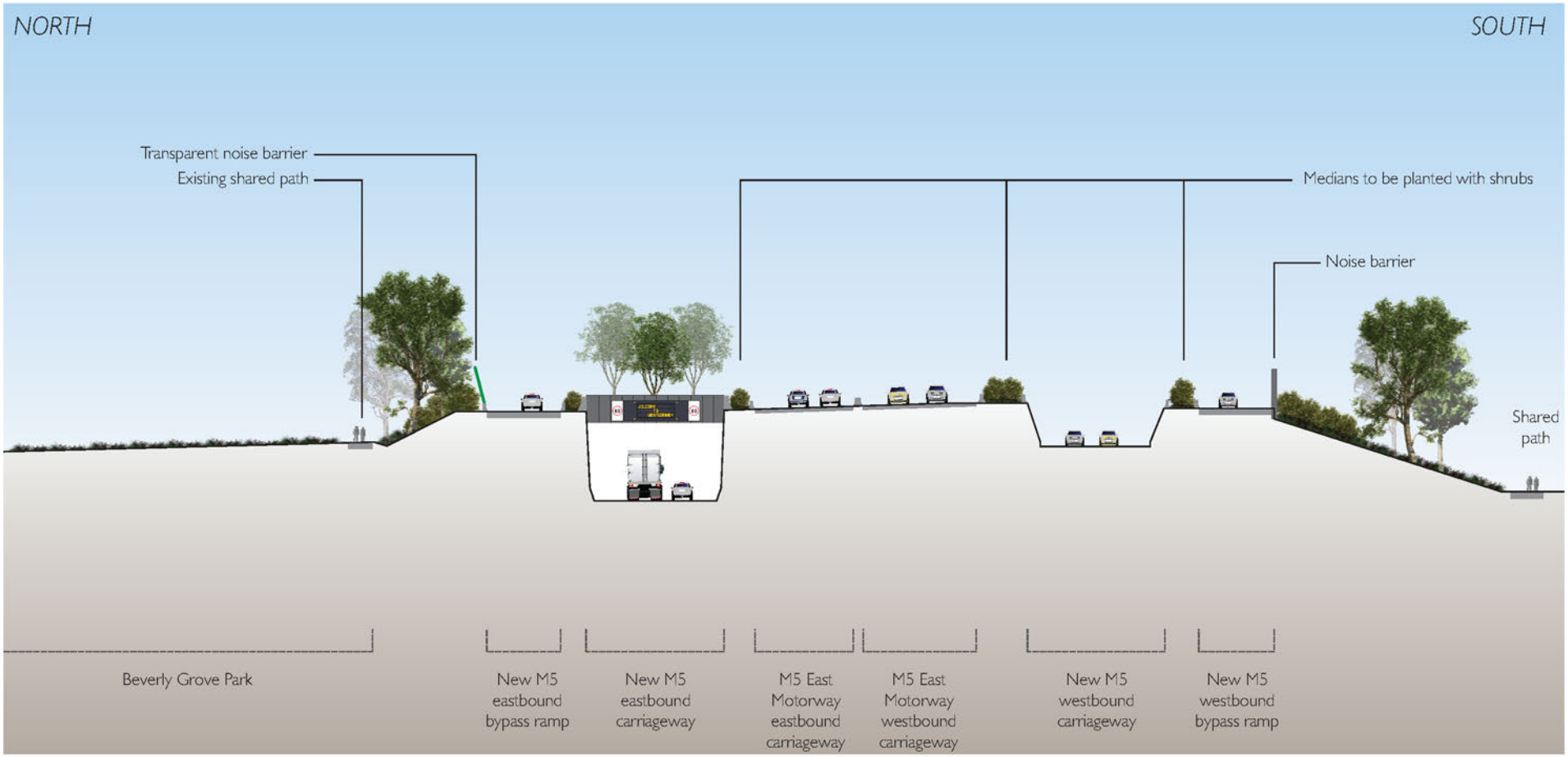
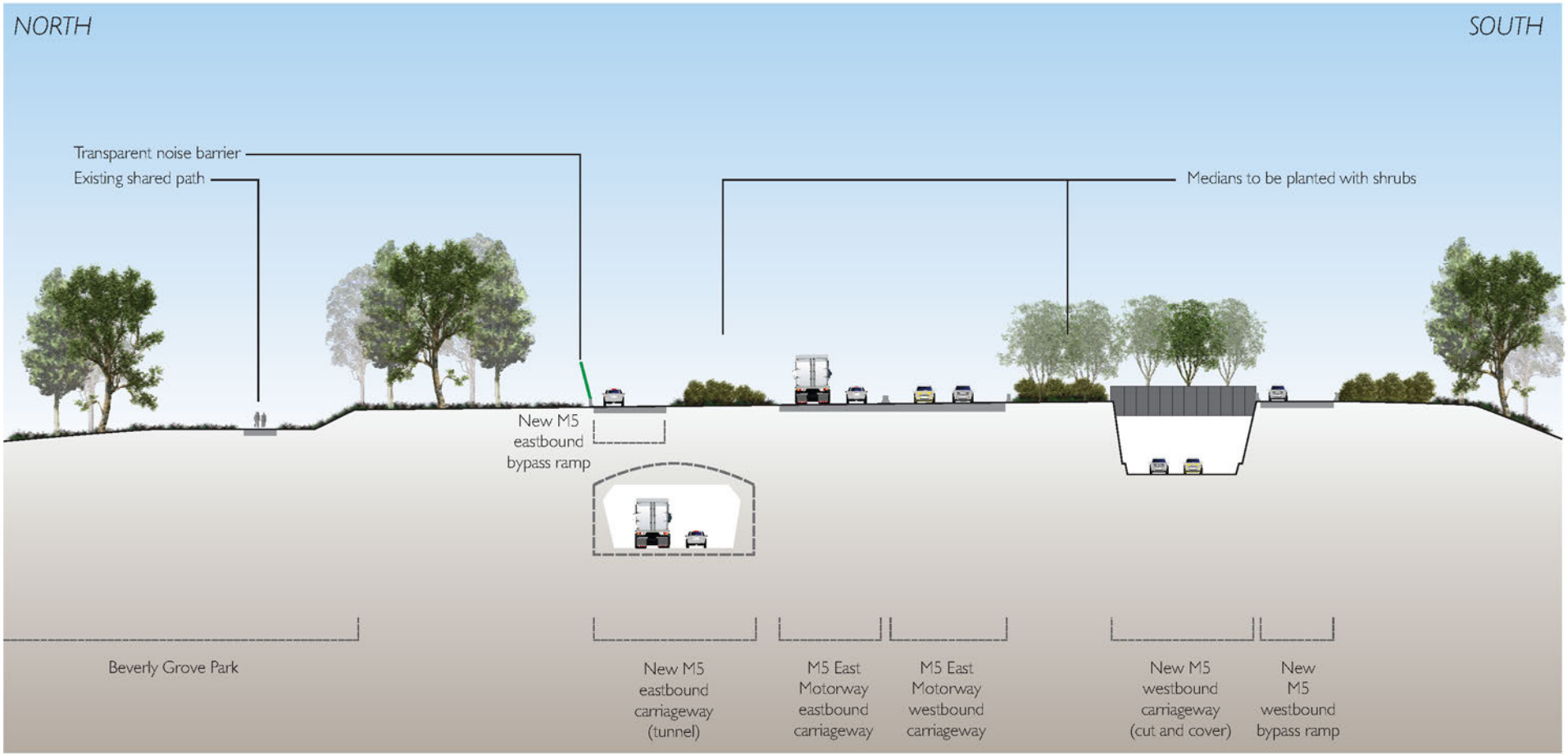


NOT TO SCALE

Figure 5-15 Indicative cross section - western surface works - west of eastbound portal

(blank page)



NOT TO SCALE

Figure 5-16 Indicative cross section - western surface works - east of eastbound portal

(blank page)

5.5 Tunnels

5.5.1 Main alignment tunnels

The main alignment tunnels would be about nine kilometres long, with the western tunnel portals located at Kingsgrove and the eastern ramp portals located at the St Peters interchange. The eastern end of the main alignment tunnels would terminate underground at St Peters in the form of stub tunnels, providing a potential future connection to the future M4-M5 link.

The project has been designed to connect to the existing road network at two locations:

- The King Georges Road interchange, the M5 East Motorway and M5 South West Motorway via the western portals
- The St Peters interchange and local surface road network via the eastern portals.

Tunnel stubs would also be included to potentially provide a connection to:

- The future Southern extension via stub tunnels at the Southern extension caverns near the Kogarah Golf Course
- The future M4-M5 Link via stub tunnels at the St Peters caverns near the St Peters interchange.

The width of excavation would be widened at these locations to allow the tunnel stubs to diverge from the main alignment tunnels. This would result in the development of a void or cavern between the two tunnels.

The main alignment tunnels include two vehicular cross passages at Bexley and Arncliffe to allow for emergency traffic switching, as well as pedestrian cross passages spaced at a maximum of 120 metres and emergency pedestrian egress between tunnels in the event of an emergency. An indicative cross passage layout is shown on **Figure 5-17**.

The main alignment tunnels would also include a breakdown bay around the Cooks River between the Southern extension caverns and St Peters caverns. The breakdown bay would be large enough to allow a B-triple vehicle to pull over into the bay and safely park outside of the nominal tunnel shoulder width. The main alignment tunnels would be widened at this location to accommodate the breakdown bay outside of the shoulders.

The speed limit within the main alignment tunnels would be 80 kilometres per hour.

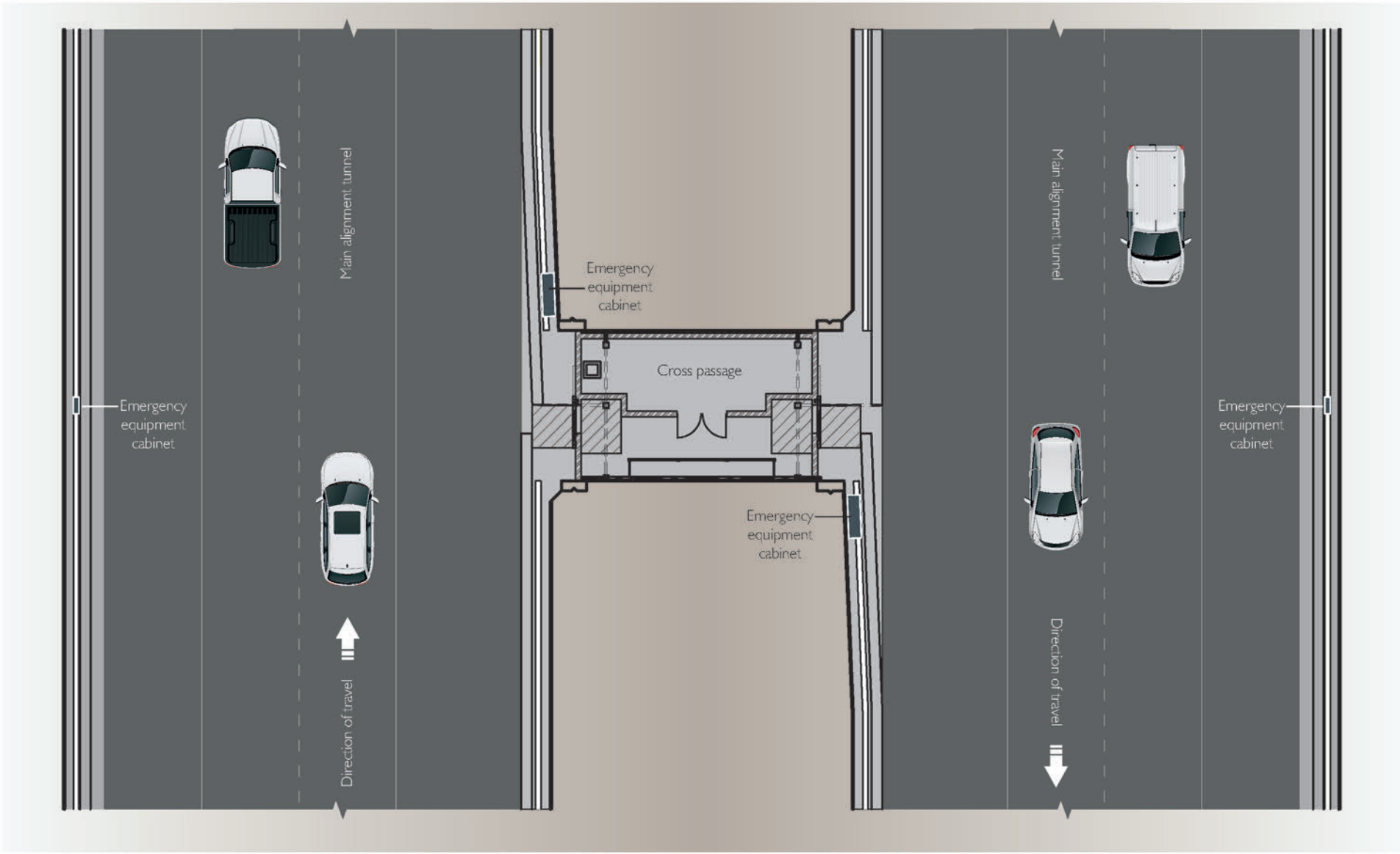
Tunnel portals

The New M5 western tunnel portals would be located at Kingsgrove and would connect to the western surface works.

The western tunnel portals would be staggered, with the eastbound portal meeting the surface around 90 metres further west than the westbound tunnel portal. The eastern tunnel portals would connect to the surface at the St Peters interchange, about 70 metres east of Canal Road. **Figure 5-18** to **Figure 5-20** show indicative configurations of the western and eastern tunnel portals respectively.

Dive and cut and cover structures would be constructed at the western and eastern tunnel portals to create entry and exit ramps to join surface roads with the main alignment tunnels (refer to **Section 6.6.5** for more detail). On and off-ramps would vary in size and shape in response to local conditions and would require a number of cuttings and embankments. The eastern and western on and off-ramps have been designed to provide for a 5.3 metre vertical clearance. The main alignment tunnels at the western and eastern tunnel portals would be line marked for two lanes with the provision to be widened in the future to three and up to five lanes (respectively), subject to additional assessment and approval.

(blank page)



NOT TO SCALE

Figure 5-17 Indicative cross passage layout between Kingsgrove and Arncliffe

(blank page)

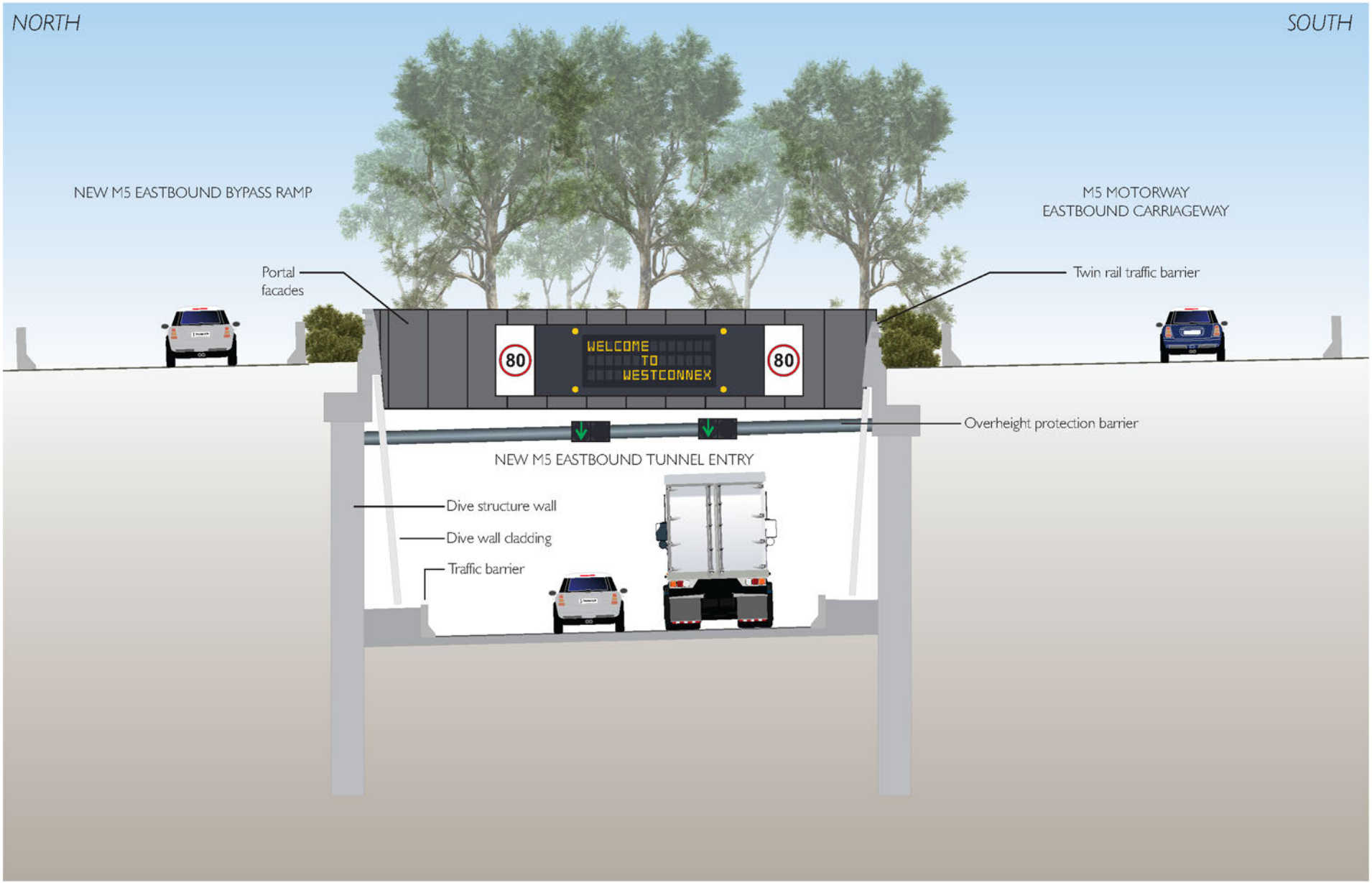


Figure 5-18 Indicative cross section - western tunnel portals (eastbound entry)

(blank page)

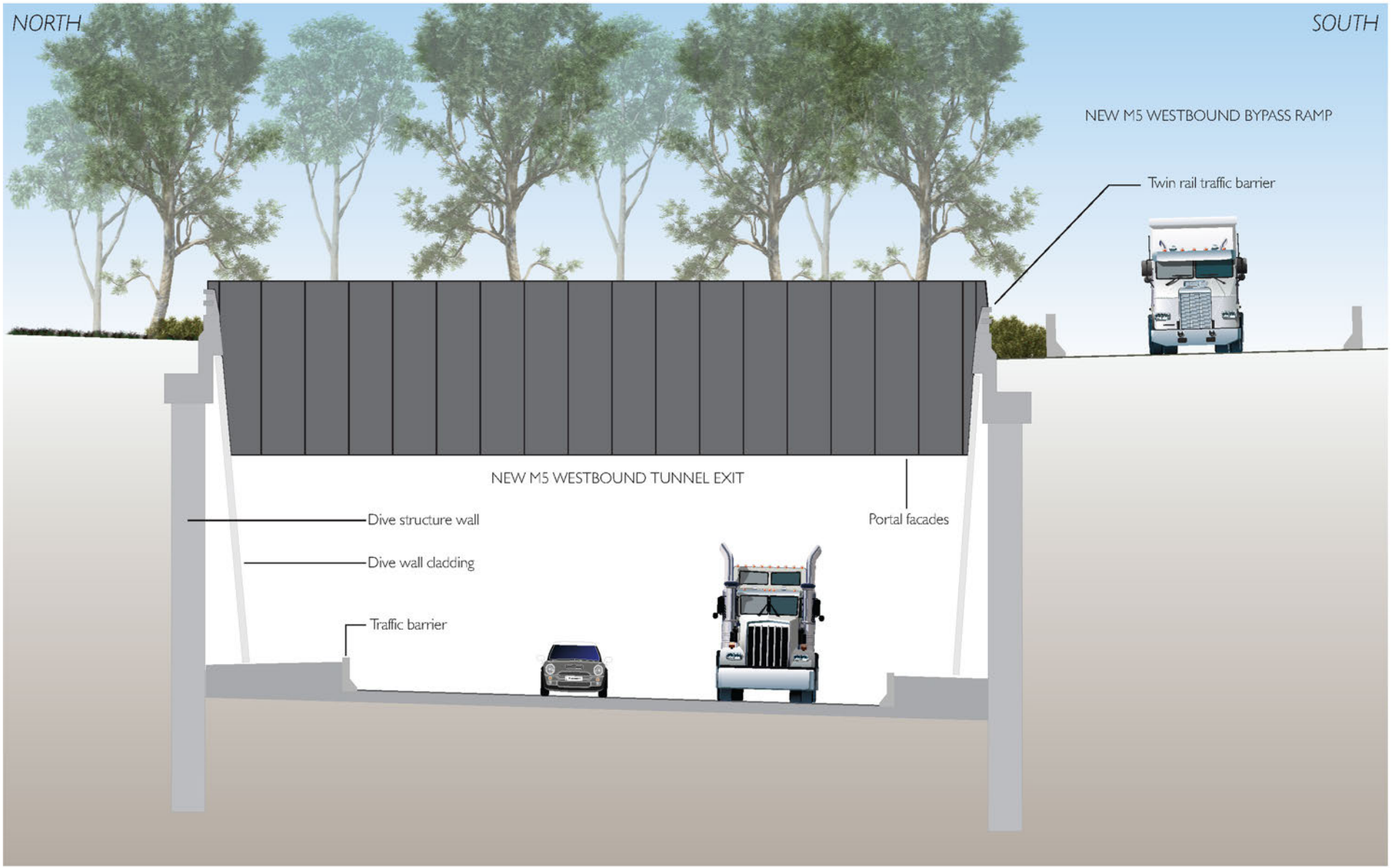
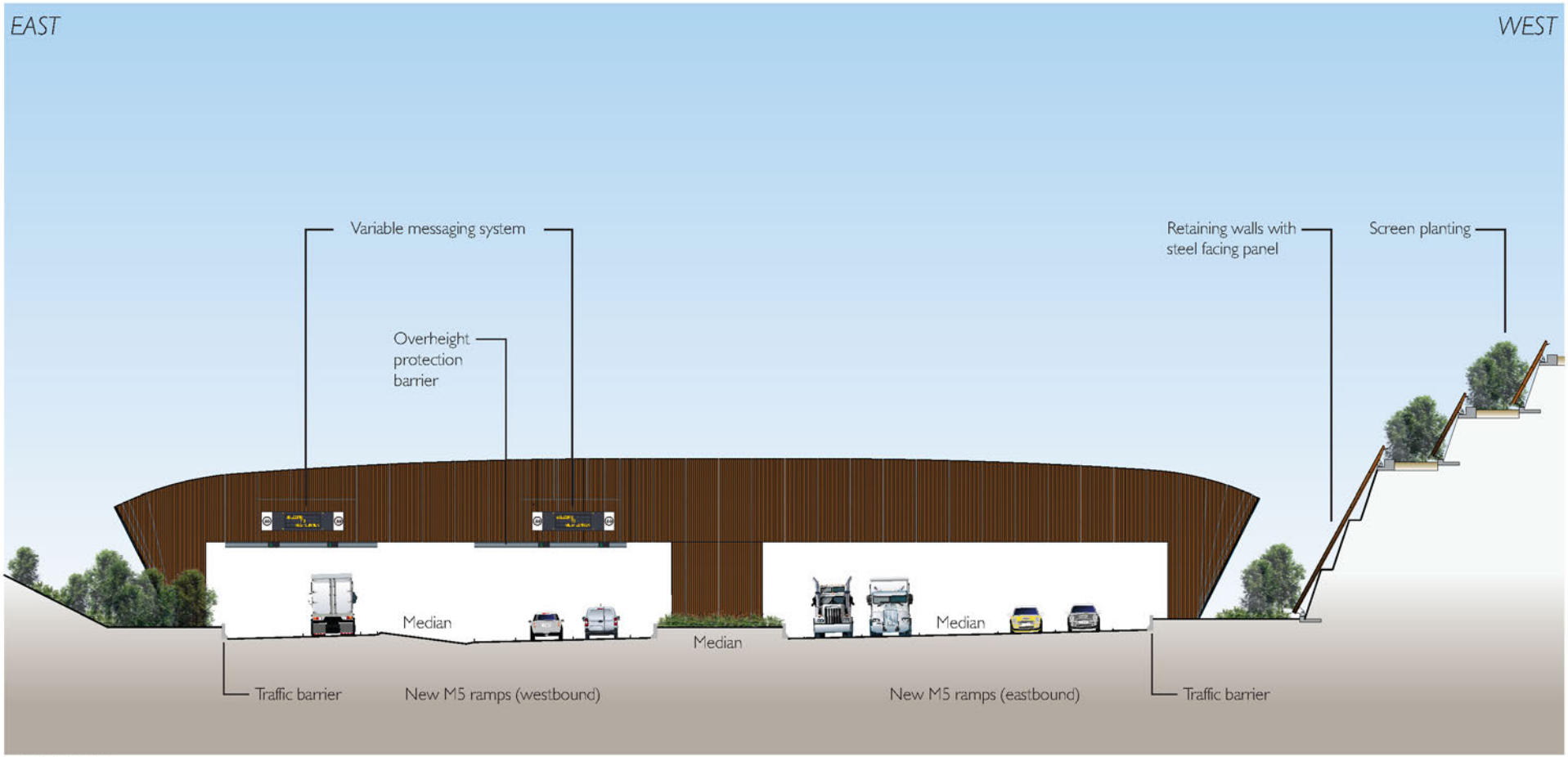


Figure 5-19 Indicative cross section - western tunnel portals (westbound exit)

(blank page)



NOT TO SCALE

Figure 5-20 Indicative cross section - eastern tunnel portals at St Peters interchange

(blank page)

Tunnel gradients

The crossfall across the carriageway in each of the main alignment tunnels would be 2.5 per cent. This would allow water to drain to the low side of each main alignment tunnel for collection and management as part of the tunnel water management system (refer to **Section 5.8.3**).

The vertical gradient along each of the main alignment tunnels would typically be between 0.5 per cent and one per cent, with the exception of the following locations:

- Near the western portals, where the eastbound carriageway would have a down-gradient of around five per cent and the westbound carriageway would have an up-gradient of four per cent. These gradients are required due to local geology and minimum separation distances from surface developments
- Immediately west of the Southern extension tunnel stubs. In this area, a section of around 600 metres of carriageway in both directions would be required at a gradient of around 2.8 per cent. This gradient is required to provide enough space for potential construction of the Southern extension in the future
- Near the eastern portals at the St Peters interchange, where the eastbound and westbound carriageways would have an up-gradient of around five per cent and a down-gradient of around six per cent, respectively. This gradient is required to balance the depth of tunnelling with reducing the extent of excavations within the Alexandria Landfill site.

The main alignment tunnels fall towards a common low point around the Kogarah Golf Course, Arncliffe, where tunnel drainage would connect to surface water treatment facilities (**Section 5.8.3**). A geotechnical long section of the main alignment tunnels is provided in **Appendix C**.

Lane configuration

The configuration of traffic lanes within the main alignment tunnels would be provided in three distinct sections, separated by:

- The Southern extension caverns, where stub tunnels would be constructed for potential future connection to the Southern extension
- The St Peters caverns, where stub tunnels would be constructed for potential future connection to the future M4-M5 Link.

A summary of the lane configuration and widths of the three sections of the main alignment tunnels is provided in **Table 5-2**. Typical cross sections within the main alignment tunnels and the New M5 ramps are shown in **Figure 5-21** to **Figure 5-24**.

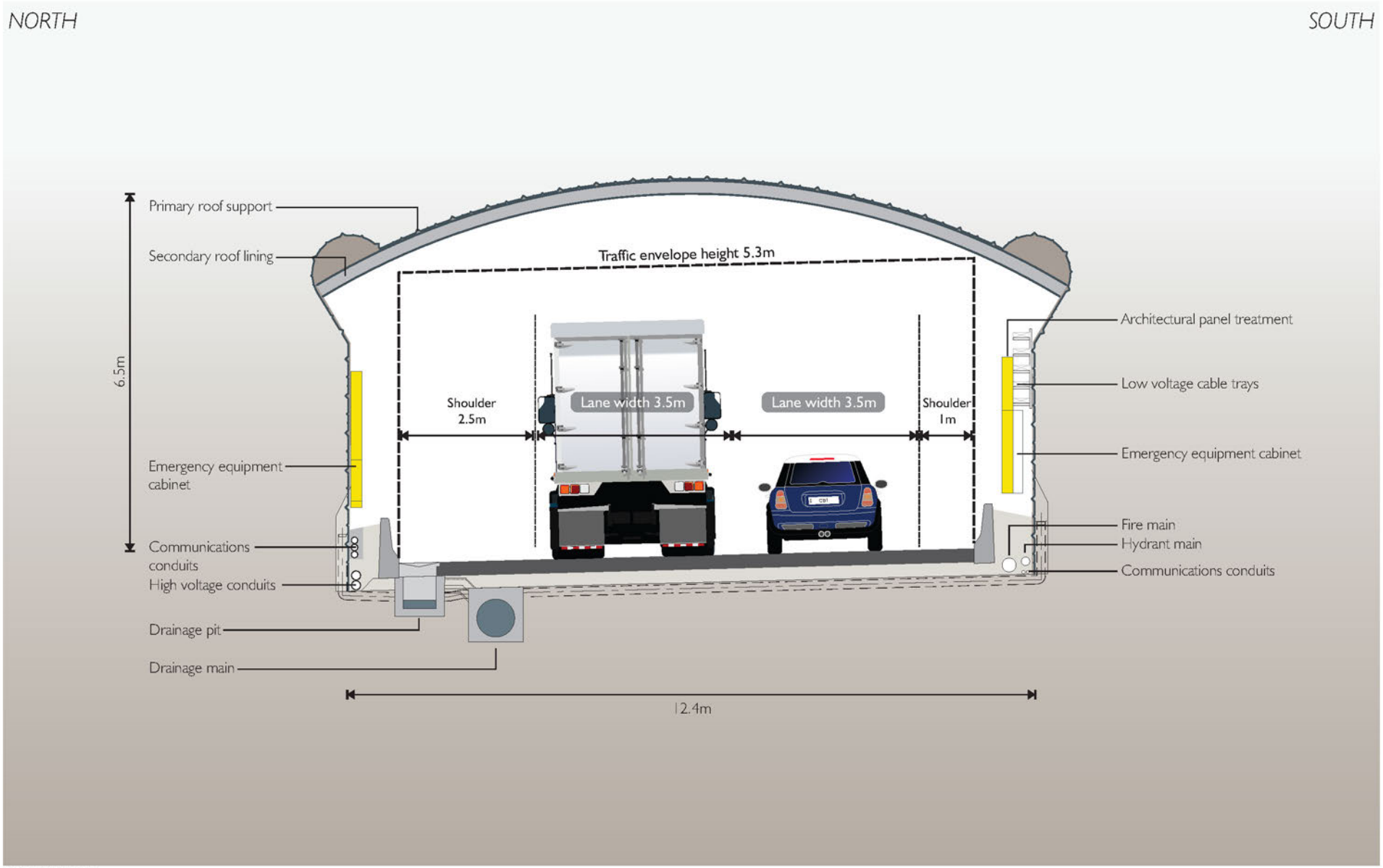
Table 5-2 Main alignment tunnels lane configuration and widths

Main alignment tunnel section	Number of lanes	Width of lanes (metres)	Width of nearside shoulder (metres)	Width of offside shoulder (metres)	In-tunnel barrier to barrier width (metres)
Western portals to the Southern extension caverns	2*	3.5	2.5	1	10.5
Southern extension caverns to the St Peters caverns and eastern portals	2**	3.375	2.5	1	17
Stub tunnels from the St Peters caverns for potential future connection to the future M4-M5 Link.	2*	3.5	1	2.5	10.5
New M5 ramps	2	3.5	2.5	1.0	10.5

*Main alignment tunnels within these sections would be linemarked for two lanes with the provision to be widened to three in the future, subject to separate assessment and approval.

**Main alignment tunnels within this section would be linemarked for two lanes, with the provision to be widened to five in the future, subject to separate assessment and approval.

(blank page)



NOT TO SCALE

Figure 5-21 Indicative cross section - main alignment tunnels between the western portals and southern extension caverns

(blank page)

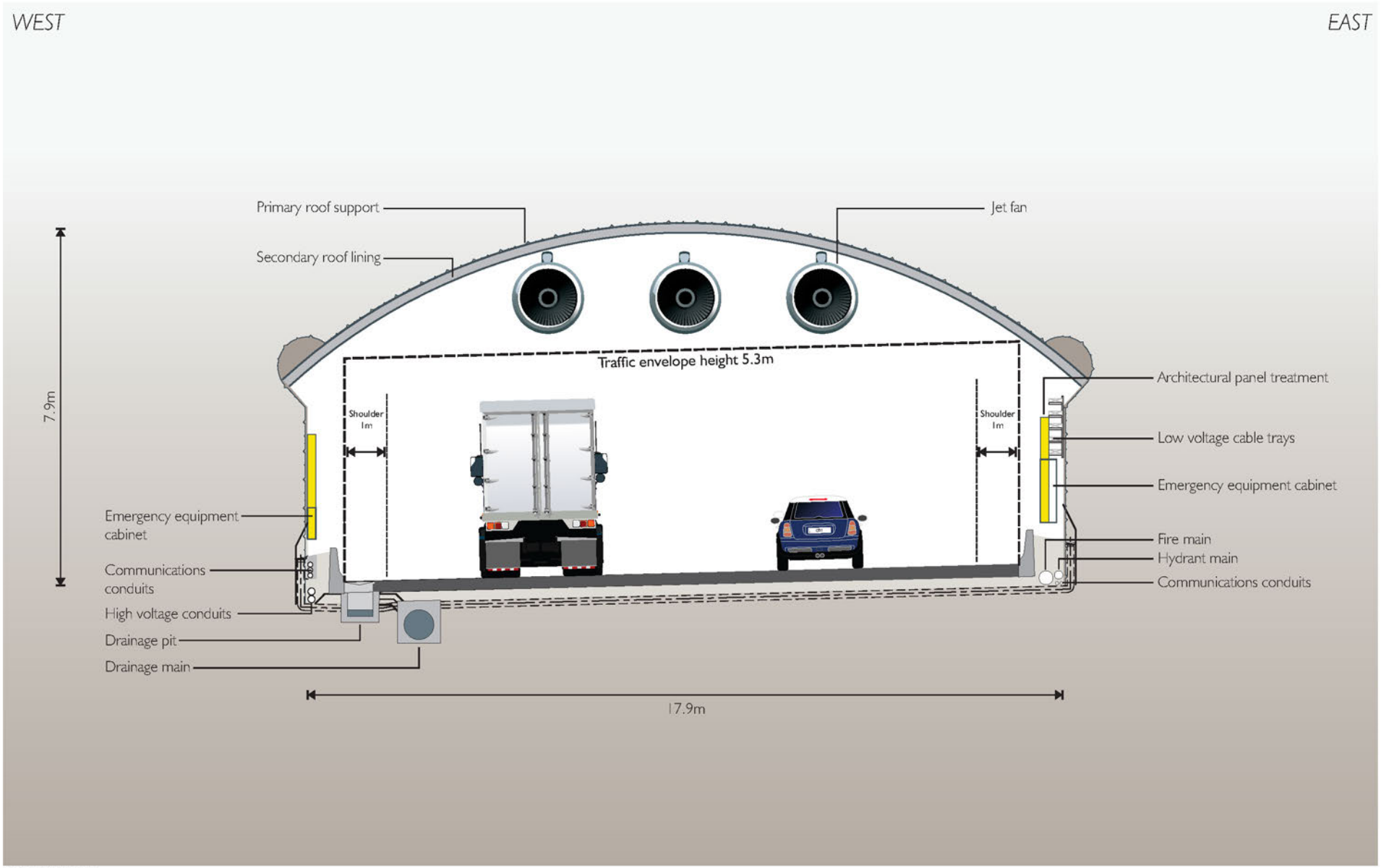


Figure 5-22 Indicative cross section - main alignment tunnels between the southern extension caverns and the St Peters caverns

(blank page)

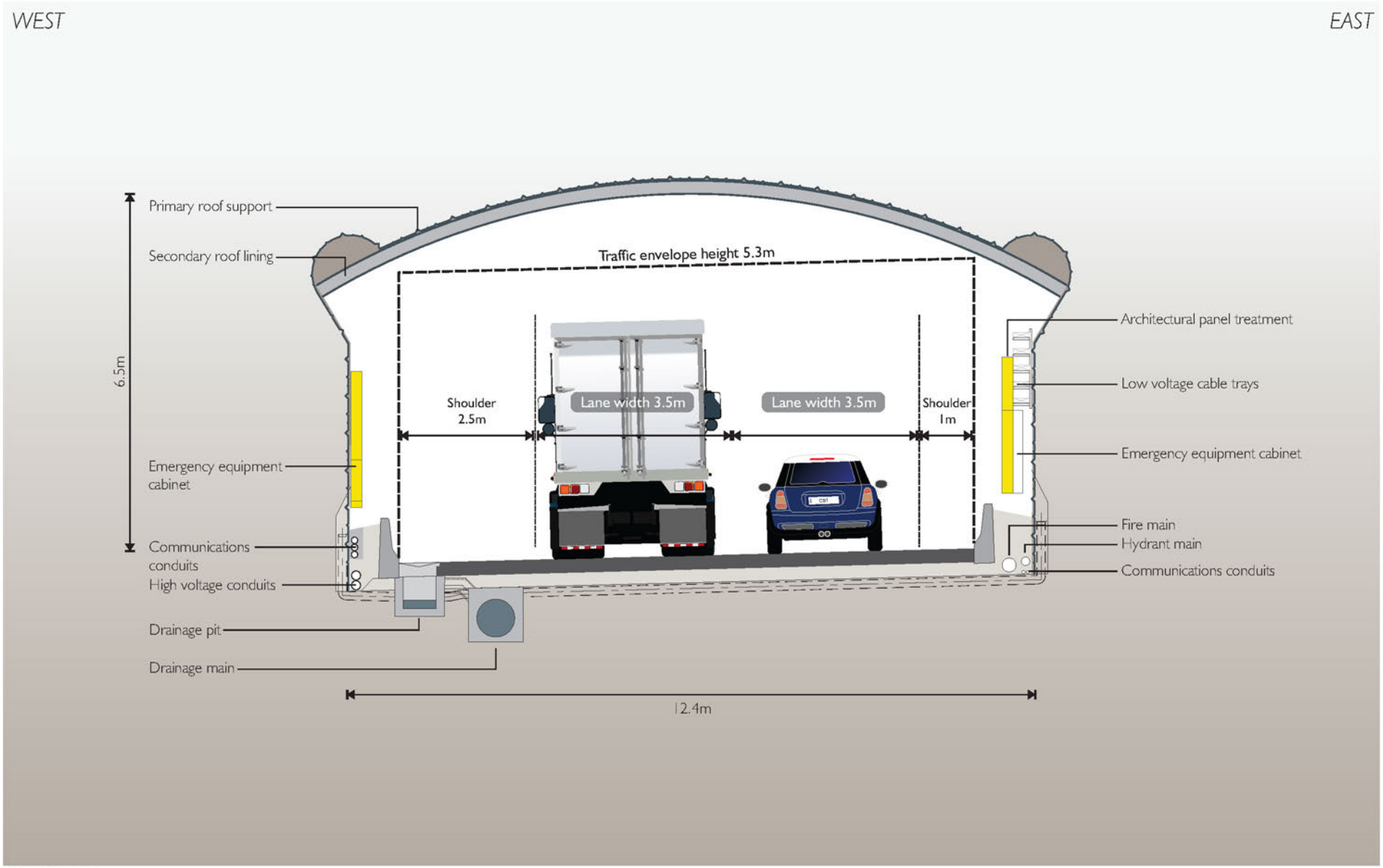


Figure 5-23 Indicative cross section - main alignment tunnels between St Peters caverns and M4 - M5 link stub tunnels

(blank page)

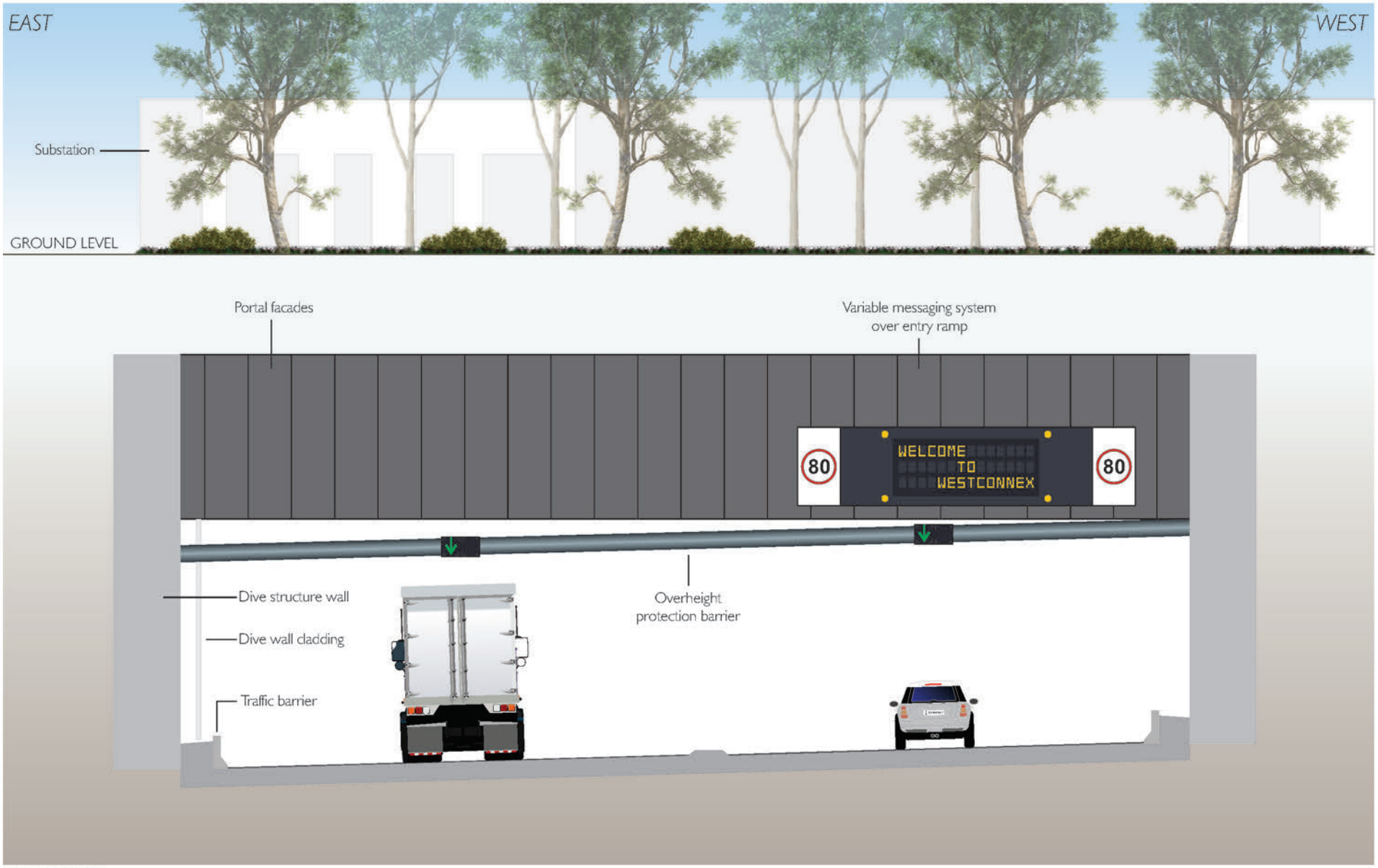


Figure 5-24 Indicative cross section - New M5 ramps at the St Peters interchange (westbound)

(blank page)

5.5.2 M4-M5 Link stub tunnels

The main alignment tunnels would be continued north of the St Peters caverns, for around one kilometre to a point underground around Canal Road, to form stub tunnels for potential connection to the future M4-M5 Link.

The stub tunnels would continue in the same configuration as the two lane sections of the main alignment tunnels, but would not be opened to traffic as part of the New M5 project. The stub tunnels would be managed and maintained to allow for connection to the future M4-M5 Link. The M4-M5 Link stub tunnels would only be operational after being connected to the future M4-M5 Link.

5.5.3 Southern extension stub tunnels

Stubs tunnels would be constructed in a southerly direction from the Southern extension caverns near the Kogarah Golf Course. These stub tunnels would extend about 20 metres and would provide for a potential connection to the future Southern extension.

The stub tunnels would continue in the same configuration as the two lane sections of the main alignment tunnels, but would not be opened to traffic as part of the project. The stub tunnels would be managed and maintained to allow for connection to the Southern extension in the future. The Southern extension stub tunnels would only be operational if connected to the Southern extension in the future.

5.6 St Peters interchange

The St Peters interchange in its ultimate configuration (ie in the event the entire WestConnex program of works is completed) would connect the New M5, the future M4-M5 Link and the future Sydney Gateway with:

- Euston Road at the intersection of Campbell Road
- Gardeners Road at the intersection with Kent Road via a new bridge over the Alexandra Canal
- Sydney Airport and Port Botany via the future Sydney Gateway.

The construction of all roads within the operational footprint of St Peters interchange would be constructed as part of this project; however, some sections of road would not connect to any operating roads. The project operational layout of the St Peters interchange is shown on **Figure 5-25**.

The ultimate configuration of the St Peters interchange is shown on **Figure 5-26**.

The configuration of the St Peters interchange and the stages in which it would be constructed are described in **Section 5.6.1**.

(blank page)

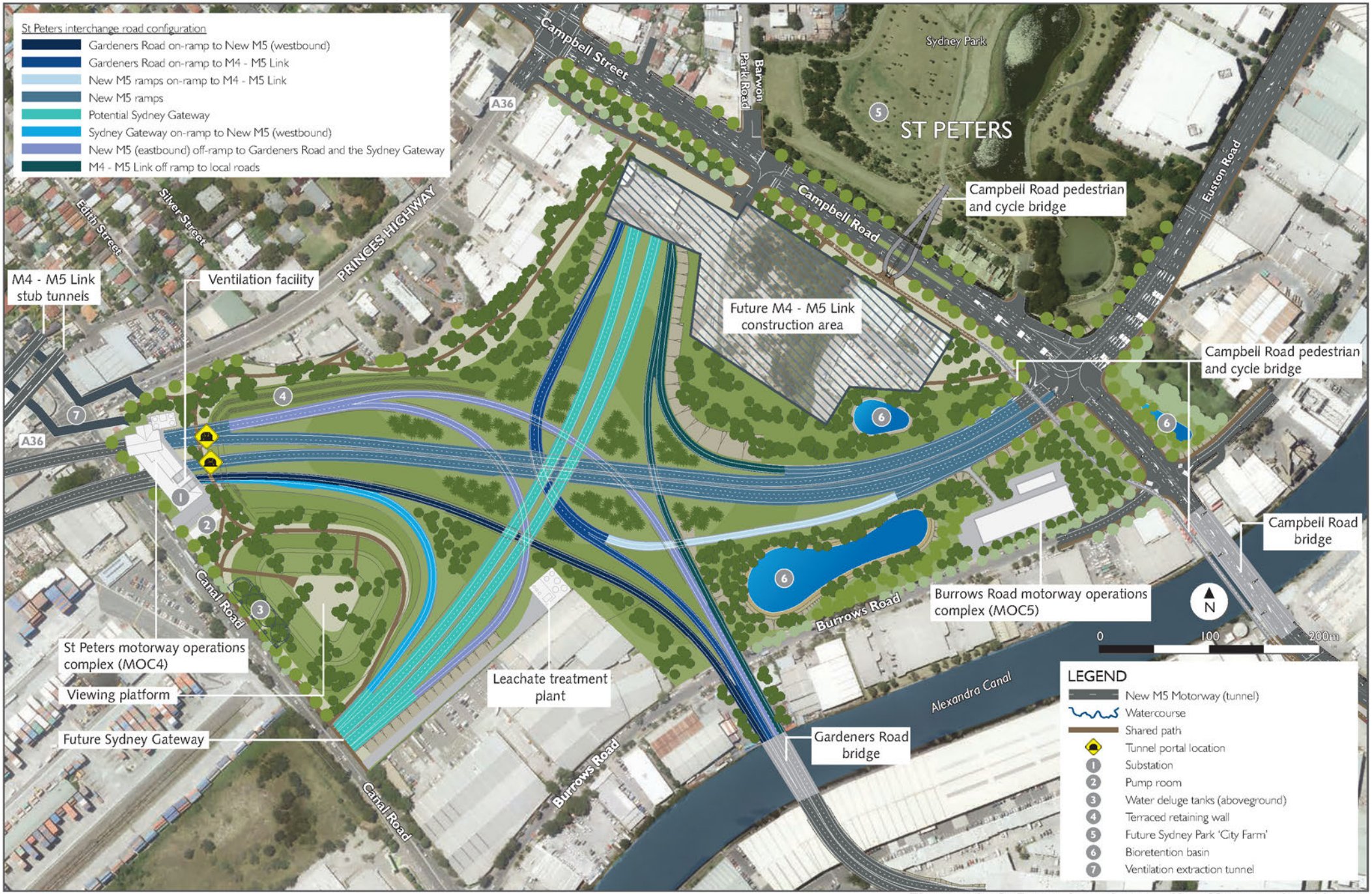


Figure 5-25 St Peters interchange - New M5 operational layout

(blank page)

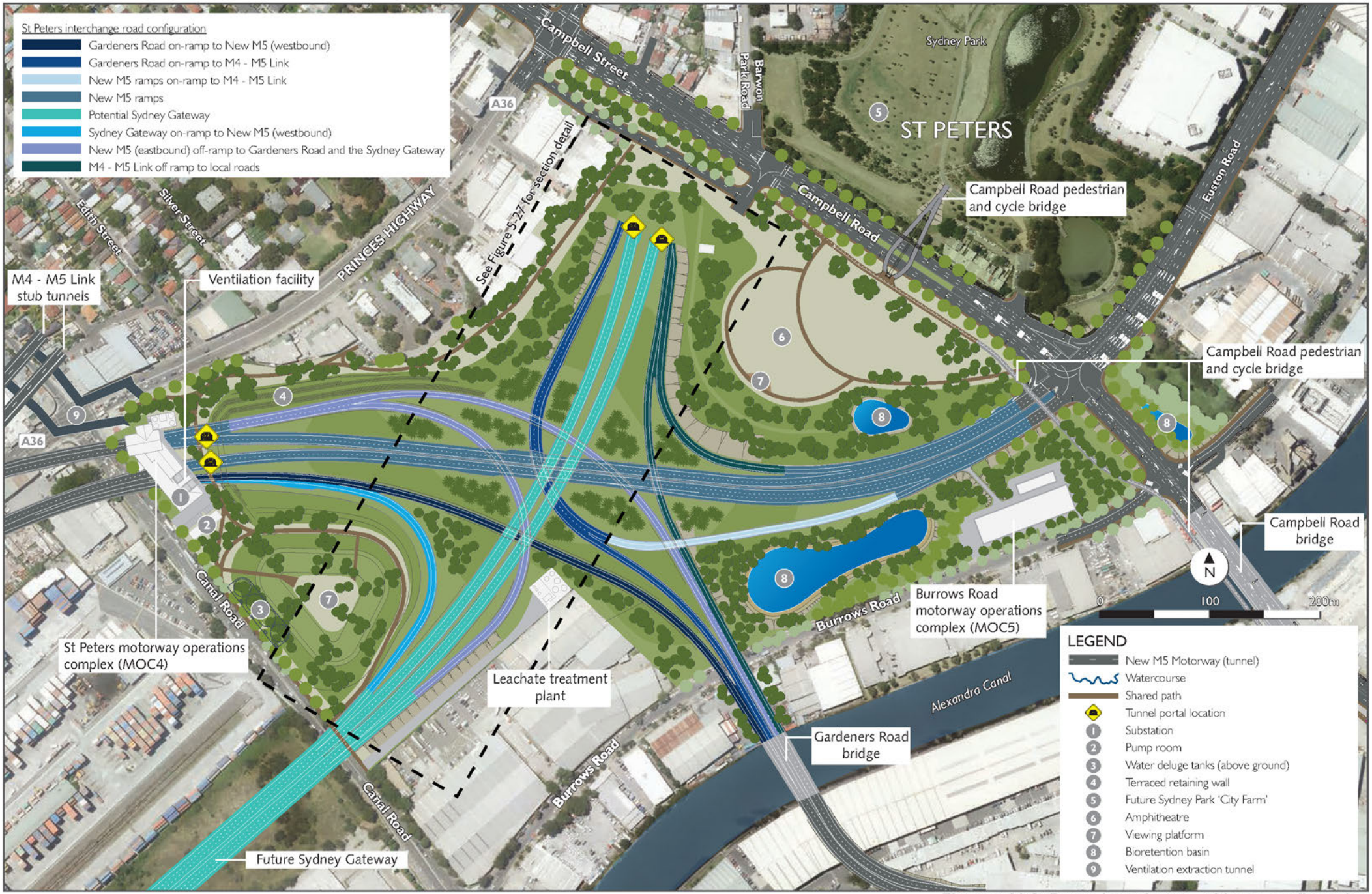


Figure 5-26 St Peters interchange - ultimate configuration

(blank page)

5.6.1 Interchange configuration

St Peters interchange ultimate configuration

The St Peters interchange, in its ultimate configuration (ie in the event the entire WestConnex program of works is completed), would be a four level interchange and would include seven bridges connection. It would provide connections between:

- The New M5 and Euston Road at the intersection of Campbell Road
- The New M5 and Gardeners Road
- The New M5 and the future Sydney Gateway
- The future M4-M5 Link and the future Sydney Gateway
- The future M4-M5 Link and Gardeners Road
- The future M4-M5 Link and Euston Road at the intersection of Campbell Road.

Construction staging

The St Peters interchange would be constructed as part of the project. Construction of the St Peters interchange would include:

- The closure of the former Alexandria Landfill site (refer to **Section 5.9**)
- Construction of roads and embankments within the St Peters interchange site
- Construction of operational ancillary infrastructure associated with the New M5 (refer to **Section 6.6.7**)
- Connection of the New M5 with the local road network at the intersection of Euston Road with Campbell Road, and with Gardeners Road via a new bridge over the Alexandra Canal
- Landscaping and revegetation works within the interchange site.

Construction of the St Peters interchange would allow for two additional future stages to provide connections between the St Peters interchange and the:

- Future M4-M5 Link
- Future Sydney Gateway.

The additional future stages of works would provide the ultimate connectivity through the interchange between the New M5, the future M4-M5 Link, the future Sydney Gateway and the local road network. These stages would be subject to future environmental assessment and approval.

The construction of all roads within the St Peters interchange site would be delivered as part of this project. The road construction works within the Alexandria Landfill site, would include landforming and construction of embankments as part of the Alexandria Landfill closure plan. All roads that form part of St Peters interchange would be constructed as part of the initial stage with the aim of minimising potential disruptions to the operation of the New M5 and local road connections during construction of the additional future stages of the WestConnex program of works.

Sections of road that provide the following road connections would be constructed within the boundary of the St Peters interchange site but would not connect to any operating roads as part of the initial stages of interchange construction:

- The New M5 and the future Sydney Gateway
- The future M4-M5 Link and the future Sydney Gateway
- The future M4-M5 Link and Gardeners Road
- The future M4-M5 Link and Euston Road at the intersection of Campbell Road.

As these roads approach the boundary of the interchange site, embankments would be constructed and stabilised. It is anticipated that if the future M4-M5 Link and the future Sydney Gateway projects proceed, they would tie-in to these embankments to complete the interchange and provide operational connections.

Landscaping and revegetation works within the St Peters interchange site would be undertaken across the site in accordance with an urban design concept plan (refer to **Chapter 14** (Visual impacts and urban design) and **Appendix L** (Urban design report). A section of the interchange site immediately south-west of Campbell Road and south of Albert Street, would be kept as an area of hardstand, with the anticipation of it being used to support construction of the future M4-M5 Link (refer to **Figure 5-25**). As part of the project, this area would be physically separated from the remainder of the interchange to restrict access.

The intersection of Campbell Road and Euston Road would be upgraded to safely and efficiently manage traffic entering and leaving the St Peters interchange. The upgraded intersection would be integrated with other local surface road improvements (refer to **Section 5.7.2**). The upgraded intersection would be signalised and would allow motorists to:

- Exit the eastbound New M5 or the future southbound M4-M5 Link main alignment tunnels along the off ramps and either turn left onto Campbell Road, or continue straight along Euston Road
- Enter the westbound New M5 or the future northbound M4-M5 Link main alignment tunnel by turning left or right from Campbell Road, or travelling straight from Euston Road, to connect to the on ramps
- Continue to travel along Campbell Road (local through traffic).

An indicative layout of the upgraded intersection is provided in **Figure 5-25**. The connection of the road network at the intersection of Campbell Road and Euston Road to the future M4-M5 Link would be constructed as part of the project, with the aim of minimising potential disruptions to the operation of the New M5 and local road connections during construction of the additional future stages of the WestConnex program of works. This road connection would only be operational if connected to the future M4-M5 Link.

Within the St Peters interchange connections between the New M5 and Euston Road at the intersection of Campbell Road and between the future M4-M5 Link and the future Sydney Gateway would be via two-lane carriageways with 3.5 metre wide lanes. These two connections would be signposted with a speed limit of 80 kilometres per hour, and would transition to 60 kilometres per hour at the Campbell Road intersection with Euston Road.

All other connections within the interchange would be via single-lane carriageways with lanes around 3.5 metres in width. These ramps within the interchange would be signposted at 60 kilometres per hour, with advisory speed signs as required.

A cross section showing the indicative lane configuration and lane widths of the New M5 ramps between the eastern portals and the upgraded Campbell Road / Euston Road intersection is provided on **Figure 5-24**.

5.6.2 Bridges and structures

The St Peters interchange would comprise seven bridges which would provide direct connectivity between the New M5, the future Sydney Gateway, the future M4-M5 Link and the local road network. Retaining walls within the interchange would be required to retain batter slopes where the level difference and the distance between the adjacent roadways and the boundaries do not allow the use of batter slopes.

A summary of the roadway bridge structures within the interchange is provided in **Table 5-3** and shown in **Figure 5-27**. An indicative cross section of the St Peters interchange is shown on **Figure 5-28**. Bridges within the interchange would be constructed at three general levels, with level one being at the ground surface:

- Level two (closest to the ground):
  - New M5 to Gardeners Road
  - New M5 to the future Sydney Gateway
- Level three:
  - The future Sydney Gateway to the future M4-M5 Link
  - The future M4-M5 Link to the future Sydney Gateway
- Level four:
  - Gardeners Road and Euston Road, at the intersection with Campbell Road, merging and connecting to the future M4-M5 Link.

The multi-level design of the interchange would provide grade-separated connectivity and efficient connections between roads without the need to provide traffic signals. It would also remove any direct interfacing of traffic travelling in opposing directions and would allow posted speed limits to be maintained, providing safe and efficient connections between roads.

A new pedestrian and cycle bridge would be provided that connects Sydney Park to Mascot. The new bridge would be delivered as part of the project to improve pedestrian and cyclist accessibility (refer to **Chapter 9** (Traffic and transport)). This bridge would be delivered as part of the local road upgrades component of the project and is discussed in more detail in **Section 5.7.6**.

Retaining walls within the interchange would be located:

- Between the New M5 ramps and the Princes Highway
- Along the future Sydney Gateway on and off-ramps near Canal Road
- Along the Gardeners Road bridge extension near Burrows Road.

5.6.3 Pedestrian access

Three new pedestrian pathways would be provided around the St Peters interchange to enhance pedestrian connectivity. These pedestrian pathways are shown on **Figure 5-25** and would include:

- Parallel to the Princes Highway along the north-western site boundary, providing a pedestrian connection between the Princes Highway at the intersection of Canal Road and Campbell Street, near the intersection of Albert Street
- Along the northbound (western) side of Canal Road
- Between the future Sydney Gateway and the Princes Highway, providing a pedestrian connection between the future Sydney Gateway crossing of Canal Road with the Princes Highway at the intersection with Canal Road.

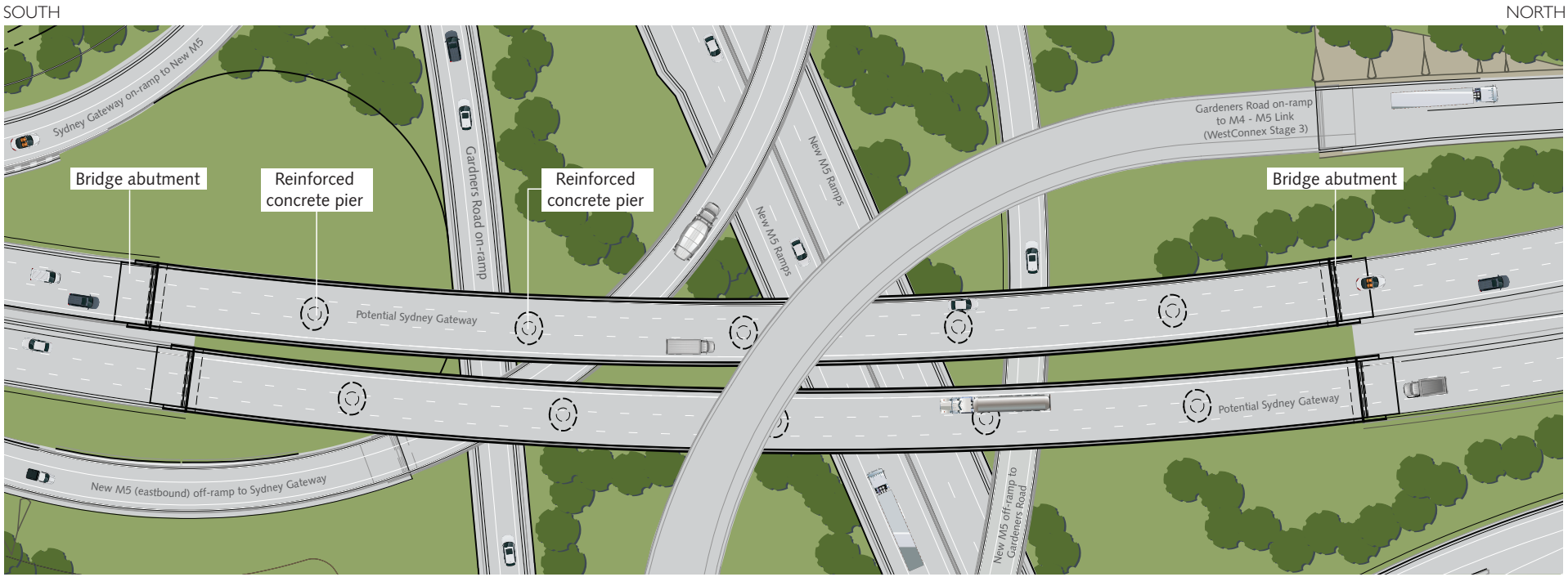
(blank page)

Table 5-3 St Peters interchange road bridges

Bridge number	Bridge Level	Connectivity	Number of lanes	Minimum lane width (metres)	Shoulder width (indicative)	Total carriageway width (metres) (indicative)	Posted speed (km / h)
1	2	New M5 (eastbound) to Gardeners Road (eastbound)	1	3.5	Two metre nearside One metre offside	6.5	60
2	2	New M5 (eastbound) to the future Sydney Gateway	1	3.5	Two metre nearside One metre offside	6.5	60
3	3	The future Sydney Gateway (northbound) to the future M4-M5 Link (northbound)	2	3.5	2.5 metres nearside One metre offside	10.5	60
4	3	The future M4-M5 Link (southbound) to the future Sydney Gateway (southbound)	2	3.5	2.5 metres nearside One metre offside	10.5	80
5	2	The future M4-M5 Link (southbound) to Gardeners Road (eastbound)	1	3.5	Two metres nearside One metre offside	6.5	80
6	4	Gardeners Road and Euston Road, at the intersection with Campbell Road, merging and connecting to the future M4-M5 Link	1	3.5	Two metre nearside One metre offside	6.5	60

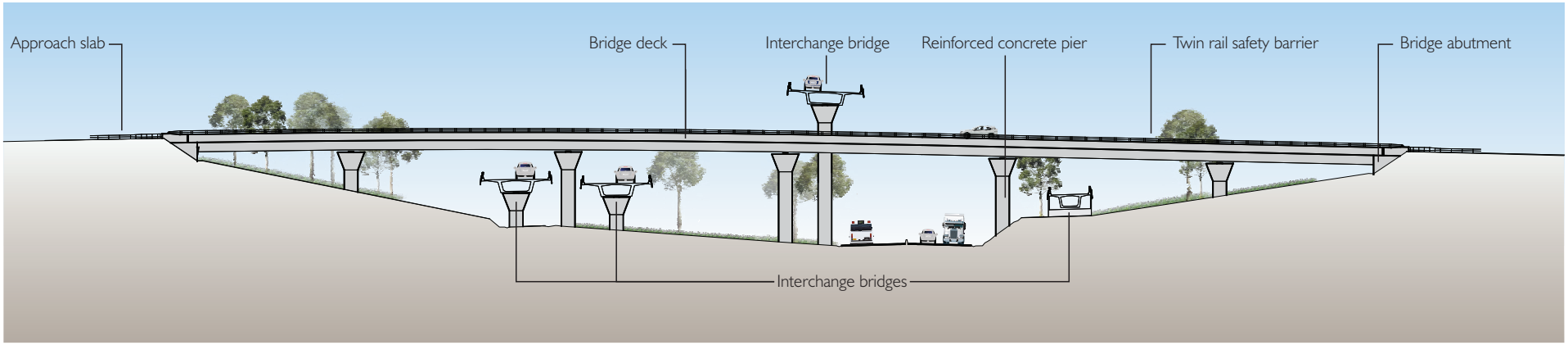
(blank page)

ST PETERS INTERCHANGE BRIDGES - PLAN



NOT TO SCALE

ST PETERS INTERCHANGE BRIDGES - SECTION

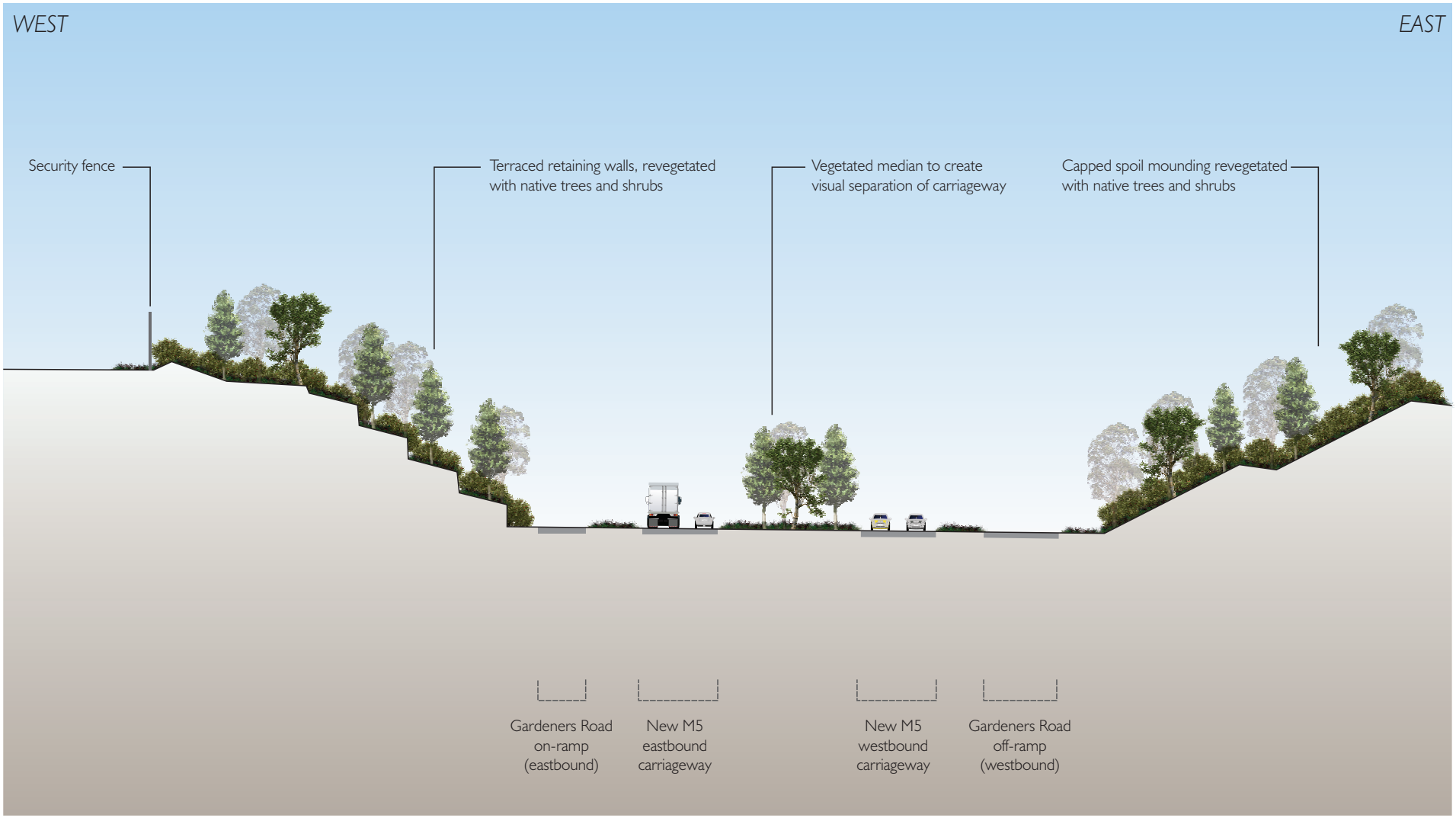


NOT TO SCALE

Refer to Figure 5-26 for section location

Figure 5-27 Indicative St Peters interchange bridges plan and section

(blank page)



NOT TO SCALE

Figure 5-28 Indicative cross section - St Peters interchange

(blank page)