

Chapter 8

Project description - construction

Table of Contents

8	Project description – construction	8-1
8.1	Overview	8-1
8.2	Enabling works	8-6
8.3	Tunnelling and associated works	8-6
	8.3.1 Bored tunnel excavation	8-6
	8.3.2 Tunnel boring machine launch and retrieval sites	8-7
	8.3.3 Tunnel boring machine support activities	8-9
	8.3.4 Tunnel portal construction	8-10
	8.3.5 Other tunnel excavations	8-10
8.4	Corridor and associated works	8-12
	8.4.1 Bridge and viaduct structures	8-12
	8.4.2 Earthworks	8-12
	8.4.3 Rail systems fitout	8-12
8.5	Stations and associated works	8-13
	8.5.1 Cut-and-cover station construction method	8-14
	8.5.2 Surface station construction method	8-15
	8.5.3 Viaduct station construction method	8-15
	8.5.4 Station fitout, precinct and transport integration works	8-15
8.6	Ancillary facilities and associated works	8-16
8.7	Construction sites	8-16
	8.7.1 St Marys	8-18
	8.7.2 Claremont Meadows services facility	8-21
	8.7.3 Orchard Hills	8-23
	8.7.4 Off-airport construction corridor	8-25
	8.7.5 Stabling and maintenance facility	8-28
	8.7.6 Luddenham Road	8-30
	8.7.7 On-airport construction corridor	8-32
	8.7.8 Airport Business Park	8-34
	8.7.9 Western Sydney International tunnel portal	8-36
	8.7.10 Airport Terminal	8-38
	8.7.11 Airport construction support site	8-40
	8.7.12 Bringelly services facility	8-42
	8.7.13 Aerotropolis Core	8-44
8.8	Interface with other construction projects	8-46
	8.8.1 Future M12 Motorway	8-46
	8.8.2 Western Sydney International Stage 1 project	8-46
	8.8.3 The Northern Road	8-47
	8.8.4 St Marys Intermodal	8-47
8.9	Other construction elements	8-47
	8.9.1 Detailed investigations and subsequent works	8-47
	8.9.2 Demolition works	8-48
	8.9.3 Vegetation clearing	8-48
	8.9.4 Spoil	8-48
	8.9.5 Construction hours	8-50
	8.9.6 Construction workforce	8-51
	8.9.7 Construction traffic and access	8-52
	8.9.8 Construction water management	8-57
	8.9.9 Construction equipment, resources and materials	8-58
	8.9.10 Power supply	8-60
	8.9.11 Utility protection, adjustment and relocation	8-64
8.10	Finishing works and testing and commissioning	8-65
	8.10.1 Finishing works	8-65
	8.10.2 Testing and commissioning	8-66
8.11	Approach to identifying and selecting additional construction related elements of the project	8-66

8.11.1	Construction sites	8-66
8.11.2	Western Sydney International	8-67
8.11.3	Surface water discharge to Thompsons Creek	8-67
8.11.4	Water quality and detention basins	8-67
8.11.5	Utilities	8-67
8.12	Related development excluded from this Environmental Impact Statement	8-68

List of tables

Table 8-1	Rail systems fit-out	8-13
Table 8-2	Indicative station construction method	8-14
Table 8-3	Indicative construction works at proposed construction sites	8-17
Table 8-4	Indicative demolition works	8-48
Table 8-5	Indicative cut and fill volumes	8-49
Table 8-6	Indicative road network adjustments and parking modifications	8-52
Table 8-7	Indicative modifications to pedestrian and cycling infrastructure	8-56
Table 8-8	Treated water discharge from construction water treatment plants	8-57
Table 8-9	Estimated quantities of major raw materials	8-59
Table 8-10	Estimated water use for the construction of the project	8-60
Table 8-11	Known major utility protection works	8-64

List of figures

Figure 8-1	Indicative main construction program	8-1
Figure 8-2a	Overview of the construction footprint	8-2
Figure 8-3	Photo of a tunnel boring machine at Epping Station on the Metro North West Line	8-7
Figure 8-4	Photo of the tunnel segment storage area at Marrickville for the Sydney Metro City & Southwest project	8-7
Figure 8-5	Indicative St Marys to Orchard Hills TBM strategy	8-8
Figure 8-6	Indicative Western Sydney International to Bringelly TBM strategy	8-8
Figure 8-7	Photo of the Sydney Metro City & Southwest Marrickville dive site	8-9
Figure 8-8	Photo of a roadheader	8-11
Figure 8-9	Photo of a rock hammer	8-11
Figure 8-10	Indicative construction program for the St Marys construction site	8-19
Figure 8-11	St Marys indicative construction site layout	8-20
Figure 8-12	Indicative construction program for the Claremont Meadows services facility construction site	8-21
Figure 8-13	Claremont Meadows services facility indicative construction site layout	8-22
Figure 8-14	Indicative construction program for the Orchard Hills construction site	8-23
Figure 8-15	Orchard Hills indicative construction site layout	8-24
Figure 8-16	Indicative cross-section of viaduct construction	8-25
Figure 8-17	Indicative construction program for the off-airport construction corridor	8-26
Figure 8-18	Off-airport construction corridor and construction access arrangements	8-27
Figure 8-19	Indicative construction program for the stabling and maintenance facility construction site	8-28
Figure 8-20	Stabling and maintenance facility indicative construction site layout	8-29
Figure 8-21	Indicative construction program for the Luddenham Road construction site	8-30
Figure 8-22	Luddenham Road indicative construction site layout	8-31
Figure 8-23	Indicative construction program for the on-airport construction corridor	8-32
Figure 8-24	On-airport construction overview	8-33
Figure 8-25	Indicative construction program for the Airport Business Park construction site	8-34
Figure 8-26	Airport Business Park indicative construction site layout	8-35
Figure 8-27	Indicative construction program for the Western Sydney International tunnel portal construction site	8-36

Figure 8-28	Western Sydney International tunnel portal indicative construction site layout	8-37
Figure 8-29	Indicative construction program for the Airport Terminal construction site	8-38
Figure 8-30	Airport Terminal Station indicative construction site layout	8-39
Figure 8-31	Indicative construction program for the airport construction support site	8-40
Figure 8-32	Tunnel and viaduct segment production and storage indicative construction site layout	8-41
Figure 8-33	Indicative construction program for the Bringelly services facility construction site	8-42
Figure 8-34	Bringelly services facility indicative construction site layout	8-43
Figure 8-35	Indicative construction program for the Aerotropolis Core construction site	8-44
Figure 8-36	Aerotropolis Core indicative construction site layout	8-45
Figure 8-37	Indicative peak construction workforce at each construction site	8-51
Figure 8-38	Temporary changes to the road network and parking at St Marys	8-55
Figure 8-39	Plant and equipment at proposed construction sites	8-59
Figure 8-40	Indicative Claremont Meadows construction power route	8-62
Figure 8-41	Indicative Kemps Creek construction power route	8-63

8 Project description – construction

This chapter provides a description of the indicative construction approach and methodology for the project and includes the indicative construction staging, strategy and program. The chapter also provides information on the proposed construction sites required to support the project; construction traffic and access; spoil and water management; equipment and materials required; and proposed construction hours.

The construction approach and methodology presented in this chapter is indicative and would be refined as design and construction planning progresses. A final construction methodology and program would be developed by the construction contractor(s) when appointed.

8.1 Overview

The proposed construction activities that would be undertaken for the project include:

- enabling works
- main construction works including:
 - tunnelling and associated works (see section 8.3)
 - corridor and associated works (see section 8.4)
 - stations and associated works (see section 8.5)
 - ancillary facilities and associated works (see section 8.6)
- rail systems fitout
- finishing works and testing and commissioning.

These activities are described in more detail in this chapter.

The indicative timeframe for the project is for main construction to commence in 2021 and take about five years to complete, subject to planning approval, with project opening anticipated to align with when Western Sydney International opens for passenger services. An indicative main construction program is provided in Figure 8-1.

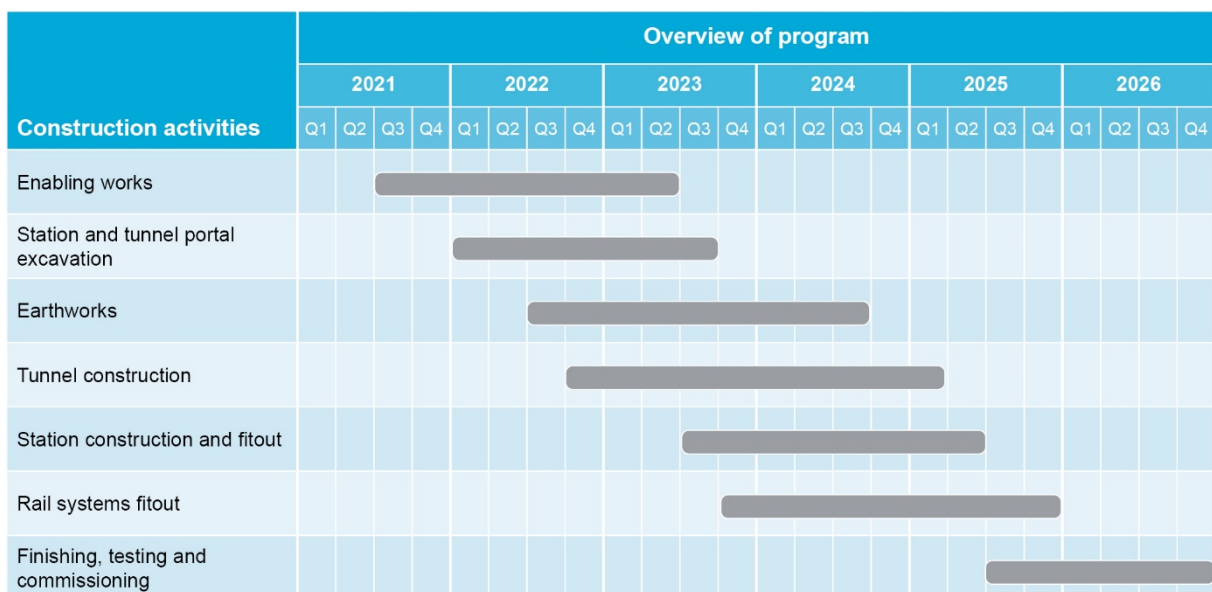
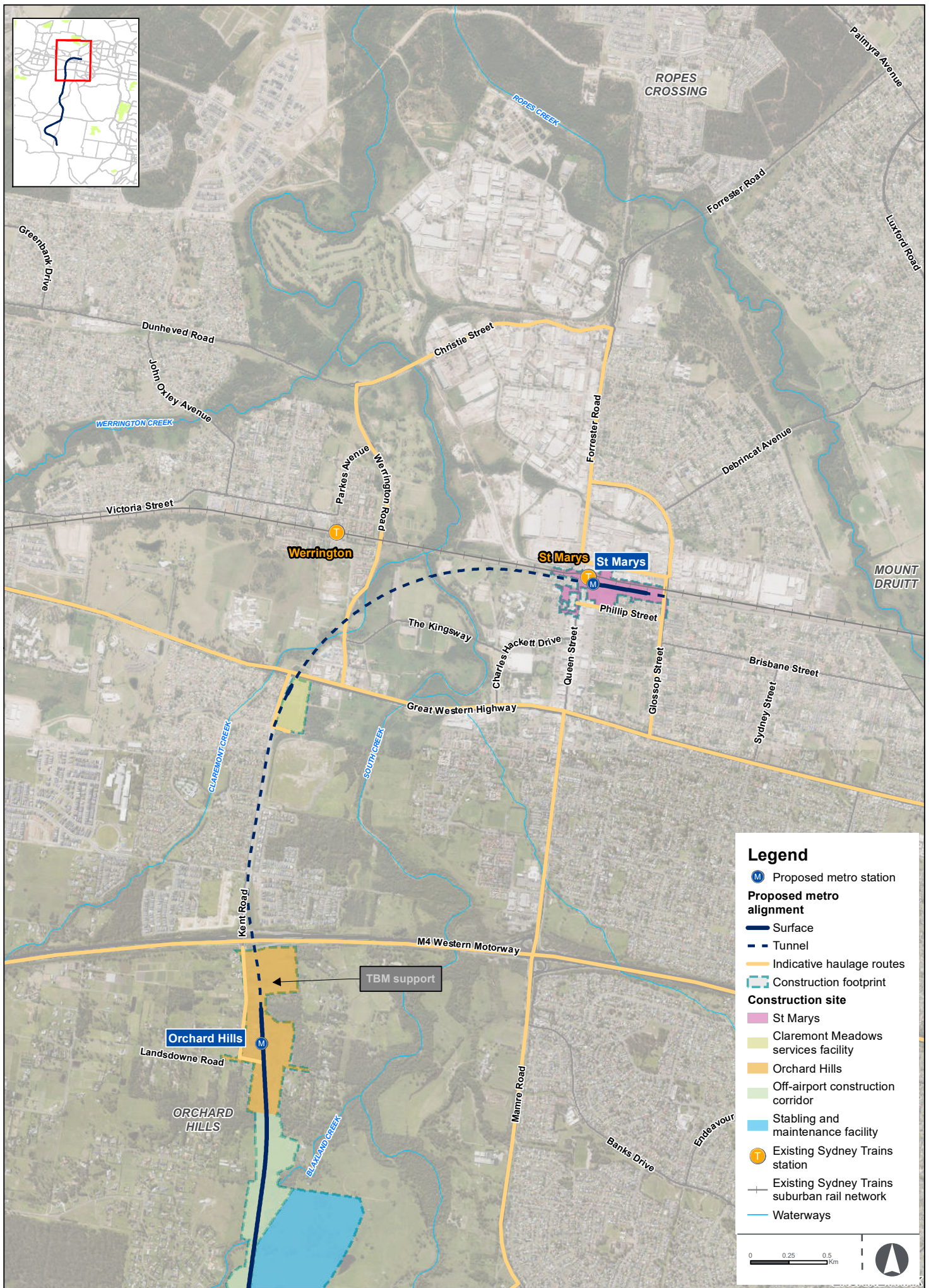


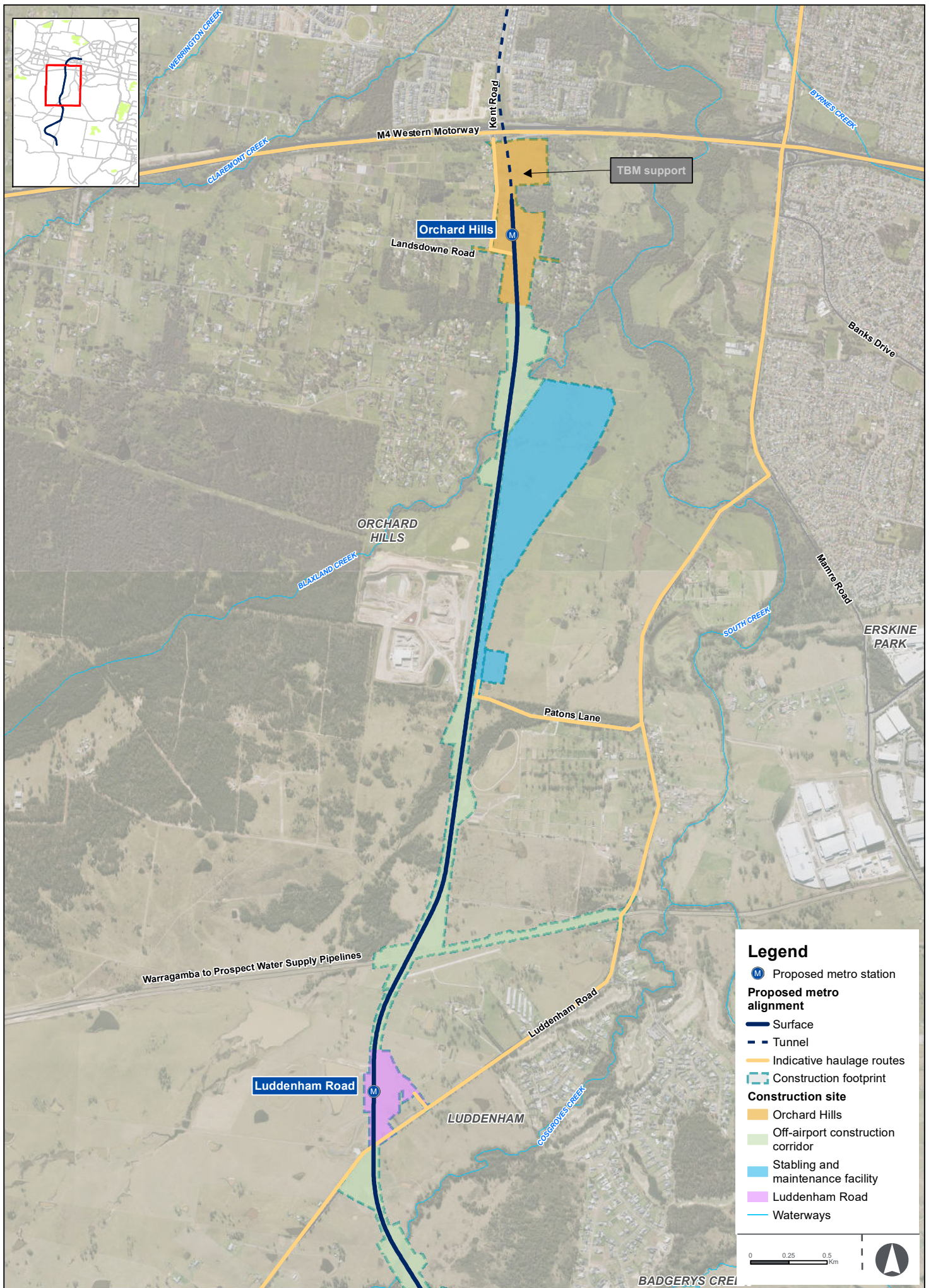
Figure 8-1 Indicative main construction program

The construction footprint and key construction sites proposed for use during construction of the project are shown in Figure 8-2a to Figure 8-2d.



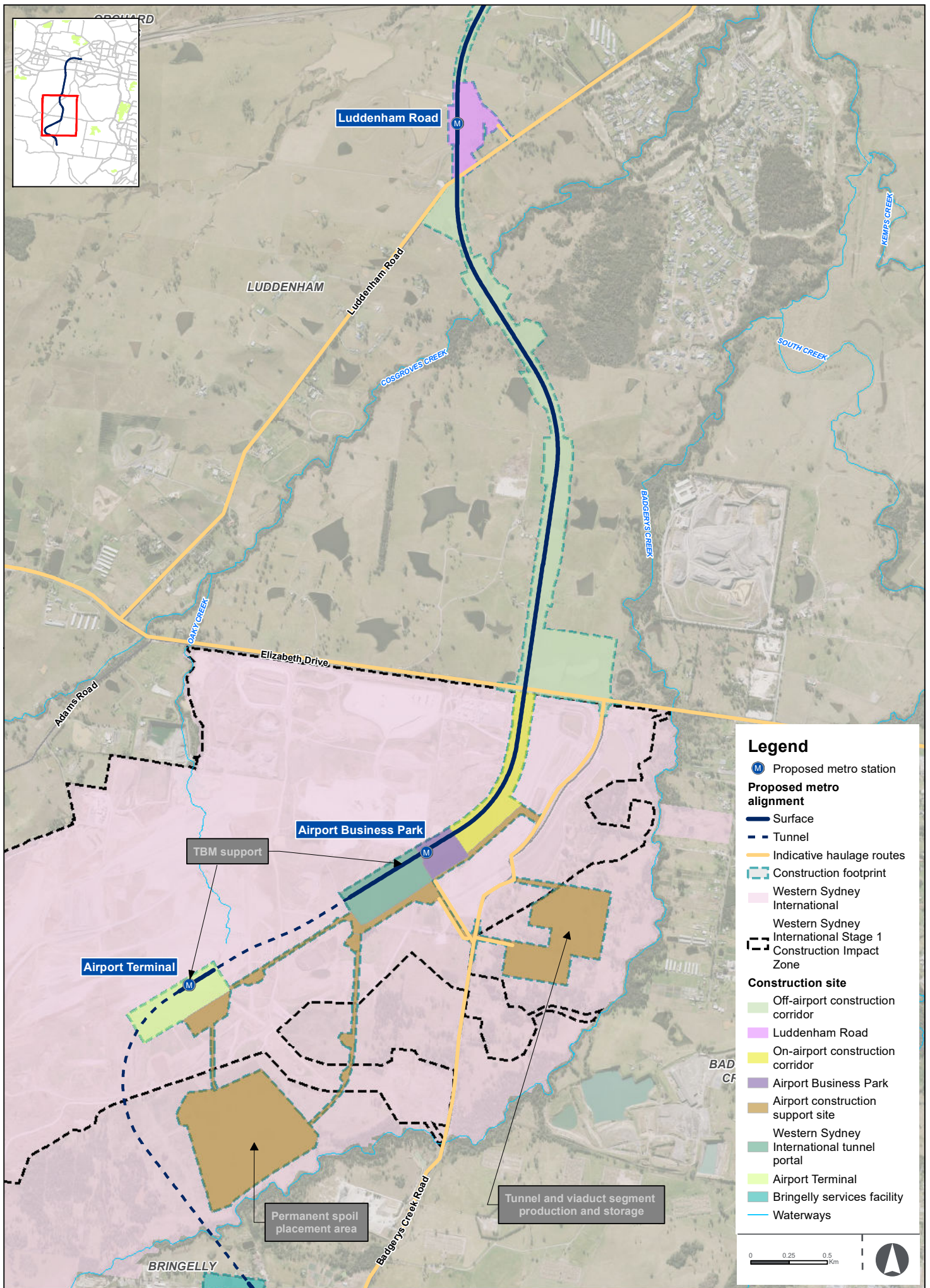
Overview of the construction footprint

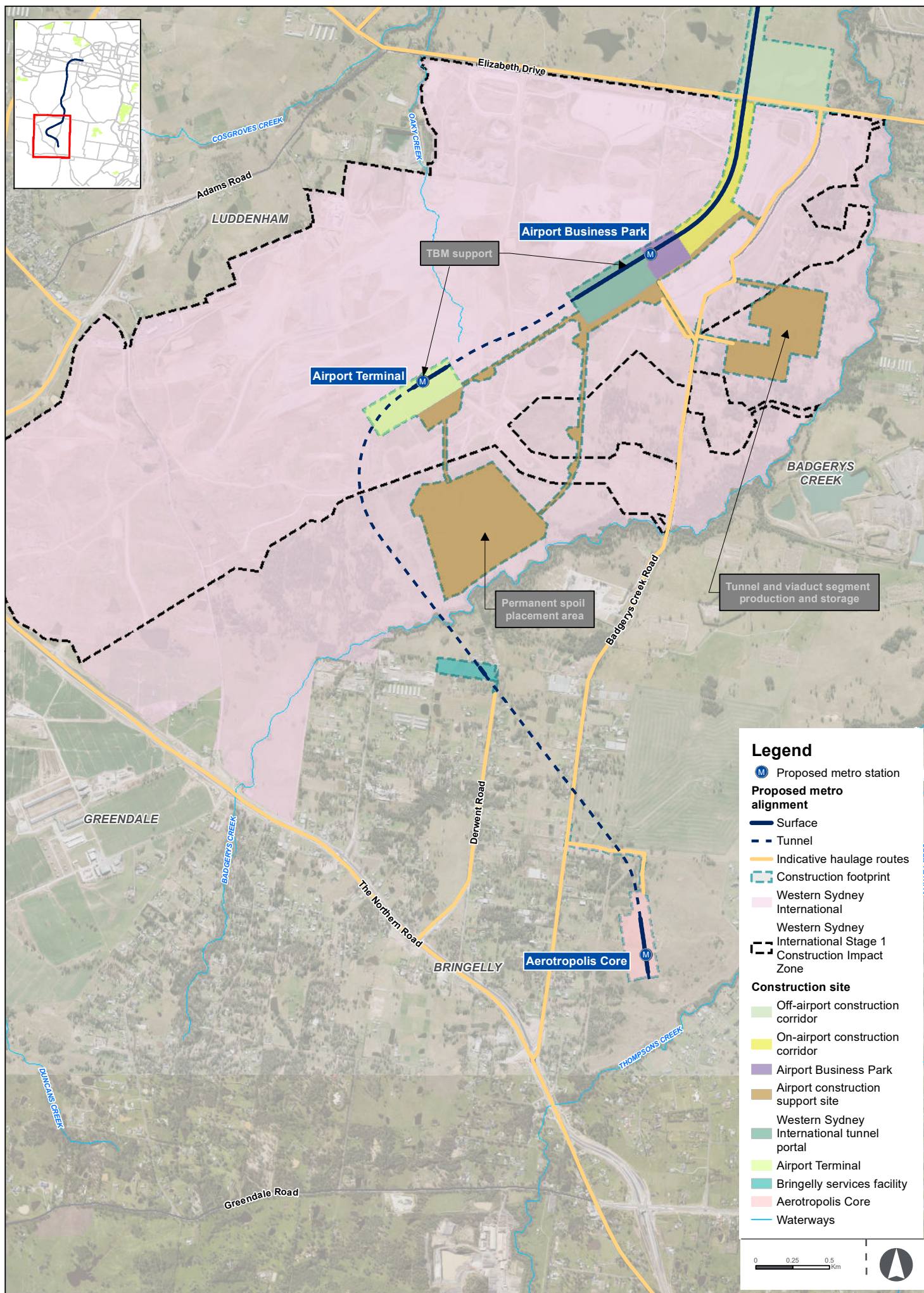
Figure 8-2a



Overview of the construction footprint

Figure 8-2b





Overview of the construction footprint

Figure 8-2d

Indicative only, subject to design development

8.2 Enabling works

Enabling works for the project are required to establish key construction sites and facilitate construction activities.

The majority of the enabling works are expected to commence in advance of the main construction works, such as tunnelling and station excavation, while some enabling works would continue concurrently with the main construction works. Enabling works would include:

- detailed site investigations and subsequent remediation or clearance works (see Section 8.9.1)
- demolition of buildings and other structures where required (see Section 8.9.2)
- transport network adjustments (see Section 8.9.7)
- relocating, adjusting and protecting utilities and services affected by the project (see Section 8.9.11)
- supplying water, power and other utilities to construction sites and other areas within the construction footprint (see Section 8.9.8 and 8.9.10)
- works within and around the T1 Western Line rail corridor (part of the existing Sydney Trains suburban rail network) (see Section 8.7.1)
- vegetation clearance (as required) (see Section 8.9.3).

In addition, there would be related development that is excluded from this Environmental Impact Statement and is subject to separate assessment and planning approvals as discussed in Section 8.12.

8.3 Tunnelling and associated works

The tunnel and excavation method would be driven by ground conditions likely to be encountered during construction, the project design and program. The methodology described below is indicative and would be developed by the construction contractor(s) when appointed.

Tunnel excavation methodologies for the project would include:

- bored tunnels for the St Marys to Orchard Hills tunnel and the Western Sydney International to Bringelly tunnel
- other techniques including the use of roadheaders or excavators to excavate non-standard sections of tunnels including cross-passages and tunnel stubs.

8.3.1 Bored tunnel excavation

A tunnel boring machine (TBM) typically consists of a shielded cutting head and trailing backup support services and mechanisms. At the front of the shield is a rotating cutter head (shown in Figure 8-3), and behind the cutter head is a chamber where the excavated rock spoil would be collected and transferred via a conveyor or slurry pipe back to the TBM launch site or other retrieval point as required. The TBM would be propelled forward by hydraulic jacks pushing off the previously excavated sections of rock. Gaps between the excavated tunnel wall and the tunnel lining would be filled with cement based grout.

It is anticipated a total of four TBMs would be required for the bored twin tunnels (two TBMs for the St Marys to Orchard Hills tunnel and two TBMs for the Western Sydney International to Bringelly tunnel).

The lining for the tunnels would be assembled from precast concrete segments and installed progressively as the TBM moves forward. The precast concrete segments would be manufactured using concrete from a dedicated concrete batching plant and stored at a tunnel segment precast facility, both of which would be located at the airport construction support site (see Section 8.7.11 and Figure 8-4). The precast facility would produce about 300 tunnel lining ring segments per day. The segments would be transported via trucks within the Western Sydney International site and on the road network to Orchard Hills.

The estimated rate of tunnel advance by the TBMs would be around 100 metres per week.



Figure 8-3 Photo of a tunnel boring machine at Epping Station on the Metro North West Line



Figure 8-4 Photo of the tunnel segment storage area at Marrickville for the Sydney Metro City & Southwest project

8.3.2 Tunnel boring machine launch and retrieval sites

St Marys to Orchard Hills tunnel

The indicative strategy for the launch and retrieval of the two TBMs for the St Marys to Orchard Hills tunnel is as follows:

- both TBMs would be launched at the Orchard Hills construction site and driven north, under the M4 Western Motorway to the location of the Claremont Meadows services facility
- if the Claremont Meadows services facility is required, the TBMs would receive maintenance there before being relaunched northwards towards St Marys

- on completion of tunnelling at St Marys, the TBMs would be disassembled and retrieved from a temporary shaft excavated to the west of the proposed station box. The shaft would be decommissioned and backfilled following the retrieval of the TBMs.

Tunnel spoil would primarily be removed from the Orchard Hills construction site. See Section 8.9.4 for further information regarding spoil management.

ST MARYS TO ORCHARD HILLS TBM STRATEGY

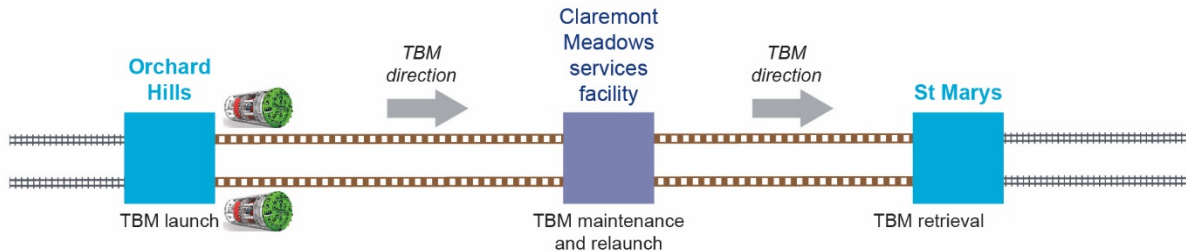


Figure 8-5 Indicative St Marys to Orchard Hills TBM strategy

Western Sydney International to Bringelly tunnel

The indicative strategy for the launch and retrieval of the two TBMs for the Western Sydney International to Bringelly tunnel is as follows:

- both TBMs would be launched from the Western Sydney International tunnel portal construction site and driven southwest towards the Airport Terminal construction site. TBM support activities would be carried out at the Western Sydney International tunnel portal construction site until the TBM reaches the Airport Terminal construction site
- the TBMs would receive maintenance at the Airport Terminal station box before being relaunched to the southeast towards the Bringelly services facility. At this time, relevant infrastructure to support TBM operations including grout plant(s) and ventilation fans would be relocated (as required) from the Western Sydney International tunnel portal construction site to the Airport Terminal construction site. TBM support activities (including spoil handling) would commence from this location and continue until tunnelling is completed
- the TBMs would receive maintenance at the Bringelly services facility before being relaunched southeast towards the Aerotropolis Core construction site
- on completion of tunnelling, the TBMs would be disassembled and retrieved from a temporary shaft excavated at the Aerotropolis Core construction site to the north of the proposed station box. The shaft would be decommissioned and backfilled following the retrieval of the TBMs.

Tunnel spoil would be removed from the Western Sydney International tunnel portal and Airport Terminal construction sites. See Section 8.9.4 for further information regarding spoil management.

WESTERN SYDNEY INTERNATIONAL TO BRINGELLY TBM STRATEGY

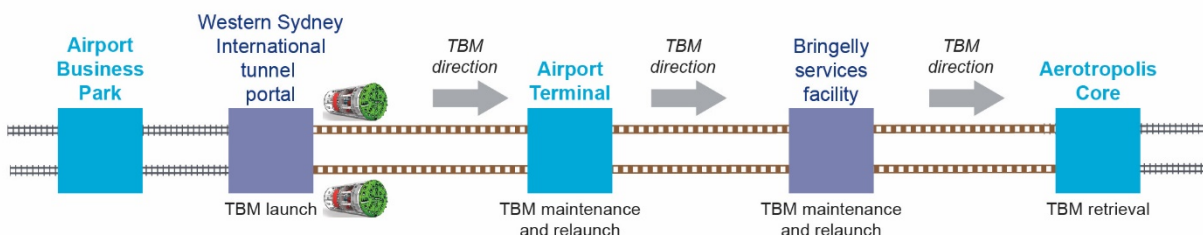


Figure 8-6 Indicative Western Sydney International to Bringelly TBM strategy

8.3.3 Tunnel boring machine support activities

TBM operations require surface construction areas for logistics support and material handling including:

- TBM delivery, assembly and commissioning
- high voltage power supply
- fresh air ventilation (fresh air ventilation fans would operate 24 hours per day, seven days per week during tunnelling)
- water supply
- drainage and water treatment plant
- spoil handling, stockpiling and removal facilities
- workforce facilities
- acoustic shed if required to mitigate environmental impacts.

An example of a tunnel boring machine launch site, the Sydney Metro City & Southwest Marrickville dive site, is shown in Figure 8-7.

TBM support activities would primarily be carried out at the following construction sites:

- Orchard Hills construction site (see Section 8.7.3)
- Western Sydney International tunnel portal construction site (see Section 8.7.9) and Airport Terminal construction site (see Section 8.7.10).



Figure 8-7 Photo of the Sydney Metro City & Southwest Marrickville dive site

8.3.4 Tunnel portal construction

Tunnel portals would be constructed at the following locations:

- directly north of the proposed Orchard Hills Station (the southern extent of the St Marys to Orchard Hills tunnel). A tunnel portal would not be required at St Marys as the alignment would be underground at this location
- about 400 metres southwest of the proposed Airport Business Park station (the northern extent of the Western Sydney International to Bringelly tunnel). A tunnel portal would not be required at the Aerotropolis Core as the alignment would be underground at this location.

A dive structure would be constructed at the tunnel portals to transition the rail track from surface to in-tunnel through the portal.

Construction of the dive structures and tunnel portals would generally involve:

- piling along the edge of the dive structure to form the walls
- excavating below proposed track level
- placing of precast and cast in-situ concrete for the cut-and-cover section and to form the tunnel portal.

Tunnel ventilation facilities would be provided at the tunnel portals as described above.

8.3.5 Other tunnel excavations

Tunnel stubs

Tunnel stubs at St Marys and Aerotropolis Core to support potential future extensions would be constructed using roadheaders and extend around 125 metres from the end of the station and crossover structures. A roadheader is an excavation machine consisting of a boom-mounted rotating cutter head, a loading device usually involving a conveyor, and a crawler travelling track to move the entire machine forward into the rock face (refer to Figure 8-8).

Crossover

The crossover at St Marys and Aerotropolis Core would be constructed using cut-and-cover methods as part of the construction of the station excavation. See Section 8.5.1 for further information.

Cross-passages

Cross-passages would be excavated between the bored twin tunnels at around 240 metre intervals. These would likely be excavated by small roadheaders and/or excavators with rock hammers (refer to Figure 8-9). Additionally, rooms would be excavated with rock hammers at various points along the bored twin tunnels for rail systems services.



Figure 8-8 Photo of a roadheader



Figure 8-9 Photo of a rock hammer

8.4 Corridor and associated works

8.4.1 Bridge and viaduct structures

The project would include the construction of bridges and viaducts to cross floodplains, watercourses and existing and proposed permanent infrastructure. The location and arrangements of proposed bridges and viaducts are described in Section 7.2.4.

It is anticipated the viaducts and bridges would be constructed using cast in-situ concrete piles, columns and headstocks with precast girders between the columns.

The precast viaduct and bridge sections would be manufactured and stored at a dedicated precast facility within Western Sydney International. The precast sections would be transported via trucks on the road network.

The viaduct and bridge construction method would include:

- substructure construction, likely to be from cast in-situ concrete in the following sequence:
 - bored pile construction
 - pile cap construction including localised excavation
 - pier or column construction
 - headstock construction
- construction of the superstructure, likely through the placement of precast concrete segments (typically through the use of a viaduct gantry or crane).

Cast in-situ construction may be employed where the design or the presence of existing infrastructure precludes the use of precast bridge or viaduct segments.

8.4.2 Earthworks

Earthworks (for example, cuttings and embankments) would be required at locations along the project alignment to achieve required levels for the surface track alignment. Sections of cut and embankment batters would not typically require support; however, in some instances, the cut and embankment sections may require structural support (for example by retaining walls, piles and soil nails). Earthworks associated with the excavation of station boxes are described in Section 8.5.1.

The existing geology would influence the slope of the cut batters. The properties of the fill material used to create the embankments would determine the slope of the embankment batters. The width required to transition to the depth below or height above existing ground level would vary along the alignment.

Earthworks would also be required along the project alignment for drainage structures and water quality basins.

The general sequence for earthworks would be as follows:

- ground stabilisation works as required
- construction of bored pile wall or similar infrastructure where required
- earthworks cut and fill to design levels
- construction of retaining structures and drainage elements where required as the earthworks progress.

8.4.3 Rail systems fitout

Indicative access points for the rail systems fitout would be via the construction sites described in Section 8.7. Access points would be confirmed by the construction contractor(s) when appointed.

The rail systems fit-out work is described in Table 8-1.

Table 8-1 Rail systems fit-out

Item	Work
Ventilation	The majority of tunnel ventilation equipment would be located at the tunnel portal facilities, stations and services facilities. The fitout of these elements is described as part of the mechanical and electrical components fitout in Section 8.5.4.
Track slab and rail fastening	The track slab would be formed by mass concrete pours with rail fasteners incorporated into the pours. Rail fasteners would be designed to mitigate operational noise and vibration where required. Ballast track form would be used at the stabling and maintenance facility and may also be used for surface sections of track.
Rail track installation	<p>Rail track would be delivered to the access points at each of the construction sites. Where there is surface access to the tunnel (i.e. the two tunnel portals), rail track sections would be welded together in lengths of up to 120 metres and then transported underground.</p> <p>Where there is no surface access to the tunnel, standard rail lengths would be delivered and lowered down via access shafts at St Marys, the two services facilities, Airport Terminal and Aerotropolis Core construction sites. Close to the access point, the rail lengths would be welded together in lengths of up to 120 metres and moved into the tunnel for installation.</p> <p>For the surface rail, rail would be delivered to site and welded or pre-welded in a casting yard and delivered to site and welded into position.</p>
Cable and equipment installation	<p>Dedicated cable routes would be provided within the tunnel environment for signalling, communications and electricity. Rooms for signalling and communications equipment would be provided at every second cross-passage, alternating with power equipment rooms within the other cross-passages.</p> <p>Signal equipment rooms would be provided at the stabling and maintenance facility, at each station and alongside the surface alignment as required. Communication rooms would be provided at the stabling and maintenance facility and at each station. The signal equipment and communication rooms at the stations would be connected to the communications backbone and subsequent system destinations.</p> <p>Galvanised steel troughs and poles and masts for communications systems and lighting would also be provided.</p>
Overhead wiring	<p>For the tunnels, overhead wiring would be installed at regular intervals on the track. Overhead wiring would have a main support located centrally over the track with a secondary support to the side of the tunnel.</p> <p>For surface rail, overhead wiring structures would be installed into the track subgrade. The viaduct sections would require a more complex overhead wiring structure with structures connected directly to the concrete viaduct segments.</p> <p>Overhead wiring structures at the stabling and maintenance facility would support the stabling roads and turnout configurations.</p>

8.5 Stations and associated works

Six stations are proposed as part of the project. The construction method for the stations is summarised in Table 8-2 with further detail provided in Section 8.5.1 to Section 8.5.4. The methodology described below is indicative and would be confirmed by the construction contractor(s) when appointed. The construction of the stations would consist of structural works (for the station box) and station fitout works. Station fitout works are generally similar for all station types and the methodology for these works is described in Section 8.5.4.

Table 8-2 Indicative station construction method

Station	Vertical alignment	Construction method (structural works)
St Marys	Underground	Cut-and-cover box
Orchard Hills	In-cutting (open cut)	Similar to cut-and-cover box
Luddenham Road	Above ground	Viaduct
Airport Business Park	Surface (shallow cutting)	Surface
Airport Terminal	Underground	Cut-and-cover box
Aerotropolis Core	Underground	Cut-and-cover box

Where the design and site conditions allow, stations would be constructed using modular design elements to minimise the construction timeframes. This approach involves the installation of structures (for example, station buildings and canopies) comprising modularised components.

8.5.1 Cut-and-cover station construction method

Cut-and-cover construction is proposed for St Marys Station, Orchard Hills Station, Airport Terminal Station and Aerotropolis Core Station.

While Orchard Hills is an open cut station, the construction method for the station is comparable to a cut-and-cover station given the requirement for vertical retaining structures on both sides of the station below ground level (refer to Figure 7-21).

Excavation method

A typical construction method for cut-and-cover station excavation would involve excavating the station from the surface and using pile walls to support the surrounding soil and rock.

The construction of the station would progress down to the level of the base slab with intermediate temporary horizontal braces, anchors and shoring installed as required. The base slab and permanent structural elements would then be built up from the bottom of the excavation, removing temporary structural supports as the work progresses upwards. The last element of the structure would be the roof slab – leaving only discrete entry and exit points – and any required backfilling to the new ground level over the slab.

Structural works

Structural works for the underground stations would involve the construction of:

- platforms
- vertical supports
- mezzanine levels and rooms
- roof slabs (covering the station box).

Platform slab construction would involve the placement of formwork panels, followed by pouring of concrete into the panels using concrete pumps located at the surface. Allowance would be made during platform construction for the location of the vertical transportation elements (such as escalators and lifts).

The construction of mezzanine levels would involve installing structural beams to span the full width of the station box, followed by secondary beams between the main beams. A concrete slab would then be poured in sections supported by the beams.

The roof slabs would likely consist of closely spaced precast girders spanning the full width of the station box, placed on the piled wall capping beam (installed as part of the excavation). A concrete topping slab would be poured on the girders, followed by a waterproof membrane and a concrete protection layer. The area would then be backfilled (as required) to the surface level.

The platform canopy components would likely be pre-fabricated at an offsite location. The canopies would likely be assembled at ground level adjacent to the station platform then lifted into place.

8.5.2 Surface station construction method

Surface station construction is proposed at the Airport Business Park Station. At this location the rail track transitions from surface to in-cutting. The station would be constructed at the surface level (or slightly below) relative to the finished surface level at Western Sydney International.

Excavation method

The excavation method for the surface station is consistent with the construction methodology for earthworks as described in Section 8.4.2.

Structural works

Structural works for the surface level station would involve the construction of:

- support columns and foundations for vertical transport structures and the station buildings
- the platform structures
- vertical transport structure and the pedestrian accesses
- the platform canopy
- the emergency egress stairs
- the station buildings.

The structures outlined above would be constructed using a combination of:

- conventional formwork and cast in-situ concrete
- precast concrete elements
- pre-fabricated steel structures
- standard blockwork and/or steel framing.

The construction of the station buildings would occur concurrently with the station construction.

8.5.3 Viaduct station construction method

Viaduct station construction is proposed at Luddenham Road Station.

The construction method for the station would generally be consistent with the construction methodology for bridge and viaduct structures described in Section 8.4.1.

Structural works

The construction methodology for the structural works for the viaduct station would be consistent with the methodology for the surface station described in Section 8.5.2.

8.5.4 Station fitout, precinct and transport integration works

Station fitout works

The mechanical and electrical fitout of the stations consists of two major elements: the rail systems located at the stations and the services required for the function of the stations. For underground stations, the initial fitout of mechanical and electrical services would occur concurrently with the structural works. This would include the installation of large equipment such as ventilation fans. The final fitout of mechanical and electrical services would occur after the completion of structural works and concurrently with the architectural fitout.

The architectural fitout of the stations would occur on completion of the station structural works and involves the final finishes for the stations, such as glazing, wall and ceiling cladding, and floor finishes.

Station precinct and transport integration works

The precinct works around each of the stations would be carried out following completion of the station structural and fitout works, and concurrently with testing and commissioning. Each of the stations would include some form of interface with other transport modes, including connections with roads, active transport links and public transport. Works would include the construction of roads and other transport integration infrastructure consisting of:

- intersection modifications, including traffic signal changes
- traffic signal works
- speed zoning
- safety infrastructure to protect vulnerable road users and manage vehicle speeds
- earthworks
- drainage works
- kerb and guttering
- surfacing including asphalt, concrete and pavers
- transport interchange facilities (for example bus shelters etc)
- public domain and placemaking infrastructure, including landscaping
- accessibility infrastructure (e.g. accessible ramps and lifts)
- line marking, signage and other finishes.

8.6 Ancillary facilities and associated works

A stabling and maintenance facility would be constructed at Orchard Hills to the south of Blaxland Creek and east of the proposed project alignment (see Figure 8-20). Access to the site would be through the off-airport construction corridor via Patons Lane.

Earthworks would be carried out at the site to achieve required ground surface levels and introduce stormwater detention and water quality basins.

Buildings located at the stabling and maintenance facility would be constructed using conventional methods. Access roads and car parking would also be required and would include earthworks, drainage works, kerb and guttering, surfacing including asphalt, concrete or pavers, line marking, signage and other finishes.

The construction of the stabling and maintenance facility would include civil works for the construction of the rail entry/exit structures to the facility from the main track alignment.

The project would complete all earthworks at the site, laying of track and stabling roads to accommodate the stabling of trains for initial and future operating scenarios for the project. Laying of track to support the stabling of additional trains for ultimate operations would be subject to separate assessment and approval.

8.7 Construction sites

The indicative works at proposed construction sites are outlined in Table 8-3 and shown in Figure 8-2a to Figure 8-2d. The construction sites would be confirmed by the construction contractor(s) when appointed.

Table 8-3 Indicative construction works at proposed construction sites

Location	Enabling works	TBM launch	TBM support	TBM retrieval	Spoil handling and removal	Roadheader launch/support	Ancillary facility construction	Stabling and maintenance facility construction	Major earthworks	Bridge and viaduct construction	General civil works	Concrete batch plant	Equipment and material laydown	Rail system fitout	Site offices and worker amenities	Water treatment plant	Potential acoustic shed	Vehicle parking
Off-airport																		
St Marys	✓			✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
Claremont Meadows services facility	✓				✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
Orchard Hills	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Off-airport construction corridor	✓				✓		✓		✓	✓	✓		✓	✓	✓			✓
Stabling and maintenance facility	✓				✓		✓	✓	✓		✓		✓	✓	✓			✓
Luddenham Road	✓				✓		✓			✓	✓		✓	✓	✓			✓
Bringelly services facility	✓				✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
Aerotropolis Core	✓			✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
On-airport																		
On-airport construction corridor	✓				✓		✓		✓	✓	✓		✓	✓	✓			✓
Airport Business Park	✓				✓		✓		✓		✓		✓	✓	✓			✓
Western Sydney International tunnel portal	✓	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
Airport Terminal	✓		✓		✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓
Airport construction support site	✓				✓				✓		✓	✓	✓	✓	✓			✓

8.7.1 St Marys

The St Marys construction site is located around the existing Sydney Trains station at St Marys (see Figure 8-11). Temporary road network adjustments and parking modifications required at St Marys are identified in Section 8.9.7.

A range of construction activities would be carried out at the site to support TBM retrieval, cut-and-cover station construction and mined excavation of stub tunnels. Key construction works would include:

- administration activities to support construction
- construction of the new station box, station structures (including aerial concourse) and finishes
- construction of the crossover
- construction of stub tunnels
- spoil handling, storage and transport
- temporary TBM retrieval shaft excavation
- TBM retrieval
- station precinct works.

Design development and construction planning of the project would further consider opportunities to reduce or minimise direct and indirect impacts during construction.

The indicative construction program is outlined in Figure 8-10 with the location and indicative layout of the construction site, including vehicle access/egress, provided in Figure 8-11.

Works at and around the T1 Western Line rail corridor (part of the existing Sydney Trains suburban rail network)

Construction works within and adjacent to the existing T1 Western Line rail corridor would be required for the integration of the project with the existing rail line and station at St Marys. Enabling works at this location would include:

- establishment of temporary hoarding and fencing to safely separate works from the public and the T1 Western Line rail operations
- preparatory work to station platforms and infrastructure associated with the construction of the aerial concourse at St Marys. This may also require works to be undertaken in the area around the goods shed to support station construction
- potential relocation of the lift shaft on the southern side of St Marys Station. This may also require temporary relocation of the heritage significant jib crane to the east of the lift.

Some construction activities within the rail corridor would be undertaken during scheduled track possessions, where train services are replaced by bus services. Track possessions would generally occur over the weekend and at night and replacement bus services would be provided for rail customers. Other works within the rail corridor would generally be carried out during standard construction hours and would not disrupt existing rail services.

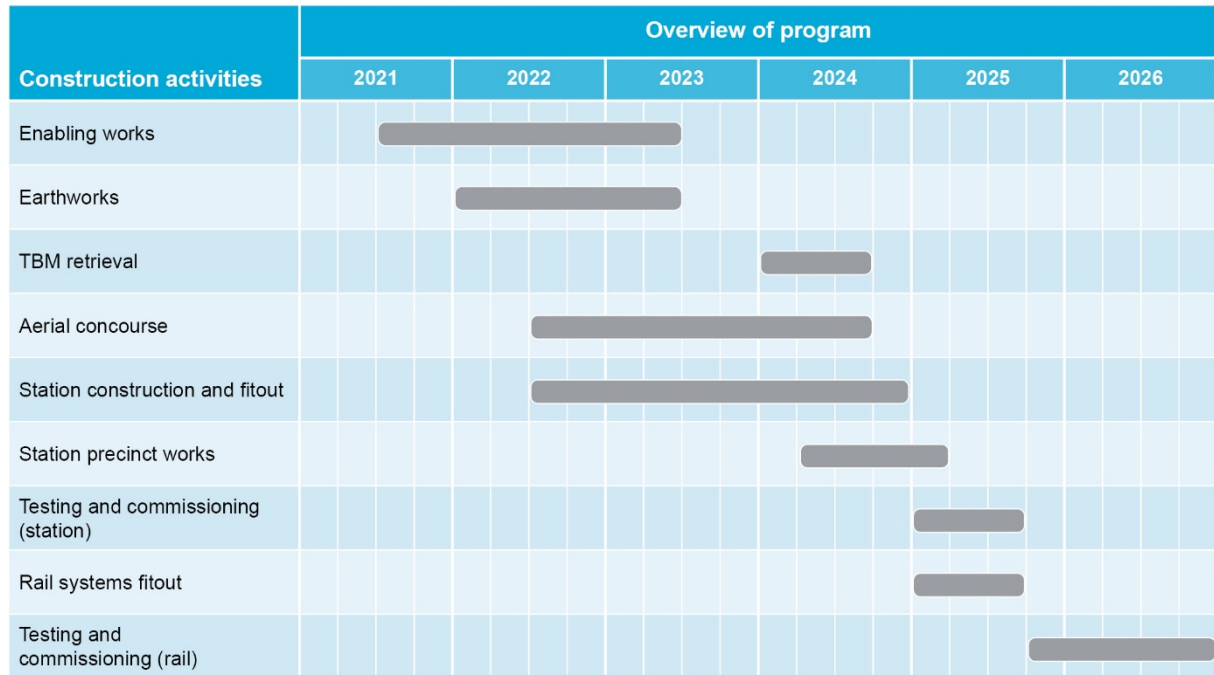
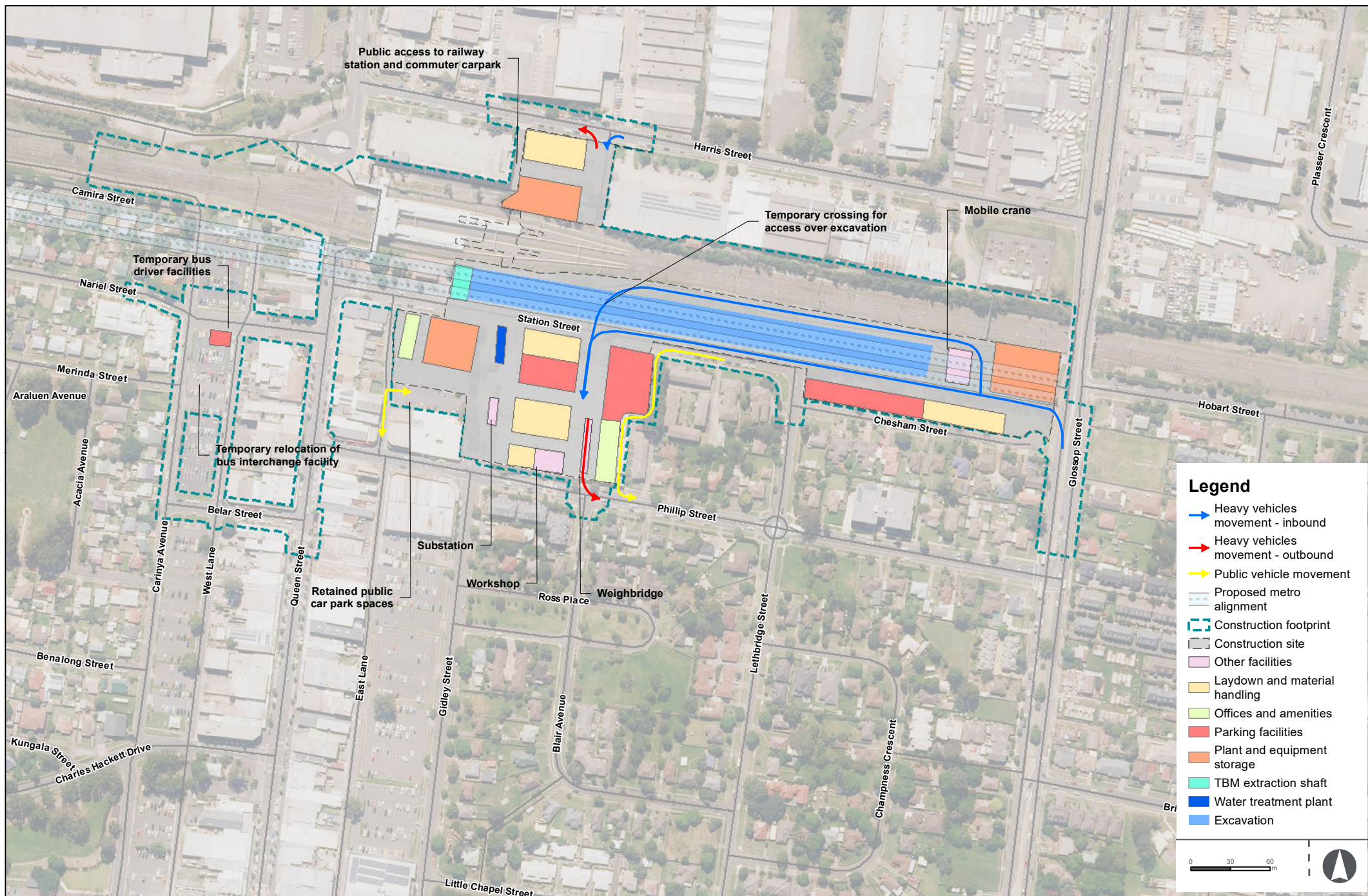


Figure 8-10 Indicative construction program for the St Marys construction site



St Marys indicative construction site layout

Figure 8-11

Indicative only, subject to design development

8.7.2 Claremont Meadows services facility

The need for the Claremont Meadows services facility is subject to ongoing investigation. If required, it would be located to the southeast of the intersection of the Great Western Highway and Gipps Street. The existing site consists of a primarily cleared grassed area and an area previously disturbed by construction activities.

The construction site would support the construction of the services facility and support the fitout of the tunnel. Key construction works would include:

- piling and pile capping
- temporary shaft excavation
- spoil handling, storage and transport
- construction of above and below ground structures for the services facility
- TBM maintenance and relaunch
- services facility fitout
- rail and tunnel systems fitout.

The indicative construction program for the site is outlined in Figure 8-12 and the location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-13.

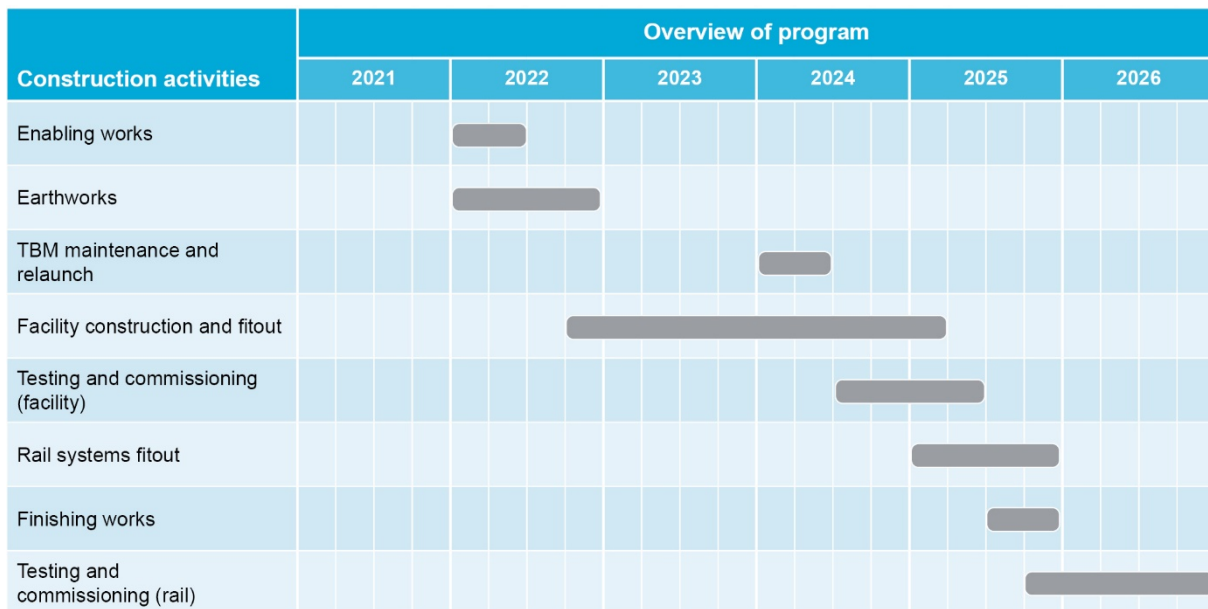
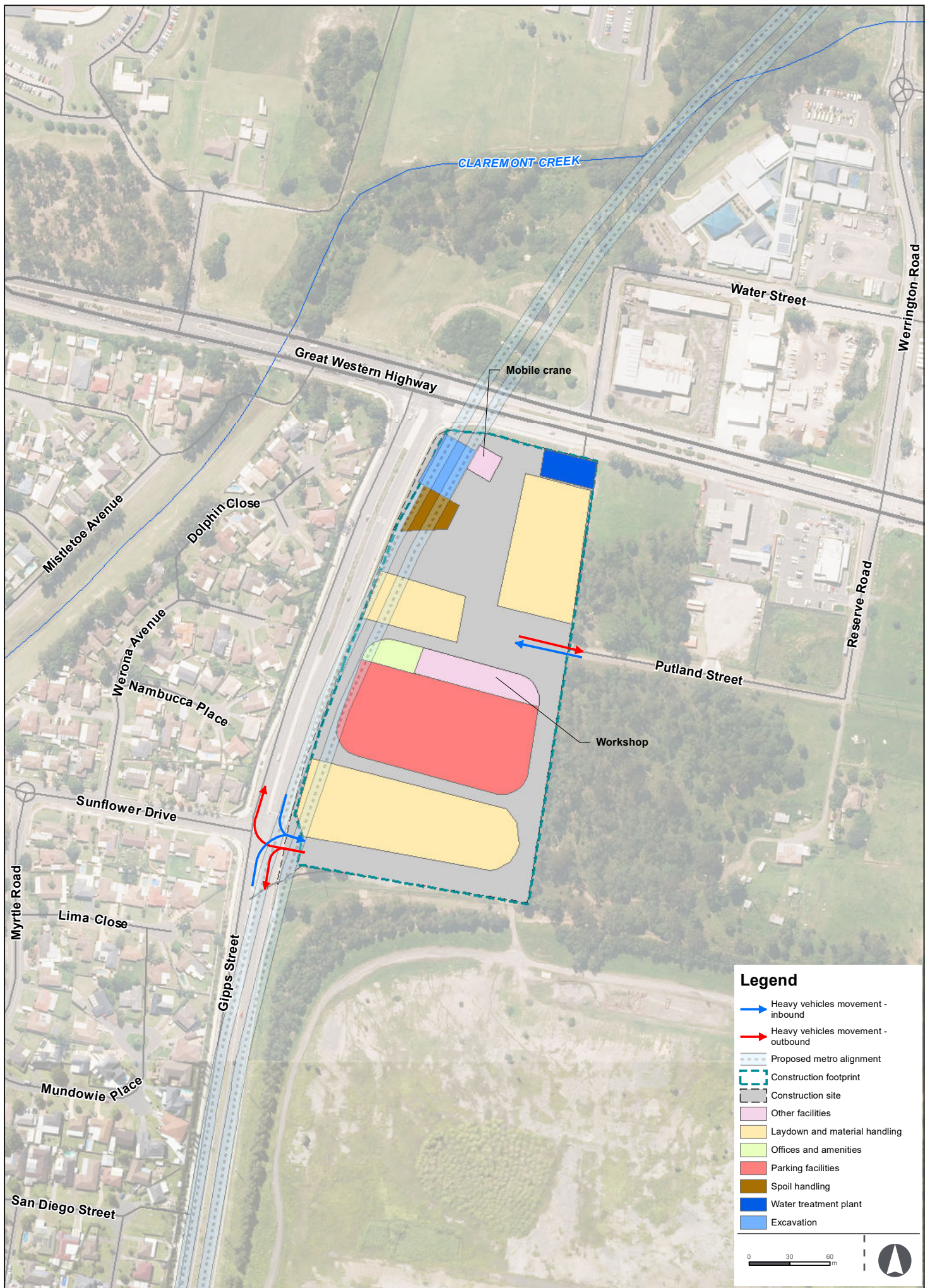


Figure 8-12 Indicative construction program for the Claremont Meadows services facility construction site



Claremont Meadows services facility indicative construction site layout

Figure 8-13

Indicative only, subject to design development

8.7.3 Orchard Hills

The Orchard Hills construction site would be located at Orchard Hills, south of the M4 Western Motorway, east of Kent Road and both north and south of Lansdowne Road. The existing site consists of semi-rural residential properties with areas of cleared and vegetated land.

A range of construction works would be carried out at this site to support TBM operations and the construction of Orchard Hills Station. Key construction works would include:

- construction of the tunnel portal
- TBM launch and support
- spoil handling and storage
- construction of the road-over-rail bridge for Lansdowne Road
- construction of the rail alignment
- construction of the Orchard Hills Station structures and finishes
- station precinct works.

The indicative construction program for the site is outlined in Figure 8-14 and the location and indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-15. The indicative site layout includes two separate areas to support tunnelling activities and station construction activities respectively.

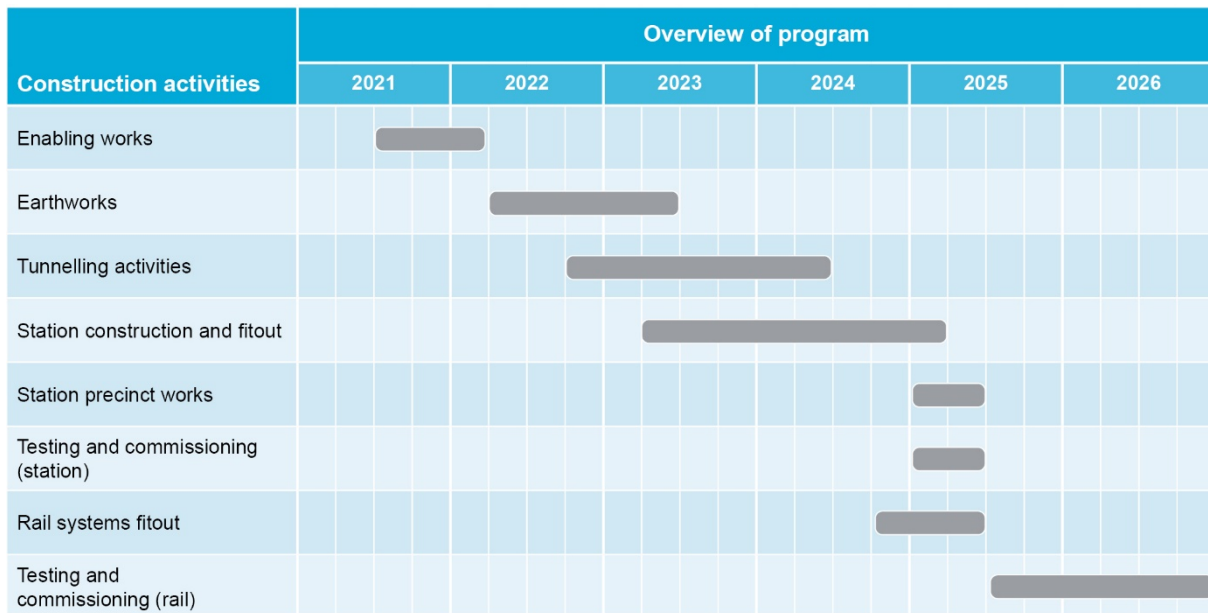
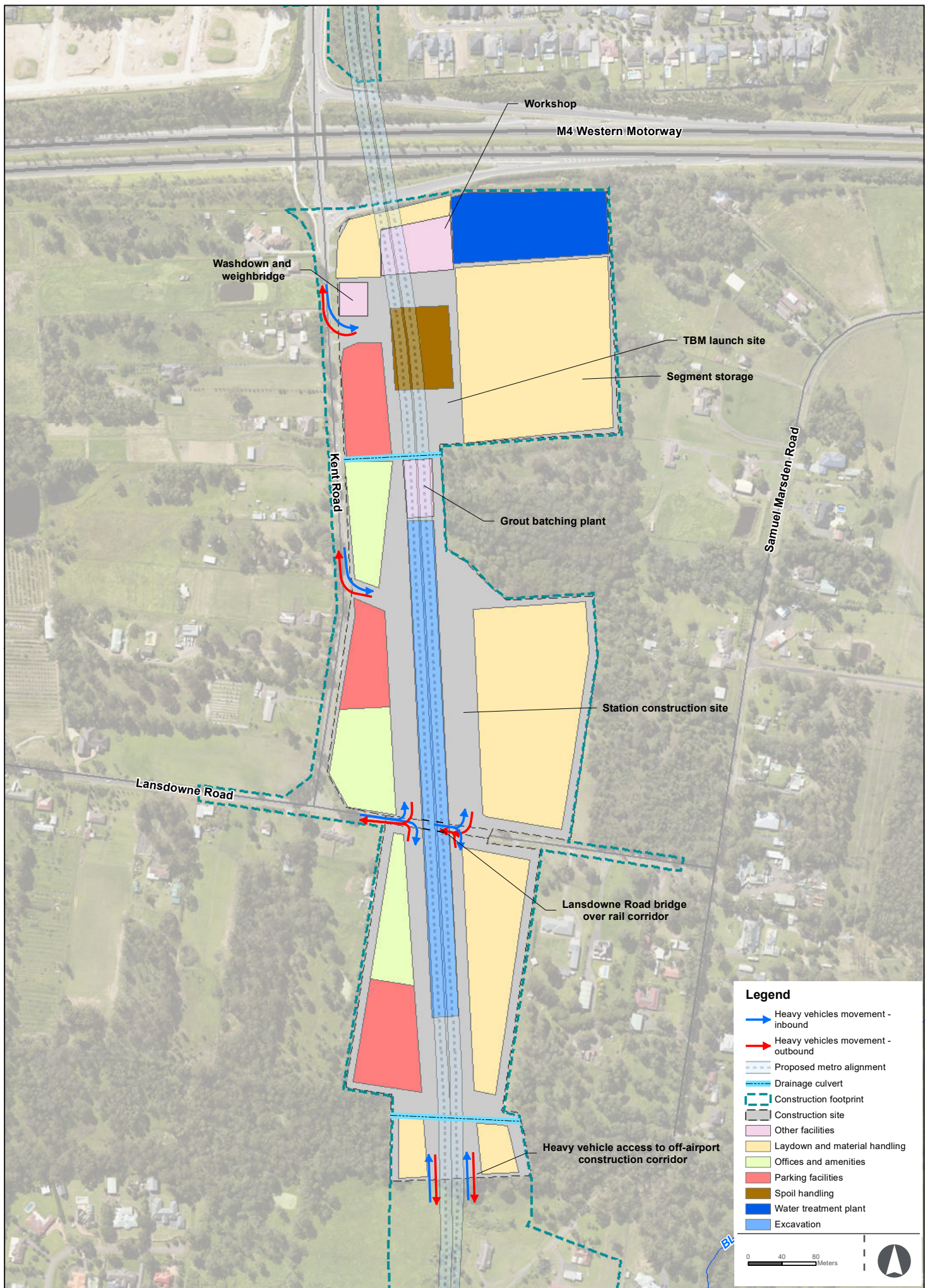


Figure 8-14 Indicative construction program for the Orchard Hills construction site



8.7.4 Off-airport construction corridor

A range of rail corridor construction activities would be carried out for the project to the north of Western Sydney International to construct the surface and viaduct sections of the alignment. The existing environment within the corridor consists of rural and semi-rural residential land use with areas of cleared and vegetated land, the riparian areas of Blaxland Creek, Cosgroves Creek and other unnamed watercourses, as well as local roads and utility corridors.

The following key construction works would be carried out within the corridor:

- construction and fitout of the surface sections of the rail alignment
- construction and fitout of the bridge/viaduct sections of the rail alignment
- earthworks and associated spoil handling, storage and transport.

Construction infrastructure within the corridor would be concentrated around areas of high construction activity, for example, gantry mobilisation and demobilisation points for viaduct construction. An indicative viaduct construction cross-section is provided in Figure 8-16.

Creek crossings would be established to provide north–south access across Blaxland Creek (during construction) and Cosgroves Creek (during construction and operation).

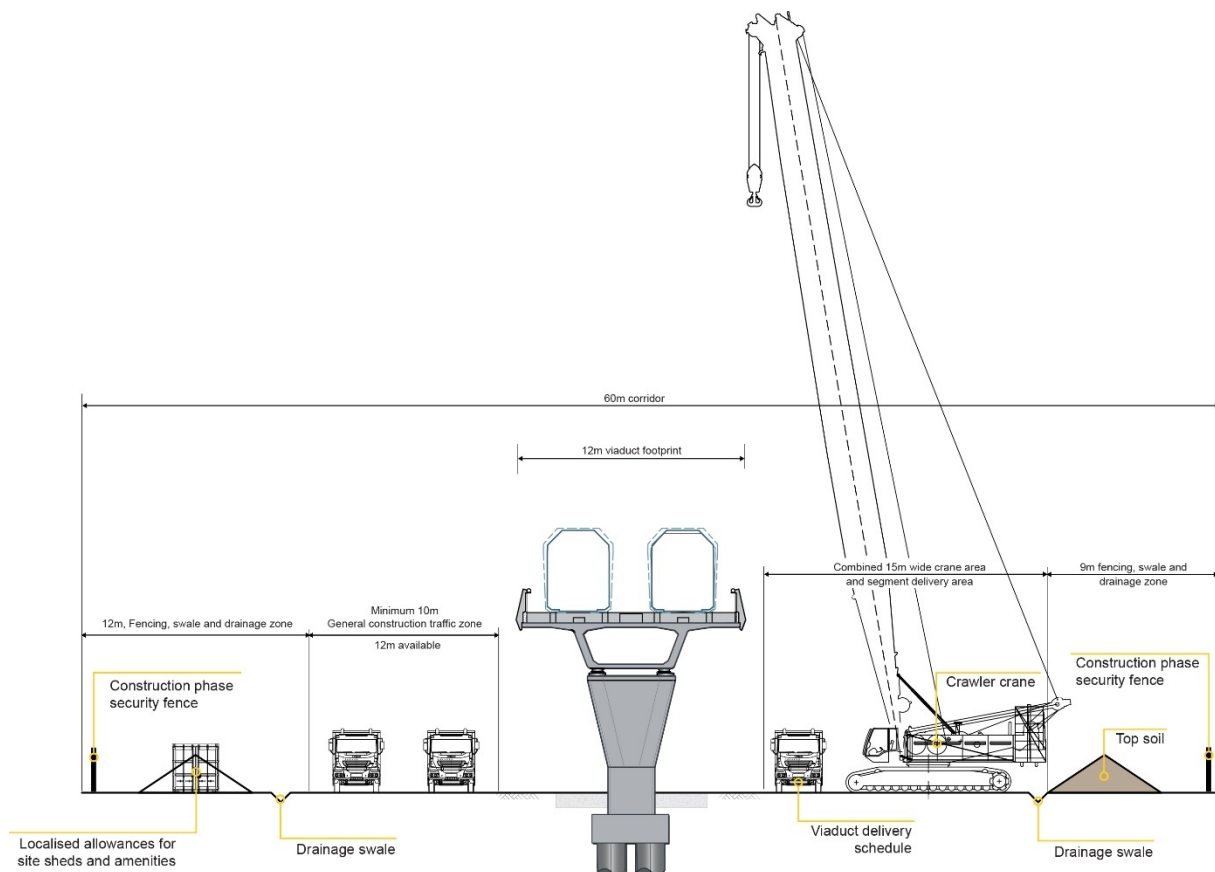


Figure 8-16 Indicative cross-section of viaduct construction

An indicative construction program for the off-airport construction corridor is outlined in Figure 8-17. Figure 8-18 shows the corridor, including construction access arrangements, for the off-airport construction sites.

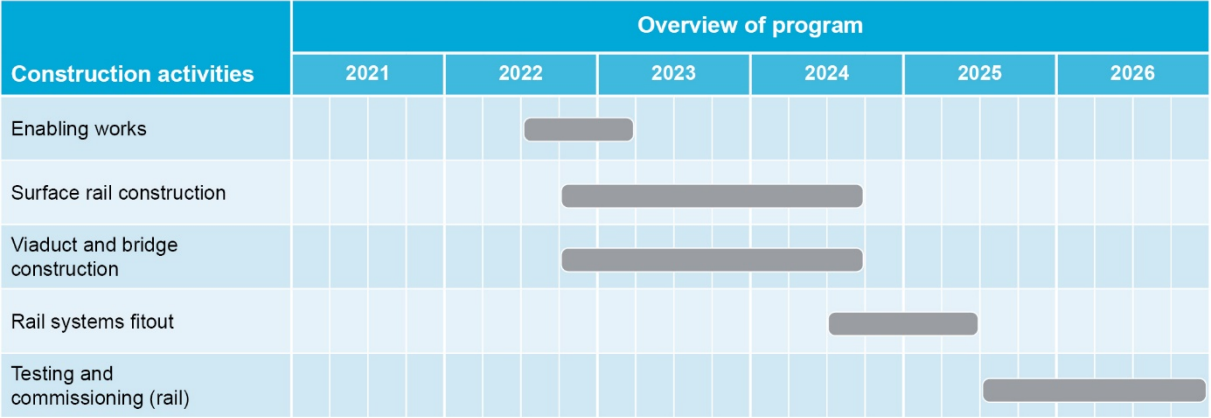
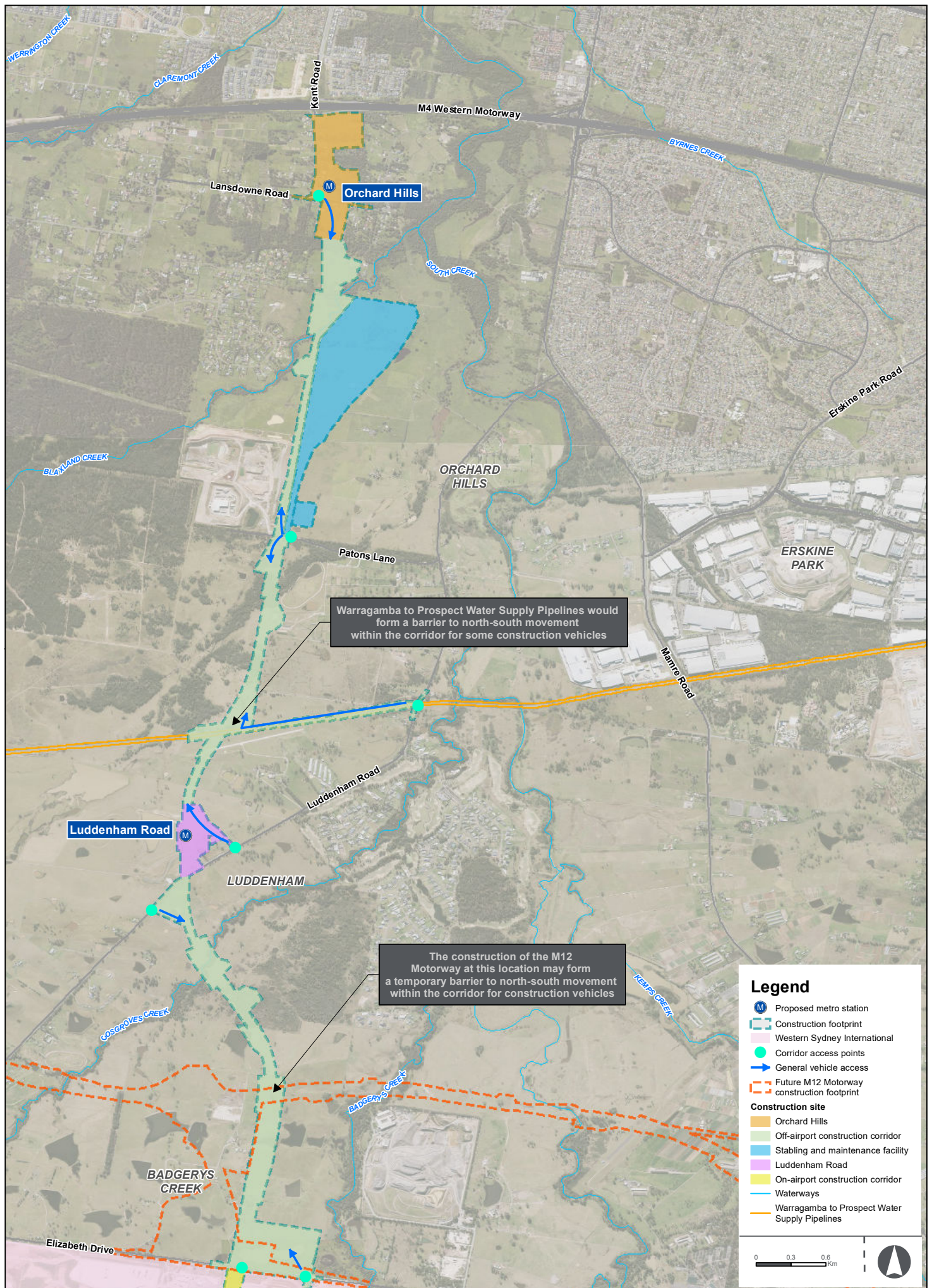


Figure 8-17 Indicative construction program for the off-airport construction corridor



8.7.5 Stabling and maintenance facility

The stabling and maintenance facility construction site would be located at Orchard Hills south of Blaxland Creek, to the east of the project alignment and to the north of Patons Lane. The existing site consists of primarily cleared land used for agriculture.

The construction site would support the construction of the stabling and maintenance facility. Key construction works would include:

- earthworks and structural works for the stabling and maintenance facility including buildings and internal roads
- construction of the stabling and maintenance facility rail entry/exit.

The indicative construction program for the site is outlined in Figure 8-19 and the location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-20.

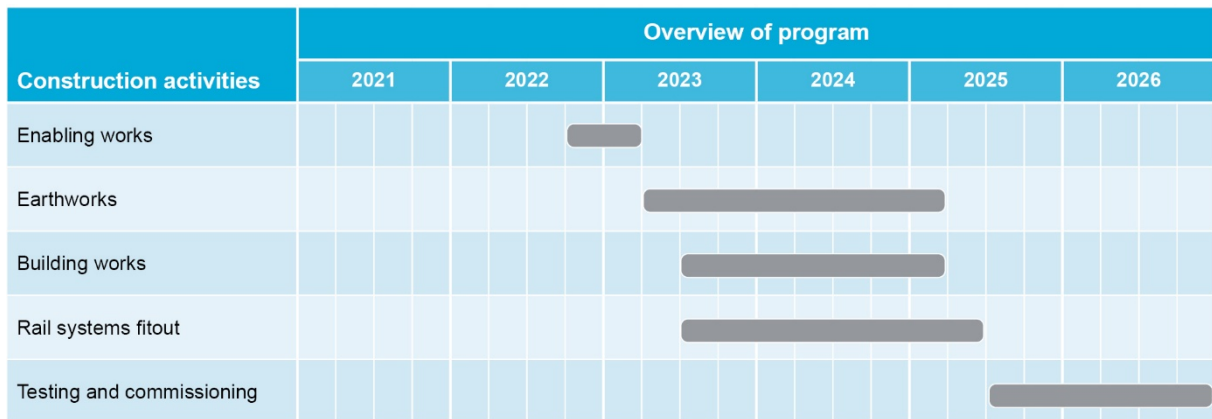
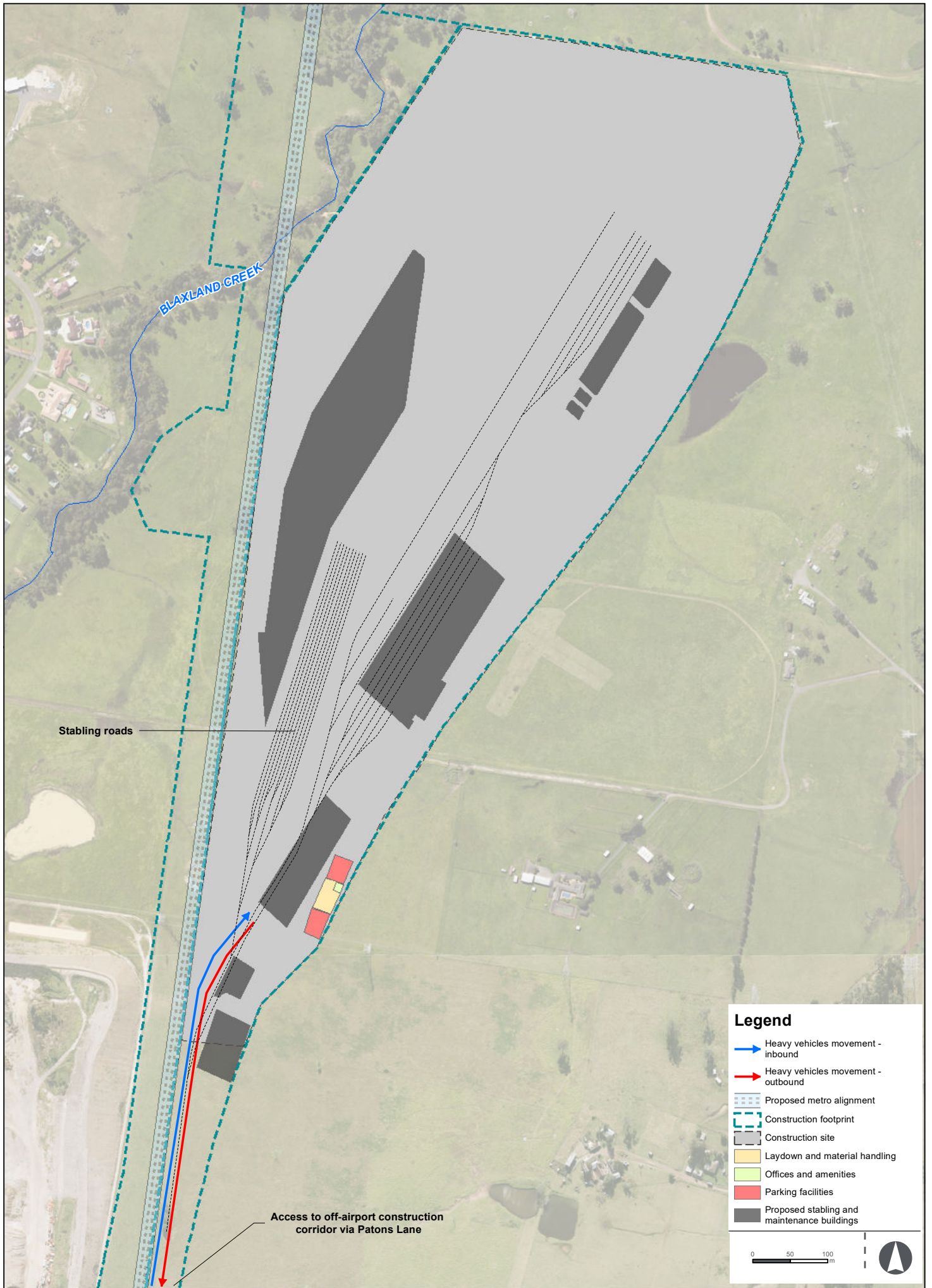


Figure 8-19 Indicative construction program for the stabling and maintenance facility construction site



8.7.6 Luddenham Road

The Luddenham Road construction site would be located north of Luddenham Road at Luddenham. The existing site consists of cleared land used for agriculture.

The construction site would support the construction of Luddenham Road Station and the viaduct section of the rail alignment in this location. Key construction works would include:

- construction of Luddenham Road Station, station structures and finishes
- construction of the viaduct section of the rail alignment
- station precinct works which includes a bus layover area and park and ride facility with 200 spaces (with the potential for a future expansion to a multi-deck facility).

The indicative construction program for the site is outlined in Figure 8-21 and the location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-22.

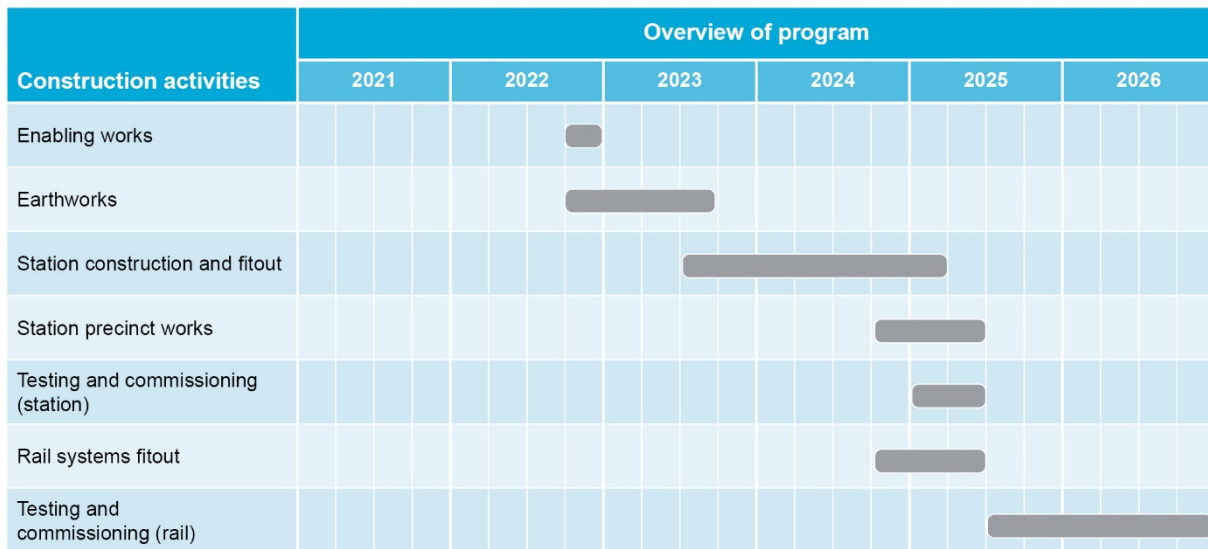
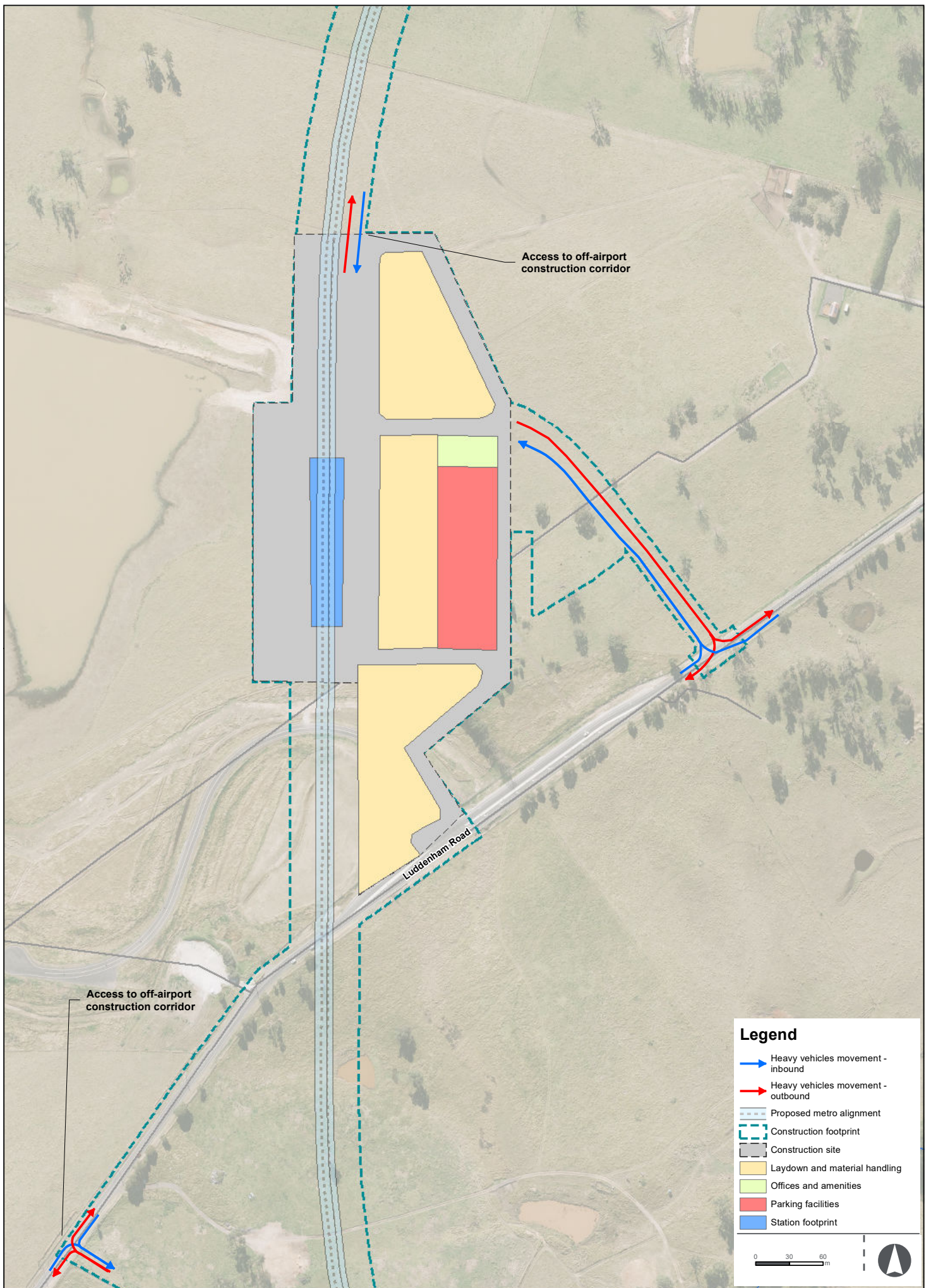


Figure 8-21 Indicative construction program for the Luddenham Road construction site



8.7.7 On-airport construction corridor

The on-airport construction corridor is located within the Western Sydney International Stage 1 Construction Impact Zone and consists of the rail corridor between Elizabeth Drive and Airport Business Park Station. The site would support the construction and fit-out of this section of the alignment within Western Sydney International.

A temporary crossing of the Western Sydney International drainage swale may be required to support work within the on-airport construction corridor.

The indicative construction program for the site is outlined in Figure 8-23. The on-airport construction corridor is shown in the context of all on-airport construction activities in Figure 8-24.

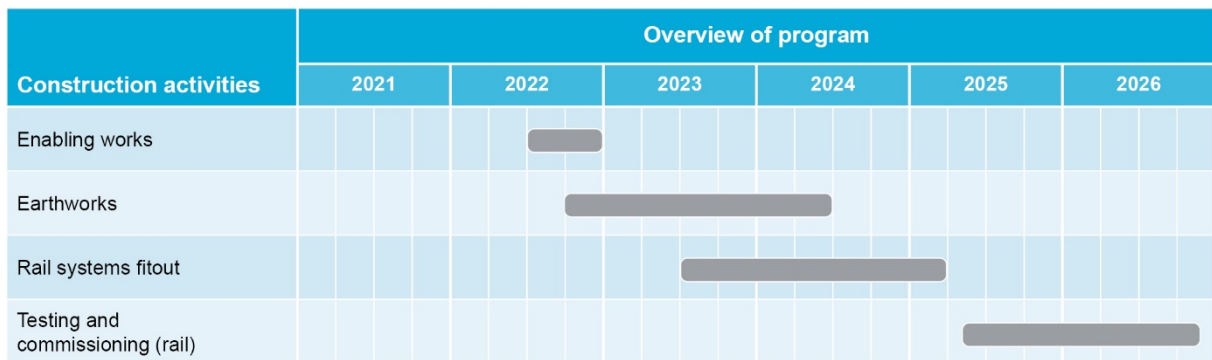
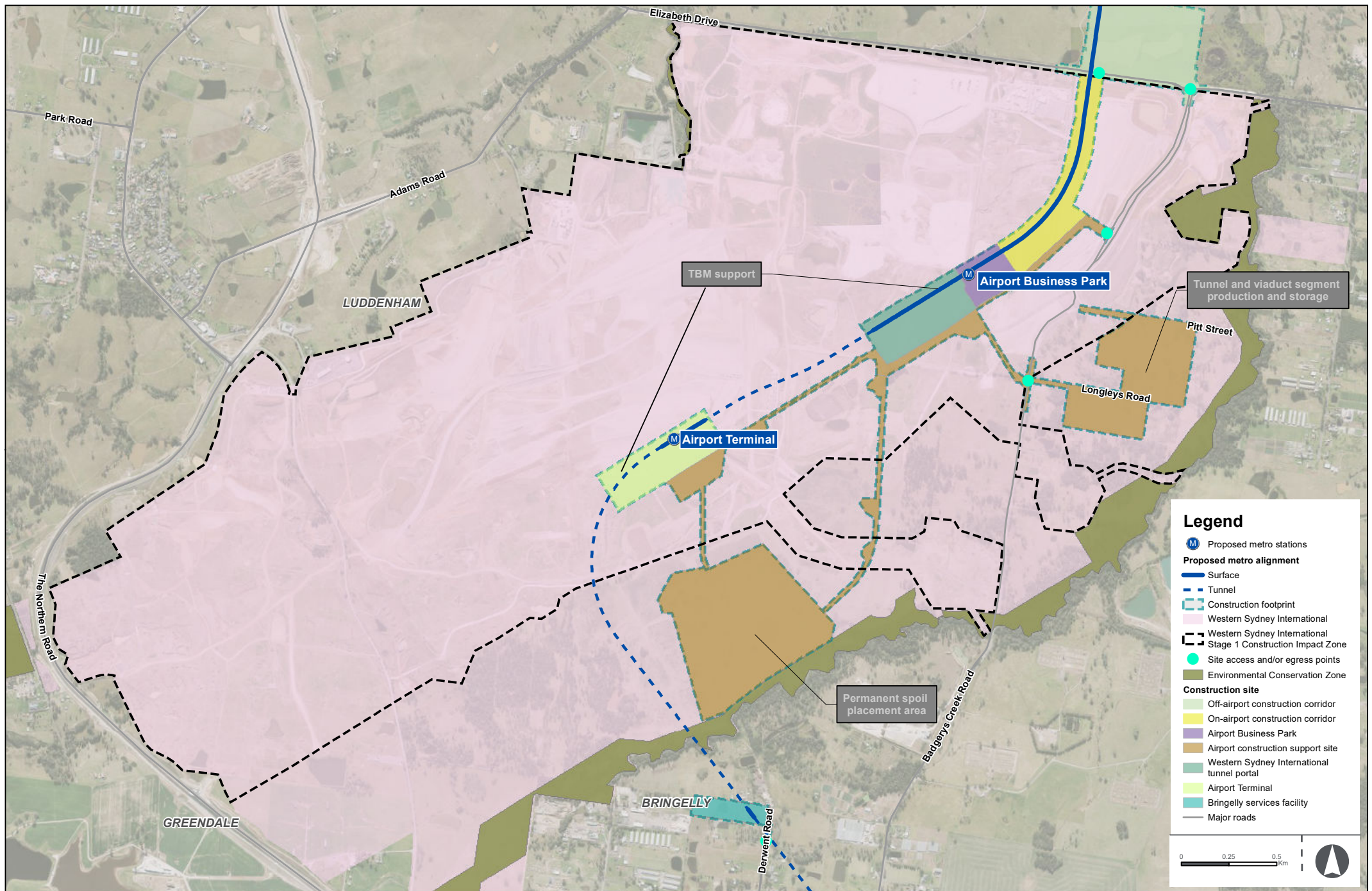


Figure 8-23 Indicative construction program for the on-airport construction corridor



8.7.8 Airport Business Park

The Airport Business Park construction site is located within the Western Sydney International Stage 1 Construction Impact Zone. The site would support the construction of the Airport Business Park Station. Key construction works would include:

- construction of the rail alignment including earthworks for the transition of the rail alignment from surface to in-cutting
- construction of an access road to the Airport Business Park Station from Badgerys Creek Road
- construction of the Airport Business Park Station structures, finishes and fitout.

The indicative construction program for the site is outlined in Figure 8-25. The location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-26.

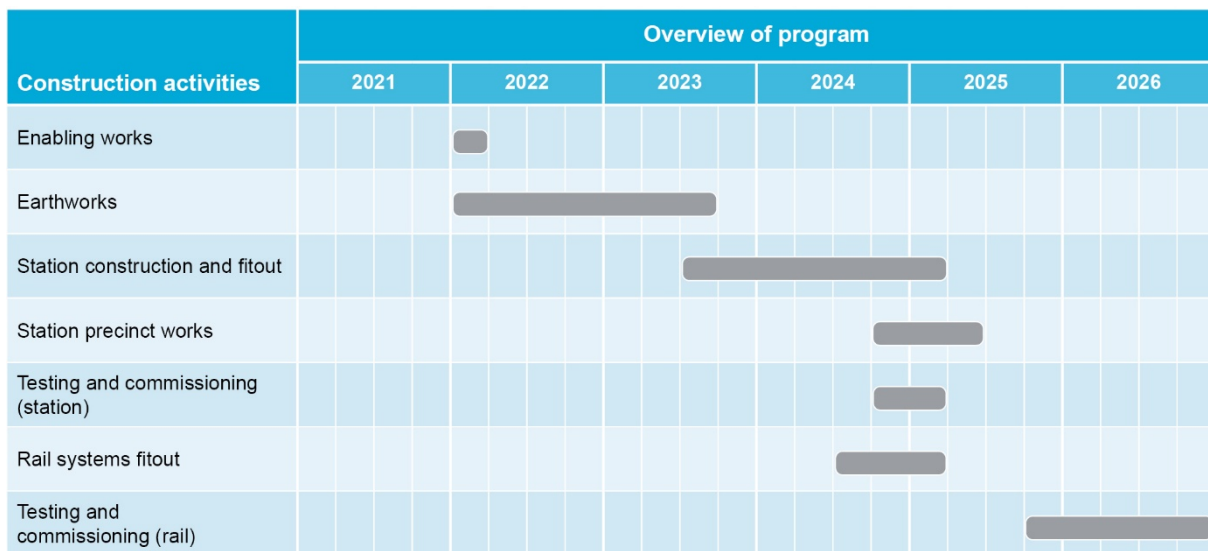
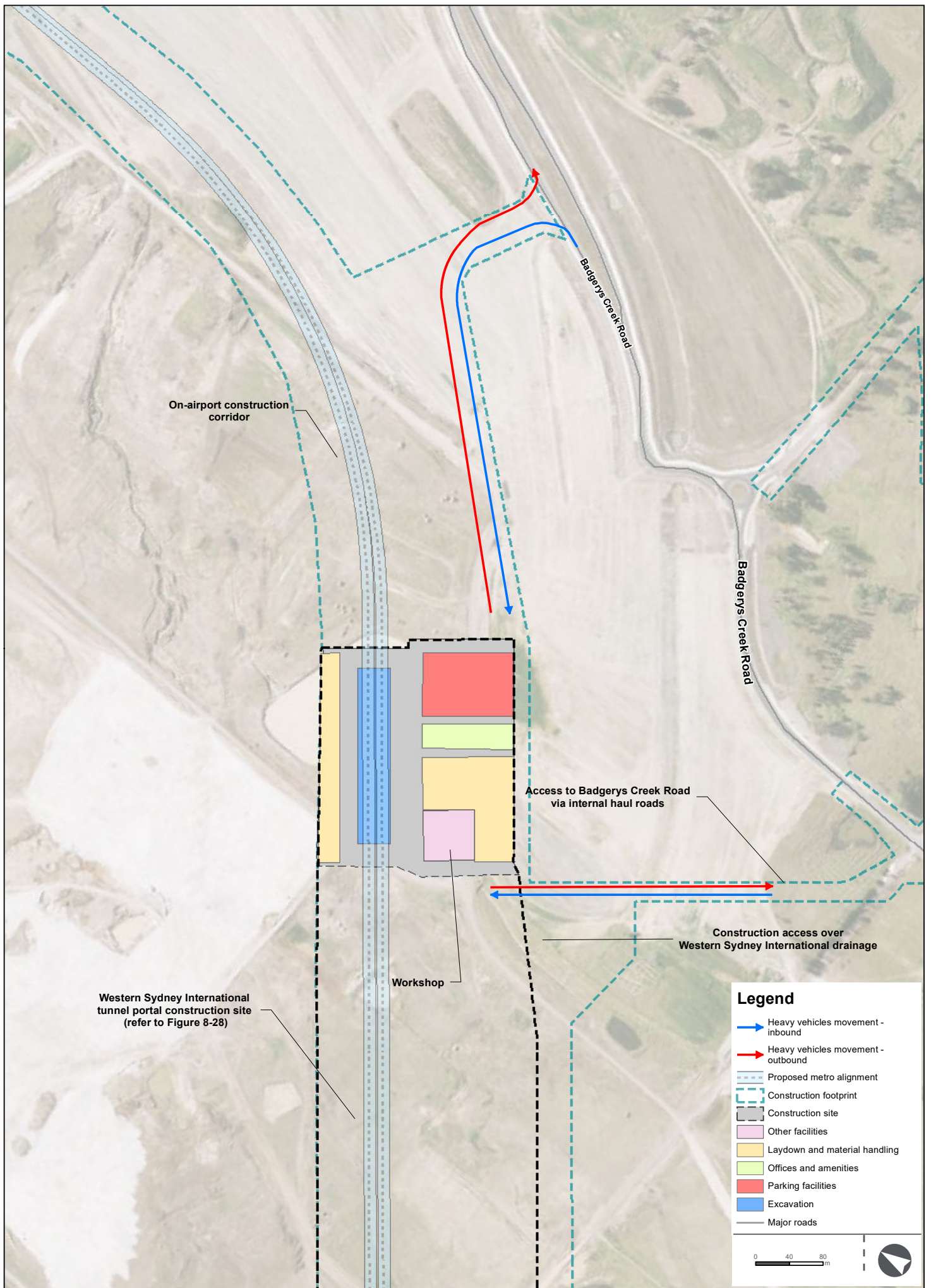


Figure 8-25 Indicative construction program for the Airport Business Park construction site



8.7.9 Western Sydney International tunnel portal

The Western Sydney International tunnel portal construction site is located within the Western Sydney International Stage 1 Construction Impact Zone, southwest of the Airport Business Park construction site.

Key construction works would include:

- construction of the rail alignment including earthworks for the transition of the rail alignment from in-cutting to in-tunnel
- TBM launch
- TBM support including spoil handling
- construction of the tunnel portal
- finishing works.

The indicative construction program for the site is outlined in Figure 8-27. The location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-28.

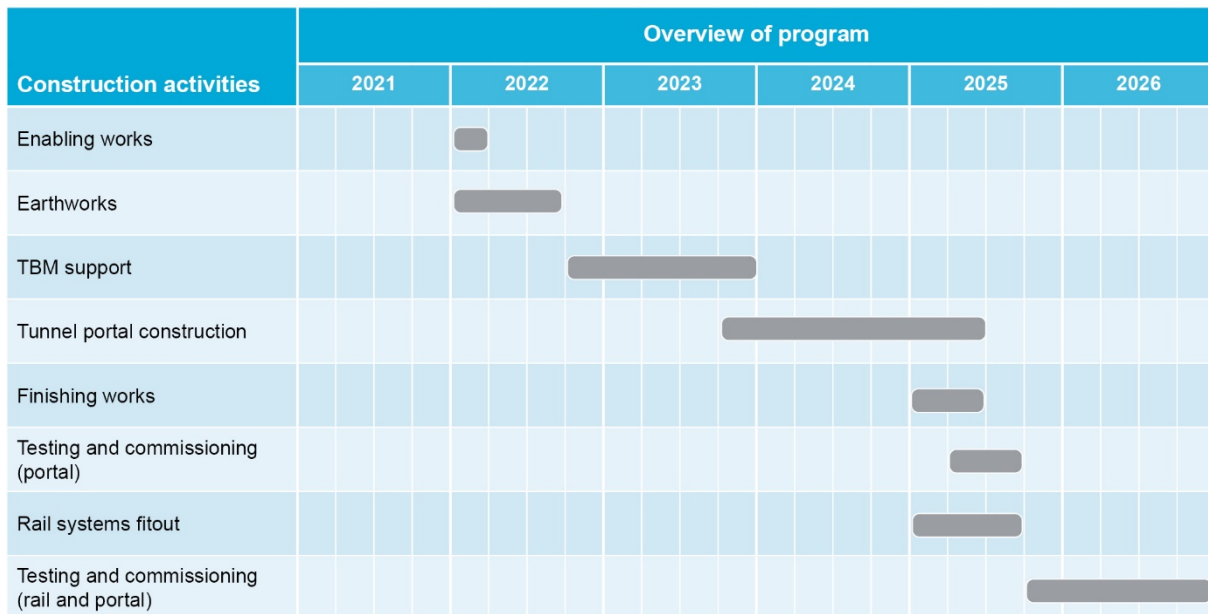
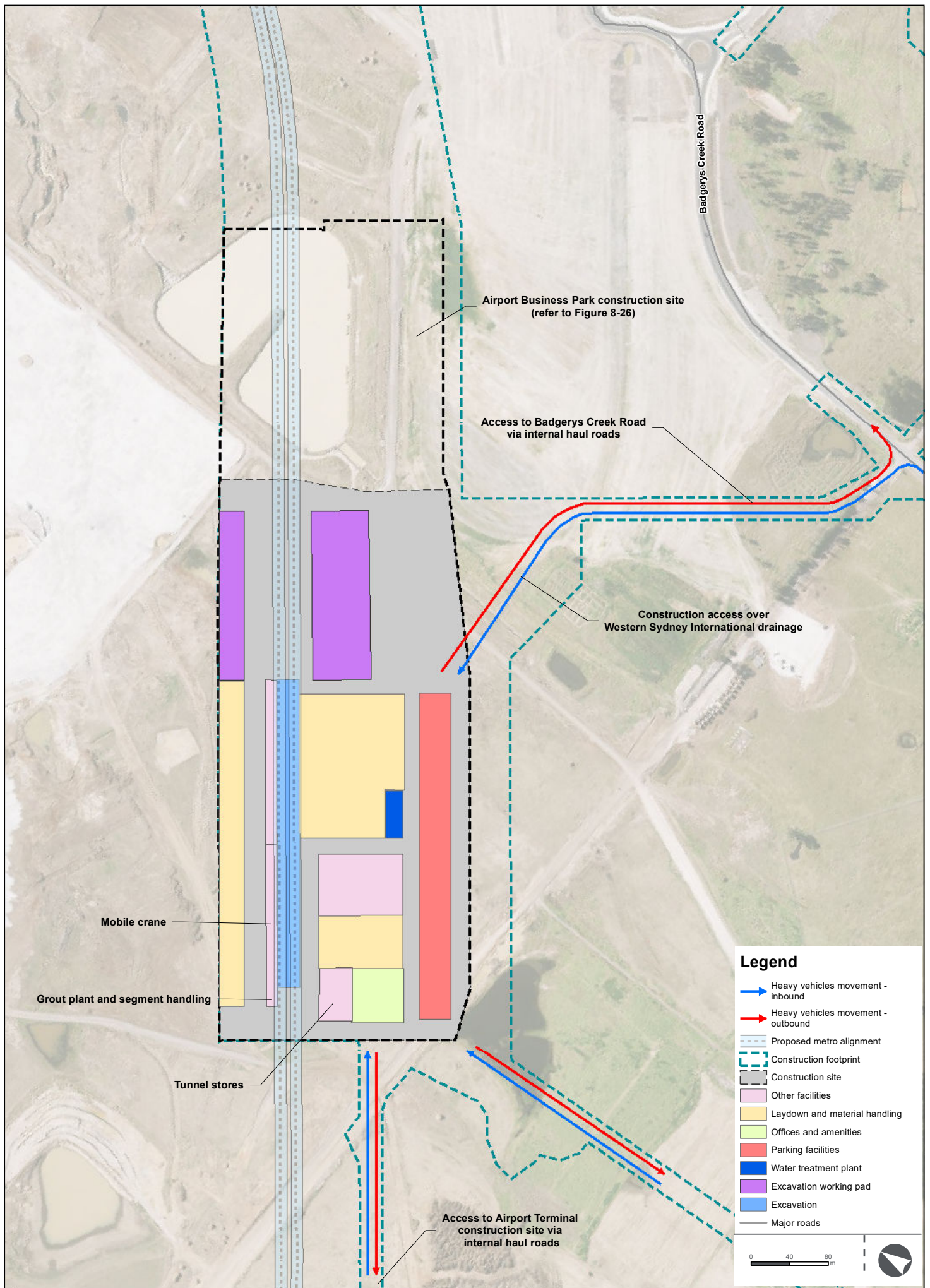


Figure 8-27 Indicative construction program for the Western Sydney International tunnel portal construction site



Western Sydney International tunnel portal indicative construction site layout

Figure 8-28

Indicative only, subject to design development

8.7.10 Airport Terminal

The Airport Terminal construction site is located within the Western Sydney International Stage 1 Construction Impact Zone. The site would effectively be separated into two sites, one supporting the construction of the Airport Terminal Station and the other supporting tunnelling activities for the Western Sydney International to Bringelly tunnel. Key construction works would include:

- earthworks to accommodate the station and tunnelling activities
- TBM maintenance and relaunch
- TBM support including spoil handling
- construction of the Airport Terminal Station structures, finishes and fitout.

The indicative construction program for the site is outlined in Figure 8-29 and the location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-30.

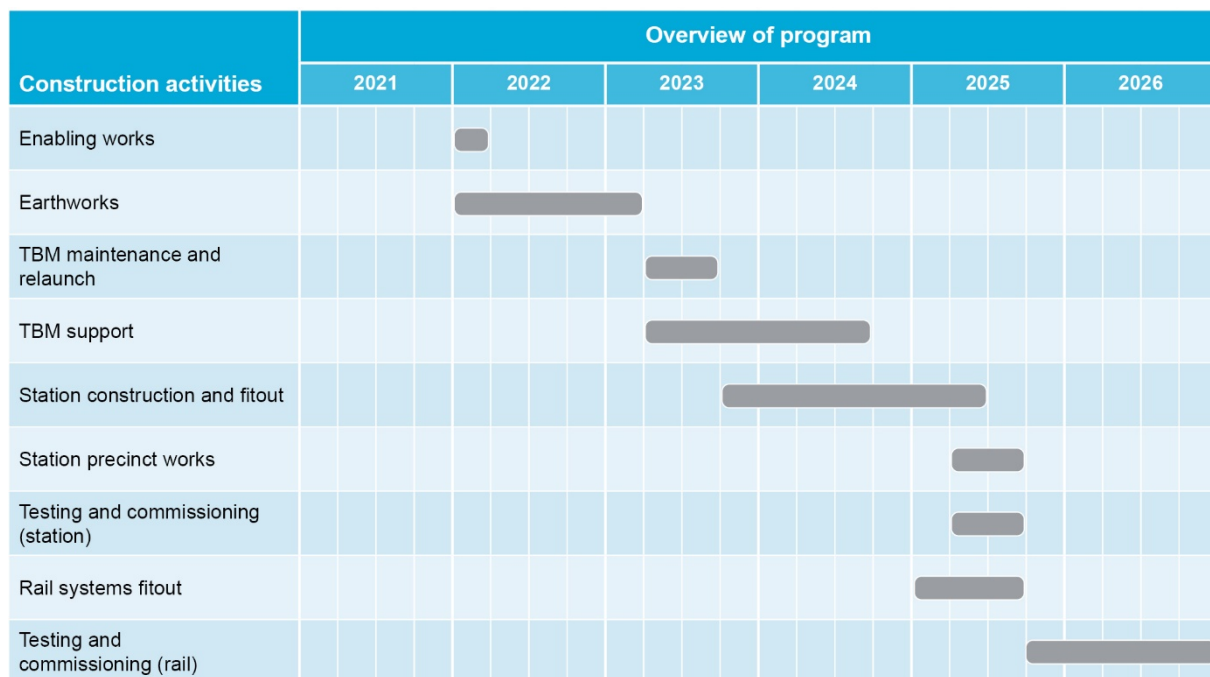
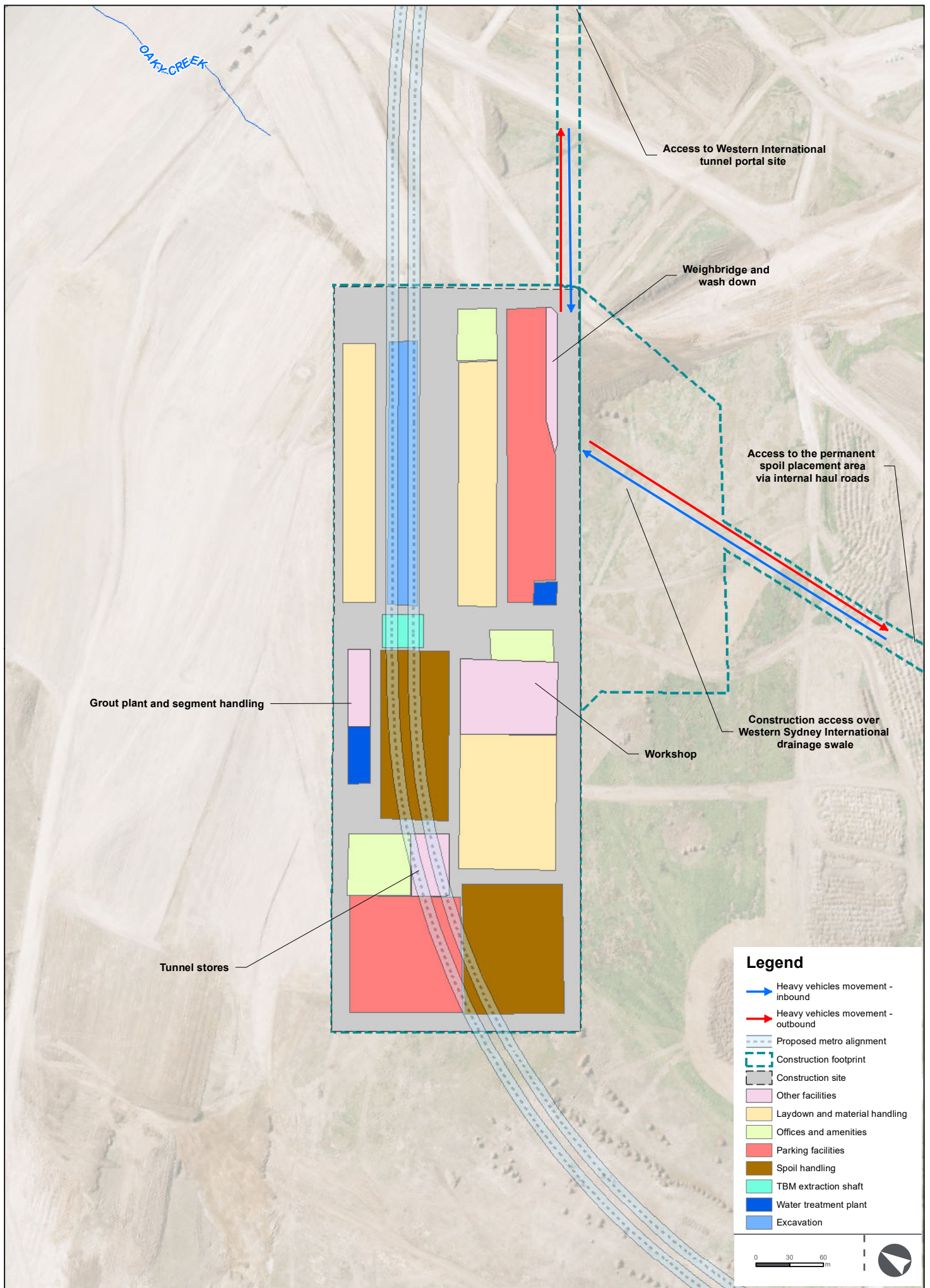


Figure 8-29 Indicative construction program for the Airport Terminal construction site



Legend

- Heavy vehicles movement - inbound
- Heavy vehicles movement - outbound
- Proposed metro alignment
- Construction footprint
- Construction site
- Other facilities
- Laydown and material handling
- Offices and amenities
- Parking facilities
- Spoil handling
- TBM extraction shaft
- Water treatment plant
- Excavation



8.7.11 Airport construction support site

The airport construction support site sits across both the Western Sydney International Stage 1 Construction Impact Zone and the area located outside of the Western Sydney International Stage 1 Construction Impact Zone (see Figure 8-24 for the boundary between these two areas). The airport construction support site comprises multiple ancillary areas where the key construction works would include:

- construction and use of haulage roads to support the construction of the project within Western Sydney International
- production and storage of viaduct and tunnel segments, including concrete batching, site offices and construction worker car parking
- potential permanent placement of spoil.

The combination of sites would support construction activities at all on-airport construction sites as well as the production of viaduct and tunnel segments to be transported and used both on-airport and off-airport as appropriate.

The indicative construction program for the site is outlined in Figure 8-31. The location and an indicative layout of the tunnel and viaduct segment production and storage facility, including vehicle access/egress, is provided in Figure 8-32 with the remainder of this site shown in Figure 8-24.

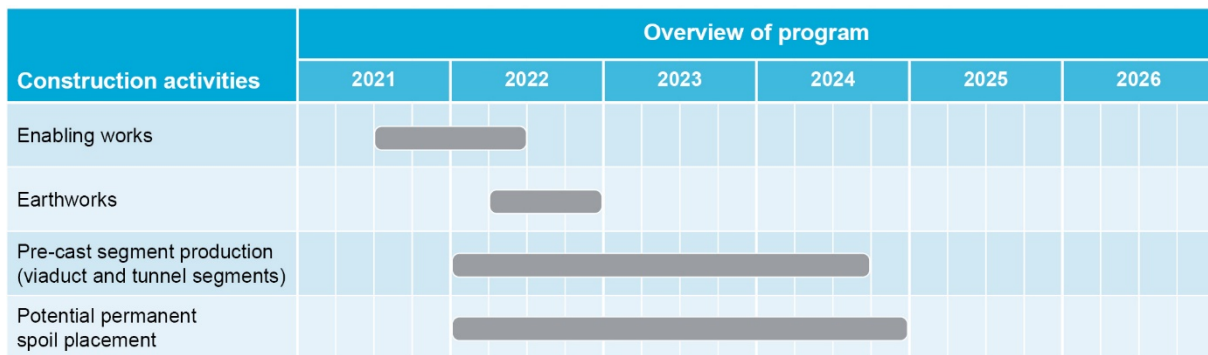
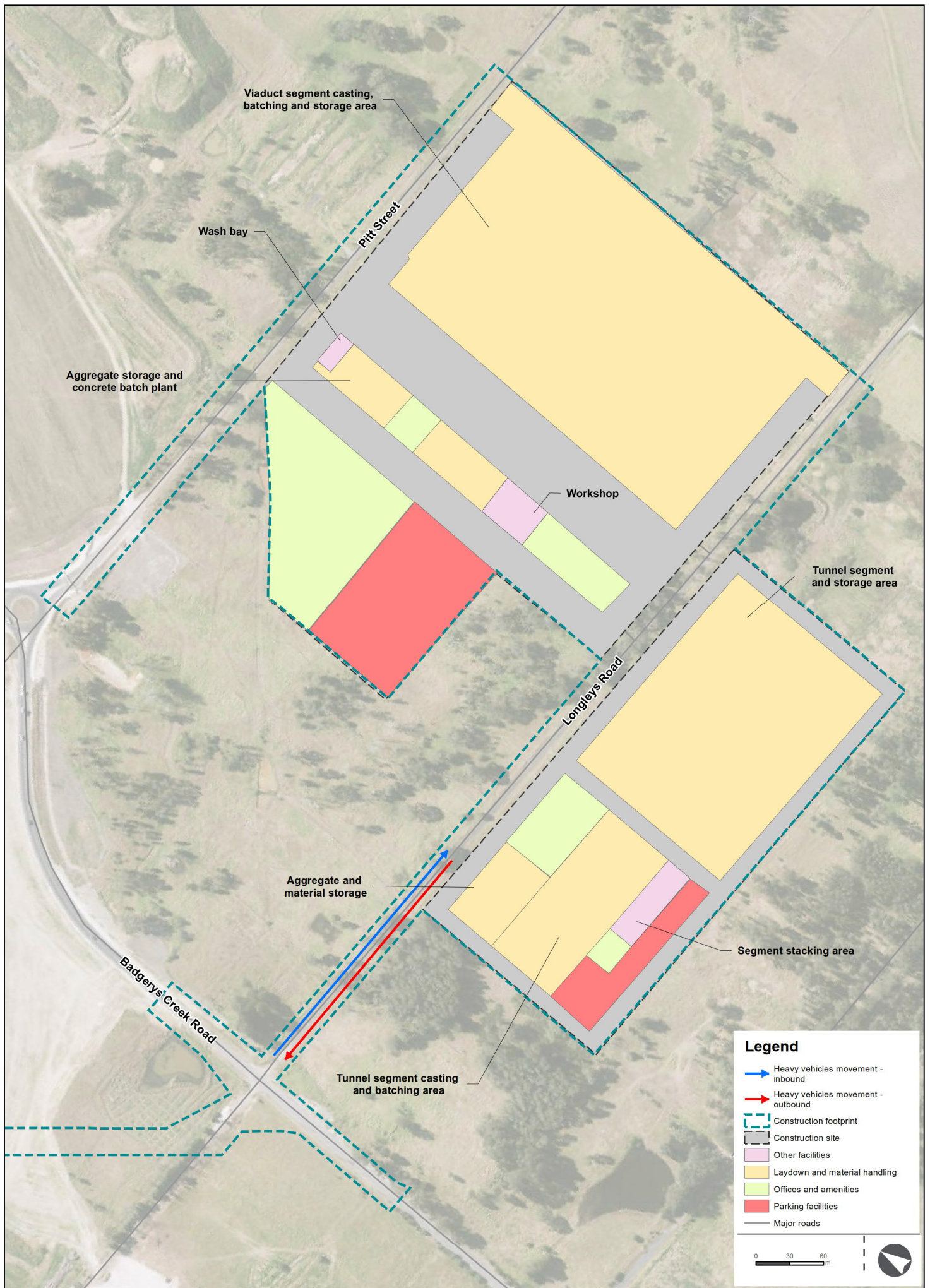


Figure 8-31 Indicative construction program for the airport construction support site



Tunnel and viaduct segment production and storage indicative construction site layout

Figure 8-32

Indicative only, subject to design development

8.7.12 Bringelly services facility

The Bringelly services facility would be located at the northern end (western side) of Derwent Road at Bringelly. The existing site consists of a rural-residential property.

Key construction works would include:

- piling and pile capping
- shaft excavation
- spoil handling, storage and transport
- construction of above and below ground structures for the services facility
- TBM maintenance and relaunch
- services facility fitout
- rail and tunnel systems fitout.

The indicative construction program for the site is outlined in Figure 8-33. The location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-34.

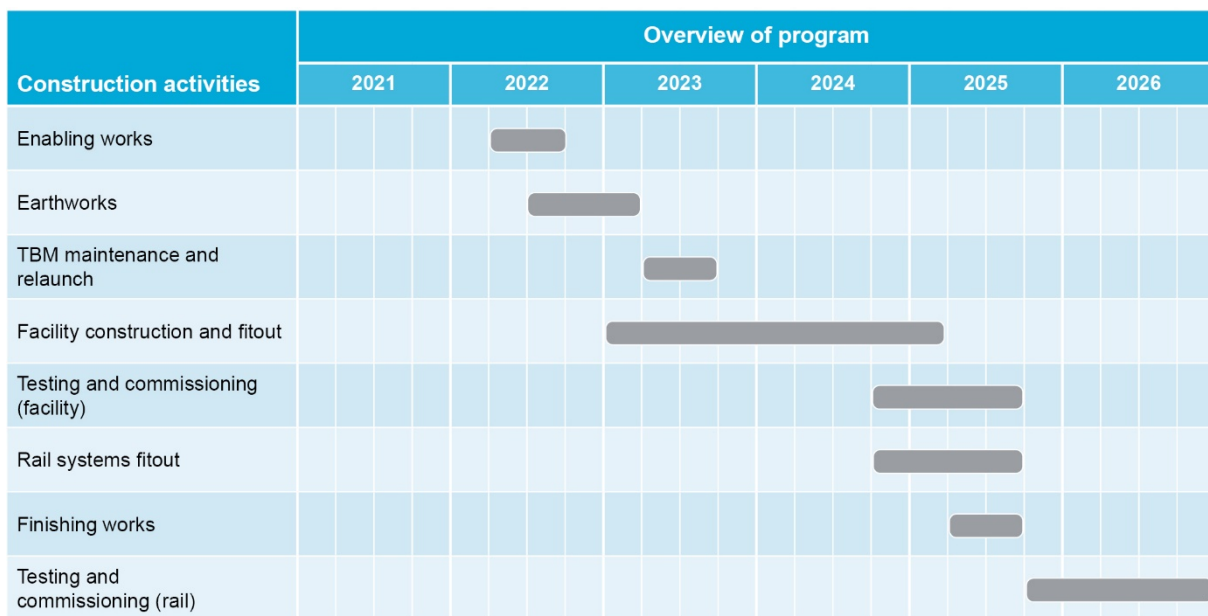
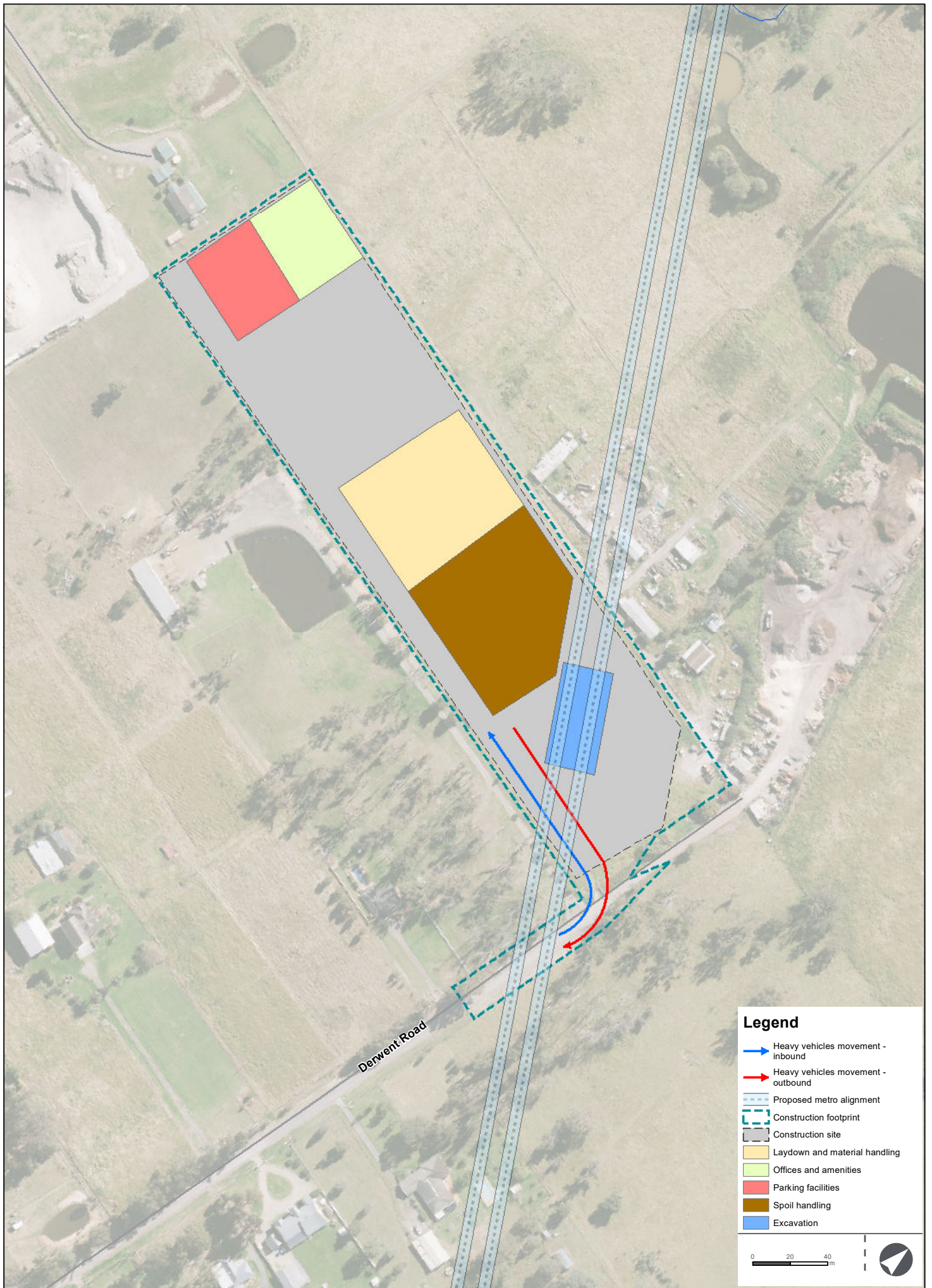


Figure 8-33 Indicative construction program for the Bringelly services facility construction site



8.7.13 Aerotropolis Core

The Aerotropolis Core construction site would be located to the east of Badgerys Creek Road. The existing site consists of partially cleared land.

A range of construction activities would be carried out at the site to support TBM retrieval, cut-and-cover station construction and mined excavation of the stub tunnel.

Key construction works at the site would include:

- construction of the new station box, station structures and finishes
- construction of the crossover
- construction of stub tunnels
- spoil handling, storage and transport
- temporary TBM retrieval shaft excavation
- TBM retrieval
- station precinct works.

The indicative construction program for the site is outlined in Figure 8-35. The location and an indicative layout of the construction site, including vehicle access/egress, is provided in Figure 8-36.

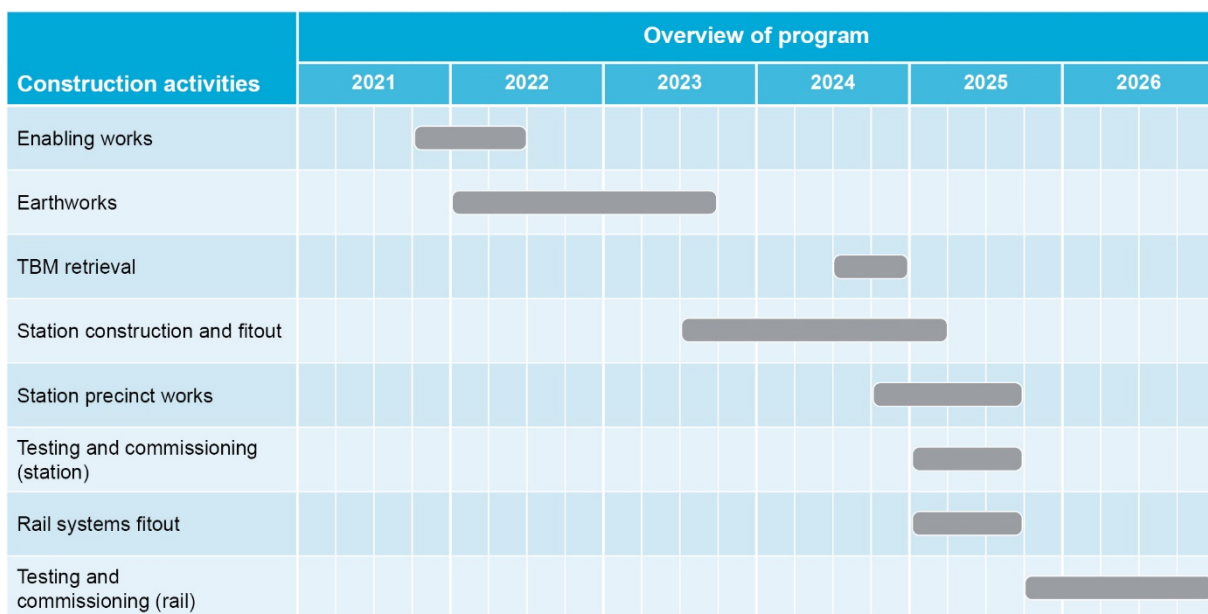
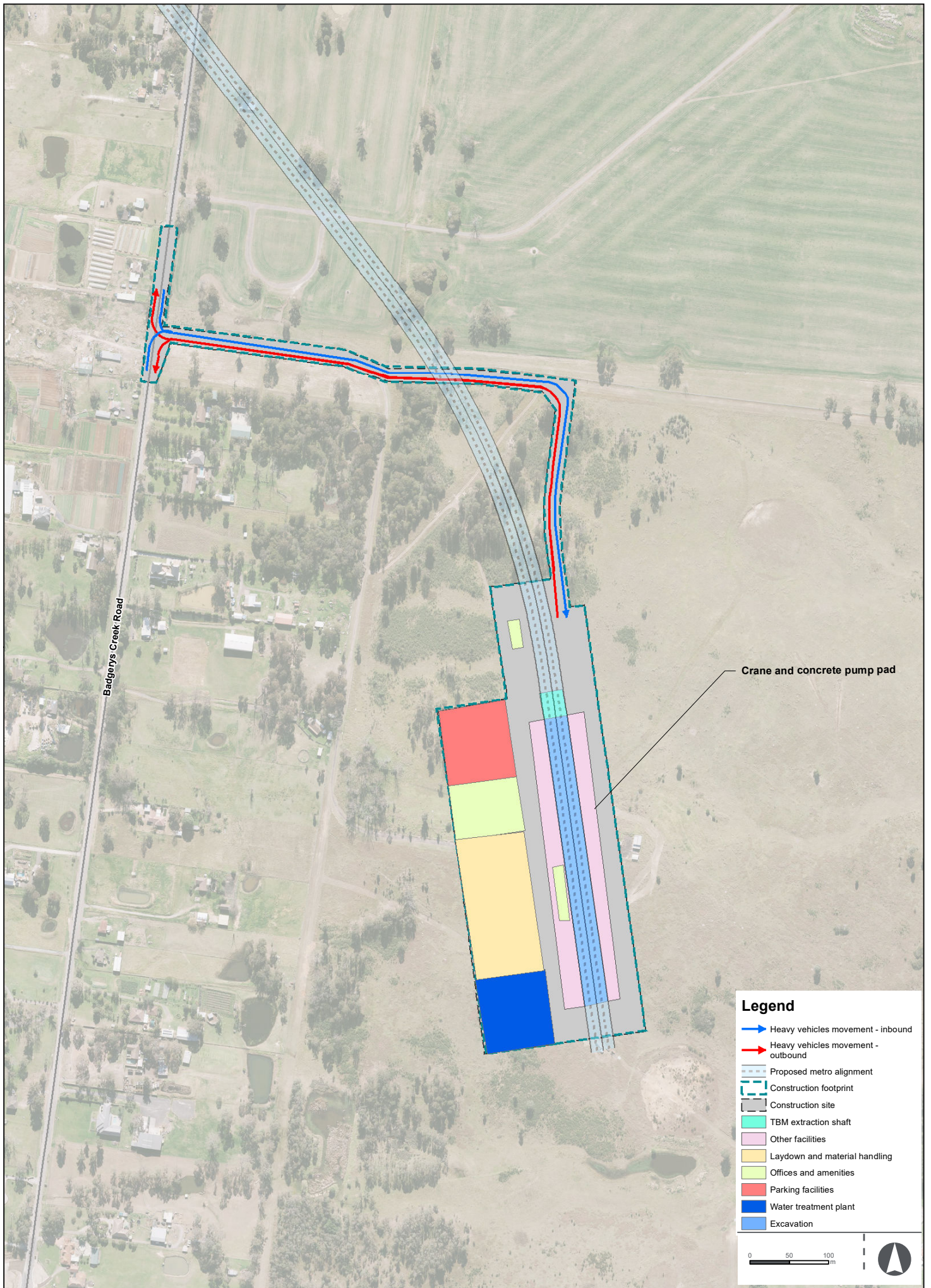


Figure 8-35 Indicative construction program for the Aerotropolis Core construction site



8.8 Interface with other construction projects

Construction of the project is likely to coincide with the construction of other planned infrastructure projects in the region including the future M12 Motorway, Western Sydney International, The Northern Road and St Marys Intermodal. Construction activities for these projects are likely to be concurrent or consecutive and have activities located close to each other (for example construction vehicles and construction activities) at and around Elizabeth Drive.

Preliminary construction planning for the project has involved consultation with the respective proponents of other infrastructure projects, including Transport for NSW and Western Sydney Airport, to identify potential construction conflicts and where possible minimise cumulative construction impacts. This consultation and coordination of construction activities would be ongoing throughout the delivery of the project.

A brief description of the interfaces with nearby projects is provided below. Further detail of potential cumulative impacts associated with construction activities is provided in Chapter 24 (Cumulative impacts).

8.8.1 Future M12 Motorway

Construction of the future M12 Motorway project is anticipated to commence in 2022, subject to approval. The key interface between the project and the future M12 Motorway is within the off-airport construction corridor, north of Elizabeth Drive.

A small portion of the off-airport corridor is located within the footprint of the future M12 Motorway where the project passes over the top of the M12 Motorway on a bridge. Given the construction footprint of the future M12 Motorway may form a barrier to north–south movements during its construction, project construction vehicles would access the off-airport corridor via Luddenham Road from the north and via Elizabeth Drive from the south.

North of Elizabeth Drive, project construction infrastructure and support sites would generally be located to the east of the project corridor to minimise conflict with the M12 Motorway construction footprint, which is located primarily to the west of the project corridor. A small portion of the construction footprint for the future M12 Motorway and the project would overlap around Elizabeth Drive. This includes two new signalised intersections into Western Sydney International, with provision for future connections to potential developments north of Western Sydney International.

It is anticipated that during the construction of the project there would be concurrent construction activities occurring for the future M12 Motorway in this location. Construction activities, including construction traffic management and environmental management requirements in this location would be coordinated as part of ongoing consultation during the delivery of the project. Ongoing consultation with the M12 project team is occurring to manage and coordinate sequencing of construction activities.

8.8.2 Western Sydney International Stage 1 project

Detail regarding the context of the project within and outside of the Western Sydney International Stage 1 project is provided in Chapter 3 (Project location and setting). Construction of the project within the Western Sydney International Stage 1 Construction Impact Zone is likely to begin on a cleared and level site.

Ongoing consultation with Western Sydney Airport has ensured the design of temporary project infrastructure also considers the temporary infrastructure required for construction of the Western Sydney International Stage 1 project. In addition, construction planning for on-airport project elements have taken into consideration the Western Sydney Airport Construction Plan.

Construction activities and infrastructure for the project that would occur outside the Western Sydney International Stage 1 Construction Impact Zone (wholly or partially) would include:

- activities required for viaduct segment and tunnel segment manufacture and storage, located within the airport construction support site
- potential permanent spoil placement
- upgrade at the intersection of Longleys Road and Badgerys Creek Road

- temporary haulage roads
- temporary power supply and other utilities to support construction
- site offices and construction worker car parking, located within the airport construction support site.

See Figure 8-24 for further information.

A number of internal roads are being delivered in this area as part of the Western Sydney International project. Internal vehicle access arrangements for the project have been developed to utilise these roads where possible. Temporary haulage roads for the project would be constructed to connect the Western Sydney International internal roads to construction infrastructure for the project.

Construction planning for the project has considered the initial design of the intersection (roundabout) with Elizabeth Drive and the realigned Badgerys Creek Road and would deliver an additional northbound exit for the intersection to facilitate construction vehicle access to the off-airport construction corridor as well as a separate new access to the west to access the on-airport construction corridor.

There would be continued consultation between Sydney Metro and Western Sydney Airport as part of the ongoing development of the construction approach for the two projects. Opportunities for the construction of the project to integrate with construction activities for Western Sydney International would be developed as the project design and construction planning is refined.

8.8.3 The Northern Road

Transport for NSW has commenced the upgrade of 35 kilometres of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway, Glenmore Park. The Northern Road project, once completed, will run in a north–south direction to the west of the project including immediately adjacent to Western Sydney International. The upgrade is being delivered in six stages. All stages are expected to be operational by 2021, except Stage 5 (Littlefields Road, Luddenham to Glenmore Parkway, Glenmore Park) which is expected to be operational in 2022. Stage 1 between Narellan and Oran Park has been completed. Therefore, concurrent construction with Stage 5 is possible which would include potential shared construction traffic routes.

Ongoing consultation with Transport for NSW is occurring to manage and coordinate sequencing of construction activities.

8.8.4 St Marys Intermodal

Pacific National is proposing the staged construction and operation of an intermodal terminal (road and rail) and container park adjacent to the T1 Western line and to the west of St Marys Station. The facility will facilitate the introduction of a new container rail shuttle service between Port Botany and greater western Sydney, increasing the volume of import and export freight moved via rail.

The project received NSW State significant development approval in May 2020. Construction of the project is expected to be completed during 2021. There is potential for some shared use of traffic routes during construction of the project and also construction and operation of the Intermodal project.

Ongoing consultation with Pacific National is occurring to manage and coordinate sequencing of construction activities.

8.9 Other construction elements

8.9.1 Detailed investigations and subsequent works

Detailed investigations would be required before the start of main construction works. Detailed investigations that would be carried out as enabling works would include:

- site surveys
- utility investigations
- geotechnical investigations including groundwater monitoring

- contamination investigations and subsequent remediation works (if required)
- heritage investigations and subsequent protection, recording and salvage and clearance works (if required).

8.9.2 Demolition works

The project would require the demolition of some buildings and structures, which would be confirmed by the construction contractor(s) when appointed. A summary of the indicative demolition works required for the project is provided in Table 8-4.

Table 8-4 Indicative demolition works

Location	Demolition required
St Marys	Demolition of the Station Plaza site between Station and Phillip streets and the St Marys Bus Layover on Station Street.
Orchard Hills	Demolition of residential structures and all sheds and other structures at properties within the Orchard Hills construction footprint on Kent Road and Lansdowne Road.
Orchard Hills to Badgerys Creek	Demolition of residential structures, sheds and other structures at properties within the off-airport construction corridor as well as the stabling and maintenance facility and Luddenham Road construction sites.
Bringelly	Demolition of ex-Defence force structures within the Aerotropolis Core construction site.

Demolition works would be carried out by licensed contractors. Typically, demolition would involve:

- demolition of the building using an excavator, bobcat, cranes or other conventional methods
- temporary propping and/or waterproofing provided for structural integrity of adjacent structures.

A hazardous materials analysis would be carried out before soft stripping and demolition of the main structures. Hazardous materials would be removed and disposed of in accordance with the relevant legislation, codes of practice and Australian Standards.

Materials such as bricks, tiles, timber, plastics and metals would be sorted where practicable and sent to a waste facility with recycling capabilities.

In addition, a pre-clearing process (including pre-clearing survey for fauna) for biodiversity related impacts and adequate protection for heritage items and Aboriginal heritage test excavation investigations (where required) in the vicinity of project works to prevent inadvertent damage would be undertaken prior to demolition works.

8.9.3 Vegetation clearing

For the purposes of this Environmental Impact Statement it has been assumed that all vegetation within the construction footprint would be removed. This assumption ensures the assessment of impacts to vegetation is representative of a worst case scenario. However, there may be opportunities to retain some vegetation within parts of the construction footprint and this would be confirmed by the construction contractor(s) when appointed. Where the project construction footprint is within the Western Sydney International Stage 1 Construction Impact Zone it is assumed that all vegetation has already been cleared as part of that project.

8.9.4 Spoil

Indicative cut and fill volumes along the alignment are summarised in Table 8-5. The volumes include earthworks required to achieve required ground surface levels for surface (shallow cut and embankment) and in-cutting sections as well as the construction of bored tunnels and the excavation of station boxes.

Table 8-5 Indicative cut and fill volumes

Off-airport location	Cut volume (m ³)	Fill volume (m ³)
St Marys (station and tunnel stubs)	510,000	15,000
Claremont Meadows services facility	85,000	20,000
Orchard Hills (including St Marys to Orchard Hills tunnel)	715,000	25,000
Off-airport construction corridor from Orchard Hills to Patons Lane	240,000	275,000
Stabling and maintenance facility	705,000	1,295,000
Off-airport construction corridor from Patons Lane to Elizabeth Drive	240,000	330,000
Bringelly services facility	80,000	20,000
Aerotropolis Core (station and tunnel stubs)	355,000	65,000
Total off-airport	2,930,000	2,045,000
Balance off-airport	885,000 surplus (m³)	
On-airport location		
Western Sydney International - Elizabeth Drive to Airport Business Park	130,000	75,000
Airport Business Park	25,000	15,000
Airport construction support site	65,000	65,000
Airport Business Park to Aerotropolis Core (including Airport Terminal and Western Sydney International to Bringelly tunnel)	1,065,000	75,000
Total on-airport	1,285,000	230,000
Balance on-airport	1,055,000 surplus	
Total balance (on- and off-airport)	1,940,000 surplus (m³)	

The estimates are based on the assumption that cut material can be used as fill for the project, which may not be the case if unsuitable material is encountered during earthworks. Fill volumes do not include reuse opportunities beyond the project which would reduce surplus volumes. Spoil volumes would be confirmed by the construction contractor(s) when appointed.

An opportunity has been identified to reuse material from the project as fill material for future development at Western Sydney International. Subject to relevant approvals and agreement with Western Sydney Airport, spoil from both on-airport and off-airport could be placed at the permanent spoil placement area. The permanent spoil placement area forms part of the airport construction support site (see Section 8.7.11 and Figure 8-24). Up to 1.9 million cubic metres of spoil could be permanently placed on-airport. The exact location for placement of the spoil would be confirmed during design development in consultation with Western Sydney Airport. The area for the placement of spoil would be outside the Environmental Conservation Zone along Badgerys Creek.

The reuse of spoil at this location would reduce potential impacts that would otherwise be associated with the movement of this spoil to other reuse locations via the public road network. Reuse of spoil within Western Sydney International would be undertaken in accordance with the Airport Plan, Construction (Rail) Plan and any relevant CEMPs.

Other opportunities to reuse spoil would also continue to be investigated as the project design progresses. This could involve the use of spoil as fill material elsewhere within the project footprint such as at the stabling and maintenance facility or possibly by other projects in the area, such as the future M12 Motorway project.

Temporary stockpiling sites would be established as required throughout the construction footprint. Stockpiling sites would be established at the Orchard Hills construction site to stockpile material excavated from the St Marys to Orchard Hills tunnel as well as other sources of excavated material from the project.

Spoil removal from construction sites would be via trucks on the road network. Refer to Chapter 9 (Transport) for details on haulage routes and Chapter 18 (Resource management) for further information regarding spoil management.

8.9.5 Construction hours

The majority of the station fitout and other above ground construction activities would be carried out during standard construction hours, as defined by the *Interim Construction Noise Guideline*:

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturdays
- no work on Sundays or public holidays.

Activities resulting in impulsive or tonal noise emissions would be limited to these hours, except as permitted by an environment protection licence and the planning approval issued by the Minister for Planning and Public Spaces.

Activities that may be carried out outside the standard construction hours include:

- utility works
- tunnelling works and other underground works
- works within an acoustic shed
- tunnel fit-out and associated works
- construction during road and rail possessions
- spoil haulage, deliveries and TBM activities at St Marys, Orchard Hills, Western Sydney International tunnel portal, Airport Terminal and Aerotropolis Core
- spoil haulage associated with placement of material at the permanent spoil placement area within the airport construction support site
- activities at the tunnel and viaduct segment production and storage facility within the airport construction support site, including transport of material to support segment production and segment deliveries
- work determined to comply with the relevant noise management level (NML) at the nearest sensitive receiver
- works on major roads in accordance with a Road Occupancy Licence
- the delivery of oversized materials or materials outside approved hours as required by the NSW Police or other authorities (including Transport for NSW) for safety reasons
- emergency situations where it is required to avoid the loss of lives and property and/or to prevent environmental harm
- testing and commissioning
- situations where agreement is reached with affected receivers.

With the exception of emergencies and subject to the terms of the planning approval and any environment protection licence, activities would not take place outside standard construction hours without prior notification of the affected community and the NSW Environmental Protection Authority as required.

Out-of-hours work

The approach to out-of-hours work would be in accordance with an Out-of-Hours Work Protocol to guide the assessment, management, and approval of works outside the recommended standard construction work hours. The protocol would ensure that out-of-hours works are managed effectively during construction, to reduce incidents and minimise impacts on the community.

The protocol would:

- be consistent with the Sydney Metro Construction Noise and Vibration Standard (Appendix H)
- address the requirements of any environment protection licence for the project
- provide guidance for the preparation of out-of-hours work plans in consultation with key stakeholders and the community
- document procedures to control potential impacts
- identify responsibilities for implementation and management including managing complaints.

In relation to on-airport out-of-hours work, this would be undertaken in accordance with the existing Western Sydney Airport out-of-hours works procedure.

8.9.6 Construction workforce

Overall, the project is anticipated to support around 14,000 jobs. The peak anticipated construction workforce is shown in Figure 8-37. It is estimated that during peak construction activity a workforce of up to around 3,000 people would be required.

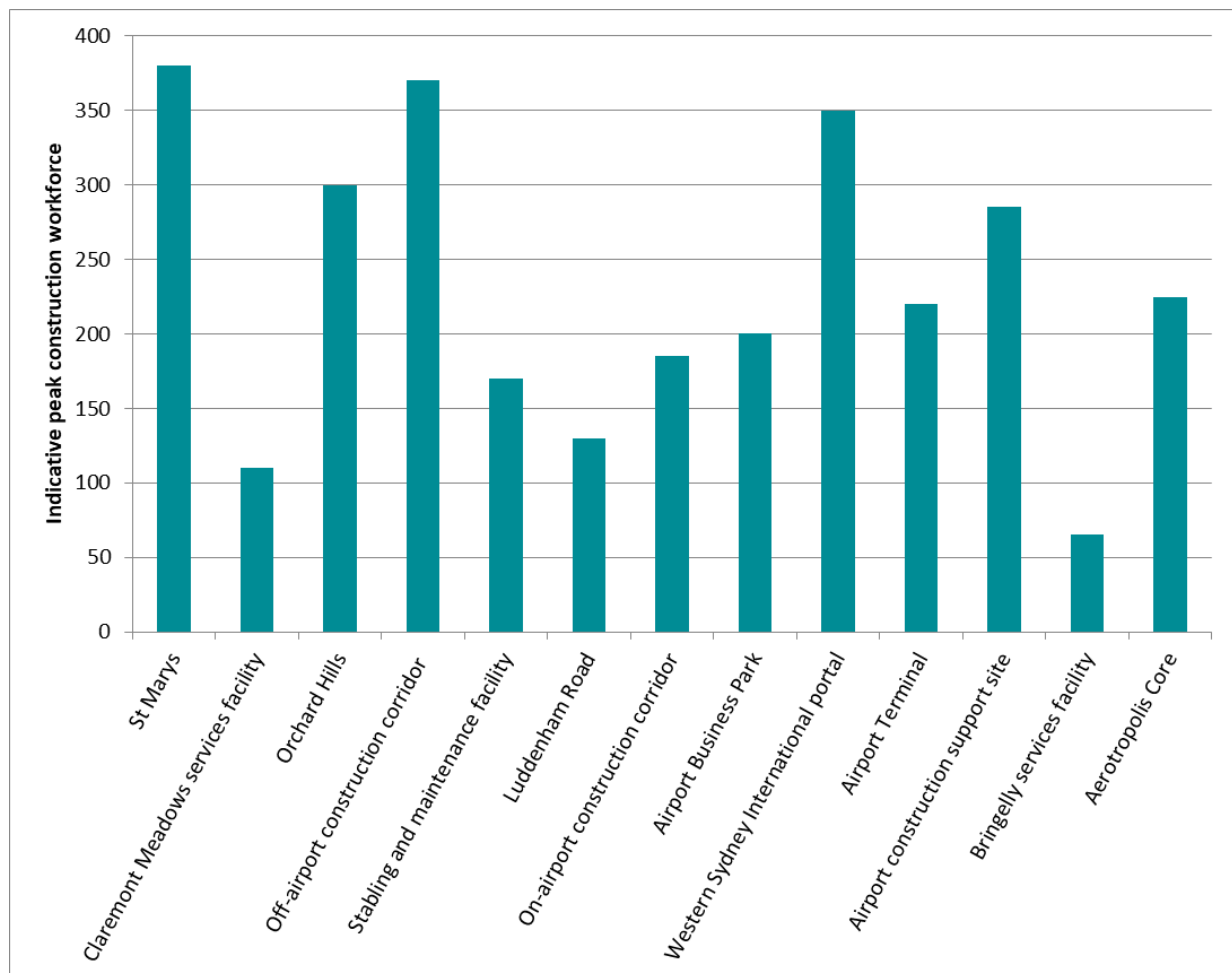


Figure 8-37 Indicative peak construction workforce at each construction site

Sydney Metro has developed a Workforce Development and Industry Participation Plan including an Aboriginal Participation Plan which includes objectives to support jobs and skills for a more diverse and inclusive workforce and supply chain.

8.9.7 Construction traffic and access

Temporary access and egress at construction sites

The proposed indicative access to the construction sites are shown in the site layout figures presented in Section 8.7. The indicative temporary access and egress to construction sites would be subject to confirmation by the construction contractor(s) through the Construction Traffic Management Plans which would be prepared in accordance with the Construction Traffic Management Framework (refer Appendix G (Construction Traffic Management Framework)). Further information relating to construction traffic impacts and mitigation is provided in Chapter 9 (Transport).

Temporary road network adjustments and parking modifications

Temporary road network adjustments would include road modifications and traffic signal works to facilitate the movement of construction vehicles and measures to ensure the ongoing function and safety of existing transport networks. The modifications are subject to further design development and construction planning and would also be reviewed and confirmed by the construction contractor(s) during the preparation of Construction Traffic Management Plans, with the objective of minimising disruptions to the road network. Construction Traffic Management Plans would be prepared in accordance with the Construction Traffic Management Framework (refer Appendix G (Construction Traffic Management Framework)).

All temporary road network and parking modifications would be carried out to ensure access to private property is maintained, where possible.

Given the proposed infrastructure required to support the Western Parkland City, other transport network adjustments may be undertaken by other agencies such as Transport for NSW (subject to separate assessment and approvals) within the project area that would support the delivery of the project.

Measures to manage potential traffic impacts associated with temporary network and parking modifications are described in Chapter 9 (Transport).

Table 8-6 Indicative road network adjustments and parking modifications

Location	Indicative road network adjustments and parking modifications
Off-airport	
St Marys	<ul style="list-style-type: none"> • minor temporary localised modifications to Harris Street to facilitate access for construction vehicles entering and exiting the Harris Street construction site • temporary closure of Station Street from around the eastern side of the Station Plaza site in the east and East Lane in the west. A one-way arrangement would be introduced to provide access for local through traffic (including for residents) westbound from Lethbridge Street along Station Street and southbound to Phillip Street via the eastern boundary of the construction site • temporary modifications to Phillip Street to facilitate egress for construction vehicles opposite Blair Avenue • adjustments to kerb and gutter, line marking and street furniture at Queen Street, West Lane, Nariel Street, Carinya Avenue and Belar Street for the temporary adjustment/relocation of bus services (routes and stops) • permanent removal of the at-grade commuter car park on Harris Street (around 130 to 140 car park spaces). This car park would be retained during the start of construction and would be permanently closed when the extension of the existing multi-deck commuter car park (subject to separate approval) is completed • retention of a point-to-point (including taxi) vehicle facility near the existing Station Plaza during construction. Depending on location, it is expected that

Location	Indicative road network adjustments and parking modifications
	<p>these spaces would be accessed via East Lane and / or Queen Street and the point-to-point services would exit towards Queen Street during construction</p> <ul style="list-style-type: none"> • temporary removal of on-street car parking on Lethbridge Street (around 16 car park spaces) • temporary removal of on-street car parking on Nariel Street (around 17 car park spaces), Carinya Avenue (around six car park spaces), West Lane (around 18 car park spaces), Belar Street (around 30 car park spaces) and Phillip Street (around 27 car park spaces) to facilitate the relocation of the temporary bus interchange to Nariel Street • permanent removal of all on-street car parking on Station Street (around 41 car park spaces) • permanent removal of around 130 to 140 car park spaces within the Station Street car park, with the potential to retain 20 to 30 car park spaces for the purposes of public parking access to the employment centres on Phillip Street, subject to ongoing consultation. The Station Street car park is also subject to ongoing investigation for use as the temporary bus interchange, subject to consultation with council and relevant stakeholders • permanent removal of on-street parking on Nariel Street (around 10 car park spaces). <p>Changes to the road network and parking at St Marys are shown on Figure 8-38.</p> <p>At St Marys, works to extend the existing multi-deck commuter car park are proposed (subject to separate approval) and would be completed prior to the occupation of the at-grade commuter car park on Harris Street for the purposes of construction of the project. Commuter parking spaces removed by the project during construction would be accommodated nearby in conjunction with the extension of the multi-deck commuter car park.</p> <p>Some construction vehicles may need to temporarily use Lethbridge Street to access Phillip Street until heavy vehicle routes have been established within the construction footprint.</p>
Claremont Meadows construction power route	<ul style="list-style-type: none"> • trenching works for the construction power connection (see Section 8.9.10), may result in short term (around four weeks) lane reduction/closure or temporary road closures and local diversions of: <ul style="list-style-type: none"> - Sunflower Drive - Gagoor Close - Nullaga Way - Pearra Way - Geewan Place - Myrtle Road - San Diego Street - Gipps Street - intersection of Gipps Street and Sunflower Drive/Fowler Street/Caddens Road - Kent Road. • construction of slip lanes on the southbound carriageway of Kent Road to facilitate access to the area between Caddens Road and the M4 Western Motorway for underboring work for the construction power connection.
Orchard Hills	<ul style="list-style-type: none"> • upgrade and widening of Kent Road between the M4 Western Motorway and Lansdowne Road • upgrade of the Kent Road/Lansdowne Road intersection to allow for heavy vehicle movements • temporary diversion of Lansdowne Road for the construction of the road over rail bridge.

Location	Indicative road network adjustments and parking modifications
Permanent power supply route	<ul style="list-style-type: none"> trenching works for the permanent power connection, may result in short term (around four weeks) traffic changes on: <ul style="list-style-type: none"> John Morphet Place Lenore Drive Erskine Park Road Mamre Road Mandalong Close Patons Lane.
Off-airport construction corridor	<ul style="list-style-type: none"> upgrade and implementation of temporary one-way traffic control and diversions of Patons Lane to maintain access to the nearby waste management facility while utilising this road for construction site access localised upgrades of the intersection of Luddenham Road and Patons Lane at Orchard Hills to support access to the construction corridor construction of a new northbound exit for the Elizabeth Drive/Badgerys Creek Road intersection (roundabout or other agreed treatment). Construction planning for the project has considered the initial design of the intersection and would deliver an additional northbound exit for the intersection to facilitate construction vehicle access to the off-airport construction corridor implementation of temporary traffic control during construction of a viaduct over Luddenham Road.
Luddenham Road	<ul style="list-style-type: none"> localised upgrade of Luddenham Road to support provision of construction access and subsequent permanent access arrangements into the Luddenham Road Station precinct (two locations).
Kemps Creek construction power route	<ul style="list-style-type: none"> trenching works for the construction power connection, would result in short term (around four weeks) lane reduction/closure or temporary road closure and local diversion of: <ul style="list-style-type: none"> Cross Street Western Road Martin Road Cuthel Road Lawson Road Pitt Street.
Bringelly services facility	<ul style="list-style-type: none"> upgrade of Derwent Road including provision of turning lanes to provide access to the services facility.
Aerotropolis Core	<ul style="list-style-type: none"> upgrade of Badgerys Creek Road south of Western Sydney International including provision of turning lanes to provide access to the construction site.
On-airport	
On-airport construction corridor	<ul style="list-style-type: none"> minor modification to a Western Sydney International internal access road to connect to temporary haulage roads.
Airport construction support site	<ul style="list-style-type: none"> upgrade to sections of Longleys Road and Badgerys Creek Road, including intersection works where Longleys Road and Badgerys Creek Road intersect to provide heavy vehicle access an additional haulage route accessing the potential permanent spoil placement area from Badgerys Creek Road is subject to further design development and is being considered to minimise spoil haulage distances and to reduce the number of heavy vehicles accessing the on-airport haulage roads from the intersection of Badgerys Creek Road and Longleys Road.



Changes to the existing public transport network

Changes to the existing public transport network during the construction of the project would be limited to changes around the existing St Marys Station with safe and controlled access to be maintained during construction. There would be no changes to infrastructure supporting the existing public transport network at other locations.

The existing bus interchange and layover at Station Street would be decommissioned and temporarily relocated to Nariel Street, subject to consultation with relevant stakeholders. Relocation works would be completed prior to the decommissioning of the existing interchange to ensure disruption to bus services is minimised. The indicative temporary bus layover and bus routes are shown in Figure 8-38. The option of relocating the temporary bus interchange to Station Street/East Lane is subject to further investigation in consultation with relevant stakeholders.

As part of the precinct works at St Marys, a reconfigured bus interchange and layover area would be provided. Following the completion of the precinct works, the temporary interchange at Nariel Street would be decommissioned, with new kiss-and-ride and point to point facilities located on the northern side of Nariel Street.

Some construction activities within the rail corridor would require track possessions where train services are temporarily not provided. Track possessions would generally occur over the weekend and at night and replacement services (i.e. buses) would be provided for rail customers. Other works within the rail corridor would generally be carried out during standard construction hours and would not disrupt existing rail services.

Access to the existing kiss-and-ride on Queen Street south of St Marys Station and Forrester Road to the north may be temporarily disrupted, but would be retained during construction.

Changes to the public transport network would be reviewed and confirmed by the construction contractor(s) through the preparation of Construction Traffic Management Plans, with the objective of minimising disruptions to public transport services.

Changes to pedestrian and cycling infrastructure

Proposed changes to existing pedestrian and cycling infrastructure is primarily limited to the following locations:

- St Marys
- in the vicinity of the Claremont Meadows construction power route in Orchard Hills
- in the vicinity of the permanent bulk power supply route at Erskine Park.

Modifications to pedestrian and cycling infrastructure for these sites are outlined in Table 8-7. The modifications would be reviewed and confirmed during the preparation of Construction Traffic Management Plans, with the objective of minimising disruptions to the pedestrian and cycling network.

Table 8-7 Indicative modifications to pedestrian and cycling infrastructure

Location	Indicative temporary modifications
Off-airport	
St Marys	<ul style="list-style-type: none"> • existing footpath on Harris Street would be temporarily affected by the movement of construction vehicles into the proposed construction site access point. Pedestrian access would be maintained through local traffic controls • pedestrian access to Station Street would be temporarily blocked during construction. Pedestrian access to St Marys Station would be maintained through diversions via Queen Street • pedestrian access to residential properties on Station Street would be maintained through local traffic controls.

Location	Indicative temporary modifications
Claremont Meadows construction power route	<ul style="list-style-type: none"> temporary local pedestrian diversions may be required within the residential area west of Gipps Street temporary local pedestrian and cyclist diversions may be required for the shared pathway and the footpath located to the west and east of Gipps Street/Kent Road respectively.
Permanent bulk power supply route	<ul style="list-style-type: none"> temporary local pedestrian and cyclist diversions may be required for the shared pathways to the south of Erskine Park Road.

8.9.8 Construction water management

Treated water discharge

The excavation of the tunnels, stations and shafts is likely to intercept groundwater, resulting in the need to capture, treat and reuse or discharge water. Treated water would be recirculated to the tunnel cutting face and used for surface dust suppression.

Treated water that could not be recirculated would be discharged from the sites via construction water treatment plants (refer to Table 8-8). The reuse of treated water would be maximised during the construction works. Where surplus treated water needs to be discharged from the sites, subject to the relevant performance outcomes in Chapter 27 (Synthesis), it may be discharged to the local stormwater system or to a surrounding local watercourse. Other reuse options including Sydney Water trade waste agreement(s) and use of treated water at Western Sydney International or other nearby projects (such as the future M12 Motorway) would be investigated during construction planning.

Table 8-8 Treated water discharge from construction water treatment plants

Location	Discharge point	Indicative discharge volume (litres per second)
Off-airport		
St Marys	Existing stormwater system	10
Claremont Meadows services facility	Existing stormwater system	10
Orchard Hills	South Creek via existing M4 Motorway drainage infrastructure	10
	Existing stormwater system	10
Bringelly services facility	Unnamed drainage line	2
Aerotropolis Core	Thompsons Creek	10
On-airport		
Western Sydney International tunnel portal	Badgerys Creek via Western Sydney International swale	10
Airport Terminal	Badgerys Creek via Western Sydney International swale	10

At Aerotropolis Core, treated water surplus to reuse requirements would be discharged to Thompsons Creek. A connection would be required to transfer treated water from the water treatment plant to Thompsons Creek. The location of the connection and discharge point would be identified during design development and be subject to the performance criteria identified in Section 8.11.

The potential water treatment regime, likely discharge quantity and quality, and other relevant performance outcomes, are provided in Chapter 14 (Flooding, hydrology and water quality).

Surface water management

Surface water management at the construction sites would be managed through the implementation of standard erosion and sediment control mitigation measures in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008). Further details regarding surface water quality management are provided in Chapter 14 (Flooding, hydrology and water quality).

Within Western Sydney International, construction water would be pumped to water quality basins, treated and then reused or discharged via constructed swales to Badgerys Creek or left to evaporate in the surrounding landscape.

Details regarding water use during construction are provided in Table 8-10. Opportunities would be considered to maximise the reuse of construction water (refer to Chapter 17 (Sustainability, climate change and greenhouse gas) for further information).

8.9.9 Construction equipment, resources and materials

Plant and equipment

The indicative plant and equipment expected to be used during construction of the project is summarised in Figure 8-39. The actual plant and equipment used at each work site would be confirmed by the construction contractor(s).

Location	Bulldozer	Compressor	Concrete pump	Concrete truck	Roadheader	Concrete saw	Crusher	Excavator	Generator	Gantry crane	Hand tools	Jackhammer	Mobile crane	Pile boring rig	TBM	Vibratory roller	Viaduct segment gantry	Water cart
Off-airport																		
St Marys	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Claremont Meadows services facility		✓	✓	✓	✓	✓		✓	✓		✓	✓	✓		✓	✓		
Orchard Hills	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Off-airport construction corridor	✓	✓	✓	✓		✓		✓	✓		✓	✓		✓		✓	✓	✓
Stabling and maintenance facility	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓			✓		✓
Luddenham Road	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Bringelly services facility	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓		✓	✓	✓		✓
Aerotropolis Core	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
On-airport																		
On-airport construction corridor	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓		✓		✓		✓
Airport Business Park	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		✓		✓
Western Sydney International tunnel portal site	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Airport Terminal	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Airport construction support site	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓			✓		✓

Figure 8-39 Plant and equipment at proposed construction sites

Raw materials

Indicative quantities of major raw materials required are provided in Table 8-9. Efficiencies in material use, management and transport would continue to be investigated during design development and construction planning stages.

Table 8-9 Estimated quantities of major raw materials

Material	Estimated quantity
Diesel	63,000 kilolitres
Concrete	520,000 cubic metres
Precast concrete (including segments)	75,000 tonnes
Cement grout	70,000 tonnes
Epoxy (waterproof) grout	10 kilolitres

Material	Estimated quantity
Rail steel	5,700 tonnes
Reinforcing steel	125,000 tonnes
Galvanised steel	9,000 tonnes
Structural steel	12,000 tonnes
Aluminium	650 tonnes
Asphalt	65,000 tonnes
Sand and aggregates	250,000 tonnes
Ballast	71,000 tonnes
Electrical cables	1,400 tonnes
Structural fill	875,000 tonnes

Water requirements

Table 8-10 outlines estimated water use for the construction of the project.

Table 8-10 Estimated water use for the construction of the project

Activity	Quantity (kilolitres)	Water source
Earthworks	38,400	Recycled
Concreting	17,800	Recycled subject to meeting Australian Standard AS1379
Tunnelling	223,100	Potable
Site facilities	34,200	Potable
Wheel washes	5,200	Recycled
Hot works	3,600	Recycled
Dust suppression	35,700	Recycled
Landscaping	165,700	Recycled
Total	523,700	

Water would be sourced from water treatment plants, sedimentation basins and rainwater tanks where feasible. Opportunities for Sydney Water to provide a recycled water connection to the project are currently being investigated. Construction water management is further discussed in Section 8.9.8.

8.9.10 Power supply

Temporary construction power supply

High voltage power supply would be required to provide traction power supply and support tunnelling activities at the Orchard Hills construction site and Western Sydney International tunnel portal construction site. It is anticipated that around 520,000 megawatt hours would be required during the construction of the project. The following sections describe the power supply required for the construction of the project.

Indicative Claremont Meadows construction power route

High voltage construction power would be provided to the Orchard Hills construction site to support tunnelling activities via a new connection from the existing Claremont Meadows substation at Nullaga Way which is located north of the M4 Western Motorway. The indicative construction power route is shown in Figure 8-40, noting the exact route would be confirmed during design development in consultation with the relevant utility provider. Trenching works would be carried out within the road reserve.

An area on the eastern side of Kent Road, between Caddens Road and just north of the M4 Western Motorway, would be used to stage works for the power connection to cross the M4 Western Motorway and extend into the Orchard Hills construction site using a horizontal direction drill. Areas for a small site office, worker amenities and light and heavy vehicle parking would be also established in this location. The work would be carried out over a period of around six months, commencing in late 2021.

Indicative Kemps Creek construction power route

High voltage construction power would be provided to the Western Sydney International tunnel portal site to support tunnelling activities via a new connection from the existing Kemps Creek substation located to the east at Devonshire Road, Kemps Creek. The indicative Kemps Creek construction power route is shown in Figure 8-41, noting the exact route would be confirmed during design development in consultation with the relevant utility provider.

Trenching works would generally be carried out within the road reserve and existing power distribution easements. Trenching works may be required in some areas of private property. Where the power route crosses South Creek and Badgerys Creek, horizontal directional drilling may be required to avoid surface impacts to riparian vegetation.

Within the airport site, the indicative construction power route generally follows internal roads or temporary haulage roads for the project.

The work would be carried out over a period of around four months, commencing in late 2021.

Construction power for other construction sites

Construction power at other construction sites would be supplied from local low voltage sources or diesel generators. Generators may be required at construction sites before the mains power supply becoming available. Each generator is likely to be around 1,000 kVA. At the St Marys construction site, construction power may be sourced from an existing substation located on the corner of Harris Street and Glossop Street.

Permanent bulk power supply

Traction power supply for the project would be provided from a new bulk power supply point at the stabling and maintenance facility and then through dedicated traction substations and supporting feeder line cables along the alignment. The proposed traction substations would be co-located with other infrastructure (such as at each station) wherever possible.

The bulk power supply point at the stabling and maintenance facility would be via a new connection to the existing substation located off Lenore Drive, Erskine Park (see Section 7.5.4). Trenching works would be carried out along the route, primarily within the road reserve but may also be required in some areas of private property. Where the power route crosses South Creek, horizontal directional drilling would be carried out to install the cable underground and avoid surface impacts to riparian vegetation.

Construction of substations would generally involve:

- enabling works
- earthworks to provide a level site
- piling works and site excavation for in-ground services including:
 - use of piling rigs to construct piles required for ground slab
 - excavation of building and bund yard areas for construction of in-ground pits and conduits
 - excavation for oil/water separator tank and related services
- preparation of concrete slab in the location of the substation or services building
- fitout, including connection to the electrical network and overhead wiring structures
- finishing, testing and commissioning.

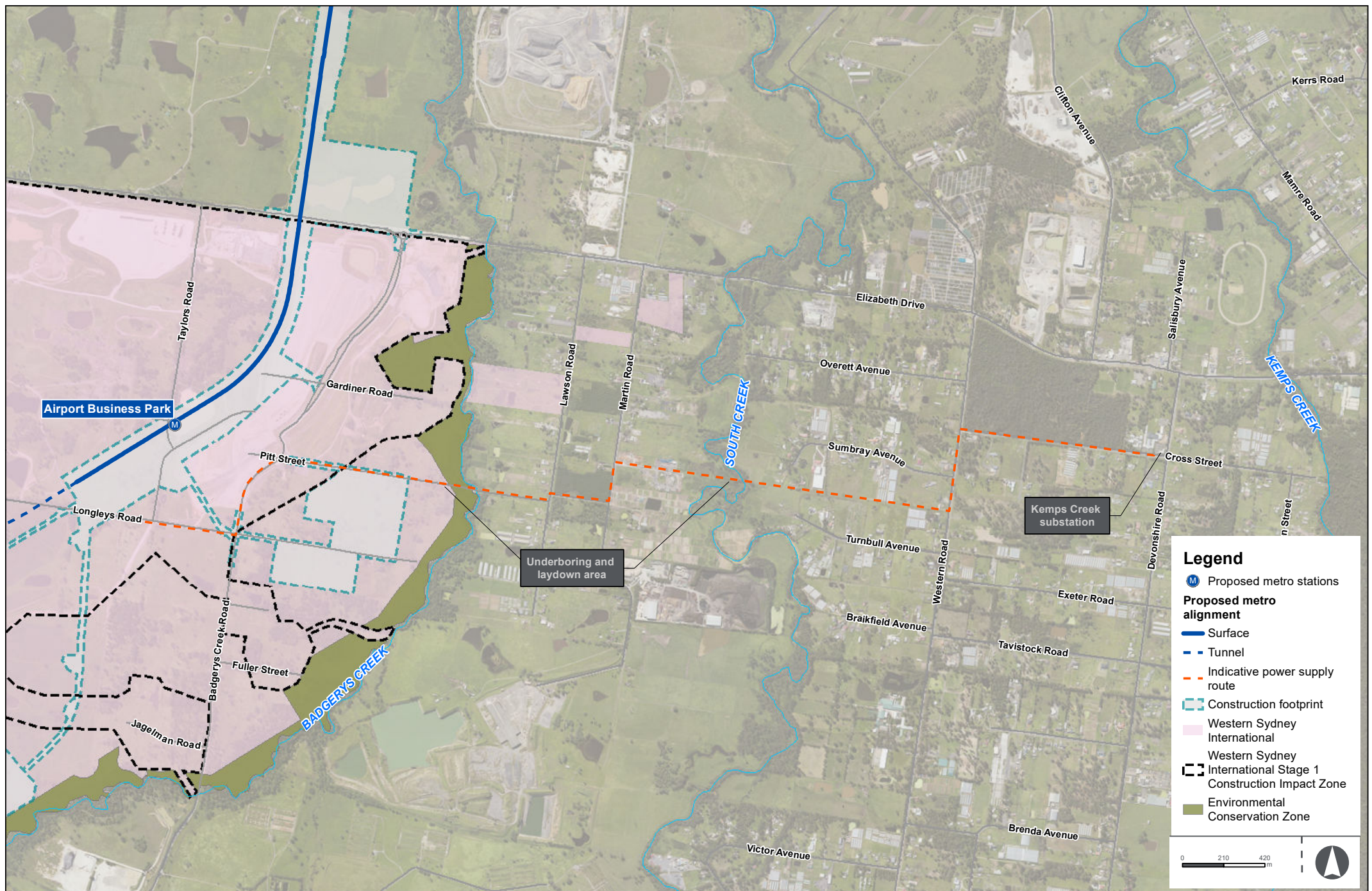
Buildings would either be prefabricated off-site and delivered and installed on a concrete slab or constructed on-site using prefabricated segments.



Indicative Claremont Meadows construction power route

Figure 8-40

Indicative only, subject to design development



Given the proposed infrastructure required to support the Western Parkland City, provision of other power supplies may be undertaken within the project area (subject to separate assessment and approvals) that would support the delivery of the project. These works may affect the need or scope of the proposed temporary construction power supply or permanent bulk power supply identified in this section.

8.9.11 Utility protection, adjustment and relocation

There are a number of active and disused utilities within the project footprint. Utilities that are located both above ground and below ground have the potential to be affected by construction of the project.

The locations of utilities have been identified based on Dial Before You Dig searches and a review of utility data, including as-built surveys, and agency and council records. The following utility providers and other agencies are known to have assets within the project footprint:

- Sydney Water (water supply, sewerage and stormwater infrastructure)
- Endeavour Energy (power and communications)
- TransGrid (power and communications)
- Penrith City Council and Liverpool City Council (stormwater infrastructure)
- Sydney Trains (power and communications)
- Jemena (gas supply infrastructure)
- Telstra, Optus and other communications providers (communications)
- Western Sydney International (power, communications and stormwater infrastructure)
- WaterNSW (Warragamba to Prospect Water Supply Pipelines)
- Transport for NSW (traffic signal infrastructure).

Sydney Metro would consult with local councils and utility providers to determine their requirements and identify any opportunities to support future initiatives or utility augmentations.

Table 8-11 provides a preliminary list of major utilities that could be affected by construction and may require protection and/or relocation. The list is indicative only and subject to design refinement, site investigations and detailed assessment in consultation with asset owners. Access would be provided to utility assets within or adjacent to the construction footprint when required during construction.

Table 8-11 Known major utility protection works

Location	Potentially affected major utility	Utility owner(s)	Work required
M4 Western Motorway	Trunk sewer and water supply infrastructure	Sydney Water	Protection
Orchard Hills	High voltage (330 kV and 500 kV) overhead power lines south of Lansdowne Road and south of Patons Lane	TransGrid	Protection
Orchard Hills	Warragamba to Prospect Water Supply Pipelines	WaterNSW	Protection

Where an existing utility conflicts with the project, it may be necessary to:

- provide physical protection for the utility, where the utility is not directly affected but may be indirectly affected by vibration or accidental impact. Protection could include constructing a piled wall between the excavation and the utility, plating over the utility to minimise the impact of construction traffic, or marking out or fencing off the location of a utility to avoid it being accidentally damaged
- modify construction methods to avoid impacting a nearby utility. This could involve using smaller plant and equipment, hand excavation and compaction tools such as hand digging tools, a vibration plate or pedestrian rollers where compacting within a specified distance of utilities

- divert the utility around the construction footprint.

A utilities coordination manager would be appointed for the project to coordinate the delivery of the utility works. Utility works do not include investigative works (such as surveying or pot-holing of utility assets) to gather information to inform design and construction methodologies.

The utilities coordination manager would:

- establish a utility working group with nominated representatives from utility service providers that may be impacted by the project
- review design and construction methodologies to assist with identifying potentially impacted utility assets
- assist with the coordination of design and construction methodology reviews by utility services providers to identify necessary utility works
- communicate with the working group and construction contractors' delivery teams to understand the proposed program of works to coordinate intercepting, interconnecting and interrelated works and manage priorities as they may arise
- observe utility works, where relevant
- manage escalation of utility work-related issues within Sydney Metro and the utility service providers as required. This may also include coordination with other projects such as the future M12 Motorway and Western Sydney International.

Respite for potentially affected sensitive receivers would be considered throughout the coordination and management of the utility works in accordance with Appendix H (Construction Noise and Vibration Standard) and Appendix C (Overarching Community Communications Strategy).

Provision of respite will consider many factors, including but not limited to, the predicted noise level, construction duration, time of day, surrounding land uses and community feedback. The utilities coordination manager will endeavour to coordinate works to avoid the same receiver being affected over consecutive nights by more than one contractor as much as possible. Furthermore, the utilities coordination manager will endeavour to stagger the timing of works by different contractors that affect the same receiver as much as possible in order to maximise the respite period between the works.

8.10 Finishing works and testing and commissioning

8.10.1 Finishing works

Following the completion of the construction works, the contractor would remove construction equipment from the construction sites. Where relevant, sites that were used for construction but do not form part of the operational project footprint would be stabilised and/or rehabilitated.

Site stabilisation and rehabilitation would be carried out progressively during the works, and would include the following activities:

- demobilise construction sites and facilities
- remove materials, waste and redundant structures from the works sites
- forming and stabilising of spoil mounds
- decommission temporary work site signs
- remove temporary fencing
- establish permanent fencing
- decommission temporary haulage roads that are no longer required
- restoration of disturbed areas as required, including revegetation where required.

Landscaping and finishing works would be carried out at permanent operational sites. Landscaping works would generally involve:

- earthworks
- soil improvement and topsoil dressing
- drainage works
- irrigation systems
- planting vegetation and laying turf.

8.10.2 Testing and commissioning

Testing and commissioning would be carried out to ensure that all systems and infrastructure have been installed and are operating according to Sydney Metro's operational requirements.

Once all services are installed, testing and commissioning of the whole system would occur in three stages:

- collection of safety and quality assurance documentation and commissioning of readiness checks
- installation and operation tests and checks
- final inspection, site acceptance tests, commissioning and validation of individual systems.

During the final stages of commissioning, test trains would run on the line to test the signalling system and the traction power supply.

8.11 Approach to identifying and selecting additional construction related elements of the project

While every endeavour has been made to identify and quantify the likely land requirements for construction, the construction contractor may require changes to elements of construction. As such performance criteria have been established to manage the approach to identifying and selecting additional construction related elements of the project, as described in the following sections.

8.11.1 Construction sites

Additional or alternative locations for construction sites would be determined on their ability to meet the performance outcomes for the project (refer to Chapter 27 (Synthesis)) and the following performance criteria:

- be located more than 50 metres from a waterway, unless an erosion and sediment control plan is developed and implemented
- have ready and safe access to the road network
- be located to minimise the need for heavy vehicles to travel on local streets and/or through residential areas
- be located on relatively level land
- be separated from the nearest residences by at least 200 metres, unless reasonable and feasible noise and light spill mitigation measures are implemented
- not require native vegetation clearing beyond that already required for the project or impact any vegetation within non-certified land within the South West Growth Area
- have no greater impact on heritage items beyond those already assessed for the project
- not unreasonably affect the land use of adjacent properties
- be above the five per cent annual exceedance probability flood level, unless a contingency plan to manage flooding is prepared and implemented

- provide sufficient space for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard daytime construction hours.

Consultation would be undertaken with affected landowners (including councils) in relation to any additional land requirements.

8.11.2 Western Sydney International

Additional or revised construction haulage routes and refinements to the construction sites and permanent spoil placement area within Western Sydney International may be required during design development and construction planning, subject to agreement with Western Sydney Airport. Changes to, or the introduction of additional haulage routes and sites would be subject to the following performance criteria:

- the works have no direct impact on heritage items (including areas of archaeological sensitivity), threatened species, populations or ecological communities or the Western Sydney International Environmental Conservation Zone
- the works can be carried out and managed consistent with the specific mitigation measures and performance outcomes described in Chapter 27 (Synthesis) or as revised.

If the works are not consistent with the performance criteria described above, the works would be managed through construction planning and consultation with Western Sydney Airport.

8.11.3 Surface water discharge to Thompsons Creek

At Aerotropolis Core, treated water surplus to reuse requirements during construction would be discharged to Thompsons Creek. The location of the connection and discharge point would be identified during design development and be subject to the following performance criteria:

- no removal of vegetation within the riparian zone areas adjacent to Thompsons Creek or outside the boundary of certified areas identified in the strategic assessment and conservation planning undertaken for the South West Growth Area (see Figure 11-1)
- the works must be consistent with the specific mitigation measures and performance outcomes described in Chapter 27 (Synthesis) or as revised.

The potential water treatment regime, likely discharge quantity and quality, and other relevant performance outcomes are provided in Chapter 14 (Flooding, hydrology and water quality).

8.11.4 Water quality and detention basins

Construction stormwater detention basins and water quality basins would be located within the construction footprint as required. The basins would discharge treated water into nearby local watercourses subject to the relevant performance outcomes in Chapter 27 (Synthesis) or as revised.

8.11.5 Utilities

During design development it may be identified that additional utility works are required outside of the construction footprint for the project. Such utility works would be delivered for the project provided the works are consistent with the following performance criteria:

- the works connect to the construction footprint or to a point adjacent to the construction footprint
- the works have no direct impact on heritage items (including areas of archaeological sensitivity), threatened species, populations or ecological communities beyond the impacts assessed in the Environmental Impact Statement
- the works can be carried out and managed consistent with the performance outcomes identified in Chapter 27 (Synthesis) or as revised.

If the works are not consistent with the performance criteria, the works may require further assessment.

8.12 Related development excluded from this Environmental Impact Statement

The following are related development that are not part of the State significant infrastructure, are excluded from this Environmental Impact Statement and are subject to separate assessment and planning approvals:

- relocation of high voltage power and demolition of incident management centre within rail corridor at St Marys to be undertaken by Sydney Trains
- addition of two levels of commuter car parking at St Marys multi-storey commuter car park to be undertaken by Transport for NSW
- intersection upgrade work at intersection of Gipps Street and Sunflower Drive (north), Claremont Meadows to be undertaken by Transport for NSW
- works to allow permanent access to the rail corridor in St Marys on Glossop Street, St Marys to be undertaken by Transport for NSW
- utility infrastructure (such as road, water, power or other utilities) that may be provided to support the broader Western Parkland City and could be used by the project for construction or operational purposes.