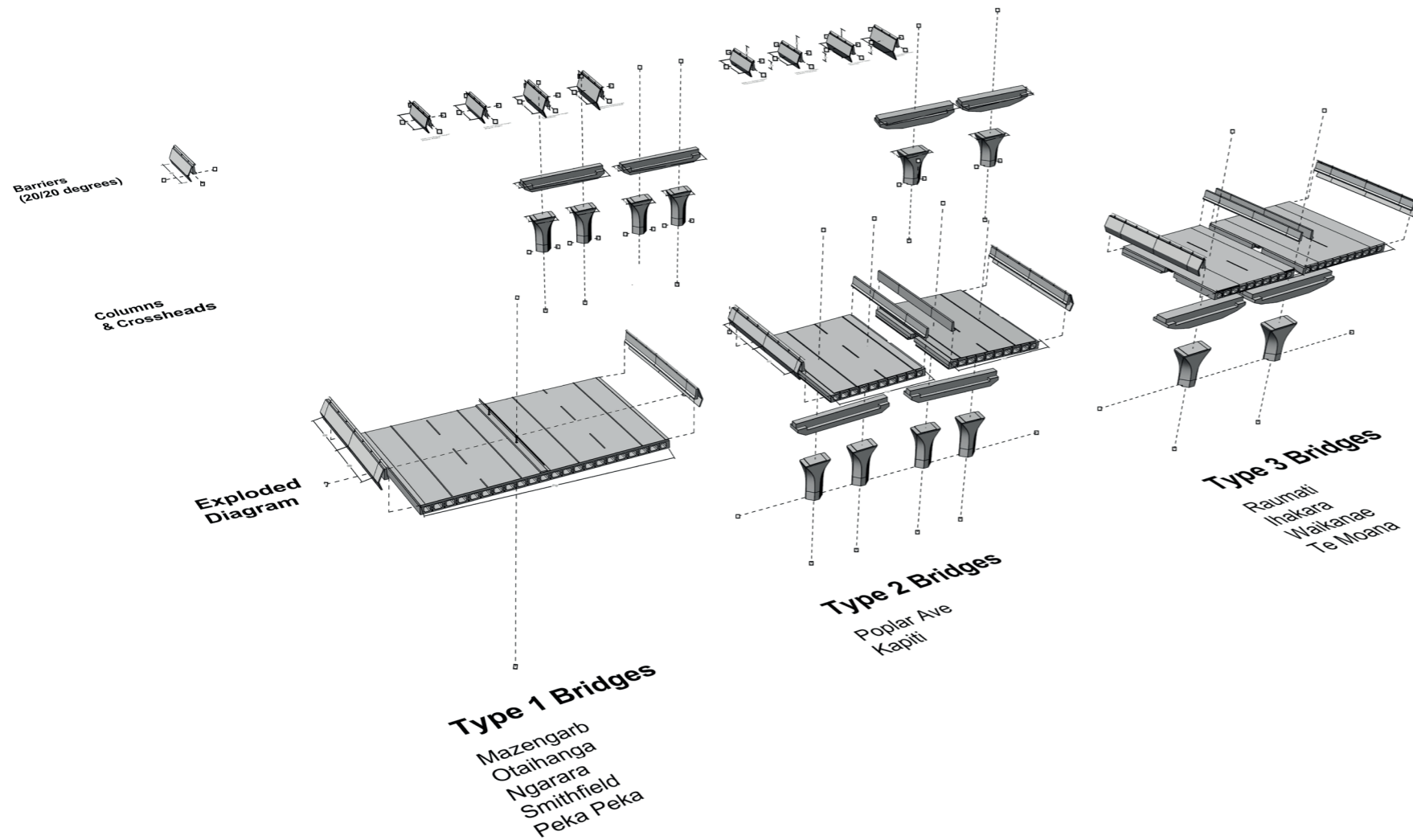


Appendix 3: BRIDGE SUMMARY- NGARARA BRIDGE  
Site Specific Management Plan 010 - [sectors 530-540-580]  
MacKays to Peka Peka Expressway

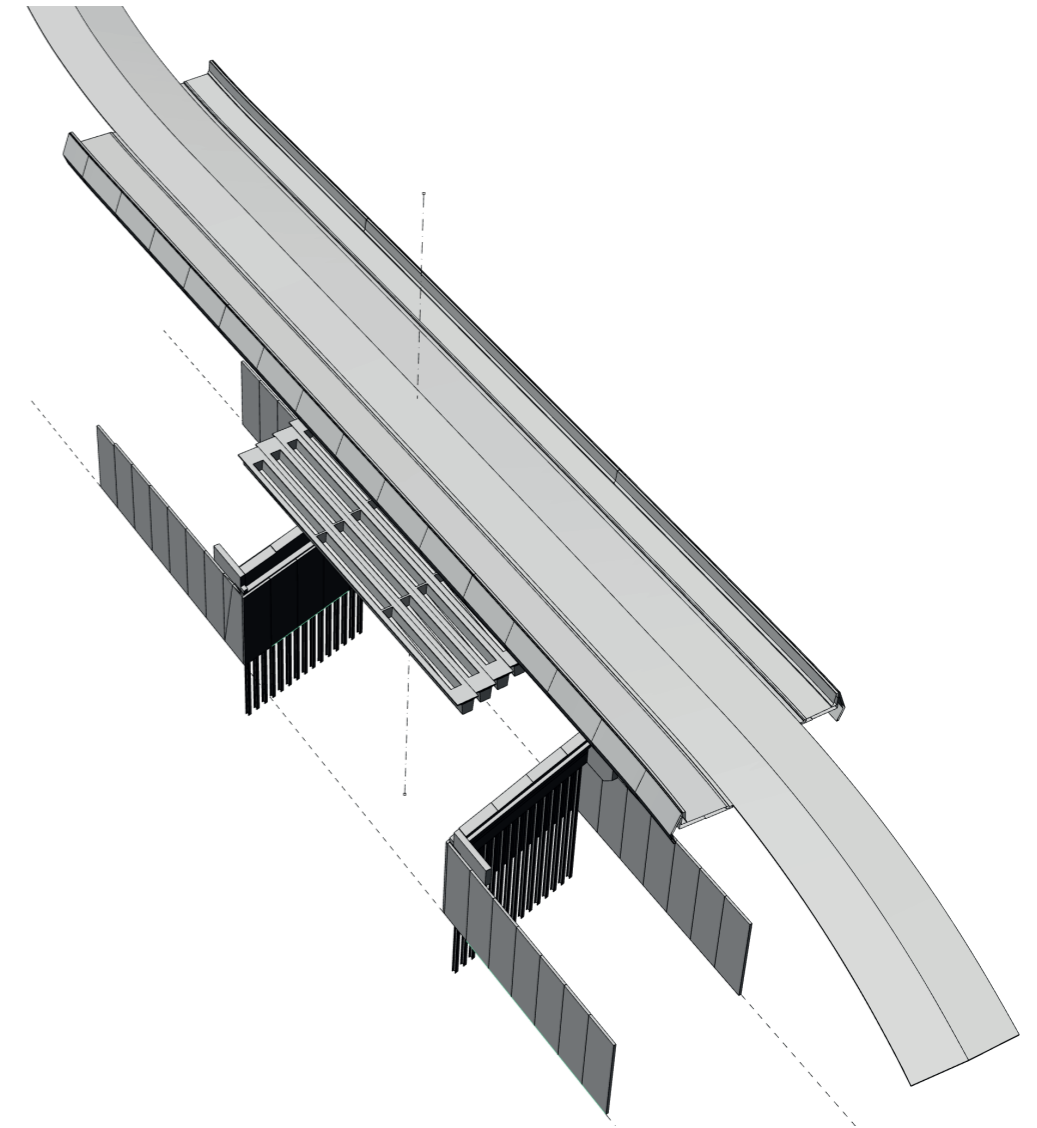
06 MARCH 2014 - REV D - FOR INFORMATION



## Bridges as a series of components



## Proposed Ngarara Rd bridge exploded isometric



## Design Objectives

With reference to the Urban and Landscape Design Framework (Technical Report 5) (ULDF) there are four design objectives for the bridges and their respective contexts. These four objectives are overarching aims for the project and have been extracted from the Design Concept statements in two sections of the ULDF: Local Road Interface Design (section 5.7) and Bridge Design (section 5.8).

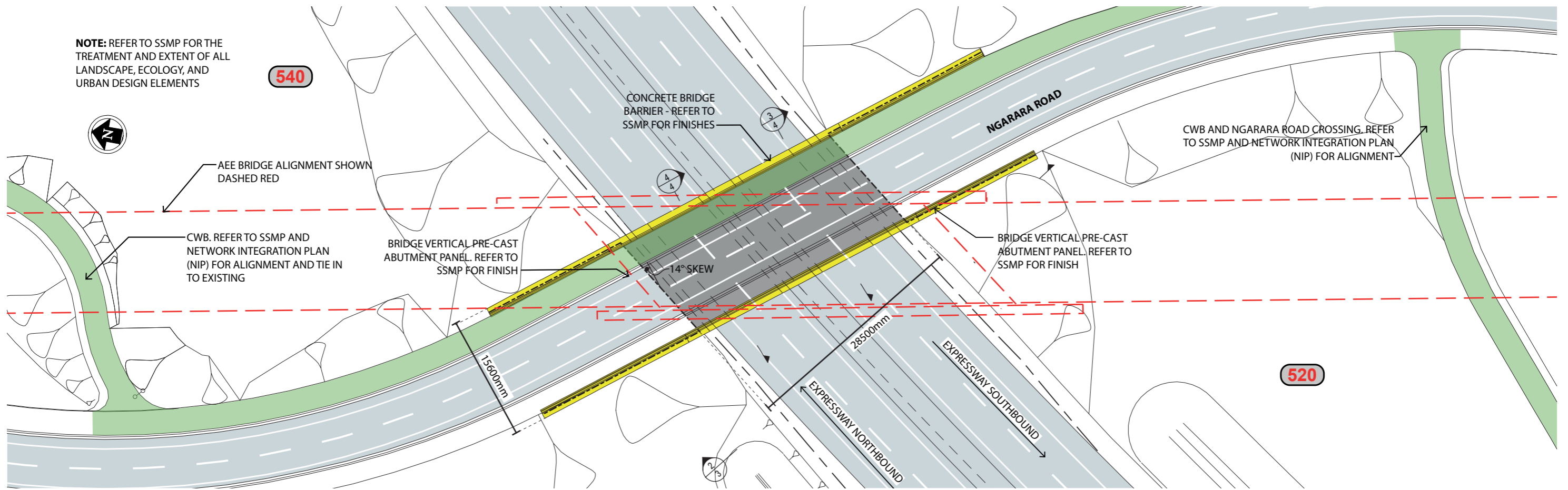
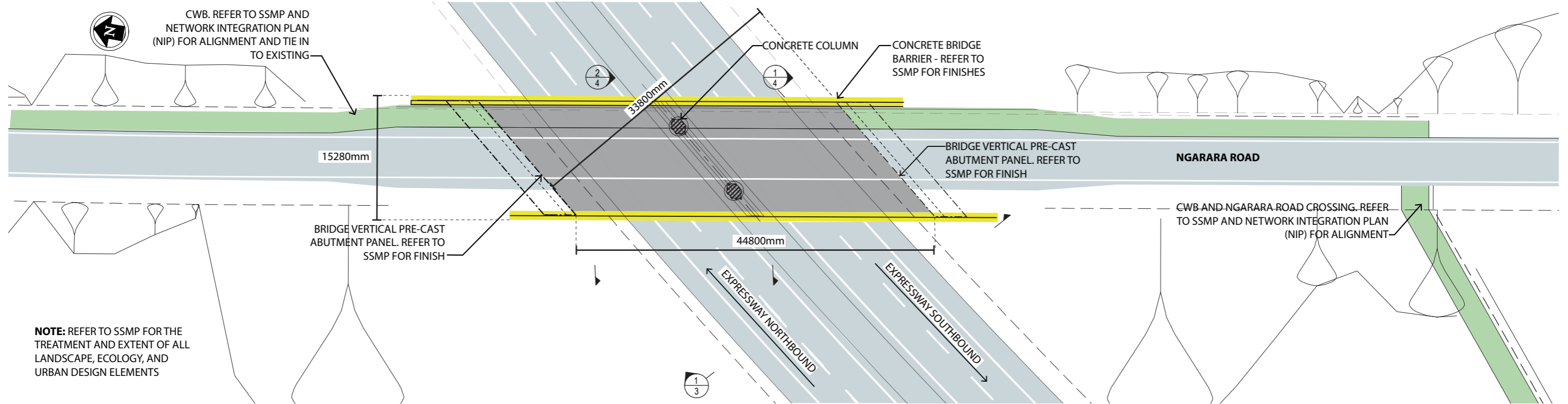
The purpose of extracting these objectives is to enable any changes to bridge structures and their context made through the concept and detailed design process to be considered at the highest level of the design intent. There are design principles in each of the sections as noted above and these too form a basis for considering the development of the designs for the bridges and their context.

As is typical in a design evaluation process, any aspects of design that do not align with the design principles would be elevated to consideration against the design objectives.

### Design Objectives:

1. The public spaces of the roads and streets take primacy over the experience of the Expressway users. Local people will be making slower movements and as a consequence the bridges will be more visually apparent to them than to people travelling along the Expressway.
2. As a new element in the landscape, the bridges respect the surrounding landscape and are expressed in terms of their horizontality, fluidity and simplicity because the landscape is relatively low key and low in scale; having several 'feature' bridges would become both visually complex and overwhelming in scale.
3. Bridges are formed as a whole from a single kit of parts, which allows the components to be repeated and a similar approach used at the multiple crossings to register as a 'family' of bridges because people will have multiple interactions day to day with the Expressway and this approach promotes simplicity and visual continuity.
4. Utilise concrete prefabricated parts because this allows fine levels of quality control, cost benefits and significant improvements in construction time at the crossings and reduces disturbance to the area.

### Approved to Proposed Graphic Comparison



#### Design development

1. Reduced overall length of the bridge, reduced number of spans from 2 to 1.
2. Reduced abutment skew angle from 47 to 11 degrees

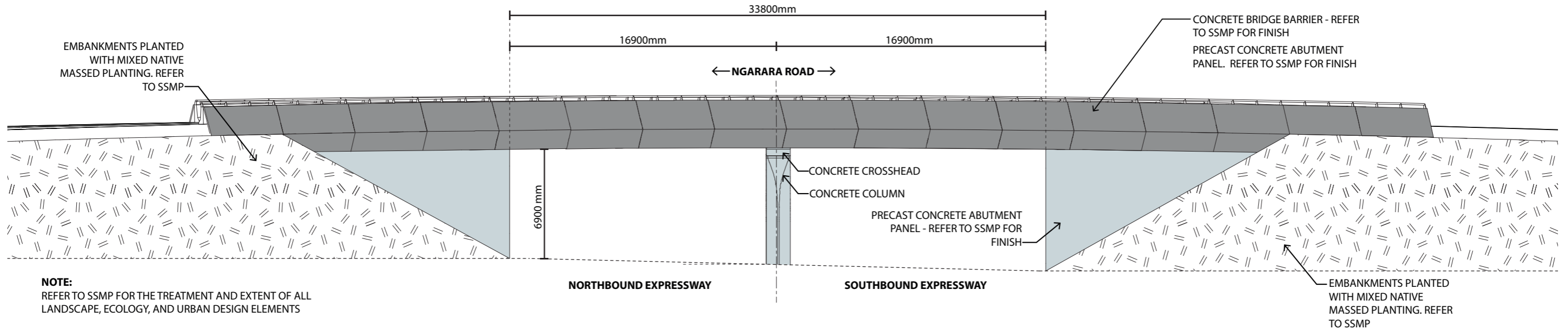
3. Columns removed
4. Local road realigned

#### Rationale

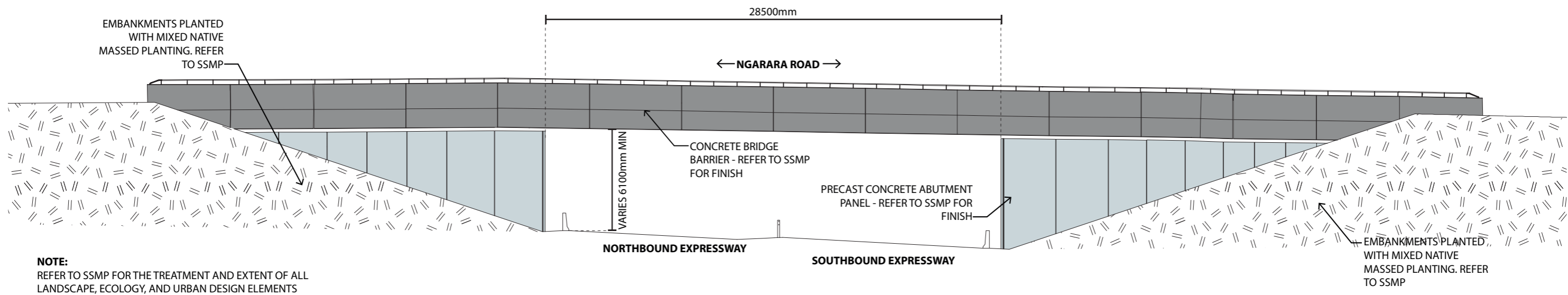
1. The realignment of the local road reduces the clear span of the bridge. New length suitable for single span bridge.
2. The realignment of the local road helps to reduce the skew of the bridge abutment panels

3. Columns are no longer required with the reduced bridge length.
4. Ngarara Road has been realigned to reduce the skew angle and span length of the bridge.

# Approved to Proposed Graphic Comparison



1. ELEVATION - APPROVED - NGARARA ROAD BRIDGE WEST ELEVATION - 1:250@A3



2. ELEVATION - PROPOSED - NGARARA ROAD BRIDGE WEST ELEVATION - 1:250@A3

## Design development

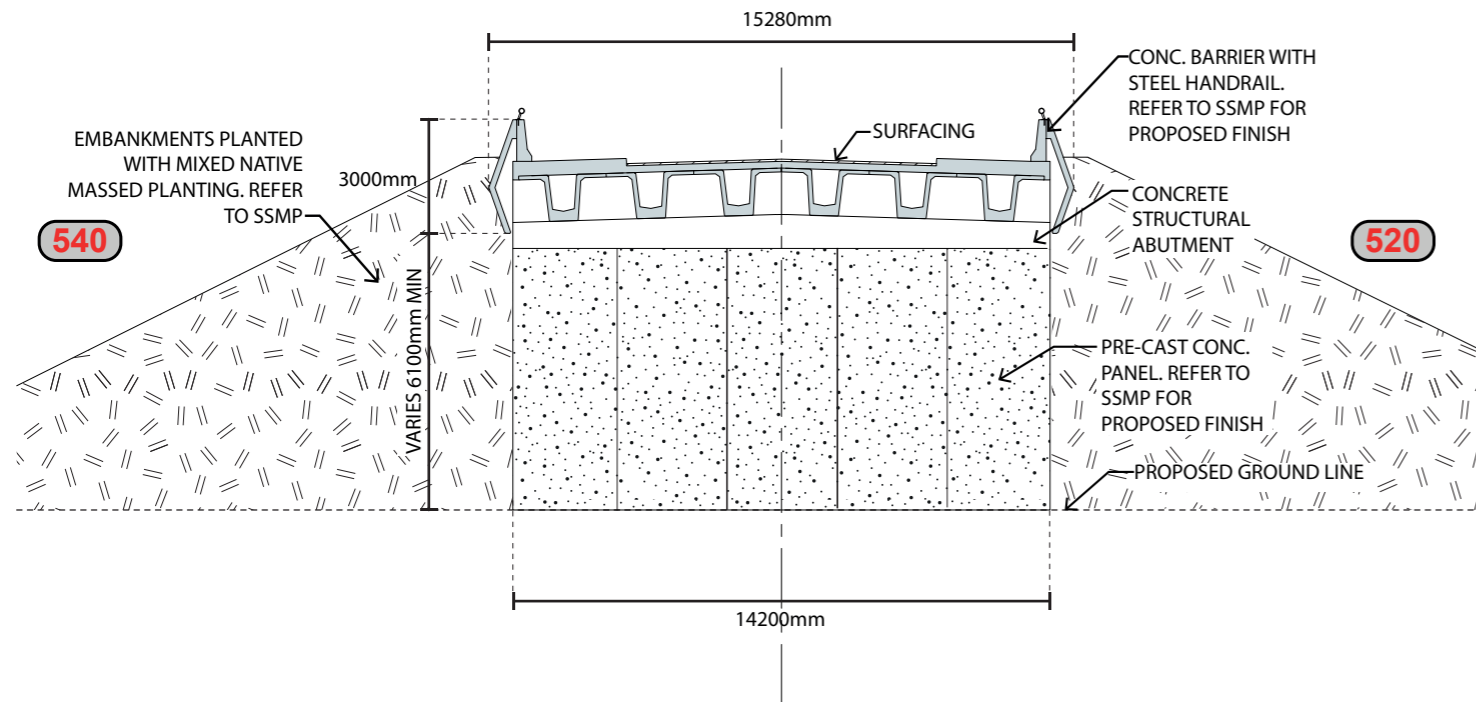
1. Reduced span length of the bridge, reduced number of spans from 2 to 1.
2. Columns removed

3. Reduced the size/height of the concrete bridge barrier/fascia panel.

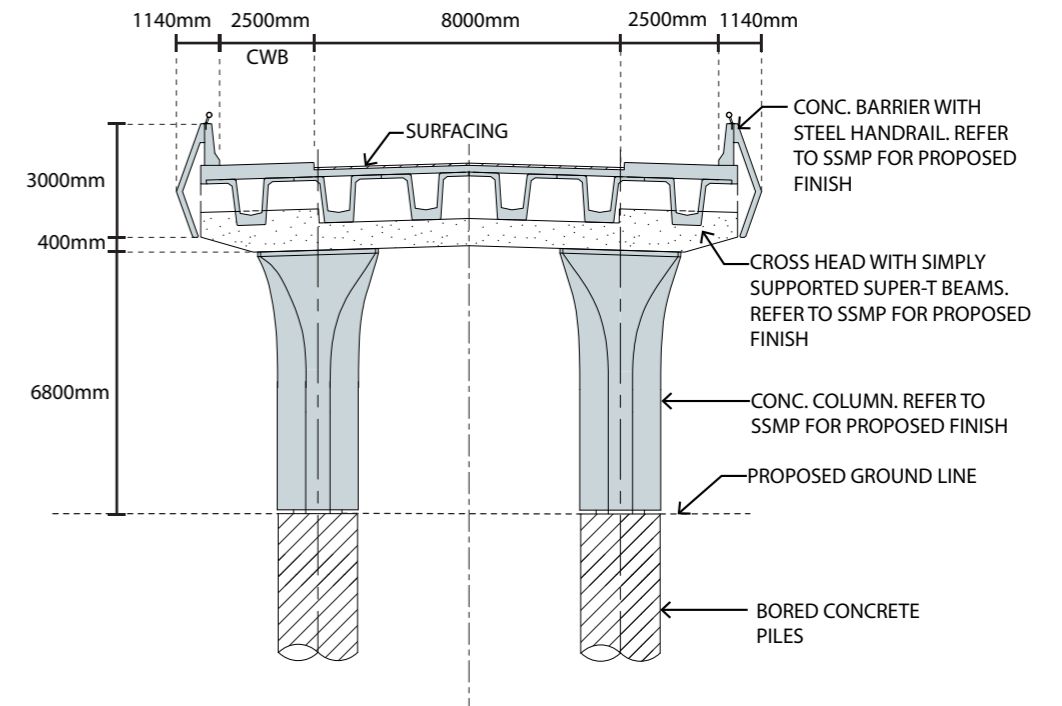
## Rationale

1. The realignment of the local road reduces the skew of the bridge and the required bridge span length.
2. Columns are no longer required with the reduced span length.

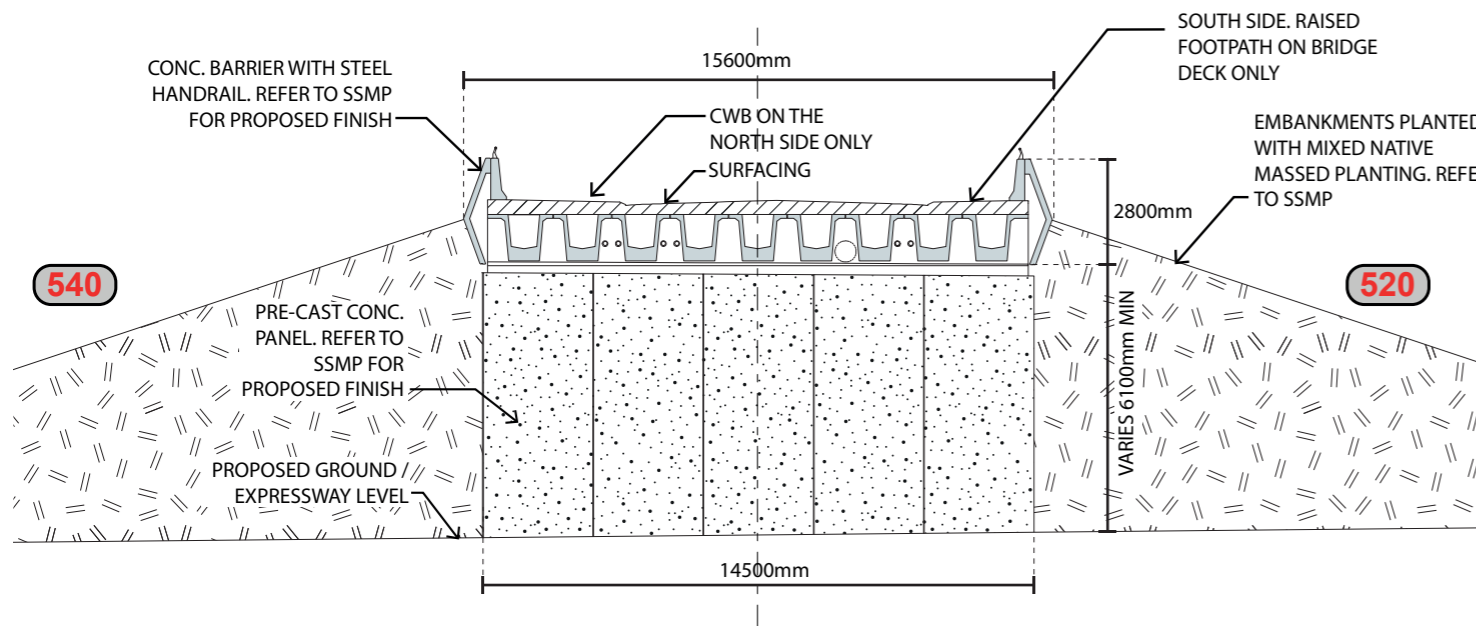
3. Change to bridge deck and beam thickness



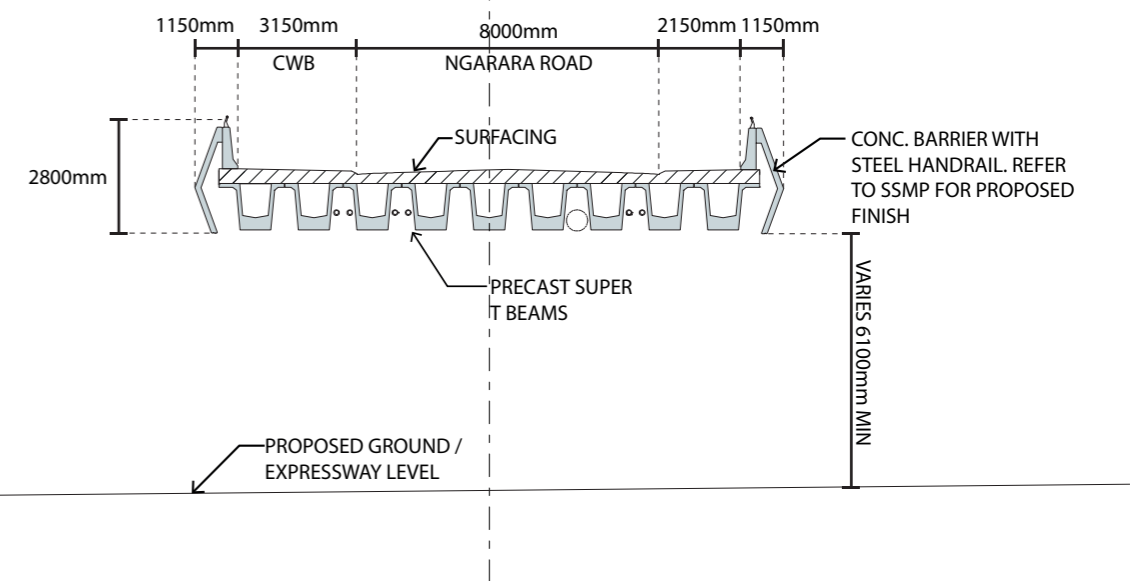
1. SECTIONAL ELEVATION - APPROVED - NGARARA ROAD BRIDGE SOUTH ABUTMENT - 1:200@A3



2. SECTIONAL ELEVATION - APPROVED - NGARARA ROAD BRIDGE (LOOKING SOUTH-EAST) - 1:200@A3



3. SECTIONAL ELEVATION - PROPOSED - NGARARA ROAD BRIDGE SOUTH ABUTMENT - 1:200@A3



4. SECTIONAL ELEVATION - PROPOSED - NGARARA ROAD BRIDGE (LOOKING SOUTH-EAST) - 1:200@A3

**Design development**

1. Increased bridge width
2. Columns removed
3. Reduced the size/height of the concrete bridge barrier/fascia panel.

**Rationale**

1. Increase to width of road corridor to accommodate full width CWB
2. Columns are no longer required with the reduced bridge span length.
3. Change to bridge deck and beam thickness

## Approved to Proposed Graphic Comparison



VISUALISATION - APPROVED - - NGARARA ROAD BRIDGE (WEST SIDE OF NGARARA BRIDGE LOOKING NORTH-EAST)



VISUALISATION - PROPOSED - NGARARA ROAD BRIDGE (WEST SIDE OF NGARARA BRIDGE LOOKING NORTH-EAST)

Elements	Approved Design	Proposed Design	Developments	Why?	ULDF Principles
<b>Column front elevation</b> <b>1:100@A3</b>			<ol style="list-style-type: none"> <li>Columns and crosshead removed</li> </ol>	<ol style="list-style-type: none"> <li>Columns are no longer required with the reduced bridge length.</li> </ol>	<ol style="list-style-type: none"> <li>Please refer to ULDF principles summary on sheet; 7 of this document. With particular reference to principle numbers; 1, 2, 3, 8, 11 and 13</li> </ol>
<b>Column side elevation</b> <b>1:100@A3</b>			<ol style="list-style-type: none"> <li>Columns and crosshead removed</li> </ol>	<ol style="list-style-type: none"> <li>Columns are no longer required with the reduced bridge length.</li> </ol>	<ol style="list-style-type: none"> <li>Please refer to ULDF principles summary on sheet; 7 of this document. With particular reference to principle numbers; 1, 2, 3, 8, 11 and 13</li> </ol>
<b>Cross Head &amp; barrier junction</b> <b>1:100@A3</b>			<ol style="list-style-type: none"> <li>Column and crosshead removed</li> <li>Reduced the size/height of the concrete bridge barrier/fascia panel.</li> <li>Change to bridge deck thickness on southern side of the bridge</li> <li>Increased bridge width</li> </ol>	<ol style="list-style-type: none"> <li>Columns are no longer required with the reduced bridge length.</li> <li>Change to bridge deck and beam thickness</li> <li>To drain the footpath towards the road</li> <li>Increase to width of road corridor to accommodate full width CWB</li> </ol>	<ol style="list-style-type: none"> <li>Please refer to ULDF principles summary on sheet; 7 of this document. With particular reference to principle number 1, 2, 3, 8 and 13</li> </ol>



## ULDF PRINCIPLES SUMMARY

ULDF principle	Assessment of ULDF principles
1. Make the bridges generally consistent in their form so they register as a 'family' and provide some visual continuity within the local environment	Proposed Ngarara Road bridge is consistent in form to that of other expressway bridges, The barrier/fascia panel remains consistent with other proposed bridges. The vertical abutment and abutment finish is consistent with Peke Peka, Waikanae, Te Moana and the stream sides of Whremauku and Smithfield.
2. Express the bridges as simple forms that sit across the changes in landscape and are not seen as strong statement in their own right	Proposed bridge form remains a visually simple structure and sits across the landscape as a horizontal element. The bridge is not seen as making a statement in its own right. The simple vertical abutments and refined material finish create a clean interface and help to emphasise and reinforce the horizontal nature of the bridge barrier.
3. Unite the bridge elements of pier, cross head, deck and barrier as one sculptural form and ensure services are concealed from view	Proposed bridge form is different from the early approved design in that the piers have been removed. The removal of the pier and crosshead makes for a much cleaner, less complex bridge aesthetic. The lack of a vertical element in the middle of the bridge further accentuates the horizontality of the bridge fascia panel. The bridge fascia panel form is consistent with other proposed bridges. The reduction in bridge components helps to maintain the perception of the bridge as a united single form.
4. Ensure the form of the bridges from the underside is visually appealing to recognise the primacy of the local roads user's experience in design consideration	As Ngarara Road bridge is an expressway underpass, the underside of bridge is not viewed from the local road.
5. Design the intersection of the piers with the ground in concert with the local road interface design of abutment forms and materials (refer to local road interface design principles)	Not relevant
6. Light the spaces beneath local road over bridges to enhance the quality of the space including the use of natural light penetration where the local road has a higher frequency of pedestrian cycling and other non-vehicular users	Not relevant
7. Use architectural lighting to emphasise the sculptural forms of the bridges and light units that are readily serviceable from the ground	Not proposing to light the expressway underpass
8. Utilise the opportunity provided by multiple bridges to make a system of parts that can be repeated at each location and improve efficiency of construction	The proposed bridge components; barriers, abutments, beams are consistent with the components on other expressway bridges. The proposed bridge use the same systematic approach to allow repetition of parts at other locations and improves the efficiency of construction.
9. Use textured finishes within the bridge elements surfaces' to provide a crafted finish – avoid printed forms	The proposed finish on the Ngarara Road Bridge barriers will be fair faced concrete with a white wash, applied concrete coating to ensure colour and tonal uniformity between panels. The bridge abutment will be constructed with precast concrete panels with an exposed Otaki pebble finish. The underside of the deck will be fair faced concrete without the applied white wash coating to help make these elements visually recessive relative to the barrier. Matt graffiti protection to be applied to all bridge elements surfaces. Refer to the SSMP for further detail on the proposed finishes.
10. Repeat the bridge design concepts within the design of pedestrians bridges recognising that these may be able to utilise lighter weight materials	Not relevant
11. Develop each bridge crossing design considering the piers types best suited to the location	The proposed Ngarara Road bridge piers have been removed and therefore differ from the approved design. As Ngarara Road bridge is an expressway underpass, the underside of bridge is not viewed from the local road. The reduction in span and the removal of the piers is appropriate to the location considering the viewing audience.
12. Locate bridge piers associated with bridge watercourse crossings away from riparian edges to prevent need to armour stream edges	Not relevant
13. Ensure that the integrity and significance of the bridge forms as important to the amenity of the community is not accorded any less priority than the other design requirements of the project	The design of the bridge forms at Ngarara Road has seen the consideration of all the contributing factors of visual amenity, structural design in high seismic zone, and constructability

