

Part B

The project

5. Project need

This chapter describes the need for the project, strategic context, and project benefits. The Secretary's environmental assessment requirements addressed by this chapter are listed in Table 5.1. A full copy of the assessment requirements and where they are addressed in the Environmental Impact Statement is provided in Appendix A.

Table 5.1 Secretary's environmental assessment requirements – project need

Ref	Secretary's environmental assessment requirements – project need	Where addressed
2.1(d)	A summary of the strategic need for the project with regard to its critical State significance and relevant State Government policy.	This chapter

5.1 Need for the project

The project consisting of the upgrade of the T3 Bankstown Line between Marrickville and Bankstown is needed for three key reasons:

1. To meet the growing demand for services on the T3 Bankstown Line.
2. To resolve current accessibility and safety improvement issues on the T3 Bankstown Line.
3. To relieve existing bottleneck and capacity issues affecting the T3 Bankstown Line and the overall rail network.

In addition to these localised needs, the project would contribute to the regional needs of a growing population and aid in the response to housing and job demands. It would also promote improved liveability through better public transport opportunities by:

- contributing to population and economic growth in Sydney
- helping to meet increasing community demand for public transport
- responding to housing demands in Sydney.

The local and regional needs, issues and drivers for the project are described in Sections 5.1.1 and 5.1.2.

The project also addresses a number of strategic needs, as outlined in the following plans and policies:

- *Australian Infrastructure Plan* (Infrastructure Australia, 2017)
- *NSW Long Term Transport Master Plan* (Transport for NSW, 2012b)
- *Rebuilding NSW – State Infrastructure Strategy* (NSW Government, 2016a)
- *Premier's and State priorities: NSW State Plan* (NSW Government, 2015)
- *Sydney's Rail Future* (Transport for NSW, 2012a)
- *Sydney City Centre Access Strategy* (Transport for NSW, 2013a)
- *A Plan for Growing Sydney* (Department of Planning and Environment, 2014)
- *Draft Sydenham to Bankstown Urban Renewal Corridor Strategy* (Department of Planning and Environment, 2017)

- *Draft South District Plan* (Greater Sydney Commission, 2016)
- *Draft Central District Plan* (Greater Sydney Commission, 2016).

The strategic needs and context for the project are described in Section 5.2.

5.1.1 Key local needs

Inability to meet growing demand with current T3 Bankstown Line services

For customers travelling on the network into and out of the Sydney CBD, the limited network capacity restricts the number of services that can be provided, resulting in increased crowding on trains and platforms and within train carriages, as well as decreased reliability of services.

By 2026, without an increase in network capacity, it is predicted that demand will exceed capacity on the T3 Bankstown Line, as well as the T1 North Shore, T1 Northern and T2 Inner West & South lines. Demand will also be approaching capacity on the T2 Airport Line.

Analysis undertaken by Transport for NSW identifies that by 2036, demand for rail services will be at 108 per cent of capacity, leading to widespread crowding and a decrease in reliability. For the T3 Bankstown Line, based on the annual growth rate of six per cent between 2014 and 2016, there will be around twice as many customers attempting to use this service.

The *NSW Long Term Transport Master Plan* notes that 'The Bankstown Line had the highest average load in the morning peak hour at 150 percent. The two faster services from Liverpool via Bankstown had an average load of 140 percent at Campsie. Such congestion results in reduced public transport reliability'.

Outside peak periods, services on the T3 Bankstown Line are even more limited. Typically, waiting times for trains into the Sydney CBD are around 15 minutes. This can deter some customers from using public transport and the interchange with their destination may be incompatible with their daily travel needs.

Accessibility issues on the T3 Bankstown Line

Of the 10 stations from Marrickville to Bankstown, five have not had major upgrades and remain largely as they were built early last century. These stations do not comply with NSW and Australian Government accessibility standards for public transport. Access is generally provided by stairs or ramps, while only five of the 10 stations have lift access. Nine of the 10 stations have curved platforms, which creates larger gaps between the train and platform compared to straight platforms, and forms a barrier to movement. This large gap makes access difficult for some customers, particularly the disabled and the elderly, those travelling with young children and prams, and customers travelling with luggage. Accessibility issues also extend into the areas surrounding the stations, presenting challenges for movement between different modes of transport.

The platform buildings along the T3 Bankstown Line are generally in good condition. However, many of them are not accessible and due to security and operational considerations are vacant, locked and unavailable to the public.

Existing bottleneck and capacity issues with the rail network and the T3 Bankstown Line

The reliability and capacity of the Sydney Trains rail network is constrained by a number of factors. Most of the rail network was built more than 100 years ago and is very complex compared to other rail networks. Part of the complexity is a result of numerous lines having to converge into fewer inbound tracks through the CBD. The convergence of these lines constrains the number of services that can operate along each of the lines in the Sydney Trains rail network. In most instances, the existing lines are unable to operate at maximum capacity.

As a result of the identified limitations, the overall capacity and reliability of the rail network and the number of services that can be provided is restricted, resulting in increased crowding on trains and platforms, and decreased reliability of services. Merging and crossing movements required as part of the convergence of lines into the CBD also introduce risks to service reliability during times of service disruption.

The existing T3 Bankstown Line effectively slows down the Sydney Trains rail network because of the way it merges with other lines close to the CBD. The T3 Bankstown Line services have to merge with services operating on other lines approaching the CBD, including the T2 Inner West & South Line at Sydenham Station and the T2 Airport Line at Central Station. The existing timetable provides for windows to accommodate merging/crossing movements without affecting reliability. However, problems arise during times of disruption, when those windows for merging and crossing are affected. This can increase the likelihood that delays on one line will impact another line.

The T3 Bankstown Line and the T2 Airport, Inner West & South Line use the City Circle to traverse the Sydney CBD. In the morning peak, the eight T3 Bankstown Line services that operate each hour are split, with four services operating on the City Inner track (counter-clockwise), and four services operating on the City Outer track (clockwise). This method of operating means that some customers using the T3 Bankstown Line have a longer journey time to reach Town Hall and Wynyard Stations, or have to change lines at Sydenham or Central Stations.

In the afternoon, given the different service types and patterns that operate via the City Circle before travelling onwards to other destinations, passengers often have to wait at the station platform for the service they wish to board, contributing to station congestion and overcrowding.

Figure 5.1 provides an indication of how services currently operate on the City Circle.

Other capacity constraints resulting from the existing infrastructure, which further limit the capacity of the network, include:

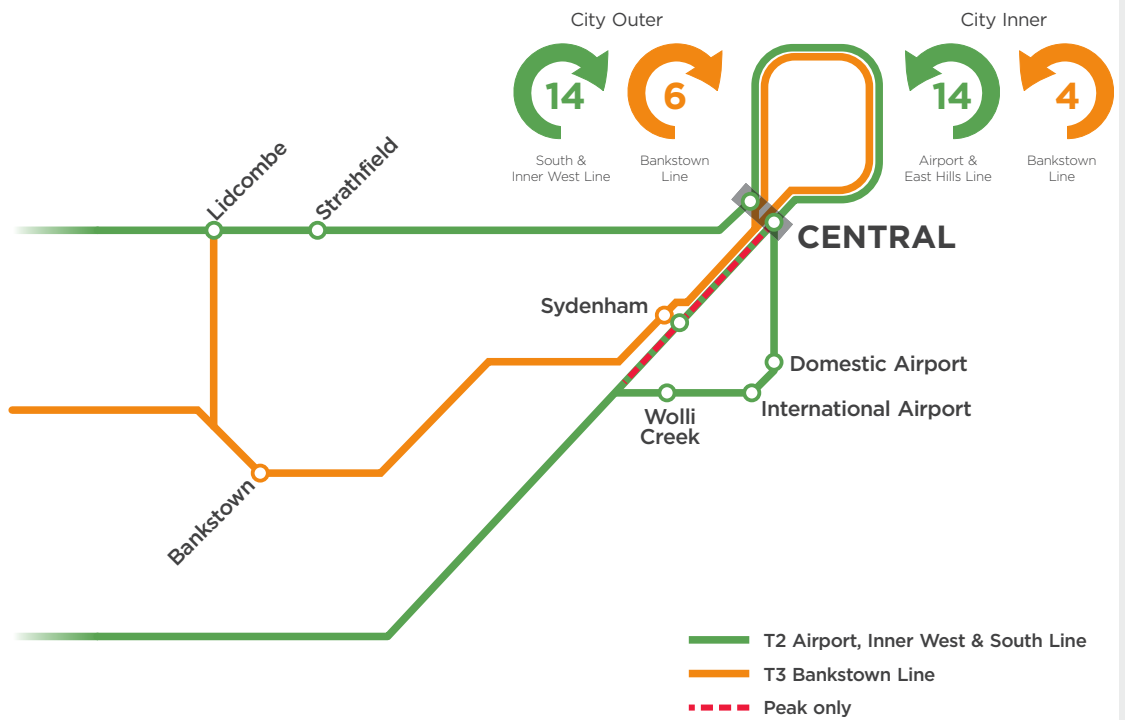
- narrow station platforms at some stations
- vertical egress required at key stations, such as Town Hall Station
- limitations associated with passenger flow rates boarding/alighting from double deck trains
- different stopping patterns for trains operating from the same platforms at many CBD stations.

5.1.2 Regional demands and drivers

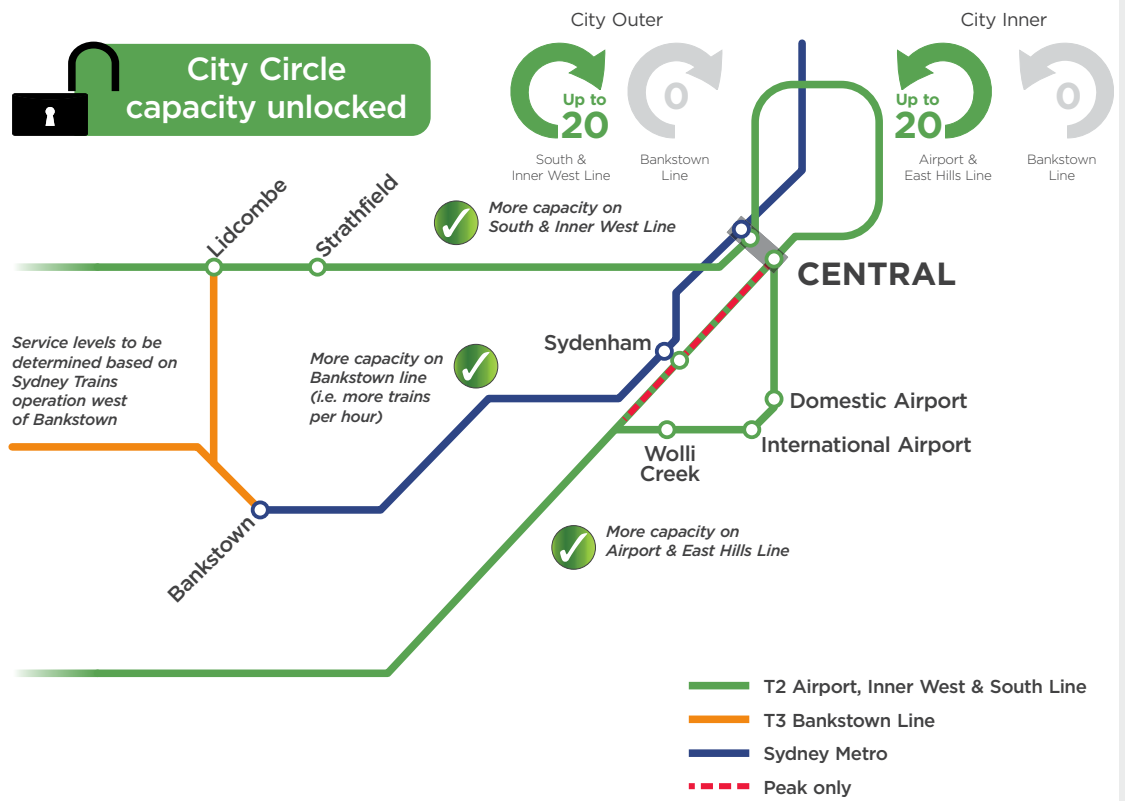
Contributing to population and economic growth in Sydney

As noted in *Sydney's Rail Future*, Sydney is a modern international city experiencing growth in population and employment. Sydney currently has a population of about 4.6 million which is projected to grow significantly over the coming years to 5.1 million by 2021 and around 6 million by 2031. Driven by population growth, employment in Sydney is expected to increase from its current level of 2.1 million workers to 2.6 million by 2031 (Transport for NSW, 2012a). *A Plan for Growing Sydney* predicts that by 2031, Sydney's economic output will almost double to \$565 billion a year and there will be 689,000 new jobs.

For Sydney to continue to be one of the most economically productive and liveable areas in Australia, its growth needs to be managed. To maintain the liveability of the city, transport capacity is required to enable the development of affordable housing and to enable people to move around the city to enjoy their daily lives.



WITHOUT SYDNEY METRO SERVICE



SYDNEY METRO OPERATIONAL

The NSW Government's strategy for accommodating Sydney's future population growth over the next 20 years aims to ensure that a competitive economy is fostered with world-class services and transport. The transport system needs to be high quality and have provision for increased capacity if Sydney is to maintain its current levels of global competitiveness and growth.

The Sydney Metro system would not only improve infrastructure and remove existing bottlenecks, it would provide faster and more reliable connections to jobs, education facilities, health services, and sports and recreation facilities. Sydney Metro will have a target capacity of about 40,000 customers per hour, similar to other metro systems worldwide.

The Australian and NSW Governments have developed national and city building policies to support the continued growth and development of Sydney's economy and sustainability. Further investment in transport infrastructure, including Sydney Metro, is a key requirement to achieve these policy objectives. Further information is provided in Section 5.2.

Helping to meet increasing community demand for public transport

Growth in employment and population will require increased transport capacity to ensure continued productivity growth and to sustain Sydney's liveability.

The growing demand for access to Sydney's City Centre is recognised by a number of studies, including the *Sydney City Centre Access Strategy*, which notes the following:

- About 180,000 of the more than 630,000 trips made into the City Centre each weekday are in the morning one hour peak. Over 80 per cent of these peak hour trips are made using public transport, with rail carrying the biggest share.
- Over 115,000 of these 180,000 trips to the City Centre in the morning peak hour occur in two main corridors: the multi-modal Harbour Bridge corridor to the north (with rail being the dominant mode) and the rail corridor through Central Station. Increasing access through key corridors will be a critical part of meeting future demand.
- The number of people travelling to the City Centre each day will grow to some 775,000 by 2031 – an extra 145,000 trips.
- Major developments at Barangaroo and Darling Harbour will generate significant travel demand, with the development at Barangaroo alone bringing an additional 23,000 jobs to the City Centre.

The current transport system cannot provide the capacity required. The road and bus networks are already heavily constrained and cannot effectively be augmented into the CBD. While there is significant investment planned for the road network, cars and buses alone are not able to provide for future travel demands.

Public transport use in Sydney is rapidly increasing, putting more pressure on already crowded trains and buses. An annual snapshot by the NSW Audit Office shows that patronage across the public transport network increased by 12 per cent in the 2015-16 financial year. Trips on the rail network increased from 328 million to 363 million (up 10.7 per cent) last financial year. Trips on Sydney's buses increased 12.8 per cent, from 257 million to 290 million. Trips on the L1 Dulwich Hill light rail line increased by 66 per cent, from six million to 10 million, while ferry trips remained stable.

The continuing rise in patronage is putting pressure on public transport, creating crowding, and issues with punctuality, reliability and capacity. The rail network in particular is experiencing significant constraints and challenges.

The *Sydney City Centre Access Strategy* describes Sydney's rail network as the backbone of the city's public transport system. On a typical workday, customers take approximately 1.2 million journeys on the rail network, one-third of which occur between 6am and 9.30am. With the expected

rate of population growth, Sydney is fast outgrowing its rail network. Growth in population and employment is forecast to increase rail network demand by 41 per cent by 2026 and by 61 per cent by 2036.

The implementation of planned rail service enhancements to coincide with the opening of Sydney Metro Northwest will increase passenger demand into the CBD by 31 per cent by 2026. The following lines are forecast to experience significantly higher growth in passenger demand into the CBD by 2026:

- T1 North Shore Line – increase of 7,200 customers per hour (40 per cent)
- T2 Inner West & South Line – increase of 5,200 customers per hour (36 per cent)
- T2 Airport Line via Airport – increase of 4,500 customers per hour (47 per cent)
- T3 Bankstown Line – increase of 4,900 customers per hour (58 per cent)
- Intercity (Northern Line) – increase of 3,500 customers per hour (88 per cent).

This increased rail demand to the CBD is estimated to represent over 6,700 additional trips in the AM peak. Efficient, high capacity public transport services will be needed to meet this growing demand to get people into the City Centre. As noted in *Sydney's Rail Future, NSW Long Term Transport Master Plan* and *Sydney City Centre Access Strategy*, the NSW Government has determined that Sydney Metro will play a key role in this regard.

Responding to housing demands

The benefits of land use and transport planning integration are generally accepted. Development may be in response to new or improved public transport or may occur where public transport provision is anticipated in light of strategic land use planning.

There is a need to provide 664,000 new dwellings in Greater Sydney over the next 20 years, which is an average of over 33,000 dwellings per annum across the city. These dwellings will need to be high quality, well connected to jobs and services, affordable, within the walking catchments of larger centres and serviced by transport infrastructure.

The draft *Sydenham to Bankstown Urban Renewal Corridor Strategy* identifies opportunities for additional housing and jobs within walking distance of the train stations along the existing T3 Bankstown Line between Sydenham and Bankstown. The strategy forecasts that around 35,400 additional dwellings could be built within the corridor by 2036.

The Greater Sydney Commission is responsible for regional planning in Greater Sydney, in a partnership between State and local government. District planning undertaken by the Commission will guide the delivery of *A Plan for Growing Sydney* across the six districts that form Greater Sydney. The project area is located within the South and Central Districts.

The draft South and Central District Plans set out the vision, priorities and actions for the development of the South and Central Districts. The draft plans outline the vision for the South and Central Districts, with Sydney Metro City & Southwest reinforcing the district's strong connections to employment hubs at Sydney Airport and the Sydney CBD, and enhancing housing opportunities along the corridor from Sydenham to Bankstown.

Regional planning undertaken by the Greater Sydney Commission indicates that accessing a greater number of jobs and services within a 30 minute commute is a key strategic goal. This requires better transport connections and stronger economic and employment centres.

5.2 Strategic context

5.2.1 Strategic planning context

The strategic context for Sydney Metro (including the project) is influenced by the outcomes of a number of strategic plans for transport and urban development that have been prepared at the national, state, regional, and local levels.

Key state and regional strategies, policies and plans have also informed and influenced the vision, objectives and development of Sydney Metro and the project. These plans and strategies are listed in Table 5.2 with a summary of the key policies/directions that are relevant to Sydney Metro and/or the project.

Table 5.2 Relevant strategies and plans

Strategy/plan/policy	Key policies and strategies relevant to the project need ¹
National	
<i>Australian Infrastructure Plan</i> (Infrastructure Australia, 2017)	Sydney Metro City & Southwest is identified as a high priority initiative under the plan, to address rail capacity issues, improve transport access to the Global Economic Corridor, and assist in realising employment growth and increased productivity.
NSW	
<i>NSW Long Term Transport Master Plan</i> (Transport for NSW, 2012b)	<p>The master plan:</p> <ul style="list-style-type: none"> recognises Sydney's Rail Future and the proposed 'three tier' network (described below), as well as the role of high capacity rapid transit services notes that without the creation of additional rail capacity, crowding levels on the network will continue to increase, with many parts of the rail network predicted to be near or exceeding capacity in 2031 recognises the major transport challenges for Sydney, including the need to build a fully integrated city-wide transport system. <p>Relevant actions identified include:</p> <ul style="list-style-type: none"> increase train capacity on the T3 Bankstown Line support Department of Planning and Infrastructure (now Department of Planning & Environment) in delivering urban renewal encourage transit-oriented development moving towards an accessible transport system.
<i>Rebuilding NSW – State Infrastructure Strategy</i> (NSW Government, 2016a)	<p>The strategy notes that:</p> <ul style="list-style-type: none"> Sydney Rapid Transit (the previous name for Sydney Metro) is the next phase in the evolution of Sydney's transit system. By extending the North West Rail Link (now known as Sydney Metro Northwest) services under Sydney Harbour and through the Sydney CBD, onto the T3 Bankstown Line, significant new capacity will be delivered for the whole rail network.
Premier's and State priorities: <i>NSW State Plan</i> (NSW Government, 2015)	<p>The following priorities are relevant to Sydney Metro:</p> <ul style="list-style-type: none"> creating jobs building infrastructure increasing housing supply ensuring on-time running of public transport.
Regional	
<i>Sydney's Rail Future</i> (Transport for NSW, 2012a)	<p>The future of Sydney's rail network is identified in Sydney's Rail Future as involving three tiers of services:</p> <ul style="list-style-type: none"> Tier 1 Rapid Transit (i.e. Sydney Metro) Tier 2 Suburban (the Sydney Trains network) Tier 3 Intercity (Central Coast, Newcastle, Wollongong and Blue Mountains services).

Strategy/plan/policy	Key policies and strategies relevant to the project need ¹
	<p>The strategy notes that conversion of the T3 Bankstown line would form part of the delivery of a rapid transit network for Sydney and that this would allow the introduction of faster services with 'turn up and go' convenience for commuters with services more than doubling after connection to the new rapid transit system.</p>
<p><i>Sydney City Centre Access Strategy</i> (Transport for NSW, 2013a)</p>	<p>The strategy:</p> <ul style="list-style-type: none"> notes that rail will remain the dominant transport mode for getting to the City Centre recognises the growing demand for access to Sydney's City Centre recognises the role that rapid transit and improvements to the rail network will play in improving access to the City Centre.
<p><i>A Plan for Growing Sydney</i> (Department of Planning and Environment, 2014)</p>	<p>The following goals and principles are relevant to Sydney Metro:</p> <ul style="list-style-type: none"> Goal 1: A competitive economy with world-class services and transport Goal 2: A city of housing choice, with homes that meet our needs and lifestyles Goal 3: A great place to live with communities that are strong, healthy and well connected Principle 1: Increasing housing choice around all centres through urban renewal in established areas Principle 3: Connecting centres with a networked transport system. <p>Relevant directions and actions under the plan include:</p> <ul style="list-style-type: none"> expand the Global Economic Corridor invest in strategic centres across Sydney to grow jobs and housing and create vibrant hubs of activity preserve future transport and road corridors to support future growth undertake urban renewal in transport corridors that are being transformed by investment, as well as around strategic centres.
<p><i>Draft Sydenham to Bankstown Urban Renewal Corridor Strategy</i> (Department of Planning and Environment, 2017)</p>	<p>The corridor strategy was prepared to identify opportunities for urban renewal and additional housing and jobs around the stations on the T3 Bankstown Line. It notes that the improvements to public transport that would be provided by Sydney Metro are likely to increase the attractiveness of the area as a place to live. The strategy forecasts that about 35,400 new homes and 8,700 new jobs could be built within the corridor by 2036.</p> <p>The corridor strategy is supported by an integrated transport strategy. Relevant actions under the strategy include:</p> <ul style="list-style-type: none"> provide a connected and integrated network that offers a range of travel options for residents, workers and visitors provide high quality walking connections between the rail stations and the surrounding environment develop a continuous and connected cycle network that provides local and regional connections and leads to an increase in cycling trips prepare strategies to reduce the reliance on private vehicle use and encourage walking, cycling and public transport. <p>As the strategy is currently in draft form, Transport for NSW would continue to work with the Department of Planning and Environment to ensure consistency between the project and the final strategy.</p>
<p><i>Draft South District Plan</i> (Greater Sydney Commission, 2016)</p>	<p>The plan:</p> <ul style="list-style-type: none"> recognises Bankstown and Campsie as district centres served by future Sydney Metro City & Southwest stations and notes the benefits of Sydney Metro to these centres in terms of increased accessibility notes that Sydney Metro City & Southwest will improve the South District's connections to the other parts of Sydney.

Strategy/plan/policy	Key policies and strategies relevant to the project need ¹
	Relevant priorities and actions under the plan include: <ul style="list-style-type: none"> • planning for job target ranges for strategic and district centres • growing economic activity in centres • providing access to a greater number of jobs and services within a 30 minute commute • facilitating enhanced walking and cycling connections.
<i>Draft Central District Plan</i> (Greater Sydney Commission, 2016).	The plan: <ul style="list-style-type: none"> • recognises Marrickville as a major employment and urban services precinct in the Central District served by future Sydney Metro City & Southwest stations. It notes the benefits of Sydney Metro to these centres in terms of increased accessibility • recognises that major transport infrastructure projects such as the construction of the Sydney Metro will improve access and productivity. Relevant priorities and actions under the plan include: <ul style="list-style-type: none"> • alignment of land use planning and infrastructure planning • investigation of opportunities to enhance east-west public transport connections • planning and delivery of regionally significant transport infrastructure • planning for job target ranges for strategic and district centres • improve 30 minute access to jobs and services • facilitate enhanced walking and cycling connections.

Notes: 1. Includes both the project in its own right and as part of Sydney Metro as a whole.

5.2.2 Strategic transport context

A key benefit of Sydney Metro City & Southwest is its role in expanding Sydney Metro. The project forms one of two components of Sydney Metro City & Southwest. Without it, the full benefits of Sydney Metro City & Southwest cannot be realised. As identified in the strategies, plans and policies listed in Table 5.2 and the *Final Business Case Summary* (NSW Government, 2016b), the strategic transport context of Sydney Metro involves the following key factors:

- the need to provide adequate transport capacity to respond to growth in population and economic growth in Sydney
- increasing demand for public transport in Sydney, in particular, rail transport
- the need to encourage transit-oriented housing and job opportunities, to respond to the growth in Sydney's population.

5.3 Project benefits

The project forms one of two components of Sydney Metro City & Southwest, which has been declared to be of critical State significance. The project is needed to complete Sydney Metro City & Southwest and to realise its full strategic benefits as part of Sydney Metro.

5.3.1 Sydney Metro City & Southwest has critical State significance

Sydney Metro City & Southwest (including the project), together with Sydney Metro Northwest, has been declared critical State significant infrastructure. Both these Sydney Metro projects have been declared as critical State significant infrastructure because they are, in the opinion of the Minister for Planning, essential for the State for economic, environmental and social reasons. These declarations recognise that Sydney Metro is part of the NSW Government's infrastructure investment program to respond to the growth in transport demand in Sydney.

With regard to Sydney Metro City & Southwest, the declaration recognised its role as part of Sydney Metro and the need for Sydney Metro. It also recognised the benefits of Sydney Metro City & Southwest in responding to existing issues with the rail network and the T3 Bankstown Line.

5.3.2 Supporting the growth of Sydney Metro

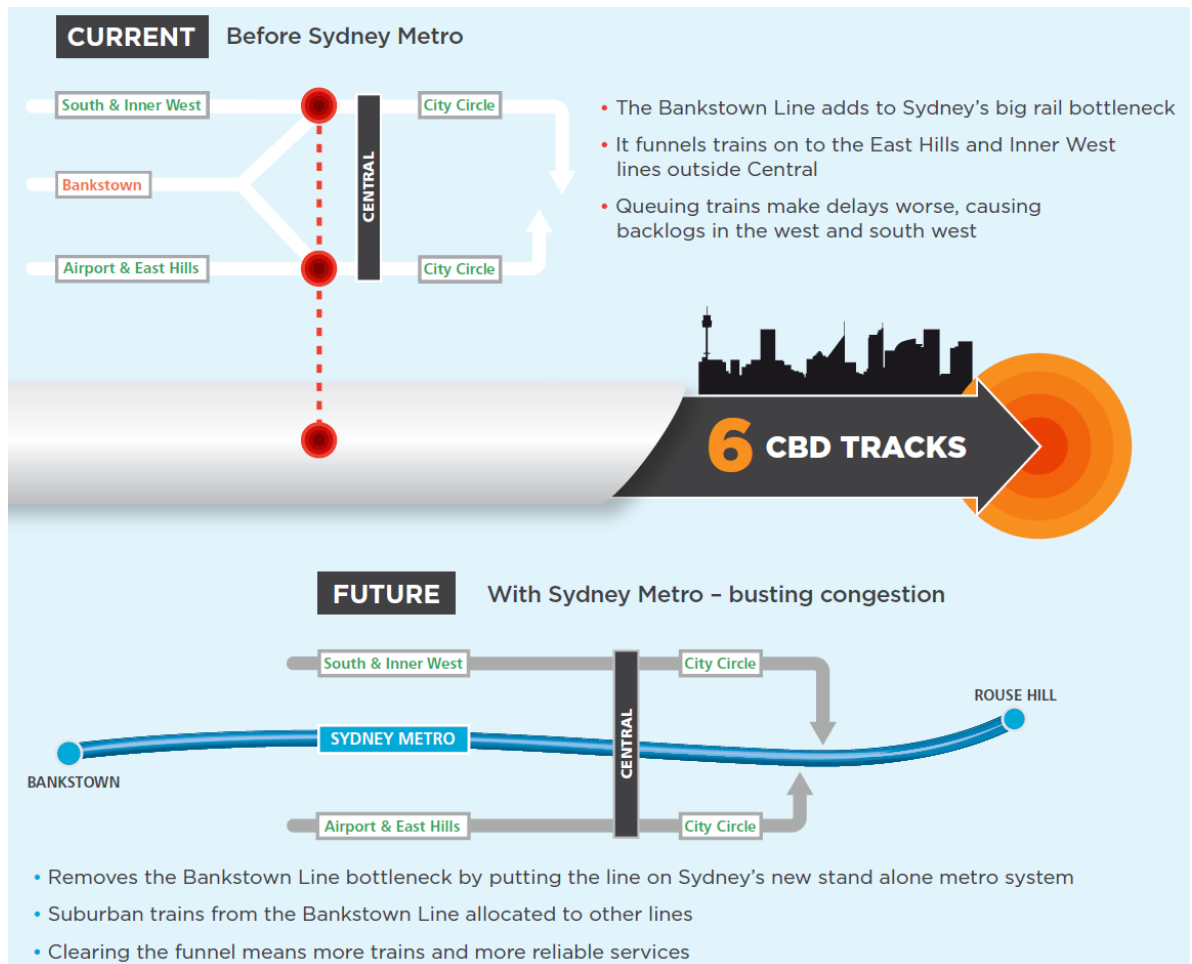
The project would further progress implementation of *Sydney's Rail Future* and Sydney Metro City & Southwest, enabling the provision of necessary public transport infrastructure to respond to the identified challenges and future demands.

Undertaking the project would enable Transport for NSW to extend the Sydney Metro system beyond Chatswood through to Bankstown. Benefits of the massive capacity growth anticipated through delivery of Sydney Metro – enough room for an extra 100,000 customers an hour – can only be achieved by delivering the full City & Southwest metro rail system (including the project) to work together with the existing suburban rail network.

5.3.3 Addressing capacity constraints

The upgrade of the T3 Bankstown Line to metro standards would address one of Sydney's biggest rail bottlenecks, delivering benefits across Sydney's rail network, as illustrated in Figure 5.2.

The suburban trains currently operating on the T3 Bankstown Line could be allocated to other railway lines. This in turn will enable the City Circle to be dedicated to the T2 Airport, Inner West & South Line in a simpler pattern of operation.



Source: Transport for NSW

Figure 5.2 Benefits of removing the T3 Bankstown Line from the existing heavy rail network

5.3.4 Better access for more people

By upgrading stations along the corridor between Marrickville and Bankstown, the project would enable better and safer access for more people and facilitate accessible interchange with other forms of transport.

This would promote mobility and safe autonomous access for all mobility levels, in accordance with relevant guidelines and standards, including the *Disability Discrimination Act 1992* and the *Disability Standards for Accessible Public Transport*.

In addition to the accessibility improvements, other station and precinct benefits to customers would include:

- new concourses, greater circulation space and new station entries better located to connect with areas surrounding the station
- improved public domain
- improved station interchange facilities.

The upgrades would deliver seamless travel to and between transport modes, encourage greater public transport use and better integrate with the role and function of the town centres along the corridor.

Accessibility improvements and bicycle facilities at upgraded stations, and safeguarding for an active transport corridor between Sydenham and Bankstown along the rail corridor, would encourage active transport use and deliver health benefits, by encouraging customers to walk and cycle to and from train stations.

5.3.5 Travel time savings

The project would result in travel time savings by providing more direct access for:

- T3 Bankstown Line customers to key destinations in the Global Economic Corridor
- T4 Eastern Suburbs & Illawarra Line customers to the key regional centre of Bankstown.

Benefits of travel time savings from the project are illustrated by comparison of typical travel times to and from certain destinations associated with introducing Sydney Metro City & Southwest (including the project) to the network, as shown in Table 5.3.

Table 5.3 Estimates of indicative travel time savings

Journey	Current travel time (using Sydney Trains) ¹	Travel time using Sydney Metro	Travel time savings
Bankstown to Central	Up to 36 minutes	26 minutes	Up to 10 minutes
Sydenham to Macquarie Park	45 to 51 minutes	29 minutes	At least 16 minutes
Bankstown to Martin Place	36 to 41 minutes	30 minutes	Up to 11 minutes

Notes: 1. Times take into account interchange between train services and wait times.

Figure 5.3 provides an illustration of how travel times would improve with the operation of Sydney Metro. The figure shows example journey options between Campsie and Macquarie Park using existing services - one using the existing Sydney Trains network only and one using both trains and buses. As shown in Figure 5.3, travelling between Campsie and Macquarie Park stations using public transport would currently take about 58 minutes. Using Sydney Metro, the travel time would reduce to about 42 minutes and no transfers would be required.

The examples show that, even in the absence of other transport changes, the project would make a major difference to travel times across the transport network. The improved connectivity and

travel time benefits represent new and more direct access to major CBD stations, to more job and employee opportunities (e.g. at Macquarie Park), and faster, more frequent access, to key education and medical services.

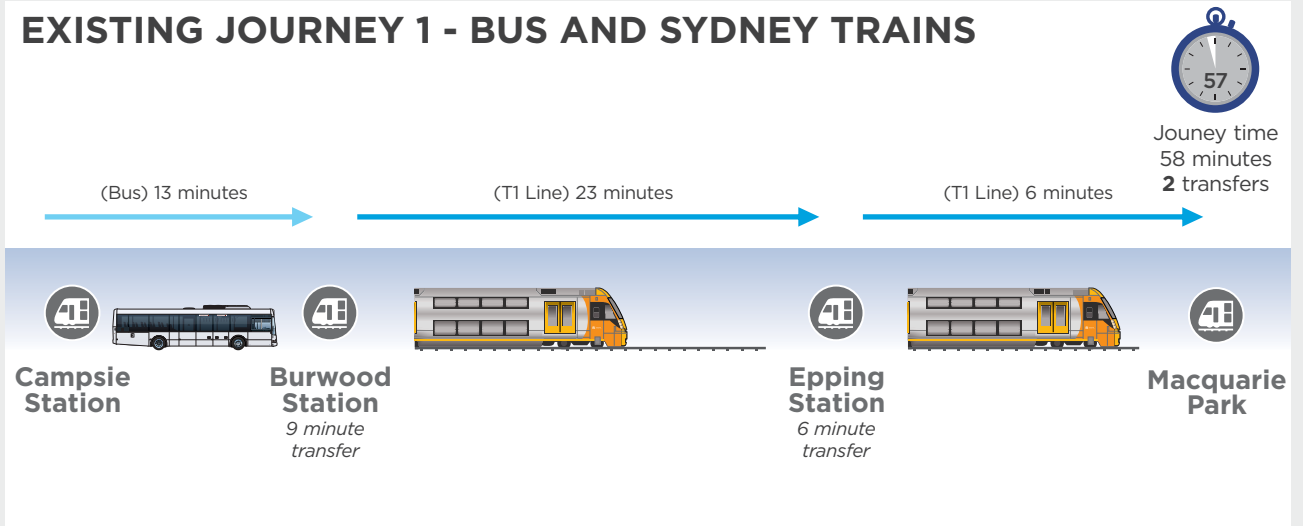
5.3.6 Facilitating urban renewal opportunities

The project would upgrade stations and support planned urban renewal opportunities, consistent with the aims of the draft *Sydenham to Bankstown Urban Renewal Corridor Strategy*, which has been prepared to identify opportunities for urban renewal, additional housing and jobs around the stations between Sydenham and Bankstown. It forecasts that over 35,000 additional dwellings could be built within the urban renewal corridor by 2036.

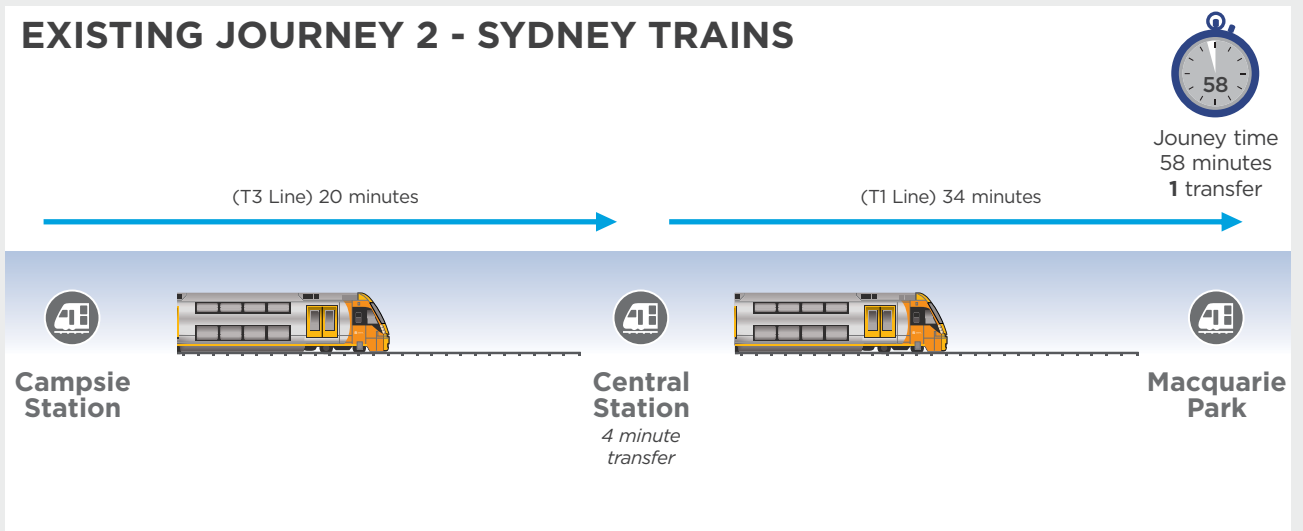
By upgrading stations, converting the T3 Bankstown Line to metro and delivering greater efficiency and reliability along the line, the project would play a role in encouraging transit oriented urban development around stations between Marrickville and Bankstown. It would facilitate realisation of urban renewal priorities and objectives under the draft *Sydenham to Bankstown Urban Renewal Corridor Strategy*, as well as the draft South District Plan and the draft Central District Plan prepared by the Greater Sydney Commission.

Further discussion on the linkages between the project and future planning in the Sydenham to Bankstown corridor is provided in Chapter 16 (Land use and property).

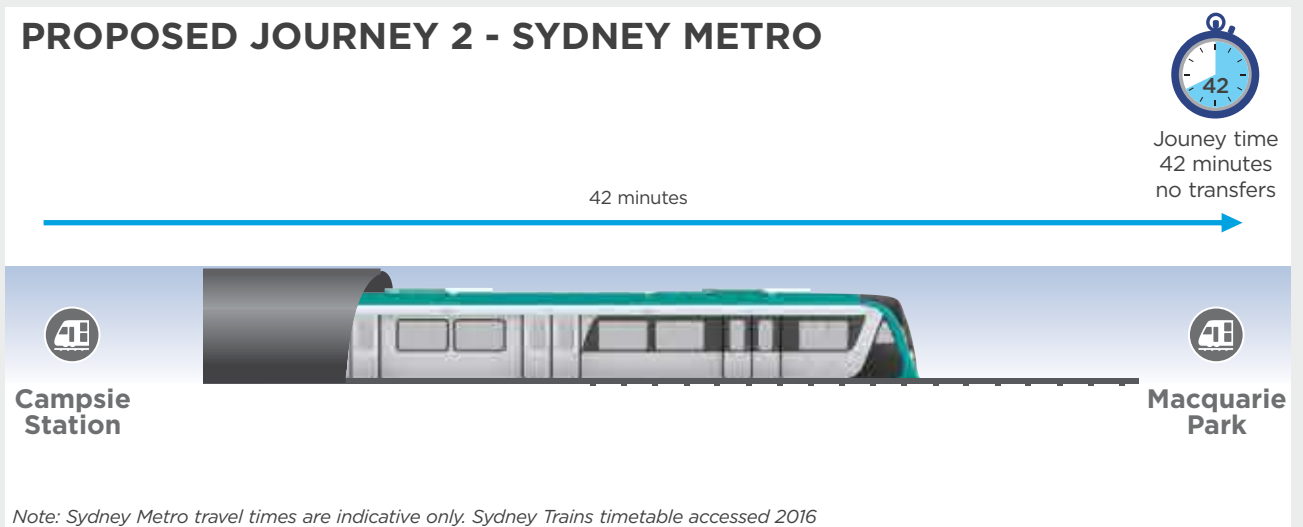
EXISTING JOURNEY 1 - BUS AND SYDNEY TRAINS



EXISTING JOURNEY 2 - SYDNEY TRAINS



PROPOSED JOURNEY 2 - SYDNEY METRO



Note: Sydney Metro travel times are indicative only. Sydney Trains timetable accessed 2016

6. Project alternatives and options

This chapter describes the alternatives to Sydney Metro as a whole (including the project) and the options considered for key design elements. The Secretary’s environmental assessment requirements addressed in this chapter are listed in Table 6.1.

Table 6.1 Secretary’s environmental assessment requirements – alternatives and options

Ref	Secretary’s environmental assessment requirements – alternatives and options	Where addressed
2 Environmental Impact Statement		
2.1	The EIS must include, but not necessarily be limited to, the following: (e) an analysis of feasible alternatives ¹ to the project	Section 6.1 The ‘do nothing’ alternative is considered in Section 6.4
	(f) a description of feasible options ¹ within the project	Sections 6.3, 6.5 and 6.6
	(g) a description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative/option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to and options(s) within the project were selected	Sections 6.1, 6.3, 6.5 and 6.6
	(h) describe opportunities for further network expansion and consideration of relationship to other Government public transport initiatives	Section 6.8

Note: 1. The Secretary’s environmental assessment requirements define alternatives to a project as ‘different projects which would achieve the same project objective(s) including the consequences of not carrying out the project’ and options within the project as ‘variations of the same project’.

6.1 Strategic transport alternatives

Various alternative transport solutions were considered as part of strategic rail planning undertaken to develop the *NSW Long Term Transport Master Plan* (the *Transport Master Plan*) and *Sydney’s Rail Future*. Strategic alternatives to further investment in rail were considered as part of this process. Alternatives considered included:

- regulatory, governance, and better-use reforms (considered in Section 6.1.1)
- investment in road, bus, and light-rail (considered in Section 6.1.2)
- *Sydney’s Rail Future* alternative rail transport solutions (considered in Sections 6.1.3 and 6.2).

6.1.1 Regulatory, governance, and better-use reforms

The NSW Government considered a range of regulatory, governance, and better-use reforms to improve transport outcomes, and meet Sydney’s growing population needs (refer Chapter 5 (Project need)). The following reforms were considered:

- regulatory reform, including review of customer transport legislation to allow for more flexible transport services
- governance reform, including centralising transport planning and policy functions within Transport for NSW, and integrating land use and transport planning, including for major growth corridors

- better-use reforms, including continued implementation of the integrated electronic ticketing system, a bus priority system, interchange upgrades, and improvements, expansion and modernisation of train and bus fleets.

While these reforms are vital to meeting the government's policy objectives and are already being implemented, they were considered insufficient on their own to resolve current issues and meet growing demand. Additional investment in transport infrastructure (considered in the following section) would also be required to meet existing accessibility issues and ensure Sydney's transport network meets future levels of demand.

6.1.2 Investment in road, bus, and light rail

The NSW Government is currently delivering or has delivered a number of rail, road, bus, and light rail projects across Sydney as part of the *Transport Master Plan*, the *Sydney City Centre Access Strategy*, *Sydney's Bus Future* (Transport for NSW, 2013e), and the More Trains, More Services program. These projects include WestConnex, NorthConnex, the CBD and South East Light Rail, the Inner West Light Rail extension, and a number of bus priority projects, including the Northern Beaches B-Line Program.

However, while investment in road, bus, and light rail projects forms part of the solution to Sydney's transport needs, these alternatives are, by themselves, insufficient to address the forecast growth in travel demand. Alternative transport modes have limited capacity to absorb Sydney's forecast long-term travel demand growth. For example, the number of people travelling to the Sydney CBD each day is forecast to grow to 775,000 by 2031, which equates to about 116,000 more cars or 2,685 more buses each day.

Sydney's suburban rail network is the backbone of the city's public transport system. On a typical workday, commuters make about one million journeys on the rail network, with one third occurring in the morning peak (between 6 am and 9.30 am) and rail will continue to be the dominant mode for getting to the city centre. Where possible, new roads (such as the proposed Western Harbour Tunnel, Beaches Link, and the M4 – M5 Link) will provide additional cross-regional links. However, investment in roads forms only part of the solution to providing the mass transit capacity required to support Sydney's growth. In addition, there is limited ability to augment the existing road network within Sydney's CBD. Accessing the Sydney CBD by car is further constrained by a lack of available on-street car parking.

Buses and light rail are complementary modes, bringing customers to, and dispersing them from, the major transport hubs served by suburban and metro rail services. However, buses and light rail cannot wholly support the large hourly commuter movements required into and out of the Sydney CBD, and to other key destinations in the Global Economic Corridor. Buses can provide a flexible response to local demand pressures, and light rail offers medium capacity solutions for major transport corridors, replacing lower capacity bus services. However, both modes alone would not provide sufficient mass transit capacity to address Sydney's transport bottlenecks or future demand. As a result, it is also necessary to invest in the expansion of the rail network.

6.1.3 Sydney's Rail Future

Sydney's Rail Future, which forms part of the *Transport Master Plan*, is a long-term plan to increase the capacity of Sydney's rail network through investment in new services and upgrading of existing infrastructure. It aims to modernise and transform Sydney's rail network and comprises a five-stage program to meet the challenges of a growing population and the needs of customers in the future. The five key stages comprise:

1. Operational efficiencies
2. Network efficiencies
3. New rapid transit system (now called Sydney Metro Northwest)

4. Second harbour crossing
5. Southern sector conversion.

Developing *Sydney's Rail Future* involved consideration of a number of alternatives for expansion of the rail network. Further information on these rail future alternatives is provided in Section 6.2.

6.1.4 Preferred strategic transport alternative

Based on the need described in Chapter 5 (Project need), including the projected population growth and transport demand in Sydney, additional investment in rail is considered to be a more efficient and effective solution than the other strategic transport alternatives.

While the other alternatives considered (regulatory, governance, and better-use reforms; investment in road, bus, and light rail; and stages one to three of Sydney's Rail Future) are in the process of being implemented, they will fall short of achieving the overall strategic goals and objectives over the long term. As a result, additional investment in rail, comprising stages four and five of Sydney's Rail Future, is required.

6.2 Rail network alternatives

6.2.1 Alternatives considered

The process undertaken in developing *Sydney's Rail Future* involved consideration of a number of rail network alternatives. A total of 15 opportunities were considered and grouped into four broad network alternatives, as summarised in Table 6.2. The first alternative (Rail Future A) is equivalent to a 'do minimal' alternative.

Table 6.2 Summary of rail network alternatives considered

Alternative	Key features
Rail Future A – the suburban alternative (existing rail network)	<ul style="list-style-type: none"> • use of the existing suburban rail network • continuation of using double-deck rolling stock on the existing network, including for all future expansions (including a second harbour crossing) • capacity of 20 trains per hour per direction (or 24,000 people per hour per direction)
Rail Future B – the rebuild alternative	<ul style="list-style-type: none"> • rebuilding parts of the existing network to run single-deck metro trains • conversion of the North Shore Line services across the Harbour Bridge to metro, using the existing harbour crossing • major upgrading of the existing CBD infrastructure and stations required
Rail Future C – a metro network integrated with the existing rail network	<ul style="list-style-type: none"> • a metro rail network that would maximise use of, and be integrated with, the existing rail network • new CBD rail line and harbour crossing
Rail Future D – an independent metro network	<ul style="list-style-type: none"> • a completely new metro network • would operate independently and not integrate with the existing rail network • new CBD rail line and harbour crossing

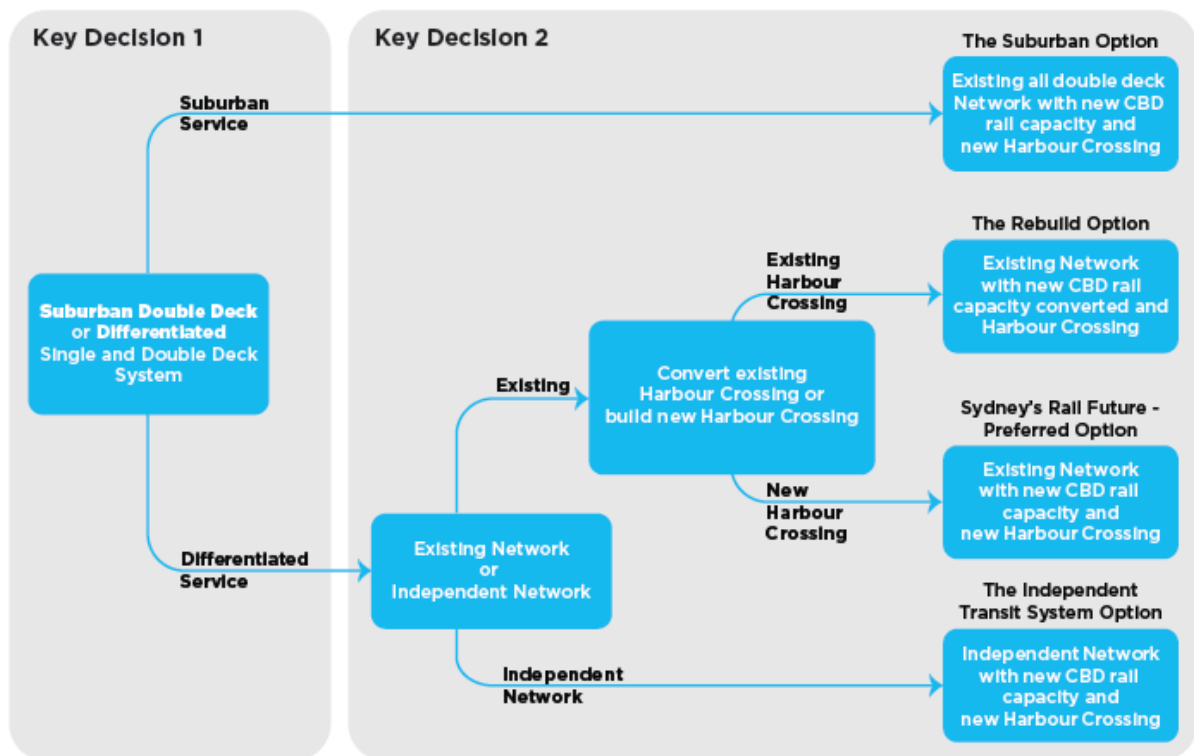
6.2.2 Assessment of alternatives

Each alternative was assessed against the criteria listed in Table 6.3.

Table 6.3 Criteria for assessment of rail network alternatives

Criteria	Measure
Customer focus	Delivery of high-quality, customer-centric services, which prioritise timeliness, safety and security, and comfort.
Network capacity	Provision and management of capacity to match future population growth and meet increased demand for passenger rail travel.
Network resilience	Improvement of on-time running performance and sectorisation (i.e, operating the rail network as independent units, which provides the ability to increase frequency and reliability of services particularly during peak periods), and reduction of incident occurrence rate.
Delivery risk	Feasibility of construction, and risks in implementation.
Cost effectiveness	Delivery of value for money, taking into account capital costs and whole-of-life costs, including operations and maintenance.

A two-step decision process was used to evaluate the alternatives, as shown in Figure 6.1.



Source: Sydney's Rail Future (Transport for NSW, 2012a)

Figure 6.1 Sydney's Rail Future alternatives decision process

As shown in Figure 6.1, the first step in the evaluation of alternatives involved assessing whether existing rail operations should be maintained and improved (Rail Future A) or whether the existing network should be supported by a separate, independent 'differentiated' system to provide metro services (Rail Futures B, C, and D).

It was concluded that Rail Future A, which involves maintaining the existing rail network and continuing to use double-deck rolling stock, including for all future network expansions, would not

meet the estimated future demand, or address the existing issues with the rail network. Issues associated with implementing this alternative include:

- Existing bottlenecks would be retained – for example, growth in South Western Sydney and in the Sydney Airport precinct will place increasing pressure on the T2 Airport, Inner West & South Line, which shares track through the Sydney CBD with the T3 Bankstown Line.
- Congestion in the Sydney CBD – Without improvements, the CBD will experience significantly higher levels of congestion by 2031. By 2031, each of the three busiest CBD stations are expected to experience an increase of more than an additional 10,000 passengers per hour in the peak. In addition, the existing network capacity is insufficient to deal with the demand generated by development at Barangaroo.
- Capacity challenges – by 2031, if major capacity improvements are not made, the T1 North Shore, Northern & Western Line, the T2 Airport, Inner West & South Line, and the T3 Bankstown Line will reach maximum capacity or even exceed capacity.
- Capability challenges – the existing rail network, including junctions, train types, stations, platforms, and technology, does not have the capability to deal with the projected future demand.

The second step in the evaluation of alternatives involved analysing the differentiated service opportunities against the assessment criteria, which included:

- delivery of capacity increases in key sections of Sydney's rail network
- high-quality levels of service
- provision of significant improvements in operational reliability required to service Sydney's growth.

Key findings of the assessment are summarised in Table 6.4.

Table 6.4 Summary of the rail network alternatives assessment

Alternative	Assessment findings
Rail Future A – the suburban alternative	<p>This alternative would not meet the long-term capacity and service improvements required by the <i>NSW Long Term Transport Master Plan</i>, and would not meet customer expectations for reliability, improved journey times, increased service frequency and convenience.</p> <p>The main beneficiaries of this alternative would be the North Shore and East Hills lines. Benefits for the west and Illawarra (Sutherland) would be limited, and further investment would be required to make more than an incremental difference to services on the Western and Illawarra lines.</p>
Rail Future B – the rebuild alternative	<p>Although rebuilding the existing network would improve capacity in the medium term, it would not meet demand in the long term, because capacity would be restricted to the existing single train line across the Harbour Bridge.</p> <p>Conversion of the existing North Shore line to accommodate a metro line would create increased safety issues associated with greater congestion on the existing, already overcrowded CBD stations. In addition, the number of services using these stations would reduce network reliability and resilience. This alternative offers the lowest cross-harbour capacity of the alternatives evaluated.</p> <p>It presents a high risk in terms of reliability and network resilience as it involves bringing more trains through the CBD and Wynyard and Town Hall Stations and fails to relieve existing bottlenecks that constrain the ability to deliver capacity increases that will help meet future demand.</p>
Rail Future C – a metro network integrated with the existing rail network	<p>This alternative scored higher than Rail Future D, as it would deliver significant capacity increases, provide high-quality levels of service, and significant improvements in operational reliability.</p>

Alternative	Assessment findings
Rail Future D – an independent metro network	This alternative would only benefit customers along the new lines, and would not adequately address the future requirements of the rail network. It would result in marginal benefits in terms of service enhancement, capacity improvements, and improved operating efficiency on the existing rail network. This alternative would also be the most expensive, and would divert funding from service improvements on the existing rail network.

6.2.3 Preferred alternative

The analysis of alternatives undertaken for Sydney's Rail Future concluded that Rail Future A would not meet the requirements of the *NSW Long Term Transport Master Plan*. This alternative would not deliver capacity and service improvements, or deliver reliability, improved journey times and convenience. Rail Future A was therefore not progressed.

With respect to Rail Future B (converting T1 North Shore Line services across the Harbour Bridge to metro operations and rebuilding other parts of the existing network), the analysis concluded that this alternative would not alleviate safety issues associated with congestion at existing CBD stations, and would impact network reliability and resilience. This alternative had the lowest cross-harbour capacity of the evaluated alternatives, and was therefore discarded.

The analysis concluded that Rail Future C (a metro network integrated with the existing rail network) would be superior to Rail Future D (an independent metro network), and consequently Rail Future D was discarded.

Building a metro rail system that would integrate with the existing rail network was considered to provide more benefits and fewer disadvantages than the other alternatives. This alternative was therefore adopted as the preferred alternative for modernising Sydney's rail network, because it would:

- be more flexible and provide more frequent services
- provide the required capacity and flexibility to respond to growing demand for rail in Sydney
- create a more modern, resilient, and faster service
- deliver a seamless and less disruptive way of modernising Sydney's rail network
- deliver transport benefits more cost effectively.

6.3 Rail line conversion options

Based on the preferred strategic transport and rail network alternatives (described in Sections 6.1.4 and 6.2.3 respectively), a range of options were considered for the conversion of the rail line for the south-western component of Sydney Metro City & Southwest. These options involved conversion of part of the existing rail network (from just south of Central Station) to metro. The options were developed to maximise the value of existing rail infrastructure. Options involved various combinations of full or partial conversion to metro of the following rail lines:

- T2 Airport, Inner West & South Line
- T3 Bankstown Line
- T4 Eastern Suburbs & Illawarra Line
- T5 Cumberland Line.

The following functionality requirements were adopted to enable evaluation of the conversion options:

- Sydney Metro will be a segregated and independent system, where tracks would not be accessible by suburban, intercity, or freight services.

- Sydney Metro City & Southwest will use single deck trains (the same rolling stock specification as Sydney Metro Northwest).
- The Sydney Metro network will meet international single deck metro rail standards.
- Specifications for Sydney Metro City & Southwest will be consistent with and fully compatible with, the specifications for Sydney Metro Northwest.
- Sydney Metro City & Southwest will use automated train operation under supervision of an automated train control system (the same as for Sydney Metro Northwest).

6.3.1 First review of conversion options

The long list of feasible conversion options were assessed in terms of their ability to meet the key criteria provided in Table 6.3. The following options were short-listed for further consideration:

- Base Case – Sydney Metro on the T3 Bankstown Line to Cabramatta and Lidcombe, and the T4 Eastern Suburbs and Illawarra Line to Hurstville.
- Option 1 – Sydney Metro via the T4 Eastern Suburbs and Illawarra Line, and the T2 Airport, Inner West & South Line, to Hurstville and Revesby, with the T3 Bankstown Line remaining suburban but terminating at Central Station.
- Option 2 – Sydney Metro via the T2 Airport, Inner West & South Line only, with the T3 Bankstown Line remaining suburban but terminating at Central Station.
- Option 3 – Sydney Metro to Revesby via Airport only (T2 Airport, Inner West & South Line), with the T3 Bankstown Line and the T4 Eastern Suburbs and Illawarra Line remaining suburban.
- Option 4 – Sydney Metro to Revesby via Airport only (T2 Airport, Inner West & South Line), with the T3 Bankstown Line remaining suburban but terminating at Central Station.

The options were subject to a detailed assessment. The outcomes of the assessment are summarised in Table 6.5.

Table 6.5 Summary of the options assessment

Option	Evaluation	Finding
Base case	<ul style="list-style-type: none"> • Consistent with <i>Sydney's Rail Future</i> • Improved connectivity from the south and southwest to the CBD and North Shore/Macquarie Park • Strengthens travel and capacity within the Bankstown corridor • Allows wider suburban network to operate more effectively (especially additional capacity for the East Hills, South and Inner West Lines) • Provides relief to the Illawarra Line 	Assessed as having some disadvantages. Otherwise performs reasonably well and consideration should be given to whether variations are available that overcome identified disadvantages.
Option 1	<ul style="list-style-type: none"> • Improved connectivity from the south to the CBD and North Shore/Macquarie Park • Connectivity and a metro service to the International and Domestic Airports 	Assessed as having some disadvantages, as well as constructability issues. Has some advantages and consideration should be given to whether variations are available that overcome identified disadvantages.

Option	Evaluation	Finding
Option 2	<ul style="list-style-type: none"> The conversion of the Inner West Line to Homebush would lead to a reduction in capacity for the T1 Western Line, as T2 South Line services would need to merge with T1 Western Line services at Strathfield, reducing the capacity of both these lines The connection of the tunnel to the T2 Inner West Line tracks would be a complex construction in an extremely constrained urban residential environment The conversion of the T2 Inner West Line would result in driverless metro tracks operating in a six track corridor in parallel with suburban and intercity tracks. 	Assessed as inferior, particularly in terms of system capacity, and would have constructability challenges and high cost.
Options 3 and 4	<ul style="list-style-type: none"> The conversion of the T2 Airport Line to Revesby to metro operations would lead to a reduction of capacity for the T2 South Line to East Hills. Services from west of Revesby would need to operate via Sydenham, and combined with T3 Bankstown Line Services, there would be insufficient capacity to operate the 14 services per hour that would be required to meet demands west of Revesby The conversion of the T2 Airport Line to metro and the operation of this line with up to 30 trains per hour in peak periods, would be significantly higher capacity than would be required to meet demand The conversion of the T2 Airport Line would involve a complex break into operating tunnel, significant tunnel ventilation upgrades to allow for 30 trains per hour and a significant period of closure The ultimate operation of 30 trains per hour would be incompatible with the requirements of airport passengers with luggage, leading to longer dwell times and compromising the metro reliability. 	Assessed as providing excessive capacity for T2 Airport Line patronage, while inadequately addressing network demand and relieving broader network capacity constraints.

As a result of the assessment, options 2, 3 and 4 were discarded. A review of the remaining options led to the development of a number of sub-options for consideration:

















- Enhanced base case – extension of Sydney Metro tunnel from Central Station to Sydenham Station, conversion of the T3 Bankstown Line to metro operations between Sydenham and Bankstown stations, and safeguarding a future connection to Liverpool.
- Option 1, sub-option C – Sydney Metro via Airport to Hurstville and Revesby (with the T3 Bankstown Line remaining as suburban and continuing to operate around City Circle).
- Option 1, sub-option D – Sydney Metro via Airport to Hurstville and Revesby (with the T3 Bankstown Line remaining as suburban and terminating at Central Station).

6.3.2 Second review of conversion options





The remaining options were evaluated using a detailed, multi-criteria analysis which identified the enhanced base case and option 1D as the two best performing options. These final two options were then compared against the Sydney's Rail Future evaluation criteria, with the findings shown in Table 6.6.

Based on the assessment, the enhanced base case was identified as the best performing rail line conversion option.

Table 6.6 Preferred conversion options – comparative assessment findings

Criteria	Sub-criterion	Enhanced base case	Option 1D – Sydney Metro via Airport
Customer focus	Demand		
	Customer experience		
	Transport network integration		
Network capacity	Capacity		
Network resilience	Rail operations		
Delivery risk	Constructability		
Cost effectiveness	Affordability		
	Economic viability		

Legend:

-  Performs better than original base case
-  Performs significantly better than original base case
-  Performs worse than original base case
-  Performs significantly worse than original base case

6.3.3 Preferred conversion option

In summary, the enhanced base case option (which is equivalent to the Sydenham to Bankstown upgrade project) was adopted as the preferred rail line conversion option, based on the above assessment, for the following reasons.

- Increased capacity – the Sydenham to Bankstown upgrade will allow Sydney Metro services to continue through Sydney’s CBD and across the harbour, facilitating the removal of the Bankstown Line from the City Circle and from the suburban network between Sydenham and Central Stations. This will provide substantial additional capacity for the T2 Airport, Inner West & South Line, by allocating all of the train paths on the City Circle to these lines. It will also significantly reduce platform and train overcrowding at Town Hall and Wynyard.
- Supports growth – the Department of Planning and Environment is investigating opportunities for urban renewal along the Sydenham to Bankstown corridor, to support Sydney’s substantial population growth. A revised *Sydenham to Bankstown Urban Renewal Corridor Strategy* was placed on exhibition in June 2017. The Sydenham to Bankstown upgrade will support growth on the T3 Bankstown Line and the T2 Airport, Inner West & South Line, by providing much needed additional forecast demand capacity on both rail corridors. Strong population growth from Sydney’s south is expected to see forecast demand exceed capacity on the T3 Bankstown Line by around 2023, on the T2 Inner West & South Line by around 2020, and on the Airport and South Line by around 2027. Both the Chatswood to Sydenham and the Sydenham to Bankstown components of the Sydney Metro City & Southwest project will provide critical congestion relief to these lines by 2024, and support long-term growth.
- Enhances reliability – network capacity and reliability from the south is constrained by multiple lines merging at Sydenham and Central stations. Redirecting rail services from the T3 Bankstown Line into Sydney Metro City & Southwest will improve reliability by reducing the number of rail network services sharing the same tracks.

- Simpler conversion – the T3 Bankstown Line is less complex to convert to metro operations and segregate from the existing rail network compared to the T4 Eastern Suburbs & Illawarra Line.
- Reduced infrastructure – it will be possible to connect Sydney Metro from Sydenham to Bankstown with minimal infrastructure compared to other lines, such as the T2 Airport, Inner West & South Line and the T4 Eastern Suburbs & Illawarra Line, which would require additional tunnels and tracks, and significant enabling works, such as alternative freight routes.
- Supports longer term network development – undertaking the Sydenham to Bankstown upgrade will support the opportunity for other extensions to the metro network in the future, such as an extension to Liverpool and/or a metro conversion of the T4 Eastern Suburbs & Illawarra Line to Hurstville/Mortdale.

6.3.4 Underground alignment

While not explicitly considered as an alternative in Sydney's Rail Future, an underground metro alignment was considered in preliminary feasibility investigations for Sydney Metro City & Southwest. Conceptually, this would involve extending the underground alignment from the Sydney CBD generally in a westerly direction with an interface at or in the vicinity of the existing Bankstown Station. Depending on the alignment chosen, other interfaces with the existing Sydney Trains network might also be possible.

Compared with the enhanced base case option however, this alternative would be significantly more expensive to construct without a corresponding ability to attract substantial additional patronage being in an area which is already well serviced by the T1 North Shore, Northern & Western Line, the T2 Airport, Inner West & South Line, and the T3 Bankstown Line, making the project economically unviable.

Also, unlike the preferred conversion option, an underground alignment would not facilitate the accessibility improvements proposed for the existing above ground stations on the T3 Bankstown line. This option was therefore inferior to the conversion option and was not considered further.

6.4 The 'do nothing' alternative

The 'do nothing' alternative would involve maintaining existing operations along the T3 Bankstown Line and not completing the Sydenham to Bankstown component of Sydney Metro City & Southwest. The 'do nothing' alternative would involve the T3 Bankstown Line continuing to operate as part of the Sydney Trains network, and Sydney Metro operating between Rouse Hill and Sydenham, rather than to Bankstown. Under this alternative, metro trains would need to terminate at Sydenham Station, and turn back (via an above ground turnback facility to the north of Sydenham Station), to provide a return service from Sydenham to Rouse Hill.

Implementing the 'do nothing' alternative would have the following issues:

- the full transport, city-building, and economic benefits of Sydney Metro City & Southwest (described in Section 5.3), and the benefits of the project would not be realised
- it would not adequately respond to the challenges posed by population growth in Sydney (refer to Section 5.1), or enable realisation of the urban renewal opportunities provided by the strategies summarised in Section 5.2
- existing rail network issues, constraints, and challenges would remain, including the existing limited network capacity of the Sydney Trains suburban network, crowding on trains and at existing CBD stations, and accessibility issues at stations between Marrickville and Bankstown (described in Section 5.1.1)
- it would not address the recognised need for Sydney Metro – as described in Section 5.1

- over 5,900 interchanges would need to occur at Sydenham Station, and additional infrastructure works would be required at Sydenham Station to allow metro trains to terminate and turn back
- there would be approximately 27,000 fewer trips on Sydney Metro in the one-hour AM peak, which would impact the effectiveness and viability of Sydney Metro between Sydenham and Rouse Hill.

Further information on the need for, and benefits of, the project is provided in Chapter 5. In the context of the analysis undertaken for *Sydney's Rail Future* and the *Transport Master Plan*, the 'do nothing' alternative is not considered viable, based on its failure to deliver solutions to the existing and future needs of the rail network.

6.5 Station design, location and upgrade options

6.5.1 Accessibility upgrade

Do minimum

The 'do minimum' option would involve retaining the existing platform 'gap' and installing new systems required for metro operations (including signalling, power and automatic train operation). This option would re-use most of the existing stations and track, as well as the existing overhead wiring infrastructure. This option would also involve continued use of ramps to provide accessible access on and off trains.

The 'do minimum' option would not satisfy relevant accessibility requirements (as per the *Disability Discrimination Act 1992* (DDA) and the *Disability Standards for Accessible Public Transport 2002* (DSAPT). This option would also provide a compromised outcome for Sydney Metro, with a significantly worse customer experience resulting from the use of the existing stations with limited upgrades, and no platform screen doors to improve safety. This compromise was considered unacceptable given the magnitude of the investment in Sydney Metro, as the customer experience would be substantially different and adverse, compared with the new metro stations and infrastructure elsewhere on the metro system.

Platform design

Two options were considered to meet relevant accessibility requirements of the DDA and DSAPT:

- straightening of platforms (demolition and rebuild as required)
- use of mechanical gap fillers (mechanisms that automatically narrow the 'gap' between the platform and the train when the train arrives at the platform).

Assessment of these options involved consideration of performance against the following criteria:

- provision of a safe, reliable, and efficient transport system
- place making and urban design outcomes
- heritage and property impacts
- relationship with, and implications on road, and rail bridges
- cost
- rail geometry required to support operations and constructability.

Straightening platforms would meet Sydney Metro, and operational requirements. Straightening of platforms was therefore identified as the preferred option, and is proposed at all stations, except for Dulwich Hill. At Dulwich Hill Station, extensive and costly civil engineering works would be required to provide a straight platform arrangement, with associated impacts. As a result, the retention of a

curved platform arrangement (with platforms rebuilt to support platform edge barriers) is currently proposed at Dulwich Hill Station, with mechanical gap fillers provided to satisfy accessibility requirements.

Transport for NSW would work with the contractor to determine whether an innovative solution can be developed in the detailed design phase to provide a straight platform at Dulwich Hill Station. The consistency of this option with the Environmental Impact Statement and any terms of approval would be considered. If the potential impacts of this option were not considered to be consistent, an application would be lodged seeking to modify the project.

6.5.2 Station location

Each station contributes significantly to its local community in terms of economic activity, productivity and accessibility. These three factors contribute to the social cohesion, social inclusion and community identity along the rail line. All existing stations are considered optimally located in terms of their topographic setting, road networks and natural features, and they respond to the optimal walking catchment for the station.

The benefits of potentially moving stations from their current location were therefore considered to be limited and was therefore not adopted. All stations along the T3 Bankstown Line would be retained in their current locations.

6.5.3 Consistency of station upgrades

The option of only upgrading some of the stations along the corridor was not considered practical, or appropriate for the Sydney Metro brand. It would also have the potential to isolate some customers who currently use train services along the line to access local centres for services, education, and employment. It would also not meet the demand and address the access issues described in Chapter 5 and referred to above.

Maintaining the existing catchment of train customers along the T3 Bankstown Line is critical to achieving the project objectives, including encouraging mode shift from cars and/or buses onto trains, delivering customers a more comfortable, reliable, and efficient train service, and contributing to the accessibility and connectivity of existing and future communities.

The preferred option for the project therefore involves upgrading all 10 stations along the T3 Bankstown Line from Marrickville Station to Bankstown Station (Sydenham Station would be upgraded as part of a modification to the Chatswood to Sydenham project).

6.6 Possession options

Some of the construction activities, such as major station works, track works, and bridge works, would need to be undertaken during rail possession periods (when trains are not operating) to minimise operational disruptions and rail worker safety risks. Project development to date and the assessment undertaken in this Environmental Impact Statement has assumed the possession periods would be repeated each year over the construction period, and the longer possession periods would generally target school holiday periods when transport demand is lower.

While alternative transport arrangements would be put in place to address customer needs during these periods, the closure of rail stations and/or the rail line would involve a level of disruption to customer journeys.

6.6.1 Possession options considered

During initial project planning and design development, five indicative rail possession options were considered, with a view to meeting delivery timeframes and minimising impacts on customers and the community more generally. The five options are listed in Table 6.7.

This initial planning identified that each option would involve use of the standard four weekend possessions per year scheduled by Sydney Trains. The options differ in terms of the use of additional possessions during school holiday periods (two and/or six week closures each year of construction), whether the final possession period would be shorter (around three to six months) or longer (at least six months), and whether additional station closures may be required (option 4 only).

Table 6.7 Possession and programming options considered

Option considered	Weekend possessions (four per year)	No. of two week closures required	No. of six week closures required	Additional closure required?	Final possession (months)
1	✓	3	1		3 to 6
2	✓	1	1		3 to 6
3	✓	None	1		3 to 6
4	✓	None	None	✓	6
5	✓	None	None		3 to 6

6.6.2 Assessment of possession options

The evaluation of options against key criteria concluded the following in relation to each option.

- Option 1 – from a delivery risk perspective, option 1 was preferred, however it would have a higher customer impact based on the total number of closure days.
- Option 2 – would have low delivery and cost risks, and a medium impact on customers, based on the total number of closure days.
- Option 3 – would have a higher delivery risk, as major reconstruction works would need to be undertaken at two to three stations during each period. With a closure during the Christmas/January school holiday period, this option provided the lowest customer impact. However, it would have a higher delivery risk, as major reconstruction works would need to be undertaken at two to three stations during each period.
- Option 4 – this option had a higher impact on customers, as it would require the longest closure of the line, although delivery and cost risks would be one of the lowest of all the options.
- Option 5 – this option, with minimum closure times, was discounted as it was not likely to be achievable, would be too risky, was likely to be the most costly, and would have a high impact on customers.

6.6.3 Preferred possession option

Option 2 was taken forward as the basis of the environment assessment, as it provides a reasonable balance between delivery risk and customer impact, had lower delivery and cost risks, and a medium impact on customers. This option would involve possession periods during the Christmas/January and July school holiday periods each year, and a final possession period of between three and six months.

The proposed possession program would be reviewed during tendering, detailed design, and construction planning to ensure the available possessions are sufficient to complete the works and to reduce the overall impacts on the community as far as possible. One of the key elements to this approach would be to use the competitive tendering process to identify alternative possession options that may deliver additional benefits relative to the environmental assessment carried out to date. These may include:

- A reduction in the total number of possession periods to reduce the number of changes to customer travel arrangements.
- Arrangements that would keep some stations open, to increase available construction windows whilst maintaining a rail service along the corridor, reducing the total distance customers would need to travel on temporary transport.
- Options that would deliver customer benefits, such as lifts and straightened platforms, earlier in the construction phase in advance of full metro operation.
- Options that would reduce the overall duration of the station and corridor works, to reduce the duration of other environmental impacts, such as noise and construction traffic impacts.

6.7 Preferred project

The preferred project was identified as an outcome of the evaluation of feasible alternatives and options described in Sections 6.1 to 6.6. The preferred option for the Sydenham to Bankstown upgrade component of Sydney Metro City & Southwest involves upgrading 10 existing stations west of Sydenham (Marrickville to Bankstown inclusive), and a 13 kilometre long section of the T3 Bankstown Line, between west of Sydenham Station and west of Bankstown Station, to improve accessibility for customers and meet the standards required for metro operations.

6.8 Potential future network expansion opportunities

Sydney Metro is planned to support programmed improvements and initiatives across the wider metropolitan rail network, and provide new connections, with progressive changes to the bus service operations. Sydney Metro City & Southwest integrates with the existing Sydney Trains network, light rail system, strategic bus corridors, and other transport modes, to allow efficient interchange at strategic locations, including Martin Place, Pitt Street, Central, Sydenham, and Bankstown stations.

As described in Chapter 5, upgrading the T3 Bankstown Line and converting it to metro would improve service reliability and frequency, support transfer between modes, and enable existing and future transport network capacity constraints to be addressed.

The NSW Government is implementing a coordinated program to provide rail and bus customers with more reliable services, and improve the integration of Sydney's transport network. For rail, this involves more modern trains, and more frequent express services, which would be enabled through infrastructure upgrades associated with the 'More Trains, More Services' program. This program is being staged to complement other system and rail capacity improvements, including Sydney Metro.

Sydney Metro forms the backbone of the NSW Government's vision for a modern transit system and improved travel for customers using Sydney's public transport system. Its implementation aligns with Sydney's growth strategy, providing much needed service capacity and travel option enhancements, which will benefit and transform public transport in Sydney.

The NSW Government is continuing to investigate improved transport connectivity across Western Sydney, which includes safeguarding a future extension corridor for Sydney Metro between Bankstown and Liverpool. In time, the Sydney Metro network would be extended by separate independent metro alignments, which would provide connectivity via strategic interchange points.

The NSW Government has announced that a new underground metro railway line will be built between Parramatta and the Sydney CBD to help cater for Sydney's growth. Sydney Metro West will provide a direct connection between the Parramatta and Sydney CBDs, linking communities not previously serviced by rail, as well as supporting growth between the two major CBDs. Sydney Metro West will integrate with long-term transport planning for Western Sydney, including rail needs associated with the Western Sydney Airport.

Further transport initiatives supported by the project include the NSW Government's target to encourage more people to walk and or cycle for part of their journey. The active transport strategy described in Chapter 10 (Operational traffic, transport and access), seeks to improve the walking and cycling mode share for all types of travel across Sydney. This would be promoted by improving active transport infrastructure and facilities, population growth, and improving access to and the overall experience at stations.

7. Design development and place making

This chapter describes how the design for the project was developed, and how it addresses key considerations and requirements. This includes a summary of place making, urban design, accessibility, and environmental considerations, including the way in which the design has evolved to avoid or minimise potential impacts, as well as refinements to the design resulting from stakeholder consultation.

The Secretary's environmental assessment requirements relevant to place making and urban design, and where they are addressed in this chapter and in the Environmental Impact Statement, are listed in Table 7.1. Further information on how the design was developed with respect to place making and urban design considerations is provided in the place making and urban design paper in Appendix H.

Table 7.1 Secretary's environmental assessment requirements – design development, urban design and place making

Ref	Secretary's environmental assessment requirements – design development, place making and urban design	Where addressed
2 Environmental Impact Statement		
2.1	The EIS must include, but not necessarily be limited to, the following: (j) a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts	Section 7.3
14. Place making and urban design		
14.1	The Proponent must deliver functional 'place' outcomes of public benefit, inclusive of how the project integrates with proposed land use changes occurring within the corridor, and how it contributes to the accessibility and connectivity of existing and future communities (with specific consideration given to the Sydenham to Bankstown Urban Renewal Corridor Strategy (as updated)). This must be done in collaboration with the Department of Planning and Environment and Councils, and must include but is not limited to:	A summary of the results of the place making and urban design process is provided in this chapter. Further information is provided in the urban design and place making paper in Appendix H.
	(a) the defining of existing and proposed station precincts including implications for urban renewal	Section 7.2
	(b) identifying design principles, strategies and opportunities to enhance healthy, cohesive and inclusive communities (including consideration of government strategies and plans)	Section 7.3
	(c) the provision of infrastructure to support accessible paths of travel and interchange	Section 7.3.8
	(d) assessing the impact of the project on the urban and natural fabric	Section 7.3.4
	(e) incorporating the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process.	Section 7.2.5
14.2	The Proponent must describe the accessibility elements of the project including relevant accessibility legislation and guidelines and:	Sections 7.1, 7.2.4 and 7.3.8 describe how accessibility was considered as part of the design process. The potential impacts of the project on accessibility during construction and operation are considered in chapters 10 (Construction traffic, transport and access) and 11 (Operational traffic, transport and access).

Ref	Secretary's environmental assessment requirements – design development, place making and urban design	Where addressed
	(a) impacts on pedestrian access in and around stations and connecting streets (including consideration of land use change)	Sections 11.4.4 to 11.4.13
	(b) enhancing the accessibility of each station and the general vicinity of walking and cycling catchments	Section 7.3.8, 11.4.2, 11.4.4 to 11.4.13
	(c) the provision of infrastructure to support accessible paths of travel and interchange	Sections 7.3.8 and 11.4.4 to 11.4.13
	(d) impacts on cyclists (including the provision of and integration with active transport routes) and pedestrian access and safety	Sections 7.3.8 and 11.4.4 to 11.4.13
	(e) minimising barriers across the rail corridor and opportunities to integrate cycling and pedestrian elements with surrounding networks and in the project.	Section 7.2.4 and 11.4.3
14.4	The Proponent must provide artist impressions and perspective drawings of the project from key receiver locations to illustrate the project.	Section 8.1.

7.1 Design development

7.1.1 Approach

The design of the project commenced in September 2014. To date, developing the design has involved:

- preliminary evaluation and review of options – evaluation of key issues, potential options, and the feasibility of the project
- scoping design – options evaluation and systems definition, constraints analysis, and mapping
- definition design – option selection and preferred option development
- reference design – augmentation of the definition design to provide a considered basis for the project, with designs produced to support contract documentation.

The design of the project has evolved over these stages, with an increasing level of detail and incorporating a range of considerations and options at each stage.

The reference design is the current design for which approval is being sought and it forms the basis of the Environmental Impact Statement. The reference design has evolved over a period of about 18 months, and has involved many iterations and regular refining, particularly in relation to the design of station upgrades. The development of the design has been informed by the consideration of stakeholder and community feedback, as well as the findings of environmental studies.

A foundation element and core value in the development of the design has been that the Sydney Metro stations would meet the needs of all potential customers. Providing equality of access is crucial to social justice and inclusion for people with disabilities. As a result, design concepts have been continuously tested against accessibility requirements and legislation, including:

- *Disability Discrimination Act 1992 (DDA)*
- *Disability Standards for Access to Public Transport (DSAPT)*
- Building Code of Australia (BCA)
- relevant Australian Standards.

7.1.2 Project setting

The project setting provides one of the primary design considerations. The project traverses a corridor of Sydney that has been undergoing continual transformation and renewal since its initial settlement.

Between Sydenham and Bankstown, centres of varying size and scale have developed around each of the stations, which were built from the 1890s to the 1930s.

The stations have played an important role in developing the local and regional economy, while enabling people to live, trade, and travel within and through the corridor, to access business, family, work, recreation, culture, leisure, health, education, shopping, and entertainment services. Tens of thousands of people pass through the stations each day.

In most cases, the stations are located at the centre of their surrounding communities and are the focal point for intensive activity, as well as integrated transport services. The existing stations and rail services have been the catalyst for higher densities of development, resulting in a broad range of uses and activity, and more people working and living close to the stations. Over time, these centres have developed a clear identity, and by virtue of mixed land uses, community facilities, and a good transport service, have developed a strong sense of place. As a result, place making has been a crucial consideration during design development.

7.2 Understanding place

The approach to place making for the project is based on a multi-faceted approach to the planning, design, and management of public spaces, which aims to create public spaces that promote people's health, happiness, and well-being.

The community gives increasing importance to proximity to high quality transport and the range of adjacent services and facilities. There are also significant demographic changes occurring in Sydney. These trends will continue in coming decades and will be supported by urban renewal plans for the corridor.

In this context, the project aims to build on and strengthen the existing role of each centre. This would be achieved by delivering upgraded stations, and providing improved transport services, that represent the next generation of rail service, with improved station design, universal accessibility, and faster and more frequent services, commensurate with the existing and future needs of the communities along the corridor.

Two key place making requirements have been adopted to develop the design:

- The stations have important functions as community places, in their own right and as a focal point within, or in close proximity to a town centre, thereby attracting a range of benefits and land uses, including:
 - reducing dependence on private vehicles
 - providing a public place for gathering commercial/retail and human interaction, and a focal point for surrounding communities
 - encouraging exercise, by promoting walking and cycling as an attractive form of transport to and from stations.
- The stations contribute to the surrounding urban environment or 'place' in which they are located, and can:
 - act a catalyst for the nature and form of development within each of their catchments
 - attract people wanting to live close to, or who are dependent on, public transport facilities, and they must therefore operate as intermodal exchanges to foster increased mode share for sustainable transport and to meet increasing demand

- act as a focal point in the local community which can draw people to an area, and enliven adjoining areas and support local businesses.

These place making requirements have been forged together and embedded in the design through a central focus on achieving high levels of safety and accessibility to maximise the attraction of people.

Key place making considerations are described in the following sections, including:

- urban design
- land use
- heritage
- access and connectivity
- crime prevention through environmental design
- environment and sustainability in design
- stakeholder and community feedback.

The design process and outcomes are summarised in Sections 7.3 and 7.4.

7.2.1 Urban design

The approach to the design of the stations is to incorporate architecture and design that projects an appropriate level of civic presence, and which continues to promote the role of the stations as urban centres, community places, and focal points as the communities evolve over the coming decades. The design of stations and associated interchanges needs to address accessibility, safety, and comfort, while retaining a strong identity, incorporating elements of station heritage, and providing for a modern rail service.

The design of the stations and surrounding interchange areas (including lighting, building placement, and landscape features) have taken into account crime prevention through environmental design (CPTED) principles, to ensure that the customer is safe on every part of the journey through the station. The designs also aim to contribute to healthy, cohesive and inclusive communities.

Attention has also been given to the areas between the stations that have the capacity to deliver and enhance health benefits and other important community outcomes, by safeguarding space in the design for an active transport corridor, which would contribute to the NSW Government's aspirations for a green grid throughout Sydney.

Station upgrades have been developed to meet a forecast demand for 2056 using a computer software model that was able to take into account multi-modal journeys (such as travelling by bicycle then train, bus and train, etc). The forecasts also took into account current and proposed future land use in the immediate vicinity of the station.

The design process involved a detailed analysis of the design and functioning of the existing stations, as well as the local context of each station and its contribution to place. This included:

- the street network
- current and future bus services and bus routes
- topography and terrain
- pedestrian movement and desire lines
- the existing character, scale, and function of the surrounding centre
- nearby attractors, including schools and colleges, sports facilities and open space, and major retail activities.

Public domain plans for centres that address the nature of existing and possible future interface activities were also considered.

7.2.2 Land use

Government strategies and policies

The District Plans developed by the Greater Sydney Commission sit within a broader strategic framework that will underpin amendments to Sydney's metropolitan strategy *A Plan for Growing Sydney*. The amended strategy conceptualises Greater Sydney as a metropolis of three cities.

The Sydenham to Bankstown corridor straddles the 'Central' and 'Western' cities, and falls within the Central and South Districts. The strategy notes that it is critical that the Central City has strong transport connections, with sufficient capacity, to the established Eastern City and the emerging Western City. The District Plans note that Sydney Metro will play a critical role in improving transport connections and capacity.

Further information on the strategic context for the project is provided in Chapter 6 (Project need).

Plans

The Department of Planning and Environment, in partnership with the Inner West Council and Canterbury-Bankstown Council, undertook a land use and infrastructure analysis as part of developing the draft *Sydenham to Bankstown Urban Renewal Corridor Strategy*. This aims to guide future planning of development and infrastructure delivery within this corridor over the next 20 years.

Planning for the corridor includes a focus on opportunities to develop low, medium, and high-rise residential, and mixed use projects, within walking distance of the stations. It also proposes new areas of open space on potentially surplus railway land and other underused areas, and promotes provision of an active transport link along the corridor.

Another focus is the quality of the public domain in residential streets and town centres, so that the future public realm supports anticipated housing and population densities. The quality and fine grain urban fabric of centres along the corridor is acknowledged, and the urban renewal corridor strategy recognises that these qualities should be retained.

Sydney Metro City & Southwest embodies the transport infrastructure goal of the urban renewal corridor strategy, and supports future development and infrastructure delivery within the Sydenham to Bankstown corridor.

7.2.3 Heritage

All stations within the project area are heritage listed, with three stations (Marrickville, Canterbury, and Belmore Stations) listed on the State Heritage Register.

The introduction of Sydney Metro on the T3 Bankstown Line constitutes the continuing evolution of the rail corridor through the introduction of the next generation of rail services and the fourth major intervention to this existing railway landscape.

The design of the stations has been developed with regard to the heritage values of the stations and the rail line overall, and has sought to:

- recognise and demonstrate the heritage significance of each phase of rail transport development along the line
- retain and conserve, wherever possible, elements of heritage significance, so that functional relationships can be understood and interpreted
- remove intrusive station elements that detract from the core heritage values

- adaptively reuse the retained and conserved heritage buildings for station and related functions
- carefully and clearly express the presence of Sydney Metro with new high quality design elements
- deliver a functionally viable line, stations, and precincts, while enhancing the legibility of key heritage values.

Key design responses to heritage considerations are summarised in Section 7.3.7.

7.2.4 Access and connectivity

An understanding of accessibility and connectivity considerations along the T3 Bankstown Line has informed design development.

Disability and elder access

As noted earlier, the provision of access for all people of all ability levels is not universally available across the stations between Marrickville and Bankstown. As a result, a core design focus is the need to recognise relevant accessibility guidelines and standards (including the DDA and DSAPT) and deliver design outcomes that resolve this. Providing good access for people with disabilities and the elderly, it also provides benefits for other passengers, such as parents with prams, and passengers travelling with luggage.

Station access hierarchy

Incorporating station access planning as an integral part of the design process is another key component of the overall customer experience and journey. Multiple travel modes would be used to access destinations, and customers need a seamless, well integrated, and safe journey. The station access hierarchy (shown in Figure 7.1) was used as the basis for the design of the stations and associated facilities.



Figure 7.1 Station access hierarchy

The objective of the hierarchy is to ensure that the design of stations, and their integration with other transport modes, gives the highest priority to the most efficient and sustainable access modes. Walking and cycling are the highest priority access modes driving design development, followed by public transport, then taxis, kiss-and-ride, and finally park-and-ride (the lowest priority).

Minimising barriers to movement

The existing rail corridor represents a substantial barrier for north–south movements, with limited road and pedestrian crossings between Marrickville and Bankstown. Cross-corridor access is generally by way of existing road overbridges, and a small number of pedestrian only bridges. Some stations also provide pedestrian only cross-corridor access, however these are generally located close to existing road overbridges. The project design has maintained the existing level of cross-corridor access, and has identified opportunities to upgrade access, particularly in relation to road overbridges, as well as providing some new or additional crossings to improve cross corridor access at Dulwich Hill, Belmore, Punchbowl, Bankstown stations.

By considering pedestrian catchments and movements to, from, and around each station, the level and direction of pedestrian activity has been used to inform design development with respect to minimising barriers to movement.

7.2.5 Crime prevention through environmental design

The design of stations, interchange facilities, car parks, and accessible areas has been, and would continue to be, informed by CPTED principles. This involves incorporating, as a minimum, the three main CPTED strategies:

- natural access control
- natural surveillance
- territorial reinforcement.

The station designs have been developed with consideration given to these principles, to provide safe and secure places, with design response including passive and physical security.

Safety is a fundamental consideration for the design of all elements. To ensure that this has been addressed, Safety in Design workshops and safety reviews of design options were embedded into the design process.

7.2.6 Environment and sustainability in design

Environment led design

The approach to design development has included a focus on avoiding and/or minimising potential environmental impacts. In this regard, a feedback process has enabled findings from a number of the technical specialist studies to collectively build an understanding of the receiving environment to refine or modify elements of the project design. While all environmental assessments were considered in this process, of particular relevance have been findings relating to:

- traffic and transport
- noise
- heritage
- landscape and visual
- biodiversity
- socio-economic and business impacts.

A summary of how the design has avoided and/or minimised potential environmental impacts is provided in Section 7.5.

Sustainability based design

Transport for NSW has applied, and would continue to apply, relevant sustainability principles throughout the design and development of the project. The Sydney Metro City & Southwest Sustainability Strategy (Appendix F) provides the approach to sustainability for the whole of Sydney Metro City & Southwest, including relevant sustainability objectives, targets, and initiatives. These apply to the entire life-cycle, including reference design, detailed design, procurement, construction, and operation.

The following overarching sustainability initiatives indicate the intended level of sustainability achievements proposed for Sydney Metro City & Southwest that have influenced design development:

- reduce energy use and carbon emissions during operations
- improve shift towards lower carbon transport
- reduce sources of pollution and optimise control at source to avoid environmental harm
- accountability and public reporting on performance.

Resilience in design

Specific resilience measures (including climate change measures) that have guided decisions in the design process have included:

- shading of station concourses as far as practicable, for both summer and winter conditions
- secondary canopies at stairs, lifts, and entry points to concourses
- use (where practical) of generous tree canopies of drought tolerant species in landscaping of station areas
- integration (where feasible) of photo-voltaic systems in built elements to meet or reduce annual low-voltage operational demand
- harvesting and storage of rainwater for reuse
- inclusion of high efficiency fixtures and fittings in station buildings
- structural loading requirements for hail and other extreme weather events.

7.3 Design

The design has drawn on existing landscapes and heritage, cultural history, and the communities along the T3 Bankstown Line, revealing and enhancing the qualities of these places, making new connections between communities, and contributing to the regeneration of town centres.

7.3.1 Themes

The design philosophy is based on three themes:

- rediscover
- reconnect
- regenerate.

These themes have been applied to the urban design elements of the reference design as follows.

Rediscover

An ambition to rediscover existing qualities of the corridor reflects a number of the project’s design objectives. Two primary qualities of the corridor are the heritage fabric of the rail line itself, and the diversity of its centres and communities. Design development has responded to this context to deliver an important public legacy for South West Sydney, by:

- revealing and repurposing heritage buildings and structures
- adding a new layer of high quality architecture and public spaces
- using and creating spaces attuned to local settings that will be a catalyst for wider urban renewal.

Reconnect

Renewal of the T3 Bankstown Line would allow the creation of a more integrated transport system and an enhanced customer experience for all users. Easy, accessible interchange between modes is part of the design, while improved walking and cycling facilities at, and between, stations would prioritise these modes. New links to town centres, across the corridor, and from station to station, would better connect communities, and build on existing landscape and open space qualities.

Regenerate

Updating the T3 Bankstown Line to 21st century standards would be a critical catalyst for the 10 town centres along the corridor. Thoughtful integration with existing landscape areas and provision of new links would foster connection and ease of travel in the region and locally.

Adding public spaces and public architecture of quality to these centres would be an important broader legacy of the project.

7.3.2 Objectives and principles

To help meet the transformational vision and aspirations of the project, five design objectives for the project were identified to guide decision making and the design process for the City & Southwest project. These objectives, together with their associated design principles and the design response, are shown in Table 7.2.

Table 7.2 Design objectives and principles

Design objectives	Design principles	Design responses
Objective 1: Ensuring an easy customer experience	Sydney Metro places the customer first. Stations are welcoming and intuitive with simple, uncluttered spaces that ensure a comfortable, enjoyable and safe experience for a diverse range of customers.	<ul style="list-style-type: none"> • A safe, comfortable and pleasant journey to the station, between transport modes and on the train • Clear wayfinding and place making, values embedded in precinct design • Public spaces and local connections with high amenity value • Attractive station environments, when seen from the platform, concourses or the precinct

Design objectives	Design principles	Design responses
Objective 2: Being part of a fully integrated transport system	Sydney Metro is a transit-oriented project that prioritises clear and legible connections with other public and active transport modes within the wider metropolitan travel network that intersect with this new spine.	<ul style="list-style-type: none"> • Quality and frequency of service • Station legibility in precinct • Seamless interchange in station precincts • Application of the modal hierarchy with an emphasis on pedestrian priority • Clarity of wayfinding, timetable and modal information • Connections to walking, cycling and open space networks
Objective 3: Being a catalyst for positive change	Sydney Metro is a landmark opportunity to regenerate and invigorate the city with new stations and associated development that engage with the station areas, raise the urban quality, and enhance the overall experience of the city.	<ul style="list-style-type: none"> • Precinct design that responds to and supports local character, urban form and activity • Promotion of urban renewal close to stations to increase the number of available dwellings and jobs • Contribute to the rejuvenation of town centres • New or additional unpaid cross corridor connections in most station precincts.
Objective 4: Being responsive to distinct contexts and communities	Sydney Metro's identity is stronger for the unique conditions of centres and communities through which it passes. This local character is to be embraced through distinctive station architecture and public domain, that is well integrated with the inherited urban fabric of existing places.	<ul style="list-style-type: none"> • Drawing on the character of each locality in the design of each stations' public spaces, furniture, landscape and public art • Responding to the landscape character of the rail line and its town centres • Signature South Western line station architecture expressed in the context of the broader line-wide Sydney Metro identity
Objective 5: Delivering an enduring and sustainable legacy for Sydney	Sydney Metro is a positive legacy for future generations. A high standard of design across the corridor, stations and station areas, that sets a new benchmark, is vital to ensuring the longevity of the metro system, its enduring contribution to civic life, and an ability to adapt to a changing city over time.	<ul style="list-style-type: none"> • A modern, architecturally distinctive line that also celebrates and re-purposes heritage buildings and structures • Minimum environmental standards for renewable energy generation, and water harvesting and reuse • Open space and active transport links permanently added to south west Sydney's green space network

7.3.3 Design strategies

Urban design

The urban design strategies for the project, illustrated in Figure 7.2, express the design intent for station areas and the overall corridor. These strategies were developed in response to the general Sydney Metro design objectives, and have informed and guided the design on the project.

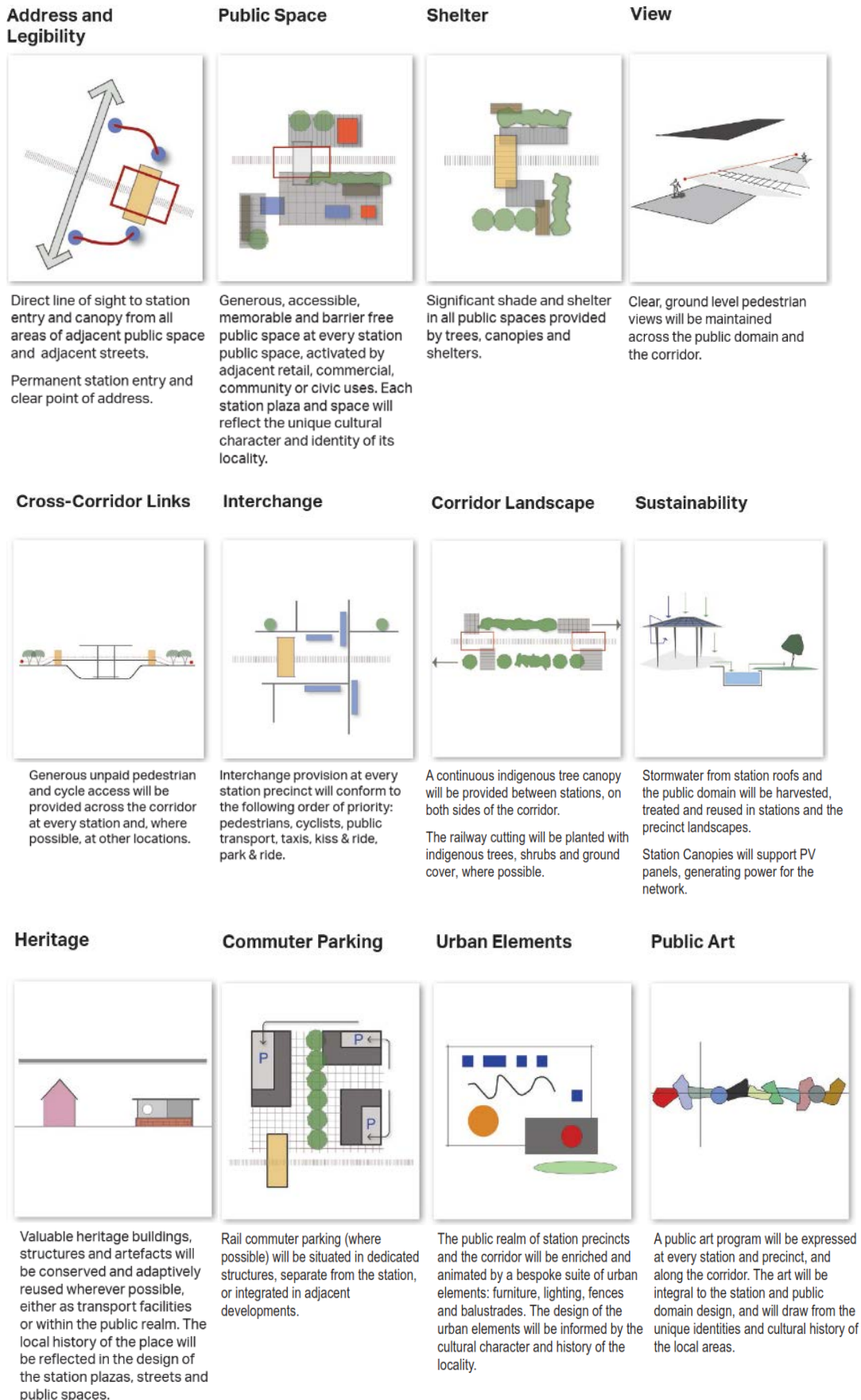


Figure 7.2 Urban design strategies for station areas and the corridor

Architectural design

To unify the different sections of Sydney Metro (Sydney Metro Northwest and Sydney Metro City & Southwest), Transport for NSW has established a coherent identity for metro infrastructure, whilst providing sufficient flexibility to respond to differences in local context and communities.

The overall architectural strategy is to introduce elegant, contemporary station structures, which complement existing station buildings (including heritage listed buildings), whilst ensuring that new development is clearly distinguishable from the earlier heritage fabric. The key architectural design strategies for stations are illustrated in Figure 7.3.

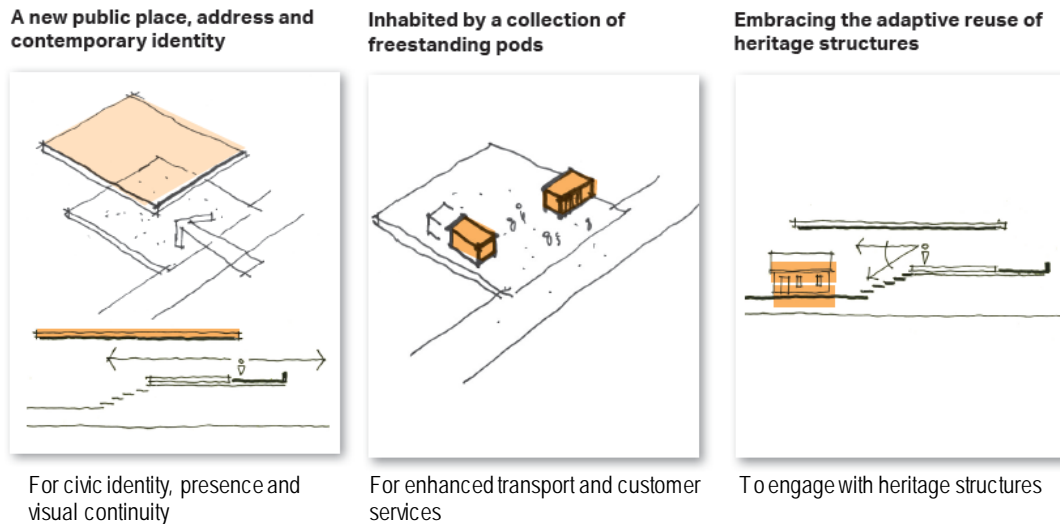


Figure 7.3 Key architectural design strategies for stations

New aerial concourses at stations have been designed so that they directly address retained heritage buildings. To ensure that impacts to existing platform buildings are minimised, the design strategy provides for an adequate offset between the contemporary new platform canopy and existing heritage canopies and awnings. This means that weather protection cannot be fully provided for a six car metro train, however, the minor gap in protection is considered to be acceptable, given the positive outcome in relation to retention of heritage buildings/structures.

A modular approach has been adopted for a number of station elements. The reasons for this are that it:

- provides a consistent approach across Sydney Metro as a whole
- minimises the construction period and time during possessions for services fit-out, and associated impacts to the local community, as pre-constructed parts can be brought to site and installed soon after
- provides for a high quality of finish via prefabricated modules, as well as ease of replacement (if and when required).

Canopies and concourses have been developed to suit the different platform types. This means that standard lifts, precast stair elements, and cladding panels can be used. Consistent branding, wayfinding, and signage would also be installed.

7.3.4 Urban and natural fabric

The urban and natural fabric of each place has been used to inform design development, and has taken into account:

- the existing urban context and infrastructure (including built form and public domain conditions, landscape elements, and existing and proposed services)

- planned initiatives in the locality.

More specifically, relevant criteria adopted for the project have guided the design in creating welcoming, secure, and easily maintained public domain spaces and station buildings, with an attractive 'sense of place', which responds to the distinct cultures of each station precinct. These criteria include:

- stations and associated spaces are to promote a welcoming image or identity that reinforces a positive sense of place within the locality
- station plazas are to reflect the local public realm context and character
- station public spaces are to be designed with a consistent hierarchy of landscape treatments to reflect local character and context, integrate within their settings, and provide attractive space and streetscapes
- fixtures, including furniture and lighting, are to enrich site context and sense of place and contribute to wayfinding
- a positive precinct image is to be developed around the particular heritage values of a place or by the qualities of the existing urban context.

For each station, the design was developed based on a comprehensive understanding of the existing place and urban context, and future place making opportunities. A comprehensive urban design analysis provided input, and the design process included consideration of:

- the design and functioning of the existing stations
- local urban context of each station, including:
 - land use and place, landscape, and urban fabric
 - culture and demographics
 - topography and terrain
 - heritage considerations
 - existing character, scale, and function of the surrounding centre
- nearby attractors, including schools and colleges, sports facilities and open space, and major retail destinations
- accessibility and connectivity, including:
 - the street network
 - current and future bus services and bus routes
 - interchange opportunities
 - pedestrian movement and desire lines
- the emerging character and likely built form of each centre, influenced by:
 - local area planning undertaken by the councils
 - regional strategic planning and district planning.

7.3.5 Design opportunities

Public domain

The public domain is a significant component of the station design. The interface between the station and surrounding streetscape needs to be well integrated and functional. The guiding principle for the design of the public domain has been the provision of hard and soft landscapes that establish high quality civic areas and an attractive public realm. The public domain for stations

would reflect and enhance the adjoining urban and landscape character, and be responsive to local conditions.

The public domain principles that have guided the development of the design include:

- The public domain design must represent a safe, clean, clutter free and functional environment that is visible and provides easy access for all users.
- The public domain design must deliver an integrated customer-focussed design that maximises a positive customer experience, including safe, legible, convenient, obstruction free environments, with direct and clear pedestrian routes.
- The public domain works associated with the stations must integrate seamlessly into the existing built environments and streetscapes, having regard to the existing and planned future context.
- Hard and soft landscaping design, species selection, and material palettes are to respond to and enhance the existing urban fabric of the station areas.
- Landscape treatments are to reinforce the identity for the stations, while also being functional and suitable for urban environments, considering maintenance and safety-in-design issues relevant to a transport customer environment, and adjacent road and public realm networks.

Station entrance/plaza areas

Stations would be set in well-designed station areas, which would provide an entrance to the stations, links with other forms of transport (such as bus stops and taxi ranks), and adequate room for circulation. Station area designs respond to their local settings and urban form, building on the diverse character of the surroundings.

Each station area design includes a main station forecourt or plaza to provide for safe and comfortable interchange between transport modes. Quality public art, furniture, landscaping, and pavements, tailored to the particular urban context, would be provided where space permits, together with opportunities for retail, civic, or community facilities to be included.

New station entries would be clearly visible and well connected to adjacent streets and town centres.

Healthy, cohesive and inclusive communities

One of the aims of place making is to create healthy, cohesive and inclusive communities. Healthy lifestyles and community cohesion are promoted by improved walking, cycling and transport access to a wide range of services and opportunities, while providing attractive and safe locations for people to meet and socialise. This in turn leads to communities that are more inclusive.

The ability of the project to promote healthy and cohesive communities can be achieved by aspects that have been integrated into the station designs. These include:

- providing access to, and facilities for, a variety of transport modes such as public transport, walking and cycling, which reduce dependence on private vehicles and encourage, and facilitate, the use of healthy transport alternatives
- provision of opportunities for people to meet, gather and circulate safely, and comfortably.

The project has been designed in accordance with a recognised modal hierarchy that favours public transport and walking/cycling over private vehicle use. This approach has clear health and social benefits, and enables access to an equitable range of safe, accessible transport services.

Public art

Successful public art recognises the particular character of a place, and in the transport context it can enrich the experience of the travelling public. As a component of amenity, and even beauty, of well-designed public spaces and infrastructure, public art can contribute to memorable journeys. As such, it should also support the growth of patronage on the network.

Public art can interface with other design disciplines to create a convincing line wide and station identity, legible wayfinding, meaningful heritage interpretation and safe public spaces. Locally resonant art pieces can build a sense of ownership by local communities, of their station and its public domain, which potentially adds to both the sustainability and meaning of these places.

The inclusion of art, its curation and production, would be a key feature of the ongoing design process. A public art strategy will be developed to incorporate appropriate curatorial and procurement processes for artistic excellence.

7.3.6 Future land use integration

While it is not the role of the project to undertake future land use planning for the corridor, the current design reflects the urban renewal corridor strategy and the role of the project in acting as a catalyst and enabler for future development.

In accordance with the corridor strategy, design responses unique to each station and local centre were developed, taking into account the distinctive character, setting, and context of each station. Additionally, to inform an understanding of urban renewal trends and opportunities, possible changes to land use, current development proposals, planning proposals, and approved plans were identified through consultation with the Department of Planning and Environment.

As the designs have developed, emerging proposals for the following elements particularly relevant to future land use integration have been shared with these agencies:

- station design/architecture
- the interchange area surrounding stations
- civil works between stations
- the active transport corridor
- introduction or upgrade of signalised or pedestrian crossings at station interchanges, to facilitate safe pedestrian movements between the stations and adjoining areas of future growth.

The project design recognises the role of the stations in the urban renewal process for the Sydenham to Bankstown corridor. To understand these future changes, Transport for NSW has consulted with the Department of Planning and Environment, and the Inner West and Canterbury-Bankstown councils on their relevant structure plans and strategies, as well as current development proposals, planning proposals, and approved plans.

This has been particularly important for rapidly changing centres such as Canterbury, Campsie, and Bankstown, where significant levels of development activity are already evident near stations.

7.3.7 Heritage

To reduce the potential heritage impacts, a number of heritage stakeholders have been involved in various iterations of the design. The approach to heritage elements has been to retain, wherever possible, existing significant items and/or elements, with particular focus given to those items listed on the State Heritage Register. As part of this process, Transport for NSW has ensured that retained heritage elements have a suitable purpose, and that their retention does not compromise the integrity of the station design and layout, or the safety and requirements of customers.

Iterations between the findings of the heritage assessment and the design development have resulted in changes to the design at five of the stations. This has enabled retention of heritage elements as summarised in Table 7.3. Further information on options considered and the justification for removal of heritage elements, where this is required, is provided in Section 5.3 of Technical paper 3 - Non-Aboriginal heritage.

Table 7.3 Overview of heritage based design changes

Location	Design changes
Marrickville Station	Significant design work was undertaken to reduce the potential heritage impacts, including the number of heritage elements impacted. As a result, the removal of Platform Buildings 1 and 2 and the booking office was avoided, and these elements are now retained in the project design.
Dulwich Hill Station	Changing the location of the entry and associated concourse avoided impacts on the platform building. However, this resulted in the separation and isolation of the overhead booking office, which would now be removed.
Hurlstone Park Station	Integration of the new entry with surrounding streets and town centre improves connectivity throughout the precinct. This limits the space available to provide a safe platform width and requires removal of Platform Building 1.
Canterbury Station	Significant design work was undertaken to reduce potential heritage impacts, including the number of heritage elements impacted. As a result, the removal of Platform Buildings 1 and 2 was avoided, and these elements are now retained in the project design. The relocation of the concourse/entry would avoid impacts on the Platform 1 Building, however this results in the separation and isolation of the overhead booking office, which would now be removed.
Belmore Station	Significant design work was undertaken to develop a design for the station that would enable retention of all existing elements of heritage significance, except for the station platforms. The project design also enables removal of the intrusive modern platform canopy structures.

7.3.8 Access, interchange and connectivity

Accessibility and connectivity have formed key considerations in the design process. The design principle is to 'ensure the stations and associated spaces are safe, efficient, universally accessible, legible and easy for customers and pedestrians'.

To determine which aspects need to be upgraded or improved, the design process involved a review of existing access and transport interchange arrangements for each station.

A description of the proposed station upgrade works is provided in Chapter 9 (Project description – operation). This includes works in the area immediately surrounding the stations.

In most cases, these works are driven by the need to make seamless and efficient connections to and from the stations. The works generally include the connections between transport modes and station entries, and facilities for pedestrians and cyclists. Planned improvements have been developed with regard to their location, including station entries, plazas and transport interchange facilities, and are formed around the station access hierarchy, highlighting the transport modes that should take precedence, and where feasible, to provide accessible paths.

The spatial reach and extent of the proposed works varies from station to station. Further information, including figures depicting the proposed works, are provided in Chapter 8. Accessible parking, taxi, and kiss and ride facilities would be located in areas identified as kerbside facilities on these figures. Some existing facilities would potentially be relocated based on the outcomes of consultation with key stakeholders.

Park and ride facilities have also been subject to similar considerations, although at certain stations, local topography and positioning of existing infrastructure means that achieving compliant access to these facilities is not always entirely possible.

7.3.9 Community enhancement

The project seeks to build on and strengthen the existing role of each centre by delivering new stations and services that represent a generational shift, with significantly improved station design, universal accessibility, faster and more frequent rail services, and integrated bus services.

The stations would incorporate architecture that projects an appropriate level of civic presence, which would promote the role of the stations as community focal points. The stations and areas surrounding them would be accessible, safe and comfortable, and have a strong identity, which complements a modern metro rail service.

Attention has also been paid to the areas between the stations that has the capacity to deliver important community outcomes.

In addition, the project design has taken into account work by the Department of Planning and Environment on 'finer grain' assessments of public domain opportunities in the areas surrounding each station. The design plans have also been scrutinised by an independent design review panel. Specifically, the location and design of station entries and forecourts, as well as other aspects of the station design, have responded to emerging urban renewal trends to make a positive contribution to place at each of the stations

One of the aims of the design development has been to provide the catalyst for creation of healthy and cohesive communities. Examples of positive contributions to place making, accessibility, and connectivity are provided in Table 7.4.

Table 7.4 Examples of community enhancements and positive contributions to place making

Location	Design aspect
All stations	All stations are designed to be fully accessible, with station entrances and concourses that comply fully with DDA requirements. The project includes provision of secure bike parking facilities at all stations, and future proofing for additional facilities at some stations. The provision of these facilities would help make bikes an attractive mode of transport to and from stations.
Marrickville	The project includes works to the Station Street station entrance to make it more accessible and inviting. There would also be improved access to Schwebel Street and Illawarra Road via an accessible ramp on Station Street (west). The existing walking/cycling path along the southern side of the rail corridor east of the station would be upgraded, to provide a safe link for pedestrians and cyclists.
Dulwich Hill	The northern station entrance would be relocated to be adjacent to the Dulwich Hill light rail stop to improve interchange between the two transport modes. Paths that form part of the connection would be made fully accessible.
Hurlstone Park	Provision of an enlarged station forecourt for safer gathering and interaction, and new pedestrian crossings to facilitate access to surrounding areas.
Canterbury	The new northern station entrance/plaza has been designed to provide connectivity with the future town centre and ongoing redevelopment in the vicinity of the station.
Campsie	An improved pedestrian area would be provided at the Beamish Street station entrance by widening footpaths and setting back the entrance from Beamish Street. A new shared area would be provided along a widened section of Lilian Lane on the southern side of the station, to assist with pedestrian and vehicular access, improve circulation from surrounding streets particularly from the south, and improve integration with an active transport corridor
Belmore	The proposed improvements to the Tobruk Avenue station frontage would improve connectivity with surrounding streets, the Burwood Road shopping area, and the Belmore Sports Ground. This would include integration of existing facilities with an active transport corridor. Accessible paths from Redman Parade would provide safe passage to Burwood Road and the existing pedestrian crossing

Location	Design aspect
Lakemba	Improved access, new station entrance forecourts, and upgrades to the existing courtyard and memorial space.
Wiley Park	New station entrance and public domain improvements would provide a more comfortable and safe station access.
Punchbowl	The proposed relocation of the station along the rail corridor to the east allows for a new station entrance and forecourt to The Boulevarde. This would improve pedestrian access to the station, and improve safety by increasing visibility and opportunities for passive surveillance.
Bankstown	Construction of a new at-grade cross-corridor concourse is proposed, between the Sydney Trains and Sydney Metro stations, to provide access to the station, and public access across the corridor. This would also improve connectivity between Restwell Street and The Appian Way, including potential future redevelopment sites on either side of the rail corridor and the Bankstown Central Shopping Centre.
Entire corridor	The project has made provision for an active transport corridor at stations. Active transport corridor planning has been undertaken with regard to existing and planned cycle and pedestrian networks, maximising connections to local and regional routes, and potential links to a broad range of community and cultural facilities, and to natural areas (such as the Cooks River).

7.4 Responses to stakeholder and community feedback

7.4.1 Stakeholder feedback

The consultation process is described in Chapter 4 (Stakeholder and community consultation). The development of the design and environmental impact assessment has been informed in part by contributions from key stakeholders, including:

- Inner West Council
- Canterbury-Bankstown Council
- Sydney Trains and NSW Trains
- Australian Rail Track Corporation
- Roads and Maritime Services
- Sydney Coordination Office
- Department of Planning & Environment
- NSW Environment Protection Authority
- the Heritage Working Group
- utility providers (Transgrid, Ausgrid, Quenos, Sydney Water)
- Sydney Motorway Corporation.

A summary of how the design has responded to key issues raised during stakeholder consultation is summarised in Table 7.5.

Table 7.5 Project responses to stakeholder feedback

Stakeholder	Issue identified	Project response
<p>Inner West Council</p>	<ul style="list-style-type: none"> • Cumulative impacts of the project, WestConnex, and other major developments on flooding, drainage, local traffic, and transport during construction and operation, including approach to commuter parking • Availability of surplus rail corridor land for an active transport corridor and its integration with Council cycle and pedestrian planning, particularly around Marrickville station • Whether proposed bridge works could include provision for cycle paths (such as Illawarra Road and Livingstone Road, Marrickville) • Avoiding closure of multiple adjoining bridges over the rail corridor at the same time to ensure sufficient traffic circulation options • Ensuring that drainage and flood management works within the corridor integrate with Council flood mitigation works, particularly around Marrickville station • Seeking clarity on the sustainability strategy for Sydney Metro City & Southwest • Concern about the potential visual impacts of crash barriers and throw screens on road overbridges, and a desire to ensure they are visually pleasing, and do not become a graffiti target 	<ul style="list-style-type: none"> • Flood modelling has been undertaken to inform the design development process, and has taken into account current Council flood modelling. Transport for NSW is currently working with WestConnex to achieve an integrated drainage solution for both projects. Transport for NSW would continue to work with the Inner West Council to integrate with flood mitigation works around Marrickville Station. Further information is provided in Chapter 21. • Transport for NSW has been working with Council to understand local traffic and transport related issues. The detailed traffic and transport assessment undertaken for the Environmental Impact Statement included a position of ‘no net loss’ of commuter parking. Transport for NSW would continue to work with Council to develop Interchange Access Plans and manage the impacts on parking. Further information, including relevant mitigation measures, is provided in Chapters 10 and 11. • The route of an active transport corridor has been identified, and the project has been designed to incorporate parts of this within the station areas. Further information is provided in Section 8.1.4. • Integration of active transport opportunities are being considered within the station precincts and along the rail corridor where practicable. There are constraints relating to existing bridges, particularly widths. Nevertheless, Transport for NSW would work with councils on cycle opportunities where feasible and reasonable. • Transport for NSW would work with relevant road authorities, including councils, in relation to potential impacts on the road network. A mitigation measure has been included in Section 10.5 to restrict works from being carried out simultaneously on adjacent bridges, where feasible and reasonable. • Chapter 24 describes Transport for NSW’s approach to sustainability. The Sydney Metro City & Southwest Sustainability Strategy is included in Appendix F. • All overbridges would be provided with parapet throw screens and vehicle collision barriers to provide an upgraded level of safety and security for customers. The design of bridges would be in accordance with relevant design standards and Sydney Metro performance specifications.
<p>Canterbury Bankstown Council</p>	<ul style="list-style-type: none"> • Station and interchange designs should create a strong relationship with existing town centres and station environs, and place making opportunities, especially having regard for future growth around centres under the NSW Government’s urban renewal strategy for the Sydenham to Bankstown corridor 	<ul style="list-style-type: none"> • The design development process has considered urban design, place making, and public domain aspects at each station, as discussed in Section 7.1. As noted below, Transport for NSW has, and would continue to, discuss urban renewal opportunities with the Department of Planning and Environment, with reference to the aims of the draft Sydenham to Bankstown Urban Renewal Corridor Strategy. Transport for NSW would continue to work with Council on the development of station design and interchange access plans.

Stakeholder	Issue identified	Project response
	<ul style="list-style-type: none"> • The layout and design of the station entry should consider appearance from the public domain, presenting a safe and welcoming environment • Opportunity to provide an underground station at Bankstown Station to assist with connectivity, permeability, and cohesion in the Bankstown town centre, reducing the barrier created by the existing rail corridor • Sufficient space at station entries should be provided to manage projected patronage figures, particularly at stations such as Campsie, which will experience considerable additional population growth • Retention of low intensity commuter parking close to station entries (such as Bankstown station) • Ensuring that station entries provide opportunities for activation (e.g. northern entry to Punchbowl station within local park) 	<ul style="list-style-type: none"> • Design guidelines (refer Section 7.7 and Appendix C) have been developed. These include objectives, principles for customer experience, safety, and place making, which would continue to guide the detailed design process. • The project does not propose an underground station for Bankstown, however the design incorporates a pedestrian link to address connectivity between the northern and southern side of the Bankstown town centre. An alternative station design has been safeguarded for the future (including potential underground platforms). Transport for NSW will contribute to a study being undertaken by the Department of Planning and Environment, and Canterbury-Bankstown Council, to determine a master plan and business case for the Bankstown town centre, including how the station fits with the centre. The study will be funded by Transport for NSW and Canterbury-Bankstown Council. • The project design has been informed by projected patronage modelling (refer to Chapter 10) and has taken into account population growth, including as a result of initiatives under the draft Sydenham to Bankstown Urban Renewal Corridor Strategy. • Adjustments would be required to car parking, including on-street parking and dedicated commuter parking, generally in the vicinity of stations. These impacts are considered in Chapters 10, 11, and 18. The project has been designed to minimise impacts on existing parking areas, and Transport for NSW would continue to work with Canterbury-Bankstown Council in the development of Interchange Access Plans and on managing the impacts on parking (relevant mitigation measures are provided in Sections 10.5, 11.5 and 18.4). • Design development has considered opportunities for activation within each station precincts. As detailed in the design guidelines (Appendix C), a key design driver at Punchbowl was the creation of a northern plaza with paths and landscaping to improve circulation and amenity in Warren Reserve.
Sydney Trains and NSW Trains	<ul style="list-style-type: none"> • Wider rail network operations and the design of future suburban rail timetables • Scope of track and civil works • Possession regimes and construction staging • Maintaining level of service during construction • Asset ownership post commissioning 	<ul style="list-style-type: none"> • Transport for NSW has and would continue to work with Sydney Trains in relation to design options and configuration of possessions to balance the conversion of the T3 Bankstown Line stations and rail systems with the safety of rail workers, minimising impacts on Sydney Trains operations. A key objective for Transport for NSW (including Sydney Trains) is to minimise disruption to the travelling public. • The Temporary Transport Strategy and mitigation measures commit to an ongoing process of consultation with Sydney Trains through the detailed design and construction phase to manage these issues (refer Appendix G and Section 10.5).

Stakeholder	Issue identified	Project response
Australian Rail Track Corporation	<ul style="list-style-type: none"> • Construction and operational interface • Possession regimes and construction staging • Segregation of works adjacent to the freight line, including segregation fence maintenance responsibilities • Maintaining ARTC operations during construction 	<ul style="list-style-type: none"> • Assessment of various options and configuration of possessions has been undertaken to balance the conversion of the T3 Bankstown Line stations and rail systems with the safety of rail workers, minimising impacts on ARTC operations. • As described in Section 4.4, ongoing consultation would be undertaken during construction planning and detailed design. • A segregation fence is proposed between the metro tracks and ARTC freight tracks, between west of Marrickville Station and west of Campsie Station. The design has also accommodated ARTC's needs in terms of ongoing maintenance access.
Roads and Maritime Services and Sydney Co-ordination Office	<ul style="list-style-type: none"> • Transport integration and road network modifications • Proposed bridge works and staging of temporary closures during construction, including the duration of closures of the Illawarra Road overbridge 	<ul style="list-style-type: none"> • Construction compounds and construction haulage routes have been carefully selected to ensure that vehicles are directed to suitably classified roads (i.e. for use by heavy vehicles) via the shortest route and, where possible, minimising the distance travelled through residential areas. • The traffic, transport and access assessment considers the potential impacts during construction, and the results are summarised for each station in Chapter 10. • Transport for NSW would work with relevant road authorities to minimise the potential impacts of the project (including bridge closures) on the road network. Potential impacts of bridge works are considered in Chapter 10, and relevant mitigation measures are provided, including restricting works from being carried out simultaneously on adjacent bridges where feasible and reasonable. • Construction methodologies would continue to be refined to minimise the number of heavy vehicle movements required. • The Temporary Transport Strategy has been developed in consultation with Roads and Maritime and the Sydney Coordination Office to outline the process for developing temporary transport management plans to manage works and alternative transport arrangements during station closures and possession periods. These plans would be developed in consultation with relevant roads authorities and the Sydney Coordination Office. • With respect to the Illawarra Road overbridge, potentially longer closures (up to one month) are being investigated. Any proposals for longer closures would be confirmed at a later date, and would be subject to additional impact assessment if required.
Department of Planning and Environment	<ul style="list-style-type: none"> • Urban renewal opportunities with reference to the aims of the draft Sydenham to Bankstown Urban Renewal Corridor Strategy • Integration of active transport corridor into the urban renewal strategy 	<ul style="list-style-type: none"> • Transport for NSW has and would continue to work with Department of Planning and Environment to integrate station designs with the urban renewal planning process. Details of the work undertaken to date in the development of the designs for each stations is described in the Place Making and Urban Design Technical Paper (Appendix H) and summarised in this chapter.

Stakeholder	Issue identified	Project response
	<ul style="list-style-type: none"> Integration of linear parkland opportunities along the rail corridor with the urban renewal corridor strategy Dwelling, population, and employment outcomes expected from the urban renewal strategy and implications for Sydney Metro patronage 	<ul style="list-style-type: none"> The route of an active transport corridor has been identified, and the project has been designed to incorporate parts of this within the station areas. Further information is provided in Section 8.1.4. Section 3 of the design guidelines (Appendix C) also addresses this issue.
NSW Environment Protection Authority	<ul style="list-style-type: none"> Approach and methodology for the operational rail noise modelling undertaken for the Environmental Impact Statement 	<ul style="list-style-type: none"> The approach and methodology for the operational noise assessment has been prepared in accordance with relevant guidelines and in consultation with NSW Environment Protection Authority. The Noise and Vibration Assessment (provided in Technical paper 2 and summarised in Chapter 13) identified receivers that would be potentially affected by operational noise, and which may require mitigation such as noise barriers or at property treatment. The provision of noise barriers has been considered as part of the design. The final location of barriers and/or at property treatment would be confirmed during detailed design.
Office of Environment and Heritage	<ul style="list-style-type: none"> Design of each of the station precincts, including options and justification for proposed heritage impacts Ongoing involvement through the design development process Opportunities for reuse of retained heritage buildings 	<ul style="list-style-type: none"> The design development process has considered heritage aspects at each station. This is described in Chapter 7 and in the Non-Aboriginal Heritage Assessment (Technical paper 3). The potential impacts are described in Chapter 14. The proposed design addresses the need to deliver accessible stations that meet the operational requirements of the Sydney Metro system, whilst minimising impacts on heritage. Transport for NSW would continue to work with the Office of Environment and Heritage and other heritage stakeholders during the ongoing design development process. A mitigation measure has also been provided in Section 14.4 to require that a heritage architect to review designs as part of the Design Review Panel. The development of station designs has considered the heritage values of the stations and the line overall, and has sought to adaptively reuse the retained and conserved heritage buildings for station and related functions (refer to Section 7.3.7, Technical paper 3, and Chapter 14).
Office of the Government Architect (OGA)	<ul style="list-style-type: none"> Station precinct design Integration of active transport corridor into the urban renewal strategy Integration of linear parkland opportunities along the rail corridor with the urban renewal strategy 'Finer grain' analysis of opportunities for public domain improvements around stations 	<ul style="list-style-type: none"> As described in Chapter 7 and in Appendix H, the design development process has considered urban design, place making and public domain aspects at each station. As noted above, Transport for NSW has and would continue to discuss urban renewal opportunities with the Department of Planning and Environment with reference to the draft Sydenham to Bankstown Urban Renewal Corridor Strategy and its implications on station designs. The route of an active transport corridor has been identified, and the project has been designed to incorporate parts of this within the station areas. Further information is provided in Section 8.1.4. Section 3.3 of the design guidelines (Appendix C) also addresses this issue.

Stakeholder	Issue identified	Project response
Utility providers including Transgrid, Ausgrid, Qenos, and Sydney Water	<ul style="list-style-type: none"> Confirmation of the location of trunk utilities affected by project Proposed utility relocations, adjustments, and design refinements to minimise disruption 	<ul style="list-style-type: none"> The location of trunk utilities has been determined at the current stage of design, based on Dial Before You Dig plans, utility data including as-built surveys, and local authority and council records. Preliminary consultation has also been held with Sydney Water, Ausgrid, Telstra, Axicom, TPG, and Qenos. A Utilities Management Framework has been prepared as part of the Environmental Impact Statement (refer to Section 9.10 and Appendix I). This framework adopts a risk-based approach to avoiding and/or minimising impacts associated with the relocation and/or adjustment of public utilities affected by the project. A key step would be the detailed design response to potential conflicts with a public utility, including whether the utility can be avoided.
Sydney Motorway Corporation	<ul style="list-style-type: none"> Confirming the extent of project interfaces in relation to WestConnex. 	<ul style="list-style-type: none"> Transport for NSW is currently working with WestConnex to achieve an integrated drainage solution for both projects.

7.4.2 Community feedback

Transport for NSW is committed to working with community and stakeholder groups to maximise the benefits of the project and deliver improved environmental outcomes.

As noted in Section 4.2, the project team met with the Hurlstone Park Association and the Save Dully Action Group, and received feedback on a range of issues including what they value about their area, the concept station design, pedestrian access and building materials.

The feedback was used to help review and influence the station concept designs. Table 7.6 indicates project refinements undertaken in response to community feedback.

Table 7.6 Project responses to community feedback

Station	Project response
Dulwich Hill Station	<ul style="list-style-type: none"> Redesign of shops on concourse and positioning of stairs and lifts. Use of natural materials and retention of natural rock face where possible. Minimising the scale of the concourse and canopies where possible, having regard to customer requirements.
Hurlstone Park Station	<ul style="list-style-type: none"> Minimising the scale of the concourse and canopies where possible, having regard to customer requirements. Redesigned arrangement to keep the entrance on the Crinian Street overbridge (same as existing), which would be located in a new plaza area. Concourse and access stairs moved east, away from remaining heritage building on Platform 2. Ongoing investigations with Council during detailed design on improvements to the plaza area. Extension of new footpath pavement into Crinan Street/Duntroon Street. Use of natural materials and retention of natural rock face where possible.

The former Canterbury Bowling and Community Club site is proposed for use during construction as a compound and site office (work site 8 – refer to Section 9.8). Transport for NSW has been in contact with one of the groups using this facility (which is leased from Canterbury-Bankstown Council) during the preparation of the Environmental Impact Statement. Initially, the entire site was proposed for the work site. In response to the feedback received, Transport for NSW has committed to a reduction in the size of this work site to enable users to continue to use the building on the site. Transport for NSW would work closely with Canterbury-Bankstown Council and users of the facility to manage how it would be used during construction.

7.5 Impacts avoided

The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the process. Specific design responses to avoid or minimise potential impacts (both construction and operational) are summarised in Table 7.7 and Table 7.8.

Table 7.7 Construction impacts avoided or minimised through design

Environmental aspect	Design response
Traffic and transport	<ul style="list-style-type: none"> Careful selection of construction haulage routes to ensure that vehicles are directed to suitably classified roads (i.e. for use by heavy vehicles) via the shortest route and, where possible, minimising the distance travelled through residential areas. Selection of construction compounds to minimise their number and therefore the number of haulage routes required. Minimising impacts on existing parking areas. Considering the construction methodologies to minimise the number of heavy vehicle movements required. Development of the Temporary Transport Strategy to guide the implementation of measures to minimise the potential impacts to the road network and station areas associated with replacing trains with buses during possession periods.
Noise	<ul style="list-style-type: none"> Construction compound layout and siting of equipment, with consideration given to minimising noise impacts to sensitive receivers. Arrangement of haulage routes to minimise the use of local roads.
Heritage	<ul style="list-style-type: none"> Placement of construction compounds within already cleared areas (such as car parks) to avoid impacting heritage sites and items, particularly where land is only required for construction.
Property and land use	<ul style="list-style-type: none"> Use of public land has been maximised for construction work sites and compounds located outside of the rail corridor.
Visual	<ul style="list-style-type: none"> Construction work sites and compounds have been positioned to minimise the need for vegetation clearance where possible. Retaining trees within the station areas has also been considered as part of the concept design.
Biodiversity	<ul style="list-style-type: none"> Placement of construction compounds within already cleared areas (such as car parks) where possible to minimise the need for further vegetation clearance, particularly where land is only required for construction Positioning of construction areas to avoid impacts on Downy Wattle, a threatened species listed under both the TSC and EPBC Acts, located to the west of Punchbowl Station within the rail corridor.
Socio-economic and business impacts	<ul style="list-style-type: none"> Designing the project to minimise the potential for noise, air, and visual quality amenity impacts during construction and operation, including the implementation of design responses summarised in this table. Construction planning has sought to minimise impacts on the community through the positioning and use of construction equipment and working times. Development of the Temporary Transport Strategy to guide the implementation of alternative transport arrangements during possession periods.
Waste	<ul style="list-style-type: none"> Reuse of materials where possible (including spoil and ballast) to minimise waste generation.

Table 7.8 Operational impacts avoided or minimised through design

Environmental aspect	Design response
Traffic and transport	<ul style="list-style-type: none"> Designing the project with regard to urban design, place making and accessibility considerations, as described in Section 7.2. Designing the project, including upgraded stations and other facilities, with regard to current and future expected demand, and in accordance with the Sydney Metro requirements.
Noise	<ul style="list-style-type: none"> Provision of new noise barriers and adjustments (including lengthening or increasing the height) to existing noise barriers located in areas where operational airborne noise is required to be mitigated in line with the <i>Rail Infrastructure Noise Guideline</i> (EPA, 2013).
Heritage	<ul style="list-style-type: none"> As described in Sections 7.2.3 and 7.3.7, significant work has been undertaken to minimise the heritage impacts of the project.
Hydrology and flooding	<ul style="list-style-type: none"> Incorporating drainage infrastructure that reduces the incidence of flooding.
Biodiversity	<ul style="list-style-type: none"> The siting of project infrastructure was refined to avoid impacts on the Downy Wattle.
Property and land use	<ul style="list-style-type: none"> Future land use and strategic planning were considered as part of the design process (as described in Section 7.3.6) Designing the project to minimise land requirements and the need for acquisition. Designing stations to minimise the impacts on, and complement, surrounding land uses.
Socio-economic and business impacts	<ul style="list-style-type: none"> Designing the project to maximise opportunities to activate existing local centres, with regard to urban design and place making considerations, as described in Sections 7.2 and 7.3. Designing the project to minimise the potential for noise and visual quality amenity impacts during operation, including the implementation of design responses summarised in this table. Minimising land requirements and the need for acquisition. Retaining existing station locations in close proximity to local centres. Maintaining connectivity on key routes in and around the local centres. Designing the project to maximise accessibility and safety, as described in Sections 7.2.5 and 7.3.8.

7.6 Summary of key design outcomes

A summary of the key design and place making outcomes achieved for each station is provided in Table 7.9. Further information is provided in Appendix H.

Table 7.9 Key design outcomes

Location	Design aspect	Outcome
Marrickville	Local public domain	<ul style="list-style-type: none"> The Station Street shared zone would add a new, intimate public space to the public domain of the Illawarra Road precinct Renewal of the southern access path and the Station Street shared zone would improve the station interface with local streetsp
	Connectivity and access	<ul style="list-style-type: none"> Improvements to crossing conditions at Illawarra Road, and Schwebel and Warburton streets Proposed cycle route on Warburton and Schwebel streets and Leofrene Avenue The southern station access path upgrade would improve access to the station from the east

Location	Design aspect	Outcome
		<ul style="list-style-type: none"> Addition of an accessible ramp on Station Street (west) to overcome the non-compliant grade
	Catalyst	<ul style="list-style-type: none"> Marrickville station and associated public space would be a potential stimulus for further redevelopment in the area surrounding the station The Station Street shared zone creates an intimate public space away from Illawarra Road
	Interchange/ accessibility	<ul style="list-style-type: none"> Secure access and sheltered bike parking in Station Street in dedicated facilities Taxi and kiss and ride bays in the Station Street shared zone Accessible ramp on Station Street (west) providing an accessible path to the Illawarra Road bus stops and the Schwebel Street accessible parking bays On-road cycle route on streets adjacent to Station Street
Dulwich Hill	Local public domain	<ul style="list-style-type: none"> Generous pedestrian / interchange zone north of the station on Bedford Crescent serving both the station and the light rail stop Paved area to south of station connecting Wardell Road to Ewart Lane
	Connectivity and access	<ul style="list-style-type: none"> New cross corridor connection Accessible approaches to station Improved link to the light rail stop and Jack Shanahan Park Upgrade of cycleway through station precinct
	Catalyst	<ul style="list-style-type: none"> Broad public connections to the new station concourse Improved public domain has the potential to generate wider urban improvements in conjunction with council Southern area has the potential to act as a catalyst for adjacent north facing development sites A range of town centre sites have redevelopment potential
	Interchange/ accessibility	<ul style="list-style-type: none"> At grade accessible connection between interchange area and station concourse Lift from concourse to light rail stop Accessible path from station area to Wardell Road crossing Secure access and bike parking in southern area
Hurlstone Park	Local public domain	<ul style="list-style-type: none"> Widened approaches to new concourse Kerb extension at road overbridge crossing would improve sightlines New crossings on Duntroon Street (south) and Crinan Street (north)
	Connectivity and access	<ul style="list-style-type: none"> Accessible approach on southern side of station Potential active transport connection in corridor east of the station and on-road south and west of the station
	Catalyst	<ul style="list-style-type: none"> Broad public connections to new station entries Improved public domain has the potential to generate wider streetscape improvements in the retail village and proposed heritage conservation areas
	Interchange/ accessibility	<ul style="list-style-type: none"> At-grade accessible connection between Crinian/Duntroon Street interchange area and station concourse Accessible path to bus stops from southern entry Bike parking in Floss Street (north)
Canterbury	Local public domain	<ul style="list-style-type: none"> Promotion of a new town centre, led by Canterbury-Bankstown Council and the Department of Planning and Environment, to the west of the Canterbury Road precinct Maintenance of station address/legibility from Canterbury Road through architectural expression of station canopy Futureproofing for a potential future station entrance on Charles Street as part of any future developments along Charles Street
	Connectivity and access	<ul style="list-style-type: none"> New pedestrian crossing on Broughton Street in line with new station entrance would provide a connection to existing and potential development areas to the north

Location	Design aspect	Outcome
	Catalyst	<ul style="list-style-type: none"> Proposed interchange area on Broughton Street would create a comfortable, attractive public forecourt to the station
	Interchange/ accessibility	<ul style="list-style-type: none"> The Broughton Street interchange would provide comfortable, accessible connections to bus stops, taxi, and kiss and ride bays, accessible parking, and secure access and sheltered bike parking The Canterbury Road entry would provide accessible connections to bus stops on Canterbury Road and bike parking facilities
Campsie	Local public domain	<ul style="list-style-type: none"> The station would reinforce Beamish Street as the central spine of the town centre The proposed retail on the station concourse and the station canopy would maintain the consistent street wall of Beamish Street across the alignment New retail on the eastern side of Beamish Street would further activate the street (the use of the retail space would be subject to a separate approval process)
	Connectivity and access	<ul style="list-style-type: none"> Generous eight metre setback to create a station forecourt and ease pedestrian congestion in front of the station New station entry and footpath upgrade on North Parade Landscaped shared zone on southern approach to station on a widened Lilian Lane
	Catalyst	<ul style="list-style-type: none"> New station and high frequency service would contribute to urban renewal of the Campsie town centre Improved public domain on Beamish Street, Lilian Lane, and North Parade has the potential to generate wider precinct improvements Maintaining the station address on Beamish Street would keep the station as the central focus of the precinct
	Interchange/ accessibility	<ul style="list-style-type: none"> Greater concentration of interchange opportunities adjacent to station Maintenance of existing bus stops and services New taxi bays next to North Parade station entry Kiss and ride on North Parade New kerbside as part of the new elevated platform on the eastern side of Beamish Street Bike parking near the northern entrance on North Parade A new shared zone along Lillian Lane between Beamish and Dewar streets A potential cycle route along Lilian Street and Lilian Lane and South Parade
Belmore	Local public domain	<ul style="list-style-type: none"> A generous station area and shared zone on Tobruk Avenue Tobruk Avenue/Bridge Road/Burwood Road would become a signalised intersection, improving vehicle, pedestrian, and cycling connectivity from east to west The crossing and shared zone would link the proposed on-road cycle route on Bridge Road to the shared path through the Belmore Sports Ground
	Connectivity and access	<ul style="list-style-type: none"> A new cross corridor concourse connection A landscaped urban area would connect the station, the Burwood Road shopping area, and the linear parkland of the Belmore Sports Ground The area would include retail development, bike parking, public seating, artwork, and landscaping The distinctive, elevated canopy would ensure the station is legible in the precinct
	Catalyst	<ul style="list-style-type: none"> The station would contribute to the renewal of the town centre. Zoning proposals allow for shop-top housing along Burwood Road and a mixture of medium and high density development near the station

Location	Design aspect	Outcome
	Interchange/ accessibility	<ul style="list-style-type: none"> The Tobruk Avenue shared zone would consolidate taxi and kiss and ride bays immediately adjacent to the station area Bike parking would be provided Bus stops on Burwood Road would remain within walking distance of the station area
Lakemba	Local public domain	<ul style="list-style-type: none"> The existing station entrances would be retained The existing elevated concourse would be retained with a minor expansion on the western side to accommodate additional station buildings/facilities The war memorial would be retained Tree planting could build on the Mediterranean theme apparent in the northern area Connection to active transport corridor along the southern side of the station, along The Boulevard west of Haldon Street, and along the rail corridor boundary east of Haldon Street
	Connectivity and access	<ul style="list-style-type: none"> A new footpath is proposed on the southern side of Railway Parade, adjacent to the existing car parking area leading to the station entrance The proposed active transport corridor would provide an on-road cycle route adjacent to Lakemba Station
	Catalyst	<ul style="list-style-type: none"> The improved public domain around the station would contribute to the wider urban renewal of the precinct
	Interchange/ accessibility	<ul style="list-style-type: none"> Re-grading the southern area would create an accessible connection to taxi bays and the Haldon Street bus stops The existing bus stops on The Boulevard, Railway Parade, and Haldon Street (south) would be retained New kerbside facilities on Railway Parade and on The Boulevard, east of the new station entrance, with accessible paths to station Bike parking would be provided
Wiley Park	Local public domain	<ul style="list-style-type: none"> Station with two new entrances away from King Georges Road The new entrances on The Boulevard and from the Stanlea Parade walkway near King Georges Road would provide safe access A new elevated concourse would provide more space for pedestrian circulation Linear areas with bike parking and public amenities north and south of the station
	Connectivity and access	<ul style="list-style-type: none"> Landscaped pedestrian approaches to the station from the west The station design would create a more permeable entry arrangement, with entry from the north and south Links with an active transport corridor along The Boulevard
	Catalyst	<ul style="list-style-type: none"> The new station and its associated areas would introduce a new urban design standard
	Interchange/ accessibility	<ul style="list-style-type: none"> At-grade accessible connection to the interchange area on The Boulevard Secure access and sheltered bike parking on both station platforms Shared path as part of a future active transport corridor on the southern station approach
Punchbowl	Local public domain	<ul style="list-style-type: none"> The new station area on The Boulevard would provide a generous public space for the centre Pedestrian and cycle paths would connect to the station area and the adjacent car park New paths and an accessible ramp in Warren Reserve would connect the station area to Punchbowl Road and Urunga Parade A new pedestrian crossing on Punchbowl Road north-east of Bruest Place would provide safe connections to Bruest Place and to the north of the precinct

Location	Design aspect	Outcome
	Connectivity and access	<ul style="list-style-type: none"> Large station entrance areas would create clear view corridors to the station The distinctive station canopy would be visible from the centre and the Punchbowl Road overbridge
	Catalyst	<ul style="list-style-type: none"> The recent development pattern evident on The Boulevard and Punchbowl Road could extend throughout the town centre New station area has the potential to promote new retail activity
	Interchange/ accessibility	<ul style="list-style-type: none"> The eastbound bus stop on The Boulevard moved closer to the new station area east of Arthur Street A new crossing on Punchbowl Road to the eastbound bus stop, and to school bus stops on Bruest Place New taxi and kiss and ride bays on The Boulevard, and the taxi bays on Arthur Street would remain Dedicated kiss and ride and accessible parking bays on Urunga Parade One accessible bay provided on The Boulevard Bike parking provided at both station entrances
Bankstown	Local public domain	<ul style="list-style-type: none"> Existing station areas would be extended eastwards to serve the entrance to the metro station, providing additional public amenities Provision of a wide concourse across the corridor The southern area extension would provide an improved setting for the heritage listed Parcels Building
	Connectivity and access	<ul style="list-style-type: none"> The existing Sydney Trains' concourse would remain New at-grade corridor crossing at the eastern end of the existing Sydney Trains platform would provide access to both the Sydney Trains and new Sydney Metro platforms New access paths servicing commuter parking east of the station Southern access path doubling as active transport shared path
	Catalyst	<ul style="list-style-type: none"> New station and high frequency service would reinforce Bankstown's strategic role in Sydney's south-west The station has the potential stimulate urban renewal and housing development in the centre, building on recent development on South Terrace
	Interchange/ accessibility	<ul style="list-style-type: none"> Bus interchange would remain on South Terrace and North Terrace Changes to taxi, and kiss and ride zones on North Terrace existing kerbside facilities (i.e. taxi rank) on northern side of North Terrace would be retained Bike parking provided on both sides of the station within the new station plazas Active transport link on southern side of the alignment

7.7 Detailed design guidelines

Transport for NSW will continue to develop the project to a greater level of detail in conjunction with the appointed design contractor. Transport for NSW will challenge the contractor to develop innovative solutions to detailed design and construction to achieve improved outcomes.

To guide the progression of the project design from the current reference design through the detailed design phase, Transport for NSW has prepared the Sydenham to Bankstown Design Guidelines, which are included in full in Appendix C. The purpose of those guidelines is to ensure that as the detailed design progresses, it would incorporate the strategies and principles embedded in the reference design, which is the subject of this Environmental Impact Statement.

The guidelines establish the on-going design approach by guiding the design of the interface between stations and their surrounding localities, including:

- station entries
- transport interchange facilities (bicycle facilities, bus stops, kiss and ride, taxi ranks, and connections to existing rail and light rail infrastructure)
- landscaping and other public domain elements
- rail corridor works including rail cuttings and embankments
- station and service buildings.

The detailed design and construction methodology proposed to deliver the project would be assessed for consistency with this Environmental Impact Statement and the terms of any approval granted by the Minister for Planning. If the detailed design or construction impacts are not considered to be consistent with any approval granted for the project, an application to modify the project would be lodged.

Additional development above or adjacent to the stations would be subject to separate planning approval.

8. Project description – operation

This chapter provides a description of the project once it is operational, including the key infrastructure/project features proposed, their main features, and how the project would operate. Proposed acquisition requirements are also described. The Secretary’s environmental assessment requirements addressed in this chapter are listed in Table 8.1. A full copy of the assessment requirements and where they are addressed in the Environmental Impact Statement is provided in Appendix A.

Table 8.1 Secretary’s environmental assessment requirements – project description

Ref	Secretary’s environmental assessment requirements – project description	Where addressed
2.1(b)	A description of the project, including all components and activities (including ancillary components and activities) required to construct and operate it.	This chapter provides a description of the components and activities required to operate the project. A description of how the project is likely to be constructed is provided in Chapter 9.
14.4	The Proponent must provide artist impressions and perspective drawings of the project from key receiver locations to illustrate the project.	Section 8.1

8.1 Project infrastructure and features

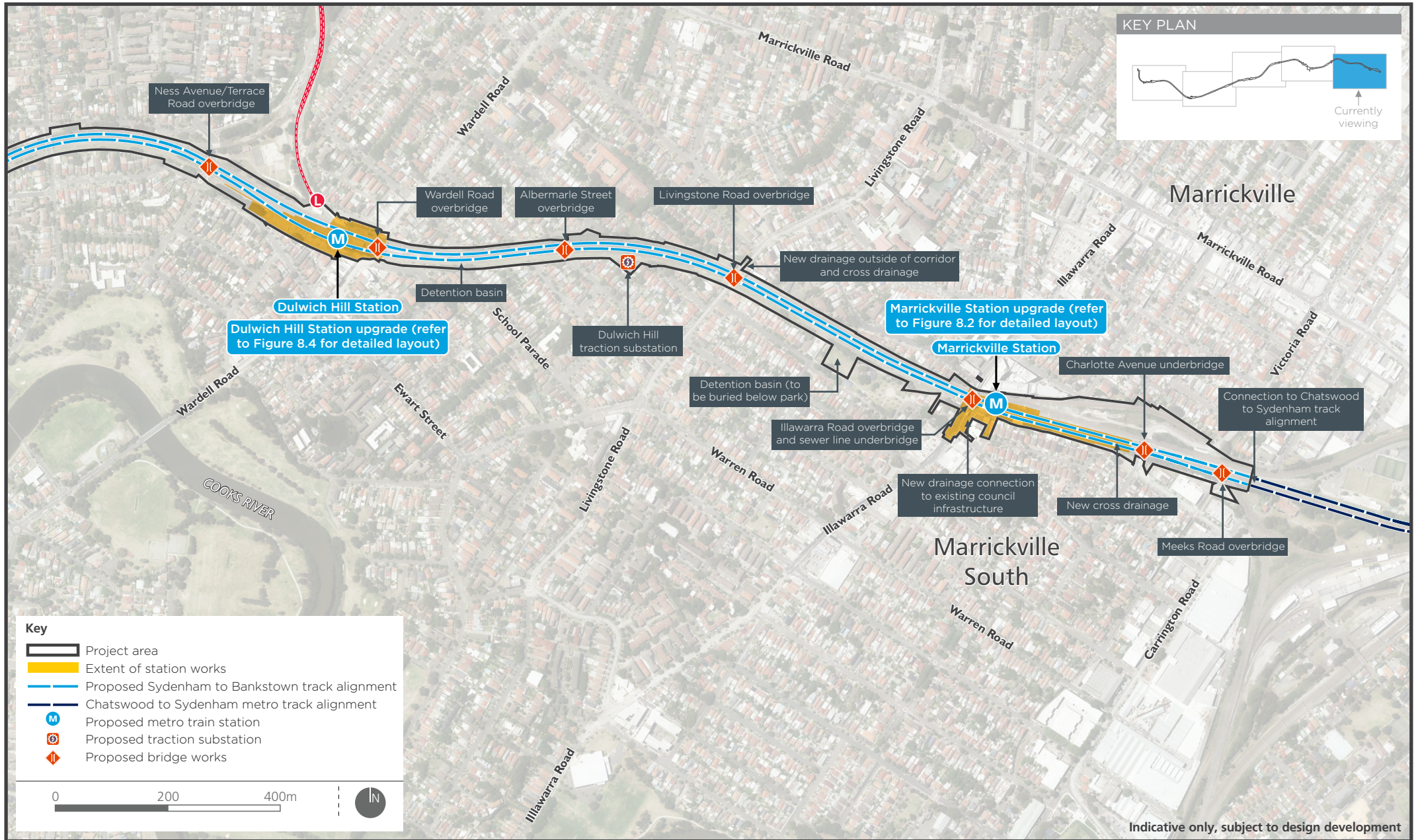
The main infrastructure and features that form part of the project are described in this section, and are shown in Figure 8.1. These include:

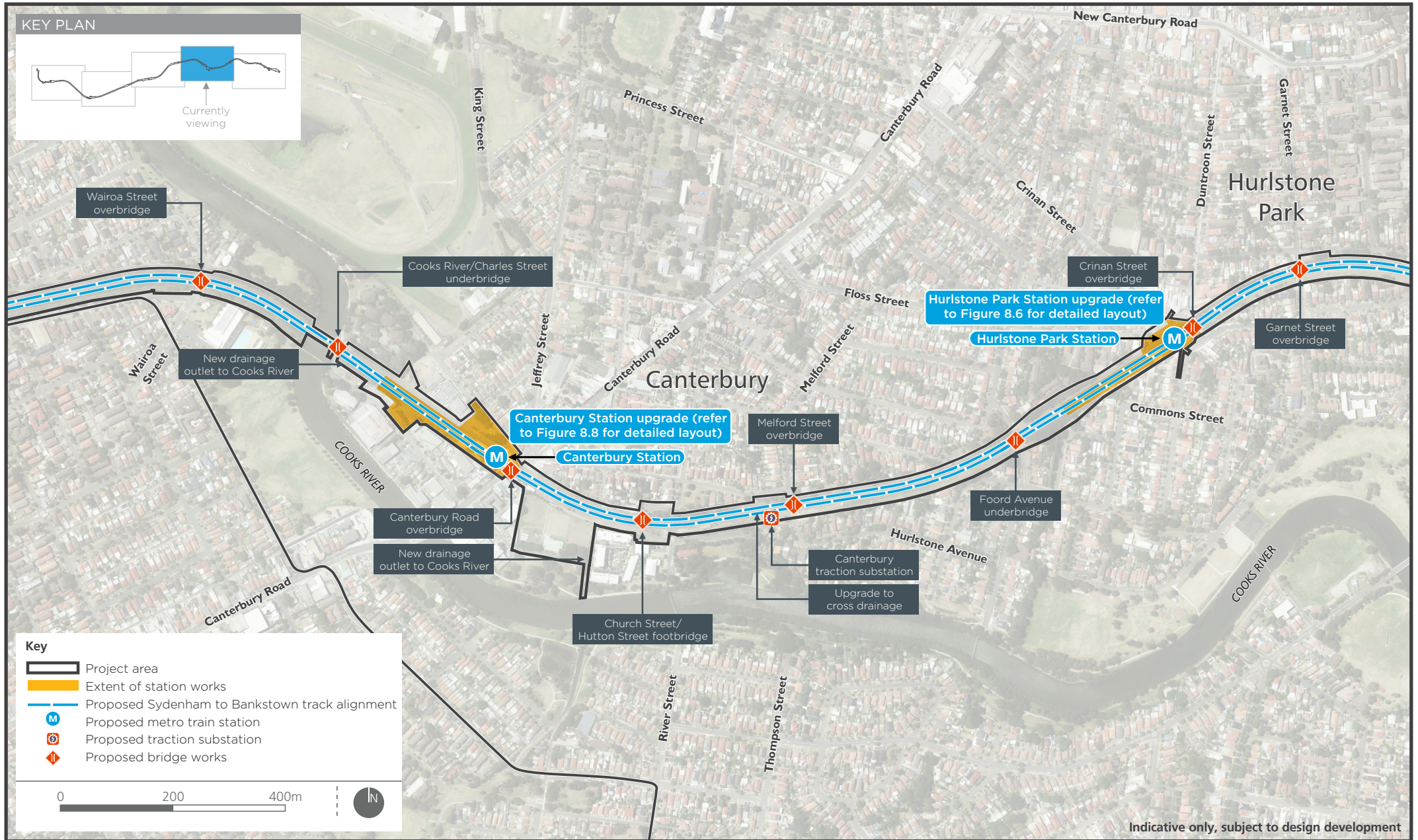
- works to upgrade the 10 stations and station areas between Marrickville and Bankstown (inclusive), to meet the standards required for accessible public transport
- works to meet the standards required for metro services, including:
 - station works
 - track and rail system facility works
 - other works along the rail corridor.

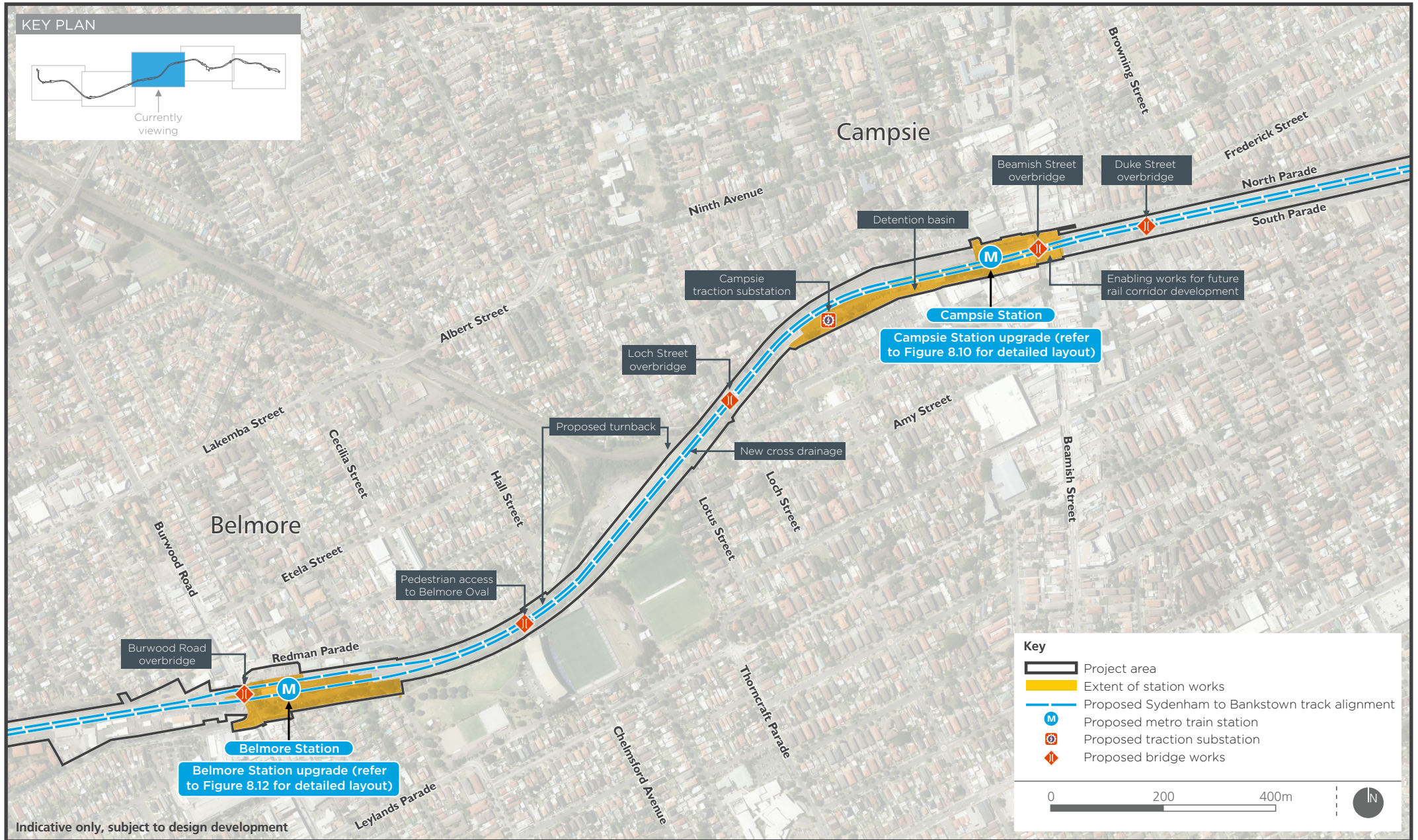
It is noted that the project scope described in this chapter is based on the level of design developed to date. Detailed design would include further engineering, construction planning, and detailed assessment work, and would be subject to further input from key stakeholders and the community.

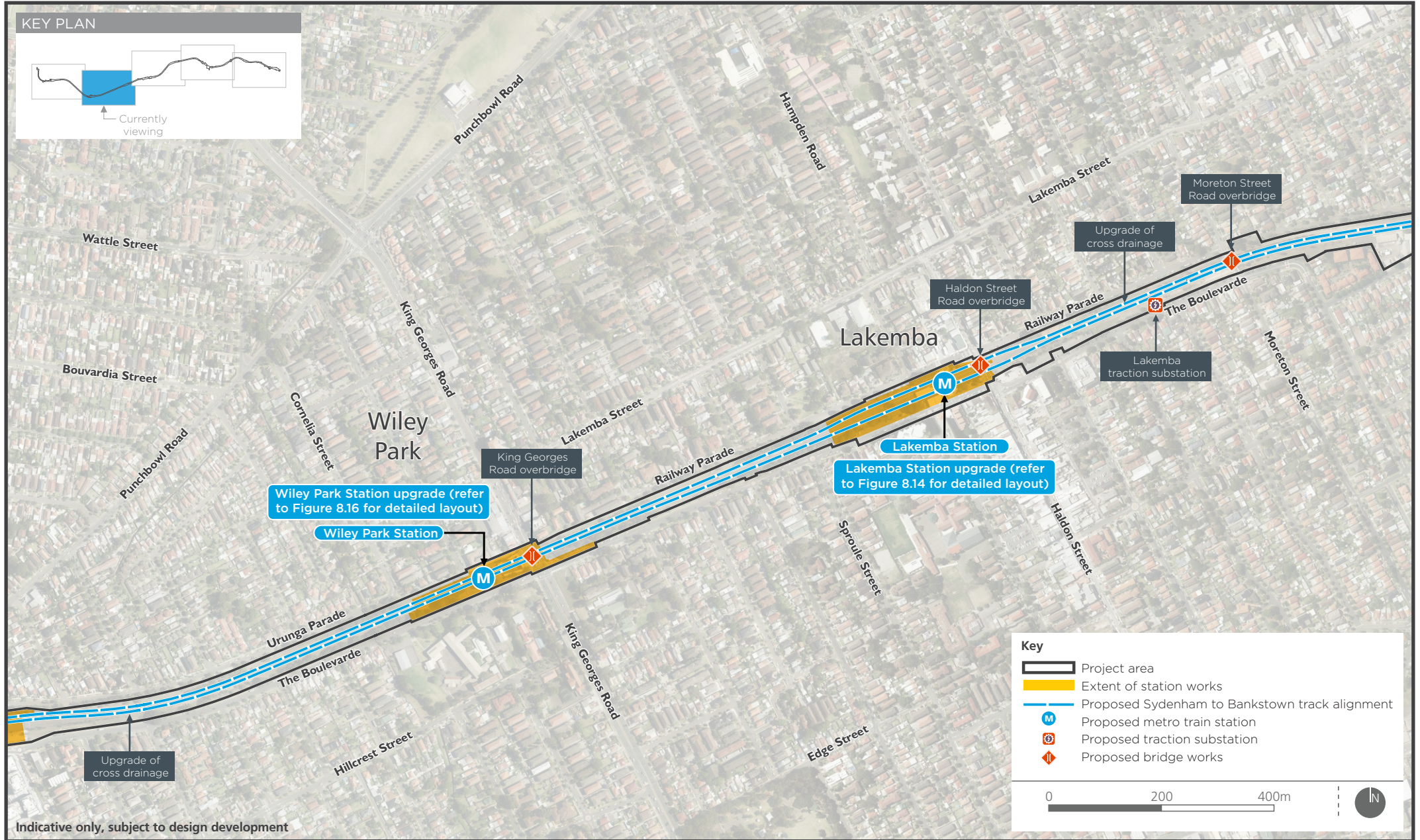
A description of how the design for the project (as described in this chapter) was developed is provided in Chapter 7 (Design development and place making).

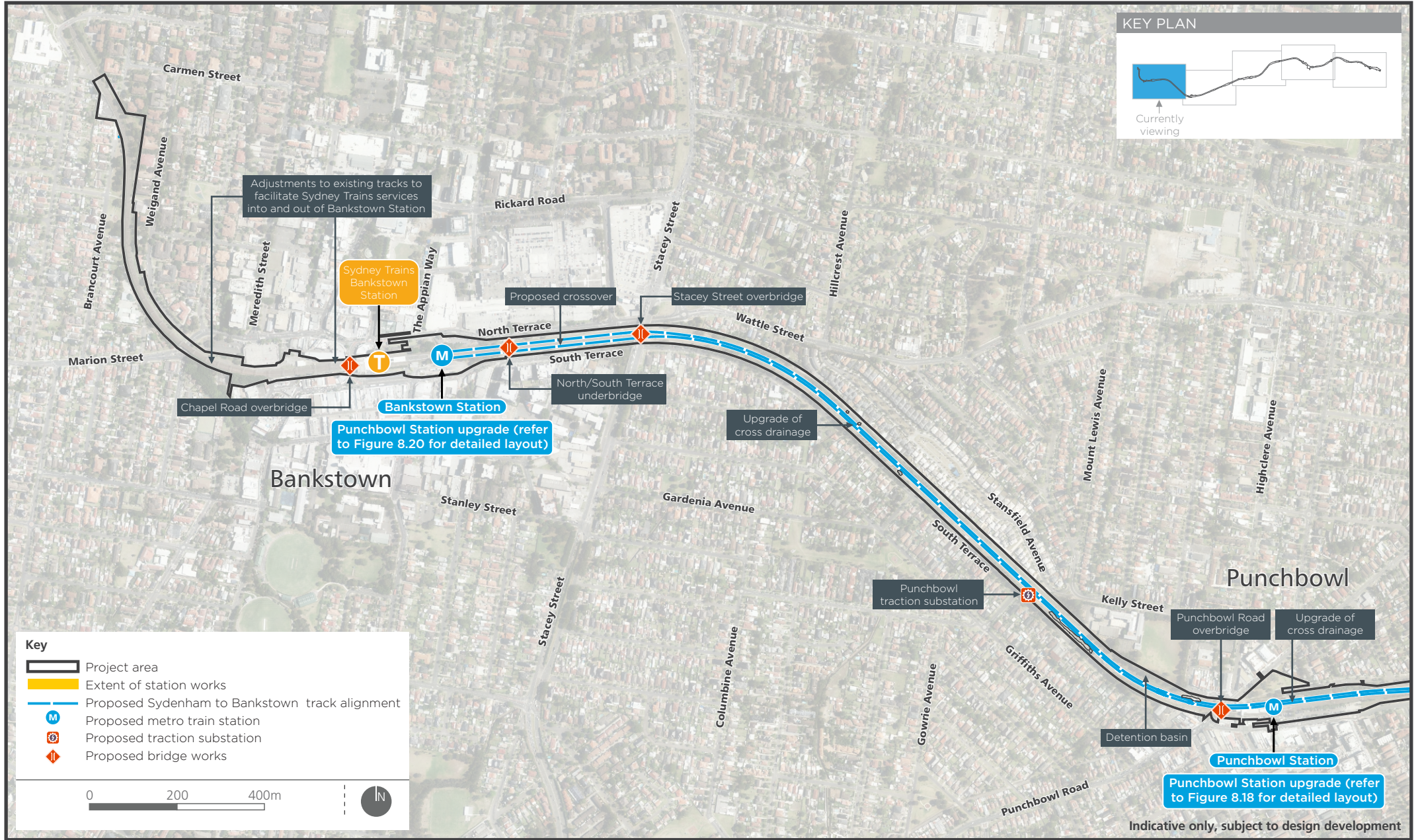
Any design modifications that occur as a result of matters arising during the exhibition of this Environmental Impact Statement would be identified in a submissions report or a preferred infrastructure report.











8.1.1 Works to upgrade stations

The project includes upgrading the 10 stations between Marrickville and Bankstown, as required, to meet legislative requirements for accessibility of public transport, including the requirements of the *Disability Discrimination Act 1992* and the *Disability Standard for Accessible Public Transport 2002*. The stations and surrounding areas are being designed to provide safe and efficient interchange between transport modes, including minimising conflicts between pedestrians, cyclists, buses, and vehicles. Common elements and design features would be incorporated into the station designs as required.

The works required at each station depend on the nature and condition of the existing facilities, and generally include:

- platform works, which could include:
 - removing and replacing platforms in the same or adjusted locations
 - extending platforms along the rail corridor (in line with the existing corridor and tracks) to provide space to straighten the platform
 - replacing the existing platform with level, straighter platforms
- new station concourse areas and station entrance locations, including:
 - new stairs and ramps
 - new or relocated lifts to access the station and station platforms, and to link various transport nodes
- provision of station buildings on platforms or at station entrances, including control and communication rooms, toilets, staff facilities, storerooms, and offices (where practical, heritage buildings would be retained and adaptively reused)
- provision of canopies for shade and shelter – this would involve providing an elevated cover over part or all of the exposed areas at stations (such as concourses, platforms and stairwells), and would include a range of styles depending on the station
- signage and wayfinding within and around the station.

Works would also be undertaken in the areas around the stations (i.e. the station area) to better integrate with other modes of transport, improve travel paths, and meet statutory accessibility requirements. This would include:

- enhancements to footpaths in the vicinity of station entrances and transport interchange areas
- landscaping and street furniture particularly within the areas near station entrances and along the corridor
- provision of new and/or relocated bicycle parking facilities
- new, upgraded or relocated parking and kerb side facilities, including accessible parking, kiss and ride, and taxi facilities.

A more detailed description of the works proposed at each station is provided in the following sections. These descriptions include reference to heritage elements at the existing stations. Further information on how heritage considerations were taken into account during the design is provided in Section 7.3.7. The potential impacts on heritage listed items are considered in Chapter 14 (Non-Aboriginal heritage).

The design development process for the station upgrades is described in Chapter 7. This includes a description of the key design principles and design considerations. The exact nature of the works

required at each station would be confirmed as an outcome of the detailed design process, which would be informed by the design guidelines provided in Appendix C.

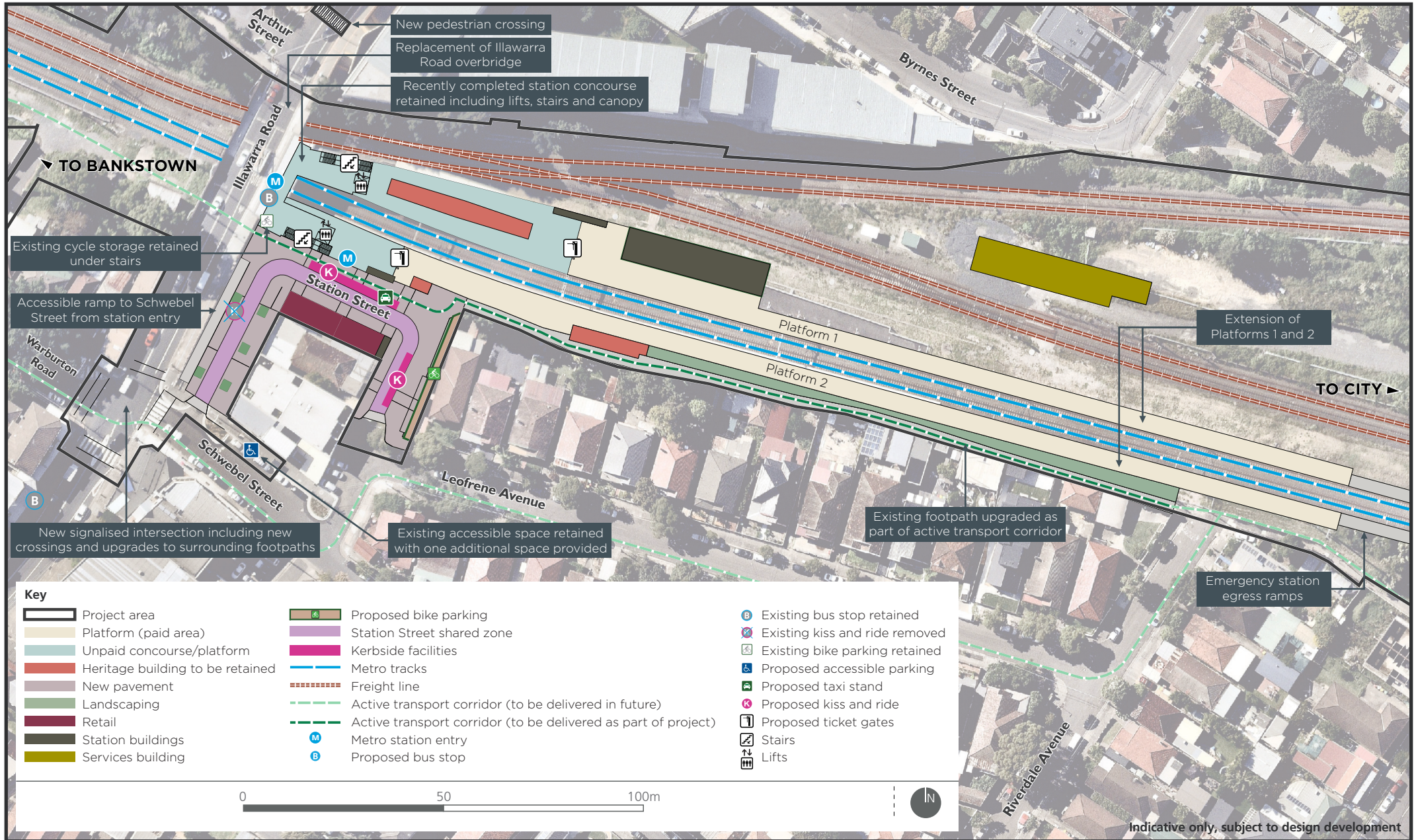
Marrickville Station

Marrickville Station is located east of the Illawarra Road overbridge. The station area is bound to the north by a multi-storey residential apartment building, located on the corner of Illawarra Road and Byrnes Street, to the south by Station Street and residential dwellings fronting Leofrene Avenue, and to the west by Illawarra Road. The station entrance is on Illawarra Road.

Marrickville Station was recently upgraded as part of Transport for NSW's Transport Access Program. The key works proposed as part of the project are shown on Figure 8.2 and summarised in Table 8.2. An artist's impression is provided in Figure 8.3.

Table 8.2 Marrickville Station key design elements

Feature	Description
Station works	
Station entry/exit	<ul style="list-style-type: none"> The existing station entrance from Illawarra Road would be retained and upgraded. The existing lifts would also be retained. The existing at-grade entry from Station Street to platform 2 would be retained and upgraded to include a new entry canopy.
Platform details	<ul style="list-style-type: none"> The existing heritage listed platforms would be straightened and extended to the east.
Station buildings	<ul style="list-style-type: none"> The existing station buildings, including the recently completed elevated concourse and associated canopy would be retained. New station buildings would be provided on platforms 1. Heritage station buildings on platforms 1 and 2 would be retained. The former booking office on platform 2 would be retained. New retail space would be provided in Station Street (the use of the space would be subject to a separate approval process).
Station area	
Public transport integration	<ul style="list-style-type: none"> All bus stops would be retained in their current locations, including the southbound bus stop on Illawarra Road which was recently relocated as part of the upgrades to the station.
Access	<ul style="list-style-type: none"> A new shared zone on Station Street would be provided, allowing access to the southern station entrance. This entrance and the new shared zone would form a new station plaza which would form part of an active transport corridor. The signalisation of Warburton Road, Schwebel Street and Illawarra Road intersection is proposed, including the installation of pedestrian crossings. The existing signalised crossing of Illawarra Road outside the station would be removed. A pedestrian crossing would be provided on Illawarra Road immediately north of Arthur Street. The existing cycle route along the southern side of the rail corridor would be rerouted along Schwebel Street, Leofrene Avenue, and Riverdale Avenue. A new accessible ramp would be provided from the southern station entrance to Schwebel Street along Station Street.
Kerbside uses, bike parking	<ul style="list-style-type: none"> New kerbside facilities would be provided within the new Station Street shared zone/plaza area on both the northern and western sections of the new shared zone. A new bike storage/parking area would be provided along the eastern side of the Station Street plaza with the existing facility retained.
Car parking	<ul style="list-style-type: none"> Loss of two on-street parking space on Schwebel Street due to new kerbside facilities.





Dulwich Hill Station

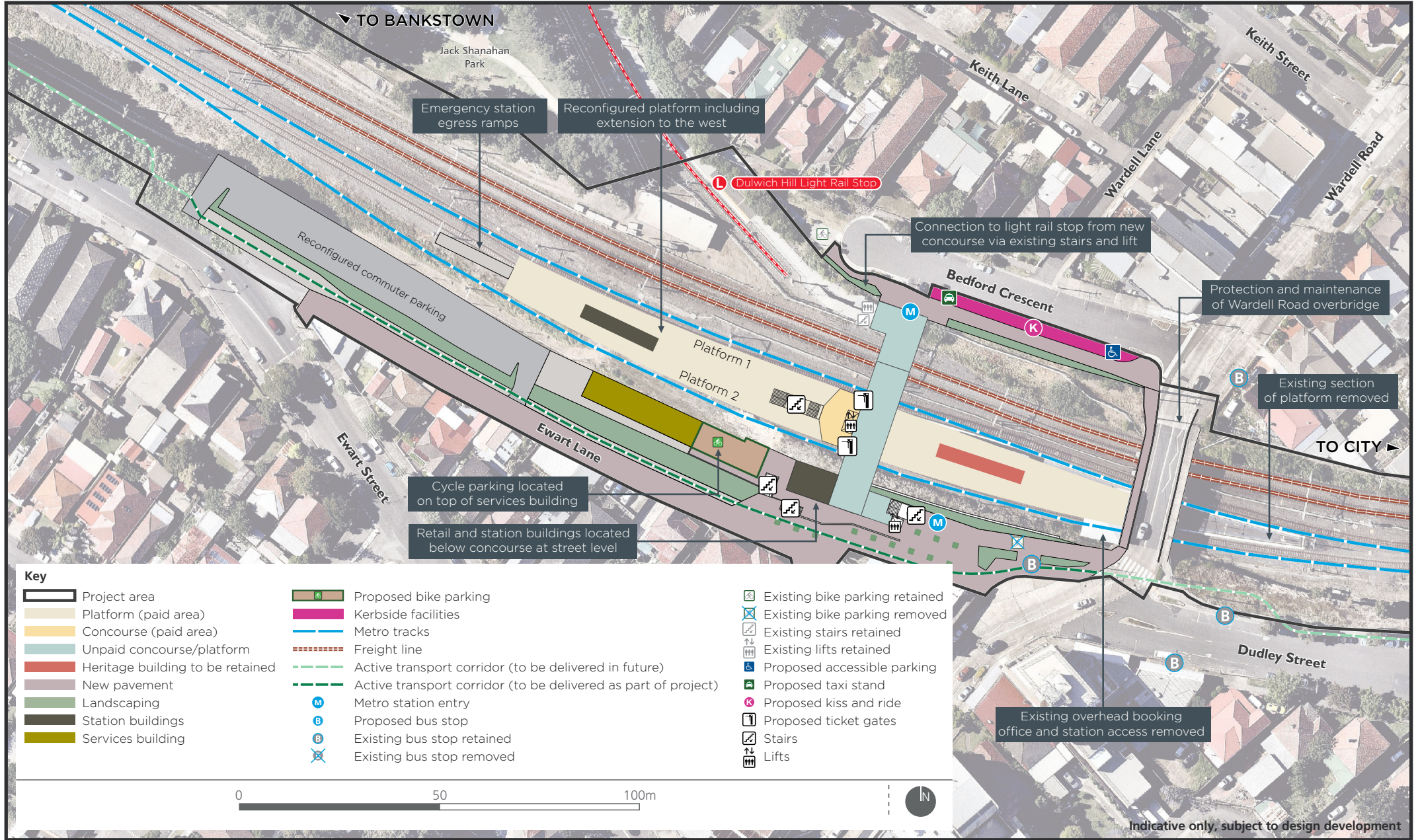
Dulwich Hill Station is located west of the Wardell Road overbridge. The station area is bounded by Bedford Crescent to the north, Ewart Lane to the south, and Wardell Road to the east. The station entrance is on Wardell Road.

The key works proposed as part of the project are shown in Figure 8.4 and summarised in Table 8.3. As described in Section 6.5.1, Transport for NSW would work with the contractor to determine whether a straight platform arrangement can be provided as part of the design of Dulwich Hill station.

An artist's impression is provided in Figure 8.5.

Table 8.3 Dulwich Hill Station key design elements

Feature	Description
Station works	
Station entry/exit	<ul style="list-style-type: none"> The existing station entrance would be removed. A new elevated station concourse would be provided and would connect with the existing stairs and lift to the Dulwich Hill light rail stop. The concourse would be accessed from two new station entrances at Bedford Crescent (northern side) and adjacent to Ewart Lane (southern side).
Platform details	<ul style="list-style-type: none"> The heritage listed platforms would be rebuilt in their current locations and extended to the west. A portion of the existing platform east of Wardell Road would be removed.
Station buildings	<ul style="list-style-type: none"> New station facilities would be provided within the new concourse structure and within a new building located on the platform. As part of the removal of the existing station entrance, the heritage listed overhead booking office would be removed. A description of how the design has been refined to minimise impacts on heritage is provided in Section 7.3.7. The existing heritage station building on the platform would be retained. New retail space would be provided within the southern station entrance below the new concourse (the use of the space would be subject to a separate approval process).
Station area	
Public transport integration	<ul style="list-style-type: none"> The existing bus stops located on Dudley Street and Wardell Road would be retained. The new concourse would connect the existing lift and stairs to the Dulwich Hill light rail stop.
Access	<ul style="list-style-type: none"> A new public plaza would be provided between the proposed southern station entrance and the existing pedestrian crossing on Wardell Road. Ewart Lane would be widened/upgraded adjacent to the new southern station entrance to improve vehicular access to the reconfigured Ewart Lane car park. Pathways would be provided along Ewart Lane, Ewart Street, and Dudley Street, to form part of an active transport corridor.
Kerbside uses, bike parking	<ul style="list-style-type: none"> New kiss and ride, taxi, and accessible parking would be provided on the southern side of Bedford Crescent. New bike parking facilities would be provided on the upper level of the proposed services building.
Car parking	<ul style="list-style-type: none"> Loss of 10 on-street parking spaces on Bedford Crescent due to new kerbside facilities.





Hurlstone Park Station

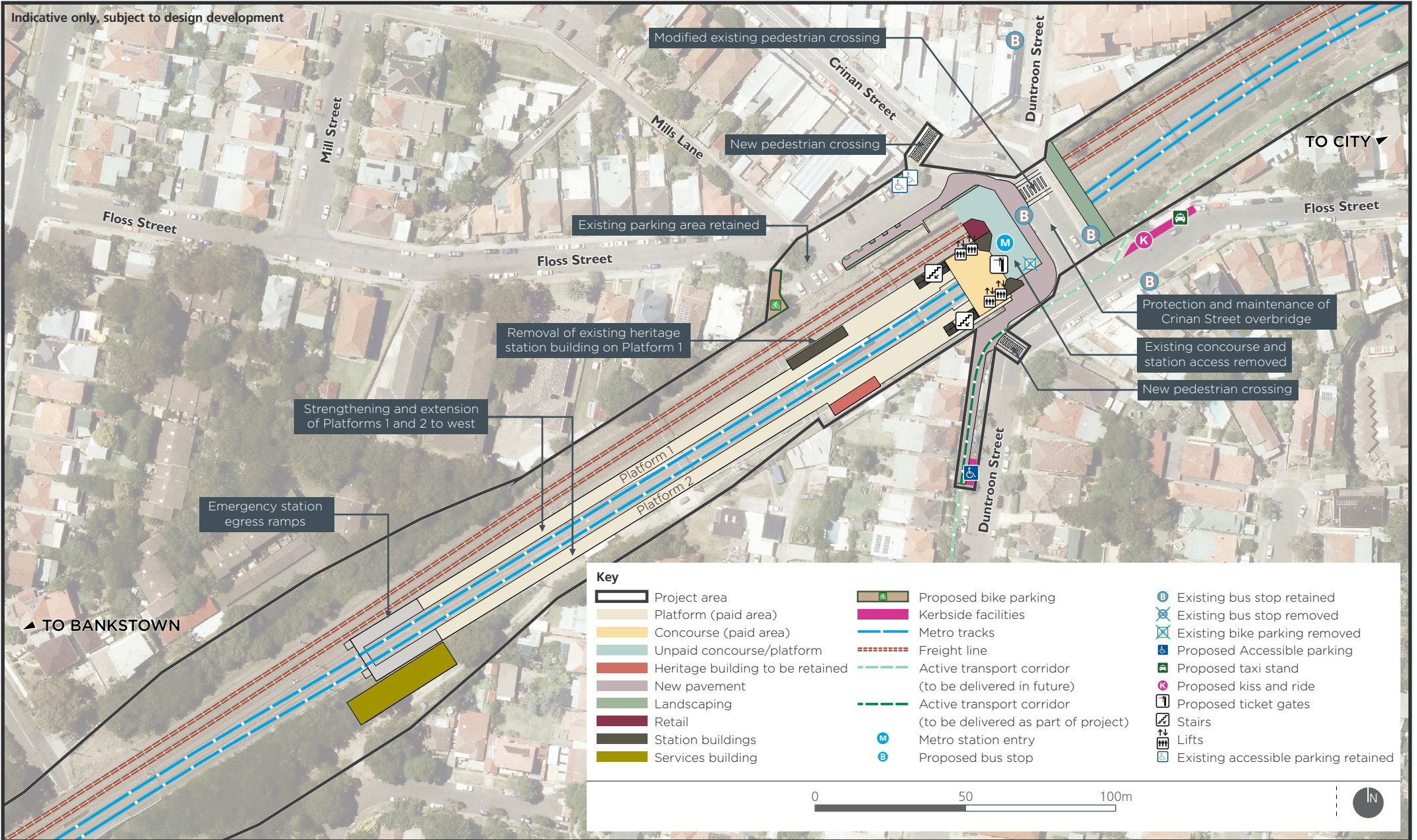
Hurlstone Park Station is located to the west of the Crinian Street overbridge. The station area is bounded by Crinian and Floss streets and residential dwellings to the north, Duntroon Street and residential dwellings to the south, and Crinian Street to the west (on the bridge). The station entrance is on the overbridge.

The key works proposed as part of the project are shown in Figure 8.6 and summarised in Table 8.4.

An artist's impression is provided in Figure 8.7.

Table 8.4 Hurlstone Park Station key design elements

Feature	Description
Station works	
Station entry/exit	<ul style="list-style-type: none"> The existing station entrance on the overbridge would be upgraded. A new enlarged, elevated station concourse would be provided in the same location to provide an enlarged station forecourt area and entry set back from the road.
Platform details	<ul style="list-style-type: none"> Heritage listed platforms would be rebuilt, straightened, and extended to the south-west along the rail corridor, generally in their existing locations.
Station buildings	<ul style="list-style-type: none"> New station buildings would be located within the concourse and on platforms. The existing heritage listed overhead booking office and heritage building on platform 1 would be removed. A description of how the design has been refined to minimise impacts on heritage is provided in Section 7.3.7. The existing heritage station building on platform 2 would be retained. New retail space would be provided as part of the new concourse (the use of the retail space would be subject to a separate approval process).
Station area	
Public transport integration	<ul style="list-style-type: none"> The existing bus stops on the overbridge would be retained.
Access	<ul style="list-style-type: none"> New pedestrian crossing facilities would be provided adjacent to the new southern station entrance and on Crinan Street just north of Floss Street. The existing pedestrian crossing on the overbridge would be modified to improve pedestrian flow by including more space on the southwestern side. Connection to an active transport corridor along the western side of Duntroon Street (south of rail corridor).
Kerbside uses, bike parking	<ul style="list-style-type: none"> New kerbside facilities would be located near the southern station entrance on Floss Street, on the eastern side of the overbridge adjacent to the station. New bike parking areas would be provided in Floss Street on the northern side of the rail corridor. The existing accessible parking spaces on Floss Street would be retained, and a new accessible space would be provided on Duntroon Street.
Car parking	<ul style="list-style-type: none"> Loss of five on-street parking spaces on Duntroon Street (south) and Floss Street (east) due to new kerbside facilities.





Canterbury Station

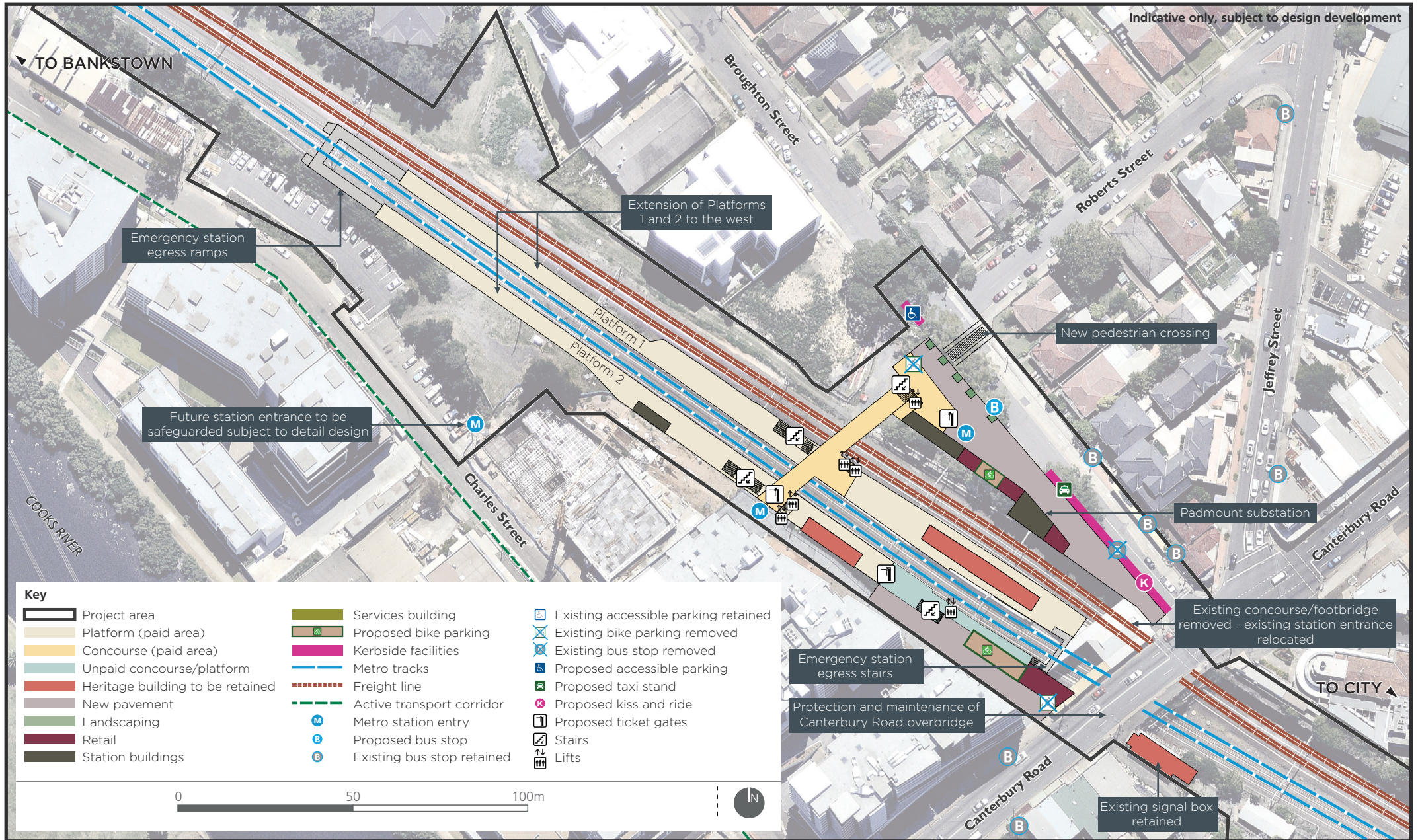
Canterbury Station is located to the north-west of the Canterbury Road overbridge. The station area is bounded by Broughton Street to the north, a large mixed use development fronting Charles Street to the south, and Canterbury Road to the east. The station entrance is on Canterbury Road.

The key works proposed as part of the project are shown in Figure 8.8 and summarised in Table 8.5.

An artist's impression is provided in Figure 8.9.

Table 8.5 Canterbury Station key design elements

Feature	Description
Station works	
Station entry/exit	<ul style="list-style-type: none"> The existing station entrance on Canterbury Road would be relocated to the western side of the rail corridor and provide access to platform 2. A new elevated station concourse would be provided about 150 metres west of Canterbury Road. A new station entrance would be provided on Broughton Street providing access to platforms 1 and 2. The design provides for a potential future station entrance on Charles Street, to enable access to platform 2.
Platform details	<ul style="list-style-type: none"> The heritage listed platforms would be rebuilt and extended to the north-west.
Station buildings	<ul style="list-style-type: none"> The heritage listed footbridge and overhead booking office would be removed. A description of how the design has been refined to minimise impacts on heritage is provided in Section 7.3.7. The heritage listed buildings on platforms 1 and 2 would be retained. The existing heritage listed signal box on the south-eastern side of the Canterbury Road overbridge would be retained. New station buildings would be provided at the station entrance on Broughton Street. New retail space would be provided at the station entrances at Broughton Street and Canterbury Road (the use of the retail space would be subject to a separate approval process).
Station area	
Public transport integration	<ul style="list-style-type: none"> All existing bus stops would be retained, with the exception of one stop on Broughton Street, which is to be relocated to the new Broughton Street entrance. A new bus shelter would be provided at the station entrance on Broughton Street.
Access	<ul style="list-style-type: none"> Connection to an active transport corridor located along Charles Street via Canterbury Road. A new pedestrian crossing would be provided on Broughton Street in line with new station entrance.
Kerbside uses, bike parking	<ul style="list-style-type: none"> Kerbside facilities would be provided on Broughton Street adjacent to the new station entry, including new accessible parking on Broughton Street. New bike parking areas would be provided within the new station plaza areas on Broughton Street and Canterbury Road.
Car parking	<ul style="list-style-type: none"> Loss of two on-street parking spaces on Broughton Street to provide new accessible parking spaces.





Campsie Station

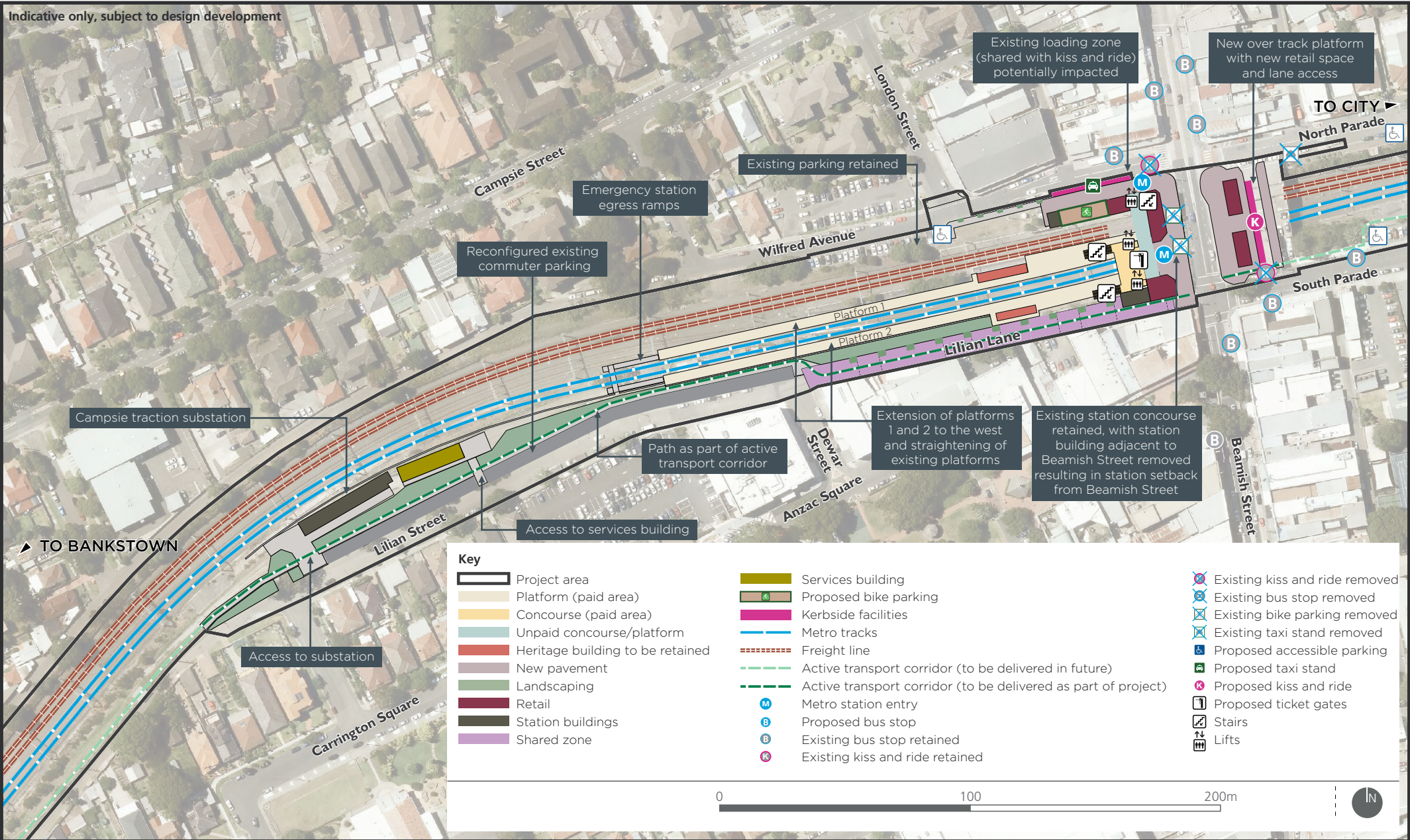
Campsie Station is located to the west of the Beamish Street overbridge. The station area is bounded by Lilian Lane/South Parade to the south, Wilfred Avenue/North Parade to the north, and Beamish Street to the east. The station entrance is located on the overbridge.

The key works proposed as part of the project are shown in Figure 8.10 and summarised in Table 8.6.

An artist's impression is provided in Figure 8.11.

Table 8.6 Campsie Station key design elements

Feature	Description
Station works	
Station entry/exit	<ul style="list-style-type: none"> The existing station entrance at Beamish Street would be upgraded. A new station entry would be provided on North Parade. A new enlarged, elevated station concourse would provide more space for pedestrian circulation and pedestrian movement along Beamish Street. The part of the existing concourse built in 2001 would be retained.
Platform details	<ul style="list-style-type: none"> The heritage listed platforms would be rebuilt, straightened and extended to the west.
Station buildings	<ul style="list-style-type: none"> The heritage listed overhead station concourse and footbridge (except the part built in 2001) would be removed. A description of how the design has been refined to minimise impacts on heritage is provided in Section 7.3.7. The existing heritage listed buildings on platforms 1 and 2 would be retained. New station facilities would be provided within the new concourse. New retail space would be provided at the station entrance on North Parade and on the eastern side of Beamish Street (the use of the retail space would be subject to a separate approval process).
Station area	
Public transport integration	<ul style="list-style-type: none"> Existing bus stops located in the vicinity of the station would be retained.
Access	<ul style="list-style-type: none"> A new shared zone would be provided along Lilian Lane between Beamish and Dewar streets. This would form part of an active transport corridor.
Kerbside uses, bike parking	<ul style="list-style-type: none"> New kerbside facilities would be provided on the southern side of North Parade, adjacent to the northern station entrance. The existing kerb facilities on the northern side of South Parade would be removed. New kerbside facilities would be provided as part of the new elevated platform on the eastern side of Beamish Street. The existing accessible parking on North Parade, Wilfred Avenue, and South Parade would be retained. New bike parking facilities would be provided near the northern station entrance on North Parade, and on the southern side of the station concourse.
Car parking	<ul style="list-style-type: none"> The existing parking area along the northern side of Lilian Lane would be reconfigured, which would result in the provision of 80 additional commuter car parking spaces. The new kerbside facilities would result in the loss of about 20 on-street car parking spaces on North Parade and South Parade.





Belmore Station

Belmore Station is located to the east of the Burwood Road overbridge. To the north and south, the station area is bounded by commuter car parks fronting Redman Parade and Tobruk Avenue respectively. To the west, the station area is bounded by Burwood Road. The existing station entrance is located on the Burwood Road overbridge.

The key works proposed as part of the project are shown in Figure 8.12 and summarised in Table 8.7. An artist's impression is provided in Figure 8.13.

Table 8.7 Belmore Station key design elements

Feature	Description
Station works	
Station entry/exit	<ul style="list-style-type: none"> The existing station entrance would be removed. A new station entrance and plaza would be provided at Tobruk Avenue to the south and a new entrance provided to Redman Parade to the north. A new elevated concourse would be provided to the east of the heritage platform building.
Platform details	<ul style="list-style-type: none"> The heritage listed platforms would be rebuilt, straightened and extended to the east.
Station buildings	<ul style="list-style-type: none"> New station buildings would be provided within the concourse and at the eastern end of the platform. The existing heritage listed platform building would be retained. The existing overhead booking office would be retained. The existing stairs from the overhead booking office to the platform would be removed. Existing heritage buildings located within the car park to the north of the station would be retained. New retail space would be provided as part of the new station plaza on Tobruk Avenue (the use of the retail space would be subject to a separate approval process).
Station area	
Public transport integration	<ul style="list-style-type: none"> The existing northbound bus stop on Burwood Road would be retained. The southbound stop on Burwood Road would be relocated to the south of Tobruk Avenue.
Access	<ul style="list-style-type: none"> The existing signalised crossing on Burwood Road at the station entrance would be removed, and a new signalised intersection would be provided at the Tobruk Avenue, and Burwood Road intersection. The new signalised intersection would include pedestrian crossings. New pathways would be provided on Tobruk Avenue to connect to an active transport corridor along Bridge Road, and the existing pathways along the southern side of the rail corridor.
Kerbside uses, bike parking	<ul style="list-style-type: none"> Tobruk Avenue would be extended and widened to provide a shared zone, including new taxi and kiss and ride facilities. A new bike parking area would be provided within the new plaza on Tobruk Avenue.
Car parking	<ul style="list-style-type: none"> Potential impacts to commuter parking and council parking on the northern side of existing station due to new northern station entrance. Removal of existing council off-street car park located south of the station, resulting in the loss of 48 spaces. Loss of five on-street spaces on Tobruk Avenue due to the provision of kerbside facilities

