

08 DESIGN OPTIMISATION OF THE PREFERRED OPTION

A Value Management Study (VMS) was undertaken to review, assess and identify issues relating to the preferred Option C (Refined). A key concern raised from the VMS workshop was overall costs of the preferred alignment relative to the allocated project funds.

As a result, a series of design reviews were undertaken to reduce the construction costs of the project and optimise the design. Key refinements include:

ALIGNMENT REFINEMENT

By shifting the alignment slightly to the east, turning movements at the roundabout at the Oxley Highway would be improved for vehicles turning west from the bridge.

The revised design would provide a better alignment by retaining continuity of the arc and would assist in settling the overall structure better within the overall floodplain setting.

The revised alignment would reduce the impact on existing vegetation, ensuring a higher quality buffer zone between the structure and the historic mill.

The roundabout at the Oxley Highway would be reduced in scale, reducing its footprint and hence impacts to the floodplain. This will allow the natural setting to be more dominant and assist in receding the road elements somewhat.



Comparison between Option C (Refined) (in blue) and the Optimised Option C (Refined) (in red).

CYCLEWAY FACILITIES

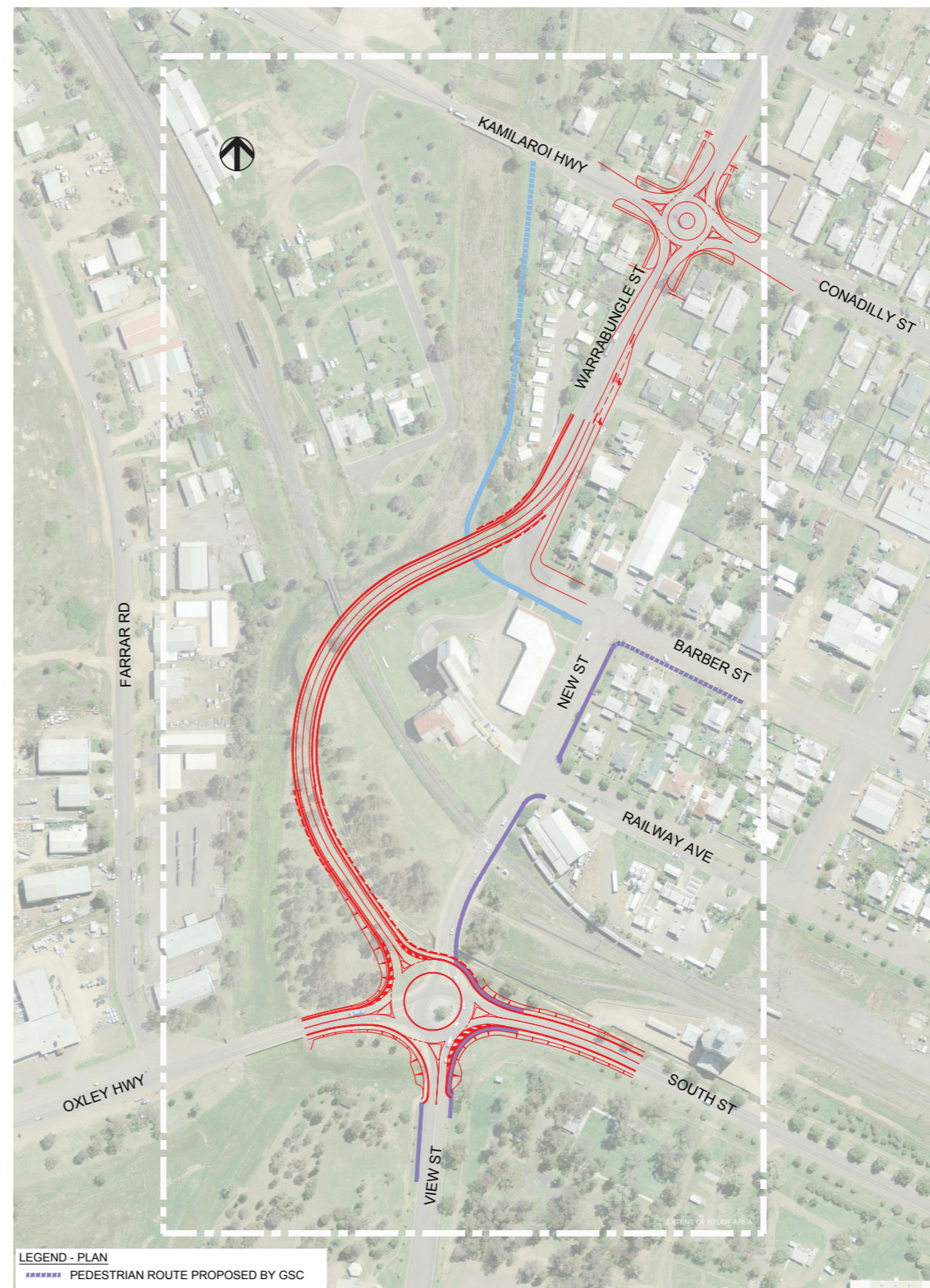
In addition to the shared user path along the viaduct, the proposed design incorporates cycleway facilities along New Street with an at grade crossing across the railway line. This configuration retains convenient access into Barber Street, linking into the town centre and is consistent with Gunnedah Shire Council's current cycleway strategy.

To the west of New Street and along Barber Street, the cycleway would run below the viaduct structure and link with the Kamilaroi Highway as a stand alone facility running along the eastern edge of the floodplain. This alignment would be consistent with the Gunnedah Shire cycleway strategy.

KAMILARCAY ROUNDABOUT

The intersection of Warrabungle Street and the Kamilaroi Highway would be modified by introducing a roundabout. The main function of this feature is to allow 'U' turn movements for traffic wanting to access Barber Street and coming from the Oxley Highway/View Street.

The roundabout also provides ease of turning movement for vehicles turning right into the Kamilaroi Highway / Warrabungle Street. The roundabout would also mark this significant intersection between the two highways, enhancing road legibility and way finding.



Plan illustrating the proposed pedestrian and cycleway routes.

09 COMMUNITY FEEDBACK

The preferred optimised option has been presented to the community and key stakeholders for comment. As a result of this process, a number of changes have been adopted in the design. These include:

- Complete closure of New Street across the railway line
- Introduction of an intersection of the proposal with Barber Street
- Partial increase in the width of the bridge structure to accommodate right turn movements from the bridge into Barber Street
- Reconfiguration of the bridge piers
- Realignment of the intersection of Barber Street and Warrabungle Street to integrate the proposed works.

The feedback provided by the community and stakeholders has been carefully considered by the project team which combined with further investigations informed the refinement of the Preferred Option.

For further information on the community and stakeholder consultation and feedback, refer to the Preferred Option Report



Kevin Anderson, MP, Mayor Owen Hasler and Gunnedah Shire Council General Manager Eric Groth. Photos provided by KBR.



Roads and Maritime project team talking to AgQuip attendees about recommended option. Photos provided by KBR.

10 CONCEPT DESIGN

DESIGN REFINEMENT

The closure of New Street was identified as a key issue for the project to meet its objective of improving traffic efficiency and safety. This resulted in compromising urban connectivity from the south into the Barber Street business precinct and raised concerns from local traders and the Shire Council as discussed in the Preferred Option Report.

The refined design responds to these issues by introducing an intersection at Barber Street and Warrabungle Street and allowing a right turn for northbound traffic into Barber Street.

In order to achieve this, slight modifications to the alignment have been adopted and the acquisition of two properties would be required to accommodate the intersection.

ALIGNMENT

Only minor modifications have occurred to the overall alignment since the Optimised Option C was identified except for the intersection arrangement of Barber Street and Warrabungle Street. In this area, the overall alignment has slightly shifted to the west.

With the closure of New Street, pedestrians and cyclist will have to use the bridge, providing for a safe crossing. Alternatively, they could use Marquis Street further to the east.



GUNNEDAH - SECOND BRIDGE OVER RAIL



LEGEND

Landscape Elements

- Existing trees
- Batters as shown

Street tree planting

- Eucalypts
- Tulipwood tree - *Harpullia pendula*
- Silky Oak - *Grevillea robusta*
- Date palm

Mass Planting Beds

- Poplar Box Grassy Woodland
- Yellow Box - Blakely's Red Gum Grassy Woodland / Riparian
- High shrubs
- Native grasses & tussocks
- Native grasses & low shrubs
- Accent groundcovers & tussocks

Water Sensitive Design

- Rock mulch swale with boulders
- Wetland filters

Pavements

- Pedestrian path
- Shared path

- Key view corridors maintained

LANDSCAPE DESIGN

Design Elements

Key design elements that fit the project's Urban design objectives include:

Retain buffers and vistas

Retention of the key contextual views, as identified in the heritage report and also in this report -to the historic Mill and its setting, from Pensioners Hill and from South Street/Oxley Highway junction, in particular. Creation of suitably scaled buffers and spaces around the historic flour Mill, and careful tree placement will achieve this principle.

Gateways for Gunnedah

Re-creation of a strong landscaped gateway into Gunnedah from the Oxley Highway, with relocated date palm, and supplementary ones, with subtly mounded roundabout planted with accent ground covers.

It is anticipated that the northern gateway on Kamilaroi Highway/Conadilly St, which is beyond this brief scope, should be of a similar character.

Reinforce indigenous vegetation associations

Reinforcing the indigenous woodland, with Koala friendly trees from the Poplar Box Grassy Woodland association, beside the bridge structure, adjacent the floodplain. This planting will effectively mitigate any visual impact, as well as increasing biodiversity values for the site.

Visual screening

Provision of effective visual screening for residents and adjoining land uses to the west of the floodplain, to mitigate views of the new bridge.

Streetscape enhancements

Streetscape enhancements including *Eucalypts* to Warrabungle Street north, *Grevillea robusta* closer to the Mill to reinforce existing species, and planting of *Harpulla pendula* (Tulipwood) to the immediate north and east of the Mill, to strengthen existing plantings.

Strengthen fauna habitat

Indigenous shrubs and native grasses and sedges are proposed to bring more understory plantings into the floodplain to promote a healthier landscape for birds, koala, insects etc.

Integrate varying batters

In final design, options to create varying, gentler batter slopes within the floodplain area will be investigated, to further settle the structure into the landscape.

Low maintenance landscape

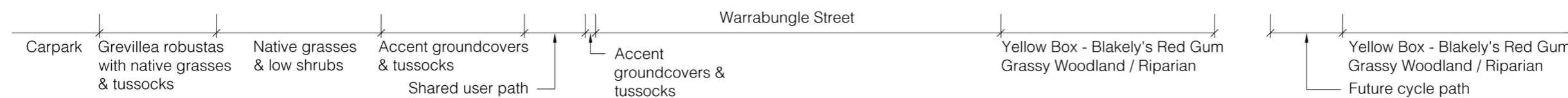
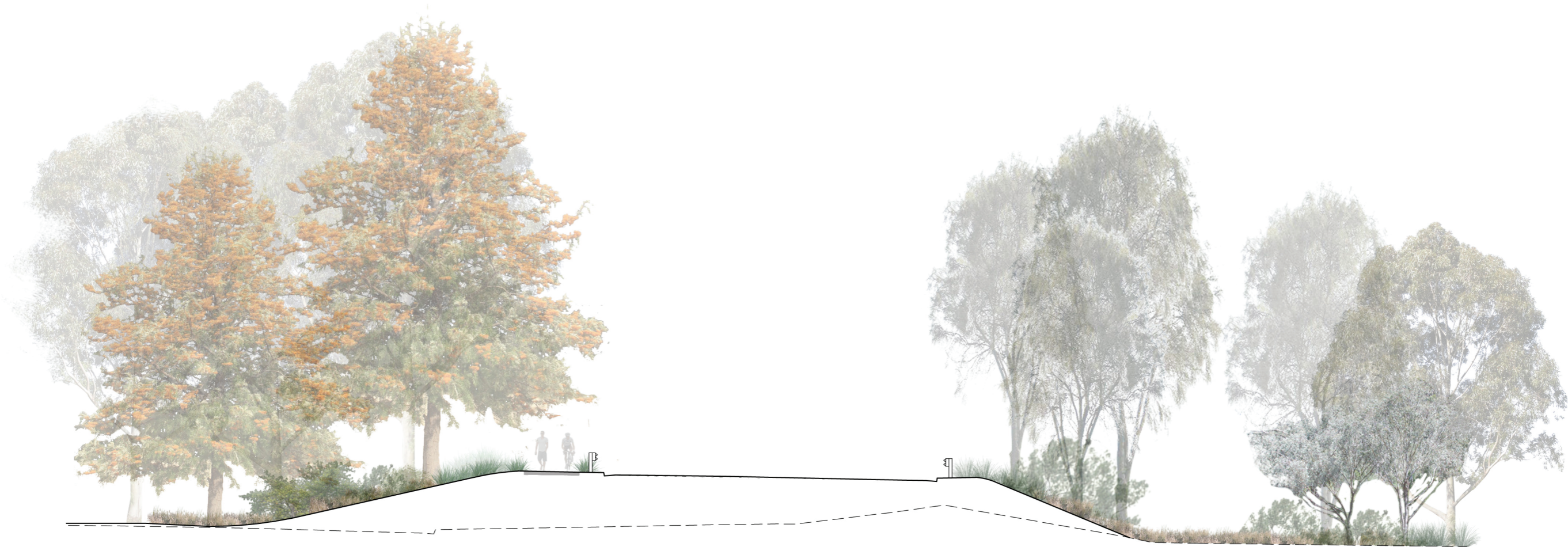
Slashing strategies of exotic grasses versus slashing native grasses within the floodplain needs further discussion at the detail design stage to investigate lower maintenance solution that would also support more fauna/insect habitat.

As the floodplain is wide, and of low velocity, there is scope to increase structural vegetation diversity to trees, shrubs and grass understorey; and to further reinforce the riparian and Yellow Box and Blakelyi Red Gum plantings within the floodplain, with strong clumps of planting as opposed to linear plantings.

GUNNEDAH - SECOND BRIDGE OVER RAIL



Section at Ch 460



Section at Ch 2200

PLANTING STRATEGY

Strengthen biodiversity

The revegetation policy reinforces the indigenous species that were originally present on the site, in a modified landscape. There are two key woodland groups that dominated the area- the Poplar Box Grassy Woodland and the Yellow Box-Blakely's Red Gum grassy woodland.

Informal groups, allow for views

Planting design in areas adjacent the bridge/viaduct has adopted an informal arrangement of groups that respond to adjacent topography and the new swale. The result is an informal landscape that mitigates the structure, allows the open space to flow under the bridge and retains open spaces where critical views across to the Mill exist.

Respect floodplain hydraulics

Given the location of the bridge that runs alongside or within the low velocity flow floodplain, the density of trees is in moderation and will be reviewed at the detailed design stage.

Poplar Box Grassy Woodland

Trees



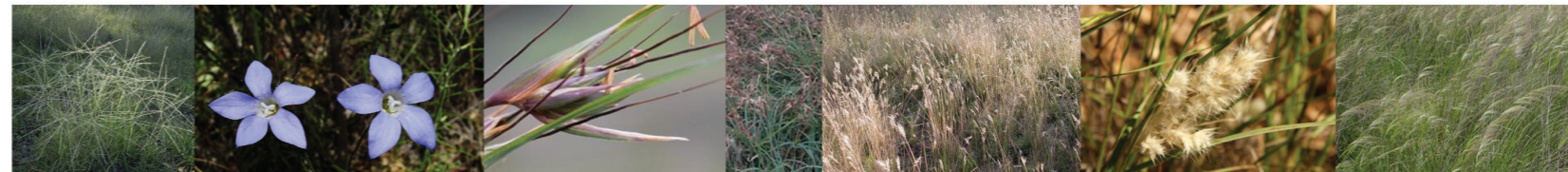
Eucalyptus populneus subsp. *bimbil* *Eucalyptus microcarpa* *Eucalyptus melliodora* *Eucalyptus albens* *Angophora floribunda*

Mid Storey



Geijera parviflora *Alectryon oleifolius* *Capparis mitchellii* *Myoporum montanum*

Native Grasses & Groundcovers



Chloris truncata *Wahlenbergia stricta* *Themeda australis* *Austrodanthonia caespitosa* *Austrodanthonia bipartita* *Austrostipa verticillata*

Yellow Box - Blakely's Red Gum Grassy Woodland

Trees & Shrubs



Eucalyptus melliodora *Eucalyptus blakelyi* *Eucalyptus albens* *Angophora floribunda* *Notelaea microcarpa* var. *microcarpa*

Native Grasses & Groundcovers



Carex inversa *Bothriochloa macra* *Lomandra longifolia* *Dianella revoluta* *Microlaena stipoides*

Plant associations

The essence of the vegetation associations that would be reinforced with the proposed design are illustrated in the adjacent coloured strips, and summarised below.

Poplar Box grassy woodland

This species association is suitable for areas beyond the floodplain or on higher reaches of the floodplain.

Dominant trees

Poplar Box (*Eucalyptus populnea* subsp. *bimbi*)
Yellow Box (*Eucalyptus melliodora*)
Inland Grey Box (*Eucalyptus microcarpa*)
White Box (*Eucalyptus albens*)
Inland Grey Box (*Eucalyptus microcarpa*)
Rough-barked Apple (*Angophora floribunda*)

Mid storey

Wilga (*Geijera parviflora*)
Western Rosewood (*Alectryon oleifolius* subsp. *canescens*)
Wild Orange (*Capparis mitchellii*)
Native Olive (*Notelaea microcarpa* var. *microcarpa*)
Black Roly Poly (*Sclerolaena muricata*)
Western Boobialla (*Myoporum montanum*)
Poison Pimelea (*Pimelea neo-anglica*)
Small-leaf Bluebush (*Maireana microphylla*)

Groundcovers and grasses:

Plains Grass (*Austrostipa aristiglumis*)
Redleg Grass (*Bothriochloa decipiens*)
Slender Bamboo Grass (*Austrostipa verticillata*)
Purple Wiregrass (*Aristida ramosa*)
Queensland Bluegrass (*Dichanthium sericeum* subsp. *sericeum*)
Wallaby Grass (*Austrodanthonia bipartita*)
Windmill Grass (*Chloris truncata*)
Austrodanthonia caespitosa
Kangaroo Grass (*Themeda australis*)
Tall Bluebell (*Wahlenbergia stricta* subsp. *stricta*)

Yellow Box-Blakely's Red Gum grassy woodland

This species association is suitable for the floodplain, along with plantings of *Casuarina cunninghamiana* to supplement existing species.

Dominant tree species:

Yellow Box (*Eucalyptus melliodora*)
Blakely's Red Gum (*Eucalyptus blakelyi*)
White Box (*Eucalyptus albens*)
Inland Grey Box (*Eucalyptus microcarpa*)
Rough-barked Apple (*Angophora floribunda*)
River Oak (*Casuarina cunninghamiana*)

Mid storey spp:

Native Olive (*Notelaea microcarpa* var. *microcarpa*)

Groundcover and grasses:

Purple Wiregrass (*Aristida ramosa*)
Lobed Wallaby-grass (*Austrodanthonia auriculata*)
Redleg Grass (*Bothriochloa macra*)
Speargrass (*Austrostipa scabra* subsp. *scabra*)
Weeping Grass (*Microlaena stipoides* var. *stipoides*)
Blue Flax-Lily (*Dianella revoluta*)
Spiny-headed Mat-rush (*Lomandra longifolia*)
Slender Bamboo Grass (*Austrostipa verticillata*)
Knob Sedge (*Carex inversa*)

Street tree planting

Street tree enhancements are proposed along the following streets to improve local amenity and assist in mitigating the works:

Warrabungle Street & southern intersection of the new road and Barber Street (north of the Mill)

Yellow Box (*Eucalyptus melliodora*)
Rough-barked Apple (*Angophora floribunda*)
White Box (*Eucalyptus albens*)

Barber Street

Silky Oak (*Grevillea robusta*) - to complement existing trees on northern verge.
Tulipwood Tree (*Harpullia pendula*) to perimeter of building north of the Mill- to reinforce existing plantings.

South Street/Oxley Highway intersection

The new, larger roundabout is slightly mounded and planted with Date Palms (*Phoenix dactylifera*) -one transplanted- to reinforce the existing accent created by the single Date Palm in the existing small roundabout. at this location. Date Palms are characteristic to Gunnedah, especially in the adjacent Railway Street.

Street Tree Planting



Harpullia pendula
'Tulipwood Tree'



Phoenix dactylifera
'Date Palm'

Water sensitive design

We have adopted an integrated approach to water sensitive design that complies with best practice and promotes soft engineered approaches.

Water sensitive design elements have been applied to the drainage line extended from the existing concrete canal, just north of the new roundabout on the Oxley Highway. Main elements to be further assessed and developed in the detail design include:

- An energy dissipater using rock boulders set into concrete adjacent the new culvert.
- A rock mulched swale with wetland plants interplanted.
- Wetland filter areas to assist in cleaning the rainwater alongside the rock mulch swale to the northern area where it passes under the bridge; and prior to discharging into the floodplain.



THE BRIDGE

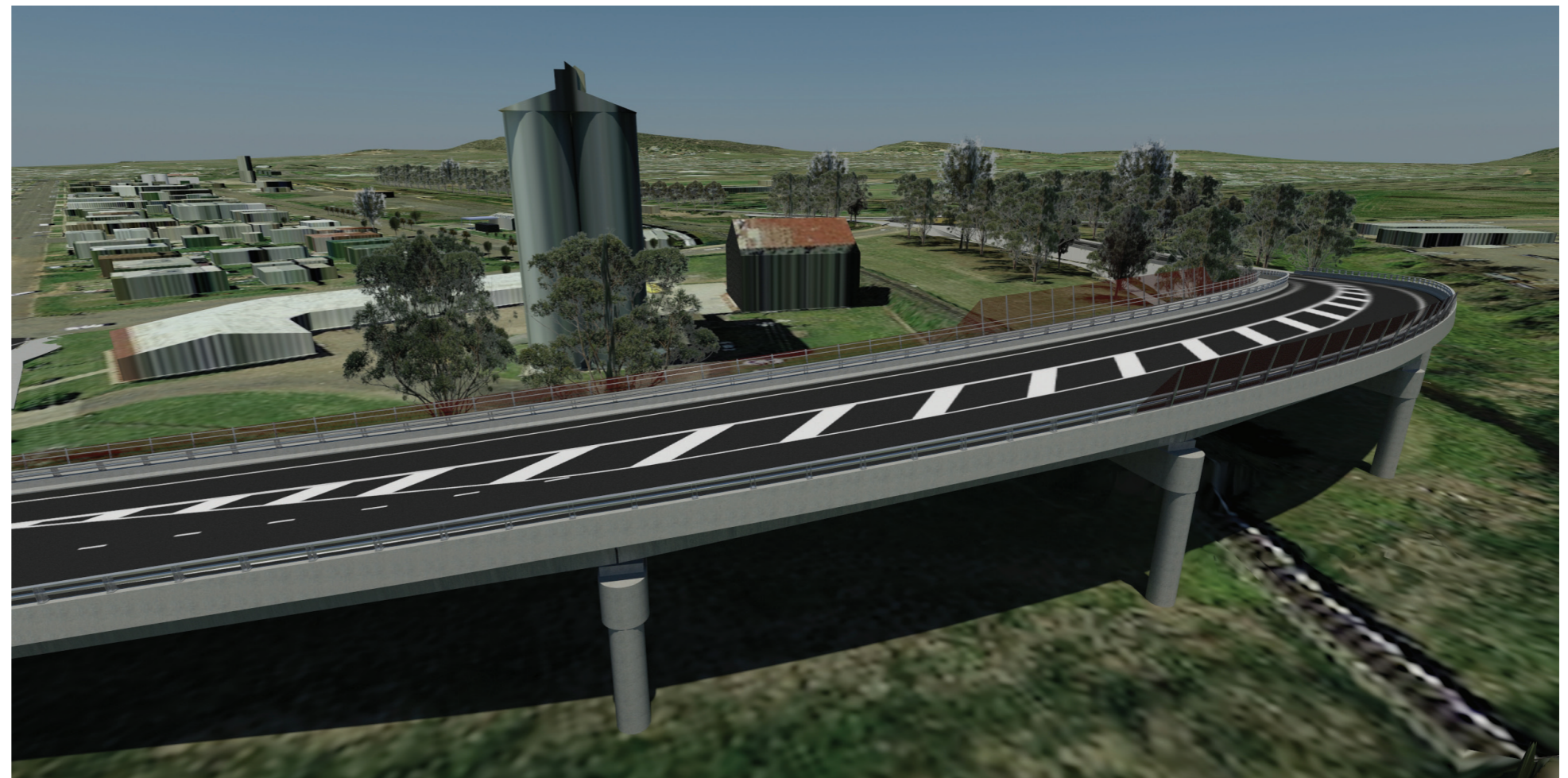
The refined bridge design minimises the use of abutment retaining walls to minimise built form elements within the floodplain, thereby reducing visual and landscape character impacts. The bridge would be composed of seven spans, with most spans ranging from 28 to 30 metres except for one, in order to minimise impacts to existing utilities.

The superstructure is envisaged as precast Super T girders, providing a cost effective and easy to maintain solution.

A key constraint of the bridge design is the required clearance both horizontally and vertically over the existing railway line. In order to minimise gradients along the structure, spans have been limited to just below 30 metres to enable a shallower superstructure of 1 metre in depth. This situation constrained the location of piers and required pier 3 to be rotated in line with the railway corridor to accommodate the required horizontal clearances.

The pier design is based on a portal type frame conceived as two circular piers and a headstock. The portal frame caters for the various widths of the structure and the headstock termination is also rounded to create an integral composition. Both elements have rounded ends to visually soften the structure, whilst better integrating skew situations, such as south of the railway corridor and minimising afflux during flooding situations.

It is recommended to further review the pier's shape in detail design to consider an oval profile in plan to better integrate headstock with pier.



Indicative abstract model image

GUNNEDAH - SECOND BRIDGE OVER RAIL

The parapet height along the roadway has been minimised by the introduction of a traffic rail barrier system, that allows views towards the floodplain, thereby reducing the apparent bulk of the structure. This approach also reinforces the horizontality of the structure and retains an elegant proportion between superstructure and parapet depth. To further minimise the parapet depth, drainage pipes have been concealed between the girders.

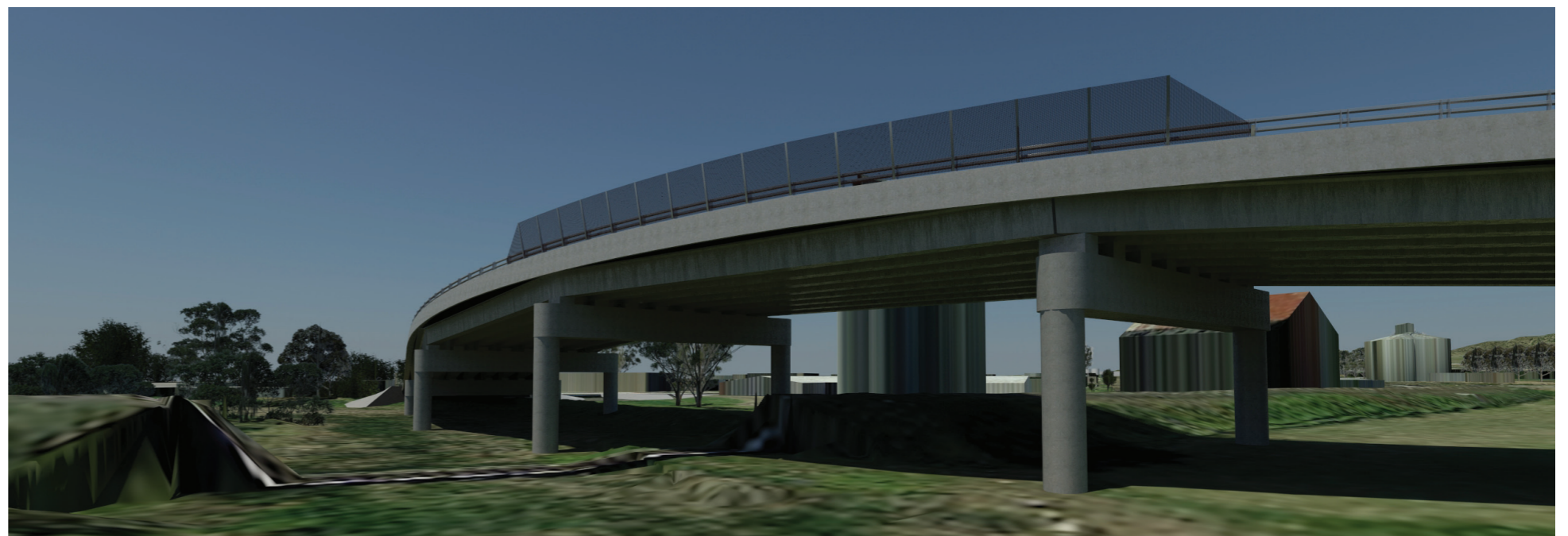
It is recommended to review the use of a double rail barrier during detail design stage to ensure lighting glare from vehicles does not impact residences further afield. Should this be the case, a full height barrier should be adopted.

The parapet along the shared path would be a pedestrian railing to visually minimise the bulk of the structure and provide a more open character. This is achieved by introducing a double rail barrier between the shared path and roadway, that will protect pedestrians and cyclists from vehicular traffic.

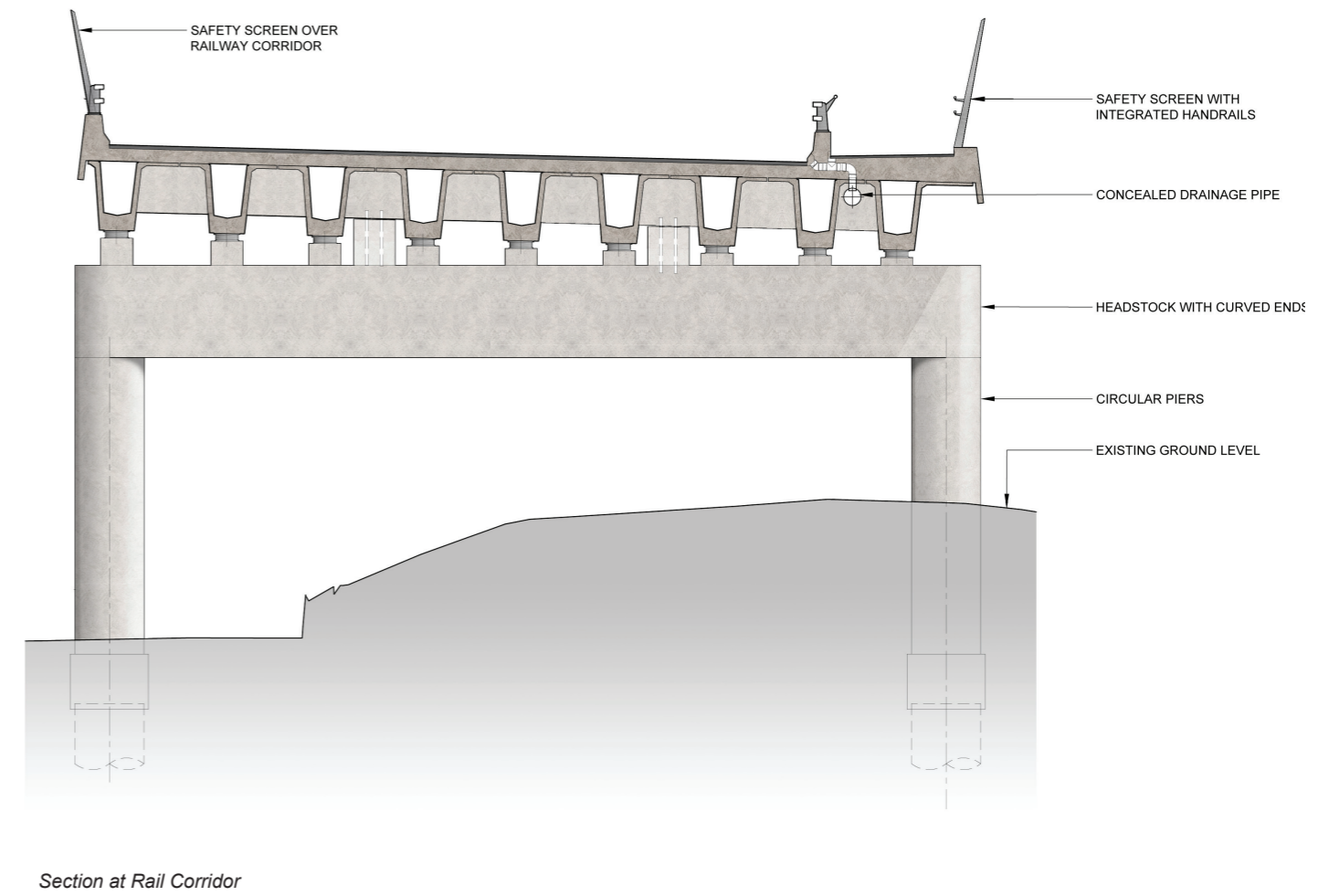
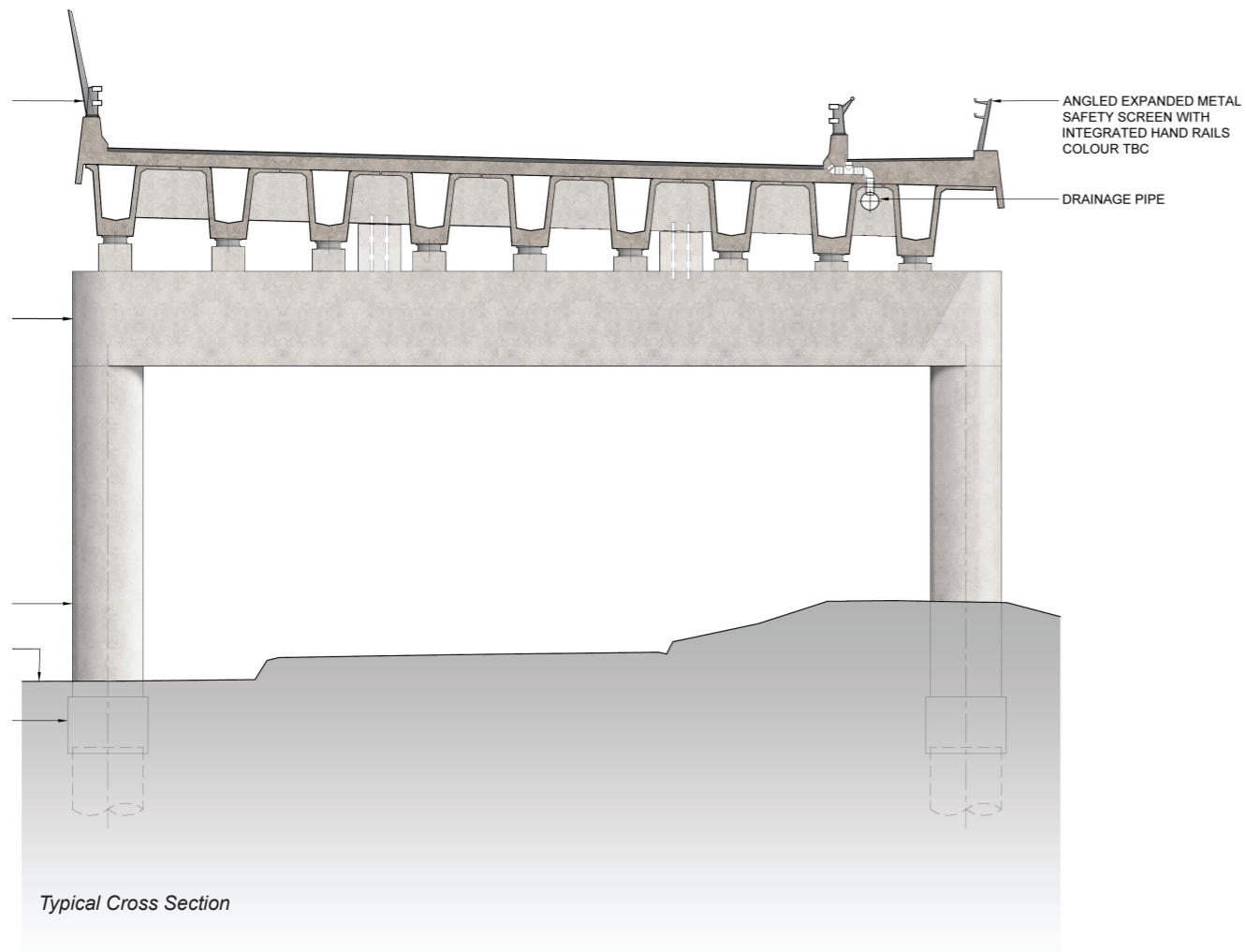
The pedestrian balustrade is designed as a tilted element with steel post and expanded mesh panels. The expanded mesh panel is proposed in a burnt red colour that echoes the brick work of the mill and introduces some colour to the structure. The use of an expanded metal screen for the balustrades would also reduce potential night time glare from vehicles crossing the bridge.

A safety screen would be introduced over the railway corridor and extend symmetrically over the bridge's span. The screen would be tilted outwards in the same way as the balustrade to visually integrate both elements into a singular composition.

Both balustrade and safety screens would be tilted by 10 degrees to create a more open character along the bridge whilst echoing the angular form language of the piers.



Indicative abstract model images



GUNNEDAH - SECOND BRIDGE OVER RAIL



Indicative photomontage





Indicative photomontage

