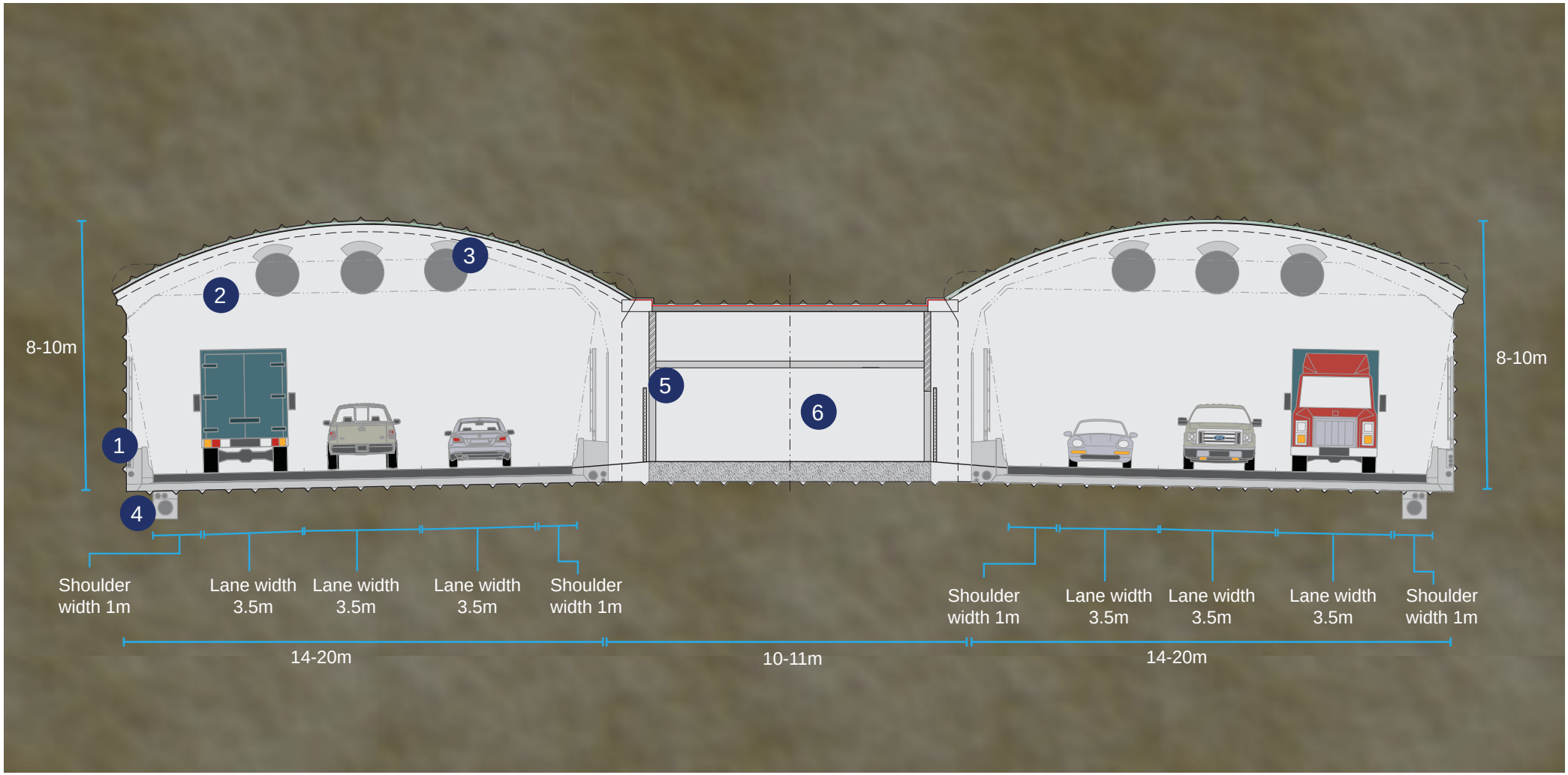
Figure 5.8 Indicative project footprint - Map 7



Legend

1. Services
2. Minimum vertical clearance of 5.3m and width of at least 12.5m
3. Jet fans
4. Tunnel drainage
5. 2hour fire rated sliding door
6. Pedestrian cross passage

Figure 5.9 Typical cross-section of tunnel including pedestrian cross passage

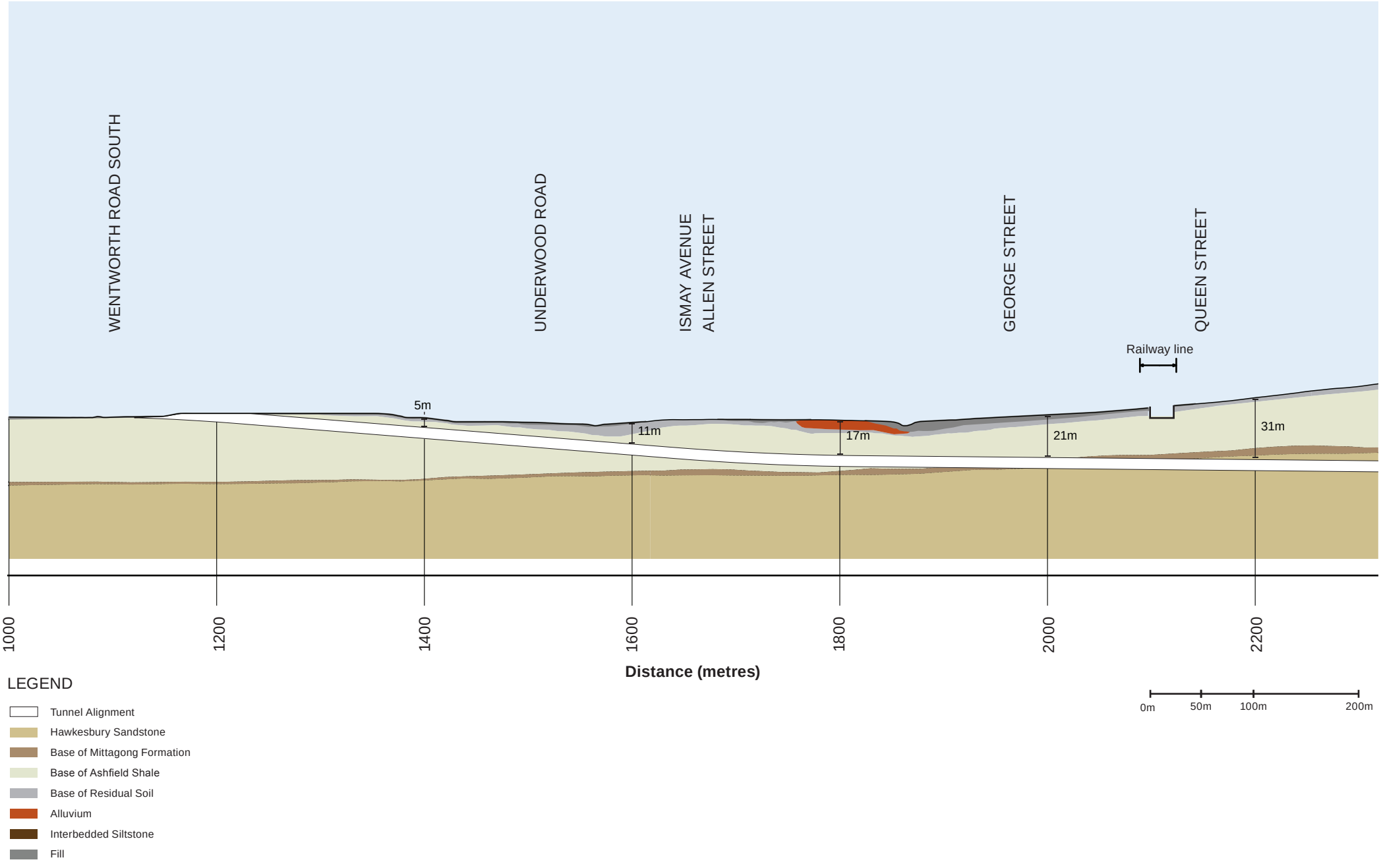


Figure 5.10 Mainline tunnel long section - Map 1

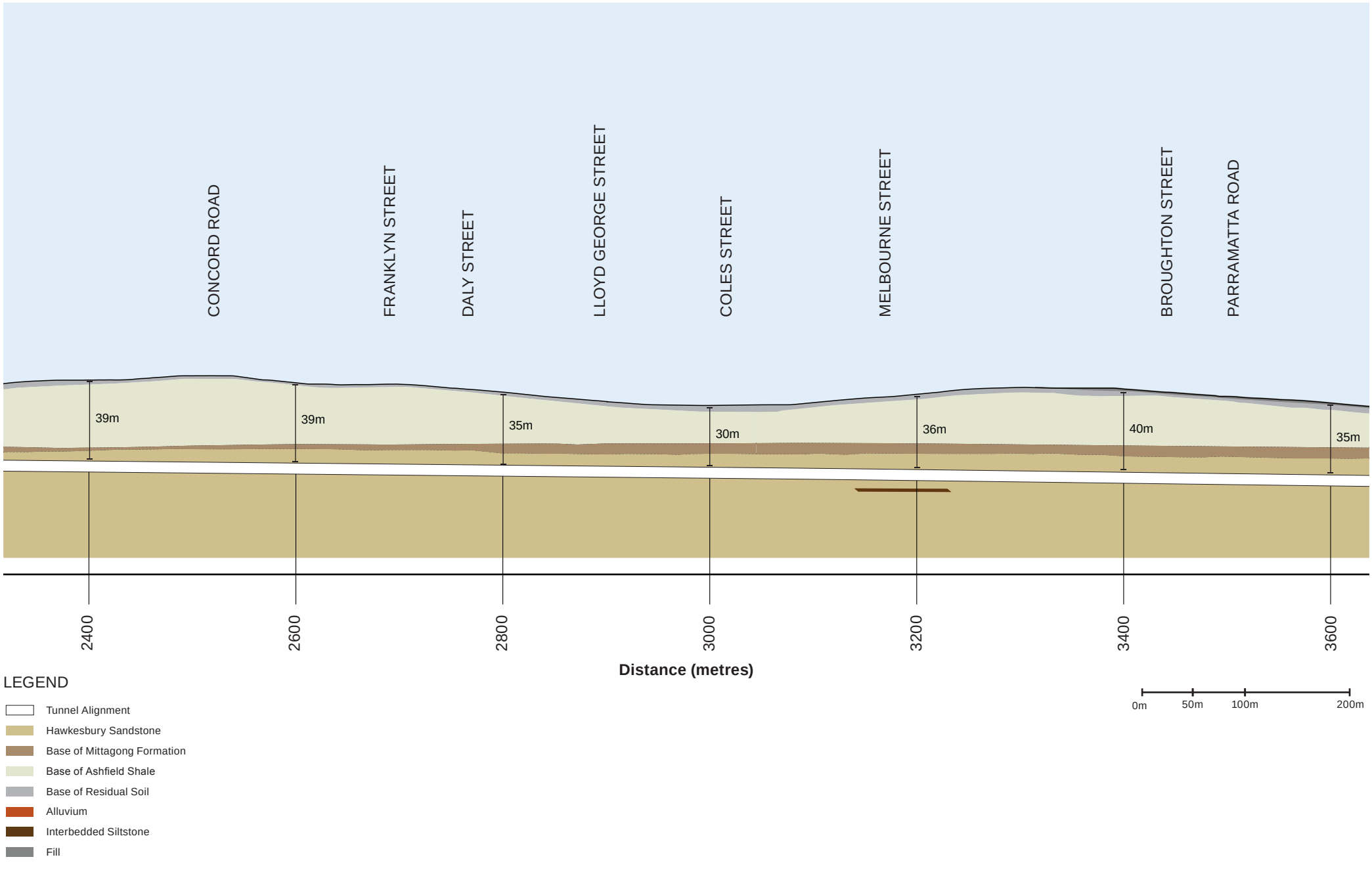


Figure 5.11 Mainline tunnel long section - Map 2

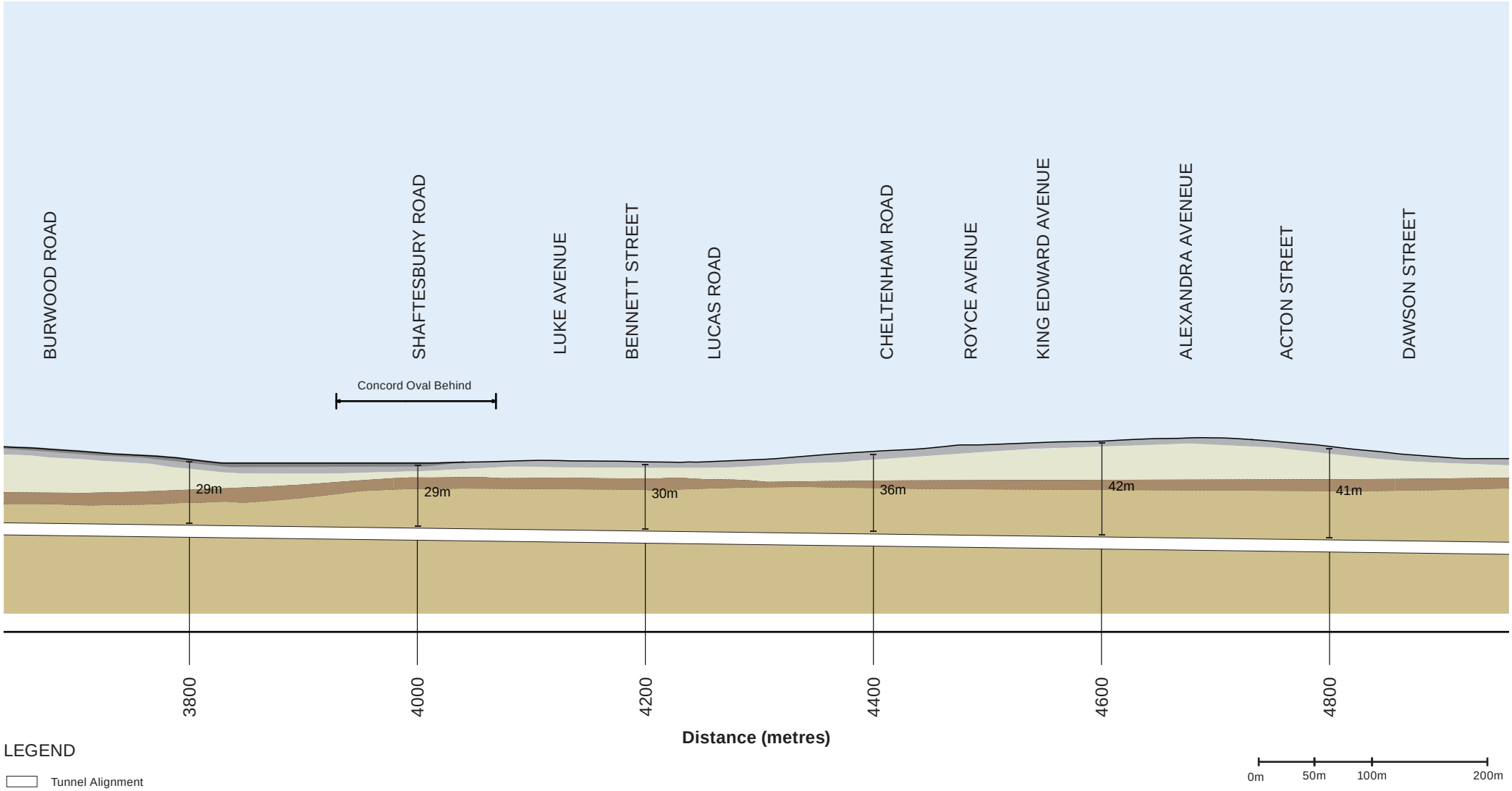


Figure 5.12 Mainline tunnel long section - Map 3

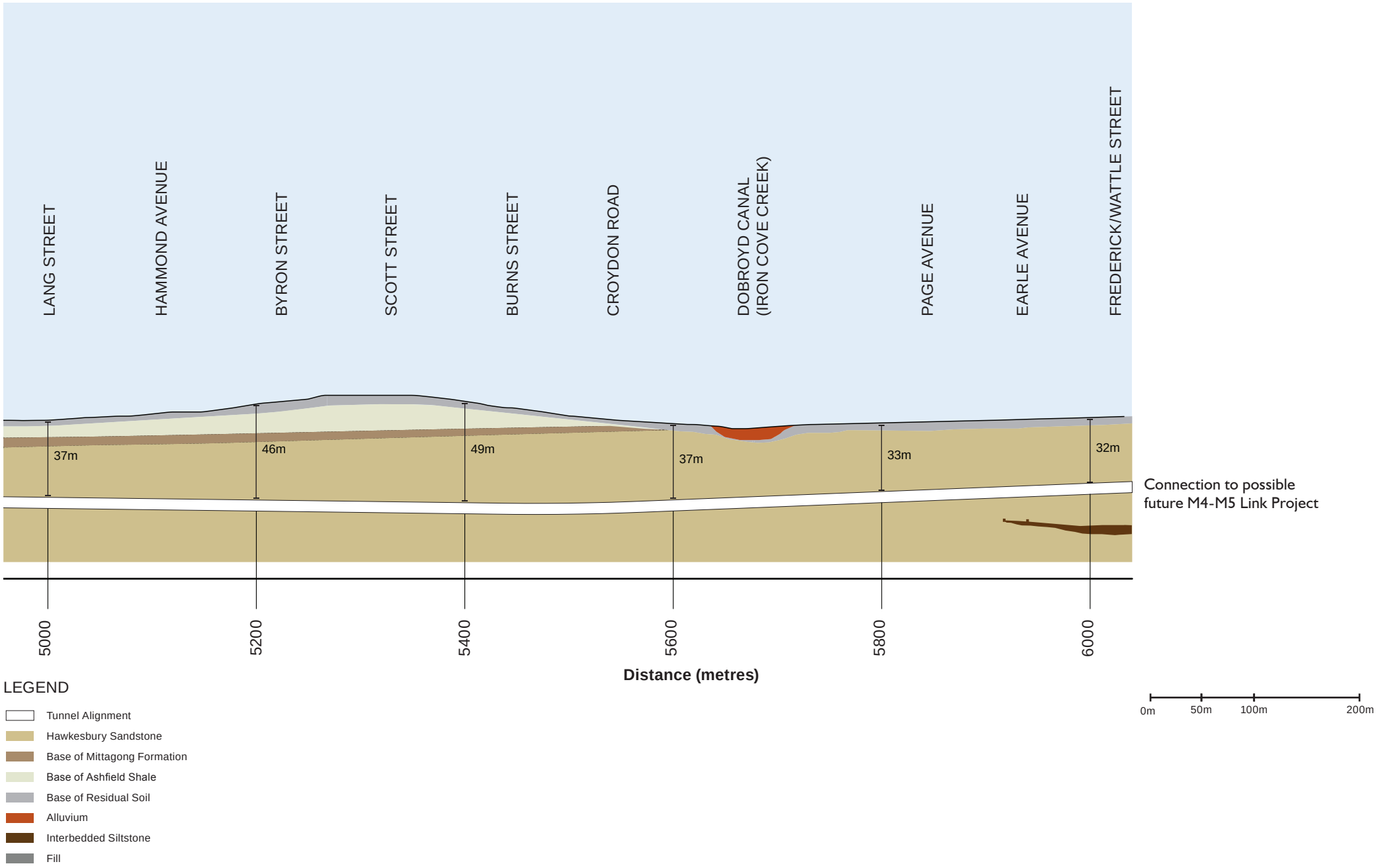


Figure 5.13 Mainline tunnel long section - Map 4

5.5 Road treatments at intersections and interchanges

The project would require the upgrade of major interchanges and realignment of major roads to connect the mainline tunnels to the surface road network. All current connections to arterial roads along the existing M4 would be maintained, although some connections at Concord Road and Parramatta Road at North Strathfield would be modified.

The interchanges are discussed in the sections below.

5.5.1 Homebush Bay Drive interchange

This interchange would connect both the M4 and Homebush Bay Drive to the new mainline tunnels, as well as maintaining current surface traffic movements to and from the existing M4. Work at the interchange starts beneath the existing Homebush Bay Drive overbridge, where the existing M4 is being widened as part of the M4 Widening. **Figure 5.14** shows the arrangement of the Homebush Bay Drive interchange. Details of the bridges located within the interchange are described in **section 5.8.1**. The re-routed cycleway is described in **section 5.9.2**.

M4 Motorway surface realignment

The western extent of the project would connect to the M4 Widening project under the existing Homebush Bay Drive bridge. The existing lane configuration would be modified to comprise two parallel three-lane carriageways with a central median.

East of Homebush Bay Drive, the M4 would be realigned so that the dominant traffic flow would be to and from the new mainline tunnels. In the eastbound direction, a new lane for M4 surface traffic would be provided to the north of the existing traffic lanes, widening to two lanes as it joins with a lane from the Homebush Bay Drive on-ramp. A bridge structure would carry these two lanes over other traffic lanes before connecting to the existing M4 just west of Underwood Road.

In the westbound direction, two traffic lanes would be provided for M4 surface traffic, realigned to the south of the existing traffic lanes. A bridge structure would carry traffic over other traffic lanes before merging to a single lane, which would then merge with the existing M4 to the east of Homebush Bay Drive.

Homebush Bay Drive eastbound on-ramp

The existing eastbound on-ramp from Homebush Bay Drive to the M4 would be realigned to the north. It would initially consist of two traffic lanes which would provide access to the eastbound mainline tunnel. A third lane would provide access to the surface M4 eastbound.

Traffic from the Homebush Bay Drive on-ramp choosing to use the eastbound mainline tunnel would travel in the two through lanes, under a bridge carrying eastbound surface M4 traffic, and then merge with traffic travelling from the existing M4 prior to the tunnel dive. Traffic from the Homebush Bay Drive on-ramp choosing to use the surface M4 would diverge from the on-ramp onto a third lane on the southern side. It would then join with the lane from the existing M4 described above, and would travel over the bridge structure before connecting to the existing M4 just west of Underwood Road.

Homebush Bay Drive westbound off-ramp

The westbound off-ramp to Homebush Bay Drive would be realigned to the south and would diverge from the surface M4 near Short Street West as a single lane. Traffic coming out of the westbound mainline tunnel and choosing to exit at Homebush Bay Drive would use a new exit lane just west of the tunnel dive, which would travel under the bridge structure (carrying westbound M4 surface traffic) and join the realigned Homebush Bay Drive off-ramp.

The two-lane off-ramp to Homebush Bay Drive (for both mainline tunnel and M4 surface traffic) would tie into the existing off-ramp about 150 metres east of the signalised intersection with Homebush Bay Drive.

Figure 5.14 M4 and Homebush Bay Drive interchange

M4 East tunnel entrance and exit

Three lanes in each direction would be provided for traffic using the M4 East mainline tunnels. The existing M4 eastbound traffic lanes would be realigned to the north and would connect to the eastbound tunnel entrance west of Pomeroy Street and the existing footbridge over the M4.

The westbound tunnel exit would be located west of Pomeroy Street and the exiting footbridge. Once at the surface, the westbound traffic lanes would generally occupy the current location of the existing M4 eastbound traffic lanes (which would be realigned as described above), and would tie in to the M4 Widening project to the east of Homebush Bay Drive.

5.5.2 Powells Creek M4 on-ramp

A new signalised intersection would be provided on Parramatta Road, about 70 metres to the west of George Street at North Strathfield. A right turn lane would be provided for westbound traffic on Parramatta Road, and traffic signals would control eastbound traffic on Parramatta Road to permit westbound traffic to turn right to access the new on-ramp. Westbound through traffic on Parramatta Road would not be restricted by the traffic signals.

This new intersection would provide access to a new on-ramp connecting to the existing M4 westbound. The on-ramp would include an elevated structure over part of Powells Creek.

Figure 5.15 shows the arrangement of the Powells Creek M4 on-ramp.

5.5.3 Concord Road interchange

The Concord Road interchange would connect the M4 East mainline tunnels to Concord Road and Parramatta Road. There would be no change to the current traffic movements at the existing Concord Road (Sydney Street) M4 off-ramp. A new on-ramp would be provided from Concord Road southbound to the existing M4 westbound, and the existing on-ramp from Concord Road northbound to the existing M4 westbound would be removed. The left turn to the existing M4 westbound for eastbound Parramatta Road traffic would also be removed.

Figure 5.16 shows the arrangement of the Concord Road interchange.

M4 East tunnel entrance from Concord Road

The on-ramps from Concord Road would start as two separate connections allowing for left turn only access from Concord Road southbound and northbound to the eastbound tunnel. South of Patterson Street, two through southbound lanes on Concord Road would be maintained, and two left turn lanes would be added to the eastern side, widening Concord Road at this location. These left turn lanes would provide unsignalised connections to either enter the eastbound mainline tunnel or connect to the existing M4 westbound. The lane to the eastbound mainline tunnel would continue at surface level in a loop, dividing from the new M4 westbound on-ramp (discussed further below) and passing under the existing Concord Road bridge. It would then enter the eastbound tunnel portal south of Sydney Street.

For northbound traffic on Concord Road choosing to enter the eastbound mainline tunnel, a left turn lane would be provided at the existing Concord Road bridge. This lane would continue in a loop and enter the eastbound tunnel portal south of Sydney Street. The existing Concord Road bridge would be extended on the western side to accommodate the eastbound tunnel on-ramp. Concord Road northbound would continue as a single lane until joined by the northbound off-ramp from the westbound mainline tunnel.

The two eastbound tunnel on-ramps from Concord Road would join in tunnel to become a two-lane ramp, before merging into one lane just prior to the merge with the eastbound mainline tunnel beneath John Street.

Figure 5.15 Powells Creek M4 on-ramp

Figure 5.16 Concord Road interchange

M4 East tunnel exit to Concord Road

The Concord Road off-ramp would start in tunnel beneath Britannia Avenue, and would initially comprise one lane before widening to two lanes between Melbourne Street and Coles Street. The lanes would split into separate ramps just west of Concord Road, with the left lane providing access to the northbound exit onto Concord Road, and the right lane providing access to the southbound exit onto Concord Road.

The westbound tunnel exit would be located just south of Sydney Street. The northbound exit lane would connect to Concord Road in a loop, joining Concord Road as an added lane to the north of the existing Concord Road bridge prior to the signalised intersection with Sydney Street. The southbound exit lane would pass under the existing Concord Road bridge before looping to connect with Concord Road via a left turn.

The northbound off-ramp would involve widening a small section of Concord Road north of the existing bridge to accommodate the added lane. The northern abutment of the existing Concord Road bridge would be modified by excavating soil and replacing with a retaining structure, to accommodate the off-ramp between the bridge pier and the abutment.

Connections to the existing M4

The left turn to the existing M4 westbound for eastbound Parramatta Road traffic would be removed. A new Concord Road southbound on-ramp connecting to the existing M4 westbound would be provided. Traffic would use the new left turn lane that starts south of Patterson Street. The on-ramp would continue at surface level in a loop, with traffic then travelling over a new bridge spanning the existing M4 and Concord Road, before joining with the existing M4 westbound as an added lane.

The existing Concord Road northbound on-ramp connecting to the existing M4 westbound would also be removed. Alternative access to the M4 westbound would be provided by the new Powells Creek M4 on-ramp.

M4 adjustment

To accommodate the separate on- and off-ramps passing below the Concord Road bridge, traffic lanes on the existing M4 would be adjusted from just east of Sydney Street to the intersection with Parramatta Road. The new eastbound carriageway would occupy the current location of the existing westbound carriageway, and would be reduced to two lanes between Sydney Street and the Concord Road bridge. The existing westbound carriageway would be relocated to the south under the southern span of the existing Concord Road bridge, which would be excavated and the southern abutment modified.

5.5.4 Wattle Street (City West Link) interchange

The proposed Wattle Street interchange would connect the M4 East mainline tunnels and the M4–M5 Link tunnels to Wattle Street and the City West Link in the vicinity of Ramsay Street. The westbound lanes of Wattle Street would be realigned to the east to accommodate the tunnel on- and off-ramps. The existing connectivity of Wattle Street and the City West Link in this area would be maintained or improved.

Figure 5.17 shows the arrangement of the Wattle Street interchange.

M4 East tunnel exit to Wattle Street

The Wattle Street eastbound off-ramp would start from the Parramatta Road of-ramp tunnel, beneath Earle Avenue at Ashfield, with the tunnel portal located on the northern side of Ramsay Street. The off-ramp would consist of a single lane, before widening to two lanes near the eastbound tunnel exit. The off-ramp would be located between the eastbound and westbound carriageways of Wattle Street, with tunnel traffic merging to one lane just after the Waratah Street intersection. This lane would then join with Wattle Street surface traffic as an added lane.

A dedicated right turn bay would be provided at the Waratah Street signalised intersection for traffic exiting the eastbound mainline tunnel only. Eastbound Wattle Street surface traffic (not originating from the eastbound mainline tunnel) would not be able to turn right at this intersection.

Figure 5.17 Wattle Street (City West Link) interchange

M4 East tunnel entrance from Wattle Street

The Wattle Street on-ramp would start as the right hand westbound lane of Wattle Street, just after the Waratah Street intersection. The on-ramp would be a single lane for the majority of its length, widening to two lanes beneath Parramatta Road and merging back to one lane before connecting to the westbound mainline tunnel beneath Croydon Road as an added lane. In the ultimate configuration (once the M4–M5 Link (if approved) is operating), the westbound mainline tunnel would comprise three lanes at this location, and the Wattle Street on-ramp would merge with the westbound mainline tunnel.

Wattle Street surface adjustments

The traffic lanes on Wattle Street would be reconfigured to accommodate the on- and off-ramps. The eastbound carriageway of Wattle Street would contain three lanes, merging to two lanes past Ash Lane, and would generally follow the existing alignment from just north of Parramatta Road to Martin Street. North of Martin Street, Wattle Street would be widened on the north-eastern side, encroaching into Reg Coady Reserve. At this point, the two eastbound lanes on Wattle Street would merge into one lane, which would then join with eastbound off-ramp traffic as an added lane. A dedicated right turn bay would be provided at Ramsay Street for eastbound Wattle Street surface traffic.

The westbound carriageway of Wattle Street would be realigned to the south of its existing alignment, commencing north of Martin Street and straddling the M4−M5 Link on- and off-ramps. At Waratah Street, the two through lanes on Wattle Street would split, with the right lane continuing as the on-ramp to the westbound mainline tunnel, and the left lane continuing as Wattle Street at the surface. The left lane would widen back to two lanes south of Waratah Street and through the Ramsay Street intersection, and a right turn lane from Wattle Street into Ramsay Street would also be provided. Traffic choosing to turn right at Parramatta Road would continue in the two through lanes past Ramsay Street, where they would veer to the right. Traffic choosing to travel across Parramatta Road to Frederick Street, or choosing to turn left at Parramatta Road, would use the left lane which would split from the two through lanes, and then widen to two lanes. The left lane would become a dedicated left turn lane onto Parramatta Road, while the right lane would widen to two lanes to connect to Frederick Street, consistent with the current configuration of the Wattle Street and Parramatta Road intersection.

M4−M5 Link on- and off-ramp tunnels

To facilitate construction of the M4−M5 Link tunnels, and associated connections to the local road network, while minimising cumulative construction impacts on the community, part of the on- and off-ramps to the M4−M5 Link tunnels at Wattle Street would be constructed as part of the M4 East project. This would include construction of the dive and cut-and-cover sections of these ramps. The ramps would not include lighting, linemarking or pavements as they would not be opened to traffic unless the M4−M5 Link tunnels are constructed to connect to the ramps. In the interim, physical barriers would be provided to prevent access other than for maintenance purposes.

The M4−M5 Link on- and off-ramps to be constructed as part of the project would be located between the divided Wattle Street carriageways between Parramatta Road and Ramsay Street. The ramps would join Wattle Street near Allum Street. The eastbound on-ramp would start at the surface near Ash Lane, and enter the eastbound tunnel portal north of Allum Street. The westbound off-ramp would join Wattle Street between Allum Street and Parramatta Road, with the westbound tunnel portal at Allum Street. The cut-and-cover sections of the ramps to be constructed as part of the project would extend to Martin Street.

The location of the two ramps is shown on **Figure 5.18**.

Figure 5.18 M4-M5 Link on- and off-ramps

5.5.5 Parramatta Road interchange

The Parramatta Road interchange would connect the M4 East mainline tunnels to Parramatta Road, with the eastbound tunnel exit and westbound tunnel entrance located west of Rogers Avenue and Orpington Street. To accommodate the on- and off-ramps, the westbound lanes of Parramatta Road would be realigned to the south. The existing connectivity of Parramatta Road in this area would be maintained.

Figure 5.19 shows the arrangement of the Parramatta Road interchange.

M4 East tunnel exit to and entrance from Parramatta Road

The Parramatta Road on- and off-ramps would be located between the Parramatta Road eastbound and westbound carriageways. Both on- and off-ramps would have two lanes until the M4–M5 Link is operating. The off-ramp would merge to one lane prior to joining the eastbound Parramatta Road traffic once the M4–M5 Link is operating.

The Parramatta Road off-ramp would start from beneath Burns Street at Croydon. Until the M4–M5 Link is operating, all traffic in the eastbound mainline tunnel would exit the tunnel via a two-lane Parramatta Road off-ramp, with the option of taking the Wattle Street off-ramp described in **section 5.5.4**. The eastbound cut-and-cover tunnel portal would be located just west of Chandos Street, and M4 East eastbound tunnel traffic would merge with the eastbound Parramatta Road carriageway just west of Rogers Avenue.

The Parramatta Road on-ramp would start just west of Orpington Street. Traffic in the right lane on Parramatta Road would enter the westbound tunnel, while traffic in the left lane could either enter the westbound tunnel or continue at the surface along Parramatta Road. The on-ramp would comprise two lanes and would join the mainline tunnel beneath Earle Avenue. In the initial configuration (before the M4–M5 Link is operating), the Parramatta Road on-ramp would continue as two lanes until joined by the Wattle Street on-ramp lane to form three lanes. In the ultimate configuration (once the M4–M5 Link (if approved) is operating), the Parramatta Road on-ramp would merge to one lane beneath Bunnings before merging with the mainline tunnel beneath Earle Avenue.

Parramatta Road surface adjustments

To accommodate the on- and off-ramps, Parramatta Road between Bland Street and Orpington Street would be reconfigured.

The eastbound carriageway would comprise three lanes and would generally follow the existing alignment of Parramatta Road from Bland Street through to the intersection with Rogers Avenue. Just before Rogers Avenue, the three lanes would merge to two lanes. As the M4 East eastbound tunnel off-ramp lanes join Parramatta Road, the two middle lanes would merge and Parramatta Road would continue as three lanes.

The westbound carriageway of Parramatta Road would be realigned on the southern side between Orpington Street and Bland Street. After the westbound on-ramp lanes split from the through lanes, the westbound carriageway would widen to three lanes. The Parramatta Road westbound carriageway would then connect back into the existing westbound carriageway prior to the Bland Street intersection.

The tunnel on- and off-ramps have been separated to allow for future provision of a seven metre-wide, central-running mass transit corridor on Parramatta Road between Bland Street and Rogers Avenue/Orpington Street. This mass transit corridor could be used for bus rapid transit or light rail services in the future. This would be subject to separate assessment and approval as appropriate.

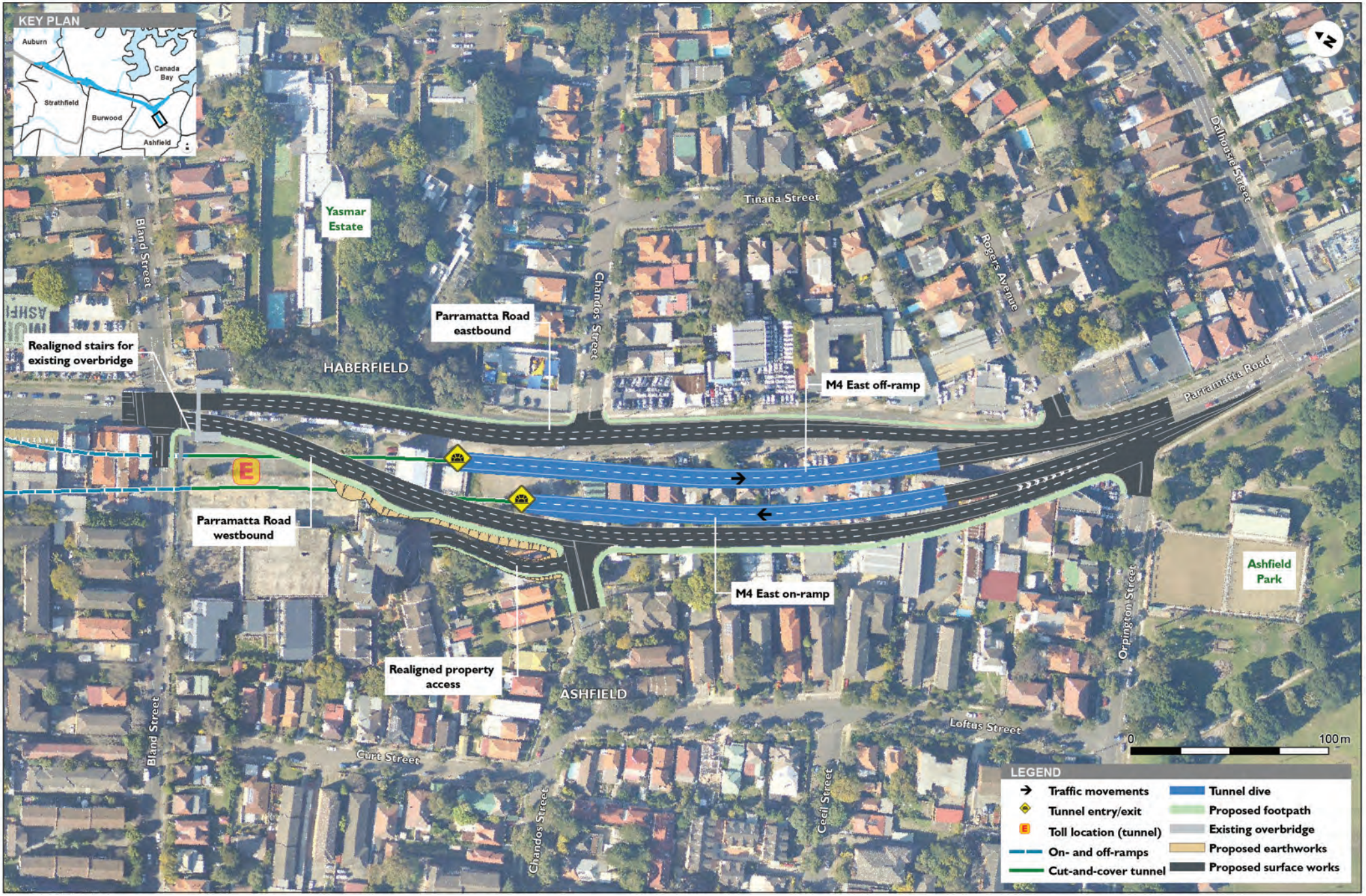


Figure 5.19 Parramatta Road interchange

5.6 Ventilation system

5.6.1 Overview

The tunnel ventilation system would be designed to meet the following criteria:

- Ensure that the air quality inside the tunnels is maintained at a level that provides a safe environment for tunnel users during normal, maximum traffic flow and minor incident operations (as described in **section 5.6.3**). The design of the ventilation system within the tunnels would cater for the interface to the M4–M5 Link
- Ensure that air is exhausted from the tunnels and dispersed in a manner that meets the external air quality goals and limits
- Provide a safe environment during a major incident or fire that allows all tunnel users to safely evacuate and provide for Fire & Rescue NSW intervention
- Ensure a suitable operational interface between the M4 East and the M4–M5 Link ventilation systems.

The tunnel ventilation system would comprise jet fans and ventilation facilities. Equipment to monitor and measure operational states that affect air quality (both inside and outside the tunnels) and the safety of tunnel users would be incorporated into the project.

During normal operation, the ventilation system would draw fresh air into the tunnels through the tunnel portals and emit air from the tunnels via two ventilation facilities:

- Western ventilation facility, located near the western tunnel portal at the Homebush Bay Drive and M4 interchange
- Eastern ventilation facility, located near the eastern tunnel portals at the Wattle Street (City West Link) and Parramatta Road interchanges.

During maximum traffic flow conditions, a major incident or fire, the fresh air supply facility at Cintra Park may be used.

During a fire emergency, smoke would be exhausted using the ventilation facilities or from the tunnel portals depending on the location of the fire.

5.6.2 Ventilation facilities

The location of the ventilation facilities is shown in **Figure 5.3**, **Figure 5.5**, and **Figure 5.8**.

Indicative layouts of the ventilation facilities are provided in **Figure 5.20** to **Figure 5.22** and details of the facilities are provided in **Table 5.3**.

Figure 5.20 Western ventilation facility

Figure 5.21 Cintra Park fresh air supply and water treatment facility

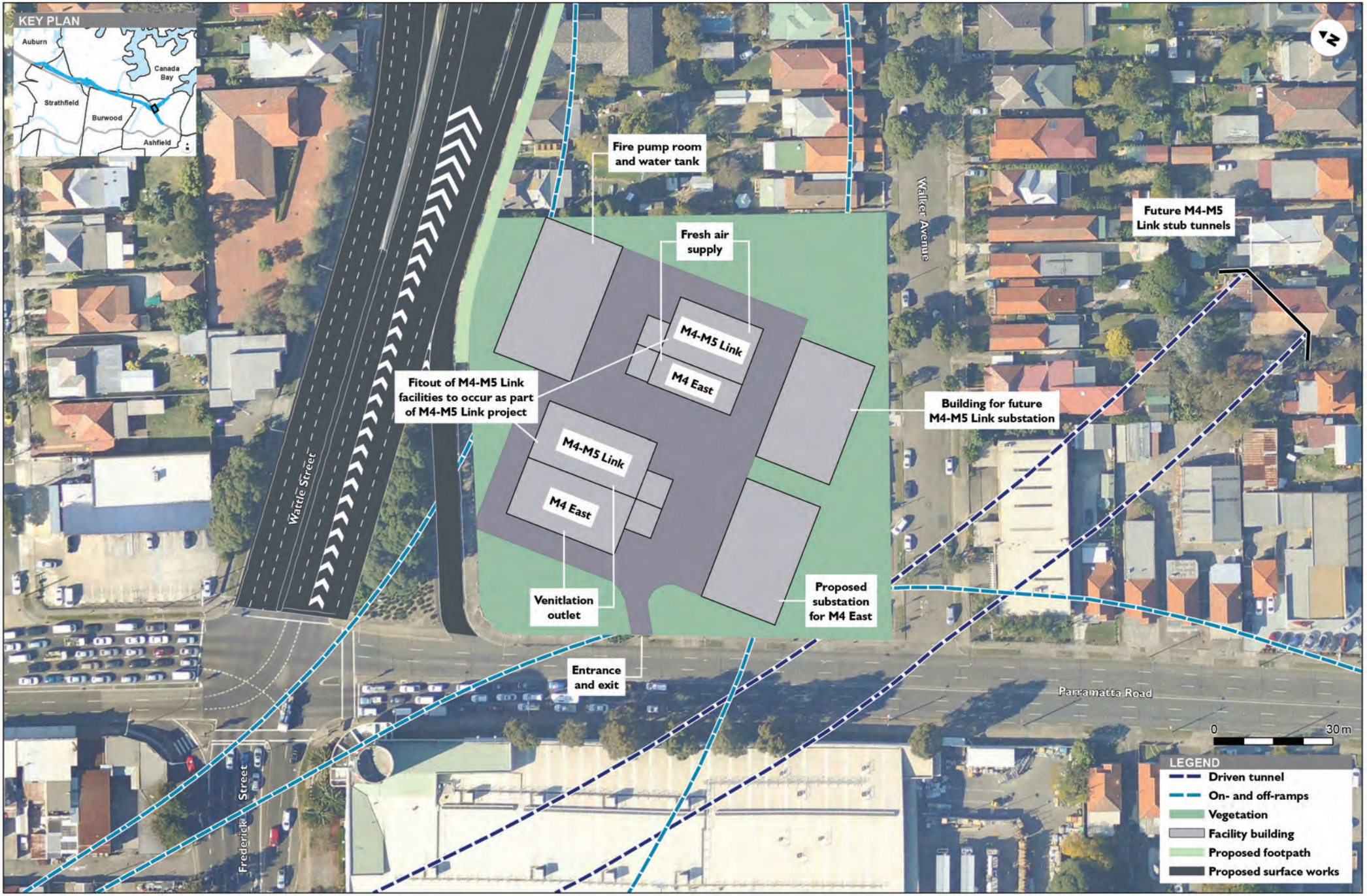


Figure 5.22 Eastern ventilation facility

Table 5.3 Indicative components of the project's ventilation system

Ventilation system component	Description
Jet fans	• Jet fans would be mounted throughout the tunnels and would operate as required to maintain in-tunnel air quality. • Up to 80 jet fans would be installed in the eastbound tunnel and ramps and up to 90 jet fans in the westbound tunnel and ramps. The final numbers of jet fans would be determined through detailed design.
Western ventilation facility	• The facility would include a substation at ground level (refer to **section 5.10**) and a ventilation outlet. • The ventilation outlet would have a height of 30.5 metres above finished ground floor level (maximum height of reduced level (RL) 37 metres Australian height datum). • The ventilation outlet would have large axial fans located at the base of the outlet to provide air dispersion from the outlet.
Cintra Park fresh air supply facility	• Depending on detailed design, additional fresh air supply could be provided through a ventilation facility located at Cintra Park. • The facility would have a height of about four metres above ground level.
Eastern ventilation facility	• The facility would service both the M4 East project and the M4–M5 Link (if approved). • The ventilation exhaust facility would consist of two separate but adjoining buildings with a 'back-to-back' outlet. • The ventilation exhaust facility for the project would provide exhaust from the mainline eastbound tunnel and exhaust from the Wattle Street and Parramatta Road off-ramps. • The ventilation exhaust facility for the M4–M5 Link would provide exhaust from the mainline westbound tunnel and exhaust from the Wattle Street M4–M5 Link off-ramp. • The ventilation outlet would have a height of 25 metres above finished ground floor level (maximum height at RL 42 metres Australian height datum). • One or two fresh air intake buildings would also be provided. These buildings would provide fresh air supply to the M4 East mainline westbound tunnel and the M4–M5 Link eastbound tunnel. • The fresh air intake buildings would have a height of about 25 metres above ground level. • The ventilation exhaust facility for the M4–M5 Link substation at the eastern ventilation facility would comprise a building only, and fitout would occur as part of construction of the M4–M5 Link (if approved). • The facility would also include two substations (refer to **section 5.10**).

5.6.3 Operating modes

The tunnel ventilation system would operate in the following modes:

- Normal traffic conditions
- Maximum traffic flow conditions which can generate the highest in-tunnel pollution levels
- Major incident conditions including major accident and fire scenarios.

Operation of the ventilation system under each of these conditions is detailed in the following sections and shown in **Figure 5.23**. Further details regarding external and in-tunnel air quality are provided in **Chapter 9** (Air quality).

Normal traffic conditions

Under normal traffic conditions the tunnel ventilation system would use the vehicle piston effect, where the movement of vehicles draws air into the tunnels through the entrance portals and moves the air along the tunnel in sufficient volumes to satisfy the fresh air demand of vehicles using the tunnels.

In-tunnel air containing vehicle emissions would be extracted from the tunnels before it reaches the exit portals. Air would be exhausted through a ventilation off-take inside the tunnels and transferred to the ventilation facility via a shaft. The air would then be discharged from the ventilation outlet to the atmosphere to achieve effective dispersion.

For the tunnel off-ramps, air would be drawn back down the ramp for extraction via the ventilation facility. This would require jet fans to maintain the air flow against the direction of traffic flow. A similar approach would be applied to sections of the mainline tunnels close to the exit portals.

Maximum traffic flow conditions

In the case of an incident (such as a vehicle breakdown or crash) and maximum traffic flow conditions (such as heavy congestion) which can generate the highest in-tunnel pollution levels, the vehicle generated piston effect would be lessened. In these situations the airflow will need to be assisted by the jet fans located throughout the tunnels. Further details of the maximum traffic flow scenario can be found in **Chapter 9** (Air quality).

The ventilation facilities would be operated during maximum traffic flow and minor incident conditions to ensure that acceptable air quality is maintained in the tunnels, and to achieve effective dispersion of tunnel air into the atmosphere. In addition, the fresh air supply facility at Cintra Park may be used.

Major incident conditions

During a major incident or fire, the tunnel ventilation system would be operated to ensure in-tunnel safety. In the case of a fire, the ventilation system would provide air in sufficient quantities to prevent smoke ‘back layering’ (ie flowing back from the fire source) over any vehicles that are stationary behind the incident. Smoke would be exhausted through the ventilation facilities or through the tunnel portals, depending on the location of the fire incident.

Low traffic flow conditions

Under low traffic, the vehicle generated piston effect would be lessened. In these situations the airflow will need to be assisted by the jet fans located throughout the tunnels. Under low traffic conditions, emission levels would also be low, consistent with the number of vehicles in the tunnel. Additional fresh air supply is unlikely to be required.

5.7 Other ancillary facilities

5.7.1 Motorway operations complex

The motorway operations complex would be located to the east of the Homebush Bay Drive interchange on the northern side of the M4. The complex would comprise a motorway control centre, maintenance facility building and bulky equipment store.

The motorway control centre would be a three-storey office-style building, with a one-storey maintenance facility building attached. The bulky equipment store would be partially enclosed with a lightweight metal roof.

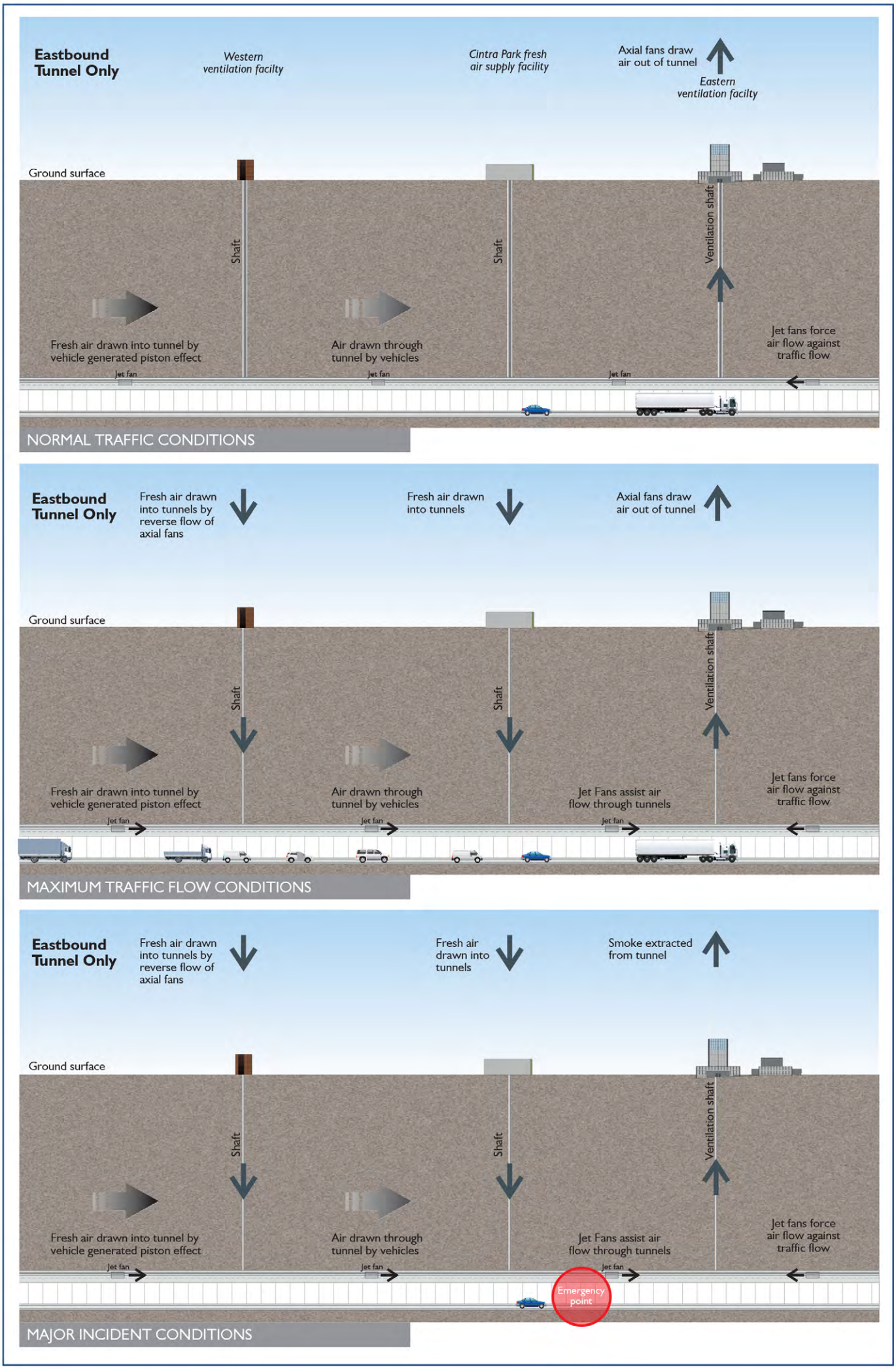


Figure 5.23 Indicative tunnel ventilation system

Figure 5.2 shows the location of the motorway operations complex and **Figure 5.24** provides an indicative layout of the motorway operations complex.

The motorway control centre would operate and be staffed 24 hours a day all year round. Up to about 20 full-time equivalent staff would work at the site. The centre would include facilities necessary for the monitoring, maintenance and control of tunnel services including tunnel safety, ventilation, power, lighting and other road systems required for the safe and efficient operation of the tunnels. Facilities would include a tunnel control room, training and incident response room, back-up power supply equipment for use in the case of mains power shutdown, computer equipment, office space and staff amenities.

The maintenance facility building would include a workshop and storage areas, office space and staff amenities. The maintenance facility would be used for light maintenance of operational infrastructure such as jet fans.

The bulky equipment store would include a covered storage area, small hazardous materials store (eg petrol for lawn mowing), and bays for parking maintenance equipment and incident response vehicles. All storage would comply with AS 1940 2004 *Storage and Handling of Flammable and Combustible Liquids*.

The complex would be accessed from a new dedicated two-way access road off the Homebush Bay Drive on-ramp. This access road would be about five metres wide. Parking would be provided for around 20 staff and visitors.

Urban design principles and landscaping would be employed to integrate the motorway operations complex into the surrounding streetscape and minimise its visual impact. Further details regarding urban design, landscaping and visual impacts are provided in **Chapter 13** (Urban design and visual amenity).

5.7.2 Incident response centre

An incident response centre would be located at Cintra Park and would be housed within the building containing the substation at this location (refer to **section 5.10.1**). This centre would be used in the event of major incidents and emergencies and would include facilities to be used by emergency services to manage incidents in the tunnels. The centre would also be used as a back up to the motorway control centre, should the need arise.

The substation and incident response building would be about 30 metres long and 17 metres wide, with a height of about five metres.

Vehicle access to the incident response centre would be provided via Gipps Street.

5.7.3 Emergency and incident management facilities

The project would be designed to minimise and manage incidents within the tunnel in accordance with the following standards:

- Australian Standard 4825-2011 *Tunnel fire safety*
- US National Fire Protection Association 502 *Standard For Road Tunnels, Bridges, and Other Limited Access Highways* (2014)
- Various publications prepared by the Permanent International Association of Road Congress (PIARC) including:
  - *Systems and equipment for fire and smoke control in road tunnels* (PIARC 2007)
  - *Road tunnels: Vehicle emissions and air demand for ventilation* (PIARC 2012)
  - *Fire and Smoke Control in Road Tunnels* (PIARC 1999)
  - *Road tunnels: Operational Strategies for Emergency Ventilation* (PIARC 2011).

Figure 5.24 Motorway operations complex

Operational emergency systems and facilities such as emergency shoulders, breakdown bays, and fire suppression and firefighting systems have been included in the design of the project. Emergency incident facilities throughout the tunnel infrastructure would include the following:

- Deluge systems, including water storage tanks and fire pump rooms (refer to **section 5.10.2**)
- CCTV throughout the tunnels and approaches
- Vehicle height detection system prior to the tunnel portals
- Tunnel barrier gates to prevent access in the event of tunnel closure
- Pedestrian cross passages, spaced a maximum of 120 metres apart
- Pedestrian longitudinal egress passages running along the on- and off-ramps at the Concord Road, Wattle Street and Parramatta Road interchanges, where it would be impractical to provide a connection to another tunnel
- Intermediate passages for access by Fire & Rescue NSW personnel during emergencies at the Concord Road, Wattle Street and Parramatta Road interchanges, connecting the long egress passages either to the adjacent long egress passages or to the mainline tunnels
- Breakdown bays along both the eastbound and westbound mainline tunnels
- Fire & Rescue NSW emergency cabinets inset into the tunnel walls at about 60 metre intervals including fire hose reels, hydrants and fire phones
- Motorist emergency equipment points inset into the tunnel walls at about 60 metre intervals including a motorist emergency telephone and a fire extinguisher
- Two incident response areas of suitable size to station an incident response vehicle, one located at the motorway operations complex and one located at the Parramatta Road ventilation facility.

Pedestrian cross passages are connection tunnels between the two mainline tunnels. A typical cross passage is shown in **Figure 5.9**. These passages would allow pedestrians to cross from one tunnel to the other in the event of a major incident in one of the mainline tunnels. Once in the other tunnel, which would be closed to traffic by the tunnel operator, pedestrians would be in a relatively safe place and could walk or be transported to the nearest tunnel portal and exit the tunnel.

Pedestrian longitudinal egress passages, located alongside on- and off-ramps, are similar to pedestrian cross passages, but instead are a protected passageway that runs along the edge of the on- or off-ramp (longitudinally), as shown in **Figure 5.25**. They would be separated from the on- or off-ramp by a fire-rated wall. Longitudinal egress passages are provided where it is not possible to provide a cross connection to another tunnel. These passages would allow pedestrians to exit the on- or off-ramp in the event of a major incident. Pedestrians would walk along the longitudinal egress passage back to the tunnel portal, to an exit into an adjoining roadway tunnel (which would have be closed to traffic by the tunnel operator) or to a tunnel portal.

Both pedestrian cross passages and longitudinal egress passages are also used by Fire & Rescue NSW to access an incident tunnel via a non-incident tunnel.

5.8 Other project elements

5.8.1 Bridges

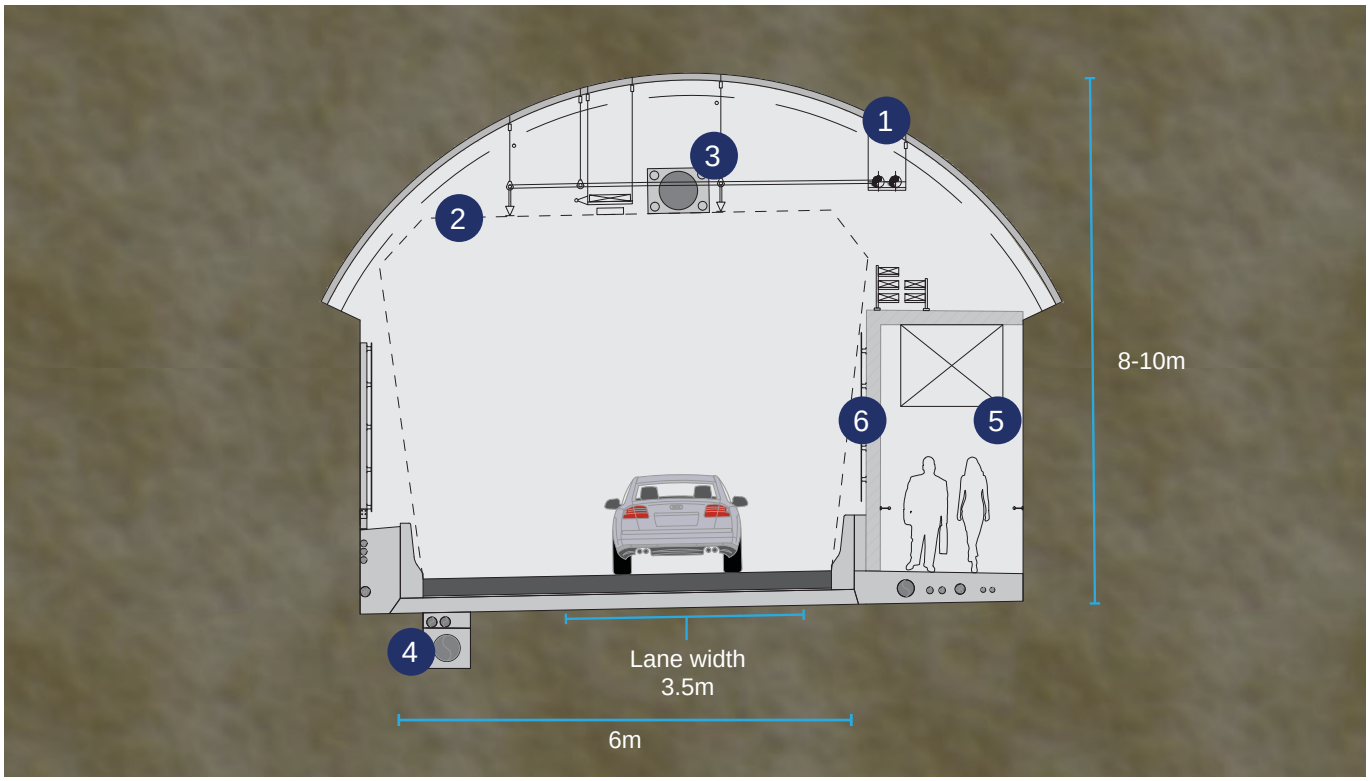
The project would require the construction of seven new bridges, and modification or replacement of three existing bridges.

New bridges

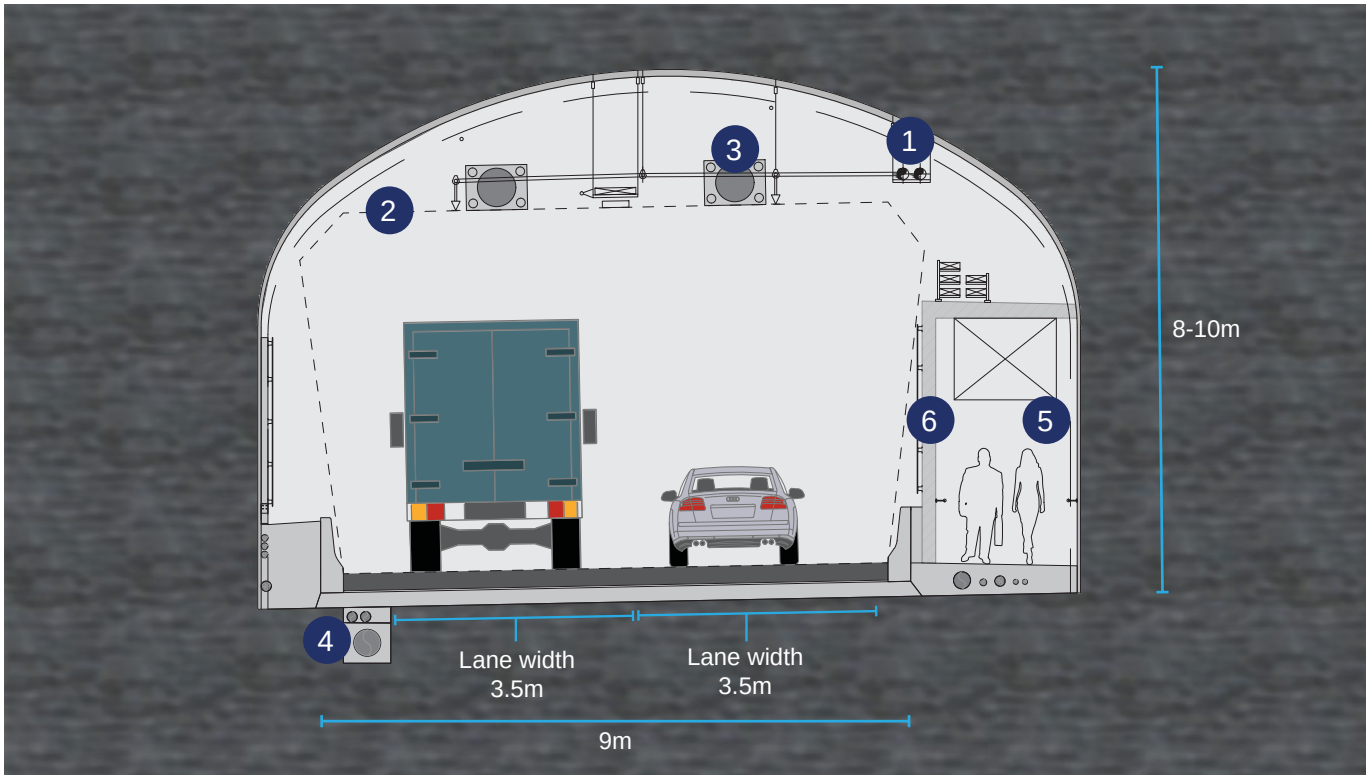
M4 eastbound bridge over Saleyards Creek

This bridge would carry eastbound surface M4 traffic over Saleyards Creek and traffic from the Homebush Bay Drive choosing to enter the eastbound mainline tunnel. The bridge would be about 11 metres wide and 330 metres long, and would have a maximum height of about 19 metres above ground level.

Typical single lane ramp tunnel section in sandstone



Typical two lane ramp tunnel section in shale



Legend

1	2	3	4	5	6
Services	Minimum vertical clearance of 5.3m and width of at least 12.5m	Jet fans	Tunnel drainage	Longitudinal egress passage	Fire proof wall

Figure 5.25 - Longitudinal egress passage

M4 westbound bridge over Saleyards Creek

This bridge would carry westbound surface M4 traffic over Saleyards Creek and traffic exiting the westbound mainline tunnel to Homebush Bay Drive. The bridge would be between about 11 and 14 metres wide and 250 metres long, and would have a maximum height of about 10 metres above ground level.

M4 westbound to Homebush Bay Drive bridge over Saleyards Creek

This bridge would carry traffic on the Homebush Bay Drive off-ramp from the surface M4 over Saleyards Creek. The bridge would be about eight metres wide and 20 metres long, and would have a maximum height of about 2.5 metres above ground level.

M4 eastbound cycleway overpass

The new alignment for the eastbound cycleway along the M4 (refer to **section 5.9.2**) would need a bridge structure to carry it across the Homebush Bay Drive on-ramp. The bridge would be around four metres wide and around 35 metres long, and would have a maximum height of about 28 metres above the on-ramp.

Powells Creek M4 on-ramp bridge

A new bridge would be constructed near Powells Creek to provide access to the M4 westbound from Parramatta Road. The bridge would be about 11 metres wide and 320 metres long. The bridge would tie in to the existing M4 which is on a viaduct above Powells Creek.

M4 westbound on-ramp bridge over Concord Road

This bridge would carry traffic on the new M4 westbound on-ramp from Concord Road southbound over the existing M4 and Concord Road. The bridge would be about nine metres wide and 250 metres long, and would have a maximum height of about eight metres above Concord Road.

Pedestrian bridge at Concord Road interchange

To provide pedestrian connectivity from the eastern side of Concord Road over the new on- and off-ramps, a new pedestrian bridge would be provided at the Concord Road interchange. The pedestrian bridge would be about three metres wide and 85 metres long, and would have a maximum height of about seven metres above the ramps.

Existing bridges to be modified or replaced

M4 bridge over Saleyards Creek

The existing Saleyards Creek bridge, which currently carries existing M4 traffic over the creek, would be replaced with a new bridge in the same location, and widened to accommodate additional traffic lanes. The new bridge would be about 66 metres wide and 14 metres long. The height of the new bridge would match the existing bridge.

Concord Road bridge

The existing Concord Road bridge would be modified to accommodate an eastbound on-ramp to the M4 East tunnel from Concord Road northbound, the westbound off-ramp to Concord Road southbound, and the realigned westbound surface M4 traffic lanes.

The bridge would be widened on the western side, starting at the southern abutment. The widened bridge would allow on-ramp traffic to travel over the realigned M4 and the new eastbound tunnel on-ramp from Concord Road southbound. The new eastbound on-ramp bridge would be about 12 metres wide at its widest point and 56 metres long.

To utilise the back spans of the existing bridge for westbound off-ramp to Concord Road southbound and the realigned westbound surface M4 traffic lanes, the northern and southern abutments would be modified, by excavating the existing abutment and replacing it with a retaining structure.

Bland Street pedestrian bridge

The existing stairs on the pedestrian bridge at Bland Street would be demolished to accommodate the realigned Parramatta Road. These stairs would be replaced with a new set between the existing lift core and Bland Street.

5.8.2 Cuttings and embankments

Sections of cuttings, embankments and retaining walls would be required for the surface works to facilitate connections to the existing road alignments. The main structures are described below.

Cuttings

The project would require multiple cuttings for the dive structures associated with the tunnel portals and the on- and off-ramp tunnels at the interchanges. Areas of cutting would range in depth, up to a maximum of around seven metres.

Embankments and retaining walls

The project would also require multiple embankments or areas of fill, mainly associated with the realignment of the M4, and for on- and off-ramps at the interchanges. In addition, the following retaining walls would be required:

- North and south of the existing M4 at the Homebush Bay Drive interchange. These walls would support traffic lanes and the cycleway at Pomeroy Street and Park Road
- At the Concord Road interchange to support the on- and off-ramps. A retaining wall would also be provided along the southern side of the M4 westbound carriageway, extending beneath the Concord Road bridge, and minor retaining walls would be provided at property adjustments east of Concord Road and north of Parramatta Road
- At the Wattle Street interchange to support the on- and off-ramps and the realigned Wattle Street near Martin Street
- At the Parramatta Road interchange to support the on- and off-ramps, the southern edge of the westbound carriageway of Parramatta Road west of Chandos Street, and the western side of Chandos Street.

5.8.3 Drainage and operational water quality

The drainage system has been designed to prevent flooding and aquaplaning within the tunnels and to avoid adverse effects on private properties and the local surface road networks surrounding the project. Further details on drainage and water quality can be found in **Chapter 15** (Soil and water quality), **Chapter 17** (Flooding) and **Chapter 18** (Groundwater).

Tunnel drainage

During the operational phase there would be an ongoing inflow of groundwater into the tunnels. The tunnel drainage system, including a water treatment facility located at Cintra Park, has been designed to accommodate the capture, removal, treatment and discharge of this groundwater.

The tunnel water proofing system has been designed to restrict groundwater inflows to one litre per second per kilometre. Groundwater inflows would flow to a sump with a dedicated groundwater chamber located at the tunnel low point, with capacity for 60,000 litres. Groundwater would then be pumped from the sump to the water treatment facility at Cintra Park, which is described below.

Treated groundwater would be discharged to the local stormwater system, which leads into St Luke's Park Canal, adjacent to Cintra Park. St Luke's Park Canal is a tidal concrete lined waterway that drains into Canada Bay.

The tunnel drainage system would also manage:

- Stormwater runoff
- Deluge system water (as part of the fire and life safety system) in the event of an emergency in the tunnels

- Tunnel wash down water
- Spills.

The project has been designed to prevent the water from the probable maximum flood storm event from entering the mainline tunnels and on- and of-ramps. Runoff collection at portals and inside the tunnels would be via gullies with longitudinal pipework to sumps.

All runoff captured by the tunnel drainage system would flow to the sump at the tunnel low point, which would contain a hydrocarbon chamber (with a capacity of at least 50,000 litres) and stormwater/deluge water chamber (with a capacity of at least 600,000 litres). The drainage system would first discharge into the hydrocarbon chamber, where a detection system would alert the tunnel operator of the presence of hydrocarbons. The sump would be fitted with connection points to allow a sucker truck to empty the hydrocarbon chamber if hydrocarbons are present.

If hydrocarbons are not present, stormwater would discharge from the hydrocarbon chamber into the stormwater/deluge water chamber. It would then be pumped to a water quality basin located at Cintra Park, before discharge to the local stormwater system.

The hydrocarbon chamber would also be used for storage of water from tunnel wash downs and spills. The hydrocarbon chamber would be fitted with sensing equipment to detect the pH value of the stored water and to determine if treatment is needed. The water would then either discharge to the groundwater sump where it would be pumped to the water treatment facility, or it would be pumped to a water quality basin at Cintra Park.

Surface drainage

Surface works at the interchanges would be located in areas managed by existing drainage infrastructure. The project would increase the amount of impervious surface within the catchment area of this drainage infrastructure, which would necessitate the following alterations and augmentations:

- Demolition and reconstruction of pits and pipes, alterations to existing drainage systems and culvert reconnection
- Alterations to the existing road drainage system around the four interchanges
- Provision of new drainage channels, gross pollutant traps, pits and pipes connecting to existing drainage systems
- Provision of a water quality basin on the western side of Saleyards Creek on the northern side of the existing M4
- Provision of a spill containment basin on the eastern side of Saleyards Creek on the northern side of the existing M4
- Provision of an underground spill containment tank adjacent to the Powells Creek on-ramp
- Provision of an underground onsite detention tank adjacent to Bland Street, on the northern side of Parramatta Road.

Operational water treatment facility

A water treatment facility would be provided at Cintra Park, and would consist of:

- A balance tank to regulate flows into the plant
- A treatment plant, including clarifier and control room, to treat water prior to discharge into the stormwater drainage system.

The location of the water treatment facility is shown in **Figure 5.21**.

The water treatment facility would be about 30 metres long and 17 metres wide, and would be surrounded by a four metre-high wall with access stairs to the clarifier and balance tanks. The water treatment plant and associated control rooms and storage bund area would be covered by a steel framed roof structure.

The water treatment plant would be designed to treat the anticipated maximum tunnel groundwater inflows of 17 litres per second.

The criteria for treatment plant discharge to surface waters would be based on existing water quality conditions at the point of discharge, with specific environmental criteria being set using the statistical methods outlined in the *Australian Guidelines for Water Quality Monitoring and Reporting* (Australian and New Zealand Environment and Conservation Council (ANZECC) and Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000). This approach would be adopted in preference to the default trigger values set out in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and ARMCANZ 2000), because the default trigger values are not suitably representative of the background surface water quality conditions and because the surface water systems are significantly disturbed by urban activities. Where no site data are available, the lower ANZECC 95th percentile default trigger value for fresh or marine water criteria would be adopted.

While considered unlikely, to suitably protect recreational users potentially coming into contact with treatment plant discharge into surface waters, the treatment plant discharge water quality would also meet the Australian Drinking Water Guidelines (National Health and Medical Research Council 2013) multiplied by a factor of 10, which is in line with the approach adopted by the World Health Organisation.

At this stage, it has been assumed that salinity would not need to be removed from tunnel groundwater. Discharges from the water treatment facility would be directed to St Lukes Park Canal which is tidal affected, and the canal discharges into a saline environment.

The water treatment facility would store and use small quantities of dangerous goods and hazardous substances including:

- Sodium hydroxide, stored in a tank in an undercover bunded area
- Coagulant, stored in a tank in an undercover bunded area
- Polymer, stored in bags and in a dosing hopper
- Diesel, stored in bunded tanks in pumps.

A water quality basin would also be provided at Cintra Park.

5.8.4 Lighting, roadside furniture and signage

Lighting

Lighting would be provided along the length of the mainline tunnels and on- and off-ramps, in accordance with relevant Austroads, Roads and Maritime, Australian and international standards.

Lighting at entrance and exit portals would consider differing light conditions outside the tunnels, and would be zoned to allow sufficient time for the motorist's eye to adjust to the in-tunnel lighting level. The tunnel lighting would include controls for daytime or night-time light levels and emergency situations, and would conform to the requirements of AS 1158.5:2007 *Lighting for roads and public spaces – Tunnels and underpasses* and International Commission on Illumination CIE 88:2004 *Guide for the lighting of road tunnels and underpasses*.

The surface roadway lighting design would comply with AS/NZS 1158 *Lighting for roads and public spaces*, and would be designed to minimise light spill in accordance with AS 4282:1997 *Control of the obtrusive effects of outdoor lighting*.

Roadside furniture

The following roadside furniture would be installed as part of the project:

- Relocated or new bus stops, including seating and bins (where required)
- Toll gantries (discussed in **section 5.8.5**) Noise walls (discussed in **section 5.8.6**)
- Headlight screen at the Concord Road interchange, between the realigned M4 eastbound and the eastbound tunnel on-ramp from Concord Road.

Signage

The project would incorporate traffic, locational, directional, warning and variable message signs within the tunnels and at the surface connections approaching the tunnels.

The directional signage would be in accordance with Austroads and Roads and Maritime standards, with the focus on providing clear direction to motorists travelling through the interchanges. Existing signage would also be amended, where required, to reflect changes to the existing road network.

Regulatory signposting would be installed to warn of the prohibition of dangerous goods vehicles and to highlight the height restrictions applicable within the tunnels. Other regulatory signage would indicate speed limits, transit lanes, bus lanes and clearway restrictions.

Advertising structures are not proposed as part of the project and would be subject to a separate assessment or approvals process should they be included at a later date.

5.8.5 Tolling gantries, communication and control systems

Toll gantries would be provided at the on- and off-ramps. Where possible, these would be located in the tunnels. Where this is not possible, such as at the Homebush Bay Drive interchange, their design and location would have regard to the urban design and landscape framework, as well as Roads and Maritime guidelines.

Other traffic management and control systems would be provided at various locations, including:

- Traffic signals
- Movable medians and barriers
- Vehicle detection devices
- Variable message signs (VMS)
- Closed circuit television (CCTV)
- Emergency telephones
- Communications infrastructure
- Variable speed limit signs
- Cabling and fixed signage.

These systems would enable monitoring and control of the M4 East during normal operation, and would also support incident management and emergency responses when required.

5.8.6 Noise barriers and low noise pavement

Noise barriers would be constructed at several locations to reduce the impacts of traffic noise. In addition, some existing noise barriers on the existing M4 near the Homebush Bay Drive interchange would be relocated, generally closer to the road reserve boundary. A number of other existing noise barriers on the existing M4 would be retained in their current location, and some of these would be increased in height.

Generally, noise barriers (which can include walls or earth mounds) are most feasible where residences are closely grouped, where the barriers do not impede access to properties, and where they are visually acceptable. Conversely, noise barriers are not cost-effective for isolated dwellings. In addition, where driveway access to properties must be maintained, the overall noise reduction provided by the barrier is compromised by the need to install an access gate.

Table 5.4 summarises the locations and profiles of existing, relocated and new noise barriers. The location of these barriers is shown in **Figure 5.26** and **Figure 5.27**. While the assessment has identified these barriers as noise mitigation, they are subject to further considerations during detailed design such as construction limitations, overshadowing, urban design and community preference.

Further details of the proposed noise walls are provided in **Chapter 10** (Noise and vibration), **Chapter 12** (Property and land use), and **Chapter 13** (Urban design and visual amenity).

Table 5.4 Indicative noise barrier provision

Location	Barrier number	Details	Type	Length	Height
Northern side of the M4	NW_M4EB_01A	A new noise barrier would be provided west of Saleyards Creek	New	100 m	6.0 m
	NW_M4EB_01B	The existing noise barrier to the east of Saleyards Creek would be retained, but may need to be relocated. The need to relocate this barrier would be determined during detailed design	Existing retained	80 m	6.0 m
	NW_M4EB_01C	The existing noise barrier of varying height to the west of Verley Drive would be relocated and would be the same height as existing	Existing relocated	116 m	4.2-6.0 m
	NW_M4EB_01D	The existing noise barrier at the rear of 39 and 41 Wentworth Road South at Homebush would be retained	Existing retained	60 m	4.2 m
	NW_M4EB_01E	The existing noise barrier (2.1 m high) adjacent to Wentworth Road South at Homebush would be retained but increased in height	Existing height increased	93 m	4.0 m
	NW_M4EB_01F	A new noise barrier would be provided to the east of Pomeroy Street, adjacent to Bill Boyce Reserve and extending to the rear of 73 Underwood Road at Homebush	New	240 m	3.5 m
	NW_M4EB_01G	The existing noise barrier at the rear of 11 Short Street East at Homebush and extending to the existing M4 bridge over Underwood Road would be relocated and would be the same height as existing	Existing relocated	144 m	3.4 m
	NW_M4EB_01H	The existing noise barrier on the existing M4 bridge over Underwood Road would be relocated and would be the same height as existing	Existing retained	210 m	3.4 m
	NW_M4EB_02	The existing noise barrier east of Sydney Street would be retained, but may need to be relocated. The need to relocate this barrier would be determined during detailed design	Existing retained	154 m	2.5 m
	NW_M4EB_03	The existing noise barrier east of the Concord Road overbridge would be retained	Existing retained	124 m	3.0 m
Southern side of the M4	NW_M4WB_02A	The existing noise barrier from west of the end of Park Road at Homebush would be relocated and would be the same height as existing	Existing relocated	34 m	3.5 m

Location	Barrier number	Details	Type	Length	Height
	NW_M4WB_02B	The existing noise barrier between the end of Park Road and the existing footbridge over the existing M4 at Homebush would be retained	Existing retained	234 m	3.0-4.2 m
	NW_M4WB_02C	The existing noise barrier east of the existing footbridge over the existing M4 would be relocated and would be the same height as existing	Existing relocated	226 m	4.2 m
	NW-M4WB_02D	The existing noise barrier from the rear of 21 Short Street West to west of Underwood Road at Homebush would be retained	Existing retained	162 m	4.2 m
Concord Road interchange	NW_CONCORD_01B	A new noise barrier would be provided around the outside of the curve of the new eastbound on-ramp from Concord Road southbound	New	187 m	3.0 m
Parramatta Road, near Wattle Street	NW_PARRA_02A and NW_PARRA_02B	A new noise barrier would be provided at the rear of properties between Wolseley Street and Wattle Street which would be acquired for the Northcote Street tunnel site (C7), subject to future land use of residual land at this location (refer to **Chapter 6** (Construction work)). This noise barrier could comprise a lapped and capped timber fence	New	162 m	2.0 m
Wattle Street	WATTLE_01A	A new noise barrier would be provided on the eastern side of the realigned Wattle Street, between the eastern ventilation facility and Ramsay Street	New	374 m	5.0 m
	WATTLE_01B	A new noise barrier would be provided on the eastern side of the realigned Wattle Street, between the Ramsay Street and Martin Street	New	94 m	5.0 m
	WATTLE_01G	A new noise barrier would be provided on the eastern side of Wattle Street (which is not realigned at this location) between Waratah Street and Crane Avenue	New	246 m	5.0 m

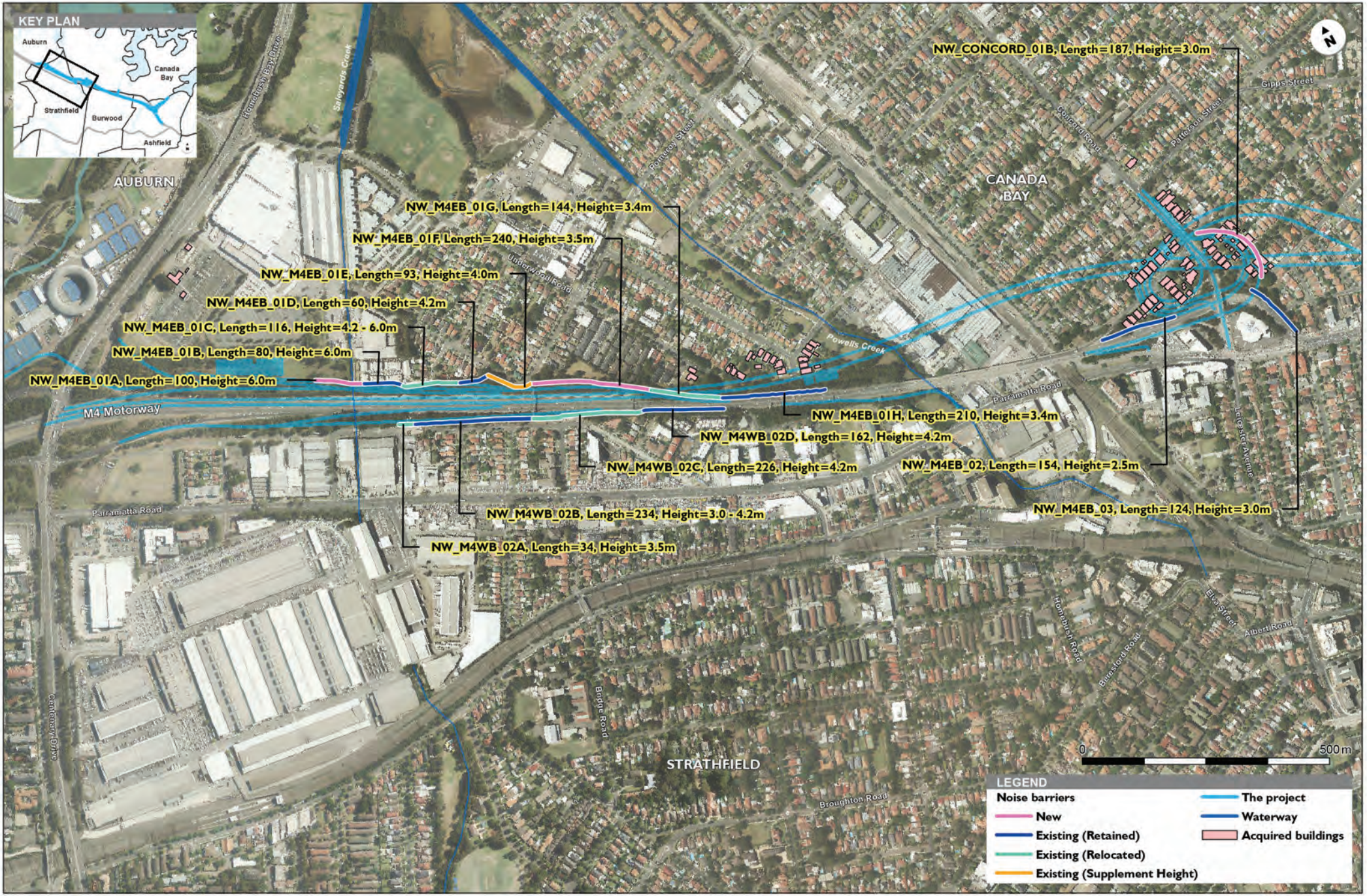


Figure 5.26 Noise barrier locations - Map 1

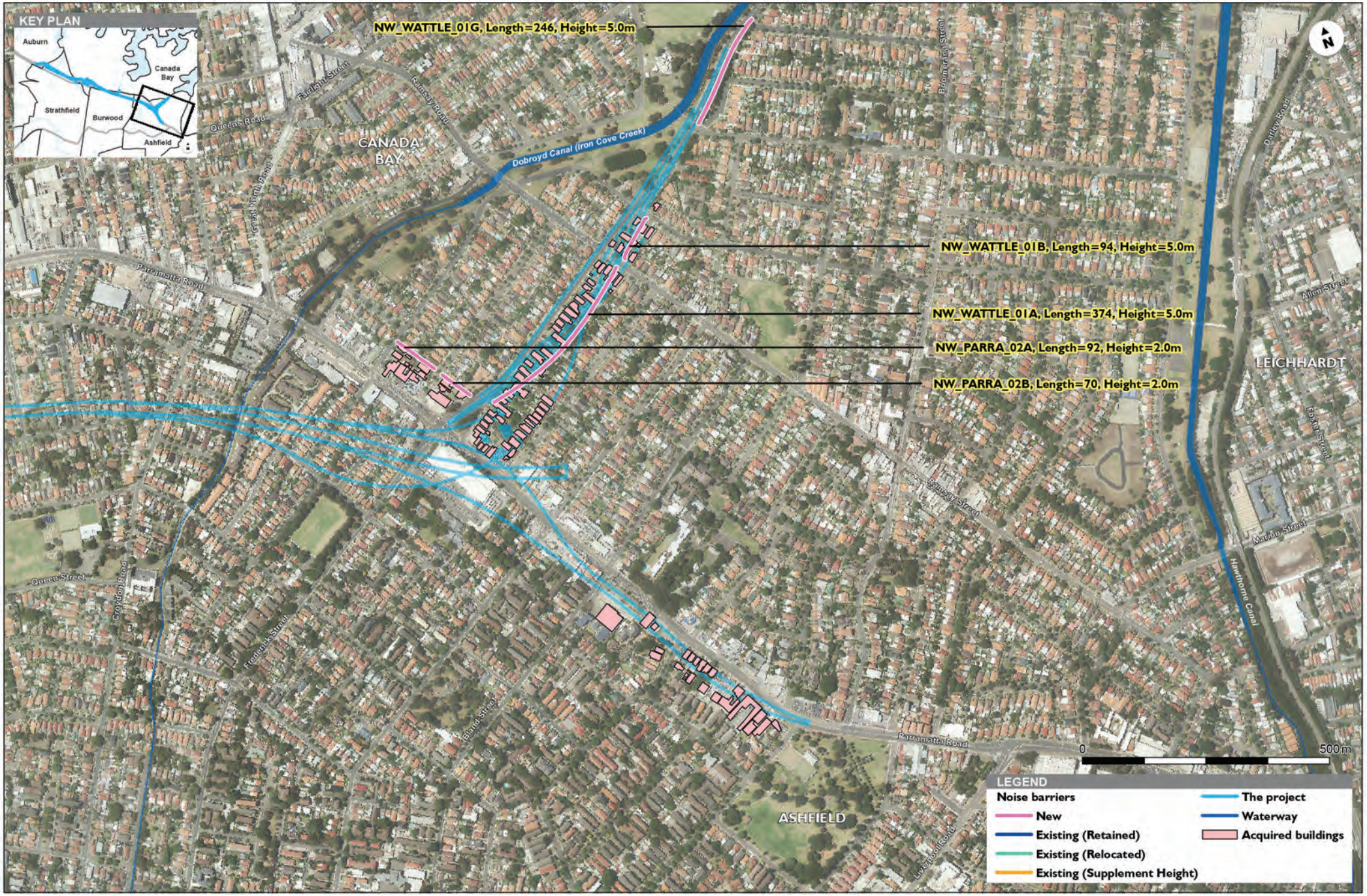


Figure 5.27 Noise barrier locations - Map 2

Low noise pavement would be provided for new and modified sections of the existing M4, and in locations where noise barriers are provided.

5.8.7 Provision for smart motorway infrastructure

'Smart motorways', also known as managed motorways, use real-time information, communication and traffic control systems incorporated into and alongside the road to improve traffic flow. They typically include:

- Variable message signs to alert drivers to congestion, incidents and travel times
- Ramp signals at on-ramps to manage the rate at which vehicles are allowed to merge with motorway traffic
- Longer and wider on-ramps to enable traffic to be 'stored' so that traffic volumes on the motorway can be regulated
- Dynamic lane and speed management signs
- Network monitoring via in-road sensors and CCTV.

The following smart motorway infrastructure would be provided as part of the project to support the future implementation of a smart motorway solution:

- A new intelligent transport system (ITS) along the M4 East
- Ramp meter signals at each of the motorway on-ramps at Homebush Bay Drive, Concord Road (excluding the new on-ramp from Concord Road southbound to the existing M4 westbound), Wattle Street and Parramatta Road, which would be similar to conventional intersection 'red, amber, green' traffic signals
- Variable message signs distributed along the approaches to each of the motorway on-ramps
- Tunnel message signs within the mainline tunnels
- Variable speed and lane use signals (including gantries on the surface sections) at various locations on the M4 and the M4 East tunnels
- CCTV cameras and an automatic video incident detection system.

In addition, all new and modified on-ramps provided as part of the project to both the surface M4 and the M4 East tunnels would be sized to provide adequate storage for a future smart motorway.

5.9 Surface road network changes

5.9.1 Changes to the existing road network

As a result of work at the surface, a number of streets would be closed or traffic movements altered. These changes are shown on **Figure 5.2** to **Figure 5.8** and include the following:

- Rod Laver Drive – currently a special events bus connection from Sydney Olympic Park to Homebush Bay Drive and the M4 eastbound. The connection to the M4 is currently prioritised. This priority would be changed so that buses would be required to join the on-ramp traffic closer to Homebush Bay Drive, and give way to through traffic. The connection to Homebush Bay Drive would remain unaltered
- Parramatta Road, near George Street – with the provision of the new Powells Creek on-ramp, a new signalised intersection would be provided on Parramatta Road. A right turn lane would be provided for westbound traffic on Parramatta Road, and traffic signals would control eastbound traffic on Parramatta Road (including the left turn onto the new ramp) to permit westbound traffic to turn right. Westbound through traffic on Parramatta Road would not be restricted by the traffic signals
- Taylor Lane and Young Street − both are located in the triangle bounded by the existing M4, Sydney Street and Concord Road. Properties in this area would be acquired as part of the project, so these roads would be closed as they would no longer be required for access

- Concord Lane, south of Carrington Lane – this section would be closed to facilitate cut-and-cover tunnel construction and would not be reopened. Access to Carrington Lane would be retained
- Carrington Street – currently has a left-out connection to Concord Road, which would be converted to a cul-de-sac
- Sydney Street, east of Concord Road − currently a left-in only connection from Concord Road, which would be converted to a cul-de-sac immediately west of the intersection with Thornleigh Street
- Edward Street − currently ends as a cul-de-sac, which would be relocated approximately 60 metres east, clear of the proposed on- and off-ramps at the Concord Road interchange
- Alexandra Street − currently connects to Edward Street via a six metre-wide lane. This connection would be cut off by the proposed M4 westbound on-ramp, and a cul-de-sac is proposed at the end of Alexandra Street
- Martin Street north of Wattle Street − currently connects to Wattle Street, providing left and right turn movements in and out. This connection would require modification to permit left-in and left-out movements only, due to the physical separation of the eastbound and westbound carriageways on Wattle Street
- Allum Street – currently connects to Wattle Street, providing left and right turn movements into Wattle Street and left turn movements from Wattle Street into Allum Street. Part of Allum Street would be affected by the realignment of Wattle Street, and the remaining section of Allum Street north of Walker Avenue would be converted into a cul-de-sac.

5.9.2 Pedestrian and cyclist facilities

The project would involve realignment and alterations to a number of roads, and adjustments to existing pedestrian and cycle facilities would therefore also be required.

Pedestrian facilities

Concord Road interchange

All existing pedestrian movements on Concord Road would be retained, with the exception of a 200 metre length of footpath along the western side between Parramatta Road and Sydney Street. This western pedestrian access would be removed, pedestrians would cross Concord Road at the existing signals at the Sydney Street intersection.

A network of new pedestrian footpaths and footbridges would be provided on the eastern side of Concord Road. The pedestrian footpath would start near Patterson Street and connections would be provided to Sydney Street (on the eastern side of Concord Road), Edward Street and Alexandra Street. A footbridge would be provided over the on- and off-ramps connecting Alexandra Street to Concord Road.

Wattle Street interchange

New footpaths would be provided on the eastern side of Wattle Street, from near Parramatta Road to near Loudon Avenue, and on the western side of Wattle Street from Ramsay Street to near Loudon Avenue.

Parramatta Road interchange

At the Parramatta Road interchange, new and/or modified footpaths would be provided on both sides of Parramatta Road between Bland Street and Rogers Avenue/Orpington Street. New footpaths would also be provided on both sides of a small section of Chandos Street, connecting to existing footpaths.

Cyclist facilities

Cyclists currently use the outside shoulders of the M4 to travel both eastbound and westbound. The eastbound Homebush Bay Drive off-ramp (west of Homebush Bay Drive) is two lanes and cyclists are required to cross both lanes to continue on the shoulder of the existing M4.

The project would widen the eastbound Homebush Bay Drive on-ramp to three lanes and introduce a new lane on the eastern side of Homebush Bay Drive. These create safety conflicts between eastbound cyclists and motorists using the M4 in this location.

To address this safety issue, a new one-way eastbound cycleway would be provided to the north of the M4. The cycleway would generally have a width of two metres, and would be designed in accordance with Australian Standards, Austroads Design Standards, Guides and Codes, and the Roads and Maritime supplements.

The cycleway would start about 300 metres west of Homebush Bay Drive. It would connect to the existing special events bus connection road as a shared cycleway and bus lane along Shirley Strickland Avenue, Rod Laver Drive and the existing underpass under Homebush Bay Drive. Existing gates that restrict use of the bus connection road by vehicles other than buses would be replaced with removable bollards to allow this route to be used by cyclists at all times.

From there, a dedicated cycleway overbridge would cross over the eastbound Homebush Bay Drive on-ramp via a new bridge, and would continue generally parallel to the eastbound on-ramp. The cycleway would connect to the existing two metre-wide shoulder along the connection from Homebush Bay Drive to the existing M4 before Pomeroy Street. The two metre shoulder provision for cyclists would continue for the full length of the connection to the existing M4.

The cycle connection would be identified with bicycle symbols on the shared sections to alert buses. Cyclists entering from Homebush Bay Drive southbound would use the access road to the motorway operations complex and join the cycleway east of the cycleway overbridge. Cyclists travelling northbound on Homebush Bay Drive would be required to access the cycleway via the internal road network at Sydney Olympic Park to join the cycleway before it crosses beneath Homebush Bay Drive.

For westbound cyclists, a new cycleway ramp would connect to the existing M4 from Queen Street at North Strathfield, between the Main North Rail Line and Concord Road. This ramp would connect to the existing westbound shoulder of the M4, and would cross the new single lane on-ramp at Powells Creek. A two metre-wide nearside shoulder would be provided adjacent to the westbound Homebush Bay Drive off-ramp. The shoulder would connect with a proposed westbound cycleway to divert cyclists permanently off the M4 and onto a new bypass of the Homebush Bay Drive interchange (which is subject to planning approval and would be delivered as part of the M4 Widening project).

Cyclists would not be permitted in the mainline tunnels.

Figure 5.28 shows the alignment of the proposed cyclist facilities between west of Homebush bay Drive and Pomeroy Street. The location of the new cycleway on-ramp connecting the M4 to Queen Street, North Strathfield is shown on **Figure 5.16**.

5.9.3 Public transport

Modification of existing public transport facilities

The existing bus priority access road to and from Sydney Olympic Park would be modified as part of the project. The existing access road connects to the existing eastbound on-ramp from Homebush Bay Drive. As the existing on-ramp would be realigned to the north, a new connection to the realigned on-ramp would be provided for buses, including a right turn lane. The existing bus access to and from Homebush Bay Drive would be retained.

A bus stop on Concord Road northbound, just north of the Concord Road bridge, would be permanently relocated adjacent to Carrington Street.