Artist's impression: Interpretation node with the Great Emu in the Sky in the background (landscape shown at full maturity and is indicative only).

4 LANDSCAPE DESIGN

Reinforcing the distinct existing landscape character of the Cumberland Plains of Western Sydney, and the re-connection of fragmented endangered ecological communities is fundamental to the M12 landscape planting design. Touches of indigenous planting knowledge are added to firmly root the project within Country.

Corridor wide planting selections will be predominantly derived of species from the endemic endangered ecological communities that the alignment travels through. This will assist in expanding the opportunity for native plants to colonise and native fauna to feed, forage and shelter, helping to re-create resilient ecological communities for the future.

The planting design across the corridor has also been designed to reinforce the existing landscape character zones from west to east of rolling hills, plains and ridgetop. The western section is characterised by undulating hills made up of a dominant pasture grass layer with some remnant vegetation including widely spaced native trees, whilst the plains has a floodplain character associated with the numerous creeks draining south-north across the alignment comprised generally of flat grasslands with a forested riparian corridor which will be key biodiversity and recreation corridors into the future. Finally, from Kemps Creek moving east the topography changes and the alignment rises along a ridgetop toward the M7 Motorway with a distinct character formed of enclosed Cumberland Plain trees with a dense understorey.

The proximity of the project to the airport has drastically effected the planting design, with varying default restrictions placed upon plant species choices within a 3,8 and 13km radius of the airport runways. A large proportion of endemic tree and shrub species that are derived from the adjacent EEC's are considered fauna attracting and are therefore unable to be used within the M12 project due to wildlife strike concerns. Other restrictions include planting of trees no greater than 10m in height and a maximum amount of 5 per group, particularly within a 3km radius. These groups then must be spaced a minimum of 50m apart to reduce fauna attraction. The involvement of an Aviation Ecologist resulted in some adjustment to the default restrictions based on actual ground conditions and a proposed monitoring regime to maximise as far as possible the density and diversity of potential tree species and ultimately canopy coverage across the project.

In addition, TfNSW have managed the Aboriginal cultural interpretation process to create a unique and distinct identity for the M12. The changing seasons of the D'harawal calendar are reflected in the flora and fauna of the region and help to guide Indigenous paths across Country. Therefore, planting throughout the corridor will reflect this seasonal change and be reinforced through signage to perform an educational and aesthetic purpose.

Existing landscape character across the project corridor

4.1 LANDSCAPE DESIGN PRINCIPLES

The Urban Design philosophy helps to outline the overarching goals of the project, and has helped guide the project from inception through to completion with influence from the macro to micro scale.

MACRO SCALE

- ◊ Ensure the integrity of the landscape journey along the corridor is maintained and enhanced, whilst fitting with the surrounding landscape quality.
- ◊ Create and enhance existing land future connections.
- ◊ Strengthen and enhance the existing landscape patterns experienced along the route. Use landscape treatments based on the relative homogeneity of the natural and cultural attributes of the route and the motorist's and pedestrians experiential response.
- ◊ Minimise the extent of clearing and earthworks to conserve existing vegetation communities and fauna habitat.
- ◊ Consistency in approach to engineering and architectural components to provide a unified design solution (e.g. medians, bridges, etc) to enhance visual unity and clarity.

MICRO SCALE

- ◊ Use vegetation treatments appropriate to reinforce desired landscape patterns.
- ◊ Generally base plant species selection on endemic vegetation patterns, consistent with safety (e.g.. headlights, frangibility) and functional e.g. erosion control, species availability) requirements.
- ◊ Blend water quality control ponds with adjoining landscape through appropriate earthworks design using naturalistic formations.
- ◊ Optimise opportunities for enhancement of local biodiversity.
- ◊ Blend cut and fill formations into adjoining terrain.
- ◊ Use landscape solutions at interchange gateways that draw upon the special qualities of place.

The design incorporates the following fundamental principles of landscape planting design in urban and road environments including:

SAFETY

Clear zone and safe sight distance setbacks are incorporated to avoid the creation of hidden public spaces which helps to increase passive surveillance opportunities in accordance with Crime Prevention Through Environment Design (CPTED) principles and species and spacing have been arrange to mitigate the risk of wildlife strike.

ECOLOGICALLY SOUND

The design uses local species from existing and adjoining plant communities and assists in protecting and recovering local biodiversity.

INTEGRATION WITH LOCAL SETTING

The design maintains and enhances existing landscape character and vegetation patterns.

ADD CHARACTER AND VALUE

The design achieves this by responding to and drawing on the existing landscape patterns of the area.

LOW MAINTENANCE AND COST EFFECTIVE

The design utilises existing site soils and local robust and durable plant species in a bold and simple way without unnecessary fussiness.

PLANT FOR CLIMATE RESILIENCE

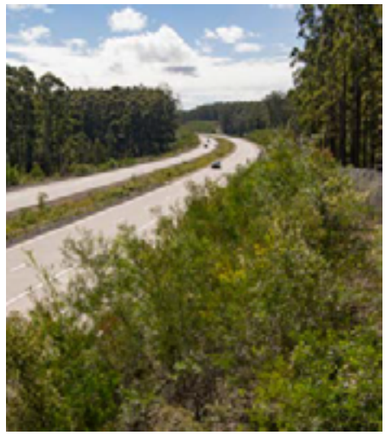
Maximising endemic vegetation that is suited to the current and future environmental conditions is key to the success of the green space in the corridor.

In addition, swales and water quality control ponds will help to slow and collect water on site to assist with collection and infiltration of stormwater.

Large endemic trees are to be maximised where possible along the length of the corridor to help reduce the effects of the heat island effect on an area of Sydney that has high median summer temperatures.

Frangible planting within the road corridor

Western Sydney Parklands



Low maintenance native planting

Planting for a changing climate

4.2 LANDSCAPE DESIGN THEMES

The landscape design will assist in delivering some of the interpretive concept themes developed in the initial concept design stages of the M12 corridor framework and carried through to detailed design. The design incorporates the following design landscape planting design themes unique to this project;

LANDFORM AND PLANTING TO REFLECT EXISTING LANDSCAPE CHARACTER AND RESPOND TO FUTURE LANDSCAPE VISION

The planting design responds to the broad landscape character zones of Western Sydney as a locale and the biodiversity of the Cumberland Plain. The project is broadly broken up into three distinct character zones which the planting design will respond to accordingly. These zones are; the rolling hills in the west, central floodplains, and eastern ridge tops.

While it is important that the planting responds to these zones, it is also important to understand that this area will undergo a vast transformation from largely farmland to a bustling Aerotropolis precinct.

The airport will have a dramatic effect on shaping the landscape of the area with drastic restrictions on planting endemic species within the majority of the project corridor. Designers have worked closely with ecologists to mitigate the loss of landscape character and canopy coverage due to the fauna attraction restrictions related to the airport.

CONNECTION TO COUNTRY

The concept of the Western Sydney Aboriginal Seasons will also be reflected in the planting design through planting choices along the M12 shared path. Using the seasonal planting concept to reinforce the wayfinding and art strategy will help to ensure a holistic integration of the Aboriginal seasons thinking into the alignment, helping to create a true sense of place.

ENDEMIC SEED COLLECTION

High quality and genetically diverse, locally sourced seed will be used where possible. Seed collection teams will follow Florabank guidelines to ethically source the highest quality seed for incorporation into vegetation used along the corridor. When seed can not be sourced locally, site environmental conditions including soils, geology, topography, climate and vegetation type are matched as close as possible with collection sites.

RECONNECT FRAGMENTED ENDANGERED ECOLOGICAL COMMUNITIES (EEC'S)

The road corridor travels through and adjacent to multiple fragmented endangered Cumberland Plain ecological communities. Efforts are to be made to connect fragmented EEC's within close proximity of each other. Vegetation is to be planted to reflect the structure of the various adjacent endemic communities of the Cumberland Plain.

MAINTAIN VIEW CORRIDORS

Planting must ensure open or revealed views of the Blue Mountains where possible. Large trees and screening shrubs will be reduced at points with valuable view corridors to help enhance the user experience. This is achieved by exposing the major western landmark that can help to clarify the drivers image of the surrounding environment.

Areas of the natural floodplain will be conserved into the future providing broad vistas from the rolling hills in the west and from the ridge tops in the east. Unveiling these vistas at key points along the journey will assist in engaging the driver and helping them orient themselves in the environment.

The airport will have a dramatic effect on the future landscape character

Planting to reflect existing character

Themeda australis seed collection by Toolijooa Nursery (TfNSW, 2021)

Clear views over creeks to be retained - South Creek

CORRIDOR WIDE PRINCIPLES

The landscape design will assist in delivering the corridor wide principles. The key strategy for this delivery can been seen in the points below:

- ◊ Focus is placed upon reconnecting fragmented ecological communities. This is achieved through rehabilitation planting in-between existing endemic communities. This will assist in providing new flora a fauna corridors adjacent to the project
- ◊ Planting design is to tie-in with future parkland space within the riparian corridors
- ◊ Wide planted medians assist in greening the corridor east of the main interchange
- ◊ There are major planting restrictions within the 3km and 8km radius zones of the airport to help reduce fauna attraction issues. These restrictions are highlighted later in this chapter
- ◊ Airport planting restrictions are exempt in riparian creek corridors so there is a key emphasis on rehabilitating these important corridors. A key focus is placed on creek bank stabilisation and rehabilitation through dense and diverse planting arrangements
- ◊ Plant species choice is broadly broken down to reflect 3 landscape character zones. They are the Rolling Hills, the Plains and the Ridgetop and are made up of species from the endemic communities that help form their character.

The plan below highlights some of the key landscape design moves within the alignment.

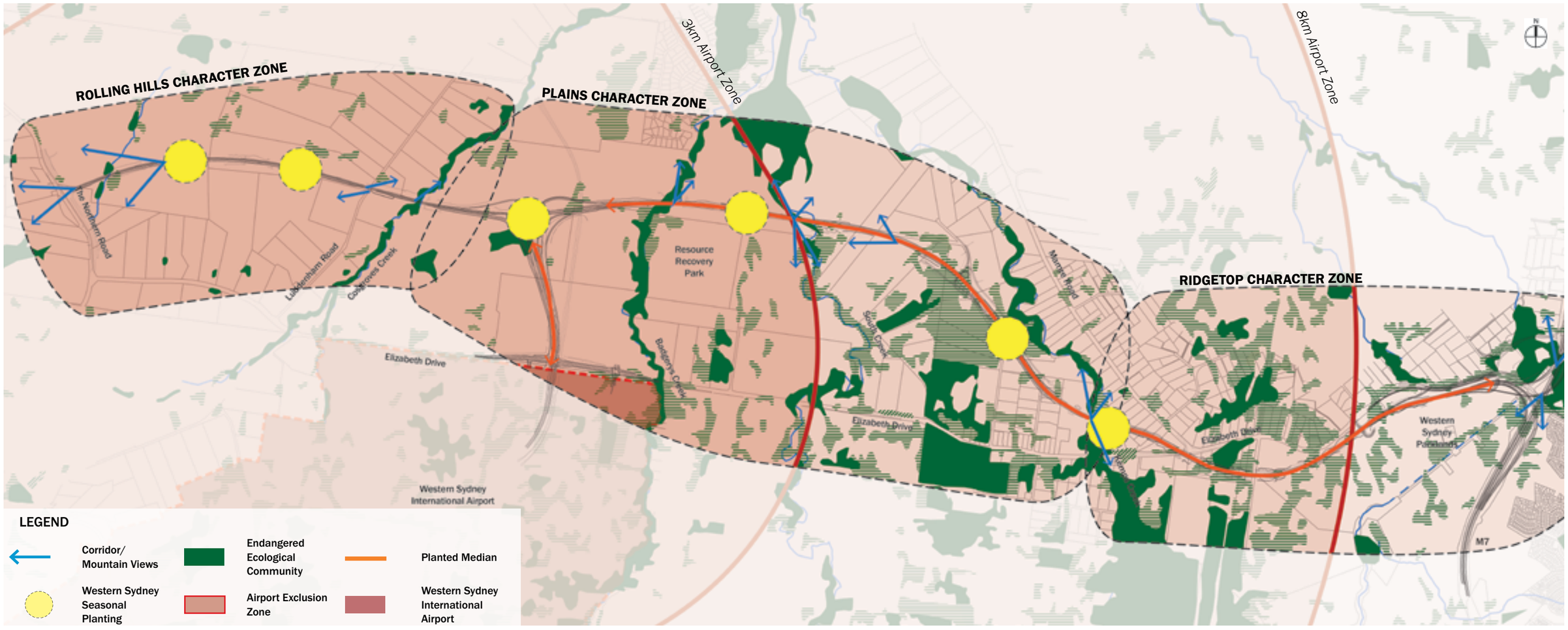


Figure 27. Landscape design themes

4.3 LANDSCAPE DESIGN AND WILDLIFE STRIKE MITIGATION

Designing landscape, both on airfield proper and surrounding an airport, with the aim to reduce the risk of wildlife strike is a complex endeavour. Safety is a key factor, however challenges are faced when trying to find a balance between biodiversity and air safety.

Following meetings and workshops with TfNSW, the current approach to addressing this issue is through a merit-based assessment that has been undertaken by the detailed design team ecologist. The detailed design team ecologist has reviewed the plant species selection, location and arrangement and provide advice about minimising the risk of wildlife strike.

Advice from the ecologist has set some firm practices in regard to plant selection and design. These vary slightly between distance zones and include:

- ◊ Implement a long-term seasonal monitoring regime of all landscaped areas and associated infrastructure
- ◊ Long term regular monitoring will help identify emerging wildlife hazards and to fully assess the extent of the wildlife attraction to landscaped areas
- ◊ Avoid species from the Proteaceae family
- ◊ Restrict species from the Myrtaceae family
- ◊ Avoid species from the Moraceae family
- ◊ Avoid palm species
- ◊ Avoid fruit trees including orchard-style trees
- ◊ Avoid trees that produce large quantities of nectar producing flowers
- ◊ Turfed Areas to be maintained at 300mm
- ◊ Regularly remove seed heads from grass species
- ◊ Maintain trees to avoid hollow forming limbs and trunks
- ◊ Plant tree groups at 50m distances
- ◊ Trees that pose some risk are to be planted in groups of no more than 5.

The above rules show the challenges posed to landscape designers in achieving the natural Cumberland Plain character whilst adhering to the strict fauna strike requirements.

The plan below highlights some of the key restrictions within the alignment.

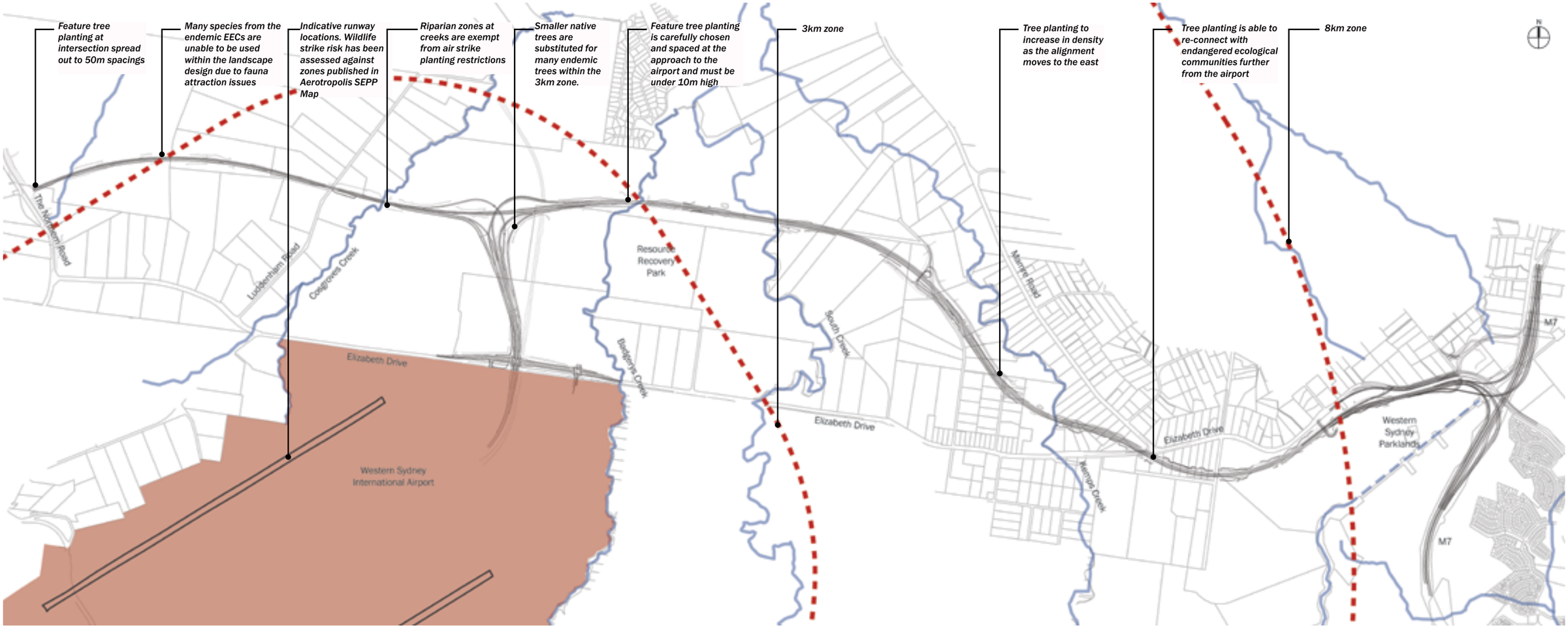


Figure 28. Western Sydney International Airport and the 3,8 and 13km radius zones

4.4 PLANTING PALETTE

TYPICAL SPECIES LOCATED WITHIN THE ROLLING HILLS CHARACTER ZONE

The typical landscape character of the Rolling Hills character zone is typified by rolling Cumberland Plains grassland and scattered tree groupings with a noticeable absence of shrubs. Focus is primarily on grasses and stands of native trees.

The species are typically found within EEC's adjacent the project such as - Shale Hills Woodland, Shale Plains Woodland and Alluvial Woodland. Plants from these communities assist in forming the landscape character and species lists of this zone.

Other plant species used in this mix are native trees that comply with the strict air safety restrictions due to fauna attraction risks associated with the airport. These preclude the use of many of the endemic shrubs and trees found locally within the adjacent EEC's.

The following endemic species help to form the plant mixes found within the Rolling Hills Character zone.

Detailed plans and species lists can be accessed within Appendix A-C of this report.

Rolling Hills	
Botanical Name - Trees	***Common Name***
Acacia decurrens	Black Wattle
Acacia falcata	Hickory Wattle
Angophora hispida	Dwarf Apple
Angophora subvelutina	Broad-leaved Apple
Brachychiton populneus	Kurrajong
Breynia oblongifolia	Coffee Bush
Bursaria spinosa	Sweet Bursaria
Callistemon linearis	Narrow-leaved Bottlebrush
Callistemon salignus	Willow Bottlebrush
Callistemon viminalis	Weeping Bottlebrush
Ceratopetalum gummiferum	New South Wales Christmas Bush
Eucalyptus crebra	Narrow-leaved Ironbark
Melaleuca decora	White Feather Honey-myrtle
Melaleuca linariifolia	Flax-leaved Paperbark
Melaleuca styphelioides	Prickly-leaved Paperbark
Tristaniopsis laurina	Water Gum
Botanical Name - Shrubs, Grass, Groundcovers	
Aristida ramosa	Purple Wiregrass
Arthropodium milleflorum	Pale Vanilla-lily
Bothriochloa macra	Red-leg Grass
Breynia oblongifolia	Coffee Bush
Bursaria spinosa	Sweet Bursaria
Chloris truncata	Windmill Grass
Chloris ventricosa	Plump Windmill Grass
Clematis glycinoides	Headache Vine
Commelina cyanea	Scurvy Weed
Dichelachne micrantha	Shorthair Plumegrass
Dodonaea viscosa	Sticky Hop-bush
Einadia nutans	Climbing Saltbush
Eremophila debilis	Winter Apple
Hardenbergia violacea	Purple Coral Pea
Indigofera australis	Australian Indigo
Microlaena stipoides var. stipoides	Weeping Grass
Panicum simile	Two-colour Panic
Plectranthus parviflorus	Cockspur Flower
Poa labillardierei var. labillardierei	Tussock Grass
Rytidosperma racemosum syn. Austrodanthonia racemosa	Clustered Wallaby Grass
Sorghum leiocladum	Wild Sorghum
Themeda triandra syn. Themeda australis	Kangaroo Grass
Wahlenbergia gracilis	Sprawling Bluebell
Wahlenbergia stricta	Australian Bluebell


Aristida ramosa


Arthropodium milleflorum


Breynia oblongifolia


Eremophila debilis


Microlaena stipoides


Dichelachne micrantha


Einadia nutans


Plectranthus parviflorus


Themeda triandra


Wahlenbergia gracilis


Chloris truncata


Dodonaea viscosa


Angophora hispida


Angophora subvelutina


Melaleuca linariifolia


Brachychiton populneus


Eucalyptus crebra


Tristaniopsis laurina


Melaleuca linariifolia *Angophora subvelutina* *Eucalyptus crebra*

TYPICAL SPECIES LOCATED WITHIN THE PLAINS CHARACTER ZONE

The Plains Floodplain Mix is characterized by Cumberland Flood Plain made up of grassland and scattered tree groupings with a minimal shrub layer present. Three riparian creek corridors are present.

The species are typically found within EEC's adjacent the project such as - Castlereagh Scribbly Gum Woodland, Shale Plains Woodland, Alluvial Woodland and Shale Gravel Transition Forest. Plants from these communities assist in forming the landscape character of this zone.

Other plant species used in this mix are native trees that comply with the strict air safety restrictions due to fauna attraction risks associated with the airport. These preclude the use of many of the endemic shrubs and trees found locally within the adjacent EEC's.

Many of the riparian corridors are exempt from these strict aviation planting rules and strongly reflect the existing endemic riparian communities.

The following endemic species help to form the plant mixes found within the Plains Character zone.

Detailed plans and species lists can be accessed within Appendix A-C of this report.

Plains	
Botanical Name - Trees	***Common Name***
Allocasuarina littoralis	Black she-oak
Angophora floribunda	Rough-barked apple
Angophora subvelutina	Broad leaved apple
Brachychiton populneus	Kurrajong
Eucalyptus crebra	Narrow-leaved ironbark
Eucalyptus tereticornis	Forest red gum
Melaleuca linariifolia	Snow-in-summer
Botanical Name - Shrubs, Grass, Groundcovers	
Ajuga australis	Austral bugle
Aristida ramosa	Purple wire-grass
Aristida vagans	Threeawn speargrass
Arthropodium milleflorum	Vanilla lily
Asperula conferta	Common woodruff
Bothriochloa macra	Red grass
Brunoniella australis	Blue trumpet
Bursaria spinosa	Sweet bursaria
Capillipedium spicigerum	Scented-top grass
Chloris truncata	Windmill-grass
Chloris ventricosa	Australian fingergrass
Chorizema parviflorum	Eastern flame pea
Chrysocephalum apiculatum	Common everlasting
Commelina cyanea	Scurvy weed
Cymbopogon refractus	Barbed wire grass
Desmodium varians	Variable tick-trefoil
Dichanthium sericeum	Silky blue-grass
Dichelachne micrantha	Short-hair plume grass
Dichelachne parva	Plumegrass
Dichondra repens	Kidney weed
Dichopogon fimbriatus	Chocolate lily
Dichopogon strictus	Chocolate lily
Echinopogon caespitosus	Bushy hedgehog grass
Einadia hastata	Berry saltbush
Eragrostis leptostachya	Paddock love-grass
Eremophila debilis	Winter apple
Eriochloa pseudoacrotricha	Early spring grass
Fimbristylis dichotoma	Forked fimbry
Glycine clandestina	Love creeper
Glycine microphylla	Small leaf glycine
Glycine tabacina	Glycine pea
Goodenia hederacea	Goodenia

Plains	
Botanical Name - Shrubs, Grass, Groundcovers	***Common Name***
Hardenbergia violacea	Native sarsaparilla
Hypericum gramineum	Small St. John's wort
Hypoxis hygrometrica	The golden weather-grass
Juncus usitatus	Common rush
Lomandra filiformis	Wattle mat-rush
Lomandra multiflora	Many-flowered mat-rush
Mentha diemenica	Slender mint
Microlaena stipoides	Weeping grass
Panicum effusum	Hairy panic
Paspalidium distans	Watercrown grass
Poa labillardierei	Common tussock-grass
Pratia purpurascens syn. Lobelia purpurascens	White root
Rytidosperma caespitosum	Common wallaby-grass
Rytidosperma racemosum syn. Austrodanthonia racemosa	Wallaby grass
Sorghum leiocladum	Wild sorghum
Sporobolus creber	Western rat's-tail grass
Sporobolus elongatus	Slender rat's-tail grass
Themeda triandra	Kangaroo grass
Tricoryne elatior	Yellow rush-lily
Wahlenbergia gracilis	Australian bluebell
Wahlenbergia stricta	Native bluebell


Acacia parramattensis

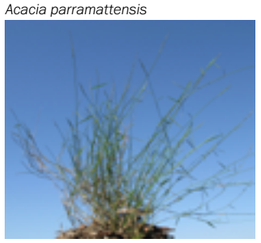

Ajuga australis


Pratia purpurascens


Rytidosperma caespitosum


Commelina cyanea


Echinopogon ovatus


Entolasia marginata


Fimbristylis dichotoma


Lomandra longifolia


Mentha diemenica


Microlaena stipoides


Sorghum leiocladum


Angophora floribunda


Angophora subvelutina


Melaleuca linariifolia


Allocasuarina littoralis


Casuarina glauca


Eucalyptus amplifolia


Melaleuca linariifolia

Angophora subvelutina

Allocasuarina littoralis

TYPICAL SPECIES LOCATED WITHIN THE RIDGETOP CHARACTER ZONE

The Ridgetop character zone is representative of remnant and revegetated bushland and by the north-south running ridge line that forms the catchment boundary between the Hawkesbury-Nepean, Georges River and Parramatta River catchments. Some mixes will differ from more open canopy mixes through to dense tree and shrub planting mixes, which will be predominantly used to screen and enclose areas and reconnect fragmented ecologies.

Species chosen are typically found within EEC's adjacent the project such as - Shale Hills Woodland, Shale Plains Woodland. Plants from these communities assist in forming the landscape character of this zone.

Other plant species used in this mix are native trees that comply with the strict air safety restrictions due to fauna attraction risks associated with the airport. These effect the use of many of the endemic shrubs and trees found locally within the adjacent EEC's, however as the project moves further east these issues reduce.

The following endemic species help to form the plant mixes found within the Ridgetop Character zone.

Detailed plans and species lists can be accessed within Appendix A-C of this report.

Ridgetop	
Botanical Name - Trees	***Common Name***
Angophora floribunda	Rough-barked apple
Angophora hispida	Dwarf apple
Angophora subvelutina	Broad leaved apple
Casuarina glauca	Swamp oak
Eucalyptus amplifolia	Cabbage gum
Eucalyptus baueriana	Blue gum
Eucalyptus elata	River peppermint
Eucalyptus eugenioides	Thin-leaved stringybark
Eucalyptus globoidea	White stringybark
Eucalyptus piperita	Sydney peppermint
Eucalyptus punctata	Grey gum
Eucalyptus sclerophylla	Scribbly gum
Eucalyptus tereticornis	Forest red gum
Ficus rubiginosa	Port Jackson fig
Melaleuca linariifolia	Snow in summer
Botanical Name - Shrubs, Grass, Groundcovers	
Acacia decurrens	Black wattle
Acacia parramattensis	Parramatta wattle
Aristida ramosa	Purple wire-grass
Aristida vagans	Threeawn speargrass
Arthropodium milleflorum	Vanilla lily
Brachyscome multifida	Rock daisy
Brunoniella australis	Blue trumpet
Bursaria spinosa	Sweet bursaria
Calandrinia pickeringii	Pink purslane
Cheilanthes sieberi subsp. Sieberi	Poison rock fern
Desmodium varians	Variable tic-trefoil
Dianella longifolia	Spreading flax lily
Dichelachne micrantha	Short-hair plume grass
Dichondra repens	Kidney weed
Dipodium punctatum	Blotched hyacinth-orchid
Echinopogon caespitosus	Bushy hedgehog grass
Entolasia stricta	Wiry panic
Eragrostis leptostachya	Paddock Lovegrass
Euchiton sphaericus (Gnaphalium sphaericum)	Tropical creeping cudweed
Glycine clandestina	Love creeper
Glycine tabacina	Love creeper
Goodenia hederacea	Goodenia
Lomandra filiformis	Wattle mat-rush
Lomandra multiflora	Many flowered mat-rush

Ridgetop	
Botanical Name - Shrubs, Grass, Groundcovers	***Common Name***
Oxalis perennans	Grassland Wood-sorrel
Paspalidium distans	Watercrown grass
Pimelea curviflora var. subglabrata	Rice Flower
Ranunculus lappaceus	Common buttercup
Rytidosperma setaceum	Small-flowered wallaby-grass
Rytidosperma tenuius	Short-awn wallaby-Grass
Themeda triandra	Kangaroo grass
Wahlenbergia gracilis	Australian bluebell


Aristida vagans


Aristida ramosa

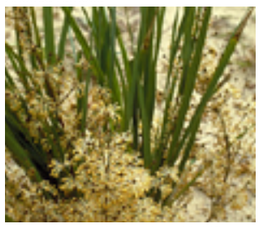

Arthropodium milleflorum


Brachyscome multifida


Brunoniella australis


Calandrinia pickeringii


Cheilanthes sieberi subsp. Sieberi

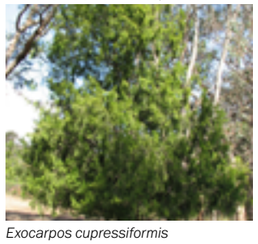

Lomandra multiflora subsp. Multiflora


Dichopogon strictus


Glycine clandestina


Dichondra repens


Pomax umbellata


Exocarpos cupressiformis


Eucalyptus piperita


Eucalyptus eugenioides


Angophora floribunda


Eucalyptus fibrosa


Melaleuca linariifolia


Exocarpos cupressiformis *Eucalyptus eugenioides* *Eucalyptus tereticornis*

4.5 WESTERN SYDNEY SEASONAL PLANTING

In addition to the species chosen from the endemic adjacent communities listed above, The project will also celebrate the seasonal landscape and signatures of Country, by highlighting and celebrating the unique flora and fauna cycles that characterise Sydney's seasons. These seasons are highlighted in the neighbouring D'harawal Calendar with all of the information and inspiration presented in this section of the report taken from Frances Bodkin's D'harawal seasons and climatic cycles publication. Frances Bodkin also worked with the Artist Cohort and Balarinji to inform planting suggestions and colour palette throughout the design. The seasons of Western Sydney offer a myriad of diverse planting opportunities across the study area and within the individual precincts. Following is an exploration of seasonal design outcomes that have been taken forward into delivery.

The seasonal planting palette will reinforce the wayfinding and art strategy specifically at the interpretation nodes. The planting palette would incorporate and showcase flowering species which reflect the changing seasons at these select locations along the project, acting as a subtle but visible marker along the route. Vibrant splashes of colour would celebrate the seasonal changes so a node will always be in bloom.

Information on the seasonal calendar can be found in the following pages. Refer to chapter 3 for information on how it has been incorporated into the six interpretation nodes along the M12 shared path.

HOT AND DRY (JANUARY - MARCH)

During this hot, dry season, spring flowers have now produced seed and fruit ready to be gathered and enjoyed first thing in the morning (Bodkin, 2008).

◊ Colour: Yellow

Hot and dry (January - March)

WET AND COOL (APRIL - JUNE)

The lilly pillys ripen on the trees. However, when the lilly pillys start to fall, it is time to begin the yearly trek to the coastal areas (Bodkin, 2008).

◊ Colour: Pink

Wet and cool (April - June)

COLD AND FROSTY (JUNE - LATE JULY)

The Burringoa - Eucalyptus tereticornis - starts to produce flowers, indicating that it is time to collect the nectar of certain plants. (Bodkin, 2008).

◊ Colour: White

Cold and frosty (June - Late July)

COLD AND WINDY (AUGUST)

The time of the flowering Acacia floribunda. At the end of this time Acacia decurrens - flower, which indicates the beginning of the gentle spring rains (Bodkin, 2008).

◊ Colour: Yellow

Cold and windy (August)

COOL, GETTING WARMER (SEPTEMBER - OCTOBER)

A time of the year when the flying foxes gather in the darkening skies, with the appearance of the splashes of the bright red (Bodkin, 2008).

◊ Colour: Red

Cool, getting warmer (September - October)

WARM AND WET (NOVEMBER - DECEMBER)

It is the time of the blooming of the Kai'arrewan (Acacia binervia) which announces the occurrence of fish in the bays and estuaries (Bodkin, 2008).

◊ Colour: Yellow, Cream

Warm and wet (November - December)

Hot and Dry
January - March

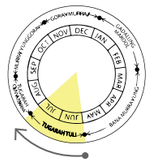
Trees	D'harawal Name
Acacia implexa	Weetjellan
Banksia serrata	Wattungoori
Brachychiton populneus	Kooritjong

Shrubs/Groundcover	
Bursaria spinosa	Kurwan
Dianella caerulea	Pokulbi
Lomandra longifolia	Kulara
Gastrodia sesamoides	Gah'marral

Wet and Cool
April - June

Trees	D'harawal Name
Acmena smithii	Tjerail
Syzygium paniculatum	Daguba
Allocasuarina littoralis	Dahlwah

Shrubs/Groundcover	
Daucus glochidiatus	Kurnell
Persoonia glaucescens	Jibbong



Cold and Frosty
June - late July

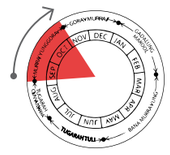
Trees	D'harawal Name
Eucalyptus tereticornis	Buringoa

Shrubs/Groundcover	
Doryanthes excelsa	Kaimia

Cold and Windy
August

Trees	D'harawal Name
Acacia floribunda	Marrai'uo
Acacia decurrens	Boo'kerrikin

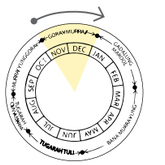
Shrubs/Groundcover	
Calotis cuneifolia	Bindii



Cool, getting warmer
September - October

Trees	D'harawal Name
Angophora subvelutina	Boonah

Shrubs/Groundcover	
Doryanthes excelsa	Kaimia
Telopea speciosissima	Miwa Gawarn/Gawaian
Actinotus helianthi	Talara Tingi



Warm and Wet
November - December

Trees	D'harawal Name
Acacia binervia	Kai'areewan
Angophora hispida	Barrindah
Ficus rubiginosa	Tam'noon

Wattungoori

Tjerail

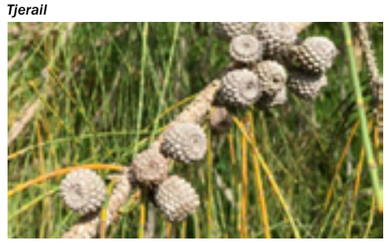
Buringoa

Marrai'uo

Boonah

Tam'noon

Weetjellan



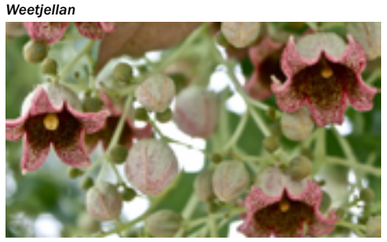
Dahlwah

Kaimia

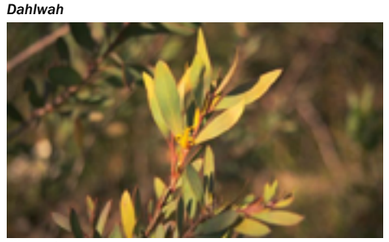
Boo'kerrikin

Miwa

Kai'areewan



Kooritjong



Jibbong

Bindii

Talara Tingi

Barrindah

4.6 LANDFORM AND EARTHWORKS

The road formation changes cross sections along the length of the corridor in response to the existing topography, drainage and vegetation patterns of the landscape through which the Motorway traverses. Throughout the corridor, there are a number of moderately deep cuts and fills along the route.

Where possible, the top embankment of any cut would be laid back to 3H:1V with all tops and edges 'rounded off' and 'feathered' into the adjoining landform. Numerous cross sections are included in this section to describe the various configurations and treatments.

The following sections highlight the different approaches and principles incorporated into the earthworks site wide. These principles help to shape the form of the project to help the roadway sit comfortably within it's landscape context.

Extended fill batters help integrate the project across floodplains

Revegetated cut batter helps integrate the road with the landscape and provides a green, attractive corridor.

SOIL PREPARATION

Preparation works will largely involve the use of in–situ soils that are stripped, stockpiled and ameliorated for re–use in the project works. In addition to this, imported topsoil suitable for landscape planting may need to be added.

The subgrade of all areas to be planted will be ripped and cultivated to depth of 200mm. Subgrades will also be tested for suitability to support plant growth and ameliorated in accordance with test results prior to installing topsoil. Topsoil depths should include the following:

- ◊ Hydroseeded/Straw mulched areas: 100-200mm over 100-200mm cultivated subgrade
- ◊ General massed planting areas: 300mm over 200mm cultivated subgrade.

EMBANKMENT DESIGN DETAILS

There are several key considerations when forming the project earthworks that affect how the Motorway sits within the surrounding landscape. These are;

- ◊ Steepness of cut and fill batters
- ◊ Interface between earthworks and existing landscape
- ◊ Profile of noise mounds.

FILL BATTERS

- ◊ All fill batters should be softened with vegetation and wherever possible grades should be kept to a maximum of 1:3 particularly across floodplain areas to allow better visual integration of the road formation with the existing floodplain landscape
- ◊ Where space is limited and 1:2 grades are necessary the planting design should be carefully considered to provide a naturalised aesthetic whilst remaining maintainable
- ◊ Round off the bottoms of fill batters where they interface with the existing landscape
- ◊ Wherever corridor width allows, the grade of the fill batter should flatten to improve aesthetics and maintainability. A batter that varies in grade along its length will have a more natural appearance than one that remains at a constant grade from start to finish.

CUT BATTERS

- ◊ Where the shared path passes through cut batters, efforts should be made to minimise the grade of the adjacent batters both uphill and downhill of the path
- ◊ If space is limited then flattening should occur where benching for the shared path interfaces to allow for buffer planting and improved maintainability
- ◊ Round off the tops of cut batters where they interface with the existing landscape
- ◊ Cut batters in other than rock will have typically have a slope of 1:2, however 1:3 cut batters are preferred wherever possible to allow for easier maintenance and better vegetation outcomes
- ◊ Wherever corridor width allows, the grade of the cut batter should flatten to improve aesthetics and maintainability
- ◊ Batter faces will typically be horizontally (parallel with the road) furrowed to provide a good key for topsoil or compost blanket.

DRAINAGE FORMATIONS

- ◊ In all cases the edges of these formations are rounded and naturalised to reduce their visual contrast with the surrounding landscape character
- ◊ Berms required between open channels and motorway embankments are rounded and integrated into the profile of the adjoining embankment to avoid unsightly bumps and steps.

MEDIANS AND VERGE AREAS

- ◊ Unless otherwise paved, all median and verge areas will be topsoiled and revegetated with grasses, shrubs and trees within the limitations of 'clear zone' safety requirements. Containerised plant stock is used in these locations and topsoil depth is increased to facilitate long term success.

TYPICAL SECTIONS - ALIGNMENT WEST OF AIRPORT INTERCHANGE

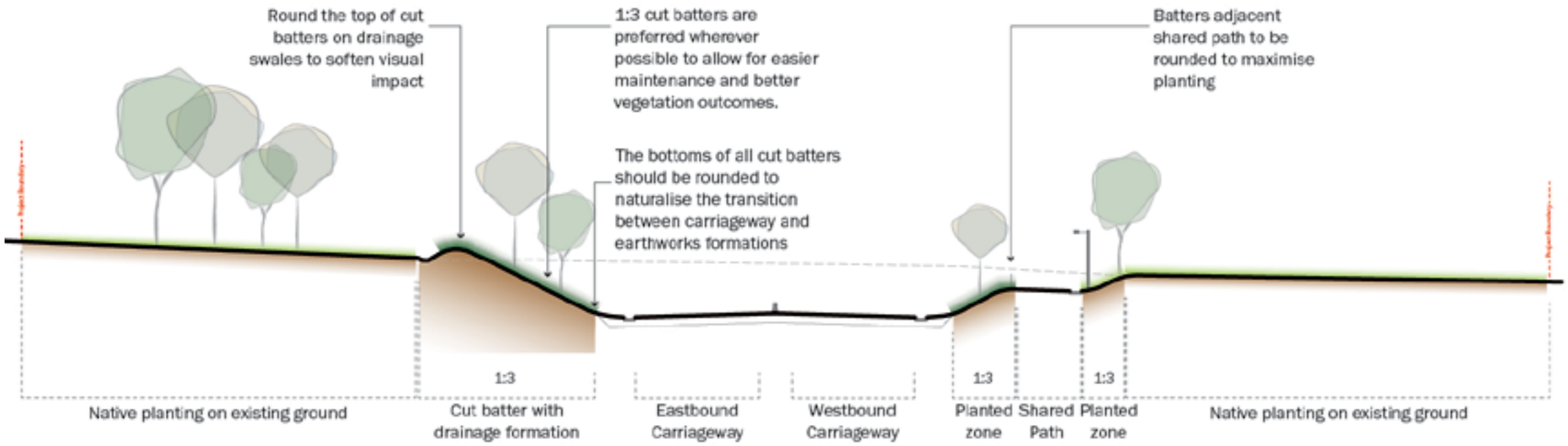


Figure 29. Typical section - Narrow median west of Airport Interchange - In cut

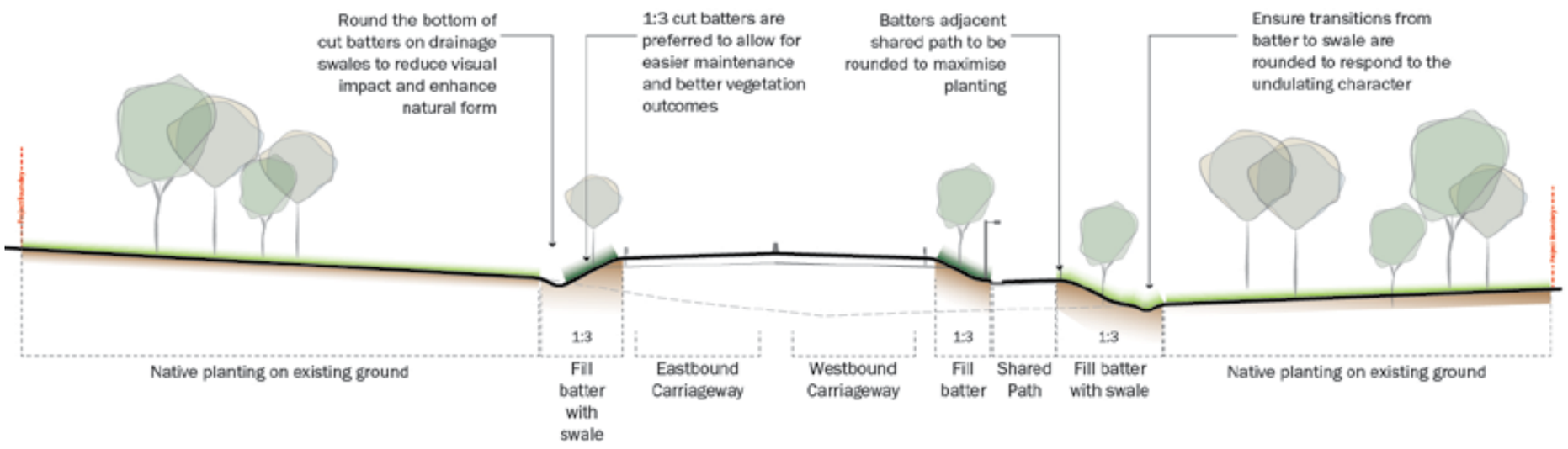


Figure 30. Typical section - Narrow median west of Airport Interchange - Fill embankment

TYPICAL SECTIONS - ALIGNMENT EAST OF AIRPORT INTERCHANGE

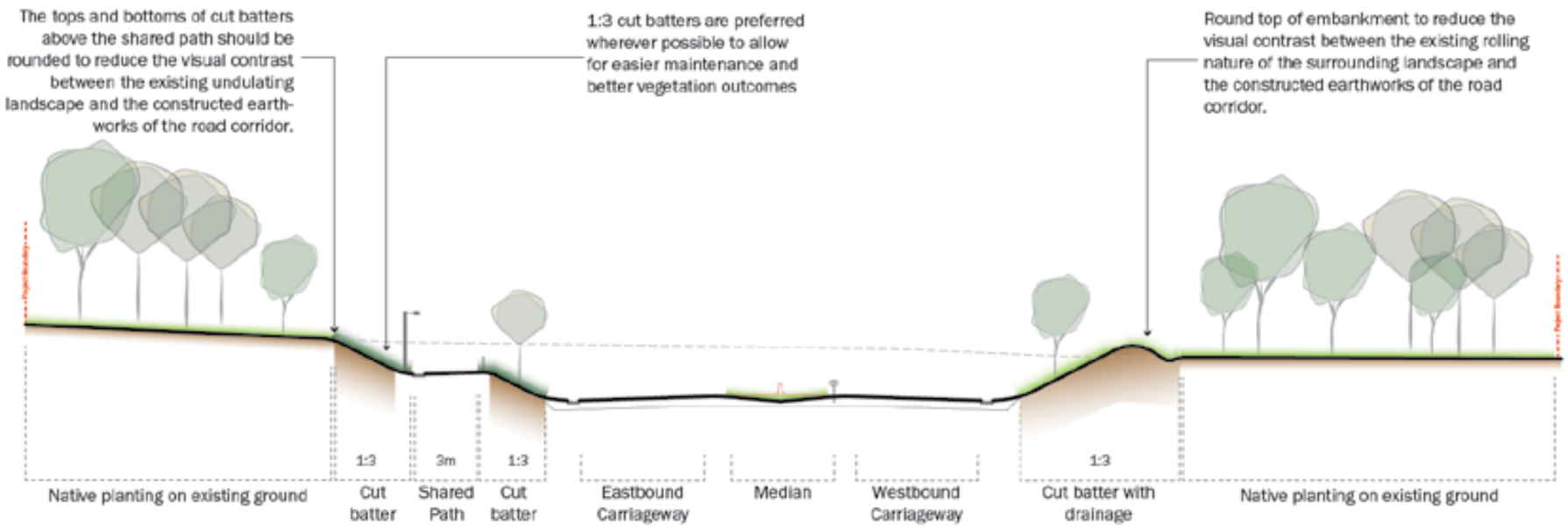


Figure 32. Typical section - Wide median east of Airport Interchange - In cut

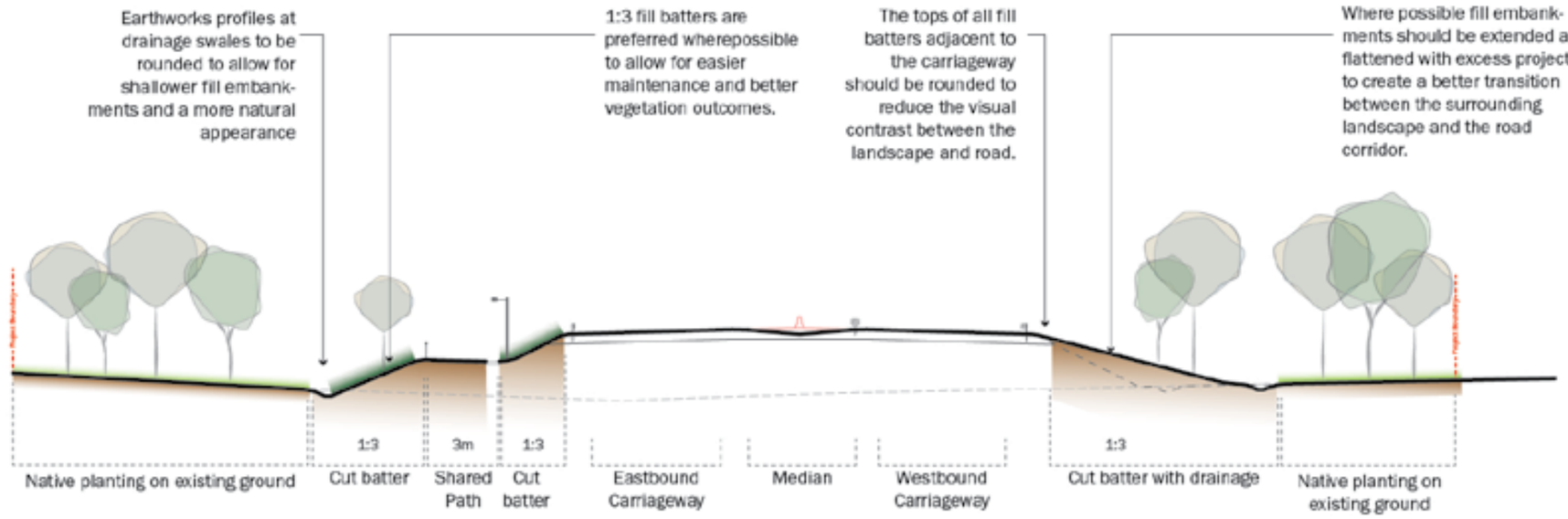


Figure 31. Typical section - Wide median east of Airport Interchange - Fill embankment

4.7 RESTORATION OF LOCAL VEGETATION COMMUNITIES

NSW NATIONAL PARKS AND WILDLIFE SERVICES - ENDANGERED VEGETATION MAPPING

The *NSW National Parks and Wildlife Services' Cumberland Plain Recovery Plan* focuses on the threatened species, populations and ecological communities that are endemic to the Cumberland Plain or are primarily distributed on the Cumberland Plain.

Connecting fragmented ecological communities is a key landscape principle of this project as re-vegetated areas can extend the area available as habitat for local fauna.

While replacement of vegetation anywhere in the landscape is beneficial, there are several reasons why it is likely to have a greater benefit if it is located next to an existing remnant:

- The size of the remnant will be increased by re-vegetating
- Native plant species may naturally colonise the revegetated area and native fauna will have less distance to travel to recolonise it
- Management of a single area will be cheaper than the maintenance of two smaller areas.

The ultimate goal of any revegetation project should be to reproduce an ecosystem that is structurally and functionally similar to existing remnant vegetation, and the chances are maximised where existing remnants are extended.

In areas adjacent to EEC's efforts have been made to use plants derived from that EEC to try to reconnect or enhance the fragmented ecological community.

The following plan is included to show the extent of EEC's within to the project corridor and the opportunity to reconnect as many s possible.

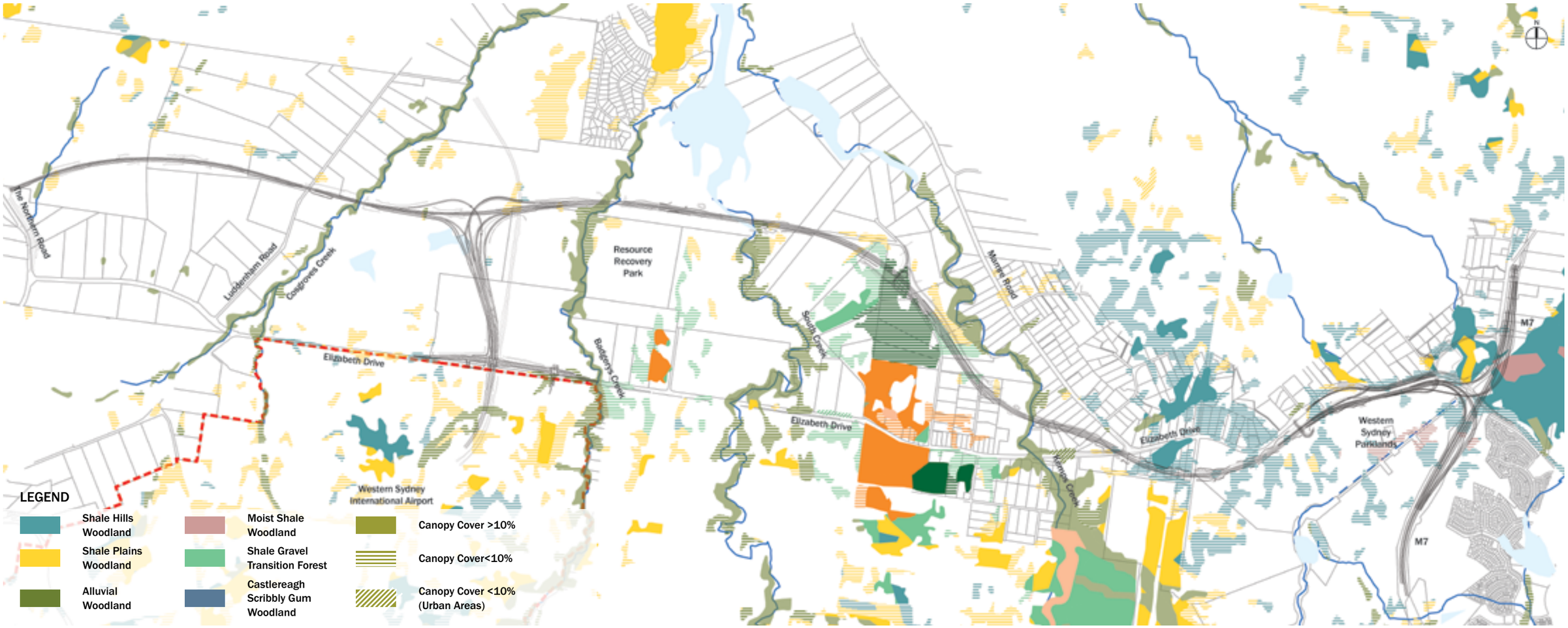


Figure 33. NPWS endangered species vegetation map

VEGETATION COMMUNITIES

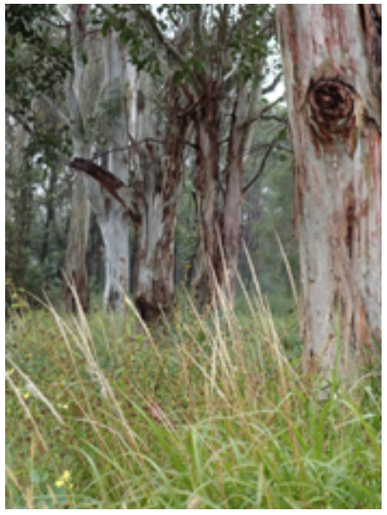
To understand what vegetation communities once existed in the area, the design team has applied understanding of nearby remnant vegetation communities combined with the previously described analysis of geology, soils, hydrology that is outlined in Section 3 of this PDLP.

As part of the design process, the characteristics and species profiles of the following planting communities have been drawn from:

- ◊ Shale Hills Woodland
- ◊ Shale Plains Woodland
- ◊ Alluvial Woodland
- ◊ Castlereagh Scribbly Gum Woodland.

It is not the intention of the planting design to take a purist approach to ecology and landscape restoration. However, the design draws upon the characteristics and species profiles to be applied across the corridor through site specific landscape typologies.

The key endangered communities are highlighted on this page to help readers can understand some of the key community characteristics that help define landscape planting within the corridor.



SHALE HILLS

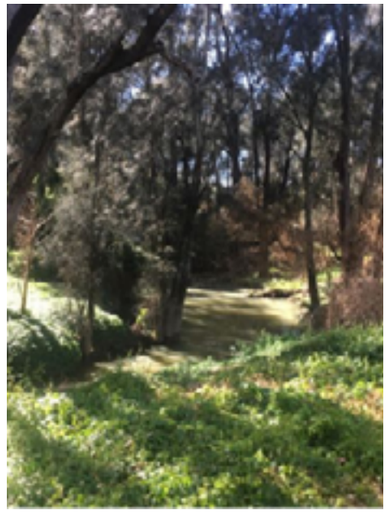
Shale Hills Woodland is found along the corridor at higher elevations as one moves south east toward the M7.

Shale Hills Woodland occurs mainly along the corridor at the elevated and sloping southern half of the Cumberland Plain as one moves south east toward the M7. The dominant canopy trees include grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*) and narrow-leaved ironbark (*Eucalyptus crebra*). It has a shrub layer dominated by blackthorn (*Bursaria spinosa*), with other shrubs, such as *Acacia implexa*, *Indigofera australis* and *Dodonaea viscosa ssp cuneata*.

SHALE PLAINS WOODLAND

Shale Plains Woodland is the most widely distributed form of Cumberland Plain Woodland.

Bursaria spinosa is the dominant shrub species and there are canopy trees such as grey box (*Eucalyptus moluccana*), forest red gum (*Eucalyptus tereticornis*), spotted gum (Corymb*ia maculata*) and thin leaved stringybark (*Eucalyptus eugenioides*). The diverse understorey layer is similar for both forms of Cumberland Plain Woodland. It is common to find grasses, such as kangaroo grass (*Themeda australis*), weeping meadow grass (*Microlaena stipoides var stipoides*) and herbs, such as kidney weed (*Dichondra repens*), blue trumpet (*Brunoniella australis*) and *Desmodium varians*.

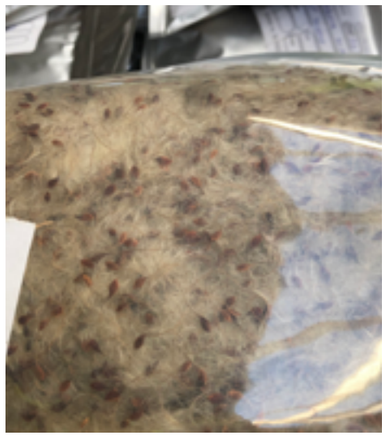


ALLUVIAL WOODLAND

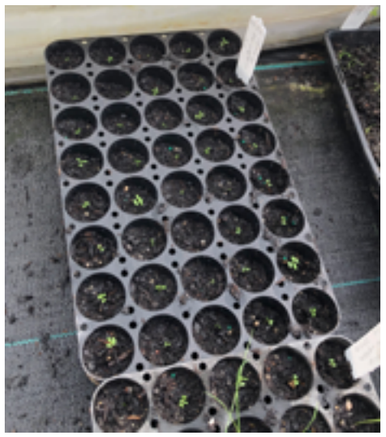
Alluvial Woodland occurs commonly along the many creek corridors within the project. Alluvial soils tend to be slightly less rich than the surrounding shale communities therefore weed species are most common at these sites. These riparian corridors will benefit highly from the proposed rehabilitation that is to be undertaken during the project. Species commonly include trees such as cabbage gum (*Eucalyptus amplifolia*) forest red gum (*Eucalyptus tereticornis*) and dense stands of Swamp Oak (*Casuarina glauca*).

SHALE GRAVEL TRANSITION FOREST

Shale-Gravel Transition Forest is an open forest community. Its canopy is dominated by broad-leaved ironbark (*Eucalyptus fibrosa*). Other canopy trees include grey box (*Eucalyptus moluccana*) and forest red gum (*Eucalyptus tereticornis*), which occur less frequently.



Clematis glycinoides (Headache vine) seed after being processed by Toolijooa Nursery for M12



Eucalyptus amplifolia (Cabbage gum) seed after being processed by Toolijooa Nursery

4.8 SEED COLLECTION AND PLANT PROPAGATION

The M12 planting design aims to bring balance to the natural environment by sourcing seed from the region to vegetate the project footprint and propagate local, native and suitable plant life. Native grassland and grassy woodland plants are resilient, attractive to pollinators and resilient to pests, aesthetically beautiful, and a low fire risk – ideal features for incorporation into the corridor.

Toolijooa Nursery has been engaged by TfNSW to undertake seed collection and propagation regarding the collection of native species seed. Toolijooa is continuing to collect seed from local plant and tree species to propagate for use within the project.

These species can be found in the following schedule. Seed sourcing for the project is focussed on capturing high quality and genetically diverse seed in order to maximise the adaptive potential of restoration efforts to current and future environmental change. Whilst endemic seed collection has been undertaken to reinforce the local community, it is understood that many species will require the sourcing of seed externally to strengthen the adaptive potential of these future planting areas.

Seed is then propagated at Toolijooa nursery in low phosphorous fertiliser, low moisture and full sun conditions to ensure the production of tough, hardy plants with high field survival rates. Planting lists have been co-ordinated between the design and seed collection teams to ensure endemic plant incorporation is maximised within the project.

Toolijooa processing M12 seed

Toolijooa processing M12 seed

Endemic Cumberland Plain Species Seed Collection

Botanical Name	***Common Name***
Acacia decurrens	Black wattle
Acacia elongata	Slender wattle
Acacia falcata	Sickle wattle
Acacia floribunda	Gossamer wattle
Acacia implexa	Hickory wattle
Allocasuarina littoralis	Black she oak
Allocasuarina torulosa	Forest she-oak
Angophora subvelutina	Broad-leaved apple
Aristida ramosa	Purple wire-grass
Arthropodium milleflorum	Vanilla lily
Austrostipa ramosissima	Stout bamboo grass
Austrostipa verticillata	Slender bamboo grass
Baumea articulata	Jointed twig rush
Bursaria spinosa	Sweet bursaria
Callistemon citrinus	Crimson bottlebrush
Callistemon linearis	Narrow-leaved bottlebrush
Callistemon pinifolius	Pine-leaved bottlebrush
Callistemon rigidus	Stiff bottlebrush
Callistemon salignus	Willow bottlebrush
Calotis cuneifolia	Burr-daisy
Capillipedium spicigerum	Scented-top grass
Casuarina glauca	Swamp oak
Chloris truncata	Windmill grass
Chloris ventricosa	Australian fingergrass
Clematis aristata	Old man's beard
Clematis glycinoides	Headache vine
Clerodendrum tomentosum	Hairy lolly bush
Corymbia maculata	Spotted gum
Cymbopogon refractus	Barbed wire grass
Daviesia ulicifolia	Gorse bitter pea
Dianella longifolia	Spreading flax lily
Dianella revoluta	Blue flax lily
Dichelachne micrantha	Short-hair plume grass
Dillwynia sieberi	Sieber's parrot-pea
Dodonaea viscosa	Hop bush
Einadia hastata	Berry saltbush
Einadia nutans subsp. linifolia	Climbing saltbush
Entolasia marginata	Bordered panic grass
Eragrostis brownii	Common love grass
Eucalyptus amplifolia	Cabbage gum
Eucalyptus baueriana	Blue box
Eucalyptus crebra	Narrow-leaved ironbark
Eucalyptus eugenioides	Thin-leaved stringybark
Eucalyptus fibrosa	Red ironbark
Eucalyptus longifolia	Woollybutt
Eucalyptus moluccana	Grey box

Endemic Cumberland Plain Species Seed Collection

Botanical Name	***Common Name***
Eucalyptus oblonga	Narrow-leaved stringybark
Eucalyptus parramattensis	Parramatta red gum
Eucalyptus tereticornis	Forest red gum
Hakea sericea	Needle bush
Hardenbergia violacea	False sarsaparilla
Indigofera australis	Austral indigo
Juncus usitatus	Common rush
Kunzea ambigua	Tick bush
Leptospermum polygalifolium	Tantoon
Lomandra longifolia	Spiny-head mat-rush
Melaleuca decora	White feather honey-myrtle
Melaleuca diosmatifolia	Rosy paperbark
Melaleuca linariifolia	Snow-in-summer
Melaleuca nodosa	Prickly-leaved paperbark
Microlaena stipoides	Weeping grass
Oxytes brachypoda	Large tick-trefoil
Ozothamnus diosmifolius	Rice flower
Plectranthus parviflorus	Little spurflower
Rytidosperma sp.	Wallaby grass
Themeda triandra	Kangaroo grass
Vittadinia cuneata	Fuzzweed
Wahlenbergia gracilis	Australian bluebell

4.9 WATER SENSITIVE URBAN DESIGN

The design of drainage infrastructure needs to be considered as an integral part of the project water sensitive urban design (WSUD) and landscape systems. Principles to meet the desired outcome of WSUD systems should align with the TfNSW water sensitive urban design guideline:

- ◊ Stormwater management elements should be considered as part of a unified design of the project and contribute to a positive urban design outcome and should visually and physically integrate with the adjacent built and natural context.
- ◊ Stormwater management should consist of a treatment train approach rather than an 'end of pipe' solution. The management treatment should comprise of multiple elements in combination rather than a single one in isolation to achieve water quality and quantity objectives. Elements should be located as close as possible to the point where adjacent hard surfaces discharge.
- ◊ The approach should aim to improve the quality of water discharged to waterways, with an amount of treatment being provided relative to the amount of change to the effective imperviousness of the catchment and the sensitivity of the receiving environment.
- ◊ The approach should minimise the intensity of stormwater events by managing the quantity of water as it passes through a project site.

DESIGN

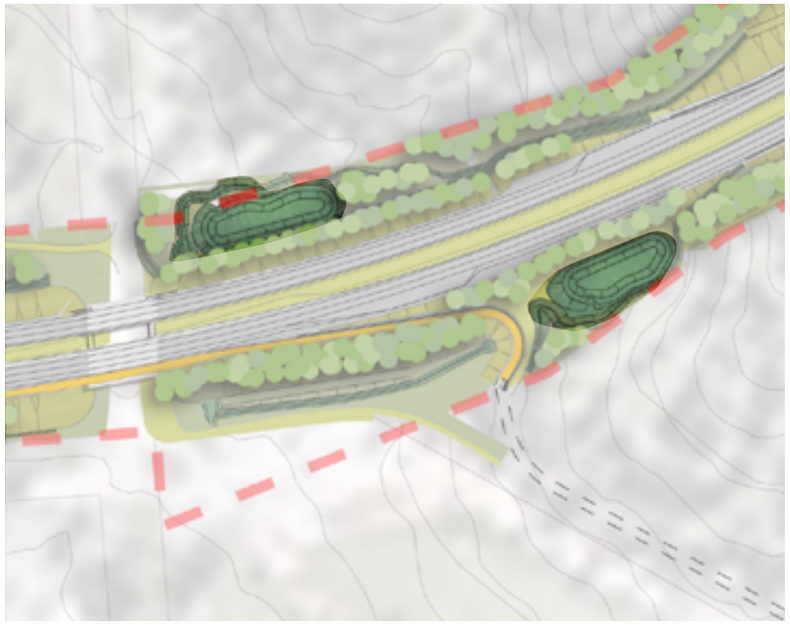
The project need to consider opportunities and constraints for WSUD in the detailed design phase. Methods of design which can facilitate the implementation of WSUD should be as follows (in line with the TfNSW water sensitive urban design guideline):

- ◊ Design main alignments to run parallel to contours to facilitate placement of treatment elements across the catchment
- ◊ Design cross falls to direct run-off to localised treatment elements
- ◊ Reduce the area of impervious surfaces through minimising hard surfaces
- ◊ Allow drainage to discharge directly to planted areas
- ◊ Use the areas created by remnant acquired land, site compound areas, and parking areas for locating WSUD elements
- ◊ Incorporate swales to carry minor flows, with major storm events bypassed to larger basins.

The drainage and landscape packages include WSUD measures to meet environmental and sustainability objectives. Drainage design elements include water quality basins, drainage channels and swales. The landscape design includes the planting of these drainage elements to improve their environmental performance and to increase the diversity of native flora.

Dirty water channels have been designed to protect the receiving waterway from direct discharge of untreated stormwater runoff from roadways. Clean water channels have been designed to mainly divert runoff into a receiving waterway. Jute mesh lined swales have been adopted within environmentally sensitive receiving areas where channel slope and velocity permit. The jute mesh swales provided treatment for road runoff as well as provision for spill containment

Typical water quality basins in motorway environments



Typical water quality basins in motorway environments

WATER QUALITY CONTROL PONDS

There are numerous water quality control ponds throughout the project. The objective is to create water quality control ponds that are an asset to the visual and ecological amenity of the area as well as ensuring adjacent areas are not adversely affected by runoff during the construction and operational phases of the project.

To mitigate the increased risk of bird strike associated with open water bodies in proximity to the proposed Western Sydney Airport, biofiltration basins have been adopted for water quality treatment. These are normally dry basins which comprise a planting media consisting of sandy loam over a subsoil drainage layer. Groundwater inflows, where they occur, will be intercepted by the basin drainage layers and groundwater will remain drawn down below the basin planting media. Outflows via infiltration will preferentially flow to the basin outlet via the subsoil drainage collection system, rather than transfer to groundwater.

SHAPE

The proposed shape of the water quality basins has been designed to blend in with the adjacent landscape the best that can be achieved practically whilst satisfying a number of primary criteria such as water quality and hydraulic performance, and space constraints. Margins of basins should be graded to blend with existing adjoining landform.

Basins will be revegetated with self colonising plants generally by seeding selected native grasses and sedges. These will be supplemented with direct planting of containerised trees and shrubs at selected locations.

4.10 STRATEGIES TO REVEGETATE DISTURBED AREAS

SOIL PREPARATION

Due to the varying conditions throughout the Project, a variety of soil preparation treatments have been developed to support the landscape design. The following section describes the project wide soil preparation treatments which will be commonly used across the Project as well as any site specific requirements related to cut and cover structures.

Specifications for all soil mixes have been developed to suit the various site conditions across the Project. All sub-grades will be tested for suitability to support plant growth and ameliorated in accordance with test results prior to installing topsoils.

Organic mulch will be applied to all planting areas to a depth of 75mm. The mulch will be derived, where possible, from trees and shrubs removed through clearing works on site. Any shortfall will be made up with imported mulch.

SOIL PREPARATION TYPES

In determining soil preparation treatments for constructed landscapes, the starting consideration understands site and sub-grade conditions. There are three basic conditions that occur consistently across the project:

- ◊ Over existing site soils
- ◊ Over formed embankments as part of the roadwork's earthworks formation
- ◊ 'On structure' conditions where landscape will be installed over structures.

For the first two conditions, organic soil mixes are placed to a depth of 100-200mm for seeded areas and 300mm for massed planting areas. The majority of planting will be native grasses and shrubs in tubestock containers planted directly into the prepared soil bed. Where larger trees are installed, they will vary container sizes ranging from 5 litres to 400 litres. These will be installed in over-excavated holes typically three times the diameter of the root ball and 100mm deeper, in accordance with TfNSW specifications.

FINISHES FOR SLOPE STABILISATION

Landscape finishing works will be completed progressively throughout the duration of the project. Typically as cut and fill formations are completed, topsoil will be installed as soon as practicable to the formations. As top-soiling to individual areas is completed, they will either be:

- ◊ Treated with compost blanket or hydroseeding (with mulch tackifier) containing a mixture of shrubs, grasses and groundcovers as per seeding schedules. This will also include cover crop species that will generate rapidly to help with stabilising the embankments and reduce erosion risk
- ◊ Mulched and planted with containerised stock.

All landscape works will be coordinated with the earthworks programme to suit the construction sequence and prevailing weather conditions.

Creek banks will be stabilised where necessary with jute mesh and tubestock planting. Native trees belonging to the Riparian Woodland vegetation community such as *Casuarina glauca, Eucalyptus amplifolia* and *Melaleuca styphelioides* are proposed to further stabilise the banks and provide habitat and connectivity for fauna.

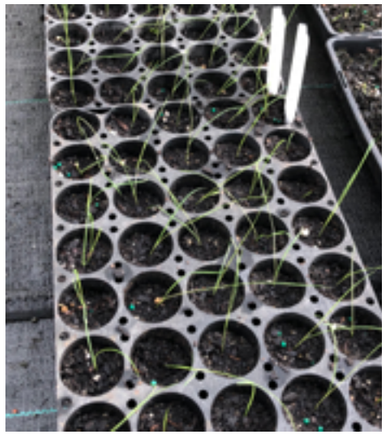
SPECIFICATIONS AND POT SIZING

In addition to areas of hydroseeding and compost blanket application, revegetation across the Project will also include areas of direct planting of containerised plant stock into prepared planting areas. All work will generally be undertaken in accordance with RMS standard specifications, including:

- ◊ R178 Vegetation
- ◊ R179 Landscape planting.

All revegetation areas will be planted in dense arrangements with densities varying between four to eight plants per square metre depending on the location and application.

Toolijooa processing M12 seed



Toolijooa processing M12 seed

Toolijooa processing M12 seed

4.11 LANDSCAPE MAINTENANCE

LANDSCAPE ESTABLISHMENT AND MAINTENANCE

The following identifies landscape maintenance activities required to be undertaken for landscape areas on the Project until handover of the project.

Maintenance of all landscaped and revegetated works shall be carried out in accordance with TfNSW Specification R178 'Vegetation' and R179 'Landscape Planting'. The specification covers standards and methods for all the normal tasks required for landscape and horticultural maintenance.

The scope of this work comprises:

- ◊ Weeding
- ◊ Pruning
- ◊ Mulching
- ◊ Fertilising
- ◊ Pest and disease control
- ◊ Replacement planting
- ◊ Mowing.

SUMMARY TABLE OF MAINTENANCE REQUIRED

The following table summarises the landscape maintenance actions and tasks required and their time frames and frequency of activity.

Table 4. Summary table of landscape maintenance requirements

Maintenance actions	Term	Time frames / frequency							
		Weekly	*Monthly*	*Seasonal*				*As required*	*As Specified Below*
				Sum	*Aut*	*Win*	*Spr*		
All Areas									
1. Pruning of vegetation for safety	Maintaining driver sightlines		■						
	Pruning trees over carriageways, roads, paths and cycleways.							■	
2. Management of non-frangible vegetation	Remove woody "non-frangible" vegetation in setbacks								Once per year
3. Noxious weed control	Treat noxious weeds according to control category		■						
4. Rubbish removal	Remove all roadside litter and debris.	■							And prior to mowing
5. Mowing verge areas	Maintain a 2m wide mown strip to the edge of all road surfaces Mow grass to a maximum height of 50mm								When growth exceeds 100mm high
6. Auditing and reporting	Audit and report on maintenance and additional works								Monthly
Mulched massed planting areas									
1. Watering	Water hydromulched areas as required to germinate seed and maintain healthy growth								
	First 8 weeks after planting - 20 litres per plant	■							
	Thereafter to 26 weeks after planting – 10 litres per plant At 14 day intervals								At 14 day intervals
2. Weeding	Weed planting areas (manual or herbicide) before weed seed set		■						
3. Mulching	Replace landscape planting damaged or killed by herbicide Reapply mulch to maintain to a depth of 10cm							■ ■	
4. Removal of dead / dying plant material	Remove dead or dying planting material and replace.							■	
5. Replacement plantings	Replace failed plantings with specified species and densities.							■	
	Water replacement plantings as listed in item 1								As listed in item 1
6. Tree guards and stakes	Replace damaged tree guards and stakes during establishment							■	
	Remove tree guards and stakes.								12 months after planting is established as required to maintain healthy condition
7. Horticultural maintenance	Fertilise all plantings at specified rates.						■		
	Prune all plantings in specified manner:								
	◊ Canopy trees							■	
	◊ Sub-canopy trees / large shrubs							■	
	◊ Low shrubs								Annually after flowering
	◊ Climbers						■		Annually After flowering
	◊ Grasses and ground covers				■				Every 4 years

Maintenance actions	Term	Time frames / frequency							
		Weekly	*Monthly*	*Seasonal*				*As required*	*As Specified Below*
				Sum	*Aut*	*Win*	*Spr*		
Tree plantings									
1. Watering	Water plants to maintain adequate soil moisture availability during establishment and to prevent plants from drying out:								
	First 8 weeks after planting - 20 litres per plant	■							
	Thereafter to 26 weeks after planting – 10 litres per plant At 14 day intervals								At 14 day intervals
2. Weeding	Weed mulch pads to spot plantings (manual or herbicide) before weed seed set.								
	Replace landscape plants damaged or killed by herbicide.							■	
3. Mulching	Reapply mulch to maintain to a depth of 10cm to an area 1.0m in diameter around each plant								Every 2 years
4. Removal of dead / dying plant material	Remove dead or dying planting material and replace.							■	
5. Replacement plantings	Replace failed plantings with specified species and densities.							■	
	Water replacement plantings								As required
6. Tree guards and stakes	Replace damaged tree guards and stakes during establishment.							■	
	Remove tree guards and stakes.								12 months after planting
7. Horticultural maintenance	Fertilise all plantings at specified rates.						■		As required to maintain healthy condition
	Prune all plantings in specified manner:								
	Canopy trees							■	
	Sub-canopy trees / large shrubs							■	
Turfed areas									
1. Watering	Water turf to maintain adequate soil moisture availability during establishment and to prevent turf from drying out								
	First 2 weeks after planting								Daily
	Thereafter								As required until turf has taken root and is making healthy growth
2. Mowing	Mow grass to a maximum height of 50mm When growth								When growth exceeds 75mm
3. Replace damaged turf	Remove damaged areas of turf and replace with new turf							■	
4. Weed control	Control weeds in turf areas using selective herbicide		■						

HOT AND DRY
JANUARY - MARCH

WET AND COOL
APRIL - JUNE

COLD AND FROSTY
JUNE - LATE JULY

Aboriginal seasonal representations

COLD AND WINDY
AUGUST

COOL, GETTING WARMER
SEPTEMBER - OCTOBER

WARM AND WET
NOVEMBER - DECEMBER

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
BR01	Bridge over Luddenham Road	Local road overbridge	Yes
BR02	Bridge over Cosgroves Creek	Creek bridge	No
BR04A	Bridge over AAR on Elizabeth Drive	Gateway bridge	Yes
BR04B	Bridge over Sydney Metro on Elizabeth Drive	Gateway bridge	No
BR04C	Bridge over WSA Channel on NB Off Ramp	Gateway bridge	No
BR04D	Bridge over WSA Channel on SB On Ramp	Gateway bridge	No
BR05	Twin bridge over Badgerys Creek	Creek bridge	No
BR06	Twin bridges over South Creek	Creek bridge	No
BR07	Bridge over M12 on Clifton Avenue	Bridge over M12 mainline	Yes
BR08	Twin bridges over Kemps Creek	Creek bridge	No
BR09	Twin bridges over Elizabeth Drive	Local road overbridge	Yes
BR10	Twin bridges over Range Road	Local road overbridge	No
BR11	Bridge over M12 on Water Tower Access Rd	Bridge over M12 mainline	Yes
BR12	Twin Bridges over WB Elizabeth Drive entry ramp	M12/M7 Interchange	No
BR13	Bridge over Elizabeth Drive to the M7 NB	M12/M7 Interchange	No
BR14	M7 Motorway SB to M12 Motorway WB	M12/M7 Interchange	No
BR15	M12 Motorway EB to M7 Motorway SB	M12/M7 Interchange	No
BR16	Shared user path bridge over the M7	Shared path bridge	No
BR17	Bridge over road reserve M7 SB entry ramp	M12/M7 Interchange	No
BR18	Bridge over road reserve M7 NB exit ramp	M12/M7 Interchange	No
BR20	Sydney Metro - Western Sydney International Airport Bridge over M12	Metro bridge	No
BR21	Viaduct on EB Exit Ramp over M12 and EB Entry and WB Exit Ramps	Gateway bridge	No
BR22	Bridge on EB Entry Ramp over M12	Bridge over M12 mainline	Yes
BR24	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.

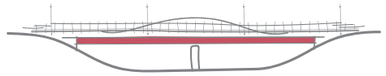
Several considerations are made when selecting the elements that make up each of the bridges on the project. Bridge aesthetics are a function of the superstructure, substructure, abutments and also the kit of parts that make up the bridge furniture. The form of all bridges have been chosen and developed 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.

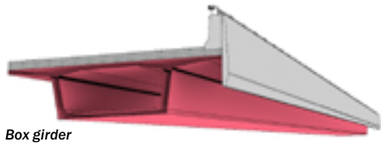
The following section provides details the following bridge elements:

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

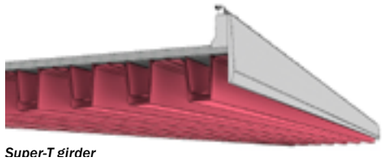


GIRDERS

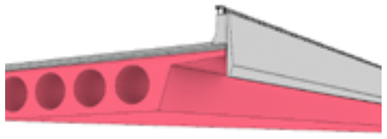
The overarching principle for bridge girders along a motorway corridor is consistency and simplicity. Super-T girders are generally used across the project, with the exception of the M12/ M7 Interchange where box girders are proposed to be used, and the Twin Bridges over Elizabeth Drive where a voided slab substructure is used given the span and site constraints.



Box girder



Super-T girder

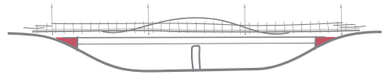


Voided slab

Voided slab - Wagga Wagga overpass

Super-T girder - Bonville Bypass

Box girder - M7 Motorway

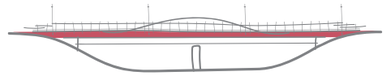


ABUTMENTS

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

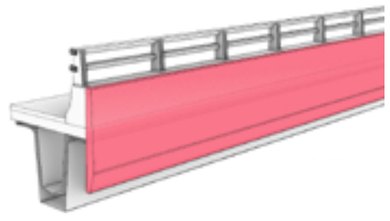
Walled abutment - Banora Point Upgrade



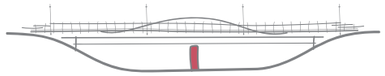
PARAPETS

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 with shadow on the lower section providing a refined and elegant, edge profile for the entire length of the bridge.



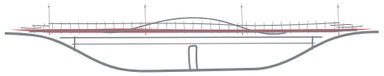
Banora Point Upgrade



PIERS

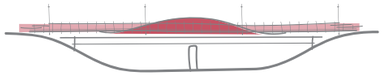
As there will be a multitude of girder types across the Project, there has been a concerted effort to ensure that the design of bridge piers is consistent across all bridges across the Project so that they are viewed as a family of elements. Pier designs include the following:

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



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:

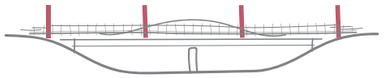


SAFETY SCREENS

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.

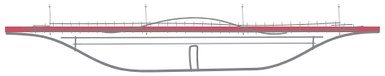
On the project, Safety screens will be used to integrate Indigenous design with colour, shapes and patterns.

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



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.

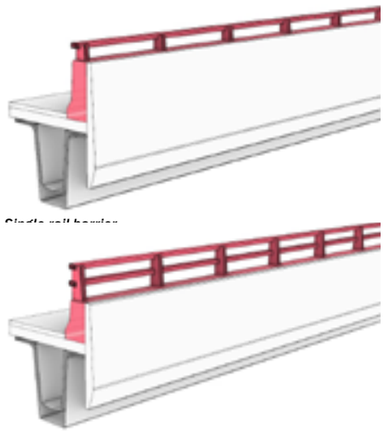


FENCING

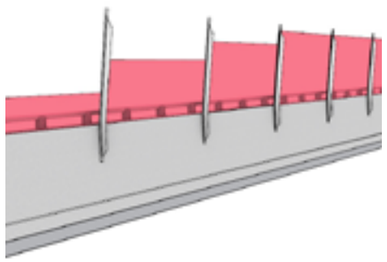
The Shared User Path for pedestrians and cyclists is provided alongside the M12 Motorway. This path is fitted with a pedestrian fence and various gates for safe access. The fence type matches the M7 Motorway fence to maintain the consistency of appearance.

Tapered blade wall pier - M7 Motorway

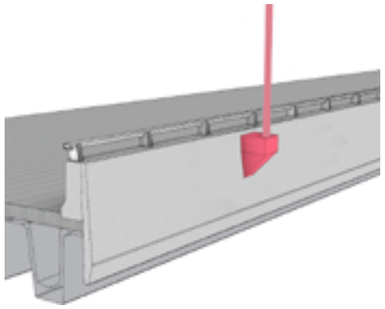
Portal frame structure pier - Bonville Bypass



Twin rail barrier



Safety screen with stepped end panels



Lighting corbel

Pedestrian fence on bridge edge

Circular piers with headstock - Bonville Bypass

Circular piers with articulated capital

M7 Motorway - Single rail barrier

Safety screen - Tugun Bypass

Existing M7 Motorway lighting corbel

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

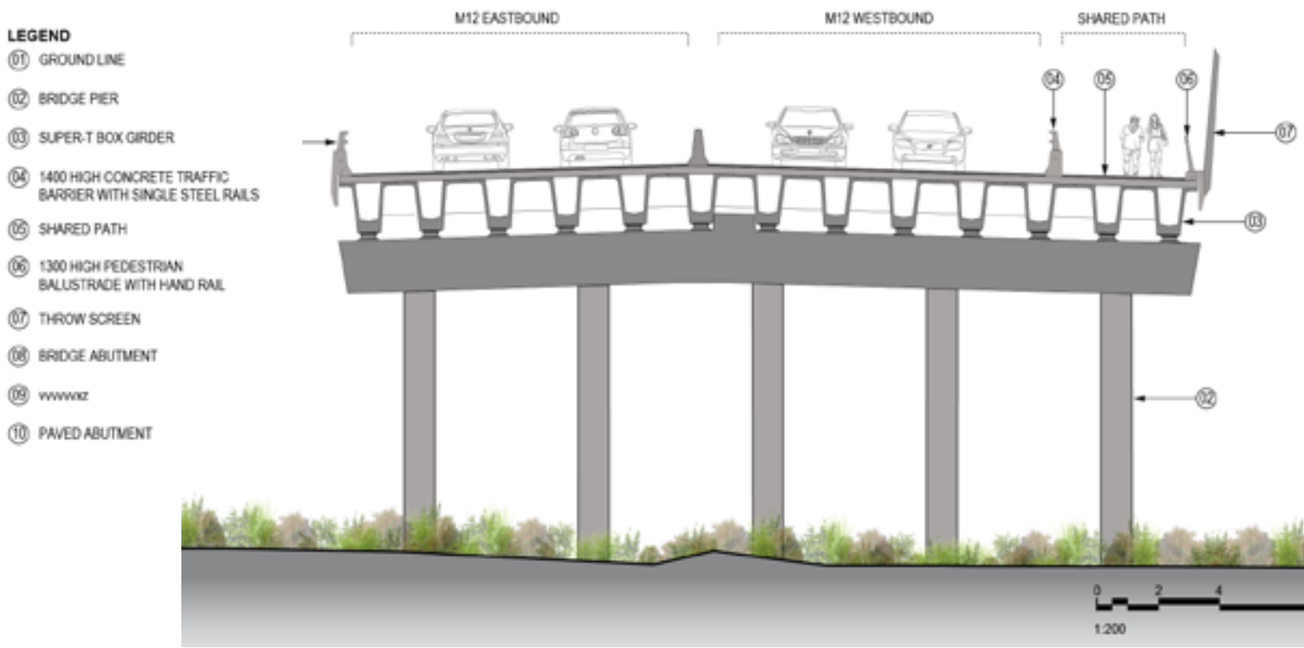


Figure 37. Section - BR02 - Bridge over Cosgroves Creek

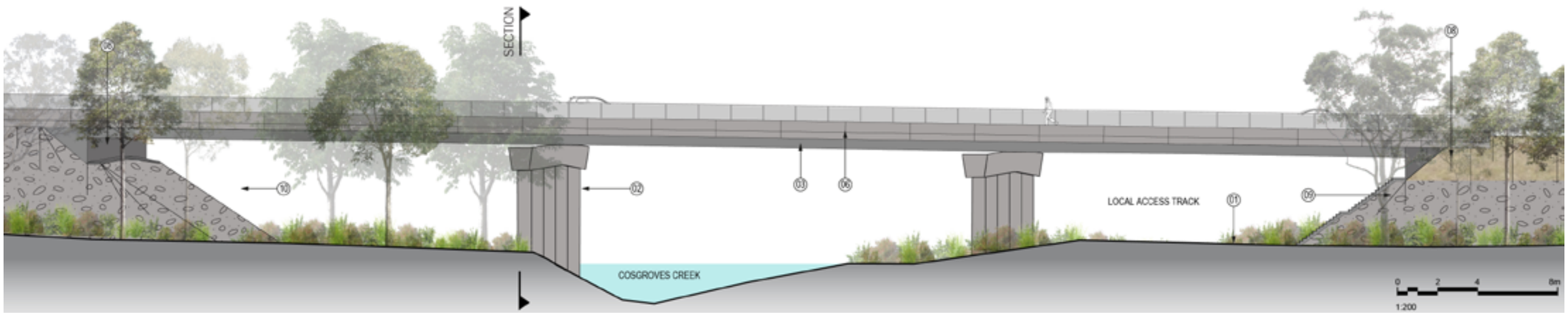


Figure 36. Elevation - BR02 - Bridge over Cosgroves Creek

GATEWAY BRIDGE

The Airport Gateway Bridge is designed to a 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

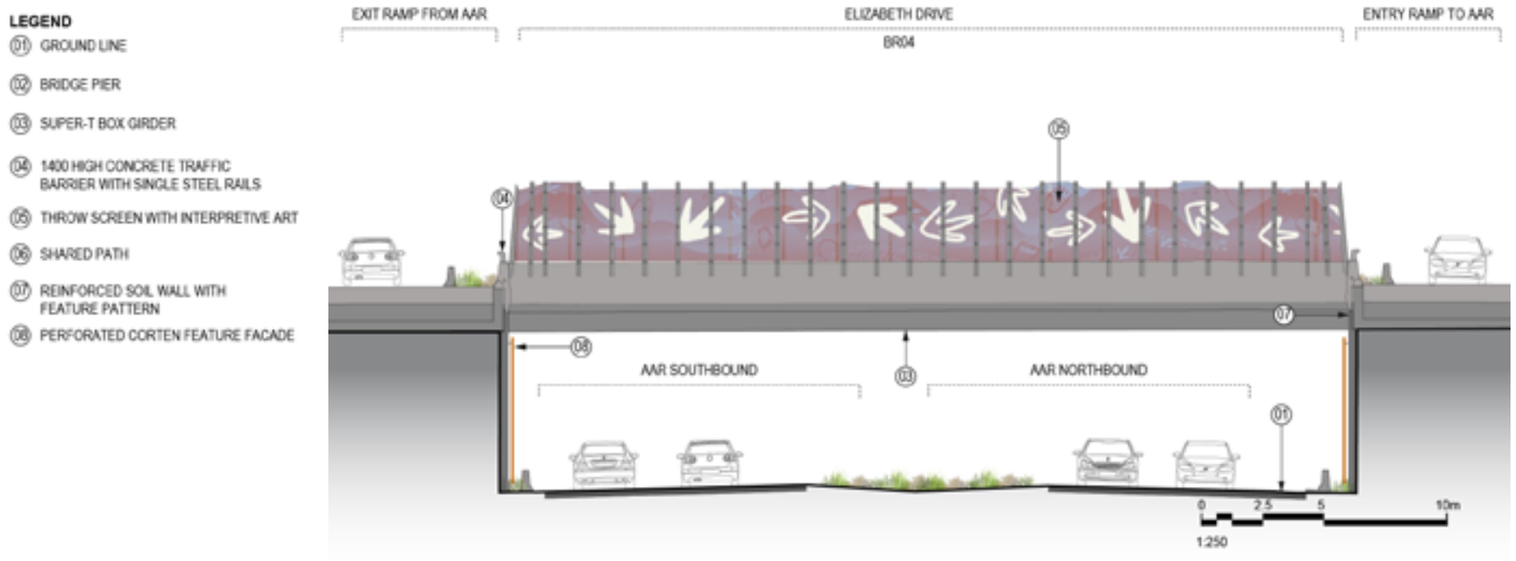


Figure 38. Section - BR04 - Bridge over Airport Access Road on Elizabeth Drive

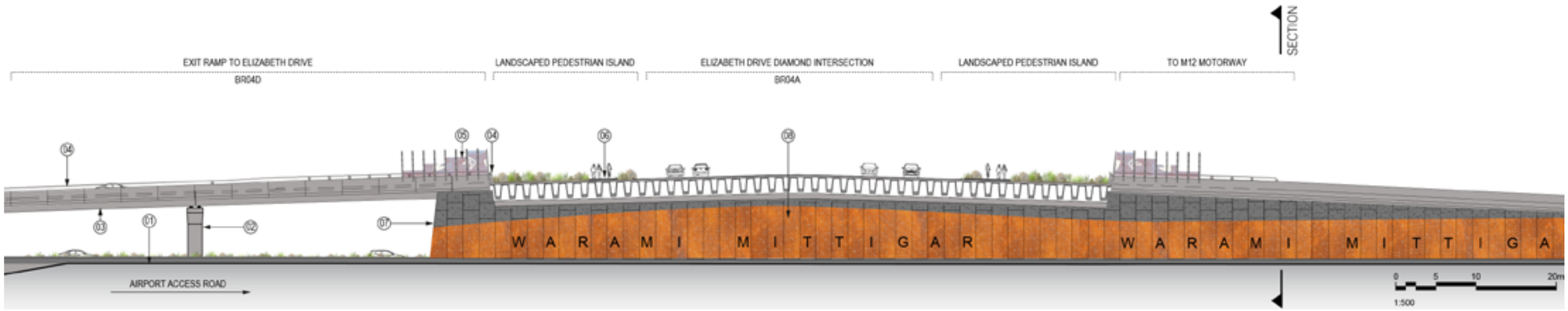


Figure 39. Elevation - BR04A - Bridge over Airport Access Road on Elizabeth Drive

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

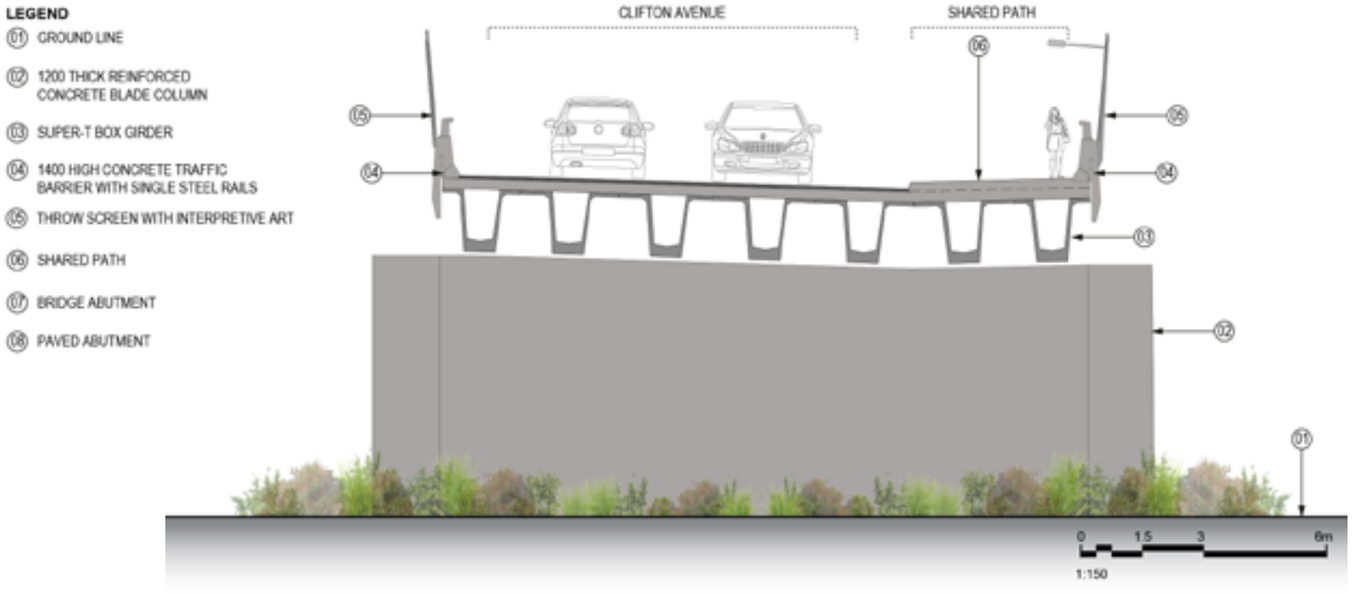


Figure 41. Section - BR02 - Bridge over Clifton Avenue

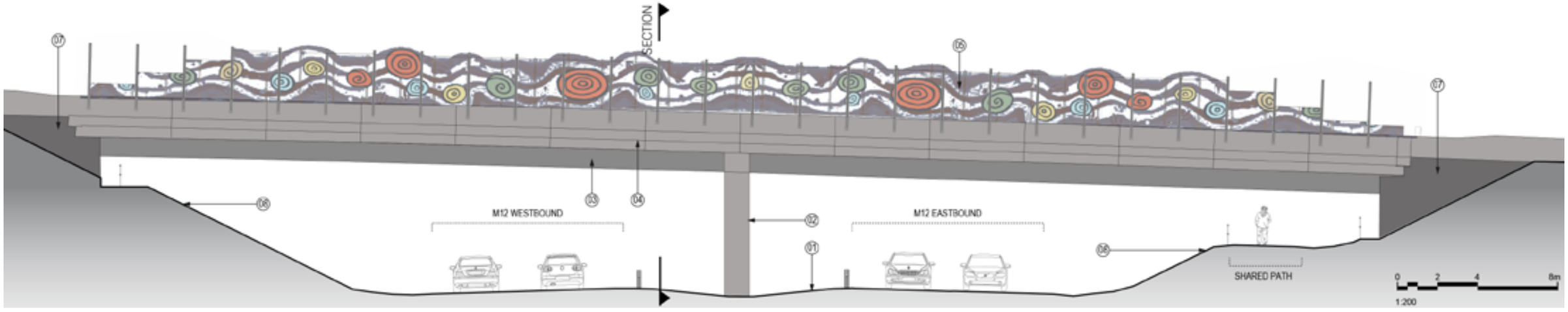


Figure 40. Elevation - BR07 - Clifton Avenue overbridge

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

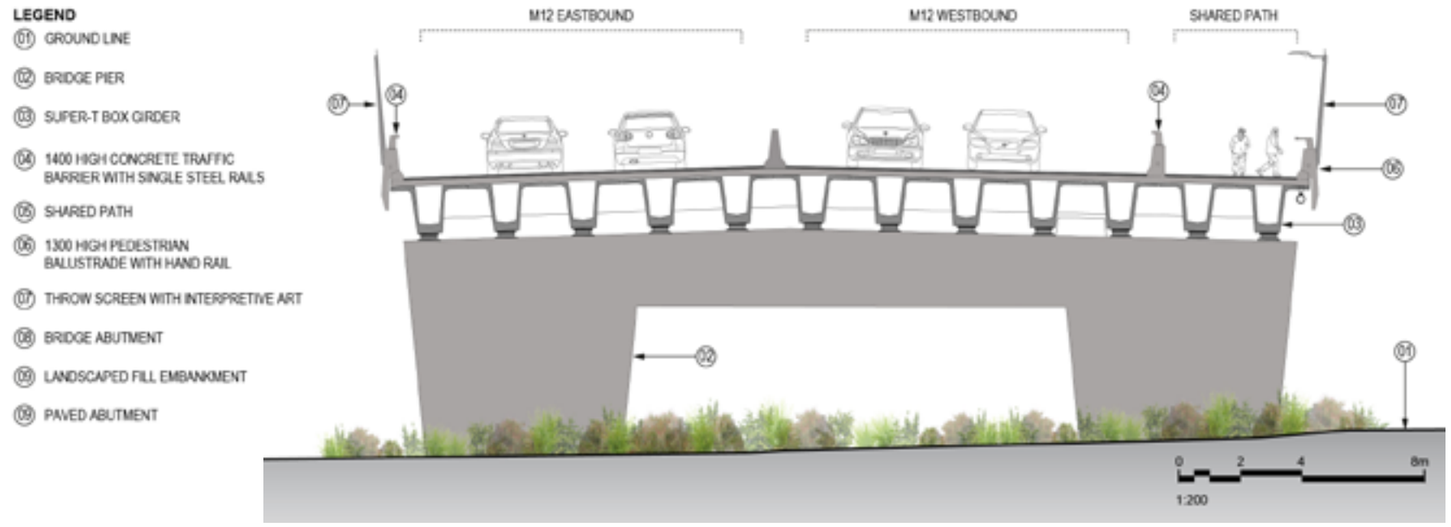


Figure 42. Section - BR01 - Bridge over Luddenham Road

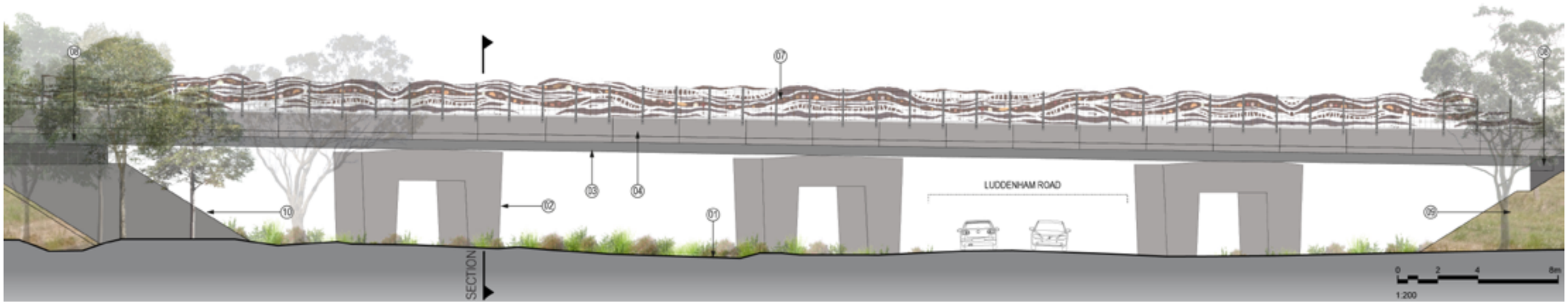


Figure 43. Elevation - BR01 - Bridge over Luddenham Road

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

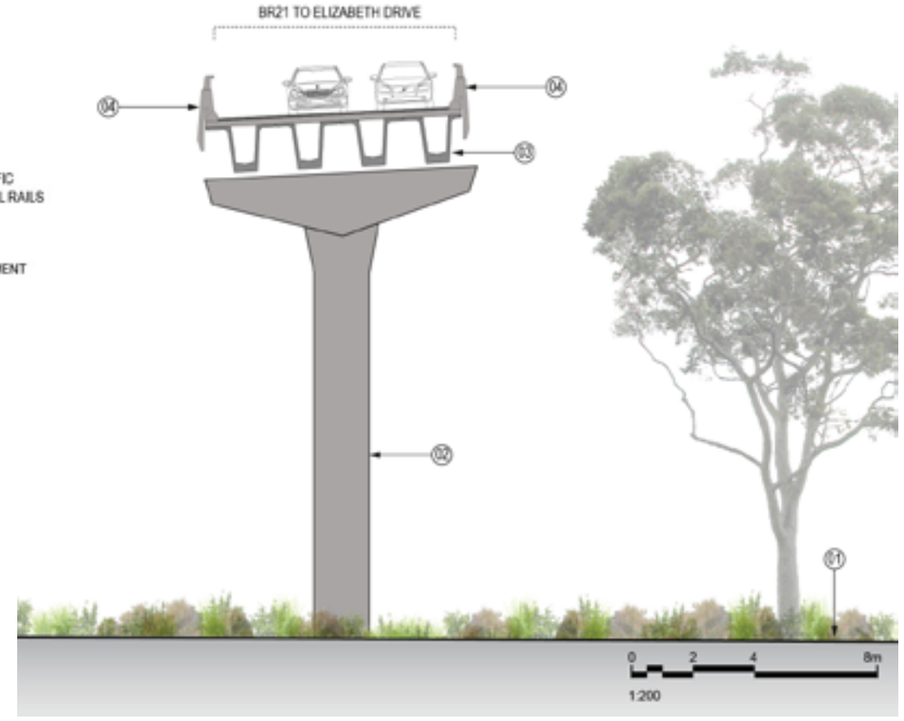


Figure 45. Section - M12 Eastbound to Airport Access Road Southbound

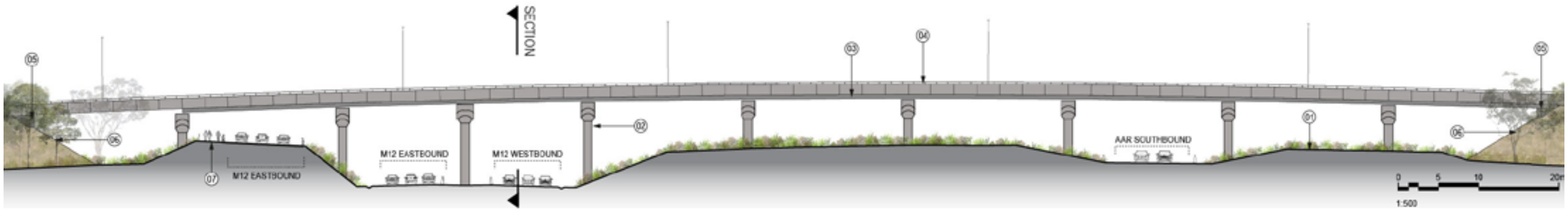


Figure 44. Elevation - BR21 - M12 Eastbound to Airport Access Road Southbound

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

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

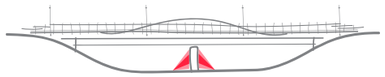
Throughout the project, lighting will enliven the night time travel experience over and above lighting for road safety. The key design principles for the design of lighting throughout the Project are as follows:

- ◊ 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.

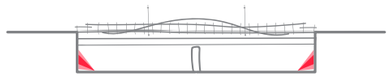


BR09 - TWIN BRIDGES OVER ELIZABETH DRIVE

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.



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.

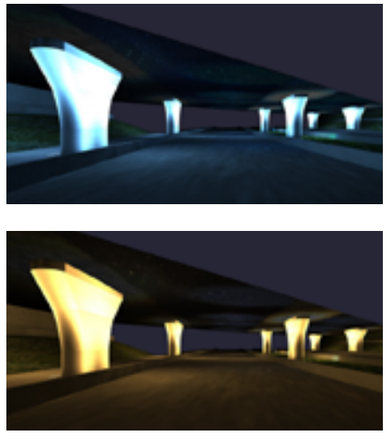
The feature lighting scheme for BR04A has been devised as the following:

- ◊ 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.

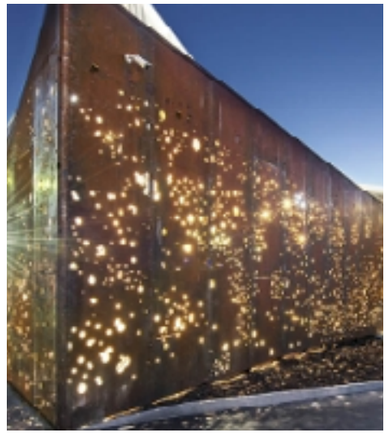
Typical spotlight luminaire unit

Typical linear recessed LED luminaire unit

Existing M7 Motorway feature lighting



BR09 Feature lighting studies



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'

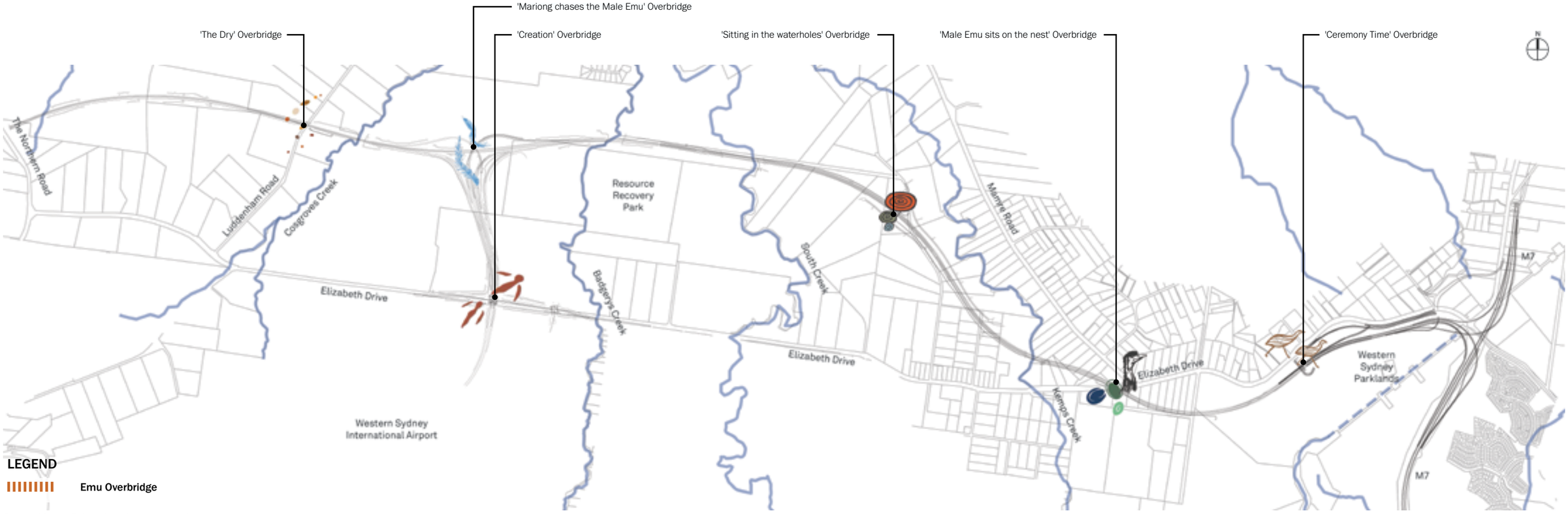


Figure 48. Bridge locations across the project

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.

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.

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.

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.

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.

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

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

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

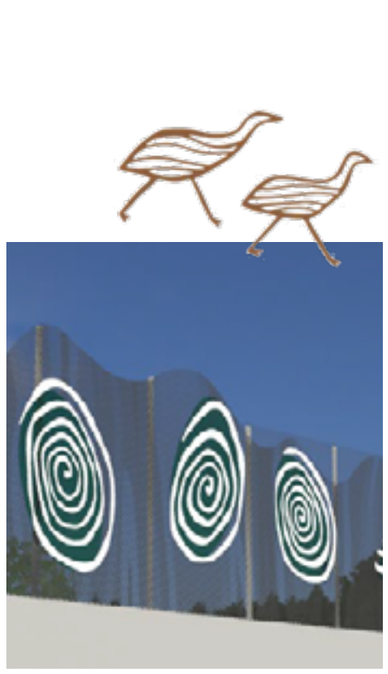


Figure 52. Ceremony time (Artist Cohort, Balarinji, 2021)

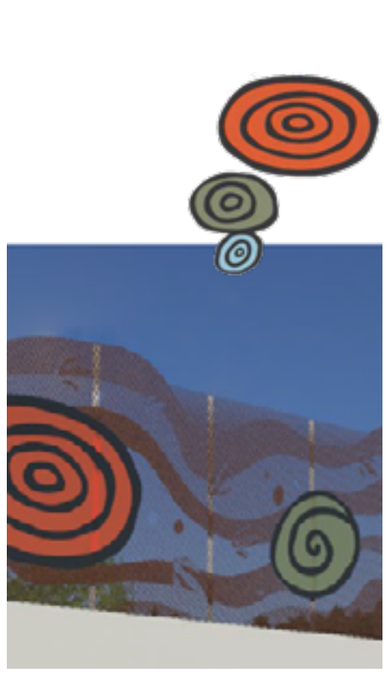


Figure 53. Sitting in the waterholes (Artist Cohort, Balarinji, 2021)

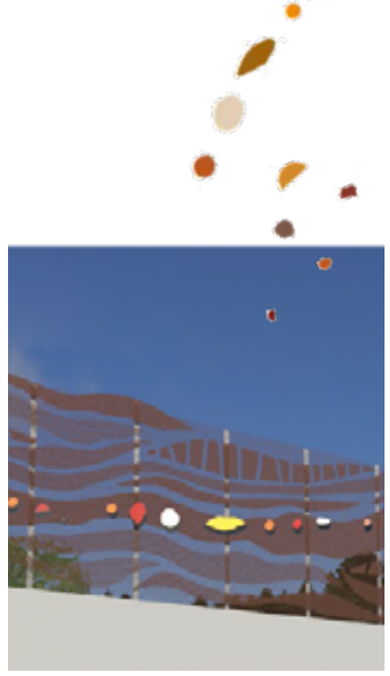


Figure 54. The Dry (Artist Cohort, Balarinji, 2021)

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.

Figure 55. Section - ATL Bebo Underpass

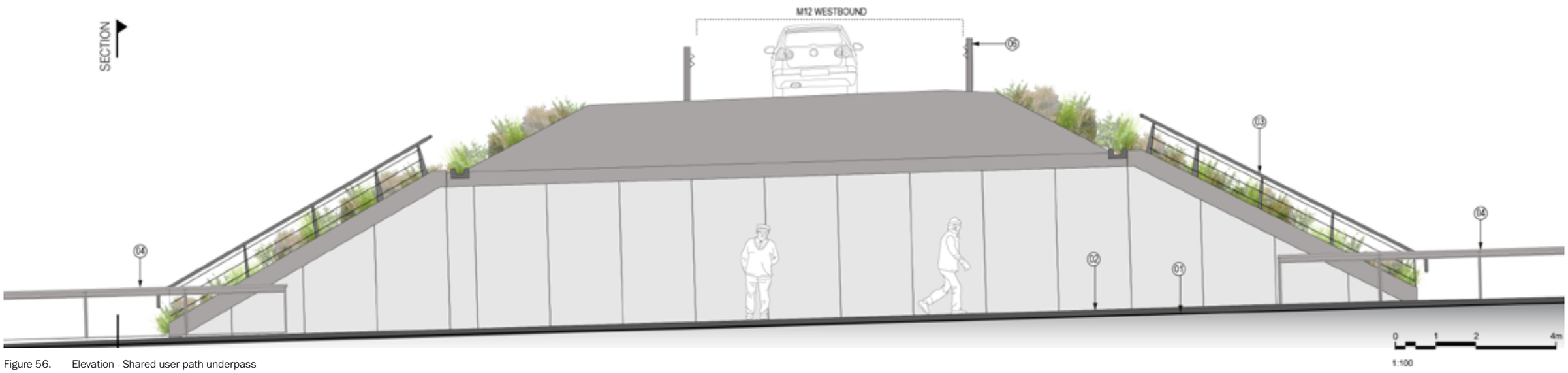


Figure 56. Elevation - Shared user path underpass

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.

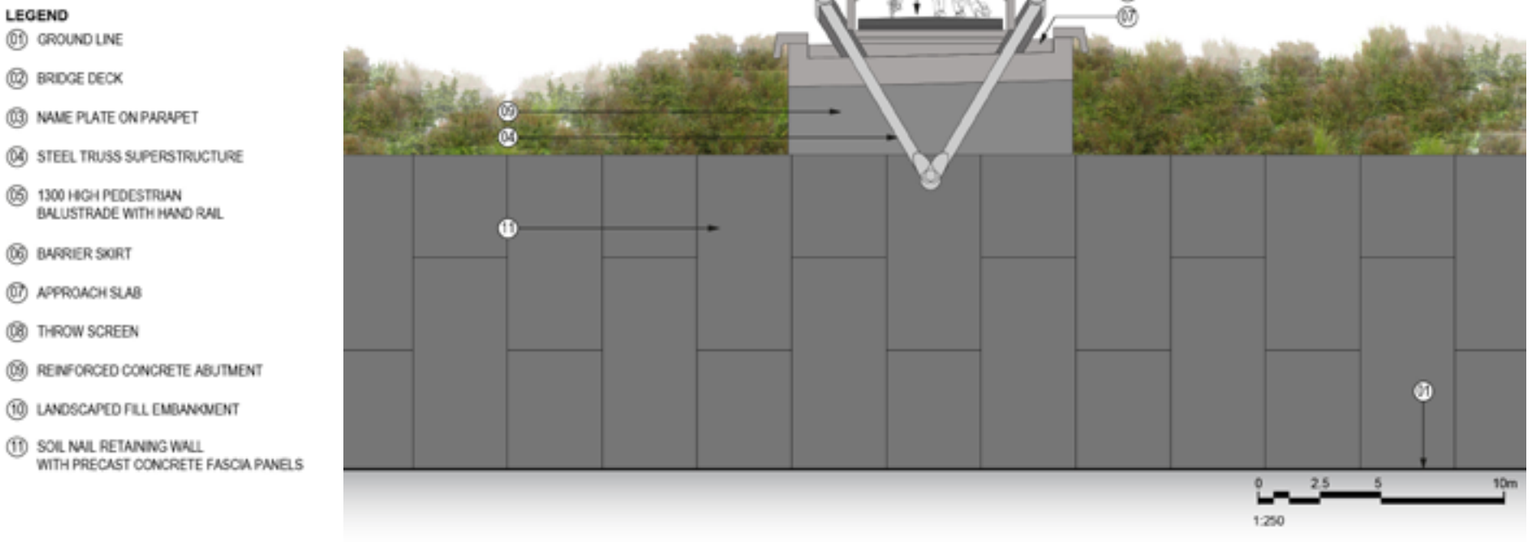


Figure 57. Section - BR16 - Shared user path bridge over M7 Northbound exit ramp

Existing M7 cycleway bridge

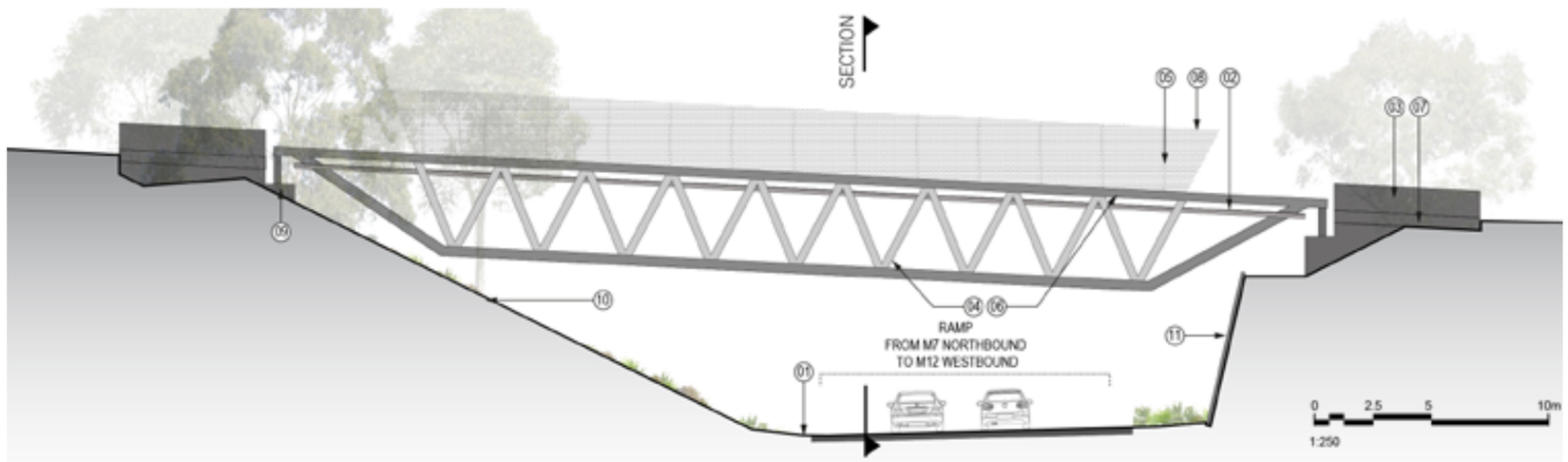


Figure 58. Elevation - BR16 - Shared user path bridge over M7 Northbound exit ramp

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.

Examples of fauna rope crossings

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.

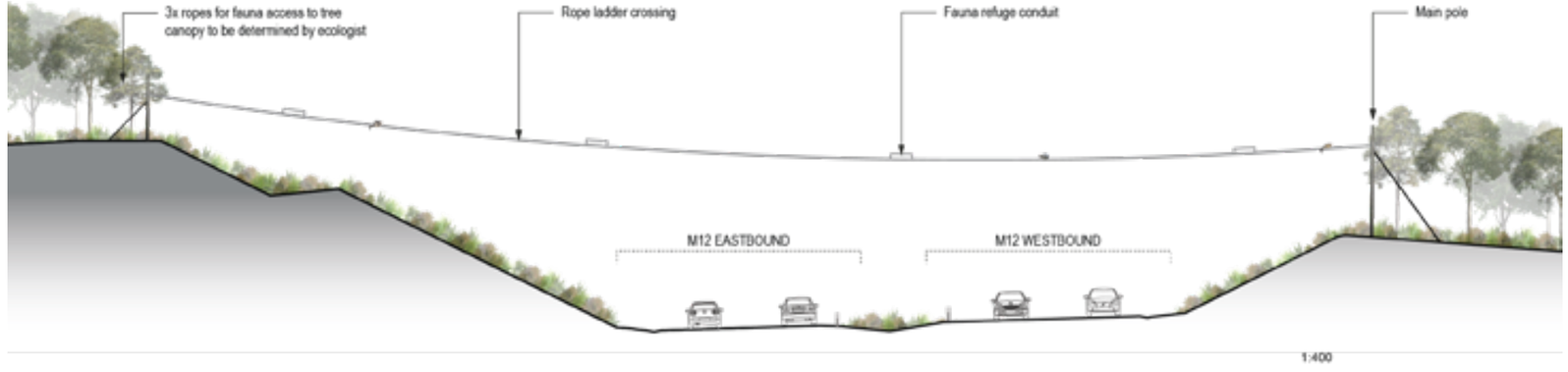


Figure 59. Section - Fauna crossing at Western Sydney Parklands

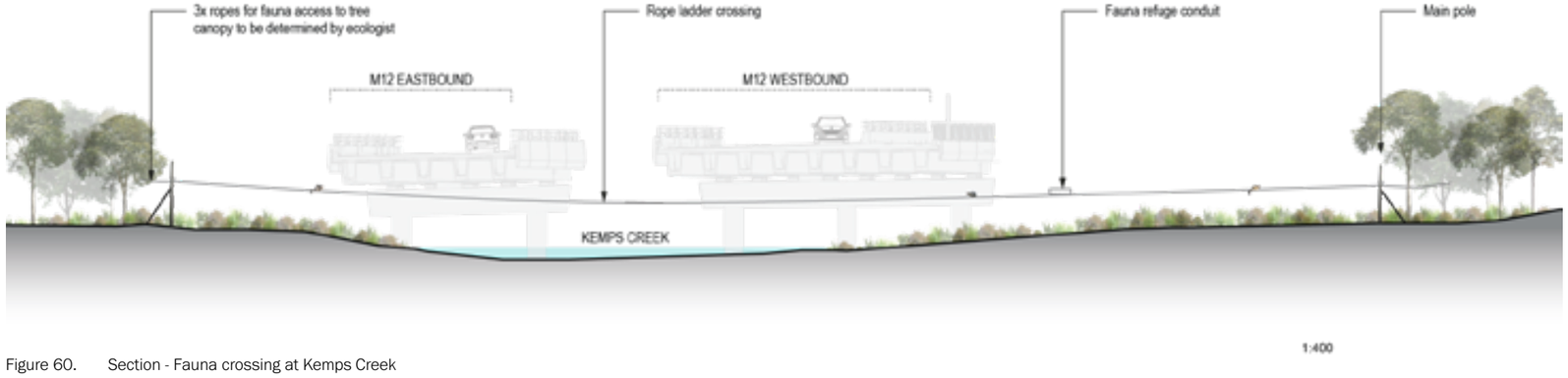


Figure 60. Section - Fauna crossing at Kemps Creek

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

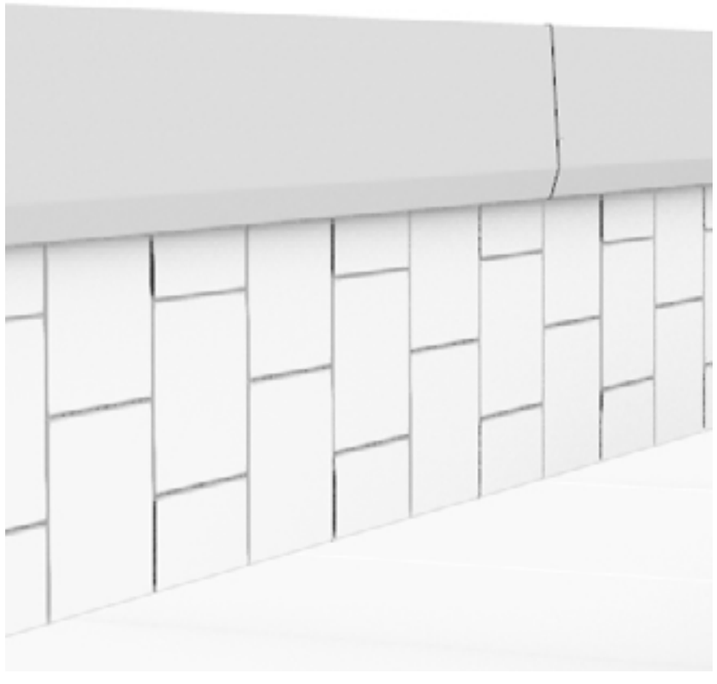


Figure 61. Reinforced soil wall - Typical perspective

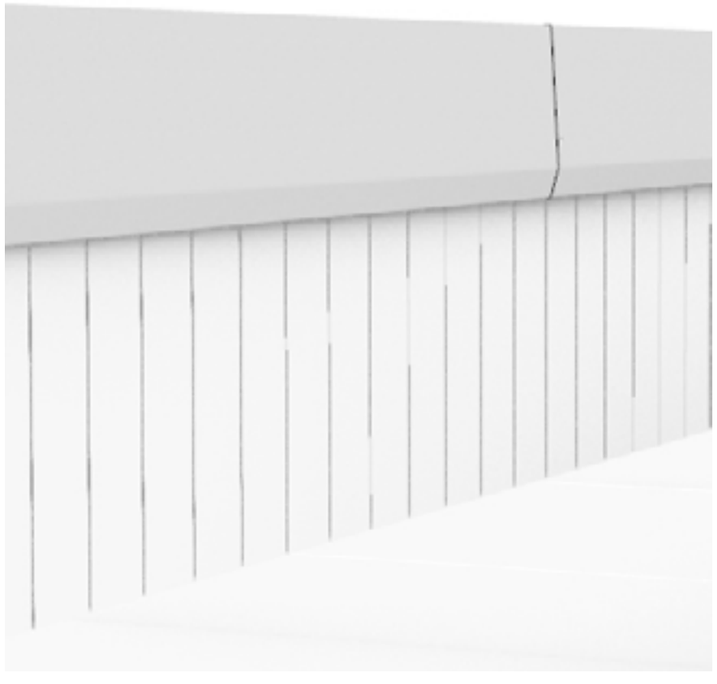


Figure 62. In-situ off-form retaining wall - Typical perspective

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
RW01	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel
RW02	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel
RW03	RSW	Pattern finish	Windspray
RW04	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel
RW05	RSW	Pattern finish with cladding on faces against Airport Access Road	Windspray/Weathering Steel
RW06	RSW	Pattern Finish	Windspray
RW07	Off-form concrete	Plain concrete as extension of adjacent bridge abutment	Plain concrete
RW08	Off-form concrete	Vertical Rebate	Windspray
RW09	Off-form concrete	Vertical Rebate	Windspray
RW10	Off-form concrete	Vertical Rebate	Windspray
RW11	RSW at bridge abutments	Vertical Rebate	Windspray

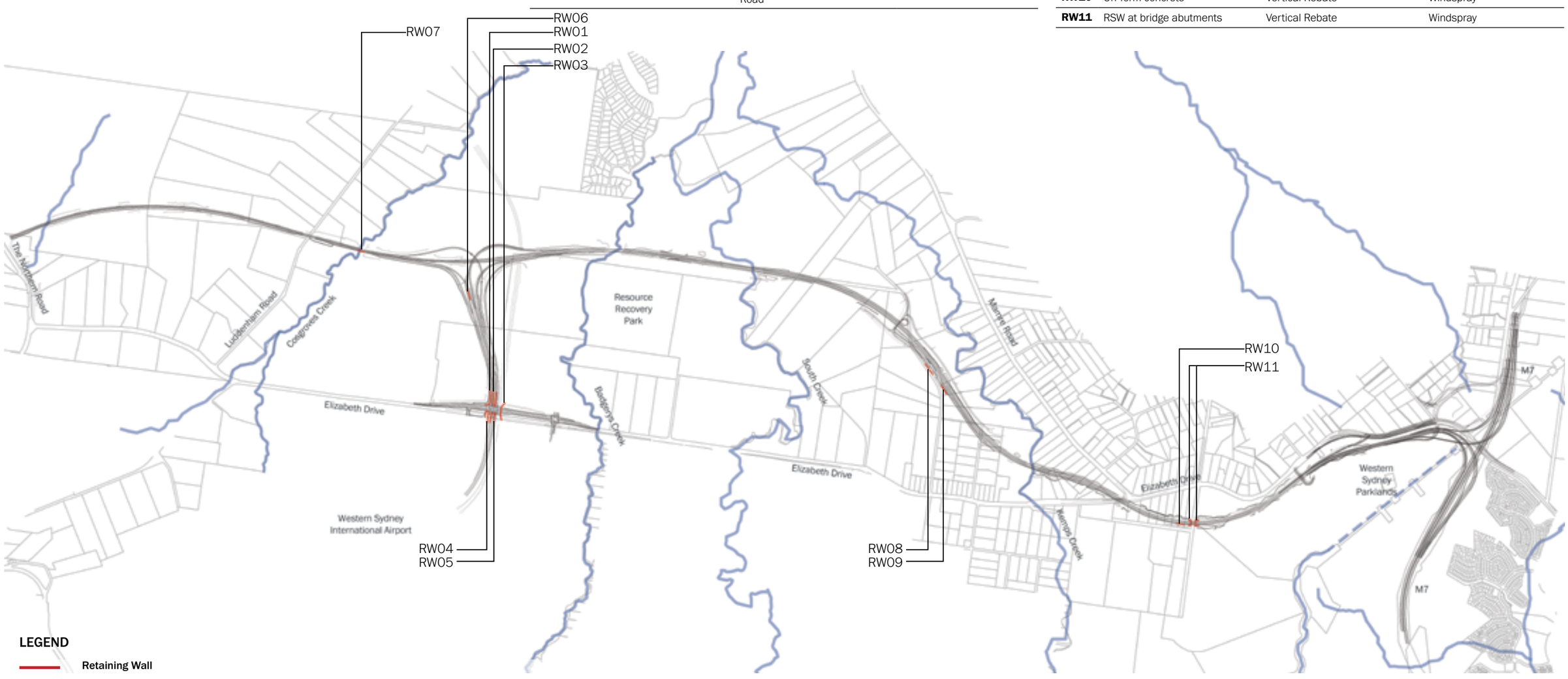


Figure 63. Retaining walls locations

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

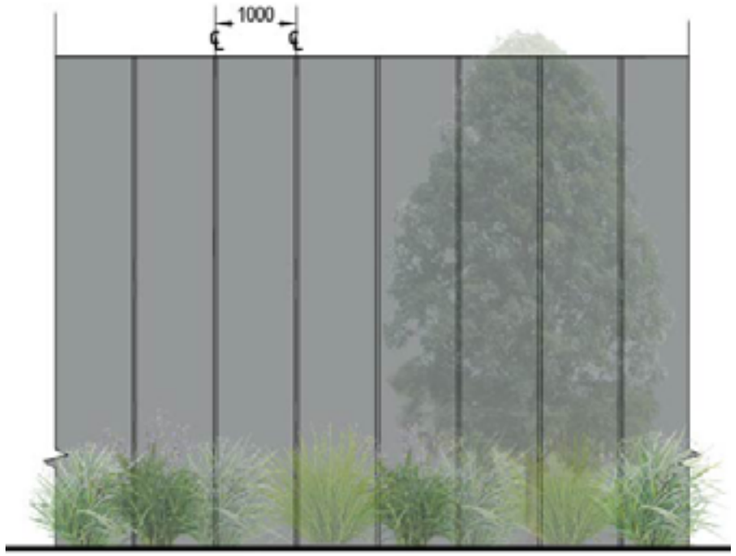


Figure 64. Vertical rebate - Typical elevation - In-situ wall

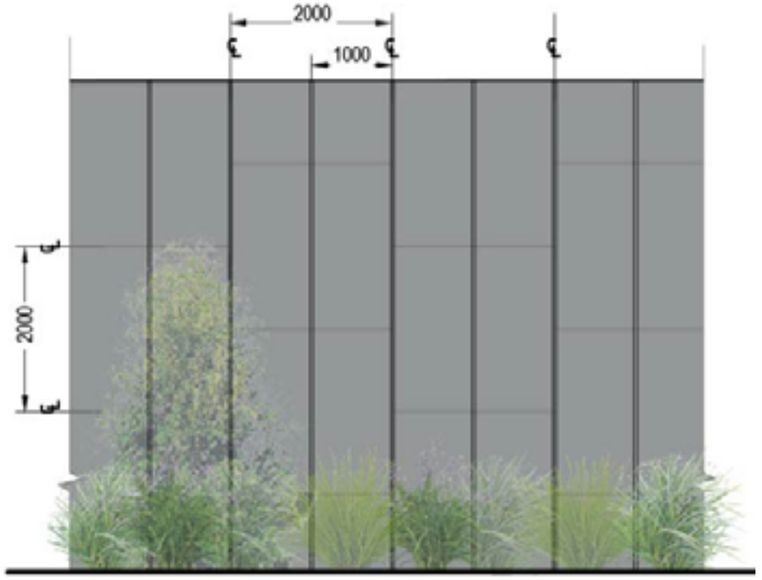


Figure 65. Vertical rebate - Typical elevation - RSW wall

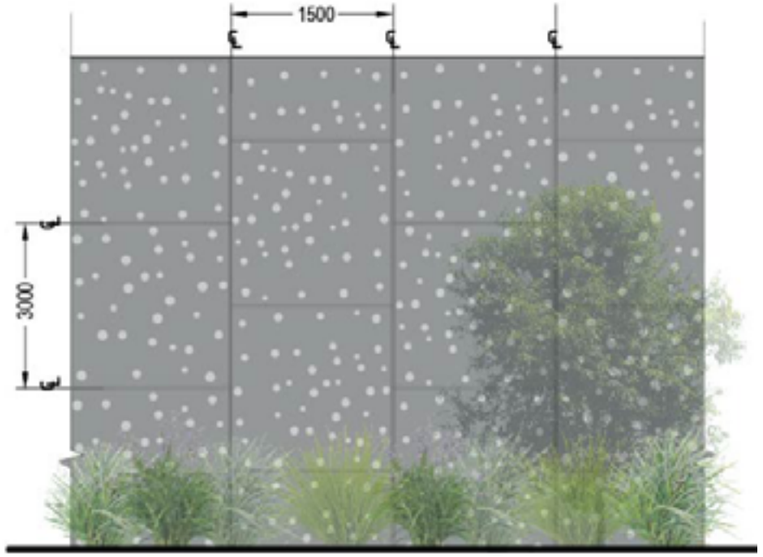


Figure 66. Pattern finish - Typical elevation - RSW wall

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).