

# **CLARIFICATIONS - WITH ADDITIONAL INVESTIGATIONS**

CHAPTER THREE



# 3 Clarifications – with additional investigations

The Environmental Impact Statement identifies that the scope of the following items would be further clarified through additional investigations:

- Barangaroo track cross-over
- Barangaroo Station – use of barges for deliveries and to remove spoil
- O’Connell Street – future underground pedestrian link to Martin Place Station
- Waterloo Station – revised footprint.

Additional heritage investigations have also been carried out since the Environmental Impact Statement. These clarifications and additional heritage investigations are discussed in this chapter.

## 3.1 Barangaroo track cross-over

Chapter 6 of the Environmental Impact Statement identifies that a track cross-over may be provided to improve operational efficiency and flexibility in the event of an incident. Further investigations have identified that the optimal location of a track cross-over would be north of the proposed Barangaroo Station.

### 3.1.1 Description

The Barangaroo track cross-over cavern would be located to the north of Barangaroo Station and would be around 190 metres long, 12 metres high and 20 metres wide. The location of the track cross-over is shown on Figure 3-1, with a long section shown on Figure 3-2.

Construction of the cross-over would be carried out from the Barangaroo Station construction site. This would involve:

- Excavation of the cavern using road headers
- Lining of the cavern to form a tanked structure
- Fit-out of the cavern with track, mechanical and electrical equipment.

The addition of the cross-over cavern would generate about 55,000 cubic metres of spoil at Barangaroo Station, taking the total spoil generation at Barangaroo Station to around 290,000 cubic metres. This would result in additional daily truck movements at the construction site, which would change the impacts assessed in the Environmental Impact Statement. These revised impacts are assessed in the following sections.

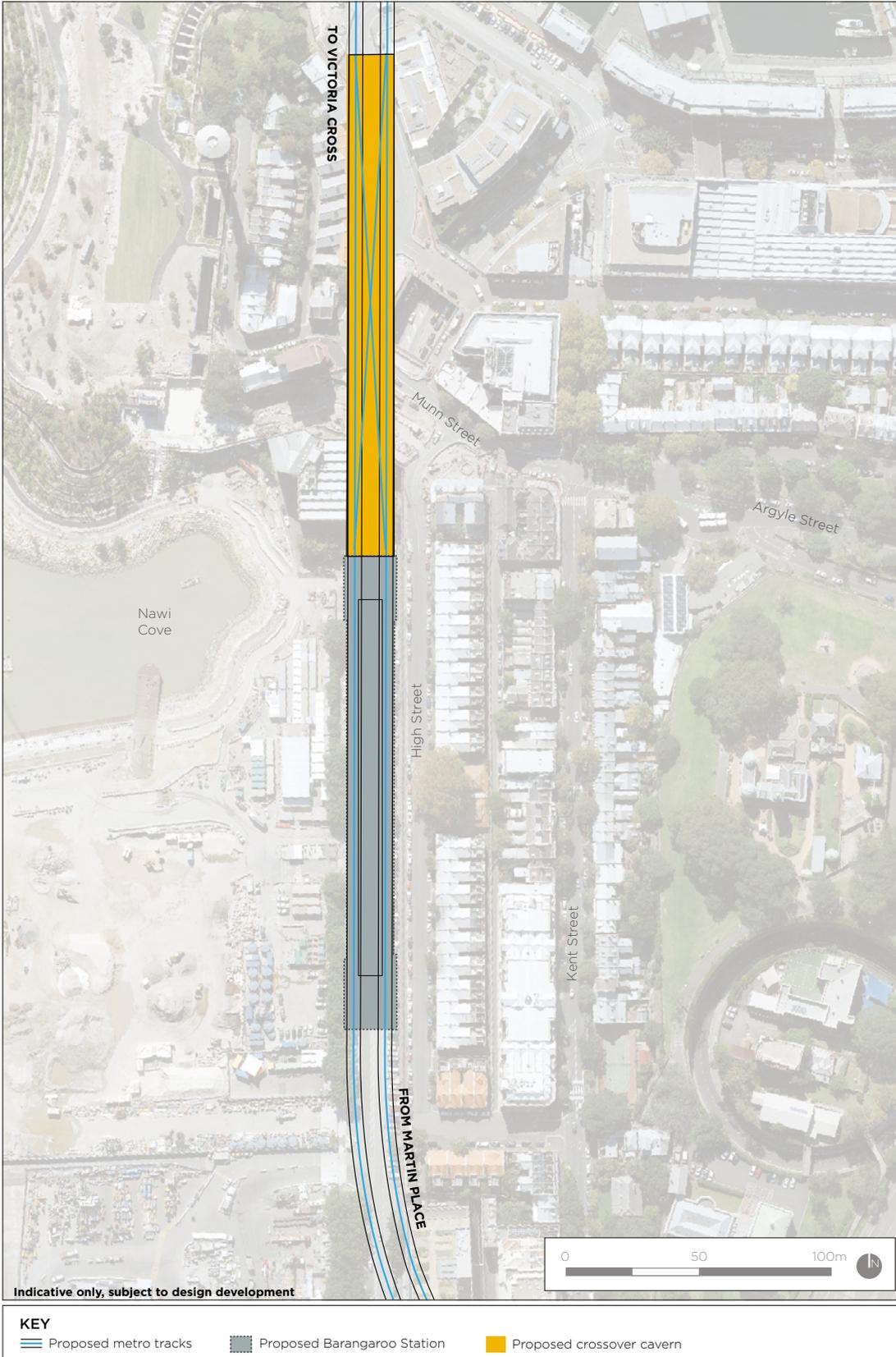


Figure 3-1 Barangaroo track cross-over (plan view)

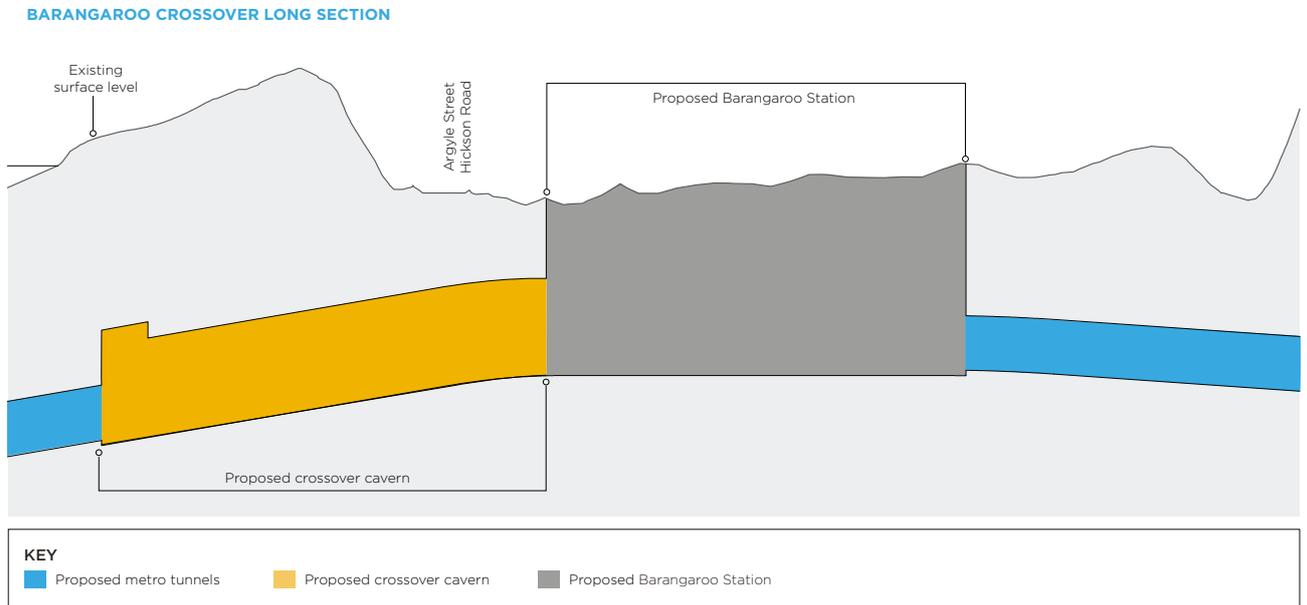


Figure 3-2 Barangaroo track cross-over (long section)

### 3.1.2 Environmental screening assessment

To understand the potential change in environmental impacts compared to that assessed in the Environmental Impact Statement, a screening assessment was conducted and is presented in Table 3-1. This assessment considers potential environmental aspects that may require further assessment to understand likely environmental impacts, and identify any relevant mitigation measures that may be required. An assessment of those aspects determined to have a potential change in impacts from the Environmental Impact Statement is provided below.

Table 3-1 Barangaroo cross-over – environmental screening assessment

Aspect	Potential change in impacts	Description
Construction traffic and transport	Yes	The addition of the cross-over cavern would increase the Metro construction vehicle numbers. A further assessment is provided in Section 3.1.3.
Operational traffic and transport	No	The cross-over cavern would not result in any changes to the function of Barangaroo Station, or require additional maintenance access. No further assessment is considered necessary.
Construction noise and vibration	Yes	The excavation of the cross-over cavern would result in the extended use of road headers, with excavation work closer to receivers above the tunnels. A further assessment is provided in Section 3.1.4.
Operational noise and vibration	Yes	The presence of a track cross-over may alter the operational noise profile of train operating on this section of track. A further assessment is provided in Section 3.1.5.
Land use and property	No	No additional land would be required to construct or operate the cross-over. No further assessment is considered necessary.

Aspect	Potential change in impacts	Description
Business impacts	No	The cross-over would not result in any additional impacts to businesses. No further assessment is considered necessary.
Non-Aboriginal heritage	No	The excavation of the cross-over would not result in any impacts on known non-Aboriginal heritage items and there would be no additional impacts in terms of vibration beyond those predicted in the Environmental Impact Statement. Further, the excavation would be entirely within rock and, as such, there would be no impact to potential archaeology. No further assessment is considered necessary.
Aboriginal heritage	No	The excavation of the cross-over would not result in any impacts to known Aboriginal heritage items. Further, the excavation works would be entirely within rock and, as such, there would be no impact to potential archaeology. No further assessment is considered necessary.
Landscape character and visual amenity	No	The cross-over would be located underground and would not require any additional land to facilitate construction. No further assessment is considered necessary.
Groundwater and geology	No	The excavation of the cross-over would result in additional tunnelling. However, the cavern would be tanked, which would prevent the long term inflow of groundwater. No further assessment is considered necessary.
Soils, contamination and water quality	No	The cross-over would not change the potential soils, contamination or water quality impacts. No further assessment is considered necessary.
Social impacts and community infrastructure	No	The cross-over would not result in additional impacts to community infrastructure or additional social impacts. No further assessment is considered necessary.
Biodiversity	No	The cross-over would not result in any additional biodiversity impacts. No further assessment is considered necessary.
Flooding and hydrology	No	The cross-over would be located entirely underground. No further assessment is considered necessary.
Air quality	No	The cross-over would not result in any additional air quality impacts. No further assessment is considered necessary.
Hazard and risk	No	The cross-over would not include the storage and use of any additional hazardous substances and dangerous goods, or be located within a bushfire prone area. No further assessment is considered necessary.
Waste management	No	The cross-over would result in a minor increase in the volume of spoil generated. However, it would not result in the generation of any different waste materials or a change in the management approach. No further assessment is considered necessary.

Aspect	Potential change in impacts	Description
Sustainability	No	The cross-over would not change the climate risk profile of the project, and would not result in a substantial change to the generation of greenhouse gases or the use of resources. No further assessment is considered necessary.
Cumulative impacts	No	The cross-over would not result in any additional cumulative impacts. No further assessment is considered necessary.

### 3.1.3 Construction traffic and transport

The excavation and fit-out of the cross-over would generate more construction vehicle movements on the surrounding road network than estimated in the Environmental Impact Statement. The total number of construction vehicles generated at the construction site is presented in Figure 3-3, and the change in heavy and light construction vehicle movements is presented in Table 3-2. There would be no change in construction vehicles associated with tunnel excavation, or to the construction routes presented in the Environmental Impact Statement.

As detailed in the Environmental Impact Statement, construction vehicles would enter and leave the site 24 hours a day, with the peak construction period occurring between 10am and 4pm. The arrival and departure pattern of construction vehicles would aim to minimise the impact of construction activity during the network peak periods, and keep heavy vehicle movements to a minimum at night-time.

**Table 3-2 Increase in construction vehicles as a result of the Barangaroo track cross-over (arrival only)**

Construction activity	Change in heavy vehicles per hour			Change in light vehicles per hour		
	AM / PM peak <sup>1</sup>	Outside AM / PM peak		AM / PM peak <sup>1</sup>	Outside AM / PM peak	
		Maximum <sup>2</sup>	Average <sup>3</sup>		Maximum <sup>2</sup>	Average <sup>3</sup>
Excavation	+4	0	+10	+8	+6	+2
Fit-out	+4	0	+10	+4	+6	+2

Note 1: The AM / PM peak is taken to be 7am to 10am, and 4pm to 7pm.

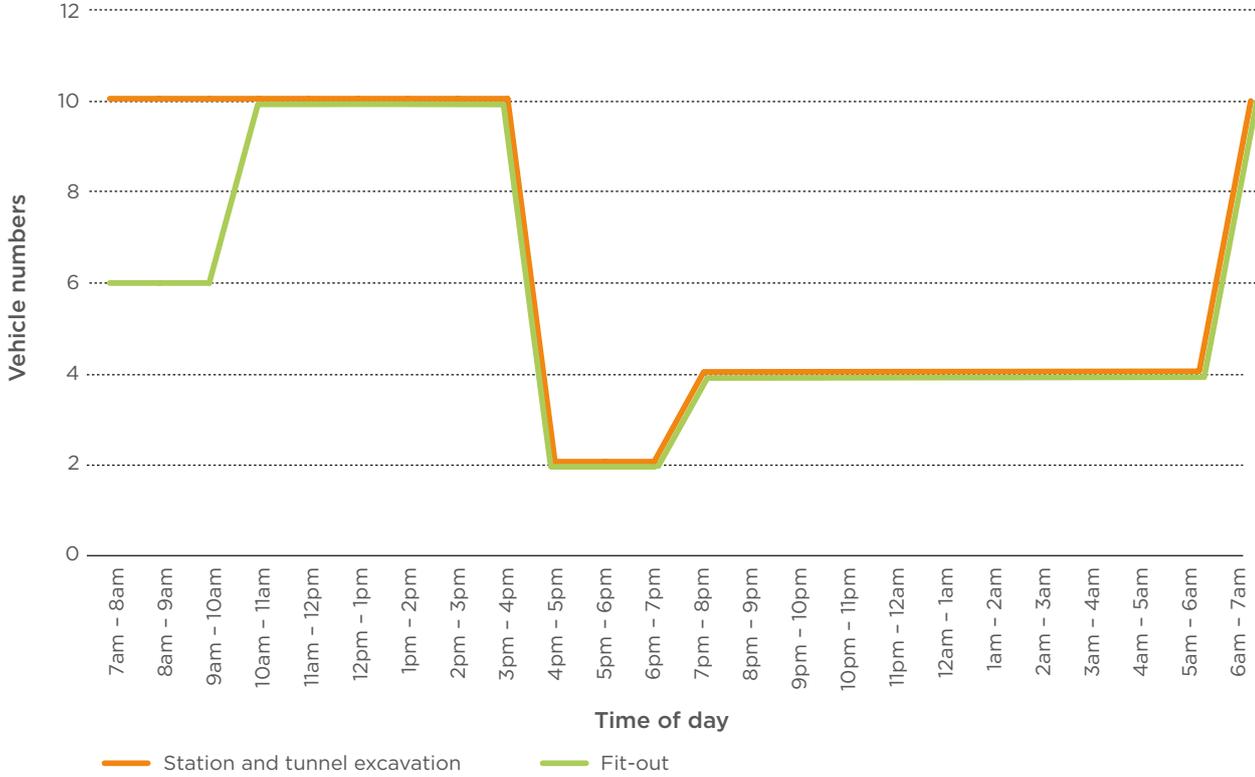
Note 2: The maximum period would occur between 10am to 4pm

Note 3: The average period would occur between 7pm and 7am

As detailed in Table 3-3 and shown in Figure 3-4, the additional vehicle movements generated by the cross-over would result in minimal change to the level of service at all intersections or the degree of saturation compared to that predicted in the Environmental Impact Statement. Additional intersection performance metrics, including average delay, are provided in Appendix F.

To manage the potential impacts on traffic and transport in the area, the mitigation measures presented in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) would be implemented. In particular, there would be ongoing consultation with the CBD Coordination Office, Roads and Maritime Services, City of Sydney Council, and Barangaroo Delivery Authority (BDA) to minimise traffic and transport impacts during construction (mitigation measure T1). No additional mitigation measures beyond those identified in the Environmental Impact Statement are considered necessary.

Light vehicles



Heavy vehicles

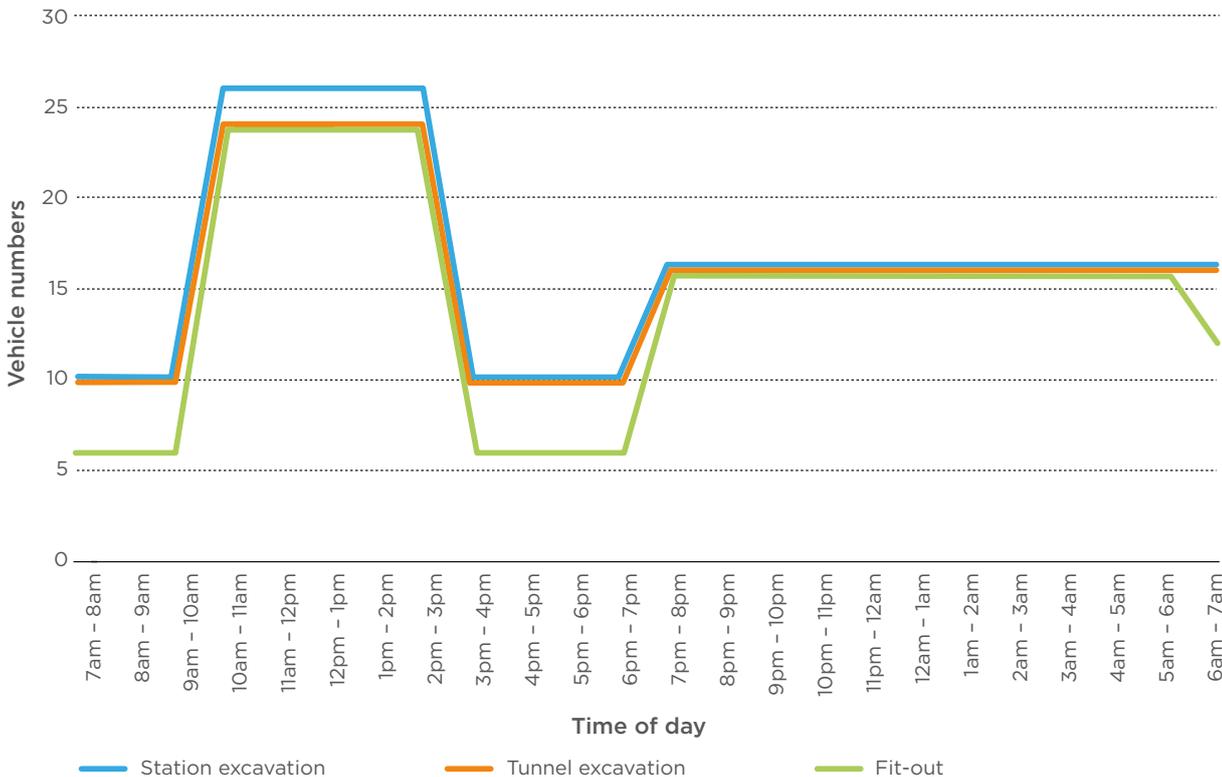


Figure 3-3 Barangaroo track cross-over – hourly traffic profile of construction vehicles (arrival only)

Table 3-3 Intersection performance – Barangaroo Station construction

Peak period	Existing (base)		With project as presented in the EIS Assessment		With project including Barangaroo cross-over	
	Level of service	Degree of saturation	Level of service	Degree of saturation	Level of service	Degree of saturation
<b>Shelley Street / Sussex Street</b>						
AM peak	A	0.61	A	0.63	A	0.66
PM peak	A	0.35	A	0.37	A	0.40
<b>Sussex Street / Napoleon Street</b>						
AM peak	B	0.70	B	0.68	B	0.68
PM peak	B	0.55	B	0.55	B	0.59
<b>Kent Street / Napoleon Street / Margaret Street</b>						
AM peak	B	0.52	B	0.52	B	0.52
PM peak	B	0.37	B	0.37	B	0.37
<b>Kent Street / Clarence Street / Harbour Bridge on-ramp</b>						
AM peak	E	1.00	E	1.00	E	1.00
PM peak	D	0.93	D	0.93	D	0.93
<b>Sussex Street / Erskine Street</b>						
AM peak	C	0.80	C	0.77	C	0.76
PM peak	B	0.59	B	0.59	B	0.59
<b>Sussex Street / King Street</b>						
AM peak	C	0.90	C	0.92	C	0.93
PM peak	B	0.72	B	0.73	B	0.76
<b>Sussex Street / Market Street</b>						
AM peak	B	0.82	B	0.83	B	0.84
PM peak	B	0.76	B	0.77	B	0.79

Note: Level of Service reported for signalised intersections is for the overall intersection. Base and 'with project' results are based on 2016 traffic counts.

Note: Outputs from LinSig Version 3.2

Note: Refer to Figure 8-31 of the Environmental Impact Statement for construction haulage routes

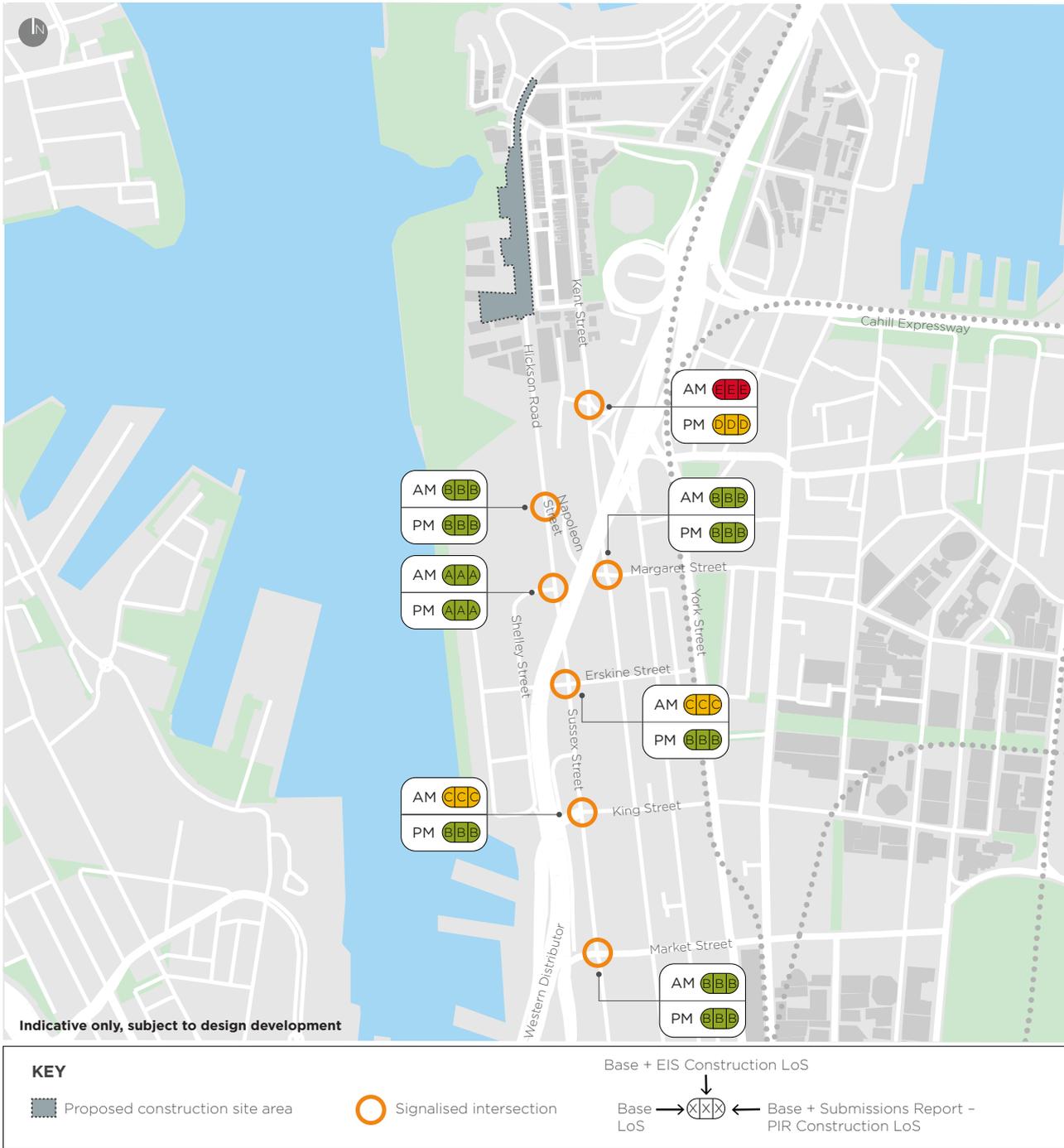


Figure 3-4 Barangaroo Station construction site – level of service with and without the Barangaroo cross-over

### 3.1.4 Construction noise and vibration

The construction of the cross-over would have the potential to generate additional ground-borne noise and vibration impacts on nearby sensitive receivers. To assess the potential impacts, it has been assumed that the road header would progress around four metres per day, and take around three months to complete.

The noise and vibration assessment is presented in Appendix E has found that:

- There would be no change in impacts during the daytime period for ground-borne noise when compared to the assessment presented in the Environmental Impact Statement
- There would be minor exceedances of the noise management level for ground-borne noise of up to 10 dB for nine residential buildings, located on Dalgety Road. Where ground-borne noise exceedances are identified, human comfort vibration exceedances would also be present
- There would be no additional buildings with vibration levels above the screening criteria.

To manage the additional potential exceedances at the nine residential buildings, the mitigation measures presented in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) would be implemented, as well as the Sydney Metro Construction Noise and Vibration Strategy (Appendix C of this report). No additional mitigation measures are considered necessary.

### 3.1.5 Operational noise and vibration

The proposed cross-over would change the potential impacts on ground-borne noise and vibration during operation. The closest receivers to the cross-over cavern would be commercial and residential receivers. The noise model for the project was updated to include the cross-over located north of the station to identify any potential changes in impacts at sensitive receivers.

The assessment is provided in Appendix E, with the results presented in Figure 3-5 to Figure 3-7. It was found that the inclusion of the cross-over would marginally increase the operational noise levels at residential receivers located above the cross-over. Specifically, the six residential buildings at the northern end of Dalgety Road would experience an increase in noise levels from between 26 and 30 dB(A) (as assessed in the Environmental Impact Statement) to between 30 and 35 dB(A) during the night-time period (10pm to 7am). However, these levels would remain at or below the 35 dB(A)  $L_{Amax(slow)}$  night-time noise trigger levels identified in the *Rail Infrastructure Noise Guideline* (NSW Environment Protection Authority, 2013). Ground-borne noise for the closest commercial building would remain below the applicable noise trigger levels for that use.

As such, the inclusion of the proposed cross-over would not require additional mitigation measures.

Ground-borne noise trigger levels almost always require lower vibration levels than would otherwise be required by the vibration objectives for rail projects. Compliance with the ground-borne noise trigger levels would ensure that the vibration design objectives would be achieved. There are no known highly sensitive facilities near the cross-over that with particular sensitivity to vibration.

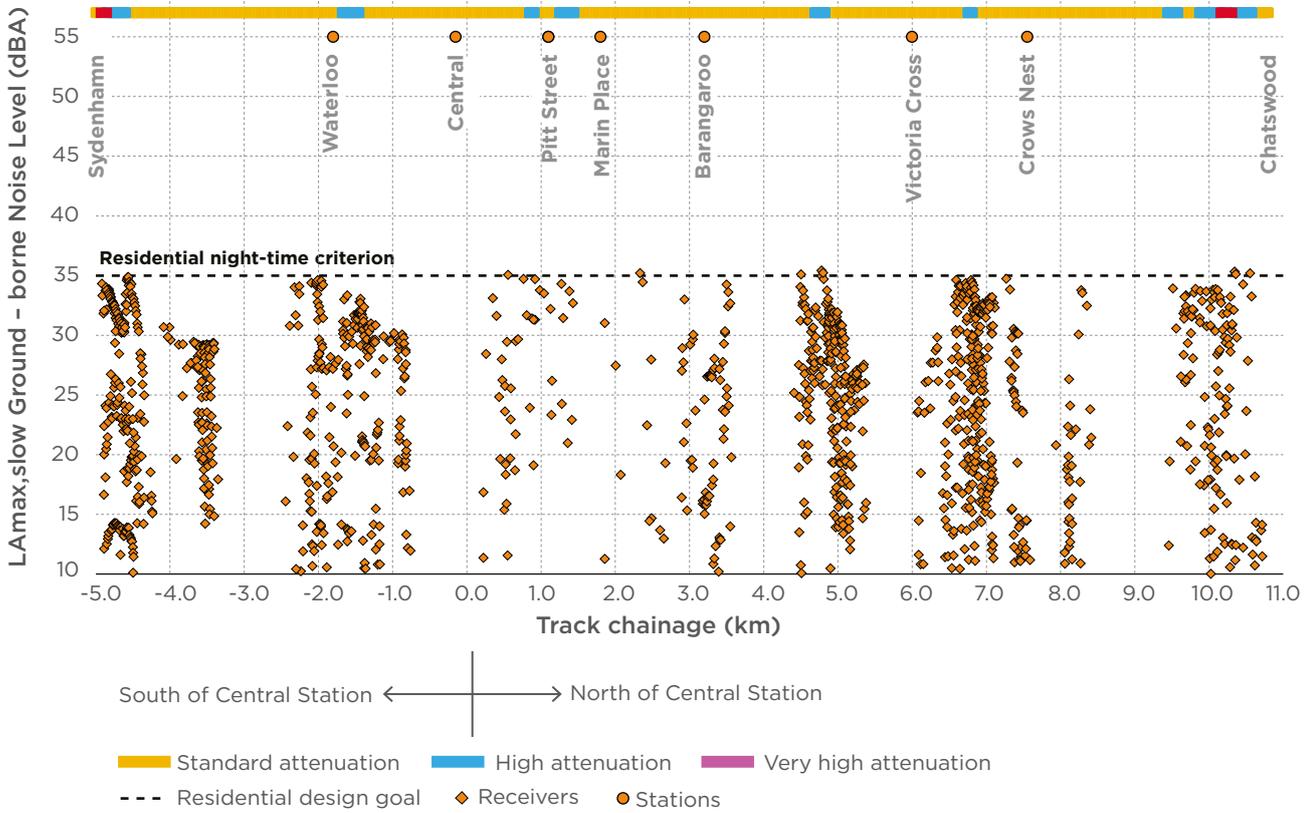


Figure 3-5 Predicted ground-borne noise levels with the cross-over – residential receivers

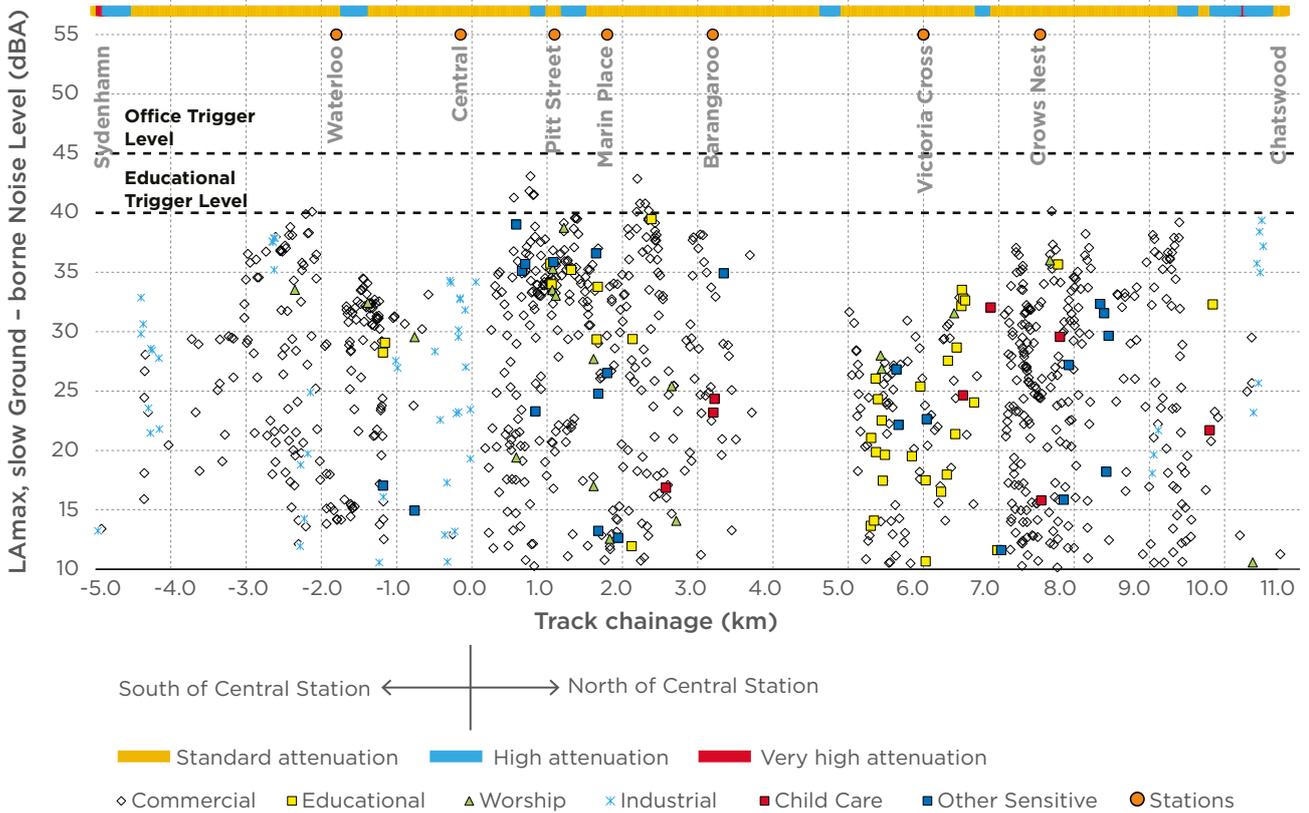


Figure 3-6 Predicted ground-borne noise levels with the cross-over – commercial and other sensitive receivers

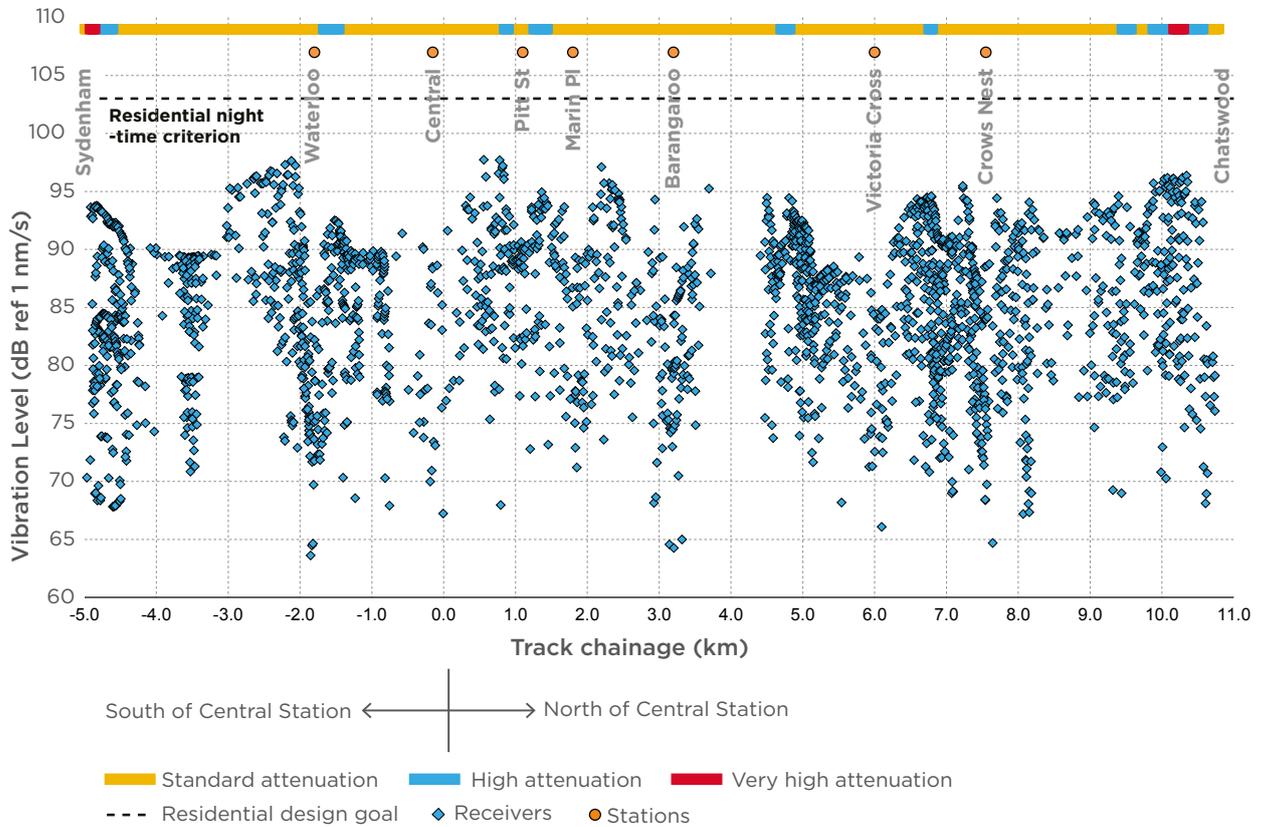


Figure 3-7 Predicted ground-borne vibration levels with the cross-over

## 3.2 Barangaroo Station – use of barges

Chapter 7 and Chapter 9 of the Environmental Impact Statement identify that it may be feasible to transport some of the spoil generated at the Barangaroo Station construction site by barge. Further investigations have been carried out to identify a feasible solution for barging in the event this is adopted as a transport method. Further investigations also identified that barges could be used to deliver materials to the Barangaroo Station construction site.

This section provides a description of the work required to enable barging to and from Barangaroo Station, and an assessment of the potential impacts of this activity.

### 3.2.1 Description

If barging is adopted as a transport method, barging facilities would likely be established to the south of the Nawi Cove. This would include around 200 metres of wharf frontage, with one section used to load spoil barges and another used as a berth for deliveries. A materials storage area would be provided adjacent to the delivery berth. A maximum of seven barge trips per day (one-way) would be generated for spoil removal and deliveries.

A conveyor system would transport spoil from the main construction site to the wharf and a haul road would be established adjacent to the conveyor to transport material deliveries from the wharf to the construction site. The location and layout of the barging infrastructure is shown on Figure 3-8. A photo of the area of foreshore that would be impacted is provided in Figure 3-9.

It is expected that the barging area would operate after hours. This would require lighting on the barges to facilitate a safe working platform while berthed, and lighting within the adjacent construction sites.

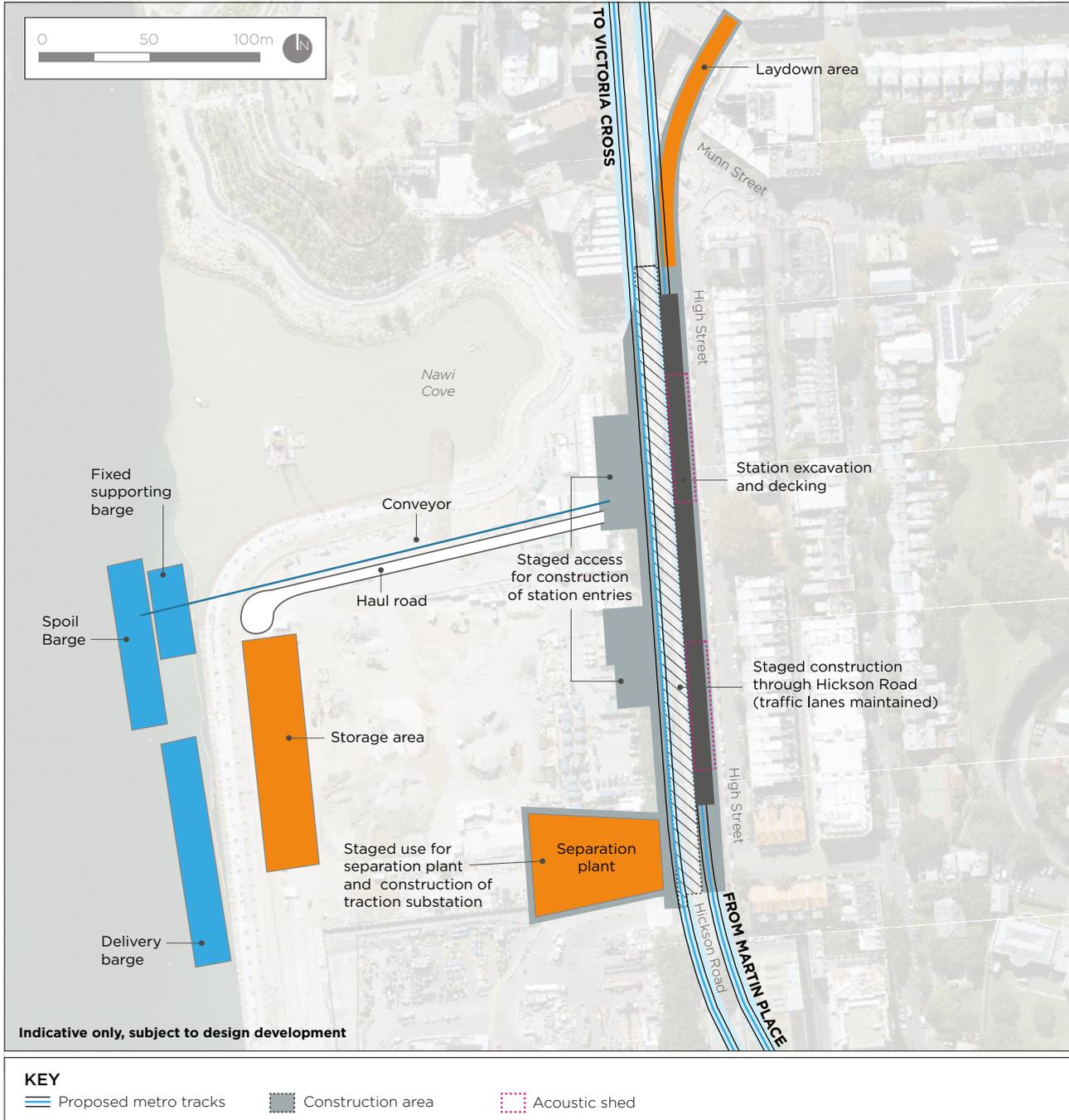


Figure 3-8 Barangaroo Station – location and layout of barging infrastructure



Figure 3-9 Existing view south from Wulugul Walk at Nawi Cove to the possible barge facility site

### 3.2.2 Environmental screening assessment

To understand the potential change in environmental impacts compared to those assessed in the Environmental Impact Statement, a screening assessment was conducted and is presented in Table 3-4. This assessment considers potential environmental aspects that may require further impact assessment to understand likely environmental impacts, and identify any relevant mitigation measures that may be required.

Table 3-4 Barangaroo barging – environmental screening assessment

Aspect	Potential change in impacts	Description
Construction traffic and transport	Yes	Barging would result in additional marine movements and would impact on pedestrian and cyclist movements. If the option were implemented, it would have major benefits in the reduction of construction vehicle movements on the surrounding road network. A further assessment is provided in Section 3.2.3.
Operational traffic and transport	No	Barging would occur during the construction phase only and would not alter the operational transport arrangements at Barangaroo Station. No further assessment is considered necessary.
Construction noise and vibration	Yes	The barging facilities would introduce new infrastructure and new noise sources during the construction phase at Barangaroo Station. A further assessment is provided in Section 3.2.4.

Aspect	Potential change in impacts	Description
Operational noise and vibration	No	Barging would occur during the construction phase only and would not alter any operational arrangements at Barangaroo Station. No further assessment is considered necessary.
Land use and property	Yes	Additional land would be required for the barging facilities, mainly within the Barangaroo Delivery Authority area. A further assessment is provided in Section 3.2.5.
Business impacts	No	Barging would not result in any additional impacts to businesses. No further assessment is considered necessary.
Non-Aboriginal heritage	No	Barging would not result in any impacts to known non-Aboriginal heritage items. There may be views of barging activities from heritage items or the heritage conservation area. However, these would not be significantly different from the views of the current construction activity at Barangaroo. Further, there would be no impact to potential archaeology as excavation is not proposed.  With the restriction of rock breaking to only standard construction hours, there would be no change to vibration levels from those predicted in the Environmental Impact Statement for heritage items. No further assessment is considered necessary.
Aboriginal heritage	No	Barging would not result in any impacts to known Aboriginal heritage items. Further, there would be no impact to potential archaeology as excavation is not proposed. No further assessment is considered necessary.
Landscape character and visual amenity	Yes	The barging facilities would introduce temporary infrastructure adjacent to the wharf near Barangaroo Station. A further assessment is provided in Section 3.2.6.
Groundwater and geology	No	Barging would not result in any additional groundwater and geology impacts as excavation is not proposed. No further assessment is considered necessary.
Soils, contamination and water quality	No	Barging would not result in any change to the potential soils, contamination or water quality impacts. No further assessment is considered necessary.
Social impacts and community infrastructure	No	Barging would not result in additional impacts to community infrastructure or additional social impacts. No further assessment is considered necessary.

Aspect	Potential change in impacts	Description
Biodiversity	No	<p>Barging would not require the clearing of any vegetation, or the removal or any potential habitat. The fixed barge would be fixed to the adjoining land, and would not involve work to the harbour bed at this location. There is the potential for overshadowing impacts, but any impact on fauna (if present) would not be permanent.</p> <p>There is potential for the spread of marine pests (particularly the marine alga (<i>Caulerpa taxifolia</i>) from the transport of materials and spoil in the harbour (eg barges). However, <i>C.taxifolia</i> is not known to occur in the Barangaroo area. Mitigation measure B4 would be in place to avoid transportation of marine pests from other locations. Therefore, no impact is expected.</p> <p>No further assessment is considered necessary.</p>
Flooding and hydrology	No	<p>Barging would not result in any changes to flooding and would not alter existing stormwater systems.</p> <p>No further assessment is considered necessary.</p>
Air quality	No	<p>Without the implementation of adequate mitigation measures, barging would pose additional risks to local air quality. However, these risks would be readily managed through standard mitigation measures.</p> <p>No further assessment is considered necessary.</p>
Hazard and risk	No	<p>Barging would not include the storage and use of any additional hazardous substances and dangerous goods, or be located within a bushfire prone area.</p> <p>No further assessment is considered necessary.</p>
Waste management	No	<p>Barging would not result in the generation of any different and increased volumes of waste materials.</p> <p>No further assessment is considered necessary.</p>
Sustainability	No	<p>Barging would not change the climate risk profile of the project, and would not result in a substantial change to the generation of greenhouse gases or the use of resources.</p> <p>No further assessment is considered necessary.</p>
Cumulative impacts	No	<p>Barging would not result in any additional cumulative impacts.</p> <p>No further assessment is considered necessary.</p>

### 3.2.3 Construction traffic and transport

#### Road network performance

If barging to and from Barangaroo is adopted, there would be a benefit to the surrounding road network due to a reduction in construction vehicles transporting spoil or materials to the site. This would result in a reduction in potential impact and therefore no further quantification of the change in network performance was carried out.

As the internal haulage route would be restricted to construction vehicles only, this would have no impact on the surrounding network.

### Maritime traffic impacts

Given the anticipated low volume of barge movements (around 14 movements per day), there would be minimal impacts to maritime services, including services to and from the planned ferry hub at Barangaroo, and the water taxi wharf at Rowntrees Wharf in Nawi Cove.

To minimise potential navigational safety impacts, warning signals and demarcation would be provided for the fixed supporting barge and for the barges moored at the designated loading / unloading areas.

The Port Authority of NSW (Harbour Master), Roads and Maritime Services and Sydney Ferries would be consulted in relation to all barge movements within Sydney Harbour to avoid impacts on the safety of other harbour users.

### Active transport impacts

Wulugul Walk, which will eventually provide foreshore access for pedestrians and cyclists to King Street Wharf and Darling Harbour, is presently closed as part of the construction of Central Barangaroo. It is anticipated that the walk will be re-opened as construction activities for Barangaroo progress. At present, it terminates around 300 metres south of Nawi Cove, and provides no through access.

To allow for the infrastructure associated with the barge activities, Wulugul Walk would need to be closed for safety requirements at the point where the conveyor belt passes over the shared paths.

As the walk presently does not provide access to the south, any temporary closure would not have a significant impact on pedestrians or cyclists, with pedestrians and cyclists having to use Hickson Road to travel to / from areas further south of Barangaroo Point Reserve.

The completion of the Central Barangaroo precinct is expected to occur in 2024. If the remaining sections of Wulugul Walk within Central Barangaroo are completed while construction of the project is underway, alternative paths would be available for north-south movements (such as Hickson Road).

Any changes to Wulugul Walk would be subject to mitigation measures as proposed in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes), such as directional signage (mitigation measure T3) and advanced community notifications (mitigation measure T5).

### 3.2.4 Construction noise and vibration

The establishment and operation of the barges at Barangaroo, including the movement of barges to and from the shoreline to the harbour, would generate additional noise impacts on nearby sensitive receivers. To assess these potential impacts, the construction noise assessment for Barangaroo Station, as provided in the Environmental Impact Statement, has been expanded to include the additional activities. The assessment incorporates revisions to:

- The classification of sensitive receiver types near Barangaroo Station (refer to Section 2.6). The sensitive receiver type changes relate to a receiver to the north on Hickson Road. This receiver was identified as commercial, However, it has since been identified that there is a theatre located on the upper floors of this building and the building is now re-classified as a theatre receiver
- A receiver to the east on High Street, which was identified and assessed as a childcare centre in the Environmental Impact Statement. However, this receiver was not identified in the summary table for airborne noise as the nearest receiver of that type. For completeness, this has now been included in the summary table
- The removal of rock breaking at night, as rock breaking would now only occur during standard construction hours (refer to Section 9.6).

### Airborne noise

A number of scenarios were developed for the daytime, evening and night-time periods to be representative of activities that would potentially have the greatest noise impact on surrounding receivers. These scenarios have been developed as a subset of those discussed in Section 3 of the *Technical Working Paper 2 Noise and Vibration*, and are:

- Enabling work, including mobilisation and demolition
- Earthworks, which consists of initial excavation (noting that rock breaking during excavation would now only occur during standard construction hours)
- Construction of an acoustic shed to shield the excavation work
- Excavation and tunnelling with an acoustic shed, including the barge support activities of spoil and materials handling
- Barge movements from the barge berth south of the Nawi Cove to a point in the harbour north of Barangaroo Reserve and west of the Harbor Bridge
- Construction and fit-out of the station.

A summary of the predicted noise level exceedances at the nearest sensitive receivers is provided in Table 3-5 for each construction scenario. Noise level exceedances are shown in brackets where they have changed from those presented in the Environmental Impact Statement.

The findings of the construction noise impact assessment indicate that:

- The restriction of rock breaking activities to standard construction hours during excavation has removed predicted exceedances of noise management levels at residential receivers in Areas A and B. In Area C and D, it has resulted in minor predicted exceedances of up to 10 dB at residential receivers during excavation with an acoustic shed, during the daytime (outside standard construction hours), evening and night-time periods. Sleep disturbance noise management levels would now not be exceeded at any receiver type
- The addition of the barging activities would not increase exceedances of noise management levels as presented in the Environmental Impact Statement. While barging within Barangaroo would introduce a new source of airborne noise, it would not be to a level that would cause an increase in the category of exceedance. This is in part due to the restriction of rock breaking activities to standard construction hours, which has lowered the predicted noise contribution from excavation activities
- Barge movements would be within the noise management levels for all receiver areas.
- For the theatre in Area B, exceedances greater than 20 dB above the noise management levels are predicted during enabling work, earthworks, excavation and construction. Moderate exceedance of the noise management levels of between 10 dB and 20 dB are predicted during construction of the acoustic shed, and minor exceedances of up to 10 dB during excavation (daytime out of hours).
- For the childcare centre in area C, exceedances greater than 20 dB above the noise management levels are predicted during enabling work and earthworks. Moderate exceedance of the noise management levels of between 10 dB and 20 dB are predicted during construction of the acoustic shed and excavation, and minor exceedances of up to 10 dB during excavation (daytime out of hours).

Table 3-5 Predicted airborne noise level exceedances at Barangaroo Station

Receiver area	Noise modelling scenario														
	Site establishment	Earthworks	Acoustic shed construction	Excavation with shed				Building construction	Barge travel through harbour						
	Day	Day	Day	Day	DOOH <sup>1</sup>	Evening	Night	Sleep	Day	Day	DOOH	Evening	Night	Sleep	
A Commercial receiver to the east (to be constructed)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
A Residential receivers to the west and south (to be constructed)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
B Residential receivers to the north on Bettington Street	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
B Passive recreation area receivers to the north in Barangaroo reserve	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
C Residential receivers to the east on High Street	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
D Residential receivers to the south on High Street	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
D Commercial receivers to the south on Hickson Road	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
E Residential receivers to the west in Balmain East	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

Legend

- NML compliance
- NML exceedance of less than 10 dB
- NML exceedance between 10 dB and 20 dB
- NML exceedance of more than 20 dB

Note 1: The results presented in the Environmental Impact Statement are shown in brackets ( )

Note 2: DOOH = Daytime out of hours (i.e Saturdays 1pm to 6pm and Sundays 7am to 6pm)

As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise airborne construction noise where exceedances are predicted. Standard mitigation measures that could be implemented, where feasible and reasonable, include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to shield receivers from noise.

#### **On-site night-time $L_{Amax}$ truck noise**

As shown in Table 3-5, the  $L_{Amax}$  noise levels associated with barge support activities would exceed the sleep disturbance screening level by up to 10 dB at residential receivers in area A during excavation with an acoustic shed. This is consistent with the impact predicted in the Environmental Impact Statement.

#### **Vibration**

During excavation of the shafts, vibration levels are anticipated to remain below the vibration screening levels associated with minor cosmetic building damage at all buildings except for one building – the heritage listed Dalgety Bond Store – adjacent to the north of the site on Hickson Road, and one proposed building to the south. The predicted exceedance at Dalgety Bond Store would be consistent with the predicted exceedance identified in the Environmental Impact Statement.

A more detailed assessment of these structures and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for these structures.

The construction of the conveyor between the construction site and the wharf may require bored piles. If these were required, vibration levels from the piling activity would remain below the relevant cosmetic damage screening criteria at the nearest sensitive receivers.

#### **Construction ground-borne noise**

The ground-borne noise analysis indicates that:

- For the receivers along High Street (including the childcare centre), there would be ground-borne noise level exceedances of up to 10 dBA during the daytime period. However, as rock breaking would be restricted to standard construction hours, exceedances during the night-time would no longer occur
- The theatre located on Hickson Road is predicted to have ground-borne noise level exceedances of the noise management levels greater than 25 dBA during the daytime period. The restriction of rock breaking to standard construction hours would reduce the level of ground-borne noise experience at this receiver during the night-time period; however, exceedances of up to 10 dB would remain.

As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented to minimise ground-borne noise where exceedances are predicted. Mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

## Blasting

Consistent with the approach taken in the Environmental Impact Statement, blasting has been considered due to the level and duration of ground-borne noise exceedances associated with rock breaking. As rock breaking would now only be undertaken during standard construction hours, only the daytime period has been further considered.

Table 3-6 shows the number of daytime periods when the noise management levels would be exceeded while excavation is underway. As shown, the adoption of blasting as an excavation technique would reduce impacts on receivers during the daytime period (there would be a reduction in impact of up to 50 per cent for residential receivers).

**Table 3-6 Barangaroo Station – blasting scenarios**

Scenario	Number of daytime periods above noise management levels			
	Residential		Commercial	
	No blasting	Blasting plus large rock breaker	No blasting	Blasting plus large rock breaker
Barangaroo	153	73	4	3

Further detailed construction planning, through the development of Construction Noise Impact Statements (as required by the Sydney Metro Construction Noise and Vibration Strategy in Appendix C of this report) would determine detailed construction activities with the aim of reducing ground-borne noise impacts on receivers. This could involve the consideration of different sized rock breakers at different periods, and the positioning of rock breakers within the site during different periods.

With careful planning and positioning of the rock breakers it may be possible to avoid consecutive periods of noise management levels exceedance at any one receiver, effectively providing respite periods. For any residual exceedances of the noise management levels, additional mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

### 3.2.5 Land use and property

Chapter 12 (Land use and property) of the Environmental Impact Statement provides an assessment of potential impacts to land use and property as a result of the project.

Subject to detailed construction sequencing, the barging option and associated infrastructure would be partially located within the foreshore areas of Barangaroo Reserve, referred to as Wulugul Walk, and partially within the construction footprint of Central Barangaroo precinct.

Central Barangaroo is currently under development and is scheduled to be completed in stages by 2024. It is currently a construction site that supports the construction of Barangaroo South and will continue to be a construction site as the Central Barangaroo precinct is developed.

Central Barangaroo covers 5.2 hectares. It will effectively become the cultural heart of Barangaroo, and will include a combination of civic and cultural attractions along with recreational, residential, retail and commercial uses. The proposed restaurants and cafes to be located at Wulugul Walk at Central Barangaroo have not yet commenced construction.

The barging option would require the temporary occupation of foreshore areas and parts of the Central Barangaroo precinct (subject to more detailed construction sequencing of both projects) for a storage area, internal haulage route and elevated conveyor system. The majority of this infrastructure would be within the Central Barangaroo precinct. The use of the land would be secured by way of lease or a Memorandum of Understanding with Barangaroo Delivery Authority.

The temporary occupation of open space areas would have a minor land use impact associated with the removal of foreshore access. This would impact on a limited section of the Wulugul Walk, which currently terminates around 100 metres south of the barging area footprint.

The temporary occupation of construction areas of Central Barangaroo could have impacts on the staging of that development. To manage these impacts, the final configuration of construction activities within Central Barangaroo would be determined in consultation with the Barangaroo Delivery Authority with the objective of minimising disruption to construction staging for the precinct.

### **3.2.6 Landscape character and visual assessment**

The barging option and associated infrastructure would be partially located within the foreshore areas of Wulugul Walk, and partially within the construction footprint of Central Barangaroo precinct.

Wulugul Walk includes a timber wharf along the harbour edge, locally quarried sandstone retaining walls, broad decomposed granite and asphalt footpaths with a triple avenue of trees, bicycle racks and lighting. Seats are provided at intervals along the path. This location provides views across the harbour to the Balmain peninsular. The foreshore park also provides access to the foreshore unfettered by boat mooring or other development.

An assessment of the landscape character and visual impacts has been completed in accordance with the methodology and rating systems as identified in Chapter 16 (Landscape character and visual amenity) of the Environmental Impact Statement.

#### **Landscape impacts**

Landscape impacts anticipated during construction and operation are summarised in Table 3-7 and Table 3-8.

During construction, there would be:

- A high adverse landscape impact on Wulugul Walk due to the restriction of access to the foreshore and proximity of construction activities to remaining accessible foreshore areas. This would reduce the attractiveness of this space
- A moderate adverse landscape impact on Sydney Harbour and foreshore areas. The presence of the barges and supporting infrastructure would result in a noticeable reduction in the landscape quality of this area.

Following the completion of construction, all infrastructure associated the barging would be removed. The path and landscaping would be reinstated consistent with existing landscaping, and with plantings of a similar maturity to the surrounding area.

Table 3-7 Barangaroo Station – landscape impacts with barging option

Location	Sensitivity rating	Construction impact		Operation impact	
		Modification rating	Impact rating	Modification rating	Impact rating
Sydney Harbour and foreshore areas	Regional	Noticeable reduction	Moderate adverse	N/A	N/A
Wulugul Walk	Regional	Considerable reduction	High adverse	No perceived change	Negligible

### Daytime visual amenity impacts

The anticipated daytime visual impacts on representative viewpoints during construction and operation are summarised in Table 3-8. Viewpoints 10 to 12 are presented as additional viewpoints to those assessed within the Environmental Impact Statement, and are shown on Figure 3-10.

As noted in Table 3-8, during construction, there would be additional adverse visual impacts due to the construction activity and infrastructure, and the changes to open space areas along the foreshore. While the work would be adjacent to construction activities associated with the Central Barangaroo site, the impacts would still be moderate to high due to the sensitivity of the views. The exception would be for views north from Wulugul Walk at Barangaroo South, where impacts are predicted to be negligible due to the distance and partial obstruction of views by the existing wharf and Central Barangaroo.

Following the completion of construction, all infrastructure associated with barging would be removed and the Wulugul Walk reinstated with landscaping. As such, there would be a negligible permanent and long term landscape impacts on all viewpoints.

No additional mitigation measures have been identified as the mitigation measures presented in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) would address the potential impacts where there is an interface with public space areas.



**KEY**

- Chatswood to Sydenham
- Proposed operational area at surface
- Proposed construction site area
- Existing suburban rail
- Viewpoint location

Indicative only, subject to design development



Figure 3-10 Barangaroo Station construction site - viewpoints

Table 3-8 Barangaroo Station – daytime visual impacts with barging option

Location	Sensitivity rating	Construction impact		Operation impact	
		Modification rating	Impact rating	Modification rating	Impact rating
Viewpoint 2: View east to Barangaroo from Darling Harbour	Regional	Noticeable reduction (no perceived change) <sup>1</sup>	Moderate impact (negligible) <sup>1</sup>	No perceived change	Negligible
Viewpoint 10: View south from Wulugul Walk at North Cove	Regional	Considerable reduction	High adverse	No perceived change	Negligible
Viewpoint 11: View southwest from Barangaroo Reserve	Regional	Noticeable reduction	Moderate impact	No perceived change	Negligible
Viewpoint 12: View north from Wulugul Walk at Barangaroo South	Regional	No perceived change	Negligible	No perceived change	Negligible

Note 1: The modification rating and impact rating in brackets denote the originally assessed impacts as stated in the Environmental Impact Statement.

### Night-time visual impacts

Barging would involve night-time work, which would create an additional source of lighting at storage areas along the foreshore and barge infrastructure.

As indicated in the Environmental Impact Statement, the project would have negligible night-time visual impacts during construction due to its brightly lit Sydney CBD location, and the relatively few visual receivers that are currently immediately adjacent to the site in the Central Barangaroo precinct. This level of impact would not change as a result of barging, and the area of the Wulugul Walk directly impacted does not presently attract a large number of night-time users.

As Central Barangaroo develops, the number of night-time users would increase, including additional residential receivers. Should this occur while construction of the project continues, mitigation measures around minimising light spill would be implemented (mitigation measure LV3).

## 3.3 O’Connell Street – future underground pedestrian link

Chapter 6 of the Environmental Impact Statement identifies that further investigations were being carried out for a proposed underground pedestrian connection and station entry for Martin Place metro station at 33 Bligh Street (now referred to as the O’Connell Street site). The Environmental Impact Statement identifies the construction activities that may be expected to occur at this site but does not provide a detailed impact assessment. The results of the further investigations and potential impacts are presented below, which are subject to ongoing negotiations with Ausgrid regarding the use of this site.

### 3.3.1 Need and justification

Chapter 9 (Operational traffic and transport) of the Environmental Impact Statement identifies that additional pedestrian crossing capacity may be needed at the intersection of Hunter and Castlereagh streets as a result of the proposed Martin Place metro station. As a result, an underground pedestrian connection between the metro station and O’Connell Street and / or Bligh Street was identified as one possible response, with a potential entry / exit at 33 Bligh Street. The site for the entry / exit point was identified on the basis of the opportunity provided by the current development work being carried out by Ausgrid (which is the landowner). The major benefits of an underground pedestrian link at this location would include:

- Reduced pedestrian queuing and congestion at the intersection of Hunter and Castlereagh streets and adjoining footpaths (particularly Hunter Street)
- Improved safety, with a reduction in informal crossings in the general vicinity of this intersection
- Improved operational performance of the metro station by:
  - ◆ simplifying pedestrian movements at platform level at the northern station entry
  - ◆ splitting pedestrian demand and reducing congestion on the escalators at the northern station entry.

Transport for NSW has continued its investigation into this option in consultation with Ausgrid. However, at this stage, it has determined that it would be necessary for any design and fit-out associated with an additional station entry / exit at this location to be incorporated into the future architectural design and construction of the new building at 33 Bligh Street. This building currently has a Concept and Project approval under Part 3A of the *Environmental Planning & Assessment Act 1979*.

As part of the construction of Martin Place metro station, it is now proposed to excavate the tunnel for the underground pedestrian link (refer to Section 3.3.2). This construction work would be in addition to work assessed in the Environmental Impact Statement. However the provision and fit out of the station entry / exit would be subject to a separate assessment and approval process given the need for it to be integrated into the proposed building development at this site.

This is a similar approach to future over station developments, in that the future underground connections would be designed and constructed to account and provide for the physical provision for potential elements associated with the station entry and pedestrian link.

Transport for NSW is continuing to negotiate with Ausgrid regarding the use of this site and to ensure appropriate planning and legal mechanisms are in place to maintain the opportunity for this site as a future entry / exit for Martin Place Station.

### 3.3.2 Construction activities

As identified in Chapter 7 of the Environmental Impact Statement, the key activities that would be carried at the O’Connell Street site to construct Martin Place Station would include:

- Excavation of a shaft to provide a future station entry / exit and vertical transport
- Excavation of underground pedestrian connections from the shaft using a mined technique
- Excavation of the Martin Place Station caverns using two road headers.

Excavation for the pedestrian link is expected to generate 54,000 cubic metres of spoil. This would be in addition to the 175,000 cubic metres identified in the Environmental Impact Statement. Construction access would be left-in from O’Connell Street and left-out to Bligh Street.

Construction works would occur for about 12 months, and would take place at the same time as Martin Place Station is being constructed. This is expected to occur from the fourth quarter of 2017 until the third quarter of 2019.

Construction would be carried out 24 hours per day, seven days a week consistent with Table 7-20 of the Environmental Impact Statement.

The location and indicative layout of the O’Connell Street construction site (being the 33 Bligh Street property), including vehicle access and egress, is shown in Figure 3-11.

Drainage infrastructure and surfacing of the tunnel would be designed to cater for the construction period and until such time that the pedestrian link is fitted out.

At the completion of construction, the site would be returned to Ausgrid (as landowner).

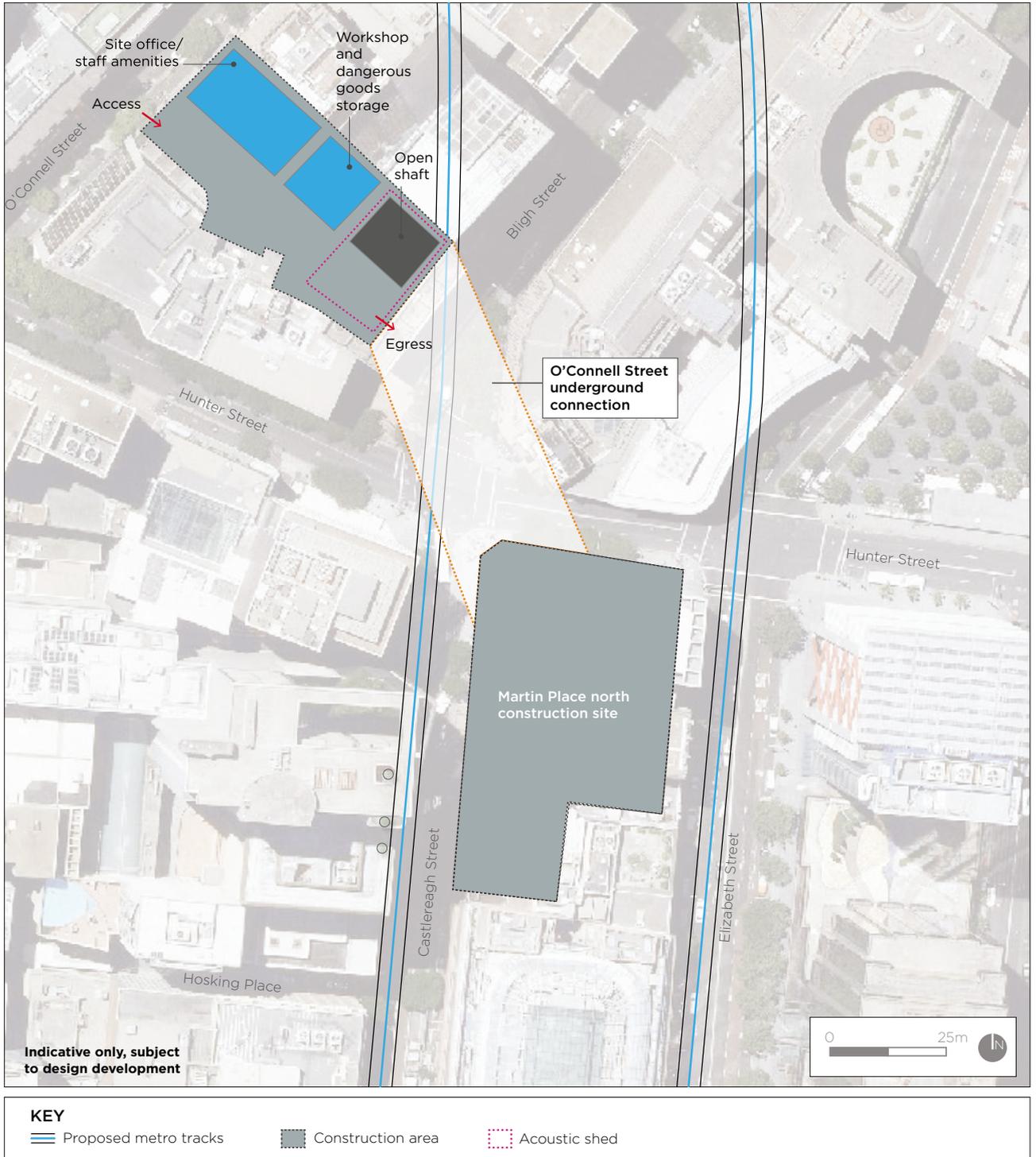


Figure 3-11 O'Connell Street - indicative construction site layout

### 3.3.3 Environmental screening assessment

To understand the potential change in environmental impacts compared to those assessed in the Environmental Impact Statement, a screening assessment was conducted and is presented in Table 3-9. The assessment considers potential environmental aspects that may require further impact assessment to understand likely environmental impacts, and identify any relevant mitigation measures that may be required. The screening assessment is presented in Table 3-9.

**Table 3-9 O’Connell Street future underground pedestrian link – environmental screening assessment**

Aspect	Potential change in impacts	Description
Construction traffic and transport	Yes	The proposed works would result in additional haul routes and additional construction traffic movements. A further assessment is provided in Section 3.3.4.
Operational traffic and transport	Yes	The proposed works would result in an additional station entry and integration with the surrounding road and transport network. This would provide benefits to pedestrians within the station, and along the pedestrian network, at surface. A further assessment is provided in Section 3.3.4.
Construction noise and vibration	Yes	The proposed works would result in an additional construction site. A further assessment is provided in Section 3.3.5.
Operational noise and vibration	Yes	As approval is not being sought for the operation of the underground pedestrian link (including the entry / exit), there would be no additional operational noise and vibration associated with the proposed works. There may be additional sources as part of the future fitout of the station entry / exit. A further assessment is provided in Section 3.3.11.
Land use and property	Yes	The proposed works would require additional property. A further assessment is provided in Section 3.3.6.
Business impacts	Yes	The proposed works may result in impact to additional businesses. A further assessment is provided in Section 3.3.7.
Non-Aboriginal heritage	Yes	The proposed works are located in close proximity to known non-Aboriginal heritage items. Additionally, the work would involve excavation in additional areas with archaeological potential. A further assessment is provided in Section 3.3.8.
Aboriginal heritage	Yes	The proposed works would involve excavation in additional areas with Aboriginal archaeological potential. As such, an assessment is provided in Section 3.3.9.
Landscape character and visual amenity	Yes	The proposed works would require an additional construction site, and further assessment is provided in Section 3.3.10. At the completion of construction, there would be no visible feature.  The future entry / exit at Bligh Street (subject to separate assessment and approval) would result in additional permanent built structures that have the potential for visual impacts. This is discussed further in Section 3.3.11.

Aspect	Potential change in impacts	Description
Groundwater and geology	No	<p>The extent of additional underground elements that could lead to an increase in groundwater impacts would be minor within the context of the project impacts at this location. As such, the proposed works would not change the potential impacts on groundwater, as presented in the Environmental Impact Statement. Further, the total predicted annual inflow provided in Section 17.4.3 of the Environmental Impact Statement would not increase given that assessment assumed all project elements would be drained.</p> <p>The target levels for groundwater levels established in mitigation measure GWG1, would also apply to the underground link. The target levels generally aim to keep the project related changes to within natural variation of groundwater levels encountered in the past.</p> <p>No further assessment is considered necessary.</p>
Soils, contamination and water quality	No	<p>The proposed works would not change the likely potential soil, contamination or water quality impacts. Mitigation measures as provided in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) of this report would be implemented to manage potential impacts.</p> <p>No further assessment is considered necessary.</p>
Social impacts and community infrastructure	No	<p>The proposed works would not result in additional impacts to community infrastructure. The potential impacts to amenity during construction would be consistent to that assessed in the Environmental Impact Statement. Mitigation measure S02 would manage any potential impacts on sensitive community facilities in the area.</p> <p>No further assessment is considered necessary.</p>
Biodiversity	No	<p>The proposed works would not result in additional biodiversity impacts as the site is highly disturbed with no vegetation.</p> <p>No further assessment is considered necessary.</p>
Flooding and hydrology	No	<p>The proposed works are not located in flood prone land and would not alter existing stormwater systems.</p> <p>No further assessment is considered necessary.</p>
Air quality	No	<p>The proposed works would not result in any additional air quality impacts, with the site currently an existing construction site. Mitigation measures, as detailed in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes), would manage any sources for air quality impacts at the site.</p> <p>No further assessment is considered necessary.</p>

Aspect	Potential change in impacts	Description
Hazard and risk	No	The proposed works would not include the storage and use of any additional hazardous substances and dangerous goods. No further assessment is considered necessary.
Waste management	No	The proposed works would result in a minor increase in the volume of spoil generated, however it would not result in the generation of any different waste materials or a change in the management approach. The increase in spoil would generate additional construction vehicle movements, which has been considered in Section 3.3.4. No further assessment is considered necessary.
Sustainability	No	The proposed works would not change the climate risk profile of the project, and would not result in a substantial change to the generation of greenhouse gases or the use of resources. No further assessment is considered necessary.
Cumulative impacts	No	The proposed works would not result in any additional cumulative impacts. Construction works associated with 33 Bligh Street are not expected to occur concurrently. Mitigation measure CU1 would also provide mitigation to any potential cumulative impacts should this occur. There would be a potential for longer duration of impacts (ie due to delay to the construction of 33 Bligh Street). Reasonable and feasible mitigation measures would be in place to reduce impacts to an acceptable level. No further assessment is considered necessary.

### 3.3.4 Construction traffic and transport

As shown in Figure 3-11, construction vehicles would enter the site from O'Connell Street, and exit onto Bligh Street. The haulage routes to and from the site are shown in Figure 3-12. These routes would be in addition to the haulage routes assessed in the Environmental Impact Statement.

This section provides a revised assessment of the combined use of all three Martin Place Station construction sites. A profile of the hourly construction vehicle movements at the O'Connell Street site is provided in Figure 3-13.



Figure 3-12 O'Connell Street construction site - haul routes

Heavy vehicles



Light vehicles



Figure 3-13 O’Connell Street construction site – hourly traffic profile of construction vehicles (inbound only)

### Impact on road network performance

Traffic data collected in 2016 indicates that during the morning peak hour, Bridge Street carries up to 990 vehicles per hour westbound and up to 640 vehicles per hour eastbound. During the evening peak hour, up to 640 vehicles per hour travel westbound and 850 vehicles per hour travel eastbound. Low traffic volumes during both peak hours are experienced on Loftus Street and O’Connell Street, with 160 vehicles per hour and 220 vehicles per hour, respectively. On Hunter Street, there are higher traffic volumes in the westbound direction during both peak hours. Bligh Street is one-way southbound and carries about 200 and 290 vehicles per hour in the AM and PM peaks, respectively.

Table 3-10 and Figure 3-14 shows a comparison of the predicted traffic impacts with that assessed in the Environmental Impact Statement. The assessment assumes that eight vehicles enter and depart the site in the AM and PM peak period per hour (totalling 16 movements), as per the profile provided in Figure 3-13, in addition to vehicle movements associated with the other Martin Place construction sites. The assessment shows there would be no change to the predicted level of service (compared with the assessment in the Environmental Impact Statement) at all key intersections during construction as a result of the additional construction vehicles.

**Table 3-10 Intersection performance – Martin Place with the O’Connell Street site**

Peak period	Base		EIS assessment		With O’Connell Street site	
	Level of service	Degree of saturation	Level of service	Degree of saturation	Level of service	Degree of saturation
<b>Macquarie Street / Bent Street / Eastern Distributor ramps</b>						
AM peak	F	1.25	F	1.27	F	1.25
PM peak	F	1.20	F	1.29	F	1.31
<b>Bent Street / Phillip Street</b>						
AM peak	B	0.61	B	0.74	B	0.68
PM peak	B	0.79	B	0.71	B	0.79
<b>Bent Street / Bligh Street</b>						
AM peak	A	0.33	N/A	N/A	A	0.34
PM peak	A	0.32	N/A	N/A	A	0.33
<b>Loftus Street / Bent Street / O’Connell Street (priority controlled)</b>						
AM peak	A	0.40	N/A	N/A	A	0.40
PM peak	A	0.36	N/A	N/A	A	0.36
<b>Castlereagh Street / Hunter Street / Bligh Street</b>						
AM peak	B	0.48	B	0.45	B	0.58
PM peak	B	0.54	B	0.50	B	0.48
<b>Elizabeth Street / Phillip Street / Hunter Street</b>						
AM peak	B	0.77	B	0.83	B	0.75
PM peak	B	0.73	B	0.81	B	0.74

Note: Level of Service reported for signalised intersections is for the overall intersection.

Note: Outputs from LinSig Version 3.2



Figure 3-14 Martin Place Station construction sites plus the O'Connell Street site

### 3.3.5 Construction noise and vibration

This section provides a revised assessment of construction noise and vibration at the Martin Place Station site with the addition of the O'Connell Street construction site. It also incorporates revisions to the classification of sensitive receiver types near the Martin Place Station and O'Connell Street construction sites (refer to Section 2.6), and the results of the removal of rock breaking at night (refer to Section 9.6).

The following revisions have been made to the sensitive receiver types assessed in the Environmental Impact Statement:

- The Commercial Travellers Association Hotel has been re-classified as a residential receiver given that this receiver provides accommodation
- The ELS Universal English College, located on O'Connell Street, has been re-classified as an educational establishment.

The Channel Seven studio at Martin Place and the Theatre Royal on King Street, were correctly identified and assessed as theatres in the *Technical Working Paper 2: Noise and Vibration*. However, the results were not presented in the summary table as the nearest receivers of this type.

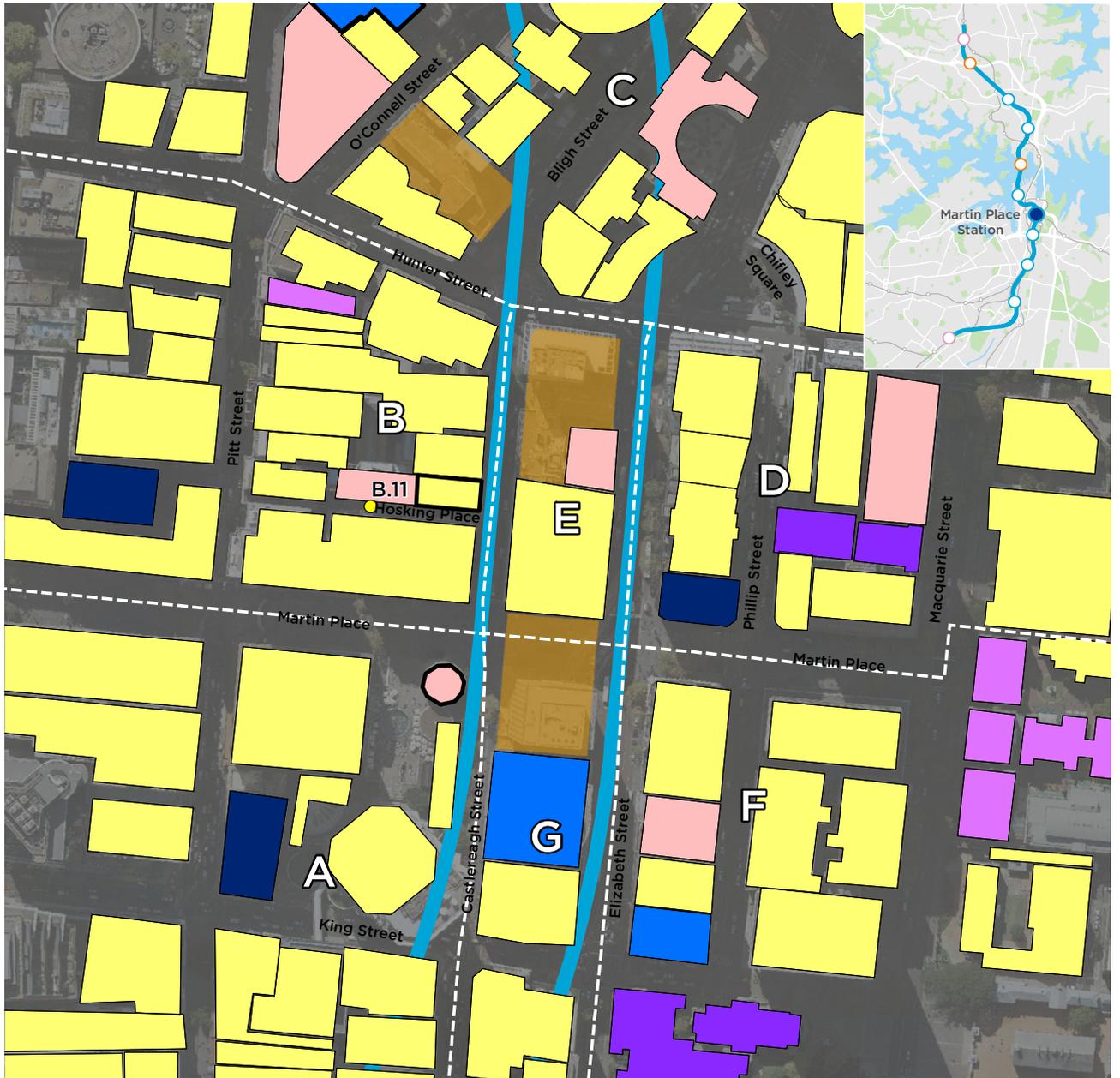
A receiver to the west on Castlereagh Street, which was identified and assessed as a residential receiver in the Environmental Impact Statement, has been clarified as being a commercial receiver with residential at the rear of this property. As the noise criteria (and therefore noise management levels) for commercial receivers are less stringent than what applies to residential receivers, this receiver has not been re-assessed.

The nearest sensitive receivers to the proposed construction sites are shown in Figure 3-15. The construction scenarios assessed are consistent with those assessed in the Environmental Impact Statement.

### Construction airborne noise

A summary of the predicted noise level exceedances at the nearest sensitive receivers is provided in Table 3-11 for each construction scenario. Where predicted noise level exceedances have changed, the results presented in the Environmental Impact Statement are shown in brackets. The construction noise impact assessment indicates that:

- The restriction of rock breaking to standard construction hours during the excavation has removed predicted exceedances of noise management levels at residential receivers in areas A, B and E
- At the Commercial Travellers Association (Area A) there would be a moderate exceedance of the noise management levels of between 10 dB and 20 dB during enabling and earthworks
- For the Theatre Royal in Area A, there would be a moderate exceedance of the noise management levels of between 10 dB and 20 dB during enabling and earthworks. At this location during construction of the acoustic shed, there is predicted to be a minor exceedance of up to 10 dB during the daytime
- There would be a change in impacts at the nearest commercial receivers in Area C:
  - ◆ During enabling and earthworks, high exceedances of the noise management levels of more than 20 dB are predicted (compared to a moderate exceedance predicted in the Environmental Impact Statement)
  - ◆ During construction of the acoustic shed, there is predicted to be a moderate exceedance of the noise management levels of between 10 dB and 20 dB (compared to a finding of compliance with the noise management levels in the Environmental Impact Statement)
  - ◆ During excavation with an acoustic shed there is predicted to be minor exceedances of the noise management levels of less than 10 dB during the daytime period (compared to a finding of compliance with the noise management levels in the Environmental Impact Statement)
- For the educational receiver in Area C, there would be a moderate exceedance of the noise management levels during enabling and earthworks. Minor exceedances of the noise management levels of less than 10 dB are predicted during construction of the acoustic shed
- For the Channel 7 studio in Area D, there would be high exceedances of noise management levels of more than 20 dB for enabling work, earthworks and construction. Exceedances of between 10 dB and 20 dB are predicted at this receiver during the construction of the acoustic shed, and up to 10 dB during excavation (with an acoustic shed).



**KEY**

- Chatswood to Sydenham
- Proposed construction site area
- Receiver area boundary
- Residential
- Other (Worship)
- Updated receiver type
- Commercial
- Other (Education)
- Other (Medical)
- Other (Theatre)
- Monitoring location

Indicative only, subject to design development



Figure 3-15 Location of sensitive receivers near Martin Place Station and O'Connell Street sites

Table 3-11 Predicted noise level exceedances at Martin Place and O’Connell Street sites

Receiver area	Noise modelling scenario								
	Enabling Works	Earthworks	Acoustic shed construction	Excavation with shed				Construction	
	Day	Day	Day	Day	DOOH <sup>2</sup>	Evening	Night	Sleep	
<i>A Commercial Travellers Association (Hotel), west of Castlereagh Street</i>	●	●	●	●	●	●	●	●	●
A Commercial receivers to the west, west of Castlereagh Street and south of Martin Place	●	●	●	●	●	●	●	●	●
<i>A Theatre Royal to the west, west of Castlereagh Street and south of Martin Place</i>	●	●	●	●	●	●	●	●	●
B Residential receivers to the west, west of Castlereagh Street and north of Martin Place	●	●	●	●	●	●	●	●	●
B Commercial receivers to the west, west of Castlereagh Street and north of Martin Place	●	●	●	●	●	●	●	●	●
C Residential receivers to the north, north of Hunter Street	●	●	●	●	●	●	●	●	●
C Commercial receivers to the north, north of Hunter Street	●	●	●	●	●	●	●	●	●
<i>C Educational ELS Universal English College to the north, north of O’Connell Street</i>	●	●	●	●	●	●	●	●	●
D Residential receivers to the east, between Hunter Street and Martin Place	●	●	●	●	●	●	●	●	●
D Commercial receivers to the east, between Hunter Street and Martin Place	●	●	●	●	●	●	●	●	●
<i>D Channel 7 Studio</i>	●	●	●	●	●	●	●	●	●
E Residential receivers between the two construction sites	●	●	●	●	●	●	●	●	●
E Commercial receivers between the two construction sites	●	●	●	●	●	●	●	●	●
F Residential receivers to the south on Elizabeth Street	●	●	●	●	●	●	●	●	●
F Commercial receivers to the east, between King Street and Martin Place	●	●	●	●	●	●	●	●	●
G Educational to the east, between King Street and Martin Place	●	●	●	●	●	●	●	●	●
G Educational receivers to the south, between Castlereagh Street and Elizabeth Street	●	●	●	●	●	●	●	●	●
G Commercial receivers to the south, between Castlereagh Street and Elizabeth Street	●	●	●	●	●	●	●	●	●

Legend

- NML compliance
- NML exceedance of less than 10 dB
- NML exceedance between 10 dB and 20 dB
- NML exceedance of more than 20 dB

Note 1: The results presented in the Environmental Impact Statement are shown in brackets ( )

Note 2: DOOH = Daytime out of hours (i.e Saturdays 1pm to 6pm and Sundays 7am to 6pm)

Note 3: Additional or clarified receiver types are shown in italics.

A recent meeting with 31 Bligh Street identified that specific uses in this building include events, conferences and filming. These particular uses would be considered as part of the Construction Noise Impact Statement process (described in the Sydney Metro Construction Noise and Vibration Strategy (Appendix C of this report)). As part of this process, consultation would be carried out with 31 Bligh Street (in accordance with mitigation measure B11 – refer to Chapter 11 of this report) to identify and develop mitigation measures to manage the specific construction impacts to 31 Bligh Street.

As identified in the Environmental Impact Statement, noise mitigation measures would be implemented, where feasible and reasonable, in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report) to minimise airborne construction noise where exceedances are predicted. Standard mitigation measures that could be implemented include avoiding the coincidence of noisy plant operating simultaneously close together, use of dampened rock hammers, scheduling of noisy activities during less sensitive periods, and considering opportunities in site layouts to provide shielding from noise for receivers.

### **Construction ground-borne noise**

The ground-borne noise analysis of the O’Connell Street site indicates that:

- For the Commercial Travellers Association there would be ground-borne noise levels potentially higher than 55 dBA on one or more floors during the daytime
- There would be a change in impacts for some receivers:
  - ◆ One commercial receiver adjacent to the north on Bligh Street is predicted to have ground-borne noise levels potentially higher than 75 dBA for several floors, which correlates to very high noise management level exceedances of greater than 25 dB
  - ◆ One commercial receiver adjacent to the south on Hunter Street is predicted to have ground-borne noise level exceedances of the noise management levels of 10 dB to 20 dB
  - ◆ One commercial receiver adjacent to the north on O’Connell Street is predicted to have ground-borne noise level exceedances of the noise management levels of up to 10 dB
- The Channel Seven studio is predicted to have ground-borne noise level exceedances of 10 to 15 dB during excavation during the daytime period.

As identified in the Environmental Impact Statement, feasible and reasonable noise mitigation measures would be implemented to minimise ground-borne noise where exceedances are predicted, in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

### **Blasting**

Consistent with the approach taken in the Environmental Impact Statement, blasting has been considered due to the level and duration of ground-borne noise exceedances associated with rock breaking. As rock breaking would only be undertaken during standard construction hours, only the daytime period has been further considered.

Table 3-12 shows the anticipated reduction in the number of times when the noise management levels would be exceeded during the daytime periods while excavation is underway. As shown, the adoption of blasting as an excavation technique would reduce impacts to commercial receivers during the daytime period at all sites. For the Martin Place Station construction site, it would also reduce impacts to residential receivers during the daytime periods.

Table 3-12 O’Connell Street blasting scenarios

Scenario	Number of daytime periods above noise management levels			
	Residential		Commercial	
	No blasting	Blasting plus large rock breaker	No blasting	Blasting plus large rock breaker
Martin Place south	9	3	21	12
Martin Place north	1	0	134	25
O’Connell Street site	0	0	12	8

Further detailed construction planning, through the development of Construction Noise Impact Statements (as required by the Sydney Metro Construction Noise and Vibration Strategy in Appendix C of this report) would determine the exact construction activities with the aim of reducing ground-borne noise impacts to receivers. For example, this could involve the consideration of different sized rock breakers at different periods, and the positioning of rock breakers within the site during different periods.

With careful planning and positioning of the rock breakers it may be possible to avoid consecutive periods of noise management levels exceedances at any one receiver, effectively providing respite periods. For any residual exceedances of the noise management levels, additional mitigation measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

### Construction ground-borne vibration

During construction of the shafts, vibration levels are anticipated to remain well below the vibration screening levels associated with minor cosmetic building damage for all the surrounding buildings except at one commercial building located immediately to the south of the southern shaft (at Martin Place Station construction site), a residential building immediately south of the northern shaft (at the Martin Place Station construction site), and the adjacent building to the north of the shaft at the O’Connell Street site.

A more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for this structure.

### Construction traffic noise

Table 3-13 shows the predicted road traffic noise level on the haul route to and from the O’Connell Street site. This haul route would be in addition to the haul routes to the other Martin Place Station construction site as presented in the Environmental Impact Statement.

On Bent Street (between Macquarie and O’Connell streets) and Bligh Street (between the site exit and Hunter Street) the base noise criterion is predicted to be exceeded. However, the increase would comply with the 2 dB allowance. On O’Connell Street (between Bent Street and the site entry) the base criterion is also predicted to be exceeded and the increase would be above the 2 dB allowance during the night-time period. Therefore, sensitive receivers along this section of O’Connell Street are likely to notice an increase in traffic noise during construction.

While there would likely be an exceedance of the sleep disturbance screening criterion (of up to 9 dB) and the external sleep disturbance noise management level of 65 dBA (by up to 11 dB), the  $L_{Amax}$  levels would be similar to that currently experienced with heavy vehicles using O’Connell Street.

Table 3-13 O’Connell Street site – road traffic noise

Road	Base criteria (dB) day / night (L <sub>Aeq</sub> (15hr / 9hr))	Predicted road traffic noise (dB) day / night	Predicted road traffic noise increase (dB) day / night	RBL + 15 dB screening criterion (dBA)	External L <sub>Amax</sub> NML Level (dBA)	Predicted L <sub>Amax</sub> Noise Level (dBA)
Bent Street	60 / 55	65 / 59	0.2 / 0.4	67	65	68
O’Connell Street	60 / 55	62 / 56	1.0 / 3.8	67	65	76
Bligh Street	60 / 55	67 / 62	0.02 / 0.04	67	65	61

### 3.3.6 Construction land use and property

The O’Connell Street site (known as 33 Bligh Street) is owned by Ausgrid, and has an approval for the construction of a substation and new commercial building. The former building at the site has been demolished under that approval. Transport for NSW is currently in discussions with Ausgrid concerning the temporary lease of the property for construction. This would delay the construction of the approved commercial building until the site has been released by Transport for NSW.

It would also be necessary to acquire stratum below the surface of properties for the construction of the underground tunnel. Under the *Transport Administration Act 1988*, compensation is not payable where stratum is required for the development of underground infrastructure. The introduction of the subsurface stratum, and the tunnel itself, has the potential to limit development above the alignment. However, the majority of the tunnel structure, beyond the footprint of the O’Connell Street site, would be directly below Hunter and Bligh streets. Where it is below existing private property, the tunnel would have a minor impact as it would limit future aboveground development.

### 3.3.7 Construction business impacts

The O’Connell Street site would not substantially alter the impacts on businesses as presented in the Environmental Impact Statement. Additional activities at the site and below ground would potentially increase impacts on surrounding businesses, primarily due to changes in amenity (as construction activities would be closer to new receivers) and increased traffic on the road network. The main impacts would relate to:

- Servicing and delivery access: Potential impacts in this precinct relate to servicing and delivery constraints for businesses as a consequence of increased traffic and the cumulative impacts of construction work from other projects such as the CBD and South East Light Rail where they temporally and geographically overlap. Delays associated with the addition of construction traffic associated with the proposed site are expected to be negligible within this local business precinct
- Customer access and passing trade: The O’Connell Street site is currently an active construction site. While there would be an increase in vehicles accessing or departing the site, and associated additional construction activity, there would be no changes to pedestrian access or visibility of surrounding businesses as a result of this activity

- Noise, vibration and dust: Activities at the proposed site could disturb businesses and the work environment. These impacts would be most noticeable at buildings beside or above the construction activities, and at amenity-sensitive businesses such as outdoor cafes and bars. The impacts would be exacerbated by construction work on other projects nearby. As concluded in the Environmental Impact Statement, the impacts have the potential to have a moderate negative impact on businesses. The impacts would be generally consistent with those assessed in the Environmental Impact Statement
- Property acquisition: The site would be temporarily leased from Ausgrid for the duration of construction of Martin Place Station. As the former building has been demolished, there would be no additional impacts on businesses due to acquisition.

### **3.3.8 Non-Aboriginal heritage**

The former building on the O’Connell Street site has been demolished under an existing approval, and would be excavated to basement level two at the time of transfer to Transport for NSW for construction purposes. Potential impacts on heritage as result of the O’Connell Street site (and underground tunnel) would be associated with indirect impacts (changes to views and vistas) and direct impacts due to vibration. However, impacts on views and vistas of heritage items during construction would not significantly differ from what has occurred.

As the station entry / exit on O’Connell Street would be subject to further design, and delivered by other entities, this assessment has not considered any permanent impacts to views and vistas of nearby heritage items.

#### **Heritage items**

The O’Connell Street site and the construction of the underground pedestrian link would impact, directly or indirectly, on a number of listed heritage items as identified in Table 3-14 and Figure 3-16. Table 3-14 also provides an indication of the potential change in impact from that presented in the Environmental Impact Statement. Further detail on these assessments is provided in Appendix G.

No additional mitigation measures over and above those included in the Environmental Impact Statement for Martin Place Station would be required. In particular, impacts due to vibration would be managed through mitigation measure NAH4 and through the Sydney Metro Construction Noise and Vibration Strategy (refer to Appendix C of this report).

Table 3-14 O'Connell Street site and underground pedestrian link – potential construction impacts on heritage items

Ref	Description	Listing <sup>1</sup>	Heritage significance	Heritage impact and magnitude of the O'Connell Street site	Change in impact, as assessed in the Environmental Impact Statement
MP3	Richard Johnson Square including monument and plinth	LEP	Local	<ul style="list-style-type: none"> <li>Indirect impact: Minor (views and vistas). There may be some minor visual impacts as a result of construction within the O'Connell Street site. These would be temporary.</li> <li>Potential direct impact: Neutral (vibration). The closest façade of this item would not experience vibration above the 7.5 mm/s screening level for cosmetic damage.</li> </ul>	No. However, there would be a minor indirect impact on the permanent structures of Martin Place Station (views and vistas), which would not change as a result of the O'Connell Street construction site.
MP13	AFT House	LEP	Local	<ul style="list-style-type: none"> <li>Indirect impact: Negligible (views and vistas).</li> <li>Potential direct impact: Neutral (vibration). The closest façade of this item would not experience vibration above the 7.5 mm/s screening level for cosmetic damage.</li> </ul>	Not assessed in the Environmental Impact Statement as it was located outside the study area.
MP12	Former NSW Club	SHR, LEP	State	<ul style="list-style-type: none"> <li>Indirect impact: Negligible (views and vistas).</li> <li>Potential direct impact: Minor (vibration). This item would experience vibration above the 7.5 mm/s screening level for cosmetic damage.</li> </ul>	Not assessed in the Environmental Impact Statement as it was located outside the study area.
MP16	Radisson Plaza Hotel	SHR, LEP	State	<ul style="list-style-type: none"> <li>Indirect impact: Negligible (views and vistas).</li> </ul>	Not assessed in the Environmental Impact Statement as it was located outside the study area.
MP15	Public Trust Office	SHR, LEP	State	<ul style="list-style-type: none"> <li>Indirect impact: Negligible (views and vistas).</li> </ul>	Not assessed in the Environmental Impact Statement as it was located outside the study area.
MP14	Manufacturers Mutual Building	LEP	Local	<ul style="list-style-type: none"> <li>Indirect impact: Neutral (views and vistas). There is no direct view line between the O'Connell Street site and the item. There would be no visual impact.</li> </ul>	Not assessed in the Environmental Impact Statement as it was located outside the study area.

Ref	Description	Listing <sup>1</sup>	Heritage significance	Heritage impact and magnitude of the O'Connell Street site	Change in impact, as assessed in the Environmental Impact Statement
MP2	Former Qantas House	SHR, LEP	State	<ul style="list-style-type: none"> <li>Indirect impact: Neutral (views and vistas). There is no direct view line between the O'Connell Street site and the item. There would be no visual impact.</li> </ul>	<p>No.</p> <p>However, there would be a minor indirect impact on the permanent structures of Martin Place Station (views and vistas), which would not change as a result of the O'Connell Street construction site.</p>
MP1	Former City Mutual Life Assurance building, including interior	SHR, LEP	State	<ul style="list-style-type: none"> <li>Indirect impact: Negligible (views and vistas).</li> <li>Potential direct impact: Neutral (vibration). The closest façade of this item would not experience vibration above the 7.5 mm/s screening level for cosmetic damage.</li> </ul>	<p>No.</p> <p>However, there would be a minor indirect impact on the permanent structures of Martin Place Station (views and vistas), which would not change as a result of the O'Connell Street construction site.</p>
MP6	Bennelong Stormwater Channel	Sydney Water S170	Local	<ul style="list-style-type: none"> <li>Potential direct impact: Neutral (vibration). The item would not experience vibration above the 7.5 mm/s screening level for cosmetic damage if construction work is not within 1 metre of the item.</li> </ul>	<p>There would be no change to the impacts assessed in the Environmental Impact Statement, but construction of the Martin Place Station would have a minor direct impact on the stormwater channel.</p> <p>The location of the item relative to the underground tunnel would be confirmed during detailed design.</p> <p>Should construction occur within one metre of the item, and / or present a risk to the item, the potential impacts would be managed in accordance with the existing mitigation measures and the Construction Noise and Vibration Strategy.</p>

<sup>1</sup> SHR: State Heritage Register; s.170: Listing under section 170 (of the Heritage Act 1977); LEP: local environment plan



**KEY**

- Chatswood to Sydenham
- State Heritage Register item
- Proposed construction site area
- LEP Heritage item
- 25 m buffer
- Section 170 heritage item
- Proposed operational area at surface

Indicative only, subject to design development



**Figure 3-16 O'Connell Street site – construction impacts on heritage items**

**Archaeological heritage**

The excavation of the shaft and use of the O'Connell Street site for construction is highly unlikely to impact on non-Aboriginal archaeology. Past activities at the site would have removed any archaeological remains apart from possibly bases of deep wells (Casey and Lowe, 2012a). As the basements have been cut down to around nine metres along Bligh Street at the location of the proposed shaft excavation, it is unlikely that even the remains of deep wells would be preserved.

The underground tunnel would be excavated at depth through bedrock. As there would be no surface impacts outside the footprint of the O'Connell Street site, any archaeological remains associated with Richard Johnson Square, including potential buried remains of a 1793 church, or nineteenth century structures, would not be directly impacted.

### 3.3.9 Aboriginal heritage

A search of the OEH AHIMS site register was conducted on 2 October 2015 during preparation of the Environmental Impact Statement (AHIMS Client ID 193689). No recorded Aboriginal sites are located within the proposed O'Connell Street site or within a 25-metre buffer of the site. The closest previously recorded Aboriginal heritage site (comprising a subsurface archaeological deposit) is about 75 metres north of the proposed Martin Place Station. A site inspection of the proposed construction site indicates that the site is located across a built environment on a gentle – moderate slope down to the west. No areas of surface visibility or intact ground surface were observed.

Construction of the project would not directly impact on any previously recorded Aboriginal heritage sites. In addition, no previously unrecorded Aboriginal heritage sites were identified during the site inspection of the study area.

Previous assessments of the O'Connell Street site also indicate that previous construction on the site included excavation into underlying bedrock. This has therefore removed any archaeological potential at the site and the site is likely to demonstrate low archaeological significance. Further, the underground tunnel would be constructed through bedrock and therefore would not have any potential for Aboriginal heritage sites.

In conclusion, no identified Aboriginal sites or areas of archaeological potential would be impacted by the proposed construction at the O'Connell Street site.

### 3.3.10 Construction landscape character and visual impacts

The O'Connell Street site is an existing construction site. The site extends across part of Richard Johnson Square. The proposed works associated with this project would require additional activities at the site, with additional temporary structures (such as an acoustic shed).

An assessment of the landscape character and visual impacts has been completed in accordance with the methodology and rating systems presented in the Environmental Impact Statement.

#### Landscape impacts

Landscape impacts anticipated during construction and operation are summarised in Table 3-15.

During construction, there would be:

- A minor adverse landscape impact on Richard Johnson Square due to the additional construction activity. This has increased the impact rating from a negligible impact (as assessed in the Environmental Impact Statement), due to the direct impacts associated with the egress point for the construction site
- A minor adverse landscape impact on O'Connell and Bligh streets due to the continued construction activity at the site, which has already commenced under existing approvals.

**Table 3-15 O’Connell Street site – landscape impacts**

Location	Sensitivity rating	Construction impact <sup>1</sup>		Operation impact	
		Modification rating	Impact rating	Modification rating	Impact rating
Richard Johnson Square	Local	Noticeable reduction (no perceived change)	Minor adverse (negligible)	No perceived change	Negligible
O’Connell and Bligh Streets	Local	Noticeable reduction	Minor adverse	N/A	N/A

*Note 1: The modification rating and impact rating in brackets denote the originally assessed impacts as stated in the Environmental Impact Statement.*

**Daytime visual amenity impacts**

The anticipated daytime visual impacts for representative viewpoints during construction and operation are summarised in Table 3-16. Viewpoints 8 to 11 are in addition to those assessed in the Environmental Impact Statement. The additional viewpoints, along with those as presented in the Environmental Impact Statement are provided in Figure 3-17.

During construction, there would be additional visual impacts due to the additional construction activity and infrastructure. However, as work would be a continuation of construction activity at the site and views of construction would be restricted by the surrounding built form, it is not likely to create a perceived change in the amenity of the views assessed. As such, the O’Connell Street site would have a negligible impact on daytime visual amenity for all assessed viewpoints.

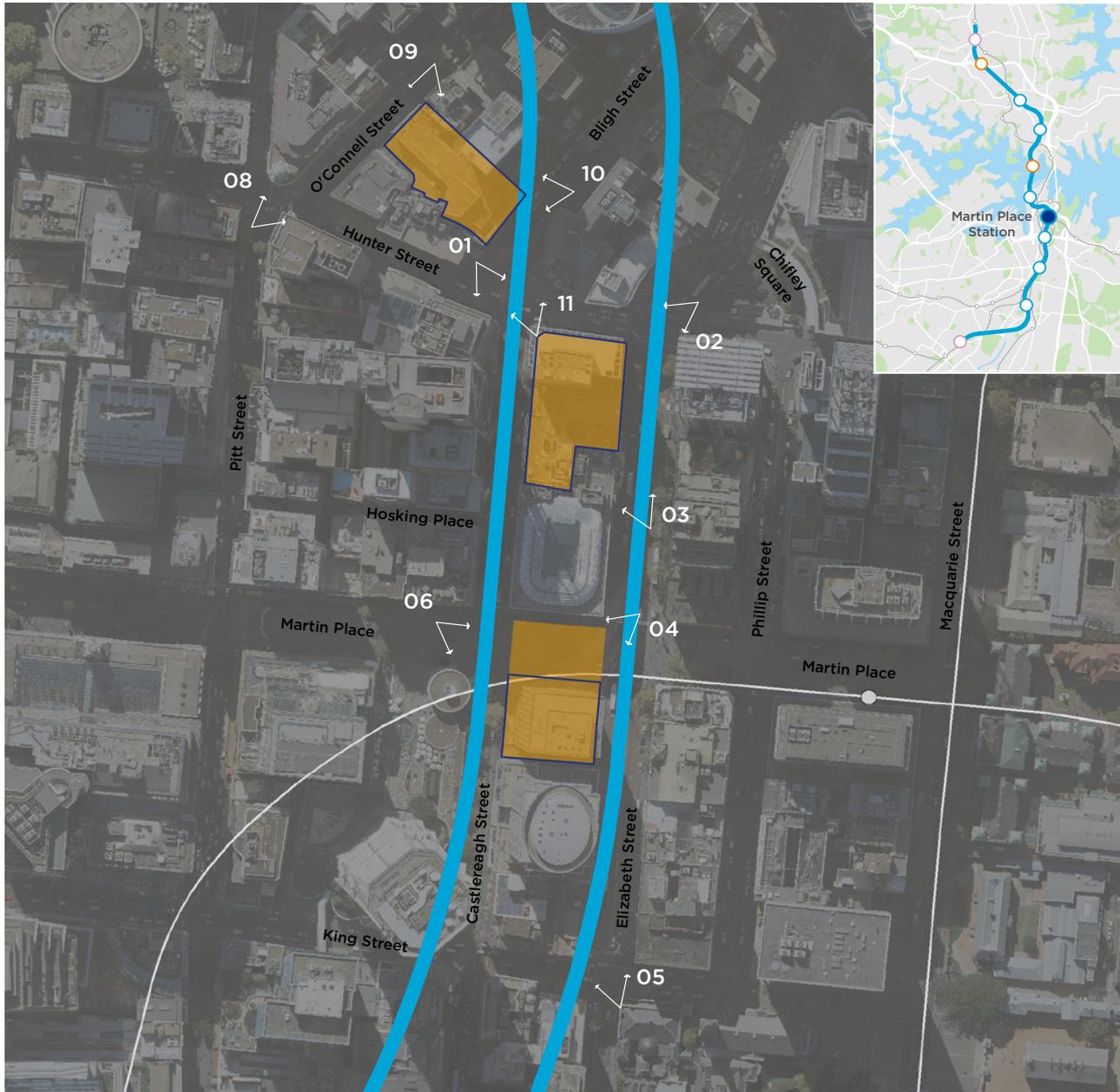
No additional mitigation measures have been identified as the mitigation measures as presented in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) would address the potential impacts where there is an interface with public space areas.

**Night-time visual impacts**

The O’Connell Street site would involve night-time construction and, as such, would create an additional source of lighting at the site and at access / egress points, which would be more brightly lit. However, as indicated in the Environmental Impact Statement, construction would have negligible visual impacts at night-time as this location is already brightly lit.

**Table 3-16 O’Connell Street site – daytime visual impacts**

Location	Sensitivity rating	Construction impact		Operation impact	
		Modification rating	Impact rating	Modification rating	Impact rating
Viewpoint 8: View northeast from the intersection of Hunter, Pitt and O’Connell Streets	Local	No perceived change	Negligible	N/A	N/A
Viewpoint 9: View southwest along O’Connell Street	Local	No perceived change	Negligible	N/A	N/A
Viewpoint 10: View southwest along Bligh Street	Local	No perceived change	Negligible	N/A	N/A
Viewpoint 11: View northwest to Richard Johnson Square	Local	No perceived change	Negligible	N/A	N/A



**KEY**

- Chatswood to Sydenham
- Proposed operational area at surface
- Existing suburban rail
- Proposed construction site area
- Viewpoint location

Indicative only, subject to design development



Figure 3-17 O'Connell Street future pedestrian link – representative viewpoints

### 3.3.11 Operational impacts

The operational impacts associated with the underground link (but not including any longer term pedestrian link) would be essentially the same as assessed in the Environmental Impact Statement.

Impacts associated with the future design and fit-out of the pedestrian underground link would be incorporated into the future architectural design and construction of the new building at 33 Bligh Street, by the developer of that site and would be assessed at that stage.

For completeness and to consider cumulative impacts, Table 3-17 provides an overview of potential impacts during operation of the O’Connell Street future underground pedestrian link.

**Table 3-17 O’Connell Street future underground pedestrian link – potential operational impacts**

Aspect	Consideration
<b>Pedestrians</b>	<p>As indicated in Section 3.3.1, the provision of an underground pedestrian link would reduce pedestrian queuing and congestion at the intersection of Castlereagh Street, Hunter Street and Bligh Street and adjoining footpaths (particularly Hunter Street), and could improve safety with a reduction in informal crossings near this intersection.</p> <p>However, the link would not remove the need to implement mitigation measures identified in the Environmental Impact Statement (such as increasing the green-time per cycle for pedestrians, or widening the pedestrian crossing).</p> <p>The provision of an underground pedestrian link would also improve the operational performance of the station by:</p> <ul style="list-style-type: none"> <li>● Simplifying pedestrian movements at platform level at the northern station entry</li> <li>● Splitting pedestrian demand and reducing congestion at the escalators at the northern station entry.</li> </ul>
<b>Noise and vibration</b>	<p>An additional station entry, and the plant required to operate the pedestrian link, would introduce additional noise sources. It is expected that the future assessment, based on the design of the entry, would provide an assessment of potential noise impacts on nearby sensitive receivers, which include the nearby Radisson Hotel. However, it is expected that the applicable criteria under the <i>Industrial Noise Policy</i> (EPA, 2000) would be achieved through the use of appropriate noise attenuation measures such as equipment selection, position of plant and ventilation discharges, in-duct attenuators and acoustic enclosures.</p>
<b>Property and land use / business impacts</b>	<p>An additional station entry would have implications for the existing project approval for 33 Bligh Street. As indicated above, Transport for NSW is liaising with Ausgrid to ensure appropriate planning and legal mechanisms are in place to facilitate the future provision of this entry. Importantly, the future provision of a station entry at this location would have direct benefits for the future commercial building and surrounding land uses, including hotels, due to the opportunities afforded by the more direct station connection.</p>
<b>Non-Aboriginal heritage</b>	<p>As noted in Section 3.3.8, there are a number of built heritage items near the future station entry / exit on O’Connell Street. The urban design of the station entry, within the context of the approved project approval at the site, would need to consider potential impacts on views and vistas to the adjoining and nearby items. However, the site has an existing approval for a new development, and the provision of a station entry within the built form of the site is unlikely to significantly alter the predicted heritage impacts on nearby items.</p>
<b>Landscape character and visual impacts</b>	<p>An additional station entry / exit on O’Connell Street would introduce a new element within the streetscape. The design of the additional station would be subject to further design work and would consider integration with the future development of the site, as well as the potential landscape character and visual impacts of the station entry.</p>

## 3.4 Waterloo Station – revised footprint

### 3.4.1 Description

Ongoing design work has identified the need for a larger excavation at Waterloo Station to accommodate the structure required to tank the station (tanking is required to inhibit the inflow of groundwater). This has resulted in the need for additional land to the east and the west, including:

- Demolition of the toilet block and the permanent acquisition of a small portion of land at the back of the Waterloo Congregational Church. Temporary toilets would be provided for church patrons for the duration of construction, and permanent toilets would be reinstated following construction. The permanent toilets would be built to at least the equivalent standard as the current toilets and in consultation with the owner. Any temporary or permanent reinstatement of fabric at the rear of the item would be sympathetic to the heritage values and architectural form of the building.
- Incorporation of the footpath and parking lane on the western side of Cope Street into the Waterloo Station construction site, for the duration of construction.

This change would also provide the opportunity for an additional access and egress point for construction vehicles, directly from Cope Street.

Construction associated with the tanking of the station box would also require rock anchors to be placed directly under the church.

The revised indicative construction layout for Waterloo Station is provided in Figure 3-18.

Rock breaking associated with station excavation would also no longer be carried out during standard construction hours. The assessment of that change is presented in Section 9.6.



Figure 3-18 Revised Waterloo Station construction site - indicative location and layout

### 3.4.2 Environmental screening assessment

To understand the potential change in environmental impacts compared to those assessed in the Environmental Impact Statement, a screening assessment was conducted and is presented in Table 3-18. This assessment considers potential environmental aspects that may require further impact assessment to understand likely environmental impacts, and identify any relevant mitigation measures that may be required.

**Table 3-18 Waterloo Station revised footprint – environmental screening assessment**

Aspect	Potential change in impacts	Description
Construction traffic and transport	Yes	The revised footprint of Waterloo Station would result in the temporary closure of the footpath and western carriageway (parking lane) on the western side of Cope Street. A further assessment is provided in Section 3.4.3.
Operational traffic and transport	No	The revised footprint of Waterloo Station would not change the station layout. No further assessment is considered necessary.
Construction noise and vibration	Yes	The addition of an access and egress point for construction vehicles on Cope Street may alter the construction traffic noise impacts. Construction work associated with the tanking of the station box would also require rock anchors to be placed directly under the church, which have the potential for ground-borne noise and vibration impacts. A further assessment is provided in Section 3.4.4.
Operational noise and vibration	No	The revised footprint of Waterloo Station would not change the station layout or the transport integration arrangements. No further assessment is considered necessary.
Land use and property	No	Although some additional land would be required to construct Waterloo Station, including the permanent acquisition of a strip of land from the Congressional Church and temporary occupation of road space, there would be no significant changes to land use. No further assessment is considered necessary.
Business impacts	No	The revised footprint of Waterloo Station would not lead to impacts on additional businesses. No further assessment is considered necessary.
Non-Aboriginal heritage	Yes	The revised footprint of Waterloo Station would result in additional impacts on the Congressional Church on Botany Road. A further assessment is provided in Section 3.4.5.
Aboriginal heritage	No	The revised footprint of Waterloo Station would not impact any additional Aboriginal heritage items and would not change the archaeological potential or significance identified in the Environmental Impact Statement. No further assessment is considered necessary.

Aspect	Potential change in impacts	Description
Landscape character and visual amenity	Yes	The revised footprint of Waterloo Station would result in the construction site shifting towards the east and encompassing the footpath and parking lane of Cope Street. A further assessment is provided in Section 3.4.6.
Groundwater and geology	No	The revised footprint of Waterloo Station would not change the ongoing inflow of groundwater. No further assessment is considered necessary.
Soils, contamination and water quality	No	The revised footprint of Waterloo Station would not change the potential soils, contamination or water quality impacts. No further assessment is considered necessary.
Social impacts and community infrastructure	Yes	The demolition of the Congressional Church toilets may result in additional temporary social and community infrastructure impacts. A further assessment is provided in Section 3.4.7.
Biodiversity	No	The revised footprint of Waterloo Station would not result in any additional biodiversity impacts. No further assessment is considered necessary.
Flooding and hydrology	No	The revised footprint of Waterloo Station would not be located on flood-prone land and would not alter existing stormwater systems. No further assessment is considered necessary.
Air quality	No	The revised footprint of Waterloo Station would not result in any additional air quality impacts. No further assessment is considered necessary.
Hazard and risk	No	The revised footprint of Waterloo Station would not change the storage and use of any additional hazardous substances and dangerous goods, or be located within a bushfire prone area. No further assessment is considered necessary.
Waste management	No	The revised footprint of Waterloo Station would result in a minor increase in the volume of spoil generated, but it would not result in the generation of any different waste materials or a change in the management approach. No further assessment is considered necessary.
Sustainability	No	The revised footprint of Waterloo Station would not change the climate risk profile of the project, and would not result in a substantial change to the generation of greenhouse gases or the use of resources. No further assessment is considered necessary.
Cumulative impacts	No	The revised footprint of Waterloo Station would not result in any additional cumulative impacts. No further assessment is considered necessary.

### 3.4.3 Construction traffic and transport

The revised footprint at Waterloo Station would result in the temporary closure of the footpath on the western side of Cope Street between Raglan Street and Wellington Street and the temporary occupation of the western carriageway of Cope Street.

#### Active transport network

The closure of the footpath on the western side of Cope Street would require pedestrians to use alternative facilities. Depending on their origin and destination, pedestrians would be able to use the existing footpath on the eastern side of Cope Street or the footpaths on Botany Road. Given the existing low pedestrian volumes, the impact of increased pedestrian activity on these alternative footpaths is expected to be minimal. Consistent with mitigation measure T3 (refer to Chapter 11 Revised environmental mitigation measures and environmental performance outcomes) directional signage would be used to direct and guide pedestrians past the construction site and to the alternative facilities available.

#### On-street parking

On-street parking on the western side of Cope Street consists of around 18 unrestricted long term spaces. It is likely demand for these spaces is generated mainly by the adjoining businesses in Cope Street, with some demand from nearby residential and commercial land uses. The removal of these on-street parking spaces is expected to have a minimal impact as:

- It is proposed to demolish the existing buildings (and hence the businesses would be removed) within the block bounded by Raglan Street, Cope Street, Wellington Street and Botany Road
- There is alternative long term residential on-street parking on adjacent streets including Raglan Street (east of Cope Street), Wellington Street (east of Cope Street) and Cooper Street.

#### Road network performance

The revised footprint would not change the proposed haul routes or the construction vehicle numbers associated with construction of Waterloo Station. Cope Street is designated as a proposed primary inbound haulage route in the Environmental Impact Statement. The proposed site access in Cope Street means that construction vehicles would use Cope Street for outbound trips as well as inbound trips. As such, there would be no potential change to the intersection performance assessed in the Environmental Impact Statement.

### 3.4.4 Construction noise and vibration

This section provides an assessment of construction noise and vibration associated with the revision to the Waterloo Station footprint. The assessment of the removal of rock breaking at night is provided in Section 9.6.

While the revised footprint would reduce the setback to residential properties along Cope Street, it would unlikely result in a change in impact at these receivers given the marginal revision of the footprint.

### Construction noise

The installation of tanking and rock anchors would result in additional ground-borne noise and vibration impacts on the Waterloo Congregational Church. Vibration is predicted to exceed the screening level of 7.5 mm/s at the rear of the church. A more detailed assessment of this structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for these structures.

Internal ground-borne noise levels from piling and the installation of rock anchors are predicted to be up to 50 dB within the church. These levels exceed the noise management level by up to 10 dB. Exceedances of the ground-borne noise management levels of between 10 dB to 20 dB at the church are predicted in the Environmental Impact Statement due to other construction activity at the Waterloo Station construction site. Feasible and reasonable measures would be implemented in accordance with Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) and the Sydney Metro Construction Noise and Vibration Strategy to minimise ground-borne noise where exceedances are predicted.

### Traffic noise

Cope Street and Wellington Street were identified as haulage routes and the provision of an access / egress point directly on Cope Street would not change the distribution of construction vehicles using this road. The predicted LAeq increase and sleep disturbance noise levels for Cope Street and Wellington Streets are presented in Table 3-19.

The predicted noise levels would comply with the base criteria on Cope Street. On Wellington Street, the base criterion would be exceeded and there would be an exceedance of the 2 dB allowance. Therefore, receivers on Wellington Street and potentially Cope Street are likely to notice an increase in traffic noise.

There would be an exceedance of the sleep disturbance screening criterion (by up to 22 dB) and external sleep disturbance noise management levels of 65 dBA (by up to 11 dB). Wellington and Cope streets are both local roads with limited night-time traffic movements, so there would be a risk of sleep disturbance from construction traffic.

Unless compliance with the relevant traffic noise criteria can be achieved night-time heavy vehicle movements would be restricted to the use of Botany Road and Reglan Street. This is reflected in an updated mitigation measure – NV2 presented in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes).

**Table 3-19 Waterloo Station – road traffic noise on Cope Street and Wellington Street**

Road	Base criteria (dB) day / night (L <sub>Aeq</sub> (15hr / 9hr))	Predicted road traffic noise (dB) day / night	Predicted road traffic noise increase (dB) day / night	RBL + 15 dB Screening criterion (dB)	External L <sub>Amax</sub> NML level (dBA)	Predicted L <sub>Amax</sub> noise level (dBA)
Wellington Street	55 / 50	57 / 52	2.9 / 7.9	54	65	76
Cope Street	55 / 50	53 / 50	N / A <sup>1</sup>	54	65	74

<sup>1</sup> Existing traffic flows are not available for Cope Street

### 3.4.5 Non-Aboriginal heritage

Waterloo Congregational Church is listed as a local heritage item on Sydney Local Environmental Plan 2012. Heritage information on the Office of Environment and Heritage register identifies the significance of the building as follows:

*The Gothic church of rendered brick construction was constructed in 1883 to replace the congregation chapel built in 1865. The symmetrical design of the façade demonstrates high quality architectural traits of the building. It is one of the earliest worship venues in Waterloo.*

The recommended management measures for the item are:

*The building should be retained and conserved. A Heritage Assessment and Heritage Impact Statement, or a Conservation Management Plan, should be prepared for the building prior to any major works being undertaken. There shall be no vertical additions to the building and no alterations to the façade of the building other than to reinstate original features. The principal room layout and planning configuration as well as significant internal original features including ceilings, cornices, joinery, flooring and fireplaces should be retained and conserved. Any additions and alterations should be confined to the rear in areas of less significance, should not be visibly prominent and shall be in accordance with the relevant planning control*

The impacts of the revised station footprint on this heritage item are outlined below. The updated heritage impact assessment for the church is presented in Appendix G.

#### **Direct impact – partial demolition**

There would be a direct impact on Waterloo Congregational Church due to the demolition of the toilet block.

The toilet block appears (from construction material and design) to be a more recent addition to the church. It is located at the rear of the church building, and is accessed via two separate doors from the annex. It is not visible from the street. The toilets are not original or significant elements, unlike the front façade and internal original features of the main church building. Demolition of the toilet block would have some physical impact on the rear façade of the annex, where the block is directly connected to the annex.

Prior to the removal of the toilet block, temporary facilities would be provided for the church community on a portion of the adjacent construction site. These facilities would not result in any direct impacts on the item.

Impacts on the fabric of the rear of the item are expected to be moderate in localised areas where brickwork, render or other structural features would be removed to facilitate demolition of the toilet block and relocation of services. The level of physical impact would depend on the structural and utility connections between the toilet block and the annex wall, which would require further investigation prior to the demolition of the structure. However, as the toilet block is not a significant or contributory feature of the heritage item, its removal would have a minor to moderate heritage impact, depending on the extent of impact on the fabric of the annex wall.

Impacts on the fabric of the annex wall would be minimised during demolition of the toilet block.

Once construction is completed, permanent toilets would be reinstated. Details of the location and design of these toilets would be discussed with the owner, but they would be reinstated to at least the equivalent standard as the current toilets. Any temporary or permanent reinstatement of fabric at the rear of the item would be sympathetic to the heritage values and architectural form of the building. A heritage impact statement would also be prepared prior to the permanent reinstatement of toilets.

An archival recording of the item would be completed in accordance with mitigation measure NAH1 prior to the demolition of the toilet block. The mitigation measure has been amended to include this item within the list of locations as provided in NAH1.

### Direct impact – acquisition of heritage curtilage

There would be a direct impact on Waterloo Congregational Church due to the acquisition of a small portion of the property at the rear to enable the station box to be tanked.

This would have a permanent impact on the heritage curtilage of the item, which aligns with the property boundary. This impact on curtilage would be minor and would not impact the aesthetic or representative values of the item as a whole.

### Potential direct impact – vibration

There would be a potential direct impact on Waterloo Congregational Church due to vibration during construction associated with the tanking of the station box, which would also involve piling activities closer to the church, and the installation of rock anchors directly under the church. Vibration from this activity would be above the screening criterion and mitigation measures would be implemented as provided in the Environmental Impact Statement.

## 3.4.6 Landscape character and visual amenity

The revised footprint at Waterloo Station would result in the following changes to visible elements at the construction site:

- The footprint of the 15-metre-high section of the acoustic shed would be enlarged to the east by around four metres, to include the western footpath and on-street parking on Cope Street
- The footprint of the 6.5-metre-high sections of the acoustic shed would be enlarged to the east by around 0.5 metres
- There would be an additional construction vehicle access and egress point on Cope Street
- The western footpath would be temporarily closed and on-street car parking on the western side of Cope Street would be removed.

An assessment of the landscape character and visual impacts has been completed in accordance with the methodology and rating systems as identified in Chapter 16 (Landscape character and visual amenity) of the Environmental Impact Statement.

### Landscape impacts

Landscape character impacts anticipated during construction are summarised in Table 3-20.

During construction there would be a minor adverse impact on Cope Street due to the addition of a construction access and egress point and the loss of the footpath. This impact has increased from a negligible impact, as assessed in the Environmental Impact Statement.

**Table 3-20 Waterloo Station – landscape impacts**

Location	Sensitivity rating	Construction impact	
		Modification rating	Impact rating
Cope and Wellington streets	Neighbourhood	Considerable reduction (noticeable reduction) <sup>1</sup>	Minor adverse (Negligible) <sup>1</sup>

*Note 1: The modification rating and impact rating in brackets denote the originally assessed impacts as stated in the Environmental Impact Statement.*

### Daytime visual amenity impacts

The anticipated daytime visual impacts for representative viewpoints during construction and operation are summarised in Table 3-21. Viewpoints 4 and 5 have the potential to be altered by the revised footprint.

Overall, the project would result in a negligible visual impact during construction. This assessment remains unchanged from the Environmental Impact Statement as the character and extent of work seen in this view would be generally consistent with that previously assessed. During construction, the following impacts are expected:

- The acoustic shed would be prominent in much of the middle ground of viewpoint 4 and would be closer to receivers; the acoustic shed would also be prominent in the view at viewpoint 5
- The character of construction work would reinforce the visual contrast with the adjacent, leafy residential area. The work would include a larger footprint, bring the construction activity closer to the viewer, and construction vehicles would be introduced into Cope Street. This would result in a considerable reduction in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a minor adverse visual impact during construction. This would represent a minor increase in the impact assessment presented in the Environmental Impact Statement.

**Table 3-21 Waterloo Station – daytime visual impacts**

Location	Sensitivity rating	Construction impact	
		Modification rating	Impact rating
<b>Viewpoint 4: View southwest from the corner of Cope and Raglan Street</b>	Neighbourhood	Noticeable reduction (noticeable reduction) <sup>1</sup>	Negligible (negligible) <sup>1</sup>
<b>Viewpoint 5: View south from Cope Street</b>	Neighbourhood	Considerable reduction (noticeable reduction) <sup>1</sup>	Minor adverse (negligible) <sup>1</sup>

*Note 1: The modification rating and impact rating in brackets denote the originally assessed impacts as stated in the Environmental Impact Statement.*

### Night-time visual impacts

The Waterloo Station construction site would involve night-time work, which would create an additional source of lighting. However, lighting impacts would be no greater than those provided in the Environmental Impact Statement.

## 3.4.7 Social impacts and community infrastructure

The toilet block at the Waterloo Congregational Church provides amenities for the church community. They are accessed through the annex at the rear of the main church building. Temporary toilets would be installed prior to the demolition of the church toilets, and would be accessed via an existing door in the annex. The provision of temporary toilets would minimise the impacts on the church community, but may still cause an inconvenience. The church pastor would be consulted concerning the provision of temporary toilets, as well as the reinstatement of amenities following the completion of construction. Any reinstatement would ensure that the functionality of the building is not impacted.

The loss of parking and a footpath on the western side of Cope Street would cause disruption to the surrounding community. As discussed in Section 3.4.3, pedestrians would be able to use the footpath on the eastern side of Cope Street or the footpaths on Botany Road, and changes to car parking availability for the community are likely to be minimal. Mitigation measures provided in Chapter 11 (Revised environmental mitigation measures and environmental performance outcomes) would be implemented to manage any disruption to pedestrian connectivity.

## 3.5 Additional heritage investigations

Since exhibition of the Environmental Impact Statement, the following additional investigations have been carried out:

- Historical Archaeological Research Design (ARD), which is included as Appendix H
- Aboriginal Cultural Heritage Assessment Report (ACHAR), which is included as Appendix I.

These investigations effectively bring forward commitments made in the Environmental Impact Statement. The Archaeological Research Design fulfils the requirement of Environmental Impact Statement mitigation measure NAH2. The Aboriginal Cultural Heritage Assessment Report fulfils the requirement of Environmental Impact Statement mitigation measures AH1 and AH2.

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