GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.43 Alignment Plan 20

GENERAL
- Road Corridor Boundary
- Existing Line Marking
- Proposed Line Marking
- Modified/ New Bridge
- Potential Compound Site

SURFACE TREATMENT
- Existing Road Pavement
- New Road Pavement
- Proposed Path
- Existing Drainage Basins
- New/ Enlarged Basins
- Proposed Culvert
- Rock Cutting

VERTICAL STRUCTURES
- Existing Noise Wall
- New Noise Wall - Refer schedules for description of type
- Existing Retaining Wall
- New Retaining Wall - Refer schedules for description of type

LANDSCAPE TREATMENT
- Veg 1 - Interchange Garden Bed
- Veg 2 - General Garden Bed
- Veg 3 - Revegetation
- Veg 4 - Rock Cuttings > 1:2
- Veg 5 - Rock Cuttings < 1:3
- Veg 6 - Grass

NOTE: Refer to Schedules for details

VEGETATION COMMUNITIES
- Feature Tree
- Sydney Turpentine Ironbark Forest
- Coastal Sandstone Ridgetop Woodland
- Hinterland Sandstone Gully Forest

0 100m

Figure 6.1.44 Alignment Plan 21

Figure 6.1.45 Alignment Plan 22

Figure 6.1.46 Alignment Plan 23

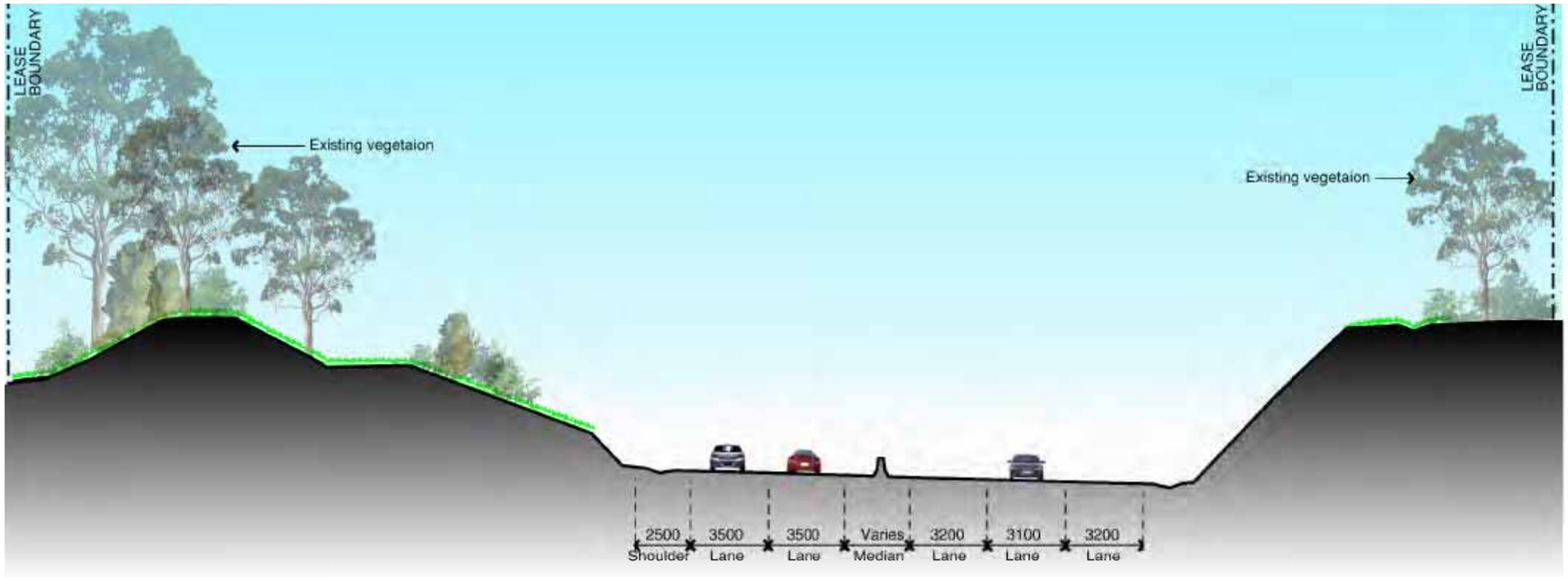

Figure 6.1.47 Stn 15100 Talavera Road - Existing

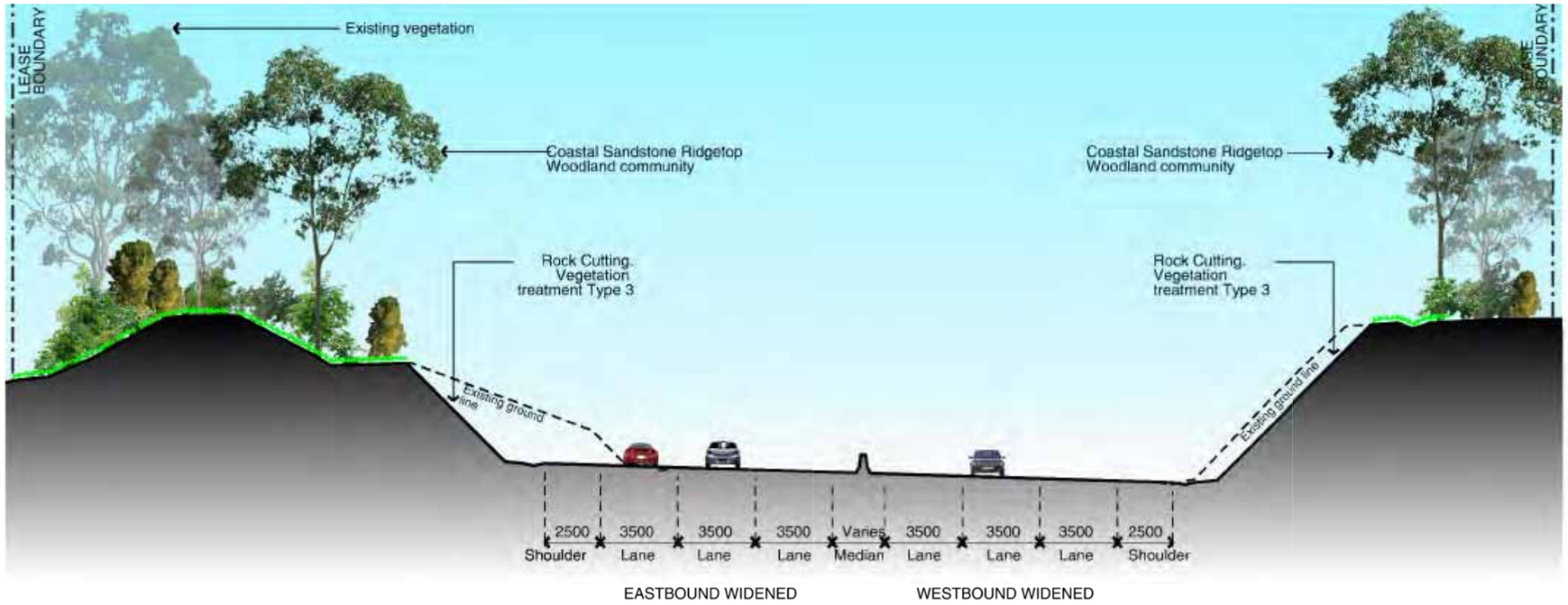

Figure 6.1.48 Stn 15100 Talavera Road - Proposed

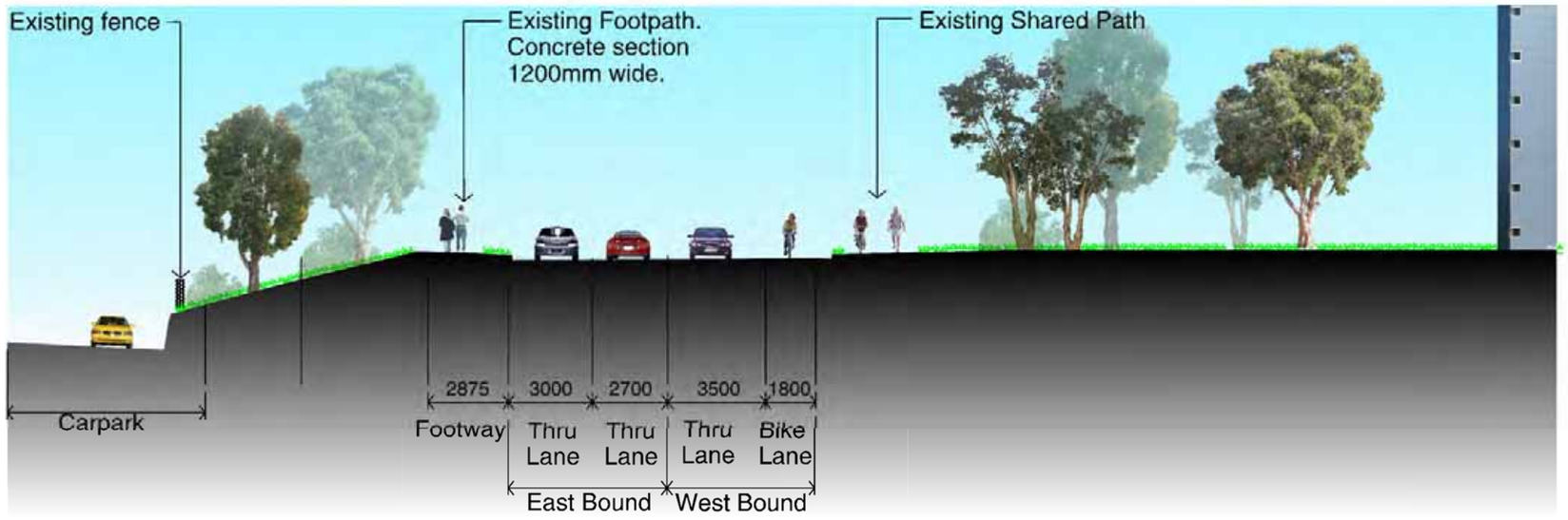

Figure 6.1.49 Talavera Road Between Christie and Herring Roads - Existing

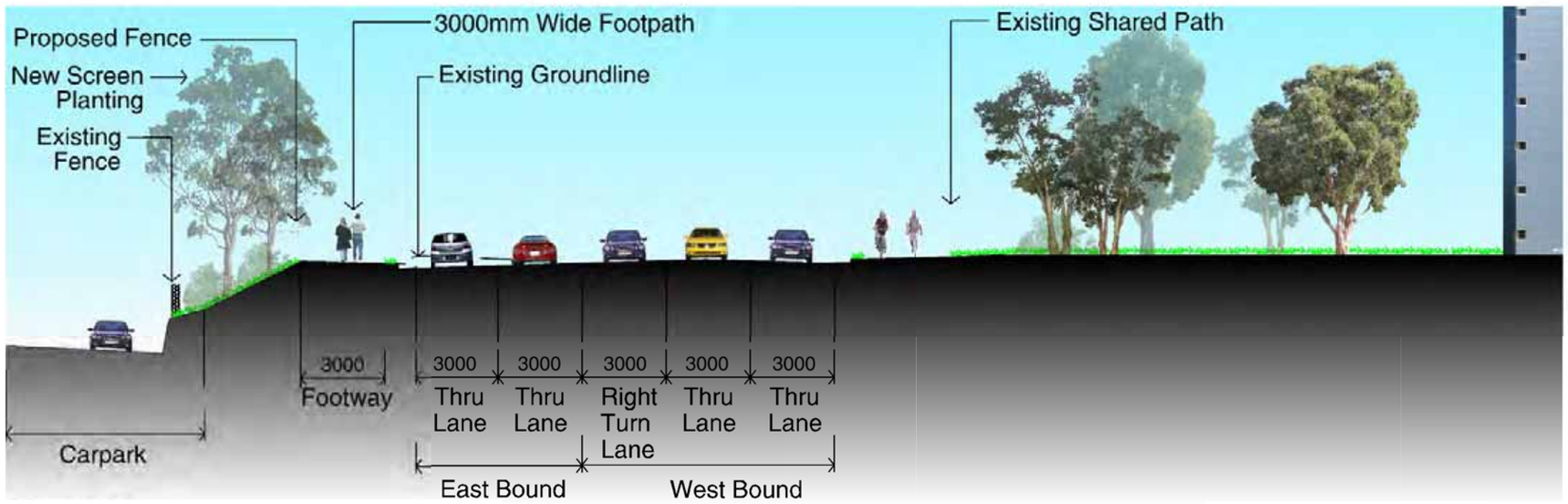

Figure 6.1.50 Talavera Road Between Christie and Herring Roads - Proposed

6.2 Built Elements

The broad urban design objective for all built elements is to identify and accentuate the natural and man-made features which are unique and significant to the M2 Motorway and to reinforce continuity with other sections of the motorway. The design principles are to preserve and enhance:

- Linear Identity – provide a continuous and consistent identity for the length of the upgrade and its seamless transition into the existing upgrade. Select paving and road furniture to reinforce continuity;
- Lateral integration – integrate the road corridor with the surrounding landscape, principally through identifying and responding to the identified landscape character of each of the five corridor precincts.

6.2.1 Bridges

Introduction

The existing bridges are generally consistent and recognisable as part of a 'family' of bridges on the M2 Motorway, despite the fact that they are not good quality urban design examples. As part of the M2 Motorway upgrade, individual interventions at particular bridges to accommodate additional travel lanes, will be required.

The strategy for the bridge design, where widening or lengthening of the bridge occurs, is to match existing construction methods as closely as possible and to match the existing detailing of parapets, piers, girder type and bridge furniture. Although, the project is unable to change the appearance of such bridges, it is intended that where the existing bridge has been poorly designed some consideration will be given to improving the appearance of the bridge or at the very least, not repeating past mistakes.

The strategy for new bridge design is to follow the RTA's Bridge Design Guidelines. It is important not to design and build to inferior standards simply to 'fit' with the existing bridges. A new bridge must be designed to improve upon the appearance of the existing bridges, despite the risk of standing out along the route.

Design Objectives

The primary objectives in the design of the bridges are to ensure that they:

- Meet all applicable structural requirements;
- Relate to their context and role in the total project composition;
- Are aesthetically pleasing for both road users and road neighbours; and
- Are elegant and refined yet robust, durable and low maintenance so that they retain an acceptable standard of appearance over time.

Design Principles

The urban design principles applied to the design of all bridges, renovated or new, are:

- Maximise views of the landscape underbridges.
- Maximise views from bridges towards the surrounding landscape setting.
- Structural bridge forms should be simple and elegant, with structural members as slender as possible.
- Give clear expression to the structural design concept.
- Integrate all bridge components (structure, abutments, parapets, railings, safety screens and lighting) into a coherent, ordered composition.
- Pay particular attention to design details.
- Select appropriate, durable materials and finishes which do not significantly degrade in appearance over time.
- Protect and recover natural vegetation.
- Treat abutment slopes under bridges to prevent erosion and create an attractive and durable surface which is integrated into the bridge composition and the landscaping design.
- The height of solid parapets should be kept as low as possible by using open rail or metal barrier systems.
- Concrete barriers should be simple pre-cast concrete units carefully proportioned in depth in relation to deck overhang & superstructure depth and be continuous past abutments.
- Slope parapet tops inwards towards the deck in order to minimise staining from rainwater on their outer faces.
- Angle the outer face of concrete parapets to better catch the light with the surface as smooth as possible and free of additional attachments.
- For bridges with drainage pipes, the bridge deck draining system to be discreet and concealed from all views. Under no circumstances are drainage pipes, services and future provision for services attached to the external visible surfaces of the bridges.

The Proposed Design

The proposed bridge designs generally comply with the requirements of the Project Scope of Works and Technical Criteria. In addition, the designs also reflect careful consideration of the RTA publication Bridge Aesthetics (January 2004). The proposed designs are consistent with the overall urban and landscape design vision established for the project.

Between Windsor Road and Lane Cove Road there are a total of 21 existing bridges and one tunnel. In order to accommodate the additional traffic lanes, the project includes the widening of 5 of the road bridges plus the lengthening of 2 of the vehicular overbridges, 1 vehicular bridge and 1 pedestrian underpass. Of the 21 bridges, 8 bridges require no change to the structure, however, the additional lanes will be accommodated at two overbridges by the removal of spill-through abutments, creating vertical walls or cuttings. Beecroft Road busway will also be demolished.

The accompanying table identifies all of the bridges on the project followed by descriptions of the changes. The urban design requirements for each individual bridge are discussed in the text following the table.

Table 6.2.1 Bridge Locations within Upgrade Area

Precinct	Area	Bridge No.	Bridge Location	Changes Required
Precinct 1 Cumberland Plain	1	1.1	Windsor Road Overbridge	Widening westbound with on and off ramps
Precinct 2 Bushland Interface	2	2.1	Darling Mills Creek Bridge	Widening
		2.2	Barclay Road Overbridge	Lengthening
		2.3	Yale Close Bridge	Widening
		2.4	Oaks Road Bridge	No change
		2.5	Pennant Hills Road Overbridge	No change
Precinct 3 Suburban Forest Interface	2	2.6	Devlins Creek Bridge	Widening
		2.7	Kirkham Street Overbridge	Lengthening
		2.8	Kent Street Pedestrian Overbridge	No change
		2.9	Beecroft Road Overbridge	No change
		2.10	Beecroft Road Busway	Demolished
Precinct 4 Suburban Bushland Interface	3		Norfolk Tunnel	Widening in both directions
Precinct 4 Suburban Bushland Interface	4	4.1	Terrys Creek Bridge	Widening
		4.15	Vimiera Road Pedestrian Underpass	Lengthening
		4.2	Busaco Road Bridge	Lengthening
		4.3	Culloden Road Overbridge	Cut back abutments to facilitate lane widening
Precinct 5	5	5.1	Christie Road Overbridge	Lengthening and widening, removal of spill through abutments
Precinct 5 Urban Bushland Interface	6	6.1	Khartoum Road Bridge	Widening
		6.2	Lane Cove River Overbridge	No change
		6.3	Wicks Road Bridge	No change
		6.4	Delhi Road Overbridge	No change

Urban Design Concept

PRECINCT 1/AREA ONE

Bridge No. 1.1 Windsor Road Overbridge (refer Figure 6.2.1 to 6.2.3)

This bridge is constructed with Super-T girders. The bridge requires widening on the western side to accommodate new west-bound on and off ramps. No changes occur on the eastern side of the bridge. The ramps require new retaining walls facing the alignment and also facing the neighbourhood and new noise walls. The composition of the bridge, retaining walls and noise walls will work together to form a complete whole. The following urban design requirements apply to changes to this bridge:

- Extend the central headstock & piers to match the existing;
- Depth of parapet to be consistent on all new edges;
- Shape the precast concrete edge beam to make it look like a Super-T girder;
- Pre-cast concrete parapet edge with downturn to cover the edge of the girder and deck and any drainage pipes;
- Safety screen to match existing and must extend around the edges of the new on and off-ramps;
- Junctions at parapet/retaining walls need to be carefully considered;
- Consider planting in the left over areas at the top of the walls, taking maintenance access into account;
- Avoid planting on the bridge deck and plant only once off the bridge; and
- Clad unsightly shotcrete retaining walls with precast concrete facing panels with vertical ribbed pattern (Type A) and extend, if possible, under bridge and further east. In combination with new noise walls, this will significantly update and improve the identity of the intersection.

Photo 6.2.1 Looking East towards Windsor Road Interchange

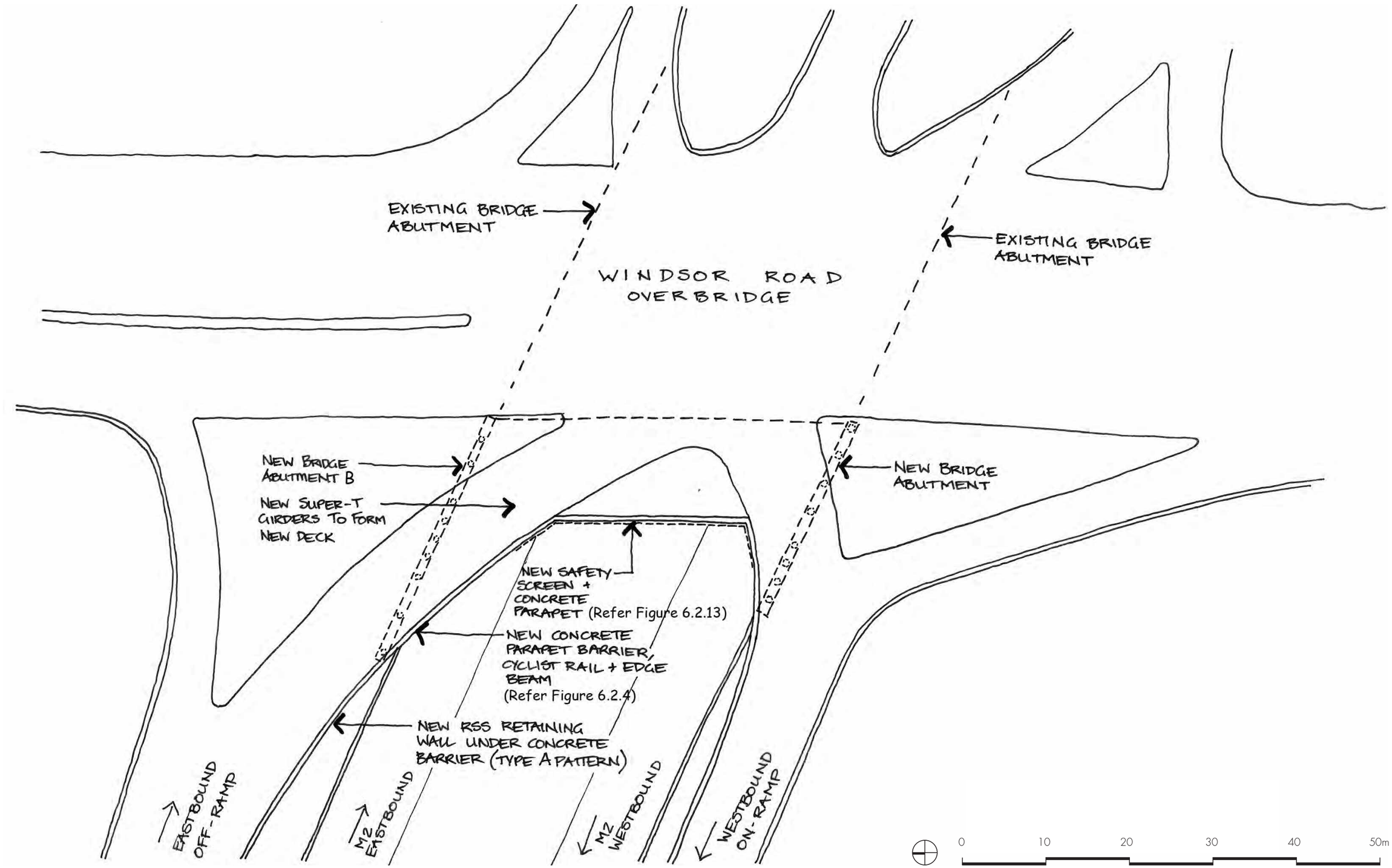

Figure 6.2.1 Windsor Road Overbridge - Plan

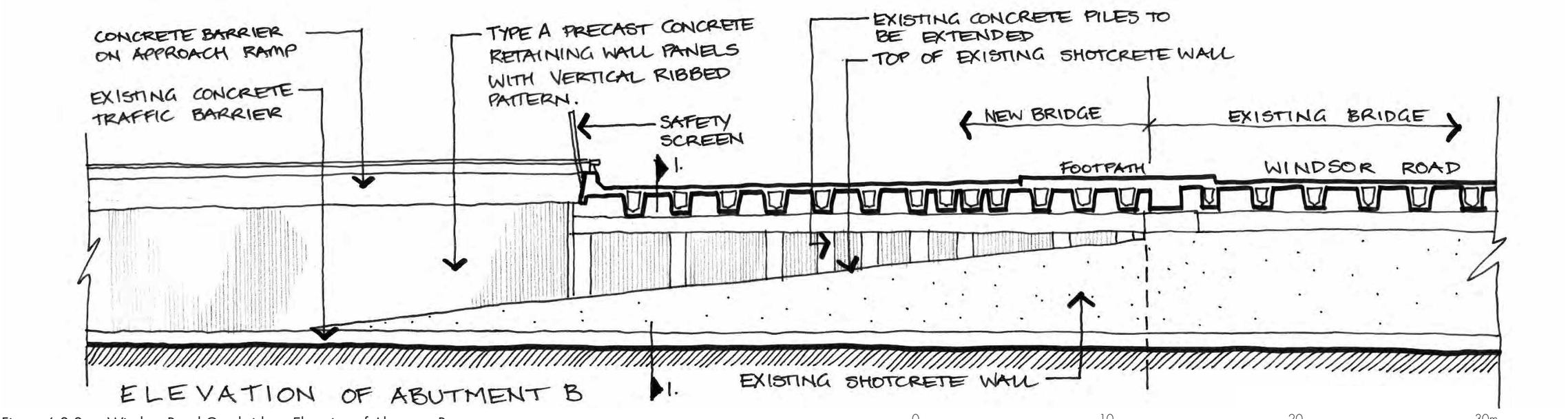

Figure 6.2.2 Windsor Road Overbridge - Elevation of Abutment B

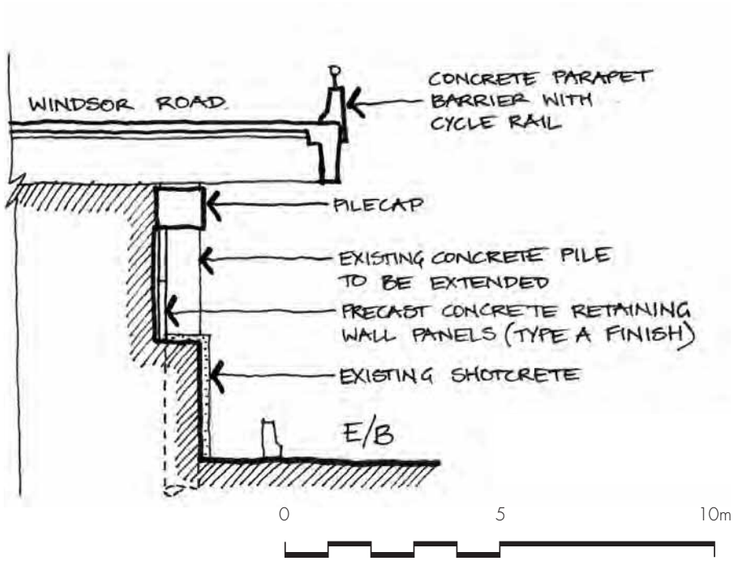

Figure 6.2.3 Windsor Road Overbridge - Section 1

PRECINCT 2/AREA TWO

Bridge No. 2.1 Darling Mills Creek Bridge

Refer Figure 6.2.4, 6.2.5 and 6.2.6.

This bridge is constructed with Super-T girders. The bridge requires widening on the east-bound side to accommodate the additional lane. The abutments which also require widening are retained earth with precast concrete panels. The following urban design requirements apply to changes to this bridge:

- Piers to be rectangular to match piers on existing bridge and dimensions to be equal to or smaller;
- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes. No noise wall is located on this parapet edge;
- Super-T girder depth is to match existing girders depth;
- Headstock to be as simple as possible and is not to protrude past the edge of the parapet; and
- New retaining wall panels at abutments to match existing in shape, size, pattern and jointing.

Photo 6.2.2 Darling Mills Creek Bridge

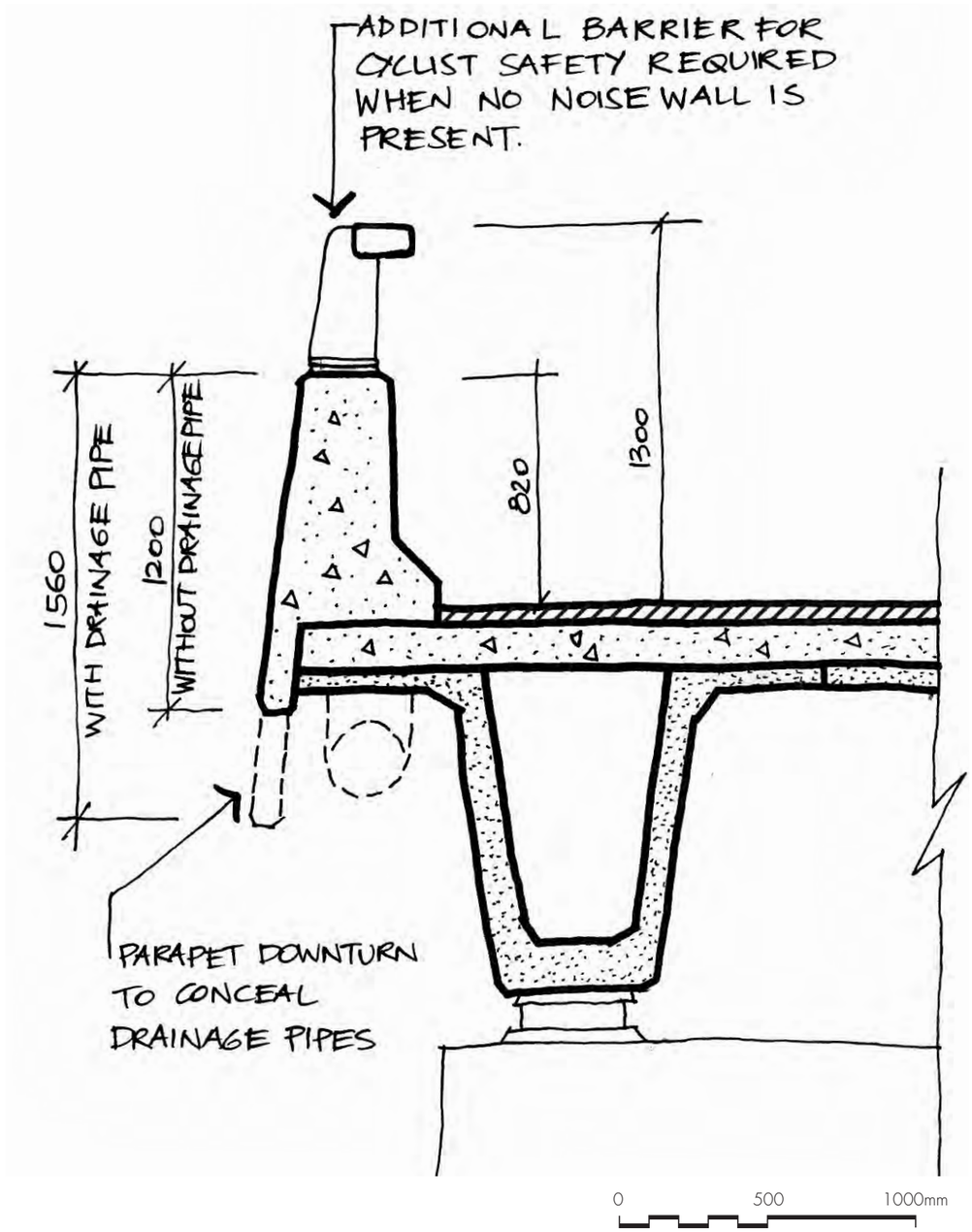

Figure 6.2.4 Typical Bridge - Parapet detail as used on Darling Mills Creek Bridge and Yale Close Bridge

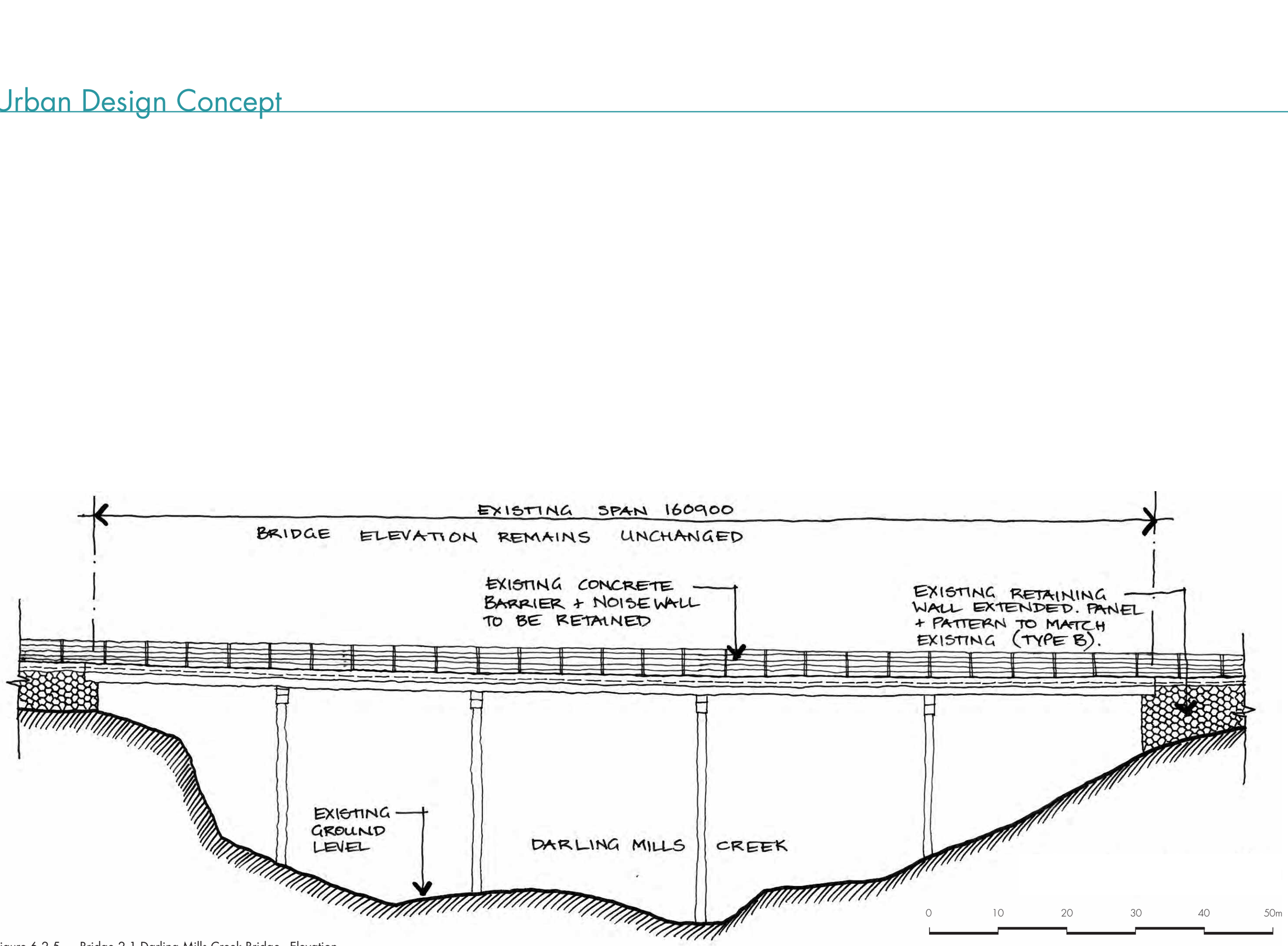

Figure 6.2.5 Bridge 2.1 Darling Mills Creek Bridge - Elevation

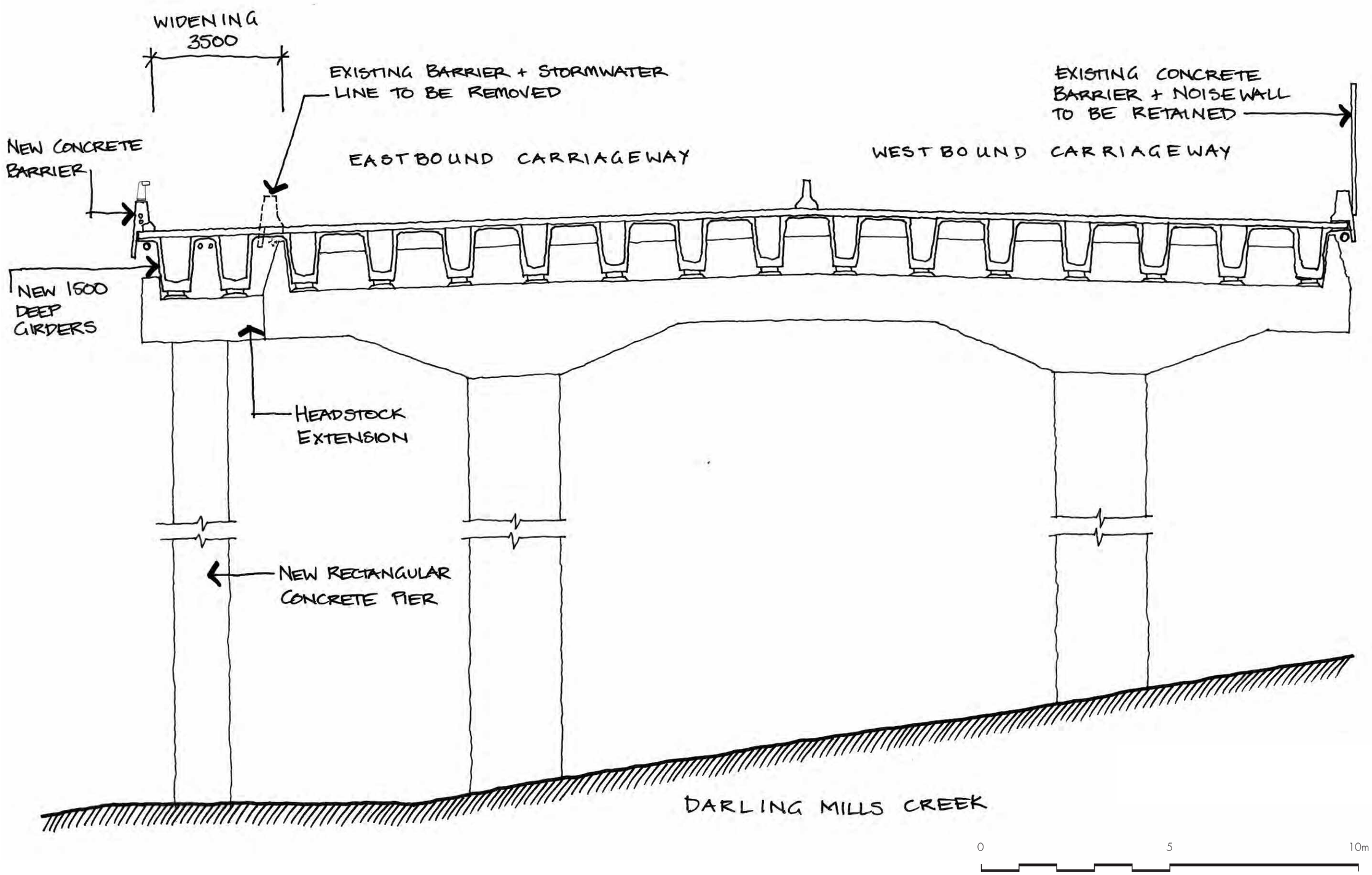

Figure 6.2.6 Bridge 2.1 Darling Mills Creek Bridge - Cross Section

Urban Design Concept

Bridge No. 2.2 Barclay Road Overbridge

Refer Figure 6.2.7, 6.2.8 and 6.2.9.

This bridge is a local road crossing the M2 Motorway and is constructed with Super-T girders. The bridge requires lengthening at the northern end to accommodate the additional lane beneath. The following urban design requirements apply to changes to this bridge:

- Parapet extension to match shape and size of existing and with the same profile and depth of overhang;
- Safety screen and railing detail to match existing;
- The junction of the Super-T girders and the new structure must be neatly resolved. Shape the edge of the new beam to look like the edge of a Super-T girder;
- The spacing and number of the piers must match the existing;
- Avoid replicating shotcrete stabilisation adjacent to abutment top corners by laying the cutting back further. The abutment wing walls would need to be extended to accommodate this; and
- Laying back top of cutting would also facilitate planting on top of vertical cut. See existing areas adjacent to this bridge as reference.

Photo 6.2.3 Barclay Road Overbridge

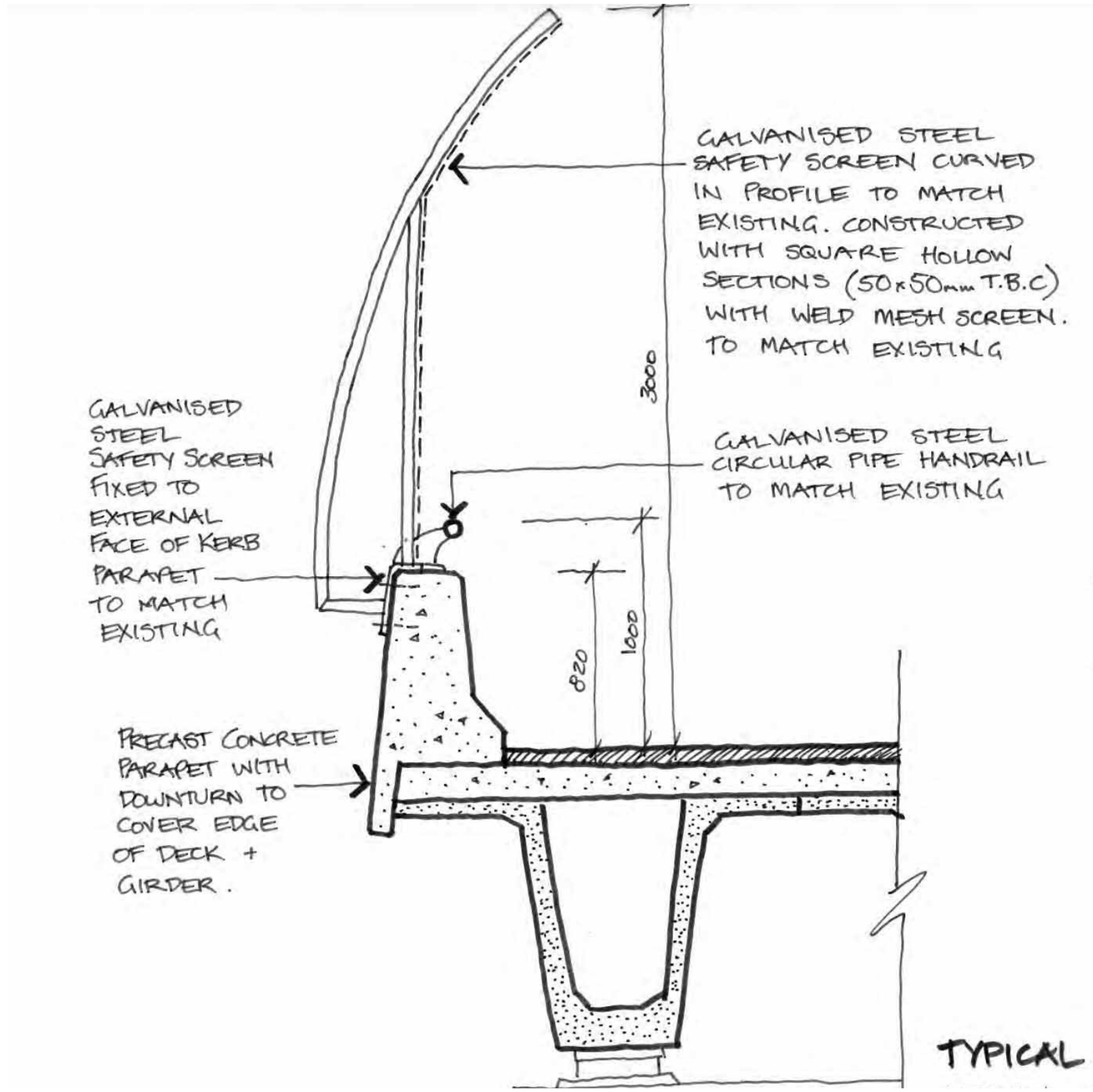

Figure 6.2.7 Typical Overbridge - Parapet detail on Barclay Road Bridge

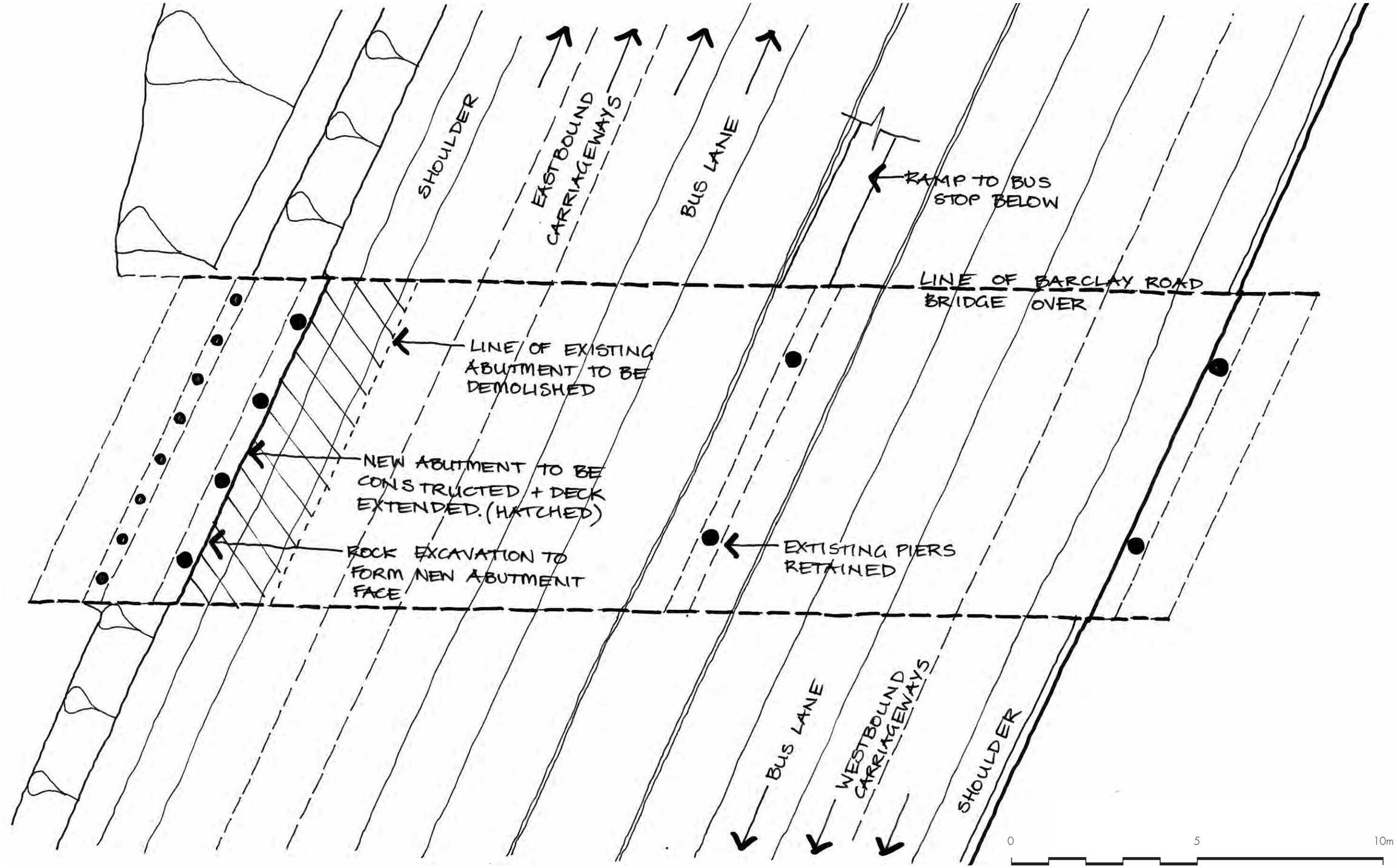

Figure 6.2.8 Bridge 2.2 Barclay Road Overbridge - Plan

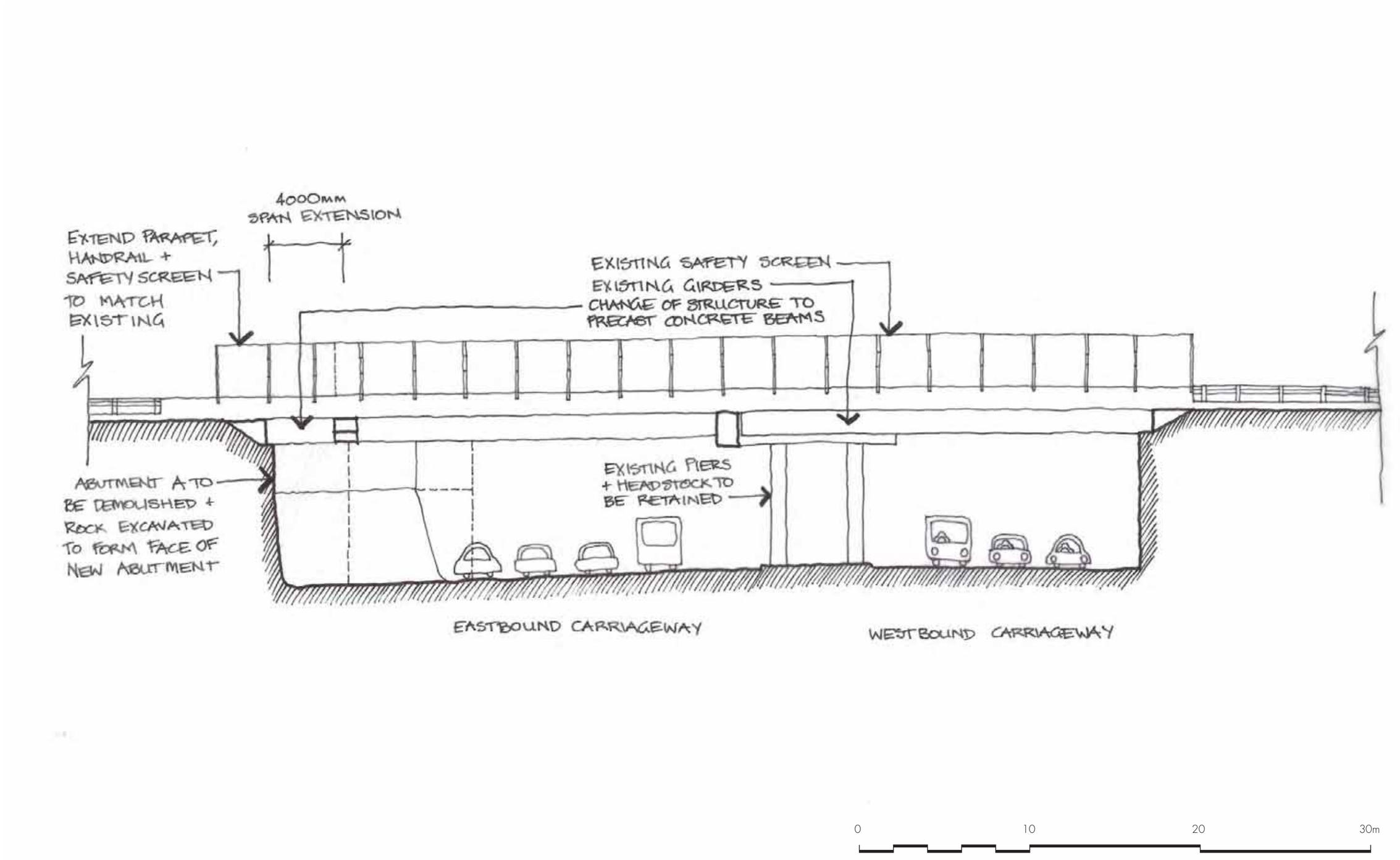

Figure 6.2.9 Bridge 2.2 Barclay Road Overbridge - Elevation

Urban Design Concept 6

Bridge No. 2.3 Yale Close Bridge

Refer Figures 6.2.4 and 6.2.10.

This bridge is a single span bridge over the local road and is constructed with Super-T girders. The bridge requires widening on the west-bound side of the bridge to accommodate the additional lanes. The following urban design requirements apply to the changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes; and
- New reinforced soil wall panels at abutments to match existing in shape, size, pattern and jointing.

Photo 6.2.4 Yale Close Bridge

Bridge No. 2.4 Oaks Road Bridge

No changes are required to this bridge as part of the M2 Motorway upgrade works

Bridge No. 2.5 Pennant Hills Road Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

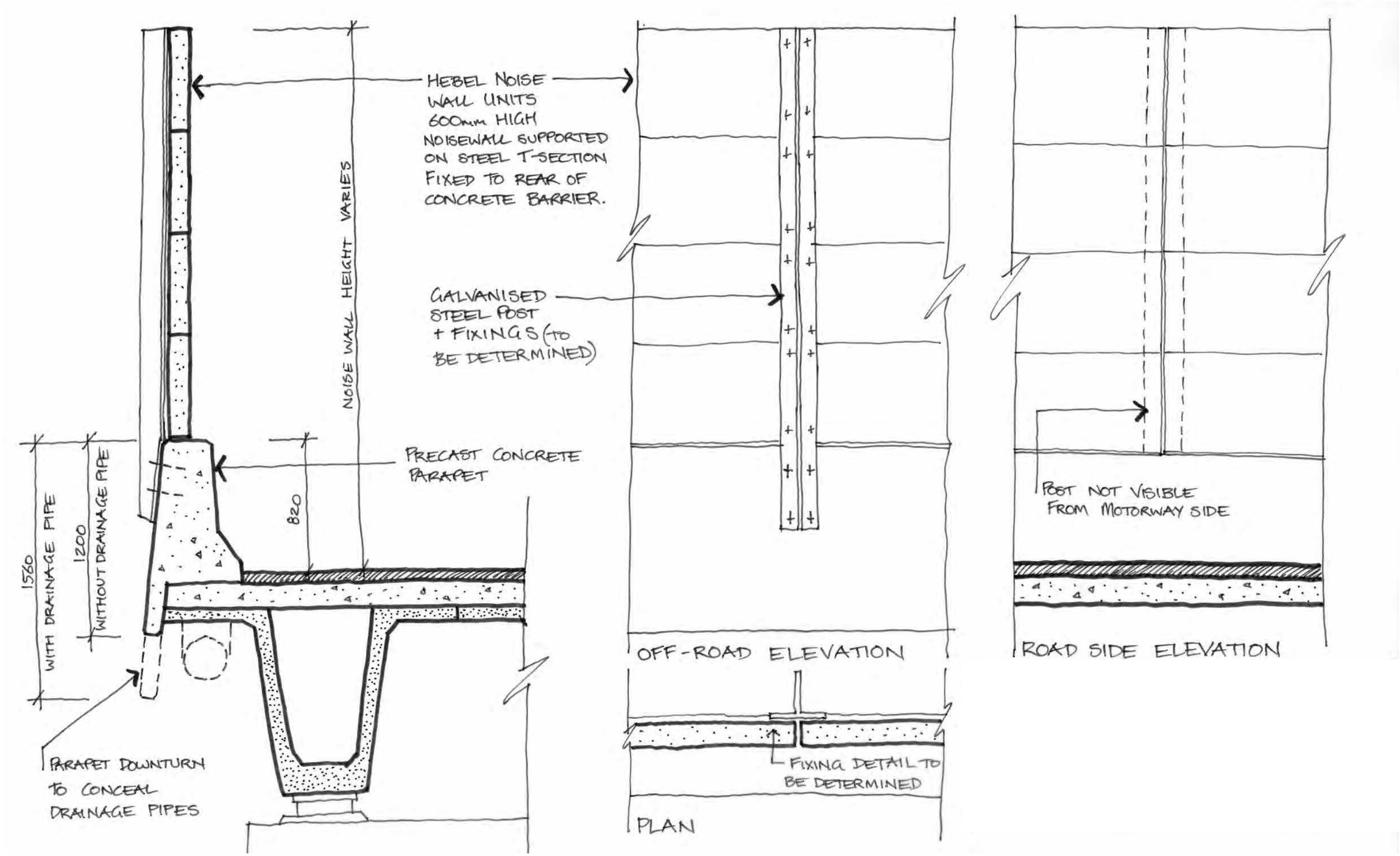

Figure 6.2.10 Typical Bridge Parapet Detail as used on Darling Mills Creek Road, Yale Close Bridge and Devlins Creek Bridge

Urban Design Concept 6

PRECINCT 3/AREA TWO

Bridge No. 2.6 Devlins Creek Bridge

Refer to Figure 6.2.10 and 6.2.11.

Devlins Creek Bridge is constructed with Super-T girders. The bridge requires widening on the west-bound side of the bridge and infilling between the existing two bridges to accommodate the additional lane. The abutments, which also require widening, are retained earth with precast concrete panels.

The following urban design requirements apply to changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes;
- New noise walls located on parapet edge;
- Super-T girders to match the existing girders in depth;
- Minimise protrusion of the headstock past the final girder;
- New circular piers to match the existing in diameter; and
- New retaining wall panels at abutments to match the existing in shape, size, pattern and jointing.

Transparent noise walls panels could be utilised in this location to improve the visual amenity, improve driver orientation and to introduce the bushland context as part of the travel experience.

Photo 6.2.5 Devlins Creek Bridge

.

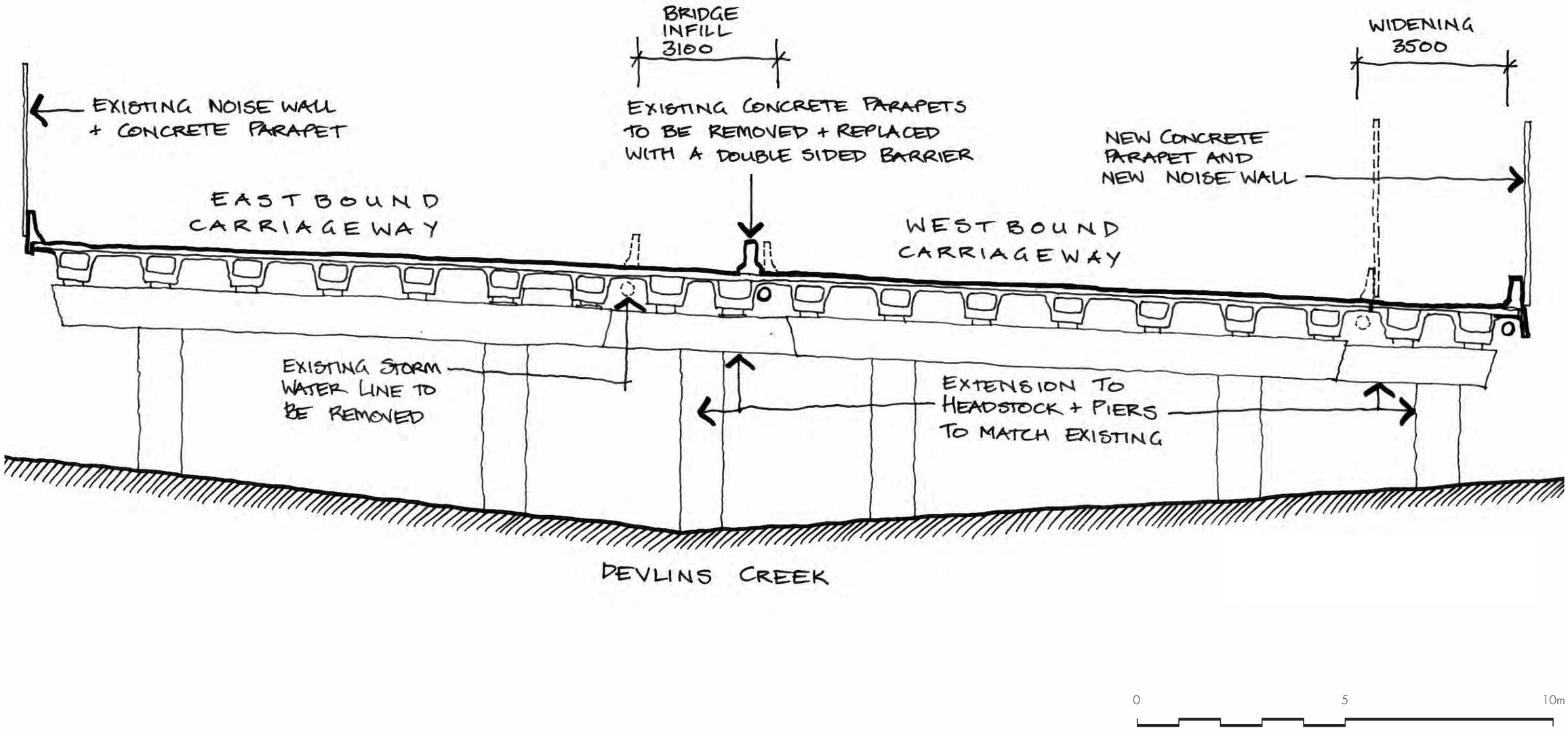

Figure 6.2.11 Bridge 2.6 Devlins Creek Bridge - Cross Section

Bridge No. 2.7 Kirkham Street Overbridge

Refer Figure 6.2.12, 6.2.13 and 6.2.14.

Kirkham Street is a local road crossing the M2 Motorway and is constructed with Super-T girders. The bridge requires lengthening at both ends to accommodate the additional lane beneath.

The following urban design requirements apply to the changes to this bridge: Parapet extension to match the shape and size of the existing and with the same profile and depth of overhang;

- Safety screen and hand rail extension to match existing;
- The junction of the Super-T girders and the new structure must be neatly resolved. Shape the edge of the new beam to look like the edge of a Super-T girder;
- The spacing and number of the piers must match the existing;
- Consider opportunities (surface finish, shape, extent) to improve appearance of abutment & concrete retaining wall; and
- Avoid replicating shotcrete stabilisation adjacent to abutment top corners by laying the cutting back further. The abutment wing walls would need to be extended to accommodate this.

Photo 6.2.6 Kirkham Street Overbridge..

Bridge No. 2.8 Kent Street Pedestrian Bridge.

No changes are required to this bridge.

Bridge No. 2.9 Beecroft Road Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Bridge No. 2.10 Beecroft Road Busway

No changes are required to this bridge as part of the M2 Motorway upgrade works.

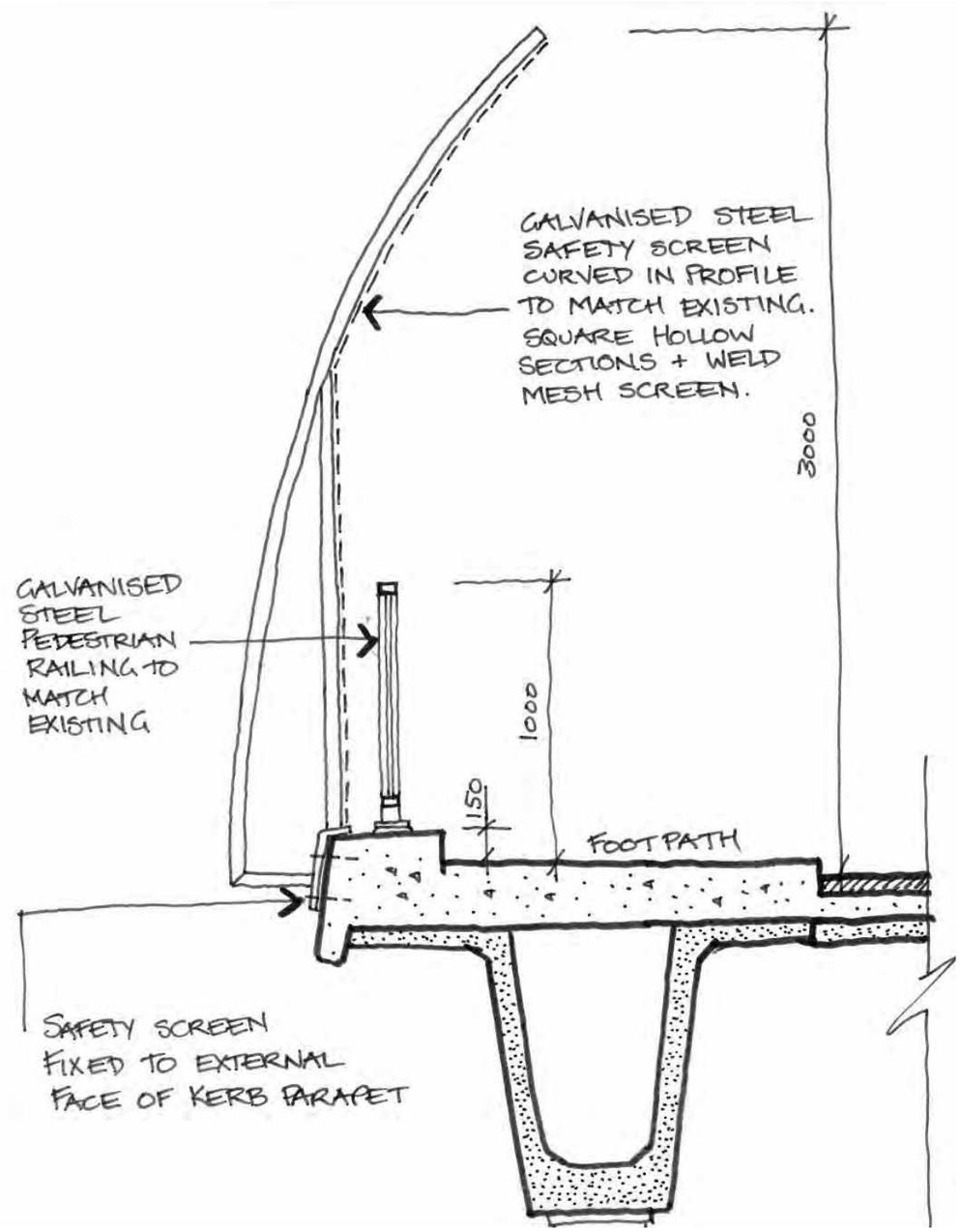

Figure 6.2.12 Typical Bridge - Parapet Detail on Kirkham Street Bridge

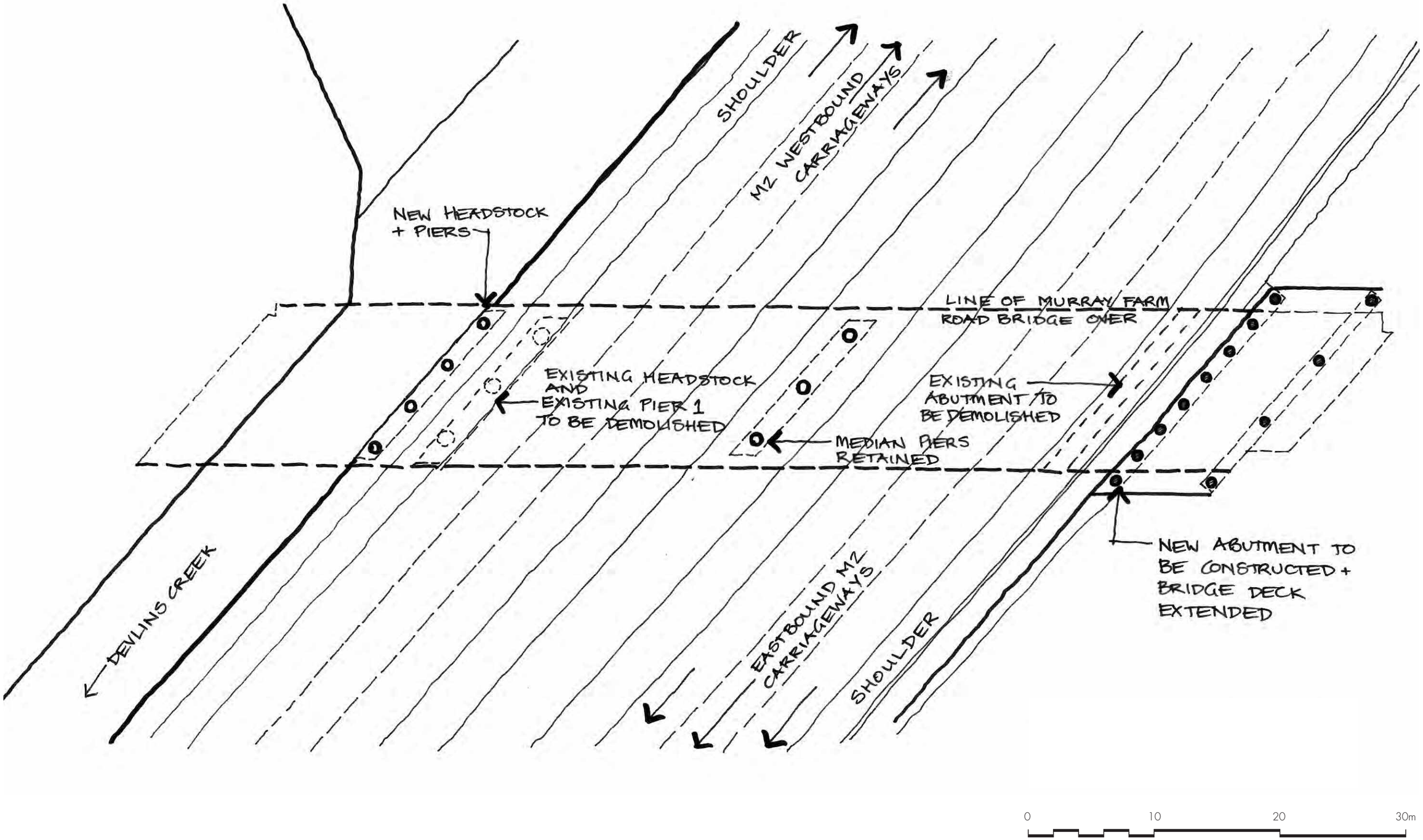

Figure 6.2.13 Bridge 2.7 Kirkham Street Overbridge - Plan

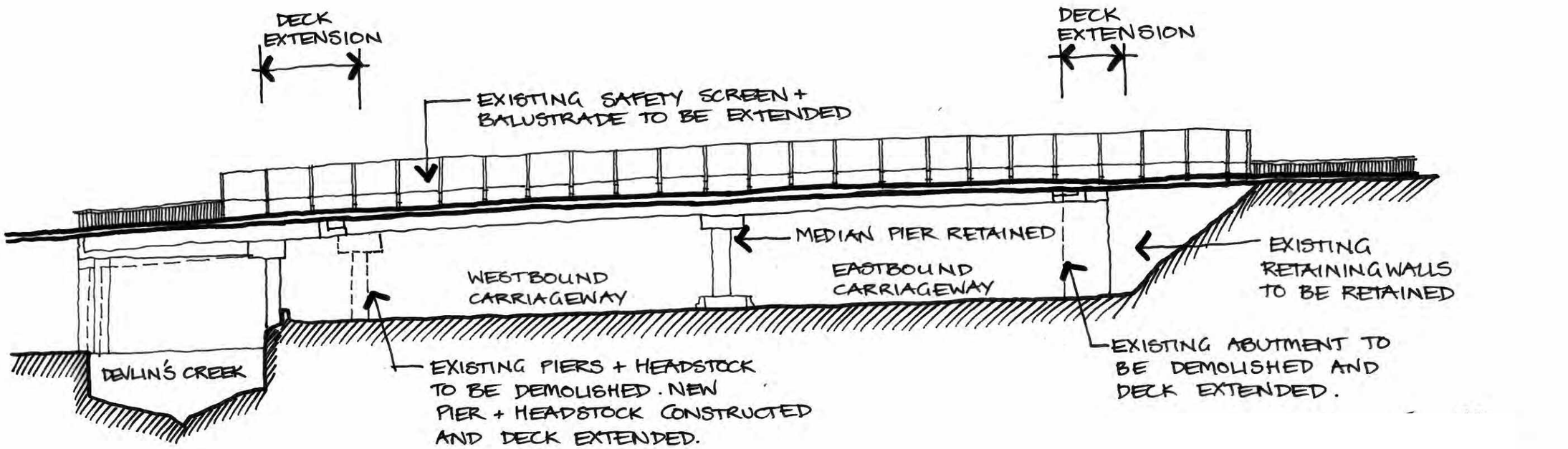

Figure 6.2.14 Bridge 2.7 Kirkham Street Overbridge - Elevation

Urban Design Concept

PRECINCT 4/AREA THREE

Norfolk Tunnel

Norfolk Tunnel is a major landmark on the M2 Motorway journey. The tunnel is being widened in each direction to cater for an additional traffic lane and breakdown shoulder, also for use by cyclists. The current tunnel portal entries are clean symmetrical arches framed by neat precast concrete units and set against the attractive backdrop of cut sandstone.

If practical construction requirements result in an asymmetrical rock excavation shape, then a design will be required to mask the uneven & asymmetrical rock excavation shape. Any changes to the portal needs to compliment the natural sandstone cutting, the existing noise wall design and also physically contribute to the Urban & landscape Design Vision for the M2 Motorway.

The other design considerations include:

- Maintaining airflow for the ventilation fans;
- The incorporation of extensive variable message and speed zone signage at the portal;
- The traffic envelope requirements;
- The filtering of the blinding effects of the strong low morning and evening sun;
- Screening the ends of the lighting suspension system from view; and

A steel mesh structure may be required above each tunnel portal to catch any rocks which fall from the cutting above.

Photo 6.2.7 Eastern portal of the Norfolk Tunnel.

PRECINCT 4/AREA FOUR

Bridge No. 4.1 Terrys Creek Bridge

Refer Figures 6.2.15 to 6.2.17.

This bridge is constructed with Super-T girders. The bridge requires widening on the east-bound side of the bridge to accommodate the additional lane. The abutments which also require widening are retained earth with precast concrete panels. The following urban design requirements apply to changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover the edge of the girder, deck and any drainage pipes;
- Piers to be rectangular to match the piers on the existing bridge and dimensions to be equal to or smaller;
- Minimise protrusion of the headstock past the final girder;
- Super-T girders to match the existing girders in depth;
- New reinforced soil wall panels to match the existing in shape, size, pattern and jointing;
- New noise walls located on both parapet edges; and
- New transparent noise walls panels are highly recommended to improve the visual amenity, improve driver orientation and to take full advantage of the bushland context.

Photo 6.2.8 Terrys Creek Bridge

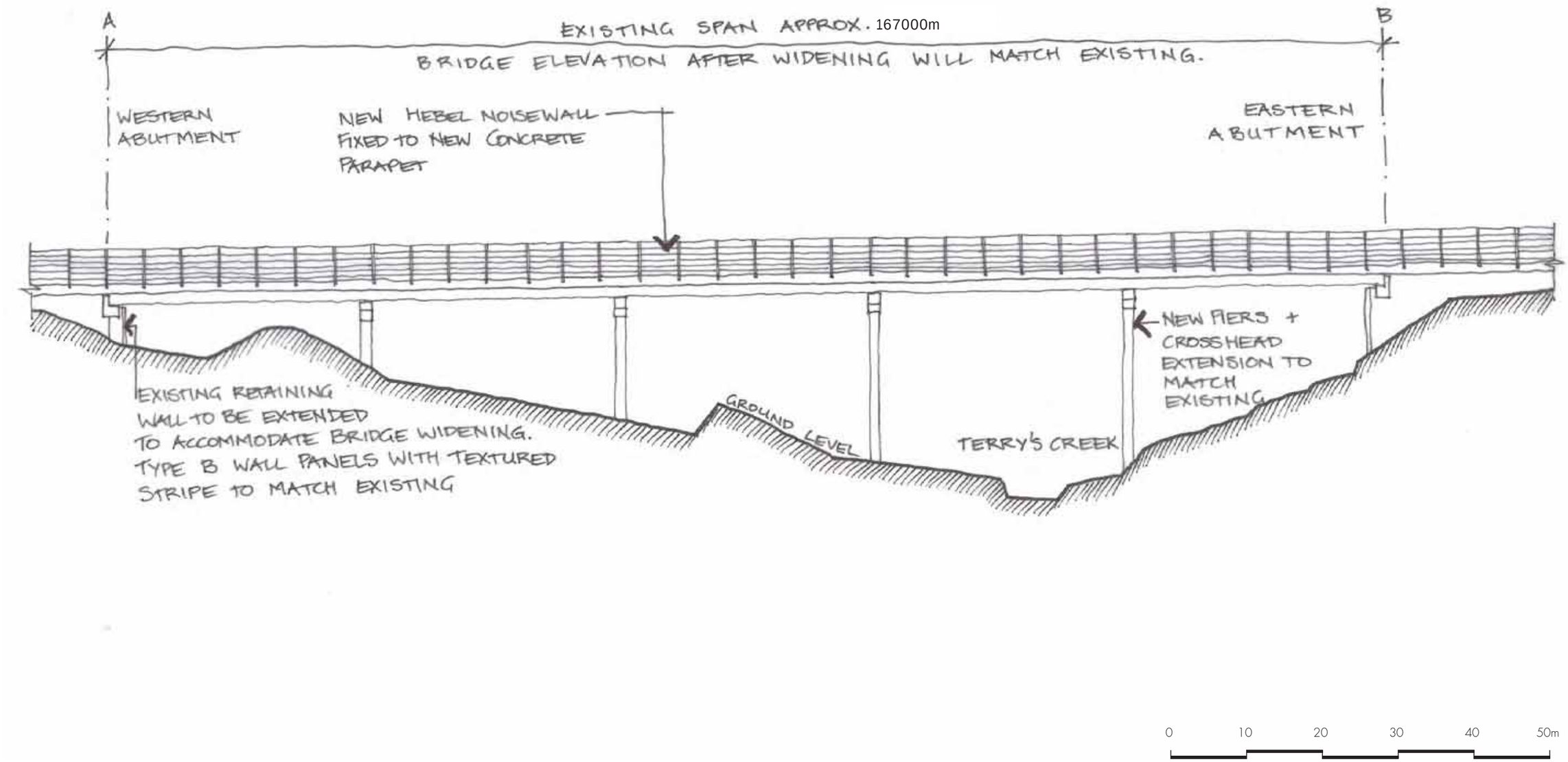

Figure 6.2.15 Bridge 4.1 Terrys Creek Bridge - Elevation

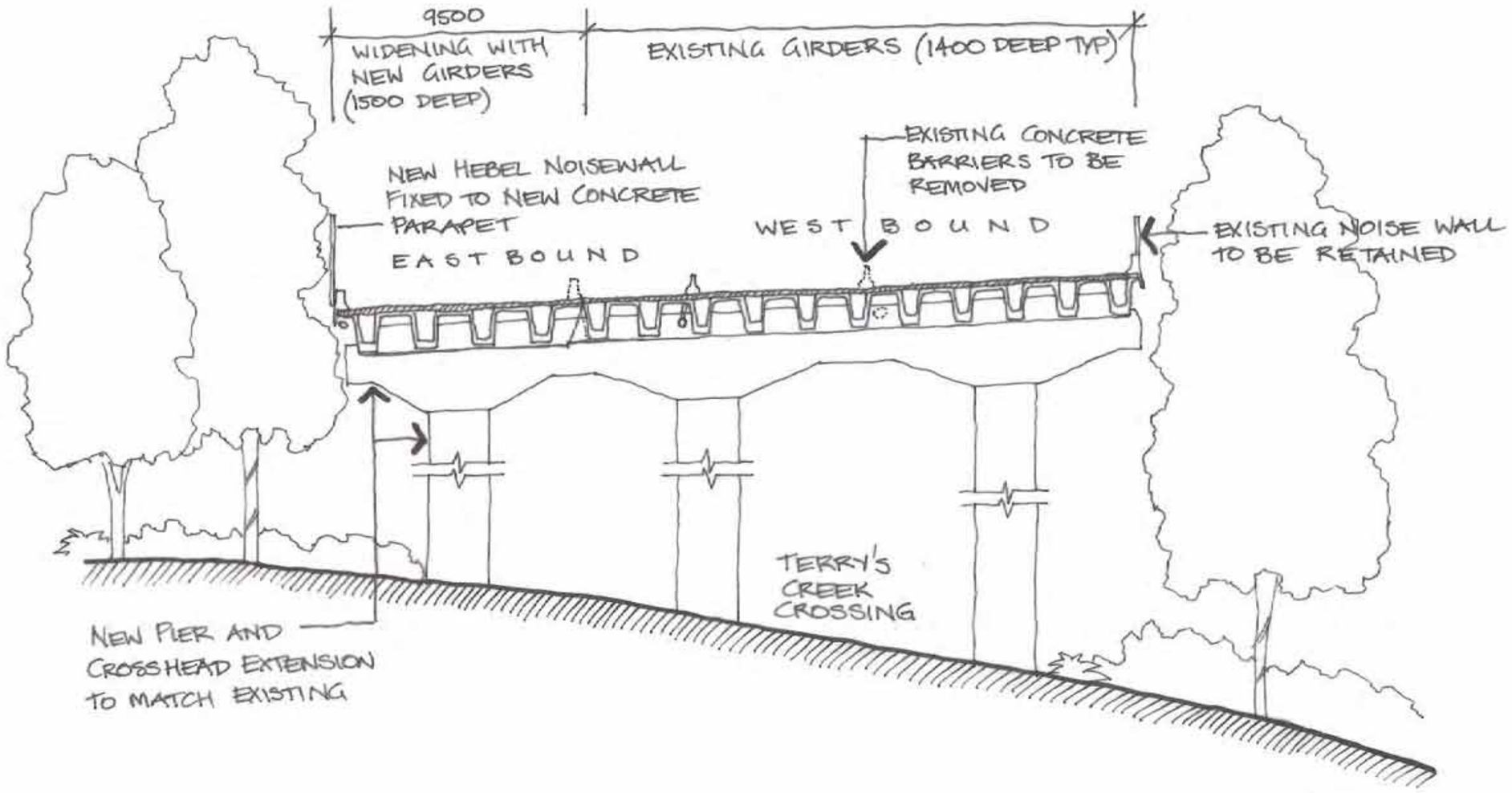

Figure 6.2.16 Bridge 4.1 Terrys Creek Bridge - Cross Section

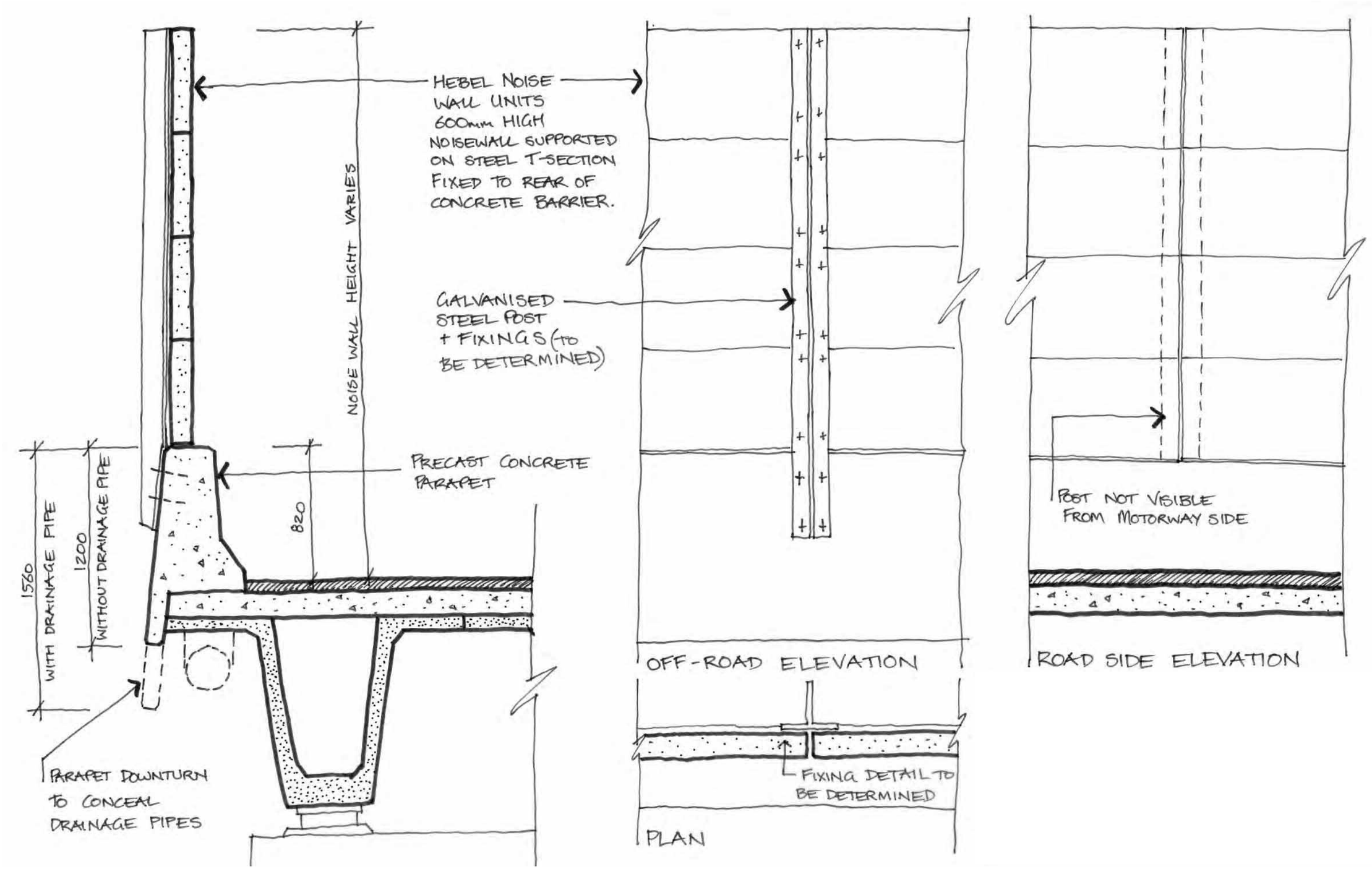

Figure 6.2.17 Typical Bridge Parapet Detail as used on Terrys Creek Bridge

Urban Design Concept

Bridge No. 4.15 Vimiera Road Pedestrian Underpass

This pedestrian underpass is a concrete culvert style 'tunnel underpass' which travels beneath the M2 Motorway. (Refer to photo 6.2.9) It requires lengthening at the northern end of the underpass. The following urban design requirements apply to the changes to this bridge:

- Underpass to be extended to the north in the same material and style;
- Splay concrete entry retaining walls and fencing to open up the approach view to the underpass. This will also visually reduce the length of the underpass;
- Improve/maintain lighting; and
- Improve appearance and safety at both ends of the underpass by upgrading fencing, lighting and landscape planting.

Bridge No. 4.2 Busaco Road Bridge.

This bridge is a "Bebo" arch structure which is being lengthened at the northern end to accommodate the additional lane. (Refer to Photo 6.2.10) The following urban design requirements apply to the changes to this bridge:

- Existing sandstone retaining boulders to be retained and re-used or extend the vertical wall at end of the arch similar to Shrimptons Creek;
- Improve appearance and safety at both ends of the underpass by upgrading fencing, lighting and landscape planting. Treated pine planter boxes to be removed from either end of the bridge; and
- Noise wall on northern side to be relocated to new parapet edge.

Photo 6.2.9 Vimiera Road Pedestrian Underpass

Photo 6.2.10 "Bebo" arch Bridge over Busaco Road

Bridge No. 4.3 Culloden Road Overbridge

Refer Figure 6.2.18.

This bridge is a local road crossing the M2 Motorway and is constructed with Super-T girders. Culloden Road & Christie Road Overbridges act as important entry and exit structures at either side of the M2 Motorway toll plaza. No bridge widening is required however the spill-through abutments are being removed and replaced by vertical walls/cuttings. The following urban design requirements apply to changes to this bridge:

- Lightweight CFC cladding panels or precast concrete facing panels are to be applied to the area directly under bridge to conceal any shotcrete stabilisation required and to improve the appearance of the bridge. The cladding will extend 2m past the edge of the bridge and will have a vertical emphasis to relate directly to the upgrade retaining walls

Photo 6.2.11 Culloden Road Overbridge

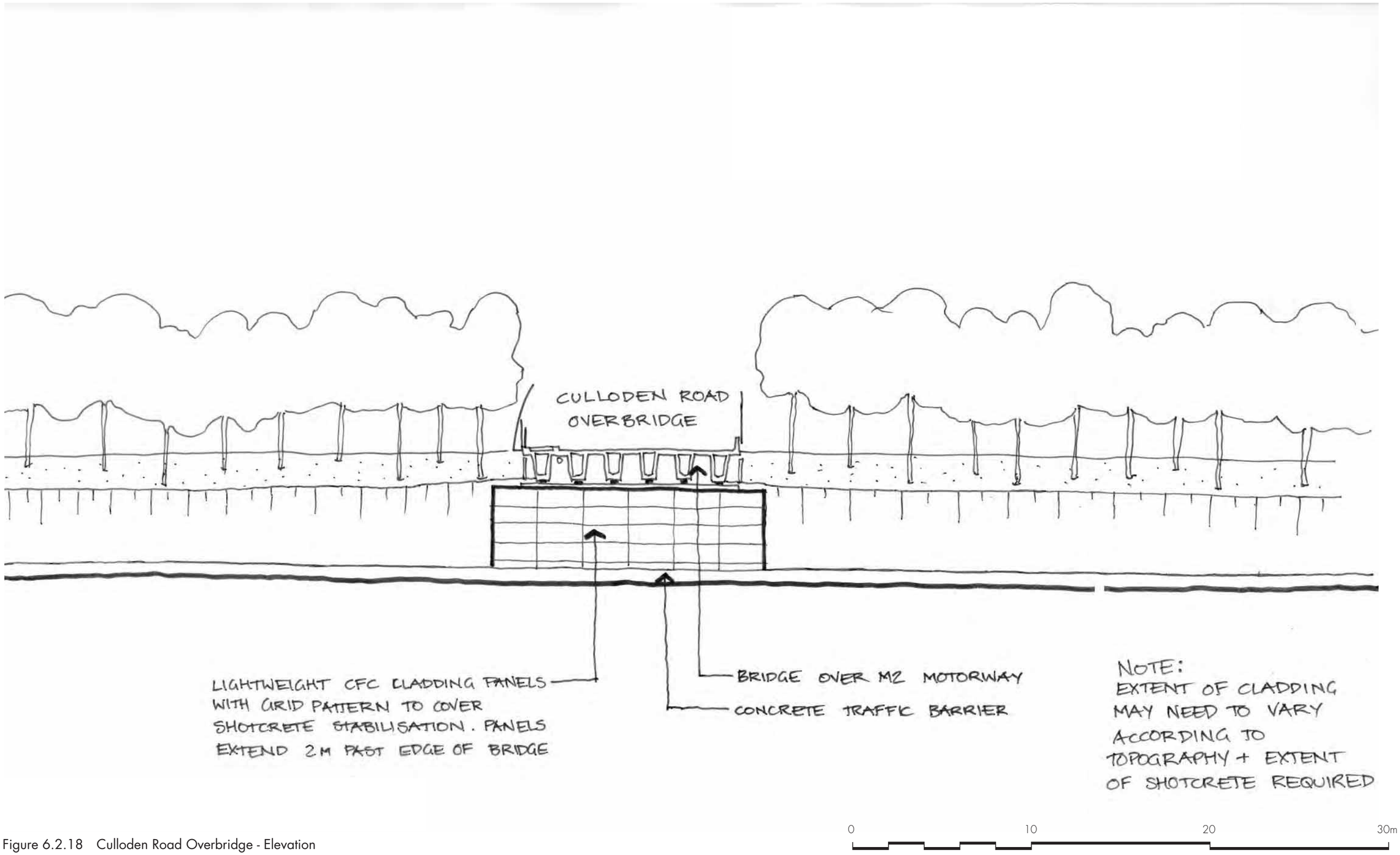

Figure 6.2.18 Culloden Road Overbridge - Elevation

Urban Design Concept

PRECINCT 5/AREA FIVE

Bridge No. 5.1 Christie Road Overbridge (refer Figure 6.2.19 to 6.2.21)

This bridge is a local road crossing the M2 Motorway and is constructed with Super-T girders. Christie Road & Culloden Road Overbridges act as entry and exit structures at either side of the M2 Motorway toll plaza. The bridge will be widened on both sides and lengthened and the abutments are being removed and replaced by vertical walls/cuttings. The following urban design requirements apply to changes to this bridge:

- Lightweight compressed fibre cement cladding panels or precast concrete facing panels are to be applied to the area directly under the bridge to conceal any shotcrete stabilisation required and to improve the appearance of the bridge. The cladding will extend 2 metres past the edge of the bridge and will have a vertical emphasis to relate directly to the upgrade retaining walls, and
- New throw screens will be required on both sides.

Photo 6.2.12 Christie Road Overbridge.

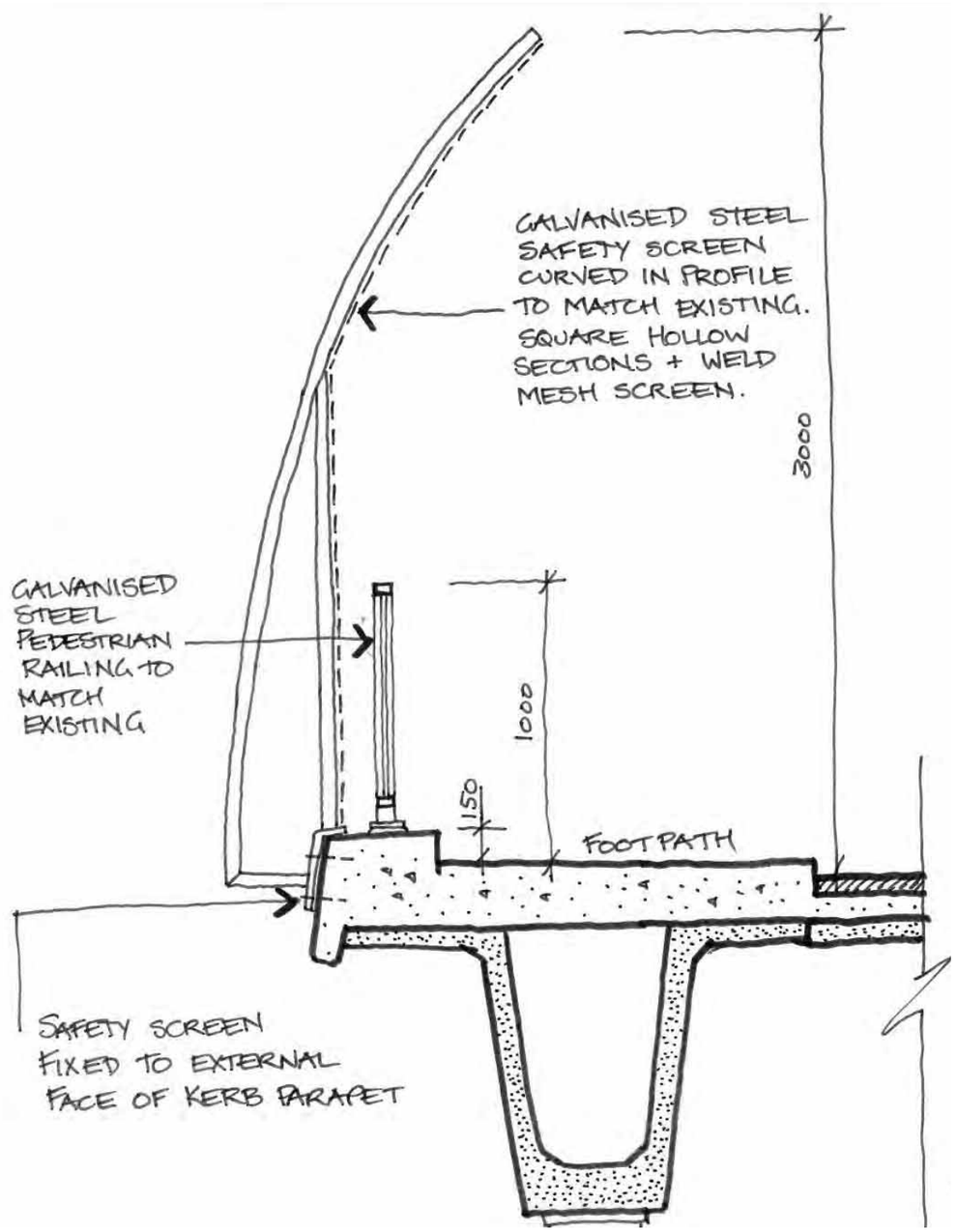

Figure 6.2.19 Typical Bridge - Parapet Detail on Christie Road Bridge

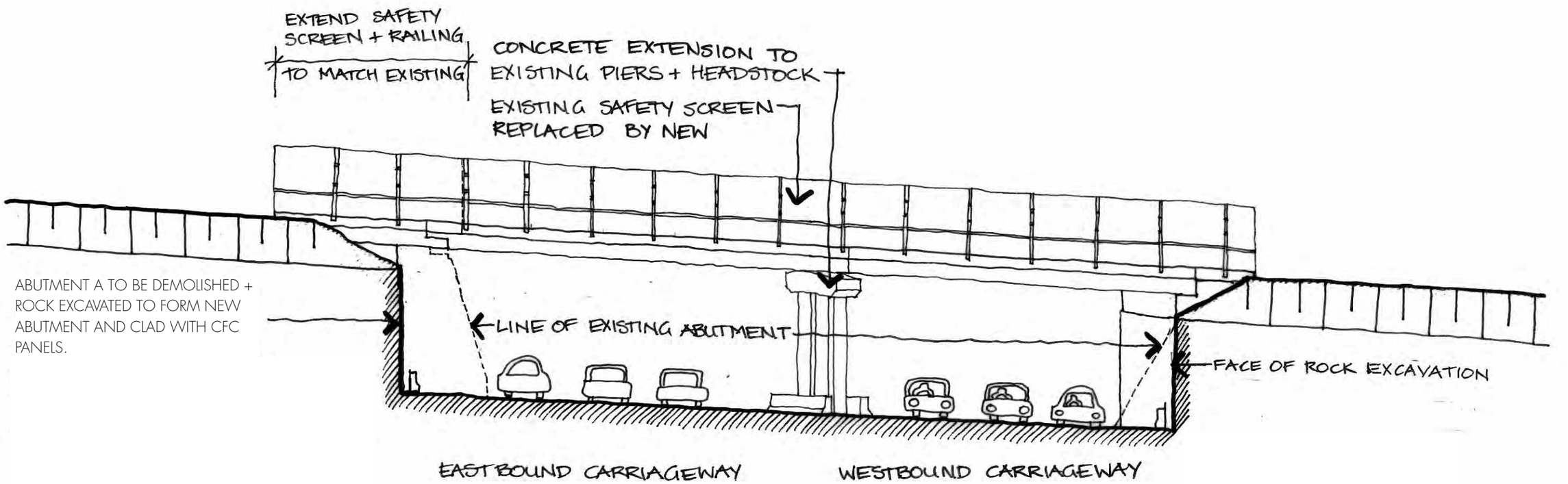

Figure 6.2.20 Bridge 5.1 Christie Road Bridge - Elevation

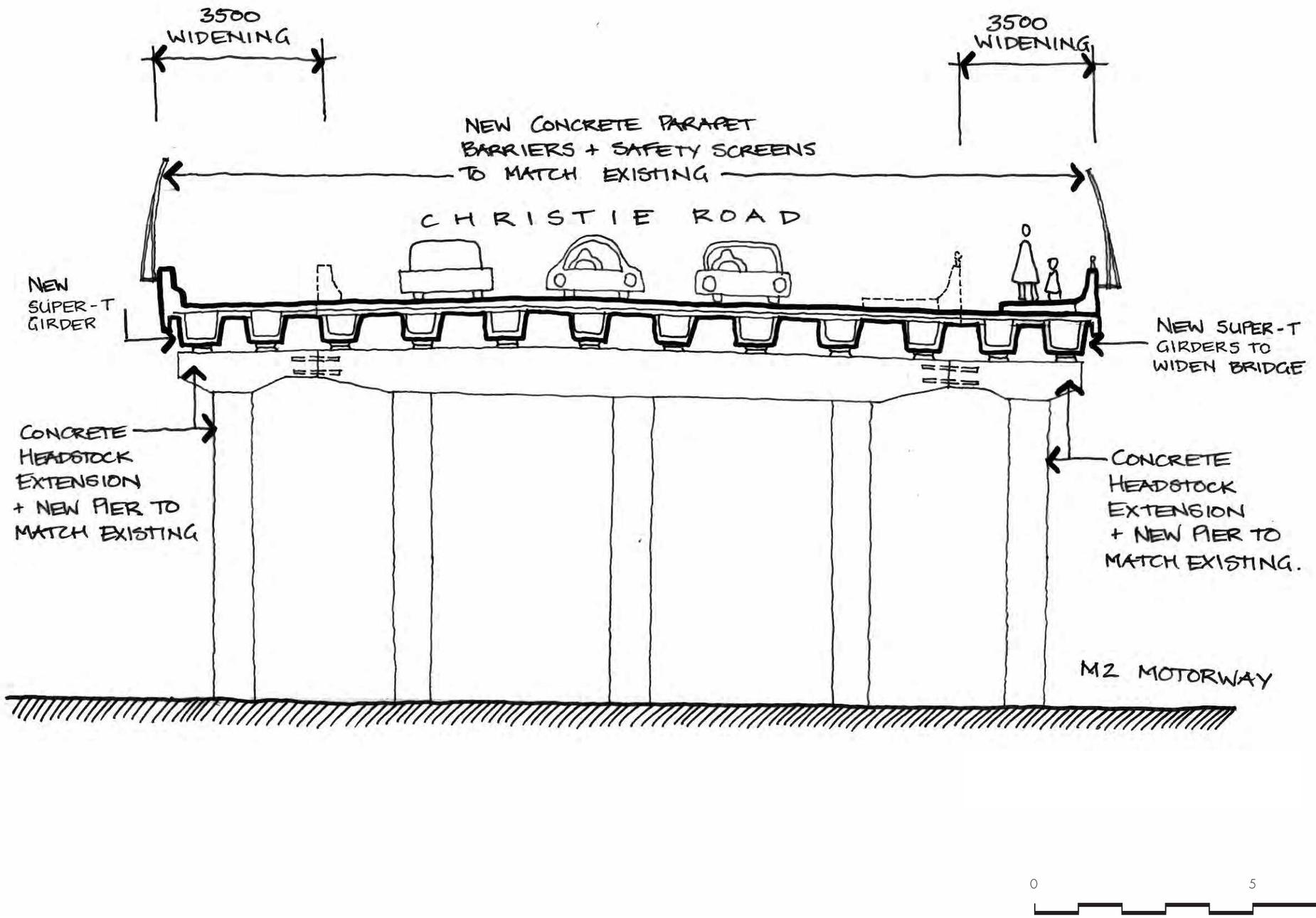

Figure 6.2.21 Bridge 5.1 Christie Road Bridge - Cross Section

PRECINCT 6/AREA SIX

Bridge No. 6.1 Khartoum Road Bridge

Refer to Figures 6.2.22 to 6.2.24.

This bridge is a single span bridge over the local road and is constructed with Super-T girders. The bridge requires widening on both sides of the bridge to accommodate the additional lanes. The following urban design requirements apply to changes to this bridge:

- Pre-cast concrete parapet edge with downturn to cover edge of the girder, deck and any drainage pipes;
- New reinforced soil wall panels at abutments to match the existing in shape, size, pattern and jointing; and
- Stabilisation of existing precast panels will take the form of evenly spaced dome shaped covers in stainless steel.

Bridge No. 6.2 Lane Cove River Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Bridge No. 6.4 Wicks Road Bridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Bridge No. 6.5 Delhi Road Overbridge

No changes are required to this bridge as part of the M2 Motorway upgrade works.

Photo 6.2.13 Khartoum Road Overbridge.

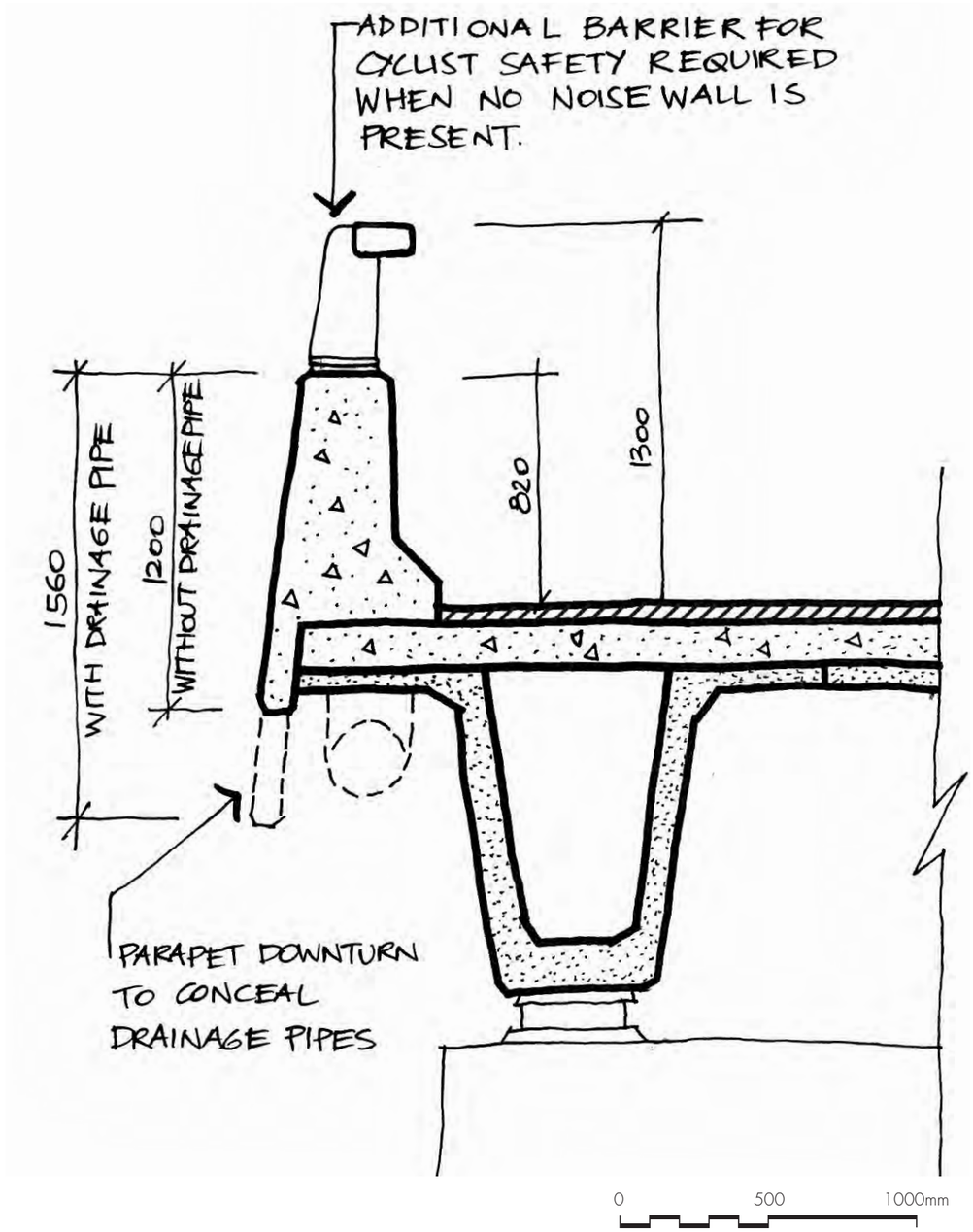

Figure 6.2.22 Typical Bridge - Parapet detail

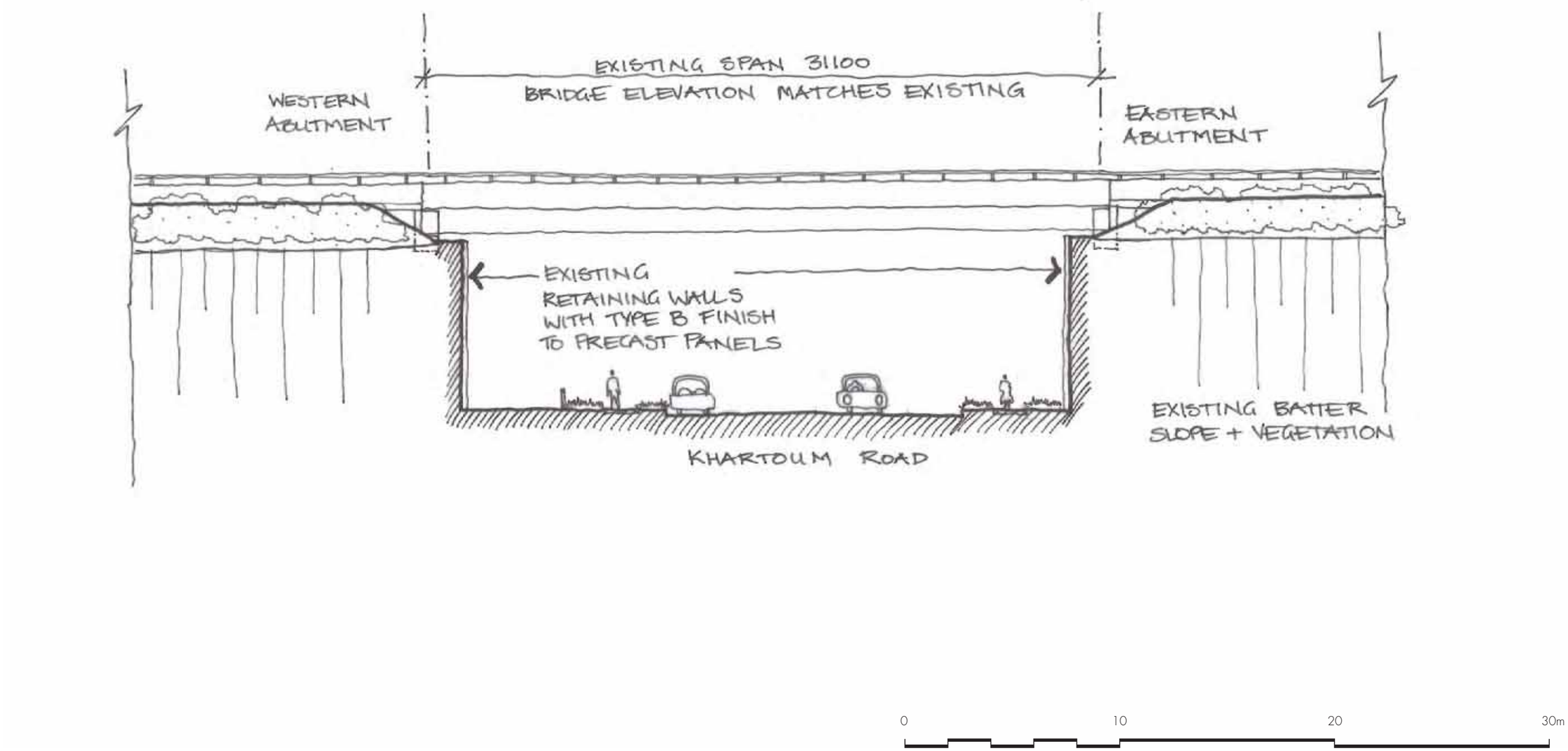

Figure 6.2.23 Bridge 6.1 Khartoum Road Bridge - Elevation

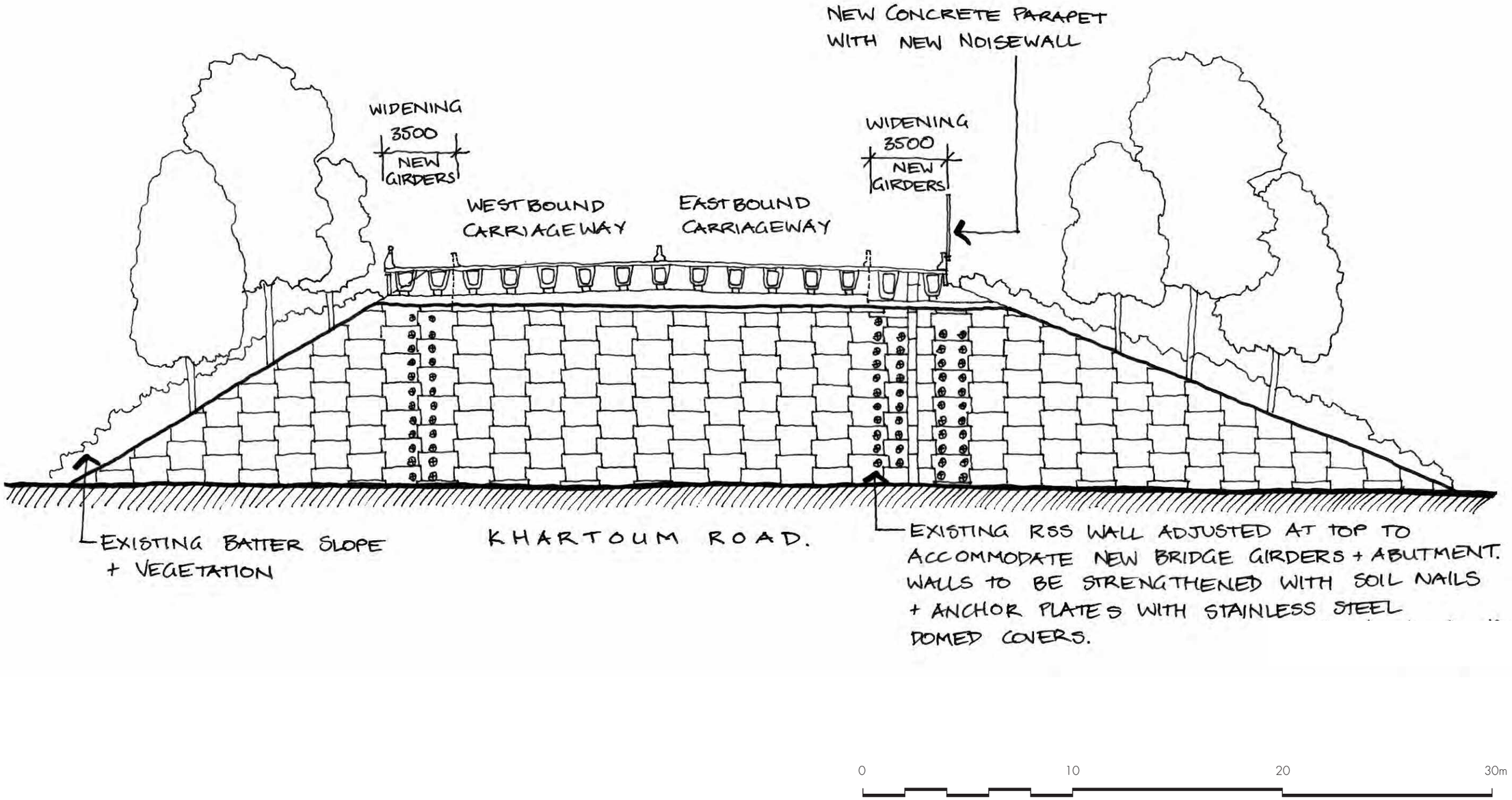

Figure 6.2.24 Bridge 6.1 Khartoum Road Bridge - Cross Section

6.2.2 Retaining Walls

Introduction

The existing retaining walls lack a consistent appearance along the length of the existing M2 Motorway. In many locations where ground stabilisation was required, rock anchors and shotcrete were used. A mix of cast in-situ concrete walls and shotcrete surfaces face the motorway, while walls facing away from the corridor range from patterned precast concrete panels to stacked sandstone boulders with no real distinction made between bushland and urban areas. The end result is one in which the walls, particularly those facing the motorway, are unattractive and visually dominating.

As part of the upgrade works, the widening of the corridor results in further cuttings, new or extended walls facing the motorway and new or extended walls facing outside the corridor, towards the bushland or residential neighbourhoods.

The urban design retaining wall strategy has assumed that apart from the existing walls that will remain unchanged in both form and colour, all other situations will result in the construction of new retaining walls. The strategy therefore has an emphasis on both sensitivity towards the existing retaining walls, and also a strong focus on high quality urban design for the new walls.

The new walls are one of the most visible and continuous built form elements along the route and provide one of the few opportunities to create a recognisable identity for the M2 Motorway. With form and alignment playing a major role, a secondary layer of information in the form of patterning and finish on the new retaining walls will create some linear identity for the motorway.

Design Objectives

The following design objectives for retaining walls are drawn from a number of sources, including the RTA publication "Beyond the Pavement" (2009). The primary aim in the design of retaining walls is, of course, to retain earth. The objectives are:

- To ensure that the design of retaining walls meets all applicable structural requirements;
- To ensure that visual impacts on the motorway's neighbours are minimised as far as reasonably possible;
- In general, make walls as visually unobtrusive as possible to minimise the effect of cutting off the motorway from its relationship to the topography;
- Relate walls to their context;
- Design walls to be aesthetically pleasing for both road users and road neighbours; and
- Design walls to be robust, durable and low maintenance so that they maintain an acceptable standard of appearance over time.

Design Principles

The urban design principles applied to the design of all retaining walls, renovated or new, are to:

- Visually integrate retaining wall finishes and detailing with the landscape design proposals and the immediate route context;
- Provide detailing and finishes which are consistent and integrated both for the retaining walls themselves and for the project's noise walls, to create overall compatibility in wall language;
- Within this overall language, craft the design of individual walls or classes of walls to respond to their immediate context and specific role in the project;
- Where appropriate, use landscaping to reduce their visual impact and perceived mass;
- Extend walls the full length to avoid messy terminations; and
- Walls are to disappear into a batter, mound or ground level.

Proposed Design

See alignment plans in Section 6.1 for retaining wall locations and Table 6.2.2 Retaining Wall Locations for a list of all new retaining walls.

The proposed retaining wall designs generally comply with the requirements of the Project Scope of Works and Technical Criteria. In addition, the designs also reflect careful consideration of the RTA publication "Beyond the Pavement" (1999). The proposed designs are consistent with the overall urban and landscape design vision established for the project.

Because of the variable topography of the motorway alignment, there are a significant number of retaining walls in this project. The longest wall stretches for approximately 455 metres and some are over 10 metres high. With the intention of minimising their perceived impacts, the proposed design seeks not to treat them all the same, but to differentiate them on the basis of their location, orientation, role and consistency with existing M2 Motorway walls.

Clear distinctions are made between:

- Walls which adjoin and are highly visible from the motorway; and
- Walls which are seen from bush reserves, residential areas and local roads (but essentially not from the Motorway)

As described below, separate but related designs are proposed for each of these types of walls. The accompanying table identifies and provides details about all of the retaining walls in the project.

Structural Wall Types

A number of structural solutions for retaining walls have been developed for the project. While in some cases the structural type may not be apparent to an observer of a finished wall, knowledge of these types is essential to understanding the finished outcome:

- In-situ concrete wall;
- Reinforced soil wall (structural pre-cast concrete panels); and
- Soil nail wall with precast concrete panel cladding.