Sydney Metro West

Planning Proposal for Hunter Street Over Station Development Utilities & Infrastructure Servicing Assessment

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Glossary

Term	Definition
ADWF	Average Dry Weather Flow
Council	City of Sydney
CSSI	Critical State Significant Infrastructure
DA	Development Application
DCP	Development Control Plan
DPE	NSW Department of Planning and Environment
EP	Equivalent Population
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
ESD	Ecologically Sustainable Design
GANSW	NSW Government Architect's Office
GFA	Gross Floor Area
HLFC	High Level Feature Code
ISD	Integrated Station Development
LEP	Local Environmental Plan
LGA	Local Government Area
MDD	Maximum Day Demand
NLA	Net Lettable Area
OSD	Over Station Development
SEPP	State Environmental Planning Policy
SSDA	State Significant Development Application
Sydney Metro West	Construction and operation of a metro rail line and associated stations between Westmead and the Sydney CBD as described in Section 1.2
SWC	Sydney Water Corporation
TfNSW	Transport for New South Wales

Executive summary

This Utilities & Infrastructure Servicing Assessment has been undertaken to support a Planning Proposal Request to amend the maximum building height and maximum floor space ratio permitted for both the east and west sites under *Sydney Local Environmental Plan 2012* (Sydney LEP 2012) at the Hunter Street (Sydney CBD) station. The scope of this report is to summarise existing utility infrastructure and consider required decommissions and/or upgrade works to service the proposed development and to confirm ability for services to support the proposed planning control increase in floor space ratio (FSR) and maximum building height.

The Hunter Street over station development (OSD) is located in the northern part of the Sydney CBD, within the commercial core precinct of Central Sydney, within the Sydney local government area and consists of an east site and a west site.

This assessment relates to the works required for the over station development, works associated to the Metro line itself is not included within this report except where utility coordination is required. Additionally, this report identifies preliminary development staging and utility authority consultation, the final staging and delivery of utility infrastructure will form part of subsequent design stages.

Services

The site is currently serviced through the following means:

- Stormwater: Stormwater flows from the local catchment area (Sydney Water City Area 29 Catchment) collect through Sydney Water Corporation (SWC) stormwater assets to the Tank Stream and Bennelong sewers
- Wastewater: Wastewater servicing is provided by SWC and directed to the Bondi Treatment Plant.
- Potable Water: Potable water is provided by SWC from the Prospect East Water Delivery System which is supplied by gravity from the Prospect Water Filtration Plant
- Telecommunications: Various telecommunications providers service the site including Telstra, NBN TPG and Optus
- Electrical: High and low voltage electrical supply is provided by Ausgrid
- Gas: Gas reticulation is provided by Jemena.

Indicative demand

Demand modelling has been based on indicative development yields listed in Section 2.2 of this report for the purpose of considering lead-in utility infrastructure requirements. A summary of the results is presented below:

- Wastewater: Average Dry Weather Flow (ADWF) including BASIX reduction of 6.3L/s Total Demand (3.4L/s East Site and 2.9L/s West Site)
- Potable Water: Maximum Daily Demand including BASIX of 775kL/day Total Demand (420kL/day East Site and 355kL/day West Site)
- Telecommunications: As this is unable to be calculated, outcomes of the feasibility application are to be incorporated into later revisions of the report
- Electrical: Peak Demand including 0.8 Diversity Factor of 9.9MVA Total Demand (5.4MVA East Site and 4.5MVA West Site)
- Gas: Commercial and retail usage have not been estimated to varying demand and are to be updated in later revisions of the report based on consultation with Jemena.

Servicing constraints

Key servicing constraints for this development include:

- Stormwater: Connection and service to heritage assets
- Wastewater: Capacity of existing sewer trunk sewers
- Potable Water: Existing potable water reticulation capacity for proposed integrated station development.
- Telecommunications: Backhaul of new feeder cables to nearest exchange.
- Electrical: 11kV high voltage supply in the CBD precinct. Investigation into existing construction power at City & Southwest for utilisation on SMW.
- Gas: Initial consultation with Jemena indicates that the low pressure network does not have sufficient capacity to supply the estimated demand, however there is sufficient capacity in the high pressure network to support the development in the advised footprint.

Servicing constraints will be updated in later versions of this report based on feasibility application responses from the utility providers.

Sustainable development initiatives

A separate Ecologically Sustainable Development (ESD) Report (SMWSTEDS-SMD-SCB-SN100-SB-RPT-044003) has been developed for the subject site. Key initiatives that may be applicable to this report are listed below. These will be investigated and developed as the design progresses, including evaluation of impact on indicative demands.

- High overall targets for green building ratings, including Climate Positive pathway considerations
- An overall water strategy to reduce potable water consumption and support water resilience
- Electric Vehicle capabilities.

1 Introduction

1.1 Purpose

The Sydney Metro West Hunter Street Station Over Station Development (OSD) Planning Proposal Request seeks to amend the maximum building height and maximum floor space ratio permitted for both the east and west sites under the *Sydney Local Environmental Plan 2012* (Sydney LEP 2012).

This Utilities & Infrastructure Servicing Assessment summarises existing utility infrastructure and considers required decommissions and/or upgrade works to service the proposed development and seeks to confirm ability for services to support the proposed planning control increase to the maximum building height and floor space ratio (FSR).

1.2 Objectives and intended outcomes

The Planning Proposal Request has been prepared to address the following objectives for future development on the Eastern and Western sites:

- Be a catalyst for positive change by regenerating and invigorating the city with new development that engages with the precinct, raises the urban quality and enhances the overall experience of the city
- Facilitate future development that promotes design excellence and is consistent with the objectives of the Central Sydney Planning Framework
- Deliver high quality employment generating floorspace that aligns with the objectives for development within the tower cluster areas identified within the Central Sydney Planning Framework
- Contribute towards the establishment of an integrated transport hub within the Sydney CBD which strengthens Sydney's rail network improving connectivity
- Delivers employment density alongside the delivery of significant new public transport infrastructure servicing the site and surrounding precinct.

The intended outcomes of the requested amendments include:

- To amend the maximum building height and maximum FSR permitted for both the east and west sites under the Sydney LEP 2012 and allow an alternative approach to design excellence to deliver integrated station development that optimises the development potential of both sites
- To facilitate new development that demonstrates an appropriate distribution of built form and floor space as part of the delivery of the integrated station development.

1.3 Planning process

1.3.1 State Significant Infrastructure

Sydney Metro West was declared as State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) under sections 5.12(4) and 5.13 of the

Environmental Planning and Assessment Act 1979 (EP&A Act) respectively on 23 September 2020.

Sydney Metro West is being assessed as a staged infrastructure application under section 5.20 of the EP&A Act. The approved Concept and major civil construction work for Sydney Metro West between Westmead and The Bays (Stage 1 of the planning approval process- application number SSI-10038) were approved on 11 March 2021.

Stage 2 of the planning approval process (application number SSI-19238057) includes all major civil construction work, including station excavation and tunnelling, between The Bays and Sydney CBD (An Environmental Impact Statement for this application was exhibited between 3 November and 15 December 2021. This application is relevant for this request for a Planning Proposal as it seeks approval for bulk excavation and tunnelling at the Hunter Street (Sydney CBD) Station sites.

Stage 3 of the planning approval process (application number SSI-22765520, being the application for the tunnel fit-out, construction of stations, ancillary facilities and station precincts, and operation and maintenance of the Sydney Metro West line. This application is notably relevant for this request for a Planning Proposal, as it seeks approval for the construction of the Hunter Street Station, including above and below ground structures, public domain works, and spatial provisioning and works to facilitate the construction and operation of an Over Station Development (OSD) above the two station entries which are described further in this report.

1.3.2 Over Station Development

The OSD components of the Hunter Street integrated station development is not declared as SSI or CSSI under *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). As such, separate development consent is required to be granted for the construction and operation of development above the Hunter Street Station.

The primary land use of the OSD sites is anticipated to be ‘commercial premises’ which has a capital investment value of more than $30 million, and which are located within a rail corridor and/or are associated with railway infrastructure. Consequently, the future OSD will be classified as State Significant Development. The Sydney LEP 2012 is a relevant environmental planning instrument for the future development, though the Sydney Development Control Plan 2012 (Sydney DCP 2012) will not apply to the OSD sites.

To inform the planning controls relevant for the Hunter Street OSD sites, amendments are proposed to the Sydney LEP 2012 to provide additional Maximum Height of Building and floor space ratio (FSR) controls. Further, as the Sydney DCP 2012 does not apply to the land, the Proponent will prepare a design and amenity guideline to support the planning proposal to inform the future built form on the site including details such as street frontage heights, setbacks, massing and tapering, development adjacent to heritage items, building exteriors, and managing wind impact.

The inter-relationship of the scope of Sydney Metro EIS 3 (part of Critical State Significant Infrastructure CSSI) and this planning proposal is illustrated in Figure 1-1.

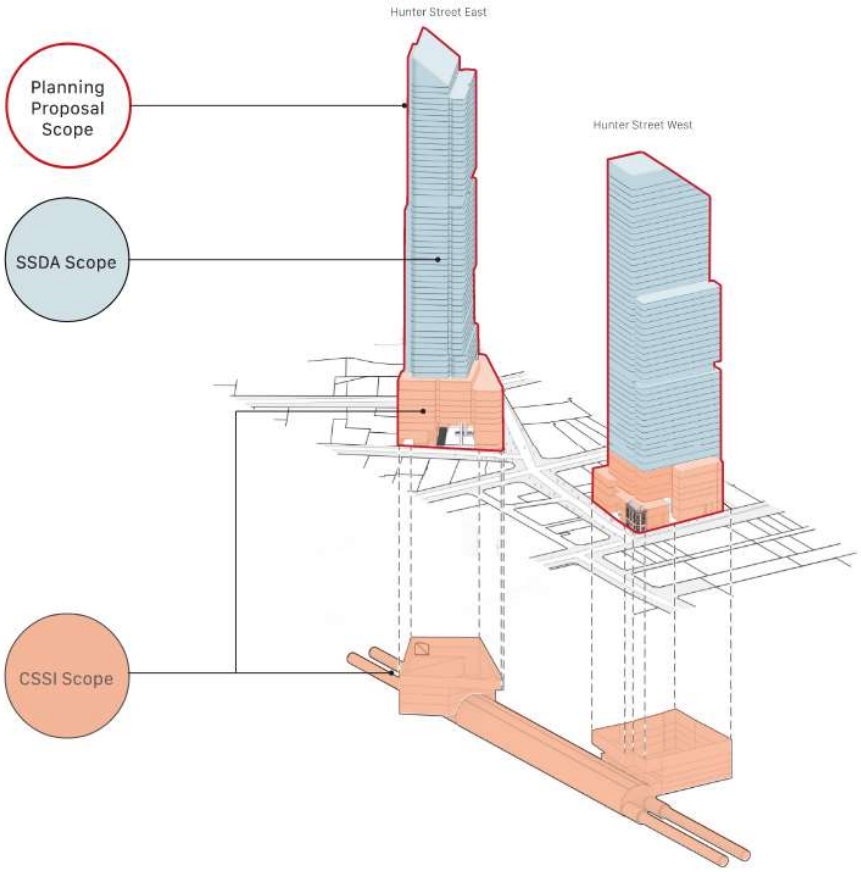


Figure 1-1 Hunter Street Station and Proposed OSD

1.3.3 Planning proposal

The planning proposal seeks to amend the *Sydney Local Environmental Plan 2012* to enable development on the site(s) as follows:

- Establish a maximum Height of Buildings control and maximum FSR control on the identified land, being the Hunter Street Station East and West sites.
- Enable the development of a commercial office building on the Hunter Street Station East and West sites
- Integration with the Hunter Street Station, the subject of a separate application process
- Adaptive reuse of the existing Former Skinners Family Hotel within the overall development on the West site
- Include site-specific controls which ensure the provision of employment and other non-residential land uses only on both the Hunter Street Station East and West sites
- Include site-specific control allowing the provision of up to a maximum of 70 car parking spaces maximum total across both the Hunter Street Station East and West sites
- Include a site-specific design guideline within the site-specific controls to guide future development sought under a State Significant Development Application process.

- Establish an alternative design excellence process for the Hunter Street Station East and West sites that responds to the integration of the development with the Sydney Metro West project and specifically the Hunter Street Station.

A summary of the key development outcomes resulting from the Planning Proposal is set out in Table 1-1 below.

Table 1-1: Proposed concept built form outcomes

Built form component	Proposed development outcome
East site	**Based on a site area of 3,666 sqm**
Height	Building height of 257.7m (RL 269.10)
FSR	22.82:1
GFA	Up to 84,287 sqm of GFA
Land use(s)	Non-residential land uses only
West site	**Based on a site area of 3,735 sqm**
Height	Building height of 213.0m (RL 220.00), including a setback interface from the heritage-listed Skinner Family Hotel
FSR	18.71:1
GFA	Up to 69,912 sqm of GFA
Land use(s)	Non-residential land uses only
Cl 7.6 – Carparking for office and business premises	• Up to 70 car parking spaces, maximum total across both the Eastern and Western sites

1.4 Site context

1.4.1 The site

The Hunter Street integrated station development is located in the northern part of the Sydney CBD, within the commercial core precinct of Central Sydney, within the Sydney Local Government Area.

The east site is located on the corner of O'Connell Street, Hunter Street and Bligh Street adjacent to the existing CBD and South East Light Rail that extends from Circular Quay to Moore Park, Kensington and Kingsford. The east site is adjacent to the new Martin Place Station which forms part of the Sydney Metro City and Southwest, Australia's biggest public transport project connecting Chatswood to Sydenham and extending to Bankstown.

The west site is located on the corner of George and Hunter Street, including De Mestre Place and land predominantly occupied by the existing Hunter Connection retail plaza.

Refer to Figure 1-2 below which illustrates the location of the Hunter Street Station within its regional context.

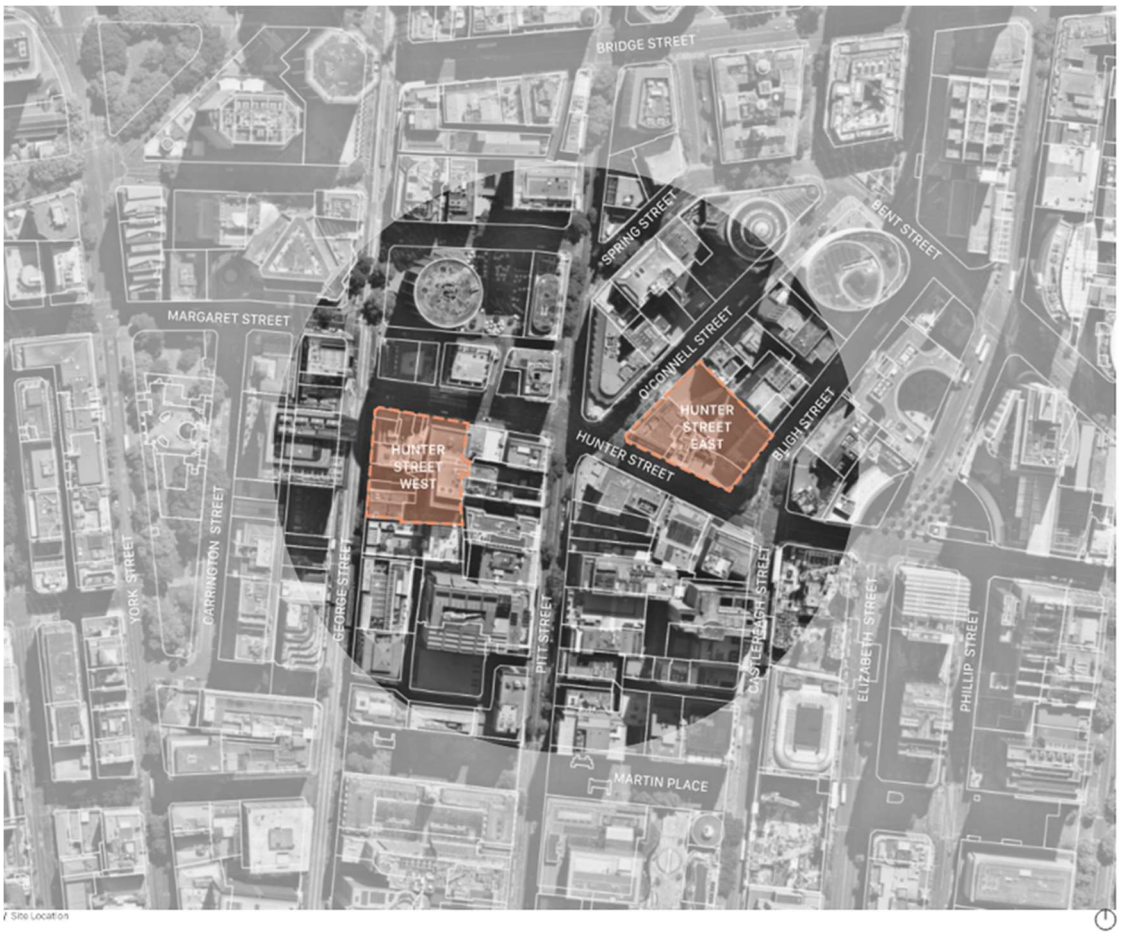


Figure 1-2 : Location of the proposed Hunter Street Station OSD sites

1.4.2 Local context

The Sydney CBD is a highly developed commercial core with a ride range of commercial, retail, health, government and community-based uses, as well as high density residential developments.

A number of key commercial buildings are located in or around the Sydney CBD, including educational facilities, historic buildings and structures, law courts, public gathering spaces and places of worship. Significant areas of open space, such as the Botanical Gardens, the Domain and Hyde Park are also located within or near the Sydney CBD area, as well as the World Heritage Sydney Opera House and iconic Sydney Harbour Bridge.

Land uses surrounding the Hunter Street Station sites include:

- North of the sites is a major commercial area comprising high density commercial towers along George Street, Pitt Street, and Bridge Street, including the MetCentre and Australia Square buildings. The area also comprises tourism and entertainment related uses including hotels, shops, restaurants, cafes, nightclubs and bars, with the area around Circular Quay and the Rocks a major tourism precinct and providing significant support for the night time economy.
- East of the sites are major commercial towers along Hunter Street, including Chifley Tower, 8 Chifley Square, Aurora Place and Deutsche Bank Place. Beyond Hunter Street, the State Library of NSW and the NSW Parliament House front onto Macquarie Street, and beyond that lies the public open space of The Domain.

- South of the sites, the land use remains predominantly multi-storey commercial offices but also includes cafes, bars and nightclubs, including the Ivy complex. Martin Place is a significant east–west pedestrian thoroughfare which contains many culturally significant buildings and structures including the Cenotaph memorial and the General Post Office building, as well as Martin Place Station. Beyond Martin Place the Sydney CBD continues towards Town Hall, Haymarket and the Central Station precinct.
- West of the sites, the land use remains predominantly high-density commercial offices, anchored by Wynyard Station. George Street contains the Sydney Light Rail (L2 Randwick Line and L3 Kingsford Line) and is a major north–south axis through the CBD, and along with Pitt Street connects Circular Quay, Wynyard, Town Hall and Central. East of Wynyard, the CBD continues towards the major commercial and entertainment areas around King Street Wharf and Barangaroo, which also contain significant high density residential apartment buildings.

1.4.3 Site description

The Hunter Street integrated station development relates to the following properties:

- 28 O'Connell Street, 48 Hunter Street, and 37 Bligh Street, Sydney (East Site); and
- 296 George Street, 300 George Street, 312 George Street, 314-318 George Street, 5010 De Mestre Place (Over Pass), 5 Hunter Street, 7-13 Hunter Street, 9 Hunter Street and De Mestre Place, Sydney (West Site).

Table 1-2 and Table 1-3 below sets out the address, legal description and area of the parcels of land that comprise the Hunter Street Station land that is the subject of this Planning Proposal.

Table 1-2: Legal description of Hunter Street Station east site

Address	Lot and DP
28 O'Connell Street, Sydney	Lot 1, DP217112
28 O'Connell Street, Sydney	Lot 1, DP536538
28 O'Connell Street, Sydney	Lot 1, DP1107981
48 Hunter Street, Sydney	Lot 1, DP59871
48 Hunter Street, Sydney	Lot 2, DP217112
33 Bligh Street, Sydney	Lot 1, DP626651
37 Bligh Street, Sydney	CP and Lots 1-14, 21-31, 33-36, and 40, SP58859
37 Bligh Street, Sydney	CP and Lots 41-49, SP61852
37 Bligh Street, Sydney	CP and Lots 50-57, SP61922
37 Bligh Street, Sydney	CP and Lots 58-65, SP61923
37 Bligh Street, Sydney	CP and Lots 66 and 67, SP63146
37 Bligh Street, Sydney	CP and Lots 67-70, SP63147
37 Bligh Street, Sydney	CP and Lot 72, SP74004
37 Bligh Street, Sydney	CP and Lots 75-82, SP87437

Address	Lot and DP
37 Bligh Street, Sydney	CP and Lots 73-74, SP87628
	Total Area: 3,694 sqm

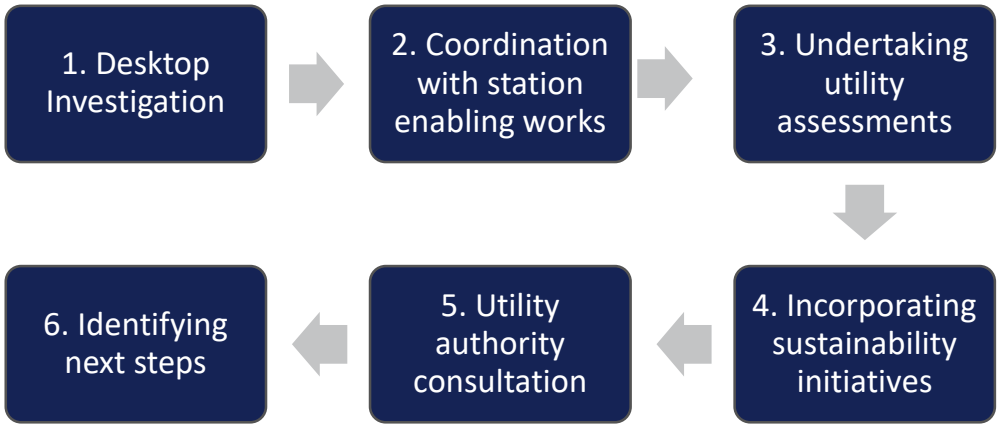
Table 1-3: Legal description of Hunter Street Station west site

Address	Lot and DP
296 George Street, Sydney	Lot 1, DP438188
300 George Street, Sydney	CP and Lots 1-43, SP596
312 George Street, Sydney	Lot 1, DP211120
314-318 George Street, Sydney	Lot 13, DP622968
5010 De Mestre Place, Sydney (Over Pass)	Lot 1, DP1003818
9 Hunter Street, Sydney	Lot 2, DP850895
5 Hunter Street, Sydney (Leda House & Hunter Arcade)	CP and Lots 1-63, SP71068
5 Hunter Street, Sydney (Leda House & Hunter Arcade)	CP and Lots 1-14, SP65054
7-13 Hunter Street, Sydney (Hunter Connection)	CP and Lots 1-53, SP50276
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 57 and 58, SP61007
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 54, 55 and 56, SP60441
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 59, 60 and 61, SP62889
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 62, 63, 64 and 65, SP69300
7-13 Hunter Street, Sydney (Hunter Connection)	Lots 66 and 67, SP77409
7-13 Hunter Street, Sydney (Hunter Connection)	Lot 2, SP50276
De Mestre Place, Sydney	N/A
	Total Area: 3,735 sqm

2 Methodology

2.1 Assessment steps

The utilities and infrastructure servicing assessment methodology is summarised in the flow chart as shown below:



Desktop investigation:

- Desktop investigation through 'Dial Before You Dig' enquiries of existing utility services
- Review of utility information obtained from site surveys
- Review of authority utility information (i.e. GIS databases)
- Gap analysis and advice on further investigations required.

Coordination with station enabling works:

- Assessment of potential opportunities for coordination with station services, such construction power supply from existing infrastructure.

Undertaking utility assessments:

- Undertake demand modelling to determine utility demand rates based on the intended use and using authority demand rates
- Consider building specific utility demand draws and the effects of changes in building use such as decreased electrical usage or changes to gas demand.

Incorporating sustainability initiatives:

- Incorporate building and station precinct initiatives including BASIX and any other selected sustainability (e.g. Green Star Ratings or NABERS)
- Coordination with any precinct wide utility sustainability measures.

Utility authority consultation:

- Development and submission of feasibility applications to each utility authority with projected demands
- Incorporation of utility agency advice around servicing options, routes, timings, costs and timings for delivery

- Continual coordination around any changes to demand assessments and detailing of any further assessments or studies required to confirm supply methods (e.g. water or wastewater modelling).
- Identifying next steps:
- Plans of potential utility decommissions, supply points and potential constraints
- Detailing of further investigations or additional works required during subsequent design stages
- Confirmation of the feasibility of obtaining utility servicing for the development.

2.2 Assessment status

Baseline demand calculations have been undertaken and feasibility applications to the utility authorities prepared according to the development yields available at the time of application submittal. Applications and utility authority feedback received to date are contained in Appendix A. This will be updated in future revisions of this report as additional information is received.

The latest status on responses received from utility authorities have been summarised in Table 2-1 below, and included in Appendix B.

Table 2-1 Utility feasibility letter status

Utility authority	Issue date	Status
Ausgrid	23rd June 2021	Pending
Jemena	23rd June 2021	Received
Sydney Water	23rd June 2021	Pending
NBN Co.	23rd June 2021	Pending

The development profiles under consideration for Hunter Street East & West are shown below Table 2-2.

Table 2-2 Demand assessment development profiles (Sydney Metro, December 2021)

Investigation site	Indicative commercial space GFA (m^2)
Hunter Street (Sydney CBD) East	83,590
Hunter Street (Sydney CBD) West	70,631

The station box and station servicing building are independent of the OSD and have not been included in this development profile.

3 Utility assessments

3.1 Desktop investigation

This report details the investigation of existing utilities in the vicinity of the development, the likely points of future connection to the utilities; and associated potential upgrades or augmentation that may be required. The basis for the investigation of the existing utilities in the vicinity of the site was a 'Dial Before You Dig' (DBYD) enquiry that was undertaken in January 2018. This report does not consider any utility infrastructure outside the enquiry boundary and its potential relationship to, or impact on the supply of utility services to the site.

While preliminary development staging and sequencing information has formed the basis of consultation with utility providers to date, the final staging of utility works and the protection of assets is dependent on detailed construction staging and shall be developed in detail at a later stage of the planning and design process.

As a part of the desktop investigation, utility information was obtained from a number of sources:

- 'Dial Before You Dig' Enquires
- Utility Authority GIS systems
- Site utility surveys (varying from Quality Level A to D)
- Information provided for utility agencies.

Table 3-1 below shows a summary of the identified utility services adjacent to the precinct.

Table 3-1 Network utility operators

Utility type	Authority name	Potential impacts
Stormwater	City of Sydney	Yes
Stormwater	Sydney Water Corporation	Yes
Wastewater	Sydney Water Corporation	Yes
Potable Water	Sydney Water Corporation	Yes
Telecommunications	Telstra	Yes
Telecommunications	NBN Co.	Yes
Telecommunications	Vodafone	Yes
Telecommunications	Uecomm	Yes
Telecommunications	Optus	Yes
Telecommunications	TPG Telecom	Yes
Electrical	Ausgrid	Yes
Gas	Jemena Gas West	Yes

A combined services plan for the site has been developed in Figure 3-1 which shows:

- Existing utility arrangements within the precinct area
- Potential constraints with the utility servicing and crossings.

These services are shown only schematically, and details are to be developed in subsequent design phases as the architectural, survey information and services design develops. Furthermore, this report has been developed to show potential

servicing points and the number and type of utility connections to the building which will depend on the ultimate ownership and stratum.

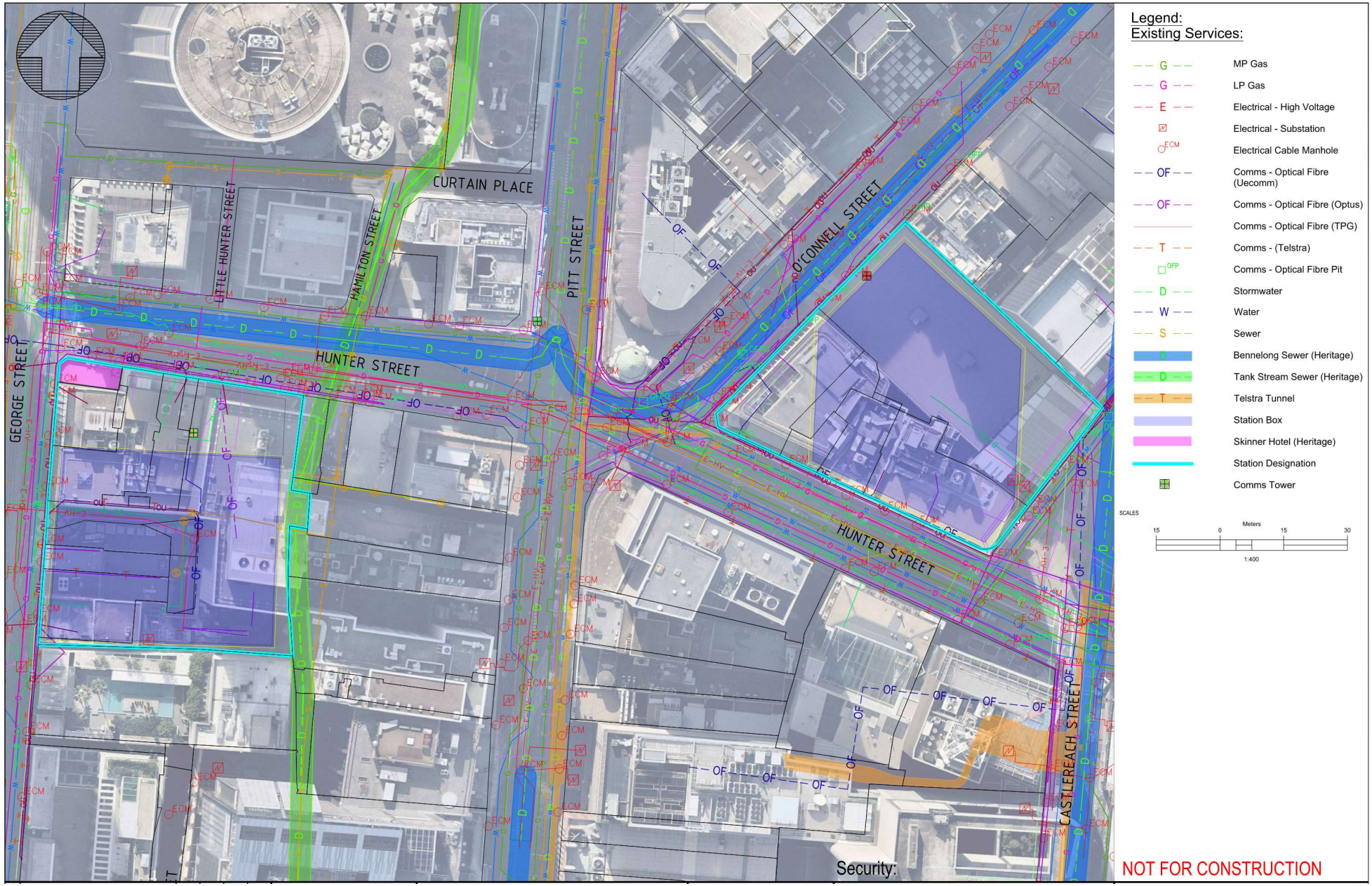


Figure 3-1 Existing utilities at Hunter Street (Sydney CBD) station

3.2 Coordination with enabling works

As a part of the tunnel and station excavation works for Sydney Metro West, utility protection, amendment or relocation works will need to be undertaken. These will take place prior to any planning works proposed as part of the CSSI application and include:

- Pot holing investigations and survey of existing utilities surrounding and impacted by the developments
- Pre-condition surveys of gravity networks impacted by developments
- City & Southwest construction power investigated to for SMW utilisation
- Decommission existing utility services to lots within development's designation
- Protection to shallow utility services in footpaths surrounding the developments from construction activities.

The enabling works are still being fully developed and are subject to change. A summary of identified utilities enabling works has been provided in the sections below.

Ausgrid

Site power requirements, approval and design as well as sub-station relocations and decommissioning. Existing construction power supply at 33 Bligh Street for Martin Place station shall be reused for construction at Hunter Street developments.

Sydney Water

Asset owners of wastewater, stormwater, and potable water networks within the CBD. Specialist engineering assessments of critical or heritage assets for construction impacts.

Monitoring of critical wastewater, heritage and large assets including Sydney Tank Stream, Bennelong sewers and large potable water mains surrounding the developments. Mitigation measures employed based on engineering assessment of settlement modelling during the development construction.

City of Sydney

Protection to existing stormwater catch pits within the catchment from impacts during flood events. Pre-condition surveys and cleaning where identified. Future connections for developments stormwater needs.

Communication Networks

Decommission communication towers and connections to lots within developments designation. Protection and monitoring to existing communication networks surrounding sites including critical assets such as Telstra tunnels and fibre optic networks.

Gas Networks

Identification of gas networks and feeds. Decommission connections to lots within the development's sites.

3.3 Stormwater

3.3.1 Existing assets

Stormwater assets in the area are maintained by Sydney Water Corporation (SWC). The desktop information indicates the presence of a number of stormwater assets in Sydney Water's City Area 29 catchment below in Figure 3-2. These are summarised below in Table 3-2.

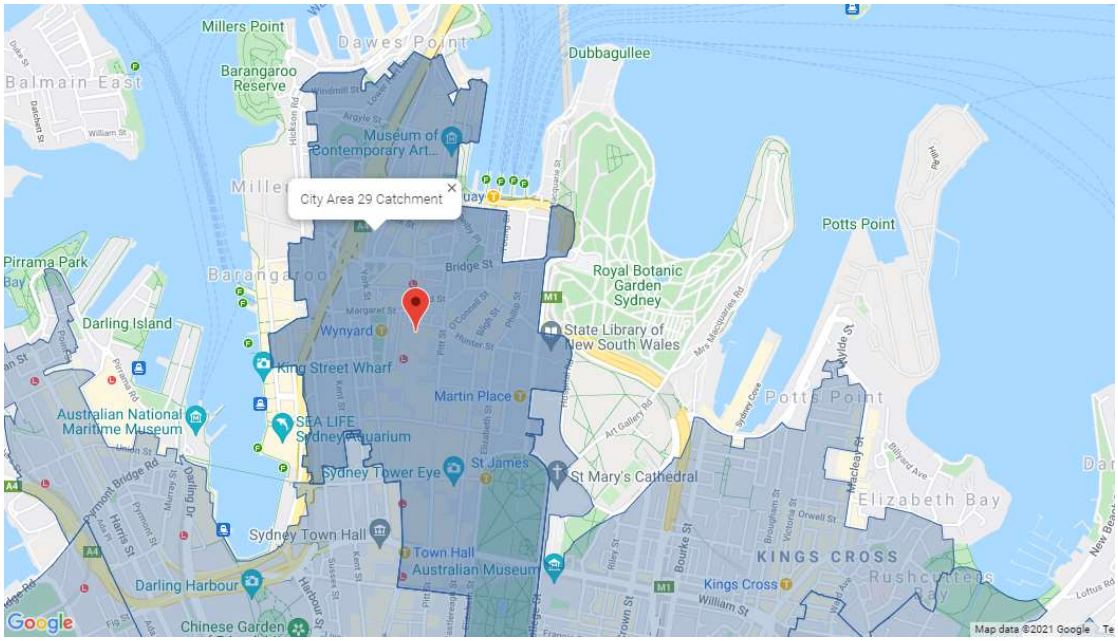


Figure 3-2 Hunter Street (Sydney CBD) Station in SWC catchment 29

Table 3-2 Existing Sydney Water stormwater assets

METRO_ID	OWNER	HLFC	SIZE (DN)	CONFIGURATION	MATERIAL	STATUS	TREATMENT	LOCATION
SW-13-050	Sydney Water	Stormwater	-	Pipe	CONC	In Service	Protect	Pitt St
SW-13-060	Sydney Water	Stormwater	-	Pipe	MSCL	In Service	Protect	Pitt St
SW-13-070	Sydney Water	Stormwater	-	Box	Not Applicable	In Service	Protect	Hamilton St
SW-13-080	Sydney Water	Stormwater	-	Oviform	Not Applicable	In Service	Protect	Hunter St
SW-13-120	Sydney Water	Stormwater	410 x 610	Oviform	Brick Oviform (Bennelong Sewer)	In Service	Protect (Heritage asset)	Along Bligh St and under adjacent development's east corner
SW-13-140	Sydney Water	Stormwater	300	Pipe	VC	In Service	Protection to stormwater assets western corner of proposal	Along O'Connell St between Bent St and Hunter St
SW-13-150	Sydney Water	Stormwater	300	Pipe	VC	In Service	Protection to stormwater assets western corner of proposal	Along Hunter St between O'Connell St and Phillip St
SW-13-160	Sydney Water	Stormwater	300	Pipe	VC	In Service	Protection to stormwater assets western corner of the proposal	Along Hunter St between O'Connell St and Phillip St

METRO_ID	OWNER	HLFC	SIZE (DN)	CONFIGURATION	MATERIAL	STATUS	TREATMENT	LOCATION
SW-13-190	Sydney Water	Stormwater	150	Pipe	CI	In Service	Decommission existing connections to the proposed site	On Bligh St between Bent and Hunter St
SW-13-200	Sydney Water	Stormwater	150	Pipe	CI	In Service	Decommission existing connections to the proposed site	Along Bligh St between Bent St and Hunter St
SW-13-210	Sydney Water	Stormwater	300	Pipe	VC	In Service	Protection or potential relocation	Along Bligh St between Bent St and Hunter St
SW-13-220	Sydney Water	Stormwater	400	Pipe	VC	In Service	Protection to stormwater assets along Hunter Street	Along Hunter St between O'Connell St and Phillip St
SW-13-420	Sydney Water	Stormwater	-	Maintenance Hole	-	In Service	Protect	Hamilton St
SW-13-430	Sydney Water	Stormwater	--	Maintenance hole	-	In Service	Protect	Pitt St
SW-13-460	Sydney Water	Stormwater	-	Maintenance hole	-	In Service	Protect	O'Connell St
SW-13-470	Sydney Water	Stormwater	-	Maintenance hole	-	In Service	Protect	Hunter St
SW-13-520	Sydney Water	Stormwater	-	Maintenance hole	-	In Service	Protect	Pitt St

A separate stormwater assessment has been undertaken (Hunter Street Planning Proposal Preliminary Flooding Report SMWSTEDS-SMD-SCB-SN100-SD-RPT-044001). The existing and proposed stormwater arrangement is shown below in Figure 3-3 for the purposes of coordination with the utility services.

3.3.2 Heritage assets

There are a number of heritage stormwater assets adjacent and in the vicinity to the proposed Hunter Street (Sydney CBD) station boxes, including:

- Sydney Tank Stream runs adjacent to station box west, site boundary and crosses Hunter St. above the station cavern. The heritage asset is a mix of stone arch, brick oviform and replaced sections with pipe or concrete box due to above recent developments
- 550x780mm brick oviform, Sydney Bennelong sewers along Hunter St
- 410x610mm brick oviform, Sydney Bennelong sewers along O'Connell St
- 410x610mm brick oviform, Sydney Bennelong sewers along Castlereagh St, crossing Hunter St. to Bligh St. under adjacent station developments
- 410x610mm brick oviform, Sydney Bennelong sewers along Elizabeth St, crossing Hunter St. under existing developments.

For further discussion on these heritage items, refer to the Hunter Street Planning Proposal Non-Aboriginal Heritage Impact Assessment SMWSTEDS-SMD-SCB-SN100-EN-RPT-044010.

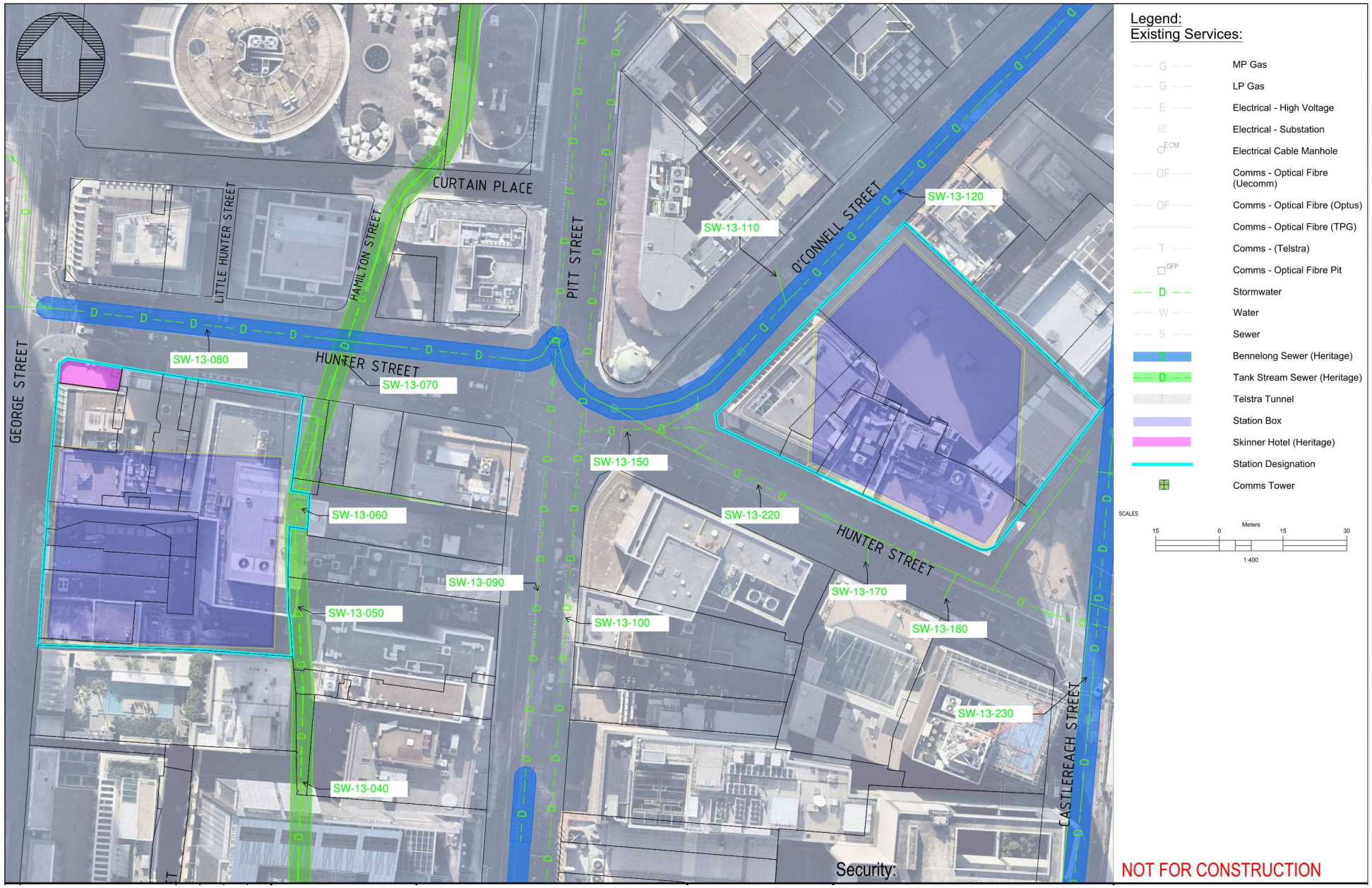


Figure 3-3 Existing stormwater network Hunter Street (Sydney CBD) Station

3.3.3 Proposed Stormwater Works

While the full details are contained within the Water Quality, Flooding and Stormwater Report, a summary of potential stormwater works is provided below.

West Site

- Protection to the heritage sewers particularly the Tank Stream station west along property boundary and Bennelong sewer along Hunter St
- Protection to existing stormwater assets (such as catch pits) from construction activities
- Possible stormwater connection during the construction phase of the development to maintenance hole.

East Site

- Protection to the heritage Bennelong sewers:
- 410x610mm brick oviform, along O'Connell St
- 410x610mm brick oviform, along Bligh St running closest to the east corner of the station box and under adjacent developments.
- Decommission existing stormwater connections servicing the station site
- DN150mm concrete pipes from Bligh Street
- Protection to existing stormwater assets (such as catch pits) from construction activities
- Possible stormwater connection during the construction phase of the station to O'Connell Street stormwater main.

The west site includes the heritage-listed Skinners Family Hotel which will be retained as part of the future development at the subject site. Utilities servicing for this heritage item may require further assessment in later design stages and during construction.

3.4 Wastewater

3.4.1 Background

Wastewater servicing is provided by Sydney Water Corporation (SWC), the desktop information indicates the presence of a number of SWC assets in the surrounding area as per Figure 3-4.

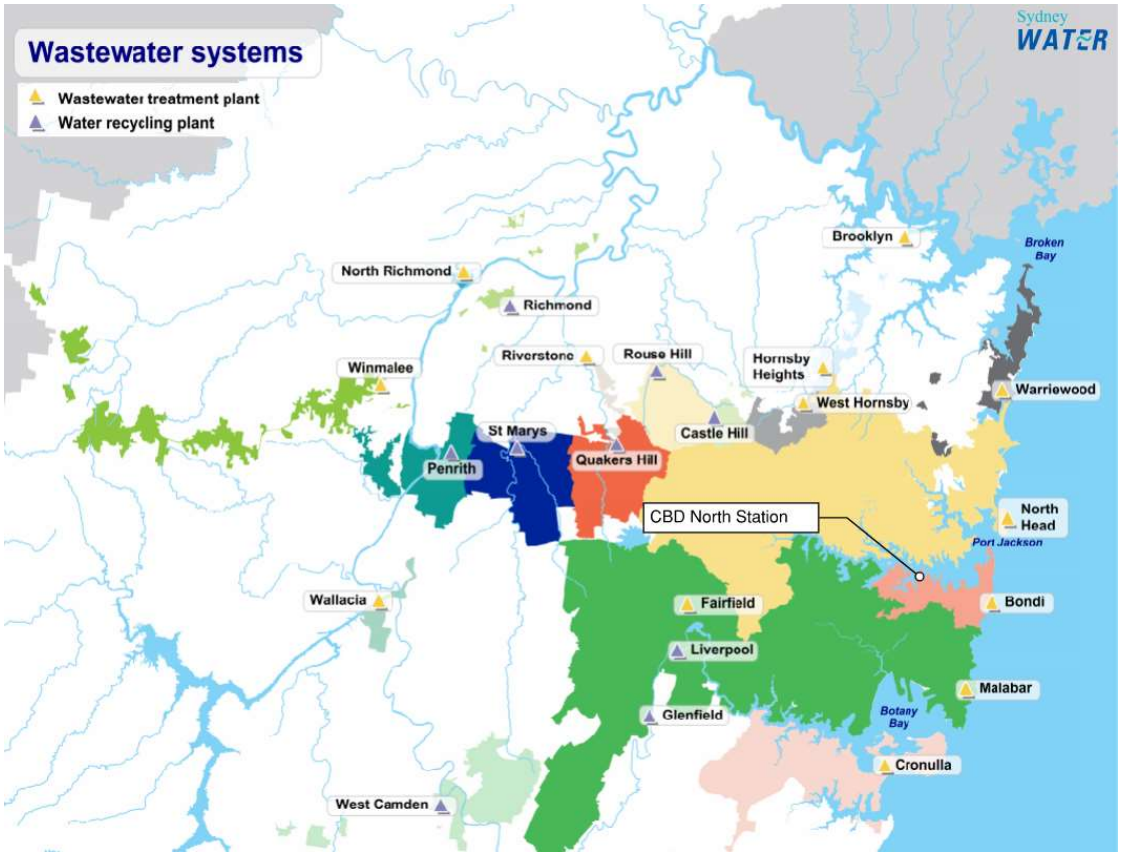


Figure 3-4 Sydney Water Sewer Catchment Plan (Sydney Water, 2021)

3.4.2 Existing assets

The desktop information indicates the presence of a number of Sydney Water assets in the surrounding area. These are summarised below in Table 3-3 and the existing assets in plan are shown below in Figure 3-5.

Table 3-3 Existing Sydney Water wastewater assets

METRO ID	Owner	HLFC	Size (DN)	Configuration	Material	Status	Treatment	Location
WW-13-010	Sydney Water	Sewer	300	Reticulation, Gravity	VC	In Service	Decommission	Along and surrounding site around De Mestre Pl
WW-13-020	Sydney Water	Sewer	225	Reticulation, Gravity	VC	In Service	Identified (No Works)	Along O'Connell St between Bent St and Hunter St
WW-13-030	Sydney Water	Sewer	150	Reticulation, Gravity	VC	In Service	Identified (No Works)	Along Hunter St between O'Connell St and Philip St
WW-13-040	Sydney Water	Sewer	225	Reticulation, Gravity	VC	In Service	Identified (No Works)	Along Hunter St between O'Connell St and Philip St
WW-13-050	Sydney Water	Sewer	225	Reticulation, Gravity	SGW	In Service	Identified (No Works)	Along Hunter St between O'Connell St and Philip St
WW-13-060	Sydney Water	Sewer	225	Property Connection Sewer, Gravity	VC	In Service	Identified (No Works)	Along George St between Bond St and Wynyard St
WW-13-070	Sydney Water	Sewer	225	Property Connection Sewer, Gravity	VC	In Service	Identified (No Works)	Along George St between Bond St and Wynyard St
WW-13-080	Sydney Water	Sewer	660 X 990	Trunk, Gravity	Concrete	In Service	Identified (No Works)	Along George St between Bond St and Wynyard St
WW-13-090	Sydney Water	Sewer	225	Reticulation, Gravity	VC	In Service	Identified (No Works)	Along George St between Bond St and Wynyard St
WW-13-100	Sydney Water	Sewer	150	Vent line, Gravity	CI	In Service	Identified (No Works)	Along Hamilton St between Curtain Pl and Hunter St
WW-13-110	Sydney Water	Sewer	300	Reticulation, Gravity	VC	In Service	Identified (No Works)	Along Hunter St between George St and Pitt St
WW-13-120	Sydney Water	Sewer	150	Reticulation, Gravity	VC	In Service	Identified (No Works)	Along Curtin Pl towards Hamilton St
WW-13-130	Sydney Water	Sewer	508	Branch, Gravity	CICL	In Service	Identified (No Works)	Along Hamilton St between Curtain Pl and Hunter St
WW-13-140	Sydney Water	Sewer	450	Branch, Gravity	CI	In Service	Identified (No Works)	Along Hamilton St between Curtain Pl and Hunter St
WW-13-150	Sydney Water	Sewer	300	Reticulation, Gravity	VC	In Service	In Service	West of Pitt St between Hunter St and Angel Pl

METRO ID	Owner	HLFC	Size (DN)	Configuration	Material	Status	Treatment	Location
WW-13-450	Sydney Water	Sewer	-	Maintenance Hole	N/A	In Service	Decommission	De Mestre Pl
WW-13-460	Sydney Water	Sewer	-	Maintenance Hole	N/A	In Service	Decommission	De Mestre Pl
WW-13-470	Sydney Water	Sewer	-	Vent shaft EDUCT	Mild Steel	In Service	Decommission	De Mestre Pl

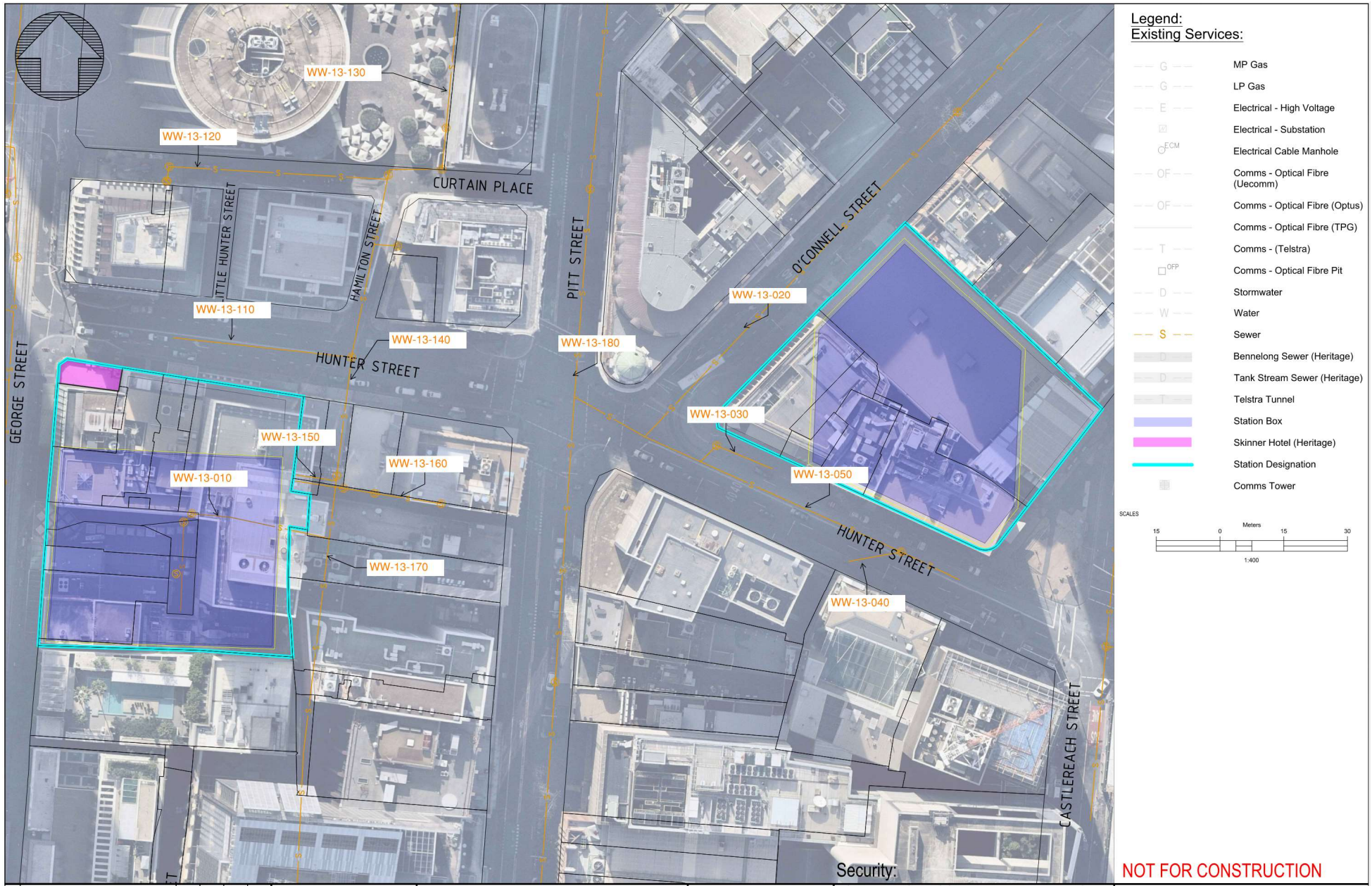


Figure 3-5 Wastewater network at Hunter Street (Sydney CBD) station

3.4.3 Proposed wastewater servicing and relocations

To allow for construction and servicing of the development, the following alteration works are required:

West Site

- Potential OSD wastewater connection to 660x990mm trunk main sewer, along George St.
- Decommission existing wastewater asset DN300mm vitrified clay pipe within the proposed designation site.
- Decommission maintenance holes in De Mestre Place
- Proposed wastewater connection during construction phase to existing wastewater pipe.

East Site

- Wastewater connection for the proposed station development to 711 x 1066mm concrete box gravity trunk sewer, along Bligh St and under the adjacent developments.
- Protect DN150mm Vitrified Clay pipe in footpath in front of the proposed development along Hunter St.

The proposed wastewater works, and potential new building connections are still under development and further work is required in subsequent design phases to confirm the final decommission and servicing arrangements in consultation with Sydney Water Corporation.

The west site includes the heritage-listed Skinners Family Hotel which will be retained as part of the future development at the subject site. Utilities servicing for this heritage item may require further assessment in later design stages and during construction.

Specific connection locations will be detailed following consultation with Sydney Water. Additional connection points would affect the building services spatial provisions within the development.

3.4.4 Demand assessment

3.4.4.1 Development demand

The estimated wastewater demand is calculated based on the standard unit rates summarised in Table 3-4 below and the development yields in Section 2.2. This development yield was used for the purposes of utilities infrastructure assessments and feasibility applications only and the final architectural designs should be used to confirm the building details. This demand assessment is summarised in Table 3-6.

Table 3-4 Sewer design loading criteria

Land use	Design criteria	Unit	Demand rate	Source
Commercial	Average Dry Weather Flow	EP/ha	300	Gravity Sewerage Code of Australia WSA 02-2014
Residential	Average Dry Weather Flow	EP/dwelling	2.5	Gravity Sewerage Code of Australia WSA 02-2014
Shopping	Average Dry Weather Flow	EP/ha	75	Gravity Sewerage Code of Australia WSA 02-2014

Land use	Design criteria	Unit	Demand rate	Source
BASIX reduction (apartments only)	N/A	%	40	Building Sustainability Index

Table 3-5: Estimated ADWF for wastewater including BASIX (L/s)

Location	Commercial and retail (L/s)	Total (± 15%) (L/s)
East Site	3.38	2.9 – 3.9
West Site	2.86	2.4 – 3.3
Totals	6.25	5.3 – 7.2

3.4.4.2 Station demand

The sewer demand for Hunter Street (Sydney CBD) Station was calculated based on current design parameters and the Traffic & Transport Planning's Passengers movement as per 2056 AM Peak Hour + 15% Station Movements (October 2020) – Transfer, Entry & Exit Model. The quantities and associated load may vary as detail design is developed. The following assumptions were used in the calculations:

- Allowance of 3% of (daily) total passengers using toilets and handwash basins during peak and off-peak
- 95% of total water usage to discharge to sewer except cooling tower make-up demands
- 50,000L/day for cooling Tower make-up water supply
- Allowance of 20% spare flow capacity
- Fixture outlets for new/temporary fixtures with minimum WELS Star Rating of 6.

The proposed wastewater demand for Hunter Street (Sydney CBD) Station was estimated to be 0.44 L/s with an allowance of 20% spare flow capacity.

Please note that the station box demand has been included in this assessment for reference only and has not been accounted for in the total demand calculations as it forms part of a separate SSI submission.

3.5 Potable water

3.5.1 Background

Potable Water servicing is provided by SWC, the desktop information indicates the presence of a number of their assets in the surrounding area as per Figure 3-6.

Figure 3-6 Potts Hill Water Delivery System (Sydney Water Corporation, 2021)

Water is sourced from a number of water sources including Coxs, Kowmung, Nattai, Wingecarribee, Wollondilly and Warragamba rivers which are stored at Warragamba Dam. When required during droughts, additional sources include Cataract, Cordeaux, Avon and Nepean rivers and Shoalhaven River System. The water is treated at the Prospect Water Filtration Plant before transported to Potts Hill reservoirs where it is delivered to the local areas via gravity or a pumping station where necessary. The supply can be additionally augmented with desalinated water from the Sydney Desalination Plant.

3.5.2 Existing assets

Potable Water servicing is provided by Sydney Water, the desktop information indicates the presence of a number of Sydney Water assets in the surrounding area.

These are summarised below in Table 3-6 and the existing assets are shown below in Figure 3-7.

Table 3-6 Existing Sydney Water potable water assets

METRO___ID	Owner	HLFC	Size (DN)	Material	Status	Treatment	Location
PW-13-010	Sydney Water	PW	150	CICL	In Service	Protect	Along O'Connell St between Bent St and Hunter St
PW-13-020	Sydney Water	PW	250	CICL	In Service	Protect	Along O'Connell St between Bent St and Hunter St

METRO ___ID	Owner	HLFC	Size (DN)	Material	Status	Treatment	Location
PW-13-030	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along Hunter St between O'Connell St and Philip St
PW-13-040	Sydney Water	PW	300	CICL	In Service	Protect	Along Hunter St between George St and Pitt St
PW-13-050	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along Bligh St between Bent St and Hunter St
PW-13-060	Sydney Water	PW	150	CICL	In Service	Identified (No Works)	Along Hunter St between O'Connell St and Philip St
PW-13-070	Sydney Water	PW	150	CICL	In Service	Identified (No Works)	Along Bligh St between Bent St and Hunter St
PW-13-080	Sydney Water	PW	200	CICL	In Service	Identified (No Works)	Along Castlereagh St between Hosking Pl and Hunter St
PW-13-090	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along Hunter St between O'Connell St and Philip St
PW-13-100	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along Pitt St between Bond St Angel Pl
PW-13-110	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along Pitt St between Bond St Angel Pl
PW-13-120	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along Hunter St between George St and Pitt St
PW-13-130	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along Hamiton St between Curtain Pl and Hunter St
PW-13-140	Sydney Water	PW	250	PE	In Service	Identified (No Works)	Along Hunter St between George St and Pitt St
PW-13-150	Sydney Water	PW	250	CICL	In Service	Protect	Along Hunter St between George St and Pitt St
PW-13-160	Sydney Water	PW	250	CICL	In Service	Identified (No Works)	Along George St between Bond St and Wynyard St
PW-13-170	Sydney Water	PW	300	CICL	In Service	Identified (No Works)	Along George St between Bond St and Wynyard St

METRO ___ID	Owner	HLFC	Size (DN)	Material	Status	Treatment	Location
PW-13-180	Sydney Water	PW	300	CICL	In Service	Protect	Along George St between Bond St and Wynyard St

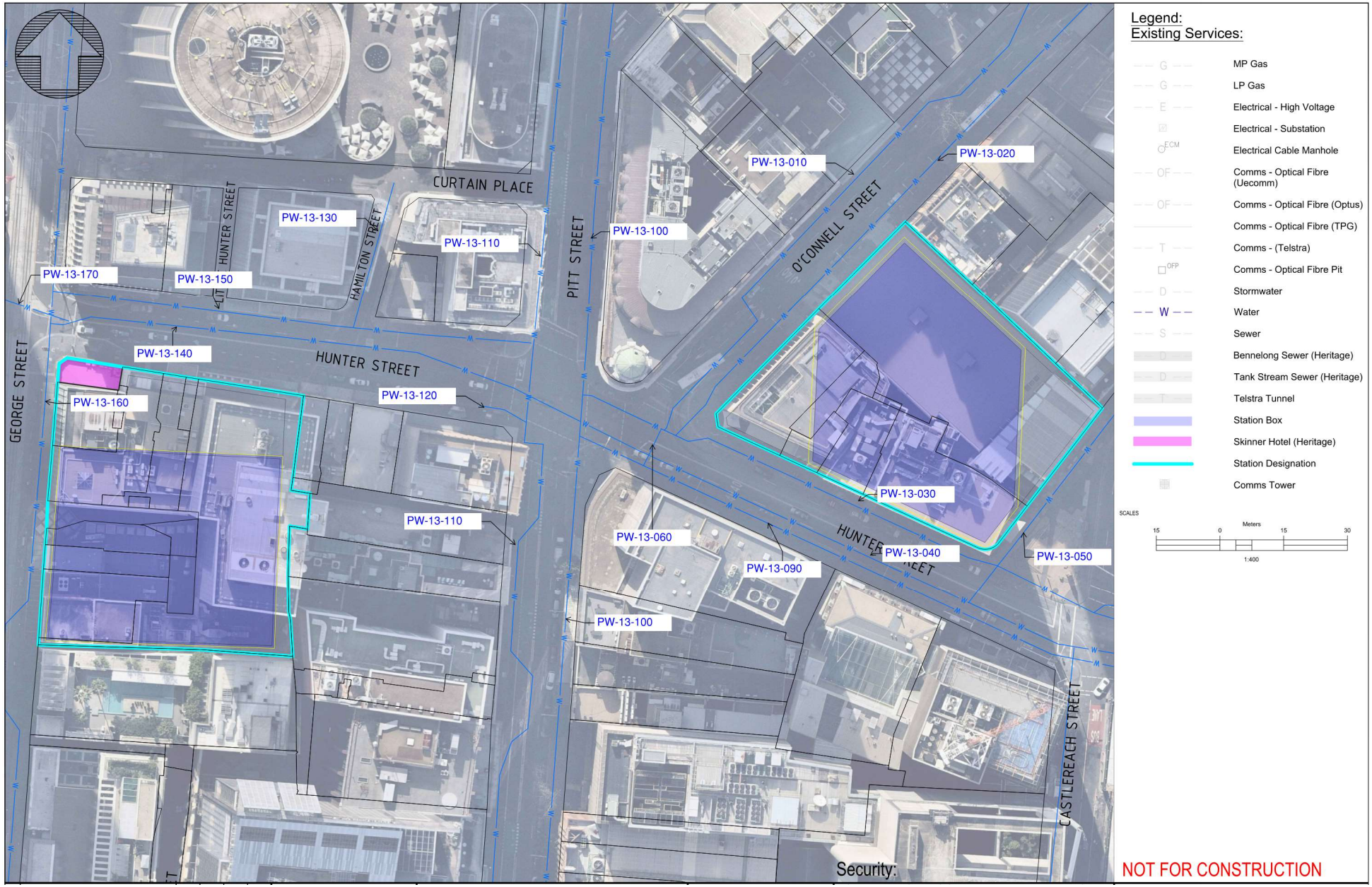


Figure 3-7 Potable water network at Hunter Street (Sydney CBD) Station

3.5.3 Proposed water servicing and decommissions

To allow for construction and servicing of the development, the following alteration works are required:

East Site

- Potential protection to existing watermains in footpaths surrounding the OSD, depending on utility survey include:
- DN250mm cast iron concrete lined (CICL), along O'Connell Street
- DN250mm CICL, along O'Connell St
- DN 250 CICL, along Hunter St
- DN 250 CICL, along Bligh St
- Decommission existing potable water connections, to development lots within the proposed designation.
- Future connection to proposed OSD from of the above DN250mm CICL watermains.

West Site

- Protect existing watermain DN250mm cast iron concrete lined in footpath along George St.
- Decommission existing potable water connections, to properties within the proposed development sites typically 25mm – 50mm ID.
- Future connection for proposed OSD from DN250mm CICL along George St.

The west site includes the heritage-listed Skinners Family Hotel which will be retained as part of the future development at the subject site. Utilities servicing for this heritage item may require further assessment in later design stages and during construction.

The potable water reticulation surrounding the proposed development is shown in Figure 3-7. It is important to note that these designs are schematic only and further work is required in subsequent design phases to confirm the final decommissions and servicing arrangements in consultation with Sydney Water Corporation.

3.5.4 Demand assessment

3.5.4.1 Development demand

A high-level demand assessment was undertaken based on the indicative building development yield. The development yields are detailed in Section 2.2. This development yield has been referenced for the purposes of utilities infrastructure assessments only and the final architectural designs shall be used to confirm the OSD demands.

The estimated water demand is calculated based on the standard unit rates summarised in Table 3-7, as shown in Table 3-8.

Table 3-7 Potable water design loading criteria

Land Use	Design Criteria	Unit	Demand Rate	Source
Commercial	Max Day Demand	kL/ha/day	63	WSA 03-2011
Residential	Max Day Demand	kL/unit/day	0.8	WSA 03-2011
Shopping	Max Day Demand	kL/ha/day	41	WSA 03-2011
BASIX reduction (apartments only)	N/A	kL/Day	40% reduction	Building Sustainability Index

Table 3-8: Estimated maximum day demand (MDD) for potable water including BASIX (kL/day)

Location	Commercial and retail (kL/day)	Total ± 15% (kL/day)
East Site	420	357 - 483
West Site	355	302 - 408
• Totals	775	658 - 890

3.5.4.2 Station demand

The potable water demand for Hunter Street (Sydney CBD) Station was calculated based on current design parameters and the Traffic & Transport Planning's Passengers movement as per 2056 AM Peak Hour + 15% Station Movements (October 2020) – Transfer, Entry & Exit Model. The quantities and associated load may vary as detail design is developed. The following assumptions were used in the calculations:

- Allowance of 3% of (daily) total passengers using toilets and handwash basins during peak and off-peak
- 95% of total water usage to discharge to sewer except cooling tower make-up demands
- 50,000L/day for cooling Tower make-up water supply
- Allowance of 20% spare flow capacity
- Fixture outlets for new/temporary fixtures with minimum WELS Star Rating of 6.

The proposed potable water demand for Hunter Street west was estimated to be 100 kL/Day with an allowance of 20% spare flow capacity.

Please note that the station box demand has been included in this assessment for reference only and has not been accounted for in the total demand calculations as it forms part of a separate SSI submission.

3.6 Telecommunications

3.6.1 Existing assets

Telecommunications servicing is provided by Telstra, Optus, TPG, Uecomm and NBN. The desktop information indicates the presence of a number of telecommunications assets in the surrounding area. These are summarised in Table 3-9. The existing telecommunications assets are shown below in Figure 3-8.

Table 3-9 Existing telecommunications assets

METRO ID	Owner	Hlfc	Type	Status	Treatment	Location
NB-13-020	NBN	Tower	Tower	In Service	Relocate	Telstra Rooftop Site 5 Hunter St Sydney
OP-13-050	Optus	Optic Fibre	Cable	In Service	Decommission	Along George St between Bond St and Wynyard St
OP-13-060	Optus	Optic Fibre	Cable	In Service	Decommission	Along and surrounding site around De Mestre Pl
OP-13-110	Optus	Optic Fibre	Cable	In Service	Decommission	Along and surrounding site around De Mestre Pl
OP-13-120	Optus	Optic Fibre	Cable	In Service	Decommission	
OP-13-130	Optus	Optic Fibre	Cable	In Service	Decommission	Along and surrounding site around De Mestre Pl
OP-13-150	TPG	Optic Fibre	Cable	In Service	Protect	
OP-13-250	Optus	Optic Fibre	Cable	In Service	Decommission	Along Bligh St between Bent St and Hunter St
TE-13-050	Telstra	Optic Fibre	Conduit Bank	In Service	Decommission	Along George St between Angel Pl and Hunter St
TE-13-060	Telstra	Optic Fibre	Conduit Bank	In Service	Decommission	Along George St between Angel Pl and Hunter St
TE-13-070	Telstra	Optic Fibre	Conduit Bank	In Service	Decommission	Along George St between Angel Pl and Hunter St

METRO ID	Owner	Hlfc	Type	Status	Treatment	Location
TE-13-080	Telstra	Optic Fibre	Conduit Bank	In Service	Decommission	Along De Mestre Pl off George St
TP-13-050	TPG	Optic Fibre	Cable	In Service	Decommission	
TP-13-080	TPG	Optic Fibre	Cable	In Service	Decommission	
TP-13-150	TPG	Optic Fibre	Cable	In Service	Decommission	
TP-13-210	TPG	Optic Fibre	Cable	In Service	Decommission	Along and surrounding site around De Mestre Pl
TP-13-220	TPG	Optic Fibre	Cable	In Service	Decommission	Along and surrounding site around De Mestre Pl
TP-13-230	TPG	Optic Fibre	Cable	In Service	Decommission	Along and surrounding site around De Mestre Pl
UE-13-030	Uecomm	Optic Fibre	Cable	In Service	Decommission	
UE-13-110	Uecomm	Optic Fibre	Cable	In Service	Decommission	Along Hunter St between O'Connell St and Philip St
VF-13-010	Vodafone	Tower	Tower	In Service	Relocate	

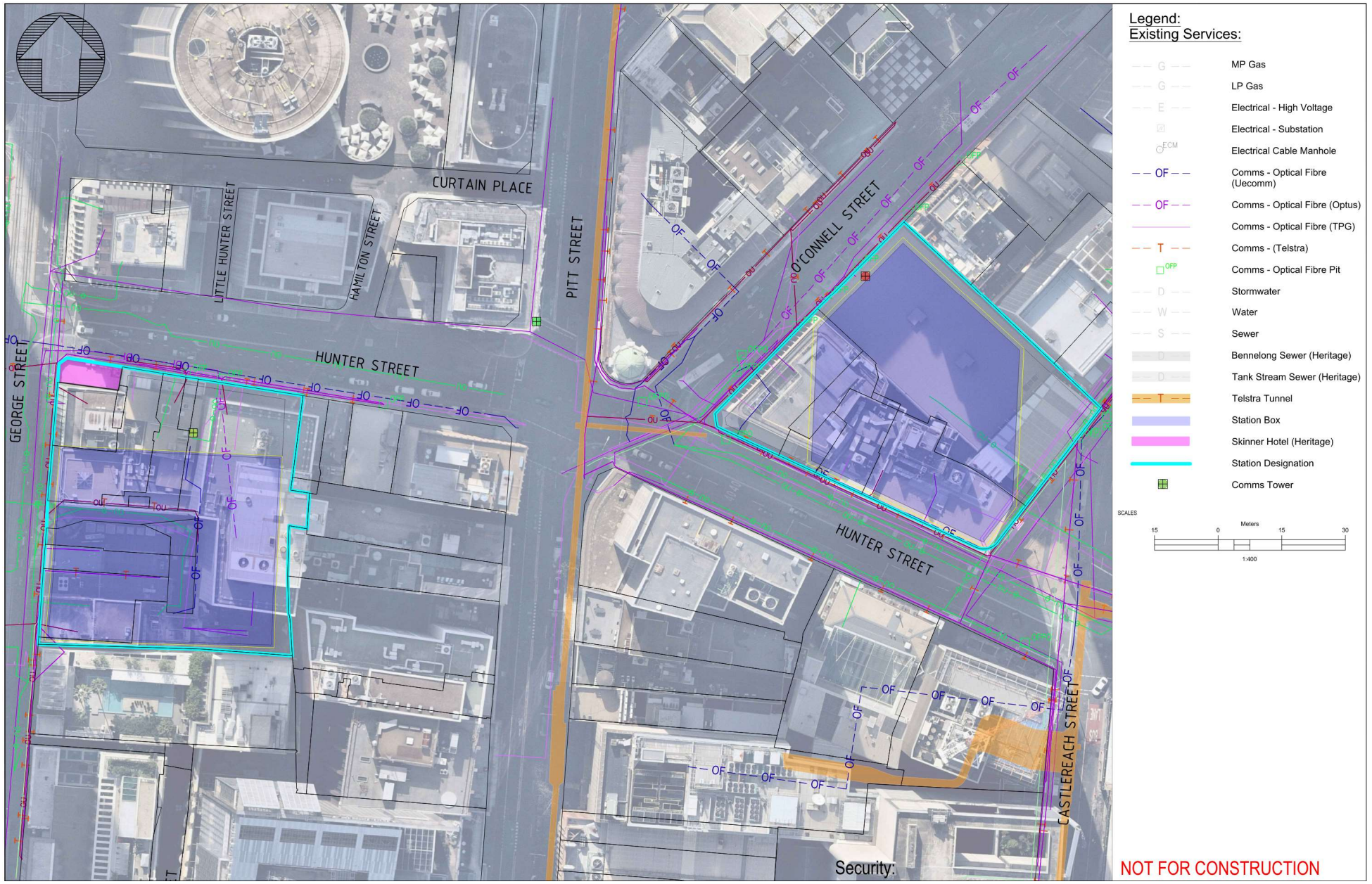


Figure 3-8 Telecommunications network at Hunter Street (Sydney CBD) Station

3.6.2 Proposed telecommunications servicing and decommissions

To allow for construction and servicing of the development, the following alteration works are required:

West Site

- Proposed telecommunications connections, from existing infrastructure pits and ducts along George St and Hunter St,
- Decommission existing telecommunications within the proposed station designation, and
- Protection to shallow telecommunications utilities from construction activities, along footpaths surrounding the proposed station development.

East Site

- Decommission existing telecommunications services within the proposal site boundary, along O'Connell St, Bligh St and Hunter St;
- Decommission Vodafone communications tower on existing development within the station designation.
- Protection to shallow comms utilities along footpaths from construction activities surrounding the proposed station designation.
- Proposed new telecommunications connections, from O'Connell St, Hunter St, and Bligh St;

The west site includes the heritage-listed Skinners Family Hotel which will be retained as part of the future development at the subject site. Utilities servicing for this heritage item may require further assessment in later design stages and during construction.

The proposed telecommunication works, and potential new building connections are still under development and further work is required in subsequent design phases to confirm the final relocations and servicing arrangements in consultation with the various utility owners.

3.6.3 Demand assessment

No demand assessment has been undertaken for this service however advice on the quantity and type of connections will be ascertained via the feasibility application process with the telecommunications authorities. Telecommunication connections will be confirmed as the building services design develops and coordinated with service providers.

3.7 Electrical

3.7.1 Existing assets

Electrical servicing to the precinct is provided by Ausgrid, the desktop information indicates the presence of a number of low voltage (<11kV) and high voltage (≥ 11kV) assets surrounding the proposed development site.

These are summarised below and in Table 3-10. The existing power utilities are shown in Figure 3-9.

West Site

- Electrical pits servicing properties located in footpaths surrounding the proposed development along Hunter St and George St.
- Multiple 11kV supply to substation, along De Mestre Place
- High voltage substation located within the proposed designation, along De Mestre Place.

East Site

- Electrical pits servicing properties located in footpaths surrounding the proposed development along O'Connell St., Hunter St, and Bligh St.
- 11kV supply, from Hunter St to within the proposed station designation, south east corner of the station boundary
- High Voltage substation located within the proposed designation supply from Bligh St.

Table 3-10 Existing Ausgrid power assets

METRO_ID	Owner	Hlfc	Orientation	Capa-City	Status	Treatment	Street
AG-13-220	Ausgrid	HV	UG	11kV	In Service	Decommission	De Mestre Pl
AG-13-230	Ausgrid	HV	UG	11kV	In Service	Decommission	De Mestre Pl
AG-13-2750	Ausgrid	HV	Substation	n/a	In Service	Relocate	De Mestre Pl
AG-13-2770	Ausgrid	HV	Substation	n/a	Abandoned	Relocate	Bligh St
AG-13-2780	Ausgrid	HV	Substation	n/a	In Service	Relocate	Bligh St
AG-13-640	Ausgrid	HV	UG	11kV	In Service	Relocate	Bligh St

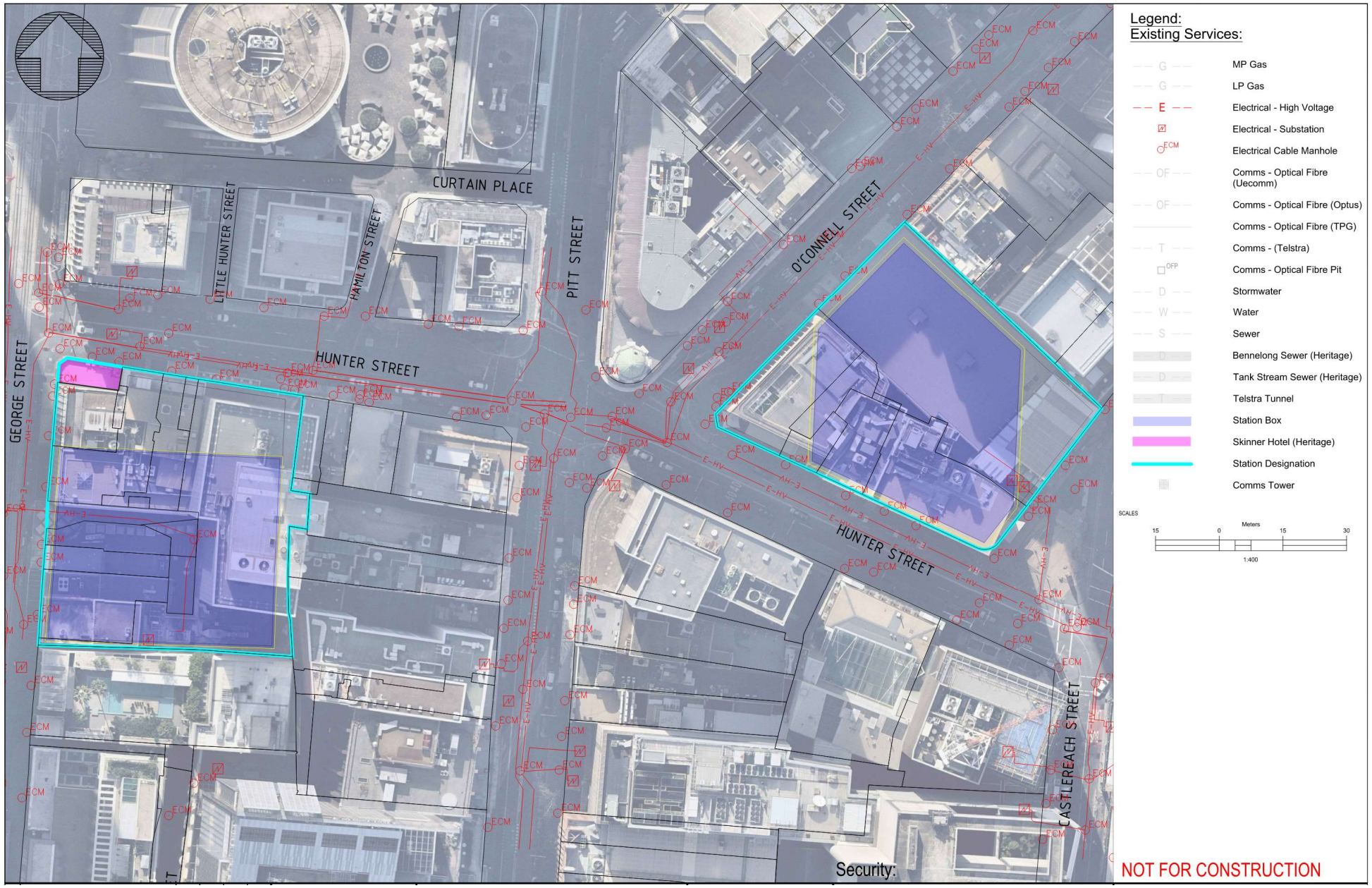


Figure 3-9 Ausgrid power network at Hunter Street (Sydney CBD) Station

3.7.2 Proposed electrical servicing and d

To allow for construction and servicing of the development, the following alteration works are required:

West Site

- Existing electrical infrastructure servicing City & Southwest, Martin Place station investigated for supply to the proposed station development,
- Protection to shallow power utilities from construction activities in footpaths surrounding the proposed station development, and
- Decommission HV (11kV), LV supplies and substations along De Mestre Pl and within the proposed development.

East Site

- Existing electrical infrastructure servicing City & Southwest, Martin Place station investigated for supply to the proposed station development,
- Decommission 11kV HV supply from Bligh St and 2no. HV substations,
- Decommission LV power supply to existing properties, from distribution pits along Bligh St., Hunter St and O'Connell St development, and
- Protection to shallow power utilities from construction activities in footpaths surrounding the proposed station development.

The west site includes the heritage-listed Skinners Family Hotel which will be retained as part of the development at the subject site. Utilities servicing for this heritage item may require further assessment in later design stages and during construction.

The proposed electrical works and potential new building connections are still under development and further work is required for subsequent design phases to confirm the final relocations and servicing arrangements in consultation with Ausgrid.

3.7.3 Demand assessment

A high-level demand assessment was undertaken based on the indicative building development yield; this development yield is detailed in Section 2.2. This development yield has been referenced for the purposes of utilities infrastructure assessments only and the final architectural designs shall be used to confirm the OSD demands.

The estimated electrical demand (is calculated based on the standard unit rates summarised in Table 3-11 below and the development yields provided in Section 2.2.

Table 3-11 Electrical design loading criteria

Land Use	Design criteria	Unit	Demand rate	Source
Commercial – Office -	Peak Demand	kV/Am^2	0.1	Ausgrid NS109 – Table 4 Guide to Typical Load Densities.
Residential - Apartments	Peak Demand	kVA/dwelling	3.5	Endeavour Energy Growth Servicing Plan 2019 – Table 1

Land Use	Design criteria	Unit	Demand rate	Source
Shopping – air conditioned	Peak Demand	kV/Am^2	0.1	Ausgrid NS109 – Table 4 Guide to Typical Load Densities.
Diversity Factor	N/A	%	80	AS3000

Table 3-12 Estimated Electrical Peak Demand, including 0.8 diversity factor (MVA)

Location	Commercial and retail (incl. 0.8 Diversity Factor) (MVA)	Total ± 15% (MVA)
Estimated Peak Demand for East Site	5.35	4.5 – 6.2
Estimated Peak Demand for West Site	4.52	3.8 – 5.2
Totals	9.87	8.4 – 11.4

3.8 Gas

3.8.1 Existing assets

Gas servicing is provided by Jemena the desktop information indicates the presence of a number of low pressure (LP) and high pressure (HP) gas assets in the surrounding area.

These are summarised below in Table 3-13 and shown in Figure 3-10.

Table 3-13 Existing Jemena gas assets

METRO_ID	Owner	HLFC	Size	Material	Status	Treatment	Street
JE-13-010	Jemena	LP	110	Nylon	In Service	Protect	O'Connell St
JE-13-040	Jemena	LP	75	Nylon	In Service	Protect	Hunter St
JE-13-080	Jemena	LP	110	PE	In Service	Protect	George St
JE-13-230	Jemena	LP	110	Nylon	In Service	Protect	Bligh St

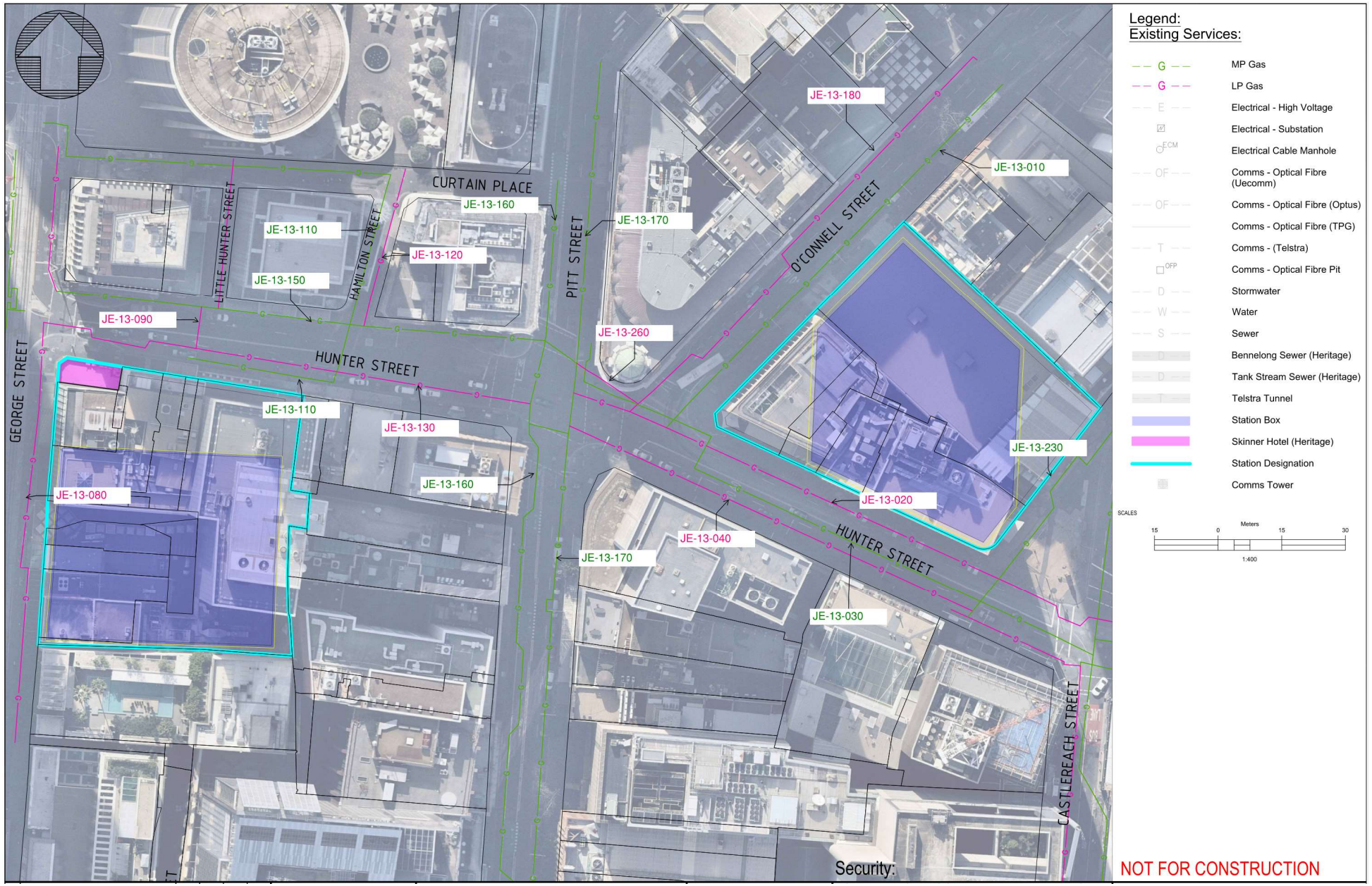


Figure 3-10 Gas network at Hunter Street (Sydney CBD) Station

3.8.2 Proposed servicing and decommissions

To allow for construction and servicing of the development, alteration and decommissions work shall be required to provide services into the Hunter Street OSD site.

The proposed gas decommissions, relocations and potential new building connections are still under development and further work is required in subsequent design phases to confirm the final relocations and servicing arrangements in consultation with Jemena.

The west site includes the heritage-listed Skinners Family Hotel which will be retained as part of the future development at the subject site. Utilities servicing for this heritage item may require further assessment in later design stages and during construction.

Initial consultation with Jemena indicates that the low pressure network does not have sufficient capacity to supply the estimated demand, however there is sufficient capacity in the high pressure network to support the development in the advised footprint.

3.8.3 Demand assessment

The current proposal's GFA is split between commercial and retail space. A detailed gas demand assessment for commercial facilities shall be assessed by service engineers in consultation with Jemena and included in future revisions of this report.

3.9 Sustainability initiatives

A separate Ecologically Sustainable Development (ESD) Report (SMWSTEDS-SMD-SCB-SN100-SB-RPT-044003) has been developed for the subject site. Key initiatives that may be applicable to this report are outlined below.

The eventual use of any of these sustainability initiatives will potentially reduce/change the type and quantity of required utility servicing. These are to be further investigated in future design stages in coordination with the building services design and utilities providers.

Sustainability rating strategy

The sustainability rating strategy set out the following minimum requirements for the proposed development:

- 6 star Green Star Buildings rating
- 6 star NABERS Energy for Offices rating (base building) (Commitment Agreement) (without GreenPower)
- 4.5 star NABERS Water for Offices rating

Climate positive pathway

The Climate Positive Pathway established under Green Star Buildings sets a Whole Life Carbon Vision:

- Credibly reduce upfront carbon and operational carbon emissions
- Eliminate emissions by avoiding locking in fossil fuels, installing low impact refrigerant systems, electrifying all energy uses and purchasing 100% renewable electricity
- Compensate by offsetting operational carbon emissions that cannot be immediately eliminated (e.g. refrigerants and standby generator test diesel fuel use)
- Neutralise embodied emissions that cannot be eliminated through short-term nature-based solutions and long-term carbon capture and storage technologies.

The Climate Positive Pathway includes the following minimum targets which may impact utilities demands as outlined in this report:

- 30% reduction in energy use
- 100% renewable energy
- 40% reduction in potable water use.

Water strategy

To support water resilience, the development must integrate water efficiency measures and make use of alternative water sources to reduce the demand for potable water. The water efficiency measures listed below have been considered in determining the minimum target noted above. It is recommended that these measures are further investigated and enhanced in coordination with the building services design and utilities providers to deliver further potable water use reductions.

- Toilets - 5 star WELS rating
- Urinals - 5 star WELS rating
- Wash hand basin taps - 6 star WELS rating
- Kitchen taps - 6 star WELS rating

- Showers - 4 star WELS rating
- Dishwashers - 5 star WELS rating
- Dual plumbing systems serving all non-potable water demands, including toilet and urinal flushing, landscape irrigation and make-up water for heat rejection systems
- 25 kL and 20 kL rainwater tank and treatment system for rainwater harvesting and reuse to meet a proportion of the non-potable water demands for the East and West buildings, respectively
- Future ready connection for a recycled water network, including future ready space provisioning for a 20 kL recycled water tank
- Closed circuit cooler (hybrid cooling tower) plant for heat rejection serving base building and tenant supplementary loop
- Landscape design - total average crop coefficient less than 0.6 (i.e. water sensitive landscape design)
- Landscape irrigation - subsurface drip irrigation - 90% system efficiency
- Fire protection system - water is not expelled during testing.

Electric vehicles

Requirements for provision of electric vehicle (EV) charging points is to be considered for the discussions with utilities providers as the design develops. As a minimum the development must provide:

- EV ready
- EV charging points to at least 5% of all car parking spaces
- EV charging points to all car share parking spaces (in addition to the 5% provided)
- EV capable
- Electrical infrastructure and a load management plan prepared to allow for future installation of EV charging to 25% of all car parking spaces (including the EV ready provision). The mix of EV charger levels assumed must be stated.
- A dedicated, safe, unobstructed route from the electrical supply point which allows for the future provision of all necessary electrical cabling without the need for substantial builders work in connection to the electrical cabling installation.

3.10 Utility authority consultation

As a part of the utility services assessment process, feasibility applications are being prepared for each of the following utility authorities with the estimated demand of the development and indicative servicing arrangements for authority review and comment:

- Sydney Water Corporation
- NBN
- Ausgrid
- Jemena.

Copies of these feasibility applications and authority responses received to date are included in Appendix A. This will be updated in future revisions of this report.

3.11 Next steps

The indicative building design that has been assessed is subject to further design development, future work that is required to ensure adequate servicing includes:

- Further coordination with utility agencies on lead-in infrastructure connections and any amplifications of existing assets
- Further utility investigation including slit trenching and obtaining Quality Level A survey information of existing utility assets
- Implementation of selected sustainability initiatives in the building design and revised demand modelling to determine the impacts on the required lead-in infrastructure
- Formal connection applications for utility services through appropriate channels such as Water Service Coordinators and Accredited Service Providers

Development of formal utility relocation and connection packages to the utility agencies including any protection details of existing utility assets.

4 Conclusion

4.1.1 Assessment summary

This Utilities & Infrastructure Servicing Assessment has identified the existing services, projected utility demands and potential opportunities and constraints considered for the servicing of the site as summarised below. It should be noted that the assessment is preliminary only based on the initial consultation advice from utility providers.

Services

The site is currently serviced through the following means:

- Stormwater: Stormwater flows from the local catchment area (Sydney Water City Area 29 Catchment) collect through Sydney Water Corporation (SWC) stormwater assets to the Tank Stream and Bennelong sewers
- Wastewater: Wastewater servicing is provided by SWC and directed to the Bondi Treatment Plant.
- Potable Water: Potable water is provided by SWC from the Prospect East Water Delivery System which is supplied by gravity from the Prospect Water Filtration Plant.
- Telecommunications: Various telecommunications providers service the site including Telstra, NBN TPG and Optus.
- Electrical: High and low voltage electrical supply is provided by Ausgrid
- Gas: Gas reticulation is provided by Jemena.

Indicative demand

Demand modelling has been based on indicative development yields listed in Section 2.2 of this report for the purpose of considering lead-in utility infrastructure requirements. A summary of the results is presented below:

- Wastewater: Average Dry Weather Flow (ADWF) including BASIX reduction of 6.3L/s Total Demand (3.4L/s East Site and 2.9L/s West Site)
- Potable Water: Maximum Daily Demand including BASIX of 775kL/day Total Demand (420kL/day East Site and 355kL/day West Site)
- Telecommunications: As this is unable to be calculated, outcomes of the feasibility application are to be incorporated into later revisions of the report
- Electrical: Peak Demand including 0.8 Diversity Factor of 9.9MVA Total Demand (5.4MVA East Site and 4.5MVA West Site)
- Gas: Commercial and retail usage have not been estimated to varying demand and are to be updated in later revisions of the report based on consultation with Jemena

Servicing constraints

Key servicing constraints for this development include:

- Stormwater: Connection and service to heritage assets
- Wastewater: Capacity of existing sewer trunk sewers
- Potable Water: Existing potable water reticulation capacity for proposed integrated station development.
- Telecommunications: Backhaul of new feeder cables to nearest exchange.

- Electrical: 11kV high voltage supply in the CBD precinct. Investigation into existing construction power at City & Southwest for utilisation on SMW.
- Gas: Initial consultation with Jemena indicates that the low pressure network does not have sufficient capacity to supply the estimated demand, however there is sufficient capacity in the high pressure network to support the development in the advised footprint.

Servicing constraints will be updated in later versions of this report based on feasibility application responses from the utility providers.

Sustainable development initiatives

A separate Ecologically Sustainable Development (ESD) Report (SMWSTEDS-SMD-SCB-SN100-SB-RPT-044003) has been developed for the subject site. Key initiatives that may be applicable to this report are listed below. These will be investigated and developed as the design progresses, including evaluation of impact on indicative demands.

- High overall targets for green building ratings, including Climate Positive pathway considerations
- An overall water strategy to reduce potable water consumption and support water resilience
- Electric Vehicle capabilities

4.1.2 Planning responses

This report complies with the utility planning requirements as per the initial advise received to date included in Appendix A.

Appendix A – Utility authority consultation

July 7, 2021

Zachary Kennett
Network Development Specialist – I&C
Jemena
99 Walker Street
North Sydney, NSW 2060

Reference: **SMWSTEDS-SMD-SW000-UG-MEM-044001**
Sydney Metro West Integrated Station Development Gas Feasibility Application

Dear Mr. Kennett,

Introduction

Sydney Metro West is a fully segregated new Metro line connecting seamlessly with other existing transport modes. Sydney Metro West is principally a 'greenfield' development that does not rely on the expansion or repurposing of existing infrastructure (excepting the development of existing concourses at Westmead and North Strathfield Stations), providing the opportunity to develop the next evolution of the metro product.

Figure 1: Sydney Metro West Context

A summary of the key elements of the Sydney Metro West configuration and operating concept is provided below for the purposes of this application:

- Approximately 24km of twin underground rail tunnels from Westmead to the Sydney CBD
- Nine new underground Metro stations at Westmead, Parramatta CBD, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD) and the provisioning for the sale of air space over stations and surplus land for property development
- Integrated Station Developments at Parramatta, Sydney Olympic Park, Hunter Street (Sydney CBD) and potentially The Bays
- A combined maintenance and stabling facility and Operations Control Centre at Clyde
- Passenger interchanges at Westmead and North Strathfield to the Sydney Trains T1 Western and T9 Northern lines
- Tunnel ventilation services facilities at Rosehill, Silverwater and Lilyfield.

Table 1 below provides a breakdown of the latest approximate development yields for each Metro station site, including a breakdown of dwellings, commercial and retail space. Figures 2 to 11 in Attachment A show indicative extents for each site development. Please note this application is for the property developments only and excludes the metro station itself due to differences in development staging timeframes. Furthermore, the details provided as part of this application are to facilitate preliminary infrastructure studies only and are subject to change as the designs develop.

Table 1: Indicative Development Growth (18th June 2021)[1]

Investigation Area		Residential Apartments[3] (No.)	Indicative Commercial Space GFA[2] (m^2)	Indicative Retail Space GFA[2] (m^2)	Development Timeframe (Year)
1.	Westmead	250	40,000	4,500	2028 - 2032
2.	Parramatta	250	150,000	20,000	2024 - 2028
3.	Clyde MSF	N/A	N/A	N/A	2024 - 2028
4.	Sydney Olympic Park	1,000	35,000	8,000	2024 - 2028
5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
8.	The Bays	550	32,450	6,150	2024 - 2028
9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

Note:
[1]Apartment numbers and commercial/retail space figures are assumptions only and are subject to review. They are provided for the infrastructure capacity analysis only.
[2]An assumed 0.8 conversion factor from gross floor area (GFA) to net lettable area (NLA) has been applied.
[3]1 apartment = 100 sqm of Residential GFA

Gas Demand Rates

A preliminary assessment has been undertaken of the potential gas demand associated with each proposed development.

Demand forecasting and profiles were developed for the ISDs and development precincts based on the number of dwellings. Please note, this excludes commercial usage as we understand the rates can vary widely for different uses.

For the purposes of this assessment we used an energy demand of 20 gigajoules (GJ) per year (equating to 2.17m3/day/dwelling) to estimate the average annual domestic usage of natural gas for residential dwellings. We also included a BASIX reduction target of 25% to the residential

dwellings.

A factor of 39.6 m³/GJ was then used to convert the estimated usage into a volume of gas (Parliament of Australia, Natural Gas: Energy for the New Millennium, 2015).

Projected Gas Demand

Using the development yields outlined in Section 1 and the demand rates in Section 2, estimates for the cumulative residential gas usages were developed as shown in Table 2. Please note that, as the design is still evolving, we believe it is appropriate to apply a ±15% factor to these numbers.

Table 2: Gas Demand Rates

Development		Estimated Gas Demand (m^3/day) (2024-2032)		Total (m^3/day)
		Residential (incl. BASIX)	Commercial and Retail	
1.	Westmead	407	TBA[1]	407
2.	Parramatta	407	TBA[1]	407
3.	Clyde MSF	N/A	TBA[1]	N/A
4.	Sydney Olympic Park	1800	TBA[1]	1800
5.	North Strathfield	N/A	TBA[1]	N/A
6.	Burwood North	342	TBA[1]	342
7.	Five Dock	34	TBA[1]	34
8.	The Bays	895	TBA[1]	895
9.	Pyrmont	293	TBA[1]	293
10.	Hunter Street (Sydney CBD)	N/A	TBA[1]	N/A

Notes:

[1] *Commercial and Retail usage excluded for the purposes of this estimate due to varying demand. Facility uses are currently under discussion as part of the design development process and demand estimates will be communicated to Jemena when made known.*

The above demand estimates do not allow for reductions in existing demand resulting from the demolition of existing land uses. Furthermore, changes to these demand estimates from potential ecologically sustainable development (ESD) initiatives have not been considered. Any future impacts will be communicated to Jemena.

Feasibility Assessment Request

As demonstrated in the demand estimate, there is projected to be a significant impact on the gas infrastructure. As such, Sydney Metro seeks to actively engage with utility stakeholders to ensure the appropriate planning measures are implemented.

Additionally, we seek the following information:

- Confirmation of existing Jemena infrastructure within and adjacent to the sites;
- Identification of the existing capacity of the gas to service the projected growth and any augmentations that may be required to Jemena's network;
- Details of any planned infrastructure works to support development within the catchments which could be expanded to support the developments;

- Other major developments currently allowed for in the development areas as part of Jemena's infrastructure planning;
- Funding arrangements for infrastructure upgrades to the meet the increased gas demand;
- Guidance on timeframes for forward planning of infrastructure works; and
- Advice on any alternative supply strategies that might be feasible for Jemena to implement for the proposed developments.

We welcome further discussion and collaboration with Jemena as part of the precinct planning and are happy to meet with Jemena and Sydney Metro to discuss the implications of this feasibility application.

Should you have any queries in relation to this application please do not hesitate to contact the undersigned. We look forward to working with Jemena on the next stages of the developments.

Yours sincerely

Paul Rogers

Paul Rogers
Utilities & Stakeholder Manager
Sydney Metro

Attachment: *Sydney Metro West – Indicative Site Extents*

Westmead

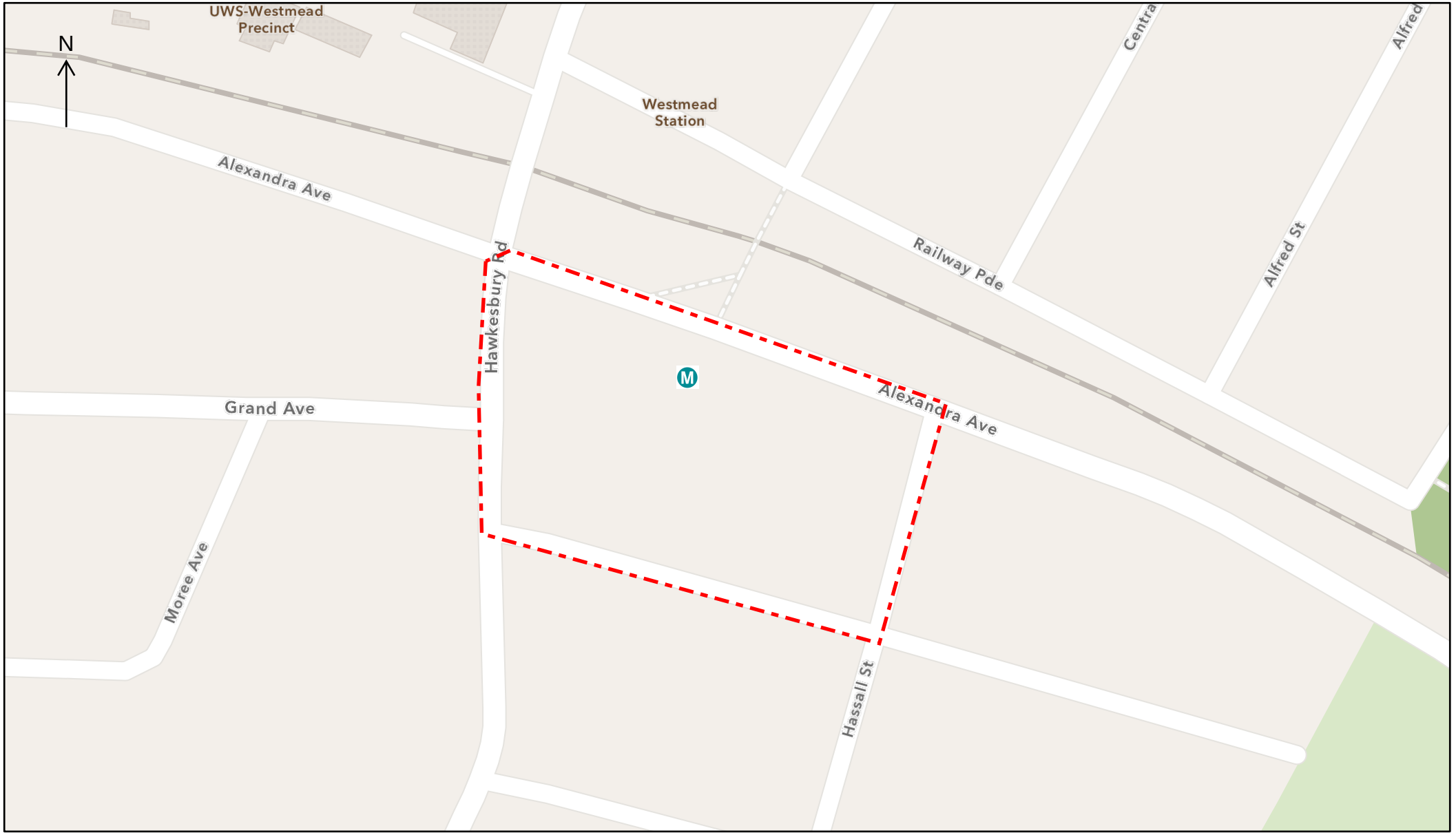


Figure 2. Potential Westmead Site Extent

Parramatta

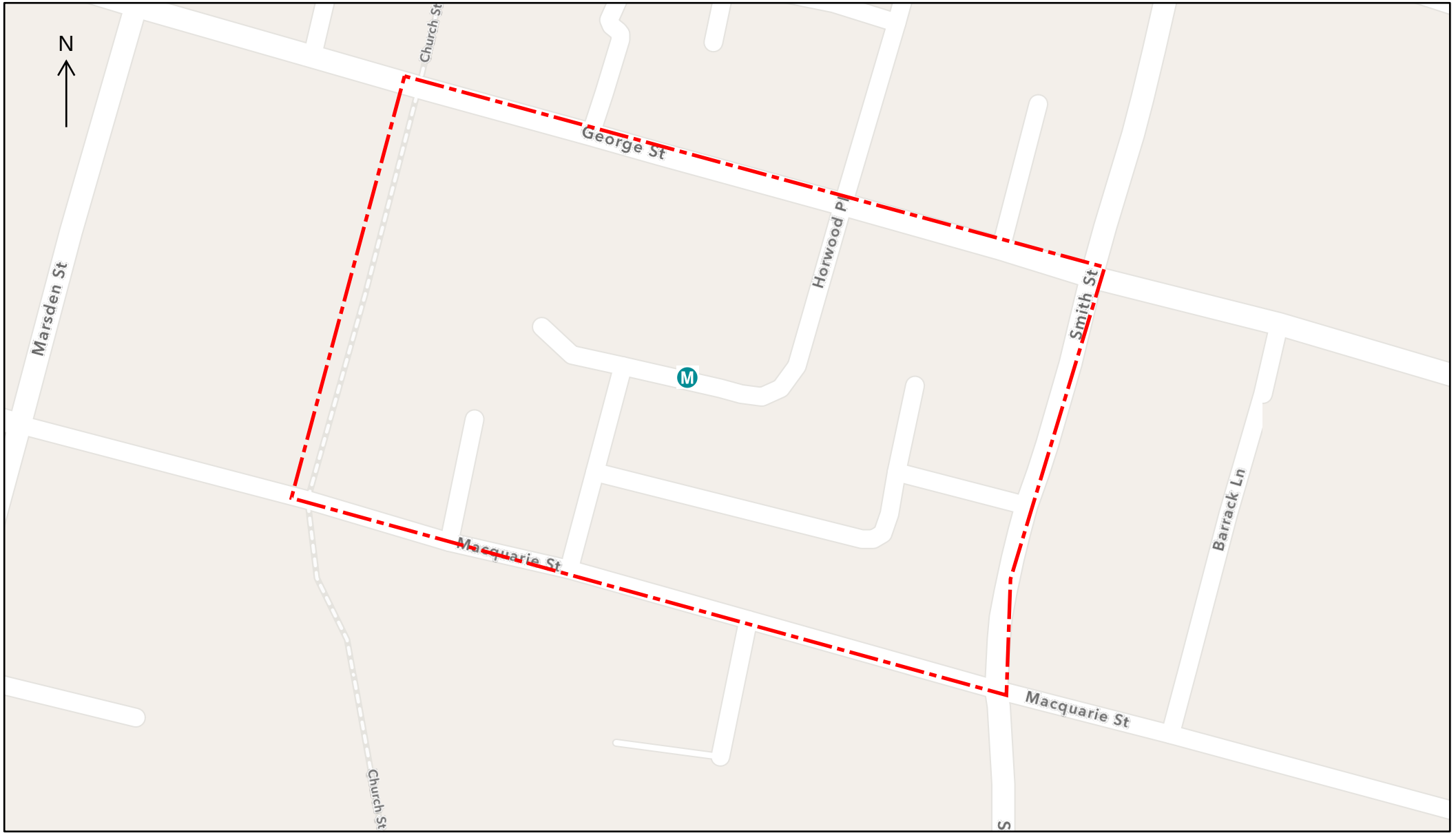


Figure 3. Potential Parramatta Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:2,500

0 0.02 0.04 0.07 mi

0 0.03 0.06 0.11 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Clyde MSF

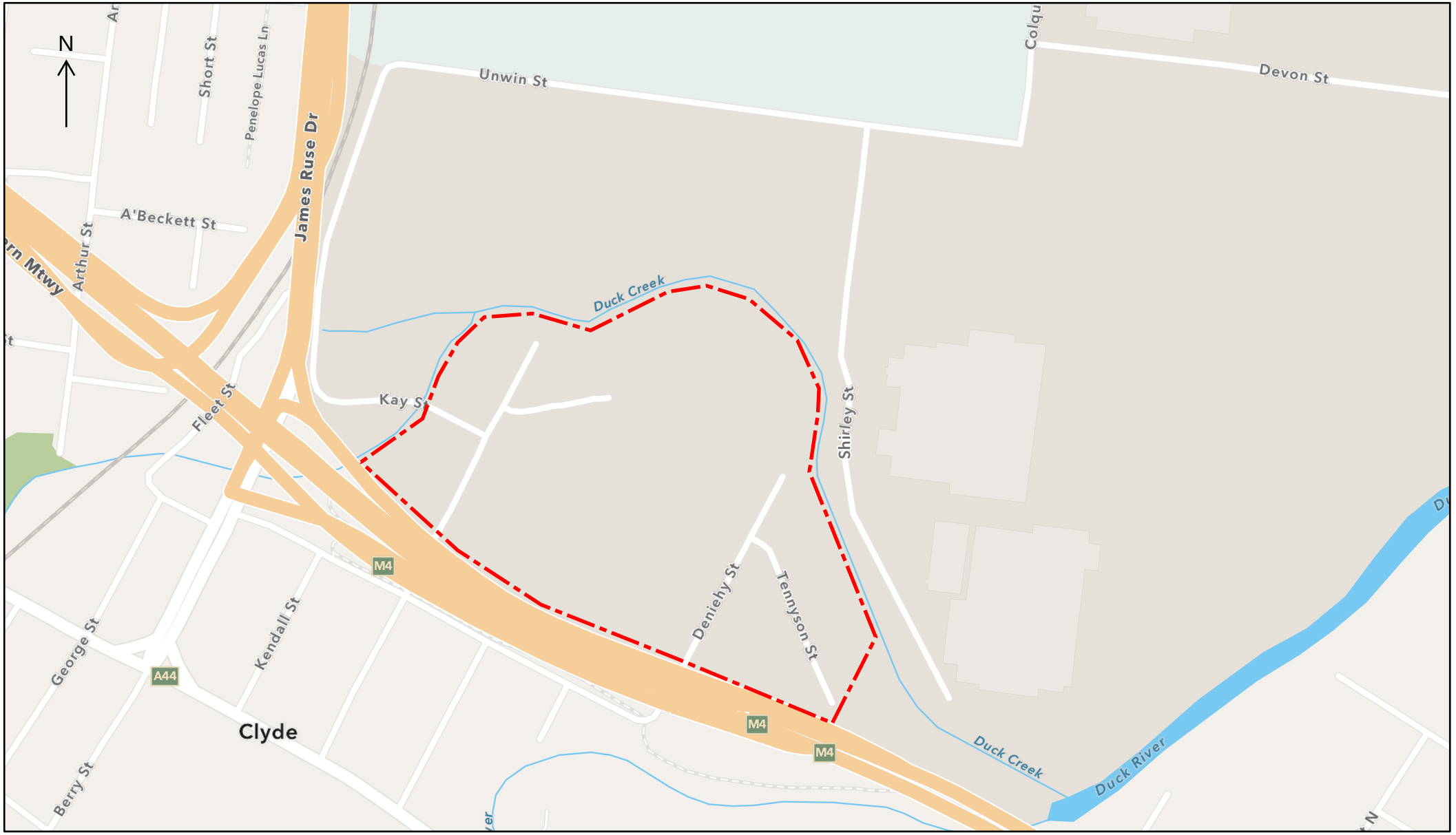


Figure 4. Potential Clyde MSF Site Extent

Legend:

Potential Site Extent

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Sydney Olympic Park

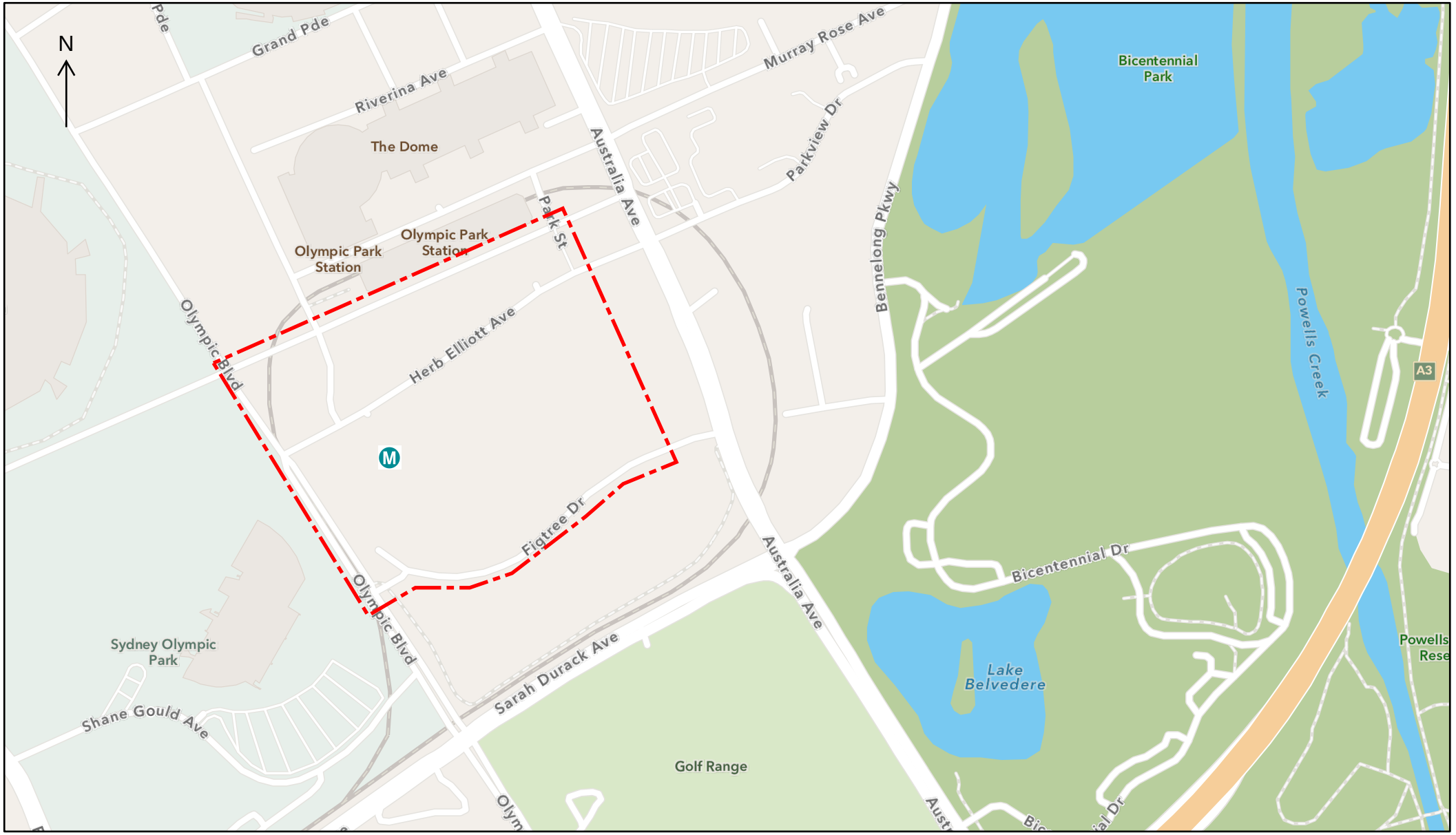


Figure 5. Potential Sydney Olympic Park Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Strathfield North

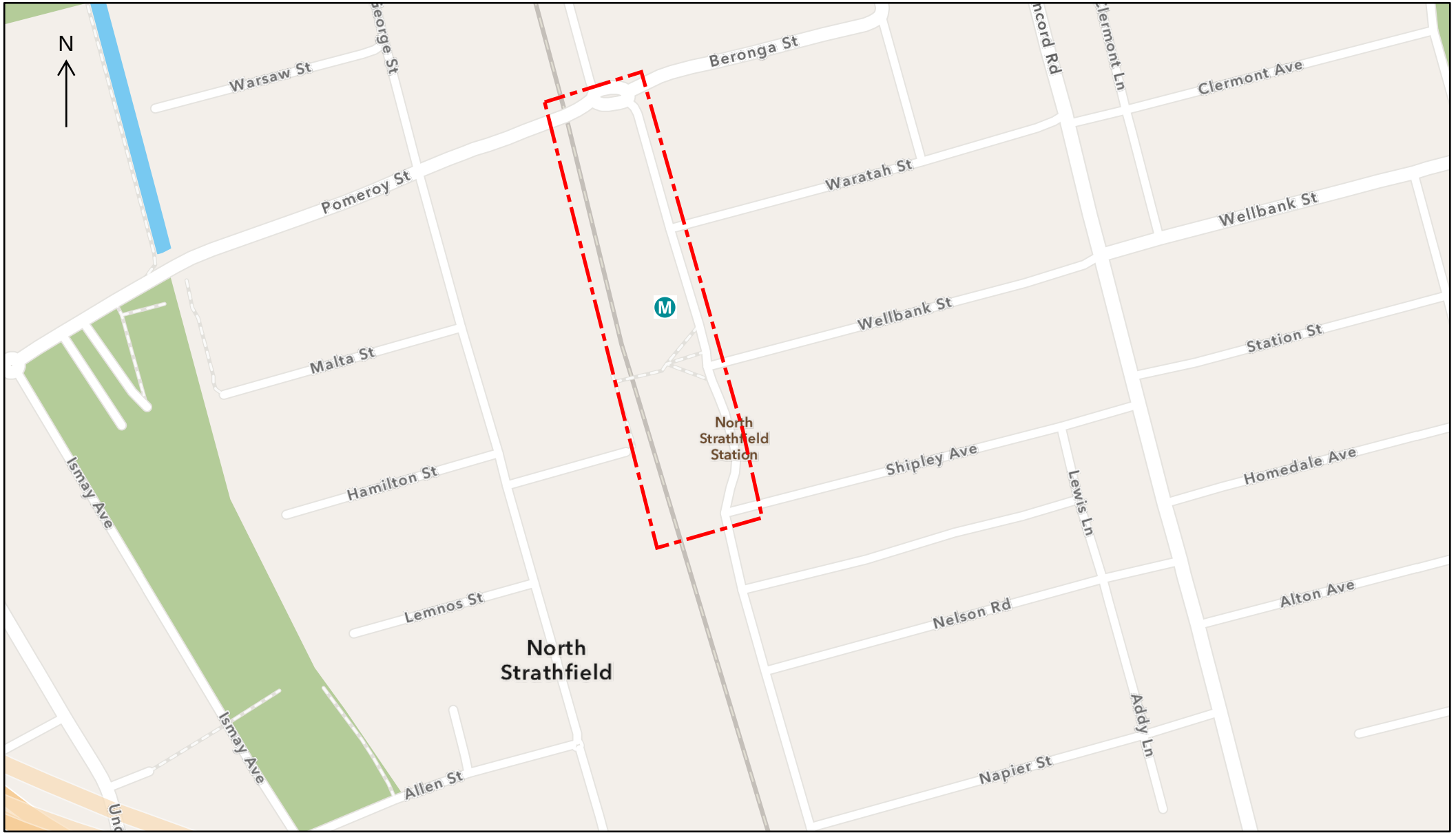


Figure 6. Potential Strathfield North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Burwood North

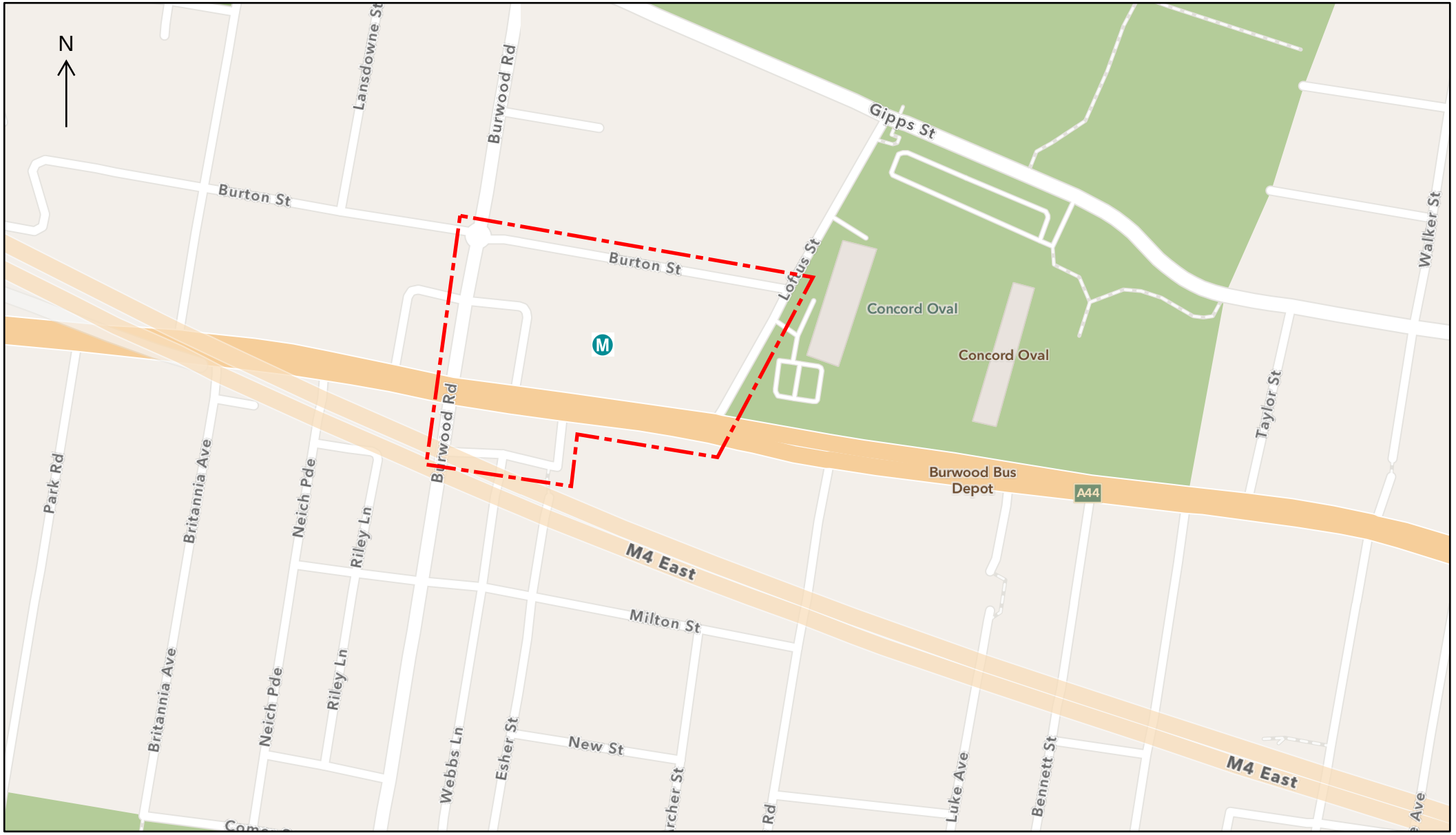


Figure 7. Potential Burwood North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Five Dock

Figure 8. Potential Five Dock Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

The Bays

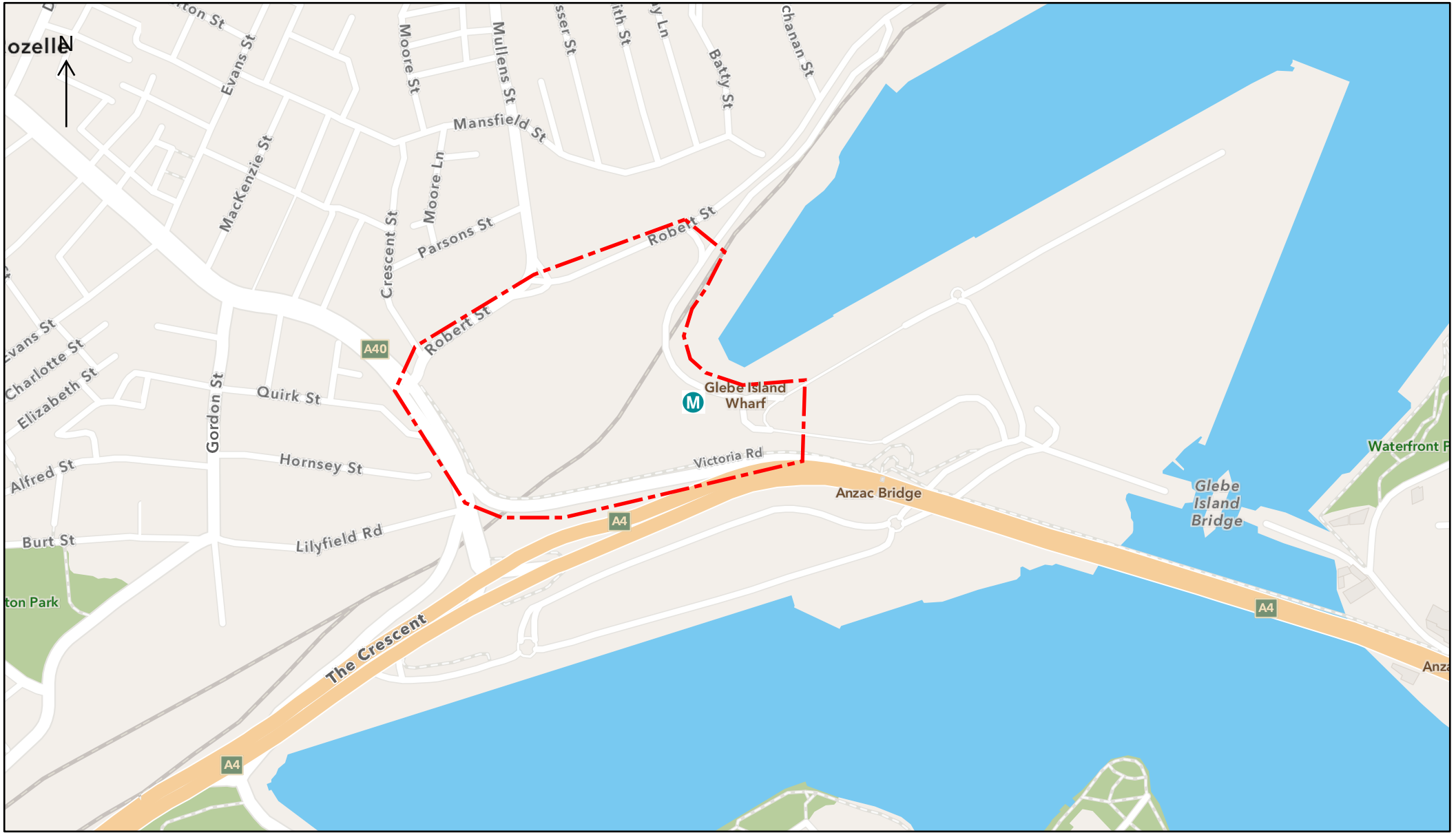


Figure 9. Potential The Bays Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Pyrmont

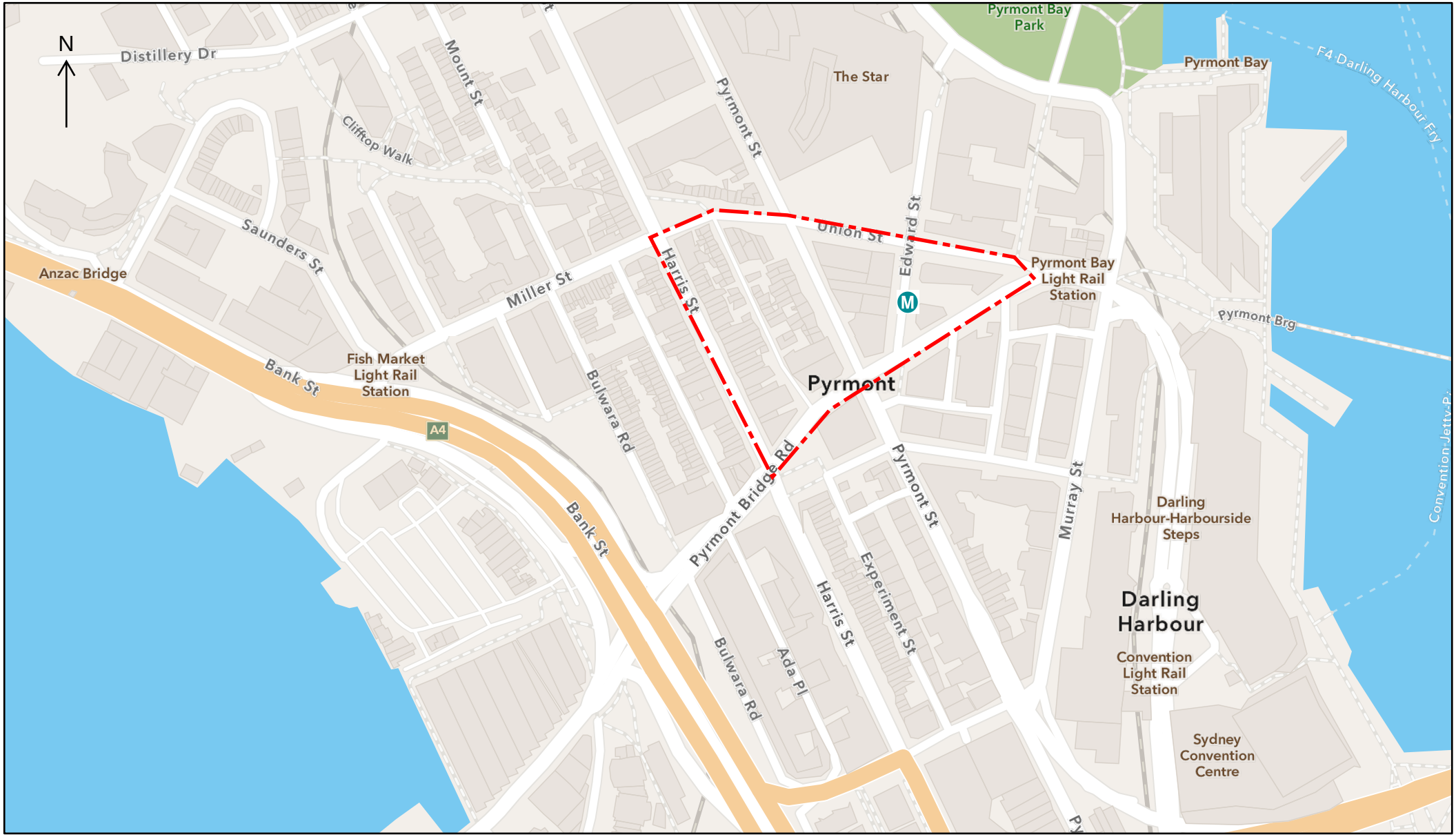


Figure 10. Potential Pyrmont Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Hunter Street (Sydney CBD)

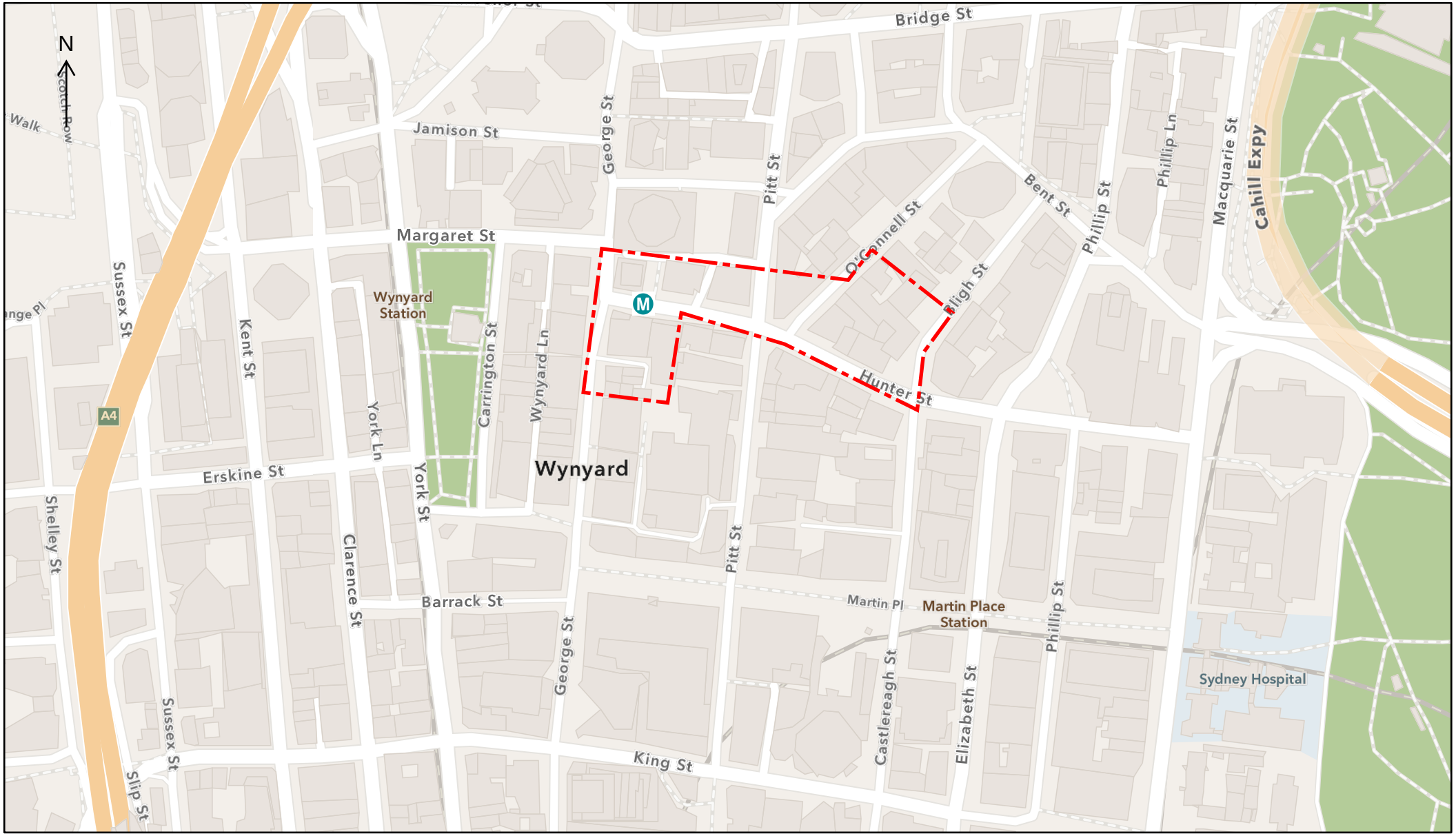


Figure 11. Potential Hunter Street (Sydney CBD) Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Memorandum

Subject: Sydney Metro West Integrated Station Development Water and Wastewater Feasibility Application	
EDS Reference: SMWSTEDS-SMD-SW000-US-MEM-044001	SM Reference:
Prepared by: Jeffrey Chan	Date: 22/06/2021
Approved by: Jennine Finlayson	Checked by: Daniel Fettell

Introduction

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A summary of the key elements of the Sydney Metro West configuration and operating concept is provided below for the purposes of this application:

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Table 1 below provides a breakdown of the latest approximate development yields for each Metro station site, including a breakdown of dwellings, commercial and retail space. Figures 2 to 11 in Attachment A show indicative extents for each site development. Please note this application is for the property developments only and excludes the metro station itself due to differences in development staging timeframes. Furthermore, the details provided as part of this application have been provided to facilitate preliminary infrastructure studies only and are subject to change as the designs develop.

Table 1: Indicative Development Growth (18th June 2021) [1]

Investigation Area		Residential Apartments[3] (No.)	Indicative Commercial Space GFA[2] (m^2)	Indicative Retail Space GFA[2] (m^2)	Development Timeframe (Year)
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5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
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9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

Note:
[1]Apartment numbers and commercial/retail space figures are assumptions only and are subject to review. They are provided for the infrastructure capacity analysis only.
[2]An assumed 0.8 conversion factor from gross floor area (GFA) to net lettable area (NLA) has been applied.
[3]1 apartment = 100 sqm of Residential GFA

Potable Water and Wastewater Demand Rates

A preliminary assessment has been undertaken of the potential potable water and wastewater demand associated with the proposed developments.

Demand forecasting and profiles were developed for the study area and individual precincts based on the number of dwellings and gross floor area for retail and commercial development. The demand assessment considered the unit rates and BASIX reduction factors as summarised in Table 2 and 3.

Table 2: Potable Water Demand Unit Rates

Land Use	Design Criteria	Units	Potable Water Demand	Sources
Multi-Unit (>140 unit/net/ha) 6-12 storey apartment	Max Day Demand	kL/unit/day	0.8	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
Multi-Unit (61-100 unit/net/ha) 6-12 storey apartment	Max Day Demand	kL/unit/day	1.09	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
City High Rise Commercial	Max Day Demand	kL/Nha/day	63	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
Suburban Commercial	Max Day Demand	kL/Nha/day	41	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
BASIX Reduction (residential only)		%	40	Building Sustainability Index Targets

Table 3: Wastewater Demand Unit Rates

Land Use	Units	Wastewater Demand	Sources
High Density Residential	EP/dwelling	2.5	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
High Density Commercial	EP/ha	500	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
Local Commercial	EP/ha	75	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
Average Dry Weather Flow (ADWF)	L/s per EP	0.0017	Water Supply Code of Australia WSA 03-2011 - 3.1 (Sydney Water Edition 2014)
BASIX Reduction (residential only)	%	40	Building Sustainability Index Targets

Projected Water and Sewer Demand

Estimates for the potable water Maximum Day Demand (MDD) and the Average Dry Weather Flow (ADWF) for wastewater were developed using the development yields outlined in Section 1 and unit rates outlined in Section 2 for each station development. The BASIX reduction has also been applied to residential developments only, while commercial demand includes office and retail uses.

Table 4 summarises an estimate of the potable water Maximum Day Demand and Table 5 provides a summary of the ADWF estimates for wastewater. Please note that, as the design is still evolving, we believe it is appropriate to apply a ±15% factor to these numbers.

Table 4: Estimated Cumulative Maximum Day Demand for Potable Water including BASIX (kL/day)

Development		Estimated MDD (kL/day) (2024 – 2032)		Total (kL/day)
		Residential (incl. BASIX)	Commercial and Retail	
1.	Westmead	120	216	336
2.	Parramatta	120	1002	1122
3.	Clyde MSF	N/A	N/A	N/A
4.	Sydney Olympic Park	480	199	679
5.	North Strathfield	N/A	N/A	N/A
6.	Burwood North	137	75	212
7.	Five Dock	10	55	65
8.	The Bays	264	365	629
9.	Pyrmont	86	57	143
10.	Hunter Street (Sydney CBD)	0	1090	1090

Table 5: Estimated ADWF for Wastewater including BASIX (L/s)

Development		Estimated Wastewater ADWF (L/s) (2024 – 2032)		Total (L/s)
		Residential (incl. BASIX)	Commercial and Retail	
1.	Westmead	0.6	2.6	3.2
2.	Parramatta	0.6	12.7	13.3
3.	Clyde MSF	N/A	N/A	N/A
4.	Sydney Olympic Park	2.6	3.0	5.6
5.	North Strathfield	N/A	N/A	N/A
6.	Burwood North	0.5	0.8	1.3
7.	Five Dock	0.1	0.4	0.5
8.	The Bays	1.4	2.0	3.4
9.	Pyrmont	0.5	0.6	1.1
10.	Hunter Street (Sydney CBD)	0.0	8.4	8.4

The above demand estimates do not allow for reductions in existing demand resulting from the demolition of existing land uses.

Feasibility Assessment Request

As demonstrated in the demand estimate there is projected to be a significant impact on the water and wastewater infrastructure. As such Sydney Metro seeks to engage with utility stakeholders to ensure the appropriate planning measures are implemented.

This request seeks to initiate the consultation and planning process by providing the initial water and wastewater demand estimates.

We welcome further discussion and collaboration as part of the precinct planning and are happy to meet with water and wastewater utilities authorities to discuss the implications of this feasibility application.

Attachments

Attachment	Title
A	Sydney Metro West – Indicative Site Extents

Westmead

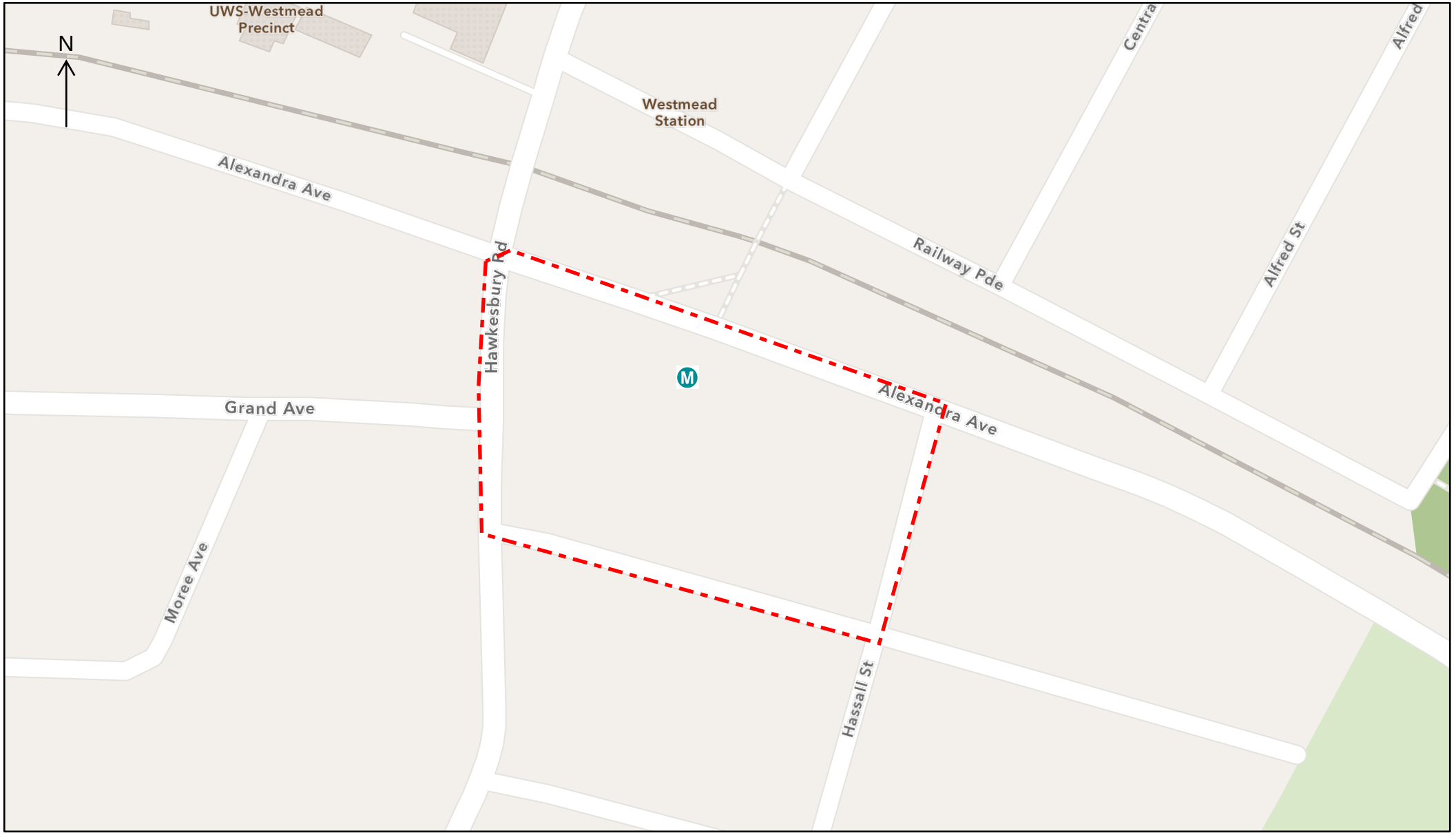

Figure 2. Potential Westmead Site Extent

Parramatta

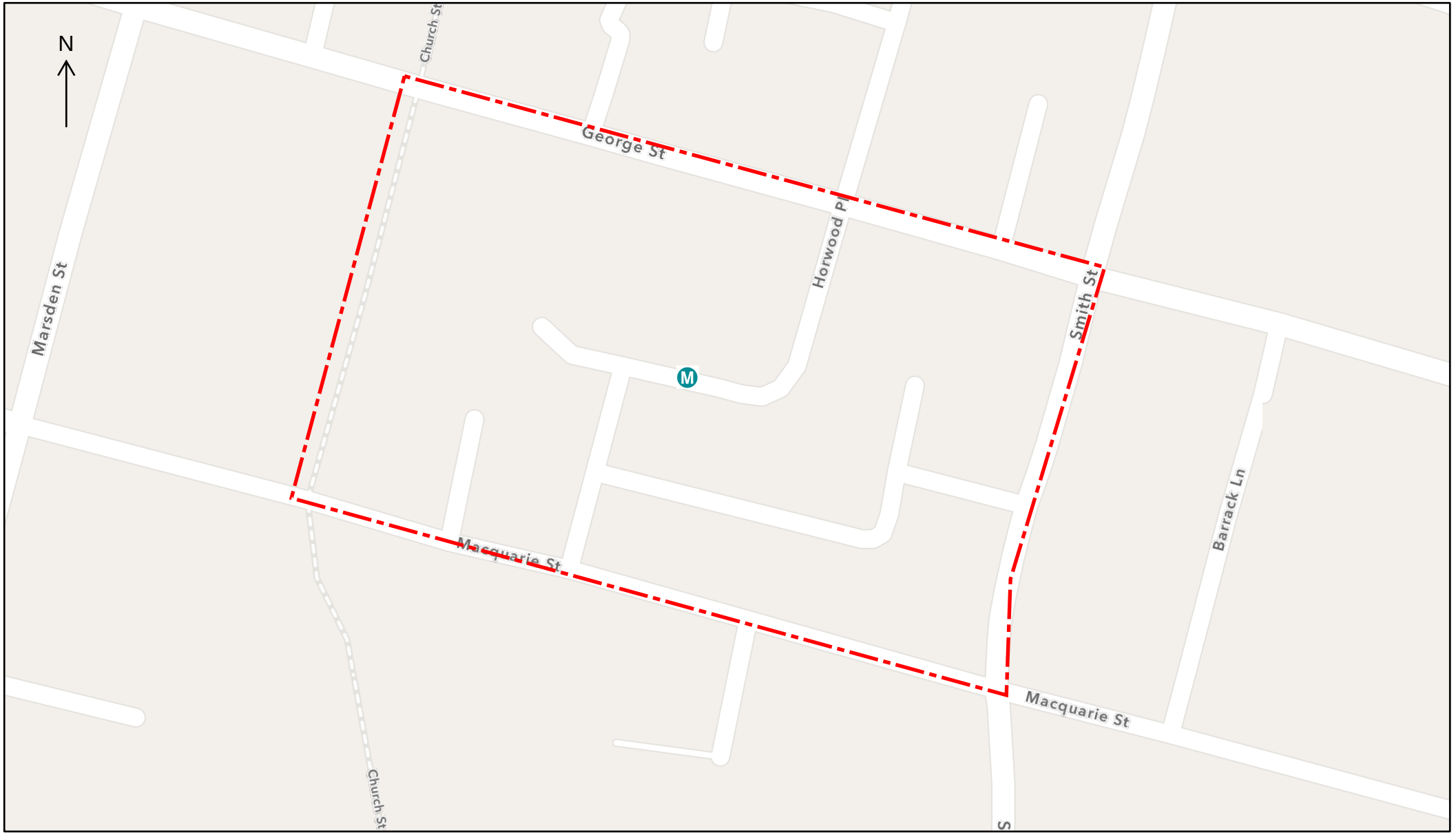

Figure 3. Potential Parramatta Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:2,500

0 0.02 0.04 0.07 mi

0 0.03 0.06 0.11 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Clyde MSF

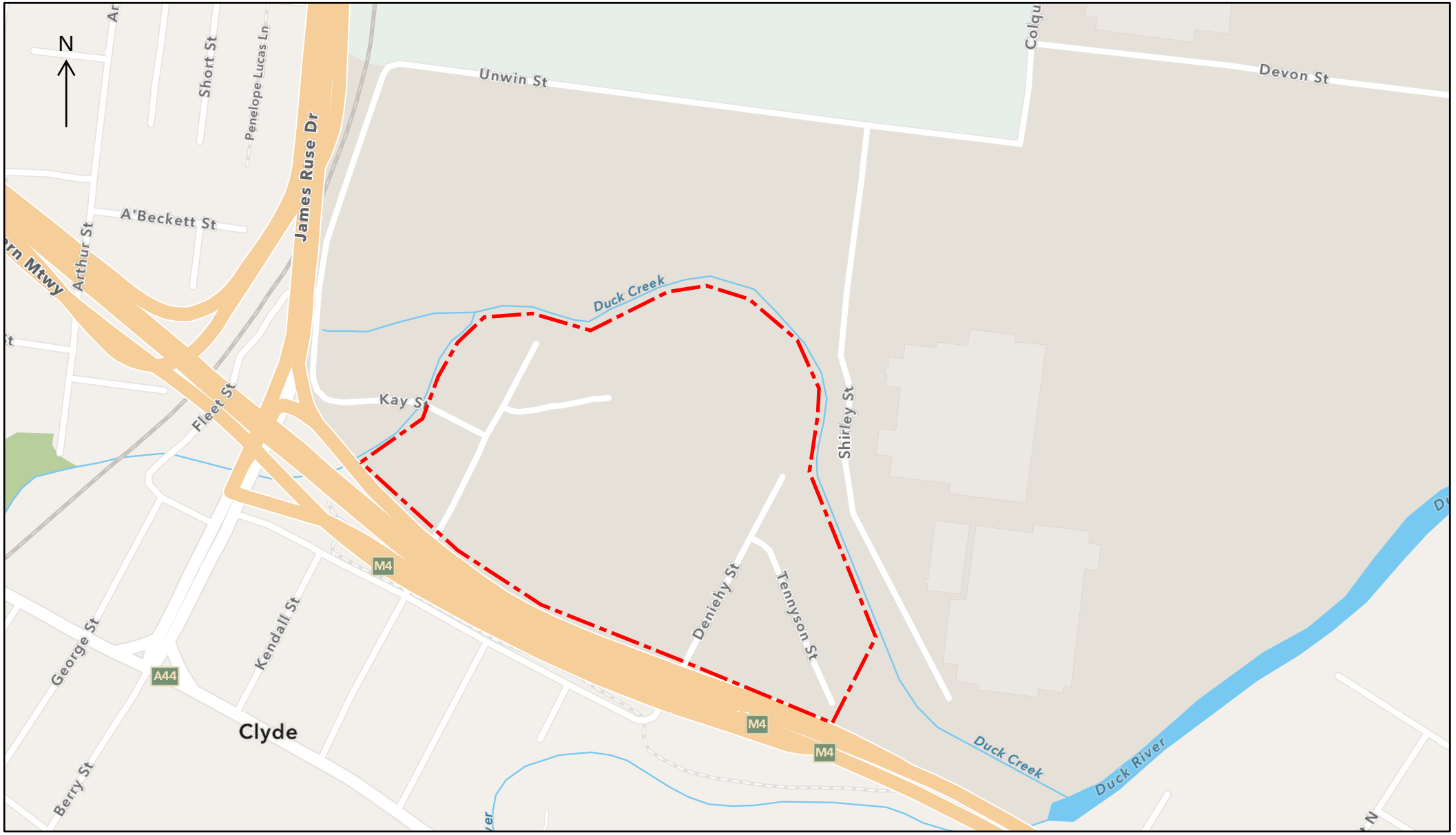

Figure 4. Potential Clyde MSF Site Extent

Legend:

Potential Site Extent

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Sydney Olympic Park

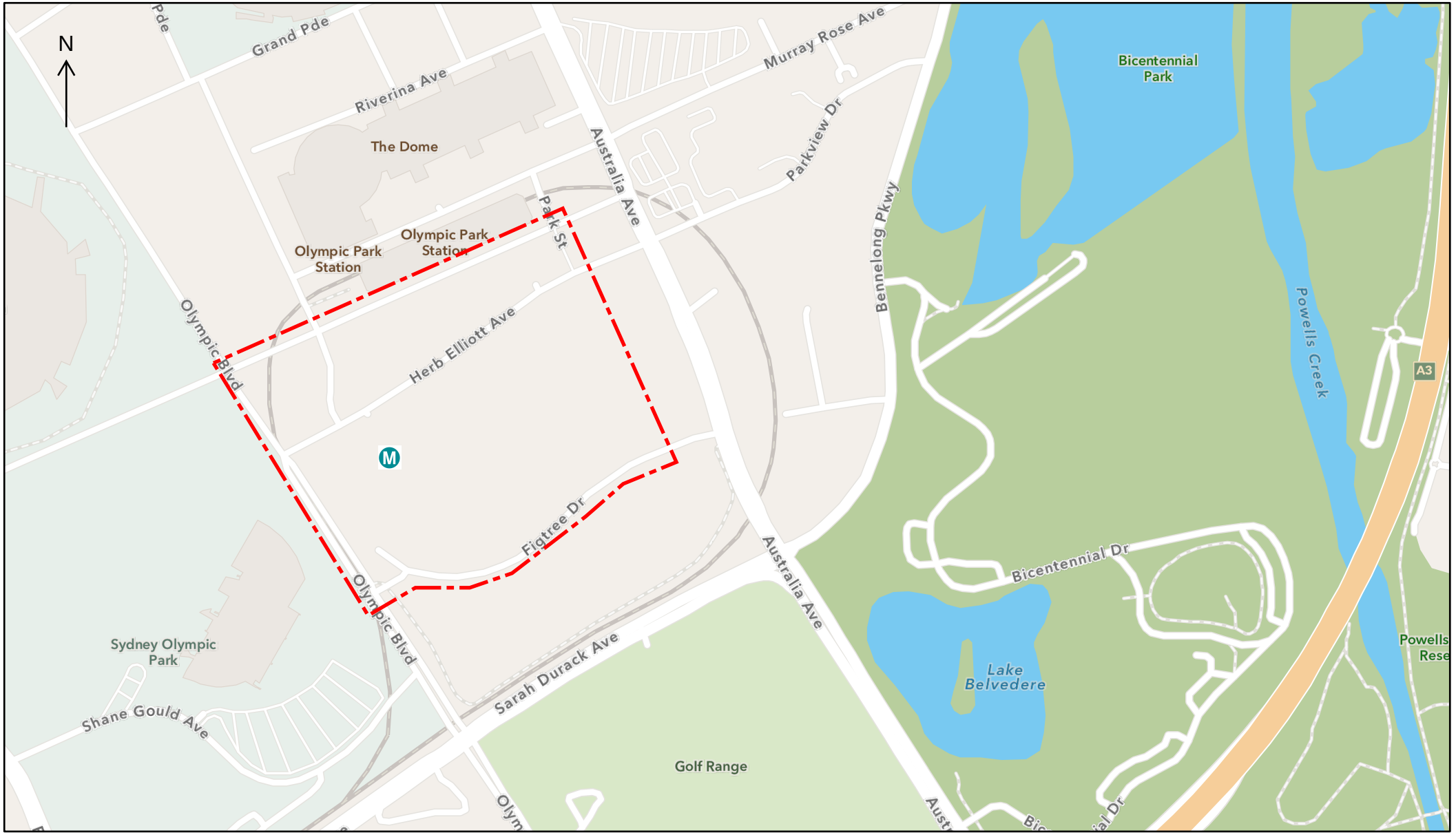

Figure 5. Potential Sydney Olympic Park Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Strathfield North

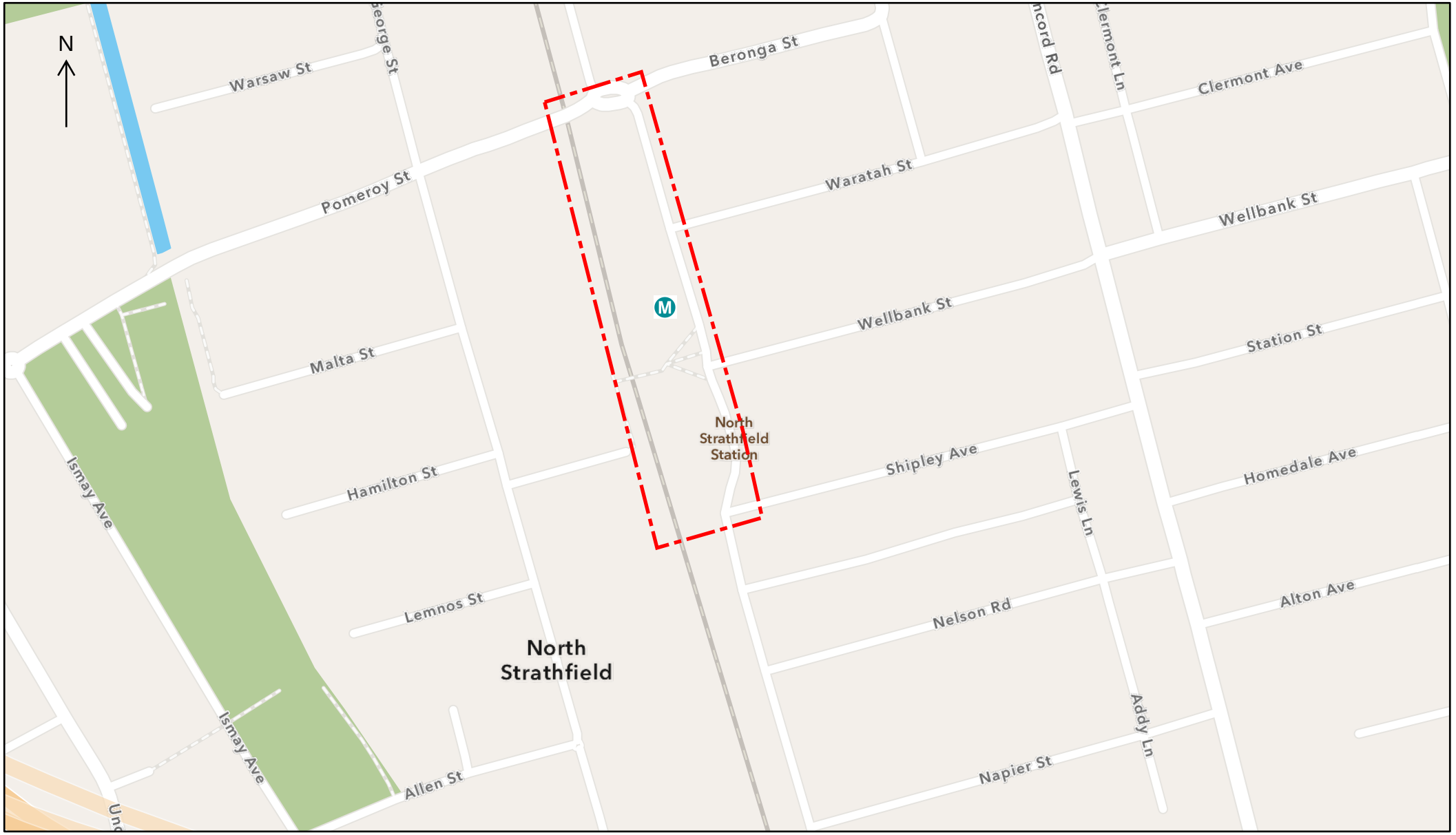

Figure 6. Potential Strathfield North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Burwood North

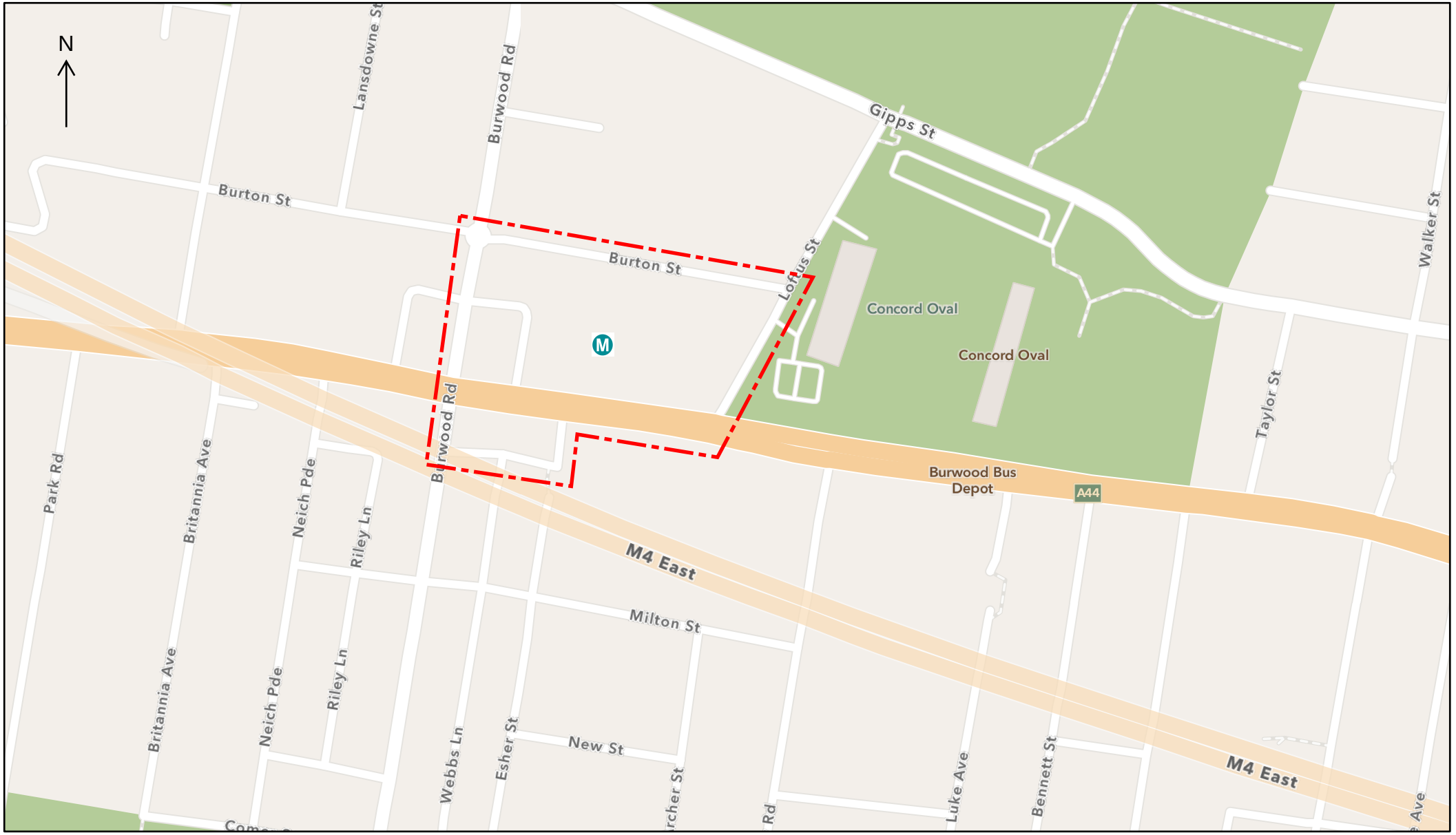

Figure 7. Potential Burwood North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Five Dock

Figure 8. Potential Five Dock Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

The Bays

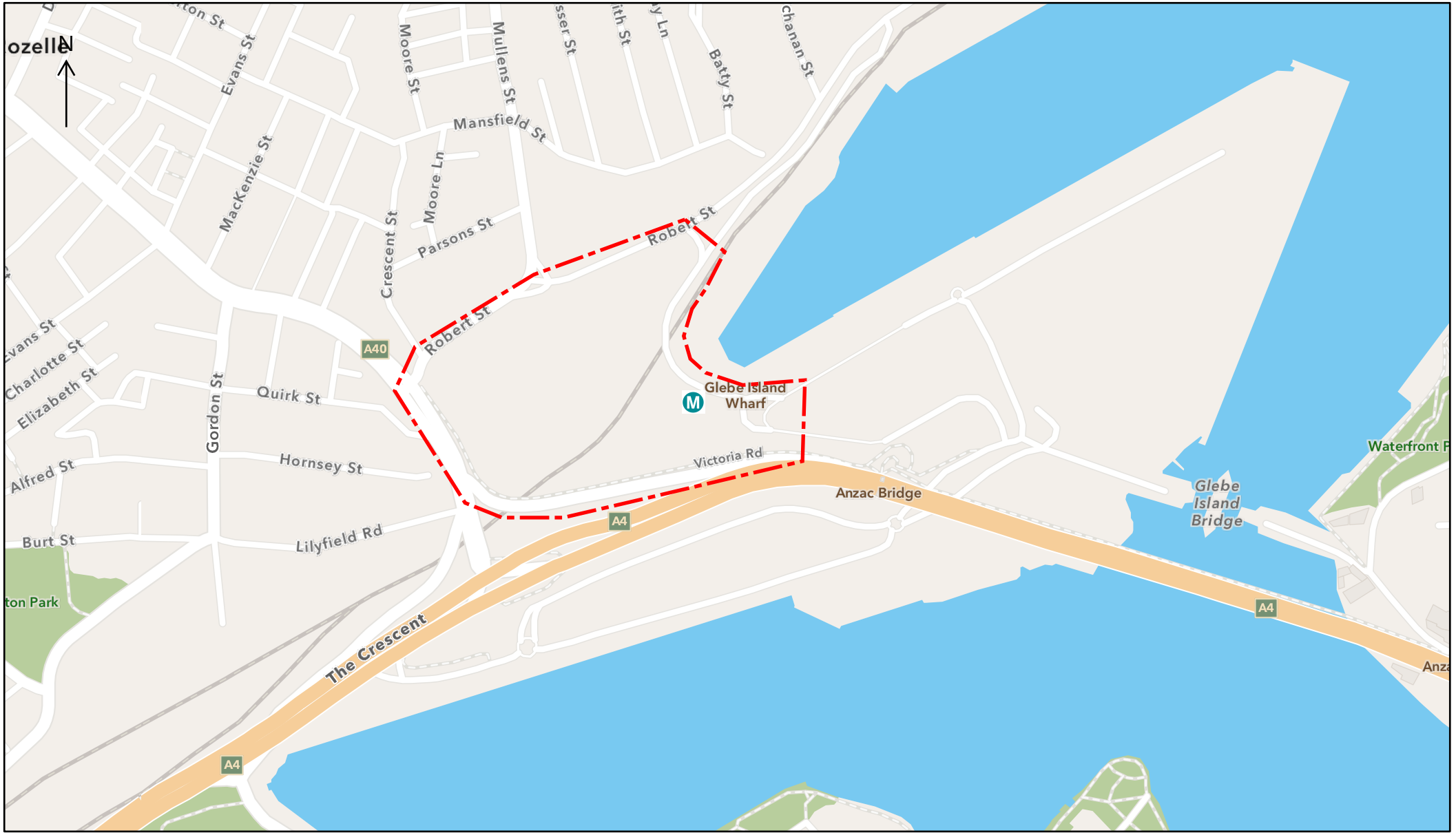

Figure 9. Potential The Bays Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Pyrmont

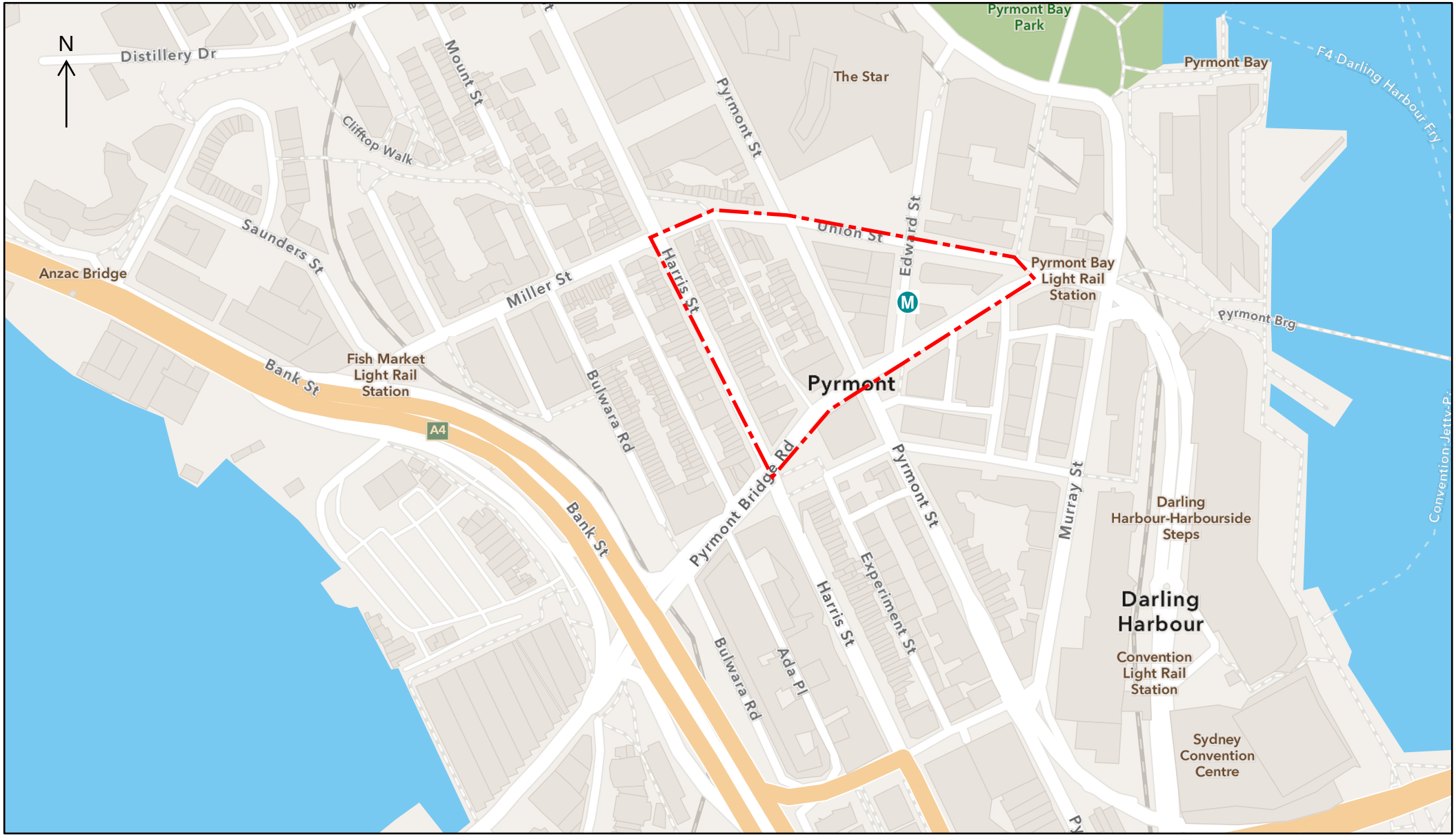

Figure 10. Potential Pyrmont Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Hunter Street (Sydney CBD)

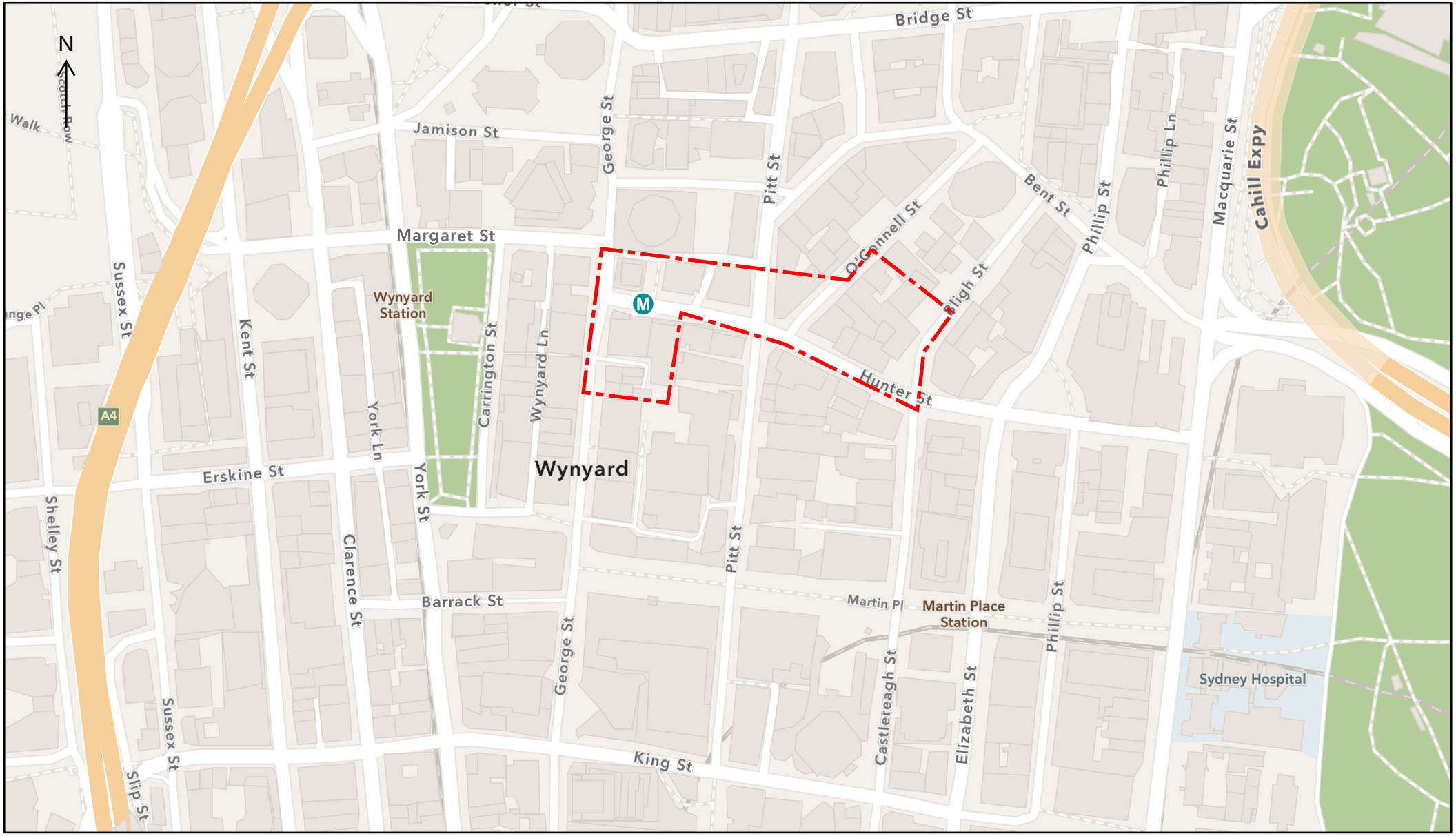

Figure 11. Potential Hunter Street (Sydney CBD) Site Extent

Legend:

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- Proposed Metro Station Location

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Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

June 22, 2021

Kenny D'Cruz
NBN Co
Level 11, 100 Arthur Street
North Sydney, NSW 2060

Reference: **SMWSTEDS-SMD-SW000-UC-MEM-044001**
Sydney Metro West Integrated Station Development NBN Feasibility Application

Dear Mr. D'Cruz,

Introduction

Sydney Metro West is a fully segregated new Metro line connecting seamlessly with other existing transport modes. Sydney Metro West is principally a 'greenfield' development that does not rely on the expansion or repurposing of existing infrastructure (excepting the development of existing concourses at Westmead and North Strathfield Stations), providing the opportunity to develop the next evolution of the metro product.

Figure 1: Sydney Metro West Context

A summary of the key elements of the Sydney Metro West configuration and operating concept is provided below for the purposes of this application:

- Approximately 24km of twin underground rail tunnels from Westmead to the Sydney CBD
- Nine new underground Metro stations at Westmead, Parramatta CBD, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD) and the provisioning for the sale of air space over stations and surplus land for property development
- Integrated Station Developments at Parramatta, Sydney Olympic Park, Hunter Street (Sydney CBD) and potentially The Bays
- A combined maintenance and stabling facility and Operations Control Centre at Clyde
- Passenger interchanges at Westmead and North Strathfield to the Sydney Trains T1 Western and T9 Northern lines
- Tunnel ventilation services facilities at Rosehill, Silverwater and Lilyfield.

Table 1 below provides a breakdown of the latest approximate development yields for each Metro station site, including a breakdown of dwellings, commercial and retail space. Figures 2 to 11 in Attachment A show indicative extents for each site development. Please note this application is for the property developments only and excludes the metro station itself due to differences in development staging timeframes. Furthermore, the details provided as part of this application are to facilitate preliminary infrastructure studies only and are subject to change as the designs develop.

Table 1: Sydney Metro West - Indicative Development Growth (18th June 2021)[1]

Investigation Area		Residential Apartments[3] (No.)	Indicative Commercial Space GFA[2] (m^2)	Indicative Retail Space GFA[2] (m^2)	Development Timeframe (Year)
1.	Westmead	250	40,000	4,500	2028 - 2032
2.	Parramatta	250	150,000	20,000	2024 - 2028
3.	Clyde MSF	N/A	N/A	N/A	2024 - 2028
4.	Sydney Olympic Park	1,000	35,000	8,000	2024 - 2028
5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
8.	The Bays	550	32,450	6,150	2024 - 2028
9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

Note:
[1]Apartment numbers and commercial/retail space figures are assumptions only and are subject to review. They are provided for the infrastructure capacity analysis only.
[2]An assumed 0.8 conversion factor from gross floor area (GFA) to net lettable area (NLA) has been applied.
[3]1 apartment = 100 sqm of Residential GFA

NBN Rollout

We understand the NBN Co (nbn) currently service the sites listed in Table 1 using existing fixed line phone and internet network infrastructure. We would appreciate the opportunity to coordinate a strategy with nbn to supply the proposed developments with nbn cables and conduits.

Feasibility Assessment Request

Sydney Metro seeks to actively engage with utility stakeholders to ensure the appropriate planning measures are implemented. To this end, we request the following information:

- Outline of the current nbn servicing arrangements for the proposed developments;
- Identification of the existing capacity of the nbn network to service the projected growth;
- Details of any planned infrastructure works to support development within the catchment which could be expanded to support the developments;
- Other major development currently allowed for in the areas as part of nbn's infrastructure planning;
- Summary of the infrastructure augmentations likely required to the nbn network to service the developments;
- Funding arrangements for infrastructure upgrades to meet the increased telecommunications demand; and
- Guidance on timeframes for forward planning of infrastructure works.

We welcome further discussion and collaboration with nbn as part of the precinct planning and are happy to meet to discuss the implications of this feasibility application.

Should you have any queries in relation to this application, please do not hesitate to contact the undersigned. We look forward to working with nbn on the next stages of the developments.

Yours sincerely

Jennine Finlayson
Principal Water Engineer

Attachment: *Sydney Metro West – Indicative Site Extents*

Westmead

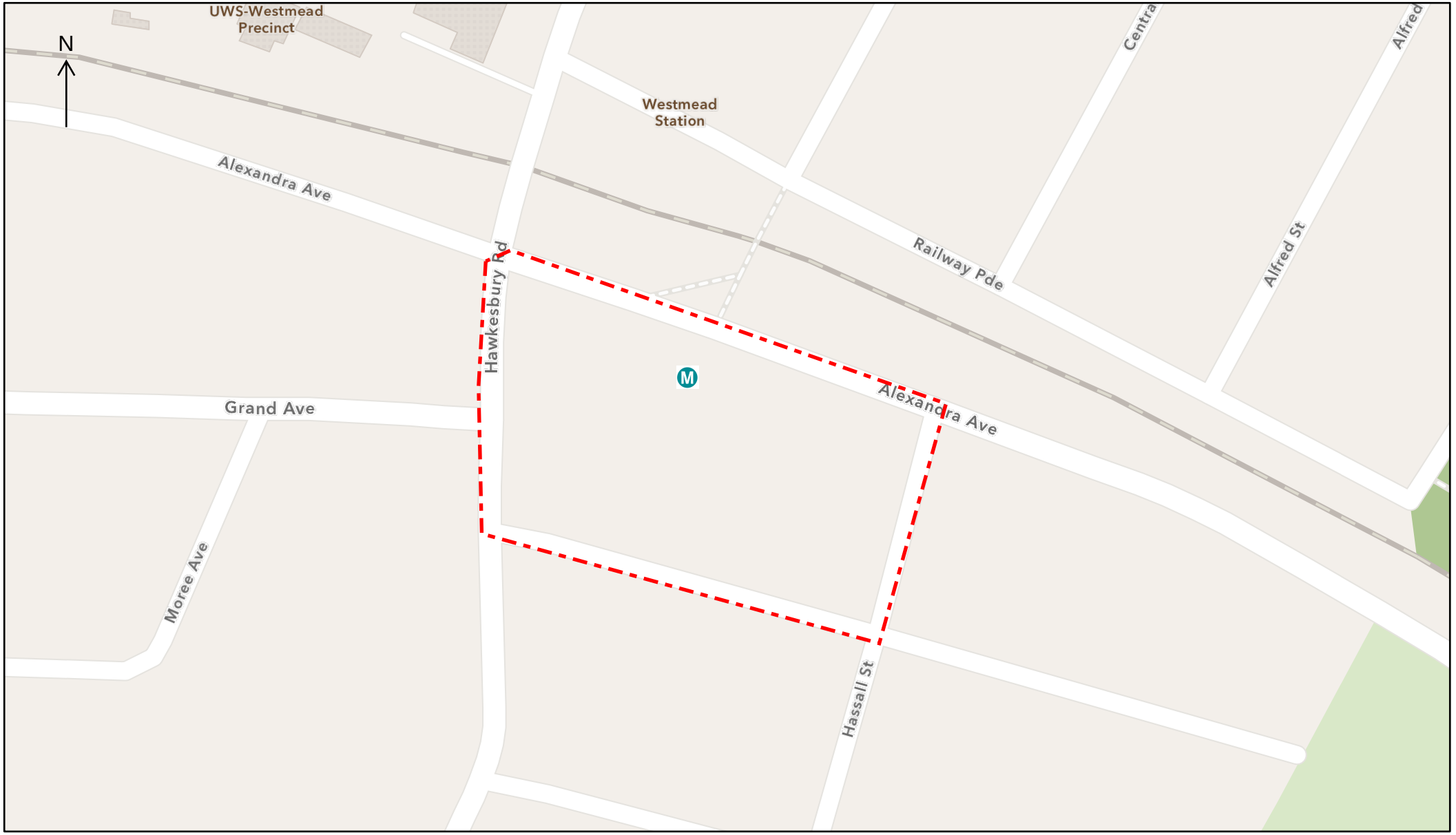


Figure 2. Potential Westmead Site Extent

Parramatta

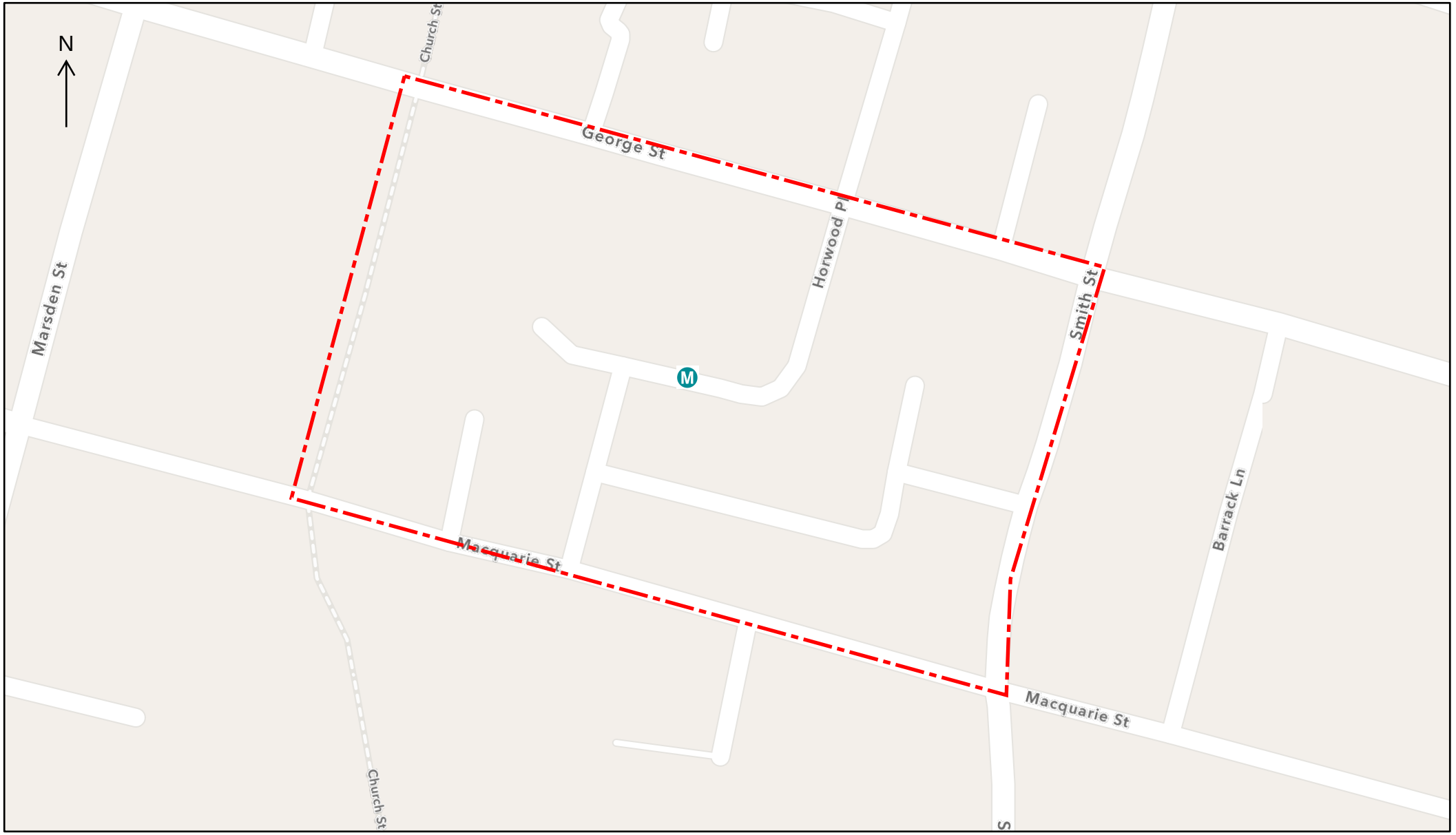


Figure 3. Potential Parramatta Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

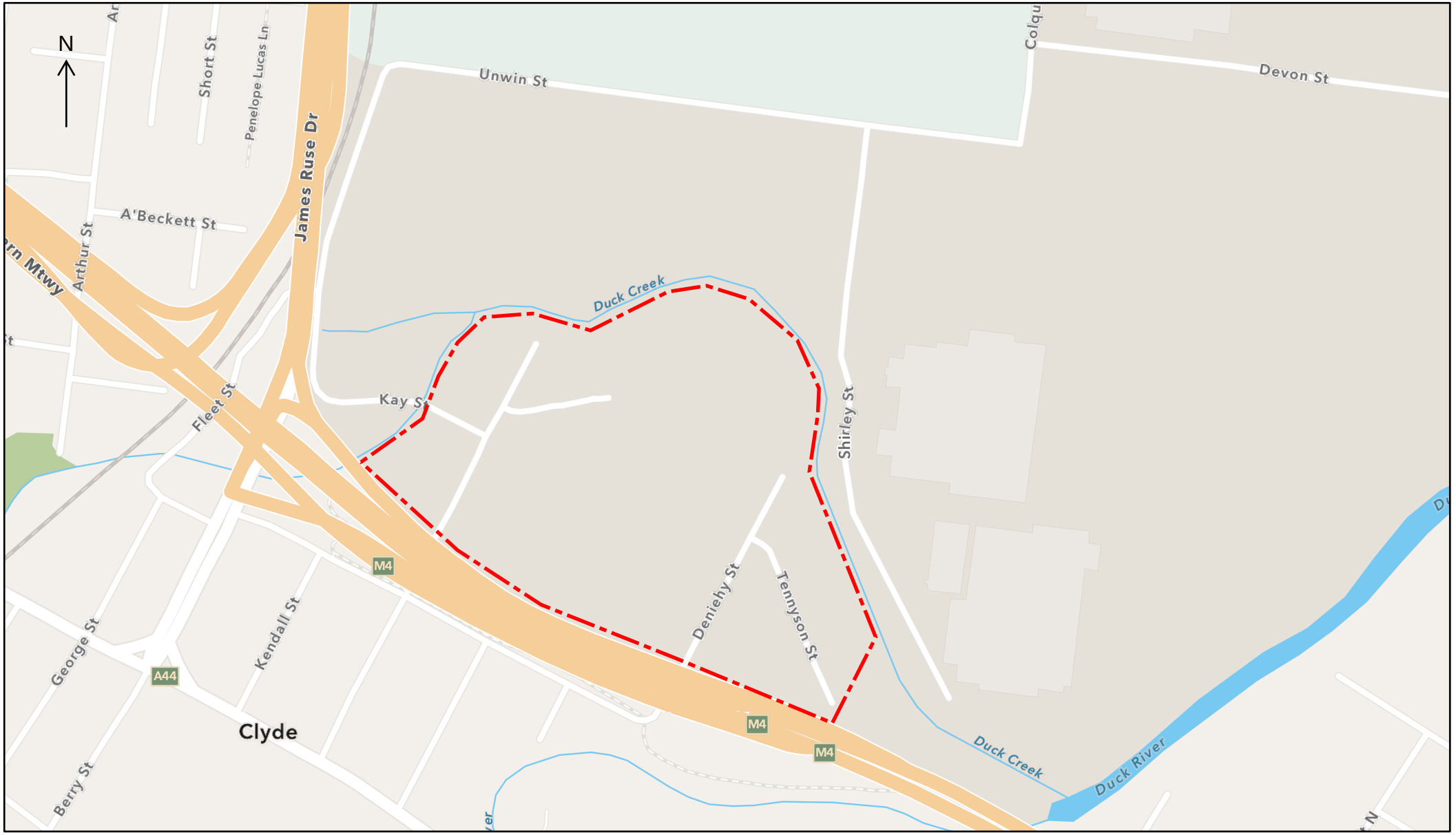
1:2,500

0 0.02 0.04 0.07 mi

0 0.03 0.06 0.11 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Clyde MSF



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Sydney Olympic Park

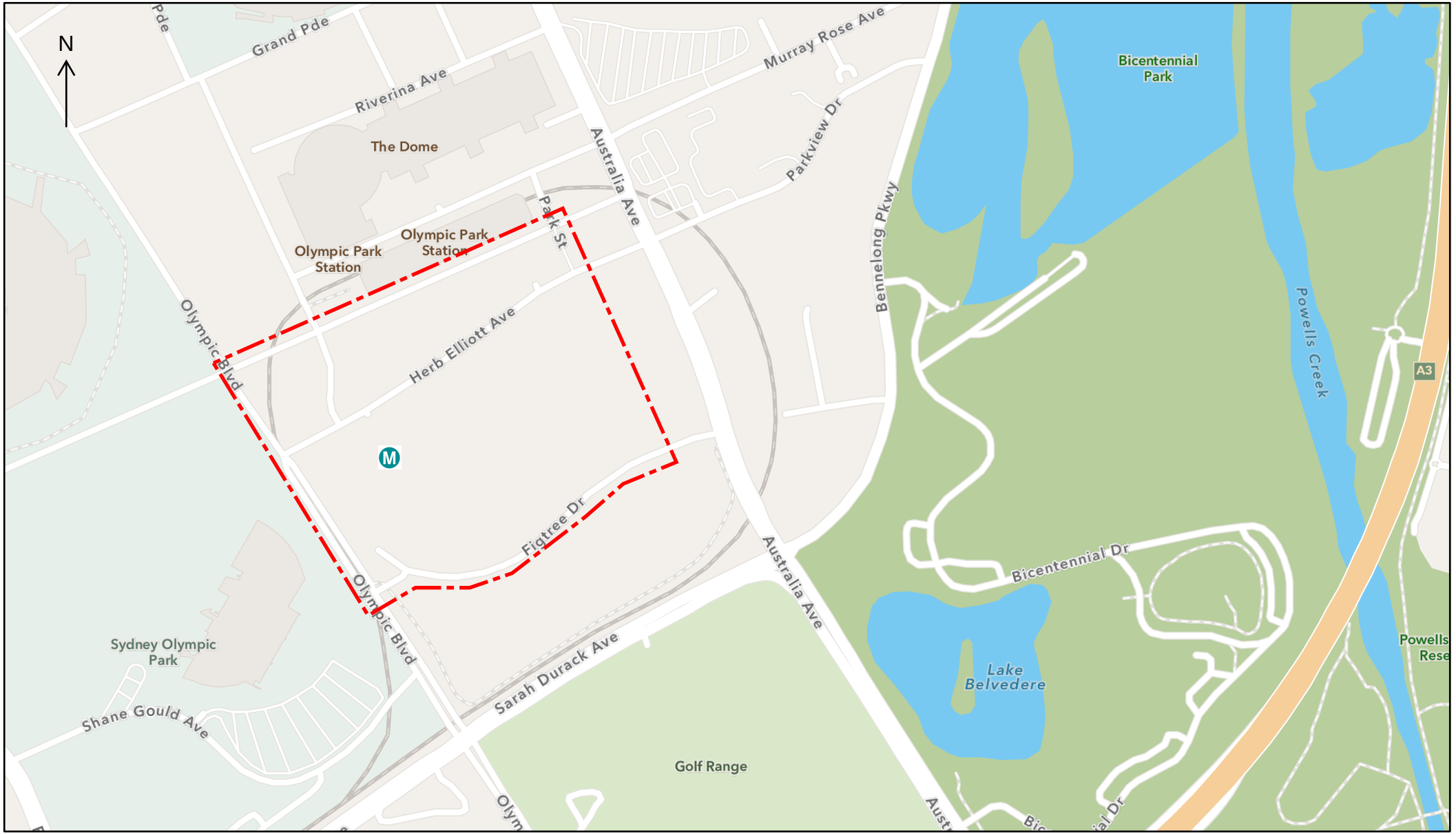

Figure 5. Potential Sydney Olympic Park Site Extent

Legend:

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- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

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Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Strathfield North

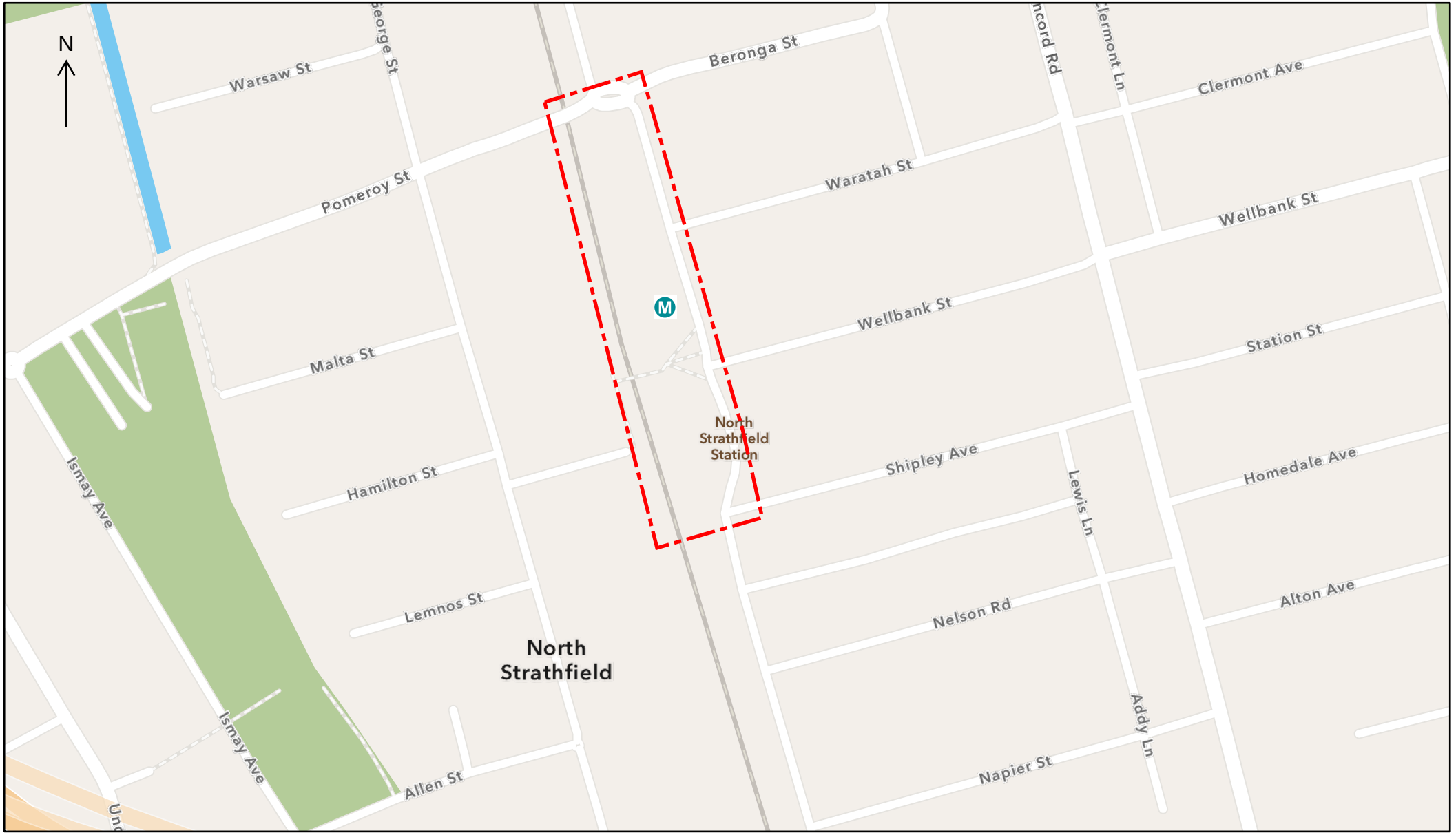

Figure 6. Potential Strathfield North Site Extent

Legend:

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- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

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Burwood North

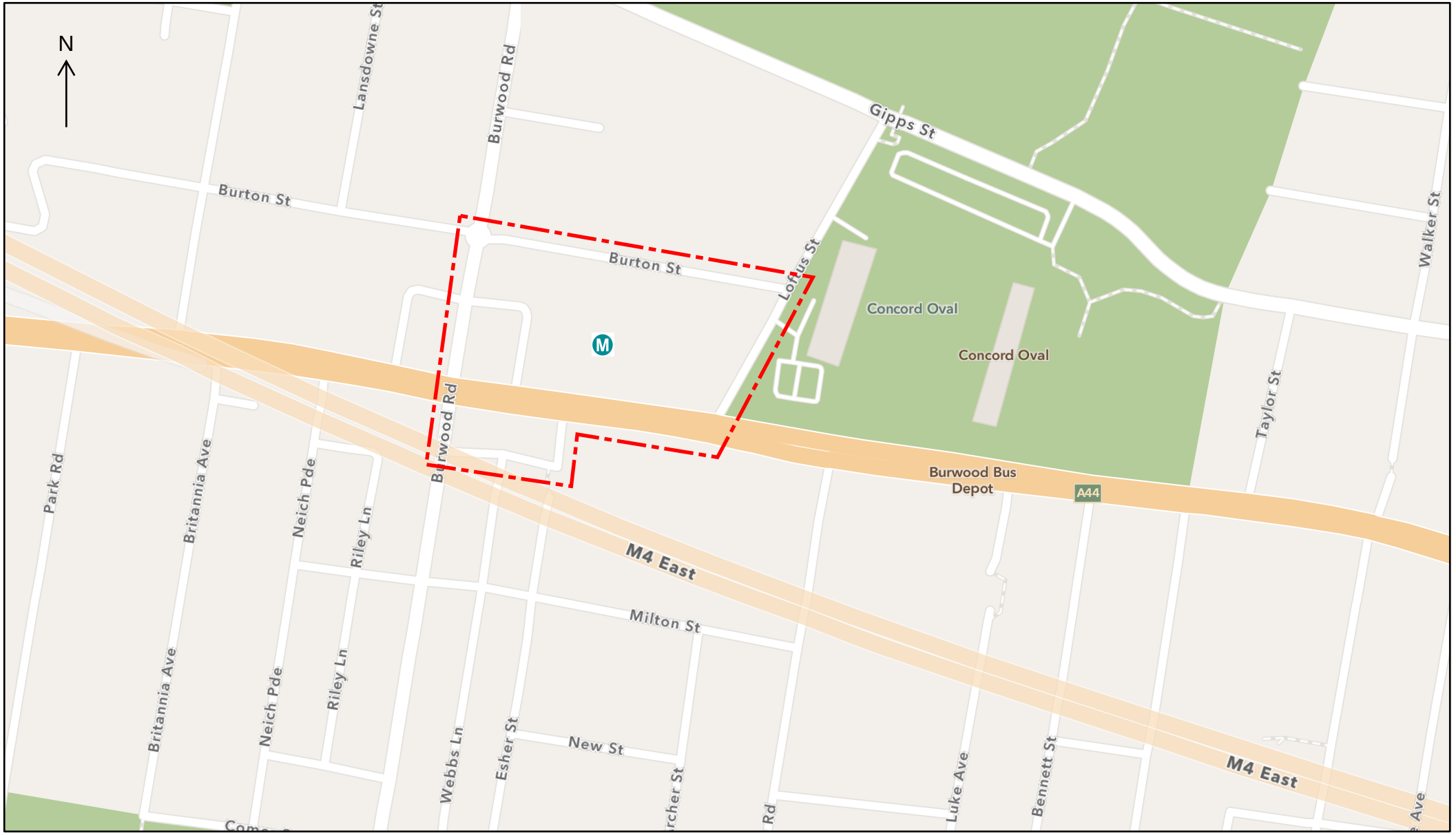

Figure 7. Potential Burwood North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Five Dock

Figure 8. Potential Five Dock Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

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Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

The Bays

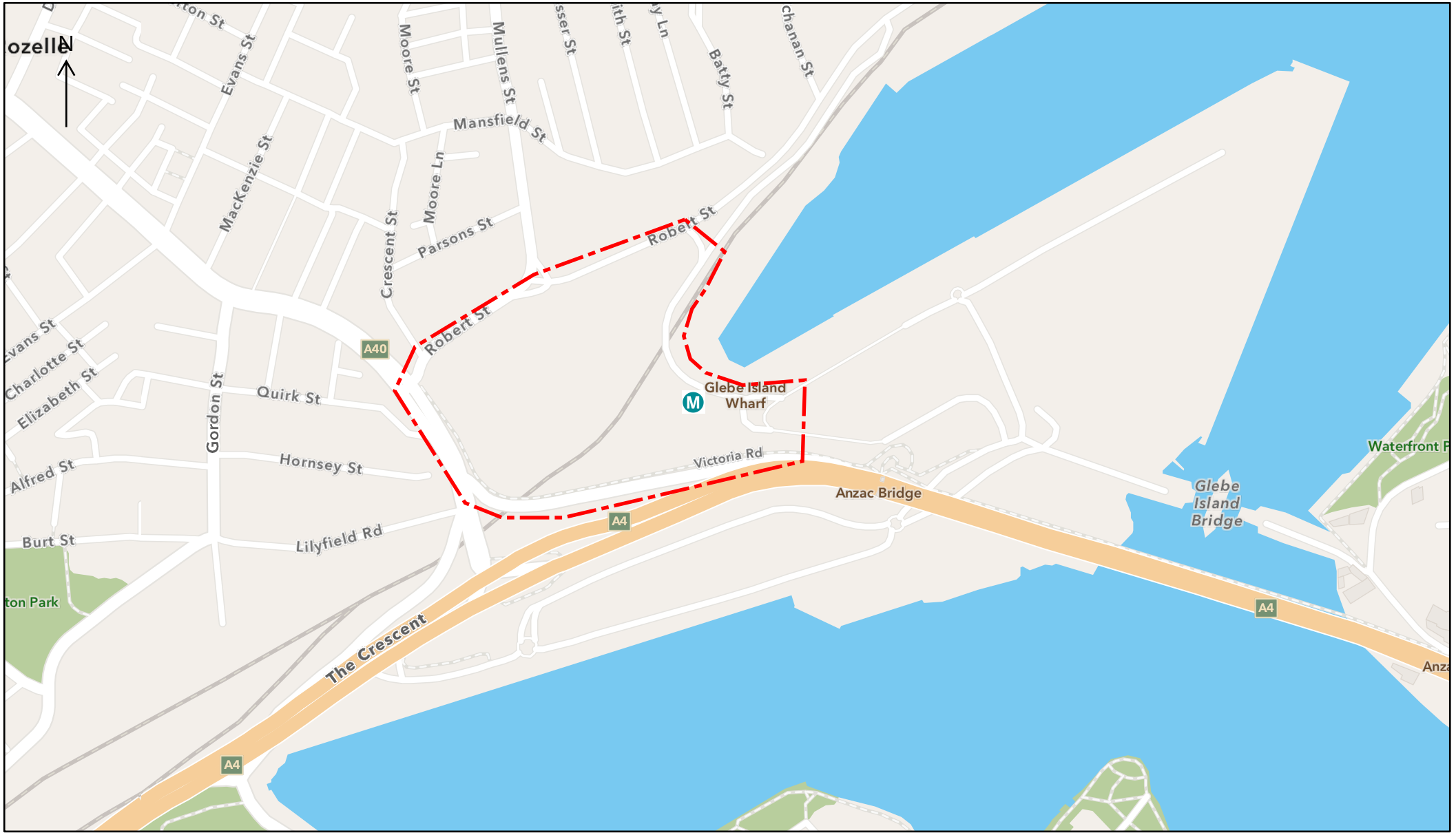

Figure 9. Potential The Bays Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Pyrmont

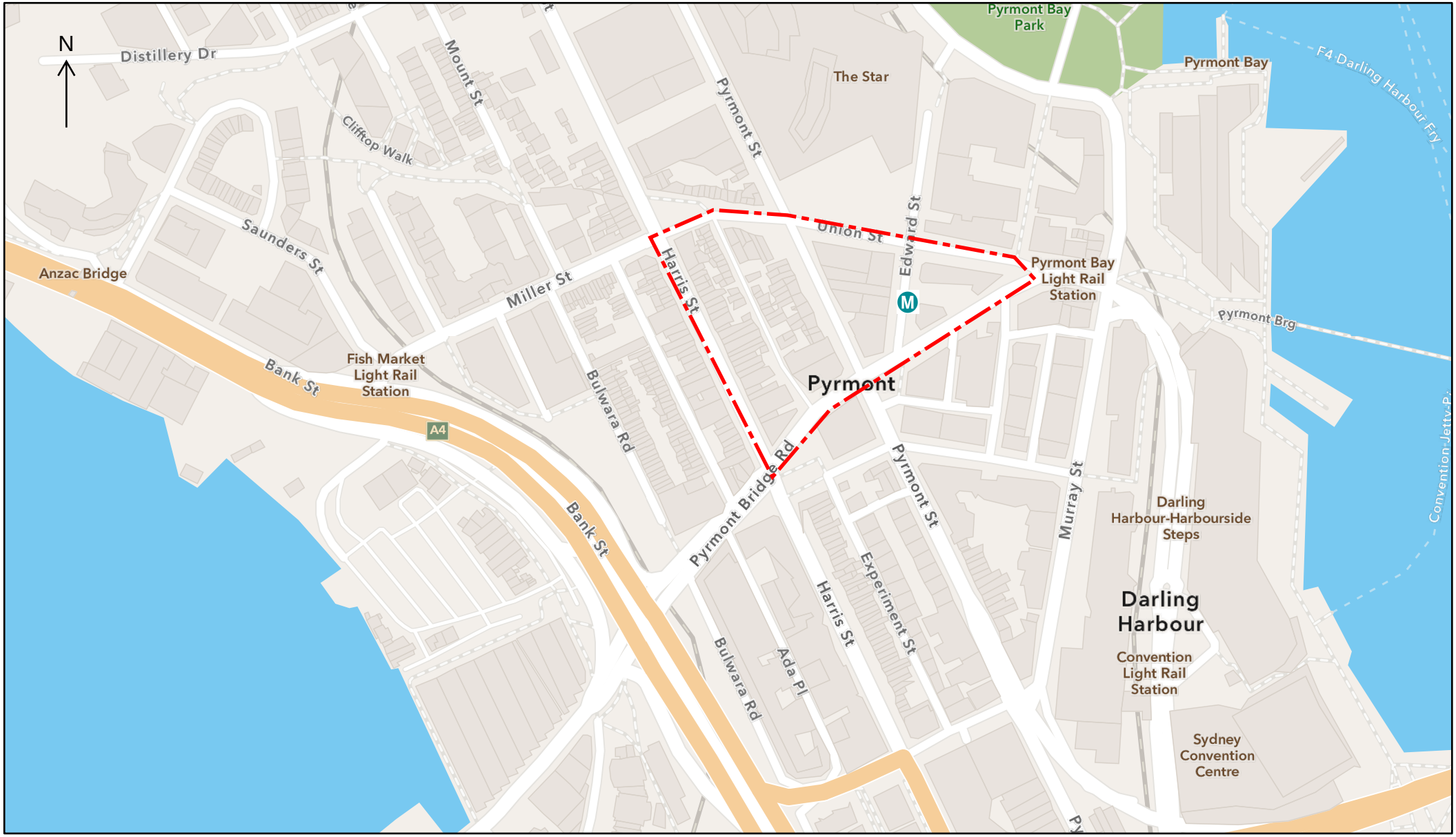

Figure 10. Potential Pyrmont Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Hunter Street (Sydney CBD)

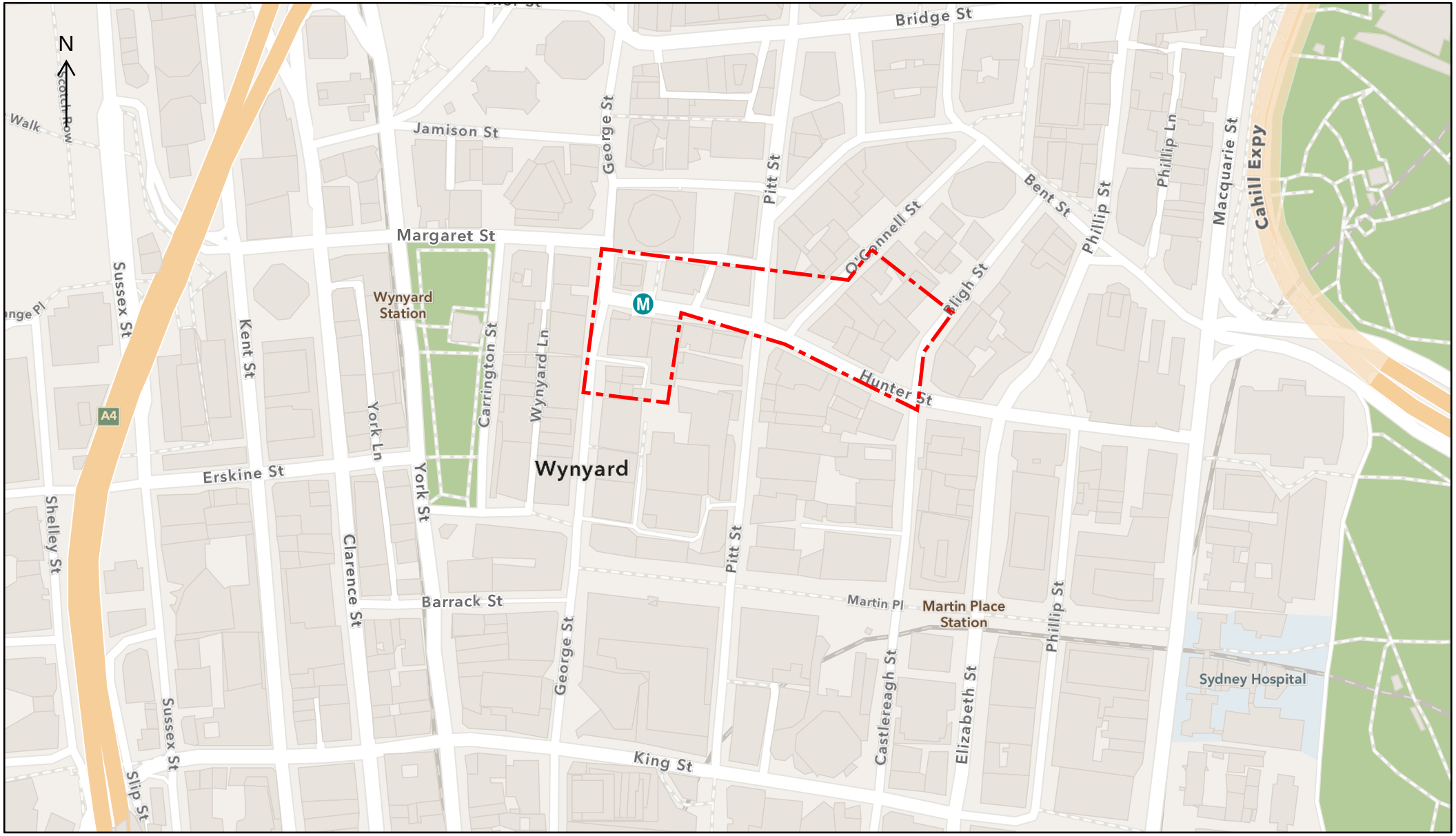

Figure 11. Potential Hunter Street (Sydney CBD) Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Memorandum

Subject: Sydney Metro West Integrated Station Development Electrical Feasibility Application

EDS Reference: SMWSTEDS-SMD-SW000-UE-MEM-044001	SM Reference:
Prepared by: Jeffrey Chan	Date: 22/06/2021
Approved by: Jennine Finlayson	Checked by: Daniel Fettell

Introduction

Sydney Metro West is a fully segregated new Metro line connecting seamlessly with other existing transport modes. Sydney Metro West is principally a 'greenfield' development that does not rely on the expansion or repurposing of existing infrastructure (excepting the development of existing concourses at Westmead and North Strathfield Stations), providing the opportunity to develop the next evolution of the metro product.

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A summary of the key elements of the Sydney Metro West configuration and operating concept is provided below for the purposes of this application:

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Table 1 below provides a breakdown of the latest approximate development yields for each Metro station site, including a breakdown of dwellings, commercial and retail space. Figures 2 to 11 in Attachment A show indicative extents for each site development. Please note this application is for the property developments only and excludes the metro station itself due to differences in development staging timeframes. Furthermore, the details provided as part of this application have been provided to facilitate preliminary infrastructure studies only and are subject to change as the designs develop.

Table 1 Indicative Development Growth (18th June 2021)[1]

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4.	Sydney Olympic Park	1,000	35,000	8,000	2024 - 2028
5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
8.	The Bays	550	32,450	6,150	2024 - 2028
9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

Note:
[1]Apartment numbers and commercial/retail space figures are assumptions only and are subject to review. They are provided for the infrastructure capacity analysis only.
[2]An assumed 0.8 conversion factor from gross floor area (GFA) to net lettable area (NLA) has been applied.
[3]One apartment = 100 m^2 of Residential GFA.

Electrical Demand Rates

A high-level demand assessment was undertaken based on the indicative building development yield. This development yield was used for the purposes of electrical infrastructure assessments only and the final architectural designs should be used to confirm the building details.

The demand assessment considered the unit rates and peaking factors summarised in Table 2 below.

Table 2: Electrical Demand Unit Rates

Land Use	Design Criteria	Unit	Demand Rate	Source
Residential - Apartments	Peak Demand	kVA/dwelling	3.5	Endeavour Energy Growth Servicing Plan 2019 - Table 1
Commercial – Office – Electrical reheat zonal	Peak Demand	kVA/m^2	0.11	Ausgrid NS109 - Table 4 Guide to Typical Load Densities
Retail – Shops air conditioned	Peak Demand	kVA/m^2	0.10	Ausgrid NS109 - Table 4 Guide to Typical Load Densities
Diversity Factor (commercial and retail only)	N/A	%	80	AS3000

Projected Electrical Demand

Estimates for the electrical maximum demand were developed using the development yields outlined in Table 1 and unit rates outlined in Table 2 for each station development. A diversity factor of 80% has been applied to commercial and retail uses.

Table 3 summarises the estimate of the electrical maximum demand. Please note that, as the design is still evolving, we believe it is appropriate to apply a ±15% factor to these numbers.

Table 3: Estimated Electrical Maximum Demand Including Diversity

Development		Estimated Electrical Demand (MVA) (2024-2032)		Total (MVA)
		Residential	Commercial and Retail (Incl. Diversity)	
1.	Westmead	0.9	2.8	3.7
2.	Parramatta	0.9	14.4	15.3
3.	Clyde MSF	N/A	N/A	N/A
4.	Sydney Olympic Park	3.5	2.9	6.4
5.	North Strathfield	N/A	N/A	N/A
6.	Burwood North	0.7	1.2	1.9
7.	Five Dock	0.1	0.4	0.5
8.	The Bays	1.9	2.5	4.4

9.	Pyrmont	0.6	0.6	1.2
10.	Hunter Street (Sydney CBD)	N/A	13.0	13.0

The above demand estimates do not allow for reductions resulting from the demolition of existing land uses. Furthermore, changes to these demand estimates from potential ecologically sustainable development (ESD) initiatives have not been considered. Any future impacts will be communicated to electrical authorities.

Feasibility Assessment Request

As demonstrated in the demand estimate, there is projected to be a significant impact on the electrical infrastructure at the proposed developments. As such, Sydney Metro seeks to actively engage with utility stakeholders to ensure the appropriate planning measures are implemented.

This request seeks to initiate the consultation and planning process by providing the initial electrical demand estimates. Additionally, as part of this consultation and planning process, the investigation of opportunities for reuse of construction power supplies (where applicable) for servicing of the future developments is requested to be undertaken with the electrical utility authorities.

We welcome further discussion and collaboration as part of the precinct planning and are happy to meet with electrical utilities authorities to discuss the implications of this feasibility application.

Attachments

Attachment	Title
A	Sydney Metro West – Indicative Site Extents

Westmead

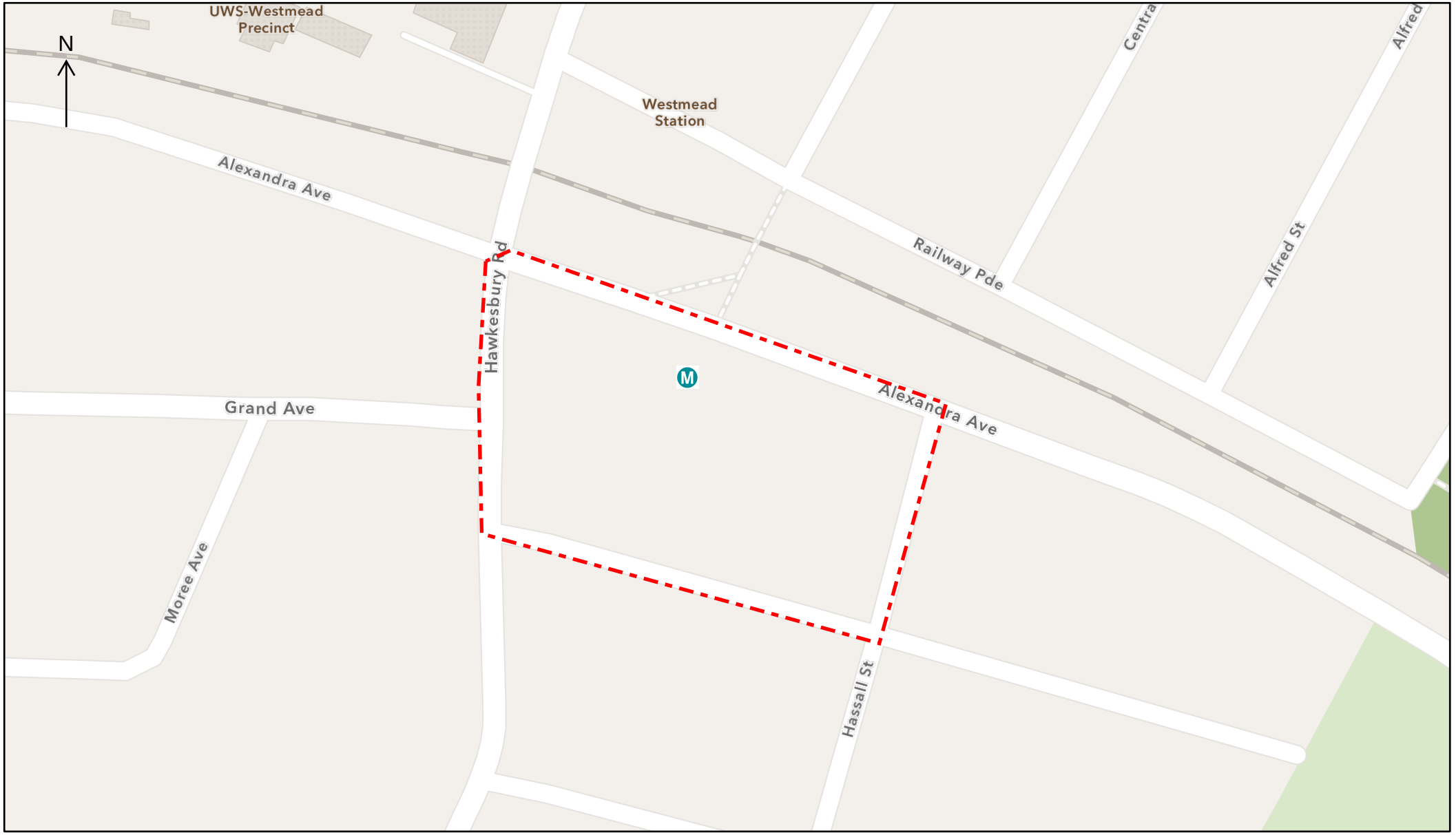

Figure 2. Potential Westmead Site Extent

Parramatta

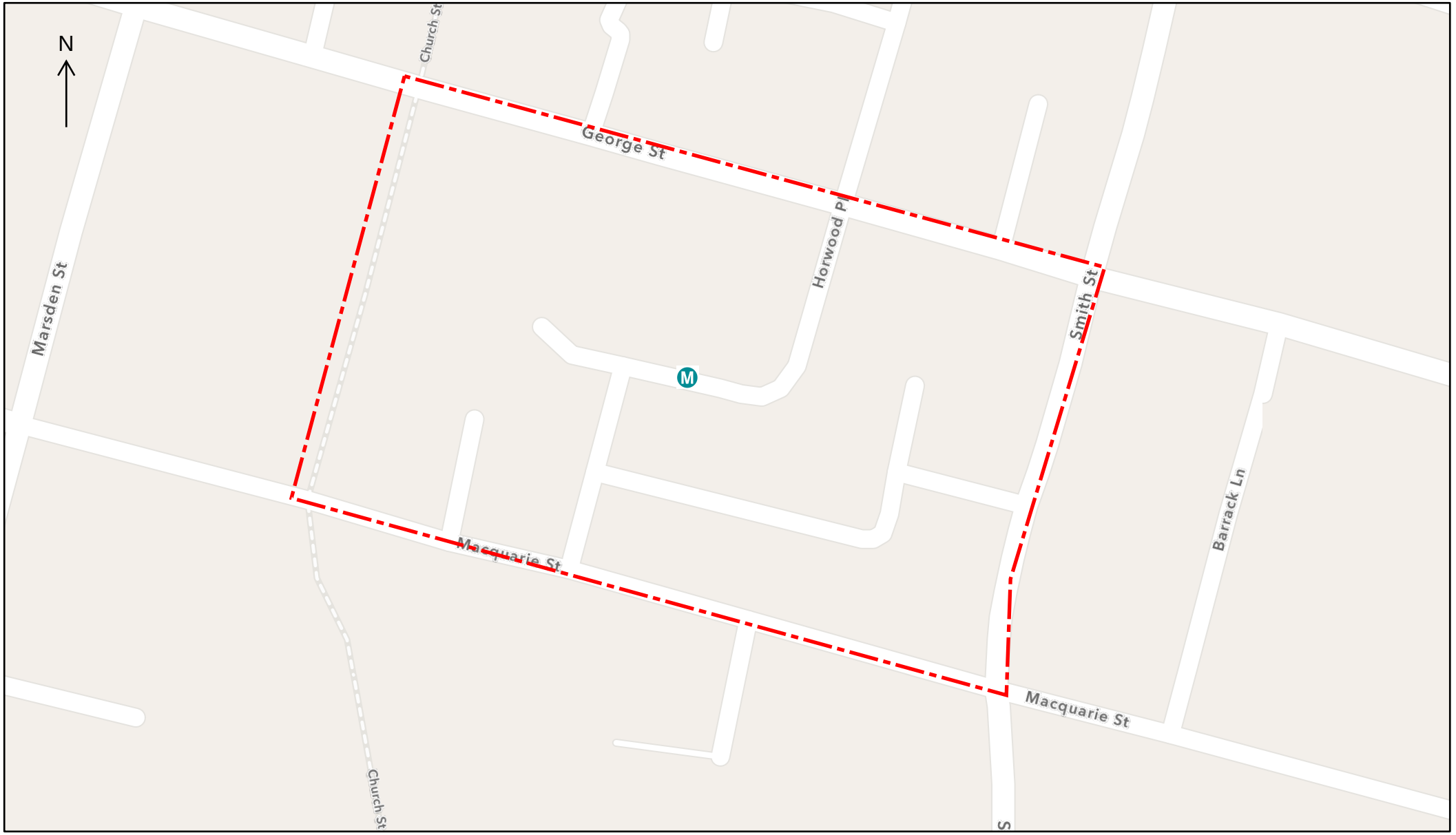

Figure 3. Potential Parramatta Site Extent

Legend:

- Potential Site Extent
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1:2,500

0 0.02 0.04 0.07 mi

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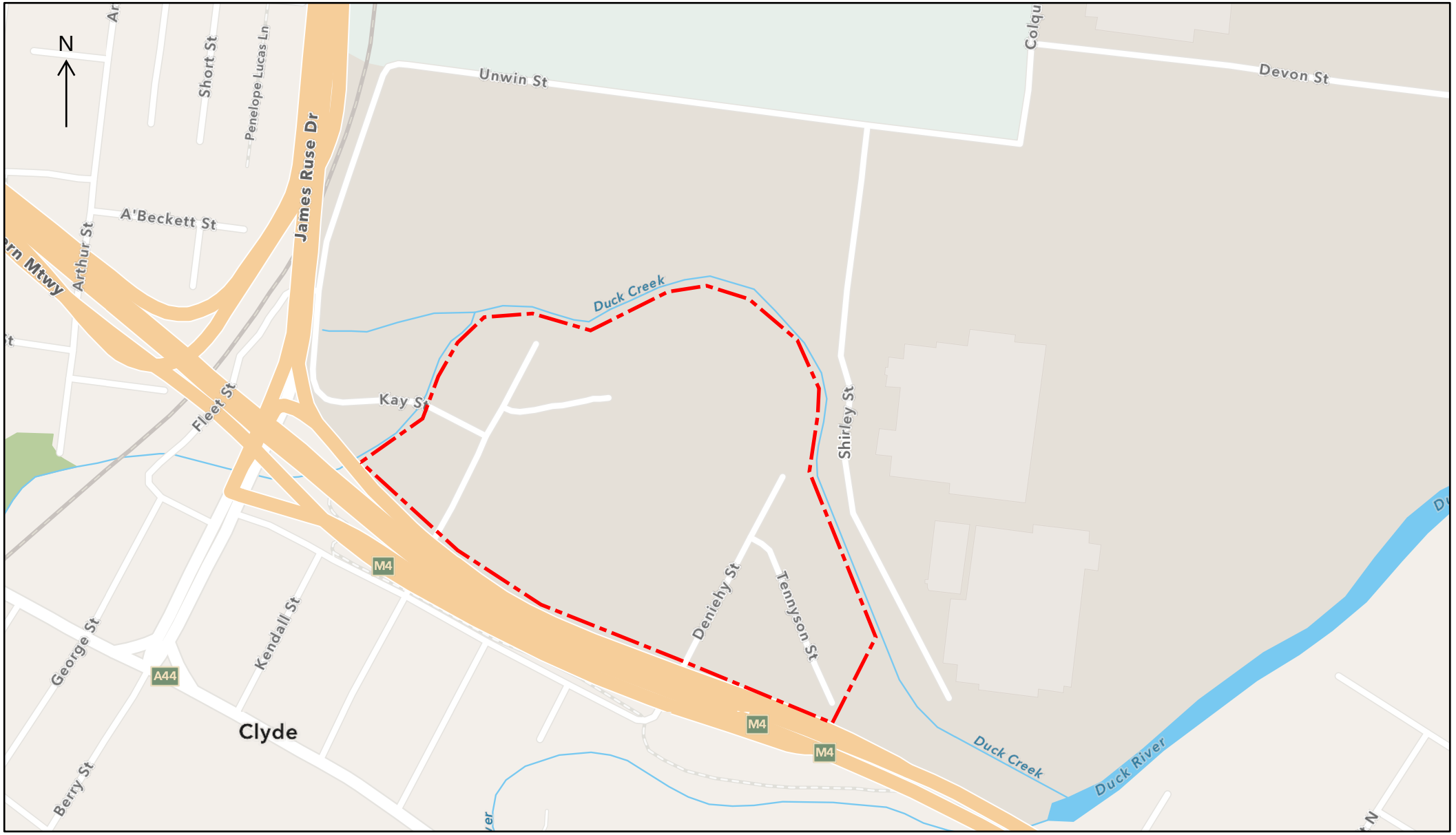
Clyde MSF



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Sydney Olympic Park

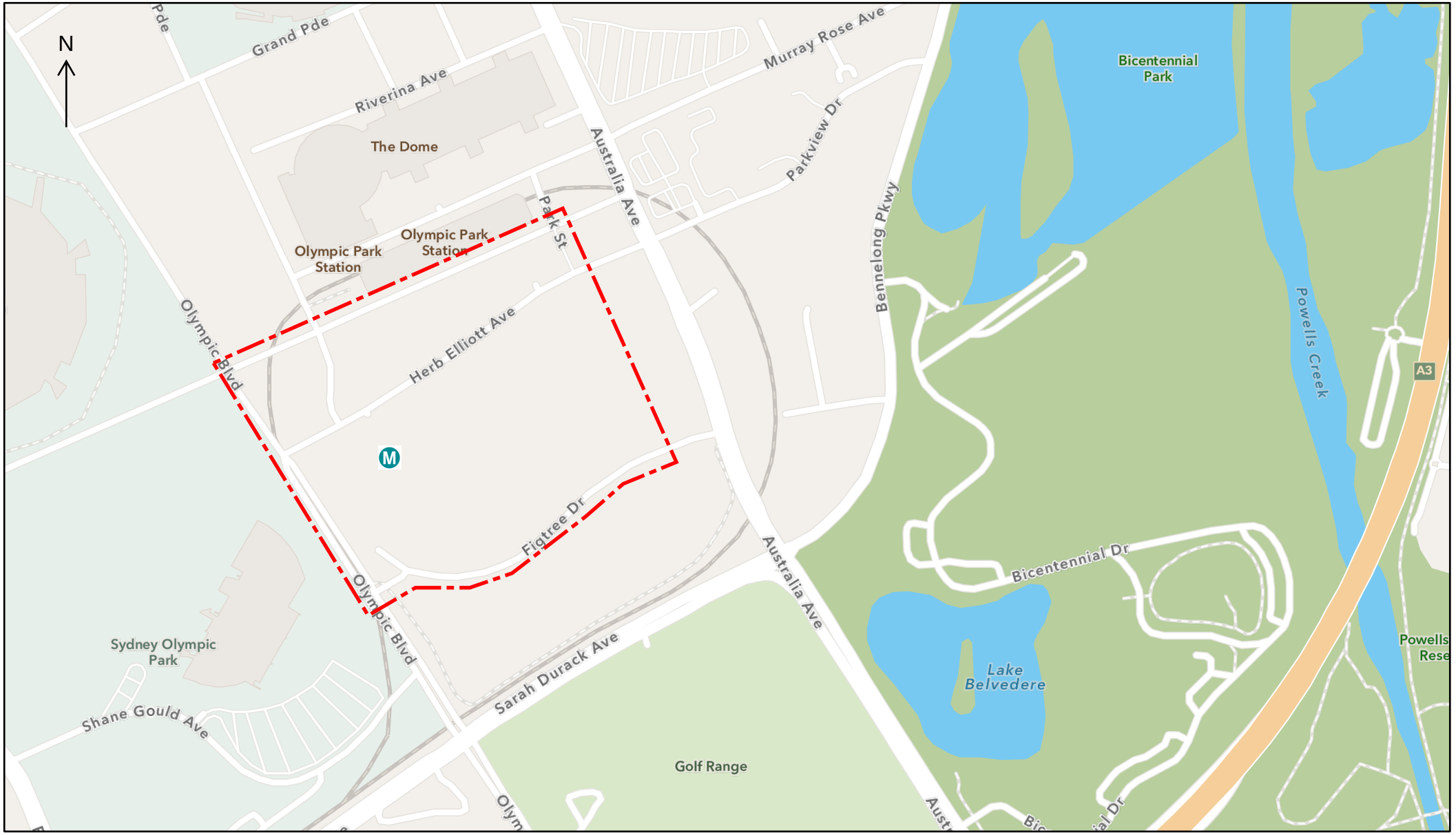

Figure 5. Potential Sydney Olympic Park Site Extent

Legend:

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- Proposed Metro Station Location

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Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Strathfield North

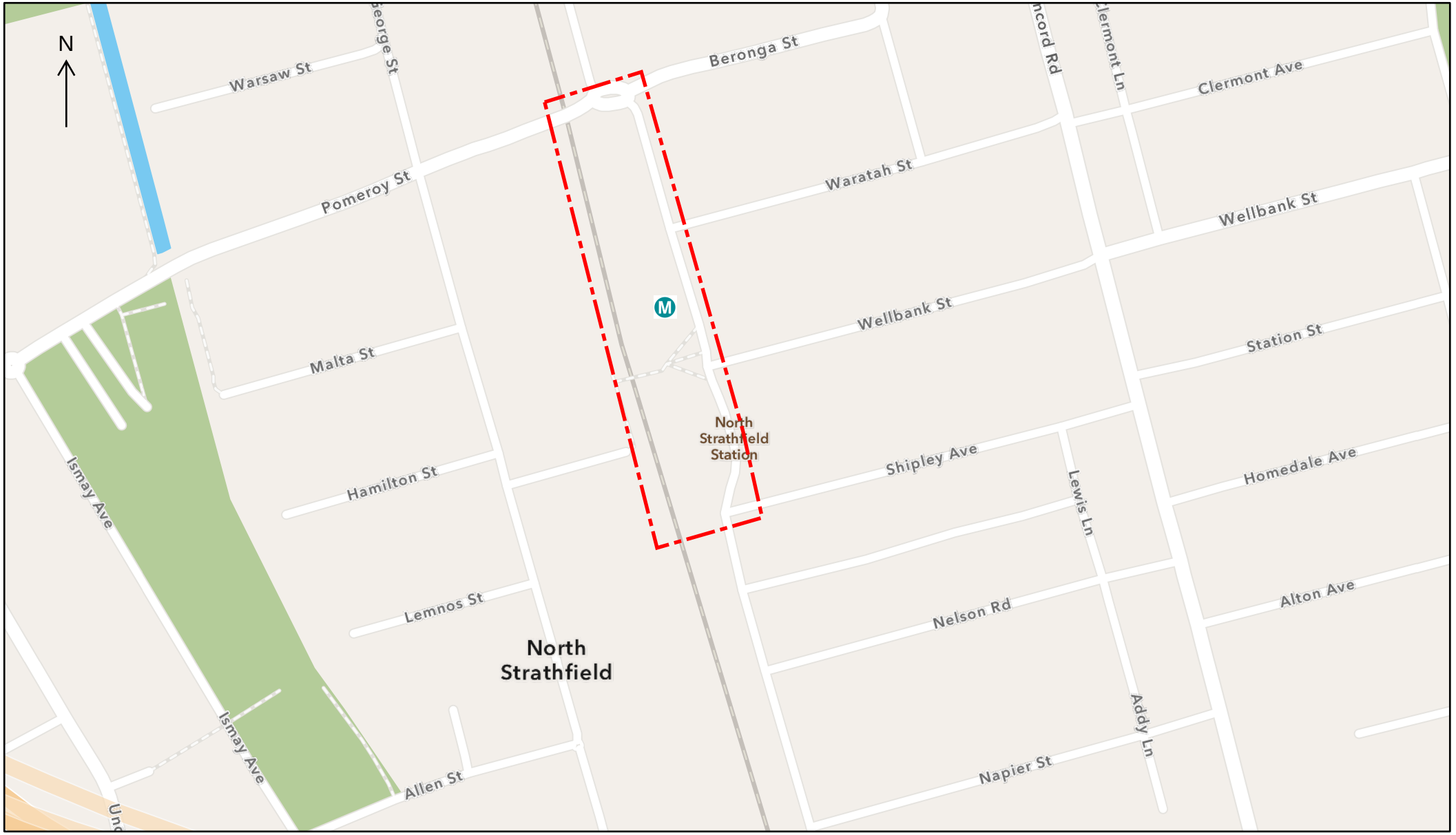

Figure 6. Potential Strathfield North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Burwood North

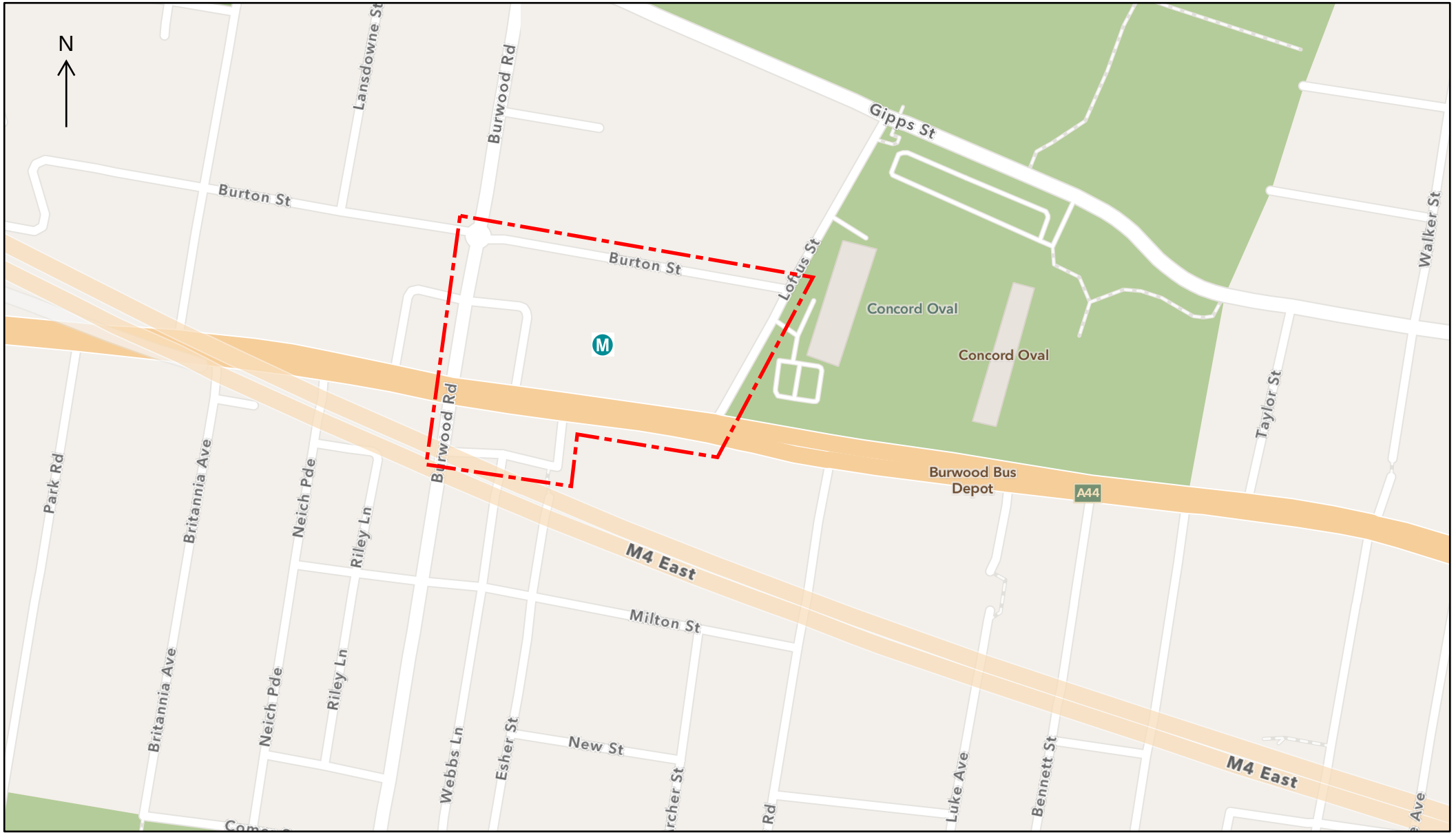

Figure 7. Potential Burwood North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Five Dock

Figure 8. Potential Five Dock Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

The Bays

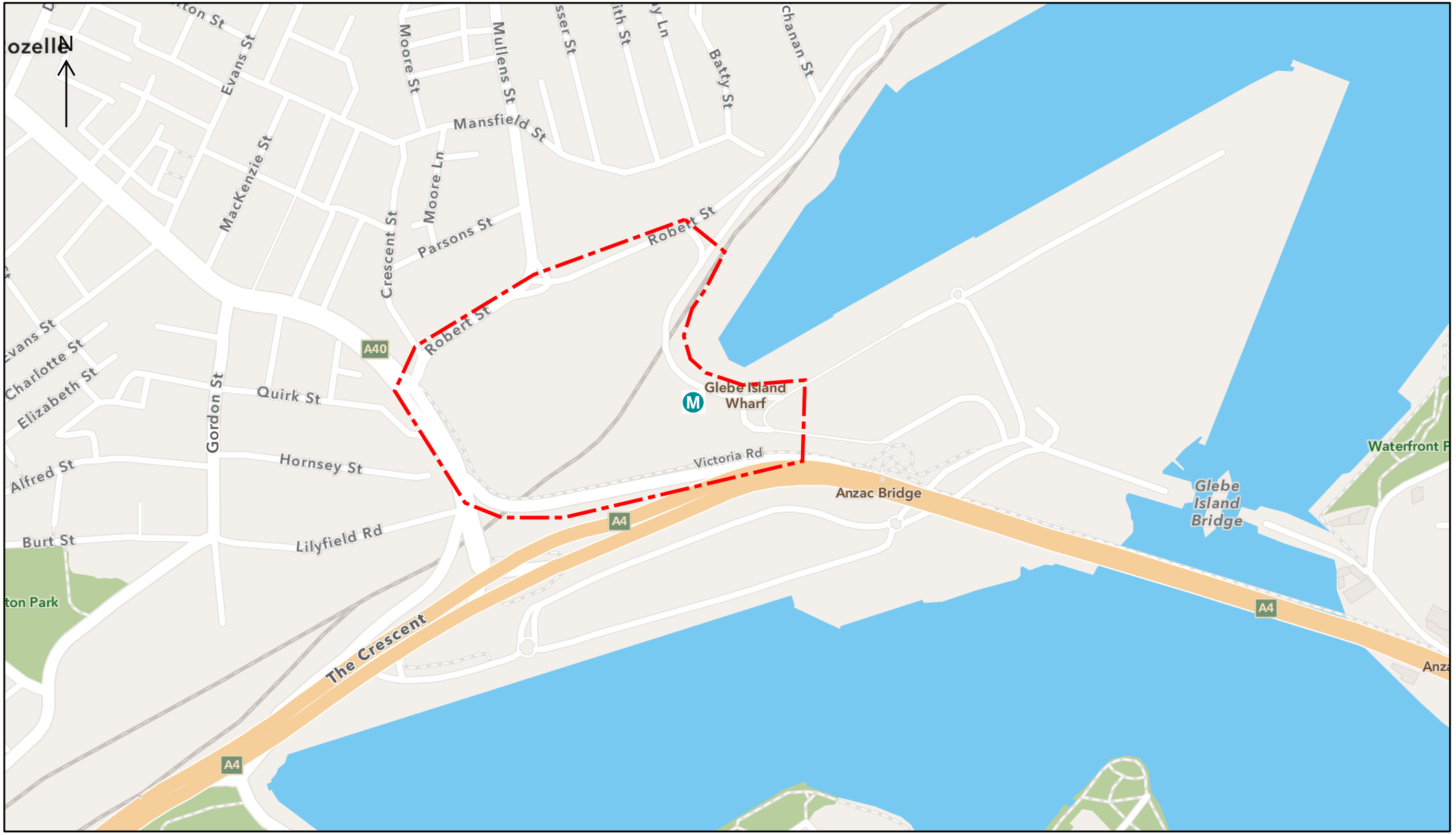

Figure 9. Potential The Bays Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Pyrmont

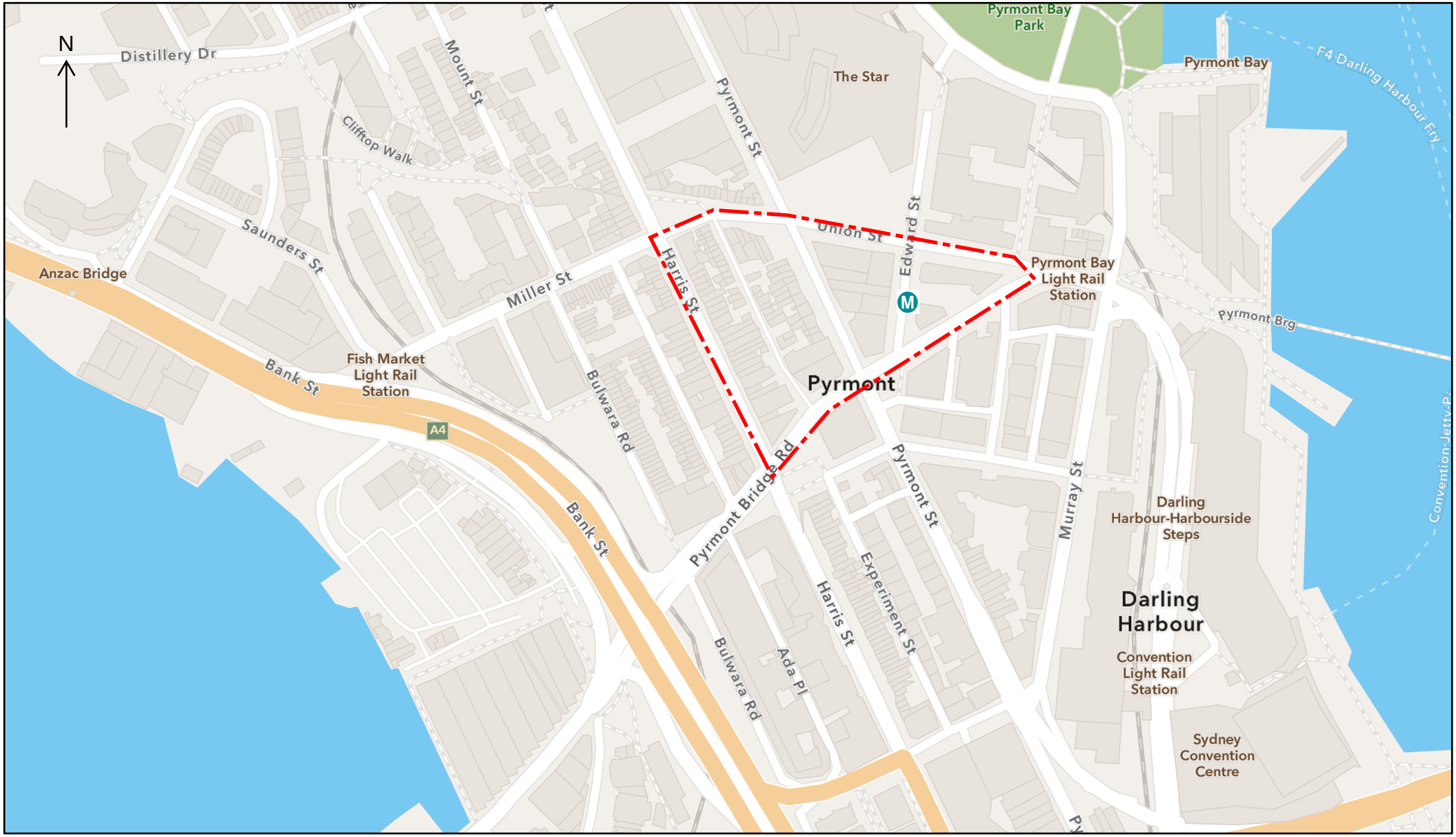

Figure 10. Potential Pyrmont Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Hunter Street (Sydney CBD)

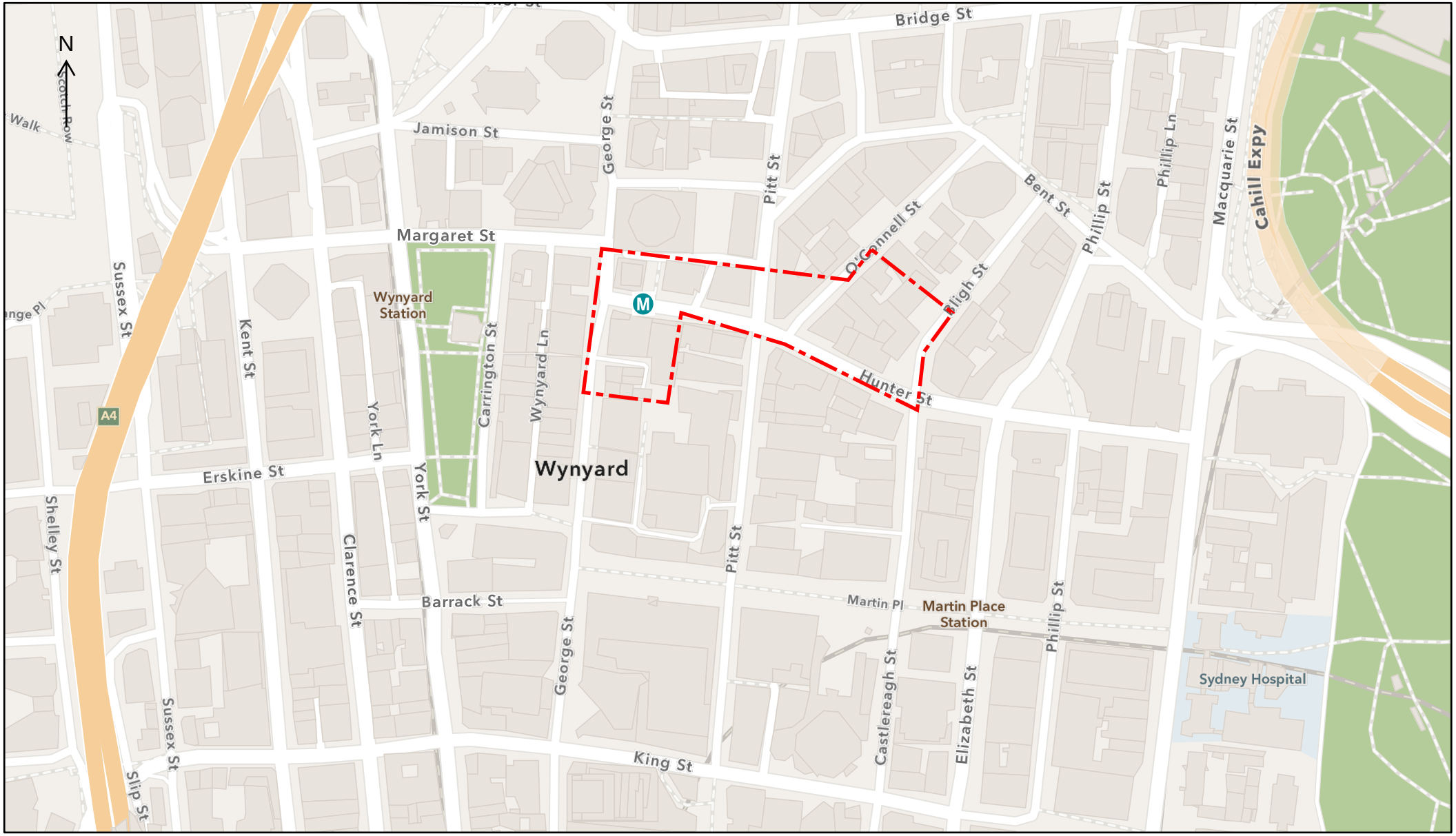

Figure 11. Potential Hunter Street (Sydney CBD) Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Memorandum

Subject: Sydney Metro West Integrated Station Development Electrical Feasibility Application

EDS Reference: SMWSTEDS-SMD-SW000-UE-MEM-044001	SM Reference:
Prepared by: Jeffrey Chan	Date: 22/06/2021
Approved by: Jennine Finlayson	Checked by: Daniel Fettell

Introduction

Sydney Metro West is a fully segregated new Metro line connecting seamlessly with other existing transport modes. Sydney Metro West is principally a 'greenfield' development that does not rely on the expansion or repurposing of existing infrastructure (excepting the development of existing concourses at Westmead and North Strathfield Stations), providing the opportunity to develop the next evolution of the metro product.

Figure 1: Sydney Metro West Context

A summary of the key elements of the Sydney Metro West configuration and operating concept is provided below for the purposes of this application:

- Approximately 24km of twin underground rail tunnels from Westmead to the Sydney CBD
- Nine new underground Metro stations at Westmead, Parramatta CBD, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD) and the provisioning for the sale of air space over stations and surplus land for property development
- Integrated Station Developments at Parramatta, Sydney Olympic Park, Hunter Street (Sydney CBD) and potentially The Bays
- A combined maintenance and stabling facility and Operations Control Centre at Clyde
- Passenger interchanges at Westmead and North Strathfield to the Sydney Trains T1 Western and T9 Northern lines
- Tunnel ventilation services facilities at Rosehill, Silverwater and Lilyfield.

Table 1 below provides a breakdown of the latest approximate development yields for each Metro station site, including a breakdown of dwellings, commercial and retail space. Figures 2 to 11 in Attachment A show indicative extents for each site development. Please note this application is for the property developments only and excludes the metro station itself due to differences in development staging timeframes. Furthermore, the details provided as part of this application have been provided to facilitate preliminary infrastructure studies only and are subject to change as the designs develop.

Table 1 Indicative Development Growth (18th June 2021)[1]

Investigation Area		Residential Apartments[3] (No.)	Indicative Commercial Space GFA[2] (m^2)	Indicative Retail Space GFA[2] (m^2)	Development Timeframe (Year)
1.	Westmead	250	40,000	4,500	2028 - 2032
2.	Parramatta	250	150,000	20,000	2024 - 2028
3.	Clyde MSF	N/A	N/A	N/A	2024 - 2028
4.	Sydney Olympic Park	1,000	35,000	8,000	2024 - 2028
5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
8.	The Bays	550	32,450	6,150	2024 - 2028
9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

Note:
[1]Apartment numbers and commercial/retail space figures are assumptions only and are subject to review. They are provided for the infrastructure capacity analysis only.
[2]An assumed 0.8 conversion factor from gross floor area (GFA) to net lettable area (NLA) has been applied.
[3]One apartment = 100 m^2 of Residential GFA.

Electrical Demand Rates

A high-level demand assessment was undertaken based on the indicative building development yield. This development yield was used for the purposes of electrical infrastructure assessments only and the final architectural designs should be used to confirm the building details.

The demand assessment considered the unit rates and peaking factors summarised in Table 2 below.

Table 2: Electrical Demand Unit Rates

Land Use	Design Criteria	Unit	Demand Rate	Source
Residential - Apartments	Peak Demand	kVA/dwelling	3.5	Endeavour Energy Growth Servicing Plan 2019 - Table 1
Commercial – Office – Electrical reheat zonal	Peak Demand	kVA/m^2	0.11	Ausgrid NS109 - Table 4 Guide to Typical Load Densities
Retail – Shops air conditioned	Peak Demand	kVA/m^2	0.10	Ausgrid NS109 - Table 4 Guide to Typical Load Densities
Diversity Factor (commercial and retail only)	N/A	%	80	AS3000

Projected Electrical Demand

Estimates for the electrical maximum demand were developed using the development yields outlined in Table 1 and unit rates outlined in Table 2 for each station development. A diversity factor of 80% has been applied to commercial and retail uses.

Table 3 summarises the estimate of the electrical maximum demand. Please note that, as the design is still evolving, we believe it is appropriate to apply a ±15% factor to these numbers.

Table 3: Estimated Electrical Maximum Demand Including Diversity

Development		Estimated Electrical Demand (MVA) (2024-2032)		Total (MVA)
		Residential	Commercial and Retail (Incl. Diversity)	
1.	Westmead	0.9	2.8	3.7
2.	Parramatta	0.9	14.4	15.3
3.	Clyde MSF	N/A	N/A	N/A
4.	Sydney Olympic Park	3.5	2.9	6.4
5.	North Strathfield	N/A	N/A	N/A
6.	Burwood North	0.7	1.2	1.9
7.	Five Dock	0.1	0.4	0.5
8.	The Bays	1.9	2.5	4.4

9.	Pyrmont	0.6	0.6	1.2
10.	Hunter Street (Sydney CBD)	N/A	13.0	13.0

The above demand estimates do not allow for reductions resulting from the demolition of existing land uses. Furthermore, changes to these demand estimates from potential ecologically sustainable development (ESD) initiatives have not been considered. Any future impacts will be communicated to electrical authorities.

Feasibility Assessment Request

As demonstrated in the demand estimate, there is projected to be a significant impact on the electrical infrastructure at the proposed developments. As such, Sydney Metro seeks to actively engage with utility stakeholders to ensure the appropriate planning measures are implemented.

This request seeks to initiate the consultation and planning process by providing the initial electrical demand estimates. Additionally, as part of this consultation and planning process, the investigation of opportunities for reuse of construction power supplies (where applicable) for servicing of the future developments is requested to be undertaken with the electrical utility authorities.

Specifically related to the development at Five Dock, the following additional information is requested:

a) Is Ausgrid able to confirm if S63388 or S7533 can be re-used for any future development works?
b) Is Ausgrid able to confirm capacity details or MDI readings for the above referenced substations?

We welcome further discussion and collaboration as part of the precinct planning and are happy to meet with electrical utilities authorities to discuss the implications of this feasibility application.

Attachments

Attachment	Title
A	Sydney Metro West – Indicative Site Extents

June 22, 2021

Andrew Haigh
Jemena
Level 12, 99 Walker Street
North Sydney, NSW 2060

Reference: **SMWSTEDS-SMD-SW000-UG-MEM-044001**
Sydney Metro West Integrated Station Development Gas Feasibility Application

Dear Mr. Haigh,

Introduction

Sydney Metro West is a fully segregated new Metro line connecting seamlessly with other existing transport modes. Sydney Metro West is principally a 'greenfield' development that does not rely on the expansion or repurposing of existing infrastructure (excepting the development of existing concourses at Westmead and North Strathfield Stations), providing the opportunity to develop the next evolution of the metro product.

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A summary of the key elements of the Sydney Metro West configuration and operating concept is provided below for the purposes of this application:

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- Tunnel ventilation services facilities at Rosehill, Silverwater and Lilyfield.

Table 1 below provides a breakdown of the latest approximate development yields for each Metro station site, including a breakdown of dwellings, commercial and retail space. Figures 2 to 11 in Attachment A show indicative extents for each site development. Please note this application is for the property developments only and excludes the metro station itself due to differences in development staging timeframes. Furthermore, the details provided as part of this application are to facilitate preliminary infrastructure studies only and are subject to change as the designs develop.

Table 1: Indicative Development Growth (18th June 2021)[1]

Investigation Area		Residential Apartments[3] (No.)	Indicative Commercial Space GFA[2] (m^2)	Indicative Retail Space GFA[2] (m^2)	Development Timeframe (Year)
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3.	Clyde MSF	N/A	N/A	N/A	2024 - 2028
4.	Sydney Olympic Park	1,000	35,000	8,000	2024 - 2028
5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
8.	The Bays	550	32,450	6,150	2024 - 2028
9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

Note:
[1]Apartment numbers and commercial/retail space figures are assumptions only and are subject to review. They are provided for the infrastructure capacity analysis only.
[2]An assumed 0.8 conversion factor from gross floor area (GFA) to net lettable area (NLA) has been applied.
[3]1 apartment = 100 sqm of Residential GFA

Gas Demand Rates

A preliminary assessment has been undertaken of the potential gas demand associated with each proposed development.

Demand forecasting and profiles were developed for the ISDs and development precincts based on the number of dwellings. Please note, this excludes commercial usage as we understand the rates can vary widely for different uses.

For the purposes of this assessment we used an energy demand of 20 gigajoules (GJ) per year (equating to 2.17m3/day/dwelling) to estimate the average annual domestic usage of natural gas for residential dwellings. We also included a BASIX reduction target of 25% to the residential

dwellings.

A factor of 39.6 m³/GJ was then used to convert the estimated usage into a volume of gas (Parliament of Australia, Natural Gas: Energy for the New Millennium, 2015).

Projected Gas Demand

Using the development yields outlined in Section 1 and the demand rates in Section 2, estimates for the cumulative residential gas usages were developed as shown in Table 2. Please note that, as the design is still evolving, we believe it is appropriate to apply a ±15% factor to these numbers.

Table 2: Gas Demand Rates

Development		Estimated Gas Demand (m^3/day) (2024-2032)		Total (m^3/day)
		Residential (incl. BASIX)	Commercial and Retail	
1.	Westmead	407	TBA[1]	407
2.	Parramatta	407	TBA[1]	407
3.	Clyde MSF	N/A	TBA[1]	N/A
4.	Sydney Olympic Park	1800	TBA[1]	1800
5.	North Strathfield	N/A	TBA[1]	N/A
6.	Burwood North	342	TBA[1]	342
7.	Five Dock	34	TBA[1]	34
8.	The Bays	895	TBA[1]	895
9.	Pyrmont	293	TBA[1]	293
10.	Hunter Street (Sydney CBD)	N/A	TBA[1]	N/A

Notes:

[1] *Commercial and Retail usage excluded for the purposes of this estimate due to varying demand. Facility uses are currently under discussion as part of the design development process and demand estimates will be communicated to Jemena when made known.*

The above demand estimates do not allow for reductions in existing demand resulting from the demolition of existing land uses. Furthermore, changes to these demand estimates from potential ecologically sustainable development (ESD) initiatives have not been considered. Any future impacts will be communicated to Jemena.

Feasibility Assessment Request

As demonstrated in the demand estimate, there is projected to be a significant impact on the gas infrastructure. As such, Sydney Metro seeks to actively engage with utility stakeholders to ensure the appropriate planning measures are implemented.

Additionally, we seek the following information:

- Confirmation of existing Jemena infrastructure within and adjacent to the sites;
- Identification of the existing capacity of the gas to service the projected growth and any augmentations that may be required to Jemena's network;
- Details of any planned infrastructure works to support development within the catchments which could be expanded to support the developments;

- Other major developments currently allowed for in the development areas as part of Jemena's infrastructure planning;
- Funding arrangements for infrastructure upgrades to the meet the increased gas demand;
- Guidance on timeframes for forward planning of infrastructure works; and
- Advice on any alternative supply strategies that might be feasible for Jemena to implement for the proposed developments.

We welcome further discussion and collaboration with Jemena as part of the precinct planning and are happy to meet with Jemena and Sydney Metro to discuss the implications of this feasibility application.

Should you have any queries in relation to this application please do not hesitate to contact the undersigned. We look forward to working with Jemena on the next stages of the developments.

Yours sincerely

Jennine Finlayson
Principal Water Engineer

Attachment: *Sydney Metro West – Indicative Site Extents*

Westmead

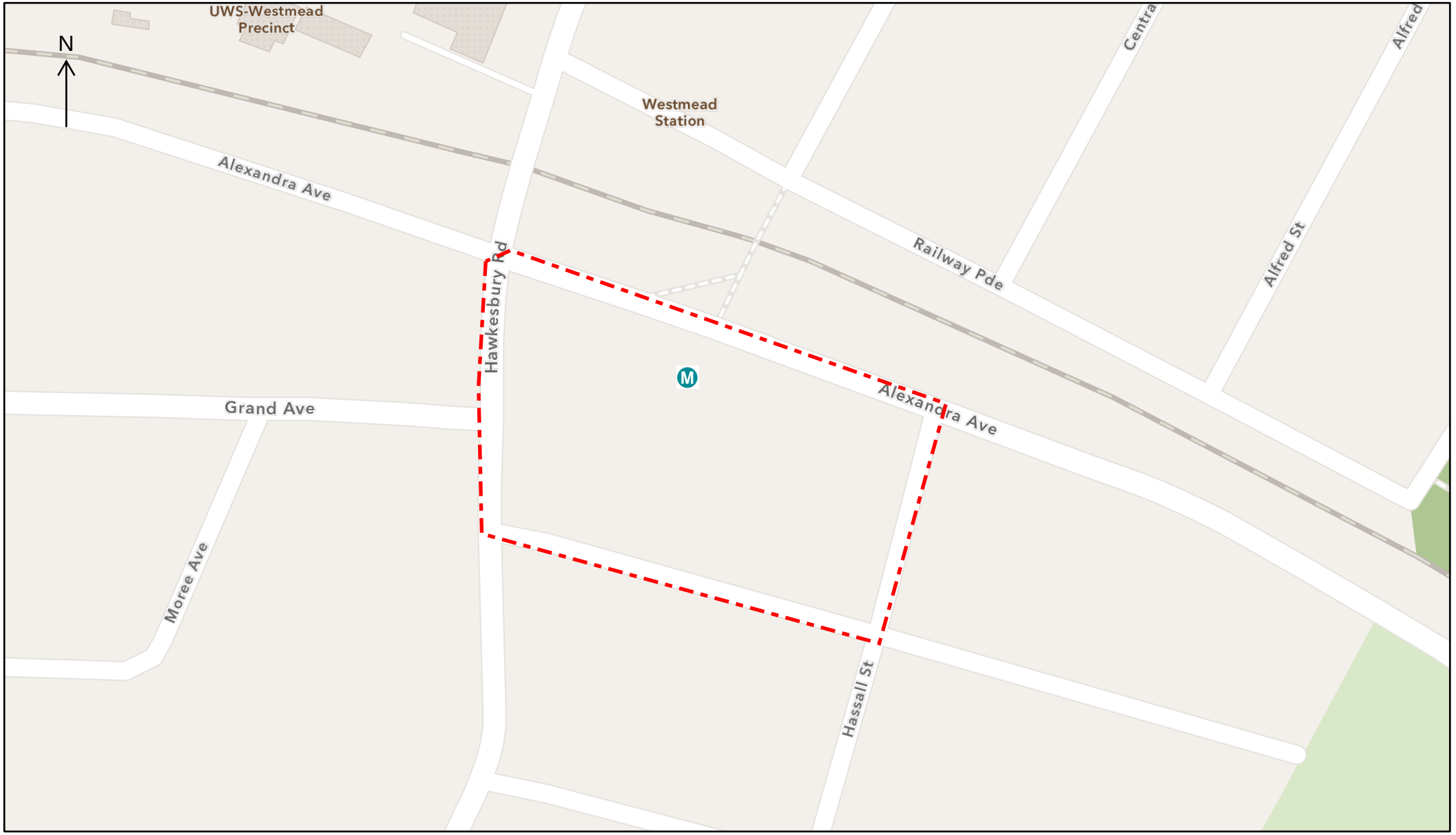

Figure 2. Potential Westmead Site Extent

Parramatta

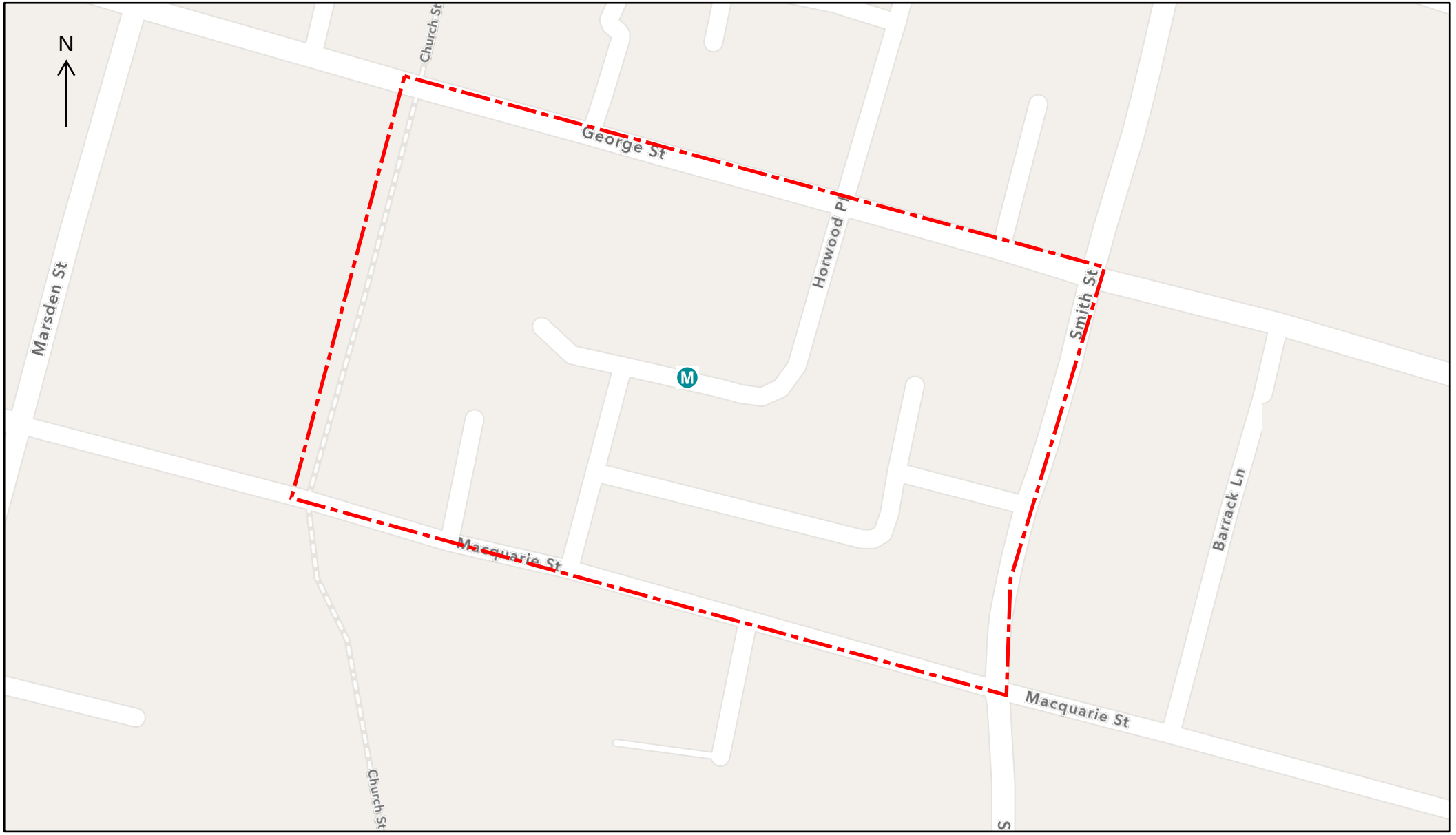

Figure 3. Potential Parramatta Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:2,500

0 0.02 0.04 0.07 mi

0 0.03 0.06 0.11 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Clyde MSF

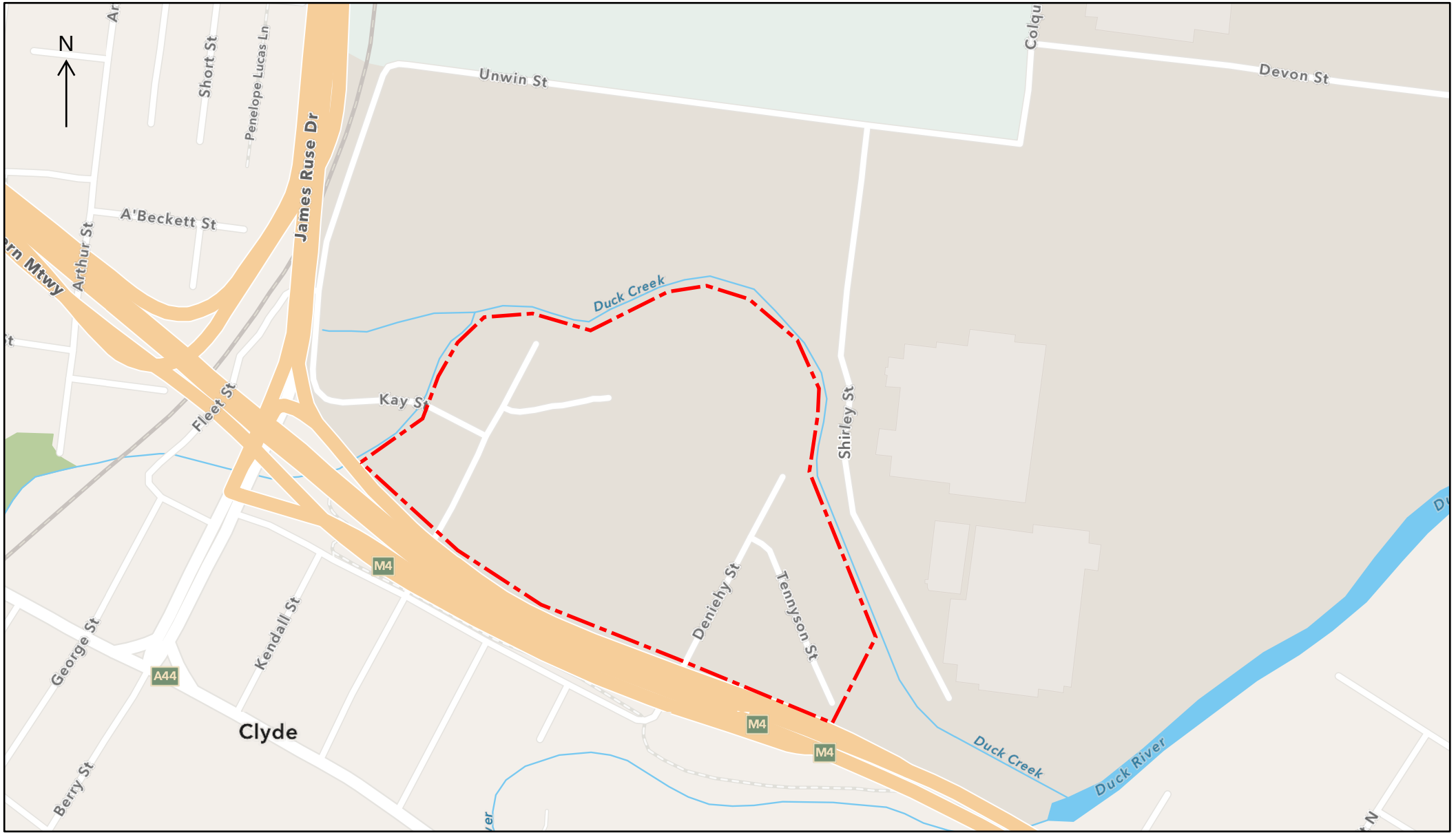

Figure 4. Potential Clyde MSF Site Extent

Legend:

Potential Site Extent

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Sydney Olympic Park

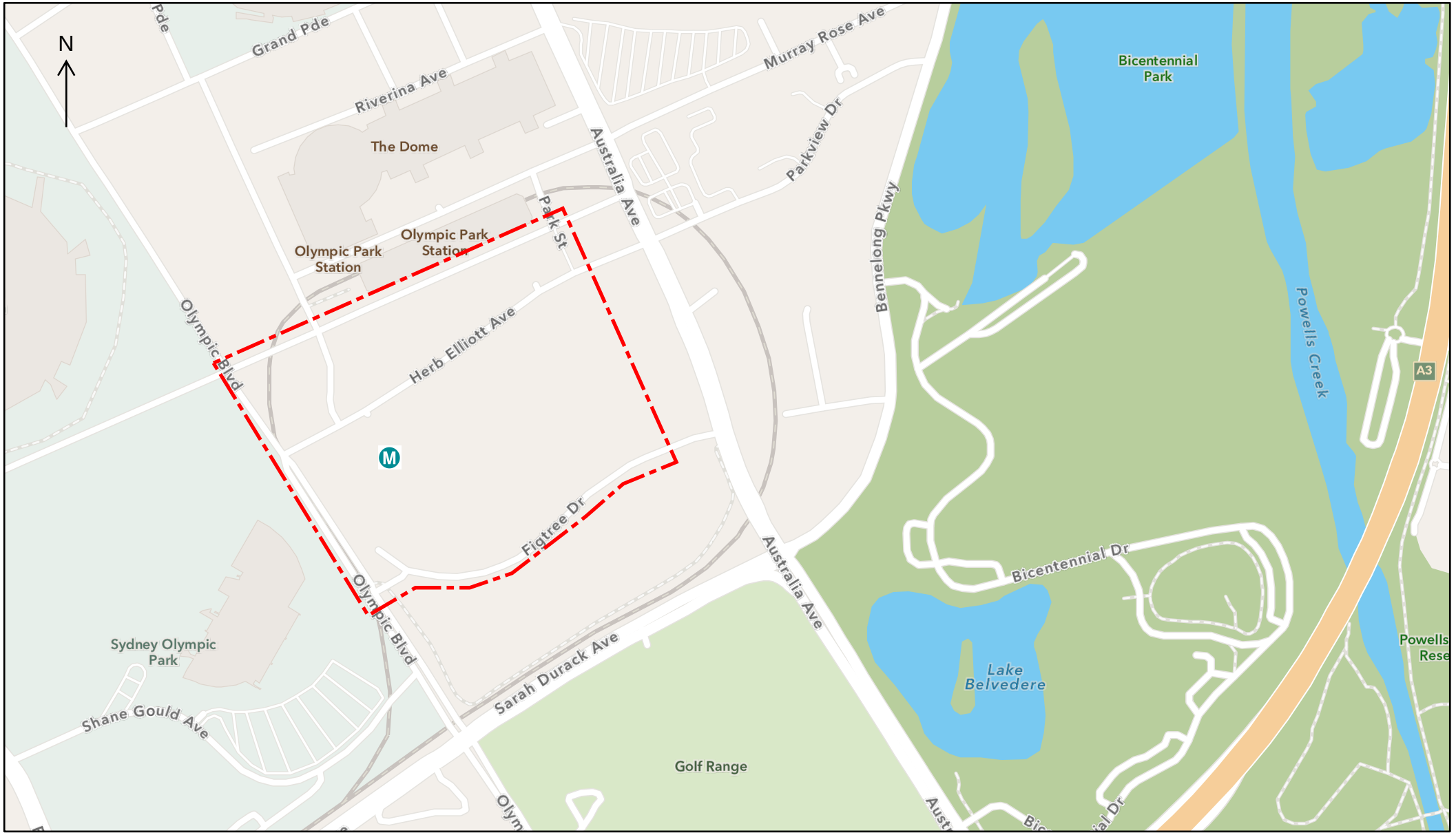

Figure 5. Potential Sydney Olympic Park Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Strathfield North

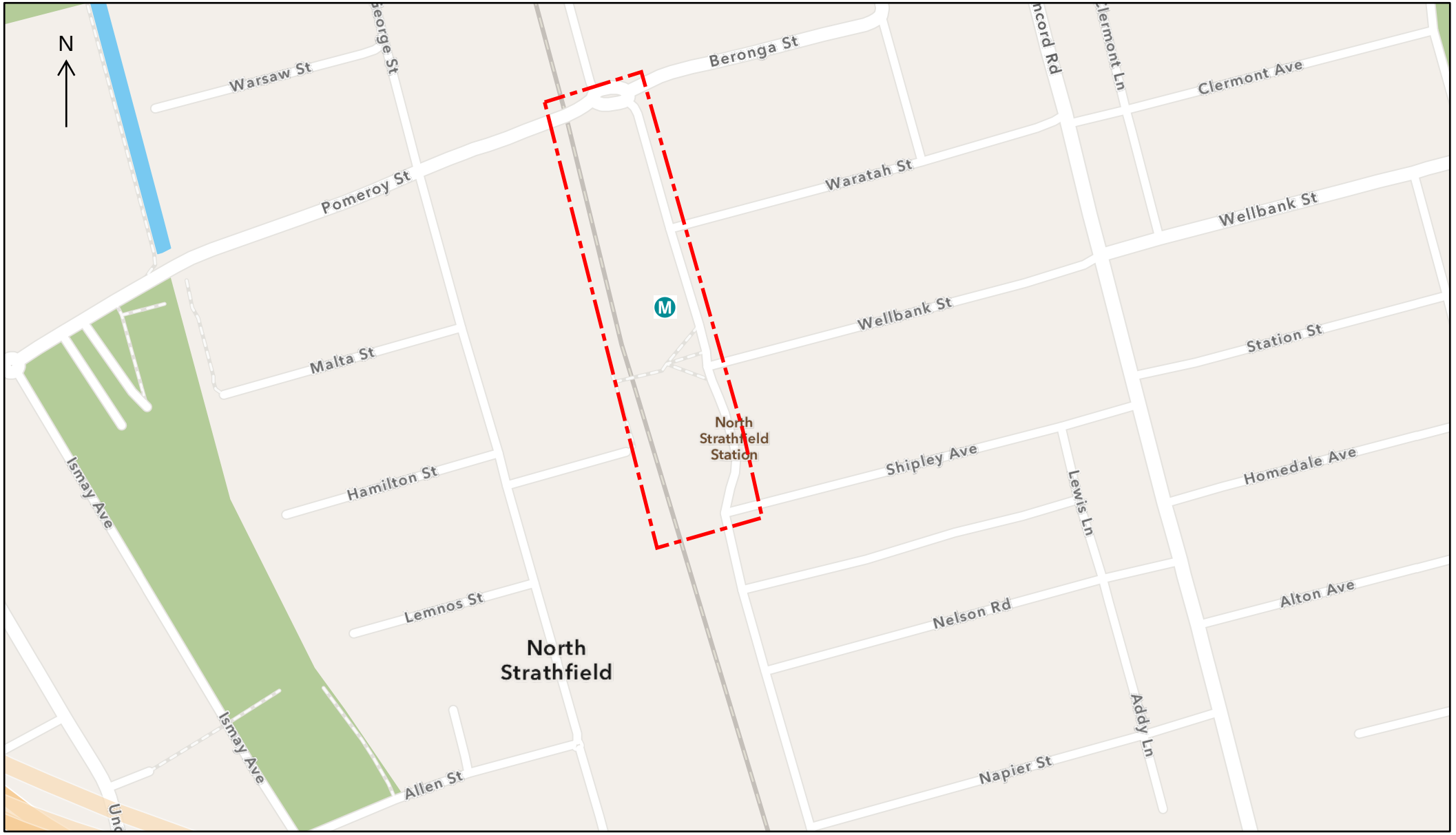

Figure 6. Potential Strathfield North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Burwood North

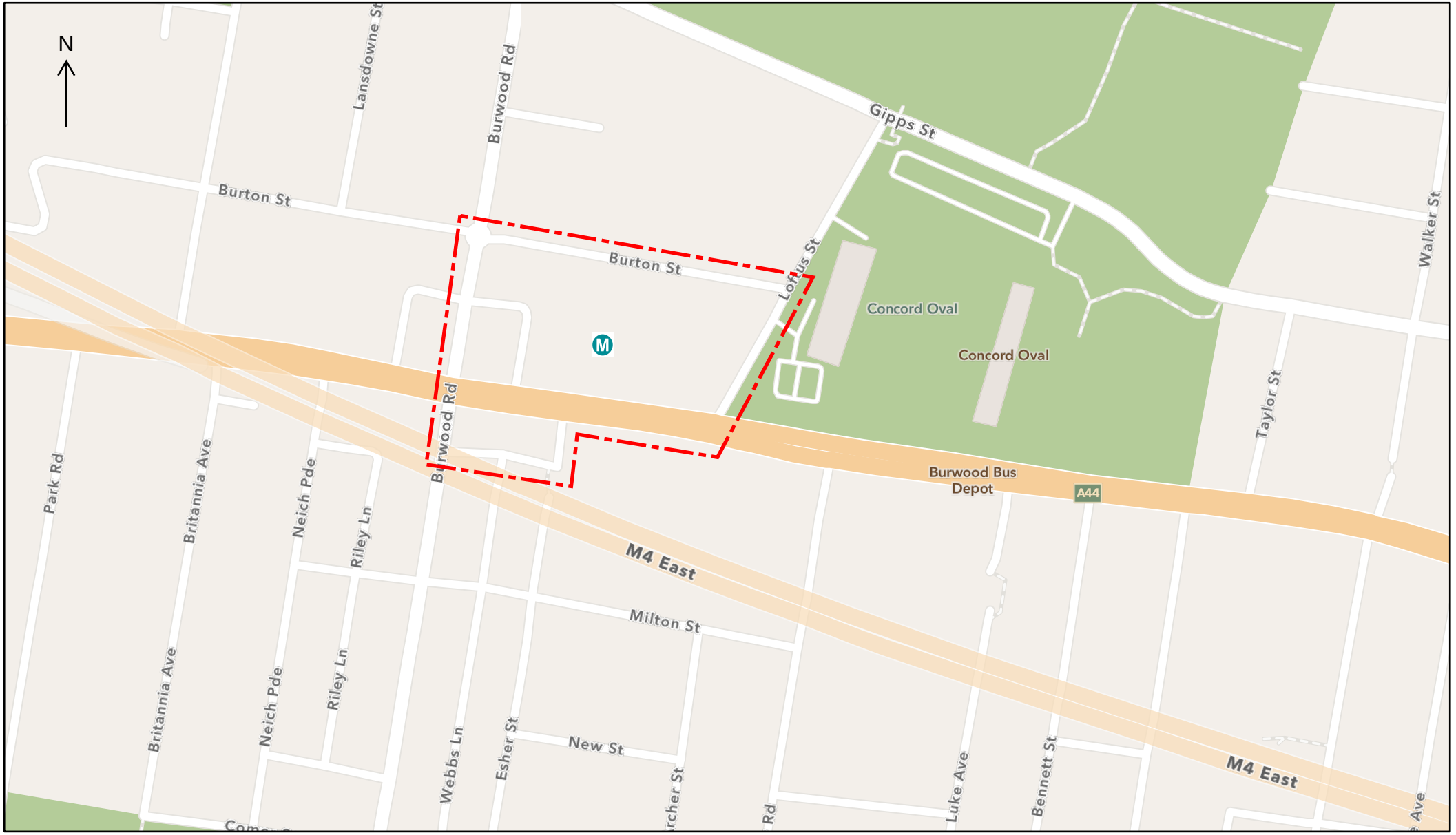

Figure 7. Potential Burwood North Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Five Dock

Figure 8. Potential Five Dock Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

The Bays

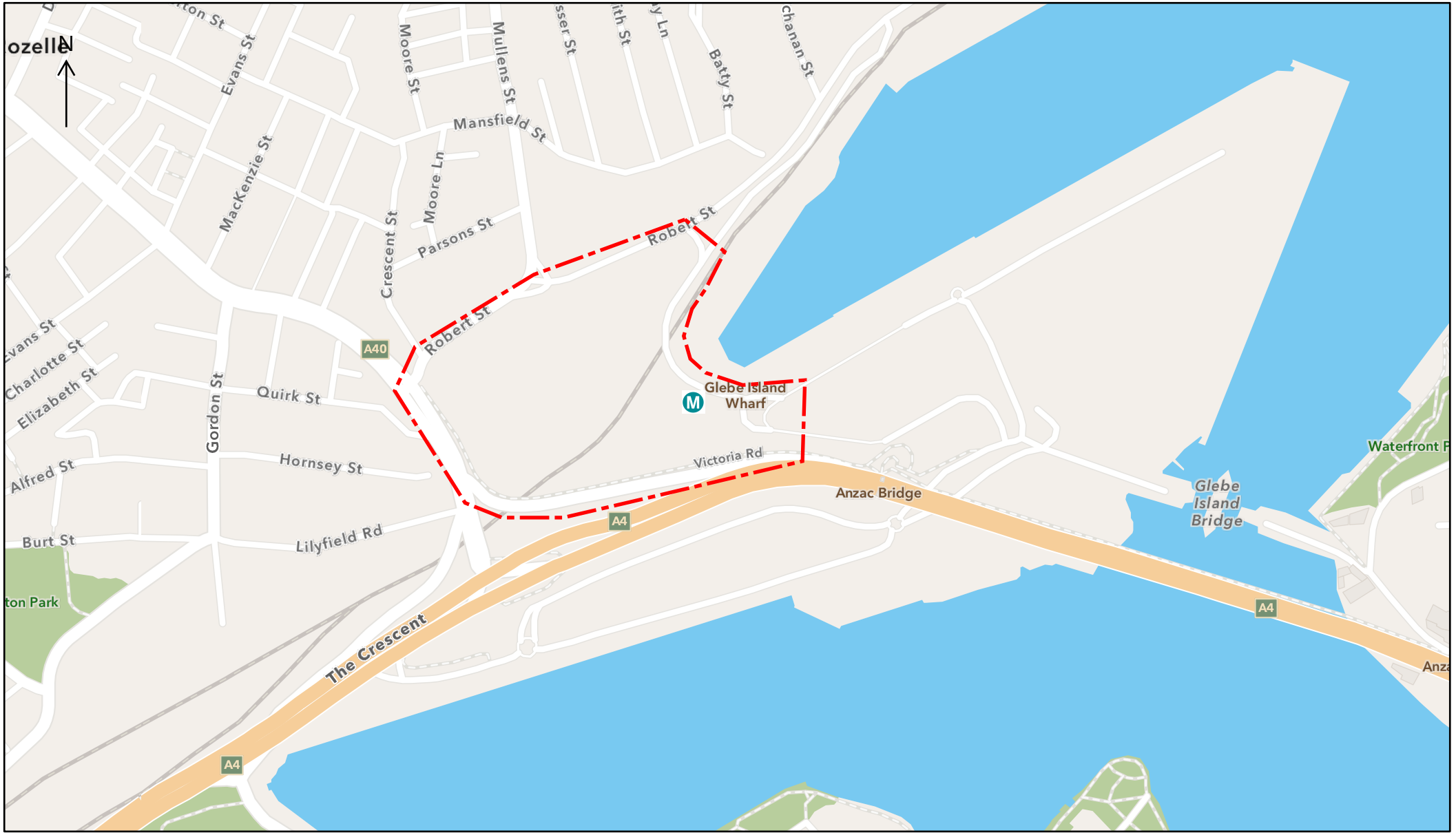

Figure 9. Potential The Bays Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:7,500

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Pyrmont

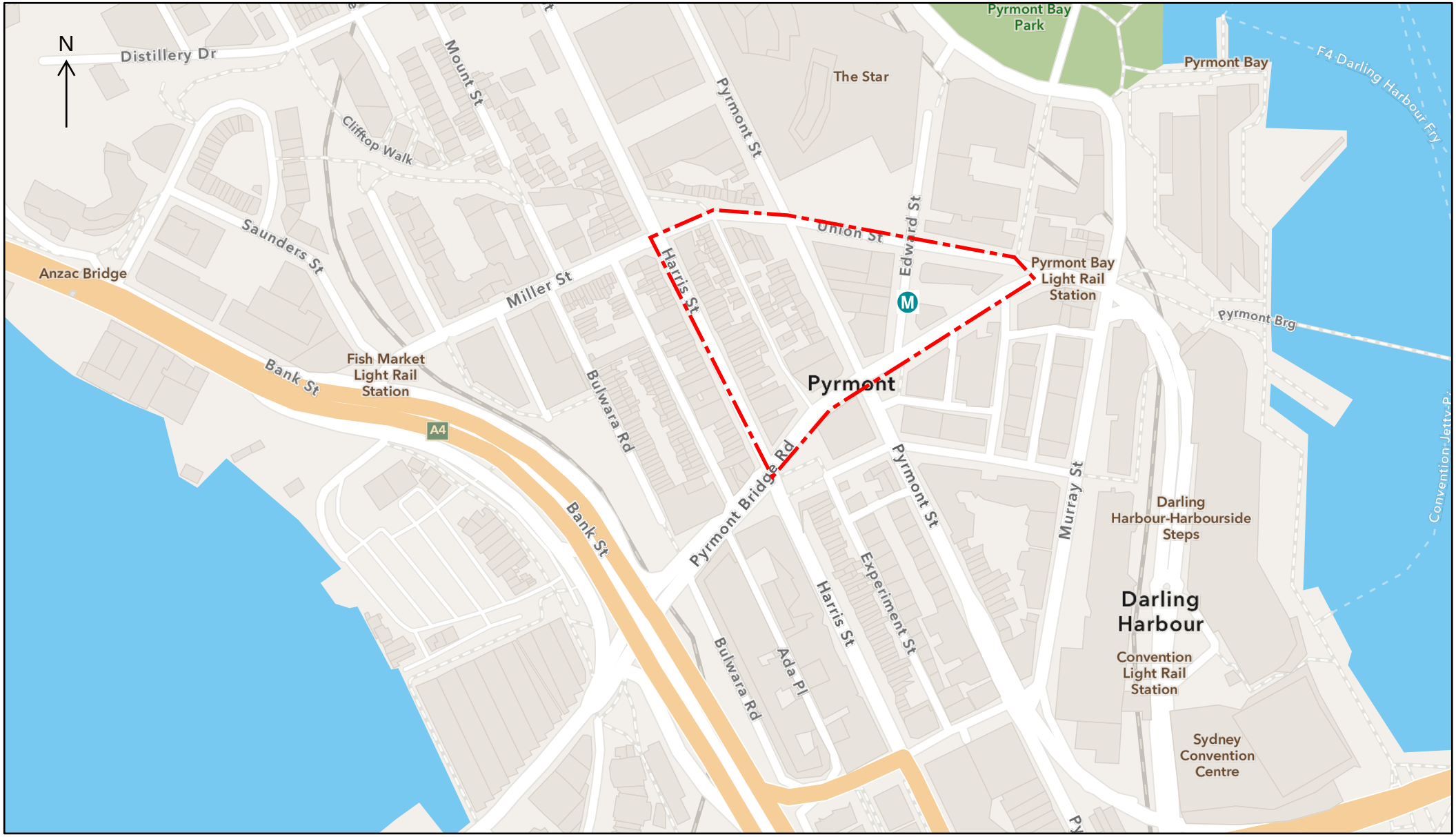

Figure 10. Potential Pyrmont Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Hunter Street (Sydney CBD)

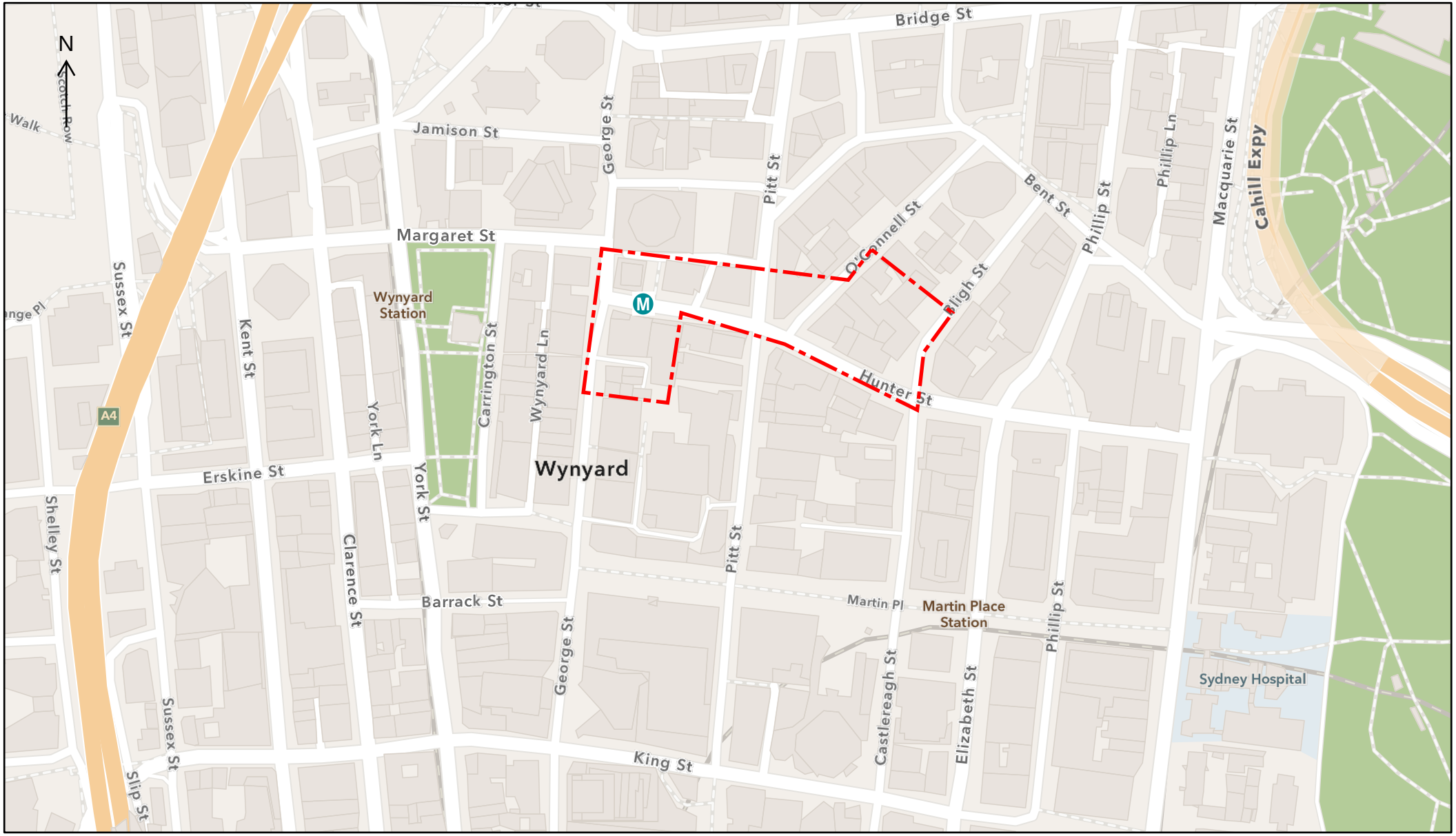

Figure 11. Potential Hunter Street (Sydney CBD) Site Extent

Legend:

- Potential Site Extent
- Proposed Metro Station Location

1:5,000

0 0.04 0.07 0.14 mi

0 0.05 0.1 0.2 km

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS

Jemena Gas Networks (NSW) Ltd

Jemena
Sydney Metro West Integrated Station Development
Gas Servicing Assessment

An appropriate citation for this paper is:

Jemena
Sydney Metro West Integrated Station Development
Gas Servicing Assessment

Contact Person

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Engineer - Capacity Planning
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North Sydney NSW 2060

Postal Address

PO Box 1220
North Sydney NSW 2060
Ph: (02) 9867 7000
Fax: (02) 9867 7010

Overview

The aim of this document is to provide a preliminary assessment of Jemena's existing infrastructure and outline Jemena Gas Network's capacity to service the new developments around Sydney Metro Stations. Where there is insufficient capacity to service the development then a gas reinforcement or network extension is specified. Gas loads that are supplied by Sydney Metro for the following Sydney Metro Stations; Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street.

Recommendations on route selection and reinforcements are subject to change with a detailed review of the proposed gas supply options.

Figure 1-1: Sydney Metro West stations

1. Commercial Feasibility

Natural Gas is available in the vicinity of some of these developments and may be able to supply these proposals.

Our policy is to supply all developments wherever possible, depending upon economic viability.

In consideration of our shareholders' interests and under NSW regulation, Jemena Gas Networks (NSW) Ltd is required to ensure that any connection to the natural gas distribution system is commercially viable and therefore must assess each request for supply on an individual basis.

Upon the provision of the final layout and load configurations for the developments a full economic evaluation can be undertaken to determine the viability of supplying natural gas to the site, as a contribution may be required to assist in the economic viability of the proposal.

There will be costs associated with disconnections and any relocation works that are required.

To assist in the planning of supply to these development I can advise that;

• The sites to be developed are either reticulated with gas;

• Where the existing network in an area does not have sufficient capacity to supply the additional load a network reinforcement will be required, and a contribution may be required.

• Costs will be associated with any works that require Jemena to relocate, provision with additional assets / or extend the existing gas network.

• See below for an assessment for each site.

2. Gas Loads

The table provided by Sydney Metro is used for modelling the loads at the aforementioned locations:

Investigation Area		Residential Apartments[3] (No.)	Indicative Commercial Space GFA[2] (m^2)	Indicative Retail Space GFA[2] (m^2)	Development Timeframe (Year)
1.	Westmead	250	40,000	4,500	2028 - 2032
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3.	Clyde MSF	N/A	N/A	N/A	2024 - 2028
4.	Sydney Olympic Park	1,000	35,000	8,000	2024 - 2028
5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
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9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

2.1 Assumptions

2.1.1 Gas Loads – Residential Apartments

Based on the information provided, an energy demand of 2.17m^3/day/dwelling is used for the residential apartments. Modelling is based on peak consumption. Therefore, it is assumed that two thirds of the load is consumed during the peak periods of the day. The peak period for residential gas consumption is from 6 am to 8 am, and 4 pm to 8 pm. A total of 8 hours / day for peak usage.

As an example, the load for 723 residential apartments in Westmead is as follows:

250 apartments x (2.17m^3/day/dwelling) x 2/3

= 362 m^3/peak period of 8 hours

The model requires the load to be provided as an hourly rate. Therefore, 362 m^3/8 = ~45 m^3/hr (1.7 GJ/hr)

By this method, the following table is assumed for these sites:

Metro Location	Hourly Consumption (m^3/hr)
Westmead	45
Parramatta	45

2.1.2 Gas Loads - Commercial & Retail

Commercial and Retail gas demand profiles were not advised by Sydney Metro. However, an estimated gas usage has been assumed for the purposes of modelling.

The following commercial and retail loads are implemented into the modelling:

Metro Location	Commercial (m^3/hr)	Retail (m^3/hr)
Westmead	400	50
Parramatta	1500	200

As the demand profiles become known, Jemena will be able re-evaluate the networks, and consider alternative reinforcement options if required.

3. Westmead

Medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Hawkesbury road (DN 75mm NY in 4” Cast iron conduit), and Alexandra Ave (DN 75mm NY in 4” Cast iron conduit).

Currently, there is a feasibility study to relocate sections of main in the proposed metro footprint. Namely along Alexandra Avenue. In order for this to be considered, existing mains in the adjoining roads will require sizing considerations. The advised load has been modelled on these considerations.

There is sufficient capacity to support the development in the advised footprint. However, should the mains from Alexandra Avenue be required to be isolated, reinforcements may be required.

Refer to Figure 2, specifying mains upgrades required based on the advised isolation.

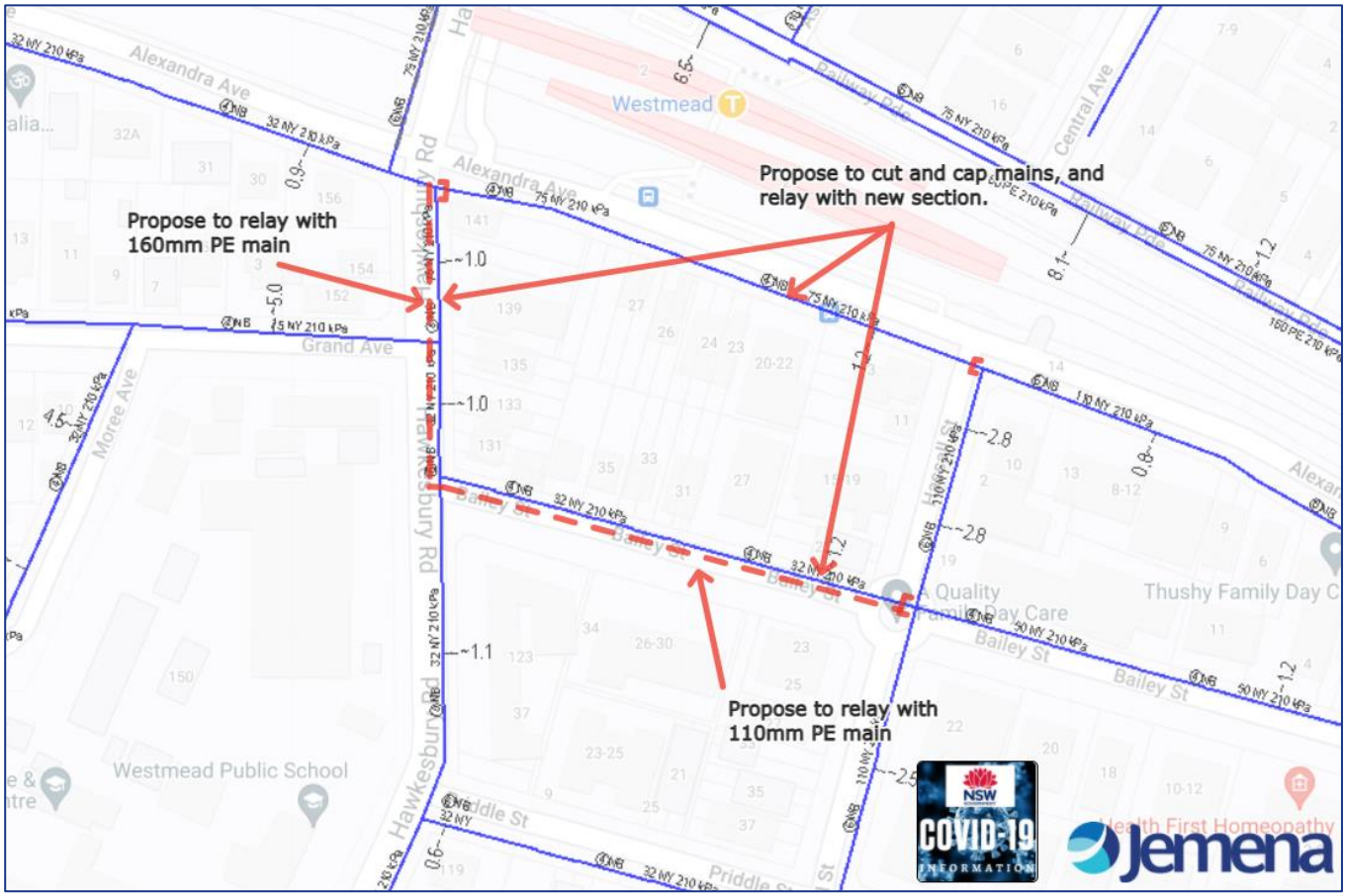

Figure 3-1: Westmead area Gas distribution network

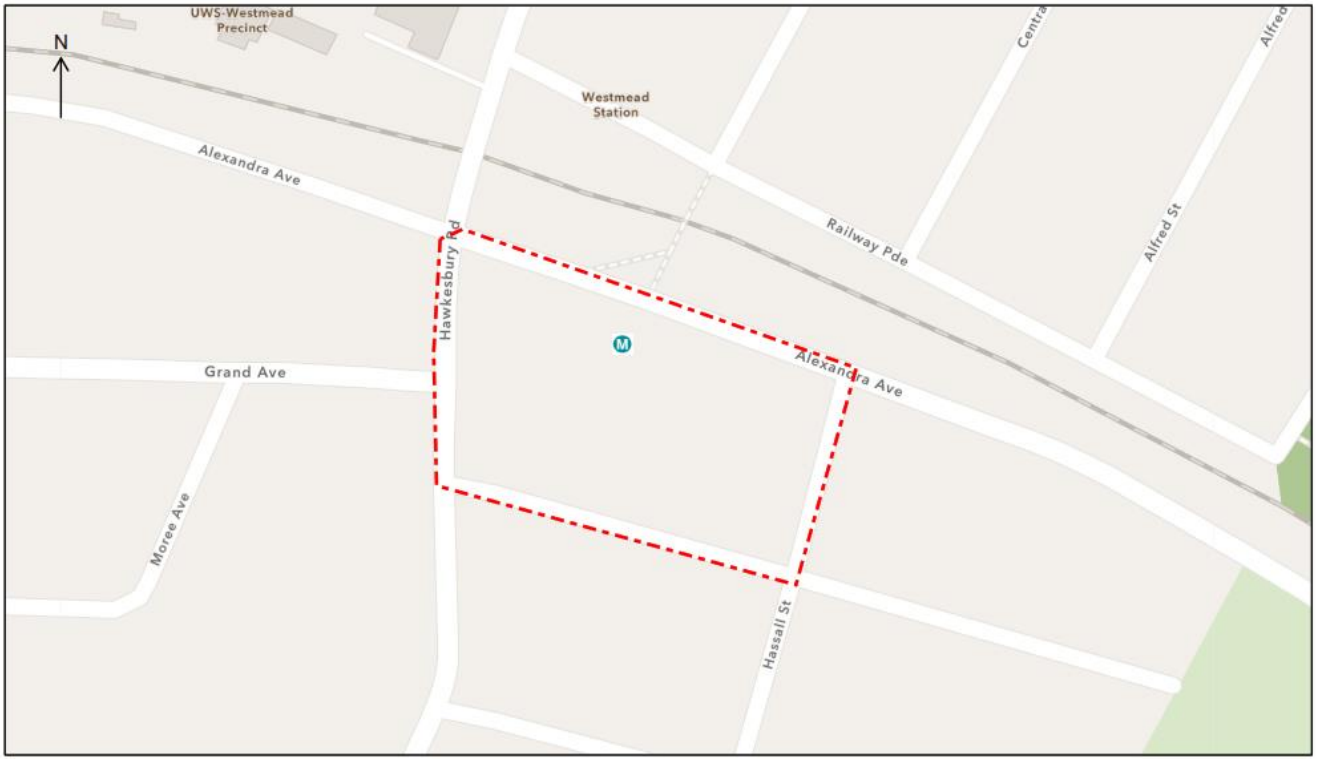

Figure 3-2: Westmead Metro Development advised by Sydney Metro

4. Parramatta

Both Secondary (denoted by the green lines within the map below), and Low pressure (denoted by the magenta coloured lines within the map below) Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Macquarie street (DN160mm PE), and Smith street (DN 150 ST).

4.1 Proposed connection strategy

Similar to the proposed Westmead Metro station, there is a feasibility study to consider sections of gas main to be relocated / isolated within the proposed footprint of the Parramatta metro station. Namely, Horwood Place.

In assessing the load requirements, there is insufficient capacity in the Low pressure network to support the development load within the block. However, as the secondary pressure network traverses along Smith street, dedicated mains, or services may be able connect indirectly to this network.

Depending on the development and load requirements, Jemena will be able to assess the design requirements in order to provision the load of the proposed development.

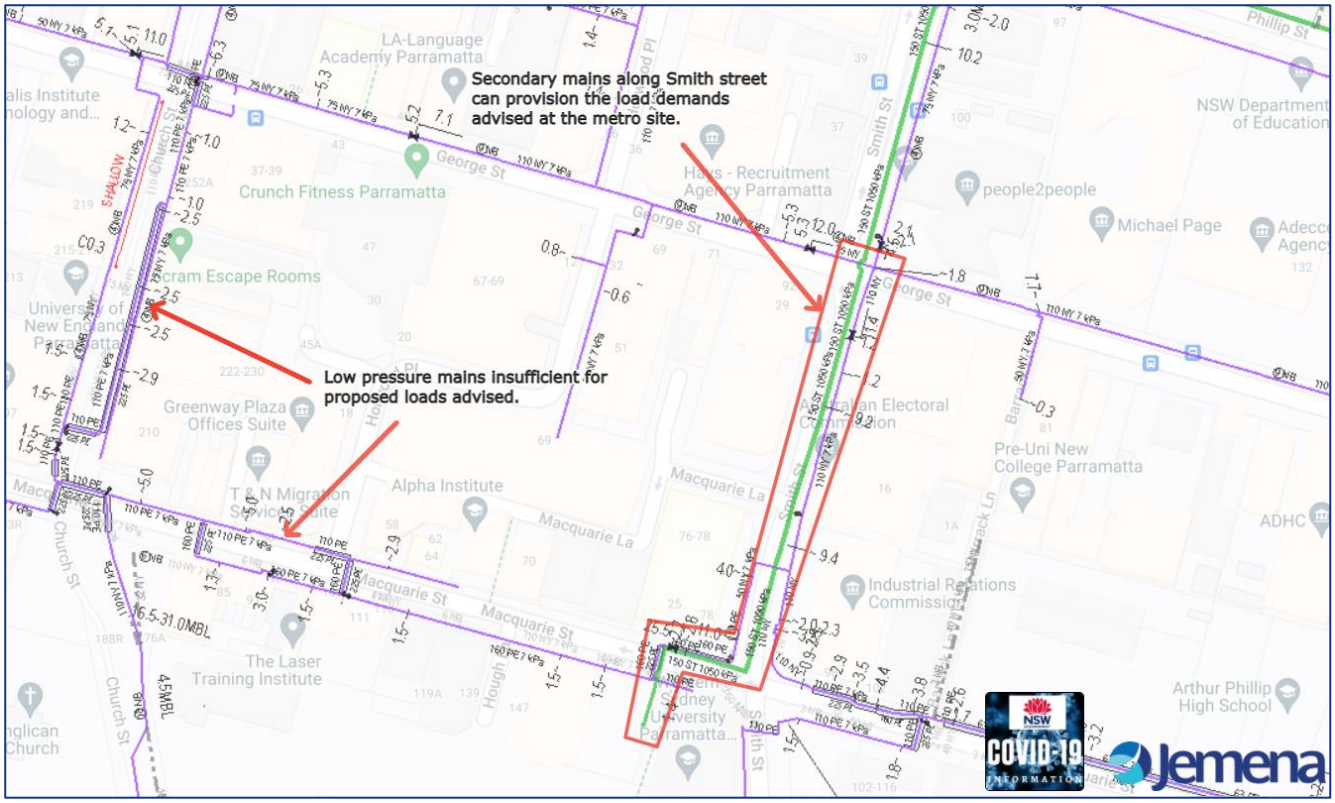

Figure 4-1: Mains for the Parramatta Sydney Metro Development

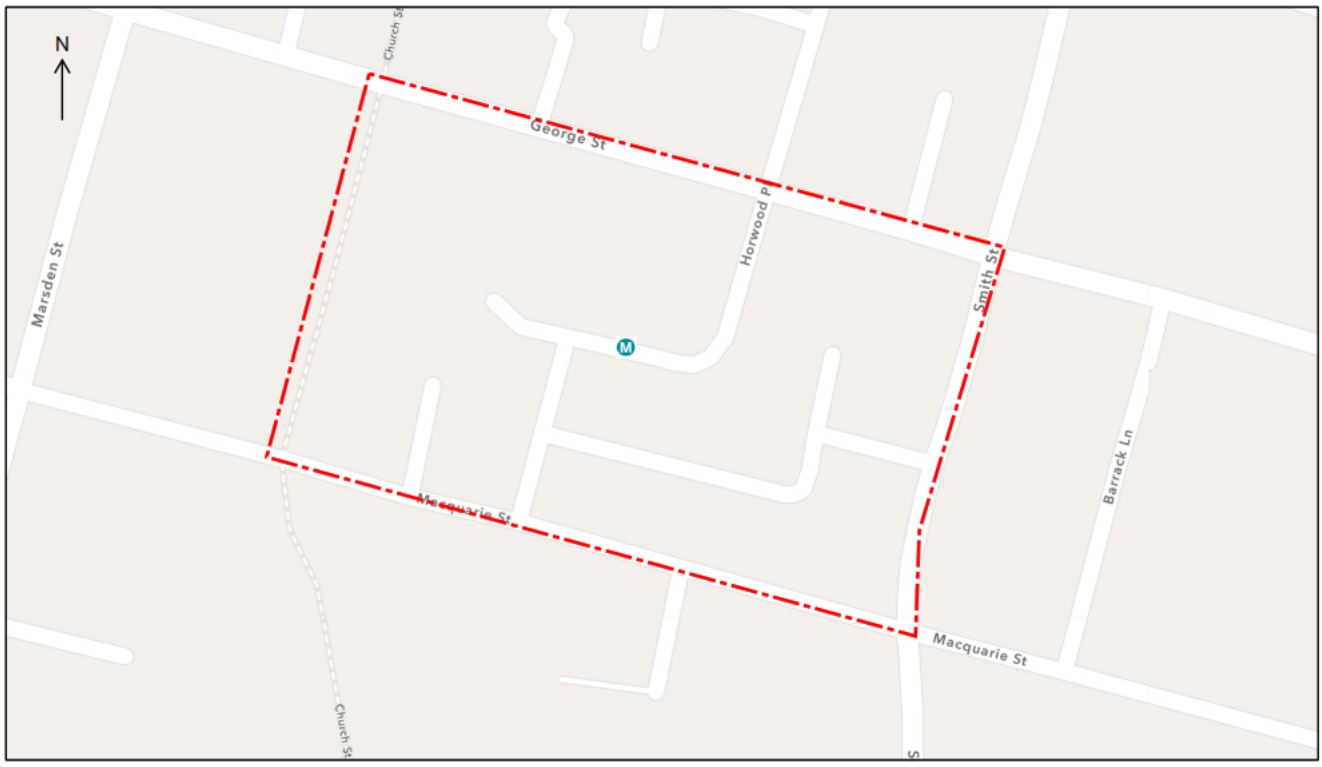

Figure 4-2: Parramatta Metro Development advised by Sydney Metro

5. Sydney Olympic Park

5.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and medium pressure (blue) assets and a secondary regulator set at the corner of Herb Elliot Ave and Olympic Blvd. Also, high pressure primary main (pink) is in the vicinity. Detailed clash assessment will be required to identify extent of actual impact

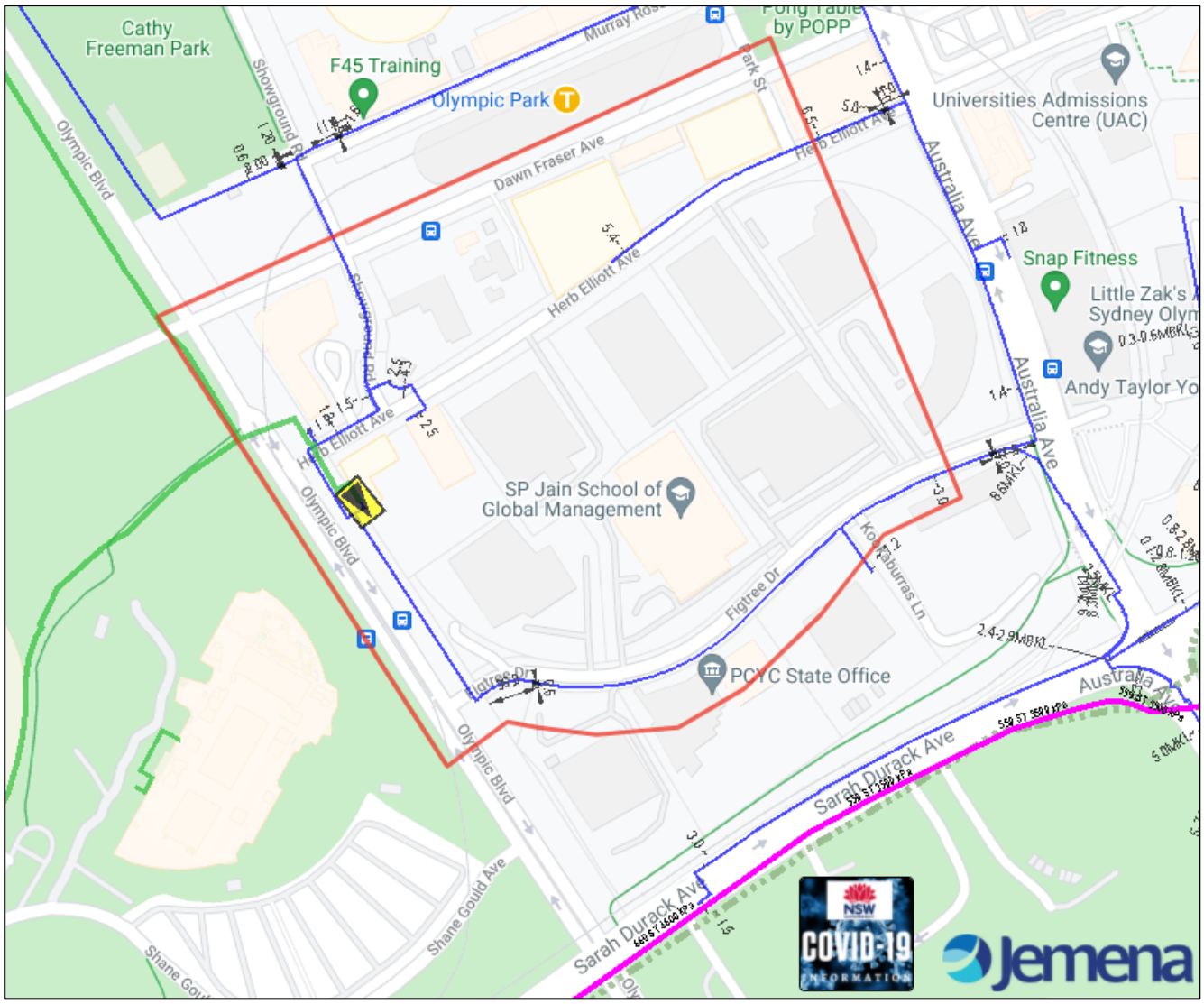

Figure 5-1 Sydney Olympic Park – Existing Jemena Network

5.2 Gas Loads

There will be a total of 1000 residential apartments with 35000sqm of commercial space and 8000sqm of retail space. The load details provided by Sydney Metro did not specify where they are located. Therefore the load has been split over the entire area.

5.3 Proposed connection strategy

To cater the proposed demand, new regulator set will be required. Also, one 110mm PE main interconnection in Herb Elliott Ave and one main upgrade in Olympic Blvd is also required. Refer to Figure 5-2 for details.

Figure 5-2 Mains upgrade plan for Sydney Olympic Park Sydney Metro Development

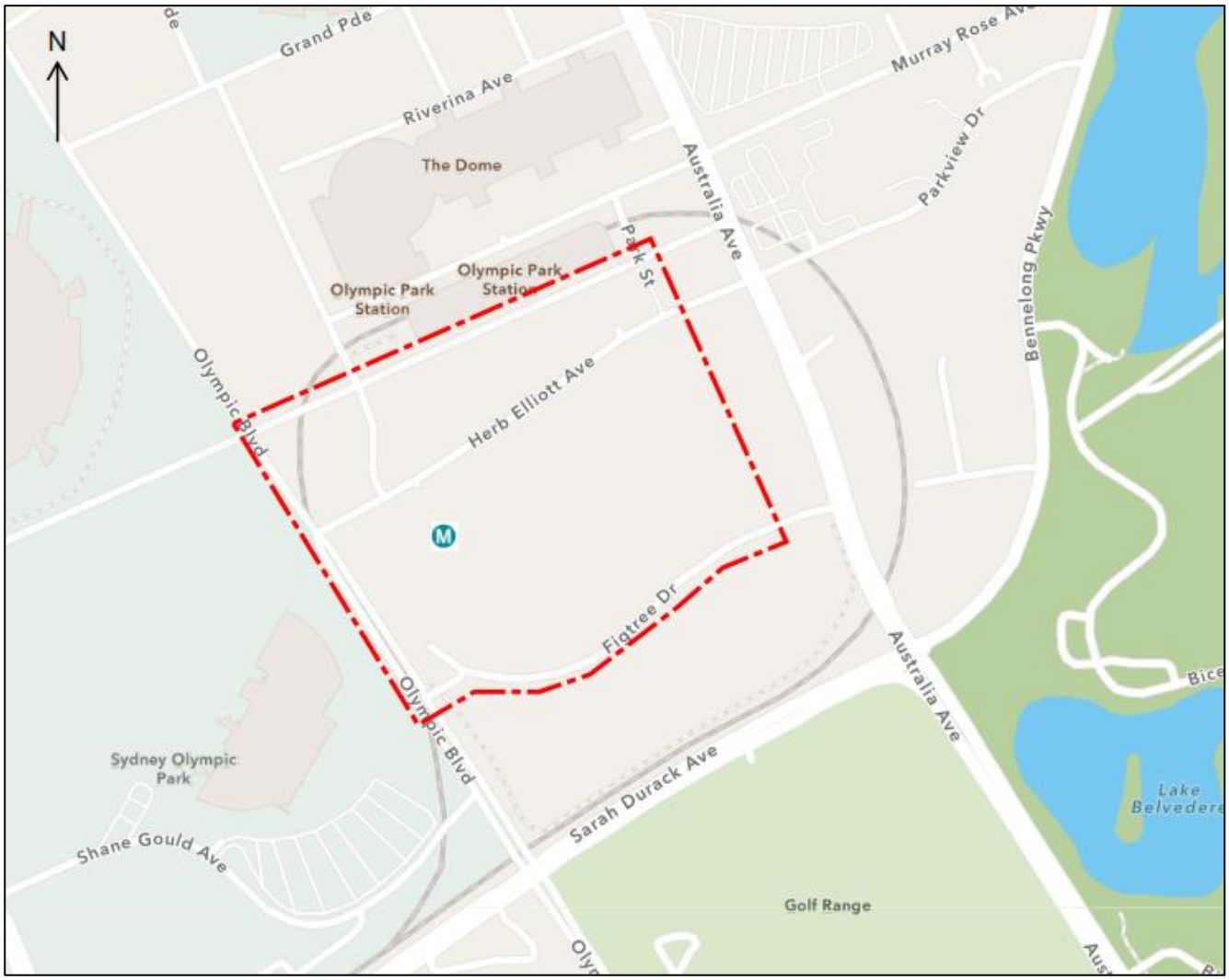

Figure 5-3 Sydney Olympic Park Metro Development advised by Sydney Metro

6. North Strathfield

6.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and medium pressure (blue) assets. Detailed clash assessment will be required to identify extent of actual impact.

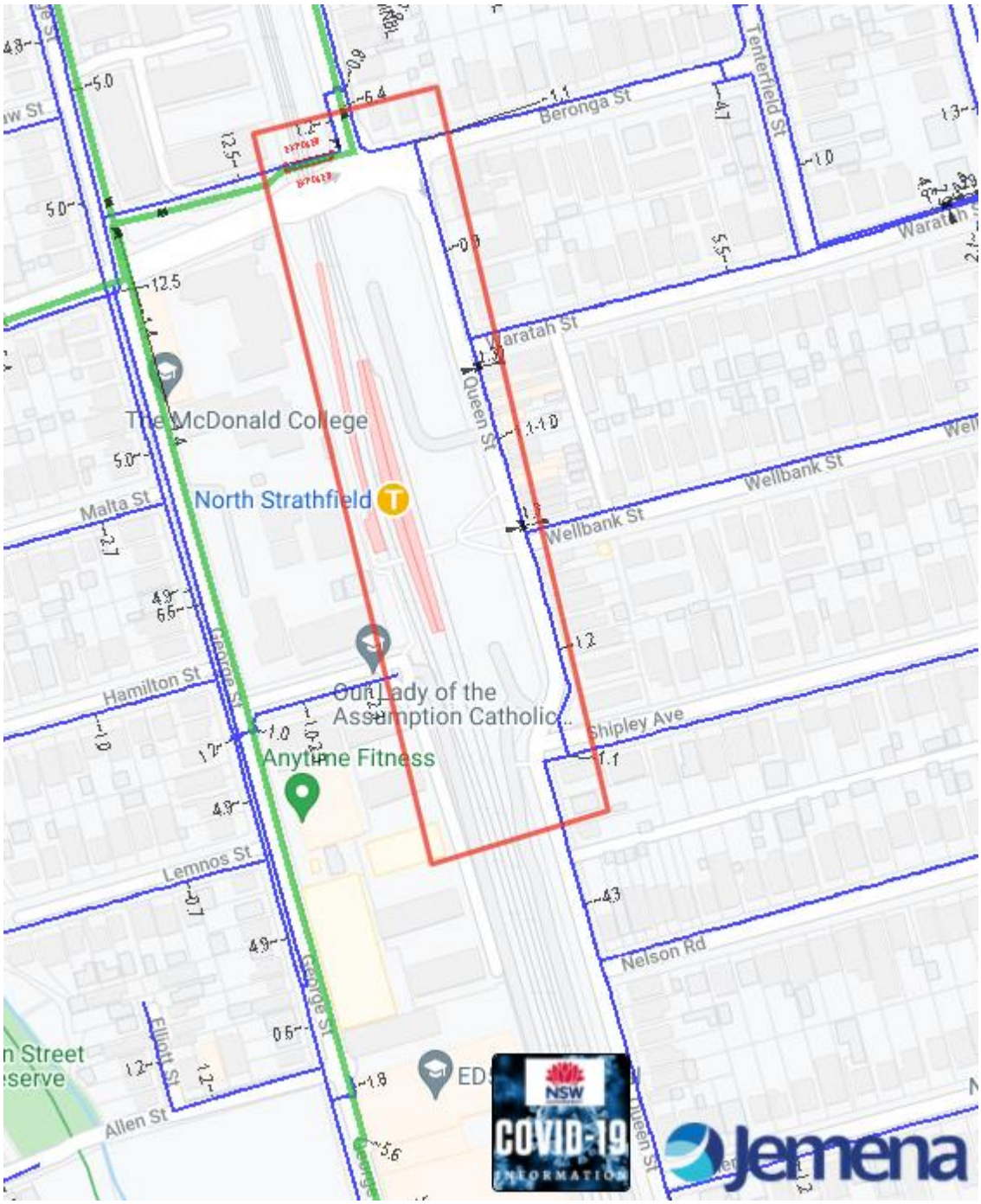

Figure 6-1 North Strathfield – Existing Jemena Network

6.2 Gas Loads

No gas load.

6.3 Proposed connection strategy

Capacity assessment not required as there is no demand requirement.

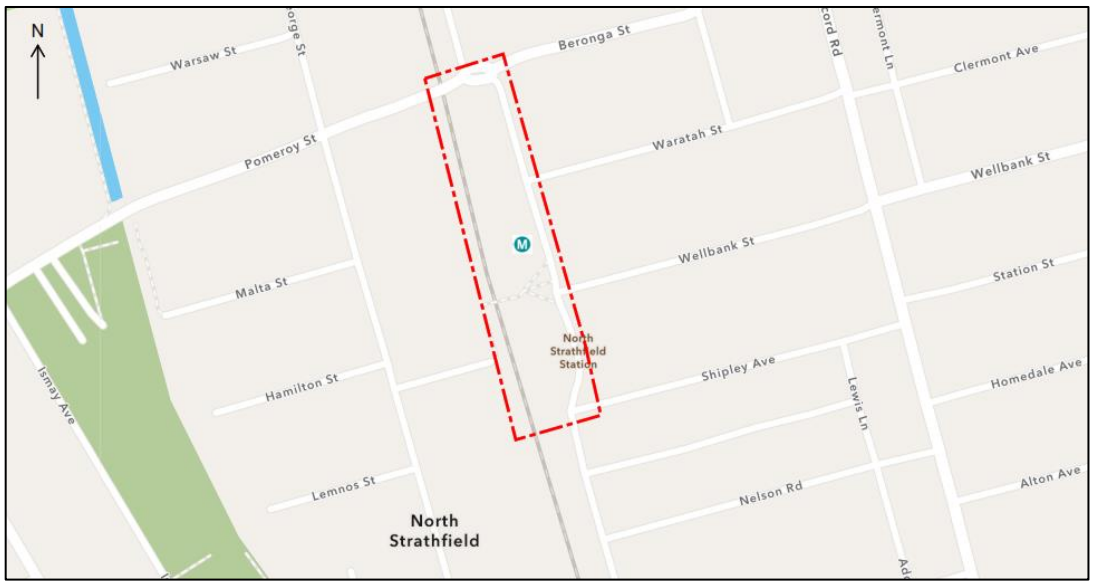

Figure 6-2 North Strathfield Metro Development advised by Sydney Metro

7. Burwood North

7.1 Existing Jemena network

Potential site extent may impact Jemena medium pressure (blue) and low pressure (magenta) assets. Detailed clash assessment will be required to identify extent of actual impact.

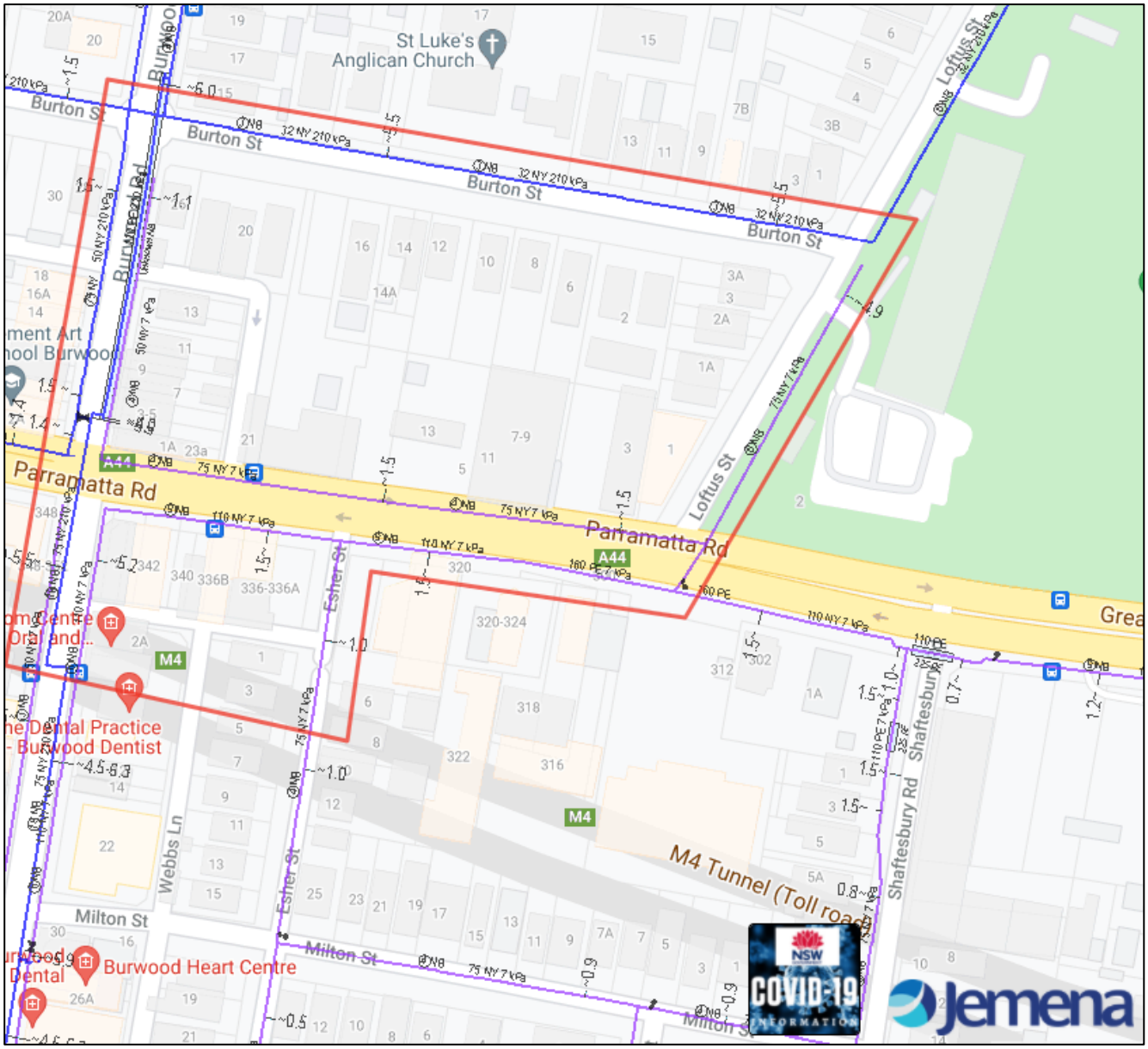

Figure 7-1 Burwood North – Existing Jemena Network

7.2 Gas loads

There will be a total of 1000 residential apartments with 35000sqm of commercial space and 8000sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

7.3 Proposed connection strategy

Medium pressure and low pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Burwood road (110mm PE in 36" Cast iron conduit). This main will be difficult to access in order supply to the proposed station.

However, if the supply point is to come from adjoining streets (Burton Street and Loftus St), pipe size upgrade will be required due to smaller diameter mains.

There is sufficient capacity in the medium pressure network to support the development in the advised footprint. However, low pressure network does not have sufficient capacity. If the supply is to come from streets with low pressure, medium pressure mains extension will be required. Refer to Figure 7-2 for details.

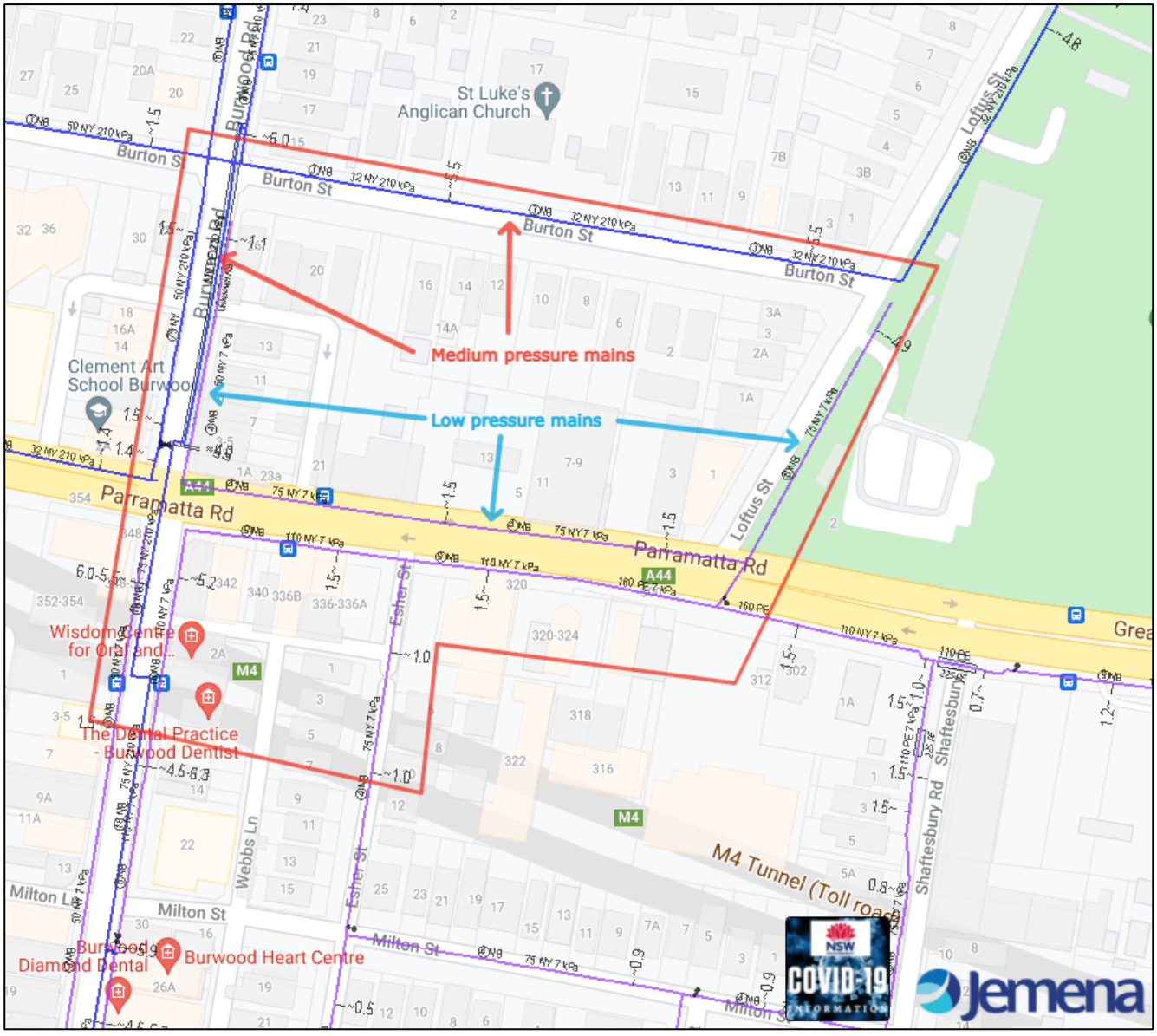

Figure 7-2 Mains for the Burwood North Sydney Metro Development

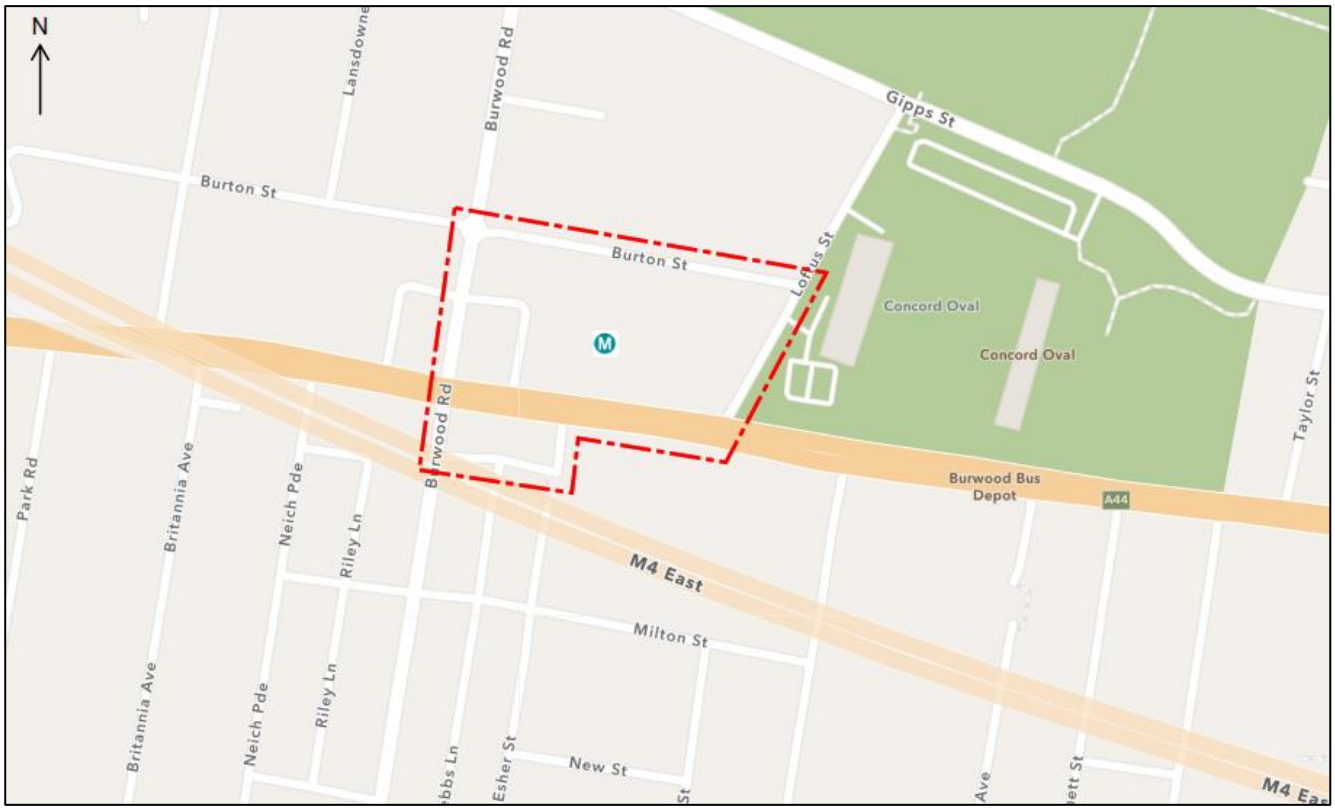

Figure 7-3 Burwood North Metro Development advised by Sydney Metro

8. Five Dock

8.1 Existing Jemena network

Potential site extent may impact Jemena medium pressure (blue) and low pressure (magenta) assets. Also, high pressure primary main (pink) is in the vicinity. Detailed clash assessment will be required to identify extent of actual impact.

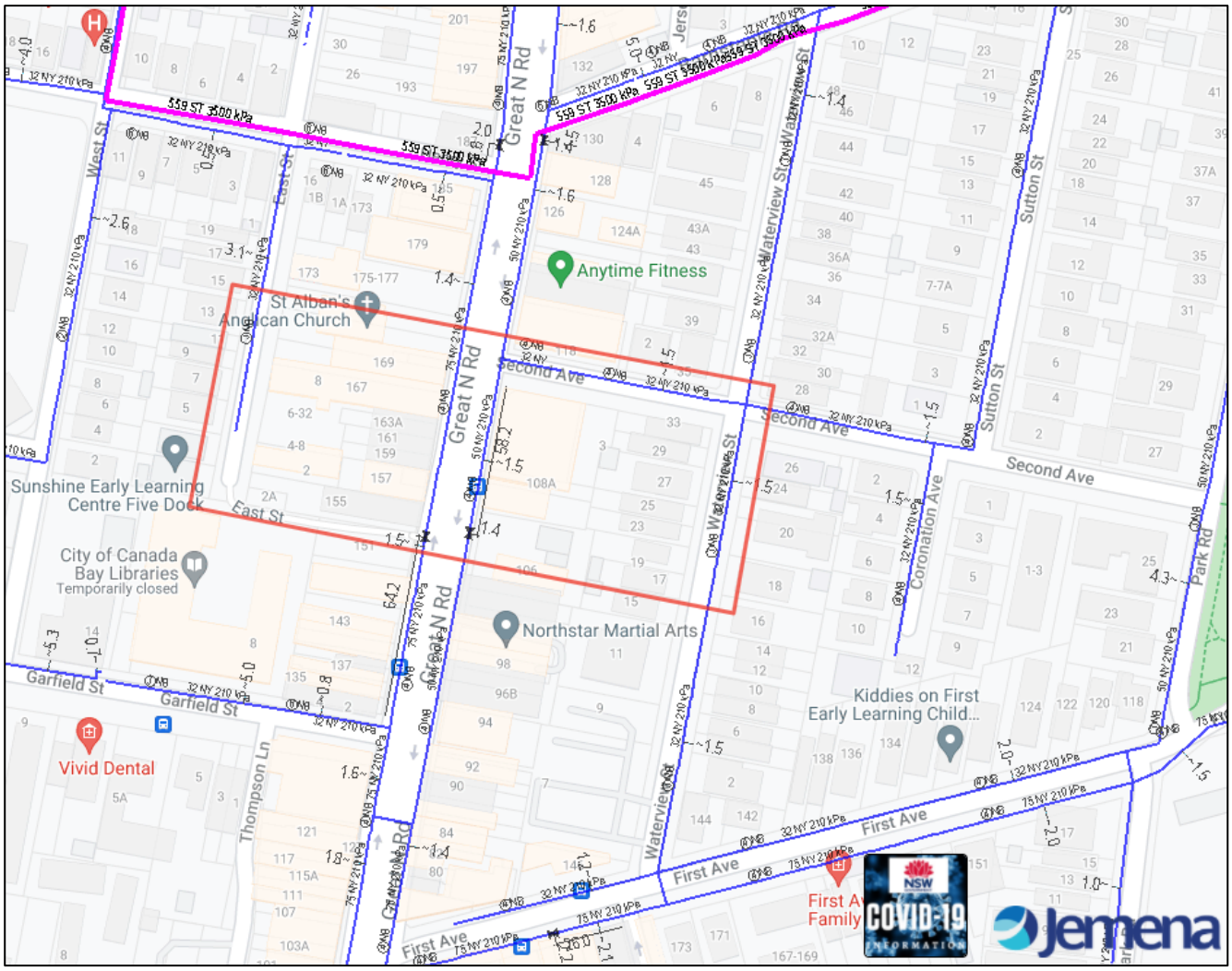

Figure 8-1 Five Dock – Existing Jemena Network

8.2 Gas loads

There will be a total of 210 residential apartments with 11000sqm of commercial space and 6000sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

8.3 Proposed connection strategy

Medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder main is along Great North Road (75mm NY in 4" Cast iron conduit).

There is sufficient capacity in the medium pressure network to support the development in the advised footprint.

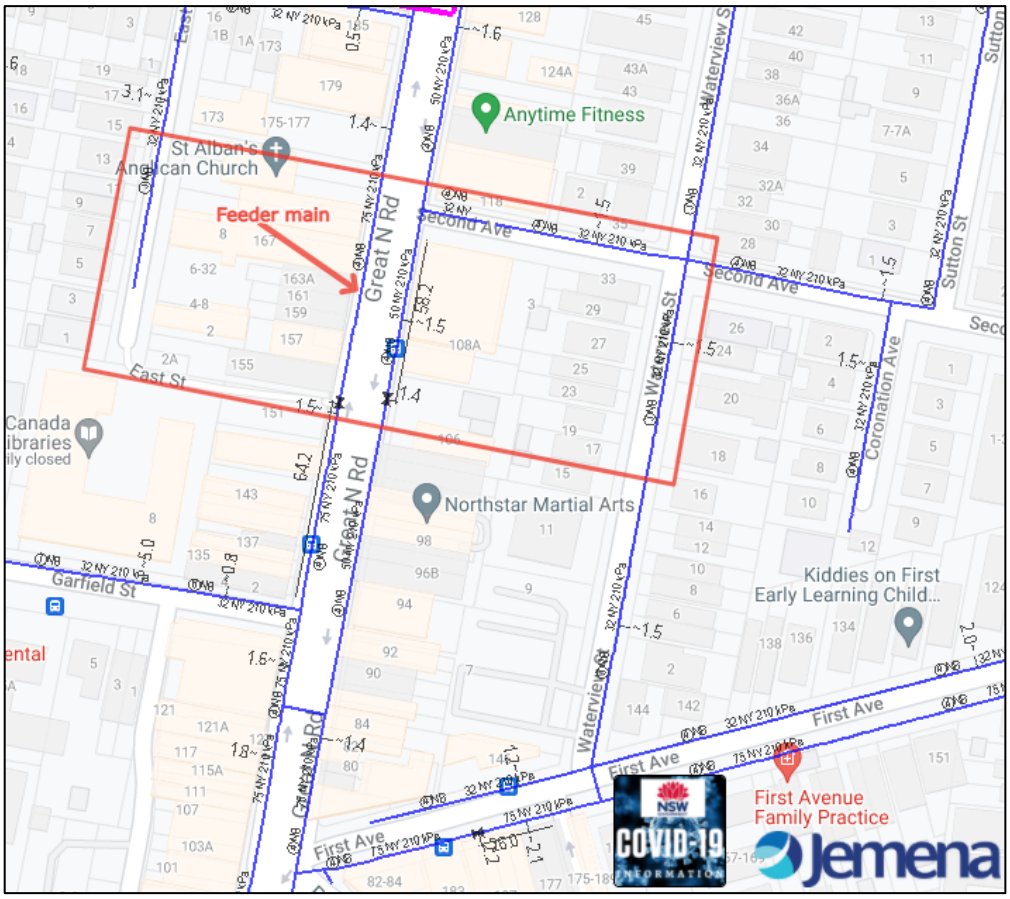

Figure 8-2 Mains for the Five Dock Sydney Metro Development

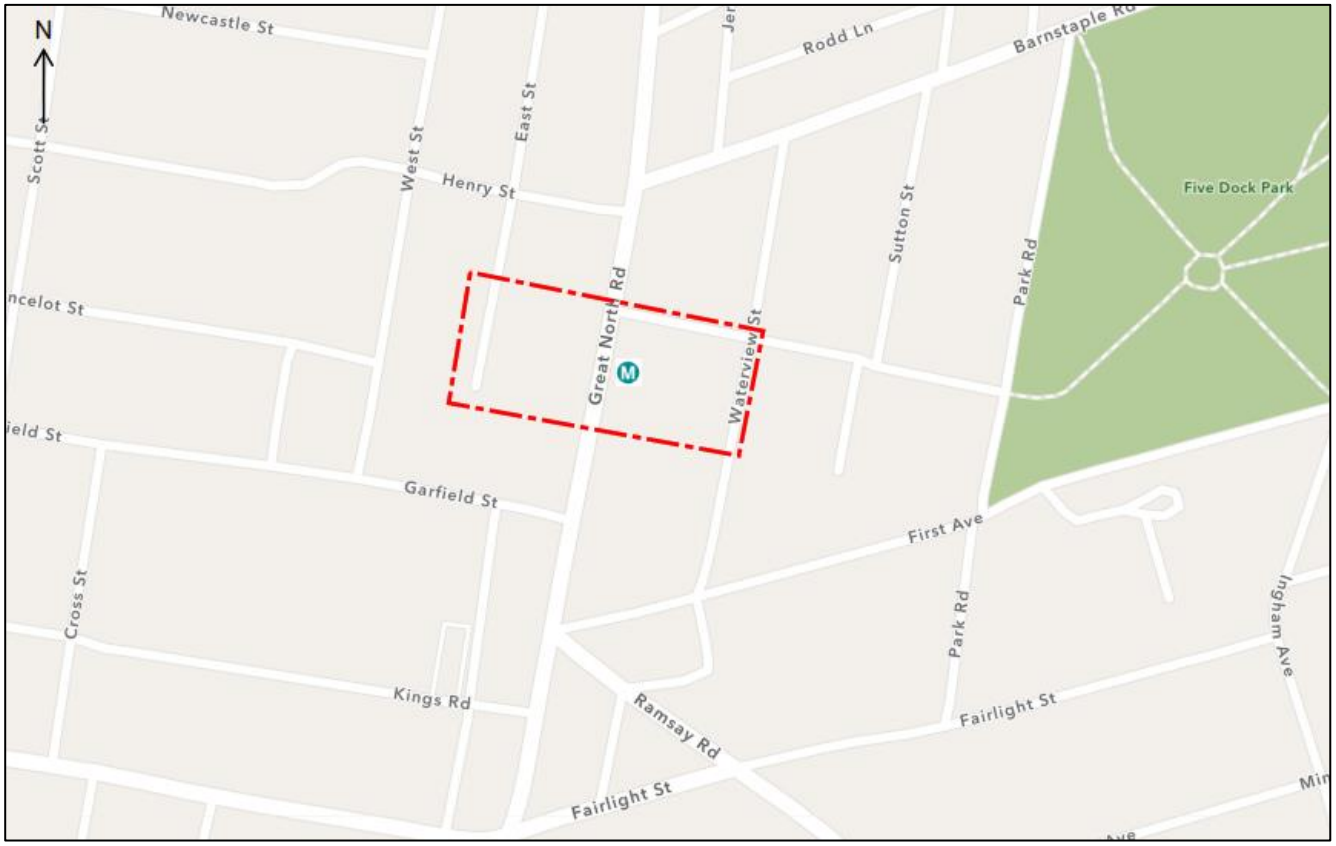

Figure 8-3 Five Dock Metro Development advised by Sydney Metro

9. The Bays

9.1 Existing Jemena network

Potential site extent may impact Jemena medium pressure (blue) assets. Detailed clash assessment will be required to identify extent of actual impact

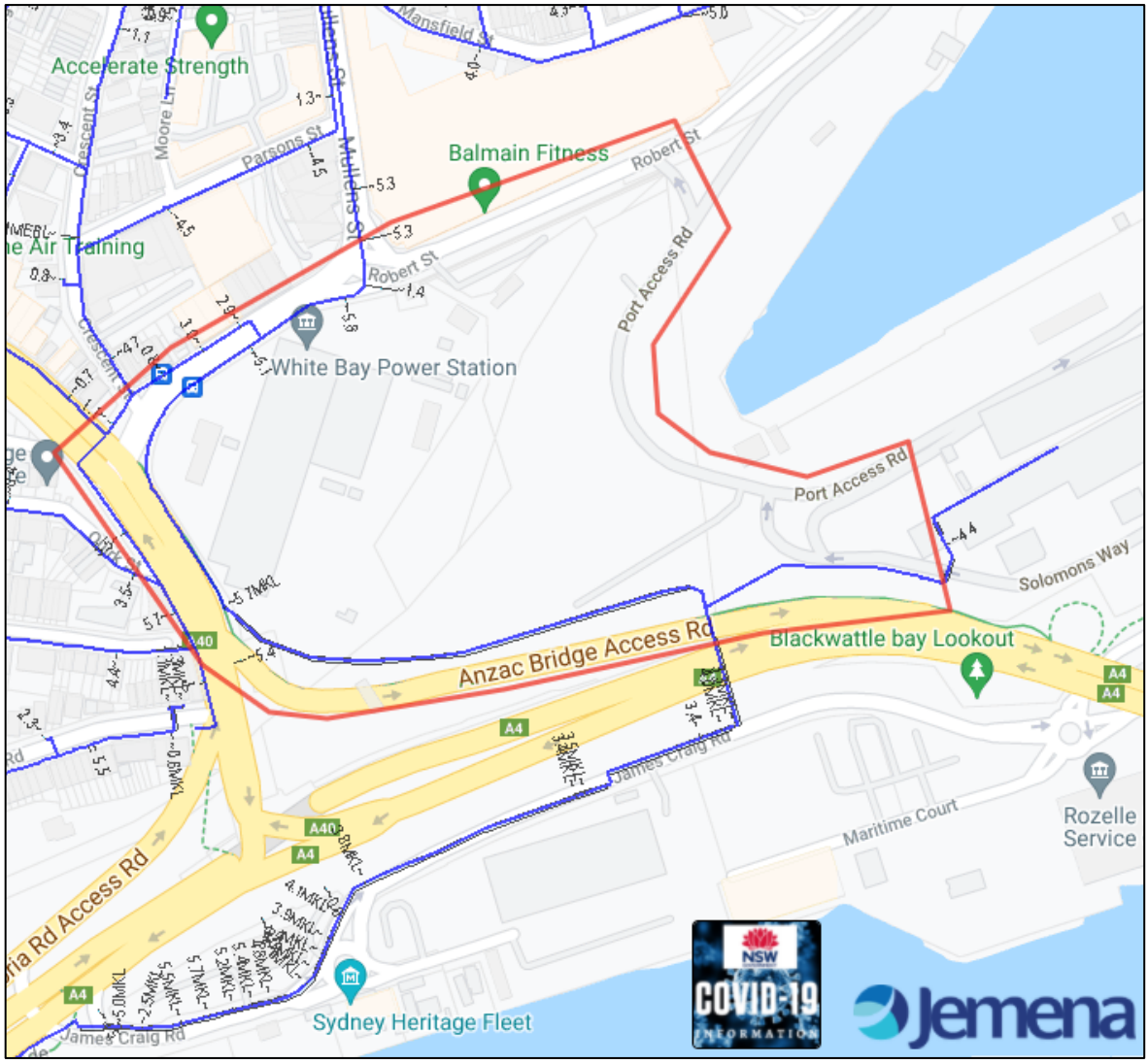

Figure 9-1 The Bays – Existing Jemena Network

9.2 Gas loads

There will be a total of 550 residential apartments with 32450sqm of commercial space and 6150sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

9.3 Proposed connection strategy

Medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder main is along Robert St, Victoria Rd and Anzac Bridge Access Rd (160mm PE part of it in 225mm PE conduit).

There is sufficient capacity in the medium pressure network to support the development in the advised footprint.

Figure 9-2 Mains for The Bays Sydney Metro Development

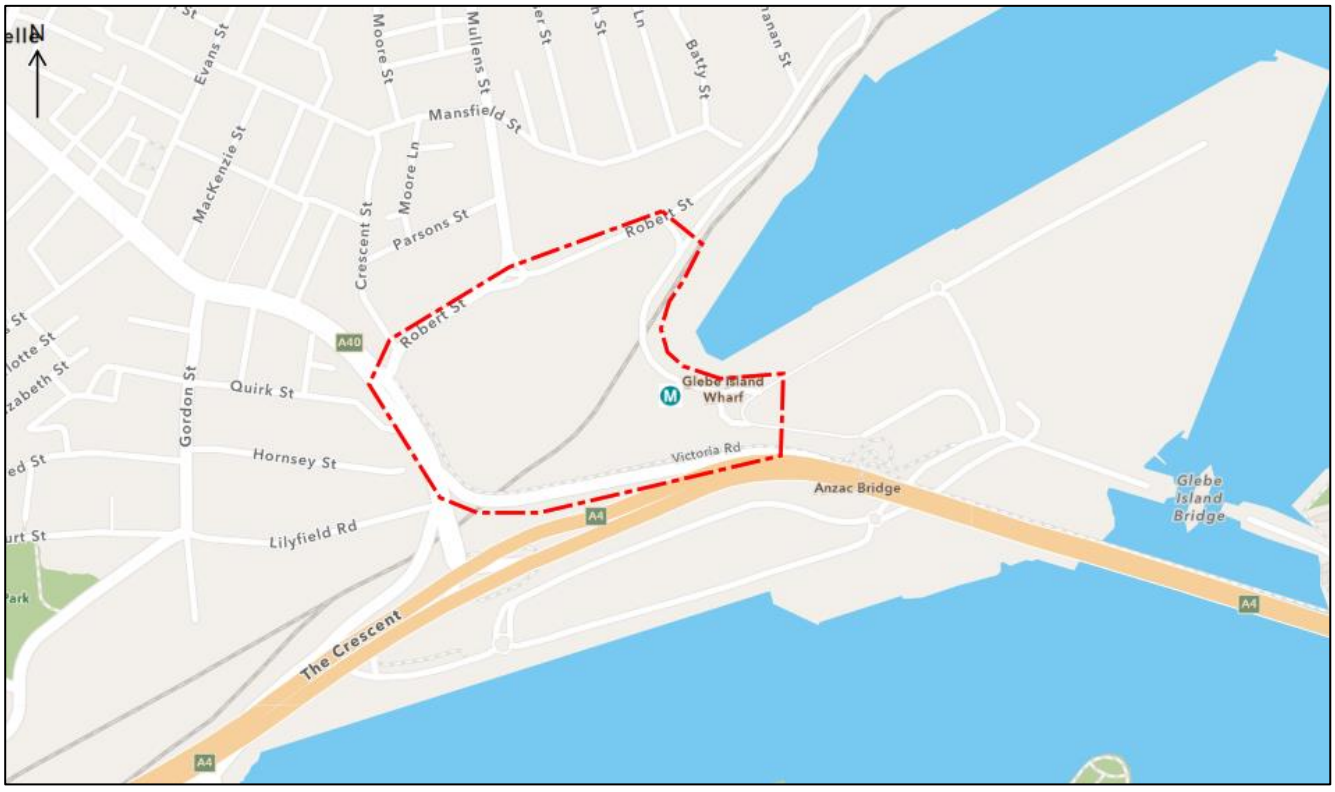

Figure 9-3 The Bays Metro Development advised by Sydney Metro

10. Pyrmont

10.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and medium pressure (blue) assets. Detailed clash assessment will be required to identify extent of actual impact.

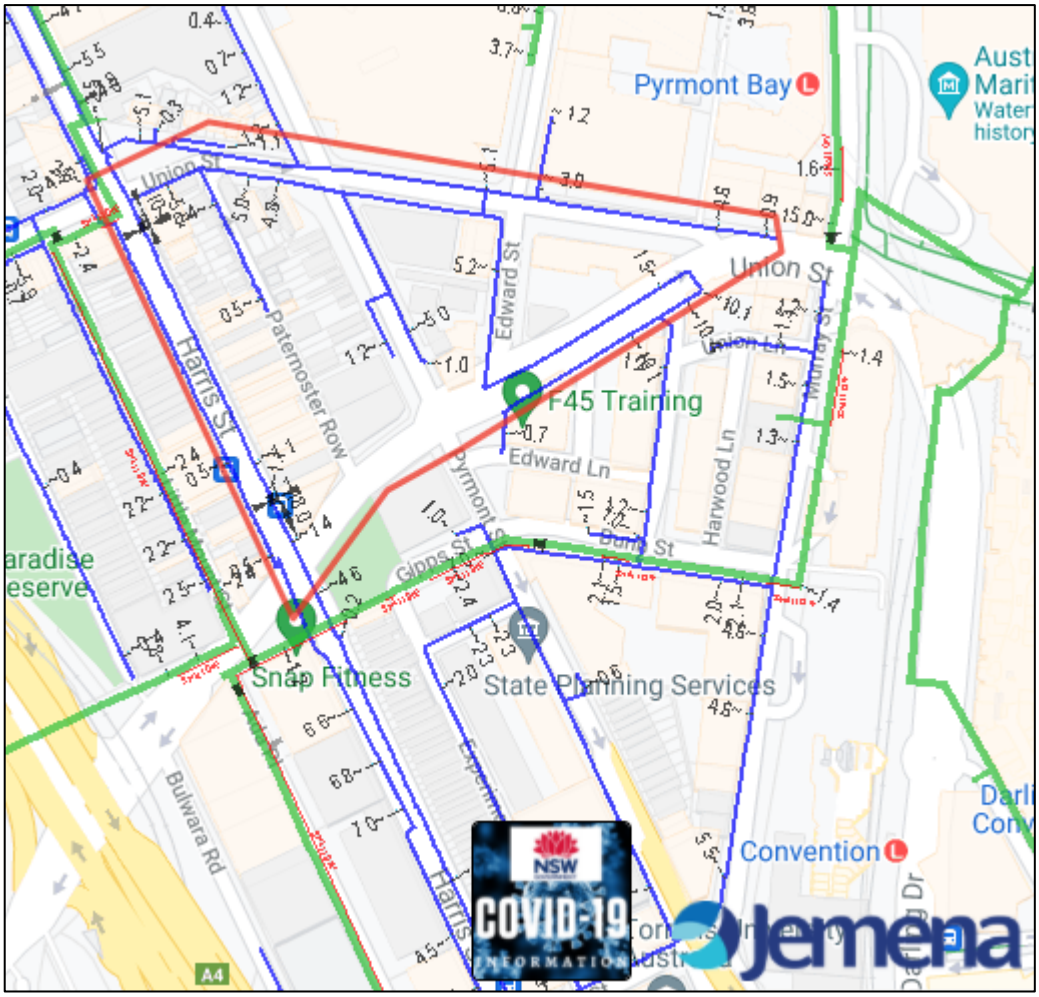

Figure 10-1 Pyrmont – Existing Jemena Network

10.2 Gas loads

There will be a total of 180 residential apartments with 8000sqm of commercial space and 500sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

10.3 Proposed connection strategy

Medium pressure and low pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Harris St (110mm NY).

There is sufficient capacity in the medium pressure network to support the development in the advised footprint. However, if the supply point is to come from adjoining streets with smaller diameter mains, pipe size upgrade or a road crossing reinforcement will be required.

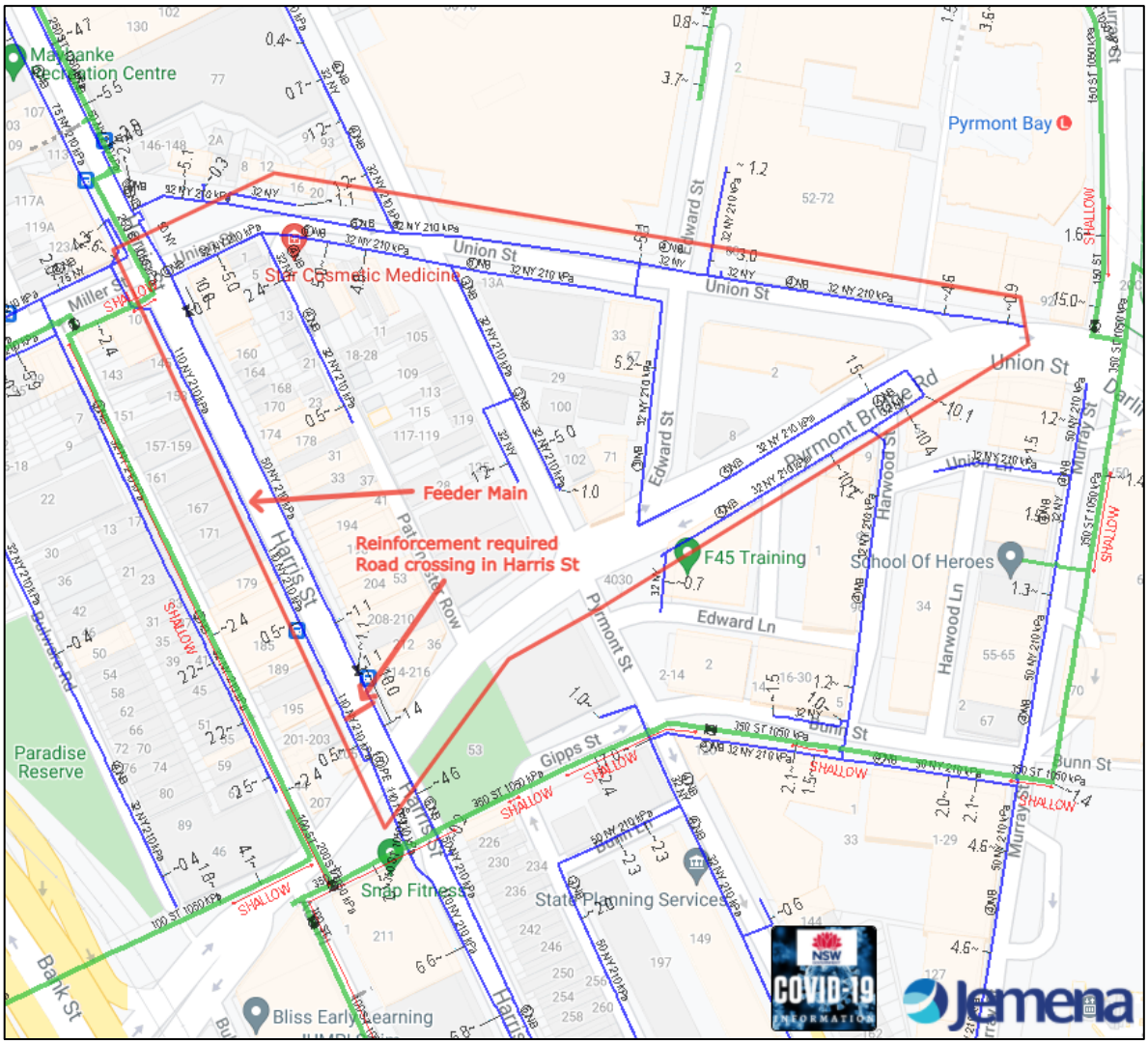

Figure 10-2 Mains for Pyrmont Sydney Metro Development

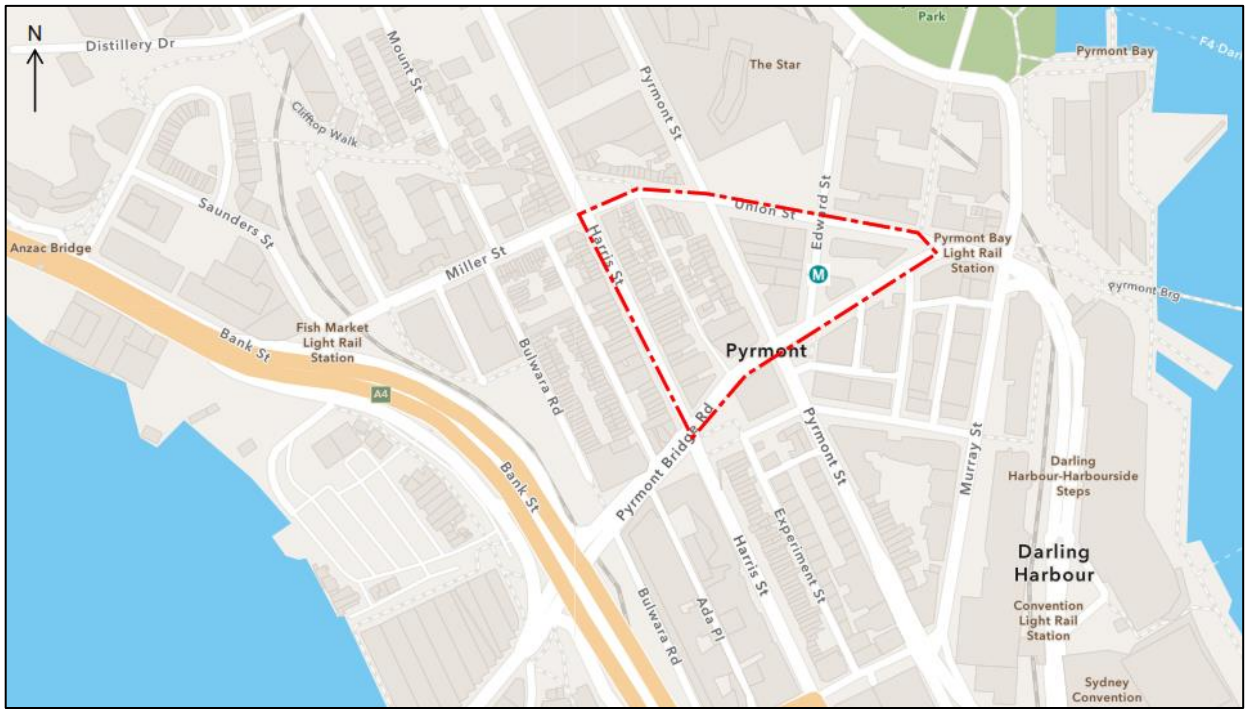

Figure 10-3 Pyrmont Metro Development advised by Sydney Metro

11. Hunter Street (Sydney CBD)

11.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and low pressure (magenta) assets. Detailed clash assessment will be required to identify extent of actual impact

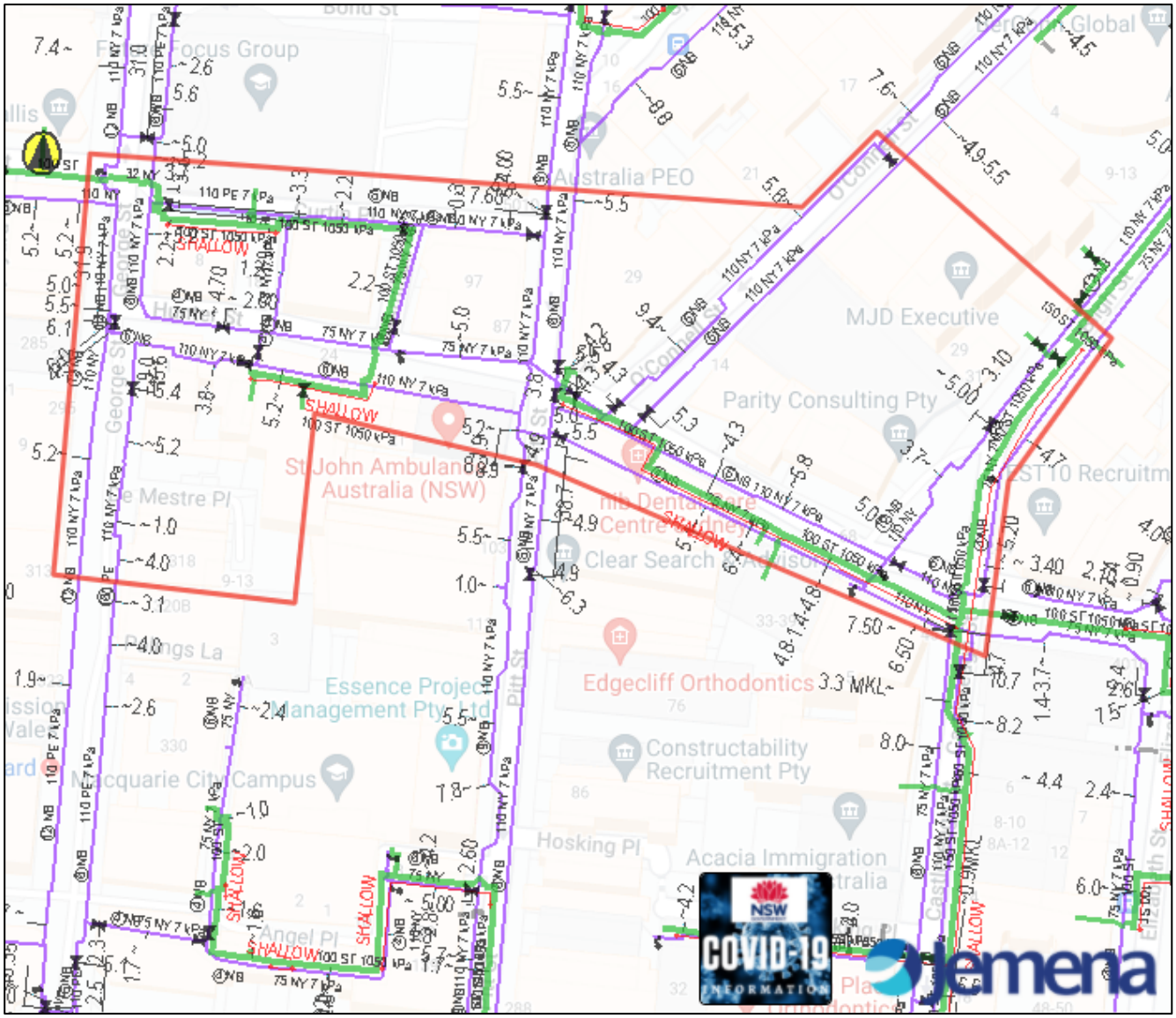

Figure 11-1 Hunter Street – Existing Jemena Network

11.2 Gas loads

There will be a total of 160000sqm of commercial space, 2000sqm of retail space and no residential apartments. The load details provided by Sydney Metro did not specify where they are located.

11.3 Proposed connection strategy

High pressure and medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. Low pressure network does not have sufficient capacity to supply the demand.

There is sufficient capacity in the high pressure network to support the development in the advised footprint.

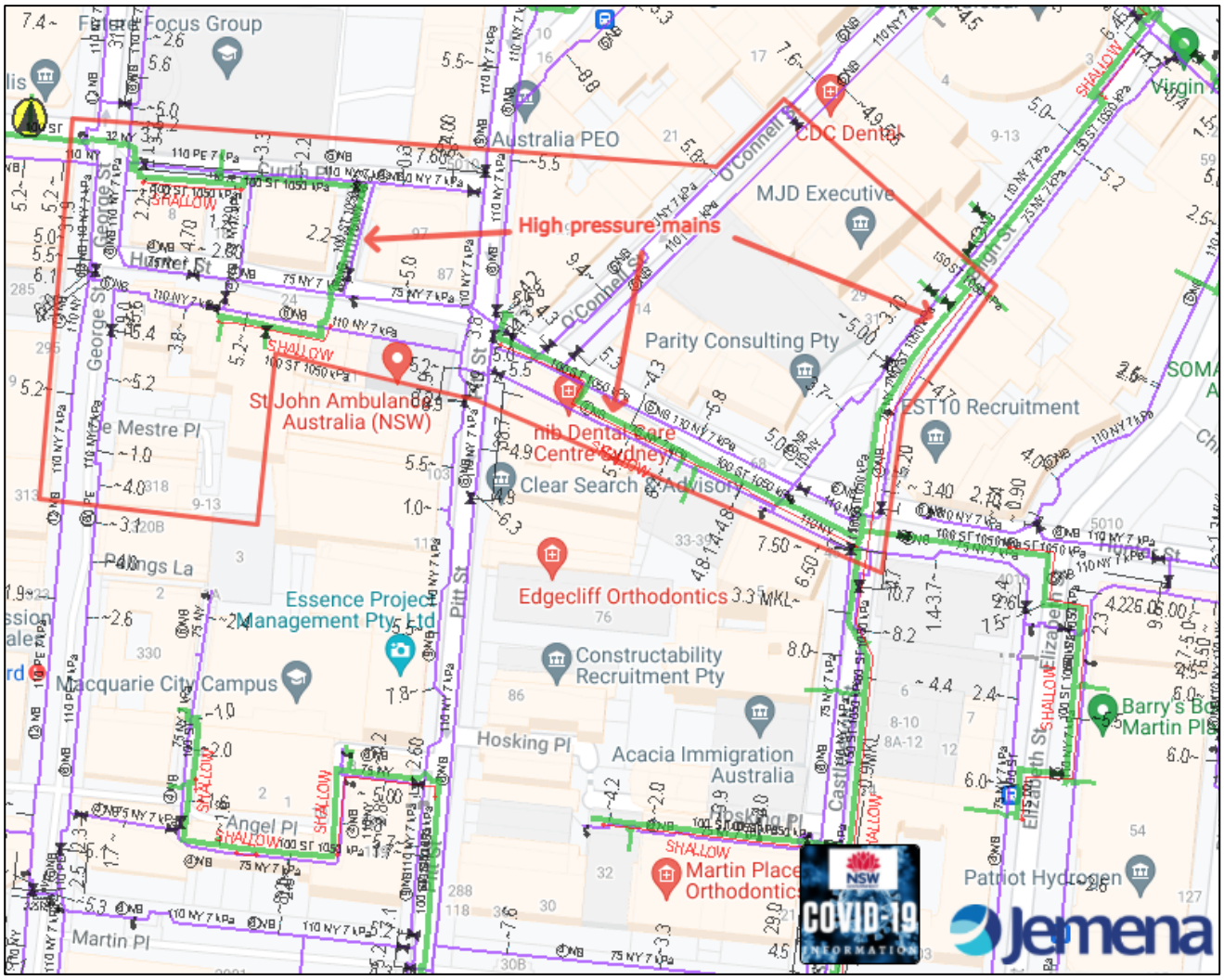

Figure 11-2 Mains for Hunter Street Sydney Metro Development

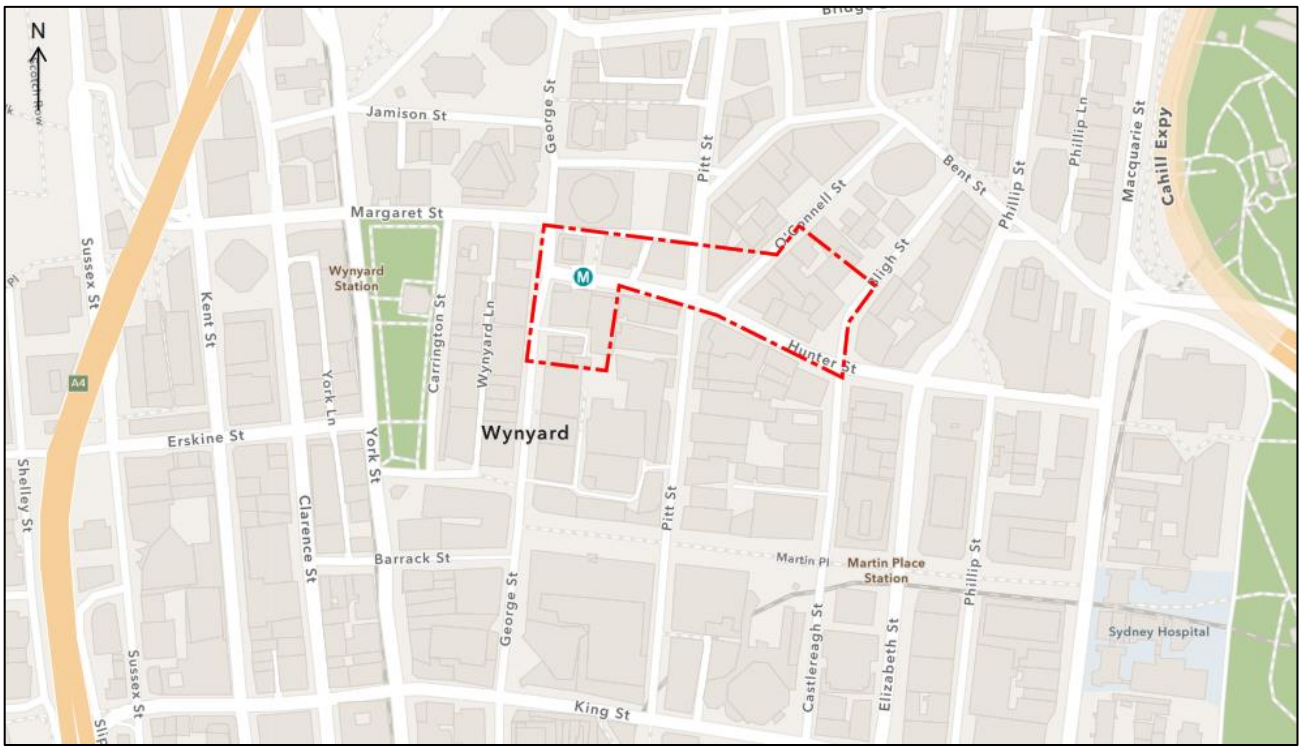

Figure 11-3 Hunter Street Metro Development advised by Sydney Metro

Appendix B – Response received from utility authorities

Jemena Gas Networks (NSW) Ltd

Jemena
Sydney Metro West Integrated Station Development
Gas Servicing Assessment

An appropriate citation for this paper is:

Jemena
Sydney Metro West Integrated Station Development
Gas Servicing Assessment

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North Sydney NSW 2060
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Fax: (02) 9867 7010

Overview

The aim of this document is to provide a preliminary assessment of Jemena's existing infrastructure and outline Jemena Gas Network's capacity to service the new developments around Sydney Metro Stations. Where there is insufficient capacity to service the development then a gas reinforcement or network extension is specified. Gas loads that are supplied by Sydney Metro for the following Sydney Metro Stations; Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street.

Recommendations on route selection and reinforcements are subject to change with a detailed review of the proposed gas supply options.

Figure 1-1: Sydney Metro West stations

1. Commercial Feasibility

Natural Gas is available in the vicinity of some of these developments and may be able to supply these proposals.

Our policy is to supply all developments wherever possible, depending upon economic viability.

In consideration of our shareholders' interests and under NSW regulation, Jemena Gas Networks (NSW) Ltd is required to ensure that any connection to the natural gas distribution system is commercially viable and therefore must assess each request for supply on an individual basis.

Upon the provision of the final layout and load configurations for the developments a full economic evaluation can be undertaken to determine the viability of supplying natural gas to the site, as a contribution may be required to assist in the economic viability of the proposal.

There will be costs associated with disconnections and any relocation works that are required.

To assist in the planning of supply to these development I can advise that;

• The sites to be developed are either reticulated with gas;

• Where the existing network in an area does not have sufficient capacity to supply the additional load a network reinforcement will be required, and a contribution may be required.

• Costs will be associated with any works that require Jemena to relocate, provision with additional assets / or extend the existing gas network.

• See below for an assessment for each site.

2. Gas Loads

The table provided by Sydney Metro is used for modelling the loads at the aforementioned locations:

Investigation Area		Residential Apartments[3] (No.)	Indicative Commercial Space GFA[2] (m^2)	Indicative Retail Space GFA[2] (m^2)	Development Timeframe (Year)
1.	Westmead	250	40,000	4,500	2028 - 2032
2.	Parramatta	250	150,000	20,000	2024 - 2028
3.	Clyde MSF	N/A	N/A	N/A	2024 - 2028
4.	Sydney Olympic Park	1,000	35,000	8,000	2024 - 2028
5.	North Strathfield	N/A	N/A	N/A	2024 - 2028
6.	Burwood North	210	11,000	6,000	2024 - 2028
7.	Five Dock	21	5,000	900	2024 - 2028
8.	The Bays	550	32,450	6,150	2024 - 2028
9.	Pyrmont	180	8,000	500	2024 - 2028
10.	Hunter Street (Sydney CBD)	0	160,000	2,000	2024 - 2028

2.1 Assumptions

2.1.1 Gas Loads – Residential Apartments

Based on the information provided, an energy demand of 2.17m^3/day/dwelling is used for the residential apartments. Modelling is based on peak consumption. Therefore, it is assumed that two thirds of the load is consumed during the peak periods of the day. The peak period for residential gas consumption is from 6 am to 8 am, and 4 pm to 8 pm. A total of 8 hours / day for peak usage.

As an example, the load for 723 residential apartments in Westmead is as follows:

250 apartments x (2.17m^3/day/dwelling) x 2/3

= 362 m^3/peak period of 8 hours

The model requires the load to be provided as an hourly rate. Therefore, 362 m^3/8 = ~45 m^3/hr (1.7 GJ/hr)

By this method, the following table is assumed for these sites:

Metro Location	Hourly Consumption (m^3/hr)
Westmead	45
Parramatta	45

2.1.2 Gas Loads - Commercial & Retail

Commercial and Retail gas demand profiles were not advised by Sydney Metro. However, an estimated gas usage has been assumed for the purposes of modelling.

The following commercial and retail loads are implemented into the modelling:

Metro Location	Commercial (m^3/hr)	Retail (m^3/hr)
Westmead	400	50
Parramatta	1500	200

As the demand profiles become known, Jemena will be able re-evaluate the networks, and consider alternative reinforcement options if required.

3. Westmead

Medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Hawkesbury road (DN 75mm NY in 4” Cast iron conduit), and Alexandra Ave (DN 75mm NY in 4” Cast iron conduit).

Currently, there is a feasibility study to relocate sections of main in the proposed metro footprint. Namely along Alexandra Avenue. In order for this to be considered, existing mains in the adjoining roads will require sizing considerations. The advised load has been modelled on these considerations.

There is sufficient capacity to support the development in the advised footprint. However, should the mains from Alexandra Avenue be required to be isolated, reinforcements may be required.

Refer to Figure 2, specifying mains upgrades required based on the advised isolation.

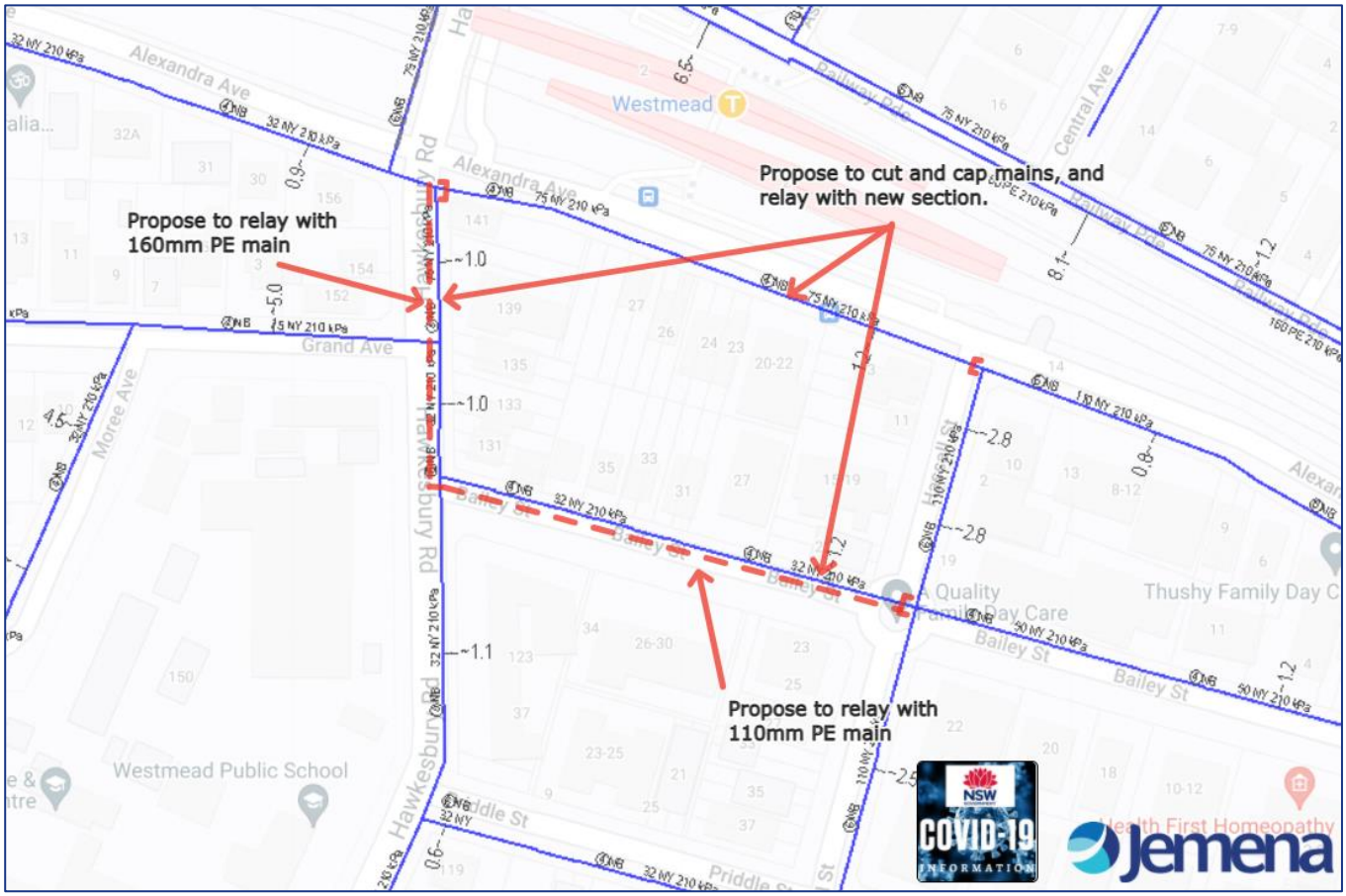

Figure 3-1: Westmead area Gas distribution network

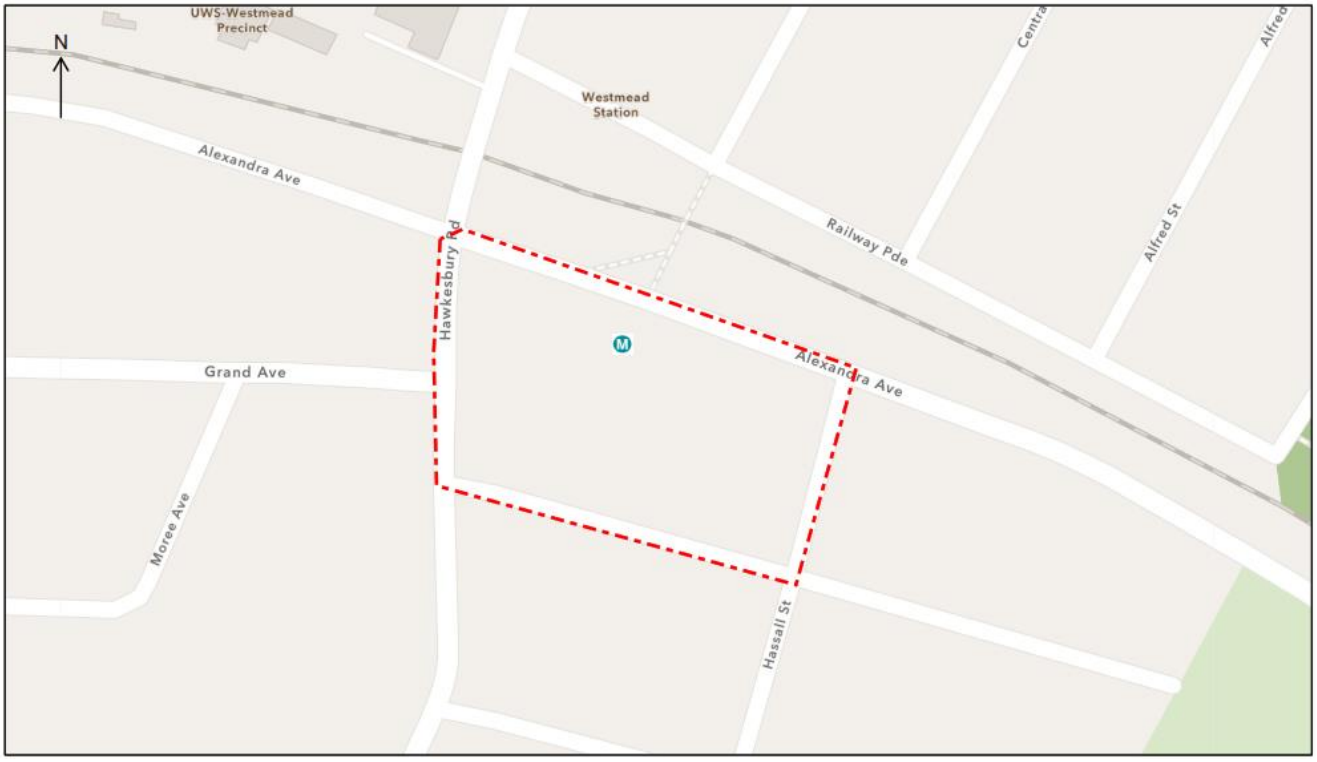

Figure 3-2: Westmead Metro Development advised by Sydney Metro

4. Parramatta

Both Secondary (denoted by the green lines within the map below), and Low pressure (denoted by the magenta coloured lines within the map below) Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Macquarie street (DN160mm PE), and Smith street (DN 150 ST).

4.1 Proposed connection strategy

Similar to the proposed Westmead Metro station, there is a feasibility study to consider sections of gas main to be relocated / isolated within the proposed footprint of the Parramatta metro station. Namely, Horwood Place.

In assessing the load requirements, there is insufficient capacity in the Low pressure network to support the development load within the block. However, as the secondary pressure network traverses along Smith street, dedicated mains, or services may be able connect indirectly to this network.

Depending on the development and load requirements, Jemena will be able to assess the design requirements in order to provision the load of the proposed development.

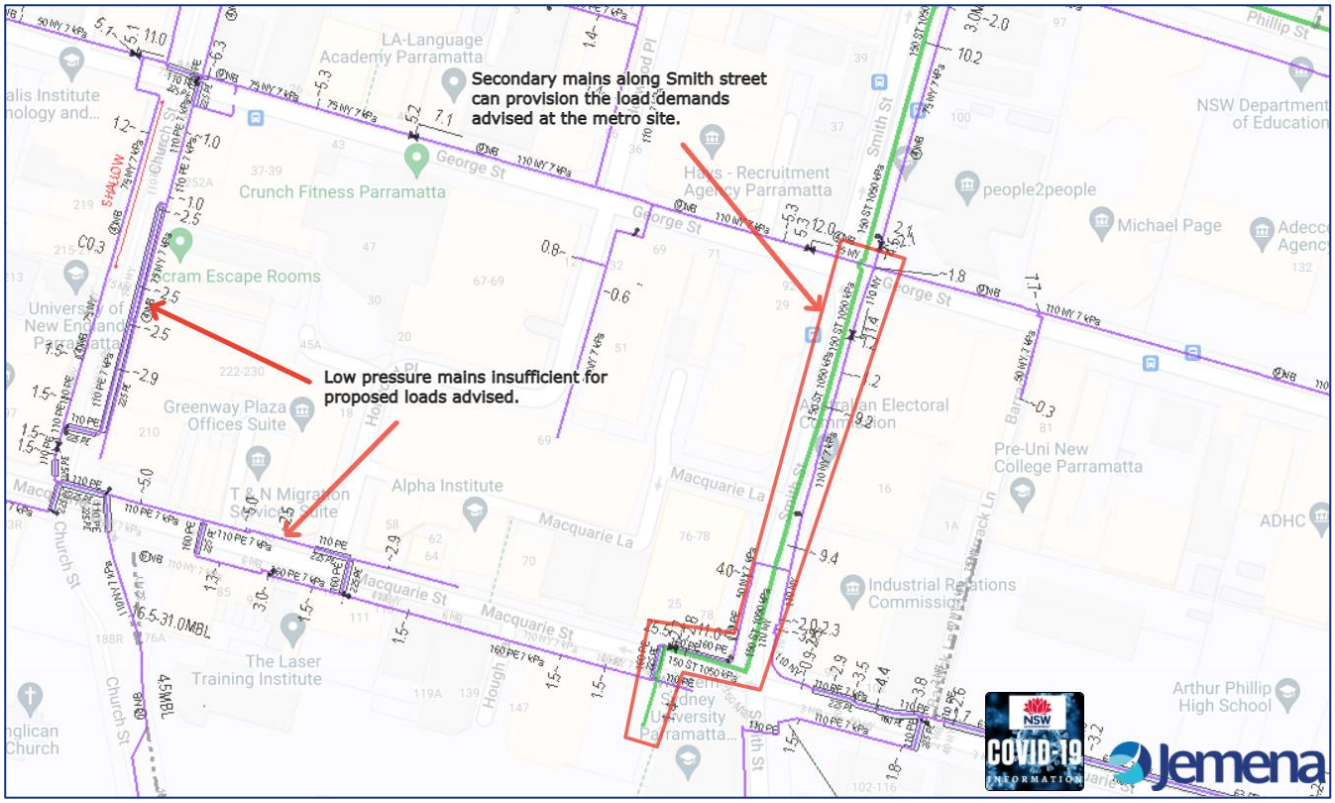

Figure 4-1: Mains for the Parramatta Sydney Metro Development

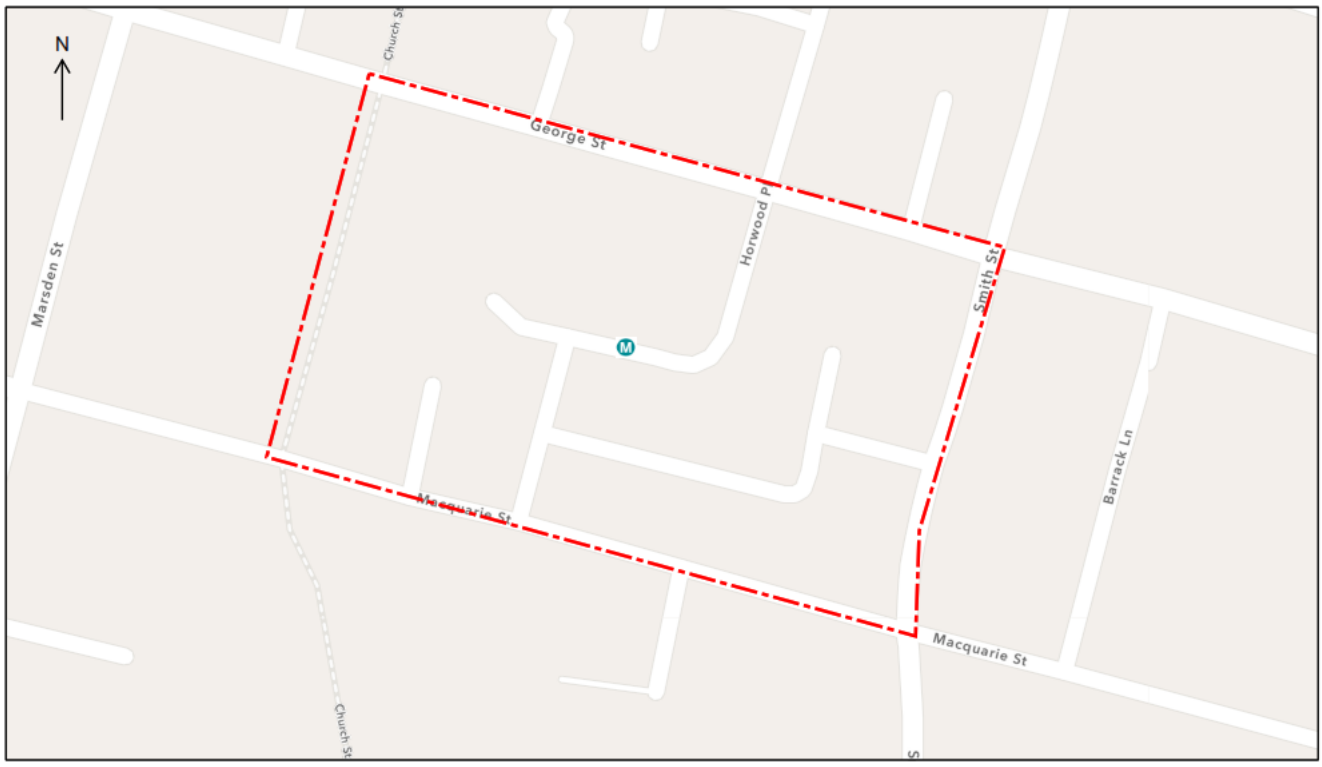

Figure 4-2: Parramatta Metro Development advised by Sydney Metro

5. Sydney Olympic Park

5.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and medium pressure (blue) assets and a secondary regulator set at the corner of Herb Elliot Ave and Olympic Blvd. Also, high pressure primary main (pink) is in the vicinity. Detailed clash assessment will be required to identify extent of actual impact

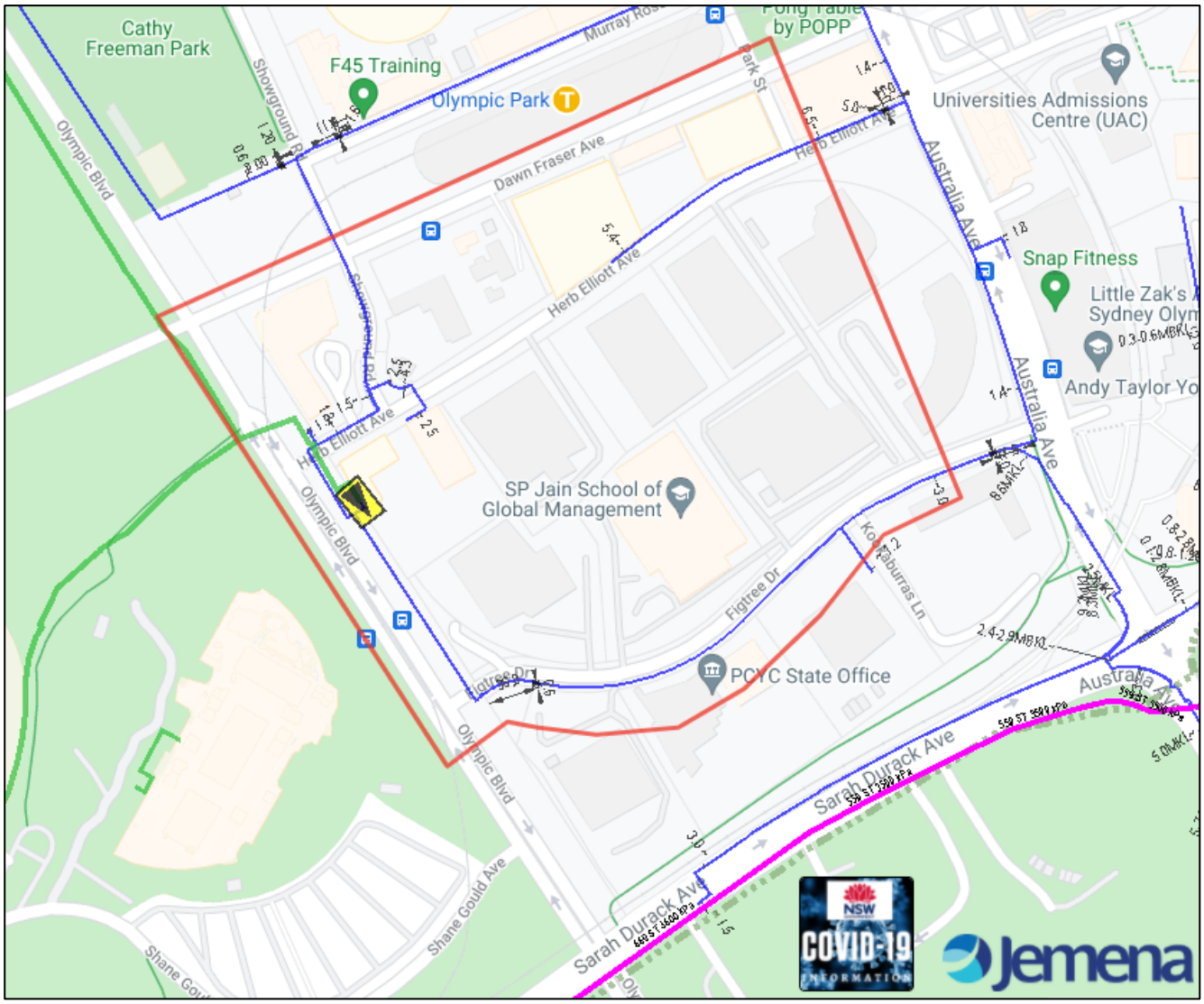

Figure 5-1 Sydney Olympic Park – Existing Jemena Network

5.2 Gas Loads

There will be a total of 1000 residential apartments with 35000sqm of commercial space and 8000sqm of retail space. The load details provided by Sydney Metro did not specify where they are located. Therefore the load has been split over the entire area.

5.3 Proposed connection strategy

To cater the proposed demand, new regulator set will be required. Also, one 110mm PE main interconnection in Herb Elliott Ave and one main upgrade in Olympic Blvd is also required. Refer to Figure 5-2 for details.

Figure 5-2 Mains upgrade plan for Sydney Olympic Park Sydney Metro Development

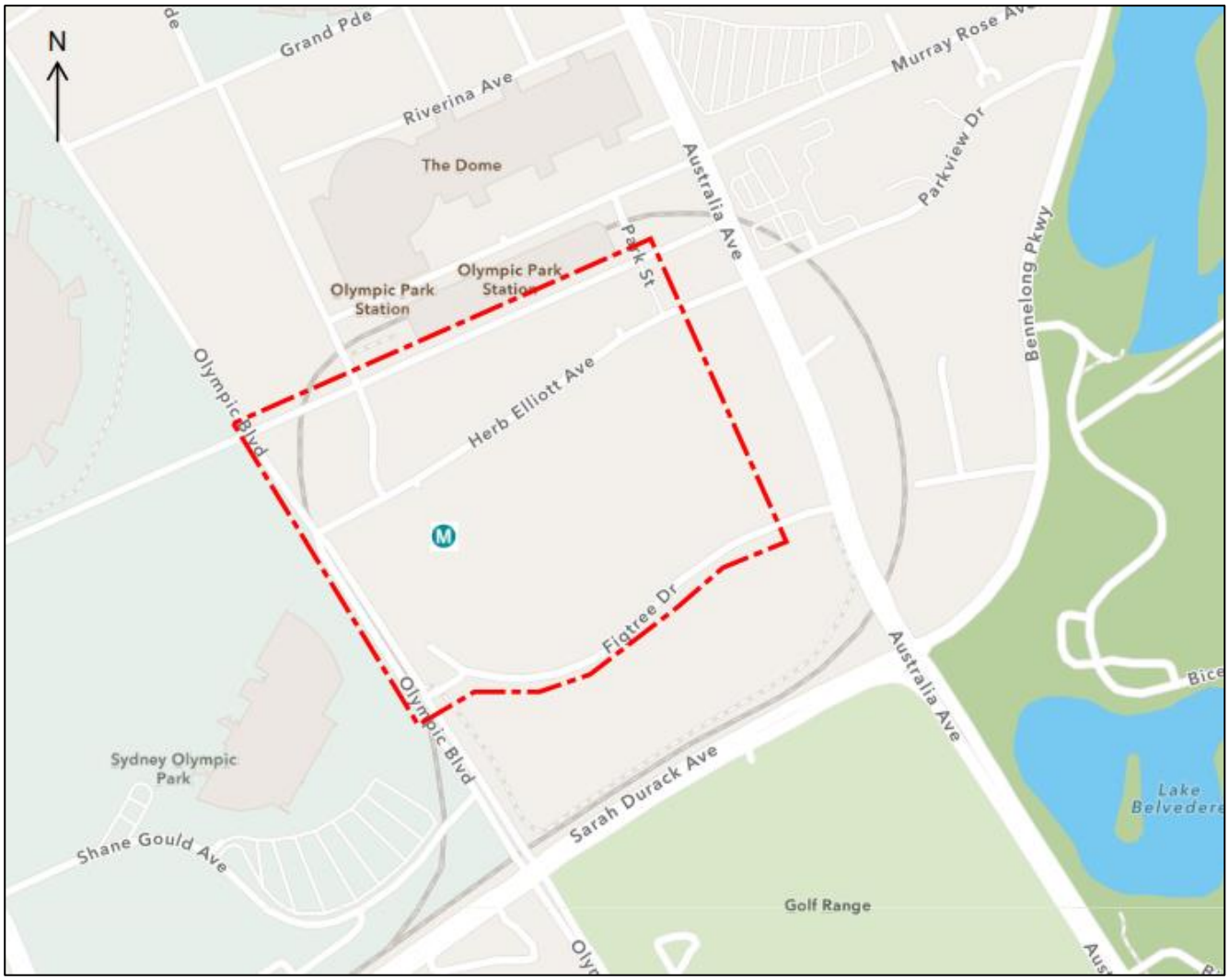

Figure 5-3 Sydney Olympic Park Metro Development advised by Sydney Metro

6. North Strathfield

6.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and medium pressure (blue) assets. Detailed clash assessment will be required to identify extent of actual impact.

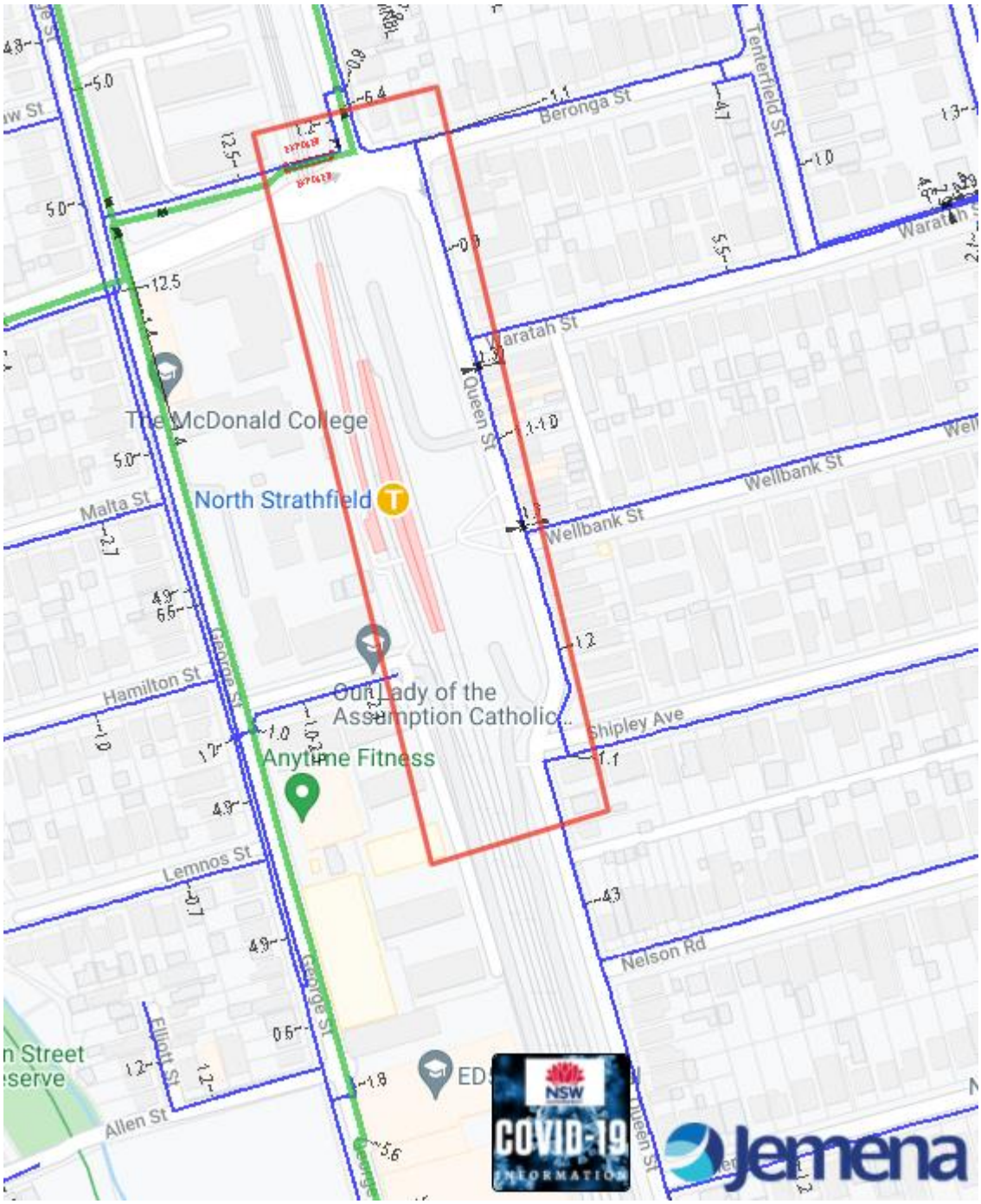

Figure 6-1 North Strathfield – Existing Jemena Network

6.2 Gas Loads

No gas load.

6.3 Proposed connection strategy

Capacity assessment not required as there is no demand requirement.

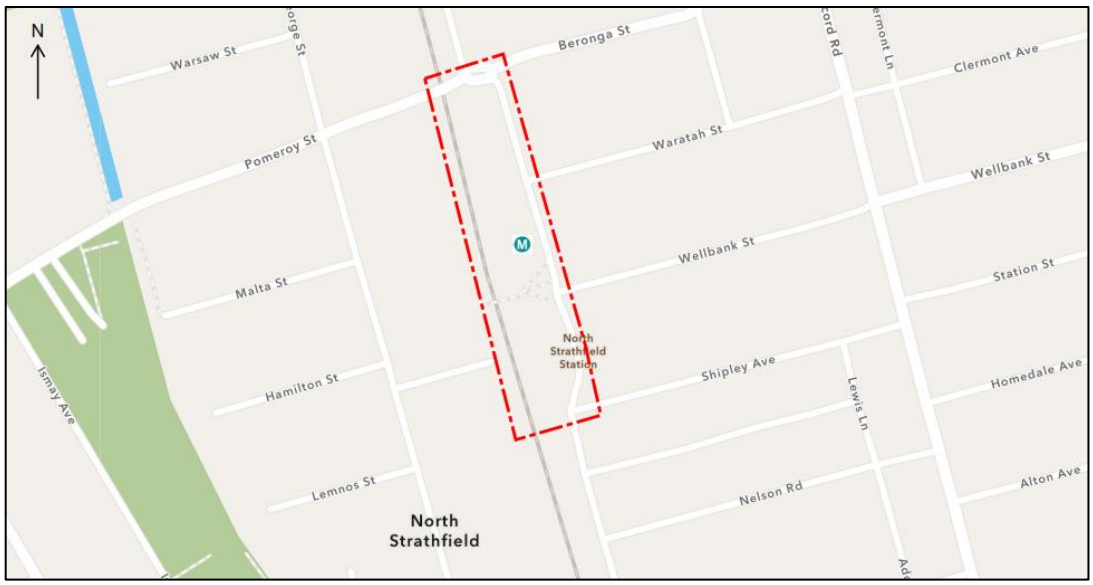

Figure 6-2 North Strathfield Metro Development advised by Sydney Metro

7. Burwood North

7.1 Existing Jemena network

Potential site extent may impact Jemena medium pressure (blue) and low pressure (magenta) assets. Detailed clash assessment will be required to identify extent of actual impact.

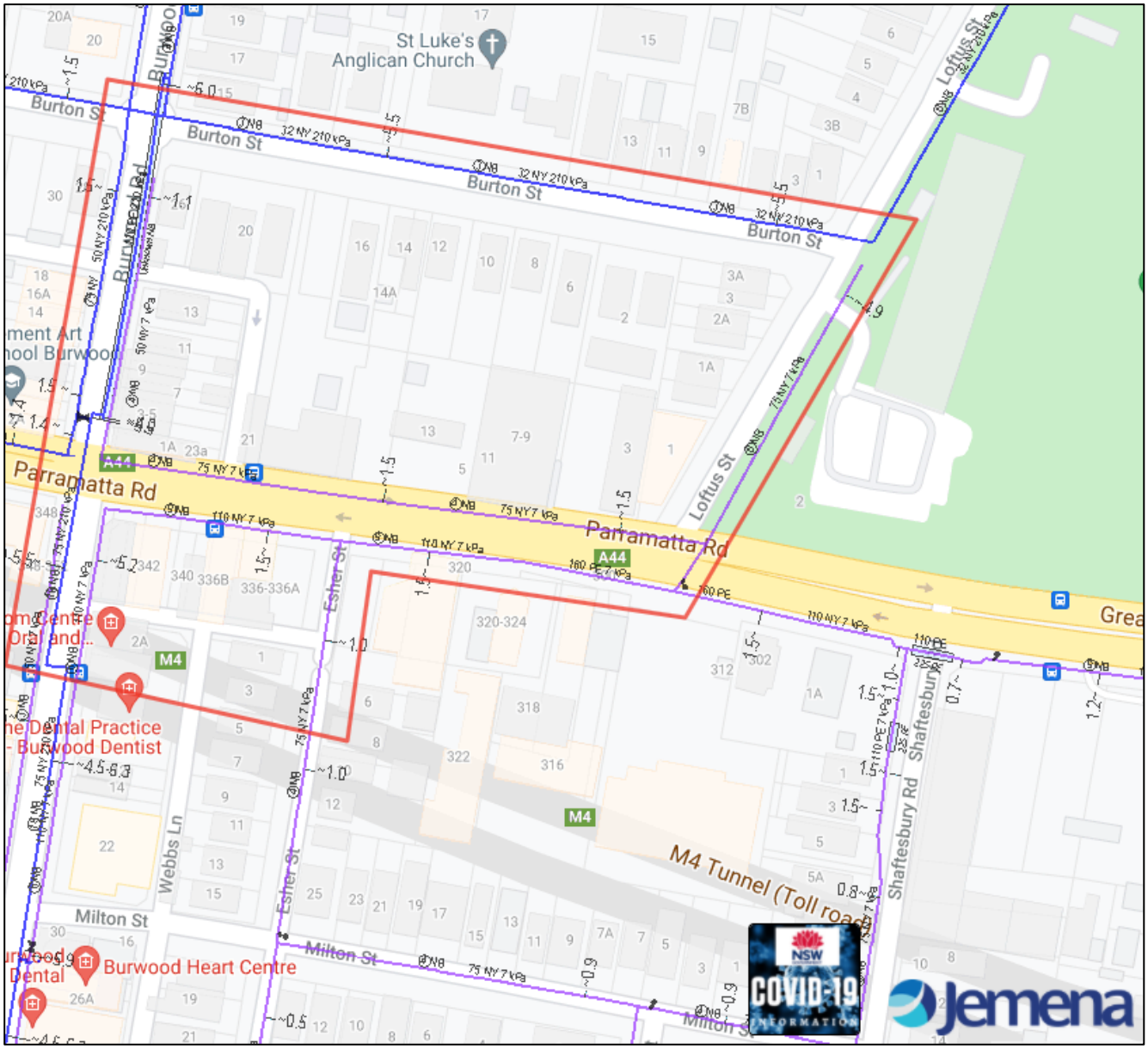

Figure 7-1 Burwood North – Existing Jemena Network

7.2 Gas loads

There will be a total of 1000 residential apartments with 35000sqm of commercial space and 8000sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

7.3 Proposed connection strategy

Medium pressure and low pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Burwood road (110mm PE in 36" Cast iron conduit). This main will be difficult to access in order supply to the proposed station.

However, if the supply point is to come from adjoining streets (Burton Street and Loftus St), pipe size upgrade will be required due to smaller diameter mains.

There is sufficient capacity in the medium pressure network to support the development in the advised footprint. However, low pressure network does not have sufficient capacity. If the supply is to come from streets with low pressure, medium pressure mains extension will be required. Refer to Figure 7-2 for details.

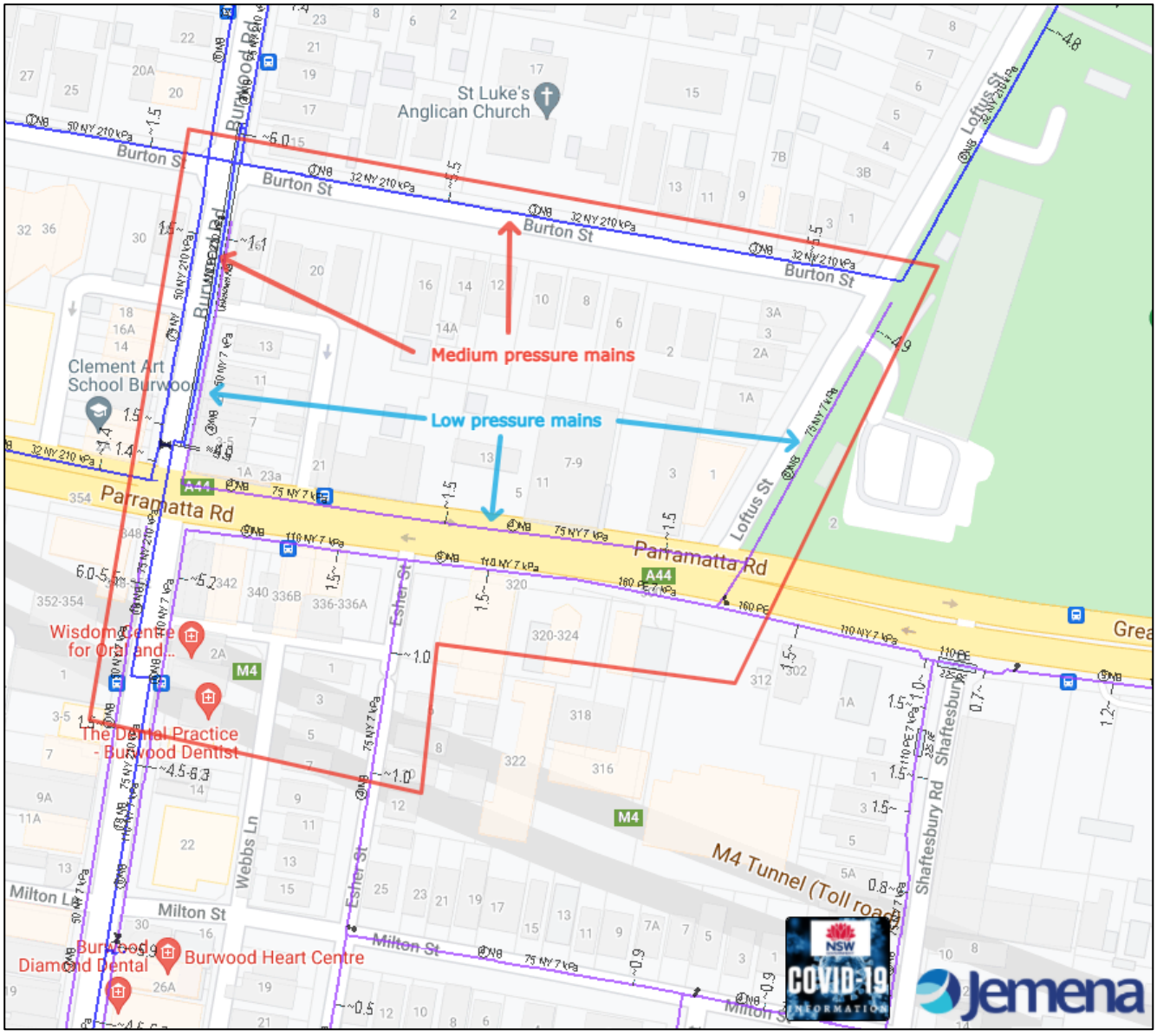

Figure 7-2 Mains for the Burwood North Sydney Metro Development

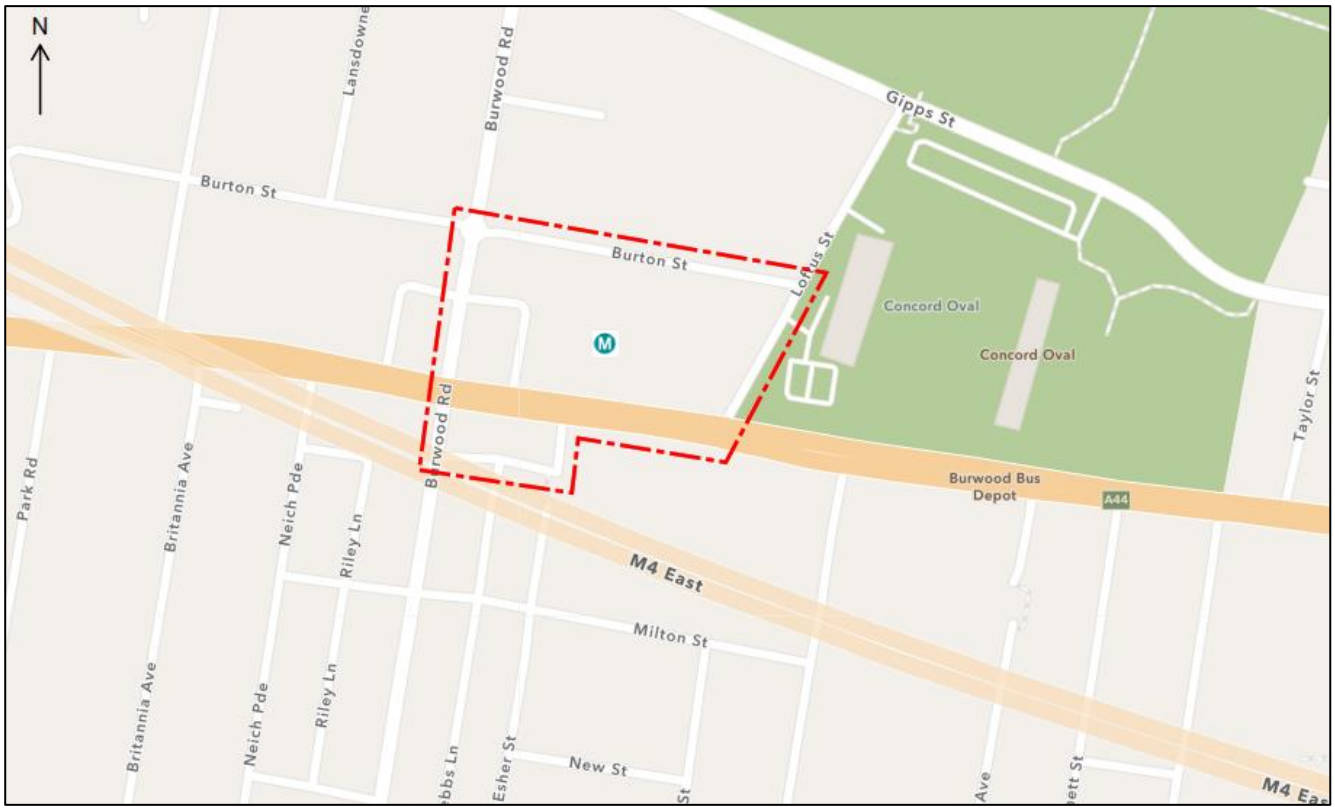

Figure 7-3 Burwood North Metro Development advised by Sydney Metro

8. Five Dock

8.1 Existing Jemena network

Potential site extent may impact Jemena medium pressure (blue) and low pressure (magenta) assets. Also, high pressure primary main (pink) is in the vicinity. Detailed clash assessment will be required to identify extent of actual impact.

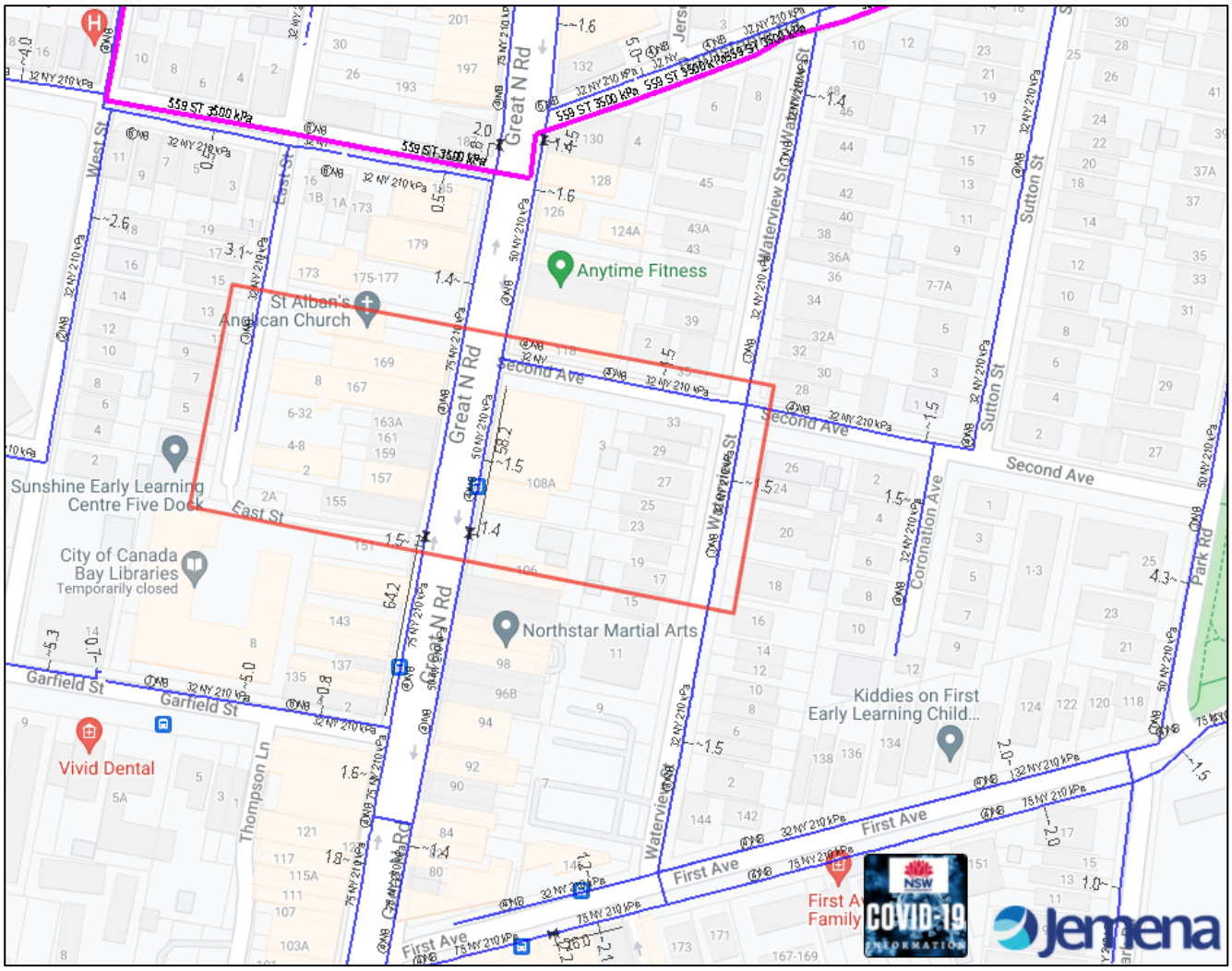

Figure 8-1 Five Dock – Existing Jemena Network

8.2 Gas loads

There will be a total of 210 residential apartments with 11000sqm of commercial space and 6000sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

8.3 Proposed connection strategy

Medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder main is along Great North Road (75mm NY in 4" Cast iron conduit).

There is sufficient capacity in the medium pressure network to support the development in the advised footprint.

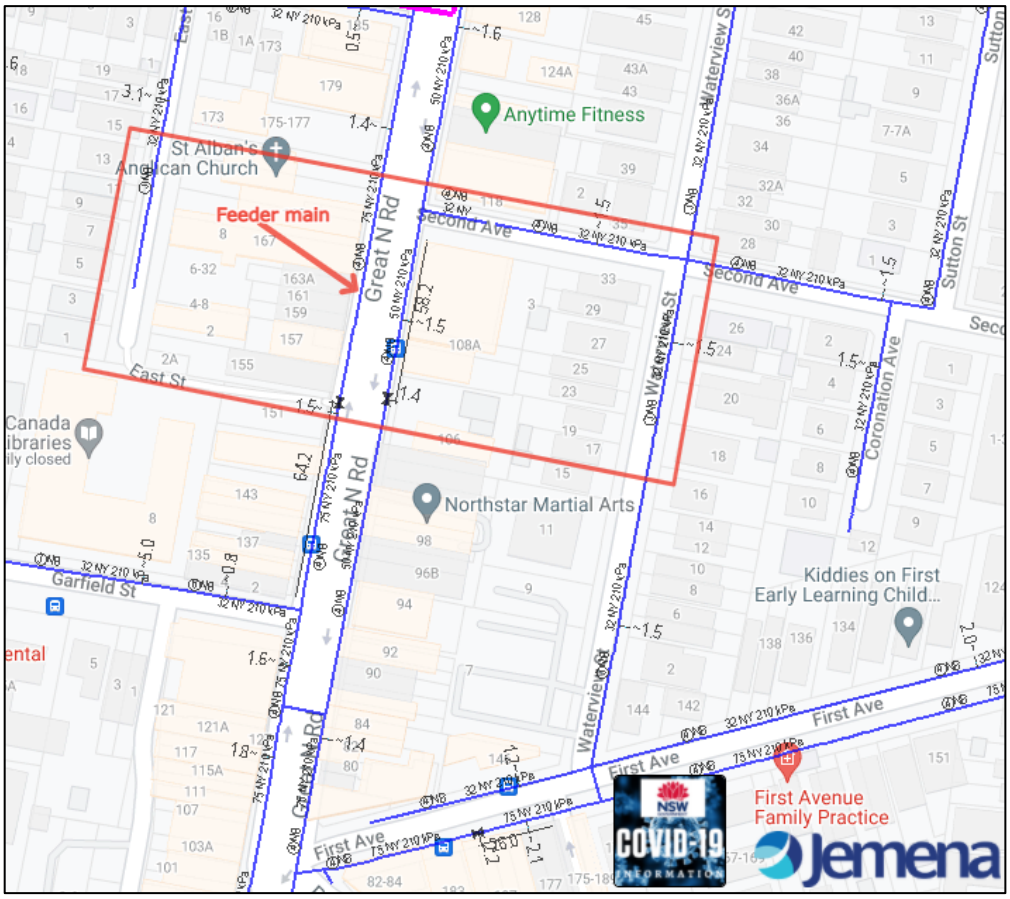

Figure 8-2 Mains for the Five Dock Sydney Metro Development

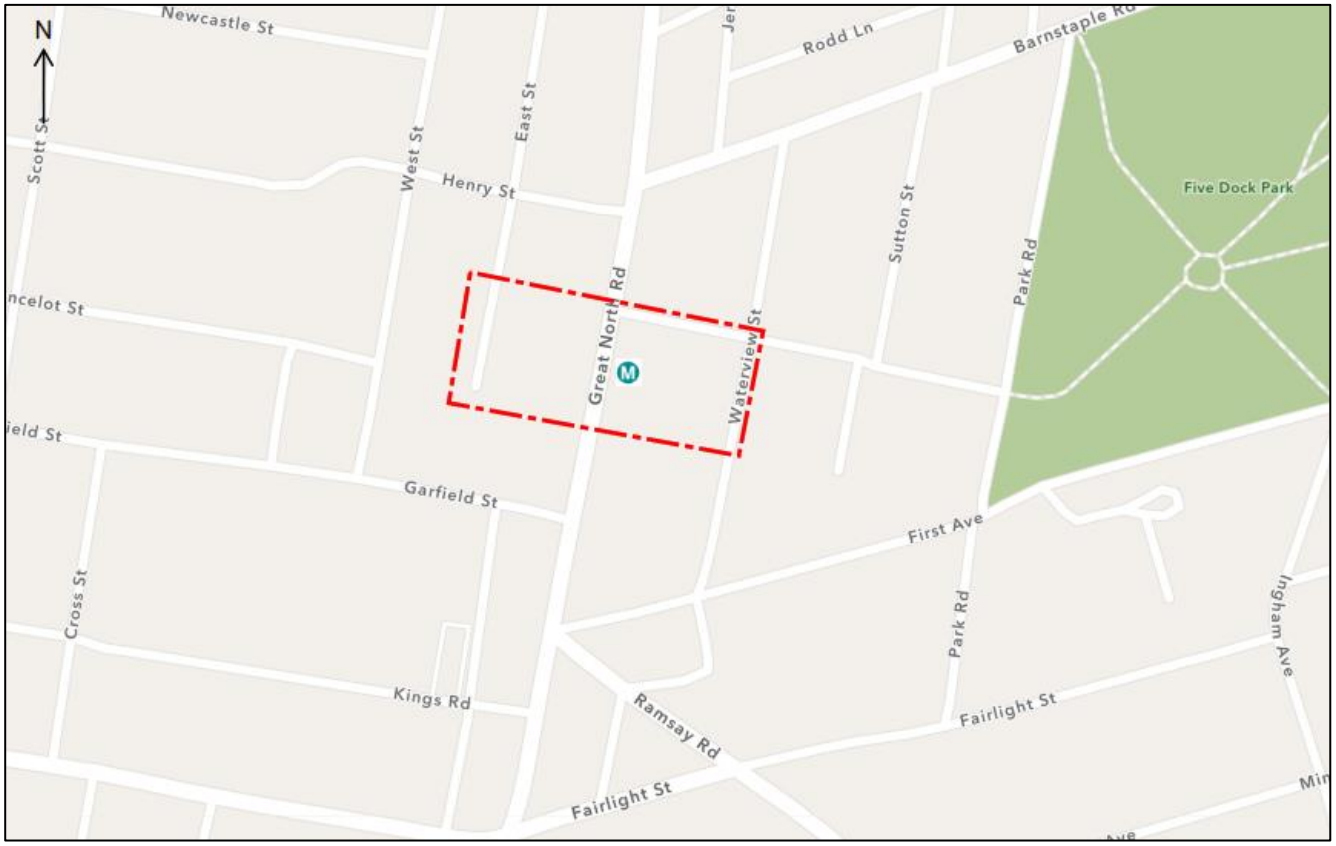

Figure 8-3 Five Dock Metro Development advised by Sydney Metro

9. The Bays

9.1 Existing Jemena network

Potential site extent may impact Jemena medium pressure (blue) assets. Detailed clash assessment will be required to identify extent of actual impact

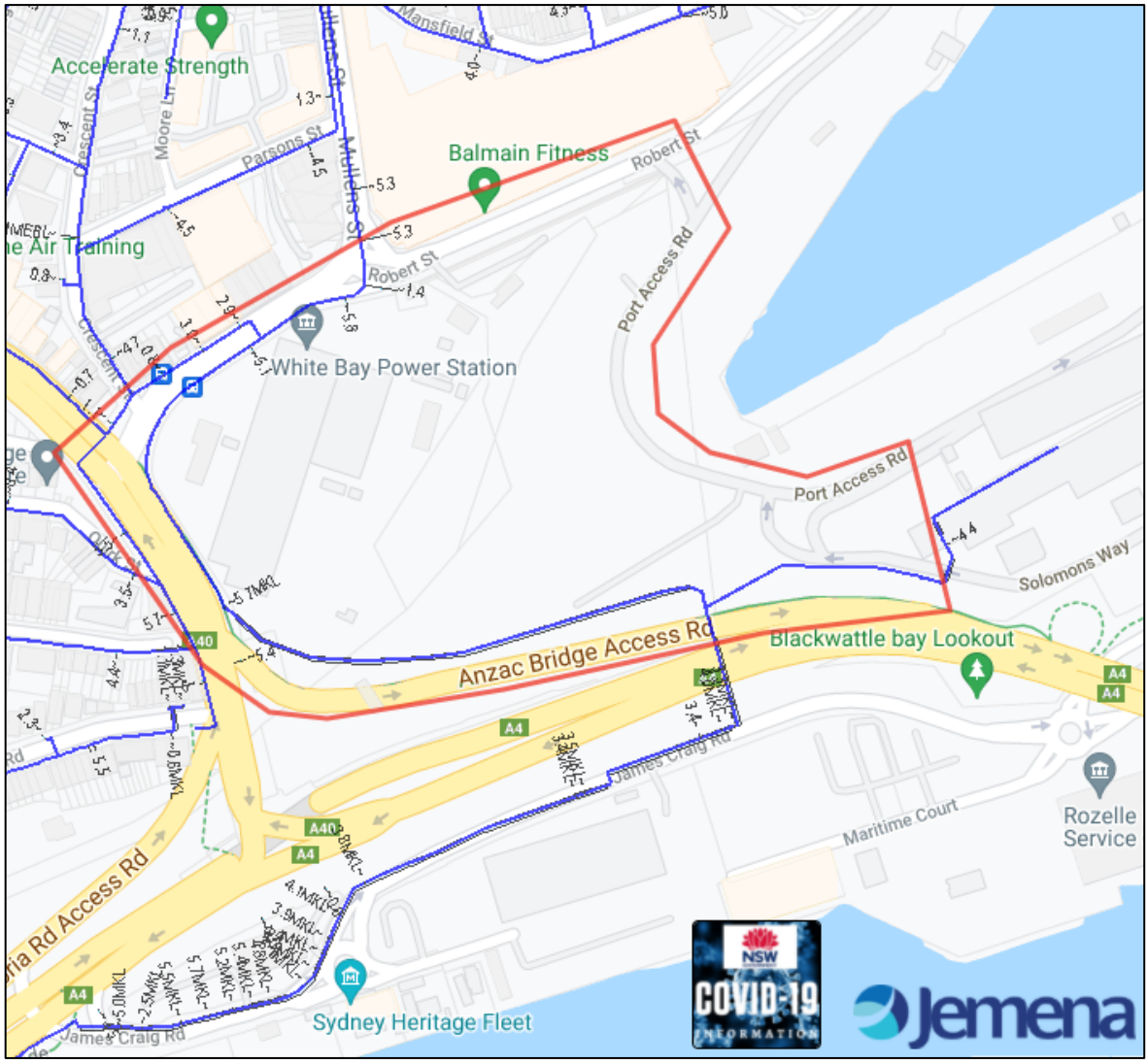

Figure 9-1 The Bays – Existing Jemena Network

9.2 Gas loads

There will be a total of 550 residential apartments with 32450sqm of commercial space and 6150sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

9.3 Proposed connection strategy

Medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder main is along Robert St, Victoria Rd and Anzac Bridge Access Rd (160mm PE part of it in 225mm PE conduit).

There is sufficient capacity in the medium pressure network to support the development in the advised footprint.

Figure 9-2 Mains for The Bays Sydney Metro Development

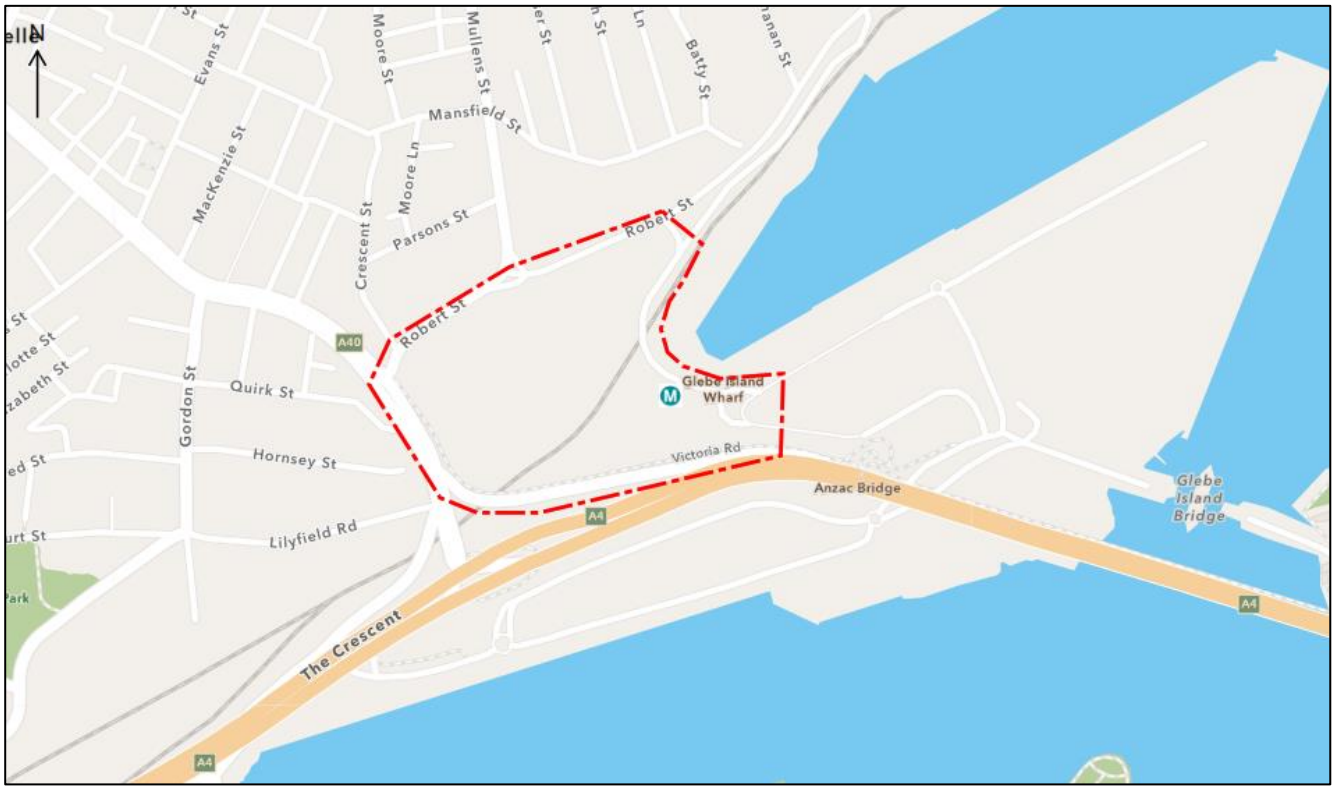

Figure 9-3 The Bays Metro Development advised by Sydney Metro

10. Pyrmont

10.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and medium pressure (blue) assets. Detailed clash assessment will be required to identify extent of actual impact.

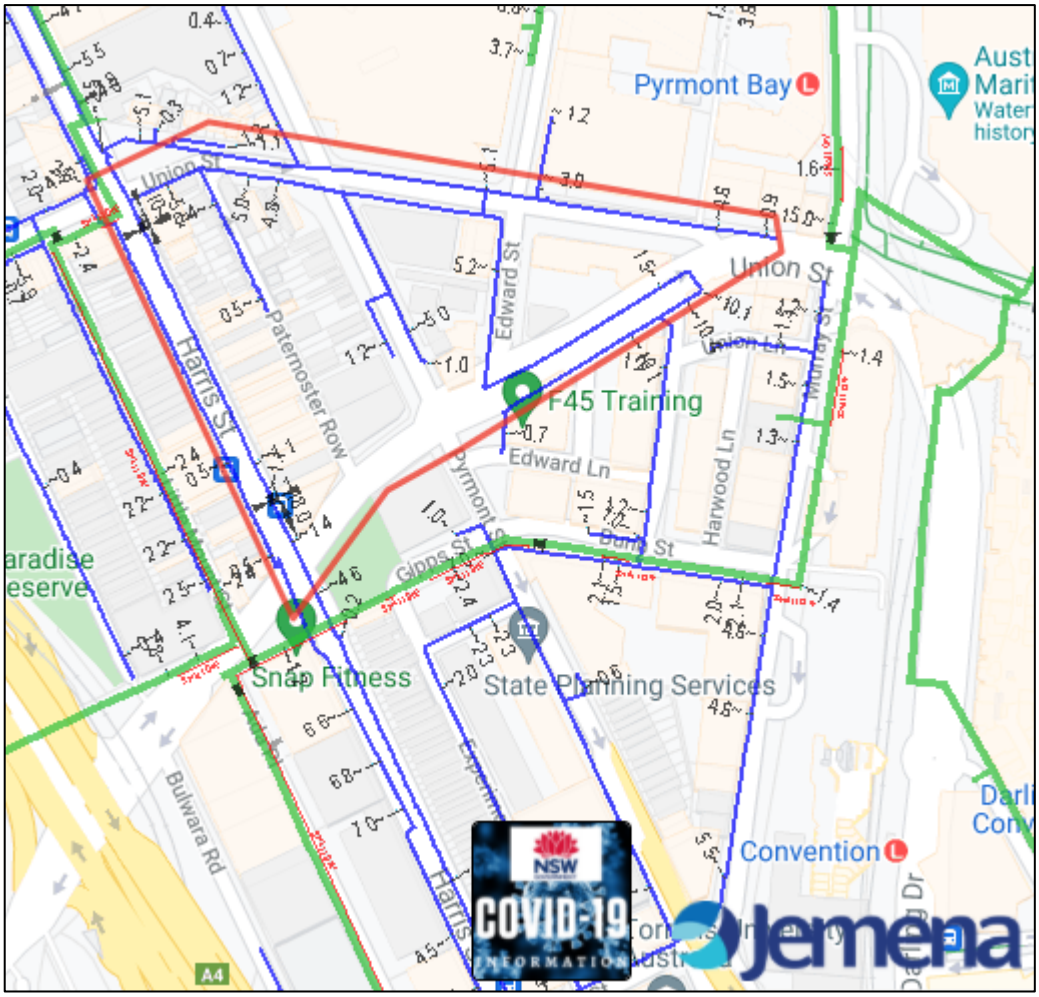

Figure 10-1 Pyrmont – Existing Jemena Network

10.2 Gas loads

There will be a total of 180 residential apartments with 8000sqm of commercial space and 500sqm of retail space. The load details provided by Sydney Metro did not specify where they are located.

10.3 Proposed connection strategy

Medium pressure and low pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. The predominant feeder mains are found along Harris St (110mm NY).

There is sufficient capacity in the medium pressure network to support the development in the advised footprint. However, if the supply point is to come from adjoining streets with smaller diameter mains, pipe size upgrade or a road crossing reinforcement will be required.

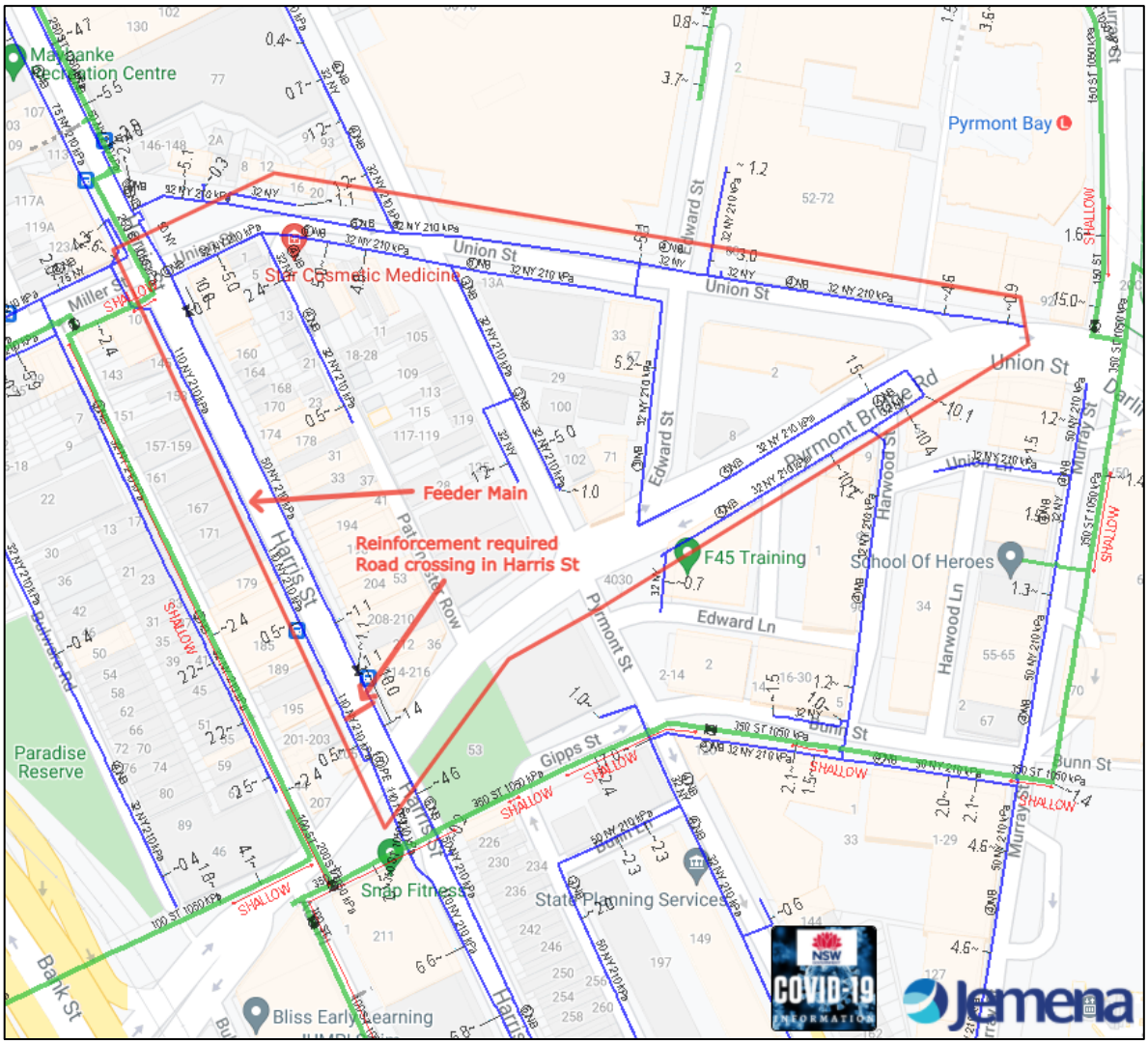

Figure 10-2 Mains for Pyrmont Sydney Metro Development

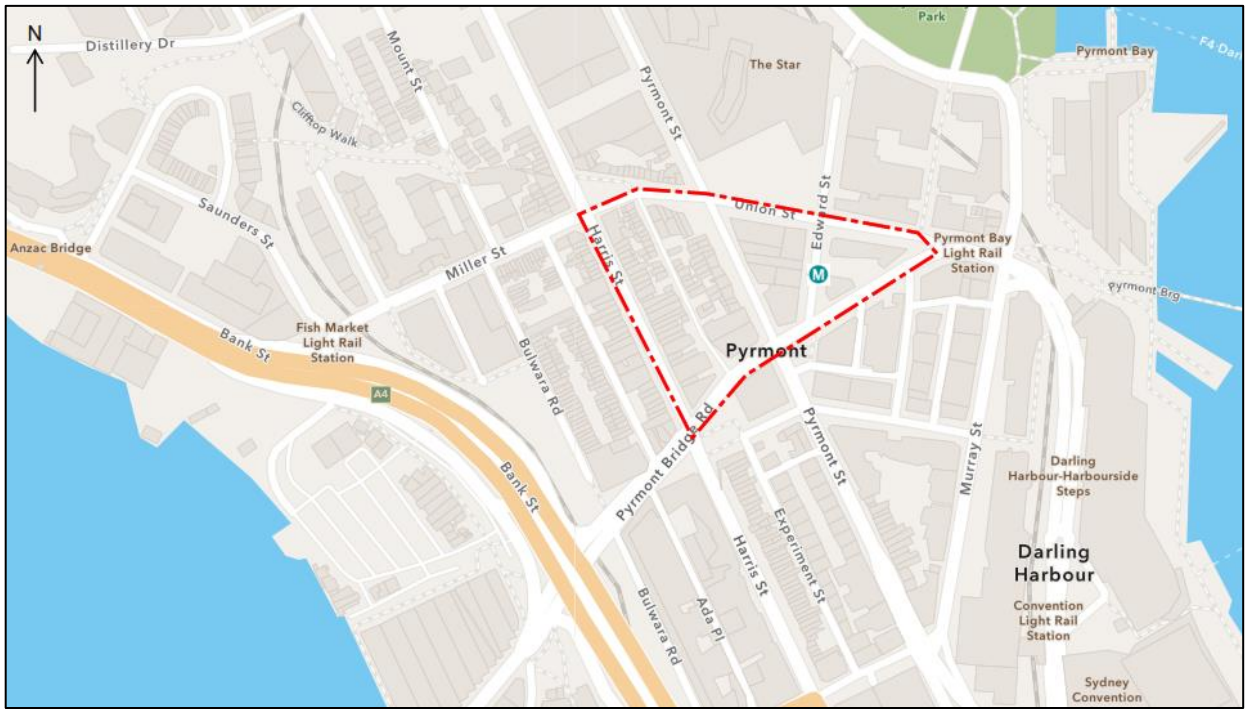

Figure 10-3 Pyrmont Metro Development advised by Sydney Metro

11. Hunter Street (Sydney CBD)

11.1 Existing Jemena network

Potential site extent may impact Jemena high pressure (green) and low pressure (magenta) assets. Detailed clash assessment will be required to identify extent of actual impact

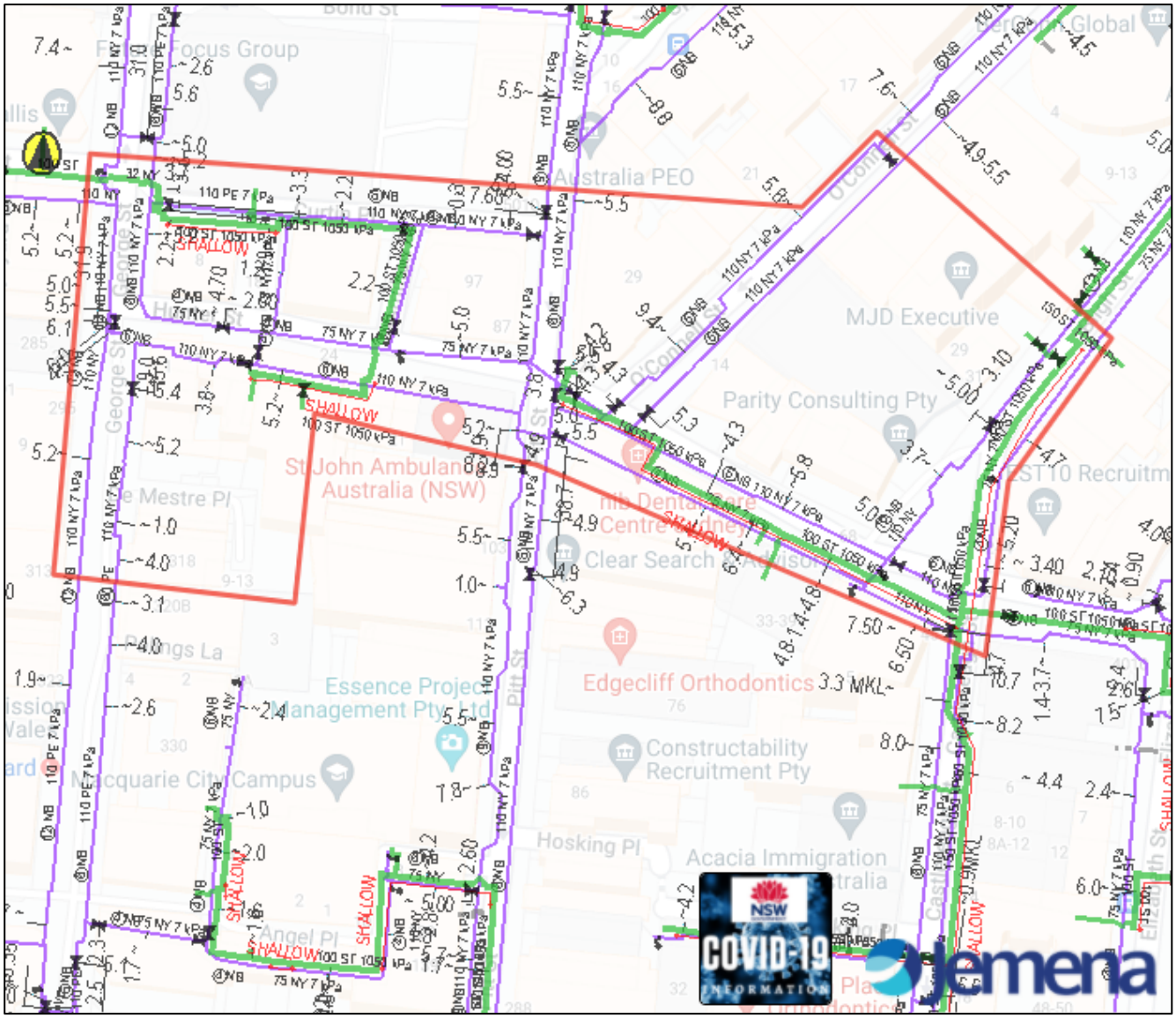

Figure 11-1 Hunter Street – Existing Jemena Network

11.2 Gas loads

There will be a total of 160000sqm of commercial space, 2000sqm of retail space and no residential apartments. The load details provided by Sydney Metro did not specify where they are located.

11.3 Proposed connection strategy

High pressure and medium pressure Gas Distribution Networks (JGN) exist within the footprint advised by Sydney Metro. Low pressure network does not have sufficient capacity to supply the demand.

There is sufficient capacity in the high pressure network to support the development in the advised footprint.

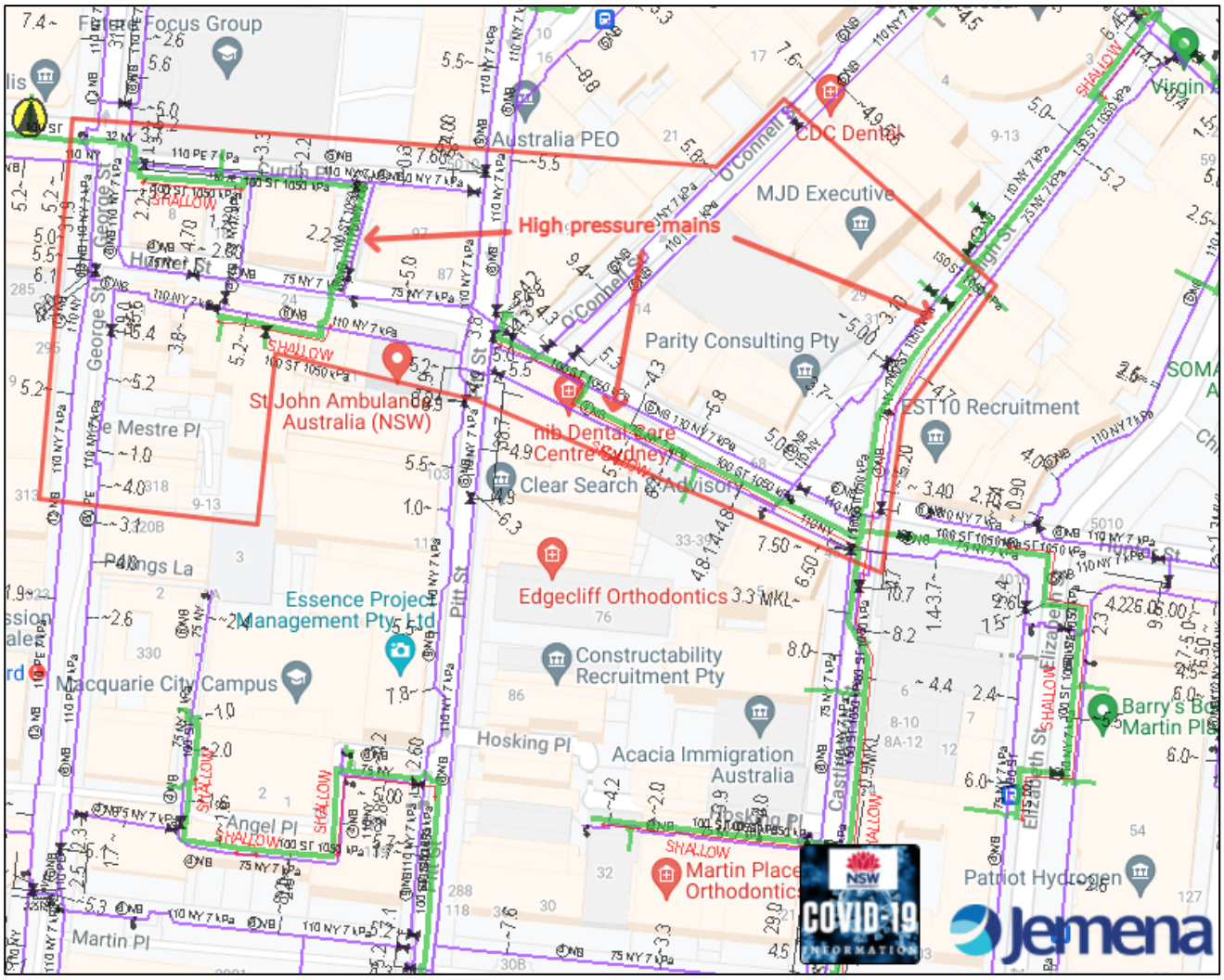

Figure 11-2 Mains for Hunter Street Sydney Metro Development

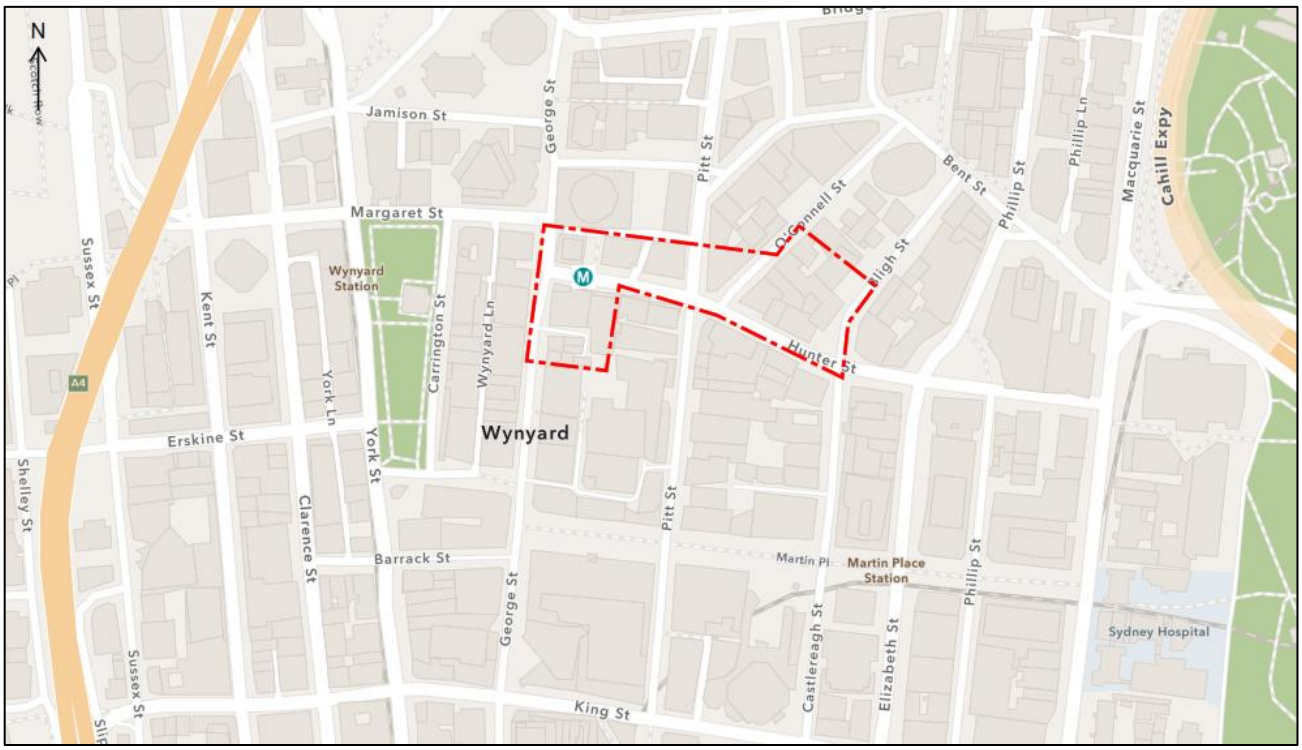

Figure 11-3 Hunter Street Metro Development advised by Sydney Metro