Electrical substations

Six above ground substations would be constructed for the project. The construction methodology for these facilities would typically involve:

- Excavation, footing and base slab installation
- Construction of concrete blockwork and/or precast walls and installation of roofing
- Installation of architectural treatments and façade systems
- Installation of in-ground services
- Internal fitout and commissioning of electrical infrastructure
- Landscaping.

Fire pump rooms

Three fire pump rooms would be constructed for the project. The construction methodology for these facilities would typically involve:

- Excavation, footing and base slab installation
- Construction of fire deluge tanks
- Construction of concrete blockwork walls and precast walls for tank enclosure
- Installation of roofing
- Installation of architectural treatments and façade systems
- Installation of in-ground services
- Internal fitout and commissioning of fire pump infrastructure
- Landscaping.

6.4.8 Finishing works

Finishing works would be undertaken towards the completion of construction and would include:

- Line marking of new road surface
- Erection of directional signage and other roadside furniture such as street lighting
- Erection of toll gantries and other control systems
- Landscaping works
- Site demobilisation and rehabilitation of temporary construction ancillary facilities.

6.5 Construction ancillary facilities

6.5.1 Overview

Ten construction ancillary facilities would be required as part of the project. These would include locations for roadheader launch and support, earthworks support and workforce amenities.

The indicative construction footprint and construction ancillary facilities are shown in overview in **Figure 6.2** to **Figure 6.8**. **Table 6.5** outlines the proposed construction ancillary facilities and their uses during the construction of the project. Details of each of these facilities are provided in the following sections.

Table 6.5 Proposed construction ancillary facilities and indicative activities

No.	Site	Temporary facilities									Permanent facilities						
		Site offices	Staff and workforce amenities	Stores and laydown	Workshop/maintenance	Tunnel launch & support	Tunnel spoil management	Construction water treatment plant	Sedimentation pond	Parking	Ventilation facility	Fresh air supply facility	Substation	Motorway operations complex	Workshop facilities/bulky equipment store	Operational water treatment facility	Fire pump room and water tanks
C1	Homebush Bay Drive civil site	✓	✓	✓	✓				✓	✓				✓	✓		
C2	Pomeroy Street civil site	✓	✓	✓					✓	✓							
C3	Underwood Road civil and tunnel site	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓
C4	Powells Creek civil site	✓	✓	✓					✓	✓							
C5	Concord Road civil and tunnel site	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓				
C6	Cintra Park tunnel site	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	
C7	Northcote Street tunnel site	✓	✓	✓	✓	✓	✓	✓	✓	✓							
C8	Eastern ventilation facility site	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓
C9	Wattle Street and Walker Avenue civil site	✓	✓	✓	✓					✓							
C10	Parramatta Road civil site	✓	✓	✓	✓			✓	✓	✓							

The layout and access arrangements for the construction ancillary facilities are based on the concept design only and would be confirmed and refined during detailed design. The final construction site layouts and access arrangements would have regard to the following amenity criteria:

- Where practicable, temporary buildings and structures (such as offices and amenities) would be used to provide a noise barrier between the construction site and adjacent sensitive receivers
- The location of temporary buildings and structures would have regard to overlooking and overshadowing impacts on adjacent sensitive receivers
- Where feasible and reasonable, acoustic sheds would be provided to enclose noise-generating activities that would be undertaken outside standard construction hours
- Lighting would be designed to minimise light spill onto adjoining properties
- Spoil stockpiles would be located away from adjacent sensitive receivers where possible
- Appropriate erosion and sediment controls would be incorporated
- Vehicle access points and internal circulation roads would be located away from adjacent sensitive receivers
- Vehicle access points would have ready access to the arterial road network and would minimise the need for heavy vehicles to travel on local roads through residential areas
- Construction sites would provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours.

Construction ancillary facility site establishment works would involve the following:

- Demolition and clearing of vegetation
- Utility connections to serve construction activities
- Construction of compound buildings, including storage sheds, staff and workforce amenities and offices
- Traffic control works and construction of site entry and exit points for use during construction
- Construction of internal access roads and hardstand areas
- Installation and construction of fencing, lighting, signage, and temporary works (eg drainage and erosion and sedimentation controls).

During site establishment, all vehicles would enter and exit the sites discussed in the following sections from existing access points, until the new construction entry and exit points as described below are constructed and operational.

6.5.2 Homebush Bay Drive civil site (C1)

The Homebush Bay Drive civil site would be located on the northern side of the existing M4, near the Homebush Bay Drive interchange on Roads and Maritime and TransGrid owned land. The site currently comprises vacant vegetated space within the M4 road reserve as well as adjacent land.

The site would support surface works to widen the existing M4, replace the Saleyards Creek bridge and construct new bridges as part of the Homebush Bay Drive interchange. The site would include site offices, staff and workforce amenities, workshop, stockpiles and laydown areas, erosion and sedimentation controls as prescribed in *Managing Urban Stormwater – Soils and Construction*, Volume 1, 4th Edition (NSW Government 2004) (the Blue Book), and car parking. The site would also operate as a surface spoil handling facility. During subsequent stages, when the spoil handling facility is no longer required, the permanent motorway operations complex would be constructed in this location.

For the initial stage of construction, vehicle access and egress would be to and from the M4 and the Homebush Bay Drive eastbound on-ramp on their existing alignment. A construction access road, with acceleration and deceleration lanes in accordance with Austroads guidance, would be built within the construction footprint to provide access from the M4.

Once the Homebush Bay civil site is established, a construction site haul road would link to the Pomeroy Street and Underwood Road civil sites (C2 and C3).

Following progression of the staged construction works, eastbound traffic would be realigned onto the permanent roadworks. At this time, access to the Homebush Bay civil site would be modified to suit the new alignment of the eastbound carriageway of the M4 and the realigned Homebush Bay Drive on-ramp, including access via the permanent access road to the motorway operations complex. It is not the intention for construction vehicles entering this site to cross existing carriageways of the M4 or future new alignments.

An indicative construction site layout for the Homebush Bay Drive civil site is shown in **Figure 6.9**. The construction activities program relevant to the site is outlined in **Table 6.6**.

Table 6.6 Homebush Bay Drive civil site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
M4 initial road works and traffic management		■														
Site establishment		■	■													
M4 road and bridge works		■	■	■	■	■	■	■	■	■	■	■	■			
Mechanical and electrical fitout works							■	■	■	■	■	■				
Motorway operations complex construction and fitout						■	■	■								
Site rehabilitation and landscaping								■	■	■	■	■				

6.5.3 Pomeroy Street civil site (C2)

The Pomeroy Street civil site would be used for construction of the dive structures and cut-and-cover tunnel sections, and adjustments to the Pomeroy Street footbridge northern approach. The site would also be used to support construction of the western ventilation facility, which would be located over the cut-and-cover tunnel sections adjacent to the Underwood Road civil site. The site currently comprises Bill Boyce Reserve which is owned by Strathfield Council.

The site would include staff and workforce amenities, laydown and storage areas, and car parking. Temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

An indicative construction site layout for the Pomeroy Street civil site is shown in **Figure 6.10**. The construction activities program relevant to the site is outlined in **Table 6.7**. Access and egress to and from the site would be via a temporary access road constructed within the road reserve from the Homebush Bay Drive civil site. Access and egress for light vehicles would be provided to and from Pomeroy Street.

Following completion of construction activities, the Pomeroy Street civil site would be rehabilitated and landscaped, and returned to use as a public reserve.

Table 6.7 Pomeroy Street civil site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
M4 initial road works and traffic management		■														
Site establishment		■	■													
Road works		■	■	■	■	■	■	■	■	■	■	■				
Dive structure and cut-and-cover works			■	■	■	■	■	■	■	■						
Western ventilation facility							■	■	■	■	■					
Mechanical and electrical fitout works							■	■	■	■	■	■				
Landscaping of cut-and-cover sections							■	■	■							
Site rehabilitation and final landscaping										■	■	■				

Figure 6.9 Indicative Homebush Bay Drive civil site layout (C1)

Figure 6.10 Indicative Pomeroy Street civil site layout (C2)

6.5.4 Underwood Road civil and tunnel site (C3)

The Underwood Road civil and tunnel site would be split into three areas:

- Underwood Road west civil site, located on the western side of Underwood Road, just north of the existing M4 viaduct
- Underwood Road east civil site, located on the eastern side of Underwood Road, just north of the existing M4 viaduct
- Underwood Road tunnel site, located on the southern side of Allen Street, just north of the existing M4 viaduct.

The site currently comprises a residential area containing 17 residential properties and one community facility (guide hall), as well as road infrastructure and the existing M4 corridor, and vegetation.

An indicative construction site layout for the Underwood Road civil and tunnel site is shown in **Figure 6.11**.

Underwood Road east and west civil sites

Initially the Underwood Road civil sites would be dedicated to activities associated with cut-and-cover tunnel construction including spoil management. The west civil site would also support construction of the western ventilation facility.

Temporary declines would be provided at both the Underwood Road civil sites for access to the cut-and-cover tunnel, along with spoil stockpiles at each site. The Underwood Road east site would also include a water treatment plant, erosion and sedimentation controls (eg ponds, curtains, fencing), staff amenities, storage containers and limited car parking. Temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

The Underwood Road civil sites would be accessed from Short Street East via Parramatta Road and Underwood Road. Vehicles accessing both the east and west sites would enter the Underwood Road west site first, via a left turn from Short Street East. Vehicles would then either exit the west civil site by turning right onto Underwood Road, or cross Underwood Road to enter the Underwood Road east civil site. Vehicles would exit the Underwood Road east civil site by turning left onto Underwood Road. Temporary traffic signals would be provided to control these movements.

Following completion of construction, the Underwood Road west civil site above the cut-and-cover tunnel would accommodate the western ventilation facility. The Underwood Road east civil site above the cut-and-cover tunnel would be rehabilitated and landscaped. The future use of the remainder of the Underwood Road civil sites would be subject to separate assessment and/or planning approval. In the meantime, the sites would be rehabilitated and stabilised with a vegetated groundcover.

Underwood Road tunnel site

The Underwood Road tunnel site would be a low volume tunnel excavation site accessed through a vertical shaft. It would operate independently of the Underwood Road civil sites. Construction work at the Underwood Road tunnel site would include:

- Excavation of a construction access shaft connecting to the eastbound and westbound tunnels
- Support for tunnel excavation works, including workshop, storage and laydown areas, power supply, ventilation, water supply, water treatment plant, workforce facilities and limited car parking
- Removal of spoil (refer to **section 6.9**)
- Construction of permanent operational facilities.

Figure 6.11 Indicative Underwood Road civil and tunnel site layout (C3)

Roadheaders would be launched from this site and would excavate the tunnels primarily in an easterly direction. An acoustic shed would be established on the site to minimise noise from out of hours tunnelling (refer to **section 6.7.2**). In addition, temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

Access to and egress from the site would be via the Underwood Road west civil site, which is accessed via the Underwood Road east civil site, as described above. No vehicles would use Ismay Avenue or Allen Street to access the tunnel site.

Following tunnel construction the permanent operational facilities would be constructed on part of the Underwood Road tunnel site, including a substation, fire pump room and water tanks.

The construction activities program relevant to the site is outlined in **Table 6.8**.

Table 6.8 Underwood Road civil and tunnel site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■														
Shaft construction		■	■													
Tunnel excavation				■	■	■	■									
Road works		■	■	■	■	■	■	■								
Dive structure and cut-and-cover works			■	■	■	■	■	■	■	■						
Water tanks, pump rooms and substation							■	■	■	■	■					
Mechanical and electrical fitout works								■	■	■	■					
Site rehabilitation and landscaping												■				

6.5.5 Powells Creek civil site (C4)

The Powells Creek civil site would be located on the northern side of Parramatta Road, immediately to the west of Powells Creek on land owned by Strathfield Council. The site currently comprises vacant land that is proposed to be remediated by council to address previous contamination (prior to work starting on the project) and returned to use as public reserve as part of the Powells Creek Masterplan prepared by Strathfield Council.

The site would support surface works to construct the new Powells Creek on-ramp to connect to the existing M4 westbound. The site would include staff and workforce amenities, limited parking, and storage and laydown areas. Access to and egress from the site would be via Parramatta Road, Powell Street and Underwood Road (between Powell Street and Parramatta Road).

Following completion of construction activities, the Powells Creek civil site would be rehabilitated and landscaped as part of the project, and returned to use as a public reserve.

An indicative construction site layout for the Powells Creek civil site is shown in **Figure 6.12**. The construction activities program relevant to the site is outlined in **Table 6.9**.

Table 6.9 Powells Creek civil site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■	■													
Initial works and traffic management			■	■	■											
Road works – Parramatta Road and M4			■	■	■	■										
Powells Creek on-ramp bridge works			■	■	■	■										
Final signals and road surfacing						■										
Site rehabilitation and landscaping						■	■									

Figure 6.12 Indicative Powells Creek civil site layout (C4)

6.5.6 Concord Road civil and tunnel site (C5)

The Concord Road civil and tunnel site would be split into three areas:

- Concord Road west civil site, located on the isolated land parcels between Concord Road, Sydney Street and the M4, and between Concord Road, Sydney Street and Carrington Lane
- Concord Road south civil site, located on the eastern side of Concord Road immediately adjacent to the M4 and between Alexandra Street and Ada Street, and extending under the Concord Road bridge over the M4 to ultimately connect with the west civil site
- Concord Road tunnel site, located on the eastern side of Concord Road, between Sydney Street and Alexandra Street.

The site currently comprises a residential area containing 51 residential properties (including four dwellings within a residential apartment building), road infrastructure and vegetation.

An indicative construction site layout for the Concord Road civil and tunnel site is shown in **Figure 6.13**.

Concord Road west and south civil sites

The Concord Road west and south civil sites would be used for the construction of dive structures and cut-and-cover tunnel sections, realignment of the M4 south of its current alignment, and approach roads and ramps, including an elevated on-ramp to the existing M4.

The Concord Road west civil site would include a spoil stockpile and associated spoil load out facility, staff and workforce amenities, and a laydown area. Temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

Access to and egress from the Concord Road west civil site would be via Sydney Street. The signalised intersection of Sydney Street and Concord Road would be modified to provide access and traffic control to the Concord Road tunnel site on the eastern side of Concord Road. Heavy vehicles leaving the west civil site would exit to Sydney Street prior to using the signalised intersection at Concord Road, or they would exit directly to Concord Road.

The Concord Road south civil site would include staff amenities, storage, electrical substation, sedimentation pond and car parking, all located in the eastern area of the site. Temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

The Concord Road south site would be connected to the Concord Road west site by excavating under the northern span of the existing Concord Road bridge over the M4. Heavy vehicles would use this access route for the initial stages of construction until completion of tunnel excavation from the tunnel site. The eastern civil site would then be combined with the tunnel site for completion of the remaining interchange. The initial stage access road would ultimately become the southbound entry and exit ramps to and from Concord Road. Heavy vehicle access and egress from the combined eastern civil site would then be via the Sydney Street and Concord Road signalised intersection.

Light vehicles (including light delivery vehicles) would enter and exit the Concord Road south civil site via Ada Street. Heavy vehicles would not use the Ada Street access.

The Concord Road civil sites would contain permanent infrastructure associated with the project. Some residual land within the civil sites would be rehabilitated and landscaped and used as public open space. The future use of other residual land that would not be adversely affected by permanent operational infrastructure would be subject to separate assessment and planning approval as required.

Figure 6.13 Indicative Concord Road civil and tunnel site layout (C5)

Concord Road tunnel site

The Concord Road tunnel site would be the main tunnel site at the western end of the project. It would operate independently of the Concord Road west and south civil sites. Construction work at the Concord Road tunnel site would include:

- Excavation of a construction access tunnel connecting to the on- and off-ramps, and a second construction access tunnel connecting the westbound off-ramp to the mainline tunnels
- Support for tunnel excavation works, including workshop, storage and laydown areas, power supply, ventilation, water supply, water treatment plant, sedimentation pond, workforce facilities and limited car parking
- Support for tunnel drainage and pavement works
- Removal of spoil (refer to **section 6.9**)
- Construction of permanent operational facilities.

Roadheaders would be launched from this site and would excavate the tunnels and ramps in an easterly and westerly direction. An acoustic shed would be established on the site to minimise noise from out of hours tunnelling and spoil handling. In addition, temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

Heavy vehicles would enter via Sydney Street (M4 off-ramp), crossing Concord Road at the signalised intersection. Internal circulation roads would allow heavy vehicles to exit via a left turn onto Concord Road at the same signalised intersection.

Light vehicles (including light delivery vehicles) would enter the site at Alexandra Street, and would exit the site via the Sydney Street and Concord Road signalised intersection. Heavy vehicles would not use the Alexandra Street access.

At completion of tunnel excavation from this site, the site would be combined with the Concord Road south civil site for completion of the surface ramp interchange. Following completion of all construction activities, the Concord Road tunnel site would contain permanent infrastructure associated with the project. Residual land would be rehabilitated and landscaped and used as public open space.

The construction activities program relevant to the site is outlined in **Table 6.10**.

Table 6.10 Concord Road civil and tunnel site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■	■													
Excavate construction access tunnel			■	■												
Tunnel excavation				■	■	■	■	■								
Tunnel drainage and pavement works						■	■	■	■							
M4 road works			■	■	■	■	■									
Concord Road works			■	■	■	■	■	■	■	■	■	■				
Dive structures and cut-and-cover works			■	■	■	■	■	■	■	■	■					
Concord Road bridge widening			■	■	■	■	■	■	■	■						
M4 westbound on-ramp and bridge			■	■	■	■	■	■	■	■						
Mechanical and electrical fitout works									■	■	■					
Site rehabilitation and landscaping						■	■	■	■							

6.5.7 Cintra Park tunnel site (C6)

The Cintra Park tunnel site would be located on the northern side of Parramatta Road, to the east of Concord Oval in Concord on Crown Land owned by the State of NSW. A reserve trust has been appointed for most of the land which would be used for the tunnel site. The affairs of the reserve trust are managed by Canada Bay Council.

The site currently comprises the Cintra Park hockey complex and an overflow car park for Concord Oval, Cintra Park and St Lukes Park playing fields. A new hockey field would be constructed at St Lukes Park, on the northern side of Gipps Street, and commissioned before construction work starts at Cintra Park. The site also contains a stormwater treatment plant on the southern boundary, owned and operated by Canada Bay Council to irrigate an extensive open space network. This would be retained during construction of the project.

The Cintra Park tunnel site would be the main mid-point tunnel site. Construction work at the site would include:

- Excavation of a construction access tunnel connecting to the eastbound and westbound mainline tunnels
- Support for tunnel excavation works including power supply, ventilation, water supply, water treatment plant, sedimentation pond and workforce facilities
- Support for tunnel mechanical and electrical, drainage and pavement works
- Removal of spoil (refer to **section 6.9**)
- Construction of permanent operational facilities.

Roadheaders launched from this site would excavate the tunnels in an easterly and westerly direction. An acoustic shed would be established on the site to minimise noise associated with out of hours tunnelling and spoil handling. In addition, temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

Heavy vehicle access to and egress from the Cintra Park tunnel site would be via Parramatta Road. Heavy vehicles would travel eastbound along Parramatta Road and enter the site via a left turn. The existing traffic signals at the intersection of Luke Avenue and Parramatta Road would be modified to allow vehicles exiting the site to turn right onto Parramatta Road and travel west.

Light vehicles would enter and exit the site at Gipps Street. Heavy vehicles would not use the Gipps Street access, except during construction site establishment.

The existing overflow car park on the northern side of Concord Oval would be upgraded with sealing and linemarking to provide about 250 car parking spaces. This would be the construction personnel parking area for the site and main offices during the week. On weekend game days during agreed times, parking for project personnel would be limited to a maximum of 100, to ensure car parking spaces are available to the public. This is discussed further in **section 6.6.5**. Access to and egress from the car park would be via Gipps Street.

Following tunnel excavation, the permanent operational facilities would be constructed. This would include the fresh air supply facility, a water treatment facility for operations (as distinct from the water treatment plant provided during construction) and an electricity substation, which would include an incident response centre. The remainder of the site would be rehabilitated and landscaped for return to use as a public reserve.

An indicative construction site layout for the Cintra Park tunnel site is shown in **Figure 6.14**. The construction activities program relevant to the site is outlined in **Table 6.11**.

Figure 6.14 Indicative Cintra Park tunnel site layout (C6)

Table 6.11 Cintra Park tunnel site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■														
Excavate construction access tunnel		■	■	■												
Tunnel excavation				■	■	■	■	■								
Tunnel drainage and pavement works						■	■	■	■	■						
Fresh air supply facility, incident response centre and substation								■	■	■	■	■				
Water treatment facility										■	■	■				
Mechanical and electrical fitout works									■	■	■	■				
Site rehabilitation and landscaping												■	■			

6.5.8 Northcote Street tunnel site (C7)

The Northcote Street tunnel site would be located on the north-eastern corner of the Parramatta Road and Wattle Street intersection, and would extend along Parramatta Road between Wolseley Street and Wattle Street. An indicative construction site layout for the Northcote Street tunnel site is shown in **Figure 6.15**.

The site is currently occupied by commercial and light industrial properties, and six residential properties. Part of Northcote Street would form part of the construction compound.

The Northcote Street tunnel site would be the main tunnel site at the eastern end of the project. Construction work at the Northcote Street tunnel site would include:

- Excavation of construction access tunnel connecting to the Parramatta Road and Wattle Street eastbound on- and off-ramps and the mainline tunnels
- Support for tunnel excavation works, including workshop, storage, power supply, ventilation, water supply, water treatment plant, sedimentation pond and workforce facilities
- Support for tunnel mechanical and electrical, drainage and pavement works
- Removal of spoil (refer to **section 6.9**).

Roadheaders would be launched from this site and would excavate the tunnels in an easterly and westerly direction, as well as the on- and off-ramps. An acoustic shed would be established on the site to minimise noise associated with out of hours tunnelling and spoil handling. In addition, temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

Heavy vehicle access to and egress from the Northcote Street tunnel site would be via Parramatta Road and Wattle Street. Construction traffic would exit the site on Wattle Street and then gain access to Parramatta Road westbound via a newly constructed turning movement at the intersection of Wattle Street and Waratah Street (refer to **section 6.5.10**).

The future use of the Northcote Street tunnel site would be subject to separate assessment and planning approval. In the meantime, it would be rehabilitated and stabilised with a vegetated groundcover. Northcote Street would be reopened to traffic.

Figure 6.15 Indicative Northcote Street tunnel site layout (C7)

The construction activities program relevant to the site is outlined in **Table 6.12**.

Table 6.12 Northcote Street tunnel site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■	■													
Excavate construction access tunnel			■	■												
Tunnel excavation				■	■	■	■	■								
Tunnel drainage and pavement works							■	■	■	■						
Mechanical and electrical fitout works									■	■	■					
Tunnel completion works												■	■			
Site rehabilitation and landscaping													■			

6.5.9 Eastern ventilation facility site (C8)

The eastern ventilation facility site would be located on the north-eastern corner of the Parramatta Road and Wattle Street intersection, and would extend along Parramatta Road between Wattle Street and Walker Avenue.

An indicative construction site layout for the eastern ventilation facility site is shown in **Figure 6.16**.

The site is currently occupied by commercial and light industrial properties, including car yards and showrooms, and 23 residential properties (including a residential apartment building containing eight dwellings). The western half of Walker Avenue, in front of the eastern ventilation facility site and the Wattle Street and Walker Avenue civil site (C9 below), would be closed and would form part of the construction site.

The eastern ventilation facility site would be a low volume tunnel excavation site for ventilation tunnels only, accessed through two vertical shafts. Construction work at the eastern ventilation facility site would include:

- Excavation of two deep shafts for excavation of ventilation shafts
- Support for tunnel excavation works, including small workshop, storage, power supply, ventilation, water supply, water treatment plant, workforce facilities and limited car parking
- Removal of spoil (refer to **section 6.9**)
- Construction of permanent operational facilities.

Excavators with rockbreakers would be used on this site to excavate the ventilation shafts. Roadheaders would be launched from this shaft to excavate the ventilation tunnels and mainline tunnels. Temporary noise mitigation, which may include noise barriers or other temporary structures such as site buildings, would be provided to minimise noise impacts on surrounding properties.

Heavy vehicle access to the eastern ventilation facility site would be via Parramatta Road. Heavy vehicle egress would be via Wattle Street, where construction traffic would enter Parramatta Road westbound from the site via the Wattle Street and Parramatta Road intersection. Vehicles would also enter and exit the site via Walker Avenue.

Following tunnel excavation, the permanent operational facilities would be constructed. These would include the ventilation outlet, substation, fire pump room and water tanks.

Figure 6.16 Indicative eastern ventilation facility layout (C8)

The construction activities program relevant to the site is outlined in **Table 6.13**.

Table 6.13 Eastern ventilation facility site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■	■													
Shaft construction			■	■	■	■										
Tunnel excavation						■	■	■								
Shaft structural works and ventilation building works								■	■	■	■					
Water tanks and pump rooms											■	■				
Mechanical and electrical fitout works								■	■	■	■					
Landscaping											■					

6.5.10 Wattle Street and Walker Avenue civil site (C9)

The Wattle Street and Walker Avenue civil site would be located on the eastern side of Wattle Street, extending from the eastern ventilation facility site to Waratah Street. It would also include some properties on the western side of Walker Avenue, and the western half of Walker Avenue in front of these properties. As the remainder of the Wattle Street and Walker Avenue civil site would contain permanent operational infrastructure and would therefore be occupied by construction activities, these additional properties would be used for construction support infrastructure including sites offices and workers amenities.

The site would also include part of Reg Coady Reserve on the western side of Wattle Street, near Waratah Avenue, which would be partly occupied by permanent operational infrastructure as well as a temporary turning lane for construction vehicles.

An indicative construction site layout for the Wattle Street and Walker Avenue civil site is shown in **Figure 6.17**.

The site currently comprises a predominantly residential area containing 78 residential properties (including 35 dwellings within four residential apartment buildings), as well as road infrastructure and vegetation.

The Wattle Street and Walker Avenue civil site would be used for the construction of dive structures and cut-and-cover tunnel sections for both the M4 East on- and off-ramps, as well as the possible future M4–M5 Link (which is subject to planning approval) on- and off-ramps. The Wattle Street and Walker Avenue civil site would also be used for Wattle Street and Dobroyd Parade surface road realignment and adjustments. The Wattle Street and Walker Avenue civil site would include site offices, workers amenities, storage and laydown areas, and limited car parking. These facilities would be located immediately to the north of the eastern ventilation facility site, extending through to Walker Avenue.

Heavy vehicle access to and egress from the site would be via Wattle Street and Parramatta Road, through the eastern ventilation facility site. A dedicated construction vehicle turning lane would be provided on the western side of Wattle Street, in part of Reg Coady Reserve, to enable construction vehicles travelling eastbound on Wattle Street to turn around. The existing traffic signals at the intersection of Wattle Street and Waratah Avenue would be modified to allow construction vehicles to turn right from the dedicated turning lane onto Wattle Street and travel westbound to either enter the Wattle Street and Walker Avenue civil site, or continue to Parramatta Road.

Traffic signals would also be provided at Ramsay Street to the south-east of the intersection of Ramsay Street and Wattle Street, to enable construction vehicles within the construction site to cross Ramsay Street.

Vehicles would also be able to enter and exit the site via Walker Avenue.

Figure 6.17 Indicative Wattle Street and Walker Avenue civil site layout (C9)

The western (eastbound) traffic and parking lanes of Walker Avenue would be closed from Parramatta Road to the end of the construction site, to provide a dedicated construction traffic lane for light vehicles only. Left turn movements into Walker Avenue from Parramatta Road would be prohibited for all vehicles other than construction light vehicles. A barrier would be placed on the eastern side of this construction vehicle lane (in the middle of Walker Avenue) for construction traffic noise mitigation to residents on the opposite side. The eastern (westbound) lanes on Walker Avenue would remain open and resident access would be maintained for this part of Walker Avenue. Walker Avenue would remain as two-way north of the construction site.

The majority of the Wattle Street and Walker Avenue civil site would be occupied by road infrastructure following completion of construction. Any residual land would be rehabilitated and either landscaped, or potentially redeveloped, subject to separate planning approval.

The construction activities program relevant to the site is outlined in **Table 6.14**.

Table 6.14 Wattle Street and Walker Avenue civil site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■	■													
Road work		■	■	■	■	■	■	■	■	■	■	■	■			
Dive structures and cut-and-cover			■	■	■	■	■	■	■	■						
Mechanical and electrical fitout works									■							
Site rehabilitation and landscaping							■	■	■	■						

6.5.11 Parramatta Road civil site (C10)

The Parramatta Road civil site would be located on the southern side of Parramatta Road between Bland Street and Orpington Street. An indicative construction site layout for the Parramatta Road civil site is shown in **Figure 6.18**.

The site is currently occupied by:

- A number of commercial properties
- A motel
- A place of worship located within a commercial building
- 10 residential properties (including three residential apartment buildings and one townhouse development)
- Vacant redevelopment sites, including the former Brescia Furniture site.

The Parramatta Road civil site would be used for the construction of dive structures and cut-and-cover tunnel sections for the project on- and off-ramps. The site would also be used for Parramatta Road surface road adjustments. The site would include site offices, staff amenities, spoil stockpile and loading area, storage and laydown areas, sedimentation pond, water tanks, and car parking.

Access to the Parramatta Road civil site would be via a new signalised intersection on Parramatta Road, near Rogers Avenue. This intersection would include a dedicated right turn bay to allow construction vehicles travelling eastbound on Parramatta Road to turn into the site. Between Bland Street and Orpington Street, Parramatta Road would be reduced to two lanes in both directions to accommodate this turning lane.

Egress from the site would be via Bland Street and the existing traffic signals at the intersection of Bland Street and Parramatta Road. Light vehicles (including light delivery vehicles) would also be to enter and exit the site from Orpington Street and Chandos Street.

The majority of the Parramatta Road civil site would be occupied by road infrastructure following completion of construction. Any residual land would be rehabilitated and either landscaped, or potentially redeveloped, subject to separate planning approval.

Figure 6.18 Indicative Parramatta Road civil site layout (C10)

The construction activities program relevant to the site is outlined in **Table 6.15**.

Table 6.15 Parramatta Road civil site indicative construction program

Construction activity	Indicative construction timeframe															
	2016				2017				2018				2019			
Site establishment		■	■													
Bland Street pedestrian bridge works		■	■													
Road works		■	■	■	■	■	■	■	■	■	■	■	■			
Dive structures and cut-and-cover sections				■	■	■	■	■	■	■	■					
Mechanical and electrical fitout works								■	■	■	■					
Site rehabilitation and landscaping							■	■	■							

6.6 Traffic management and access

During construction of the project, traffic management measures would be put in place to maintain the functionality of surrounding roads, and to protect the safety of pedestrians, cyclists, motorists and construction personnel.

A construction traffic and access management plan would be developed in consultation with the relevant road authority, in accordance with measures outlined in *Roads and Maritime Traffic Control at Worksites* (RTA 2010) and *Roads and Maritime Specification G10 – Control of Traffic* (RTA 2006). Traffic management measures implemented during construction would be determined during detailed design, documented in the management plan, and may include:

- Undertaking the works in a staged manner to reduce traffic impacts
- Implementation of temporary speed restrictions within construction work zones
- Reduced lane widths within construction work zones
- Reduced shoulder widths and erection of traffic barriers along construction work zones
- Provision of appropriate warning and advisory signposting
- Provision of temporary access arrangements with private landowners whose property is adjacent to construction activities
- Provision for public transport and emergency services to ensure disruption is minimised.

Local residents, business owners and road users would be notified of traffic changes, and ongoing consultation would be undertaken to provide information on planned construction activities and changes to any access arrangements.

The changes to local roads, pedestrian and cycle routes discussed in this section are based on the concept design and construction methodology. The community and road users would be kept informed about these changes as outlined in the draft community consultation framework discussed in **Chapter 7** (Consultation).

This chapter also provides indicative heavy and light vehicle volumes associated with construction, and details of parking for the construction workforce.

6.6.1 Changes to local roads

The project would require temporary road closures and diversions to facilitate construction. **Table 6.16** details these closures. Roads which would permanently be closed as a result of the project are discussed in **section 5.9** in Chapter 5 (Project description).

Table 6.16 Indicative temporary road closures and diversions during construction

Location	Estimated duration	Staging of any closure or modification	Road access reinstatement
Pomeroy Street/ Wentworth Road South intersection	6 months	Closure of both lanes for about two months, then reduction to one lane to facilitate road works and associated modification of retaining wall. Temporary traffic signals would be provided either side of the corner to manage traffic during single lane operation. Existing street parking within the area would be maintained except within the work zone.	Once works are completed, road would be reopened.
Underwood Road	2 years	Temporary diversions at various stages. One lane in each direction would be maintained at all times. A new signalised intersection would be provided to facilitate safe site and pedestrian access. No parking would be allowed in front of the worksite along Underwood Road.	Once works are completed, road would be reopened.
Sydney Street (M4 off-ramp) and Queen Lane	2 years	Temporary diversions at various stages. There would be no reduction in the number of traffic lanes or impact on movements.	Road would rebuilt on existing alignment at completion of works.
Existing M4 east of Sydney Street off-ramp	2 years	Temporary diversions at various stages and potential reduction in speed limit. There would be no reduction in the number of traffic lanes (except during night works) or impact on movements.	Road would be rebuilt on new alignment at completion of works.
Northcote Street at Parramatta Road	Duration of construction works	Closure at Parramatta Road for use as part of the Northcote Street tunnel site (C7).	Once works are completed, road would be reopened.
Ramsay Street (east of Wattle Street)	18 months	Temporary diversions at various stages.	Road would be rebuilt on existing alignment at completion of works.
Martin Street (east of Wattle Street) at Wattle Street	2 years	Closure to facilitate road construction.	Once works are completed, road would be reopened in line with permanent design.
Walker Avenue at Parramatta Road	Duration of construction works	Closure of eastbound traffic and parking lanes and left-in from Parramatta Road permitted only for construction traffic. The westbound traffic lane would remain open to the public and would permit left turn onto Parramatta Road.	Once works are completed, road would be reopened.
Chandos Street (south of Parramatta Road) at Parramatta Road	18 months	Closure to facilitate demolition of buildings and dive construction.	Once works are completed, road would be reopened.

Location	Estimated duration	Staging of any closure or modification	Road access reinstatement
Parramatta Road between Orpington Street and Bland Street	Duration of construction works	Closure of one of the three eastbound and westbound lanes, resulting in only two lanes in both directions from Dalhousie Street to east of Bland Street. Provision of a new signalised intersection on Parramatta Road, near Rogers Avenue, to provide a dedicated right turn bay for eastbound construction vehicles entering the Parramatta Road civil site.	Once works are completed, temporary traffic signals would be removed and the road would be reopened in line with permanent design.
Orpington Street	Duration of construction works	Reconfiguration of the Parramatta Road / Orpington Street intersection to facilitate new site entry intersection including traffic signals.	Once works are completed, traffic signals would be removed.

At all locations where road closures are required, access would be maintained to retained properties throughout the construction period. Appropriate signage for road closures or detours would be installed.

There would also be car parking restrictions at a number of other locations, including:

- Short Street East at Homebush
- Edward Street, Alexandra Street and Ada Street at Concord.

6.6.2 Changes to pedestrian and cycle routes

A number of pedestrian diversions would be put in place during construction to protect community safety. These would involve eliminating where possible interactions between pedestrians and heavy vehicles at site access points, and providing alternative pedestrian access around the construction sites. In most cases, this would involve maintaining pedestrian access on one side of the road, with suitable crossing points and signage provided.

Initial assessment has identified that there would be temporary closure of footpaths along Wattle Street, Martin Street, Parramatta Road and Chandos Street. As the detailed design develops, additional footpaths requiring temporary closure may be identified.

Local residents and business owners would be notified of pedestrian changes, and ongoing consultation would be undertaken to provide landowners with information on planned construction activities and changes to any access arrangements.

The existing cycleway on the outside shoulders of the existing M4 has been closed for construction of the M4 Widening and would remain closed during construction of the project. An alternate cycle route has been implemented as part of the construction of the M4 Widening, which may also be used during construction of the project. This alternate route is shown in **Figure 6.19**. Other alternate cycleway diversion options may be developed during detailed design of the project, subject to discussions with relevant stakeholders.

Table 6.17 includes indicative details of major pedestrian and cycleway diversions during construction.

Figure 6.19 Alternate cycle routes during construction

Table 6.17 Indicative pedestrian and cyclist diversions during construction

Location of diversion	Estimated duration	Details of diversion	Measures to maintain pedestrian/cycle route
Homebush Bay Drive civil site (C1), Pomeroy Street civil site (C2) and Underwood Road civil and tunnel site (C3)			
M4 Motorway	Duration of construction works	Cyclists detoured off the M4 in both directions for duration of works	• Existing M4 Widening construction alternate cycle route via Hill Road, Pondage Link, Edwin Flack Avenue, Sarah Durack Avenue, Bennelong Parkway, existing Bicentennial park shared path, existing shared path along Powells Creek through Bressington Park and Mason Park, Pomeroy Street, Queen Street, Princess Avenue, Patterson Street, Gipps Street, Sydney Street, Inverary Street, Alexandra Street, and Coles Street.
Footbridge over the M4 between Pomeroy Street and Park Road	Short-term	Closure of footbridge	• Pedestrians and cyclists would be detoured via Pomeroy Street and Underwood Road.
Wattle Street and Walker Avenue civil site (C9)			
Wattle Street between Parramatta Road and Martin Street	Duration of construction works	Closure of pedestrian footpath on eastern side of road, between Parramatta Road and northern side of Martin Street	• Pedestrian route on northern side would be available along Wattle Street and Dobroyd Parade at all times with crossings located at Parramatta Road, Ramsay Street and Waratah Street.
Martin Street south of Wattle Street	25 months	Closure of access to Wattle Street from Martin Street (east of Wattle Street)	• Alternate route to Wattle Street via Alt Street and Ramsay Street or Waratah Street.
Dobroyd Parade between Martin Street and north of Waratah Street (end of works)	Duration of construction works	Closure of pedestrian footpath on the western side of road, north of Martin Street to the end of the works	• Alternate pedestrian route via Reg Coady Reserve and Timbrell Park, or footpath on western side of Dobroyd Parade, with pedestrian crossings located at Ramsay Street, Waratah Street, and Timbrell Drive/Mortley Avenue.
Parramatta Road civil site (C10)			
Parramatta Road, between Bland Street and Orpington Street	Duration of construction works	Closure of pedestrian footpath on southern side of road, between Orpington Street and Bland Street	• Pedestrian route on north side of road would remain open at all times with crossing located at Bland Street and Dalhousie Street (south of Orpington Street).
Footbridge over Parramatta Road at Bland Street	Short-term	Closure of footbridge	• Pedestrians and cyclists would be able to cross Parramatta Road using the existing traffic signals at the Bland Street intersection.

Location of diversion	Estimated duration	Details of diversion	Measures to maintain pedestrian/cycle route
Chandos Street	17 months	Closure of access to Parramatta Road from Chandos Street due to construction site at intersection.	Alternate routes via: • Chandos Street, Loftus Street and Orphington Street • Chandos Street, Julie Street and Bland Street.

6.6.3 Changes to bus stops

Construction of the project would generally not impact bus stops and bus services. Initial assessment has identified that four bus stops would be relocated during construction to protect community safety. As the detailed design develops, additional bus stops requiring relocation may be identified. Any bus stop relocations would be agreed with Transport for NSW and all affected bus operators.

Local residents, business owners and bus passengers would be notified of traffic management procedures, and ongoing consultation would be undertaken to provide information on planned construction activities and changes to any bus stops or access arrangements.

Table 6.18 outlines the indicative changes to bus stop locations during construction.

Table 6.18 Indicative bus stop relocations

Location	Estimated duration	Details of relocation
Underwood Road civil and tunnel site (C3)	2 years	Bus stops located on Underwood Road beneath the M4 bridge would be relocated north to in the vicinity of Short Street. The bus stops would remain relocated for the duration of works at this construction site.
Concord Road civil and tunnel site (C5)	3 years	The bus stop located on Concord Road (northbound) near the Concord Road bridge over the existing M4 would be permanently relocated north to the vicinity of Carrington Street (refer to **section 5.9.3** in Chapter 5 (Project description). The bus stop on Concord Road (southbound) near the Concord Road bridge would be closed during the duration of works at this construction site. The nearest existing bus stop is located to the north near the Patterson Street intersection.
Cintra Park tunnel site (C6)	3 years	Bus stop currently near Cintra Park would be relocated east in the vicinity of Taylor Street. The bus stops would remain relocated for the duration of works at this construction site.
Parramatta Road civil site (C10)	2 years	Westbound bus stop at Chandos Street would be closed for the duration of works at this construction site. This bus stop would reopened following completion of works. Westbound bus stop after Orpington Street would be relocated closer to Orpington Street for the duration of works at this construction site. Eastbound bus stops near Chandos Street and Rogers Avenue would be affected by short-term temporary relocations as required due to traffic staging and adjustments to footpaths.

6.6.4 Access routes and vehicle numbers

The proposed access and egress points to and from the construction ancillary facilities are described in **section 6.5**.

Table 6.19 Indicative access routes to and from construction ancillary facilities

Site	Proposed access route
Homebush Bay Drive civil site (C1) and Pomeroy Street civil site (C2)	Heavy vehicles – via existing M4 Light vehicles – via existing M4 and Pomeroy Street
Underwood Road civil and tunnel site (C3)	Underwood Road and Short Street East
Powells Creek civil site (C4)	Heavy vehicles – Powell Street, Underwood Road and Parramatta Road Light vehicles – Powell Street and Parramatta Road
Concord Road civil and tunnel site (C5)	Heavy vehicles – Sydney Street (M4 off-ramp) and Concord Road Light vehicles – Alexandra Street and Ada Street
Cintra Park tunnel site (C6)	Heavy vehicles – Parramatta Road Light vehicles – Gipps Street
Northcote Street tunnel site (C7)	Parramatta Road and Wattle Street
Eastern ventilation facility site (C8)	Heavy vehicles – Parramatta Road and Wattle Street Light vehicles – Walker Avenue
Wattle Street and Walker Avenue civil site (C9)	Heavy vehicles – Wattle Street and via eastern ventilation facility site (C8) All vehicles – Wattle Street and Walker Avenue
Parramatta Road civil site (C10)	Heavy vehicles – Parramatta Road Light vehicles – Orpington Street

Construction traffic movements would include heavy and light vehicles associated with spoil and waste removal, material deliveries and the arrival and departure of construction workers. Estimated daily worst case vehicle numbers are summarised in **Table 6.20**.

6.6.5 Construction workforce parking

The majority of the construction sites would have parking for the construction workforce based at those sites.

As noted in **section 6.5.7**, the upgraded car park on the northern side of Concord Oval would provide about 250 car parking spaces. This would serve as the parking area for the main project office during the week. This site would also be available for use by the public on weekends and on weeknights, with the following spaces allocated to both groups:

- 145 public parking spaces on Saturdays (leaving 100 for the construction workforce)
- 195 public parking spaces on Sundays (leaving 50 for the construction workforce)
- 145 public parking spaces on weeknights after 6.30 pm (leaving 100 for the construction workforce).

This allocation is indicative only and would be further refined following consultation with Canada Bay Council and Concord Oval user groups.

An additional car park site has also been identified at Railway Lane containing about 50 car parking spaces. The site is owned by Roads and Maritime and is currently occupied by the North Strathfield Rail Underpass (NSRU) Alliance. NSRU works will be completed by mid-2015, leaving this site available for use as an overflow car park. This car park is within walking distance of the Underwood Road civil and tunnel site (C3), Powells Creek civil site (C4) and the Concord Road civil and tunnel sites (C5).

The construction workforce would be encouraged to utilise public transport. Parramatta Road is a major transport corridor that has multiple bus routes. The study area is also well serviced by the rail network with seven stations within walking distance of the construction sites.

Table 6.20 Indicative construction vehicle routes and numbers

Site	Vehicles per day		Vehicles per hour AM peak (7.30 am- 8.30 am)		Vehicles per hour PM peak (4.15 pm - 5.15 pm)		Heavy vehicles per hour outside of standard hours	
	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Evening (6.00 pm – 10.00 pm)	Night (10.00 pm – 7.00 am)
Homebush Bay Drive civil site (C1) and Pomeroy Street civil site (C2)	110	160	15	50	5	20	-	-
Underwood Road civil and tunnel site (C3)	80	30	10	10	10	10	2	2
Powells Creek civil site (C4)	40	50	8	5	20	15	-	-
Concord Road civil and tunnel site (C5)	260	80	19	14	16	14	18	18
Cintra Park tunnel site (C6)	200	330 (non-game days – refer to section 6.6.5)	13	30	13	40	14	14
Northcote Street tunnel site (C7)	300	30	20	4	20	4	18	18
Eastern ventilation facility site (C8)	60	30	10	4	10	4	10	2
Wattle Street and Walker Avenue civil site (C9)	120	70	20	15	10	10	-	-
Parramatta Road civil site (C10)	90	90	9	5	5	15	-	-

In addition, a car parking strategy would be developed as part of the Traffic Management and Safety Plan to limit impacts on the surrounding communities, in consultation with local councils and stakeholders associated with the sporting facilities adjacent to the project site.

6.7 Construction workforce numbers and work hours

6.7.1 Construction workforce

The peak construction workforce at each site is detailed in **Table 6.21**. Peaks at each construction location do not necessarily occur at the same time, so these numbers cannot be added together to give a whole of project peak workforce number.

The construction workforce comprises trades and construction personnel, subcontract construction personnel and engineering, functional and administrative staff.

Table 6.21 Peak construction workforce estimates

Site name/location	Approximate peak construction workforce	Approximate day shift peak construction workforce	Approximate afternoon shift peak construction workforce	Approximate night shift peak construction workforce
Homebush Bay Drive civil site (C1) and Pomeroy Street civil site (C2)	295	295	N/A	40 (periodic)
Underwood Road civil and tunnel site (C3)	71	35	18	18
Powells Creek civil site (C4)	45	45	N/A	N/A
Concord Road civil and tunnel site (C5)	290	200	45	45
Cintra Park tunnel site (C6) (including main office)	315	215	40	40
Northcote Street tunnel site (C7)	285	135	75	75
Eastern ventilation facility site (C8)	71	35	18	18
Wattle Street and Walker Avenue civil site (C9)	120	120	N/A	N/A
Parramatta Road eastern civil site (C10)	75	75	N/A	N/A
Design/planning office (pre-construction, likely in Sydney CBD)	300	300	N/A	N/A

Figure 6.20 shows the estimated workforce demand profile (total employment by month).

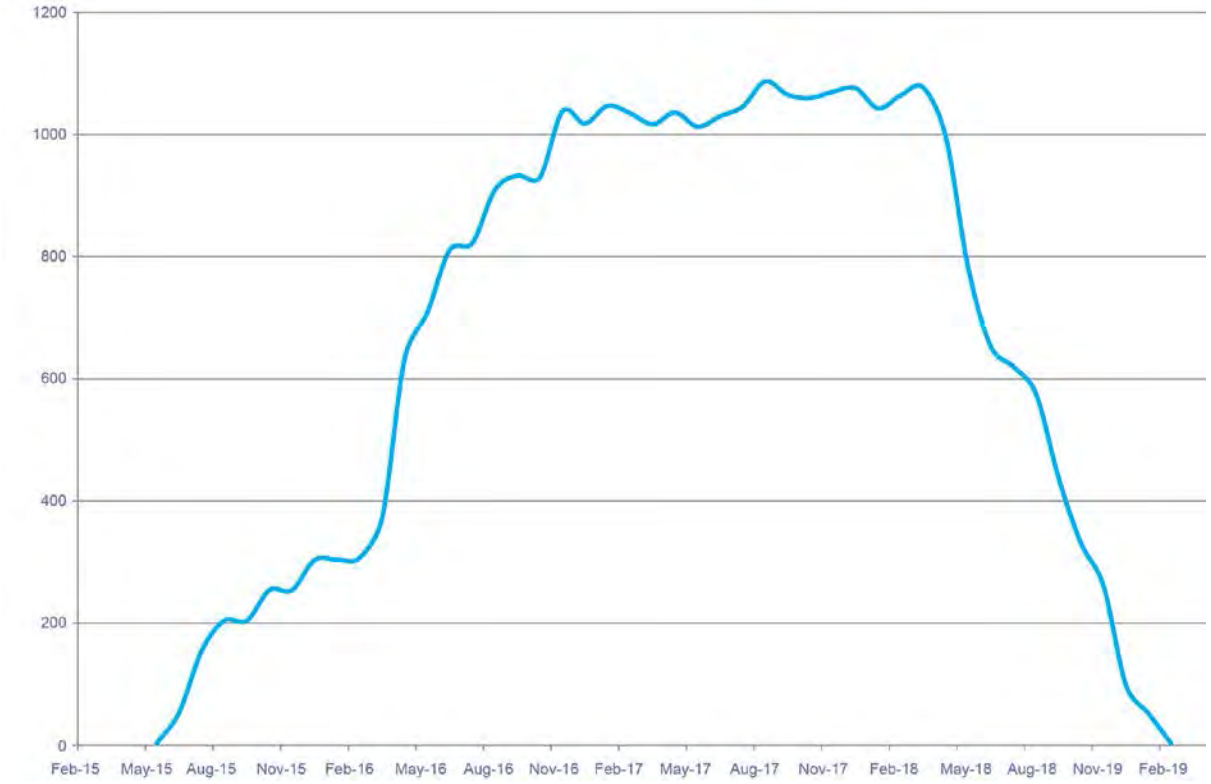

Figure 6.20 Workforce demand profile

6.7.2 Construction work hours

The majority of aboveground construction works would be undertaken in accordance with the *Interim Construction Noise Guideline* (DECCW 2009a) during the standard working hours of between:

- 7.00 am and 6.00 pm Monday to Friday
- 8.00 am and 1.00 pm on Saturdays.

There would generally be no aboveground construction works on Sundays or public holidays, with the exception of those activities required to be undertaken outside of standard construction hours.

To minimise the overall length of construction and the duration of amenity impacts on the local community, tunnelling works are proposed to be carried out 24 hours a day, seven days a week. The exception to this would be blasting activities which would only be undertaken during the following hours:

- 9.00 am to 5.00 pm Monday to Friday inclusive
- 9.00 am to 1.00 pm Saturday
- At no time on a Sunday or on a public holiday.

Underground blasting would also be limited to one single detonation in any one day per receiver group, unless otherwise agreed by the NSW Environment Protection Authority (EPA).

As tunnelling works would operate continuously, the associated tunnel support activities would also be undertaken up to 24 hours a day, seven days a week. This would include heavy vehicle movements to and from the five tunnel construction sites, and on these sites outside the acoustic sheds. Allowing heavy vehicle movements outside standard construction hours would also minimise congestion impacts on the surrounding road network, particularly during the peak hours.

A number of other construction activities would also be undertaken outside of standard construction hours to:

- Minimise unacceptable traffic impacts on and disruptions to the road network

- Minimise disturbance to surrounding landowners and commercial properties
- Ensure the safety of the construction workers, motorists and the general public.

Activities listed in **Table 6.22** are anticipated to be required to be performed out of hours.

Table 6.22 Out-of-hours work activities and justification

Activity	Construction hours	Frequency and duration	Justification for out-of-hours activities
Tunnelling works (except blasting)	24 hours a day	7 days a week	Continuous tunnelling would minimise the overall length of construction and the duration of any associated amenity impacts on the local community.
Activities that support tunnelling works, including spoil handling (within the construction sites)	24 hours a day	7 days a week throughout the tunnelling works	Continuous tunnelling means that all activities that support the tunnelling would be required to be undertaken continuously. Handling of spoil on the surface would be required, as stockpiling large amounts of spoil within the tunnels would not be feasible. Spoil is therefore required to be transported from the tunnel to stockpiles on the surface within the construction site, prior to haulage from the site.
Construction traffic for spoil haulage from: • Concord Road civil and tunnel site (C5) • Cintra Park tunnel site (C6) • Northcote Street tunnel site (C7) • Eastern ventilation facility site (C8)	24 hours a day	7 days a week throughout the tunnelling works	Continuous tunnelling would result in spoil being removed from the tunnels 24 hours a day, seven days a week. Stockpiling of spoil with no spoil haulage outside of standard hours would result in a greater number of spoil haulage vehicle movements during standard hours. This would have an adverse effect on the performance of the road network, particularly in peak hours. Spoil haulage is therefore required 24 hours a day, seven days a week. Spoil haulage from these four construction ancillary facilities would be confined to arterial roads only. Construction traffic and noise impacts from spoil haulage outside standard hours are assessed in **Chapter 8** (Traffic and transport) and **Chapter 10** (Noise and vibration) respectively.
Concrete delivery (for shotcrete) to: • Underwood Road civil and tunnel site (C3) • Concord Road civil and tunnel site (C5) • Cintra Park tunnel site (C6) • Northcote Street tunnel site (C7) • Eastern ventilation facility site (C8)	24 hours a day	7 days a week throughout the tunnelling works	Continuous tunnelling requires 24 hour a day concrete deliveries, as the excavated tunnel would be supported progressively behind the roadheader by applying shotcrete to the excavated tunnel walls. The alternative would be a concrete batch plant at each tunnel site.

Activity	Construction hours	Frequency and duration	Justification for out-of-hours activities
M4 traffic lane adjustment near the Homebush Bay Drive and Concord Road interchanges	Up to 24 hours a day	Various times between March 2016 and January 2018	To minimise unacceptable traffic impacts on the road network, some work would be carried out at night when traffic numbers are low and the number of lanes can be reduced. This would also improve safety for workers and road users as the work is located adjacent to live traffic lanes.
Widening and lengthening of existing bridges on the existing M4 and Concord Road	Out of hours as required	Various times throughout the construction period	
Road tie-in works, temporary diversions, and traffic switches	Out-of-hours as required	Works to occur when required	Completing or installing these items at night when traffic flows on the M4, Wattle Street and Parramatta Road are low would minimise disruption to traffic and minimise any potential safety conflict between construction personnel and traffic.
Pavement works, temporary medians and linemarking	Out-of-hours as required	Works to occur when required	These works require lane closures and, in some cases, total closure of roads in order to safely carry out the works. This means that pavement works cannot be undertaken during periods of high traffic volumes and would need to occur during evening and night-time periods. Carrying out these works at night would minimise disruption to local traffic flows, as the work would involve multiple traffic switches within a short period of time before traffic is allowed to use the completed sections of pavement.
Use of construction ancillary facilities to support out of hours works.	Out of hours as required	As required for the above works	Some activities at construction ancillary facilities would be required to support out-of-hours works. Where possible, activities would be kept to a minimum with only those required to support the works to be used.
Delivery of oversized material, plant and equipment	Out-of-hours as required by NSW Police and Roads and Maritime	As required	Delivery of some materials and equipment may require oversized loads. Such activities would be undertaken in line with NSW Police and Roads and Maritime requirements, which may include out-of-hours movements when vehicle numbers on the network are lower.

6.8 Plant and equipment

Indicative plant and equipment lists for each construction location are outlined in **Table 6.23**.

Table 6.23 Indicative plant and equipment list

Plant/equipment	Homebush Bay Drive (C1) and Pomeroy Street civil sites (C2)	Underwood Road civil and tunnel site (C3)	Powells Creek civil site (C4)	Concord Road civil and tunnel site (C5)	Cintra Park tunnel site (C6)	Northcote Street tunnel site (C7)	Eastern ventilation facility site (C8)	Wattle Street/ Walker Avenue civil site (C9)	Parramatta Road civil site (C10)
Articulated dump truck		♦		♦	♦	♦	♦	♦	
Asphalt paver	♦		♦	♦				♦	♦
Bulldozer (D7-D11)	♦			♦				♦	♦
Compressor (fixed)		♦		♦	♦	♦	♦		
Concrete cutter	♦	♦	♦	♦	♦	♦	♦	♦	♦
Concrete pump / boom pump	♦	♦	♦	♦	♦	♦	♦	♦	♦
Crawler crane	♦	♦		♦			♦	♦	♦
Diesel generator	♦	♦	♦	♦	♦	♦	♦	♦	♦
Drill rig	♦	♦	♦	♦	♦	♦	♦	♦	♦
Dust scrubber		♦		♦	♦	♦	♦		
Excavator (<25T) c/w attachments	♦	♦	♦	♦	♦	♦	♦	♦	♦
Excavator (>25T) c/w attachments	♦	♦	♦	♦	♦	♦	♦	♦	♦
Front end loader		♦		♦	♦	♦	♦	♦	
Jumbo drill rig		♦		♦	♦	♦	♦		
Mobile crane (<50T)	♦	♦	♦	♦	♦	♦	♦	♦	♦
Mobile crane (50T to 200T)	♦	♦	♦	♦	♦	♦	♦	♦	♦
Mobile crane (>200T)	♦	♦	♦	♦	♦	♦	♦	♦	♦
Piling rig	♦	♦	♦	♦	♦	♦	♦	♦	♦
Roadheader		♦		♦	♦	♦	♦		
Road profiler	♦		♦	♦				♦	♦
Rockbolting jumbo		♦		♦	♦	♦	♦		
Shotcrete rig (diesel)	♦	♦		♦	♦	♦	♦	♦	♦
Shotcrete rig (electric)		♦		♦	♦	♦	♦		
Slipform paver	♦			♦	♦	♦	♦	♦	♦
Surface miner	♦	♦		♦		♦		♦	♦
Tower crane	♦						♦		
Truck and dogs (trailers)	♦	♦	♦	♦	♦	♦	♦	♦	♦
Vibratory roller	♦	♦	♦	♦	♦	♦	♦	♦	♦

6.9 Spoil and waste management

6.9.1 Spoil and waste generation

The project would generate around 2.4 million bank cubic metres of spoil. A bank cubic metre is a cubic metre of rock or material in-situ before it is removed from the ground.

The majority of spoil would be generated from excavation of the tunnels. As such, the primary facilities for receipt and dispatch of spoil would be the five tunnel construction sites. Relatively smaller quantities of spoil would be generated from site preparation activities, excavation of dive structures, and cut-and-fill activities for the above ground components of the project.

Anticipated spoil volumes generated from each construction ancillary facilities site for tunnelling and surface works are outlined in **Table 6.24**.

Table 6.24 Anticipated spoil volumes

Site	Estimated spoil volume (bank cubic metres)		
	Tunnel	Surface	Total
Homebush Bay Drive civil site (C1)	-	244,000	244,000
Underwood Road civil and tunnel sites (C3)	162,000	36,000	198,000
Powells Creek civil site (C4)	-	4,000	4,000
Concord Road tunnel site (C5)	345,000	110,000	455,000
Cintra Park tunnel site (C6)	560,000	-	560,000
Northcote Street tunnel site (C7)	580,000	-	580,000
Eastern ventilation facility site (C8)	125,000	-	125,000
Wattle Street and Walker Avenue civil site (C9)	-	116,000	116,000
Parramatta Road civil site (C10)	-	72,000	72,000
Total	**1,772,000**	**582,000**	**2,354,000**

Based on the depth of the tunnel and the local geology, the majority of excavated spoil material would be uncontaminated crushed sandstone and shale, classified as virgin excavated natural material (VENM). This would generally consist of mixed size crushed rock, ranging from shale and sand to lumps of rock.

A contamination assessment has been undertaken as part of this environmental impact statement (further details are provided in **Chapter 16** (Contamination). This assessment identified the potential presence of contaminated material at the Powells Creek civil site (C4) and Parramatta Road civil site (C10). Contaminated materials including asbestos may also be present at sites where older residential homes would be demolished.

Other waste streams that would be generated during construction of the project include:

- Demolition waste from existing structures and properties
- Contaminated soil which may be encountered during construction
- General construction waste such as concrete, steel and timber formwork off-cuts
- Vegetation waste from clearing and grubbing
- Plant and vehicle maintenance waste such as oils and lubricants
- General office waste such as paper, cardboard, plastics and food waste
- Sewage waste.

6.9.2 Spoil disposal hierarchy

The design of the project has taken into consideration the waste hierarchy by aiming to reduce the volume of excess spoil generated, as far as practical. Where possible and fit for purpose, spoil would be beneficially reused as part of the project before alternative spoil disposal options – such as other infrastructure or development projects – are pursued.

The spoil reuse strategy would be regularly reviewed during detailed design and project construction to identify new opportunities for reuse, in accordance with the hierarchy outlined below.

The project would seek to reuse or recycle at least 95 per cent of uncontaminated spoil generated for beneficial purposes, either within the project or at other locations. Spoil reuse would be prioritised in accordance with the following hierarchy:

- Within the project
- Environmental works/community works
- Development works/land restoration.

Where reuse is not possible, disposal of spoil would be the last resort.

Within the project

The following spoil reuse opportunities have been identified within the project:

- 10,000 cubic metres of spoil as earthworks fill, sourced from surface works
- 2,000 cubic metres of spoil to backfill tunnel site shafts, sourced from tunnel spoil.

Environmental and community works

Tidal inundation prevention works along the Canada Bay foreshore and the Ashfield Council Wangal Park development have been identified as potential beneficial reuse locations. The feasibility of these options would be discussed with local councils during detailed design. These projects would be subject to separate environmental assessment and appropriate approvals as required.

Development works/land restoration

The majority of spoil would be beneficially reused for environmental and development works at a number of sites, as described in **section 6.9.3**.

6.9.3 Spoil reuse and disposal sites

Remaining spoil after reuse within the project or in environmental and community works would be beneficially reused for environmental and development works. Where reuse is not possible, disposal of spoil would be the last resort.

The spoil reuse and disposal sites described in **Table 6.25** have been identified at this stage of construction planning.

Table 6.25 Description of currently identified spoil reuse and disposal sites

Reference	Site	Description	Address
S1	Riverstone Precinct	Development site that is part of the North West Growth Centre	170 Riverstone Road, Riverstone
S2	Quakers Hill	Development works at the former military site	Railway Terrace, Schofields
S3	Marsden Park	Solid waste landfill	920 Richmond Road, Marsden Park
S4	Horsley Park	Development works for reuse to produce bricks or land restoration of the former brick pits	Wallgrove Road, Horsley Park

Spoil would be delivered to the spoil reuse sites in accordance with the conditions and planning approvals governing those sites. It has been confirmed that the spoil reuse sites currently have adequate capacity to accept spoil from the project.

Table 6.26 provides details of the capacity and approved hours for receival of spoil from external sources.

Table 6.26 Capacity and approved hours of currently identified spoil reuse and disposal sites

Site	Distance	Capacity	Approved spoil receival hours
Riverstone Precinct	About 30 km	500,000 tonnes	Standard construction hours only
Quakers Hill	About 30 km	600,000 tonnes (not yet approved)	Not yet approved
Marsden Park	About 30 km	360,000 tonnes	Monday to Friday 6 am to 5 pm Saturday 7 am to 4 pm Sunday 9am to 3 pm
Horsley Park	About 25 km	Unlimited (manufacturing facility)	No restrictions

The spoil reuse and disposal sites identified above are based on the current existing availability of spoil receival locations (including projects with a fill deficit) across the Sydney area. Construction of the project would occur over a three year period, with spoil generation peaking in 2017. It is therefore anticipated that alternative spoil reuse locations may emerge during construction that could represent an improved outcome.

The following criteria would be applied to determine the priority given to the four identified spoil reuse and disposal sites, including how much spoil would be sent to each site, and to evaluate any additional spoil reuse or disposal options that emerge during construction:

- Environmental benefit – in terms of a preference for the material to be reused for such purposes as:
  - Environmental works (eg coastal protection works, flood mitigation or restoration)
  - Clean fill on other projects (eg landscaping, barrier mounds, land reclamation, capping)
  - Land restoration (eg filling of disused mines and quarries)
- Traffic impacts – with a preference for haulage routes that keep to major arterials as far as possible
- Approvals – any receiving location would need to be approved, to receive the applicable type and volume of spoil
- Economic – feasibility of transporting the spoil compared to the options already identified, including consideration of the distances to be travelled.

6.9.4 Spoil haulage routes

The currently identified proposed spoil reuse sites described in **section 6.9.3** are all located in western and north-western Sydney. The locations of these sites are shown in **Figure 6.21**.

Haulage routes from each construction ancillary facility site, as described in **section 6.5**, have been designed to allow vehicles to head west on major arterial roads. All haulage routes are on the existing M4 or arterial roads, except for a small section of Underwood Road near Parramatta Road which, although a local road, runs through a sparsely populated, commercial area. Access to and egress from sites on these roads would be at signalised intersections, unless there is another appropriate safe strategy available (such as a deceleration or acceleration lane).

The haulage routes from the construction ancillary facility sites to the arterial road network heading west are shown in **Figure 6.22** to **Figure 6.24**.

Figure 6.21 Spoil reuse sites

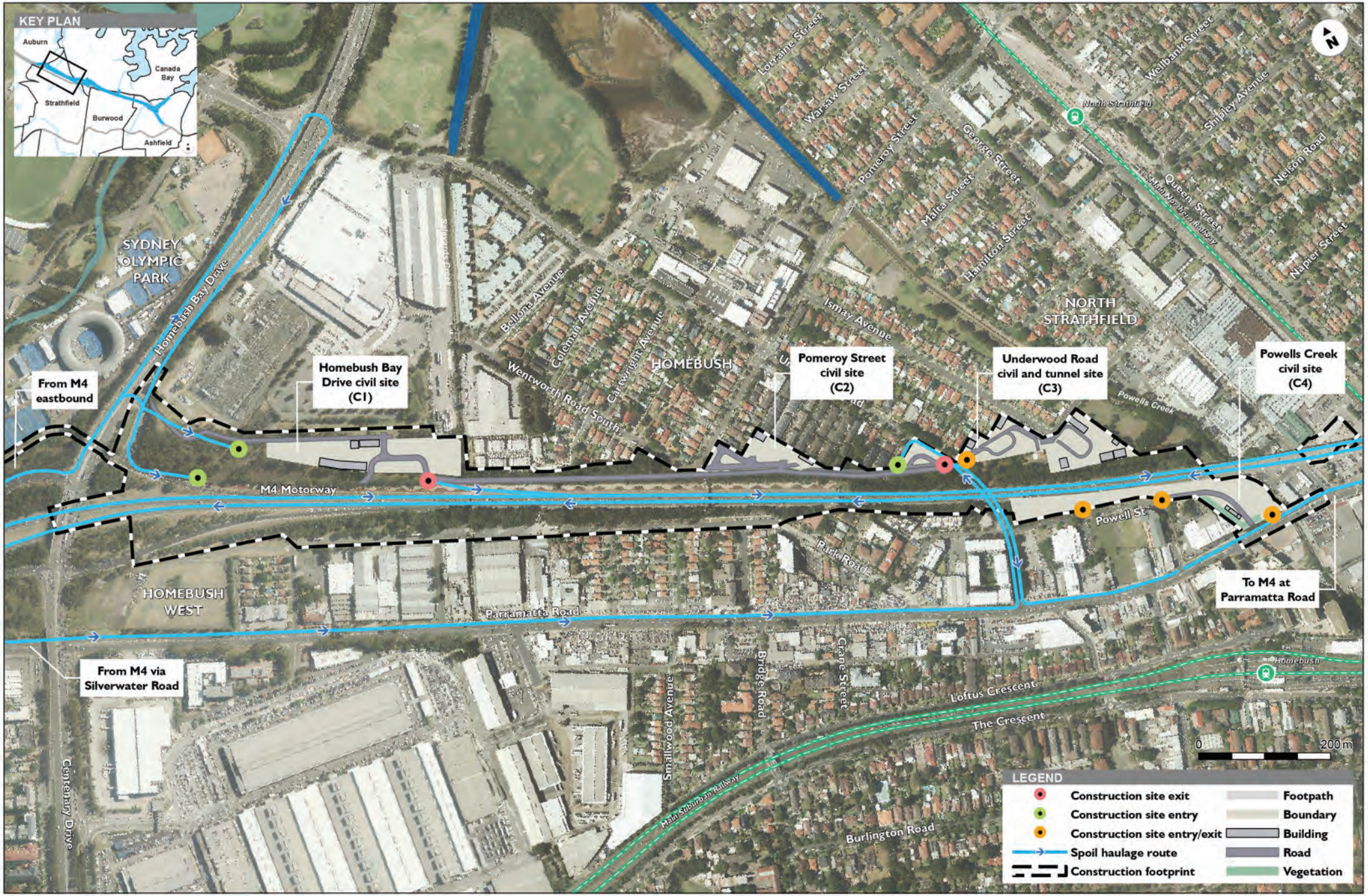

Figure 6.22 Homebush Bay Drive and Powells Creek spoil haulage routes

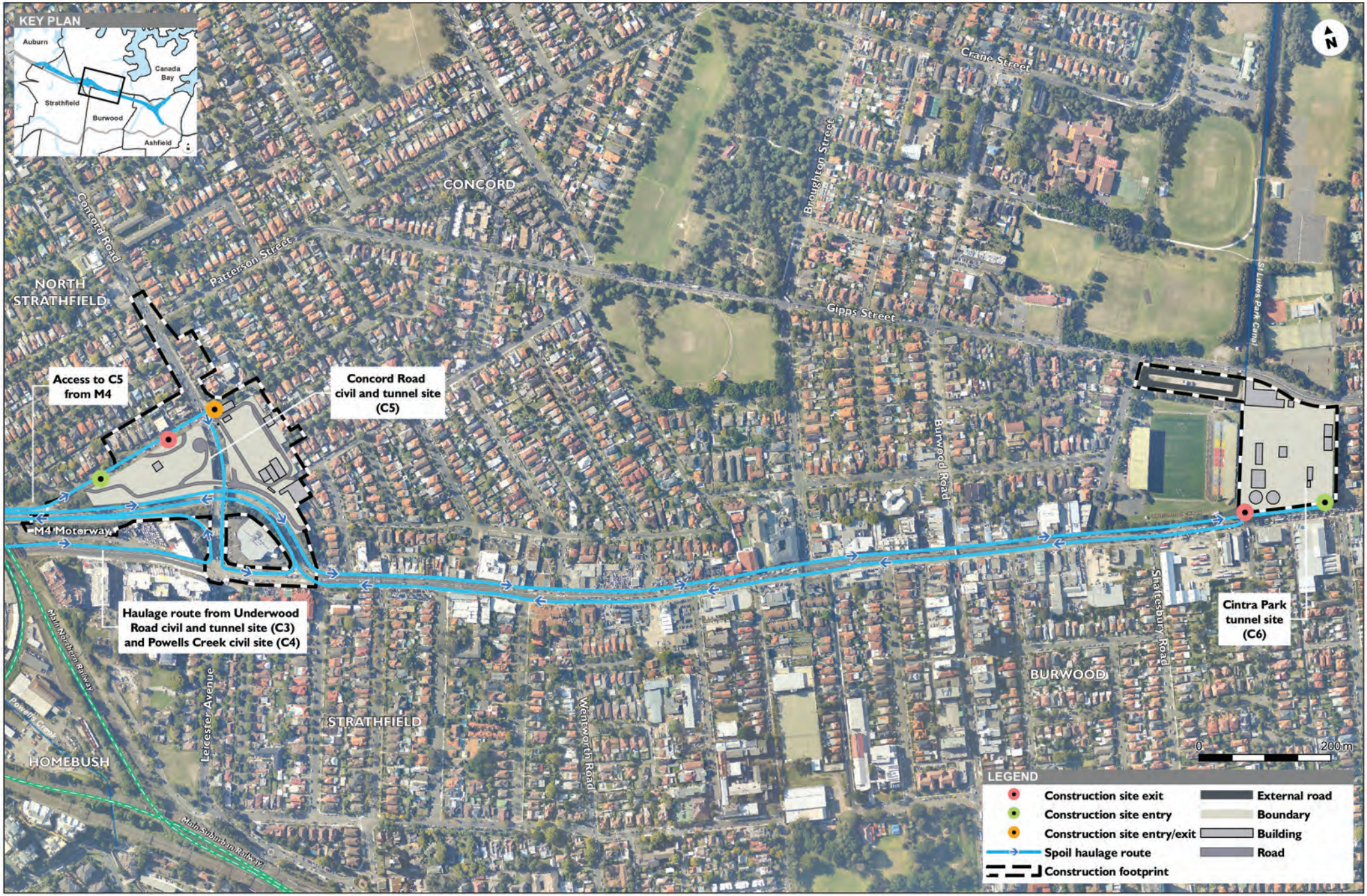

Figure 6.23 Concord Road and Cintra Park spoil haulage routes

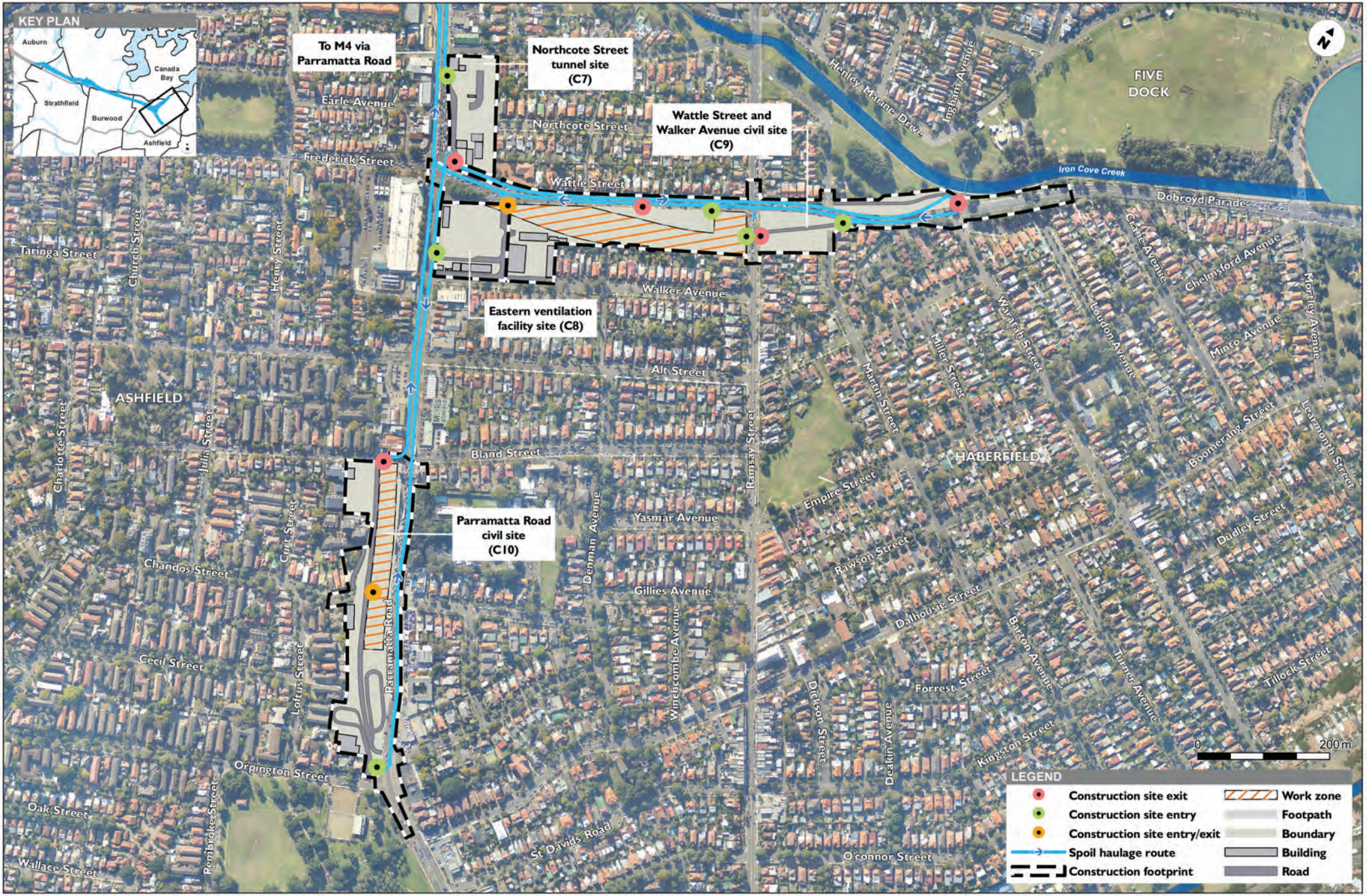

Figure 6.24 Wattle Street and Parramatta Road spoil haulage routes

6.9.5 Spoil management strategy

A formal spoil management plan would be developed and documented for the project before tunnelling works begin. The strategy would take into account the progression of the detailed design of the project and specific conditions of approval that may be applied to the project. The broad parameters within which the plan would be developed are summarised in **Table 6.27**.

Table 6.27 Spoil management plan broad parameters

Parameter	Strategy response
Spoil generation	Around 2.4 million cubic metres (surplus spoil).
Spoil generation locations	Spoil would be generated as per **Table 6.24**.
Spoil management hierarchy	Where feasible and reasonable, spoil would be managed according to the following hierarchy: • Minimisation of spoil generation through design and management • Reuse of spoil within the project • Beneficial reuse of spoil outside the project for environmental and community works • Beneficial reuse of spoil outside the project for site levelling, development or rehabilitation • Disposal of spoil outside the project for non-beneficial uses (landfilling).
On-site management	Spoil would be transported from the tunnel face to the surface by truck, where it would be stored at each tunnel site with capacity to store up to one day's spoil generation from the site. For surface earthworks, spoil would be stockpiled at the construction ancillary facilities. Spoil would be loaded onto trucks (within an acoustic shed at tunnel sites) for transport off site. Appropriate dust management controls would be implemented at stockpiles.
Spoil testing	Spoil would be sampled, analysed and characterised according to the *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA 2014). In the case of spoil generated from the excavation of tunnels, spoil testing would be limited to initial testing to confirm that the excavated material is VENM.
Spoil quality	The majority of spoil that would be generated by the project is expected to meet the classification of VENM. There is some potential, particularly for spoil generated at the surface around current and historical development, for spoil to be classified as solid waste. More heavily contaminated materials are not expected to be encountered.
Spoil disposal locations	Excess spoil would be disposed of at a location that has appropriate approval or licences to accept the material. Alternative sites from those listed in this chapter may also be considered for spoil reuse or disposal, subject to necessary environmental planning approvals being in place for those sites and the specific needs of the project. Solid waste and more highly contaminated materials would only be reused on sites permitted to accept the materials, or otherwise directed to an appropriately licensed waste management facility.
Spoil transport	Spoil would be transported by truck. Haulage routes are outlined in **section 6.9.4**.

6.10 Construction resource use

6.10.1 Construction materials

Indicative quantities and the major sources of materials required for construction are detailed in **Table 6.28**.

Table 6.28 Indicative resource requirements

Resource	Total estimated quantity	Anticipated source
Concrete	400,000 cubic metres	Sydney suppliers located close to the project
Precast concrete	23,500 cubic metres	Combination of NSW and overseas suppliers
Cement (additional to concrete)	365 tonnes	Sydney suppliers located close to the project
Structural steel	920 tonnes	Manufactured in Australia and/or overseas
Reinforcing steel	29,000 tonnes	Manufactured in Australia and/or overseas
Asphalt	40,000 tonnes	Sydney suppliers located close to the project
Aggregate	350,000 tonnes	Quarries within the Sydney region
Stabilised sand	1,600 tonnes	Sydney suppliers
Water	1,300 megalitres	Recycled construction water and mains water
Petrol	27,000 litres	Local Sydney supplier
Diesel	11,616,000 litres	Local Sydney supplier

Construction material would generally be sourced from off-site suppliers. This would include the balance of fill material to address shortfalls in required volumes, in the event that material sourced from the site is unsuitable. Wherever feasible, local sources of construction materials would be preferred in order to minimise haulage distances.

6.10.2 Construction energy use

It is estimated that the total energy requirements for the construction of the project would be around 76,400,000 kilowatt hours. Around six per cent of the total energy requirements would be from renewable sources as required by the *WestConnex Sustainability Strategy Summary* (WDA 2015). Tunnel sites would require direct high voltage feeds from local substations to supply power for ventilation and roadheaders at Underwood Road civil and tunnel site (C3), Concord Road tunnel site (C5), Cintra Park tunnel site (C6), Northcote Street tunnel site (C7) and eastern ventilation facility site (C8).

Table 6.29 shows the proposed source and routes for each tunnel site. These routes minimise traffic disruptions by using local roads/footpaths and reusing redundant conduits.

Table 6.29 Indicative construction power supply sources and route locations

Destination	Source	Proposed route
Underwood Road civil and tunnel site (C3)	Homebush substation	Footpaths of Ismay Avenue
Concord Road civil and tunnel site (C5)	Burwood zone substation – corner Lloyd George Avenue and Ada Street, Burwood	Footpaths of Ada Street
Cintra Park tunnel site (C6)	Burwood zone substation – corner Lloyd George Avenue and Ada Street, Burwood	Footpaths of Ada Street and Burton Street
Northcote Street tunnel site (C7)	Five Dock zone substation – Parramatta Road, Five Dock	Parramatta Road – utilise redundant conduits
Eastern ventilation facility site (C8)	Five Dock zone substation – Parramatta Road, Five Dock (subject to approval from power provider)	Parramatta Road – utilise redundant conduits

Construction power demand for site offices, facilities, tools and small plant at the Homebush Bay Drive civil site (C1), Pomeroy Street civil site (C2), Powells Creek civil site (C4), Concord Road civil and tunnel site (C5), Wattle Street and Walker Avenue civil site (C9) and Parramatta Road civil site (C10) would be within the capacity of the existing local distribution network.

Generators may be required at each of the construction ancillary facility sites prior to connection to the supply network, and at each of the electricity substations prior to their commissioning.

6.10.3 Construction water use and management

Water use

Tunnelling works would require significant volumes of water for excavation and would generate wastewater requiring treatment and disposal. Construction water supply would also be required for the following construction activities:

- Interchange construction and road widening activities, including earthworks, concreting and dust suppression for surface works
- Building construction activities.

The total volume of water required for construction of the project would be around 1,300 megalitres.

The use of non-potable water would be preferred over potable water. The extent to which non-potable water sources can be used would be governed by workplace health and safety considerations, economic feasibility, the functional specifications of the design and the availability of non-potable water. Water would be sourced from:

- The mains supply
- Non-potable sources including:
  - Stormwater harvesting
  - On-site construction water treatment and reuse
  - Alternative sources of reclaimed water from the area, such as Sydney Water, in the event that the above two non-potable water sources are inadequate for the project's needs.

The use of non-potable water is more likely to be feasible for temporary works and environmental controls, such as dust suppression, rather than permanent works. Reclaimed stormwater, recycled water and groundwater inflows would need to meet the guidelines set out in the tip sheet *Use of Reclaimed Water* (RTA 2006b).

Wastewater generation and management

The project would include the installation and commission of construction water treatment plants to treat tunnel groundwater and dirty construction water at the following tunnelling sites:

- Underwood Road civil and tunnel site (C3), discharging to a concrete stormwater canal that forms a tributary of Powells Creek
- Concord Road civil and tunnel site (C5), discharging to a stormwater pipe under Concord Road that ultimately discharges to Canada Bay
- Cintra Park tunnel site (C6), discharging to St Lukes Park Canal located along the eastern side of Concord Oval
- Northcote Street tunnel site (C7), discharging to a stormwater pipe under Parramatta Road that connects to Dobroyd Canal
- Eastern ventilation facility site (C8), discharging to a stormwater pipe that connects into Dobroyd Canal.

The water treatment plants would be designed to treat stormwater and groundwater to water quality guidelines within the environment protection licence and may consist of:

- Primary settling tanks/pond to remove sand and silt sediment fractions and oil and grease

- pH balance/metals oxidation tank, with primary flocculation
- Secondary flocculation tank
- Clarifiers to remove sediment and residual oil
- Sediment dewatering processes
- Inline process and discharge turbidity and pH monitoring with diversion valves to divert out of specification water for retreatment.

The volume of wastewater generated during construction would vary according to construction activities taking place within the tunnel, the amount of groundwater infiltrating into the tunnel, and the length of the tunnel that has been excavated. Anticipated water treatment and discharge volumes at the construction sites are summarised in **Table 6.30**.

Table 6.30 Indicative construction phase daily water treatment and discharge

Site	Estimated daily treatment (kl)	Estimated daily discharge (kl)
Underwood Road civil and tunnel site (C3)	600	300
Concord Road tunnel site (C5)	1,000	600
Cintra Park tunnel site C6)	1,000	600
Northcote Street tunnel site (C7)	1,400	800
Eastern ventilation facility (C8)	600	300

The difference between the volume of wastewater treated and the volume discharged represents the total volume of wastewater available for reuse at each site, each day. Wastewater from water treatment plants would be reused for:

- Dust suppression
- Wheel washes
- Plant washing
- Earthworks soil treatment (at Homebush Bay Drive civil site (C1))
- Potential reuse underground for roadheader dust suppression, rock bolting and wash down.

Wastewater not used on site would be discharged into the local stormwater system in accordance with the requirements of the local council and the EPA. Impacts related to the discharge of water to the local stormwater system are discussed in **Chapter 15** (Soil and water quality) and **Chapter 18** (Groundwater).

In addition, erosion and sediment controls including temporary water quality and spill containment basins if required, would be provided at construction sites to meet the requirements of the Blue Book. Temporary basins would be sited and sized in a similar location to permanent basins where appropriate. The location and size of any required basins would be confirmed during detailed design.