



Artist's impression: Aerial perspective view north-east over Airport Interchange (landscape shown at full maturity and is indicative only).



# 5 BRIDGES AND WALLS

Bridges and wall structures are a key visual element and prominent markers for road users, pedestrians and cyclists as they move along the corridor and are often the most visible and enduring legacy of road projects. The design has been undertaken in consideration of all other elements to provide a cohesive and unified outcome with refined and elegant structural designs.

## PRINCIPLES FOR BRIDGES

The design of bridges throughout the Project integrate the following design principles:

- ◇ Bridges must include a high standard of bridge architecture. The design of these structures must carefully consider their forms, spans, profile, finishes and pier rhythm in conjunction with well-coordinated detailing
- ◇ Bridges should be visually unobtrusive allowing the landscape and environmental attributes of the area to be fully appreciated by road users
- ◇ Bridges must have clean lines and incorporate piers and abutments sympathetic to the structural form. All piers must be architectural profiled and shaped
- ◇ Structures should be simple, refined and elegant with minimal piers and abutments to maximise usability, permeability and visual transparency
- ◇ Bridge elements to be elevated through lighting, interpretation and integrated art
- ◇ The bridge designs wherever possible “float” above the landscape rather than being grounded on a large vertical abutment
- ◇ Bridges must use robust and durable elements that are easily maintainable.

## PRINCIPLES FOR RETAINING WALLS

The design principles for the design of the retaining walls along the Project are as follows:

- ◇ Retaining walls must be designed as a simple, robust and integrated element
- ◇ Walls must be neutral in colour with non-reflective finishes
- ◇ Wall tops are to form continuous smooth flowing lines with no stepping
- ◇ Wall plan layouts are simple, with straight or large radius curved alignments, without sharp changes of direction
- ◇ All cut and fill batters and retaining structures at bridges and underpasses must be fully integrated into the adjacent landform
- ◇ The appearance of concrete retaining structures associated with noise walls is to have a strong vertical emphasis
- ◇ Fixings for retaining structures must be concealed, or expressed as part of the structure’s design if concealment cannot be achieved.



Examples of bridge and wall precedent examples relevant to the M12 Motorway

## 5.1 BRIDGE LOCATIONS

Across the corridor, bridges are located at the following noted in the table and shown in the following diagram:

Table 5. Bridge locations

No.	Bridge	Typology	Art
<b>BR01</b>	Bridge over Luddenham Road	Local road overbridge	Yes
<b>BR02</b>	Bridge over Cosgroves Creek	Creek bridge	No
<b>BR04A</b>	Bridge over AAR on Elizabeth Drive	Gateway bridge	Yes
<b>BR04B</b>	Bridge over Sydney Metro on Elizabeth Drive	Gateway bridge	No
<b>BR04C</b>	Bridge over WSA Channel on NB Off Ramp	Gateway bridge	No
<b>BR04D</b>	Bridge over WSA Channel on SB On Ramp	Gateway bridge	No
<b>BR05</b>	Twin bridge over Badgerys Creek	Creek bridge	No
<b>BR06</b>	Twin bridges over South Creek	Creek bridge	No
<b>BR07</b>	Bridge over M12 on Clifton Avenue	Bridge over M12 mainline	Yes
<b>BR08</b>	Twin bridges over Kemps Creek	Creek bridge	No
<b>BR09</b>	Twin bridges over Elizabeth Drive	Local road overbridge	Yes
<b>BR10</b>	Twin bridges over Range Road	Local road overbridge	No
<b>BR11</b>	Bridge over M12 on Water Tower Access Rd	Bridge over M12 mainline	Yes

No.	Bridge	Typology	Art
<b>BR12</b>	Twin Bridges over WB Elizabeth Drive entry ramp	M12/M7 Interchange	No
<b>BR13</b>	Bridge over Elizabeth Drive to the M7 NB	M12/M7 Interchange	No
<b>BR14</b>	M7 Motorway SB to M12 Motorway WB	M12/M7 Interchange	No
<b>BR15</b>	M12 Motorway EB to M7 Motorway SB	M12/M7 Interchange	No
<b>BR16</b>	Shared user path bridge over the M7	Shared path bridge	No
<b>BR17</b>	Bridge over road reserve M7 SB entry ramp	M12/M7 Interchange	No
<b>BR18</b>	Bridge over road reserve M7 NB exit ramp	M12/M7 Interchange	No
<b>BR20</b>	Sydney Metro - Western Sydney International Airport Bridge over M12	Metro bridge	No
<b>BR21</b>	Viaduct on EB Exit Ramp over M12 and EB Entry and WB Exit Ramps	Gateway bridge	No
<b>BR22</b>	Bridge on EB Entry Ramp over M12	Bridge over M12 mainline	Yes
<b>BR24</b>	Bridge on Westbound Entry Ramp over Eastbound Entry Ramp	Bridge over M12 mainline	No



Figure 34. Bridge locations across the project





Artist's impression: View south from Airport access road to Elizabeth Drive Interchange and entrance to WSIA precinct (landscape shown at full maturity and is indicative only).



## 5.2 BRIDGE ELEMENTS

Across the Project, there are differing combinations of bridge elements to suit a variety of conditions or requirements. The urban design intent for bridges has sought to achieve a refined approach that minimises the variance in structural form and systems and to avoid any superfluous and unnecessary embellishment.

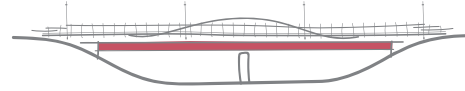
Several considerations are made when selecting the elements that make up each of the bridges on the project. Bridge aesthetics are a function of the superstructure, substructure, abutments and also the kit of parts that make up the bridge furniture. The form of all bridges have been chosen and developed to be as cohesive as possible and integrated into the family of bridges, both from an aesthetic and structural perspective.

The intent of the M12 Motorway bridge designs is to display consistency with variety, to achieve a family resemblance with their common components such as abutments, blade type piers, continuous parapets and full length safety screens.

The number of bridges throughout the project means that road furniture and road edge conditions are constantly changing. To provide a consistent and cohesive experience for motorists, a family of elements has been developed that extend across all areas of the network, establishing the Project as a unique and memorable gateway experience for all.

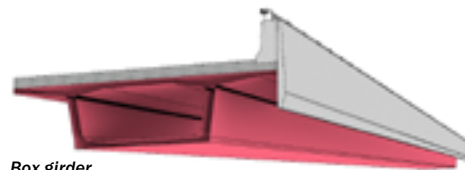
The following section provides details the following bridge elements:

- ◇ Girders
- ◇ Abutments
- ◇ Parapets
- ◇ Barriers
- ◇ Piers
- ◇ Safety screens
- ◇ Lighting
- ◇ Fencing.

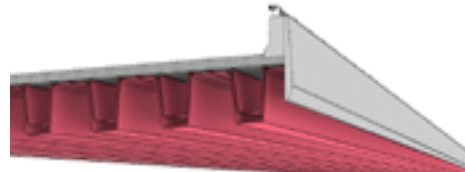


### GIRDERS

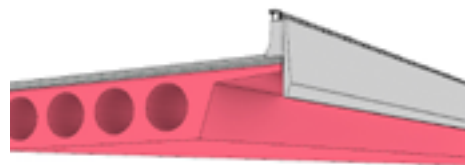
The overarching principle for bridge girders along a motorway corridor is consistency and simplicity. Super-T girders are generally used across the project, with the exception of the M12/M7 Interchange where box girders are



Box girder



Super-T girder

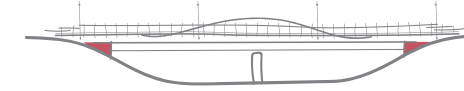


Voided slab

proposed to be used, and the Twin Bridges over Elizabeth Drive where a voided slab substructure is used given the span and site constraints.



Voided slab - Wagga Wagga overpass

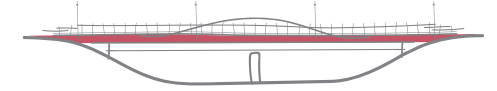


### ABUTMENTS

Across the project, spill through abutments are utilised as they allow a more open structure in the landscape and have a lightness of form, allow views and emphasise the continuous slender form of the bridge. Walled abutments are only used at Range Road due to space considerations with tight alignments.



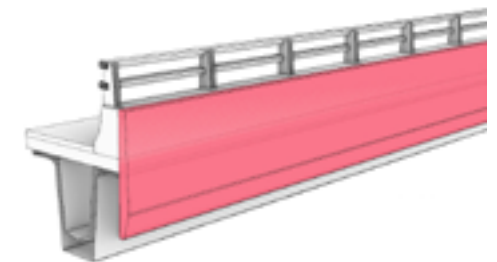
Spill through abutment



### PARAPETS

Parapets across the project will be one of the most visible bridge element, as they offer a continuous, uninterrupted face which extends the full length of the bridge with overlap of abutments.

The bridge parapet and edge barrier incorporates a profiled outer face that catches sunlight on the upper section providing a refined and elegant, edge profile for the entire length of the bridge.



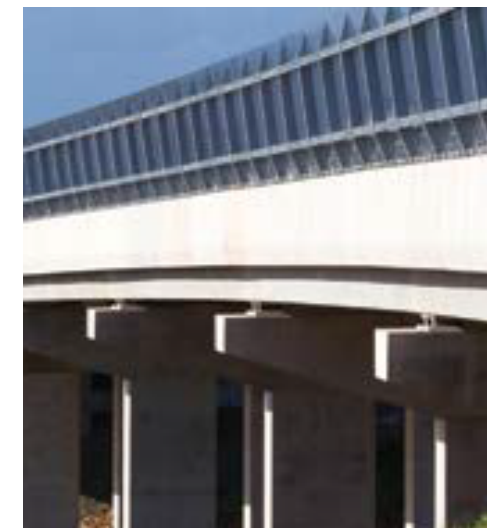
Super-T girder - Bonville Bypass



Box girder - M7 Motorway

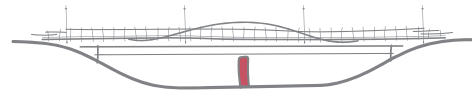


Walled abutment - Banora Point Upgrade



Banora Point Upgrade





## PIERS

As there will be a multitude of girder types across the Project, there has been a concerted effort to ensure that the design of bridge piers is consistent across all bridges across the Project so that they are viewed as a family of elements. Pier designs include the following:

- ◇ M12 Overbridges - Tapered blade
- ◇ Local Road Overbridges - Portal Frame structure
- ◇ Creek Bridges - Circular piers with articulated headstock
- ◇ Viaduct - Circular piers with articulated capital.



Tapered blade wall pier - M7 Motorway



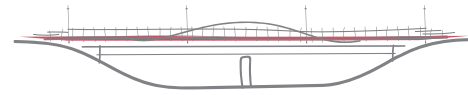
Portal frame structure pier - Bonville Bypass



Circular piers with headstock - Bonville Bypass

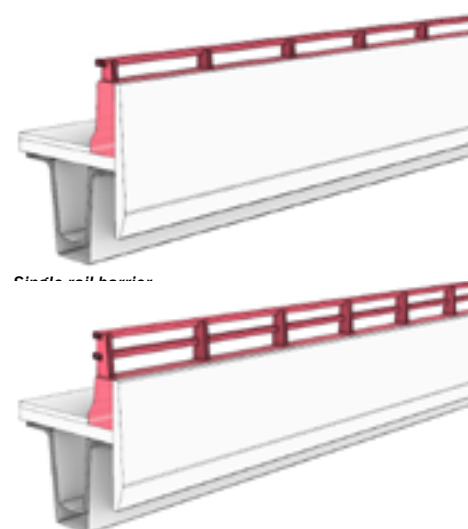


Circular piers with articulated capital



## BARRIERS

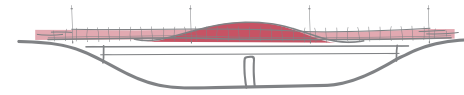
Bridge barriers influence views from the bridge, and views to the bridge. Within the project with complex and adjacent alignments, the project team has a preference for solid or single rail bridge barriers which have been used on recent projects including the following:



Twin rail barrier



M7 Motorway - Single rail barrier

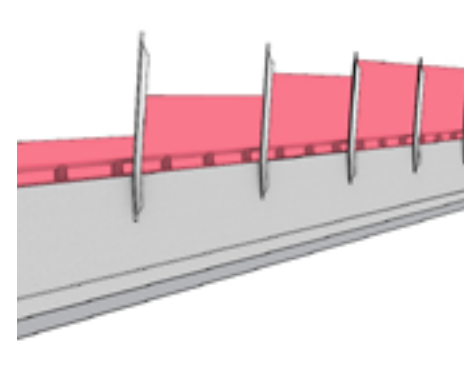


## SAFETY SCREENS

Although Safety screens are a protective fence to deter the launching of objects from a bridge, they can be used as a linear artistic element.

On the project, Safety screens will be used to integrate Indigenous design with colour, shapes and patterns.

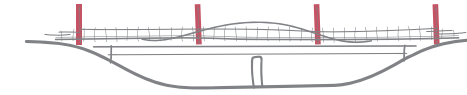
Further details of the integrated art designs can be found within this section of the report.



Safety screen with stepped end panels

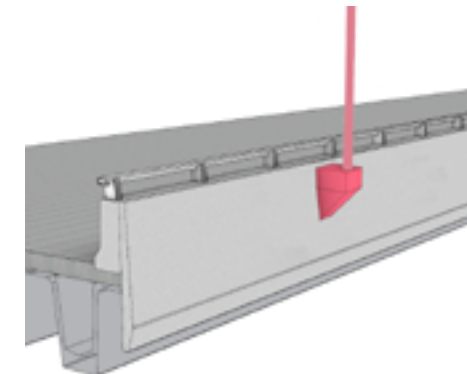


Safety screen - Tugun Bypass



## LIGHTING

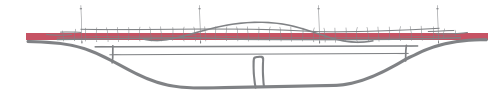
Light poles are a consistent rhythmic presence along the corridor, and the overall form and corbel design will be consistent with the light poles along the M7 Motorway.



Lighting corbel



Existing M7 Motorway lighting corbel



## FENCING

The Shared User Path for pedestrians and cyclists is provided alongside the M12 Motorway. This path is fitted with a pedestrian fence and various gates for safe access. The fence type matches the M7 Motorway fence to maintain the consistency of appearance.



Pedestrian fence on bridge edge



Existing M7 Motorway shared path fencing



## 5.3 BRIDGE TYPOLOGIES

For a consistent approach throughout the corridor, the bridges were divided into seven typologies according to their urban design appearance, importance, engineering function, and visibility to the general public and road users. The bridges throughout the alignment can be broken down into seven distinct bridge typologies:

- Creek Bridges
- Gateway Bridge
- M12 overbridges
- Local road overbridges
- Airport Interchange bridges
- M12/M7 Interchange bridges
- Shared path bridge

Typical details for each bridge typology are included within the following pages.



Figure 35. Bridge typologies across the project



## CREEK BRIDGES

Four bridges spanning over creeks all share the same construction and engineering design, and allow potential for subtle variation in architectural finish and artistic interpretation. Creek bridges incorporate circular piers with articulated headstock.

The main design features of the creek bridges are as follows;

- ◇ Pre-stressed Super-T girder superstructure
- ◇ Simple circular piers with flared 'Bathtub' headstock
- ◇ Profiled precast concrete parapets
- ◇ Twin rail steel traffic barriers to maintain views across the landscape.

Provision should also be made for both functional and bridge feature lighting to be included should there be a future pedestrian connection made along the creek corridor.



Bonville Upgrade creek bridge

### BR02 - BRIDGE OVER COSGROVES CREEK

**LEGEND**

- 01 GROUND LINE
- 02 BRIDGE PIER
- 03 SUPER-T BOX GIRDER
- 04 1400 HIGH CONCRETE TRAFFIC BARRIER WITH SINGLE STEEL RAILS
- 05 SHARED PATH
- 06 1300 HIGH PEDESTRIAN BALUSTRADE WITH HAND RAIL
- 07 THROW SCREEN
- 08 BRIDGE ABUTMENT
- 09 WWWXX
- 10 PAVED ABUTMENT

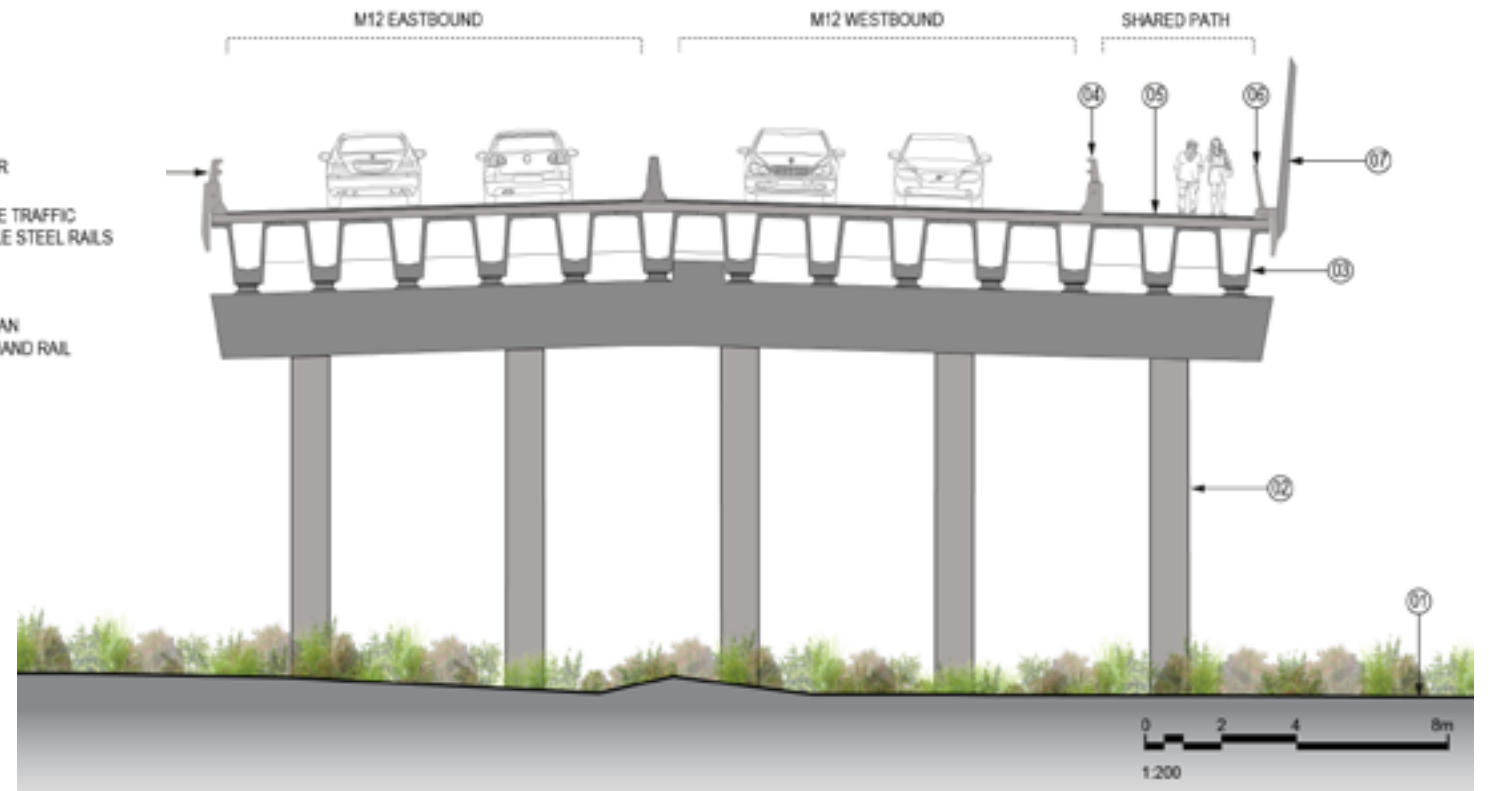


Figure 37. Section - BR02 - Bridge over Cosgroves Creek

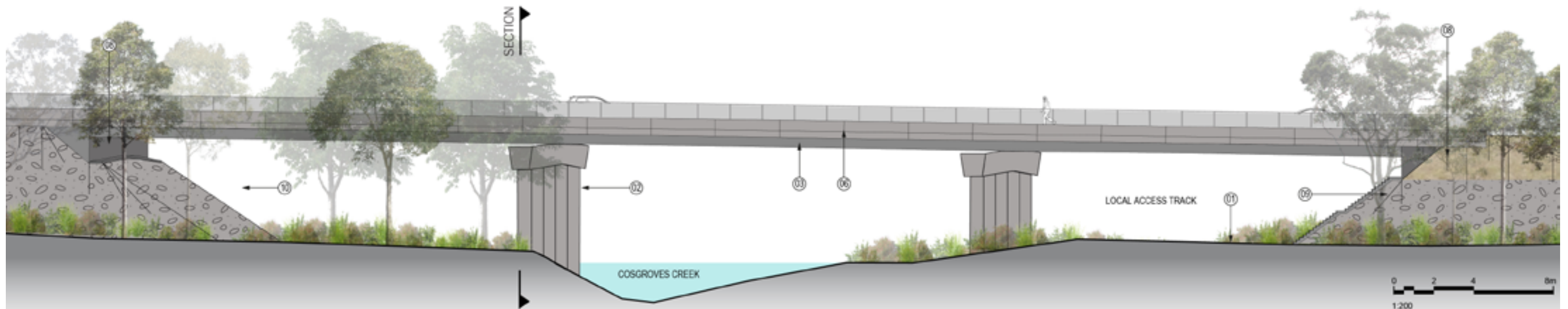


Figure 36. Elevation - BR02 - Bridge over Cosgroves Creek





## GATEWAY BRIDGE

The Airport Gateway Bridge is designed to be a sweeping structure that spans the M12 carriageways and sits as a portal between the Elizabeth Drive ramps. The key elements are as follows;

- ◇ The Elizabeth drive ramp parapets and the portal wall are integrated and form a smooth continuous element
- ◇ Safety screens are consistent with those designed for the remaining M12 overbridges
- ◇ Full height concrete or Single rail traffic barriers are to be used
- ◇ Integrated feature lighting should be included to subtly uplight the portal wall.



Leura Underpass

## BR04A - BRIDGE OVER AIRPORT ACCESS ROAD ON ELIZABETH DRIVE

### LEGEND

- 01 GROUND LINE
- 02 BRIDGE PIER
- 03 SUPER-T BOX GIRDER
- 04 1400 HIGH CONCRETE TRAFFIC BARRIER WITH SINGLE STEEL RAILS
- 05 THROW SCREEN WITH INTERPRETIVE ART
- 06 SHARED PATH
- 07 REINFORCED SOIL WALL WITH FEATURE PATTERN
- 08 PERFORATED CORTEN FEATURE FACADE

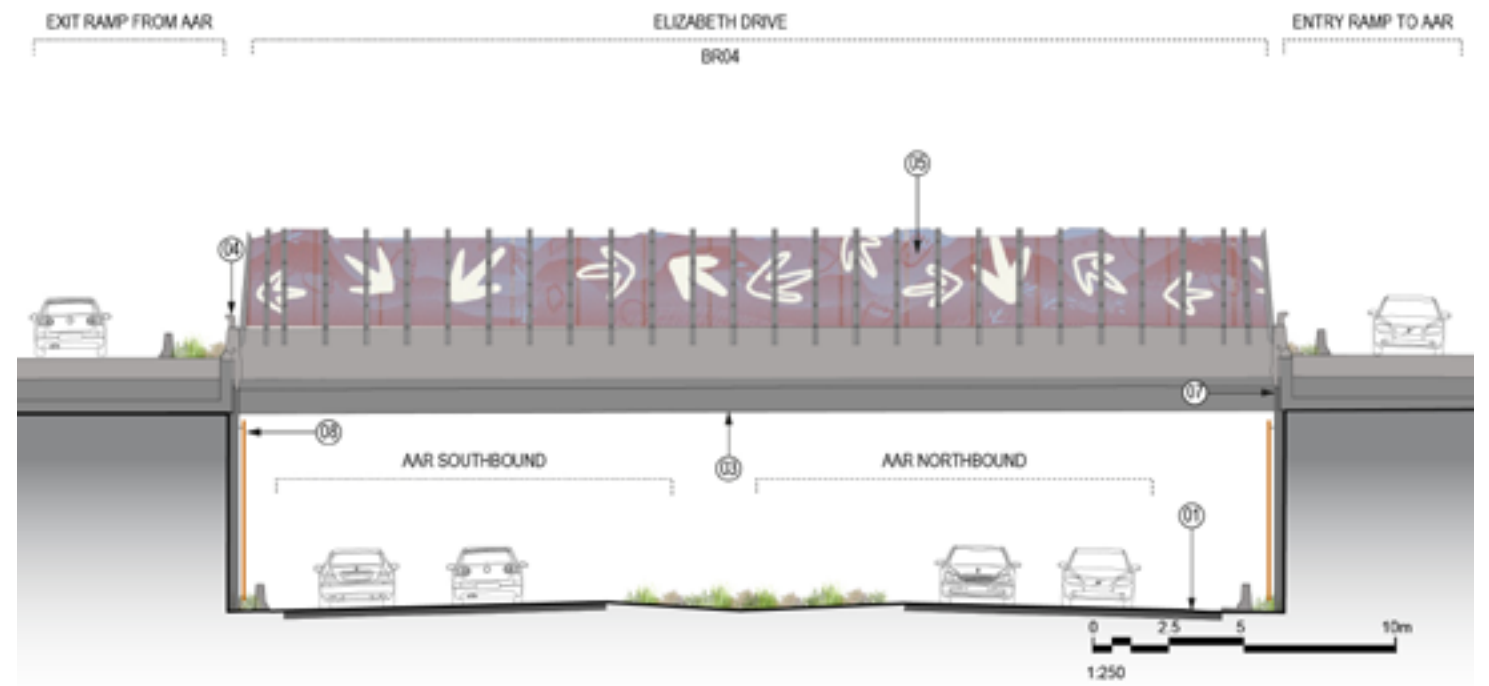


Figure 38. Section - BR04 - Bridge over Airport Access Road on Elizabeth Drive

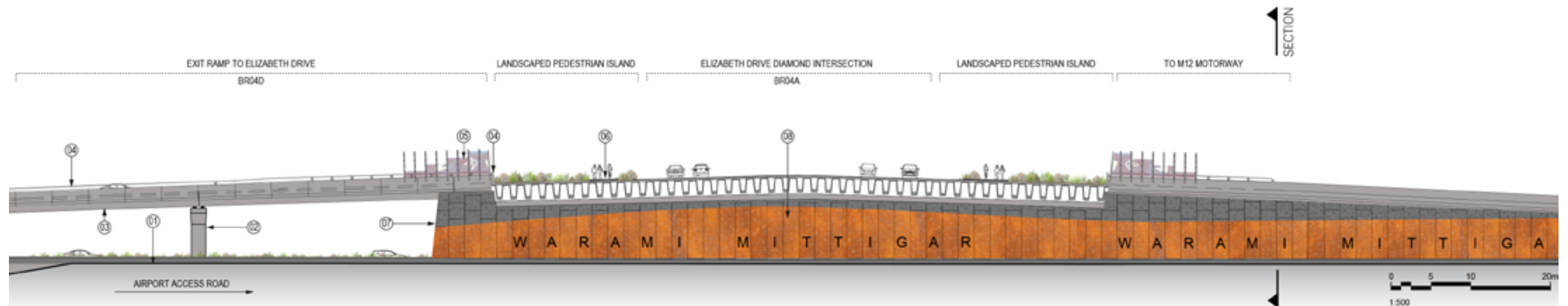


Figure 39. Elevation - BR04A - Bridge over Airport Access Road on Elizabeth Drive





### M12 OVERBRIDGES

The three bridges over the project carriageways would be highly visible and all feature an extended off form, tapered blade walls. The design also has a similarity of form with the M7 Motorway.

The main design features of the M12/M7 Interchange bridges are as follows;

- ◇ Pre-stressed Super-T girder superstructure
- ◇ Profiled precast concrete parapets
- ◇ Single rail steel traffic barriers to minimise visual clutter along the bridge edge.

The typical blade pier should:

- ◇ Have vertical sides that are continuous from the ground level below to the underside of the bridge superstructure
- ◇ Maintain a constant thickness for the entire span of the superstructure and bearings
- ◇ Taper gradually but to a rounded nose
- ◇ Blade piers can remain contained within the shadow line of the bridge or extend out beyond the superstructure as requires by the overarching framework.



Newcastle Inner City Bypass - Shortland to Sandgate

### BR07 - CLIFTON AVENUE OVERBRIDGE

- LEGEND**
- 01 GROUND LINE
  - 02 1200 THICK REINFORCED CONCRETE BLADE COLUMN
  - 03 SUPER-T BOX GIRDER
  - 04 1400 HIGH CONCRETE TRAFFIC BARRIER WITH SINGLE STEEL RAILS
  - 05 THROW SCREEN WITH INTERPRETIVE ART
  - 06 SHARED PATH
  - 07 BRIDGE ABUTMENT
  - 08 PAVED ABUTMENT

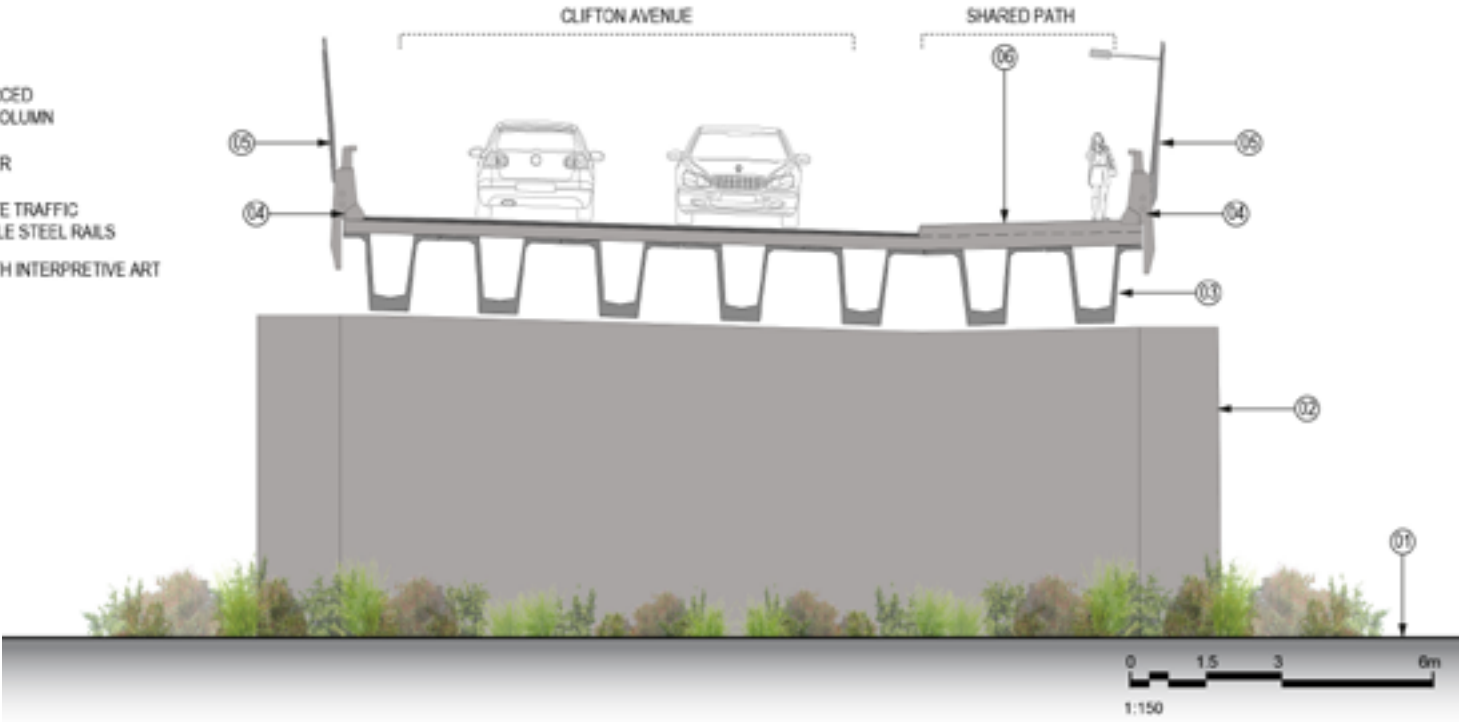


Figure 41. Section - BR02 - Bridge over Clifton Avenue

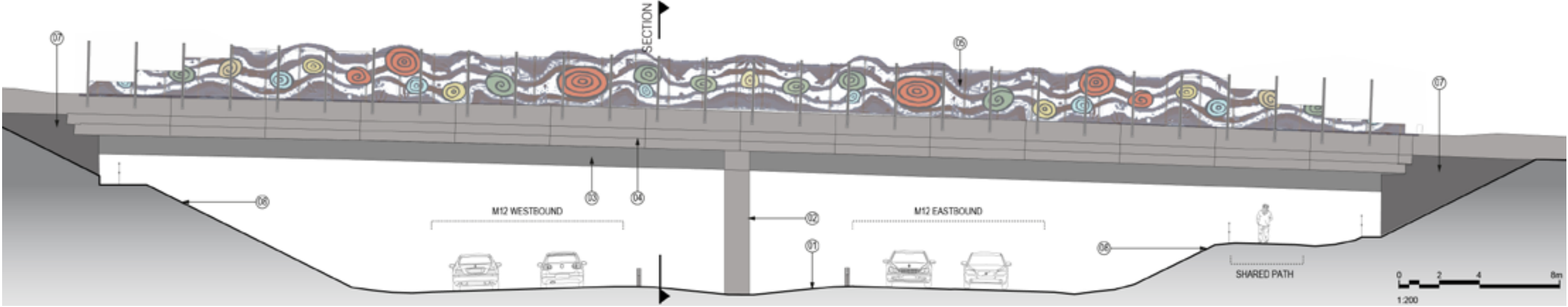


Figure 40. Elevation - BR07 - Clifton Avenue overbridge





## LOCAL ROAD OVERBRIDGES

The bridges over local and arterial roads would feature an extended off form, tapered trouser leg pier. The design also has a visual similarity with the M7 Motorway bridges.

The main design features of the M12 bridges that cross over local roads are as follows;

- ◇ Pre-stressed Super-T girder superstructure
- ◇ Profiled precast concrete parapets
- ◇ Single rail steel traffic barriers to minimise visual clutter along the bridge edge
- ◇ A tapered blade pier with open viewing portal.

The typical tapered blade pier should:

- ◇ Contain an open viewing portal which is centralised within the shadow line of the superstructure.
- ◇ The portal is to terminate 2/3 of the height of the pier.



Bonville Bypass

## BR01 - BRIDGE OVER LUDDENHAM ROAD

- LEGEND**
- 01 GROUND LINE
  - 02 BRIDGE PIER
  - 03 SUPER-T BOX GIRDER
  - 04 1400 HIGH CONCRETE TRAFFIC BARRIER WITH SINGLE STEEL RAILS
  - 05 SHARED PATH
  - 06 1300 HIGH PEDESTRIAN BALLUSTRADE WITH HAND RAIL
  - 07 THROW SCREEN WITH INTERPRETIVE ART
  - 08 BRIDGE ABUTMENT
  - 09 LANDSCAPED FILL EMBANKMENT
  - 10 PAVED ABUTMENT

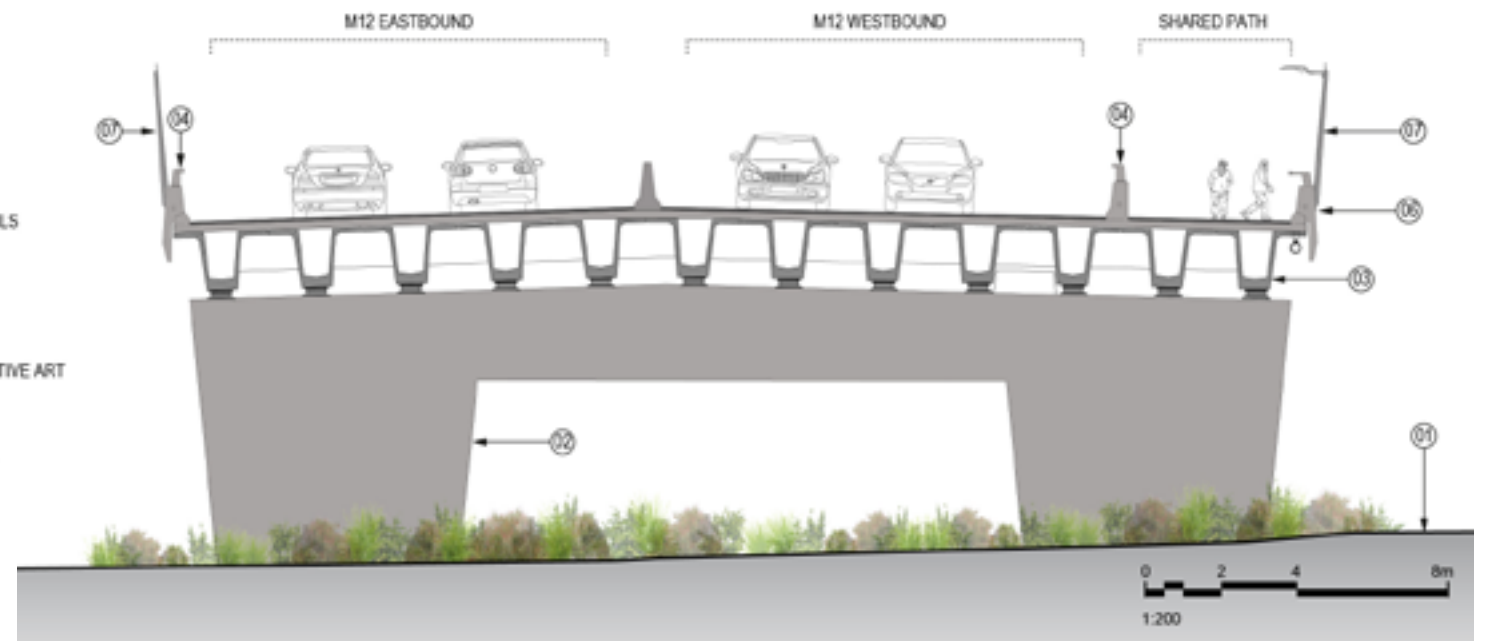


Figure 42. Section - BR01 - Bridge over Luddenham Road

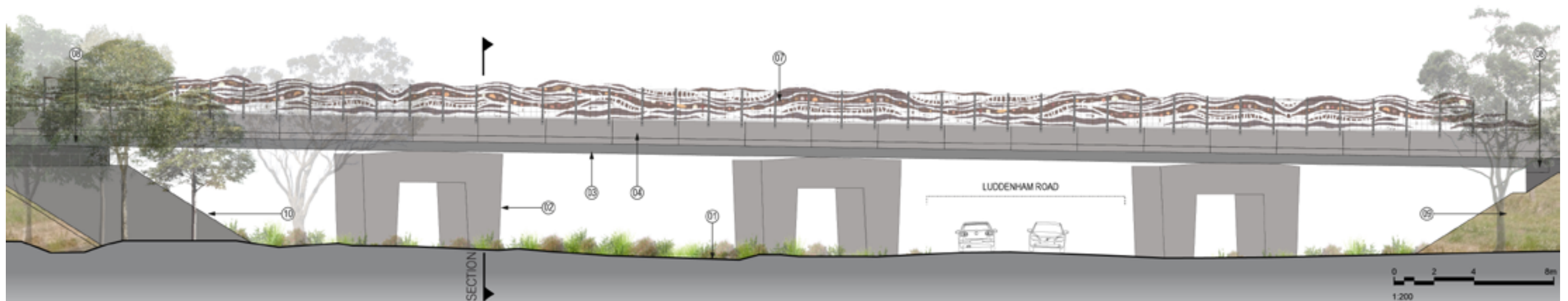


Figure 43. Elevation - BR01 - Bridge over Luddenham Road





## AIRPORT INTERCHANGE BRIDGES

The design intent draws on the area characterised by rolling hills and plains. The RSW walls along the ramps on approach to the bridge form part of the aesthetic that will be seen predominantly travelling eastbound and northbound.

Features of the design include:

- ◇ A consistent profile for the superstructure which is comprised of 1.8m Super-T girders
- ◇ Feature curved edge profile to the bridges on approach to provide a clean and elegant edge profile and reduce the issues with interfaces with odd junctions



Western Ring Route, Auckland

### BR21 - M12 EASTBOUND TO AIRPORT ACCESS ROAD SOUTHBOUND

**LEGEND**

- 01 GROUND LINE
- 02 BRIDGE PIER
- 03 SUPER-T GIRDER
- 04 1400 HIGH CONCRETE TRAFFIC BARRIER WITH SINGLE STEEL RAILS
- 05 BRIDGE ABUTMENT
- 06 LANDSCAPED FILL EMBANKMENT
- 07 SHARED PATH

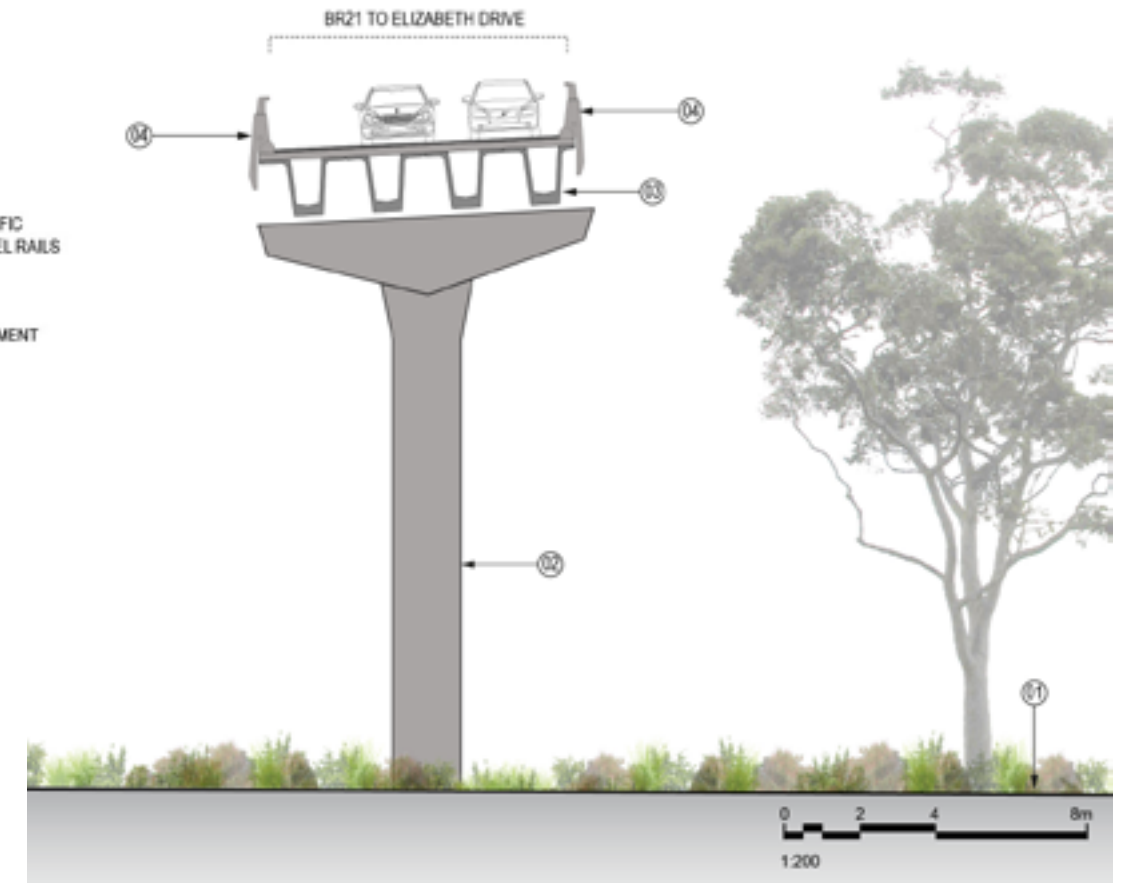


Figure 45. Section - M12 Eastbound to Airport Access Road Southbound

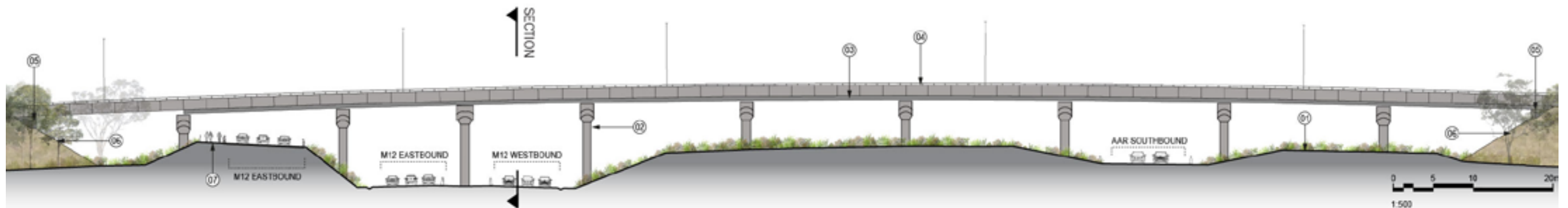


Figure 44. Elevation - BR21 - M12 Eastbound to Airport Access Road Southbound





## M12 / M7 INTERCHANGE BRIDGES

The design intent has sought to achieve a refined approach that incorporates recognisable elements of the existing M7 Motorway Light Horse Interchange. The proposed Interchange includes bridges with column piers with an articulated capital and headstock.

The main design features of the M12/M7 Interchange bridges are as follows;

- ◇ Overall bridge design to be visually similar to the existing M7 Motorway Light Horse Interchange
- ◇ Concrete box girder superstructure
- ◇ Simple circular piers with flared capital headstock
- ◇ Profiled precast concrete parapets.



M7 Interchange

## BR15 - BRIDGE OVER M7 - M12 EASTBOUND TO M7 SOUTHBOUND

### LEGEND

- 01 GROUND LINE
- 02 BRIDGE PIER
- 03 BRIDGE PIER HEADSTOCK
- 04 BOX GIRDER
- 05 BEARING
- 06 BARRIER SKIRT
- 07 1400 HIGH CONCRETE TRAFFIC BARRIER WITH SINGLE STEEL RAIL
- 08 THROW SCREEN
- 09 BRIDGE ABUTMENT
- 10 LANDSCAPED FILL EMBANKMENT

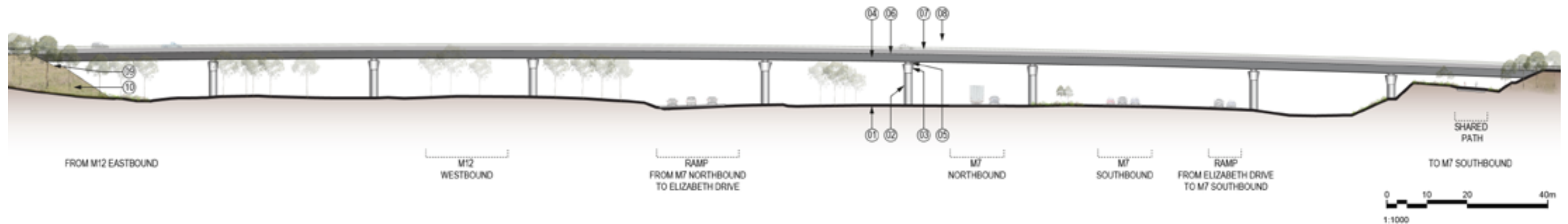
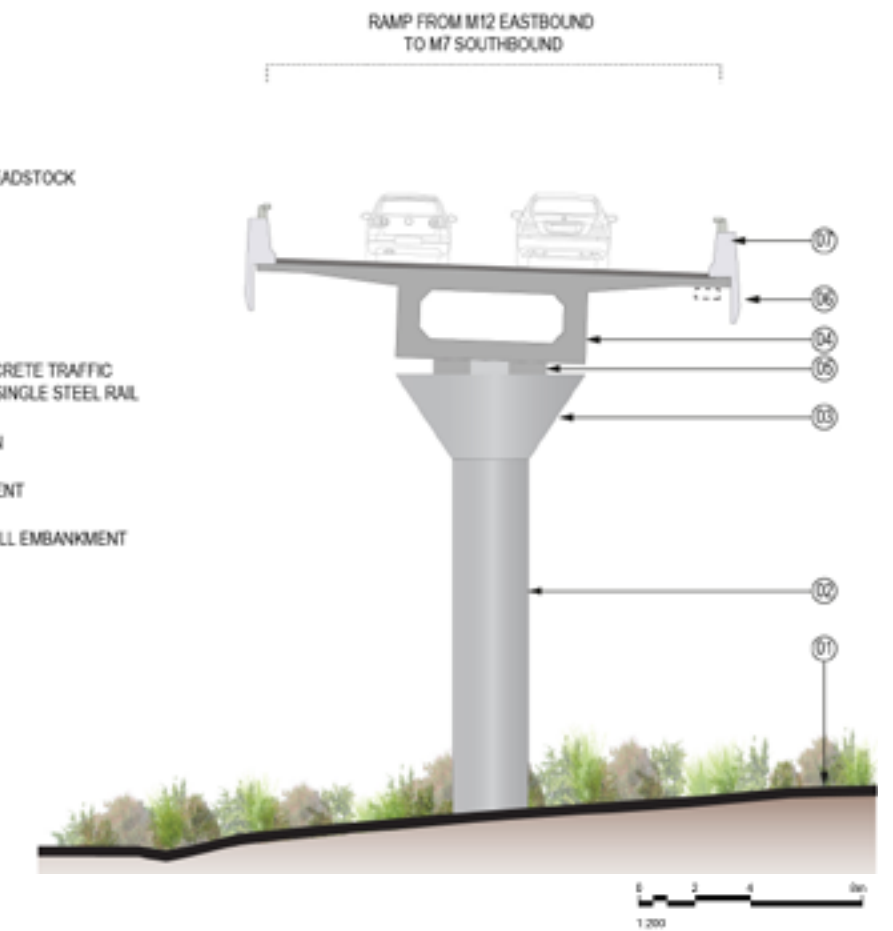


Figure 47. Elevation - BR15 - Bridge over M7 - M12 Eastbound to M7 Southbound





Artist's impression: Aerial view south-west over M7 / M12 Motorway Interchange (landscape shown at full maturity and is indicative only).





Artist's impression: Aerial view west over M7 / M12 Motorway Interchange (landscape shown at full maturity and is indicative only).



## 5.4 FEATURE LIGHTING

While the various forms, spaces, materials and details that form the M12 Motorway will be appreciated by day, there is a need to ensure that the scheme will have visual clarity and identity once darkness falls.

### PRINCIPLES FOR FEATURE LIGHTING

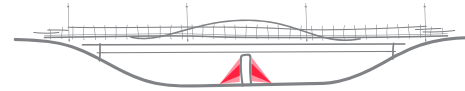
Throughout the project, lighting will enliven the night time travel experience over and above lighting for road safety. The key design principles for the design of lighting throughout the Project are as follows:

- ◇ Dynamic and creative feature lighting should be energy efficient, avoid light spill and be easy to maintain
- ◇ Feature lighting to create an artistic effect, articulate urban forms of walls and bridges and amplify the night time experience
- ◇ Feature lighting to be located in select locations in line with the strategy so as not to dilute the power of each intervention
- ◇ Balance feature lighting with the constraints of cost, safety, context and environment.

As a result, design should consider the careful integration of artificial light into the project to meet the functional requirements to keep people safe and secure, and also to help create character and legibility. It will result in the Project being every bit as successful after dark as it is by day.

For visitors and residents arriving or departing, the M12 will be the first thing you see of the region at night, or be your final memory. As such, it is critical that the lighting is sensitive and imaginative, and also provides a robust and practical solution.

Following is a description of the feature lighting designs to be applied to BR09 and BR04A.



#### BR09 - TWIN BRIDGES OVER ELIZABETH DRIVE

Below the superstructure, integrated piers and spill through abutments are often left in the shadow of the bridge. This presents an opportunity to enhance the driver experience by adding feature lighting to show off the form and materiality of the substructure.

The feature lighting scheme for BR09 has been devised as the following:

- ◇ Small surface mounted LED spotlights fitted with spread lenses will wash down the principle faces of the piers. The floodlights will employ RGBW sources to allow the colour of the wash to change to a prescribed set of lighting scenes
- ◇ Surface mounted linear recessed luminaire LED units providing wall grazing uplighting of the piers. The floodlights will also employ RGBW sources to allow the colour of the wash to change to a prescribed set of lighting scenes.



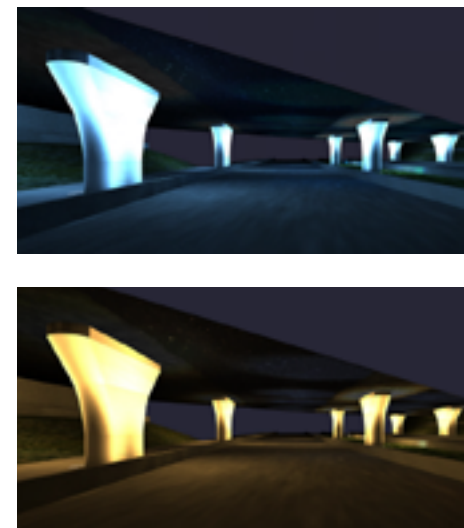
Typical spotlight luminaire unit



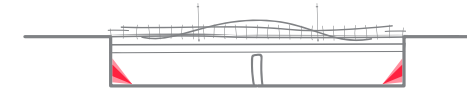
Typical linear recessed LED luminaire unit



Existing M7 Motorway feature lighting



BR09 Feature lighting studies



#### BR04A - BRIDGE OVER AIRPORT ACCESS ROAD ON ELIZABETH DRIVE

The extended retaining wall abutments at the Gateway bridge at the entry to Western Sydney International Airport present an opportunity to enhance the driver experience by adding subtle feature lighting to show off the form and materiality of the feature retaining wall feature panels. The feature perforated weathering steel walls at BR04A will reference the Emu constellation and incorporate local indigenous language.

The feature lighting scheme for BR04A has been devised as the following:

- ◇ Small surface mounted LED spotlights fitted with spread lenses will light behind the perforated panels with RGBW sources to allow the colour of the wash to change to a prescribed set of lighting scenes.



Backlit perforated steel panel - Precedent



Weathering steel panel - Precedent



## 5.5 ABORIGINAL CULTURAL INTERPRETATION - OVERBRIDGE SAFETY SCREENS

Integral to the bridges across the project is 'Connection to Country' Aboriginal storytelling. At the six selected bridges, The outcomes of the M12 Aboriginal Art Strategy will focus on the life cycle of the Mariong (Emu) by utilising a system of panelling to integrate with the bridge safety screens to provide an enlarged art canvas. The six phases of the Emu life cycle are as follows:

- ◇ Phase 1 - Creation story (January - March)
- ◇ Phase 2 - Mariong chases the male Emu (March - April)
- ◇ Phase 3 - Male Emu sits on the nest (June - July)
- ◇ Phase 4 - Ceremony time (September - November)
- ◇ Phase 5 - Sitting in the waterhole (December)
- ◇ Phase 6 - The dry (December - January).

Across the corridor, bridges with integrated Safety screen art is located at the following bridge locations:

Table 6. Bridge art locations

No.	Bridge	Artwork
BR01	Bridge over Luddenham Road	'The Dry'
BR04A	Bridge over AAR on Elizabeth Drive	'Mariong chases the Male Emu'
BR07	Clifton Avenue overbridges	'Sitting in the waterholes'
BR09	Twin bridges over Elizabeth Drive	'Male Emu sits on the nest'
BR11	Bridge over M12 on Water Tower Access Rd	'Ceremony Time'
BR22	Bridge on EB Entry Ramp over M12	'Creation phase'



Figure 48. Bridge locations across the project



### PHASE 1 - CREATION STORY

#### STORY

Mariong is sitting in the river, she stands up, shakes the water off her feathers and creates the stars and became the Milky Way.

#### SEASON

N/A- Creation Story.

#### FORMS FOR INTERPRETATION

- ◇ Feathers
- ◇ Emu Wings
- ◇ Water
- ◇ Sky
- ◇ Stars
- ◇ Reflection.

#### BRIDGE PRIMARY COLOUR

Blue.



Figure 49. Creation Phase (Artist Cohort, Balarinji, 2021)

### PHASE 2 - MARIONG CHASES THE MALE EMU

#### STORY

This concept is based on the phase of the Mariong (Emu) story where the female chases the male.

#### SEASON

March - April.

#### FORMS FOR INTERPRETATION

- ◇ Footprints
- ◇ Mariong footprints running
- ◇ Mundo footprints and the Western Sydney landscape.

#### BRIDGE PRIMARY COLOUR

Red.



Figure 50. Mariong chases the emu (Artist Cohort, Balarinji, 2021)

### PHASE 3 - MALE EMU SITS ON THE NEST

#### STORY

This concept is based on the phase of the Mariong story where the male Emu is sitting on the nest.

#### SEASON

June - July.

#### FORMS FOR INTERPRETATION

- ◇ Nest building
- ◇ Grass trees
- ◇ Eggs
- ◇ Emus.

#### BRIDGE PRIMARY COLOUR

Silver/Grey.



Figure 51. Male emu sits on nest (Artist Cohort, Balarinji, 2021)

### PHASE 4 - CEREMONY TIME

#### STORY

Ceremony time, when the chicks hatch.

#### SEASON

September - November.

#### FORMS FOR INTERPRETATION

- ◇ Eggs
- ◇ Seven layers of the eggs
- ◇ Chicks/patterns on their backs
- ◇ When Country is in full bloom and dark green to blue.

#### BRIDGE PRIMARY COLOUR

Green.



Figure 52. Ceremony time (Artist Cohort, Balarinji, 2021)

### PHASE 5 - SITTING IN THE WATERHOLE

#### STORY

As the season heats up, Mariong starts searching for remaining cool waterholes.

#### SEASON

December.

#### FORMS FOR INTERPRETATION

- ◇ Creeks/waterways
- ◇ Water droplets
- ◇ Patterns ripple in water
- ◇ Patterns on sand left from water.

#### BRIDGE PRIMARY COLOUR

Brown.



Figure 53. Sitting in the waterholes (Artist Cohort, Balarinji, 2021)

### PHASE 6 - THE DRY

#### STORY

The many dried out layers of the earth hide Aboriginal artefacts.

#### SEASON

Late December - January.

#### FORMS FOR INTERPRETATION

- ◇ Layers of earth
- ◇ Soil
- ◇ Aboriginal artefacts.

#### BRIDGE PRIMARY COLOUR

Brown.

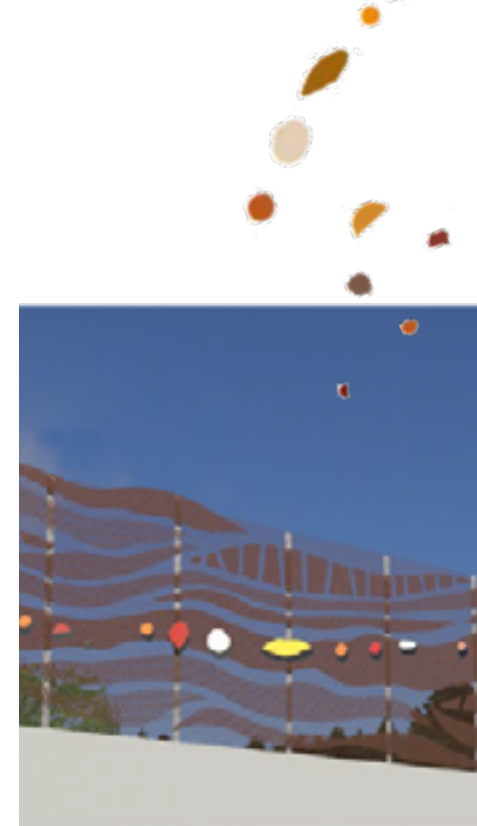


Figure 54. The Dry (Artist Cohort, Balarinji, 2021)





Artist's impression: View south along Luddenham Road (landscape shown at full maturity and is indicative only).





Artist's impression: Aerial perspective view south-east across Range Road and Western Sydney Parklands (landscape shown at full maturity and is indicative only).



## 5.6 SHARED PATH CONNECTIONS

### SHARED PATH LINK TIED ARCH CONNECTION

The shared user path underpasses are located under the westbound on-ramp to M12 Motorway and beneath Elizabeth Drive at the entrance to the Western Sydney International Airport. Each underpass comprises a single cell proprietary concrete arch structure. The approximate length is about 34.5m under the ramp and 50m at Elizabeth Drive.

The underpass design includes:

- ◇ A consistent profile for the concrete arch structure throughout the full length of the underpass
- ◇ Bamboo cut ends which follow the slope of the batters above, so that the arch profile is seamlessly integrated into the batters around the arch
- ◇ The arch to have a closer to vertical profile at the ends to allow for height clearances
- ◇ Provision for feature lighting
- ◇ Incorporation of CPTED measures.

#### LEGEND

- ① GROUND LINE
- ② SHARED PATH
- ③ 900 HIGH FALL PROTECTION RAIL
- ④ SHARED PATH BALUSTRADE
- ⑤ LANDSCAPED FILL EMBANKMENT
- ⑥ W-BEAM ROAD BARRIER

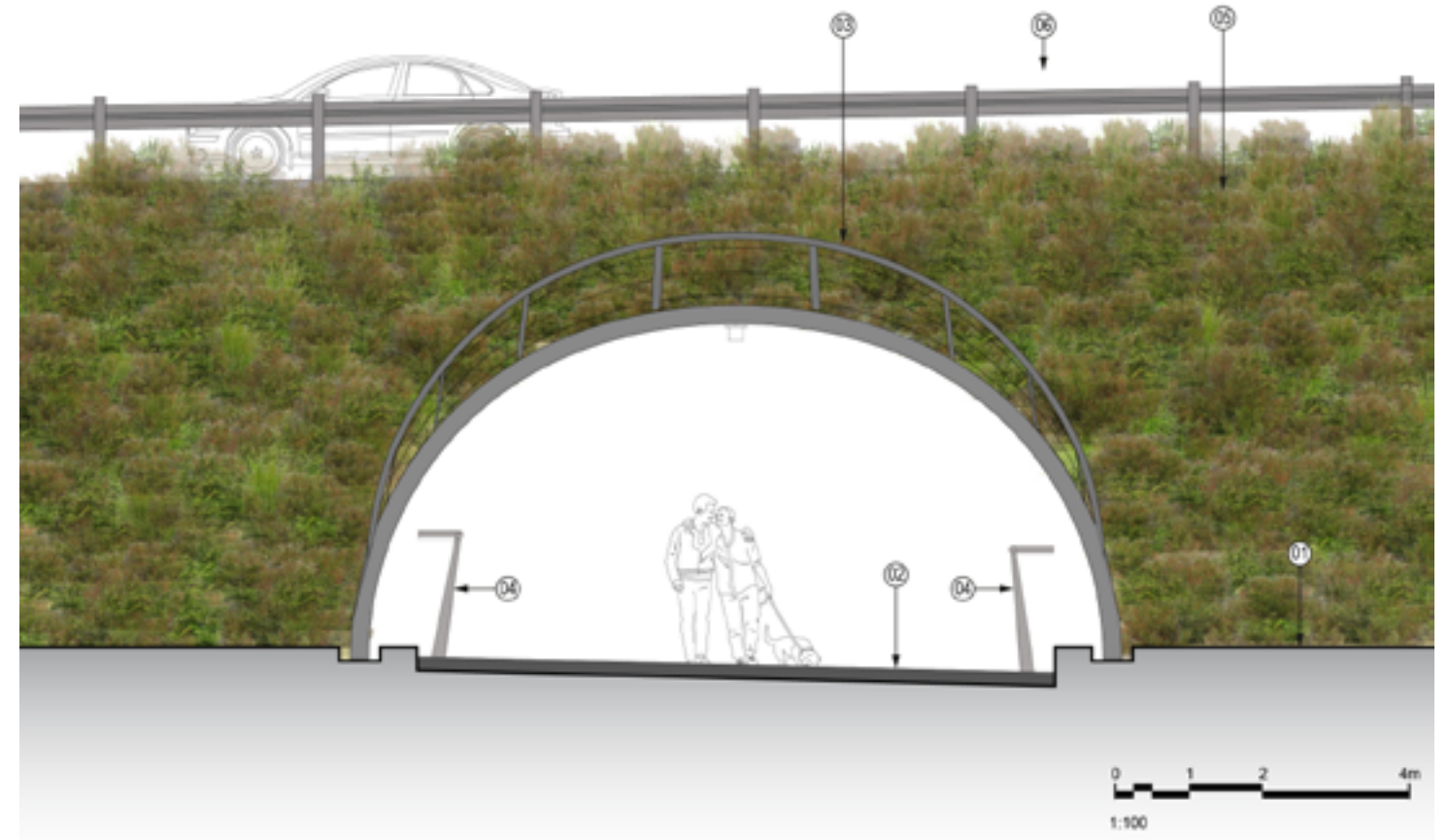


Figure 55. Section - ATL Bebo Underpass

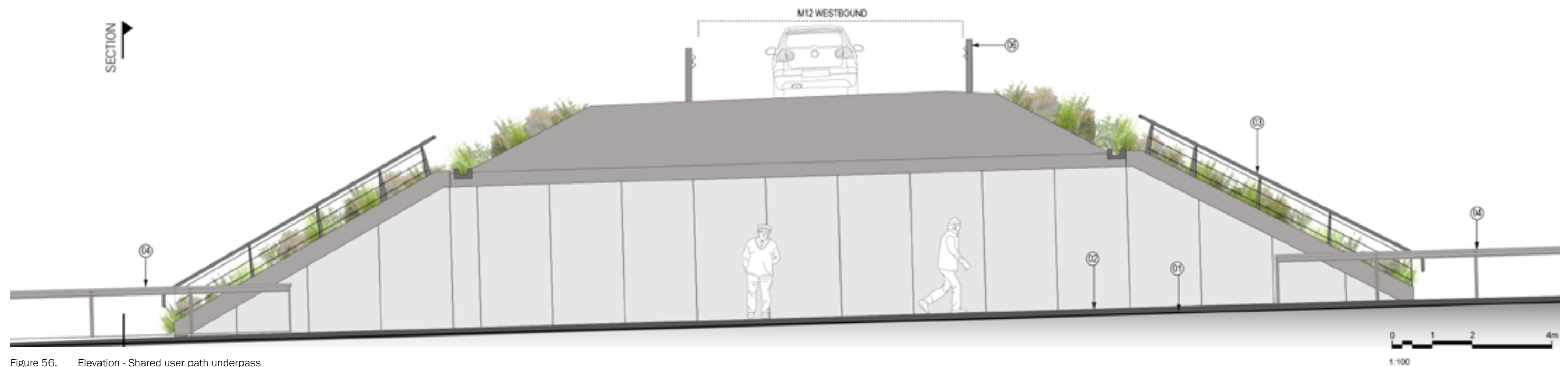


Figure 56. Elevation - Shared user path underpass



### SHARED USER PATH BRIDGE

With a high level of visibility, the extension of existing steel truss bridge over M7 Motorway would adopt a matching form and quality to the existing series of Shared Path bridges that cross the Motorway.

- LEGEND**
- 01 GROUND LINE
  - 02 BRIDGE DECK
  - 03 NAME PLATE ON PARAPET
  - 04 STEEL TRUSS SUPERSTRUCTURE
  - 05 1300 HIGH PEDESTRIAN BALUSTRADE WITH HAND RAIL
  - 06 BARRIER SKIRT
  - 07 APPROACH SLAB
  - 08 THROW SCREEN
  - 09 REINFORCED CONCRETE ABUTMENT
  - 10 LANDSCAPED FILL EMBANKMENT
  - 11 SOIL NAIL RETAINING WALL WITH PRECAST CONCRETE FASCIA PANELS

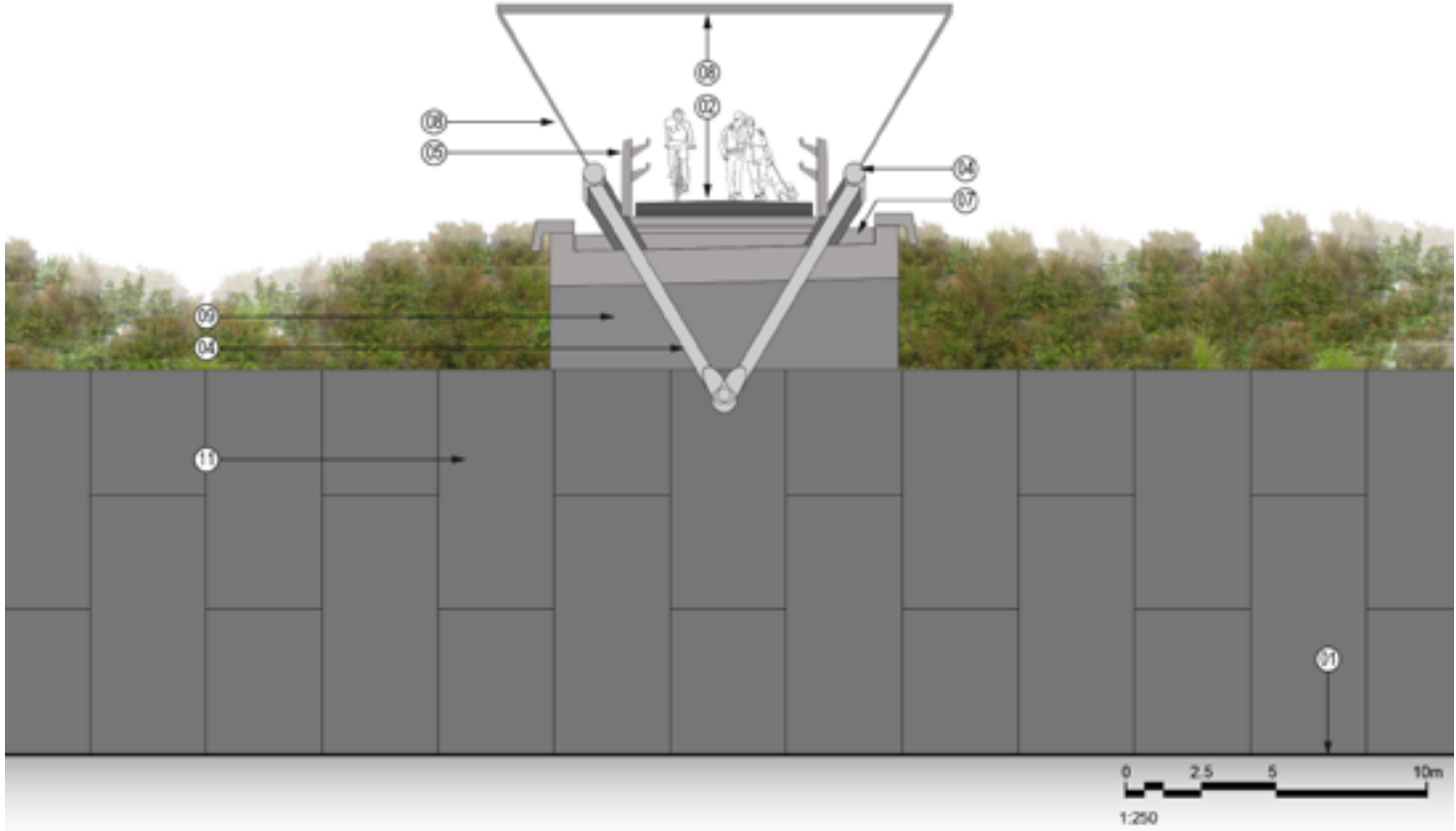


Figure 57. Section - BR16 - Shared user path bridge over M7 Northbound exit ramp



Existing M7 cycleway bridge

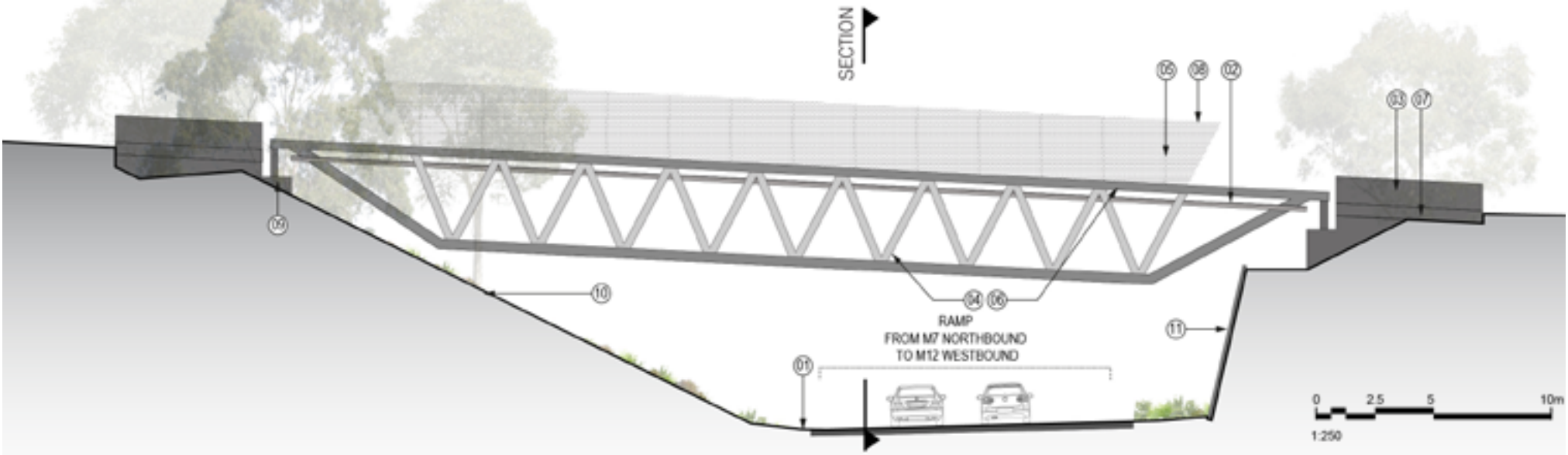


Figure 58. Elevation - BR16 - Shared user path bridge over M7 Northbound exit ramp



## 5.7 FAUNA CROSSINGS

There are four crossing structures proposed for the M12 corridor. Three are located beneath creek bridges (Kemps Creek, Badgerys Creek and Cosgroves Creek) and will be detached from underneath the new structures. The fourth is located across the motorway at a cutting between Range Road and Water Tower Access Road within Western Sydney Parklands.

The fauna crossings are each a rope ladder structure, supported by timber posts at either end and span up to approximately 80m with stainless steel spiral strand cables. Coming off each post are three silver ropes attached to an adjacent tree, which will allow fauna to access and exit the fauna crossing structure.

The design is based on adopting similar fauna crossing structures which were recently built as part of the Pacific Highway project, and can support expected fauna such as the Common Brush-tailed Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Sugar Glider (*Petaurus breviceps*).

The bridges across the four main creeks - Kemps Creek, South Creek, Badgerys Creek and Cosgroves Creek - have also been designed to offer dry passage for ground dwelling fauna.

The figures adjacent show elevations of the two proposed fauna crossing structures.

### MICROBAT HABITAT

The M12 EIS included a Habitat Compensation Plan, which recommended installation of suitable compensatory roosting habitat for the Southern Myotis bat be provided using the project's bridges. Due to historic and ongoing clearing in Western Sydney, the riparian corridors provide important linkages for native wildlife.

Provision of microbat habitat has been included in the detailed design of the four main creek bridges. The following features have been included to provide roosting habitat:

- ◇ Roughened surface of the inside face of the precast barrier and the edge of the deck that will be situated over waterways for microbats to grip.
- ◇ Inclusion of grooves with tapered edges to provide smaller roost spaces.



Examples of fauna rope crossings

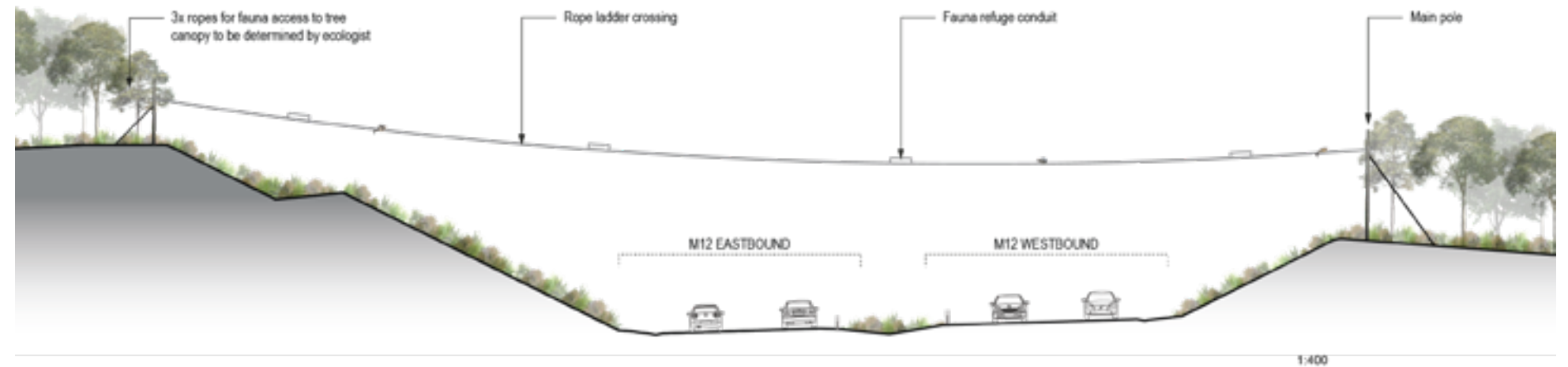


Figure 59. Section - Fauna crossing at Western Sydney Parklands

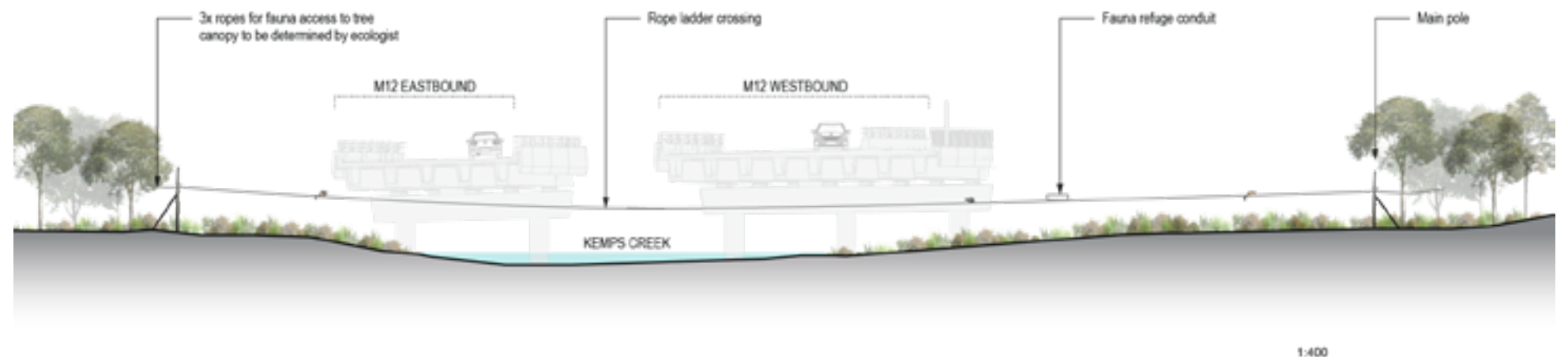


Figure 60. Section - Fauna crossing at Kemps Creek



## 5.8 RETAINING WALLS TYPES

Retaining walls are used throughout the project to achieve grade separation and to minimise grade of roadside batters. Whilst road users benefit from the improved views across the landscape offered by this increased elevation, the walls themselves often present a significant visual barrier to shared path users, local road users and adjacent stakeholders.

The Connection to Country design philosophy for the M12 motorway improves the standard and visual appearance of certain retaining walls by applying an artistic pattern connected to the overarching Aboriginal Art Strategy to the wall panels that are situated along the Airport Access Road between the entrance to the M12 and the Great Emu Sculpture.

The chapter will outline the types, finishes and colours of the retaining walls within the M12 Motorway corridor. A focus on details and superior finishes was required to make up for a lack of adornment, with a minimalistic material palette used to ensure they are recessive in nature.

A range of major structural retaining wall types are required to construct the Project. The main wall construction types are listed below:

### REINFORCED SOIL WALLS

Reinforced Soil Walls (RSW) will incorporate 1.5m x 3m wall cladding panels in front a retained earth soil mass. A variety of wall finishes have been utilised to reinforce local character and identity.

### IN-SITU OFF-FORM REINFORCED CONCRETE WALL

Reinforced in-situ concrete retaining wall on shallow spread footing foundations. A variety of wall finishes have been utilised to reinforce local character and identity.

Typical perspective views of each wall type can be found following.



Precedent of retaining wall and barrier details

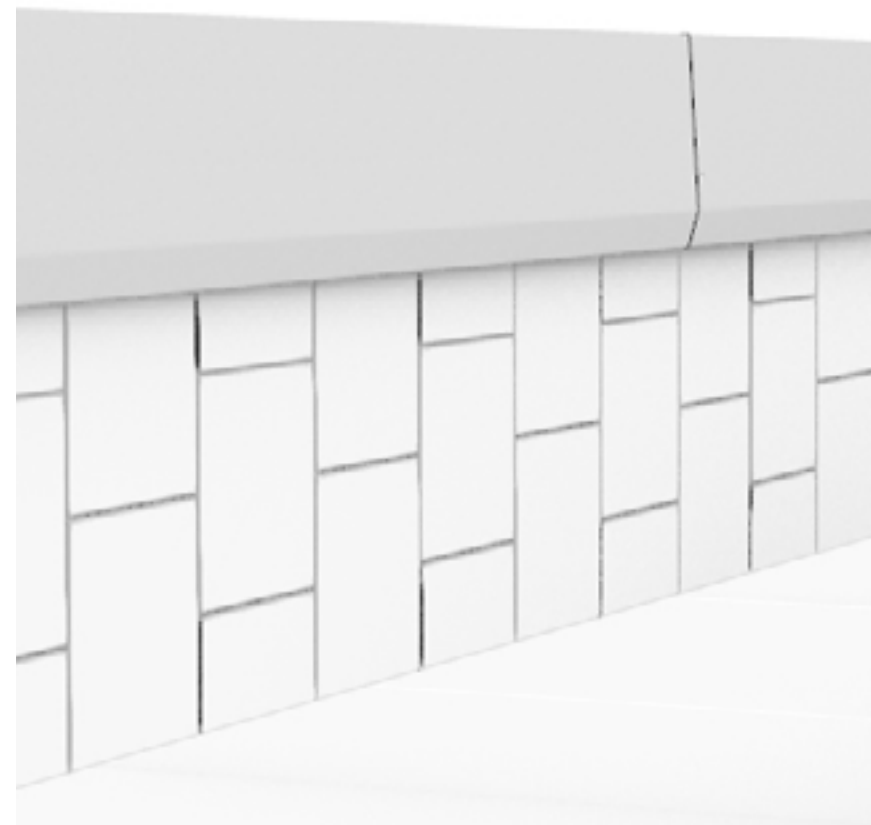


Figure 61. Reinforced soil wall - Typical perspective

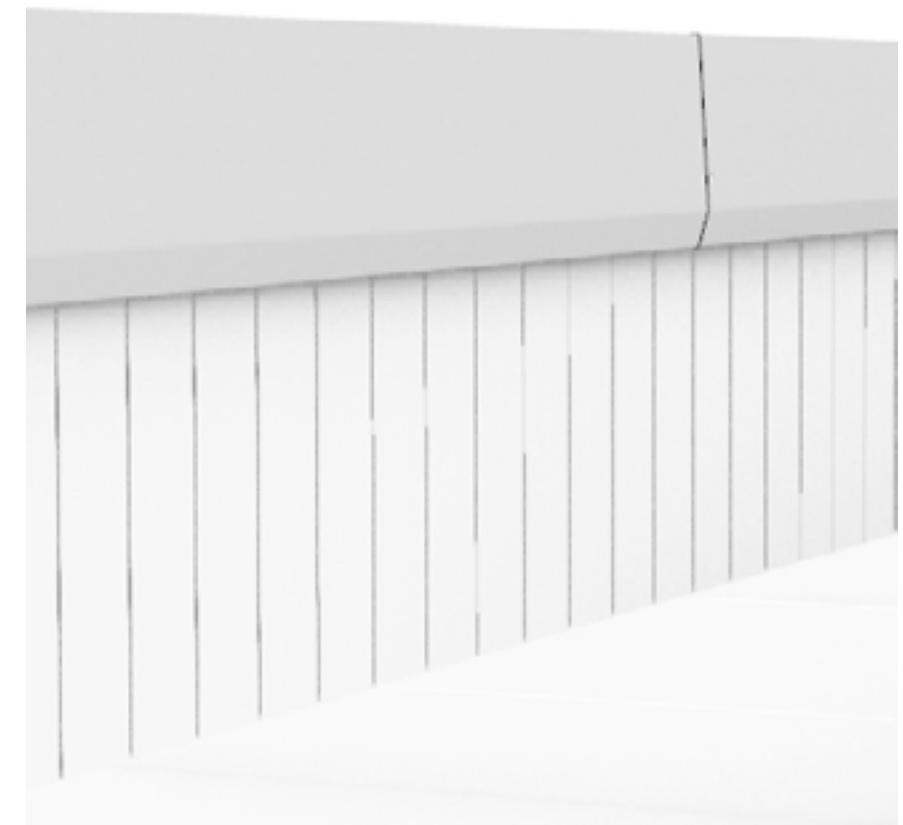


Figure 62. In-situ off-form retaining wall - Typical perspective



## RETAINING WALL LOCATIONS

The design team has worked hard to eliminate the use of these often overbearing structures from the majority of the project, and when the project has required the use of them, they have been designed to be refined and elegant.

The majority of retaining walls on the project are located at the Elizabeth Drive and M12 interchanges, with one other wall located at the western abutment to Cosgroves Creek Bridge (BR02).

Table 7. Retaining wall locations

No.	Wall type	Finish	Colour
<b>RW01</b>	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel
<b>RW02</b>	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel
<b>RW03</b>	RSW	Pattern finish	Windspray
<b>RW04</b>	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel

No.	Wall type	Finish	Colour
<b>RW05</b>	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel
<b>RW06</b>	RSW	Pattern Finish	Windspray
<b>RW07</b>	Off-form concrete	Plain concrete as extension of adjacent bridge abutment	Plain concrete
<b>RW08</b>	Off-form concrete	Vertical Rebate	Windspray
<b>RW09</b>	Off-form concrete	Vertical Rebate	Windspray
<b>RW10</b>	Off-form concrete	Vertical Rebate	Windspray
<b>RW11</b>	RSW at bridge abutments	Vertical Rebate	Windspray



**LEGEND**  
Retaining Wall

Figure 63. Retaining walls locations



## 5.9 RETAINING WALL FINISHES

In consideration of the wall construction type, location and adjacent land uses, the following high quality finish treatments have been developed to provide a unified aesthetic for the project for each retaining wall finish.

### MINOR RETAINING WALLS - VERTICAL REBATES

For secondary and minor retaining walls that are viewed predominantly by road users, a simple vertical banding pattern will be incorporated. The rebate will generally be 50mm wide x 20mm deep and spaced at nominal 1000mm centres (unless otherwise specified) across both insitu and RSW wall types.

### MAJOR RETAINING WALLS - PATTERN FINISH

The Connection to Country design philosophy for the M12 Motorway improves the standard and visual appearance of the major retaining walls by applying a subtle constellation pattern that references the surrounding Great Emu story.

Typical elevation views of each wall type can be found following.

### RETAINING WALL COLOURS

Colour selection has been considered for retaining walls, so that walls remain visually recessive, blending into the adjoining landscape and remain consistent across the Project.

Retaining walls across the Project will typically be post-painted with anti-graffiti coatings post-applied to reduce the risk and impacts of vandalism. Where space and landscaping permits, planting at the base of some walls will be used to soften their appearance and visually integrate with the landscape.

The painting strategy being adopted will consist of a sealer undercoat on the raw concrete. This will be followed by the application of a pigmented anti-graffiti paint. Walls will be painted in a Dulux system or similar which works as follows:

- ◇ Wash: Dulux Tilt Wash
- ◇ Primer: Dulux Acra Prime
- ◇ Final Coat: Dulux Weathermax HBR
- ◇ Colour: Colorbond 'Windspray' or equivalent.

The majority of the surfaces will be spray painted via a specialist contractor. Where painting may be close to residential properties, paint will be applied by a roller. Work method statements will be provided to ensure the project achieves the desired finish.



Concrete natural grey



Colorbond 'Windspray'



Feature walls - Weathering steel

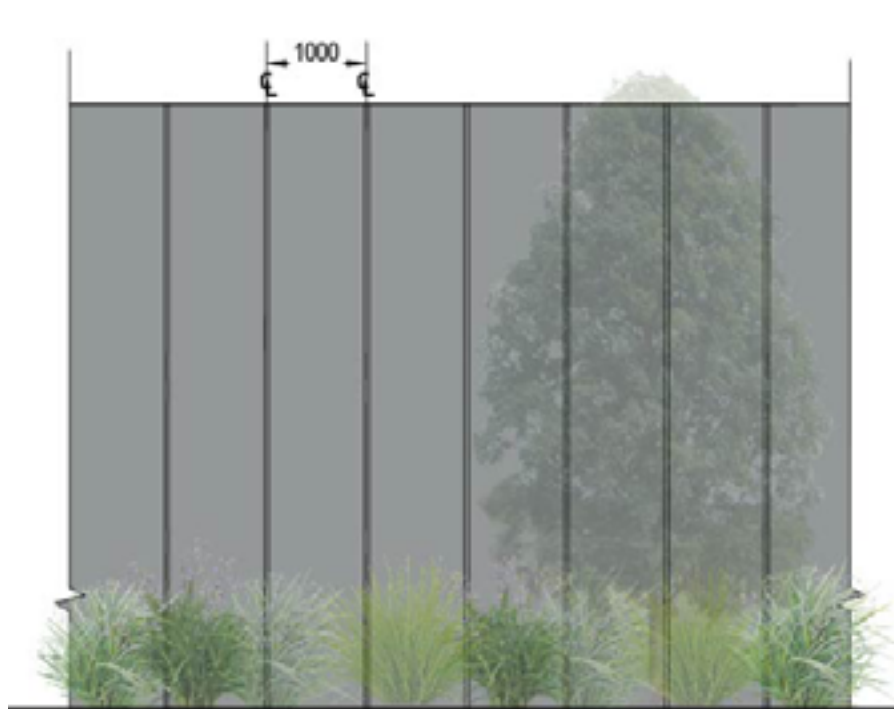


Figure 64. Vertical rebate - Typical elevation - In-situ wall

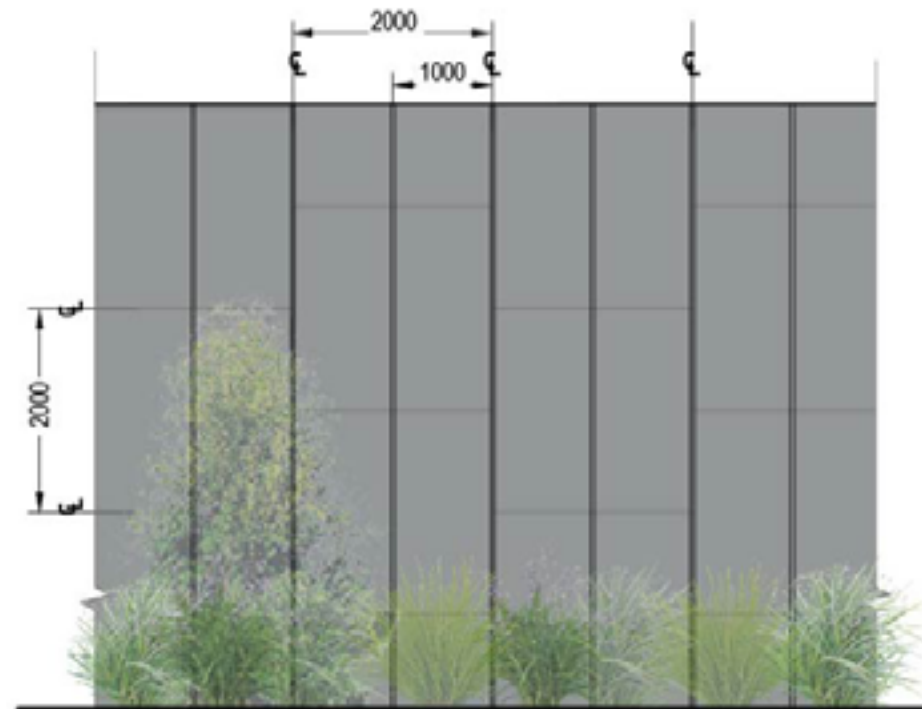


Figure 65. Vertical rebate - Typical elevation - RSW wall

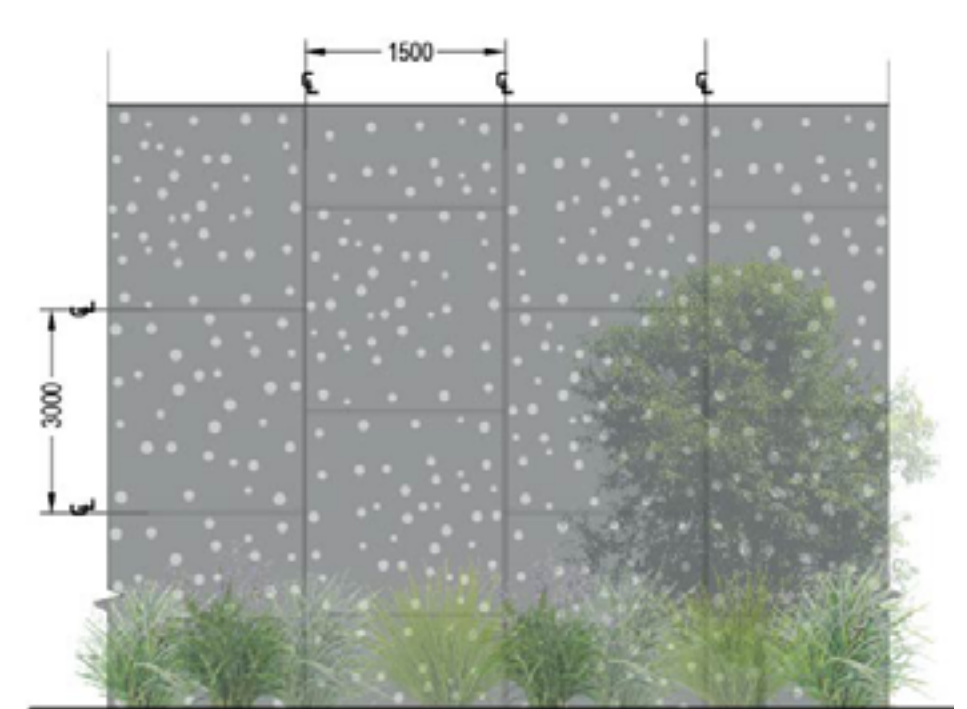


Figure 66. Pattern finish - Typical elevation - RSW wall



## 5.10 ABORIGINAL CULTURAL INTERPRETATION - INTEGRATED WALL ELEMENTS

### MAJOR RETAINING WALLS - FEATURE WALL

The project vision of 'Connection to Country' seeks to embed key interpretive themes throughout the project. Balarinji, on behalf of TfNSW, has consulted with the local aboriginal community as part of the design process, identifying key interpretive themes and an art strategy to be incorporated into the M12 shared path across the project. This is described further in the Appendix E.

As part of the overarching corridor narrative that was developed by Balarinji, the Great Emu story is interconnected across Australia. Most Aboriginal groups tell their own version of the Emu in the Sky story. According to Creation stories, Emus were Creator Spirits that cared for Country. Below the Southern Cross, the Great Emu can be seen stretched across the Milky Way constellation. More locally in Ku-ring-gai National Park, there are many rock engravings, one of which features the Emu, and at certain times of the year, the Emu constellation shines directly over the engraving.

As an outcome of the strategy, the major retaining walls located along Elizabeth Drive and the Airport Interchange will complement the other nearby artworks. The walls will reference the Emu constellation through the use of an elegant, refined and receding material palette incorporating a constellation relief within the Reinforced Soil Walls. In addition, undulating perforated weathering steel panelling will fix to the face of the walls at the Elizabeth Drive interchange and incorporate local indigenous language and a continuation of the constellation motif.



Figure 68. Pattern finish - Typical elevation - RSW wall



Perforated weathering steel panel - Precedent



Weathering steel panel - Precedent



Figure 67. Pattern finish - Typical perspective view - RSW wall





Artist's impression: View south from Airport access road to Elizabeth Drive Interchange and entrance to WSIA precinct (landscape shown at full maturity and is indicative only).





Artist's impression: View north along Luddenham Road (landscape shown at full maturity and is indicative only).





Artist's impression: Aerial view north-west over M7 / M12 Motorway Interchange (landscape shown at full maturity and is indicative only).