

Part C

Preferred Infrastructure Report

Part C Preferred Infrastructure Report

8. Introduction

8.1 Statutory context

The planning approval process for the project is described in Section 3.1.2 (Planning approval process under Part 5.1 of the EP&A Act) of the Environmental Impact Statement. The project is State significant infrastructure and critical State significant infrastructure and, as such, its assessment and approval process is regulated under Division 5.2 (formerly Part 5.1) of the EP&A Act.

This report has been prepared in accordance with Section 5.17 (6) (formerly 115Z (6)) of the EP&A Act. Section 5.17(6) of the EP&A Act specifies that:

'The Secretary may require the proponent to submit to the Secretary:

a) a response to the issues raised in those submissions, and

b) a preferred infrastructure report that outlines any proposed changes to the State significant infrastructure to minimise its environmental impact or to deal with any other issue raised during the assessment of the application concerned.'

The above provision of the EP&A Act enables changes to an exhibited project in the form of a preferred project, to respond to issues raised regarding the exhibited project and/or minimise its environmental impact. In accordance with Section 5.17 (6) b) of the EP&A Act, the exhibited project has been revised to minimise environmental impacts as well as address issues raised during exhibition of the Environmental Impact Statement. A comparison of the preferred project to the exhibited project is provided in Chapters 9 and 10 of this report. A detailed description of the preferred project is provided in Appendix B.

In accordance with Section 5.15 (formerly Section 115X) of the EP&A Act, Transport for NSW submitted a State Significant Infrastructure application and supporting State Significant Infrastructure Application Report to the Secretary of the Department of Planning and Environment on 16 February 2017. The State Significant Infrastructure Application Report included an analysis of environmental risks for the project, as it was defined in the State Significant Infrastructure Application Report. Regulatory stakeholders considered the State Significant Infrastructure Application Report and the environmental risk analysis when providing input into the Secretary's environmental assessment requirements. The Secretary's environmental assessment requirements were then used to define the scope of the Environmental Impact Statement.

An environmental risk analysis has been undertaken for the preferred project to demonstrate that the potential impacts are either the same, or have been reduced, when compared to the exhibited project, and the Secretary's environmental assessment requirements as provided remain appropriate. This analysis and comparison are provided in Chapter 11 of this report. The comparison demonstrates that changes to the preferred project would result in an overall reduction in potential environmental impacts when compared to the exhibited project.

Given the reduction in potential environmental impacts, consideration has also been given to the applicability of the Secretary's environmental assessment requirements to the preferred project (refer to Appendix C).

8.2 Preferred project justification

To address a number of issues raised during the public exhibition period, and to respond to industry feedback about constructability and cost, Transport for NSW has developed a revised design solution that enables the retention of existing station entrances, heritage buildings, bridges and concourses, but enables upgrades that provide accessible stations and conversion to metro service. The revised design allows easier and quicker construction providing better value for money.

Importantly, these changes to the exhibited project have enabled the development of a preferred project that not only addresses a number of the issues raised in submissions, but also significantly minimises potential impacts – especially in respect of heritage, vegetation, construction noise and traffic impacts, while delivering a world class metro.

By reusing existing infrastructure (where possible), Transport for NSW has revised:

- the activities required to construct the preferred project, reducing construction noise and traffic impacts
- the amount of vegetation that needs to be removed
- the amount of land required to upgrade the Sydenham to Bankstown line to a metro line.

A comparison of the preferred project to the exhibited project is provided in Chapters 9 and 10 of this report.

The preferred project would deliver the following benefits:

- all stations fully accessible, with lifts and level access between trains and platforms
- faster, more frequent and direct access to key employment centres providing more job opportunities
- better access to education, with fast, more frequent and direct connections
- no timetable required – customers can just turn up and go
- new and direct access to major CBD stations, including Martin Place, Pitt Street and Barangaroo, and Victoria Cross at North Sydney
- increased train frequency in AM and PM peak services – a train at least every four minutes
- improved interchange with light rail, pedestrian and cycling networks, and provision of taxi, kiss and ride and bike parking facilities at key stations
- fast, safe and reliable services – a new generation of 21st century metro trains.

The key challenges of converting the T3 Bankstown Line are described in Section 2.2.1 of this report.

The preferred project would form a key part of Sydney Metro and support Sydney's growing population. Therefore the need for the preferred project, as part of Sydney Metro as a whole, is driven by the challenges being experienced in responding to the growth of Sydney. The preferred project would also involve the conversion the existing T3 Bankstown Line to metro operations. Conversion of the T3 Bankstown Line is required as the existing line currently slows down the Sydney Trains network and creates a bottleneck because of the way it merges with other railway lines close to the city. Its conversion would deliver benefits across Sydney's rail network.

The preferred project, as part of Sydney Metro, would contribute to the transformation of Sydney, cutting travel times, reducing congestion and delivering economic and social benefits for generations to come.

The preferred project is one of two components of Sydney Metro City & Southwest. Without the preferred project, the benefits of Sydney Metro City & Southwest would not be fully realised and the bottleneck created by the T3 Bankstown Line would remain.

8.3 Overview of preferred project

The preferred project involves upgrading 10 existing stations west of Sydenham (Marrickville to Bankstown inclusive), and a 13 kilometre 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. The preferred project would enable Sydney Metro to operate beyond Sydenham to Bankstown.

8.3.1 Key features of the preferred project

The key features of the preferred project are summarised below and are shown in Figure 8.1.

A comparison of the key features of the preferred project with the exhibited project is provided in Chapters 9 and 10 of this report. A detailed description of the preferred project is provided in Appendix B.

Works to upgrade stations

The preferred project includes upgrading the 10 stations from Marrickville to Bankstown as required. The works at each station generally include:

- works to platforms including re-levelling and the provision of emergency access ramps
- new lifts to access the station and station platforms, where required
- refurbishment/repurposing of station buildings on platforms or at station entrances
- renewing/revitalising station interiors and exteriors
- provision of additional station facilities as required.

Works to integrate with other modes of transport and improve travel paths would also be undertaken in some areas adjoining the stations. This would include the provision of accessible parking, cyclist facilities, and kiss and ride facilities at locations where these currently do not exist.

Works to convert stations and the rail line to Sydney Metro operations

Station works

In addition to the station upgrades, works to meet the standards required for metro services would include:

- installation of platform screen doors and fixed or mechanical gap fillers on platforms to ensure that the gap between the platform and the train is minimal
- provision of operational facilities, such as station services buildings.

Track and rail system facility works

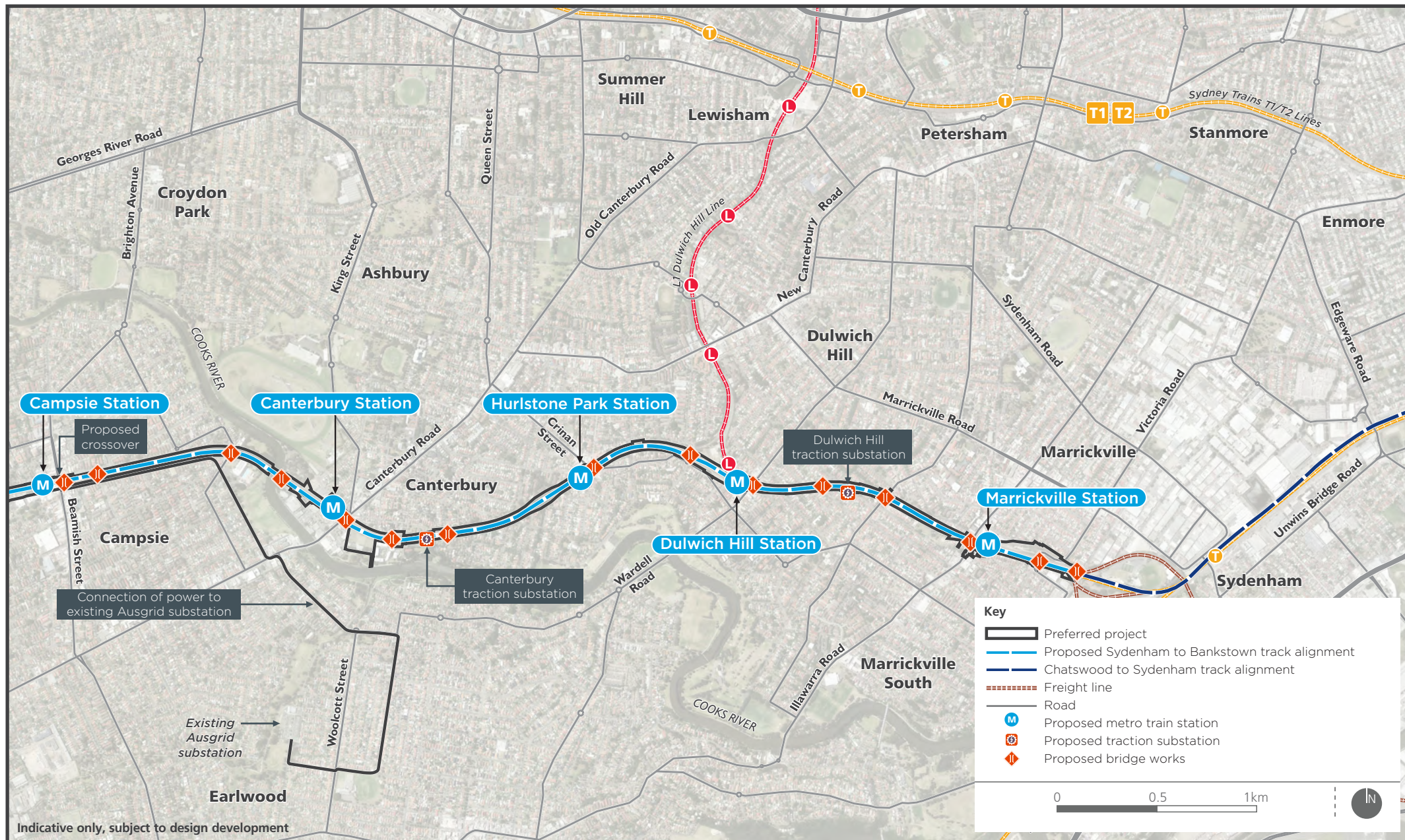
Upgrading the track and rail systems to enable operation of metro services would include:

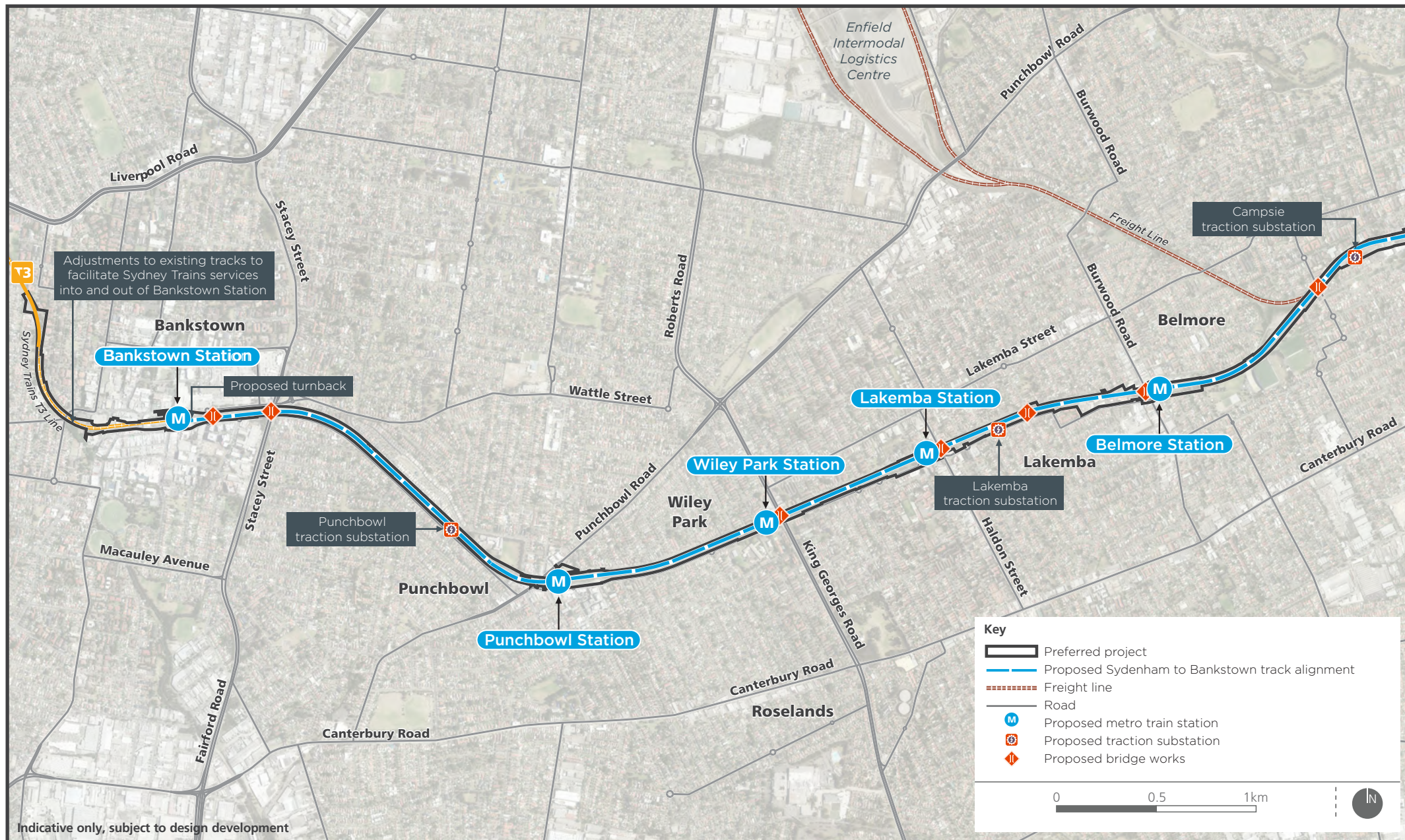
- track works where required along the rail corridor
- new or replacement turn back facilities and track crossovers
- installing Sydney Metro rail systems and adjusting existing Sydney Trains rail systems
- overhead wiring adjustments.

Other works

Other works proposed to support Sydney Metro operations would include:

- upgrading existing bridges and underpasses across the rail corridor
- installation of security measures, including fencing, where required
- installation of noise barriers where required
- augmenting the existing power supply, including new traction substations and provision of new feeder cables
- utility and rail system protection and relocation works.





9. Preferred project – operational features

This section summarises the preferred project's operational features as compared to the exhibited project's operational features. A detailed description of the preferred project is provided in Appendix B, including how the preferred project would operate.

9.1 Operation of the preferred project

The preferred project has been revised to address a number of issues raised in submissions during the public exhibition period. The preferred project also significantly minimises potential impacts – especially in respect of construction, heritage and vegetation impacts, while delivering a world class metro.

Operation of the preferred project would be as described in Section 8.3 (Operation of the project) of the Environmental Impact Statement and in the preferred project description provided in Appendix B of this report.

The following sections highlight differences between operational features of the preferred project compared with the exhibited project.

9.2 Station works

The preferred project upgrade works would be undertaken at the 10 stations between Marrickville and Bankstown. These stations would be provided with lifts and level access, and some works would be undertaken on station platforms, such as platform re-levelling, to make stations accessible. Accessibility upgrades would be undertaken so that existing station buildings and entrances can be retained, including heritage buildings which would be repurposed and refurbished.

Works would be undertaken in the areas around the stations to better integrate with other modes of transport including new bike parking, kiss and ride, taxi and accessible parking facilities. Where sufficient bike parking and kerbside facilities exist, these facilities would be retained.

The works at Bankstown Station would be as described in the exhibited project, as a new Sydney Metro station is still required to retain the existing Sydney Trains station and its operations.

The following works are described in the exhibited project and would be retained for the preferred project:

- installation of platform screen doors on the rail side of all platforms
- fixed or mechanical gap fillers on platforms to ensure a minimal gap between the platform and the train
- provision of operational facilities for Sydney Metro including new services buildings, signalling equipment, electrical equipment and other rail systems equipment. The indicative locations of these buildings are shown in the station figures provided in this section.

The preferred project, compared to the exhibited project works are summarised in the following sections.

9.2.1 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. Station entrances are located on Illawarra Road and in Station Street.

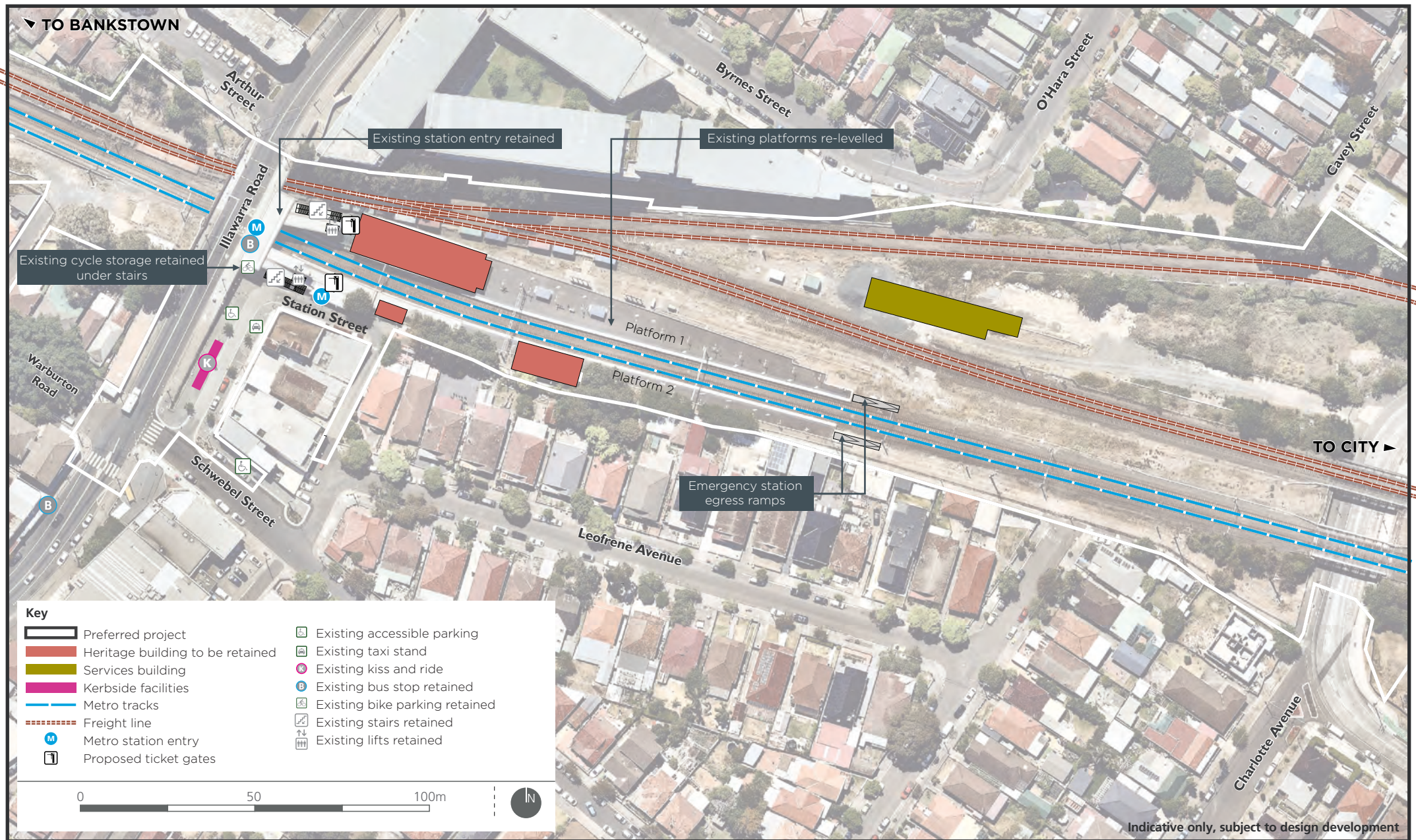
Marrickville Station was recently upgraded as part of Transport for NSW's Transport Access Program.

The key works proposed as part of the exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.1. Figure 9.1 shows the key works of the preferred project.

Table 9.1 Marrickville Station key design elements

Exhibited project works	Preferred project works
Station works	
<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. The existing heritage listed platforms would be straightened and extended to the east. The existing station buildings, including the recently completed elevated concourse and associated canopy would be retained. New station buildings would be provided on platform 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). 	<ul style="list-style-type: none"> The existing station entrance from Illawarra Road would be retained. The existing lifts would also be retained. The existing at-grade entry from Station Street to platform 2 would be retained. The existing heritage listed platforms would be re-levelled. The existing station buildings, including the recently completed elevated concourse and associated canopy, would be retained. The existing heritage station buildings on platforms 1 and 2 would be retained and repurposed. The former booking office on platform 2 would be retained.
Station area	
<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. 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. 	<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. The existing kiss and ride facility on the western side of Station Street would be retained. The existing accessible parking space on Station Street would be retained. The existing taxi zone on Station Street would be retained. The existing bike storage/parking facility below the station stairs would be retained. The existing cycle route along the southern side of the rail corridor would be retained.

Exhibited project works	Preferred project works
<ul style="list-style-type: none"> • 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. • 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. 	



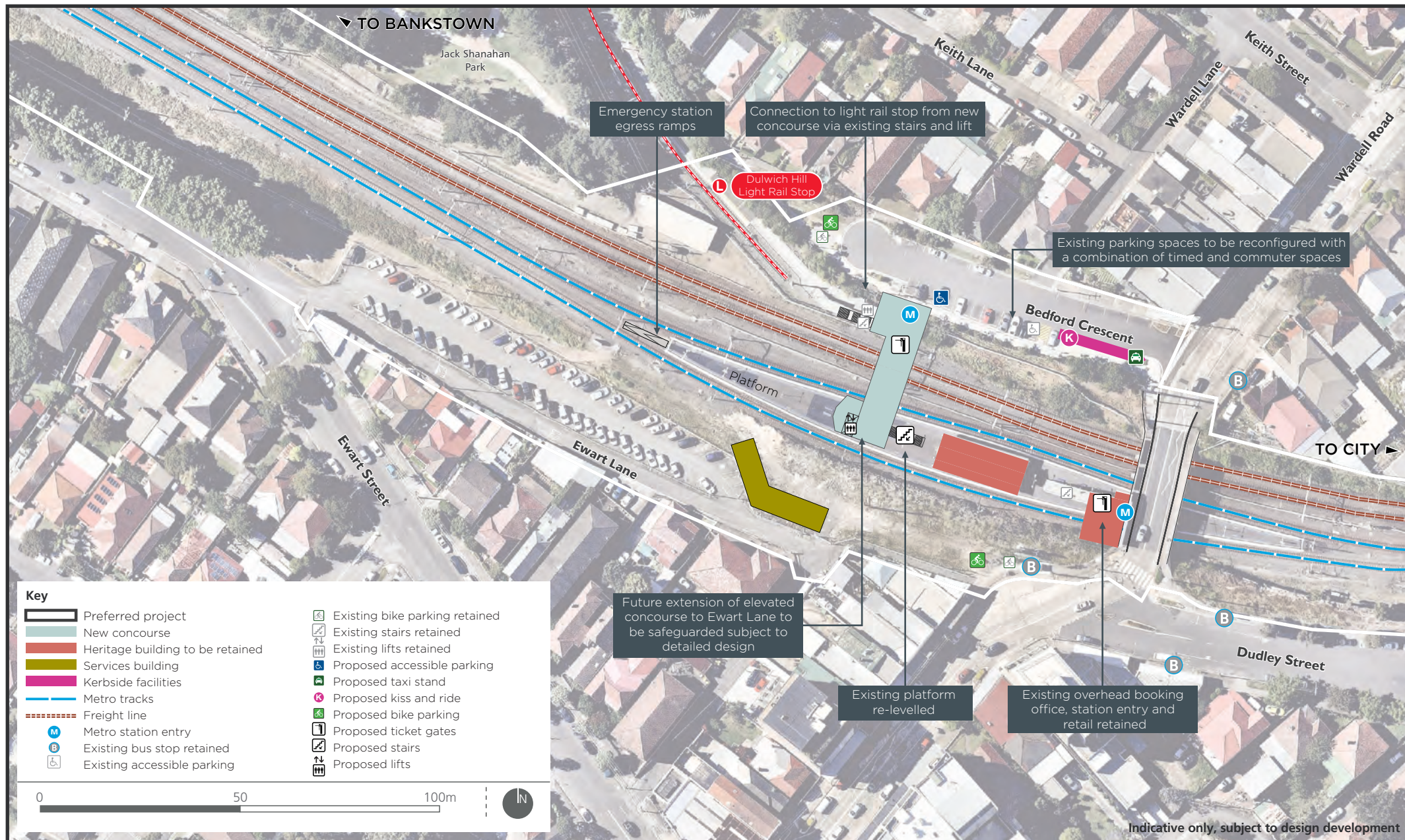
9.2.2 Dulwich Hill Station

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 exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.2. Figure 9.2 shows the key works of the preferred project.

Table 9.2 Dulwich Hill Station key design elements

Exhibited project works	Preferred project works
Station works	
<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). 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. 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. 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). 	<ul style="list-style-type: none"> The existing station entrance would be retained and upgraded. A new elevated station concourse would be provided with new stairs and a lift, and would connect the station platform to the Dulwich Hill light rail stop. The concourse would be accessed from a new station entrance at Bedford Crescent (northern side). The future extension of the new elevated concourse to Ewart Lane has been safeguarded. The existing heritage listed platforms would be re-levelled. The existing heritage listed overhead booking office and station building on the platform would be retained and repurposed. The existing retail within the overhead booking office would be retained.
Station area	
<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. 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. 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. 	<ul style="list-style-type: none"> The existing bus stops located on Dudley Street and Wardell Road would be retained. Existing pedestrian pathways surrounding the station would be upgraded, including from Ewart Lane to Wardell Road and from Keith Lane to Bedford Crescent. New kiss and ride and taxi facilities would be provided on the southern side of Bedford Crescent at its eastern end. The two existing accessible parking spaces on the southern side of the Bedford Crescent would be retained and one new accessible parking space would be provided. Existing bike parking on Wardell Road to the south of the station would be retained. New bike parking facilities would be provided on Wardell Road to the south of the station. The existing bike parking spaces on Bedford Crescent would be retained and additional spaces provided.



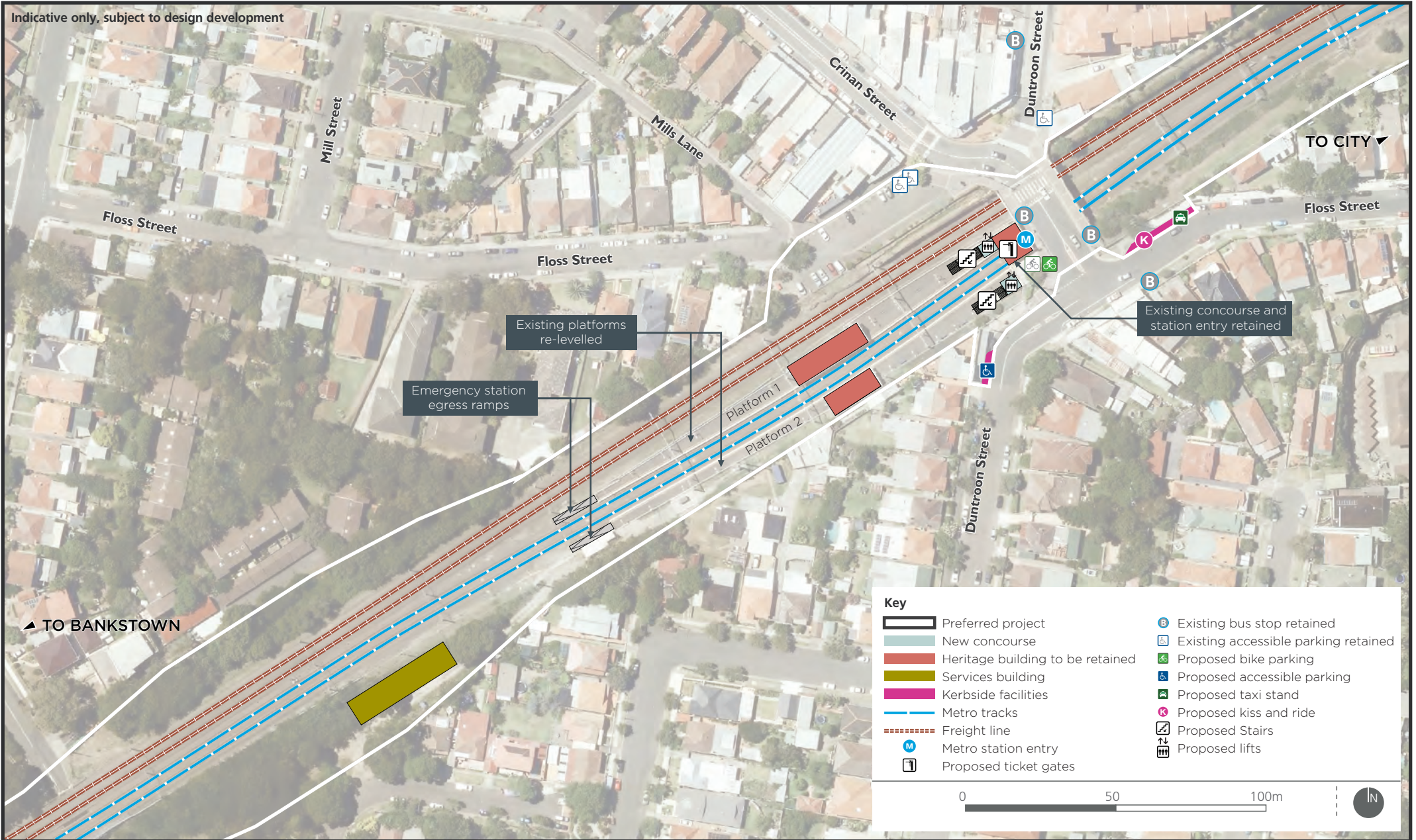
9.2.3 Hurlstone Park Station

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

The key works proposed as part of the exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.3. Figure 9.3 shows the key works of the preferred project.

Table 9.3 Hurlstone Park Station key design elements

Exhibited project works	Preferred project works
Station works	
<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. Heritage listed platforms would be rebuilt, straightened, and extended to the south-west along the rail corridor, generally in their existing locations. 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. 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). 	<ul style="list-style-type: none"> The existing station entrance would be retained and upgraded. Two new lifts would be provided. The existing stairs would be removed and replaced. The existing heritage listed platforms would be re-levelled. The existing heritage listed overhead booking office and heritage buildings on platforms 1 and 2 would be retained and repurposed.
Station area	
<ul style="list-style-type: none"> The existing bus stops on the overbridge would be retained. 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 south-western side. Connection to an active transport corridor along the western side of Duntroon Street (south of rail corridor). 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. 	<ul style="list-style-type: none"> The existing bus stops on the overbridge would be retained. New kerbside facilities would be located on Floss Street, on the eastern side of the overbridge adjacent to the station. The existing accessible parking spaces on Floss Street and Duntroon Street on the northern side of the rail corridor would be retained. New accessible parking would be provided on Duntroon Street on the southern side of the rail corridor. The existing bike parking on Crinan Street outside the station entrance would be retained and additional bike parking provided.



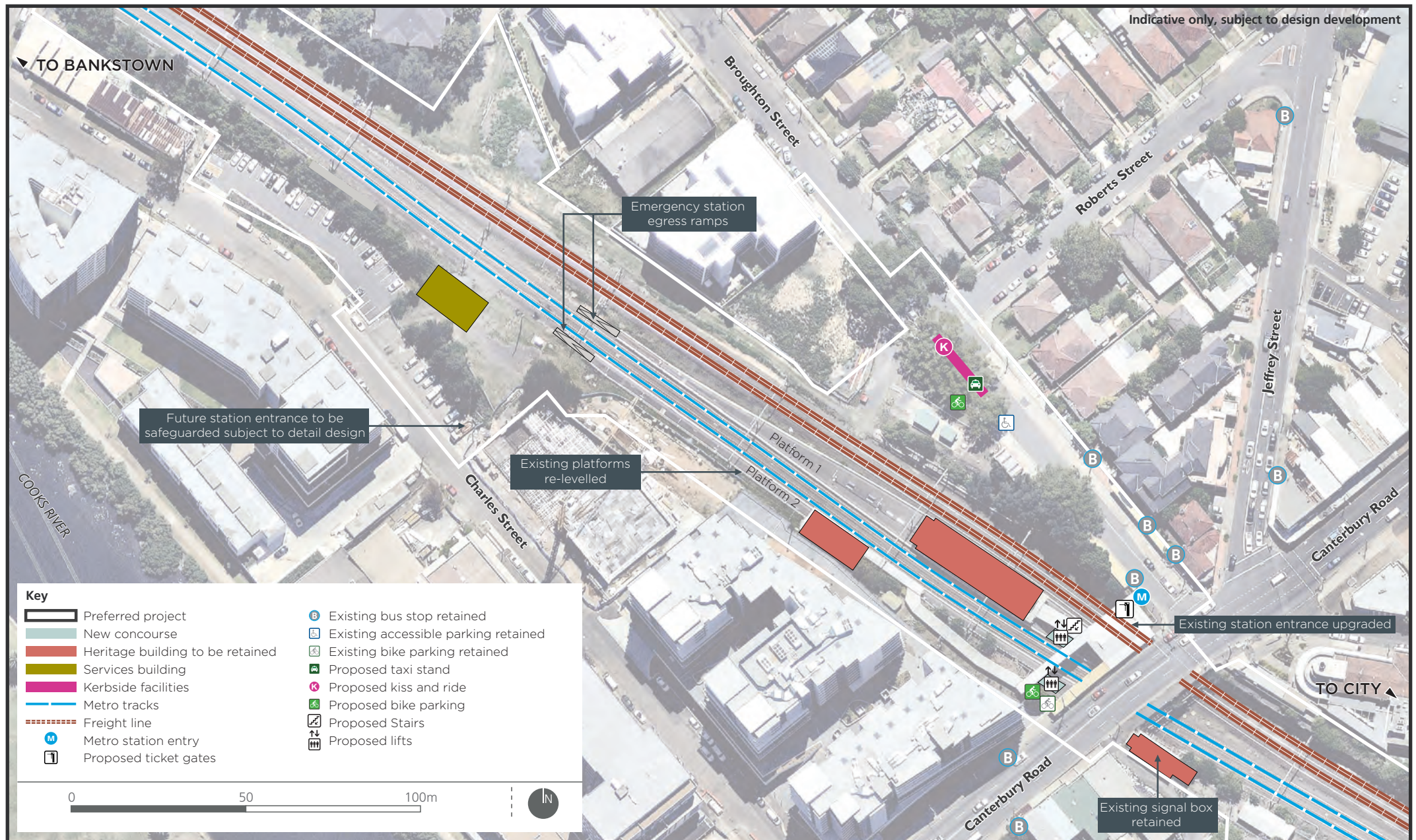
9.2.4 Canterbury Station

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 exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.4. Figure 9.4 shows the key works of the preferred project.

Table 9.4 Canterbury Station key design elements

Exhibited project works	Preferred project works
Station works	
<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. The heritage listed platforms would be rebuilt and extended to the north-west. The heritage listed footbridge and overhead booking office would be removed. 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). 	<ul style="list-style-type: none"> The existing station entrance would be retained and upgraded. The design provides for a potential future station entrance on Charles Street, to enable access to platform 2. The existing heritage listed platforms would be re-levelled. The existing stairs from platform 1 to the footbridge would be replaced with new stairs. Two new lifts to the platforms would be provided. The existing heritage listed footbridge and overhead booking office would be retained The existing heritage listed buildings on platforms 1 and 2 would be retained and repurposed. The existing heritage listed signal box on the south-eastern side of the Canterbury Road overbridge would be retained.
Station area	
<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. 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 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. 	<ul style="list-style-type: none"> The existing bus stops on Broughton Street and Canterbury Road would be retained and the bus shelters on Broughton Street would be refurbished. Existing pedestrian pathways surrounding the station would be upgraded. New kerbside facilities would be provided on Broughton Street. The existing accessible parking space on Broughton Street would be retained. The existing bike parking on Canterbury Road would be retained and additional bike parking provided. New bike parking would be provided on Broughton Street, directly south of the proposed kerbside facilities.



9.2.5 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 exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.5. Figure 9.5 shows the key works of the preferred project.

Table 9.5 Campsie Station key design elements

Exhibited project works	Preferred project works
Station works	
<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. The heritage listed platforms would be rebuilt, straightened and extended to the west. The heritage listed overhead station concourse and footbridge (except the part built in 2001) would be removed. 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). 	<ul style="list-style-type: none"> The existing station entrance at Beamish Street would be retained and upgraded. The existing heritage listed platforms would be re-levelled. The existing heritage listed buildings on platforms 1 and 2 would be retained and repurposed.
Station area	
<ul style="list-style-type: none"> Existing bus stops located in the vicinity of the station would be retained. A new shared zone would be provided along Lilian Lane between Beamish and Dewar streets. This would form part of an active transport corridor. 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. 	<ul style="list-style-type: none"> The existing bus stops located in the vicinity of the station would be retained. The existing kiss and ride facility on South Parade would be retained and a new accessible park provided at this location. The existing taxi stand on North Parade would be retained. The existing accessible parking on North Parade, Wilfred Avenue, and South Parade would be retained. The existing bike parking on Beamish Street outside the station would be retained. New bike parking facilities would be provided on North Parade.



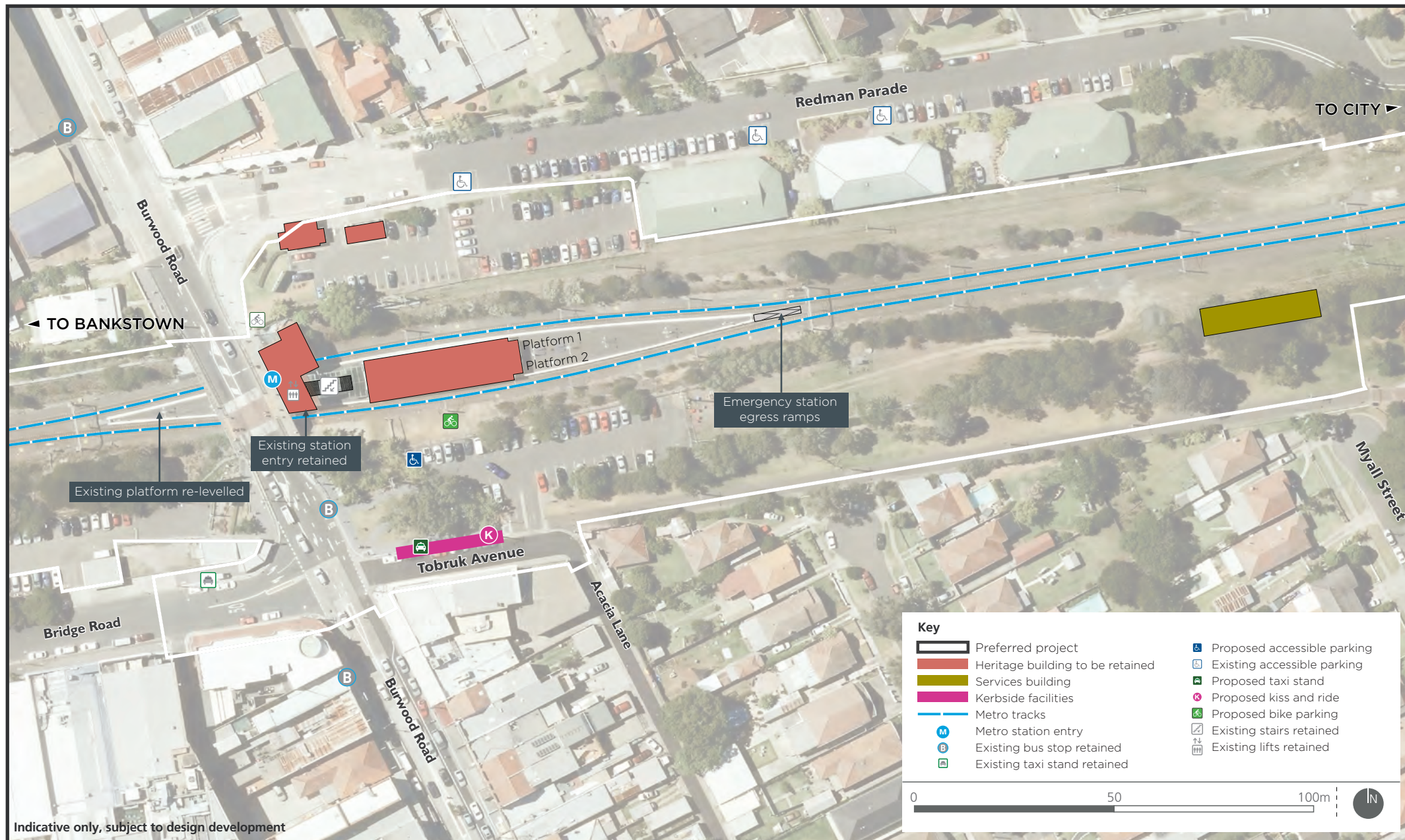
9.2.6 Belmore Station

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 exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.6. Figure 9.6 shows the key works of the preferred project.

Table 9.6 Belmore Station key design elements

Exhibited project works	Preferred project works
Station works	
<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. The heritage listed platforms would be rebuilt, straightened and extended to the east. 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). 	<ul style="list-style-type: none"> The existing station entrance would be retained and upgraded. The existing heritage listed platforms would be re-levelled. The existing heritage listed platform building and overhead booking office would be retained and repurposed. The existing heritage buildings located within the car park to the north of the station would be retained.
Station area	
<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. 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. 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. 	<ul style="list-style-type: none"> The existing bus stops in the vicinity of the station would be retained. New taxi and kiss and ride facilities would be provided on Tobruk Avenue. New accessible parking spaces would be provided in the Tobruk Avenue car park. The existing accessible parking along Redman Parade would be retained. New bike parking area would be provided within the Tobruk Avenue car park. The existing bike parking on Burwood Road to the north of the station entrance would be retained.



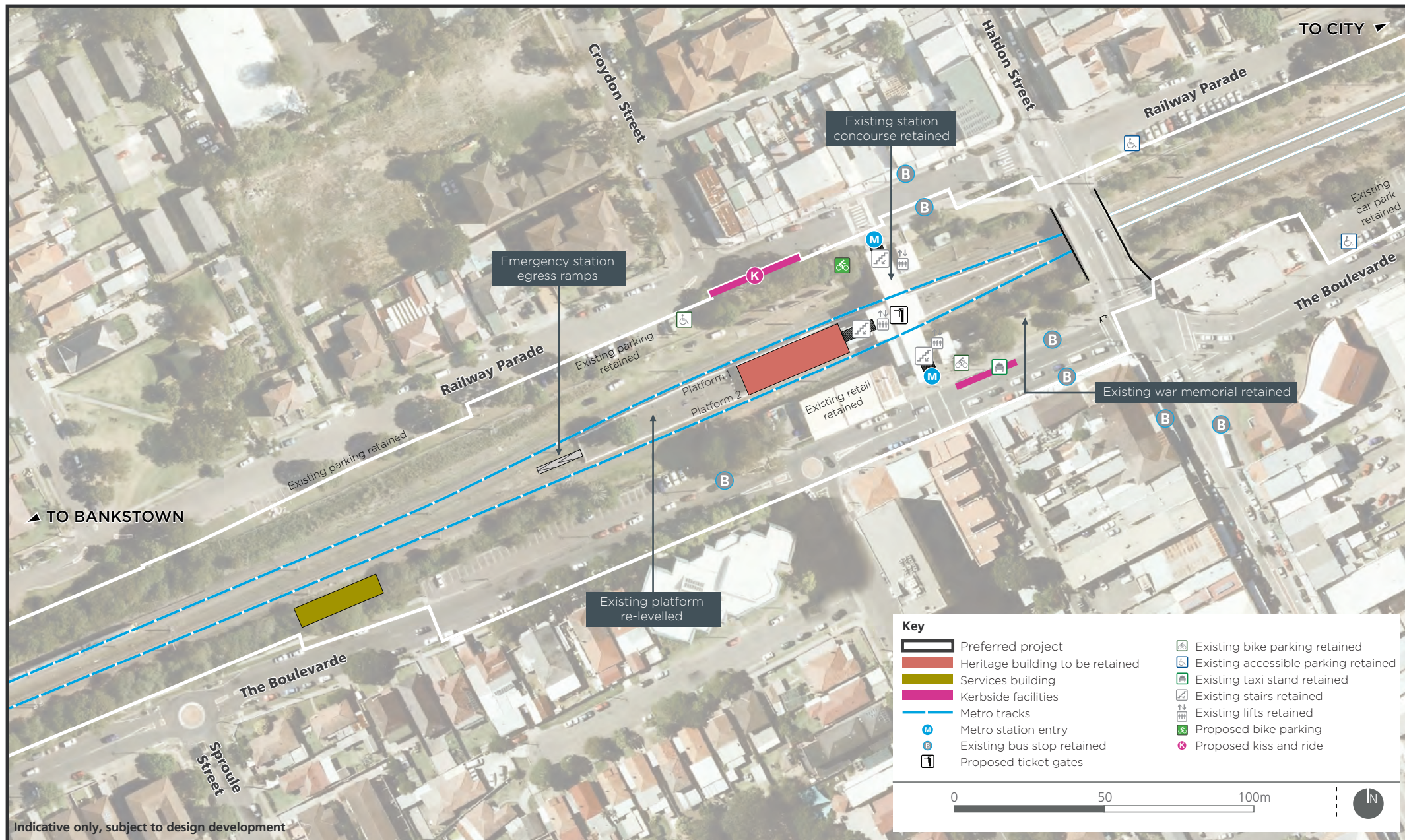
9.2.7 Lakemba Station

Lakemba Station is located about 60 metres to the west of the Haldon Street overbridge. The station area is bounded by Railway Parade to the north and The Boulevard to the south. Access to the station is provided off Railway Parade and The Boulevard.

The key works proposed as part of the exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.7. Figure 9.7 shows the key works of the preferred project.

Table 9.7 Lakemba Station key design elements

Exhibited project works	Preferred project works
Station works	
<ul style="list-style-type: none"> The existing station entrances on Railway Parade and The Boulevard 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 heritage listed platform would be rebuilt and straightened. New station buildings would be provided in the concourse, on the platform and would also be provided adjacent to the Railway Parade entrance. The existing heritage station building on the platform would be retrofitted. 	<ul style="list-style-type: none"> The existing station entrance would be retained. The existing heritage listed platforms would be re-levelled. The existing heritage station building on the platform would be retained and repurposed.
Station area	
<ul style="list-style-type: none"> The existing bus stops located on The Boulevard, Railway Parade, and Haldon Street (south) would be retained. A connection would be provided to an active transport corridor along The Boulevard east of Haldon Street, and along the rail corridor boundary east of Haldon Street. A new footpath is proposed on the southern side of Railway Parade, adjacent to the existing car parking area leading to the station entrance. New kerbside facilities would be provided on Railway Parade and on The Boulevard, east of the new station entrance. New bike parking areas would be provided on either side of the rail corridor adjacent to the existing station entrances. 	<ul style="list-style-type: none"> The existing bus stops located on The Boulevard, Railway Parade, and Haldon Street (south) would be retained. The existing bike parking on the northern side of The Boulevard would be retained. New bike parking would be provided on the southern side of Railway Parade. New kiss and ride kerbside facilities would be provided on Railway Parade (west of new station entrance) and new taxi kerbside facilities would be provided on The Boulevard (east of the new station entrance). The existing accessible parking on Railway Parade and The Boulevard would be retained.



Lakemba Station - indicative layout of key design elements

FIGURE 9.7

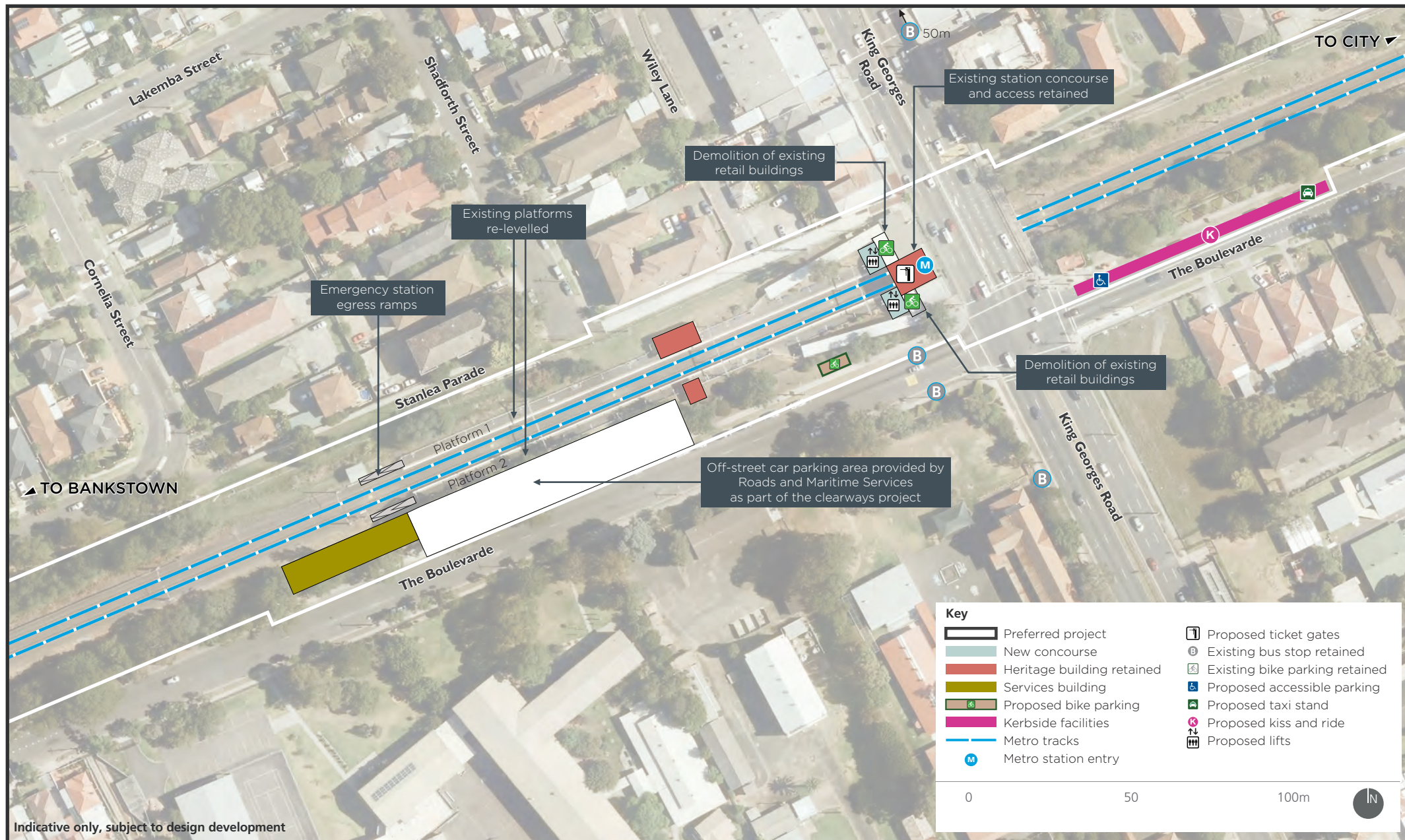
9.2.8 Wiley Park Station

Wiley Park Station is located to the west of the King Georges Road overbridge. The station area is bounded by Stanlea Parade walkway to the north, by King Georges Road to the east and The Boulevarde to the south. The station entrance is located on the overbridge.

The key works proposed as part of the exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.8. Figure 9.8 shows the key works of the preferred project.

Table 9.8 Wiley Park Station key design elements

Exhibited project works	Preferred project works
Station works	
<ul style="list-style-type: none"> The existing station entrance on King Georges Road would be removed. Two new entrances would be provided on The Boulevarde and from the Stanlea Parade walkway near King Georges Road. The existing station concourse would be removed, and a new structure would be installed in the same location. A new elevated concourse would be built to provide more space for pedestrian circulation. The heritage listed platform would be rebuilt, straightened and extended to the west. New station buildings would be provided within the southern side of the new concourse, on platforms 1 and 2 and adjacent to The Boulevarde. The existing heritage listed overhead booking office, concourse and platform buildings would be removed to enable the new facilities to be provided. New retail space would be provided in the new concourse along King Georges Road (the use of the retail space would be subject to a separate approval process). 	<ul style="list-style-type: none"> The existing station entrance would be retained and upgraded. The existing retail shop and a disused premises at the station entrance would be demolished. Two new lifts would be provided. The existing heritage listed platform would be re-levelled. The existing heritage listed overhead booking office, concourse and platform buildings would be retained and repurposed.
Station area	
<ul style="list-style-type: none"> The existing bus stops would be retained. Connection to an active transport corridor on the southern side of the station, along The Boulevarde east of Haldon Street, and along the rail corridor boundary west of Haldon Street. New bike parking areas would be provided on either side of the rail corridor, adjacent to the platforms. Kerbside facilities would be provided on the northern side of The Boulevarde, east of King Georges Road. 	<ul style="list-style-type: none"> The existing bus stops would be retained. Existing pedestrian pathways surrounding the station would be upgraded. New bike parking would be provided on The Boulevarde and at the station entrance. New kerbside facilities and accessible parking would be provided on The Boulevarde, east of King Georges Road.



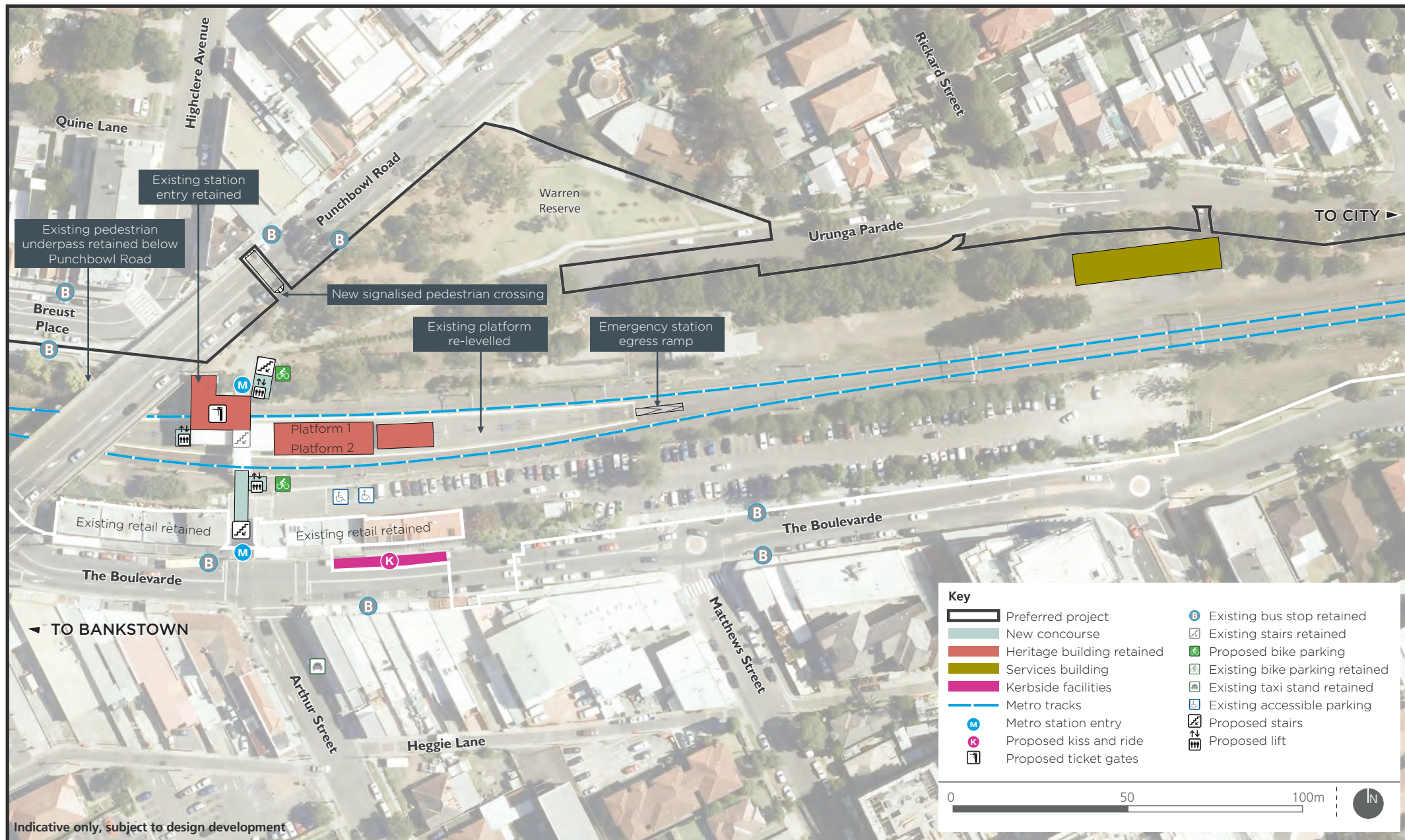
9.2.9 Punchbowl Station

Punchbowl Station is located to the east of the Punchbowl Road overbridge. The station area is bounded by commercial land uses and a car park fronting The Boulevard to the south, Warren Reserve and Urunga Parade to the north, and Punchbowl Road to the west. The station entrances are located on Punchbowl Road (via Warren Reserve) to the north, and The Boulevard to the south.

The key works proposed as part of the exhibited project and the key works proposed as part of the preferred project are summarised in Table 9.9. Figure 9.9 shows the key works of the preferred project.

Table 9.9 Punchbowl Station key design elements

Exhibited project works	Preferred project works
Station works	
<ul style="list-style-type: none"> The existing station entrance would be removed. Two new station entrances would be provided from The Boulevard (to the south) and adjacent to Warren Reserve to the north. The new southern entrance would be located within a new station plaza. A new elevated bridge would be constructed to provide access between the two platforms. The heritage listed platform would be rebuilt, straightened and extended to the east. A portion of the existing platform to the west of the new concourse would be removed. New station buildings would be provided at the station entrances and platforms. The heritage listed station buildings and overhead booking office would be removed. New retail space would be provided within the southern station plaza adjacent to The Boulevard (use of this space would be subject to separate approval). 	<ul style="list-style-type: none"> The existing station entrance would be retained and upgraded. Three new lifts and two new stairs would be provided. The existing concourse footbridge would be extended to accommodate new lifts and stairs. The existing stairs to both entrances would be replaced. The existing heritage listed platform would be re-levelled. The existing heritage listed station buildings and overhead booking office would be retained.
Station area	
<ul style="list-style-type: none"> The existing bus stops on Punchbowl Road would be retained. The existing eastbound bus stop on The Boulevard would be relocated east of Arthur Street, adjacent to the new station entry. Paths located in the vicinity of the station between the rail corridor and The Boulevard would form part of an active transport corridor. New bike parking areas would be provided on either side of the corridor at the station entrances. Kerbside facilities would be provided on both sides of The Boulevard adjacent to the southern station entrance. Kerbside facilities would be provided along the southern side of Urunga Parade to the east of the northern station entrance. A new pedestrian crossing would be provided on Punchbowl Road north-east of Bruest Place. 	<ul style="list-style-type: none"> The existing bus stops on Punchbowl Road and The Boulevard would be retained. New bike parking would be provided at the northern and southern station entrances. Kerbside facilities would be provided on The Boulevard. The existing accessible parking adjacent to the southern station entrance would be retained. A new pedestrian crossing would be provided on Punchbowl Road north-east of Bruest Place. The existing pedestrian underpass below Punchbowl Road would be retained and upgraded.



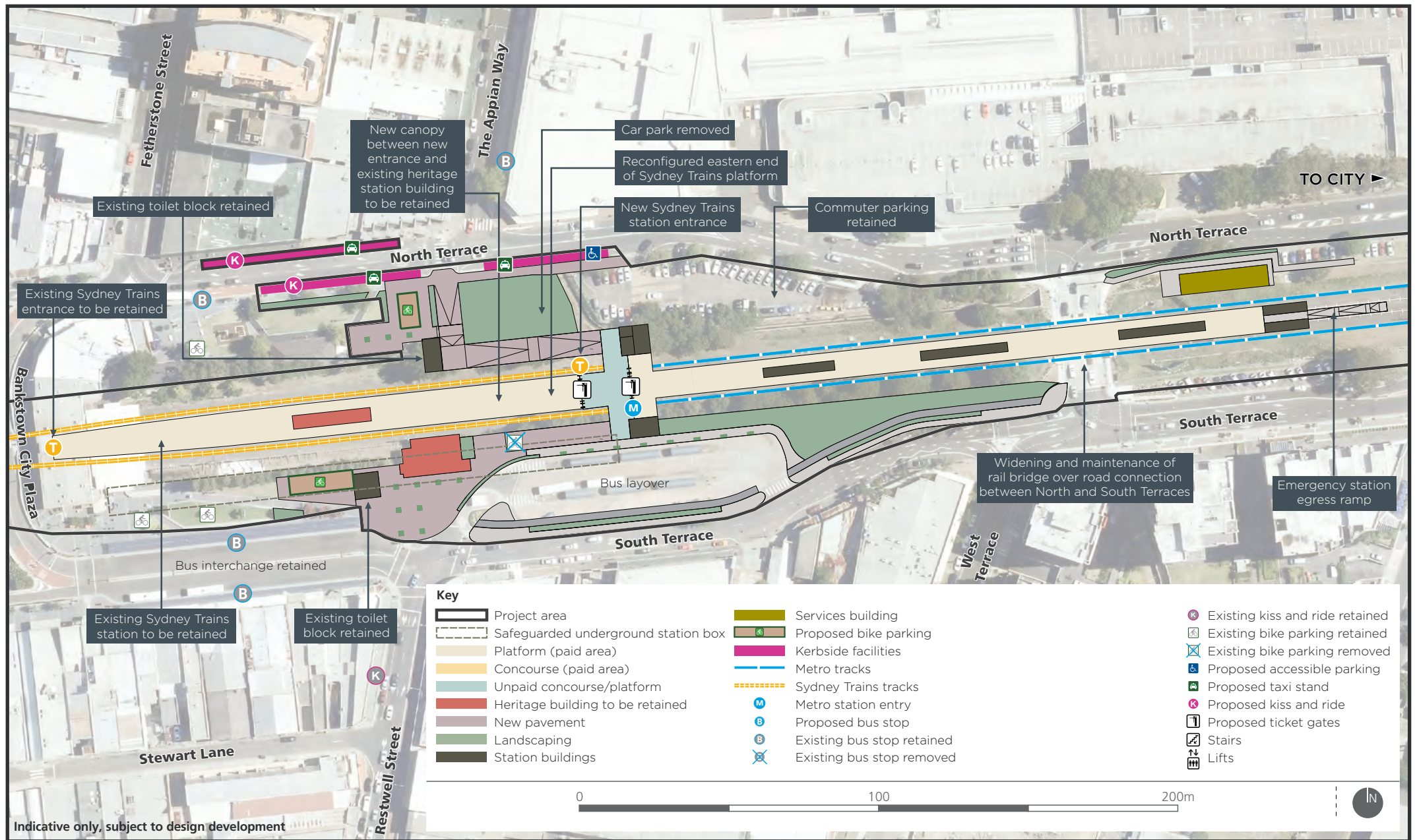
9.2.10 Bankstown Station

Bankstown Station is located to the east of the Bankstown City Plaza overbridge. The station area is bounded by North Terrace to the north, South Terrace to the south, and Bankstown City Plaza to the west. A new Sydney Metro station would be constructed to the east and adjoining the existing Sydney Trains Bankstown Station.

The key works as part of the preferred project are as per the key works of the exhibited project and are summarised in Table 9.10 and shown in Figure 9.10. Figure 9.10 also shows how the design safeguards for a potential future underground station.

Table 9.10 Bankstown Station key design elements

Exhibited project works	Preferred project works
Station works	
<ul style="list-style-type: none"> The existing Sydney Trains station entrance at Bankstown City Plaza would be retained. A new at-grade corridor crossing would be provided at the eastern end of the existing Sydney Trains platform and would provide access to both Sydney Trains and new Sydney Metro platforms. New station plazas would be constructed at station entrances on both sides of the rail corridor. The heritage listed Sydney Trains platforms would be retained with minor modifications required at the eastern end. New Sydney Metro platforms would be constructed to the east of the new at-grade corridor crossing. All station buildings (including the heritage listed station building and Parcels Office) on the Sydney Trains platforms would be retained. A new canopy would be constructed over the Sydney Trains platform between the new station entrance and the existing platform building. 	As per the exhibited project.
Station area	
<ul style="list-style-type: none"> The bus layover area on South Terrace would be retained with minor adjustments to accommodate the new station entrance. The bus interchange area on South Terrace, near the existing station entrance, would be retained. The existing bus stop on the northern side of station on North Terrace would be retained. The pedestrian/shared paths located along South Terrace would form part of an active transport corridor. A new 'at grade' corridor crossing would be provided at the eastern end of the existing Sydney Trains platform and would provide access to both Sydney Trains and new Sydney Metro platforms. Changes would be made to kerbside facilities and parking along North Terrace, between the new station entrances and the existing entrance. Existing kerbside facilities (i.e. taxi rank) on northern side of North Terrace would be retained. New bike parking would be provided on both sides of the station within the new station plazas. 	As per the exhibited project, with the exception of the active transport corridor. The pedestrian/shared paths along the South Terrace, as part of the active transport corridor, would not form part of the preferred project.



9.3 Track and rail system facilities

The track and rail system facilities proposed as part of the exhibited project and those proposed as part of the preferred project are summarised in Table 9.11.

Table 9.11 Track and rail system facilities works

Exhibited project works	Preferred project works
Track works	
<p>The exhibited project would use the existing Sydney Trains tracks where possible. In some locations, there may be a need to upgrade/replace the existing track, which would involve replacing the rails, sleepers, fastenings and ballast. The track may need to be replaced because of its condition and in some locations, particularly around stations, the alignment of the tracks would need to be adjusted to align with the new or straightened platforms.</p> <p>Changes to the track alignment would be undertaken:</p> <ul style="list-style-type: none"> around Bankstown Station to facilitate the separation of the metro tracks from the Sydney Trains network at the location of the new turnbacks and crossovers at other stations to ensure the tracks align with new platforms. <p>Works to realign sections of the track would generally occur within the existing rail corridor.</p> <p>Track works would also include connecting to the metro tracks being provided west of Sydenham Station as part of the Chatswood to Sydenham project.</p>	<p>The preferred project would use the existing Sydney Trains tracks. In some locations, there may be a need to upgrade/replace the existing track, which would involve replacing the rails, sleepers, fastenings and ballast. The track may need to be replaced because of its condition.</p> <p>Changes to the track alignment would be undertaken:</p> <ul style="list-style-type: none"> around Bankstown Station to facilitate the separation of the metro tracks from the Sydney Trains network at the location of the new turnbacks and crossovers. <p>Track works would also include connecting to the metro tracks being provided west of Sydenham Station as part of the Chatswood to Sydenham project.</p>
<p>New turnback and crossover facilities are likely to be required at the following locations:</p> <ul style="list-style-type: none"> new turnback between Campsie and Belmore replacement of the existing track crossover to the east of Bankstown Station a reconfigured rail junction and turnback to the west of Bankstown Station for Sydney Trains services. 	<p>New turnback and crossover facilities are likely to be required at the following locations:</p> <ul style="list-style-type: none"> new crossover on the eastern side of Campsie Station to support Sydney Metro operations replacement of the existing track crossover to the east of Bankstown Station with a new turnback a reconfigured rail junction and turnback to the west of Bankstown Station for Sydney Trains services.
Rail system facilities	
<p>All sections of the Sydney Metro network would use advanced signalling technology to support safe operations. This would be controlled from the Sydney Metro Trains Facility at Tallawong Road, Rouse Hill. The system would:</p> <ul style="list-style-type: none"> control the stopping of trains at stations ensure trains stop at the correct location on the platform control train speed initiate the opening and closing of train and platform screen doors. 	<p>As per the exhibited project.</p>

Exhibited project works	Preferred project works
<p>The exhibited project would include an integrated information system to communicate with customers or metro staff via audio and visual links at each station and on trains. The communications equipment would be housed within designated services areas at each station. Equipment for radio communications, customer telecommunications, closed-circuit televisions, and emergency warning systems would be housed in the service areas at each station.</p> <p>To facilitate automated operations, telecommunications masts would be positioned along the rail corridor between 150 and 250 metre intervals. The height of each mast would vary between three to six metres. Masts would consist of a concrete or steel pole.</p>	<p>As per the exhibited project.</p>
Other track and rail system works	
<p>The following work would also be undertaken as part of the track and rail system facility works:</p> <ul style="list-style-type: none"> • adjustment of existing track alignments and overhead wiring along the line to meet Sydney Metro operational requirements, Sydney Trains requirements, and freight operational requirements • adjustment of existing Sydney Trains rail systems, including removal of existing junctions to segregate the metro tracks from Sydney Trains tracks, and removal of redundant Sydney Trains systems (e.g. signalling, communications) • utility and rail system protection and relocation works within the construction footprint and public areas. <p>With the exception of the utility protection and relocation works these works would take place within the rail corridor.</p>	<p>As per the exhibited project.</p>

9.4 Other project elements

9.4.1 Inside rail corridor elements

Other project elements proposed as part of the exhibited project and those proposed as part of the preferred project that would be provided within the rail corridor are summarised in Table 9.12.

Table 9.12 Project elements provided within the rail corridor

Exhibited project works	Preferred project works
Traction power supply	
<i>Substations</i>	
<p>Five new traction substations are required to power the metro trains. These would all be located within the existing rail corridor in the following locations:</p> <ul style="list-style-type: none"> • Dulwich Hill – southern side of the railway corridor at Randall Street • Canterbury – southern side of the railway corridor, north of Hutton Street and west of the Melford Street overbridge • Campsie – southern side of the railway corridor, north of Lilian Street and east of Carrington Street • Lakemba – southern side of the railway corridor, north of The Boulevarde and west of Taylor Street • Punchbowl – southern side of the railway corridor, north of South Terrace and east of Scott Street. <p>The substations would be above ground, and would be positioned within a secure compound within the rail corridor. The compound would include a parking area for one or two vehicles, and a loading dock for deliveries.</p>	As per the exhibited project.
Maintenance	
<p>Maintenance access to the rail corridor would be generally similar to the existing situation. Changes to existing accesses or provision of new access gates may be required to provide:</p> <ul style="list-style-type: none"> • access to new key infrastructure such as station services buildings and substations • change of access type (for example, change from pedestrian to vehicular access) • additional emergency access/egress points. <p>Some access points would include provision for access by rail-mounted vehicles.</p> <p>The need for new access points (including for ARTC tracks) would be determined during detailed design.</p>	As per the exhibited project.

Exhibited project works	Preferred project works
Security	
<i>Security fencing</i>	
<p>Security fencing would be installed as part of the exhibited project. This would comprise a new security fence along both sides of the rail corridor. In addition, a segregation fence would be installed between the metro tracks and ARTC freight tracks, between west of Marrickville Station and west of Campsie Station.</p> <p>Security fencing would be a minimum of two metres above ground level in height, and would be constructed from palisade or close-spaced welded mesh. Controlled access points would be provided at appropriate locations.</p> <p>The design and type of fencing would be confirmed during detailed design.</p>	As per the exhibited project.
<i>Trackside intruder detection system</i>	
<p>A trackside intruder detection system, consisting of non-mechanical protection measures, would be installed throughout the rail corridor. Closed circuit television would form part of the system, and would monitor all automatic control areas and stations. These would be fitted to the telecommunications masts positioned along the corridor.</p>	As per the exhibited project.
Noise barriers	
<p>Noise barriers would be required in some locations to mitigate operational noise impacts. Noise modelling undertaken for the Environmental Impact Statement has identified preliminary locations where noise barriers are potentially required. The final location of barriers would be confirmed during detailed design.</p>	As per the exhibited project.
Drainage	
<p>The exhibited project would include drainage works to ensure that stormwater is efficiently conveyed within and across the corridor to the surrounding stormwater drainage system. This would include new and modified drainage infrastructure, consisting of trunk stormwater and intertrack drainage.</p> <p>Track drainage</p> <p>New or augmented track drainage would be constructed as required within the project area, where:</p> <ul style="list-style-type: none"> existing overland flooding issues are present and not adequately addressed by existing drainage infrastructure proposed changes to the track alignment mean that new track drainage infrastructure would be required. 	<p>The preferred project would include maintenance of existing track drainage to ensure that stormwater is efficiently conveyed within and across the corridor to the surrounding stormwater drainage system.</p>

Exhibited project works	Preferred project works
<p>Cross drainage</p> <p>Modification of cross drainage infrastructure (i.e. infrastructure that crosses the rail corridor into which track drainage drains) would be required at a number of locations. This would include upgrading crossings and construction of new crossings, and would involve (where required):</p> <ul style="list-style-type: none"> • extension of cross drainage infrastructure • augmentation to improve existing capacity constraints • full removal and replacement. <p>In addition to the drainage works proposed within the rail corridor, new drainage infrastructure would be provided outside the rail corridor in the following locations:</p> <ul style="list-style-type: none"> • at Marrickville Station – drainage infrastructure would be provided to connect to the existing stormwater network in Schwebel Street • at the junction of Livingstone Road and Hollands Avenue – drainage infrastructure would be provided to convey existing overland flows into the rail corridor drainage network • east of Canterbury Station – drainage infrastructure would be provided to convey stormwater from the rail corridor to the Cooks River • west of Canterbury Station – a new drainage outlet would be provided to the Cooks River. <p>Detention basins</p> <p>Four drainage detention basins are proposed to hold water from minor flood events.</p>	<p>The preferred project would include maintenance of existing track drainage to ensure that stormwater is efficiently conveyed within and across the corridor to the surrounding stormwater drainage system.</p>
Active transport corridor	
<p>As part of the exhibited project, Transport for NSW would work with the Department of Planning and Environment to support the development of an active transport corridor along its alignment, including walking and cycling infrastructure. Transport for NSW would deliver sections of the active transport corridor around stations.</p> <p>The active transport corridor will provide a major east-west spine and include:</p> <ul style="list-style-type: none"> • pedestrian footpaths • separated cycleways • shared footpaths • designated pedestrian and cyclist road crossings. 	<p>As the existing rail corridor is being utilised and not widened or changed as part of the preferred project, there would no longer be the space created to provide for an active transport corridor within the rail corridor.</p> <p>Transport for NSW would work with the Department of Planning and Environment and local Councils to determine how this can be delivered outside of the rail corridor and ensure that it aligns with the urban renewal corridor.</p> <p>Transport for NSW is developing a Walking and Cycling Strategy to encourage active transport to the stations. Initiatives identified in the Strategy would be considered during development of the detailed design and Interchange Access Plans for the stations.</p>
Future rail corridor development	
<p>The exhibited project includes enabling works to support future rail corridor development adjacent to Beamish Street opposite Campsie Station. These works involve construction of a new platform and columns for a potential future development to replace the existing retail/commercial building located on land owned by the NSW Government (RailCorp). The works would also include the construction of a new lane (roadway) over the rail corridor for use as a kiss and ride facility.</p> <p>The exhibited project also includes the provision of retail space at a number of stations.</p>	<p>Due to the revised construction methodology, no enabling works for future rail corridor development or construction of retail space is proposed as part of the preferred project.</p> <p>Sydney Metro station renewals and the start of metro services in 2024 could be the catalyst for wider urban renewal in consultation with the community, local councils and NSW Government departments.</p>

9.4.2 Outside rail corridor elements

Other project elements proposed as part of the exhibited project and those proposed as part of the preferred project, which would be undertaken outside the rail corridor are summarised in Table 9.13.

Table 9.13 Project elements undertaken outside the rail corridor

Exhibited project works	Preferred project works
Bridge upgrade works	
<p>Works are required to 19 road overbridges and 11 underbridges located within the project area. The type of works required would vary, and would be confirmed during detailed design.</p> <p>Upgrades would be required to a number of the bridge structures to meet current design standards, Sydney Metro operation specifications, and (in some locations) to suit the amended track alignment. In addition, all overbridges would be provided with parapet throw screens and vehicle collision barriers to provide an improved level of safety and security for customers.</p> <p>The bridge upgrade works would generally consist of one or more of the following:</p> <ul style="list-style-type: none"> • Bridge replacement – full bridge replacement would be required due to track realignment, insufficient widths, structural issues, to improve precinct gradients, or to meet metro standards. • Strengthening – strengthening of existing bridge piers, abutments, bridge decks and primary steel elements. • Protection – providing enhanced protection to existing bridge piers, over-height vehicle crash protection beams adjacent underbridge structures, vehicle collision protection to overbridge parapets, and installation of parapet throw screens. • Widening – widening would generally be required where the track alignment has been adjusted. A combination of existing embankment strengthening and new retaining walls may also be required. • General maintenance – to ensure long-term durability of the bridge structures, maintenance works would include preparation and re-painting of steel elements and, where appropriate, raking out and re-pointing of masonry, and waterproofing works to bridge decks. • Retaining wall works – replacement of existing retaining walls or installation of new walls. 	<p>Through the refinement of the scope of works for the preferred project, upgrade works to bridge structures would be undertaken at 16 road overbridges and six underbridges located within the project area. The type of works required would vary, and would be confirmed during detailed design.</p> <p>Generally, the bridge upgrade works would consist of providing enhanced protection to existing bridge piers, installation of anti-throw screens, vertical protection screens, vehicle collision barriers and general maintenance work.</p>

Exhibited project works	Preferred project works
Traction power supply	
To provide a reliable source of power to the new traction substations, a 33 kilovolt high voltage electricity supply cable is proposed between the Campsie traction substation and the existing Ausgrid Canterbury electrical substation, which is located about one kilometre south of Canterbury Station in Earlwood.	As per the exhibited project.
<p>The route for the power supply cable would be about 3.5 kilometres long, and would be located within the following road reserves:</p> <ul style="list-style-type: none"> • Beamish Street • South Parade • Phillips Avenue • Canterbury Road • Fore Street • Burlington Avenue • Karool Avenue/ River Street • Spark Street • Mooney Avenue. <p>The alignment would also traverse Hughes Park to the south of the Canterbury substation.</p>	<p>The route for the power supply cable would be about 3.5 kilometres long, and would be located within the following road reserves:</p> <ul style="list-style-type: none"> • Beamish Street • South Parade • Phillips Avenue • Canterbury Road • Fore Street • Burlington Avenue • Karool Avenue/ River Street • Spark Street • Mooney Avenue • Westfield Street. <p>The alignment would no longer traverse Hughes Park, as shown in Figure 9.11.</p>
Property requirements	
<i>Land acquisition</i>	
The exhibited project would require the full acquisition of three privately owned lots under one ownership (near Marrickville Station), and the acquisition of three portions of publicly owned land (near Marrickville and Punchbowl stations).	No land or properties would be permanently acquired as part of the preferred project.
<i>Cessation of commercial leases on NSW Government owned land</i>	
The exhibited project would require access to land which is currently subject to about 37 existing commercial leases at seven stations, on land owned by the NSW Government (RailCorp).	The project would require access to land which is currently subject to one existing commercial lease at Wiley Park Station, on land owned by the NSW Government (RailCorp).
<i>Temporary lease of land</i>	
Some areas of land would need to be temporarily leased or occupied for construction compounds and other work sites during construction of the exhibited project.	As per the exhibited project.



Figure 9.11 Alignment of power supply cable near Hughes Park

10. Preferred project - construction methodology

This section summarises the indicative construction methodology for the preferred project as compared to the exhibited project's construction methodology. A detailed description of the indicative construction methodology for the preferred project is provided in Appendix B, including information on the proposed approach to out of hours work; utilities management during construction; and the alternative transport arrangements that would be implemented during temporary closures of the stations and track required during construction.

10.1 Construction of the preferred project

The preferred project would minimise construction impacts. However, some aspects of the construction methodology would be as per the exhibited project, including:

- the key construction stages (enabling works, main construction works, finishing works and testing and commissioning) and the approach to avoiding or minimising impacts during construction (described in Section 9.1 (Overview) of the Environmental Impact Statement) and in Appendix B of this report)
- the construction methodology for the substations, services buildings and the traction power supply cable (described in Section 9.5 (Associated infrastructure) of the Environmental Impact Statement and in Appendix B of this report)
- the construction method associated with the finishing, testing and commissioning works (described in Section 9.6 (Finishing, testing and commissioning) of the Environmental Impact Statement and in Appendix B of this report).

The following sections highlight the differences between aspects of the construction methodology for the preferred project compared to the exhibited project.

10.2 Construction methodology for key construction stages

Table 10.1 summarises the construction methodology for each key construction stage of the preferred project compared to the exhibited project, with the exception of the final finishing, testing and commissioning stage. As discussed in Section 10.1 this final stage would not change from that described for the exhibited project.

Table 10.1 Key construction stages

Exhibited project works	Preferred project works
Enabling works	
<i>Site establishment</i>	
Site establishment works are expected to include: <ul style="list-style-type: none">• carrying out heritage investigations, protection and archival recordings in accordance with the construction environmental management plan• install site environment management and traffic controls in accordance with the construction environmental management plan• establishing construction compounds and work sites	Site establishment works for the preferred project would be the same as the exhibited project with the exception of the minor piling works, which would not be undertaken for the preferred project.

Exhibited project works	Preferred project works
<ul style="list-style-type: none"> supplying power, water and other utilities to construction compounds and other areas within the construction work area (whether temporary or permanent supplies) relocating, adjusting and protecting utilities and services affected by the project removing buildings and other structures where required potential remediation works (subject to identification of contaminated materials) adjusting or removing Sydney Trains rail infrastructure (signalling, communication routes) within the rail corridor vegetation clearance (as required) within the rail corridor undertaking minor piling works on platforms to assist with later concourse works. 	
<i>Building removal works</i>	
<p>The exhibited project would require the removal of a number of buildings and structures at each station. In addition to station buildings and structures, four other buildings would need to be removed, including:</p> <ul style="list-style-type: none"> three commercial buildings (two located at Marrickville Station and two at Campsie Station) one house (located at Marrickville Station). <p>A number of Sydney Trains buildings (e.g. section huts) located along the corridor would also need to be removed. The need for removal of these buildings would be confirmed during detailed design.</p>	<p>A number of Sydney Trains buildings (e.g. section huts) located along the corridor would need to be removed for the preferred project. This would be confirmed during detailed design. There is no need to remove the four other buildings for the preferred project.</p>
<i>Transport network adjustments</i>	
<p>Enabling works for transport infrastructure, including roads, would reduce the duration of construction works and associated disruptions to traffic and surrounding land uses. The indicative transport network adjustments proposed to be undertaken as part of enabling works would generally include:</p> <ul style="list-style-type: none"> road modifications to facilitate the movement of construction vehicles, such as redesigned intersections and road layouts, kerb modifications, turn restrictions, changes to line marking, signage, and restrictions on parking at intersections optimisation of traffic signals to facilitate network management, including phase adjustments, bus priority measures, and geometry upgrades provision of minor access roads to construction compounds and work sites from the road network and access gates into the rail corridor (where required) temporary relocation of pedestrian and cycle paths and the provision of property access temporary relocation of some existing bus stops and associated facilities, bus service rerouting, and installation of infrastructure to support temporary bus services (such as new bus stops and shelters) relocation of kerbside facilities, including taxi ranks, mail zones, loading zones, and associated modifications to advisory signage 	<p>As per the exhibited project.</p>

Exhibited project works	Preferred project works
<ul style="list-style-type: none"> relocation of pedestrian access points into stations and improvements to walkways and lighting, wayfinding, and information signage changes to parking, including on and off street parking and access changes installation of monitoring devices such as CCTV, to aid real-time traffic monitoring and improved incident response. <p>These adjustments would be confirmed during detailed design and construction planning.</p>	
Station works	
Outline methodology	
<p>Station works would be staged to suit operational requirements and the availability of possession periods. To minimise the construction timeframes at each station, stations would be constructed using modular design elements where possible. The modular approach involves the installation of structures (e.g. station buildings, canopies) comprising modularised components. All structures would be constructed using base pieces which can be assembled differently on each site to suit station requirements.</p> <p>The modular approach would be used to enable each station to be assembled quickly on site and minimise the number of possessions required to complete the works. This would reduce the overall construction period at each station. The use of a modular approach also allows for some works to be undertaken during non-possession periods.</p> <p>The following general work activities would be undertaken for a typical station upgrade:</p> <ul style="list-style-type: none"> Site establishment and enabling works: <ul style="list-style-type: none"> establishment of site compound (erect fencing, tree protection zones, site offices, amenities and plant/material storage areas, etc) relocation of services/seats/bins on platforms. Lift and stairs construction: <ul style="list-style-type: none"> erection of hoardings removal/demolition of existing structures (existing canopies, shelters and stairs etc) construction of footings/foundations for new stairs and lift shafts (on platforms) construction of footings/foundations for new stairs and lift shafts (outside platforms areas) fit out of stairs, canopies and anti-throw screens installation of lifts installation of fixtures, lighting and CCTV cameras for areas affected by construction works. 	<p>Station works would be staged to suit operational requirements and the availability of possession periods.</p> <p>The following general work activities would be undertaken for a typical station upgrade as part of the preferred project:</p> <ul style="list-style-type: none"> Site establishment and enabling works, which would be as per the exhibited project. Lift and stairs construction, which would be as per the exhibited project with the exception of the fit out of canopies, which would not be undertaken. Station works: <ul style="list-style-type: none"> reuse and refurbishment of station and services buildings (including mechanical/electrical/building fit-out) platform works and re-levelling station area works provision of new kerbside and bike parking facilities landscaping, painting and paving works. Finalisation, which would be as per the exhibited project. Testing and commissioning, which would be as per the exhibited project.

Exhibited project works	Preferred project works
<ul style="list-style-type: none"> Platform/building and concourse works: <ul style="list-style-type: none"> construction of station and services buildings (including mechanical/electrical/building fit-out) platform rebuilding, straightening, extending and resurfacing station area works upgrade of existing roads and footpaths reconfiguration of bus, taxi and kiss and ride areas landscaping, painting and paving works. Finalisation: <ul style="list-style-type: none"> landscaping and public domain works, including installation of new bus shelters, seats, bins, wayfinding signage to the station. Testing and commissioning: <ul style="list-style-type: none"> various activities to test and commission power supplies, lifts, lighting, modifications to station services, ticketing systems and communication and security systems. 	
<i>Tree removal and management</i>	
<p>The exhibited project would involve trimming or removing trees in the vicinity of stations to facilitate the upgrades of stations and station areas.</p> <p>A summary of the number of trees that would be potentially impacted at each station is provided as follows:</p> <ul style="list-style-type: none"> Marrickville – 88 Dulwich Hill – 19 Hurlstone Park – 43 Canterbury – 56 Campsie – 48 Belmore – 130 Lakemba – 88 Wiley Park – 108 Punchbowl – 137 Bankstown – 176. <p>Impacts to trees would be minimised wherever practicable. Where removal of trees is unavoidable, trees would be replaced in accordance with the tree management strategy for the exhibited project, which would be prepared in consultation with relevant stakeholders (including local councils).</p>	<p>The preferred project would still involve the trimming or removing trees in the vicinity of stations. However, the potential impacts to vegetation have been reduced.</p> <p>A summary of the number of trees that would be potentially impacted at each station is provided as follows:</p> <ul style="list-style-type: none"> Marrickville – 65 Dulwich Hill – 13 Hurlstone Park – 17 Canterbury – 45 Campsie – 34 Belmore – 72 Lakemba – 67 Wiley Park – 63 Punchbowl – 47 Bankstown – 80. <p>A tree management strategy would be prepared for the preferred project, consistent with that described for the exhibited project.</p>

Exhibited project works	Preferred project works
Corridor works	
<i>Track works</i>	
<p>The exhibited project would involve upgrading/realigning the existing track in some locations. This would generally occur near stations due to the straightening of platforms and for other reasons. There may, however, also be a requirement to upgrade or replace track elsewhere between stations following further investigations to be undertaken as part of detailed design. The scope of civil works would include:</p> <ul style="list-style-type: none"> • earthworks and track formation • retaining walls • stormwater drainage • new overhead wiring structures. <p>Rail work would involve:</p> <ul style="list-style-type: none"> • removing existing fastenings, rail and sleepers • placement of ballast (consisting of either recycled or new ballast) and sleepers on the formation • tamping and profiling the ballast around the sleepers and to a smooth alignment • installing, fixing, and welding the rails to the sleepers • installing cable and equipment, including signalling, communications and electrical systems • installing overhead wiring for rolling stock • installing fire and life safety systems (including walkways connecting to emergency egress and fire hydrant systems) • installing track drainage. 	<p>The preferred project would involve changes to the existing track at Campsie (new crossover) and Bankstown (reconfigured rail junction and turnback and new turnback).</p> <p>There may also be a requirement to upgrade or replace track or supporting infrastructure elsewhere along the rail corridor following further investigations to be undertaken as part of detailed design.</p> <p>The civil works methodology has been revised for the preferred project.</p> <p>Rail work would involve:</p> <ul style="list-style-type: none"> • removing existing fastenings, rail and sleepers • placement of ballast (consisting of either recycled or new ballast) and sleepers on the formation • tamping and profiling the ballast around the sleepers and to a smooth alignment • installing, fixing, and welding the rails to the sleepers • installing cable and equipment, including signalling, communications and electrical systems • installing overhead wiring for rolling stock • maintenance of existing track drainage.
<i>Bridge works</i>	
<p>It is anticipated that most bridges would be able to remain partially open to traffic during the installation of new traffic barriers and anti-throw screens, replacement of existing parapets, and waterproofing of bridge decks. In some locations, depending on the works, full closures would be required, particularly where a replacement bridge is required.</p> <p>Construction would typically involve:</p> <ul style="list-style-type: none"> • relocation of utilities to a new alignment (some utilities would be terminated at the bridge abutments) • close bridge or lanes depending on requirements • existing parapets being removed down to the existing bridge slab • existing asphalt removed from bridge deck to allow cleaning and waterproofing of the deck • precast parapet sections being positioned with the use of cranes and fixed to the bridge deck, throw screens would be prefabricated prior to installation • asphalt being applied to roadway surface along with any line marking • installation of any barriers, drainage, screens on to bridge • bridge tie-ins being adjusted to match the new bridge roadway surface levels • the bridge or lanes being reopened to traffic • footpaths being periodically closed to allow for the reinstatement of services within the bridge. 	<p>It is anticipated that most bridges would be able to remain partially open to traffic during the installation of new traffic barriers and anti-throw screens.</p> <p>Construction would typically involve:</p> <ul style="list-style-type: none"> • close bridge lanes and/or footpaths depending on requirements • remove existing parapets down to the existing bridge slab • position precast parapet sections with the use of cranes and fix to the bridge deck, throw screens would be prefabricated prior to installation • install bridge protection measures • carry out modifications and maintenance where required • reopen bridge lanes and/or footpaths to traffic.

Exhibited project works	Preferred project works
<p>Embankments, cuttings and retaining walls</p>	
<p>The exhibited project would require upgrades to existing embankments and cuttings to provide for:</p> <ul style="list-style-type: none"> • realignment of existing tracks • extension of station platforms • installation of civil infrastructure, station services buildings and substations • general maintenance or upgrade where required to ensure each structure is sound. <p>Retaining walls may be required in the vicinity of stations to suit the new metro tracks or to support new infrastructure.</p> <p>Construction of the project would require rock anchors, which would be installed under or near to, adjacent properties.</p>	<p>These construction works would generally not be required as part of the preferred project, although some minor earthworks may still be required to provide a level site for the station services buildings and substations.</p>
<p>Removal of vegetation within the rail corridor</p>	
<p>The exhibited project assumed that all vegetation within the rail corridor would need to be removed to construct the project, with the exception of identified areas of the threatened species Downy Wattle, which are located within the rail corridor between Punchbowl and Bankstown stations.</p> <p>Based on this assumption, about 17.3 hectares of vegetation (not including vegetation classed as exotic grassland) would need to be removed, including:</p> <ul style="list-style-type: none"> • one hectare of native vegetation • 7.3 hectares of planted native vegetation • nine hectares of exotic scrub and forest. 	<p>The preferred project assumed that all vegetation within the rail corridor would need to be removed to construct the project, with the exception of:</p> <ul style="list-style-type: none"> • native vegetation that would require biodiversity offsets if removed (specifically areas of 'Turpentine - Grey Ironbark open forest on shale', 'Degraded Turpentine - Grey Ironbark open forest on shale' and 'Broad-leaved Ironbark - Grey Box') • identified areas of the threatened species Downy Wattle located within the rail corridor between Punchbowl and Bankstown stations. <p>Based on this assumption, about 16.3 hectares of vegetation (not including vegetation classed as exotic grassland) may need to be removed, including:</p> <ul style="list-style-type: none"> • up to 7.3 hectares of planted native vegetation • up to nine hectares of exotic scrub and forest. <p>It is expected that large areas of the planted native vegetation and exotic scrub and forest would not require removal for the corridor works, however this is subject to the detailed design of the proposed works, including fencing and the communications services route.</p> <p>The need for and replacement of vegetation removed within the rail corridor would be undertaken in accordance with the tree management strategy, consistent with that described for the exhibited project.</p>

10.3 Construction program and timing

Table 10.2 highlights the differences between the construction program and timing for the preferred project compared to the exhibited project.

Table 10.2 Construction program and timing

Exhibited project works	Preferred project works
Program	
Construction of the exhibited project would commence once all necessary approvals are obtained (anticipated to be in 2018). Upgraded stations would be progressively delivered from 2019 until 2024, with the main station upgrade works estimated to take about two years for each station, however, the works would be spread across the entire project construction period (depending on the extent of works required). Works to upgrade other infrastructure, such as bridges, embankments and drainage, would also occur during this period.	Construction of the preferred project would commence once all necessary approvals are obtained (anticipated to be in 2018/2019). Upgraded stations would be progressively delivered from 2019 until 2022, with the main station upgrade works estimated to take about one year for each station, however, the works would be spread across the entire project construction period (depending on the extent of works required). Works to upgrade other infrastructure would also occur during this period.
Rail possession periods	
<p>Some construction works would need to be undertaken during rail possession periods when trains are not operating.</p> <p>Works that would need to be undertaken during possession periods include:</p> <ul style="list-style-type: none"> major station works and activities on stations which cannot be undertaken during operation of the network track works bridge works activities requiring the temporary possession of roads or to accommodate road network requirements (including bridge works) to minimise safety impacts and inconvenience to commuters. <p>A description of the possession types (for both Sydney Trains and freight lines) is provided as follows:</p> <ul style="list-style-type: none"> Standard weekend possessions – Sydney Trains currently schedules routine maintenance possessions on four weekends per year. School holiday possessions – This would involve a six week possession of the T3 Bankstown Line during the Christmas school holiday period each year between 2019 and 2024, and two-week school holiday possessions of the T3 Bankstown Line in July each year. Freight track possessions - ARTC currently has four weekend possessions a year available for maintenance of the corridor which coincide with the standard Sydney Trains possessions. Any works near ARTC tracks would be undertaken during these possessions including bridge replacement works at Meeks Road overbridge, Illawarra Road overbridge and Albermarle Street overbridge. Final possession – once the stations have been upgraded, there would be a final possession period of between three and six months in duration. 	<p>Some construction works would need to be undertaken during rail possession periods when trains are not operating.</p> <p>Works that may need to be undertaken during possession periods include:</p> <ul style="list-style-type: none"> station works and activities on stations which cannot be undertaken during operation of the network track and corridor works bridge works. <p>A description of the possession types (for both Sydney Trains and freight lines) is provided as follows:</p> <ul style="list-style-type: none"> Standard weekend possessions – Sydney Trains currently schedules routine maintenance possessions on four weekends per year. Additional weekend possessions - Up to an additional eight weekend possessions would be required each year to complete the preferred project works. School holiday possessions – This would involve up to a two week possession of the T3 Bankstown Line (either in full or part) during the Christmas school holiday periods each year. Freight track possessions - ARTC currently has four weekend possessions a year available for maintenance of the corridor. Any works near ARTC tracks would be undertaken during these possessions. Night-time weekday possessions – To be used occasionally to prepare the rail corridor ahead of weekend and school holiday possessions. Final possession – once the stations have been upgraded, there would be a final possession period of between three and six months in duration.

Exhibited project works	Preferred project works
Temporary station closures	
The temporary closure of individual stations, outside of possession periods, would be considered during detailed construction planning. Closures could potentially occur overnight when stations are not in use, or between possessions for a period of up to several weeks. Closures would generally be considered at stations with lower patronage, and where this would enable construction activities to be undertaken faster resulting in less overall impact on customers.	Individual stations may also be closed for up to two months to complete the station works. Up to three stations may be closed at any one time.
Working hours including out of hours work framework	
<p>During non-possession periods, the majority of works would be undertaken during recommended standard hours as defined by the <i>Interim Construction Noise Guideline</i> which are:</p> <ul style="list-style-type: none"> Monday to Friday: 7am to 6pm Saturday: 8am to 1pm Sundays and public holidays: no work. <p>Activities resulting in impulsive or tonal noise emissions would be limited to these hours, except as permitted by an environment protection licence. During possession periods, works may be undertaken 24 hours per day.</p> <p>During these periods, the use of highly noise intensive equipment, including ballast tamping and hydraulic breaking, would not be used during the night-time period (between 10pm and 7am), unless constraints exist.</p> <p>The out of hours work framework is described in section 9.7.4 of the Environmental Impact Statement.</p>	The preferred project working hours and out of hours framework would be as per the exhibited project.

10.4 Construction compounds, work sites and access

Table 10.3 highlights the differences between the construction compounds, work sites and access proposed for the preferred project compared to the exhibited project.

Table 10.3 Construction compounds, work sites and access

Exhibited project works	Preferred project works
Construction compounds	
<p>Construction compounds would be required at each station to support construction activities and associated works.</p> <p>Compounds would generally be located on land owned by RailCorp, mainly located within the rail corridor. Some compounds would need to be located on land outside of the rail corridor on other public land (i.e. owned by a government agency or council).</p> <p>A total of 21 construction compounds would be required for over 18 months (and potentially for the entire construction period), while three construction compounds would be required for a period of up to about 18 months.</p>	<p>The location and use of construction compounds for the preferred project would primarily be as per the exhibited project. However, compound C2 would no longer be required on Station Street in Marrickville as the existing facilities on Station Street would be retained.</p> <p>Further, the duration of use for the majority of the compounds has been changed from long-term to short-term use (i.e. now utilised for up to 18 months).</p>

Exhibited project works	Preferred project works
Work sites	
<p>In addition to the compounds and general construction activities within the rail corridor, there are also a number of other sites where construction activities would be undertaken, or where support would be provided for other construction areas. These sites would generally be located outside the rail corridor.</p> <p>A total of 15 work sites would be required for the exhibited project.</p>	<p>The location and use of work sites for the preferred project would be as per the exhibited project with the exception that the following two work sites would no longer be required as drainage works are not being undertaken:</p> <ul style="list-style-type: none"> • McNeilly Park – existing use is open space • Livingstone Road bridge – existing use is a roadway.
Environmental management at construction compounds and work sites and approach for selection of additional sites	
Compounds and work sites would be managed in accordance with the approach to environmental management for construction as a whole.	As per the exhibited project.
Approach for selecting additional construction compounds and work sites	
Additional or alternative location compounds and/or work sites would be determined based on the criteria described in Section 9.8.4 (Approach for selecting additional construction compounds and work sites) of the Environmental Impact Statement.	As per the exhibited project.
Access to construction compounds	
Construction areas would be generally accessed via existing corridor gates along the rail corridor. In some locations new gates would also be installed.	As per the exhibited project.
Worker parking	
Some parking would be provided for construction workers within compounds and/or work sites where practicable. However, these spaces would generally be no more than 10 per compound or work site.	As per the exhibited project.
Temporary site hoarding and fencing	
<p>Erection of site hoarding and fencing would be required to provide temporary enclosure of work sites and work areas to ensure the safety of the public. Hoardings/fencing would be required in and around areas of heavy pedestrian usage, potentially including the temporary closure and/or diversion of pedestrian thoroughfares as well as management of pedestrians around work sites and past work site access points. Hoardings/fencing may also be erected to protect buildings or structures and to provide protection from dust and debris generated during construction.</p> <p>The type of hoarding or fencing used would be further developed during detailed design.</p>	As per the exhibited project.

Exhibited project works	Preferred project works
Preliminary haulage routes	
<p>Preliminary identification of haulage routes has been undertaken with consideration to the sensitive nature of surrounding residential areas. Preliminary haulage routes have been identified for each construction compound and other site access points likely to be required.</p> <p>These preliminary haulage routes would be reviewed during detailed design and confirmed following appointment of the construction contractor.</p>	<p>The preliminary haulage routes would be as per the exhibited project with the exception of the following routes based on further refinement following consultation with council and Roads and Maritime Services:</p> <ul style="list-style-type: none"> the section of Marrickville Road east of Victoria Road (north-east of Marrickville Station) would not be used as a haulage route Jersey Street would not be used as a haulage route the section of Warren Road between Illawarra Road and Carrington Road (south of Marrickville Station) would not be used as a haulage route the haulage route along Illawarra Road would extend south of Warren Road to Homer Street and Bexley Road, south of Marrickville Station Wangee Road north of Lakemba Station would not be used as a haulage route the haulage route along Charles Street would extend under the rail corridor, and to the Broughton Street route at Canterbury Station. <p>The revised preliminary haulage routes are shown in Figure 2.3 of this report.</p>
Construction traffic volumes	
<p>Construction traffic would include heavy and light vehicles associated with spoil and waste removal, material deliveries, and the arrival and departure of construction workers.</p> <p>See Section 9.8.9 (Construction traffic volumes) of the Environmental Impact Statement for estimated traffic volumes.</p>	<p>The traffic volume estimates for the preferred project would be up to those estimated for the exhibited project.</p>

10.5 Workforce and construction resources

Table 10.4 highlights the differences between the workforce and construction resources proposed for the preferred project compared to the exhibited project.

Table 10.4 Workforce and construction resources

Exhibited project works	Preferred project works
Workforce	
<p>During non-possession periods, it is estimated that a workforce of approximately 470 people would be required on average, with up to 700 people required during peak construction activity. During possession periods, it is estimated that a workforce of approximately 715 people would be required on average, with up to 1,540 people required during peak construction activity.</p>	<p>The workforce estimates for the preferred project would be equal or less than those estimated for the exhibited project.</p>

Exhibited project works	Preferred project works
Materials and water usage	
<p>A variety of materials would be required to construct the exhibited project. The major items and indicative quantities were provided in Section 9.9.2 (Materials and water usage) of the Environmental Impact Statement.</p> <p>Reconditioning of ballast would be undertaken where required, particularly areas subject to track alignment changes. It is expected that roughly 60 per cent of ballast is likely to be considered suitable for reuse in the rail corridor.</p> <p>It is estimated that about 85,000 cubic metres of fill material would be required to construct the project. It is expected that all, or the vast majority of, fill material could consist of spoil excavated from the project area.</p>	<p>A variety of materials would be required to construct the preferred project. The major items and indicative quantities are provided in Section 2.9.2 of the preferred project description in Appendix B of this report. Indicative quantities for the preferred project are reduced for all materials at all locations with the following exceptions:</p> <ul style="list-style-type: none"> • Ballast at Marrickville Station (still 0 tonnes) • All materials at Bankstown Station • Steel, water and ballast in the corridor between Bankstown and Punchbowl (still 80; 1,200,000 and 6,000 tonnes, respectively). <p>It is estimated that about 45,000 cubic metres of fill material would be required to construct the project. It is expected that all, or the vast majority of, fill material could consist of spoil excavated from the project area.</p>
Construction plant and equipment	
<p>An indicative list of the plant and equipment expected to be used during construction was provided in Section 9.9.4 (Site servicing requirements) of the Environmental Impact Statement. The actual plant and equipment used at each work site would be further refined during the detailed design stage and upon appointment of the construction contractor.</p>	<p>The indicative list of plant and equipment expected to be used for the preferred project would be generally as per the exhibited project. The actual plant and equipment used at each work site would be further refined during the detailed design stage and upon appointment of the construction contractor.</p>
Utilities	
<p>Utilities such as water, power, sewer and telecommunications would need to be supplied to work areas. Generally, these utilities are located close to the sites (such as the adjacent footpath) and the supply is considered 'business as usual' for utility companies.</p>	<p>As per the exhibited project.</p>

10.6 Utilities management

There are a number of active and disused utilities located within and/or crossing the project area (either underground, aboveground or via existing road overbridges) with the potential to be affected by construction of the preferred project. This is consistent with the exhibited project, although there is less need for utilities management as part of the preferred project.

Utilities management for the preferred project would be as per the Utilities Management Framework provided as Appendix I to the Environmental Impact Statement. Work to progress this framework since the exhibition of the Environmental Impact Statement is described in Section 2.4.3 of this report. The updated Utilities Management Framework is provided in Appendix H of this report.

10.7 Alternative transport arrangements

The Temporary Transport Strategy (provided as Appendix G to the Environmental Impact Statement) describes the process for planning the integrated, multi-modal transport network changes required during the exhibited project possessions. This strategy is relevant to the preferred project, however, because possession periods would be reduced, the number and scale of the temporary transport plans required for each possession period is also likely to be reduced.

11. Environmental risk rating

This section summarises the environmental risk rating and the potential impacts of the preferred project to identify if risks are either the same, or have been reduced, when compared to the exhibited project.

11.1 Introduction

As described in Section 8.1 an environmental risk analysis was undertaken as part of the State Significant Infrastructure Application Report, for the project that was defined in that report. That environmental risk analysis was undertaken in accordance with the principles of the Australian and New Zealand standard *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines*. It involved ranking the risks by identifying the consequence of an impact and the likelihood of that impact occurring.

To inform the risk analysis, an environmental risk workshop was held with key members of the project team. The aim of the workshop was to identify the potential impacts of the project defined in the State Significant Infrastructure Application Report, and set appropriate consequence and likelihood levels.

The purpose of the risk analysis at that early stage of the project was to categorise issues as 'key' or 'other' and the following rules were used to guide the analysis:

- risk ratings were considered at the broader issue level only (for example, construction noise and vibration)
- industry standard practice was considered in determining risk ratings, however project-specific mitigation (which would depend on the outcomes of the Environmental Impact Statement) was not applied.

The resultant risk analysis provided in the State Significant Infrastructure Application Report was used by regulatory stakeholders when providing input to the Secretary's environmental assessment requirements, which informed the scope for the Environmental Impact Statement for the project.

To demonstrate that the environmental risk rating and the potential impacts of the preferred project are either the same, or have been reduced, when compared to the exhibited project for which the Secretary's environmental assessment requirements were provided, an environmental risk analysis has been undertaken for the preferred project. Using the same methodology used for the exhibited project, risk ratings for the preferred project have been determined and then compared with those of the exhibited project in order to identify if there are changes to the risk rating outcomes.

The purpose of this revised environmental risk analysis is therefore to:

- re-visit the potential environmental and community risks and issues that were considered in the State Significant Infrastructure Application Report and used to inform the preparation of the Secretary's environmental assessment requirements
- identify potential environmental and community risks and issues associated with the preferred project
- compare the identified risks and issues of the preferred project to those identified for the exhibited project, to determine whether risk ratings have changed.

The first step in the risk analysis involved identifying the potential consequence and likelihood of impacts. The definitions of consequence levels and likelihood used for this assessment are the same as those used in the Environmental Impact Statement and are reproduced in Table 11.1 and Table 11.2.

The resulting risk matrix is also the same as that used in the Environmental Impact Statement and is reproduced in Table 11.3.

Table 11.1 Risk analysis consequence definitions

Consequence level	Definition
Catastrophic	<ul style="list-style-type: none"> long-term (greater than 12 months) and irreversible large-scale environmental, social or economic impacts extended substantial disruptions and impacts to stakeholder(s) or customers
Severe	<ul style="list-style-type: none"> long-term (6 to 12 months) and potentially irreversible impacts extensive remediation required severe disruptions or long-term impacts to stakeholder(s) or customers
Major	<ul style="list-style-type: none"> medium-term (between 3 and 6 months) and potentially irreversible impacts considerable remediation required major impacts or disruptions to stakeholder(s) or customers
Moderate	<ul style="list-style-type: none"> medium-term (between 1 and 3 months), reversible and/or well-contained impacts minor remedial actions required moderate impacts or disruptions to stakeholder(s) or customers
Minor	<ul style="list-style-type: none"> short-term (less than 1 month), reversible or minor impacts that are within environmental regulatory limits and within site boundaries minor or short-term impacts to stakeholder(s) or customers
Insignificant	<ul style="list-style-type: none"> no appreciable or noticeable changes to the environment negligible impact to environment, stakeholder(s) or customers

Table 11.2 Risk analysis likelihood definitions

Likelihood	Definition	Probability
Almost certain	Expected to occur frequently during time of activity or project (10 or more times per year)	>90%
Likely	Expected to occur occasionally during time of activity or project (1 to 10 times per year)	75% to 90%
Possible	More likely to occur than not occur during time of activity or project (once per year)	50% to 75%
Unlikely	More likely not to occur than occur during time of activity or project (once every 1 to 10 years)	25% to 50%
Rare	Not expected to occur during the time of activity or project (once every 10 to 100 years)	10% to 25%
Almost unprecedented	Not expected to ever occur during time of activity or project (less than once every 100 years)	<10%

Table 11.3 Risk matrix

Likelihood	Consequence					
	Catastrophic	Severe	Major	Moderate	Minor	Insignificant
Almost certain	Very high	Very high	Very high	High	High	Medium
Likely	Very high	Very high	High	High	Medium	Medium
Possible	Very high	High	High	Medium	Medium	Low
Unlikely	High	High	Medium	Medium	Low	Low
Rare	High	Medium	Medium	Low	Low	Low
Almost unprecedented	Medium	Medium	Low	Low	Low	Low

11.2 Environmental risk rating

Using the framework described above, the environmental risk analysis for the preferred project was undertaken with the resultant risk ratings presented in Table 11.4. Consistent with the approach used in the State Significant Infrastructure Application Report the environmental risk analysis for the preferred project was based on consideration of unmitigated impacts.

Table 11.4 also provides a discussion of how the risk ratings were derived for the preferred project, including the reasoning where changes to the risk rating of the preferred project are identified (when compared to those for the exhibited project). For consistency, the discussion regarding the preferred project risk rankings provided in Table 11.4 is based on the rationale used in the discussion/reasoning provided in the environmental risk analysis within the State Significant Infrastructure Application Report.

Table 11.4 Revised environmental risk analysis

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Operational traffic, transport and access</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Changes (loss) to commuter parking spaces or loading zones.</p> <p>Altered (poorer) pedestrian and cyclist arrangements.</p> <p>Deterioration of bus, taxi, and kiss and ride facilities at or around stations.</p> <p>Changes to interchange arrangements at Bankstown for customers moving between Sydney Trains and metro services.</p>	<p>In the same manner as the exhibited project, the preferred project would improve the transport system by providing a stand-alone railway network with the capacity to operate 30 trains an hour through the CBD in each direction. Both the exhibited project and the preferred project would result in an increase to train frequency in the AM and PM peak, with trains running at least every four minutes between Sydenham and Bankstown stations. The preferred project and the exhibited project would both enable trains to run every 10 minutes outside of peak times, compared with the current 15-minute service frequency. The preferred project would also integrate with the existing transport network in the same way as the exhibited project, helping to relieve congestion on the existing rail network.</p> <p>The preferred project's primary goal remains the same as that of the exhibited project, being to convert the existing rail line to ensure conformity with Sydney Metro operational requirements, while limiting potential operational impacts on traffic, transport, and access within the wider area.</p> <p>Consistent with the exhibited project, the preferred project would provide customers with the benefit of enhanced access within the stations via the provision of new lifts and level access.</p> <p>Potential impacts from the preferred project are likely to be similar to the exhibited project, consisting of alterations to parking arrangements, however there would be no net loss of parking due to the preferred project.</p> <p>As with the exhibited project, potential operational traffic impacts of the preferred project would be offset by the significant traffic transport and access benefits including improved public transport system capacity, efficiency and accessibility, kiss and ride zones, improved interchanges and bicycle parking.</p> <p>Overall, the risk rating for operational traffic, transport and access associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Low	Low

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Construction traffic, transport and access</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Deterioration of traffic performance on surrounding road network due to construction vehicles, road closures or lane closures.</p> <p>Loss of parking spaces or loading zones due to construction sites and temporary transport arrangements.</p> <p>Reduced pedestrian and cyclist access or flows due to construction.</p> <p>Adverse impacts on the reliability of public transport services (Sydney Trains and buses).</p> <p>Impacts on customer travel during station closures.</p> <p>Closure of the rail line between Sydenham and Bankstown for final conversion to metro, testing and commissioning.</p> <p>Deterioration of traffic performance in the surrounding area due to the rail replacement bus services during rail possession periods.</p> <p>Restricted access to private property.</p> <p>Traffic, pedestrian and cyclist safety.</p>	<p>Construction of the preferred project would, in a similar manner to the exhibited project, require the use of heavy vehicles to transport materials to and from the sites.</p> <p>Temporary closure of individual stations and the rail network and the use of replacement buses would temporarily alter and potentially adversely impact customers' travel patterns, including for a period of three to six months during the final commissioning phase. Replacement buses may also impact on the performance of the road network. However, with the preferred project, this impact would be reduced compared to the exhibited project as there are less possessions during peak periods.</p> <p>Both the preferred project and the exhibited project would require other alterations to the local transport network such as road modifications to facilitate the movement of construction vehicles, and temporary closures of bridge lanes to enable bridge upgrade works. However, in comparison to the exhibited project the need for these alterations for the construction of the preferred project would be less.</p> <p>As with the exhibited project, the preferred project may also require temporary alterations to the existing bus network including relocation of some bus stops and some changes to bus routes, changes to parking and access arrangements, and alterations to pedestrian and cyclist facilities. However, in comparison to the exhibited project the need for these alterations for the construction of the preferred project would be less.</p> <p>Given the construction program and activities for the preferred project, (which would result in a reduction in the likelihood of construction impacts), the risk rating for the preferred project has been reduced compared to the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Very High	High

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Operational noise and vibration</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Adverse airborne noise impacts on surrounding sensitive receivers as a result of higher train speeds and higher service frequency.</p> <p>Adverse airborne noise impacts from upgraded stations including new facilities and upgraded systems such as public address systems.</p> <p>Adverse airborne noise impact from fixed facilities such as the stabling facility and substations.</p>	<p>Diesel freight trains are currently the dominant existing rail noise source in the area between Sydenham and to the west of Campsie Station.</p> <p>Without mitigation, the preferred project has the same potential as the exhibited project to increase operational noise levels at surrounding sensitive receivers from increased train speeds and frequency, as well as the introduction of new infrastructure and upgrades to existing facilities. As with the exhibited project, the preferred project involves conversion of the existing T3 Bankstown Line to metro operations with the provision of associated infrastructure.</p> <p>Overall, the risk rating for operational noise and vibration associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	High	High

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Construction noise and vibration</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Localised adverse airborne noise impacts to sensitive receivers in surrounding areas from track works associated with the modification of existing rail infrastructure.</p> <p>Adverse airborne noise impacts from works to stations including demolition of existing structures, construction of new structures and buildings.</p> <p>Construction traffic results in a perceptible increase in traffic noise (greater than 2 dB).</p> <p>Vibration from surface works exceeding human comfort or damage levels.</p> <p>Perceived long term construction noise adversely impacting on human health.</p>	<p>Construction of the preferred project would involve the use of multiple construction sites across the length of the project, similar to the exhibited project. In the same manner as the exhibited project, construction works associated with the preferred project are likely to exceed relevant noise management levels, however the number of sensitive receivers associated with the preferred project at which exceedances are predicted would be less. This would result in a reduction in consequence of the impact of the preferred project.</p> <p>As with the exhibited project, the preferred project would require work outside of standard daytime construction hours as it includes works which cannot be safely undertaken while the rail network is operational. While works would generally be undertaken during the recommended standard hours defined by the <i>Interim Construction Noise Guideline</i>, there would remain a need to undertake some works during evenings, at night, and on weekends, particularly during rail possessions. These works have the potential to impact on surrounding noise sensitive receivers in the same manner as with the exhibited project.</p> <p>Road traffic noise from the preferred project associated with construction traffic movements and alternative transport arrangements during rail possessions has the potential to impact on sensitive receivers surrounding the stations during construction of the preferred project in the same manner as the exhibited project. However, the consequence of this impact would be reduced with the preferred project, due to the revised construction methodology and footprint.</p> <p>As with the exhibited project, vibration levels resulting from construction of the preferred project may also impact buildings proximate to the construction works. However the potential impact of the preferred project would be reduced.</p> <p>Given the construction program and activities for the preferred project, the consequence of construction noise and vibration impacts is reduced and therefore the risk rating for the preferred project has been reduced compared to the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Very high	High

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Non-Aboriginal heritage</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Direct impact to State listed heritage items during construction.</p> <p>Direct impacts to local and section 170 listed heritage items during construction.</p> <p>Impacts to the heritage values of conservation areas during construction.</p> <p>Damage to heritage items from construction vibration.</p> <p>Direct impacts on unknown heritage items (e.g. archaeological items) during construction.</p> <p>Indirect impacts on heritage items from construction such as change in visual outlook.</p> <p>Adverse indirect impacts on heritage item values during operation (e.g. change in visual outlook).</p> <p>Ground-borne vibration impacts on heritage listed items during operation.</p>	<p>Consistent with the exhibited project, work for the preferred project would occur directly within the curtilage of State significant heritage items.</p> <p>While, all heritage buildings would now be retained in the preferred project and works to heritage platforms would be limited to re-levelling, there is potential for direct or indirect impacts to heritage items and heritage values of conservation areas during construction if works are not properly mitigated. However, the consequence level associated with impacts of the preferred project has been downgraded to 'moderate' when compared to the exhibited project.</p> <p>The extent of civil works has been revised from that required for the exhibited project and therefore the likelihood of impacting unknown heritage items would be reduced.</p> <p>While the potential for some of the impacts to non-Aboriginal items to occur due to the preferred project has been reduced compared with the exhibited project, there is potential for direct and indirect impacts to heritage items, given the presence of these items within the preferred project area.</p> <p>Considering both the consequence and likelihood of impacts to non-Aboriginal heritage items and values would be reduced as a result of the preferred project, the overall risk rating of the preferred project has been downgraded to 'high' when compared to the original risk rating identified in the State Significant Infrastructure Application Report for the exhibited project.</p>	Very High	High

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Hydrology and flooding</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Impacts on flood-prone areas during operation (e.g. increase in flood risk outside the project area).</p> <p>Flooding impacts on project infrastructure during operation.</p> <p>Impacts on construction activities due to flooding.</p> <p>Impacts on flood-prone areas (e.g. increase in flood risk outside the project area) during construction.</p>	<p>As the preferred project would retain existing infrastructure within the rail corridor and would be operated within the existing hydrological environment, the provision of additional drainage infrastructure is not required for the preferred project. The preferred project would not change existing flooding or flood hazards in, or surrounding, the rail corridor.</p> <p>Hydrology and flooding impacts associated with the preferred project during construction would be similar to those associated with the exhibited project, albeit somewhat reduced. As a result, the consequence of potential impacts to hydrology and flooding resulting from the preferred project would be reduced.</p> <p>Considering the potential impacts resulting from the preferred project would be reduced, the overall risk rating for hydrology and flooding associated with the preferred project has been downgraded to 'medium' when compared to the original risk rating identified in the State Significant Infrastructure Application Report.</p>	High	Medium

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Property and land use</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Temporary acquisition or leasing of properties for construction.</p> <p>Temporary loss of public open space.</p> <p>Impacts on other infrastructure during construction including utilities and Sydney Trains property.</p> <p>Permanent property acquisition and changes to land use.</p> <p>Future restrictions to development within the corridor due to rail infrastructure.</p>	<p>The preferred project would primarily be located on land that forms part of the existing rail corridor and adjacent road reserves owned by the NSW Government or the relevant local council. Some changes have been made to the exhibited project so that the design of the preferred project has avoided the need to permanently acquire land and properties.</p> <p>Construction of the preferred project would, however, require the temporary leasing of land and the need to cease one commercial lease on NSW Government owned land. This has been reduced from the number involved in the exhibited project. In addition, as with the exhibited project, construction of the preferred project would require the temporary use of public open space and would also have the potential to impact on other infrastructure. However, given the preferred project does not involve property acquisition and the cessation of only one commercial lease, the consequence level associated with potential impacts of the preferred project has been downgraded to 'minor' when compared to the exhibited project.</p> <p>The preferred project would provide the proposed metro services identified for the exhibited project, which would meet the transport needs of the existing commuter catchment. The metro would also be a catalyst for future urban renewal that might occur in consultation with the community, local councils and NSW Government departments.</p> <p>Considering the potential impacts associated with property and land use would be reduced the overall risk rating for property and land use associated with the preferred project has been downgraded to 'medium' when compared with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	High	Medium

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Business impacts</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Disruption to servicing, deliveries and access during both construction and operation.</p> <p>Increased congestion and travel times result in both direct and indirect impacts during construction.</p> <p>Impacts on business during construction due to reduced visibility of businesses, changes to pedestrian and vehicle movements or reduction in amenity.</p> <p>Pre-construction trade not returning once the construction period is complete.</p>	<p>As with the exhibited project, a large number of businesses are located in the vicinity of the preferred project due to works at stations being in areas where businesses are focused.</p> <p>The preferred project may result in similar direct and indirect impacts to businesses as the exhibited project during construction if not properly mitigated. Businesses may receive a direct stimulus from construction workers requiring food and beverage supplies and other goods and services. While the preferred project does not include property acquisition, there would be a need to cease one commercial lease on NSW Government owned land where demolition of retail within a station precinct is required.</p> <p>Closure of the rail line and/or stations during rail possessions has the potential to impact on businesses dependant on passing trade generated by rail customers.</p> <p>Impacts to businesses during operation are expected to be minor given operations would be largely consistent with the existing operation of the T3 Bankstown Line. Positive impacts could include improved amenity and accessibility due to the provision of accessible facilities and an improved transport system which is more frequent and reliable.</p> <p>Given the preferred project does not involve property acquisition, the consequence level associated with potential impacts of the preferred project has been downgraded to 'moderate' when compared to the exhibited project. However, the overall risk rating of the preferred project remains the same as the original risk rating identified in the State Significant Infrastructure Application Report.</p>	High	High

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Aboriginal heritage</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Direct impacts on known Aboriginal heritage items.</p> <p>Direct impacts on unidentified Aboriginal heritage items.</p>	<p>The exhibited project was not anticipated to impact on previously recorded Aboriginal heritage sites. Given the revised construction methodology, the likelihood of impacts to Aboriginal heritage is reduced compared to the exhibited project.</p> <p>As with the exhibited project, Aboriginal heritage may be impacted e.g. on site PAD02 by the preferred project during the construction phase with possible ground disturbance and excavation, although impacts would be unlikely during operation.</p> <p>While the likelihood of impacts to Aboriginal heritage is reduced for the preferred project, the risk rating would remain the same as the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Landscape character and visual amenity</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Adverse visual impacts from the presence of construction activities and zones.</p> <p>Adverse impacts on landscape character during construction.</p> <p>Light-spill on sensitive receivers during night construction works.</p> <p>Adverse visual impacts associated with the introduction of new station structures such as concourses, lifts and ramps and associated infrastructure including noise attenuation measures.</p> <p>Light spill from upgraded stations affecting sensitive receivers during operation.</p> <p>Impacts on landscape character from operation of the project, which would involve minor changes to the public domain at some stations due to the provision of share zones and station concourses.</p>	<p>Construction of the preferred project may cause temporary adverse impacts on the landscape and views of the site and surrounding area during construction. These impacts may result from the introduction of construction compounds, construction activities, the removal of vegetation, light spill and changes to traffic movements.</p> <p>However, the extent of vegetation removal and the number of construction compounds for the preferred project would be reduced from that of the exhibited project.</p> <p>Operation of the preferred project may result in both adverse and beneficial impacts to landscape character and views from the introduction and/or modification of new infrastructure. However, as the station upgrades for the preferred project would largely be confined to the adaptive re-use of existing buildings and provision of accessible facilities, the potential for adverse and beneficial impacts may be reduced.</p> <p>Overall, the risk rating for landscape character and visual amenity associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	High	High

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Soils, contamination and water quality</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Water quality impacts due to spills and erosion during construction.</p> <p>Exposure of acid sulfate soils during construction.</p> <p>Disturbance of contaminated land during construction.</p> <p>Encountering contaminated building structures during demolition works.</p> <p>Water quality impacts due to spills and erosion from the project site during operation.</p> <p>Contamination of land, groundwater or waterways due to leaks and spills.</p>	<p>Potential erosion and sedimentation impacts, as well as potential spills or leaks associated with the preferred project are anticipated to be similar to those of the exhibited project, and remain manageable through the implementation of standard mitigation measures.</p> <p>The project may encounter contamination at a number of locations. The exposure of contaminated materials during construction may increase the potential for contaminant mobilisation and may create additional exposure pathways to sensitive receptors including workers, the general public, surface water bodies, groundwater bodies and terrestrial ecosystems.</p> <p>However, the extent of earthworks required to construct the preferred project has been reduced from the exhibited project. In addition, new drainage works are no longer required.</p> <p>Construction and operation also have the potential to result in the contamination of soils and/or groundwater due to spills and leaks of fuel, oils and other hazardous materials.</p> <p>Overall, while the revised civil works would potentially decrease the likelihood of impact, the potential for soils, contamination and water quality impacts associated with the preferred project remains. Therefore, the risk rating for soils, contamination and water quality associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium
<i>Groundwater and geology</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Adverse impacts on groundwater flows, quality and levels due to excavation works required for the project.</p> <p>Ground movement due to excavation including works to existing cuttings.</p>	<p>The civil works required to construct the preferred project has been revised compared to the exhibited project. It no longer includes piling works at bridges or excavation of cuttings, embankments or retaining walls. If groundwater is encountered it is likely to be shallow groundwater. Given this, the consequence level of impacts is likely to be reduced from the exhibited project.</p> <p>While the consequence of impacts to groundwater is reduced for the preferred project, the risk rating would remain the same as the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Social impacts and community infrastructure</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Adverse amenity impacts on adjacent residents and businesses during construction.</p> <p>Temporary impacts on community values and lifestyle.</p> <p>Temporary access changes to community facilities due to construction activities.</p> <p>Cumulative social issues from overlap with other construction projects.</p> <p>Adverse amenity impacts on adjacent residents, businesses and social infrastructure from operation of the project.</p> <p>Positive social and health outcomes associated with public transport.</p> <p>Perceived adverse impacts on human health from the operation of new traction substations.</p>	<p>As with the exhibited project, the preferred project would result in temporary impacts to community infrastructure during construction through changes to amenity and access, including during possessions. Construction of the preferred project would also result in temporary impacts on community values and lifestyle for local residents, workers and visitors due to temporary changes to travel patterns and interruptions to transport services.</p> <p>However, due to the revised construction methodology for the preferred project, the likelihood of the impact would be reduced. In the same manner as the exhibited project, the preferred project would have the potential to impact community infrastructure located near the project area mainly as a result of impacts to amenity and access arrangements. This includes the former Canterbury Bowling and Community Club, which would be directly impacted.</p> <p>Operation of the preferred project would result in minor adverse amenity impacts on residents, businesses and social infrastructure as the operation of the project would largely be consistent with operation of the existing T3 Bankstown Line.</p> <p>While there would be some potential impacts during operation, the preferred project would result in a number of long term benefits and positive social outcomes. These beneficial outcomes would be a result of improved public transport infrastructure and access. This could potentially facilitate future development around the stations and within the commuter catchment, which could result in both adverse impacts and positive benefits.</p> <p>Due to the retention of existing infrastructure along the rail corridor, provision of an active transport corridor is no longer viable within the rail corridor as part of the preferred project. The preferred project does not preclude the Department of Planning and Environment and local councils delivering an active transport corridor between Sydenham and Bankstown outside of the rail corridor.</p> <p>The preferred project would include development of a Walking and Cycling Strategy to encourage active transport to the station precincts. Active transport routes may include pedestrian footpath upgrades, separated cycleways, shared footpaths and designated pedestrian and cyclist road crossings.</p>	Very High	High

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
	While there would be a minor reduction in some benefits, the reduction in construction impacts would mean there would be a reduction in the likelihood of social impacts and impacts to community infrastructure. Therefore the risk rating for social impacts and community infrastructure associated with the preferred project has been reduced compared to the original risk rating identified in the State Significant Infrastructure Application Report.		
<i>Ecology</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Impacts on endangered populations, threatened species and threatened ecological communities within the construction footprint.</p> <p>Impacts on endangered populations, threatened species and threatened ecological communities outside the construction footprint.</p> <p>Impacts on native vegetation (non-threatened).</p> <p>Impacts on riparian and aquatic habitats from construction.</p> <p>Impacts on groundwater dependent ecosystems.</p> <p>Indirect impacts such as light and noise impacts, sedimentation, spread of weeds.</p>	<p>Construction of the preferred project would result in a reduction in the extent of vegetation removal, including remnant native vegetation. However, without mitigation the potential for impacts to native vegetation remains due to its presence within the project area.</p> <p>The revised construction methodology associated with the preferred project would also likely result in a reduced potential for impacts on listed species or communities to occur outside the construction footprint when compared to the exhibited project.</p> <p>Due to changes to drainage, bridge and civil works for the preferred project compared to the exhibited project, construction would also result in a reduced potential for impacts on riparian and aquatic habitats and groundwater dependant ecosystems.</p> <p>Given the revised construction methodology, the likelihood of impacts to ecological values associated with the preferred project has been reduced to 'unlikely' and therefore the risk rating for the preferred project has been reduced compared to the original risk rating identified in the State Significant Infrastructure Application Report.</p>	High	Medium

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Greenhouse gas and energy</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Emissions of greenhouse gases from operational and construction energy use, and embodied energy in materials.</p>	<p>As with the exhibited project, construction of the preferred project would result in the generation of greenhouse gas emissions through combustion of fuel, disposal of construction waste and use of construction materials with a high embodied energy.</p> <p>During operation, the preferred project may result in lower indirect greenhouse gas emissions than the exhibited project, associated with electricity for the new station facilities of the preferred project. However, this may also result in reduced opportunity for the incorporation of energy efficiency in design.</p> <p>Overall, the risk rating for greenhouse gas and energy associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium
<i>Climate change and adaption</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Impacts of climate change and severe weather events on construction.</p> <p>Impacts of climate change on project infrastructure and functionality.</p>	<p>The preferred project would address the effects of climate change during design development in the same manner as the exhibited project.</p> <p>Overall, the risk rating for climate change and adaptation associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Hazard and risks</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Rupture of, or interference with, underground utilities and services during construction.</p> <p>Transport and storage of hazardous substances and dangerous goods during operation.</p> <p>Transport and storage of hazardous substances and dangerous goods during construction.</p>	<p>Potential hazards and risks during construction and operation of the preferred project would be managed through the implementation of appropriate design standards and construction methodologies in the same manner as the exhibited project.</p> <p>The preferred project, when compared to the exhibited project would result in less opportunity for interference with underground utilities and services during construction.</p> <p>Risks associated with other hazards such as the removal of buildings and structures, contamination and subsidence are also likely to be slightly reduced for the preferred project compared with the exhibited project.</p> <p>However, given that the consequence of unmitigated hazard and risk impacts, the risk rating for hazard and risks associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium
<i>Waste and resource use</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Impacts associated with the management of waste during operation.</p> <p>Increased resource consumption during operation.</p> <p>Impacts associated with the management of waste during construction.</p> <p>Increased resource consumption during construction.</p>	<p>The preferred project would likely require lower quantities of materials and less track work, when compared to the exhibited project. The preferred project would therefore also likely generate less waste than the exhibited project, particularly due to the reduced extent of excavation. However, the likelihood and consequence of unmitigated impacts associated with the management of waste during construction would remain the same.</p> <p>The preferred project would involve conversion of the T3 Bankstown Line to metro operations and therefore impacts associated with waste management during construction would not change.</p> <p>While both the preferred project and the exhibited project would increase demand on local and regional resources, the preferred project would reduce this demand and it is unlikely that this would result in a resource becoming scarce or in short supply.</p> <p>Overall, the risk rating for waste and resource use associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium

Potential unmitigated impact	Discussion	State Significant Infrastructure Application Report risk rating	Preferred project risk rating
<i>Cumulative impacts</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Cumulative impacts from construction of multiple projects on parking, traffic congestion, noise, vibration, visual amenity, loss of public space and business impacts.</p> <p>Cumulative impacts on non-aboriginal heritage from construction and operation of multiple projects.</p> <p>Cumulative flooding impacts during construction and operation.</p>	<p>Consistent with the exhibited project, construction and operation of the preferred project would be undertaken concurrently with other major projects in the Sydney region.</p> <p>However, the preferred project would likely result in reduced cumulative impacts due to the reduced intensity and extent of construction works compared to the exhibited project. Additionally, works associated with the preferred project would be generally limited to the existing rail corridor (including stations) and therefore, the consequence of cumulative impacts associated with the preferred project may be reduced.</p> <p>While the consequence of cumulative impacts is reduced for the preferred project, the risk rating would remain the same as the original risk rating identified in the State Significant Infrastructure Application Report.</p>	High	High
<i>Air quality</i>			
<p>The project would need to appropriately manage the following potential impacts:</p> <p>Impacts to local air quality due to operation of construction plant and equipment.</p> <p>Impacts to local air quality due to increased vehicle movements from replacement bus services and transport of construction materials.</p> <p>Impacts to local air quality due to dust generation from exposed surfaces.</p>	<p>As with the exhibited project, during construction, the preferred project would be likely to result in local reductions in air quality due to the generation of dust and other particulates and the emissions of gaseous emissions. However, given the revised construction methodology, potential air quality impacts of the preferred project would also be expected to be reduced compared to the exhibited project.</p> <p>Potential impacts resulting from the generation of dust for the preferred project would be similar to the type of air quality impacts experienced with the exhibited project and on other large infrastructure projects. These impacts can be readily managed through the implementation of standard mitigation measures.</p> <p>Overall, the risk rating for air quality associated with the preferred project has been determined to be consistent with the original risk rating identified in the State Significant Infrastructure Application Report.</p>	Medium	Medium

11.3 Findings

The environmental risk analysis presented above has identified that the risk rating on four environmental aspects (construction traffic, transport and access; construction noise and vibration; social impacts and community infrastructure; and ecology) has been reduced compared to the exhibited project, due the reduction in environmental impacts of the preferred project.

While a general reduction in environmental impacts was identified across a number of environmental matters, specific reductions in potential consequence or likelihood of impacts were identified for business impacts; groundwater and geology; hazard and risks; and cumulative impacts, although the net risk rating for these matters remained unchanged.

On the basis of 'key' issues being those identified as those with a risk rating of high or very high, and 'other' issues being those with a risk rating of low or medium, the environmental risk analysis has resulted in the categorisation of issues, as summarised in Table 11.5.

Table 11.5 Categorisation of issues

Issue	State Significant Infrastructure Application Report categorisation	Preferred project categorisation
Traffic, transport and access	Key	Key
Noise and vibration	Key	Key
Non-Aboriginal heritage	Key	Key
Hydrology and flooding	Key	Key
Property and land use	Key	Key
Business impacts	Key	Key
Landscape character and visual amenity	Key	Key
Ecology	Key	Other
Social impacts and community infrastructure	Key	Key
Cumulative impacts	Key	Key
Aboriginal heritage	Other	Other
Soils, contamination and water quality	Other	Other
Groundwater and geology	Other	Other
Air quality	Other	Other
Greenhouse gas and energy	Other	Other
Climate change and adaptation	Other	Other
Hazard and risks	Other	Other
Waste and resource use	Other	Other

As demonstrated in Table 11.5, the environmental risk analysis has identified only one environmental aspect where categorisation changes, being ecology which changes from 'key' issue to 'other' issue. Accordingly, the risk ratings identified in the State Significant Infrastructure Application Report remain consistent with the preferred project and guidance provided through the State Significant Infrastructure Application Report on the scope of the Environmental Impact Statement remains valid and unchanged.