Roads and Maritime Services/Sydney Airport Corporation Limited

Sydney Gateway Road Project

Environmental Impact Statement/ Preliminary Draft Major Development Plan

Chapter 7 Project description

November 2019

Contents

Tables

Figures

Chapter 7

Project description

This chapter provides a description of the project's design features. It includes a description of the main infrastructure proposed, ancillary infrastructure, land requirements and proposed access changes. It also describes the approach to urban design and place making, and how this has, and will continue to be, integrated in the design process.

The project is located on Sydney Airport land and on land subject to the EP&A Act. As it is not always possible to meaningfully separate the individual components of each project feature according to the approval pathway, the features are described as a whole in this chapter, with additional information provided where possible to define the elements that are located on each type of land.

The project described in this chapter is based on a concept design. Flexibility has been provided in the concept design to allow for refinement during detailed design in response to submissions received following exhibition and/or if opportunities arise to minimise environmental impacts. The final design may therefore vary from the concept design described in this chapter. Further refinements may be identified in the preferred infrastructure report and the project approval.

The SEARs and MDP requirements addressed in this chapter are listed below. Full copies of the SEARs and MDP requirements, and where they are addressed in this document, are provided in Appendices A and B respectively.

Reference	Requirement	Where addressed
General standard SEARs		
2.1	The EIS must include, but not necessarily be limited to, the following: (b) a description of the proposal, including key components and activities (including ancillary components and activities) required to construct and operate it, including:	This chapter describes the components required to operate the project. The activities required to construct the project are described in Chapter 8 (Construction)
	• the proposed route	Section 7.1.1
	• all surface road work upgrades including road widening, intersection treatments, partial or full road closures and bridges	Sections 7.3 to 7.8
	• pedestrian and cyclist facilities including any temporary changes resulting from construction activities	Section 7.9 (proposed facilities)
	• construction and operational ancillary facilities and infrastructure	Section 7.10 (operational ancillary facilities)
	• the relationship of the proposal with existing and proposed road and freight transport services	Chapter 5 (Strategic context and project need)
	• all utility undertakings (relocations, augmentations, adjustments and protection works) which will be undertaken as part of the proposal	Sections 7.10.11 and 8.7
	• land use changes and acquisition of privately owned, council and crown land	Section 7.11 (land requirements) and Chapter 19 (Land use and property) (land use changes)
	(j) a demonstration of how the proposal design has been developed to avoid or minimise likely adverse impacts	Chapter 6 (Project alternatives and options)

Reference	Requirement	Where addressed
Key issue SEARs		
4	**Place making and urban design**	
4.1	The Proponent must identify how functional 'place' outcomes of public benefit will be achieved, including design principles and strategies that: (a) consider areas identified for future urban renewal;	Section 7.12.2
	(b) identify areas of reduced traffic volumes and reduction of traffic permeation, particularly in and around commercial and community centres;	Section 7.12.2, Chapter 9
	(c) avoid locating infrastructure, including ancillary facilities, adjoining residential areas and other sensitive receivers, and justify where this cannot be achieved;	Section 7.12.2
	(d) achieve high quality landscape design, streetscapes, architecture and design;	Section 7.12.2
	(e) identify and incorporate urban design strategies and identify opportunities that will enhance healthy, cohesive and inclusive communities, including in relation to accessibility and connectivity;	Section 7.12.2
	(f) consider residual land treatments, and demonstrate how the proposed hard and soft urban design elements of the proposal would be consistent with the existing and desired future character of the area traversed or affected by the proposal;	Sections 7.12.2 to 7.12.4
	(g) identify opportunities to utilise surplus or residual land, particularly for the provision of community space (passive and recreational) and the process for determining ongoing maintenance of the lands; and	Section 7.12.4
	(h) explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance during the design development process, including natural surveillance, lighting, walkways, signage and landscape.	Section 7.12.2
MDP requirements		
91(1)	A major development plan, or a draft of such a plan, must set out: (c) a detailed outline of the development	This chapter

7. Project description

7.1 Overview

7.1.1 The project and its alignment

The project would comprise new and upgraded sections of road linking the Sydney motorway network at St Peters interchange with Sydney Airport's terminals. It would also provide improved links to the surrounding road network, including Marsh Street, O'Riordan Street, Joyce Drive and beyond. Overall, about 6.6 kilometres of road would be constructed or upgraded as part of the project.

The project provides a number of linked road connections to facilitate the movement of traffic between the Sydney motorway network, Terminal 1 (the International Terminal) and Terminals 2/3 (the Domestic Terminals). The project would connect Terminal 1 and Terminals 2/3 with each other and with the Sydney motorway network (ie the New M5 and M4-M5 Link) at St Peters interchange. The project would also facilitate the movement of traffic towards Port Botany via Joyce Drive and General Holmes Drive.

The project would provide three main routes for traffic:

- Between the Sydney motorway network and Terminal 1, and towards the M5 motorway and the Princes Highway
- Between the Sydney motorway network and Terminals 2/3, and towards General Holmes Drive, Port Botany and Southern Cross Drive
- Between Terminal 1 and Terminals 2/3.

Figure 7.1 provides an overview of the primary connections the project would provide as well as the secondary connections the project would also facilitate.

The project would also provide access to Sydney Airport land on both sides of Alexandra Canal.

Key features

For the purpose of the impact assessment, the project has been divided into key components or features based on the location and functionality of each. The key components or features include:

- Road links to provide access between the Sydney motorway network and Sydney Airport's terminals, consisting of the following components:
  - St Peters interchange connection – a new elevated section of road extending from St Peters interchange to the Botany Rail Line, including an overpass over Canal Road
  - Terminal 1 connection – a new section of road connecting Terminal 1 with the St Peters interchange connection, including a bridge over Alexandra Canal and an overpass over the Botany Rail Line
  - Qantas Drive upgrade and extension – widening and upgrading Qantas Drive to connect Terminals 2/3 with the St Peters interchange connection, including a high-level bridge over Alexandra Canal
  - Terminal links – two new sections of road connecting Terminal 1 and Terminals 2/3, including a bridge over Alexandra Canal
  - Terminals 2/3 access – a new elevated viaduct and overpass connecting Terminals 2/3 with the upgraded Qantas Drive

- Road links to provide access to Sydney Airport land:
  - A new section of road and an overpass connecting Sydney Airport's northern lands on either side of the Botany Rail line (the northern lands access)
  - A new section of road, including a signalised intersection with the Terminal 1 connection and a bridge, connecting Sydney Airport's existing and proposed freight facilities on either side of Alexandra Canal (the freight terminal access)
- An active transport link, about 1.3 kilometres long and located along the western side of Alexandra Canal, to maintain connections between Sydney Airport, Mascot and the Sydney central business district
- Intersection upgrades or modifications at:
  - Link Road/Airport Drive
  - Lancastrian Road/Qantas Drive
  - Robey Street/Seventh Street/Qantas Drive
  - Qantas Drive/O'Riordan Street/Joyce Drive/Sir Reginald Ansett Drive
  - Ross Smith Avenue/Sir Reginald Ansett Drive
  - Shiers Avenue/Sir Reginald Ansett Drive
- Operational ancillary infrastructure, including maintenance bays, new and upgraded drainage infrastructure, signage and lighting, retaining walls, noise barriers, flood mitigation basin, utility works and landscaping.

The key features of the project are shown on Figure 7.2 to Figure 7.7 and described in sections 7.3 to 7.10.

As part of the above, the project includes four new bridges over Alexandra Canal and six overpasses over roads and the Botany Rail Line (the rail corridor). The proposed bridges and overpasses are described in sections 7.3 to 7.8. The names used in those sections are indicative reference names applied for the purposes of the impact assessment.

Preparatory investigations, surveys and notifications

The project would not include some preliminary works, including surveys, test drilling, test excavations, geotechnical or contamination investigations or other tests, sampling or investigations undertaken for the purposes of the design or assessment of the project.

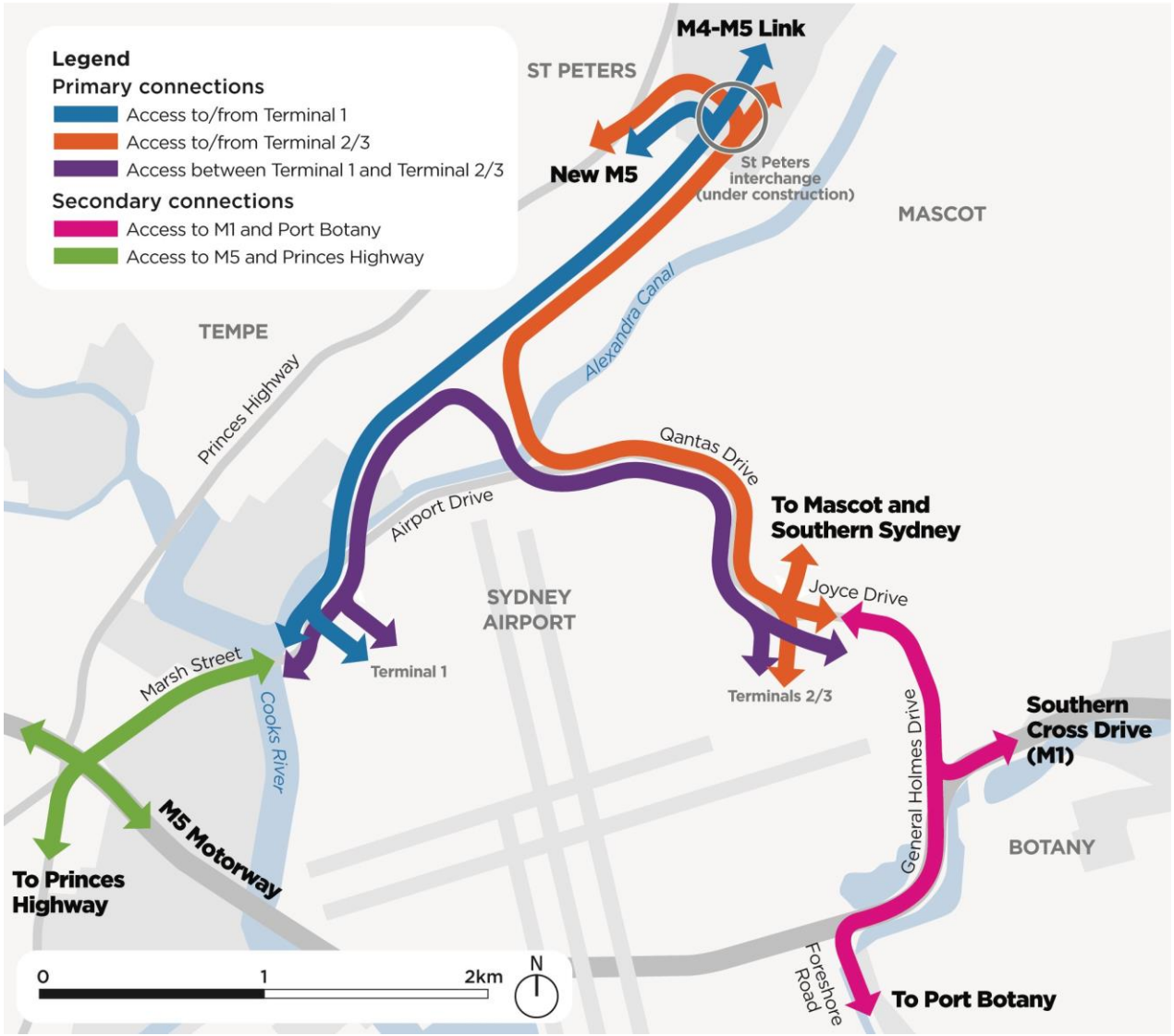

Figure 7.1 Connectivity provided by the project

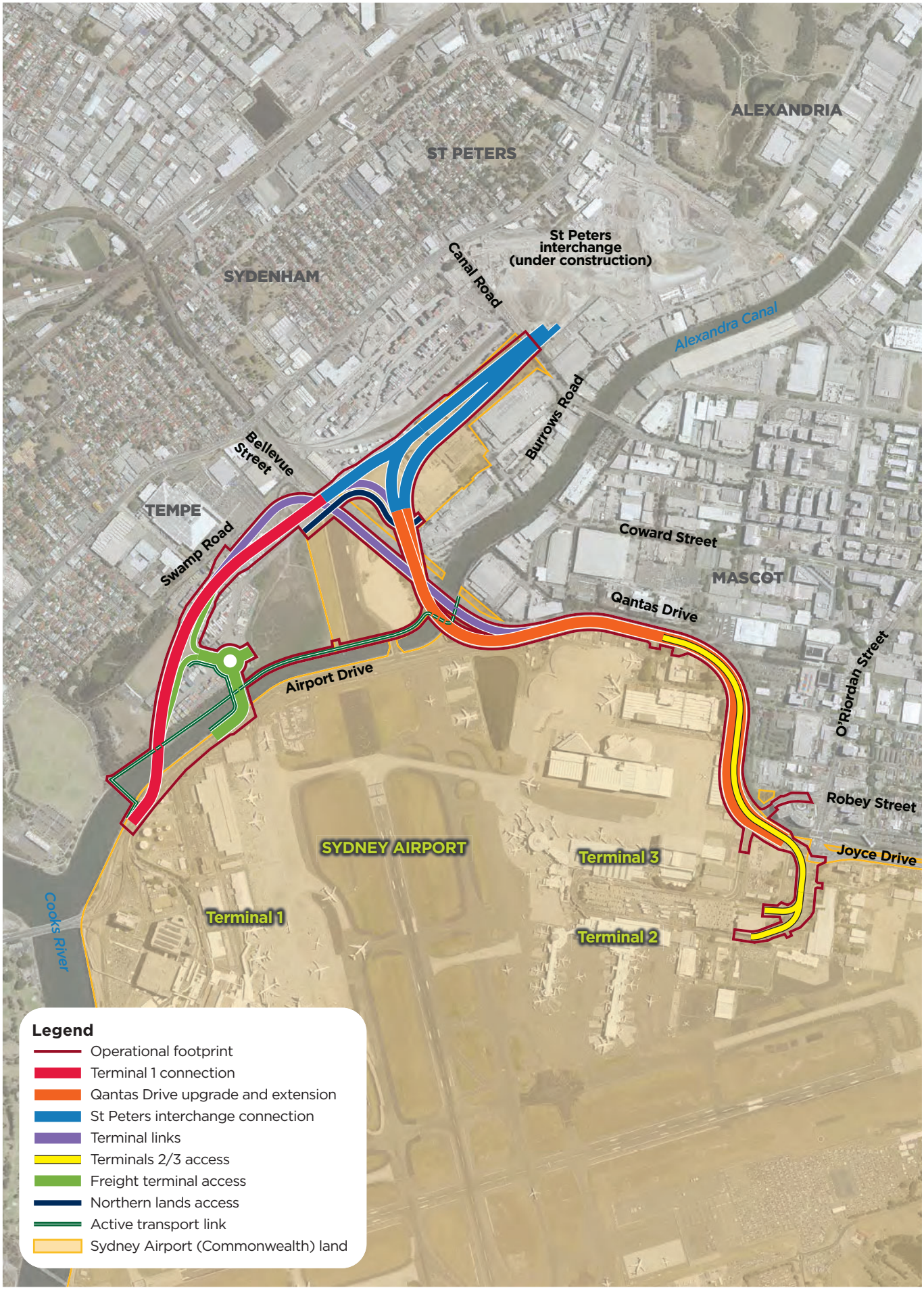

Figure 7.2 **Project layout - overview**

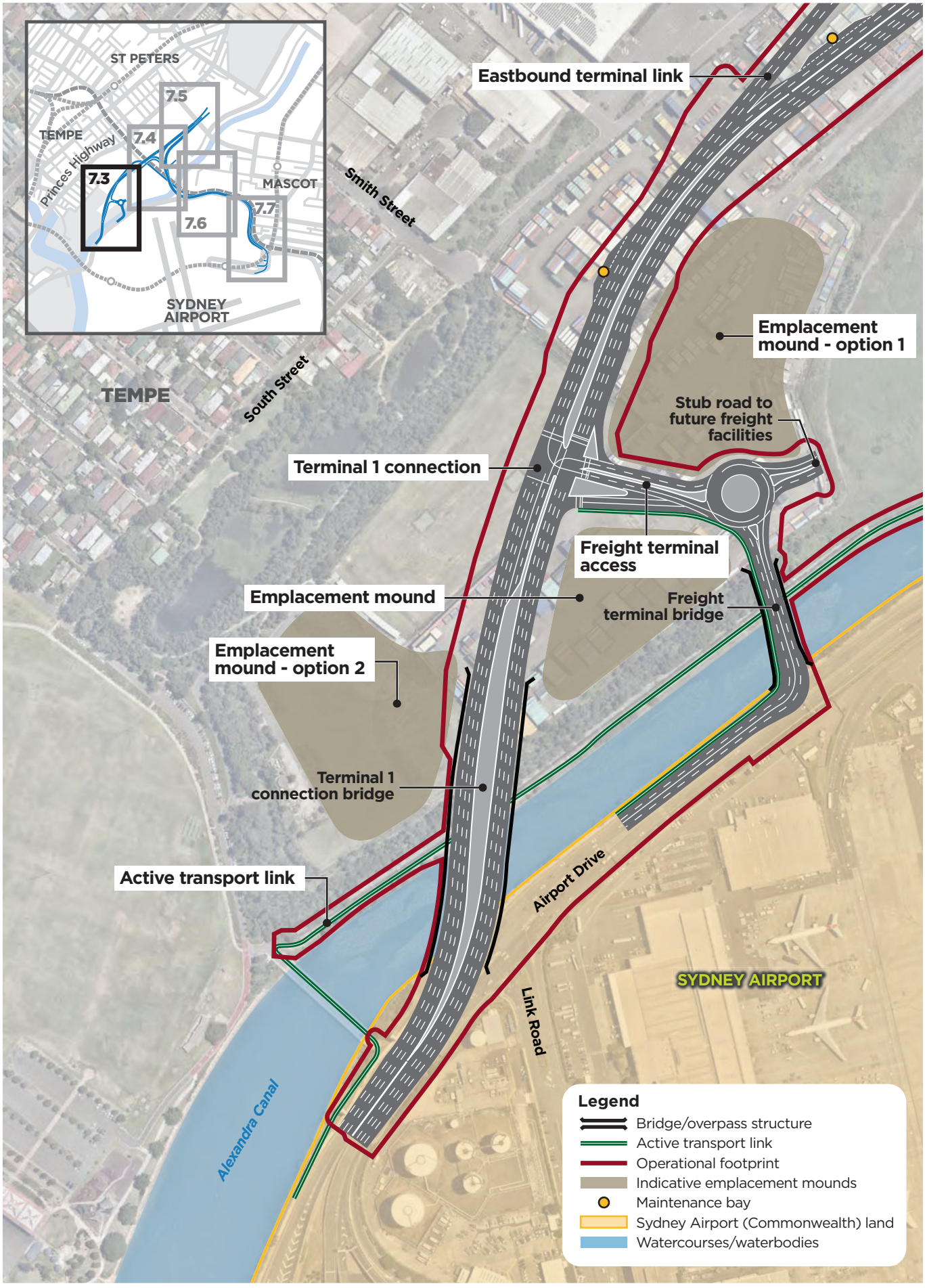

Figure 7.3 **Project layout - map 1**

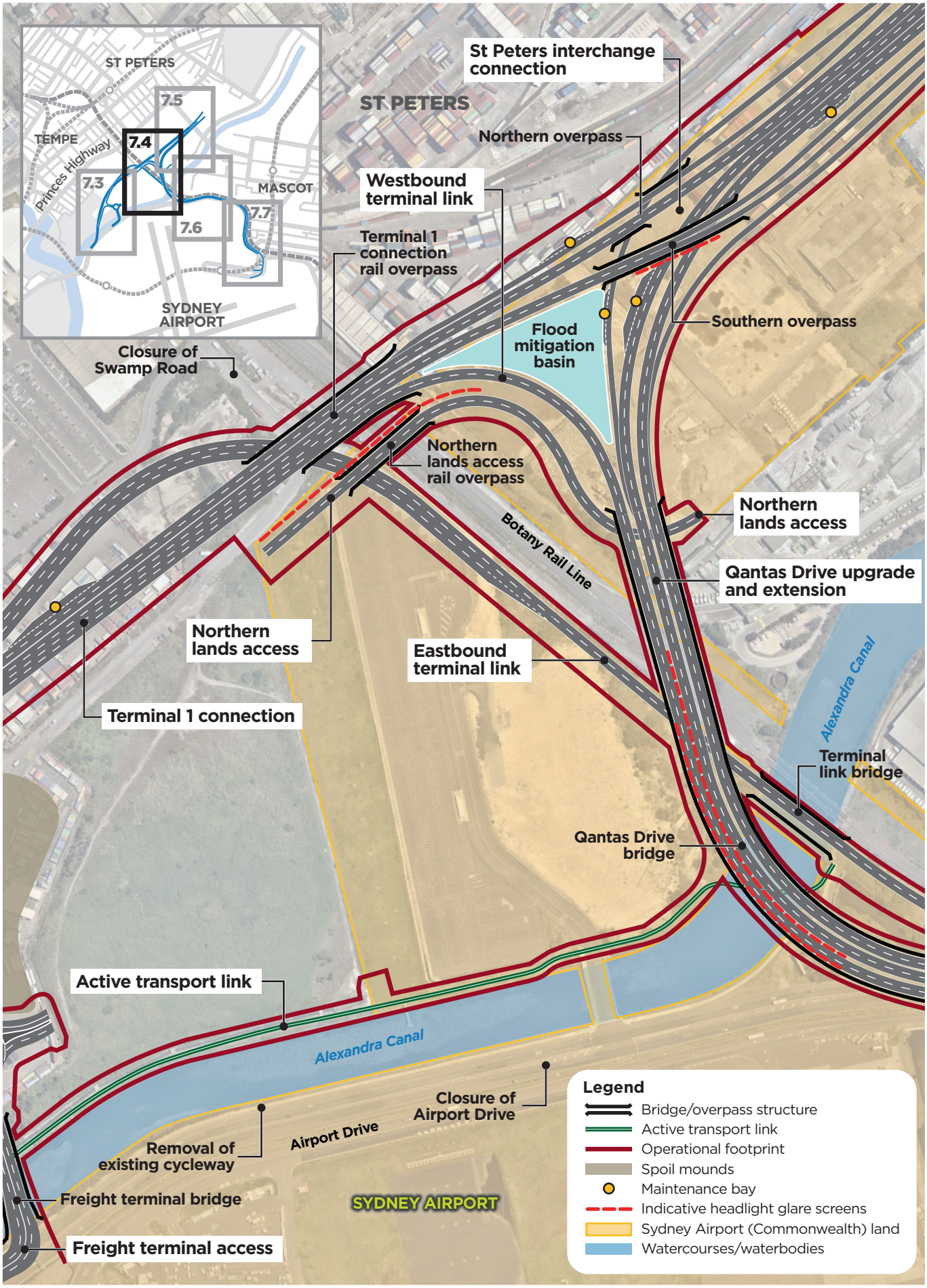

Figure 7.4 **Project layout - map 2**

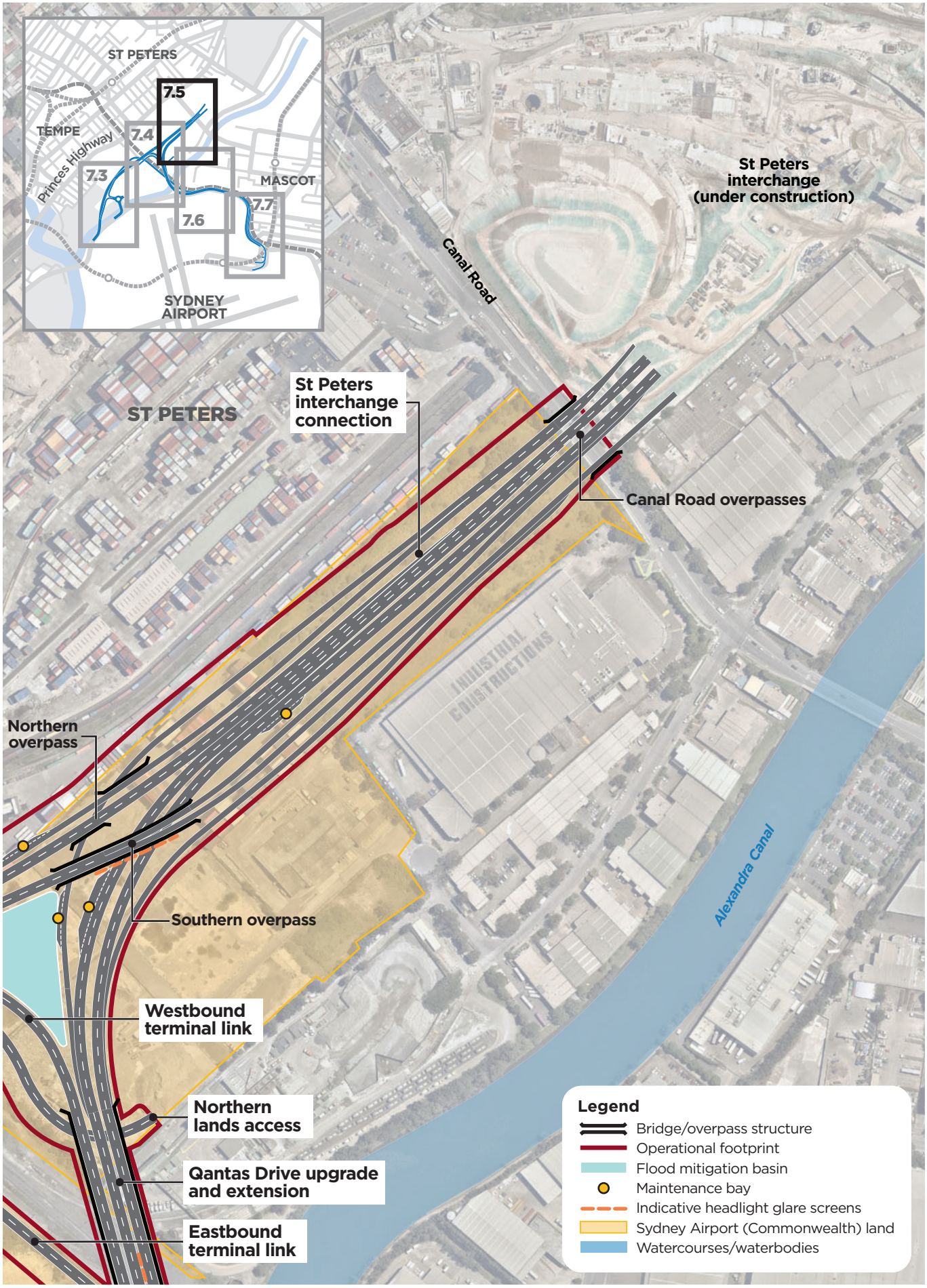

Figure 7.5 **Project layout - map 3**

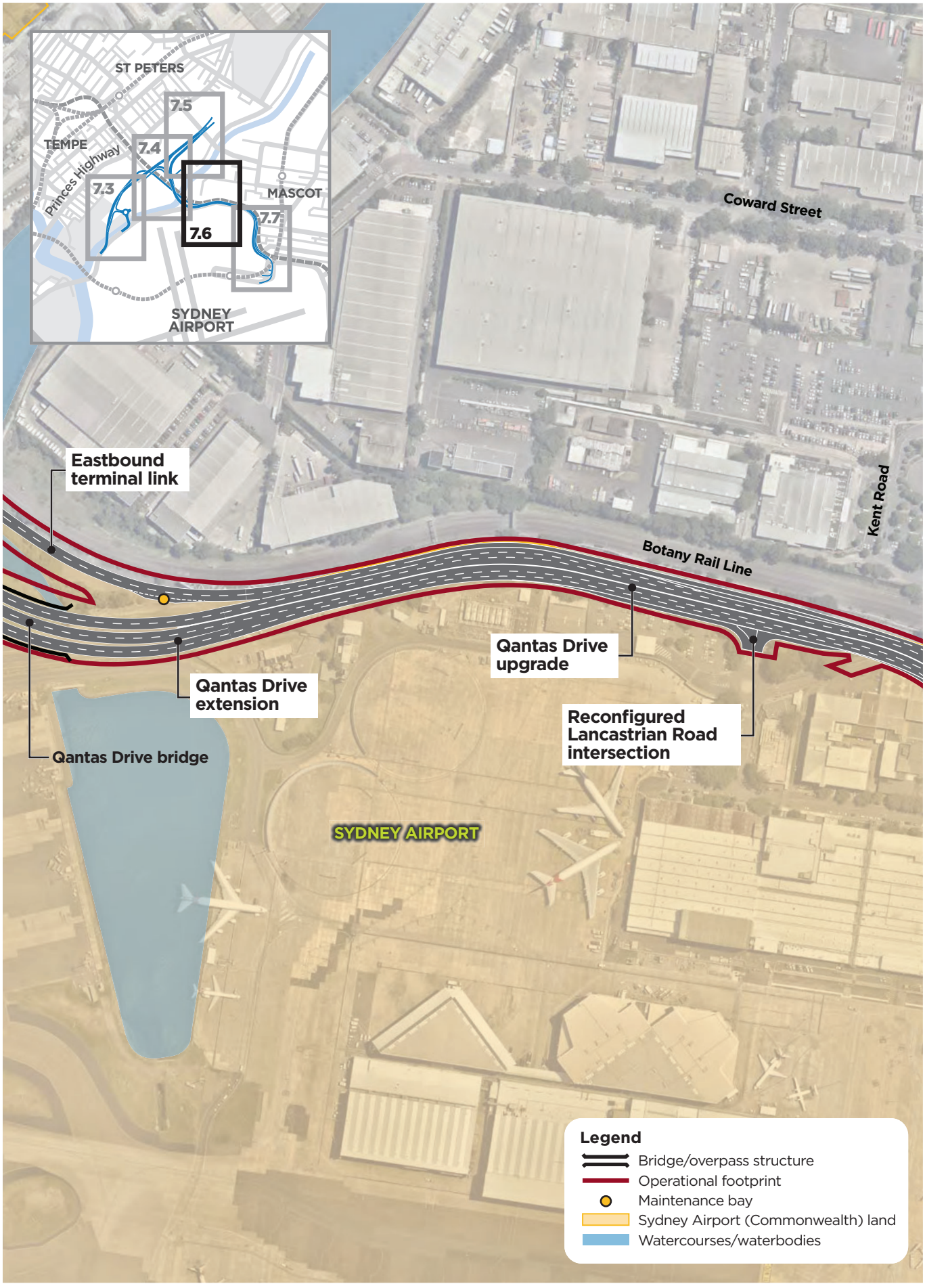

Figure 7.6 **Project layout - map 4**

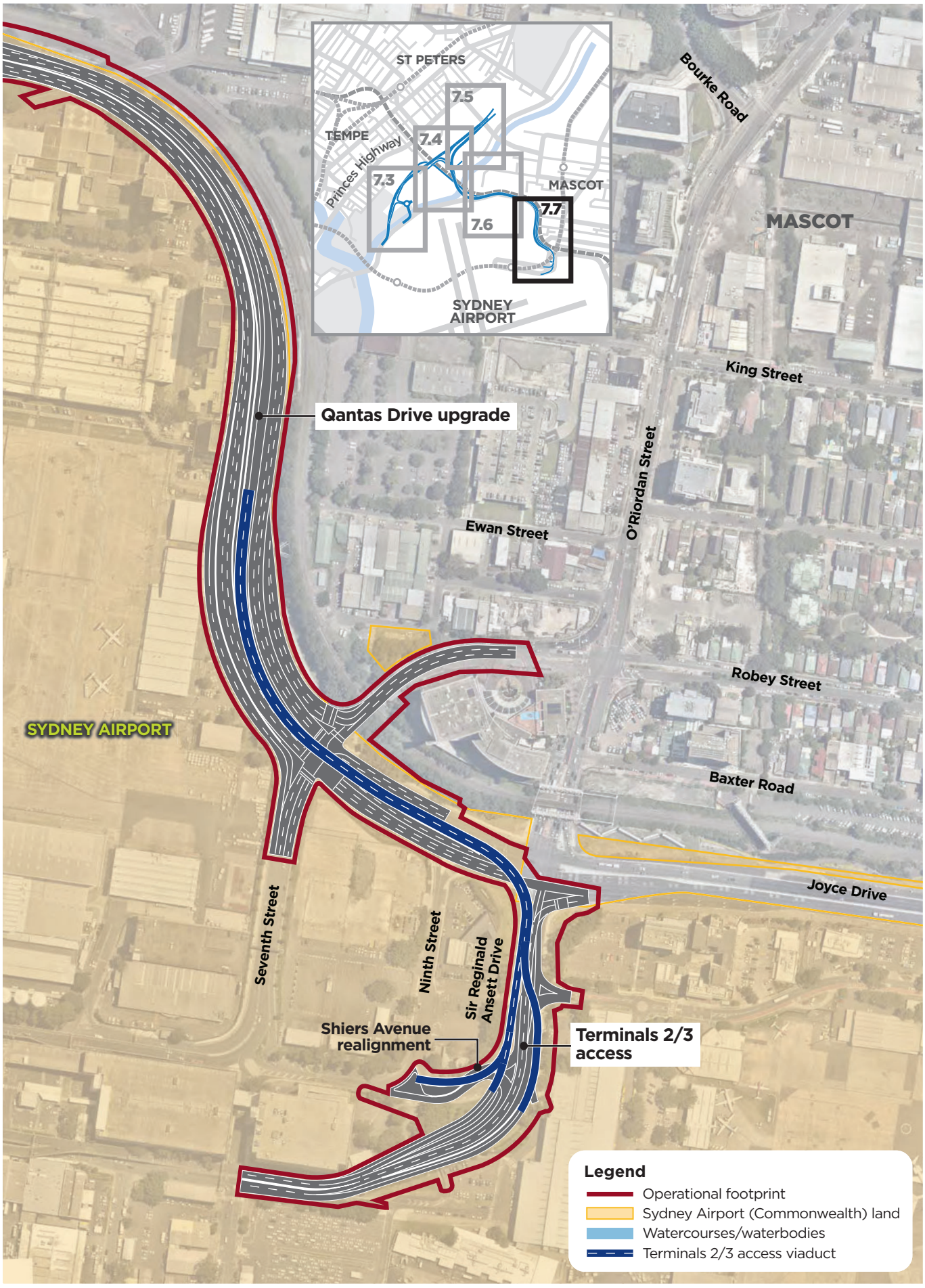

Figure 7.7 **Project layout - map 5**

Project alignment

The following sections describe the project's alignment along the main travel routes (as shown on Figure 7.1), according to the main routes and features described above.

Between the Sydney motorway network and Terminal 1

The project would extend south from its tie-in with St Peters interchange, cross Canal Road and continue south-west across industrial land adjacent to the Cooks River Intermodal Terminal. It would then split into two separate alignments – the western alignment, which would provide access to Terminal 1, and the eastern alignment, which would provide access to Terminals 2/3.

The access to Terminal 1 would cross the rail corridor and the eastbound terminal link via a new overpass. About 400 metres south of the rail corridor, the alignment would turn to the south, and would continue across industrial land and open space, where it would connect with the freight terminal access via a three-way intersection. The alignment would continue south from this intersection across industrial land and would cross Alexandra Canal via a new bridge. East of the canal, the alignment would continue to the south-west and would tie into Airport Drive near the access to Terminal 1 (to the east of Link Road).

Between the Sydney motorway network and Terminals 2/3

The project would extend south from its tie-in with St Peters interchange, cross Canal Road and continue south-west across industrial land adjacent to the Cooks River Intermodal Terminal. It would then turn to the south-east and cross the rail corridor, the eastbound terminal link and Alexandra Canal via a new bridge. The project would continue to the east along the existing Qantas Drive corridor, with Qantas Drive upgraded and widened.

Between Lancastrian Road and Seventh Street, the alignment would continue along the existing alignment of Qantas Drive, with the road widened to the south within Sydney Airport land. In the vicinity of King Street, the eastbound and westbound carriageways would move to the outside edge of the road corridor to allow the Terminals 2/3 access to be constructed between the two carriageways.

The project would provide access to Terminals 2/3 via a new elevated road structure (the Terminals 2/3 access). From the west, the alignment would commence near Ewan Street and extend generally in an easterly direction along the centre of the widened Qantas Drive (generally along the alignment of the existing central road median). Near the existing intersection of Qantas Drive, O'Riordan Street, Joyce Drive and Sir Reginald Ansett Drive, the alignment would extend south into the Terminals 2/3 precinct along Sir Reginald Ansett Drive. North of the intersection at Ross Smith Avenue, the alignment would split into a western and eastern viaduct.

The western viaduct would connect with the proposed Sydney Airport ground transport interchange (to the west) and would tie into Sir Reginald Ansett Drive's western lane providing access to the Terminals 2/3 departures road located on the upper deck of the grade-separated Keith Smith Avenue. The eastern viaduct would cross over Sir Reginald Ansett Drive and tie into Sir Reginald Ansett Drive's eastern lane providing access to the Terminals 2/3 arrivals road located on the lower deck of the grade-separated Keith Smith Avenue. The two central lanes of Sir Reginald Ansett Drive would continue to provide access from the Qantas Drive/O'Riordan Street/Joyce Drive/Sir Reginald Ansett Drive intersection to the Terminals 2/3 departure and arrival roads.

The viaduct would provide an overhead clearance of about 5.4 metres above Qantas Drive and Sir Reginald Ansett Drive and would gradually descend to meet Sir Reginald Ansett Drive and Keith Smith Avenue.

Between Terminal 1 and Terminals 2/3

From the north-western side of the Terminal 1 connection the project would continue to the north (via the eastbound terminal link) towards the rail corridor and across industrial land near the existing corridor for Swamp Road. It would continue to the east below the Terminal 1 connection and northern lands access overpasses and adjacent to the rail corridor, and would cross Alexandra Canal via a new bridge. The eastbound terminal link would merge with Qantas Drive to the east of Alexandra Canal.

The westbound terminal link would commence from the Qantas Drive upgrade and extension on the western side of Alexandra Canal to the north of the rail corridor. From here, it would continue across the rail corridor and merge with the northern end of the Terminal 1 connection.

Access to Sydney Airport land east and west of Alexandra Canal

The freight terminal access would connect with the Terminal 1 connection about 200 metres north of Alexandra Canal via a three-way signalised intersection. The alignment would extend about 100 metres east of the intersection with the Terminal 1 connection to the proposed roundabout (as the western leg of roundabout). One leg of the roundabout would extend to the east, a short stub road would be constructed to provide access to freight facilities proposed on Sydney Airport land and another short stub road would be constructed to provide access to land owned by Inner West Council. The southern leg of the roundabout would cross Alexandra Canal via a new bridge.

On the southern side of the canal, the road would turn west where it would tie into the existing alignment of Airport Drive near the existing Link Road intersection.

The alignment of the northern lands access would commence about 80 metres north of the rail corridor, on the north-eastern side of the proposed Qantas Drive bridge. The alignment would continue below the Qantas Drive bridge, and would extend to the north across industrial land and then turn to the south-west to cross the rail corridor and the eastbound terminal link via the northern lands access rail overpass. From here, it would continue to the south-west into the northern lands to provide access to the proposed future freight facilities on Sydney Airport land.

7.1.2 Parts of the project subject to the Airports Act and the EP&A Act

The project is located on land subject to the Airports Act as well as land subject to the EP&A Act. The parts of the project located on Sydney Airport land (as shown on Figure 1.3 and in more detail on Figure 7.3 to Figure 7.7) are subject to the assessment and approval process of the Airports Act. Other parts of the project, which are not located on Sydney Airport land (as shown on Figure 1.3 and in more detail on Figure 7.3 to Figure 7.7), are subject to the assessment and approval process of the EP&A Act. For completeness and readability, the project is described as a whole in this chapter.

7.1.3 Operational footprint

The operational footprint forms part of the overall project site described in Chapter 2 (Location and setting). It consists of land that would be occupied by permanent project infrastructure. The operational footprint has an area of about 37 hectares and includes about 21 hectares of Sydney Airport land. The operational footprint is shown on Figure 7.3 to Figure 7.7.

7.2 Design development

7.2.1 Design process

The concept design evolved over a period of about 18 months and involved many iterations and refinements, incorporating a range of considerations at each stage. Key considerations included:

- Environmental features and constraints, surrounding land use and key infrastructure, including Sydney Airport and the Botany Rail Line (described in Chapter 2 (Location and setting))
- Sydney Airport's prescribed airspace (described in Chapter 2)
- Urban design and place making considerations
- The needs and objectives of Sydney Airport Corporation, ARTC and other stakeholders
- The ability to construct the project, including the indicative construction methodology
- Design issues and constraints, including opportunities to safeguard future expansion and flexibility

- Potential alternative design solutions and innovations
- Cost and program.

The approach to design development has included a focus on avoiding or minimising the potential for impacts during all key phases of the process. In this regard, a feedback process has enabled findings from the various technical specialist studies to be captured and shared, allowing a collective understanding of the receiving environment to be built up, and leading to elements of the design being refined or changed to respond to these findings (see Chapter 6 (Project alternatives and options)).

As described in Chapter 6, the multi-criteria assessments carried out during the option selection and design process for corridor locations and key pieces of infrastructure included consideration of environmental and social issues. The options assessment process also included assessment of opportunities and risks. Further information on the options considered and key design refinements is provided in Chapter 6.

Prior to construction commencing, a detailed design process would be undertaken to prepare designs suitable for construction based on the concept design and project approval conditions.

7.2.2 Design standards

The design has been prepared in accordance with all relevant standards and design requirements for roads and bridges, including the following:

- Austroads Guide to Road Design and other relevant publications
- Roads and Maritime supplements to Austroads
- Other Roads and Maritime specifications, standards, guidelines and technical directions
- Australian Standards
- National Airports Safeguarding Framework and Sydney Airport Corporation design standards
- ARTC's Code of Practice for track and civil infrastructure
- CASA Manual of Standards
- Utility authority design standards.

Additional legislation and guidelines that have been used to ensure equality of access is integrated into the design of footpath upgrades and the provision of the active transport link:

- *Disability Discrimination Act 1992*
- Building Code of Australia
- Relevant Australian Standards.

7.2.3 Urban design and place making

Urban design and place making were key considerations in the design process. This is consistent with the NSW Government's policy directions, recognising the importance of good design in making cities and towns appealing, liveable and successful for the communities that live there. It is also consistent with Roads and Maritime's urban design policy, *Beyond the Pavement* (Roads and Maritime, 2014), which requires the design process to incorporate urban design and achieve quality design outcomes for the community.

The design was developed recognising that integration of urban design and place making considerations into the design process assists in maximising the benefits of new infrastructure, ensuring it improves existing places and spaces, and delivers greater returns for the community. The quality of built outcomes in the public domain is important and incorporating design methodologies early in the process will support well-considered and integrated outcomes. By commencing the urban design and place making assessment early in the project development process, potential impacts can be identified early and resolved through appropriate design to optimise project outcomes.

The urban design vision and objectives for the project (see Figure 7.8) were framed consistent with key guidelines and policies, including *Beyond the Pavement*. The project described in the following sections (7.3 to 7.10) has been developed in line with this vision and objectives.

Further information about how the design presented in the following sections has been, and will continue to be, developed taking into account urban design and place making principles is provided in section 7.12.

The urban design and place making concept for the project is described in Technical Working Paper 13 (Urban Design, Landscape Character and Visual Impact Assessment).

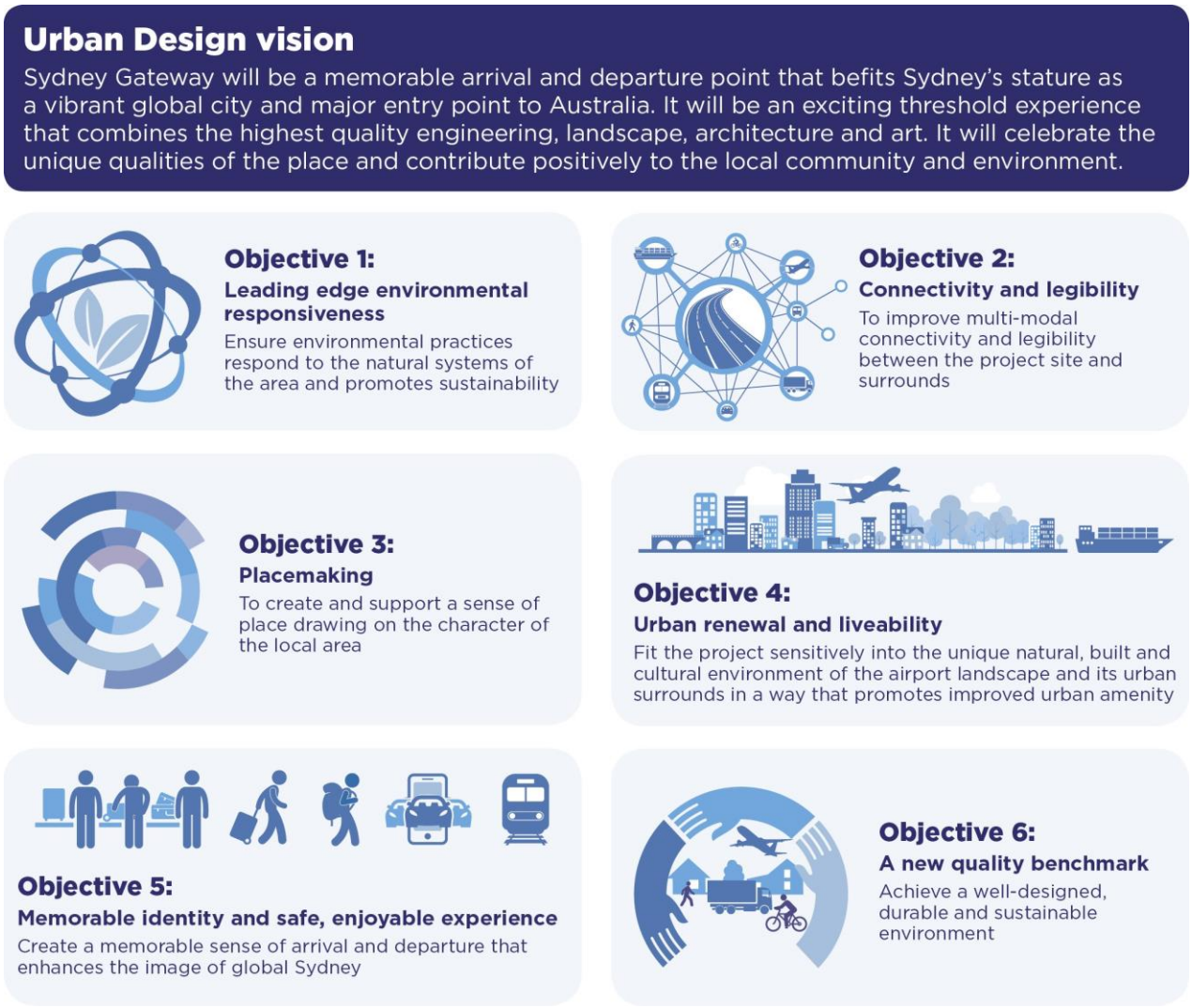

Figure 7.8 Design vision and objectives for the project

7.3 Terminal 1 connection

7.3.1 Overview

The Terminal 1 connection would consist of a new section of road to connect Terminal 1 with the Sydney motorway network. It would also connect Terminal 1 to Terminals 2/3 via the terminal links and the Qantas Drive upgrade and extension.

This new road would replace the existing access to Terminal 1 from the east via Airport Drive. Once the project is operational, Airport Drive would be closed to the east of the freight terminal access.

The Terminal 1 connection would include:

- Two carriageways with generally four lanes in each direction
- A tie-in to Airport Drive just north of the existing access to Terminal 1
- A new bridge over Alexandra Canal (see section 7.3.3)
- An overpass over the rail corridor (see section 7.3.4)
- An intersection with the freight terminal access (see section 7.8.1).

The Terminal 1 connection and its location with respect to land type (Sydney Airport land or land subject to the EP&A Act) is shown on Figure 7.3 and Figure 7.4.

7.3.2 Lane configuration

The Terminal 1 connection would generally comprise four lanes in each direction. The lanes would generally be 3.5 metres wide, with outside shoulder widths of about one metre, and inside shoulder widths of about 0.5 metres. A typical cross-section is shown on Figure 7.9.

North of the starting point for the eastbound terminal link (see section 7.6), the northbound carriageway of the Terminal 1 connection would comprise two lanes (see Figure 7.3 and Figure 7.4). Additional lanes would be provided on both carriageways at the intersection with the freight terminal access to facilitate turning movements into the freight terminal access.

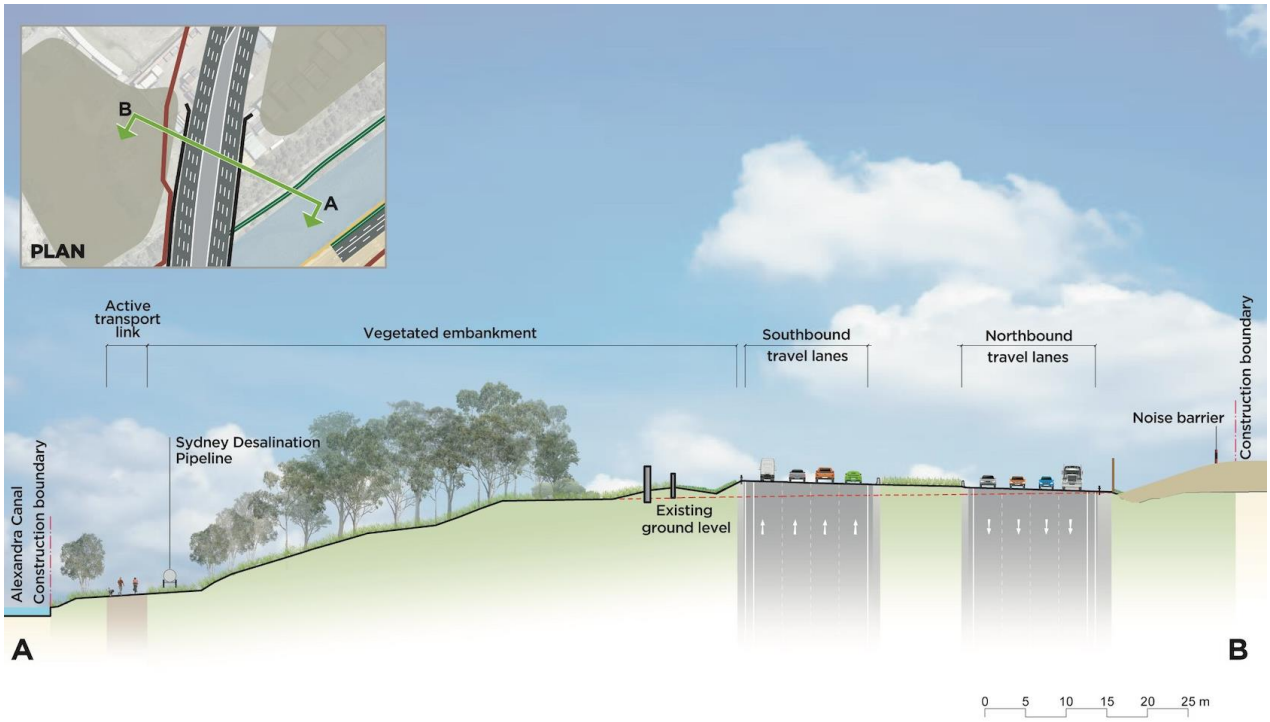

Figure 7.9 Terminal 1 connection – typical cross-section (looking south)

7.3.3 Terminal 1 connection bridge

The Terminal 1 connection bridge would cross Alexandra Canal about 500 metres north of the Giovanni Brunetti Bridge. It would consist of twin balanced cantilever concrete structures, located adjacent to each other. Both structures would be about 17 metres wide, consist of three spans, and have a total length of about 180 metres. The central span, which would cross the canal, would be about 90 metres long. The bridge structure would be elevated to about 13 metres above the canal. The bridge piers would be set back from the top of the banks of the canal to minimise impacts on the canal wall. The alignment of the bridge is shown on Figure 7.3. A visual representation is shown on Figure 7.10.

Figure 7.10 Terminal 1 connection bridge from Link Road – visual representation

7.3.4 Terminal 1 connection rail overpass

The Terminal 1 connection rail overpass would cross over the rail corridor, the existing alignment of Swamp Road and the eastbound terminal link (see Figure 7.4). The overpass would comprise six spans and have a total length of about 110 metres. As a result of the length, existing infrastructure and land use constraints, a set of bridge piers would need to be located within the rail corridor.

The height of the overpass structure would be about six metres above ground level, which would achieve the minimum 5.4 metre high clearance required over the Botany Rail Line whilst remaining below Sydney Airport's prescribed airspace at this location. The maximum height would be about 7.5 metres above ground level including roadside barriers and anti-throw screens.

7.4 Qantas Drive upgrade and extension

7.4.1 Overview

The Qantas Drive upgrade and extension would consist of a new and upgraded section of road and a bridge to connect Terminals 2/3 with the Sydney motorway network. It would also connect:

- Terminals 2/3 and Terminal 1 (via the terminal links and the Terminal 1 connection)
- The Sydney motorway network (at St Peters interchange) and Port Botany (via Joyce Drive, General Holmes Drive and Foreshore Road).

Qantas Drive would be upgraded from about 220 metres east of Alexandra Canal (about 400 metres west of Lancastrian Road) to the intersection of O'Riordan Street, Sir Reginald Ansett Drive and Joyce Drive. This would include:

- Widening the road to provide three lanes in each direction (compared with the existing two lanes)
- Realigning the eastbound and westbound carriageways to provide space for the Terminals 2/3 access viaduct between the two carriageways
- Modifying the intersections with Lancastrian Road, Robey and Seventh streets, O'Riordan Street, Sir Reginald Ansett Drive and Joyce Drive
- Tie-ins to the existing sections of Joyce Drive, Robey Street and O'Riordan Street at the eastern end.

A new section of road would extend across Alexandra Canal, over the eastbound terminal link and rail corridor, to the St Peters interchange connection. This would include:

- Three carriageways with two lanes in each direction, providing four lanes in the northbound direction and two lanes in the southbound direction
- A new bridge over Alexandra Canal (see section 7.4.3).

The Qantas Drive upgrade and extension, and its location with respect to land type, is shown on Figure 7.3, Figure 7.6 and Figure 7.7. A visual representation is shown on Figure 7.11.

7.4.2 Lane configuration and intersection upgrades

Westbound lanes

West of the O'Riordan Street/Sir Reginald Ansett Drive intersection, three westbound lanes would extend along Qantas Drive and two westbound lanes would extend from the left turn out of Seventh Street. To the west of the Robey Street/Seventh Street intersection, the three westbound lanes along Qantas Drive would merge to become two lanes and the two lanes out of Seventh Street would merge to one lane (see Figure 7.7). In addition to the three westbound lanes between the O'Riordan Street/Sir Reginald Ansett Drive and Robey Street/Seventh Street intersections, two right turn lanes would be provided into Robey Street (see Figure 7.15).

There would be three westbound lanes until about 400 metres west of Lancastrian Road. At this location (see Figure 7.6), the lanes would diverge, and an additional lane would be added, to form two dual-lane carriageways. The two carriageways would cross the canal via the Qantas Drive bridge (see Figure 7.4). The eastern carriageway would extend to the north to St Peters interchange. The western carriageway would extend to the west towards Terminal 1 via the westbound terminal link.

Eastbound lanes

East of Alexandra Canal, the two eastbound lanes from the St Peters interchange connection would merge with the two lanes from the eastbound terminal link to form four lanes (see Figure 7.6). The four eastbound lanes would then converge to become three lanes.

Further to the south-east (see Figure 7.7), one lane would diverge onto the Terminals 2/3 viaduct and two lanes would continue east. A third lane would be added to the two eastbound lanes, and the three lanes would continue to the east. Two left turning lanes into Robey Street would be provided, which would diverge from the eastbound lanes. An additional left turning lane would be added, and the three lanes would turn left into Robey Street.

All lanes would generally be a minimum of 3.3 metres wide.

Typical cross-sections are shown on Figure 7.12 to Figure 7.14.

Intersection upgrades

The following intersection works would be undertaken:

- Qantas Drive/Lancastrian Road – existing traffic signals would be removed and turning movements would be limited to left-in and left-out from the westbound carriageway of Qantas Drive (shown on Figure 7.6)
- Qantas Drive/Robey Street/Seventh Street – the intersection would be upgraded with the addition of a left turn lane into Robey Street northbound and a left turn out of Seventh Avenue westbound (shown on Figure 7.15)
- Qantas Drive/O'Riordan Street/Sir Reginald Ansett Drive – the existing median would be removed and an additional through lane provided to Joyce Drive in the eastbound direction. The right turn lanes into Sir Reginald Ansett Drive would be removed (shown on Figure 7.7).

Figure 7.11 Qantas Drive upgrade and extension west of King Street – visual representation

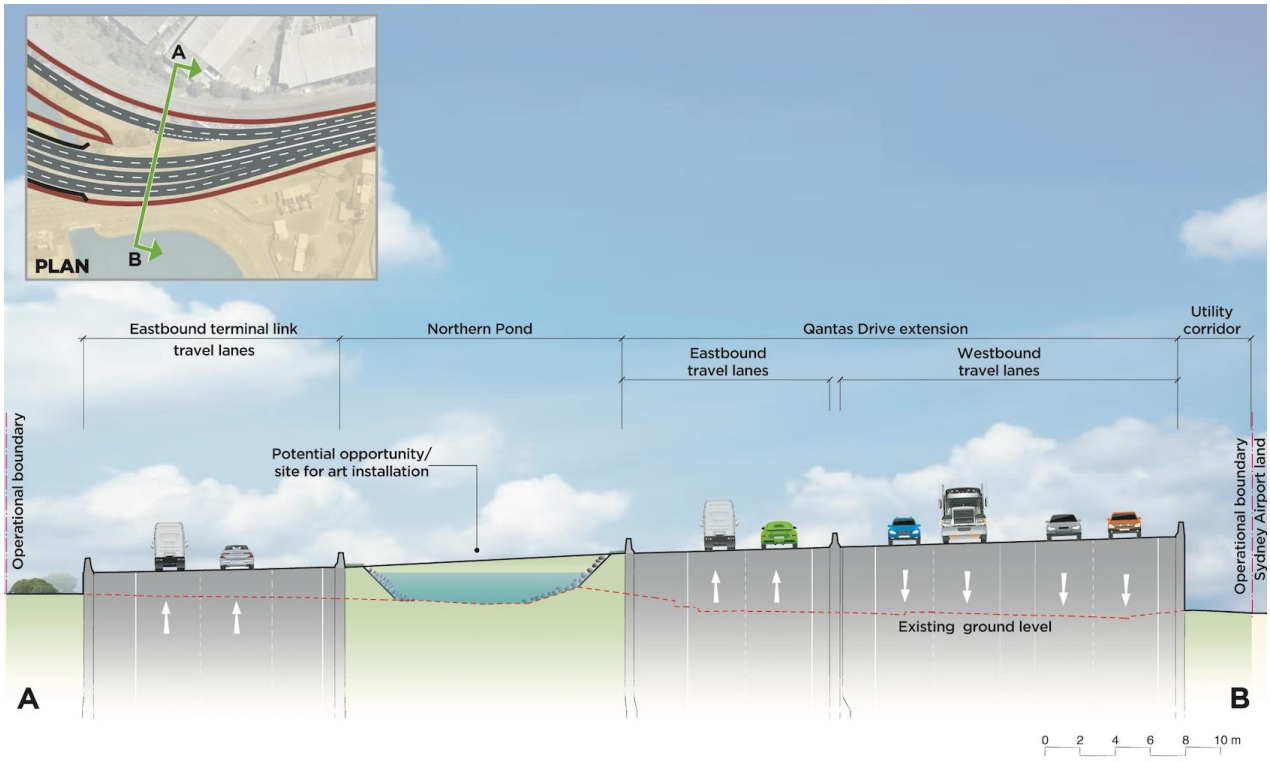

Figure 7.12 Qantas Drive upgrade and extension east of Alexandra Canal – typical cross-section (looking south)

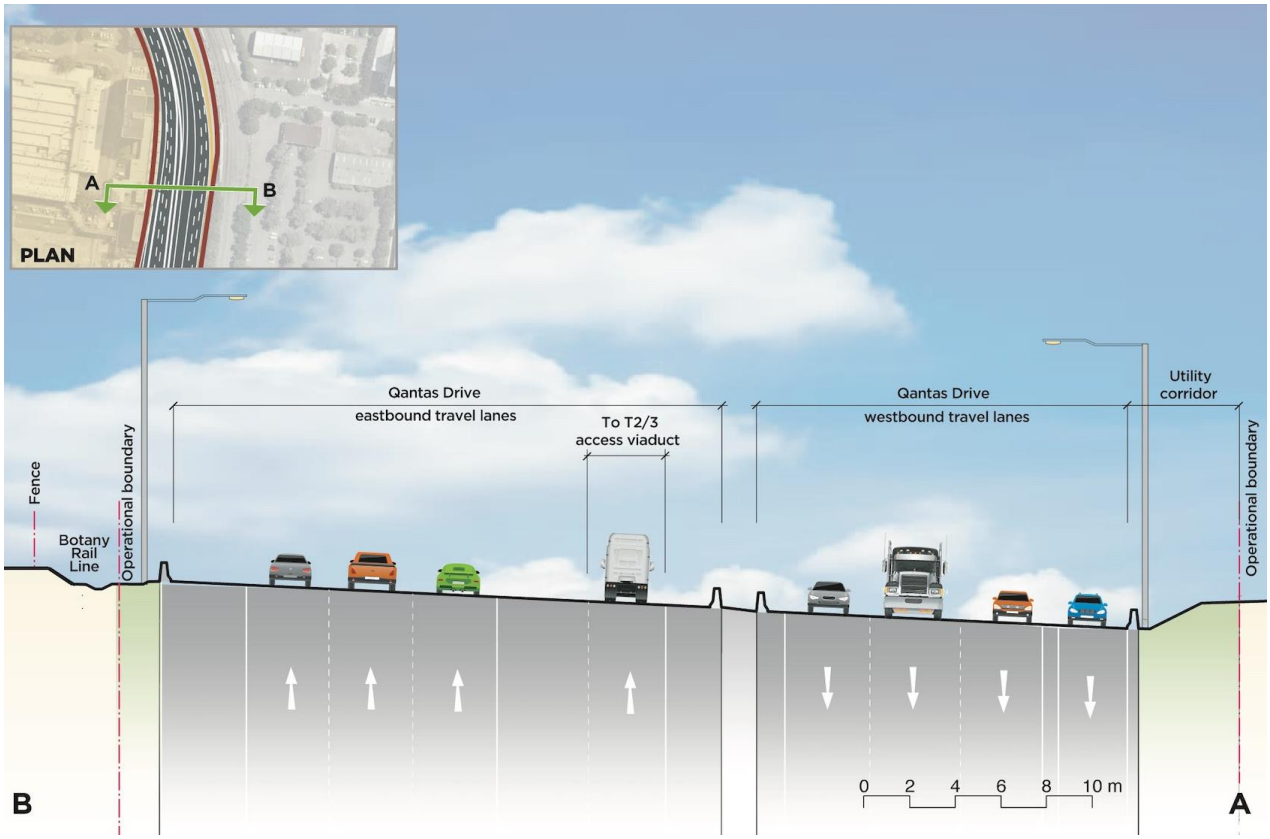

Figure 7.13 Qantas Drive upgrade and extension between King Street and Ewan Street – typical cross- section (looking south)

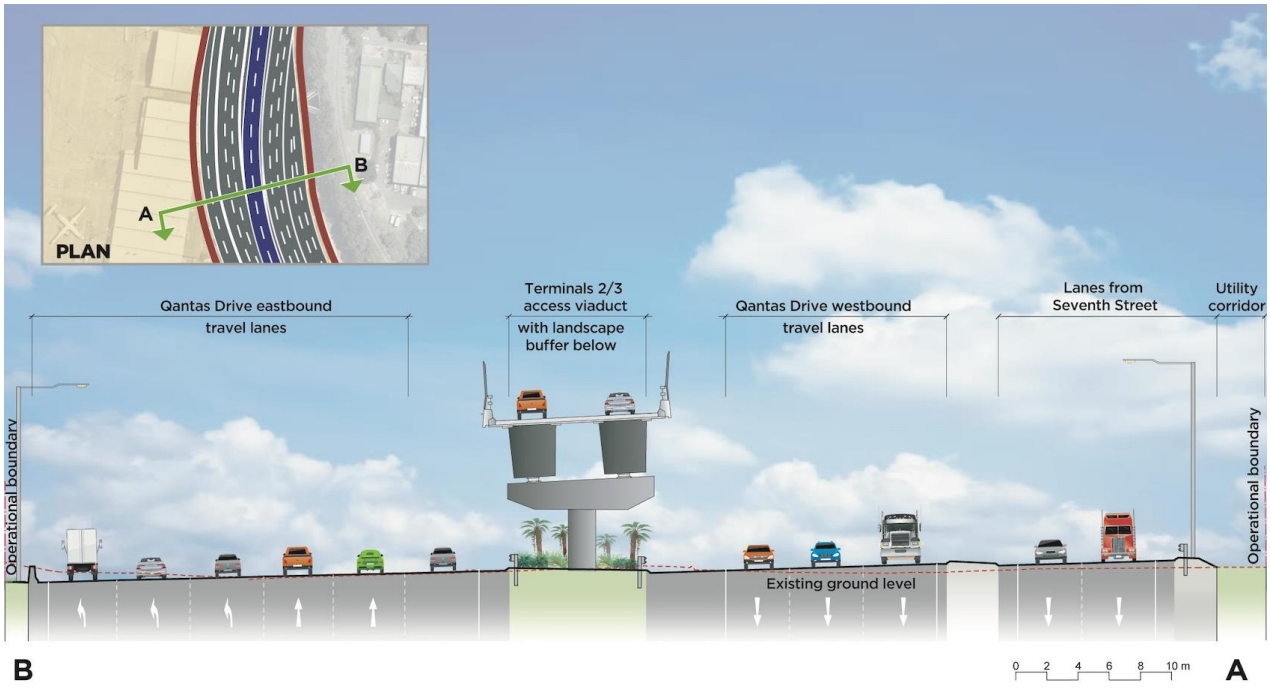

Figure 7.14 Qantas Drive upgrade and extension with Terminals 2/3 viaduct west of Robey Street – cross- section (looking south)

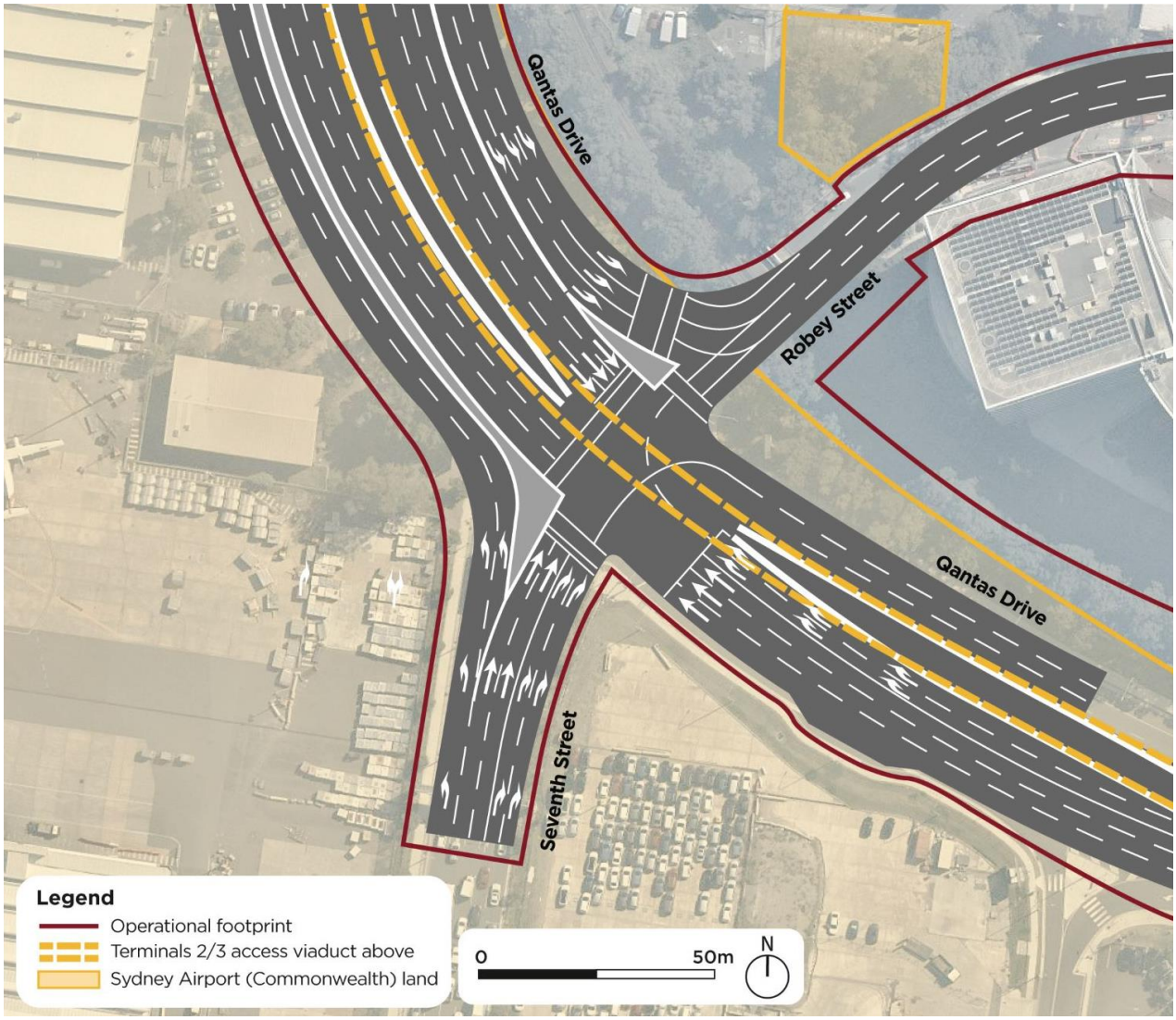

Figure 7.15 Qantas Drive/Robey Street/Seventh Street intersection upgrade and lane configuration

7.4.3 Qantas Drive bridge

The new bridge would cross Alexandra Canal about 70 metres south of the existing rail bridge. It would consist of twin box girder structures located adjacent to each other. The northern structure would carry the lanes providing access to and from St Peters interchange, while the southern structure would carry the lanes connecting towards Terminal 1 via the westbound terminal link.

The structures would have a total length of about 410 metres and would consist of eight spans. A single span, about 90 metres long, would cross Alexandra Canal. This span would be supported on piers set back from the banks of the canal. Piers would also be located within the Botany Rail Line corridor. These would be set back from the rail lines in accordance with ARTC's requirements.

The bridge structure would be elevated about 12 metres above the canal.

The alignment of the bridge is shown on Figure 7.3. A visual representation is shown on Figure 7.16.

Figure 7.16 Qantas Drive bridge – visual representation

7.5 St Peters interchange connection

7.5.1 Overview

The St Peters interchange connection would comprise a number of multi-lane road carriageways that would facilitate movements from the Sydney motorway network at St Peters to either Terminal 1 or Terminals 2/3 (as shown on Figure 7.1). The number of carriageways/lanes would vary moving southward away from the interchange. The carriageways would be grade-separated to provide the various connections required.

The St Peters interchange connection and its location with respect to land type is shown on Figure 7.4 and Figure 7.5.

The majority of the St Peters interchange connection would be constructed on fill about eight metres above the existing ground level.

7.5.2 Lane configuration

The carriageways would generally consist of one or two lanes, with the lanes and carriageways merging or diverging depending on the location and connections provided. The carriageway and lane configurations are shown on Figure 7.18. The configuration of lanes within the St Peters interchange connection allows specific carriageways (ie those travelling to the New M5 or M4-M5 Link) to connect directly into the corresponding lanes within St Peters interchange.

The lanes would be generally about 3.5 metres wide. A typical cross-section is shown on Figure 7.17.

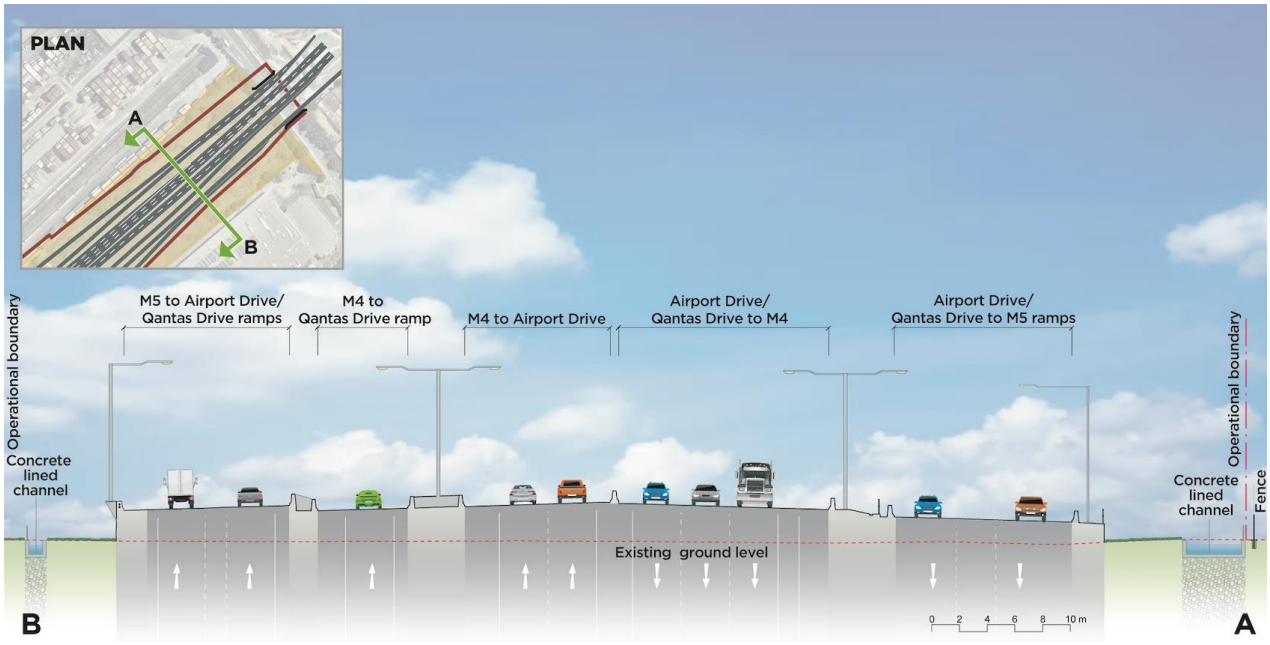

Figure 7.17 St Peters interchange connection south of Canal Road – typical cross-section (looking south)

7.5.3 Canal Road overpasses

Four overpasses about 35 metres long would be used to convey traffic from St Peters interchange over Canal Road. The total width of the structures would be up to about 51 metres. A clearance of 5.4 metres above Canal Road would be provided.

The alignment of the overpasses is shown on Figure 7.5.

7.5.4 Northern and southern overpasses

Two overpass structures would be used to carry two of the carriageways providing access to/from Terminal 1 over the carriageways providing access to/from Terminals 2/3. Both of these structures are located north of the Botany Rail Line, with the alignment of the overpasses shown on Figure 7.5.

The northern overpass would be a single span about 20 metres long and 45 metres wide, supported on retaining walls located on either side of the carriageways below. It would be about 4.5 to eight metres above ground level, and would allow for a minimum clearance of 5.4 metres over the carriageways below.

The southern overpass would consist of a five-span structure, which would be about 150 metres long and between 9.5 and 14 metres wide. The maximum height of the overpass deck would be about eight metres above the road below (or 12 metres above existing ground level). This would provide the required minimum clearance of 5.4 metres over the carriageways below while remaining below the OLS at this location. The overall height would be about 13 metres above the road below, including roadside barriers and anti-throw screens.

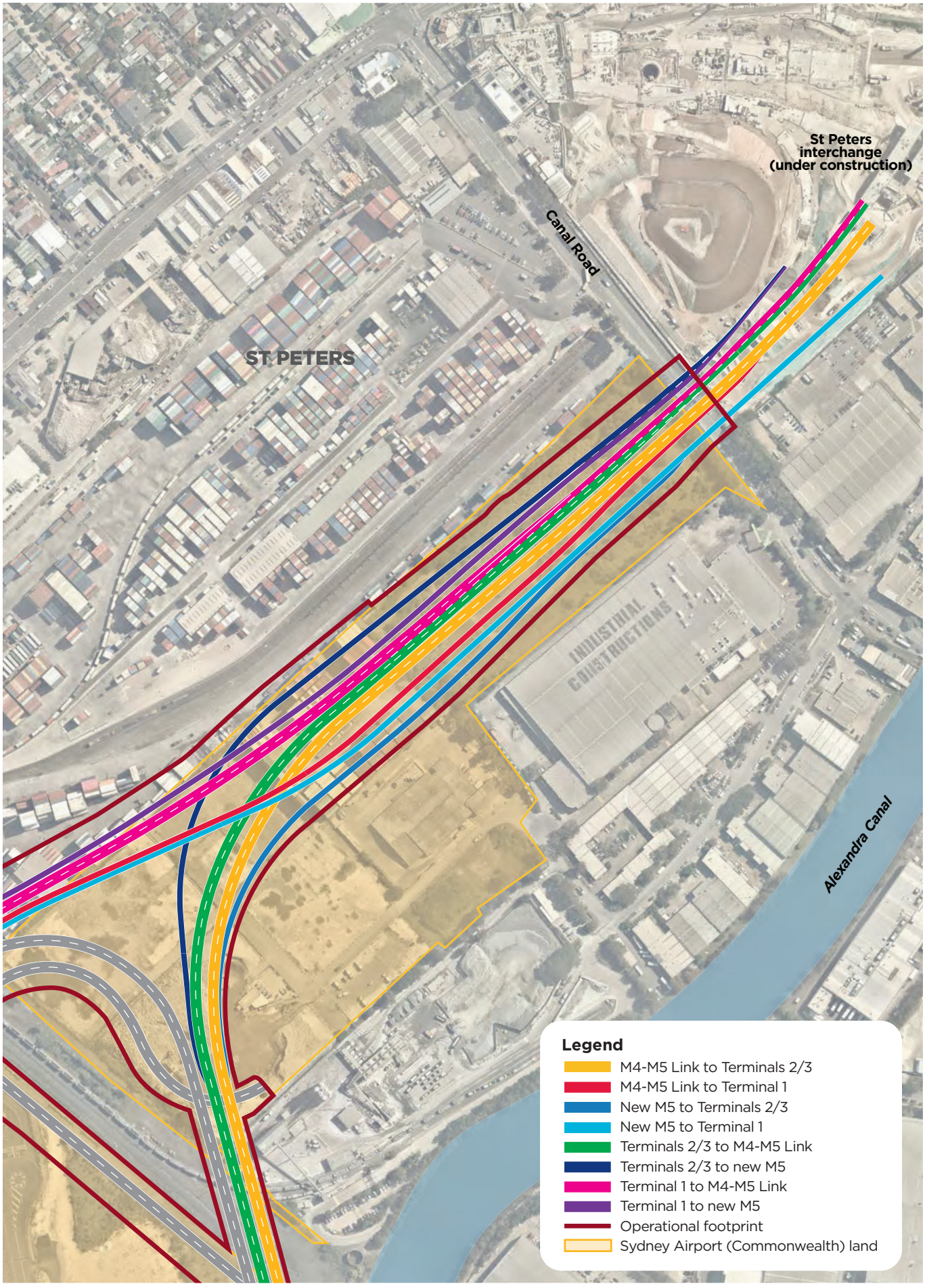

Figure 7.18 **St Peters interchange connection – lane configuration**

7.6 Terminal links

7.6.1 Overview

The terminal links would consist of two new sections of road to facilitate access between Terminal 1 and Terminals 2/3. The westbound terminal link would facilitate access to Terminal 1 from Terminals 2/3. It would consist of a short, one-way section of road, which would extend between the north-western end of the Qantas Drive upgrade and extension and the north-eastern end of the Terminal 1 connection.

The eastbound terminal link would facilitate access to Terminals 2/3 from Terminal 1. It would diverge from the north-western side of the Terminal 1 connection and would merge with the north-eastern side of the Qantas Drive upgrade and extension. The eastbound terminal link would include a new bridge over Alexandra Canal (see section 7.6.3).

The terminal links and their locations are shown on Figure 7.3, Figure 7.4 and Figure 7.6.

7.6.2 Lane configuration

The terminal links would generally consist of two lanes about 3.5 metres wide each. Road shoulders would vary from about 0.5 to one metre wide. The eastbound terminal link would include a three-lane section of roadway near Bellevue Street in Tempe.

7.6.3 Terminal link bridge

A new bridge would carry the eastbound terminal link over Alexandra Canal. It would be located about 10 metres south of the existing rail bridge and about 60 metres north of the proposed Qantas Drive bridge. The bridge would comprise a single-arch steel structure with one span. It would be about 90 metres long and about 12 metres wide.

The bridge deck would be about 7.5 metres above the canal. The overall height of the bridge would be about 20 metres above the canal.

A visual representation of the bridge is shown on Figure 7.19.

Note: The piers shown near the proposed terminal link bridge are those that support the existing Botany Rail Line bridge

Figure 7.19 Terminal link bridge – visual representation

7.7 Terminals 2/3 access

7.7.1 Overview

The Terminals 2/3 access would consist of a new elevated road (viaduct) structure providing access from Qantas Drive to Terminals 2/3. It would separate eastbound traffic travelling to Terminals 2/3 from through traffic, including east–west traffic travelling along Joyce Drive and Qantas Drive, and north–south traffic accessing and leaving Terminals 2/3 via Sir Reginald Ansett Drive and Seventh Street respectively.

The Terminals 2/3 access would extend from Qantas Drive (opposite the western end of Ewan Street) into Terminals 2/3. It would include:

- A new ramp from the western-most eastbound lane connecting to an elevated viaduct structure into the Terminals 2/3 precinct
- Adjustments to intersections along Sir Reginald Ansett Drive at Ross Smith Avenue and at Shiers Avenue (see section 7.7.2).

The new viaduct structure would be about 660 metres long and provide a clearance of 5.4 metres to Qantas Drive and Sir Reginald Ansett Drive. A visual representation is shown on Figure 7.20.

The Terminals 2/3 access is shown on Figure 7.7.

Figure 7.20 Terminals 2/3 access from Qantas Drive at O'Riordan Street – visual representation

7.7.2 Lane configuration and road adjustments

Viaduct structure

The majority of the new section of road would consist of two lanes. A third lane would be added where it turns to the south into the Terminals 2/3 precinct. North of the intersection at Ross Smith Avenue, the structure would split into a western and eastern viaduct. The western viaduct would then split into two lanes, with one lane turning west into the proposed ground transport interchange and the other crossing Shiers Avenue and descending via a ramp to merge with Sir Reginald Ansett Drive. At this location it would

provide access to the departures ramp at Terminals 2/3. The ramps on Sir Reginald Ansett Drive are shown on Figure 7.22.

The eastern viaduct would consist of one single lane, which would merge with Sir Reginald Ansett Drive towards the arrivals road at ground level on Keith Smith Avenue.

The lanes would be about 3.3 metres wide. A typical cross-section is shown on Figure 7.21.

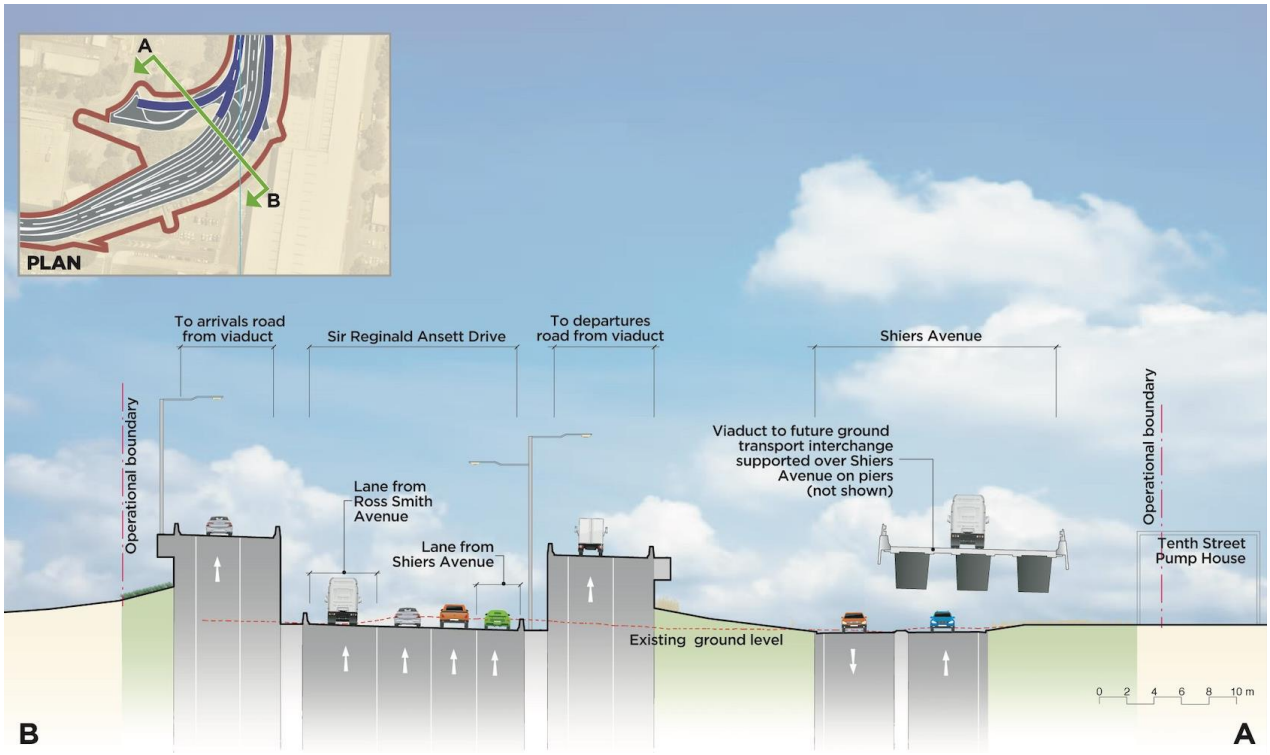

Figure 7.21 Terminals 2/3 access at ramp structure along Sir Reginald Ansett Drive north of Shiers Avenue – typical cross-section (looking south)

Sir Reginald Ansett Drive and Shiers Avenue adjustments

Sir Reginald Ansett Drive would comprise two lanes at the intersection with Qantas Drive and O'Riordan Street, with in-bound traffic coming from O'Riordan Street and Joyce Drive.

South of the turning lanes from Joyce Drive to Sir Reginald Ansett Drive, a third lane would be provided along the eastern edge of Sir Reginald Ansett Drive. This lane would provide access into and out of Ross Smith Avenue, where it would then merge with the lanes located between the ramps from the Terminals 2/3 access viaduct. An additional lane would diverge from this lane south of Ross Smith Avenue to access the taxi staging area.

An additional lane would diverge off the western edge of Sir Reginald Ansett Drive at Shiers Avenue. This lane would provide access into Ninth Avenue via an adjusted alignment of Shiers Avenue with a new intersection from Sir Reginald Ansett Drive. The existing eastbound Shiers Avenue lane, which provides for internal circulation, would be realigned north. A merge lane would also be provided from the eastbound Shiers Avenue lane onto Sir Reginald Ansett Drive, where it would merge with the two Sir Reginald Ansett Drive lanes located between the ramps from the Terminals 2/3 access viaduct. The proposed arrangement at Shiers Avenue is shown on Figure 7.22.

As part of the works along Sir Reginald Ansett Drive, the intersection at Ross Smith Avenue would be modified with the existing signals removed. The intersection would be reconfigured to suit the changes along Sir Reginald Ansett Drive while maintaining the existing movements and pedestrian crossing.

Figure 7.23 shows the lane configuration of Sir Reginald Ansett Drive including the location of the Terminals 2/3 access viaduct.

Figure 7.22 Terminals 2/3 access along Sir Reginald Ansett Drive (at the adjusted Shiers Avenue intersection) – visual representation

7.8 Accesses to Sydney Airport land

7.8.1 Freight terminal access

The freight terminal access would consist of a new section of road and a bridge to provide access to Sydney Airport's existing and proposed air freight facilities on either side of Alexandra Canal. It would extend between the Terminal 1 connection, land proposed (by the *Sydney Airport Master Plan*) for future freight facilities on the western side of Alexandra Canal, and existing freight facilities at Link Road near Terminal 1 on the eastern side of the canal. The new access would include:

- A single carriageway with two lanes in each direction
- A signalised intersection with the Terminal 1 connection
- A roundabout east of the Terminal 1 connection
- A stub road off the roundabout to provide access to future freight facilities
- A tie-in to Airport Drive to the east of the Terminal 1 connection
- Adjustments to the existing intersection of Airport Drive and Link Road
- A new bridge over Alexandra Canal (described below)
- A shared pedestrian and cycle path (see section 7.9).

The freight terminal access is shown on Figure 7.3 and Figure 7.4.

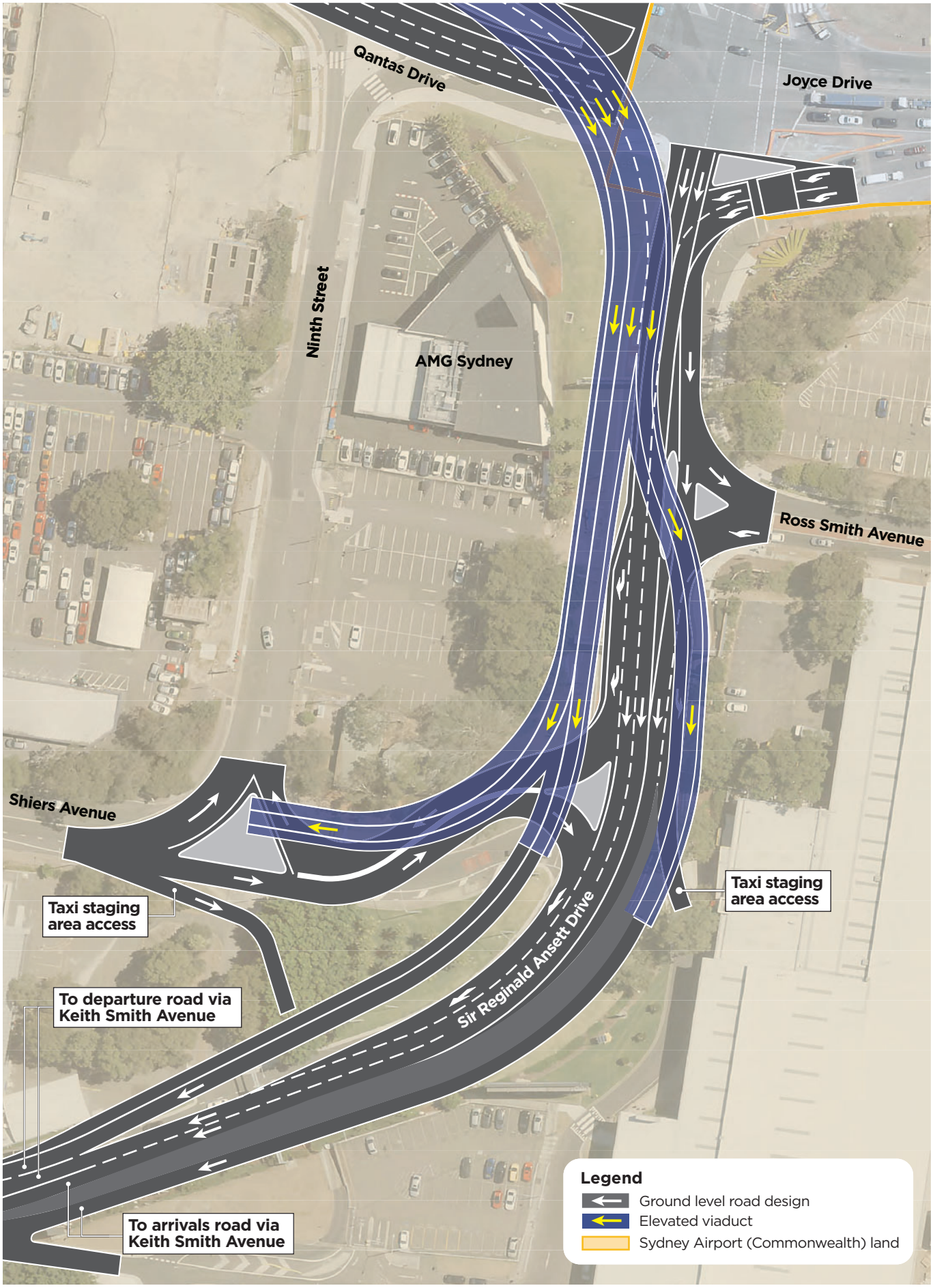

Figure 7.23 **Sir Reginald Ansett Drive and Shiers Avenue intersection upgrade and lane configuration**

Lane configuration

At the intersection with the Terminal 1 connection, two lanes would be provided. The lanes would be about 3.5 metres wide; however, the width would change at some locations to provide space for heavy vehicles to make turning movements. Two lanes would be provided in both directions (including on the roundabout).

As part of the works for the freight terminal access, the existing traffic signals at Airport Drive and Link Road would be removed to provide free flow from the freight terminal access into and out of Link Road.

Freight terminal bridge

The new bridge would cross Alexandra Canal about 250 metres to the north of the proposed Terminal 1 connection bridge. It would consist of a single structure with two spans, including a short back span to cross the desalination water pipeline, and a total length of about 80 metres. One span would cross the canal and would be about 55 metres long. The piers on either side of this span would be set back from the banks of the canal to minimise impacts on the canal and adjacent infrastructure. The maximum height of the bridge would be about 15 metres above the canal.

A visual representation of the bridge is shown on Figure 7.24.

Figure 7.24 Freight terminal bridge from proposed active transport link – visual representation

7.8.2 Northern lands access

The northern lands access would consist of a new section of road and overpass to provide access between Sydney Airport land located on either side of the rail corridor to the west of Alexandra Canal. The new access would extend between land accessed from Burrows Road on the northern side of the rail corridor and land on the southern side of the corridor. It would include:

- A single carriageway with two lanes in each direction
- A new overpass over the rail corridor.

The northern lands access is shown on Figure 7.4.

Lane configuration

Two 3.5 metre wide lanes would be provided, with one lane in each direction.

Northern lands access rail overpass

The new overpass would cross over the rail corridor and the eastbound terminal link about 40 metres to the east of the proposed Terminal 1 connection rail overpass (see section 7.3.4).

The maximum height of the overpass deck would be about eight metres above ground level. This would provide for the required minimum clearance of 5.4 metres over the Botany Rail Line and the eastbound terminal link, while remaining below the OLS and high intensity approach lighting surfaces at this location. The overall height would be about 12 metres above ground level including roadside barriers and anti-throw screens.

7.9 Active transport link

A new active transport link would be provided along the western side of Alexandra Canal in the form of a shared pedestrian and cycle path. The proposed alignment is shown on Figure 7.3 and Figure 7.4.

The new link would be about 160 metres longer than the existing and would replace the existing shared path located along the eastern side of Alexandra Canal adjacent to Airport Drive. The new link would maintain access for cyclists between existing cycle paths and areas to the south, Tempe, Mascot and towards Alexandria and the Sydney central business district. The existing path needs to be closed to:

- Maintain a safe route for cyclists and pedestrians during construction, which includes work areas along Airport Drive (described in Chapter 8 (Construction))
- Maintain the connectivity and function of the existing route which in the future, will become unavailable and part of Sydney Airport's future operating area.

The south-western end of the new active transport link would connect to the existing shared path on the eastern side of Alexandra Canal, near the southern end of the proposed Terminal 1 connection bridge. The link would cross to the western side of Alexandra Canal near Tempe Recreation Reserve via the existing (unnamed) pedestrian/cyclist bridge, which is located near the intersection of Link Road and Airport Drive. The alignment would then head to the north-east along the western side of Alexandra Canal adjacent to the desalination pipeline (see Figure 7.3).

The alignment would continue along the western edge of the canal, passing under the proposed Terminal 1 connection bridge, the freight terminal bridge and the existing Nigel Love bridge. The link would then cross to the eastern side of the canal, passing over the canal via a new bridge, which would be located beneath the proposed Qantas Drive bridge. On the eastern side of the canal the link would connect to the existing cycle path near the proposed Terminal link bridge (see Figure 7.4).

A new section of shared path would also be provided as part of the freight terminal access. The path would extend from Airport Drive to the Terminal 1 connection, passing over Alexandra Canal via the freight terminal bridge (see Figure 7.3).

The active transport link and shared path would be about three metres wide and would have a grade of no more than five per cent. The proposed new route has been designed to ensure suitable gradients are achieved. The new route would also provide separation from adjacent roadways and improved air quality compared to that experienced along the existing route. The link has also been designed with reference to the principles of crime prevention through environmental design (CPTED) (see section 7.12).

Roads and Maritime are continuing consultation with local councils, Sydney Airport and Transport for NSW about cyclist and pedestrian connections to Sydenham and St Peters interchange, and further enhancements around Sydney Airport. However, these are not included in the current design and do not form part of the project for which approval is being sought.

7.10 Other (ancillary) infrastructure

7.10.1 Maintenance bays

Maintenance bays would be provided near infrastructure that would require regular access for maintenance purposes, such as drainage channels, gross pollutant traps and variable message signs. Eight maintenance bays are proposed in various locations. Four of the proposed maintenance bays would also function as breakdown bays. The maintenance bays are shown on Figure 7.3 to Figure 7.7.

7.10.2 Emplacement areas and mounds

The project would involve excavating about 90,000 cubic metres of waste material from the former Tempe landfill. It is proposed to retain and re-emplace some of this material within the boundary of the former Tempe landfill site (see Figure 7.3). This would reduce the need for disposal at an off-site location and associated truck movements, although some material may still need to be moved off site if it is not able to be reused.

It is proposed to re-emplace a portion of this material within the project site in the form of mounds, located as follows:

- One mound is proposed in the area bounded by the Terminal 1 connection, the freight terminal access and the western side of Alexandra Canal
- Two options are being considered for the location of the other mound – either north of the freight terminal access or west of the Terminal 1 connection (see Figure 7.3).

The mounds would have a maximum height of about 15 metres above sea level and would occupy an area of about three hectares. The mounds would be integrated into the capping and underlying waste materials in accordance with the *Environmental Guidelines: Solid waste landfills* (NSW EPA, 2016a).

The design of the emplacement mounds would need to:

- Address aviation hazard issues according to the ‘as low as reasonably practicable’ principle
- Minimise the volume of material excavated from the former Tempe landfill
- Avoid disturbance outside the project boundary
- Not be located on Sydney Airport land
- Enable compatible uses for remaining land within the project area.

The proposed mounds would be designed to ensure compliance with the *National Airports Safeguarding Framework Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports* (Department of Infrastructure, Regional Development and Cities, 2018b) and other relevant aviation guidelines (see Chapter 11 (Airport operations)). This would include locating and optimising the mounds to minimise the effects of windshear and turbulence on aircraft (see section 11.4.2). The optimisation process would address Sydney Airport’s operational requirements, and would occur in consultation with Sydney Airport Corporation, aviation stakeholders, and relevant Australian, NSW and local government agencies.

The selection of the preferred location for the mounds would be subject to detailed design and consideration by a range of stakeholders. The design, landscaping and future uses for the mounds would be co-ordinated with Inner West Council and other relevant stakeholders, and would be refined as part of the landscaping for the project, which would also consider the future use of residual land (see section 7.12).

7.10.3 Gas collection and venting

A new gas collection and venting system would be installed as required below the mounds (and road infrastructure excavated into the former landfill) to allow landfill gas to be collected and vented. The gas collection system would also include bentonite seals around any other perforations of the capping layer (eg for bridge piles or other structures) to minimise preferential pathways for gas movement. The gas collection and venting system and capping layer would be designed in accordance with the requirements of the *Environmental Guidelines: Solid waste landfills*. Further information on the potential impacts of the project on the former Tempe landfill is provided in Chapter 13 (Contamination and soils).

7.10.4 Landscaping

Landscaping would be provided in two main areas:

- Open space areas at Tempe Lands and the former Tempe landfill, including the emplacement mounds described above
- Roadside landscaping.

Landscaping would consist of a range of elements and vegetation, and would be confirmed during detailed design, guided by the master plan for open space areas at Tempe Lands and the urban design and landscape plan for the project.

The provision of landscaping would be a key element in achieving the overall urban design objectives for the project. Further information is provided in section 7.12.

7.10.5 Retaining walls

Retaining walls would be required in a number of locations, generally to support the road across elevation changes and at bridge abutments. The majority of retaining walls are needed to support:

- The southern end of the Terminal 1 connection and freight terminal access at Airport Drive
- The St Peters interchange connection
- The terminal links.

The walls would generally consist of reinforced soil, with a maximum height ranging from about two to eight metres, depending on location.

The final treatment used on the outside surface of the walls would be confirmed during detailed design in accordance with the project's urban design and landscape plan (see section 7.12.3).

The indicative locations and heights of retaining walls are shown on Figure 7.25.

7.10.6 Noise attenuation

The project would require measures to minimise the levels of operational road traffic noise experienced at residences and other sensitive receivers.

Based on preliminary noise modelling undertaken, a noise attenuation barrier is proposed as part of the project. Figure 7.25 shows the proposed location of the barrier. The noise attenuation barrier would be located adjacent to the Terminal 1 connection (near South Street) would be about five metres high and about 400 metres long.

The location and height of this barrier would be confirmed during detailed design.

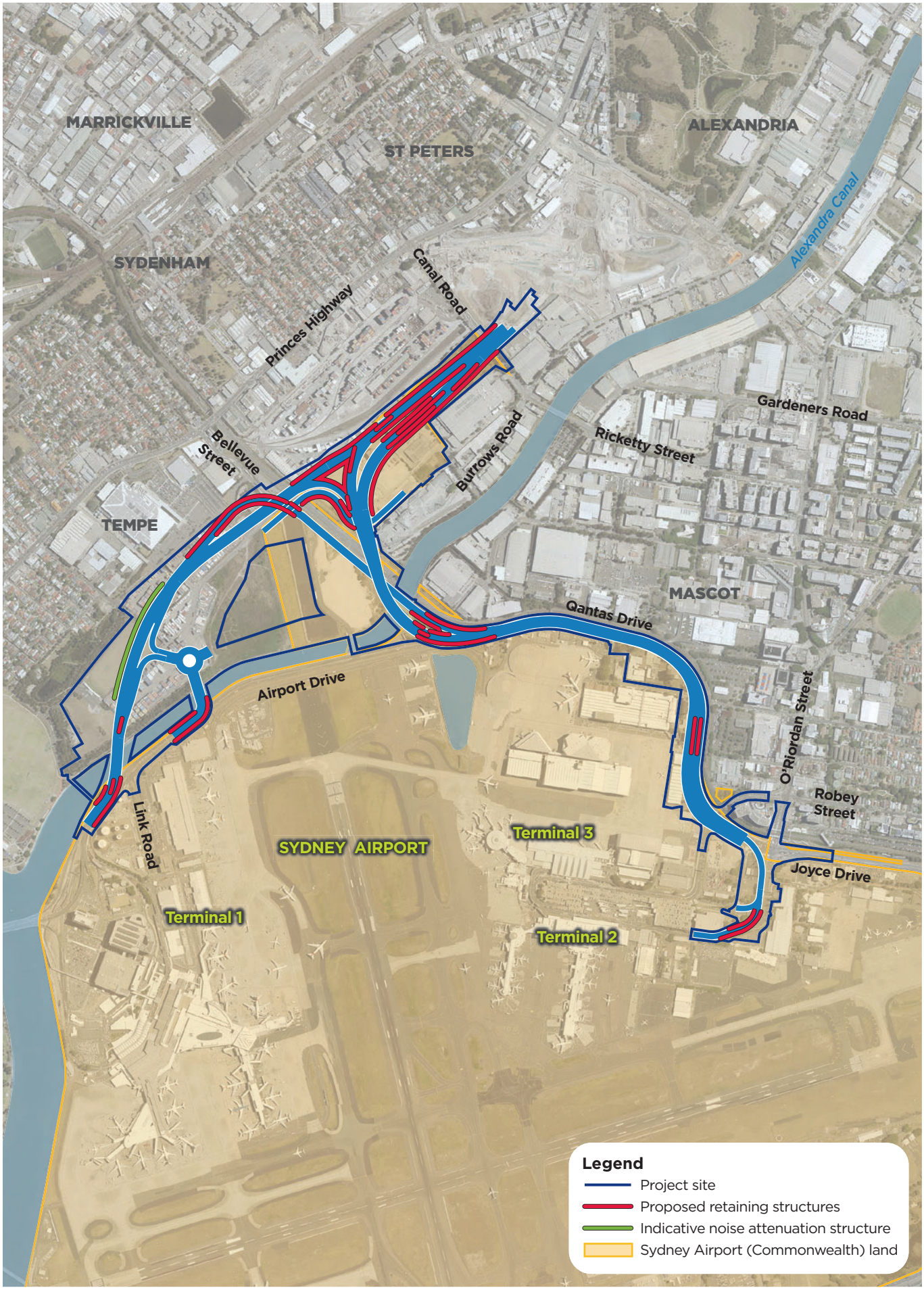

Figure 7.25 **Indicative location of retaining structures and noise attenuation structure**

7.10.7 Headlight glare and anti-throw screens

Anti-glare screens would be installed at the following locations to minimise headlight glare from vehicles:

- Qantas Drive bridge
- Southern overpass
- Northern lands access on the southern side of the Botany Rail Line.

The screens would be typically between 1.4 and 3.3 metres high. The height and location of the screens would be confirmed during detailed design. Indicative locations of headlight glare screens are shown on Figure 7.4.

Anti-throw screens would generally to be attached to all bridges and overpasses constructed as part of the project. The screens would have a height of about three metres above the roadway.

7.10.8 Drainage

An overview of the main drainage infrastructure proposed is provided below. The design of the drainage infrastructure would continue to be developed during detailed design. Other drainage works (including some adjustment to existing drainage systems) are proposed and would be developed further during detailed design.

Road drainage

To the east of Alexandra Canal, existing drainage infrastructure would be reused as far as possible. In some locations, existing infrastructure would need to be upgraded to ensure it can manage the changes in stormwater flows that would occur as a result of the project. In general, upgrades to existing infrastructure would include replacing existing pipes with larger pipes or minor adjustments to pipe alignments to improve efficiency. Where existing infrastructure cannot meet the project's drainage needs, new infrastructure would be constructed. In general, this would involve providing new drainage pipes that would connect to the surrounding drainage network.

West of Alexandra Canal, the key drainage infrastructure would comprise a cut-off channel to collect surface water upstream from the Cooks River Intermodal Terminal around the St Peter interchange connection. This channel would connect with an existing open channel along the northern side of the rail corridor before entering culverts and discharging into Alexandra Canal. A second channel would collect surface water flows from the corner of Swamp Road and Bellevue Street running east along the southern side of the Botany Rail corridor into Alexandra Canal.

The majority of drainage infrastructure would consist of pipes and stormwater channels generally located on either side of the new or upgraded roadways. Drainage infrastructure would include new stormwater channels/culverts to which the road drainage systems would generally drain. The drainage network would generally drain to the proposed channels/culverts; however, some piped drainage would discharge directly to the receiving waters (including Alexandra Canal) or discharge off site to existing drainage infrastructure, such as the existing infrastructure located along Qantas Drive. Areas located along Sir Reginald Ansett Drive would connect to existing drainage, which drains to Mill Stream.

The Terminals 2/3 access would have its own drainage system, which would drain to either end of the viaduct structure where it would connect with existing and proposed drainage systems.

Water would be captured from the base of retaining walls and emplacement mounds by catch drains. It would then be diverted to the project's drainage system, existing drainage infrastructure, or directly to receiving waters.

For parts of the project elevated above the ground, drainage in the form of bridge 'scuppers' would be used to intercept the flow of water from the road pavement and convey it to the proposed discharge locations described below.

Alexandra Canal outlets

Based on the concept design, the project includes nine drainage outlets at Alexandra Canal. As shown on Figure 7.26, this would consist of:

- Upgrading four existing outlets on the eastern side of the canal
- Providing four new outlets on the western side of the canal
- Providing one new outlet on the eastern side of the canal.

A preliminary study of outlet discharges has identified that a number of the outlets would require energy dissipaters to minimise scour in the canal. This would be reviewed during detailed design and the necessary measures at outlets confirmed in conjunction with relevant stakeholders, including Sydney Water.

Flood mitigation basin

A flood mitigation basin is proposed between the lanes of the St Peters interchange connection and Botany Rail line as shown on Figure 7.26. This basin would capture any stormwater flows upstream of the St Peters interchange connection to minimise the flooding impacts of stormwater flows on downstream areas. The basin would be designed to be 'dry' under normal conditions (to minimise attracting birds), and would only operate during large storm events.

Further information on the management of flooding is provided in Chapter 14 (Hydrology and flooding).

Adjustment of Sydney Airport northern ponds

The northern ponds are two ponds which are located either side of Qantas Drive and provide flood mitigation and stormwater detention functions for Sydney Airport.

Constructing the piers for the Qantas Drive bridge would result in a small loss of storage in the northern most of these ponds located immediately adjacent to Alexandra Canal. The project includes enlargement of the pond to ensure this storage loss is offset. The volume of offset required would be confirmed during detailed design in consultation with Sydney Airport Corporation. The southern pond would not be affected.

7.10.9 Water quality measures

The project includes measures to reduce the potential for impacts on water quality. Generally, treatment devices would be installed near connections to the existing drainage network and/or the outlets at Alexandra Canal. These devices would include gross pollutant traps and other separators designed to remove waste matter, hydrocarbons, nutrients and suspended solids from stormwater runoff. The size and type of devices installed would be confirmed during detailed design. A preliminary sizing of these devices has been undertaken based on a three month design storm event.

In other locations, alternative drainage measures may be possible such as grassed swales. All water quality measures would be developed in accordance with the principles of water sensitive urban design and with the aim of achieving the water quality targets in the *Botany Bay and Catchment Water Quality Improvement Plan* (Sydney Metropolitan Catchment Management Authority, 2011) subject to feasibility during the detailed design stage.

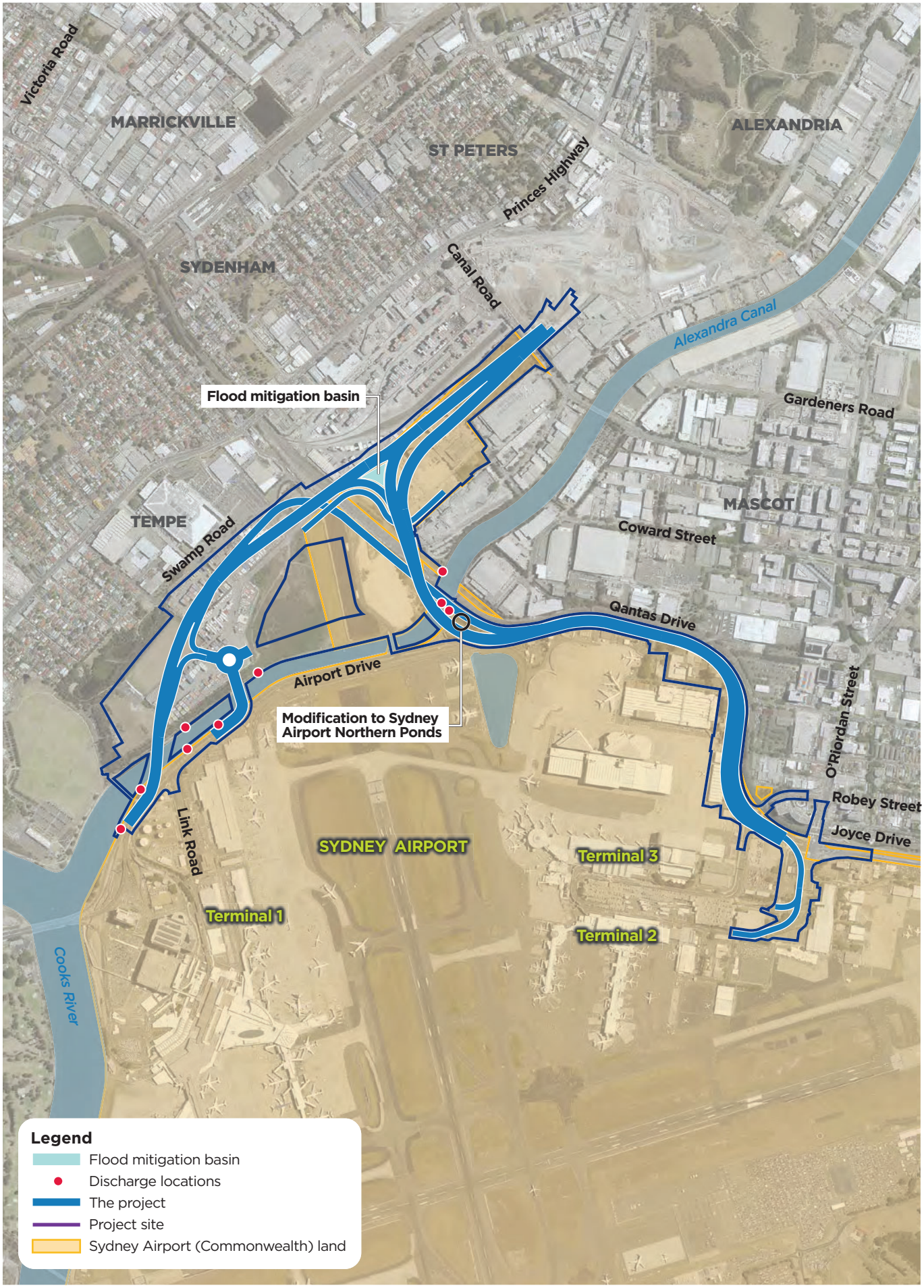

Figure 7.26 **Indicative location of key drainage infrastructure**

7.10.10 Lighting and road signs

Lighting

Lighting would be provided as part of the project, including along roadways, at interchanges, ramps, intersections and along the active transport link. Lighting would be designed in accordance with *AS/NZS 1158.6 – Lighting for roads and public spaces* and CASA's requirements as defined by the *Manual of Standards Part 139 – Aerodromes* (CASA, 2017).

Aviation hazard lighting would be provided in accordance with the *Manual of Standards Part 139 – Aerodromes*.

Signs

Traffic, locational, directional, warning and variable message signs would be provided across the project. Directional signs would be installed in accordance with Austroads and Roads and Maritime standards, with a focus on providing clear and unambiguous directions to motorists.

Variable message signs (see Figure 7.27) would be mounted on gantries along roads and would be used to advise motorists of prevailing traffic conditions. These signs would generally display the regulatory speed limit and would be modified where required to display variable speed limits in response to incidents and congestion.

Variable message and integrated speed and lane use signs would be sized and located to achieve a safe and well guided road environment, while minimising impacts on existing land uses and visual amenity, and avoiding intrusions into protected airspace. Final locations would be determined during detailed design.

Some signage (including variable message signs) may need to be located outside the project site to provide information about movements and incidents within the project site. The location of this signage would be confirmed during detailed design.

Figure 7.27 Typical variable message sign

7.10.11 Utility connections

Utilities and services located within and close to the project site may need to be protected, adjusted or augmented during construction, particularly where excavation is required as part of the project. These services include electricity, telecommunications, sewer, water and gas services.

The locations of existing utility services and any changes required would be confirmed by the construction contractor during detailed design, in consultation with the relevant utility providers.

The project would also involve connections to existing electricity, water and wastewater/sewer utilities.

Further information is provided in section 8.7.

7.11 Access changes and permanent land requirements

7.11.1 Access changes

The proposed changes to existing access arrangements are outlined in Table 7.1. Further information, including an assessment of the potential impacts of the proposed changes, is provided in Chapter 9 (Traffic, transport and access) and Technical Working Paper 1 (Transport, Traffic and Access).

Table 7.1 Proposed changes to access arrangements

Location	Proposed changes
Airport Drive	Airport Drive would be closed to the public between the freight terminal access and Qantas Drive upgrade and extension, with access between Terminal 1 and Terminals 2/3 as described in section 7.1.1.
Northern lands – Sydney Airport employee car park	The closure of the section of Airport Drive mentioned above would remove the existing access to Sydney Airport's staff car park located west of Alexandra Canal from the surrounding road network (and the Nigel Love bridge). Access to this car park would be adjusted by Sydney Airport as part of a separate approval.
Swamp Road and Bellevue Street	Swamp Road would be closed, and access to properties in this area (including the northern lands and those to be acquired as part of the project) would be via the northern lands access and the freight terminal access. A cul-de-sac would be installed at the southern end of Bellevue Street to the north of the project site.
Lancastrian Road	Access to Lancastrian Road would be left-in and left-out via the upgraded Qantas Drive.
Freight terminal at Terminal 1	The freight terminal at Terminal 1, which is currently accessed via Airport Drive and Link Road, would be accessed via the freight terminal access.
Active transport link	Closure of the existing active transport link along eastern side of Alexandra Canal, with a new link provided on the western side of Alexandra Canal (see section 7.9).

7.11.2 Permanent land requirements

The anticipated permanent land requirements associated with the project's operational footprint are listed in Table 7.2. In total, it is anticipated that about 36.2 hectares of land within the project site would be permanently required for the project. The permanent land requirements are anticipated to include:

- 20.6 hectares of Commonwealth-owned land
- 14.1 hectares of land owned by the NSW or local government
- 1.5 hectares of privately-owned land.

No residential land would be required.

Land acquisition (for land other than Commonwealth-owned land) would be undertaken in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW), the *Land Acquisition Information Guide* (NSW Government, 2014), and the land acquisition reforms announced by the NSW Government in 2016, which can be viewed online at: *https://www.finance.nsw.gov.au/land-property/land-acquisition-reform-2016.*

Commonwealth-owned land required for the project would be leased by the NSW Government under a long-term lease agreement, subject to compliance with any requirements of relevant Australian Government agencies.

Relocation and some other categories of expenses would be claimable under the *Land Acquisition (Just Terms Compensation) Act 1991* and related policies.

Further information about the project's land requirements, including property details, is provided in Chapter 19 (Land use and property).

Table 7.2 Anticipated permanent land requirements

Location	Property title	Ownership	Estimate of area (hectares) and proportion of lot required[1]
Private land			
25 Burrows Road, St Peters	Lot 1 DP 866946	Private	0.1 (2%)
Swamp Road, Tempe	Lot 725 DP 48012	Private	0.2 (4%)
	Lot 2 DP 869306	Private	0.2 (31%)
	Lot 723 DP 48012	Private	0.1 (2%)
Talbot Street and 20 Canal Road, St Peters	Lot A DP 1188682	Private	0.3 (23%)
	Lot 2 DP 454156	Private	0.2 (41%)
	Lot 22 DP 1069118	Private	0.4 (3%)
Private total			**1.5 hectares**
Commonwealth-owned land			
Sydney Airport, Mascot	Lot 8 DP 1050923	Commonwealth of Australia	11 (2%)
30 Canal Road, St Peters	Lot 4 DP 555771	Commonwealth of Australia	1.8 (85%)
	Lot 3 DP 825649	Commonwealth of Australia	0.5 (45%)
6-10 Burrows Road, St Peters	Lot 3 DP 555771	Commonwealth of Australia	1.3 (100%)
	Lot 2 DP 802342	Commonwealth of Australia	3.6 (48%)
Swamp Road and Bellevue Street, St Peters	Lot 1 DP 186164	Commonwealth of Australia	0.1 (20%)
	Lot 2 DP 830952	Commonwealth of Australia	0.2 (22%)
	Lot 1 DP 830952	Commonwealth of Australia	<0.1 (93%)
Swamp Road, St Peters (car park)	Lot 12 DP 825649	Commonwealth of Australia	0.4 (52%)
	Lot 643 DP 727045	Commonwealth of Australia	0.2 (9%)
	Lot 2 DP 790186	Commonwealth of Australia	0.1 (12%)
	Lot 1 DP 826101	Commonwealth of Australia	1.1 (27%)

Location	Property title	Ownership	Estimate of area (hectares) and proportion of lot required[1]
Swamp Road, St Peters (HIAL)	Lot 5 DP 107811	Commonwealth of Australia	<0.1 (100%)
	Lot 724 DP 481012	Commonwealth of Australia	0.2 (35%)
	Lot 1 DP 869306	Commonwealth of Australia	0.1 (27%)
Commonwealth-owned land total			**20.6 hectares**
Land owned by the NSW or local government			
Various (rail corridor)	Lot 1 DP 1063121	NSW Government	<0.1 (87%)
	Lot 2 DP 1054373	NSW Government	0.3 (31%)
	Lot 1 DP 450245	NSW Government	<0.1 (9%)
	Lot 2 DP 963240	NSW Government	0.1 (32%)
	Lot 21 DP 1069118	NSW Government	0.1 (15%)
	Lot 5 DP 1184446	NSW Government	<0.1 (34%)
	Lot 1 DP 621535	NSW Government	0.1 (21%)
	Lot 11 DP 213317	NSW Government	0.5 (26%)
	Lot 17 DP 217443	NSW Government	<0.1 (2%)
	Lot 95 DP 1157632	NSW Government	0.2 (41%)
	Lot 6 DP 209847	NSW Government	<0.1 (29%)
	Lot 9 DP 747022	NSW Government	0.1 (9%)
	Lot 1 DP 1054373	NSW Government[2]	0.1 (100%)
1-3 Swamp Road, Tempe	Lot 202 DP1097238	Local Government	0.8 (83%)
2 and 5-15 Swamp Road, Tempe	Lot 303 DP 1136081	Local Government	3.2 (67%)
	Lot 304 DP 1136081	Local Government	3.7 (60%)
South Street, Tempe (open space)	Lot 25 DP 227132	Local Government	1.9 (23%)
South Street, Tempe (golf driving range)	Lot 305 DP 1136081	Local Government	0.9 (32%)
Alexandra Canal, Mascot/St Peters/ Tempe	Lot 11 DP 1050464	NSW Government[2]	0.1 (61%)
	Lot 6 DP 1184447	NSW Government	0.1 (22%)
	Lot 13 DP 1050464	NSW Government	1.9 (8%)
5 and 5A Canal Road, St Peters	Lot A DP 391775	NSW Government	<0.1 (2%)
	Lot 14 DP 606737	NSW Government	<0.1 (<1%)
Holbeach Avenue, Tempe	Lot 400 DP 1233792	NSW Government	<0.1 (<1%)
Other publicly-owned land total			**14.1 hectares**

Notes: 1. The estimate of land required is based on a concept design that is subject to refinement during detailed design, and the final area required may vary from that shown

2. The Commonwealth of Australia has aerial title above some of the lots identified

7.12 Urban design and place making

7.12.1 Urban design and place making strategy and concept for the project

As discussed in section 7.2.3, an urban design and place making strategy and concept was developed as part of the project concept design and is described in Technical Working Paper 13 (Urban Design, Landscape Character and Visual Impact Assessment).

The strategy and concept identifies four main project elements and includes guiding principles for each:

- Structures (bridges and viaducts, retaining walls, noise walls)
- Place making elements (eg feature lighting, pedestrian and active transport connections, heritage interpretation features, public art opportunities, indigenous design approach)
- Landscape elements (public open space, roadside landscaping, vegetation, drainage structures)
- Roadside elements (headlight screens, signage gantries, other roadside furniture).

Key recommendations of the strategy have been incorporated into the project's concept design and/or will be investigated further as part of detailed design.

7.12.2 Consideration of key urban design and place making issues in the concept design

The concept design for the project has been developed taking into account the urban design vision and objectives (see Figure 7.8) and the urban design and place making strategy (see chapter 6 of Technical Working Paper 13 (Urban Design, Landscape Character and Visual Impact Assessment)). A summary of how key urban design and place making issues have been addressed during the concept design process is provided below.

Considering urban renewal areas and existing issues and constraints

As described in chapter 6, the project has been developed with regard to a range of engineering and environmental constraints, including an extremely tight operational project boundary, existing land uses and ownership, sensitive receivers, large areas of historically contaminated and saline soils, and Sydney Airport operational issues. Much of the project is located in existing brownfield areas to minimise impacts on existing sensitive receivers, existing urban renewal areas (particularly in Mascot) and urban amenity.

Alexandra Canal is one of the major heritage items in the area and links Mascot with the Wolli Creek urban renewal areas, which are located in close proximity to the project site. The landscape and urban design concept plan integrates the canal as a central element of the urban design and place making strategy and ensures continued community access to and along the canal, strengthening existing linkages. It also identifies opportunities for meaningful interpretation experiences, such as a heritage interpretive trail and locations for site-specific artworks to complement and reinforce the indigenous heritage of the area. The strategy includes an art strategy that provides opportunities for cultural expression by a wide range of artists. Both the artworks and process of creating the artworks would contribute to fostering a sense of local community cohesion and inclusiveness.

Infrastructure has been located to minimise impacts on sensitive receivers within the constraints of the project site. Much of the project is located in commercial and industrial areas, or within existing road corridors.

Sensitive areas that were not able to be avoided include existing open space within Tempe lands and Alexandra Canal. The project impacts on areas in and around Tempe Lands and the canal. This affects existing open space and the landscape setting of the heritage-listed Alexandra Canal. These sensitive areas were not able to be avoided, due to the need to incorporate areas east of Alexandra Canal, including the existing Airport Drive, into Sydney Airport land. Both of these are areas are proposed to be a focus of future design development and master planning processes.

Reduction of traffic in and around commercial and community centres

Commercial and community centres surrounding the project include Mascot, St Peters, Tempe and Wolli Creek. They include employment, warehousing, light industrial, bulky goods retailing areas, hospitality and other commercial businesses, as well as residential communities. Open space areas are also important community destinations.

By providing a direct connection to the Sydney motorway network, the project would result in a reduction of through traffic volumes in Mascot, as well as along the Princes Highway, benefiting local centres in Mascot, Tempe and Wolli Creek. This will improve the amenity of these centres and improve safety for pedestrians and active transport users wanting to access community facilities and areas of open space in Tempe. The project would provide for ongoing pedestrian and cyclist connectivity, wayfinding and amenity, with facilities fully integrated with the project. This will include ensuring continued access to open space and local footpaths in Mascot accessed via the relocated active transport link along Alexandra Canal.

High quality design, including enhancement of healthy, cohesive and inclusive communities

The urban design and landscape concept plan (see Technical Working Paper 13) has sought to maximise high quality design of the landscape, streetscape and project elements by:

- Promoting the use vegetation as a unifying element, and to provide visual relief and reduce heat, to deliver a memorable arrival and departure experience supporting the project's 'gateway' function
- Creating new open space beyond the project's operational boundary, which would be experienced by recreational users from surrounding communities, as well as by motorists
- Integrating the design of all project elements, to ensure that:
  - Forms and detailed resolution are elegant and refined to create a unified and well composed journey experience that sets a new quality benchmark
  - The night-time experience is considered and integrated, as many visitors will view the project at night and during dawn and dusk
  - Engineering, architecture and art are fully integrated.

In conjunction with the above, the project's residual land (see section 7.12.4) would provide opportunities for future areas of open space/recreation in accordance with community needs, including the need for inclusive facilities and accessibility by all community members. Future new areas of open space would contribute to an open space link from inner city areas via Sydney Park, St Peters interchange and the former Tempe landfill to connect to Botany Bay through existing open space south of the Cooks River. Due to its location immediately adjoining existing open space in Tempe Recreation Reserve and its proximity to residential areas, potential use of residual land as public open space would be consistent with the existing and desired future character of the area.

Future new open space areas and the proposed active transport link would contribute to achieving healthy, cohesive and inclusive communities.

The design of the project's hard and soft urban design elements would seek to ensure consistency with the existing and desired future character of the area. Key strategies to realise a meaningful, unique and cohesive experience of arriving and departing from Sydney Airport are:

- Ensuring that the forms and detailed resolution of the built elements are elegant, refined and work together to create a unified and well composed journey experience
- Designing road elements to provide legible and self-explanatory wayfinding to reduce visual clutter
- Responding to identified heritage values and providing meaningful interpretation at appropriate locations
- Integrating art and interpretation with the design of project elements
- Using a palette of materials and finishes that respond to and celebrate the landscape, urban and historical context

- Framing views to the surrounding landscape and landmarks to provide a unique travel experience steeped in the sense of place and to foster a sense of anticipation
- Preparing a master plan in conjunction with Inner West Council for the residual land adjacent to the Terminal 1 connection and open space areas as outlined above.

Crime prevention through environmental design

The project would also provide for ongoing pedestrian and cyclist connectivity, through the relocated shared path along the western side of Alexandra Canal, including continued access to open space as part of the master planning process to be undertaken with Inner West Council for the Tempe Lands area.

Reflecting the consideration of crime prevention through environmental design principles, and in accordance with the requirements of the *Disability Discrimination Act 1992* (Cth), integrating lighting with the proposed active transport link would create a more memorable active transport experience as well as improving passive surveillance and safety. All new shared paths and connections would be fully accessible and meet relevant design standards and guidelines.

7.12.3 Urban design and landscape plan

An urban design and landscape plan would be prepared during detailed design in accordance with the urban design and place making strategy and concepts presented in Technical Working Paper 13. The plan would present an integrated urban and landscape design for the project and would include:

- Design objectives, principles and standards based on:
  - Local environmental and heritage values
  - Urban design context
  - Sustainable design and maintenance
  - Community safety, amenity and privacy
  - Relevant design standards and guidelines
  - Minimising the footprint of the project
- A description of the project's design features, including graphics such as sections, perspective views and sketches
- Landscaping and structural design opportunities to mitigate the visual impacts of road infrastructure and operational fixed facilities
- Details of proposed landscaping (as described below)
- Details of disturbed areas (including compounds) and the strategies to progressively rehabilitate, regenerate and/or revegetate these areas
- The timing for implementation
- Monitoring and maintenance procedures for built elements, vegetation and landscaping.

The plan would be prepared in consultation with relevant stakeholders, including local councils and the community.

Landscaping

The provision of landscaping would be a key element in achieving the overall urban design visual and objectives for the project (see Figure 7.8). Areas available to be landscaped would be landscaped where there is the opportunity to do so. The design of landscaping areas would:

- Maximise retention of existing mature trees where possible
- Replace trees that would need to be removed with new trees as far as possible, including planting mature vegetation to provide a more immediate effect at project completion

- Provide a generous landscape curtilage for vegetation (including tree cover), landform and public art to create a memorable landscape setting for the motorway
- Create a continuous 'green edge' to the roadway, comprised vegetation at differing heights
- Take into consideration important views and sight line requirements
- Take into consideration Sydney Airport's airport operational constraints, particularly in terms of the airport's prescribed airspace and minimising the risk of wildlife strike
- Install trees in verges wherever possible to minimise the visual scale of the road infrastructure, mitigate heat generated by large pavements, and assist in the absorption of dust and noise to enhance the amenity of both the road corridor and adjoining areas
- Provide shade and maximise amenity for users of the active transport link
- Investigate opportunities for feature landforms to create visual interest and provide deep soil to support the growth of feature trees (subject to Sydney Airport's operational requirements)
- Provide visual separation to the Botany Rail Line, including a green interface to replace existing mature vegetation that would need to be removed to construct the project (see Chapter 21 (Landscape character and visual amenity)).

Preparing the plan

The urban design and landscape plan would be prepared by a suitably qualified consultant, in consultation with relevant stakeholders (including Inner West Council, the community and Sydney Airport Corporation), and with consideration of:

- The concept plans for the project
- The master plan being developed by Inner West Council for land located within the Tempe Lands (including former industrial lands located on Inner West Council land)
- The urban design and place making principles described in Technical Working Paper 13 (Urban Design, Landscape Character and Visual Impact Assessment)
- Relevant mitigation measures (particularly those in Chapters 11 (Airport operations), 17 (Non-Aboriginal heritage), 21 (Visual amenity) and 22 (Biodiversity))
- The tree replacement strategy (see Chapter 21)
- The conditions of approval for the project
- Relevant guidelines and policies (see below).

The plan would be approved by the Secretary of the Department of Planning, Industry and Environment.

Design guidelines

The plan will be prepared in accordance with relevant guidelines, policies and strategies, including:

- *Beyond the Pavement: Urban design policy, procedures and design principles* (Roads and Maritime, 2014)
- *Bridge Aesthetics: Design guideline to improve the appearance of bridges in NSW* (Roads and Maritime, 2019a)
- *Better Placed. An integrated design policy for the built environment of New South Wales* (Government Architect New South Wales, 2017)
- *Crime Prevention through Environmental Design* (Queensland Government, 2007)
- *Technical Guidelines for Urban Green Cover in NSW* (OEH, 2015a)
- *Sustainable Design Guidelines Version 4.0* (Transport for NSW, 2017)
- *Australian Standard AS4282-1997 Control of the obtrusive effects of outdoor lighting*
- *Sydney Airport Master Plan 2039* (SACL, 2019a)

- *Sydney Airport Environment Strategy 2019-2024* (SACL, 2019b)
- *Landscape Guideline: Design guideline to improve the quality, safety and cost effectiveness of green infrastructure in road corridors* (Roads and Maritime, 2018a)
- *Noise wall design guideline. Design guideline to approve the appearance of noise walls in NSW* (Roads and Maritime, 2016a)
- *NSW Bicycle Guidelines* (Roads and Traffic Authority, 2005)
- *Water Sensitive Urban Design Guideline* (Roads and Maritime, 2017a).

Urban design refinements

Additional opportunities for enhancement of the concept plan and design refinements to be explored during detailed design would include:

- Increasing the horizontal setback of all bridge abutments from the top edge of Alexandra Canal to maintain the integrity of the heritage curtilage and allow for public enjoyment of the canal within a safe and attractive environment set in the landscape
- Maximising 'openness' under the bridges through slender bridge design to maintain clear sight lines along the canal
- Retaining uncluttered views along Alexandra Canal and maximising retention of the 'big sky' landscape of Sydney Airport, including sweeping views across the open airport landscape and of aircraft movements
- Additional connectivity measures and opportunities to strengthen links between communities surrounding the project site
- Opportunities for additional vegetation, in particular tree cover in open space areas, to ensure user amenity through thermal comfort and provide spatial definition and interest
- Innovative responses to the design of 'under viaduct' spaces
- Design refinements of major project elements, including bridges and the Terminals 2/3 access viaduct, to achieve a high standard of architectural design and finish
- Emphasising the nightscape environment.

7.12.4 Residual land

Following construction, it is expected that some of the land required to construct the project in Tempe (including land within the Tempe Lands and other areas on the former Tempe landfill) would be available for other uses. This land is referred to as 'residual land' for the purpose of this document. Potential future uses of residual land could include open/space recreation, or other future uses in accordance with the priorities of local and regional strategic planning documents, Inner West Council (the landowner) and the community.

Council is developing a master plan to identify how this land could be used, which will consider council's Recreation Needs Study (Cred Consulting, 2018). The future use of this land would be subject to a separate assessment and approval process.

Roads and Maritime would provide support to Inner West Council with the master planning process for these areas and ensure that the urban design and landscape plan for the project is consistent with the outcomes of this process.

Further information on residual land is provided in section 19.4.3.