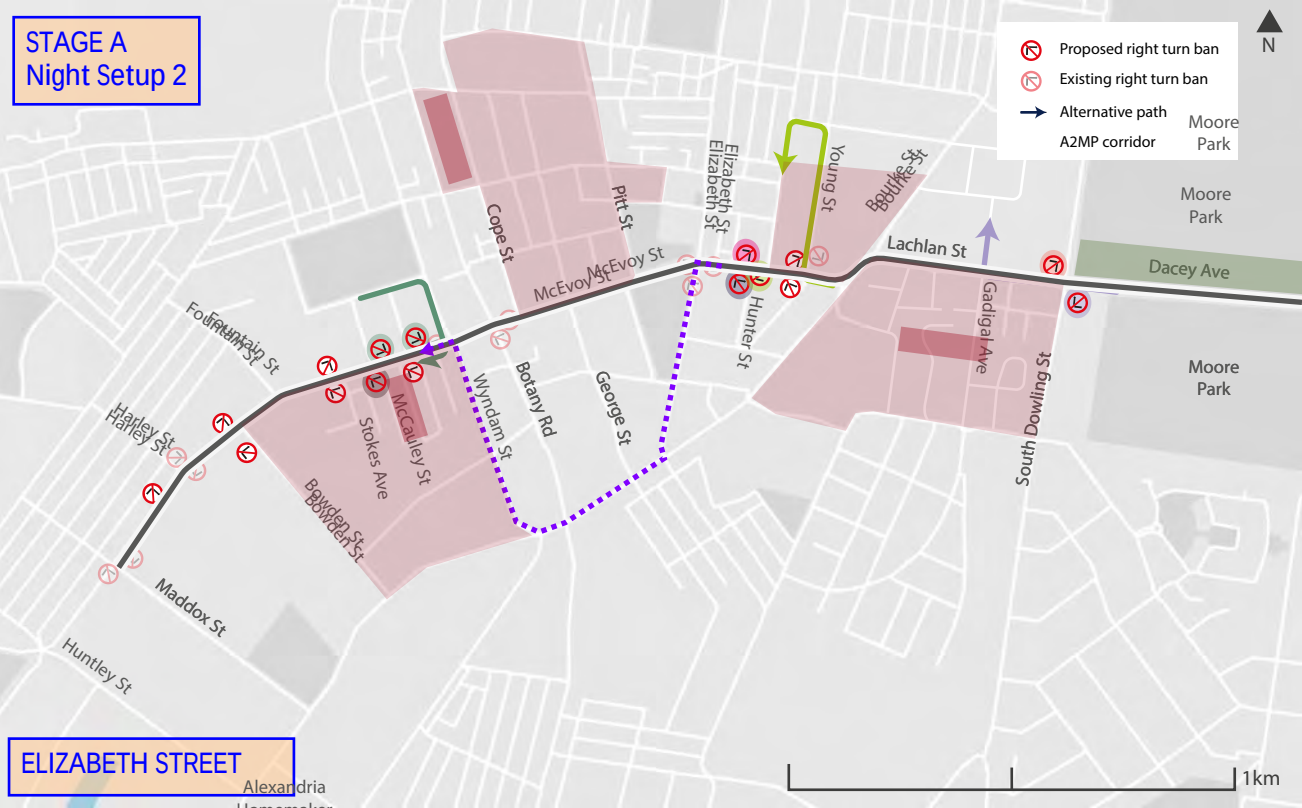

STAGE E
Night Setup 3
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Alexandria
1km
BOTANY ROAD

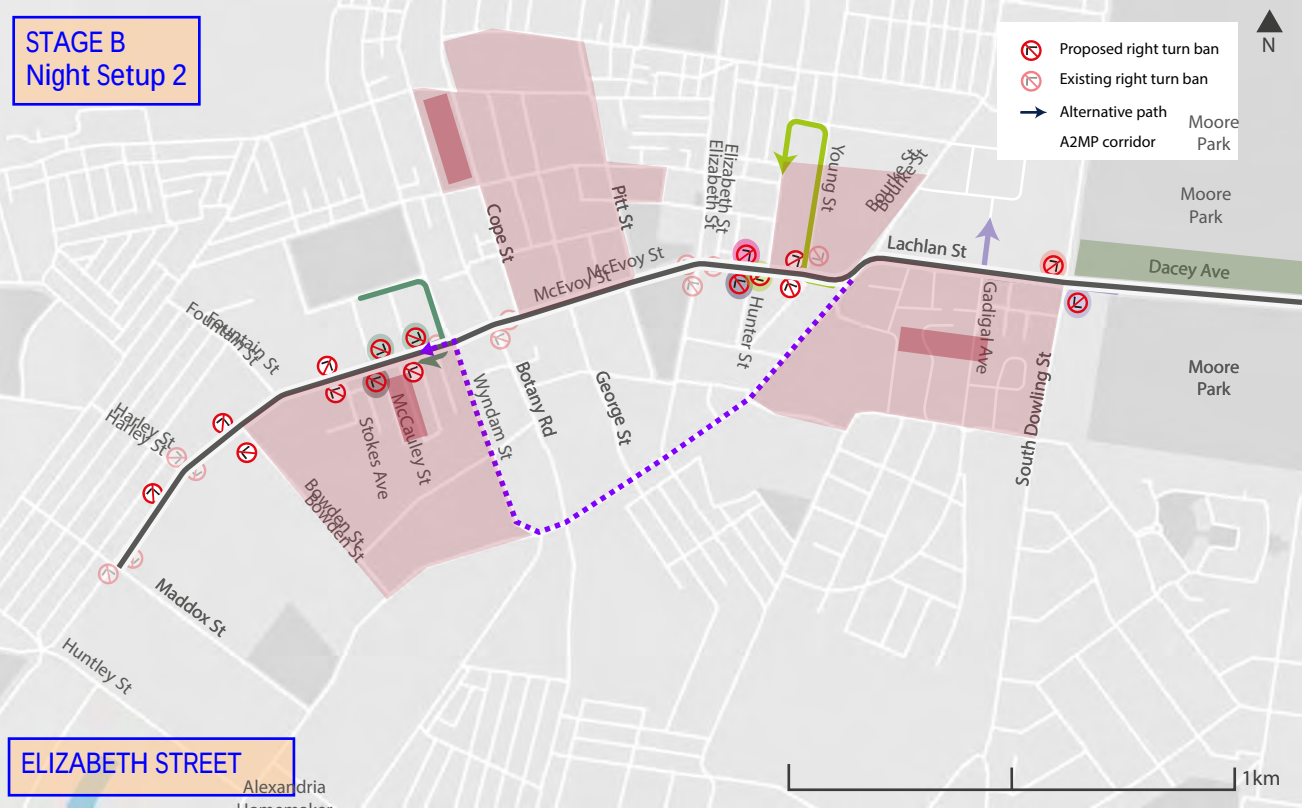

STAGE E
Night Setup 4
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Fountain St
Fountain St
Harley St
Harley St
Stokes Ave
McCauley St
Wyndam St
Botany Rd
George St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Bowden St
Bowden St
Maddox St
Huntley St
Alexandria
1km
BOTANY ROAD

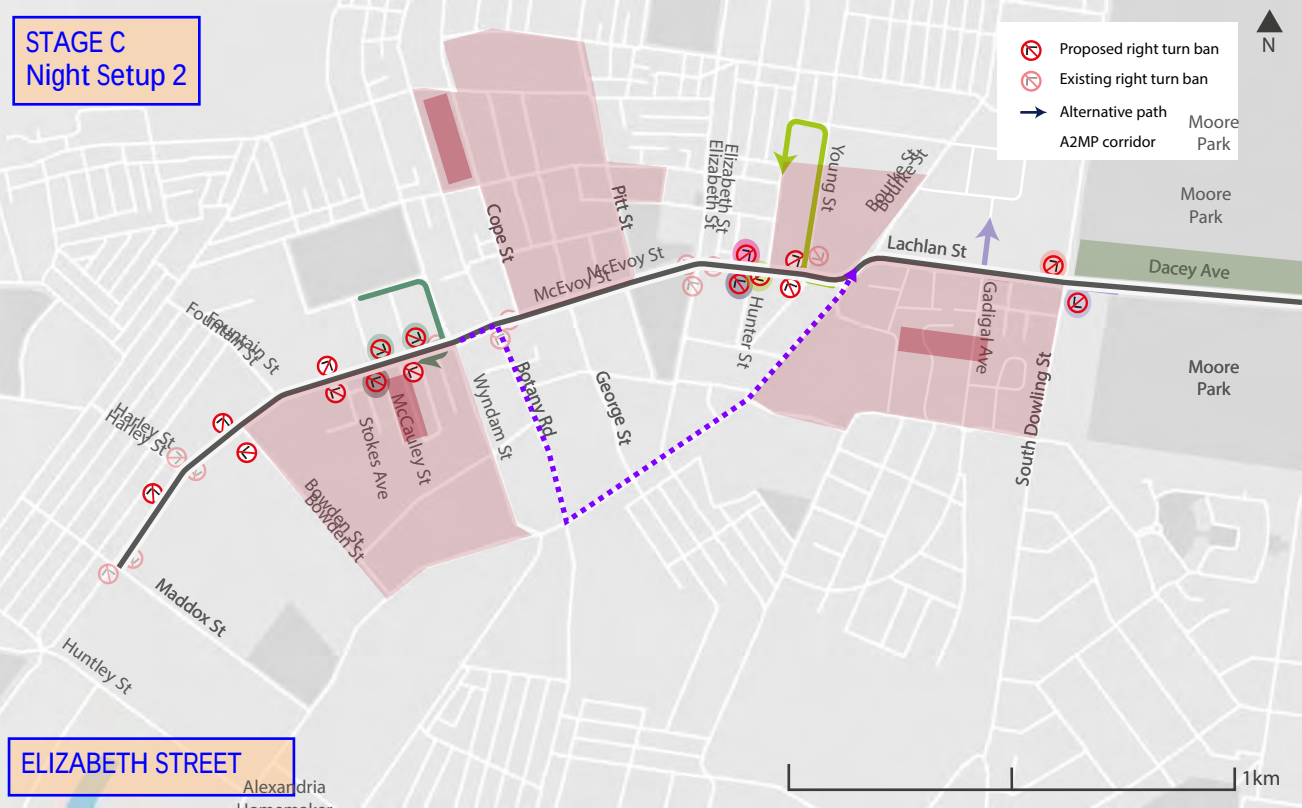

STAGE F
Night Setup 1
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
Gadigal Ave
South Dowling St
Hunter St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Cope St
Pitt St
McEvoy St
McEvoy St
Fountain St
Fountain St
Harley St
Harley St
Stokes Ave
McCauley St
Wyndam St
Botany Rd
George St
Bowden St
Bowden St
Maddox St
Huntley St
BOTANY ROAD
Alexandria
1km

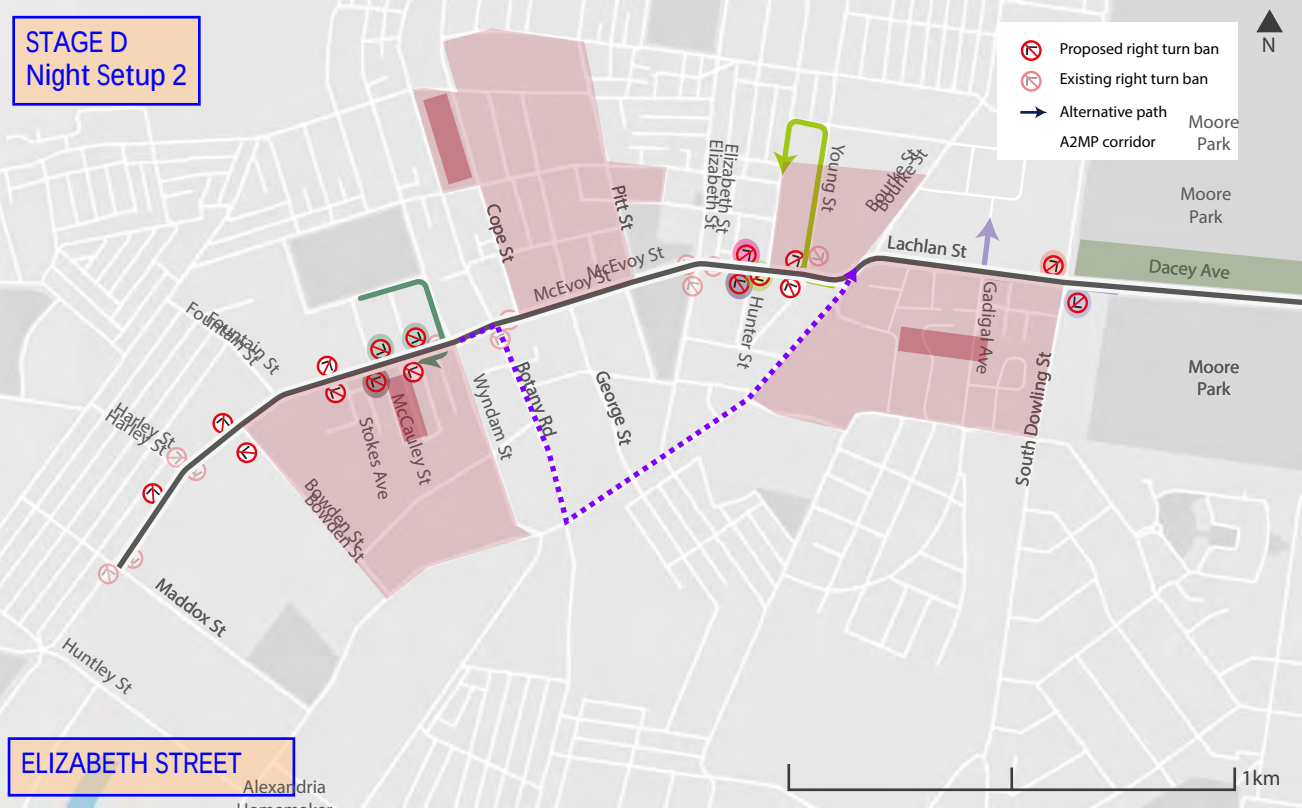

STAGE F
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Alexandria
1km
BOTANY ROAD

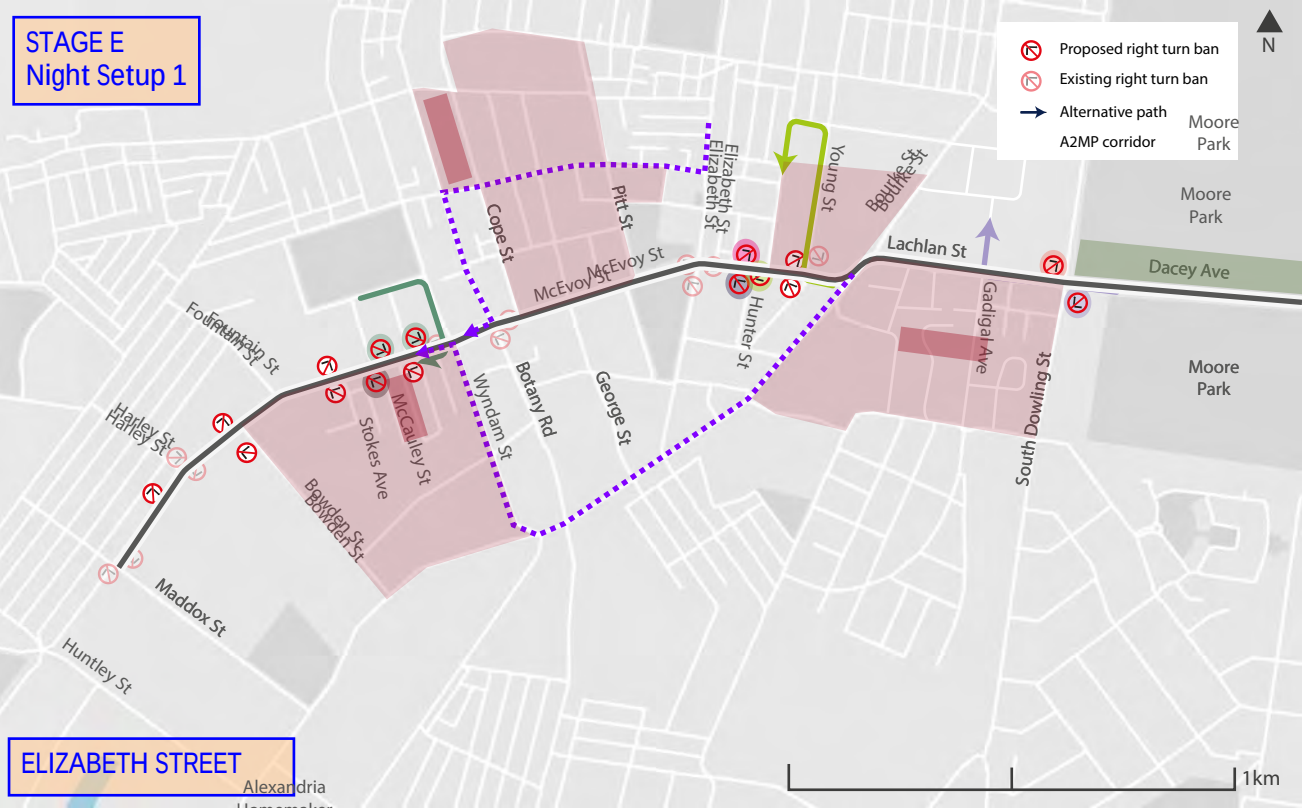

STAGE F
Night Setup 3
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
Gadigal Ave
South Dowling St
Cope St
Pitt St
McEvoy St
McEvoy St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Fountain St
Fountain St
Harley St
Harley St
Stokes Ave
McCauley St
Wyndam St
Botany Rd
George St
Bowden St
Bowden St
Maddox St
Huntley St
BOTANY ROAD
Alexandria
1km

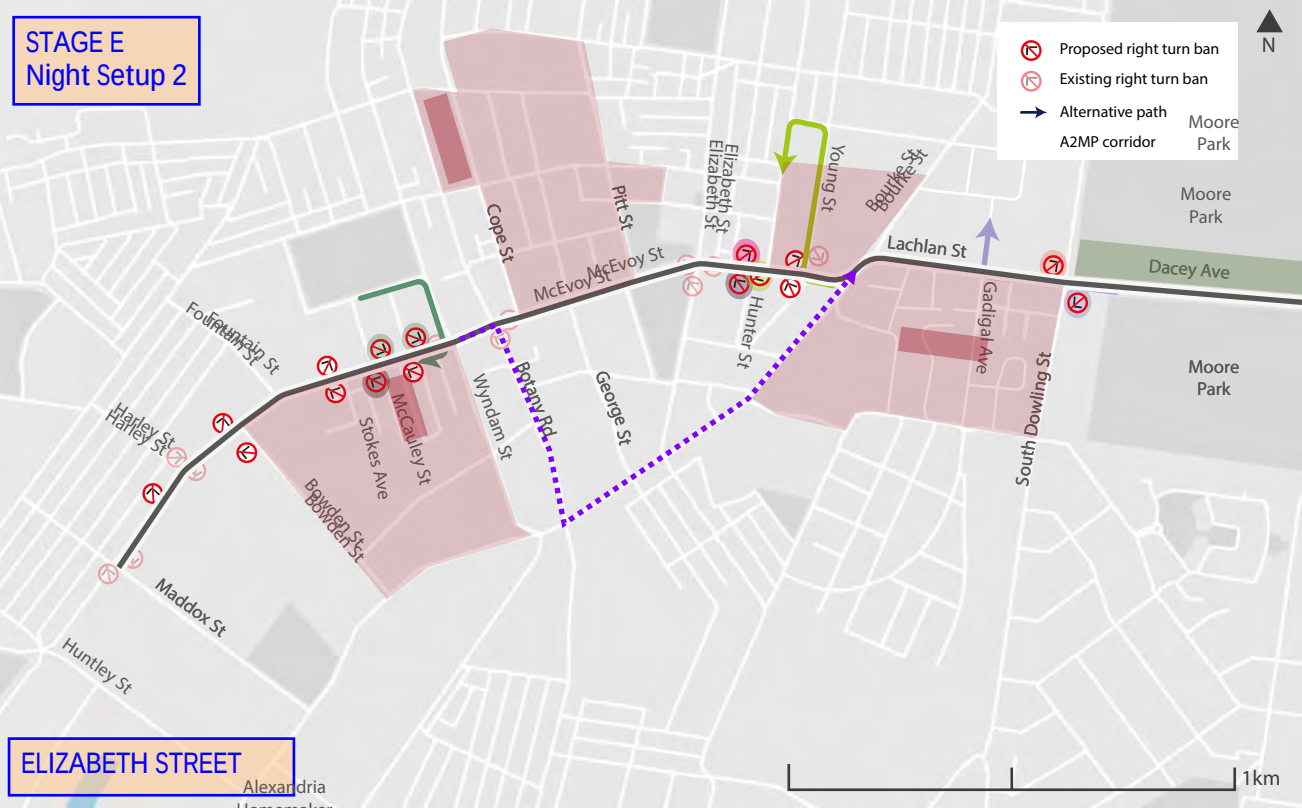

STAGE A
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Fountain St
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Stokes Ave
McCauley St
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
ELIZABETH STREET
Alexandria
1km

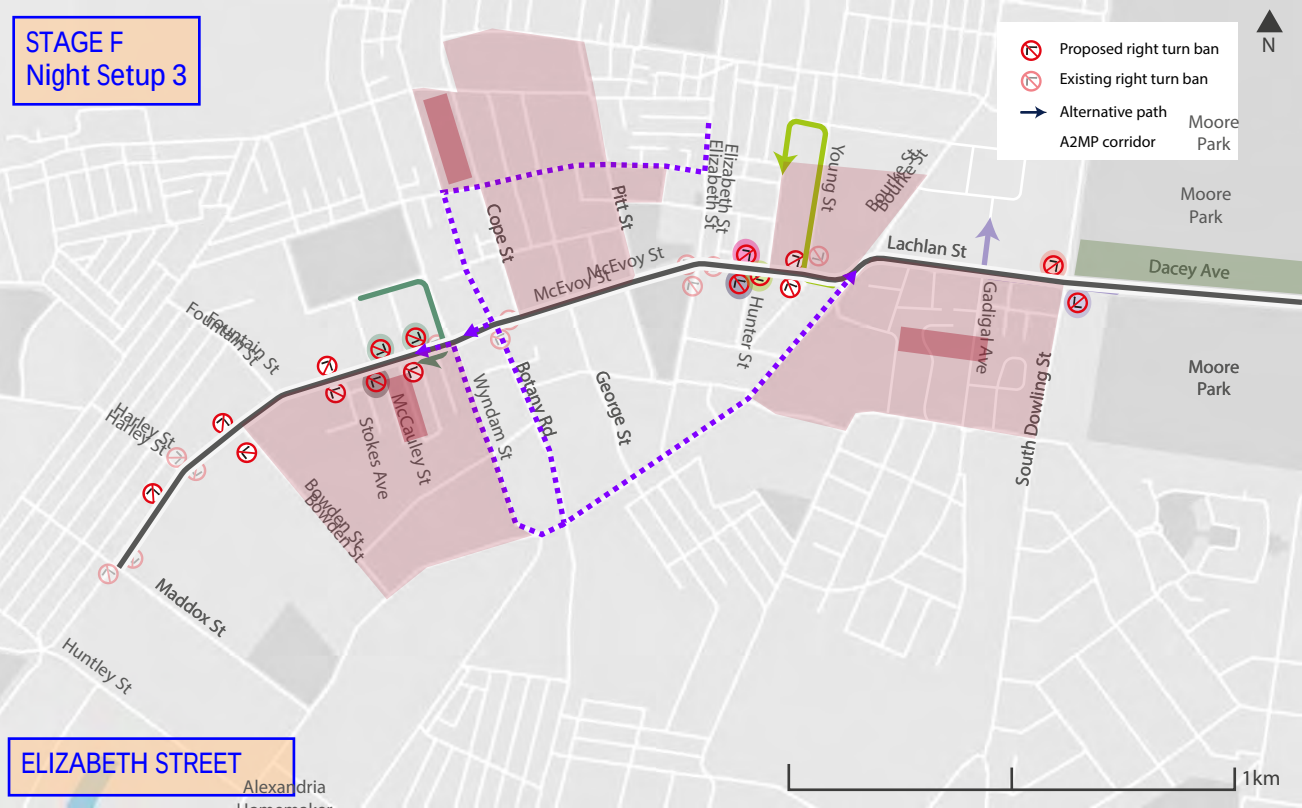

STAGE B
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
Stokes Ave
McCauley St
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
ELIZABETH STREET


STAGE C
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
Stokes Ave
McCauley St
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
ELIZABETH STREET


STAGE D
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
Stokes Ave
McCauley St
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
ELIZABETH STREET


STAGE E
Night Setup 1
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
Stokes Ave
McCauley St
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
ELIZABETH STREET


STAGE E
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
McCauley St
Stokes Ave
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
ELIZABETH STREET


STAGE F
Night Setup 3
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
George St
Botany Rd
Wyndam St
McCauley St
Stokes Ave
Bowden St
Bowden St
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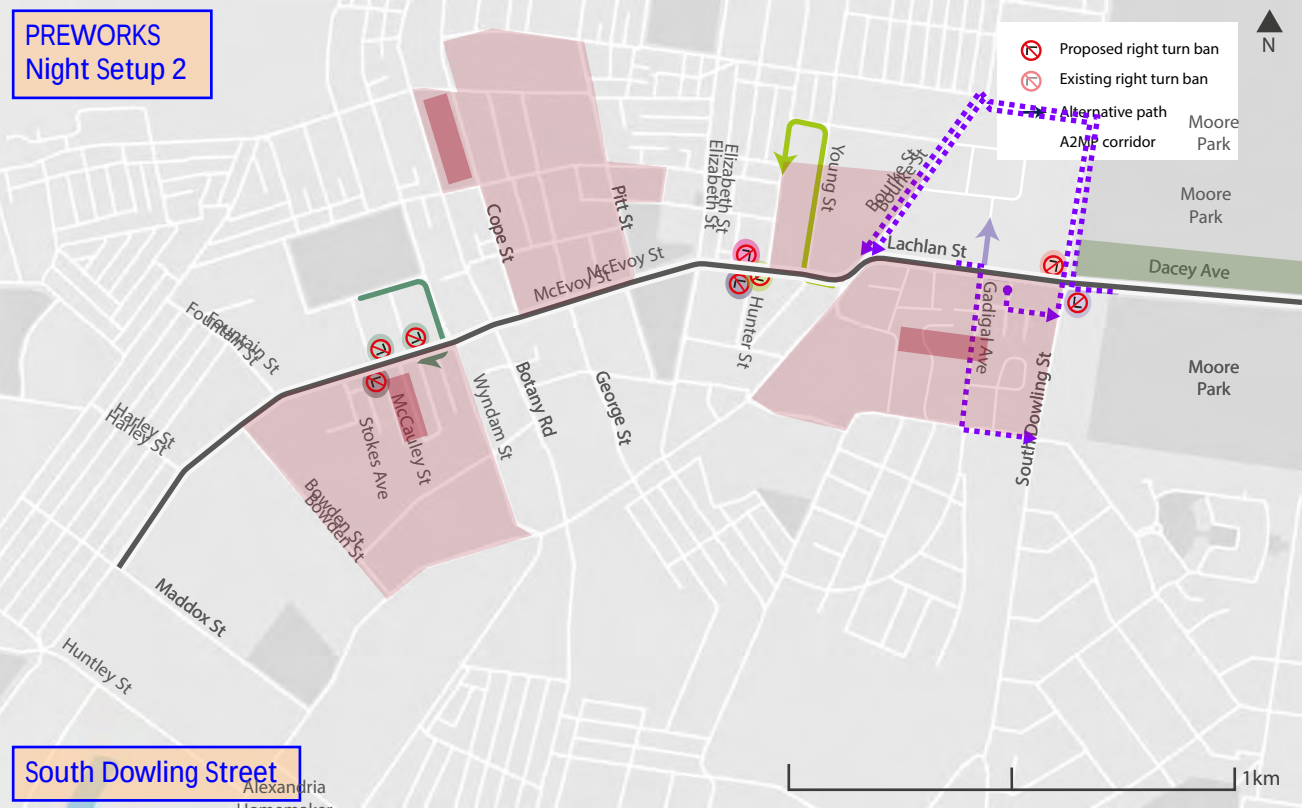
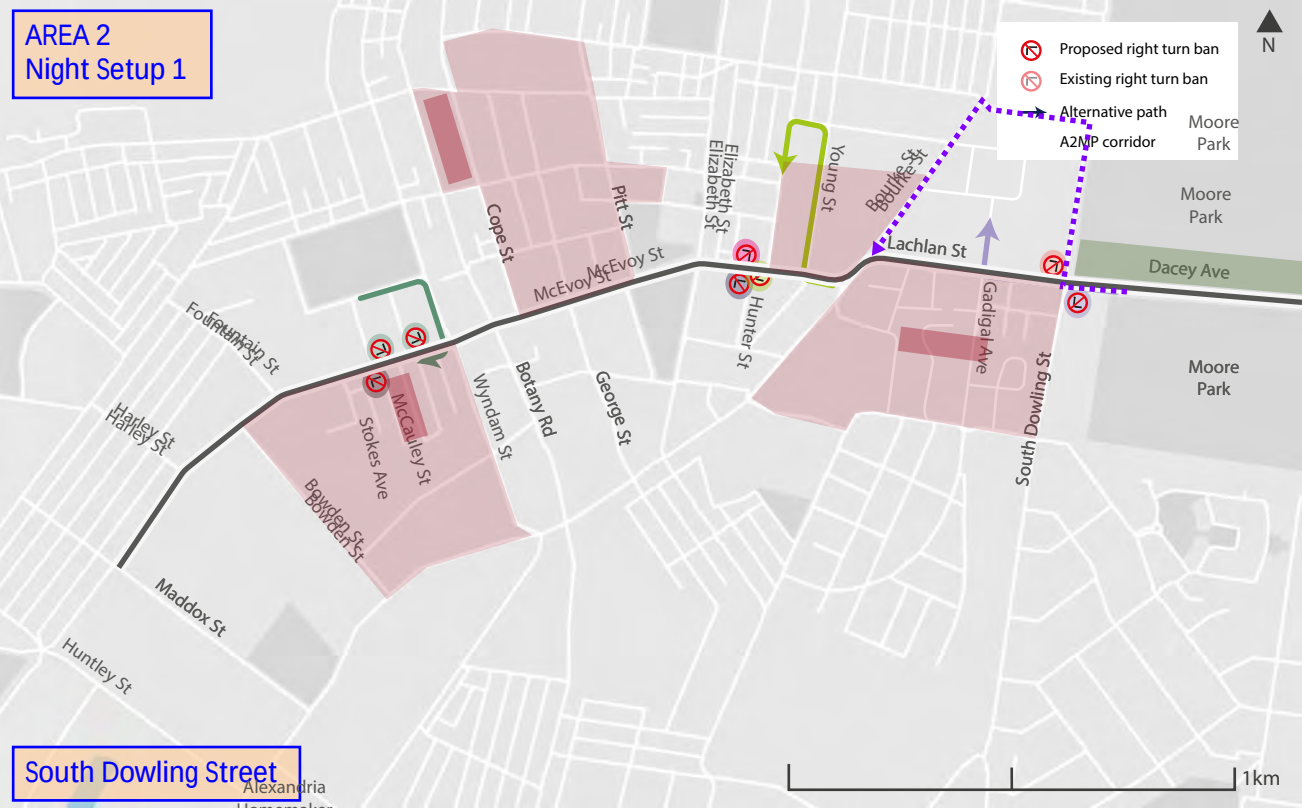
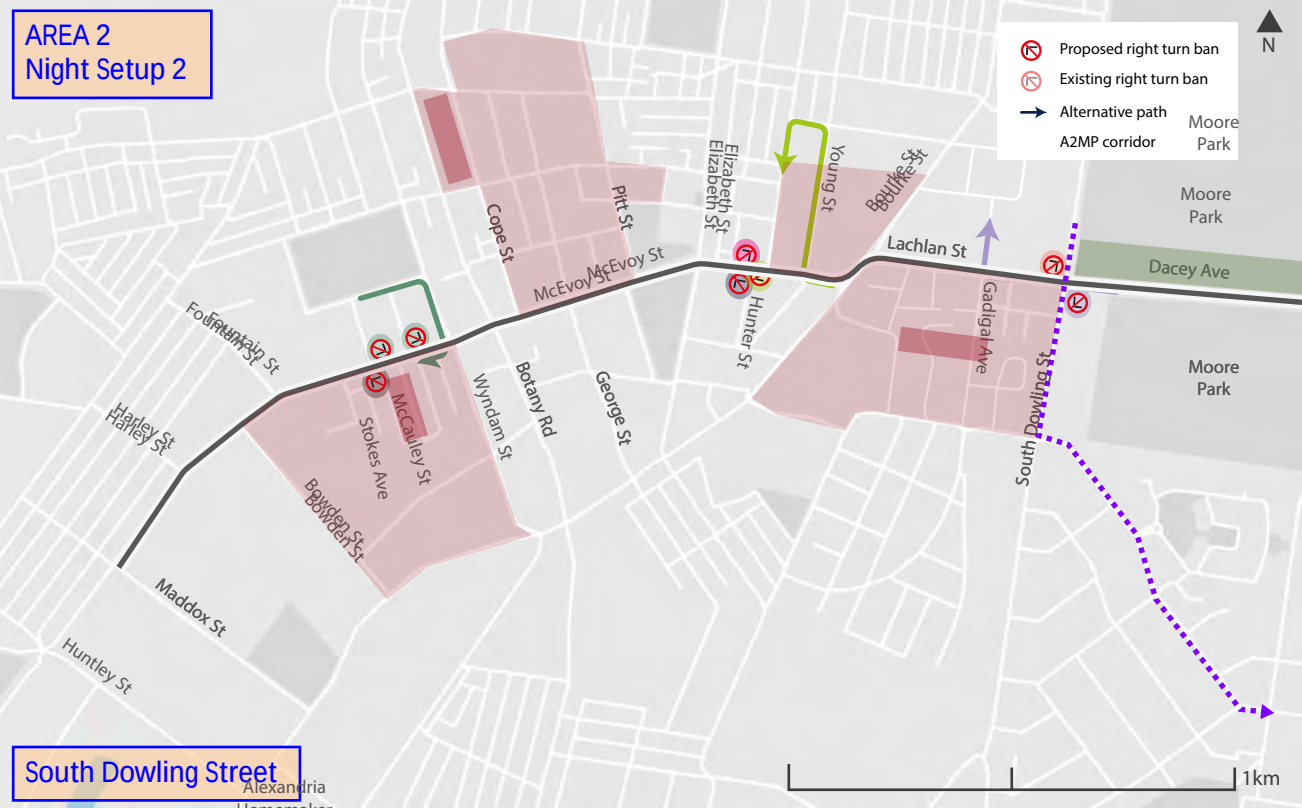
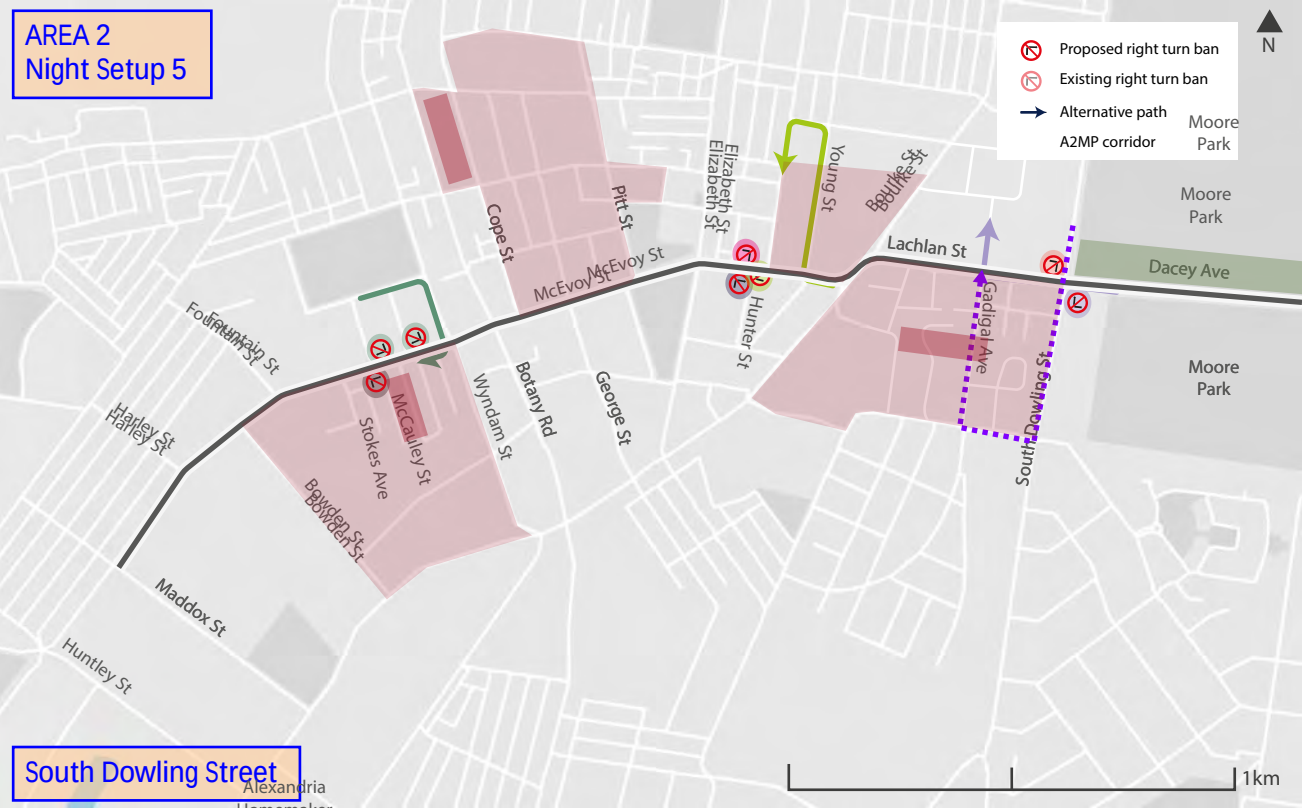
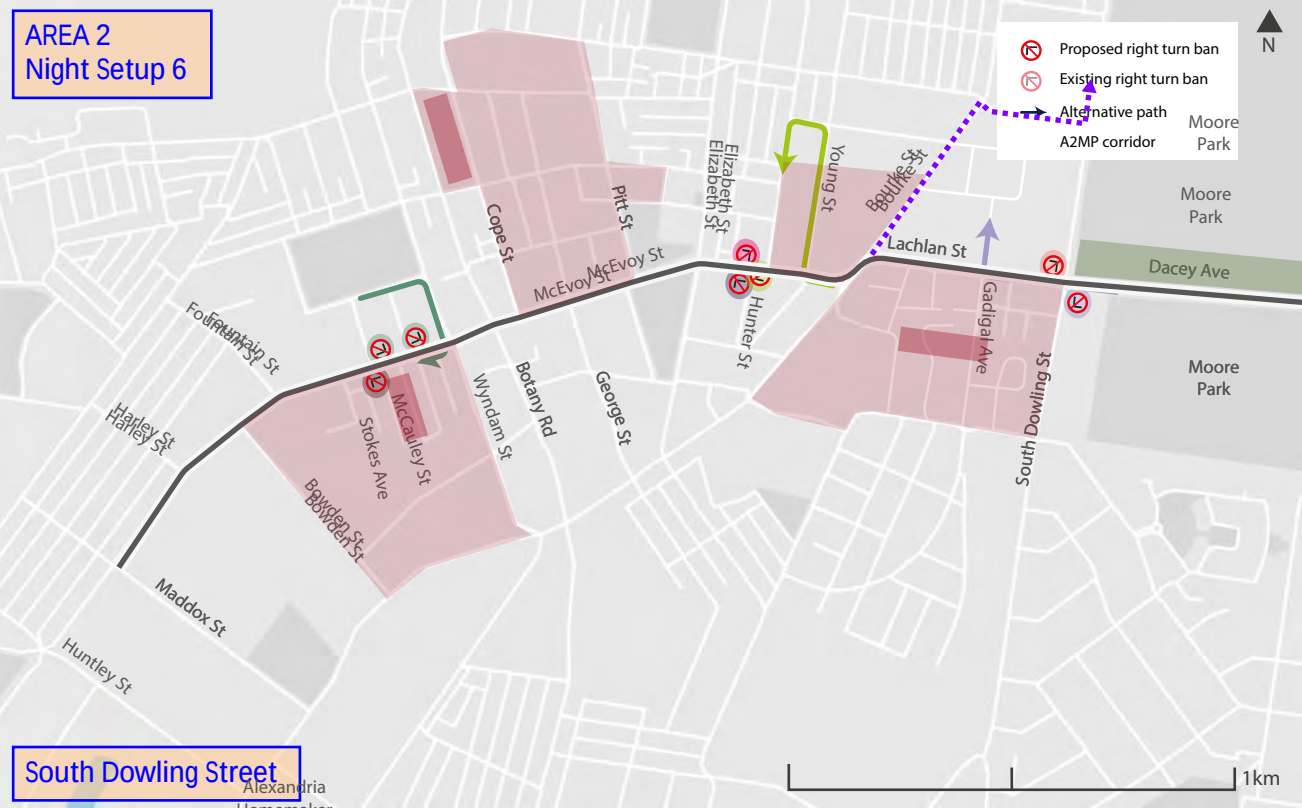
Fountain St
Harley St
Harley St
Maddox St
Huntley St
Alexandria
1km
ELIZABETH STREET


PREWORKS
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
Gadigal Ave
South Dowling St
Young St
Bourke St
Elizabeth St
Hunter St
McEvoy St
Cope St
Pitt St
Fountain St
Botany Rd
George St
Wyndam St
McCauley St
Stokes Ave
Bowden St
Harley St
Maddox St
Huntley St
Alexandria
1km
South Dowling Street

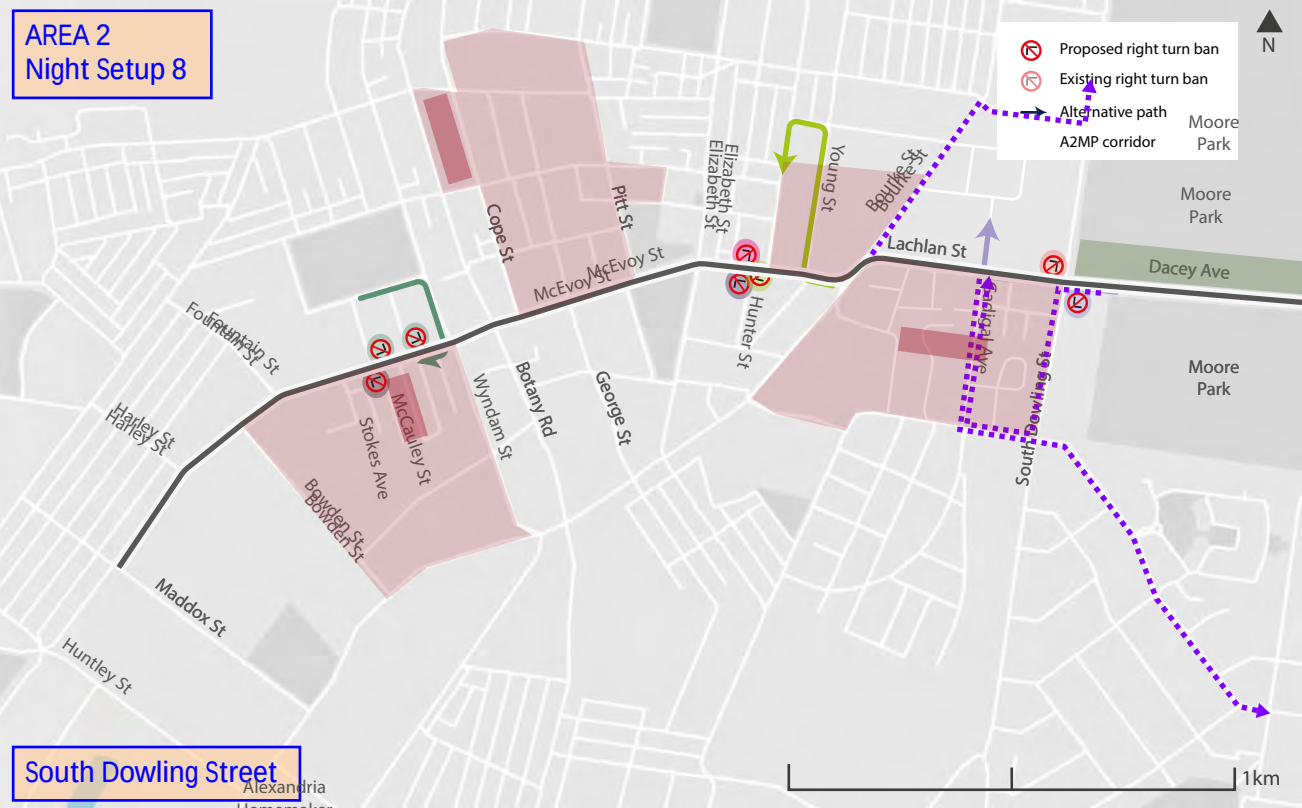

AREA 2
Night Setup 1
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
McCauley St
Stokes Ave
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
South Dowling Street


AREA 2
Night Setup 2
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
McCauley St
Stokes Ave
Wyndam St
Botany Rd
George St
Bowden St
Bowden St
Maddox St
Huntley St
Alexandria
1km
South Dowling Street


AREA 2
Night Setup 5
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
McCauley St
Stokes Ave
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
South Dowling Street


AREA 2
Night Setup 6
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Dacey Ave
Lachlan St
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Gadigal Ave
South Dowling St
Fountain St
Fountain St
Harley St
Harley St
McCauley St
Stokes Ave
Bowden St
Bowden St
Wyndam St
Botany Rd
George St
Maddox St
Huntley St
Alexandria
1km
South Dowling Street


AREA 2
Night Setup 7
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Bourke St
Hunter St
Fountain St
Fountain St
Harley St
Harley St
McCauley St
Stokes Ave
Wyndam St
Botany Rd
George St
Bowden St
Bowden St
Maddox St
Huntley St
Alexandria
Lagoon Ave
South Dowling St
1km
South Dowling Street


AREA 2
Night Setup 8
Proposed right turn ban
Existing right turn ban
Alternative path
A2MP corridor
N
Moore Park
Moore Park
Moore Park
Lachlan St
Dacey Ave
McEvoy St
McEvoy St
Cope St
Pitt St
Elizabeth St
Elizabeth St
Young St
Bourke St
Hunter St
Fountain St
Fountain St
Harley St
Harley St
McCauley St
Stokes Ave
Wyndam St
Botany Rd
George St
Bowden St
Bowden St
Maddox St
Huntley St
South Dowling St
Alexandria
1km
South Dowling Street