



ADDITIONAL CROSSING OF THE CLARENCE RIVER AT GRAFTON

Appendix J – Technical Paper: Urban
design and landscape concept report
(including landscape character and
visual impact assessment)

AUGUST 2014

CONTENTS

Contents	v			
List of tables	vi			
List of figures	vi			
List of plates	vii			
Executive summary	ix			
1 INTRODUCTION	1	4	PROJECT CONTEXT	31
1.1 Background	2		4.1 Proposed Bridge and Approach Road Context	32
1.2 Description of the project	2			
1.3 Scope of this report	3	5	OBJECTIVES AND PRINCIPLES	43
1.4 Concept design study method	3			
1.5 Director General's requirements	4	6	URBAN DESIGN, BRIDGE AND LANDSCAPE CONCEPT	47
1.6 Roads and Maritime guidelines	4		6.1 Overview	48
1.7 Report structure	4		6.2 Grafton	51
			6.3 The proposed Grafton Bridge	61
			6.4 South Grafton	71
			6.5 Project-wide recommendations	83
			6.6 Planting	84
2 EXISTING CONTEXT	5	7	IMPACT ASSESSMENT	87
2.1 Location	6		7.1 Impact Assessment Method	88
2.2 Transport	7		7.2 Proposed Bridge and Approach Roads Landscape character impact	89
2.3 Hydrology	8		7.3 Proposed Bridge and Approach Roads Visual impact	104
2.4 Historical context	10		7.4 Proposed Bridge and Approach Roads Overshadowing	118
2.5 Heritage listed items	11	8	MITIGATION MEASURES AND CONCLUSION	121
2.6 The Clarence River	12		8.1 Project Mitigation strategies	122
2.7 Grafton Bridge	13		8.2 Conclusion	124
2.8 Urban form	14	9	APPENDICES	123
2.9 Two town centres	15		9.1 Grafton Waterfront Precinct Concept Masterplan	125
2.10 Established residential areas	17			
2.11 Industrial areas	19			
2.12 Rural hinterland	20			
2.13 Open space and recreation	21			
3 PROJECT DESCRIPTION	23			
3.1 Proposed Bridge and Approach Roads	24			

LIST OF TABLES

Table 1.1:	Director General's requirements.	4
Table 6.1:	Indicative STREET TREE plant species list	84
Table 6.2:	Indicative REVEGETATION plant species list	84
Table 7.1:	Impact assessment grading matrix	88

LIST OF FIGURES

Figure 0.1:	Landscape and Urban Design Concept	viii
Figure 0.2:	View of proposed Grafton Bridge from the Clarence River	viii
Figure 2.1:	Regional context of Grafton on the Clarence River.	6
Figure 2.2:	The local context of Grafton and South Grafton.	6
Figure 2.3:	Regional road network around Grafton	7
Figure 2.4:	Local road network in Grafton and South Grafton	7
Figure 2.5:	Flood affected areas	8
Figure 2.6:	Grafton levee system	9
Figure 2.7:	Heritage listed items	11
Figure 2.8:	Urban settlement patterns	14
Figure 2.9:	Two town centres	15
Figure 2.10:	Infrastructure elements	16
Figure 2.11:	Wide gracious street network	18
Figure 2.12:	Recreation and Open Space areas	21
Figure 3.1:	Extent of the proposed bridge, approach roads and levee upgrade works required to complete the project.	25
Figure 3.2:	Proposed bridge and road design plan, sheet 1 of 5.	26
Figure 3.3:	Proposed bridge and road design plan, sheet 2 of 5.	27
Figure 3.4:	Proposed bridge and road design plan, sheet 3 of 5.	28
Figure 3.5:	Proposed bridge and road design plan, sheet 4 of 5.	29
Figure 3.6:	Proposed bridge and road design plan, sheet 5 of 5.	30

Figure 4.1:	Key view points from Grafton and South Grafton of the existing bridge in the context of the proposed project	32
Figure 4.2:	Aboriginal heritage in the context of the proposed project	34
Figure 4.3:	Non Aboriginal heritage in the context of the proposed project	35
Figure 4.4:	Vegetation and habitat in the context of the proposed project	36
Figure 4.5:	Urban character areas in the context of the proposed project	37
Figure 4.6:	Recreational areas in the context of the proposed project	38
Figure 4.7:	New arrival point based on the proposed project	39
Figure 4.8:	Main activity generator locations in the context of the proposed project	40
Figure 4.9:	Pedestrian and cyclist connections in the context of the proposed project	41
Figure 4.10:	Property and built form in the context of the proposed project	42
Figure 6.1:	Landscape and Urban Design Concept – Overview	48
Figure 6.2:	Urban design and landscape concept plan – Sheets 1 & 2	55
Figure 6.3:	Section AA at CH 1900	56
Figure 6.4:	Section BB CLARENCE STREET	56
Figure 6.5:	Section CC at CH 1700	57
Figure 6.6:	Section DD at CH 1620	57
Figure 6.7:	Section EE at CH 1540	58
Figure 6.8:	Section FF at CH 1500	59
Figure 6.9:	Section GG at CH 1400	60
Figure 6.10:	View of proposed Grafton Bridge from the Clarence River	61
Figure 6.11:	Section HH at CH 1160	63
Figure 6.12:	Urban design and landscape concept plan – Sheets 3 & 4	65
Figure 6.13:	Bridge elevation	66
Figure 6.14:	Bridge cross section B1	68
Figure 6.15:	Bridge cross section B2	69
Figure 6.16:	Bridge cross section B3	70
Figure 6.17:	Urban design and landscape concept plan – Sheets 5 & 6	73
Figure 6.18:	Section II at CH 880	74
Figure 6.19:	Section JJ at CH 800	75

Figure 6.20:	Section KK at CH 460	76
Figure 6.21:	Section LL at CH 340	77
Figure 6.22:	Urban design and landscape concept plan – Sheets 7 & 8	79
Figure 6.23:	Urban design and landscape concept plan – Sheets 9 & 10	81
Figure 6.24:	Section MM at CH 260	82
Figure 7.1:	Landscape Character Zones - LCZs.	89
Figure 7.2:	Visual Envelope Map (VEM) and location of viewpoints at local scale	105
Figure 7.3:	Visual Envelope Map (VEM) and location of viewpoints at sub-regional scale	105
Figure 7.4:	Shadow at 9am in December (source: Arup)	118
Figure 7.5:	Shadow at 9am in June (source: Arup)	118
Figure 7.6:	Shadow at 12pm in December (source: Arup)	118
Figure 7.7:	Shadow at 12pm in June (source: Arup)	118
Figure 7.8:	Shadow at 3pm in December (source: Arup)	118
Figure 7.9:	Shadow at 3pm in June (source: Arup)	118

LIST OF PLATES

Plate 2.1:	Flood sign, South Grafton	8	Plate 2.27:	View from elevated land along Centenary Drive, across the agricultural floodplain to Grafton Bridge.	20	Plate 7.14:	View along existing Iolanthe Street looking north	97
Plate 2.2:	2001 flood in Grafton	9	Plate 6.1:	View along existing Pound Street, looking north west	51	Plate 7.15:	View along existing Pacific Highway, near Iolanthe Street intersection, looking north east	98
Plate 2.3:	Grafton levee	9	Plate 6.2:	View along existing Clarence Street, looking south west	51	Plate 7.16:	View along existing Pacific Highway looking west	98
Plate 2.5:	Punt service on the Clarence River at Grafton	10	Plate 6.3:	View along existing Pound Street, looking south east	51	Plate 7.17:	View along existing Pacific Highway, near Gwydir Highway intersection, looking east	98
Plate 2.6:	View of Grafton Bridge with the bascule span open	10	Plate 6.4:	Existing railway viaduct over Pound Street, Grafton	52	Plate 7.18:	View to Derek Palmer Place looking north	99
Plate 2.8:	Aerial view of Grafton, 1946	10	Plate 6.5:	Existing railway bridge over the Gwydir Highway, South Grafton	52	Plate 7.19:	Existing landscape character of the Grafton area without the proposed bridge and approach roads	100
Plate 2.7:	View along Prince Street to the Clarence River, c.1940	10	Plate 6.6:	Example of blockwork retaining wall	52	Plate 7.20:	Artist impressions of the landscape character of Grafton with the proposed bridge and approach roads	101
Plate 2.4:	Grafton and South Grafton 1954	10	Plate 6.7:	Example of transparent noise wall	52	Plate 7.21:	Existing landscape character of the South Grafton area without the proposed bridge and approach roads	102
Plate 2.9:	The public riverfront at Grafton, west of Grafton Bridge.	12	Plate 6.8:	Transition pier between box girder and Super T girders at the new Iron Cove Bridge.	62	Plate 7.22:	Artist impressions of the landscape character of South Grafton with the proposed bridge and approach roads	103
Plate 2.10:	The public riverfront at South Grafton, west of Grafton Bridge.	12	Plate 6.9:	Slightly tapering pier shape with rounded pier ends on the existing Grafton Bridge	62	Plate 7.23:	Before and after artist impressions of Viewpoint 2	114
Plate 2.11:	Agricultural floodplain along the southern riverfront east of Grafton Bridge	12	Plate 6.10:	View along existing Iolanthe Street, looking south	71	Plate 7.24:	Before and after artist impressions of Viewpoint 5	115
Plate 2.12:	Construction drawings for Grafton Bridge, dated 1926. (Source: Roads and Maritime)	13	Plate 6.11:	View along existing Gwydir Highway, looking east	71	Plate 7.25:	Before and after artist impressions of Viewpoint 7	116
Plate 2.13:	Shared path on downstream side of Grafton Bridge	13	Plate 7.1:	View along existing Pound Street looking south east	90	Plate 7.26:	Before and after artist impressions of Viewpoint 8	117
Plate 2.14:	Double deck bascule span	13	Plate 7.2:	View along existing Pound Street looking south east	90			
Plate 2.15:	Grafton Bridge	13	Plate 7.3:	View along existing Clarence Street looking south west	90			
Plate 2.16:	Representative streetscapes in Grafton and South Grafton town centres	15	Plate 7.4:	View along existing Pound Street, near Girl Guide Park, looking north west	92			
Plate 2.17:	Road viaduct, Grafton.	16	Plate 7.5:	View along existing Pound Street, at Kent Street intersection, looking north west	92			
Plate 2.18:	Railway viaduct, Grafton with road viaduct & Grafton Bridge beyond.	16	Plate 7.6:	View along existing Greaves Street looking east	92			
Plate 2.19:	Railway bridge over local road, Grafton.	16	Plate 7.7:	The existing bridge viewed downstream from South Grafton CBD	94			
Plate 2.20:	Railway embankment, Grafton.	16	Plate 7.8:	Pedestrian path on the downstream side of the existing bridge, looking south	94			
Plate 2.21:	Representative streetscapes and residential buildings in established residential areas in Grafton and South Grafton	17	Plate 7.9:	Pedestrian path on the downstream side of the existing bridge, looking east	94			
Plate 2.22:	Victoria Street, Grafton	18	Plate 7.10:	View from northern foreshore to existing bridge	95			
Plate 2.23:	Skinner Street, South Grafton	18	Plate 7.11:	View south east from the Bent Street layby south of the existing bridge	96			
Plate 2.24:	Fig-lined avenue at Breimba Street, Grafton	18	Plate 7.12:	View along existing Butters Lane looking east	96			
Plate 2.25:	Sugar loading facility in South Grafton and representative examples of industrial developments in Grafton and South Grafton.	19	Plate 7.13:	View north east from the Bent Street layby south of the existing bridge	96			
Plate 2.26:	View from elevated land along Centenary Drive, across the agricultural floodplain to the newly developing residential areas along Grafton's riverfront.	20						

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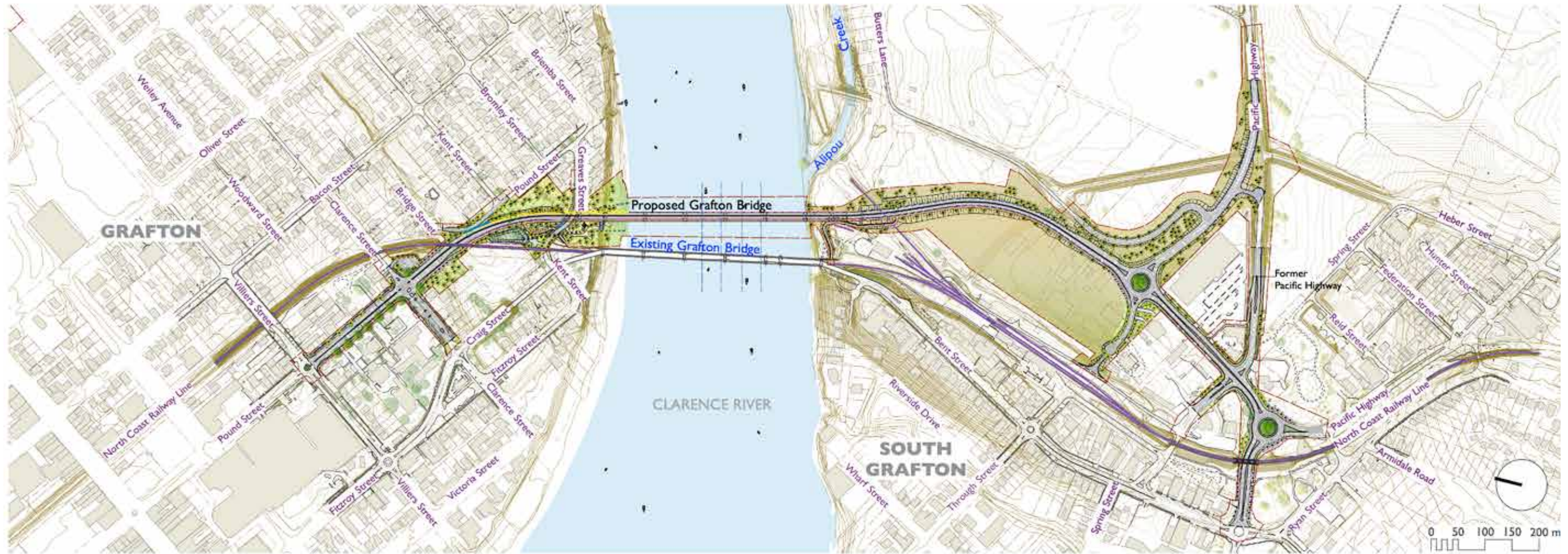


Figure 0.1: Landscape and Urban Design Concept . Refer to Section 6 for further detail.

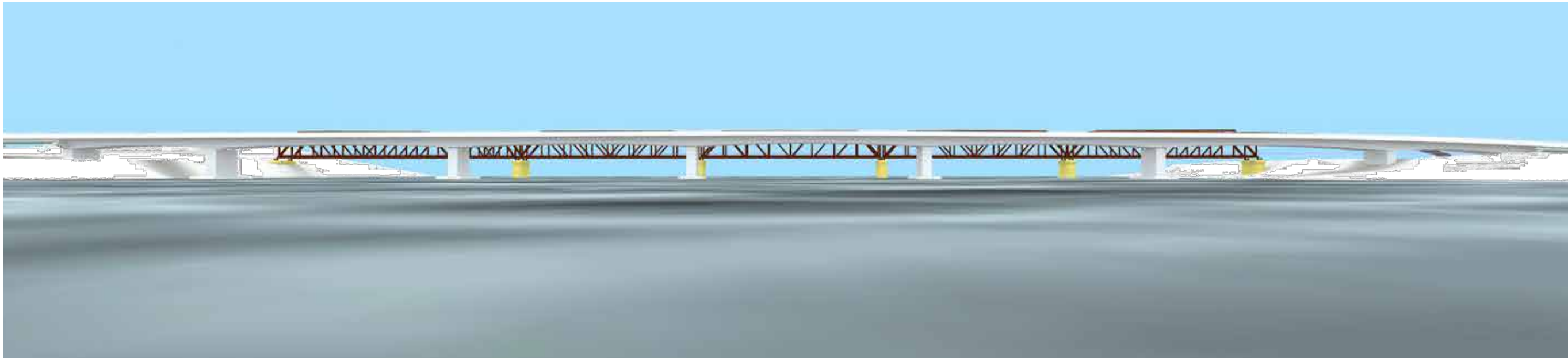


Figure 0.2: Downstream view of proposed Grafton Bridge from the Clarence River

EXECUTIVE SUMMARY

Purpose

Roads and Maritime Services is seeking approval to construct an additional bridge across the Clarence River at Grafton (the proposal). The proposal would include the construction of a new bridge with viaducts, a pedestrian and cycle path, and upgrades to the road network in Grafton and South Grafton to connect the new bridge to the existing road network. This technical paper has been prepared by Spackman Mossop Michaels (SMM) on behalf of Roads and Maritime Services (Roads and Maritime) as part of the Environmental Impact Statement (EIS) for the project and addresses the Director-General's Environmental Assessment Requirements for visual amenity, bridge form and elements, and landscape aspects of the project that make up its 'urban design'.

Context

Grafton is a major regional centre situated on the Clarence River in the north coast of New South Wales. The existing landscape character of the area is topographically dominated by the Clarence River and its flat river floodplain. Either side of the river sit the town centres of Grafton and South Grafton which consist of wide gracious streets laid out on a square grid. The town centres are connected across the river by an historic bridge which is part of the identity of Grafton. Outside of the town centres are established and newly developing residential areas, and industrial areas, generally concentrated around the regional road and rail corridors and surrounded by the agricultural areas that comprise the city's rural hinterland.

Urban design approach

Understanding the built, natural and community character of Grafton, analysing the impacts that a new crossing of the Clarence River and associated road upgrades can make, identifying opportunities, and articulating urban design objectives and principles has been an integral part of designing the project. An iterative engineering and urban design process has been adopted to produce an integrated design that fits in with its context, complements the existing historic bridge, minimises the impacts and mitigates the impacts that are unavoidable. This follows Roads and Maritime urban design policy document Beyond the Pavement (2009), the Bridge Aesthetics design guideline (2012), the EIS Landscape Character and Visual Impact Assessment guideline (2012) and the Landscape Guideline (2008).

Urban design and landscape concept

The proposed concept plan, in Fig. 1, shows how the project fits into Grafton, South Grafton and the river setting and with the existing historic

bridge, and the future public domain that will be created. The form of the proposed new bridge relative to the existing bridge is shown in elevation in Figure 2. The concept is documented in greater detail in Chapter 6. This includes the proposed new bridge, viaducts and abutments, retaining walls, noise barriers, cuttings, fill embankments, planting to integrate the proposed works with the existing character of the local area, feature planting to define the township entries and other cultural areas, creation of new landscaped public open space, integration of the pedestrian and bicycle network, and retrofitting of local streets affected by road widening.

Proposed new bridge: the river crossing

The proposed new bridge is designed to complement the existing historic bridge:

- It has been designed, within site constraints, to be as parallel as possible to the existing historic bridge
- Its straight horizontal alignment references the straight alignment of the existing bridge
- The piers have been positioned to align as closely as possible with the piers of the existing bridge and match the spans over the Clarence River
- It has been kept as low as possible over the Clarence River to allow the existing bridge to take visual precedence and minimise the loss of views to the existing bridge.

Key design features of the proposed new bridge are:

- The superstructure would be concrete allowing for a simple, clean, contemporary character, and would have long, smoothly tapering haunches that help reduce its visual bulk and create a slender, graceful appearance when viewed in elevation
- The proposed 16.9 metre wide deck, over and above two vehicle lanes, shoulders and a median, includes a pedestrian and cycle path on the western, upstream, side to facilitate connections to existing path systems in Grafton and South Grafton
- Both sides of the bridge would be cantilevered over a box girder to cast a shadow on the vertical face of the girder, helping it to visually recede and minimise its visual bulk. In contrast, the precast concrete parapets would be angled slightly out to catch the sunlight
- The parapets are designed to appear as crisp, uninterrupted linear elements extending the full length of the bridge to beyond the abutments.
- Balustrades are designed to allow views for users.

Proposed urban design and landscape concept in Grafton

To mitigate loss of trees, demolition of houses and noise impacts, the proposed concept includes street tree planting, planting of fig trees within Grafton TAFE (subject to agreement with the TAFE), Jacaranda and formal garden beds at strategic locations, landscaped car park areas, transparent noise barriers on northern bridge approach road and landscaped public open space either side of the Pound Street approach.

Proposed urban design and landscape concept in South Grafton

Key design characteristics are pasture grasses on southern bridge approach embankments, retention of rural views, street tree planting, and feature planting, such as Jacaranda, at major entry points and roundabouts. Native street trees and revegetation would be undertaken to the former Pacific Highway and the Butters Lane extension.

Landscape character impacts

Landscape character impact assessments are provided in Chapter 7. Landscape character assessment determines the impact of the proposal on the aggregate of the built, natural and cultural aspects that make up an area and provide its unique sense of place. The landscape character analysis identifies five landscape character zones in the study area, representing the range of different settings through which the proposal passes.

The landscape character impact assessment identifies that the proposal would have a moderate to high character impact with areas of highest impact concentrated at:

- Pound Street
- The Grafton established residential area in the vicinity of Pound Street, Kent Street, Bridge Street and Greaves Street
- Parts of the Clarence River and foreshore.

Visual impact assessment

Visual impact assessment is provided in Chapter 7, defining the day to day visual effects of a proposal on people's views. It is based on the assessment of a number of selected key viewpoints that are rated according to the sensitivity of the view and the magnitude of the proposal within that view. The locations and directions of the chosen viewpoints are generally representative of the range of viewpoints both within and beyond the study area.

A total of 12 key viewpoints form the basis of the visual impact assessment and the following visual impact ratings were determined:

- Six viewpoints would have High visual impact
- Two viewpoints would have High to Moderate visual impact
- Two viewpoints would have Moderate visual impact
- One viewpoint would have Moderate to Low visual impact
- One viewpoint would have Low visual impact.

Ratings of high and high to moderate impacts occur in the town centre, residential areas, heritage areas, educational precincts, open space areas and the picturesque river setting, where the sensitivity to change is the highest and the magnitude of the works are greatest. The moderate and low ratings occur in areas where distance from the works is greater and in areas of lower sensitivity, for example the South Grafton industrial area.

Mitigation strategy

A mitigation strategy is provided in Chapter 7. It has been developed during the project concept design to mitigate landscape character and visual impacts. It is reflected in the Urban design and landscape concept and should be refined in the ongoing development of the design. The strategy also includes a summary of further mitigation measures to be investigated during the subsequent detailed design phase of the project, and measures to be considered during construction.

Conclusions

The overall fabric of the historic town centres and streetscapes of Grafton and South Grafton are kept largely intact, however, there are unavoidable high visual and landscape character impacts concentrated at Pound Street, Clarence Street and the residential area associated with proposed northern bridge approach road, to a zone of the Clarence River and foreshore where the proposal is inserted, and affecting the ambience around Alipou Creek - which require mitigation. The urban design and landscape objectives and principles developed, take into account urban design and visual character not only for the study area itself, but also reflect its relationship with the surrounding river floodplain and urban areas. The urban design, bridge and landscape concept has been developed to achieve an integrated outcome that helps fit the project as sensitively as possible into its context and to minimise the impacts of the project on the future character of the area, through the incorporation of a number of mitigation measures. The urban design will:

- Ensure attractive views into the broader landscape are maintained by planting in appropriate locations.
- Incorporate materials and finishes for new road elements that are site appropriate
- Ensure that the existing Grafton Bridge retains its visual precedence
- Ensure there is a visually complementary relationship between the proposed bridge and the existing bridge
- Include a planting design intended to reduce the scale of the proposed road infrastructure by the provision of appropriate tree species in the streetscapes of the urban areas of Grafton and South Grafton
- Provide new landscaped open spaces at impacted urban development sites
- Provide distinctive town entry points
- Provide screening, through the use of native plant species, of the road infrastructure to residential areas
- Provide new pedestrian and bicycle connections for the community.

Development of the project during a future detail design phase should consider the further key mitigation strategies outlined in this report to further integrate this project into the townships of Grafton and South Grafton.

1 INTRODUCTION

Roads and Maritime Services (Roads and Maritime) is proposing to construct an additional bridge across the Clarence River at Grafton to supplement the existing bridge. In seeking project approval of the additional crossing of the Clarence River at Grafton, Roads and Maritime is preparing an Environmental Impact Statement (EIS) under Part 5.1 of the Environmental Planning and Assessment Act 1979.

This Urban Design and Landscape Concept Report was prepared by Spackman Mossop Michaels (SMM) on behalf of Roads and Maritime and is a Technical Paper that supports the environmental impact Statement (EIS) being prepared by Arup. SMM has worked on this project in conjunction with the Roads and Maritime Centre for Urban Design, other Roads and Maritime specialist advisors, and road and bridge designers from Arup.

1.1 BACKGROUND

In 2002 the NSW Government began formal investigations into an additional crossing of the Clarence River in Grafton. The investigations were deferred in September 2005 and restarted in 2009.

In December 2010 Roads and Maritime announced a revised approach to engage more effectively with the community and stakeholders in identifying a preferred route for an additional crossing. A community update issued in December 2010 identified 13 preliminary route options and invited community comment via a postal survey. Subsequent phone and business surveys were also carried out.

In June 2011 RMS published the Feasibility Assessment Report which described the assessment undertaken of the 41 suggestions identified after the December 2010 to March 2011 community consultation period. Twenty-five preliminary route options in five corridors were identified for engineering and environmental investigation.

In January 2012 six route options were announced for further investigation. The short-listed options and short-listing process are documented in the Preliminary Route Options Report – Final (RMS, January 2012).

Design refinements and further field and technical investigations were undertaken on the six route options. These were documented in the Route Options Development Report (RMS, September 2012).

The six route options were subject to consultation and assessment process in September, October and November 2012 to identify the preferred location for the additional crossing. Based on community feedback, technical investigations and value management workshops Option C was selected as the preferred option which connects the Pacific Highway near the junction with Gwydir Highway in South Grafton to Pound Street in Grafton.

The Recommended Preferred Option Report (RMS, December 2012) documents the process followed for the assessment of the six short-listed route options and the identification of a recommended preferred option. It also provides information on community involvement and feedback received after the display of the Route Options Development Report (RMS, September 2012).

The Recommended Preferred Option Report (RMS, December 2012) was placed on exhibition from 19 December 2012 to 4 March 2013. A number of supporting consultation activities were undertaken to ensure that information was received by the wider community and opportunities were available for comment and questions. The exhibition period, during which comments on the report were invited, was initially due to finish on 18 February 2013, but was extended until 4 March 2013 to allow members of the community impacted by floods in Grafton additional time to comment.

In April 2013, Option C was confirmed as the preferred option for an additional crossing of the Clarence River at Grafton. Refinements were made to the recommended preferred option after Roads and Maritime review of the preliminary design, stakeholder consultation and feedback received during the public display of the Recommended Preferred Option Report (Roads and Maritime, December 2012).

The concept design for the project has been further refined to define those elements of the preferred option that are required to provide acceptable traffic performance at least to year 2039 and to take into consideration issues raised during consultation of general community and stakeholders.

1.2 DESCRIPTION OF THE PROJECT

A description of the project is provided in Chapter 5 and Chapter 6 of the EIS. This section provides a summary of the project.

The main components of the Grafton Bridge project include:

- Construction of a new bridge over the Clarence River about 70 metres downstream (east) of the existing road and rail bridge, comprising two traffic lanes
- Construction of a new road to link the new bridge with Iolanthe Street in South Grafton
- Construction of a new road to link the new bridge with Pound Street in Grafton
- An approach viaduct, about 58 metres long, on the South Grafton side of the Clarence River and 29 metres long on the Grafton side
- Upgrades to the road network in South Grafton to connect the new bridge to the existing road network, including:
 - Widening Iolanthe Street to four lanes
 - Widening the Gwydir Highway to four lanes between Bent Street and the Pacific Highway
 - Realigning the existing Pacific Highway to join Iolanthe Street near Through Street
 - Providing a new roundabout at the intersection of the Pacific Highway and Gwydir Highway
 - Providing a new roundabout at the intersection of Through Street and Iolanthe Street
 - Limiting Spring Street and the Old Pacific Highway to left in and left out only where they meet Iolanthe Street
 - Realigning Butters Lane
- Upgrades to the road network in Grafton to connect the new bridge to the existing road network, including:
 - Widening Pound Street to four lanes between Villiers Street and the approach to the new bridge
 - Providing traffic signals at the intersection at Pound Street and Clarence Street
 - Closing Kent Street where it is crossed by the bridge approach road

1.3 SCOPE OF THIS REPORT

- Realigning and lowering Greaves Street beneath the new bridge
- Realigning Bridge Street to join directly to the southern part of Pound Street (east of the new bridge approach). There would be no direct connection between Pound Street south and the new bridge approach
- Widening Clarence Street to provide formal car park spaces
- Minor modifications to the existing Dobie Street and Villiers Street roundabout..
- Replacement of the existing three span concrete arch rail viaduct which crosses Pound Street in Grafton with a single span steel truss bridge
- Construction of a pedestrian and cycle path to provide connectivity between Grafton, South Grafton and the new bridge.
- Provision of two pedestrian crossings with lights in South Grafton to improve safety for pedestrians crossing Iolanthe Street and Gwydir Highway
- Construction of new pedestrian links to connect the new bridge with the existing bridge.
- Provision of designated car park spaces in Pound Street and Clarence Street, including some off street parking, to maintain a similar number of existing car park spaces currently available in those two streets.
- Flood mitigation works, which include raising the height of sections of the existing levee upstream from the new bridge in Grafton and South Grafton
- Construction of a stormwater detention basin and pump station in Grafton to manage local flooding.
- Public utilities adjustment.
- Ancillary facilities required for the construction of the project, including some or all of the following: site compounds, concrete batching plant, pre-cast facilities, and stockpile areas for materials and temporary storage of spoil and mulch.

These project elements are described in more detail in Chapter 4 of this report.

This Urban Design & Landscape Concept Report (Including Landscape Character and Visual Impact Assessment) has been prepared for Roads and Maritime by Spackman Mossop Michaels as part of the EIS for the proposed additional crossing of the Clarence River at Grafton (the project) in Clarence Valley Council local government area. This document is a technical paper that supports the EIS being prepared by Arup. Spackman Mossop Michaels has worked on this project in conjunction with, Roads and Maritime Centre for Urban Design, other Roads and Maritime specialist advisors, and road and bridge designers from Arup.

The report documents the landscape character and visual impacts of the project and has been prepared as part of the planning approval process. It aims to facilitate an integrated urban design and engineering design outcome for the proposal, through the utilisation of visual impact assessment to identify and summarise the visual and landscape character opportunities and issues within the study area. This, in turn, would guide the development of the road and bridge concept design process by avoiding or mitigating potential impacts wherever possible.

1.4 CONCEPT DESIGN STUDY METHOD

The preparation of this study follows Roads and Maritime guidelines (refer to Section 1.9) and includes an integrated team design and assessment process which has included consultation with agencies and the local community. The undertaking of the impact assessment and the finalisation of the concept design has been an iterative process which has enabled the concepts to be refined as they were developed, thereby reducing and mitigating the potential impacts wherever possible.

This study has involved the following:

- Site visits and field investigations, reviewing relevant literature, analysing aerial photographs, topographic maps to understand the study area.
- Reviewing the initial engineering concept design and supporting material to gain an appreciation of the project.
- Defining urban and landscape character through a contextual analysis.
- Identifying and describing landscape character zones and evaluating the project's impact on them.
- Identifying the visual catchment of the project.
- Selecting viewpoints within the visual catchment representing a range of different land uses.
- Evaluating the project's visual impact by comparing the sensitivity of viewpoints and the magnitude of the impact of the upgrade upon them.
- Identifying urban design and landscape strategies to mitigate adverse impacts.
- Development of the urban design, bridge and landscape concept for the project.
- Summary recommendations and conclusions for further consideration in the future detailed design phase of the project.

1.5 DIRECTOR GENERAL’S REQUIREMENTS

The Director General’s Environmental Assessment Requirements (DGRs) for the visual amenity, bridge form, urban design and landscape aspects of this project are as follows:

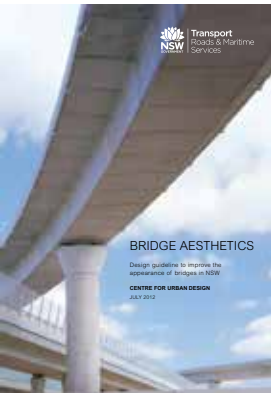
Table 1.1: DIRECTOR GENERAL’S REQUIREMENTS.

KEY ISSUE	REPORT REFERENCE
An assessment of the visual and amenity impacts of the project (height, scale and lighting) on the local and regional area, particularly on: ▫ The existing State Heritage listed Grafton Bridge (SHR 01036) and local heritage items, ▫ Any adjoining land owners and land owners along the foreshore of the Clarence River, ▫ Existing and future residential properties in Grafton and South Grafton, ▫ The southern ‘town entry’, ▫ Use of the Clarence River, and ▫ Significant vantage points in the public domain	7.2 & 7.3
Overshadowing impacts of the bridge structure, embankments and ramps on existing and proposed public domain, open space, foreshore areas and residential uses	7.4
Integration of the bridge with existing and future pedestrian and cycle network in the local, regional and metropolitan context	6.2, 6.3, 6.4, 6.5
Consideration of design, and safety measures for pedestrian and cycle access on the bridge	6.3
Development of urban design objectives for the new bridge, approaches and local road network treatments	5.0
Rationale for the overall design (length, height, width and appearance) and an assessment of the built form (materials and finishes) and urban design (bulk and scale) of the bridge, including: ▫ Justification for the proposed width of the bridge based on shared use by pedestrians, cyclists and public transport, ▫ Details of pedestrian and cyclist access (dedicated or shared-use), and public transport and emergency vehicle access, ▫ Design details such as lighting, balustrades, street furniture and their integration generally, ▫ Design relationship to the existing Grafton and South Grafton built forms and streetscapes, including the existing State Heritage listed Grafton Bridge, ▫ Views to and from the bridge	6.2, 6.3, 6.4, 6.5, 7.2, 7.3

1.6 ROADS AND MARITIME GUIDELINES

Roads and Maritime have produced a comprehensive list of design guideline documents aimed at achieving good urban design outcomes. This report has been undertaken with reference to the following published documents:

- Beyond the Pavement (Roads and Maritime, 2009).
- Landscape Guideline (Roads and Maritime, 2008).
- Bridge Aesthetics Design Guidelines (Roads and Maritime, 2012).
- Environmental Impact Assessment Guidance Note, Guidelines for Landscape Character and Visual Impact Assessment (Roads and Maritime, 2013).



1.7 REPORT STRUCTURE

This report is structured as follows:

- Chapter 1: Introduction - introduces the project and outlines the scope and study team.
- Chapter 2: Existing Context - a description and illustration of the environmental and cultural factors of the local area.
- Chapter 3: Project Description - a summary of the key concept design works.
- Chapter 4: Project Context - a description of the project in the context of the area it will be located, to assist in the development of the objectives and principles for the project.
- Chapter 5: Objectives and Principles - a description the urban design, bridge and landscape objectives and principles.
- Chapter 6: Urban Design, Bridge and Landscape Concept - illustration of the concept design in graphic format including plans, cross sections and details.
- Chapter 7: Impact Assessment - landscape character, visual impact and overshadowing assessment of the project.
- Chapter 8: Mitigation Measures and Conclusions - provides a list mitigation measures to be considered as part of the detailed design process. It also includes a summary of the conclusions and next steps.

2 EXISTING CONTEXT

This chapter provides an overview of the Grafton area. This existing context broadly describes the range of urban and rural elements that make up the Grafton area and contributes to its unique identity and character.

2.1 LOCATION

REGIONAL CONTEXT

The City of Grafton is situated on the northern New South Wales coastal plain, within the Clarence Valley local government area. It is located on the banks of the Clarence River, approximately 36.5km inland from the coast and 65.5km from the river's mouth at Yamba. Grafton is the major urban centre for the region, being the primary focus of commercial, industrial, institutional and administrative activities in a predominantly rural part of the north coast.

LOCAL CONTEXT

The Clarence River passes through the centre of the city, dividing Grafton into two separate urban areas that are linked by a single bridge crossing. Grafton Bridge currently provides the only rail, motor vehicle, pedestrian and cyclist connection between Grafton (north of the river) and South Grafton. The existing bridge has limited capacity to meet the demands of the large volumes of road traffic that cross it during peak times. It is likely that this demand will increase over time due to the future urban growth that is envisaged for Grafton as part of the Clarence Valley Council's (CVC) regional urban planning strategies. As such, Roads and Maritime has identified a need to provide an additional bridge crossing in Grafton.



Figure 2.1: Regional context of Grafton on the Clarence River.

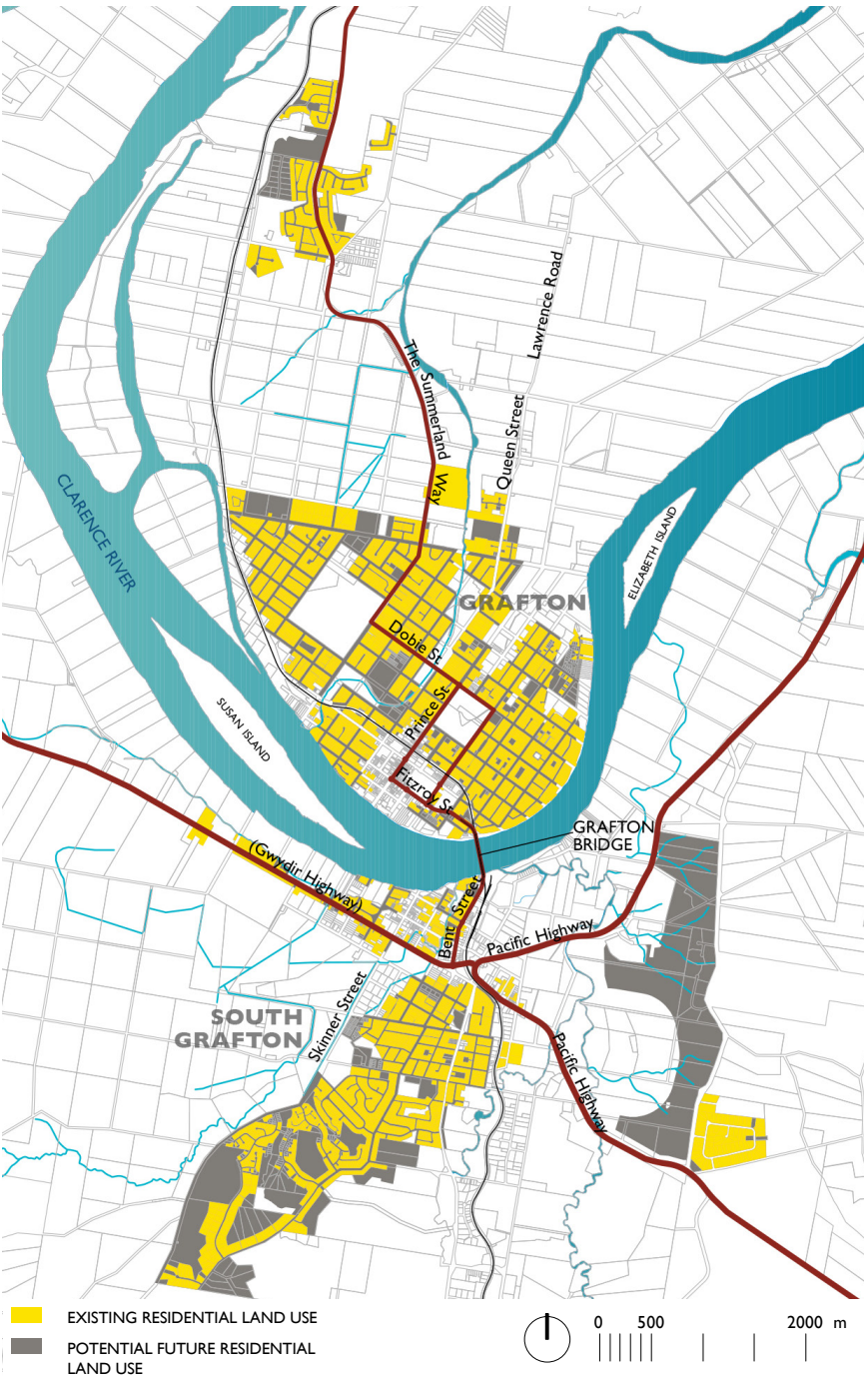


Figure 2.2: The local context of Grafton and South Grafton.

2.3 HYDROLOGY

Grafton is located in the lower reaches of the Clarence River catchment, within the Clarence Valley - one of the largest coastal floodplains in the country. Most of the city is situated within Council's flood planning area (Clarence Valley Local Environmental Plan 2011, CVLEP 2011) and the only part of the township that is not part of the floodplain is the southern approach to Grafton Bridge, along Bent Street. Due to the large size of the river catchment upstream of Grafton (approximately 19,800m²), flooding is a major concern for the city.

A series of levee banks has been constructed over time to protect both Grafton and South Grafton from the regular flooding of the Clarence River. These levee banks are a distinctive characteristic of the Clarence riverfront in Grafton and South Grafton.

The proposed bridge would need to address both maritime navigational requirements and provide immunity from 1 in 100 year flood levels. As such, the soffit (underside) level of any new bridge is to be above the 1 in 100 year ARI flood event to ensure that it would be trafficable during major flood events. The most recent major flood was in 2013, when the river reached levels of 8.09 AHD at the Prince Street gauge in Grafton.

The generally low-lying topography on either side of the river means that any new river crossing would need to include some level of levee upgrade works. The nature and degree of these levee upgrade works will be determined by the design of the proposed bridge and approach roads.



Plate 2.1: Flood sign, South Grafton

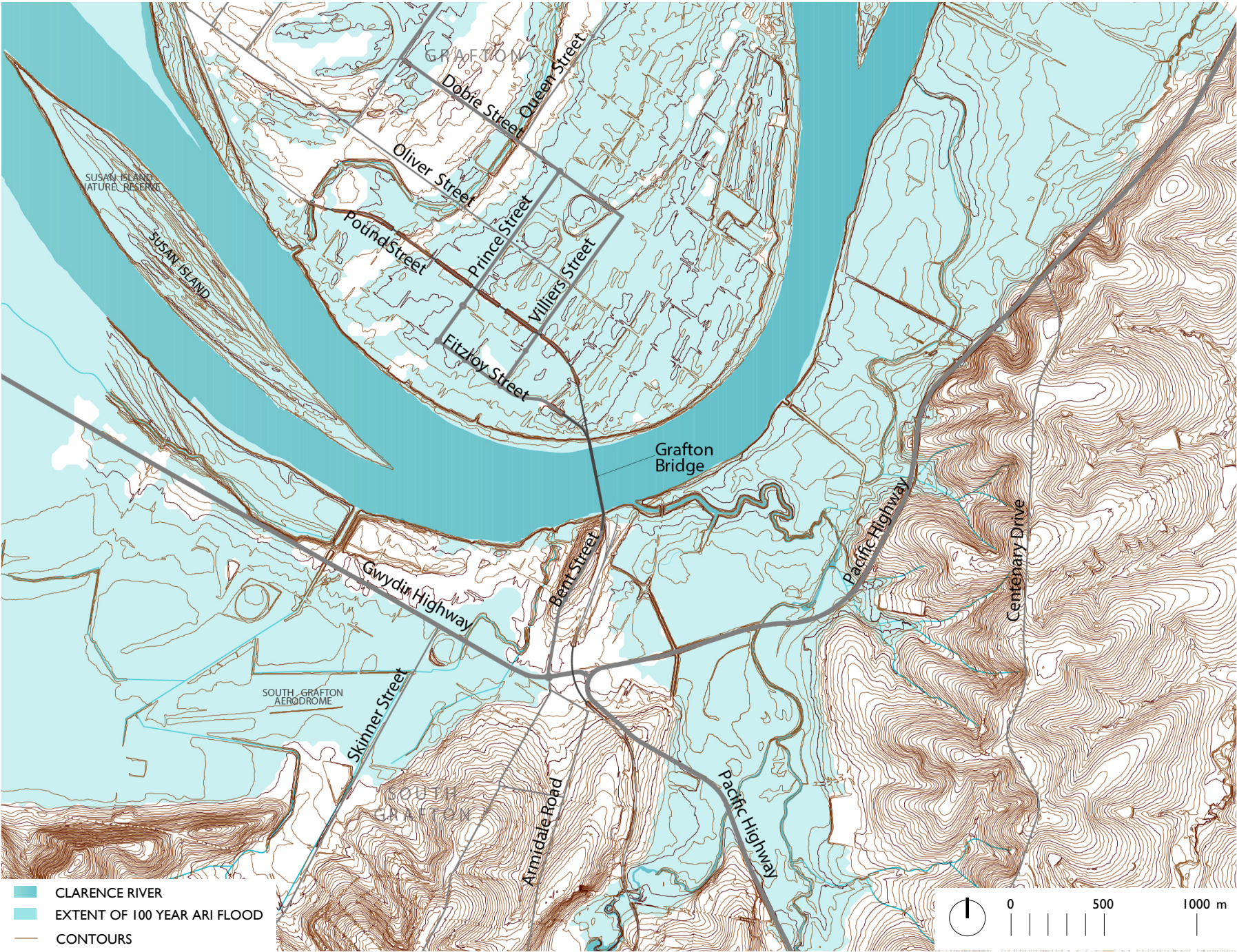


Figure 2.5: Flood affected areas



Plate 2.2: 2001 flood in Grafton



Plate 2.3: Grafton levee

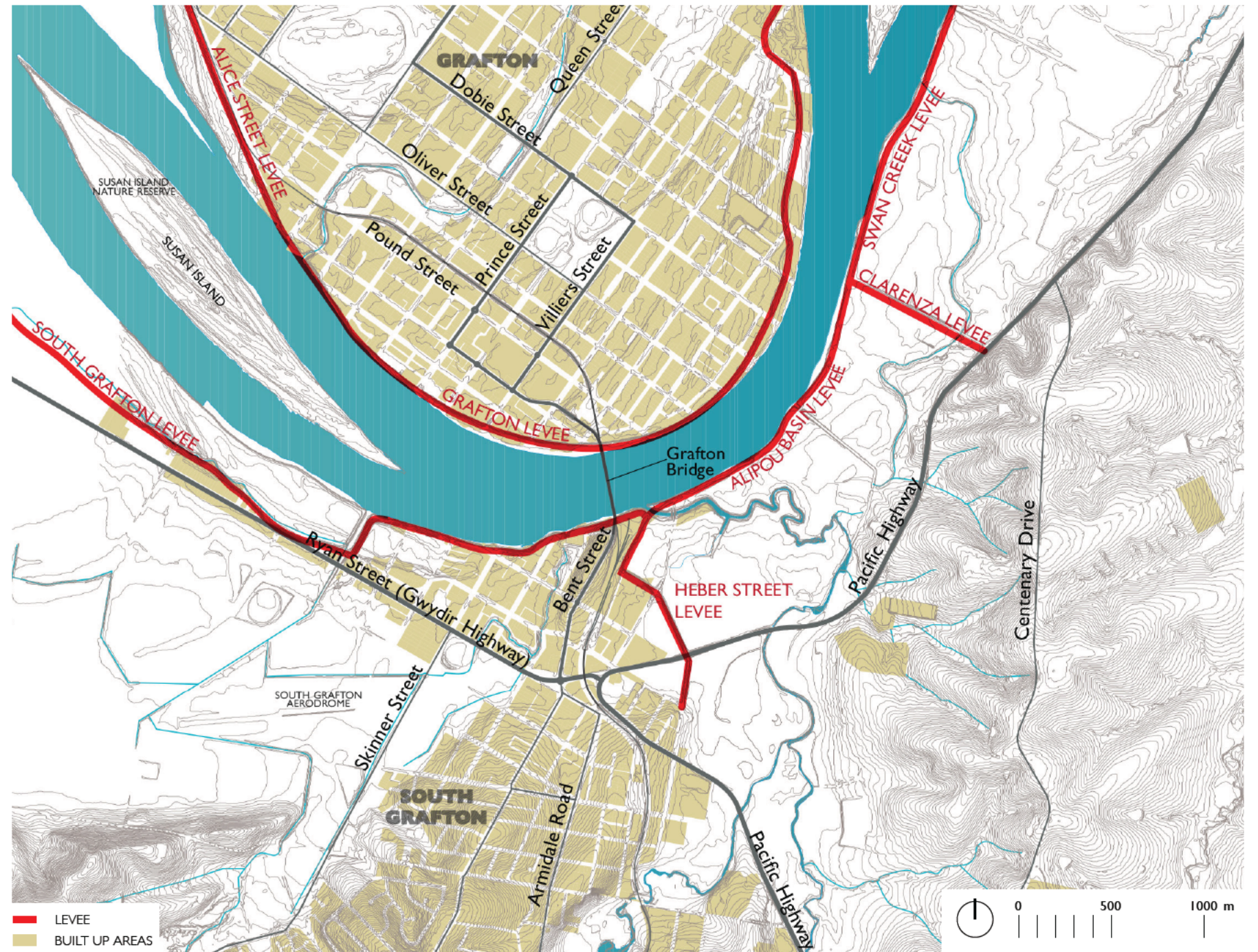


Figure 2.6: Grafton levee system

2.4 HISTORICAL CONTEXT

European settlement of the Grafton area dates from the 1830s, with the arrival of timber-getters attracted by the plenitude of valuable timber, particularly cedar, in the region. Subsequently, the land was used for predominantly agricultural and pastoral purposes, including farming (particularly sugarcane), dairying and grazing.

The establishment of a village in Grafton in the 1850s was initially facilitated by the development of wharves in the area to transport goods from the rural hinterland to the coast. Wharves and a shipyard had been established in what is now the Grafton riverfront by the early 1840s. Shipbuilding continued to be the major local industry until the end of the century, when the railways became the primary means of internal goods transport.

Grafton expanded rapidly in the 1860s and 1870s, aided by its strategic location on the main coastal road, the break-up of large pastoral properties and the discovery of gold nearby. The town soon became the major urban settlement on the Clarence River and the commercial focus for an extensive agricultural and pastoral district. Grafton was proclaimed a city in 1885, and in 1897 South Grafton became a separate municipality. The two towns were not amalgamated until 1957.

The existing Grafton Bridge was completed and opened to traffic in 1932. Prior to this, Grafton and South Grafton were connected by a punt service across the Clarence River.



Plate 2.5: Punt service on the Clarence River at Grafton



Plate 2.6: View of Grafton Bridge with the bascule span open



Plate 2.8: Aerial view of Grafton, 1946



Plate 2.7: View along Prince Street to the Clarence River, c.1940



Plate 2.4: Grafton and South Grafton 1954

2.5 HERITAGE LISTED ITEMS

The former Grafton Local Environment Plan 1988 lists a number of heritage items within Grafton and South Grafton, including all heritage items listed on the State Heritage Register, (SHR) a number of items that are listed on the North Coast Regional Environmental Plan (REP), and the majority of items proposed for listing by the Community Based Heritage Study (Gardiner 2010). On the recommendation of the Community Based Heritage Study, the heritage conservation area listed in the LEP (1988) was substantially modified in June 2011. It is now divided into the Grafton and South Grafton Urban Conservation Areas, and its boundaries have been considerably expanded in Grafton and less so in South Grafton. This has been updated based on the adopted CVLEP 2011.

The adjacent map shows the heritage items and heritage conservation areas listed under the current Grafton Local Environment Plan 2011, including those listed on the State Heritage Register. Grafton Bridge is one of the items listed on the SHR. Detailed discussion of the heritage issues is provided in Appendix G Technical Paper: Non-Aboriginal Heritage Assessment (Biosis 2014) of the Environmental Impact Assessment for this project.

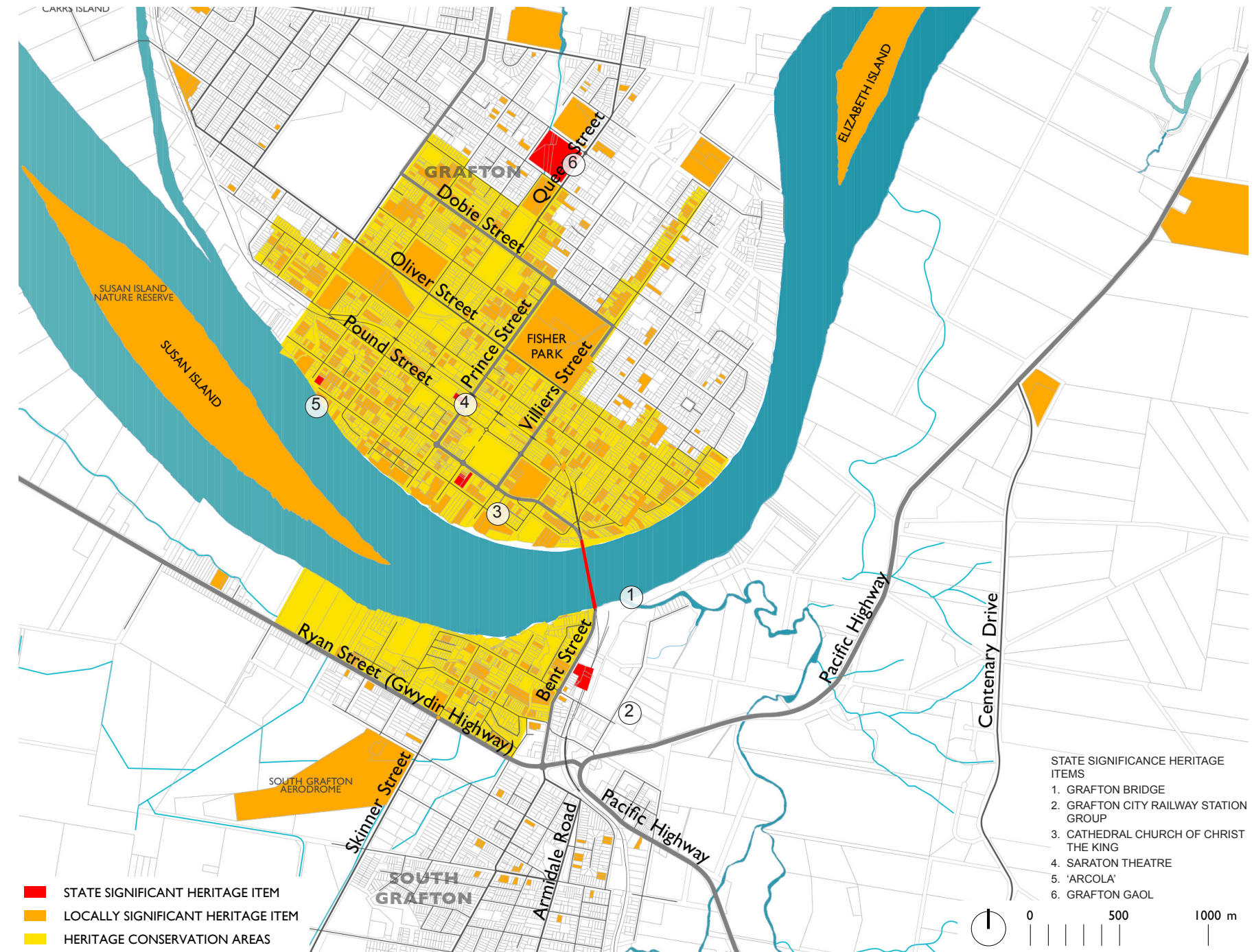


Figure 2.7: Heritage listed items

2.6 THE CLARENCE RIVER

The Clarence River is the defining landscape feature for the city and it was the fundamental reason for the establishment of the city in this location.

The river is the dominant visual element in the local landscape. It has a distinctive character that is defined by its wide sweeping form as it winds across the flat river plain. The flat, open, topography of the local area reinforces the visual prominence of the river and its important role as the visual focus and landscape point of reference for the locality. As the only structure that crosses the river in the locality, the landmark quality of Grafton Bridge is accentuated by the exposed visual character of the river and its setting.

The river's edge is defined by the high levee banks that protect Grafton and South Grafton from periodic flooding of the river. The character of the river's edge varies throughout the study area. Between Grafton Bridge and Susan Island, boat sheds, launches, wharves and pontoons have been developed along the riverfront at both Grafton and South Grafton, which support the public recreation focus along this stretch of the river. Future implementation of Council's Grafton Waterfront Precinct Masterplan (March 2011) would see further development of this riverfront area for public recreation. East of Grafton Bridge, the riverfront has two distinct characters. The southern riverfront is defined by the open character of the agricultural floodplain, which consists of fields and scattered trees. The northern riverfront has a more developed character, with houses and gardens extending up to, and in a few cases, over the levee bank, as well as private moorings on the river. The concept plan for the Waterfront Precinct Masterplan is included in Appendix A.



Plate 2.9: The public riverfront at Grafton, west of Grafton Bridge.



Plate 2.10: The public riverfront at South Grafton, west of Grafton Bridge.



Plate 2.11: Agricultural floodplain along the southern riverfront east of Grafton Bridge

2.7 GRAFTON BRIDGE

Grafton Bridge is an iconic structure that is central to the image of Grafton as a river city. Completed in 1932, the bridge remains the only road and rail connection between Grafton and South Grafton. The bridge is the only one of its type in NSW and is listed on the State Heritage Register.

The distinguishing feature of the bridge is its double deck steel trusses, including a bascule span that would lift to allow ships to continue along the Clarence River. The bascule span is no longer in use. The upper deck of the bridge carries the road, while the lower deck carries the North Coast Railway Line. Two shared paths for pedestrians and cyclists are cantilevered from the trusses at the railway deck level.

The bridge consists of five truss spans about 74 metres long, and a bascule span of 23.2 metres. The steel trusses are supported by seven concrete piers that feature simple and robust detailing. The piers have distinctive rounded ends, a detail that has been carried through to the pier capitals and pile caps.

Grafton Bridge is 457 metres long (including two approach spans) and spans 396 metres of water. It is visually prominent in the local area not only due its size, but also because it is the only structure over the Clarence River. The bridge is located immediately east of Grafton and South Grafton and is their foremost built landmark, physically and visually connecting the two town centres.

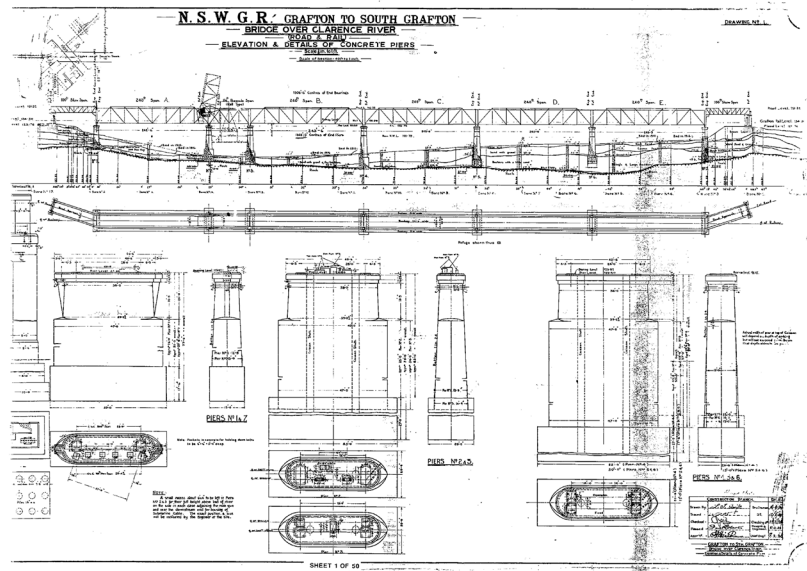


Plate 2.12: Construction drawings for Grafton Bridge, dated 1926.
(Source: Roads and Maritime)



Plate 2.13: Shared path on downstream side of Grafton Bridge



Plate 2.14: Double deck bascule span



Plate 2.15: Grafton Bridge

2.8 URBAN FORM

The two original urban settlements of Grafton and South Grafton are located on either side of the Clarence River, on the floodplain immediately adjacent to the river. The two towns were laid out with a regular square grid pattern of streets. However, although the proportions of the Grafton and South Grafton grids are essentially identical, their orientations differ slightly.

North of the river, the grid is a defining characteristic of the urban experience. With few exceptions, the urban area of Grafton conforms to the historical grid. Where the geometry of the grid is interrupted, for example at the road and rail viaduct approaches to the bridge, the effect is immediately apparent and is perceived in dramatic contrast to the uniform regularity of the grid.

South of the river, the historical grid is much less prevalent. Only the older parts of South Grafton, those areas closest to the river, are laid out on the original grid. The historical grid terminates at Cambridge Street, which cuts across the old grid and establishes a new, less regular, street grid to its south. South of Tyson Street, the grid geometry disappears altogether as the newer areas of South Grafton extend onto higher ground and an irregular street pattern of looping roads and cul-de-sacs prevails. While the Gwydir Highway conforms to the local urban patterns, being aligned with the historical grid, the other regional infrastructural elements in south Grafton - the railway line, the Pacific Highway and Bent Street (Summerland Way) - have their own individual geometries that cut across the local grain.

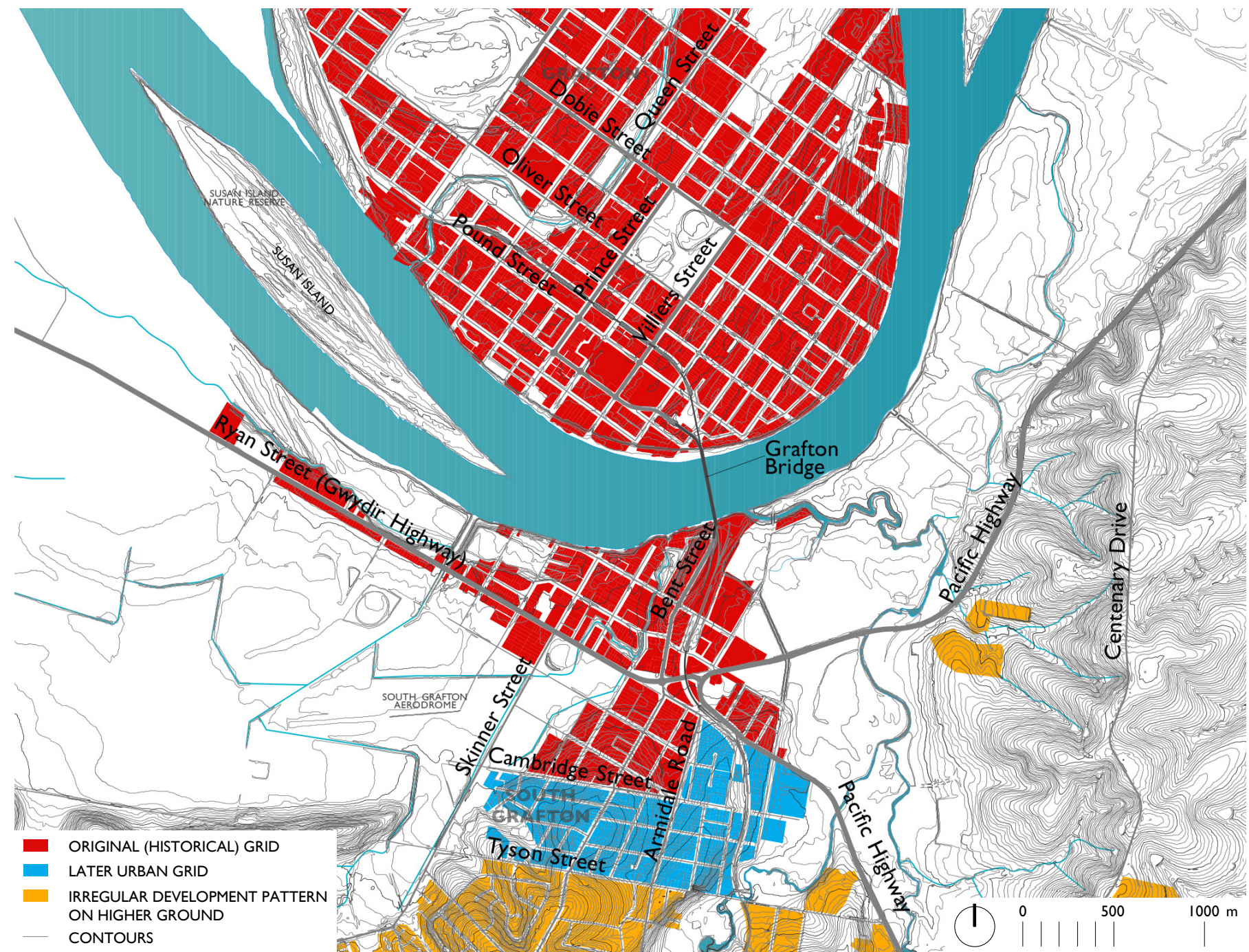


Figure 2.8: Urban settlement patterns

2.9 TWO TOWN CENTRES

North of the river, Grafton has a clearly defined urban core with the primary commercial activities centred along the traditional main street of Prince Street. Running perpendicular to Prince Street, Victoria Street is Grafton's civic street, where much of the town's administrative and institutional activities are concentrated. Highway-related businesses are located along Fitzroy Street, which also runs perpendicular to Prince Street to bring traffic off the bridge in to the main commercial street. While the recently redeveloped Grafton Shopping World, located on Fitzroy Street, has shifted some of the commercial and retail focus away from the 'main street' environment (Prince Street) to an internalised shopping mall, its close proximity to Prince Street and connecting arcade has helped to keep the town centre intact.

South of the river, Skinner Street is the historical main street of South Grafton. Like Prince Street north of the river, Skinner Street provides a strong, direct, connection to the river and public open spaces along the foreshore. However, in contrast to the cohesive town centre north of the river, South Grafton's town centre has been fractured by successive developments that have eroded the commercial—and hence to a certain extent, civic—relevance of the historical main street. The siting of the current bridge crossing outside of town had the effect of disconnecting South Grafton's main street from the regional transport network. This is likely to have contributed, at least in part, to the gradual decline of South Grafton's town centre. While Fitzroy Street brings traffic off the bridge directly into Prince Street in Grafton, its counterpart in South Grafton—Bent Street—parallels Skinner Street and allows potential passing trade to bypass the main street. The subsequent development of highway commercial and retail businesses—as well as light industrial activities—along Bent Street and the Pacific Highway has shifted South Grafton's commercial focus from the historical main street to the highway environment.

CHARACTER

A defining characteristic of the two town centres of Grafton and South Grafton is their physical separation by the Clarence River. As previously discussed, both town centres were originally laid out on a square grid, with strong connections between the main commercial streets and the river itself. The relationships between Clarence River, the urban form created by the grid and the transport infrastructure of highway and railway have established the key distinguishing features of the urban landscape character of the town centres. These are:

- The experience of infrastructure in the town centres.
- The wide gracious streets in the town centres.
- The town centres' connection to the Clarence River.

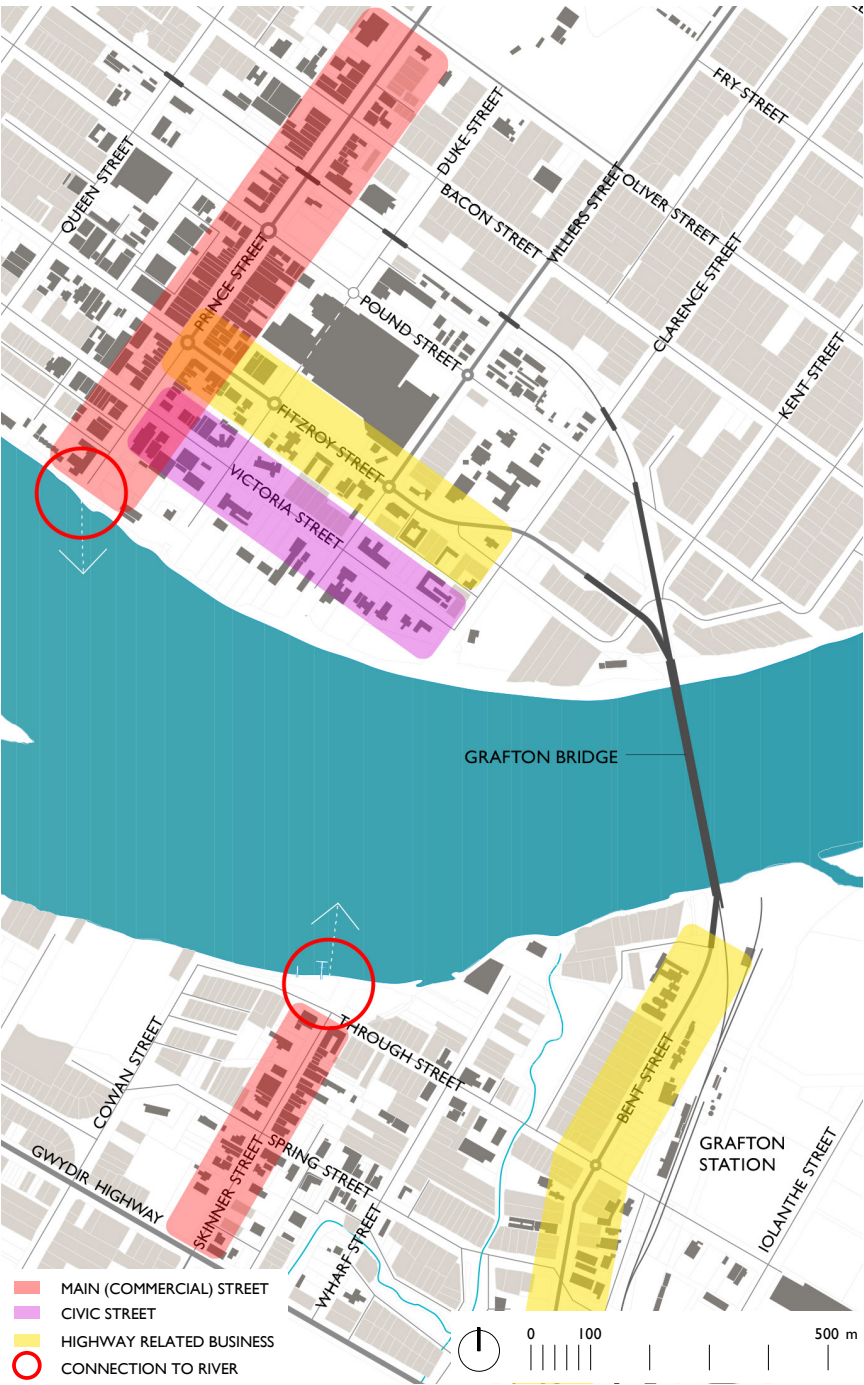


Figure 2.9: Two town centres



Plate 2.16: Representative streetscapes in Grafton and South Grafton town centres

THE EXPERIENCE OF INFRASTRUCTURE

The prevalence of transport infrastructure elements in the urban landscape is a defining aspect of the city's urban character. This is particularly the case north of the river in Grafton, where the low-lying land at the river's edge has necessitated the use of viaduct (bridge) structures to elevate both the road and railway approaches to Grafton Bridge. The long viaduct structures at the river's edge are a distinctive and memorable part of Grafton's urban landscape.

The corridor of elevated railway between Bacon Street and Pound Street is also a distinctive characteristic of Grafton's urban landscape. The railway line is elevated on a high embankment that parallels the street grid, forming a physical barrier that generally defines the extent of Grafton's commercial core. Where the railway embankment intersects the local street grid, railway bridges provide permeability for vehicular and pedestrian movement below. These railway bridges are a distinctive component of the experience of Grafton's local streets, creating memorable thresholds between the town centre and the outlying residential areas.

While the visual and physical presence of transport infrastructure is a dominant quality of Grafton's urban character north of the river, it is not a defining characteristic of South Grafton. This is because, unlike the area north of the river, the topography in South Grafton has enabled both Bent Street and the railway line to remain on natural ground as they approach the bridge crossing. The only piece of elevated infrastructure in South Grafton is the curving railway viaduct over the Gwydir Highway, which creates a memorable landmark at the highway entry to town.

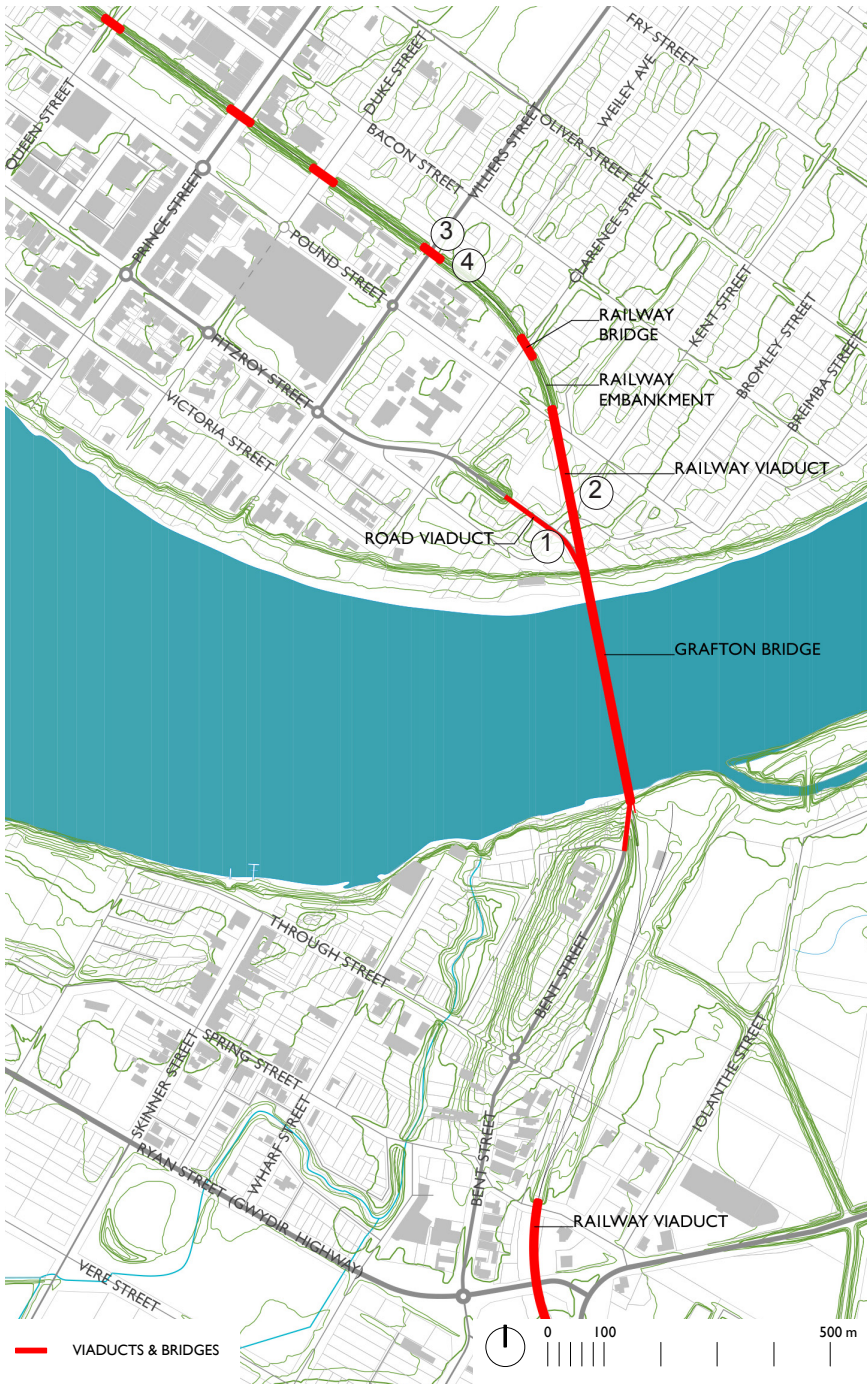


Figure 2.10: Infrastructure elements



Plate 2.17: Road viaduct, Grafton.



Plate 2.18: Railway viaduct, Grafton with road viaduct & Grafton Bridge beyond.



Plate 2.19: Railway bridge over local road, Grafton.



Plate 2.20: Railway embankment, Grafton.

2.10 ESTABLISHED RESIDENTIAL AREAS

The established urban residential areas of Grafton and South Grafton are directly connected to the two town centres. The urban and landscape character of these areas is defined by the pattern of the street layouts and the combination of building types, planting and road formation that make up the streetscapes.

As previously discussed in section 2.4 – Urban form, the residential areas of Grafton are laid out according to the historical grid, while the established residential areas of South Grafton were laid out in three clearly distinguishable patterns: the older areas closer to the town centre conform to the original grid, a second grid defines the area south of Cambridge Street, while the newer areas south of Tyson Street have an irregular street pattern of looping roads and cul-de sacs.

The housing stock in the established residential areas vary in age, with the older homes generally located closest to the town centres, and the post-war and later homes generally located further north and south of the two town centres. The established residential areas are also generally characterised by established gardens, with front gardens visible to the street. The streets themselves generally have sealed roads with unformed edges (no kerbs) and wide grassy verges. Many are lined with mature street trees.

The overriding character of this landscape type is that of informal streets with established houses and gardens, which is in keeping with the urban character of a genteel provincial town.



Plate 2.21: Representative streetscapes and residential buildings in established residential areas in Grafton and South Grafton

WIDE, GRACIOUS STREETS

The two town centres at Grafton and South Grafton have a distinctive character that has been directly influenced by the proportions of the historical urban grid. The historical grid has created the wide, generously scaled, light-filled streets and the long avenue vistas that characterise the urban experience of the town centres. Extensive avenue tree plantings enhance the landscape character of the streets and are highly valued aspects of the town centres' urban character.

Integral to Grafton's identity as a genteel provincial centre are its wide, gracious tree-lined streets. Grafton's Jacaranda Festival, held annually in late spring, centres on the visual spectacle provided by hundreds of jacaranda street trees (*Jacaranda mimosifolia*) in full bloom. Inaugurated in 1935, Grafton's festival is the country's longest-running floral festival, and is a source of great civic pride for the city. Grafton's streets are also lined with many other types of trees, predominantly tropical or sub-tropical species, that make a significant contribution to the stately character of the city's streets. Of particular note are the large fig trees found in and around the civic centre (Victoria Street), and the fig avenue in Breimba Street.

While the character of South Grafton's streets does not figure as prominently in the popular perception of the city, the streets in the town centre nonetheless possess a genteel character, lined with trees and Victorian buildings that are similar to that of Grafton's streets.

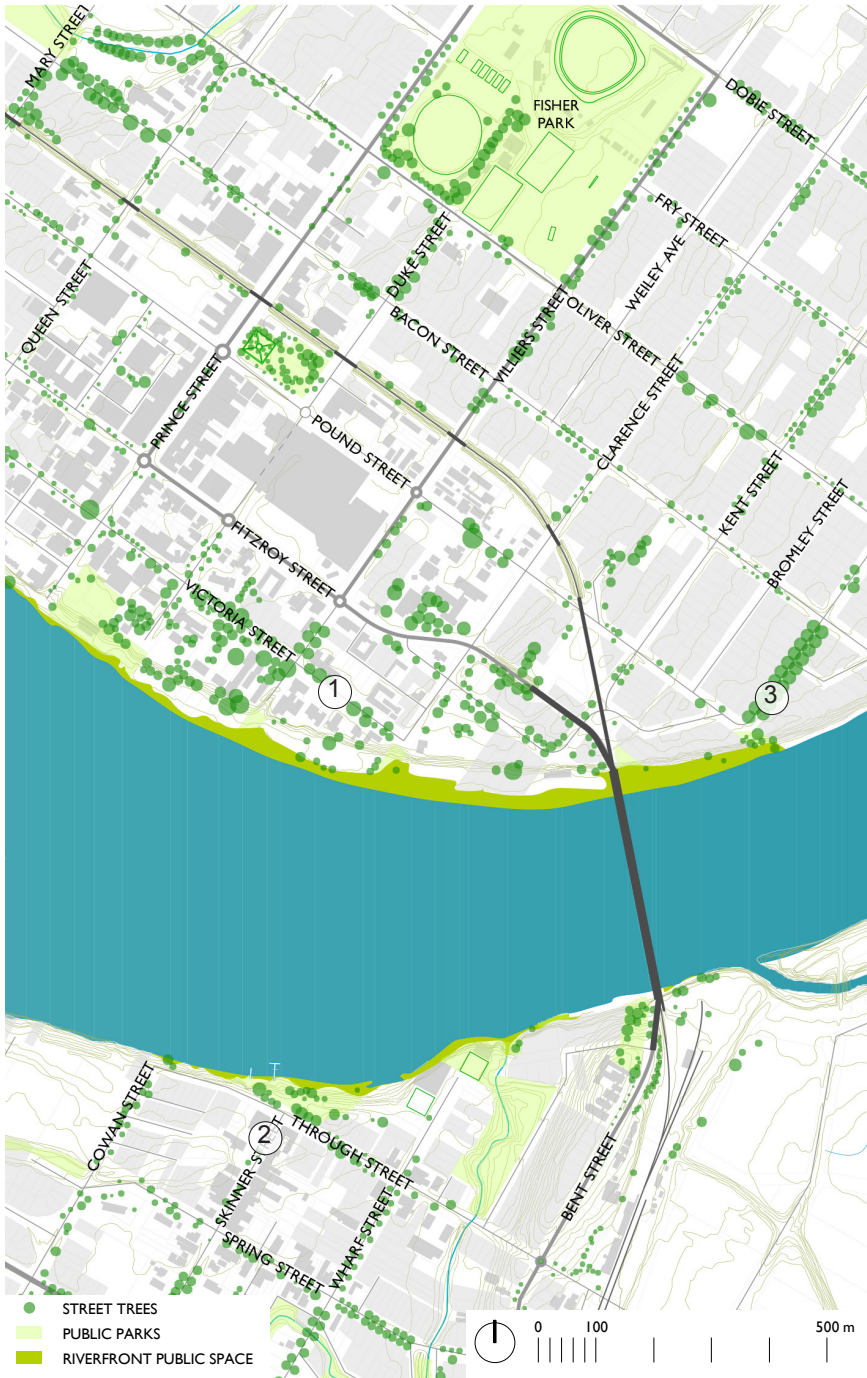


Plate 2.22: Victoria Street, Grafton



Plate 2.23: Skinner Street, South Grafton



Plate 2.24: Fig-lined avenue at Breimba Street, Grafton

2.11 INDUSTRIAL AREAS

The primary areas of industrial activity in Grafton and South Grafton are generally concentrated around the regional road and rail corridors. The character of these areas is distinguished by large industrial buildings, often surrounded by large open yards. The large scale of the buildings and their associated yards is in marked contrast to the surrounding smaller-scaled residential and commercial areas of Grafton and South Grafton.

The characters of the industrial buildings vary, with the newer industrial buildings typically being “big box” warehouse developments that are designed to be flexible and accommodate a range of different uses. As such, they tend to be visually homogeneous and somewhat anonymous. The older industrial buildings tend to be use-specific. As such, they tend to have a more distinctive architecture that in some cases, for example the sugar loading facility at South Grafton, have become prominent landmarks for the town.



Plate 2.25: Sugar loading facility in South Grafton and representative examples of industrial developments in Grafton and South Grafton.

2.12 RURAL HINTERLAND

The urban areas of Grafton and South Grafton are surrounded by agricultural areas that comprise the city's rural hinterland. This landscape type has two distinctive characters—the flat open country on the floodplain immediately south of the Clarence River, which is visually exposed and connected to the river; and rolling hills as the land rises further to the south, which have a more enclosed character with long-range views to the river and town.

The rural hinterland is distinguished by the geometric layout of the agricultural fields, which establishes a regular pattern across the landscape irrespective of topography. The geometry of the property boundaries is clearly visible in the landscape through the long straight roads, the fence lines and lines of trees that follow the patterns of land division.



Plate 2.26: View from elevated land along Centenary Drive, across the agricultural floodplain to the newly developing residential areas along Grafton's riverfront.



Plate 2.27: View from elevated land along Centenary Drive, across the agricultural floodplain to Grafton Bridge.

2.13 OPEN SPACE AND RECREATION

Both Grafton and South Grafton are well served by recreational public open spaces. In addition to their public parks, both town centres are directly connected to the Clarence River and the recreational opportunities it affords. The primary public riverfront spaces on both sides of the river are located between the existing bridge and Susan Island, and this section of the river is highly valued as the focus of water-based recreational activities and public events.

The public waterfront on the southern side of the river includes the wharf at Skinner Street, and the bowling club and Ex-Servicemen's Club at Wharf Street. The public waterfront on the northern side of the river incorporates a number of recreational facilities, including a jetty, boat ramp and rowing club at Prince Street and the sailing club at Fitzroy Street. This part of the riverfront also includes a substantial amount of privately-owned land, situated between residential and church properties along Victoria Street and the river. Council's Grafton Waterfront Precinct Masterplan (March 2011) aims to develop continuous public access along the foreshore between Clarence Street and Queen Street, to improve the public recreational amenity of this stretch of the river.

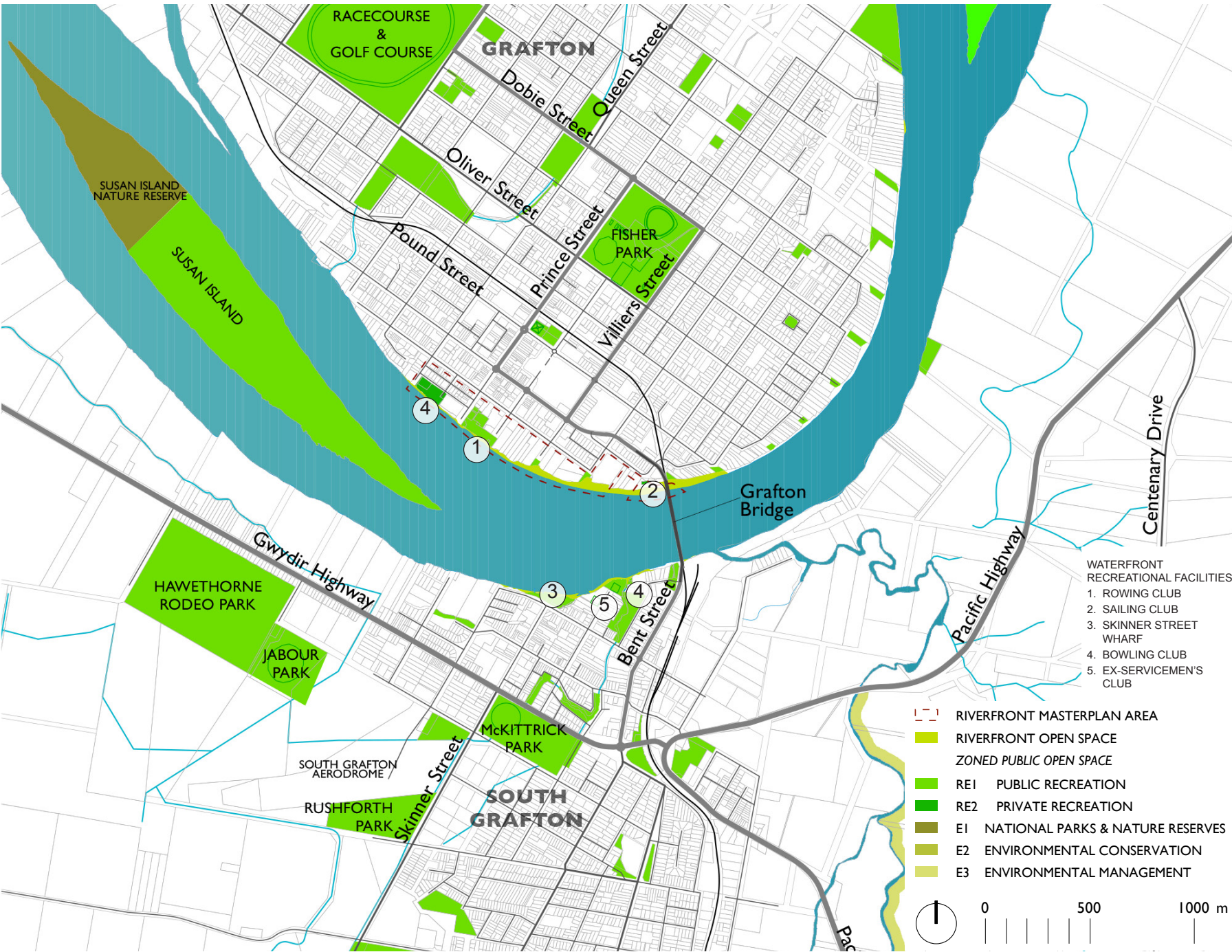


Figure 2.12: Recreation and Open Space areas

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3 PROJECT DESCRIPTION

This chapter provides an outline of the engineering components and design standards used in the development of the concept design of the project, as illustrated in Figure 3.1. A description of the project is provided in Chapter 5 and Chapter 6 of the Environmental Impact Statement. The main components of the Grafton Bridge project include:

- Bridge design, including pedestrian and cycle path.
- Road design.
- Levee upgrade works.

The main elements of the project are shown in Figure 3.1 and Figure 3.2 on the following pages. The description and assessment of the impacts of the levee upgrade works are provided separately in the Environmental Impact Statement.

3.1 PROPOSED BRIDGE AND APPROACH ROADS

BRIDGE DESIGN

The project has been designed in accordance with the Australian Standard for Bridge Design (AS 5100). The general bridge parameters and engineering criteria are summarised below:

- Construction of a new bridge over the Clarence River about 70 metres downstream (east) of the existing road and rail bridge.
- An approach viaduct, about 58 metres long, on the South Grafton side of the Clarence River and 29 metres long on the Grafton side.
- Construction of a single pedestrian and cycle path on the upstream (western) side of the proposed bridge, to provide connectivity between Grafton, South Grafton and the new bridge.
- Construction of new pedestrian links to connect the new bridge with the existing bridge.
- Ancillary facilities required for the construction of the project, including some or all of the following: site compounds, concrete batching plant, pre-cast facilities, and stockpile areas for temporary storage of materials.

ROAD DESIGN

The road works component of the project has been designed in accordance with Austroads - Guide to Road Design. The proposed road works components are summarised below:

- Construction of a new road to link the new bridge with Iolanthe Street in South Grafton.
- Construction of a new road to link the new bridge with Pound Street in Grafton.
- Upgrades to the road network in Grafton to connect the new bridge to the existing road network, including:
 - Widening Pound Street to four lanes between Villiers Street and the approach to the new bridge
 - Providing traffic signals at the intersection at Pound Street and Clarence Street
 - Closing Kent Street where it is crossed by the bridge approach road
 - Realigning and lowering Greaves Street beneath the new bridge
 - Realigning Bridge Street to join directly to the southern part of Pound Street (east of the new bridge approach). There would be no direct connection between Pound Street south and the new bridge approach
 - Widening Clarence Street to provide formal car park spaces
 - Minor modifications to the existing Dobie Street and Villiers Street roundabout.

- Upgrades to the road network in South Grafton to connect the new bridge to the existing road network, including:
 - Widening Iolanthe Street to four lanes
 - Widening the Gwydir Highway to four lanes between Bent Street and the Pacific Highway
 - Realigning the existing Pacific Highway to join Iolanthe Street near Through Street
 - Providing a new roundabout at the intersection of the Pacific Highway and Gwydir Highway
 - Providing a new roundabout at the intersection of Through Street and Iolanthe Street
 - Limiting Spring Street and the Old Pacific Highway to left in and left out only where they meet Iolanthe Street
 - Realigning Butters Lane.
- Replacement of the existing three span concrete arch rail viaduct which crosses Pound Street in Grafton with a single span steel truss bridge.
- Provision of two signalised pedestrian crossings in South Grafton to improve safety for pedestrians crossing Iolanthe Street and Gwydir Highway.
- Provision of designated car park spaces in Pound Street and Clarence Street, including some off street parking, to maintain a similar number of existing car park spaces currently available in those two streets.
- Construction of a permanent stormwater detention basin and pump station in Grafton to manage local flooding.
- Public utilities adjustment.
- Architectural treatments for noise mitigation, as required, where feasible and reasonable and in agreement with affected property owners.
- Ancillary facilities required for the construction of the project, including some or all of the following: site compounds, concrete batching plant, pre-cast facilities, and stockpile areas for materials and temporary storage of spoil and mulch.

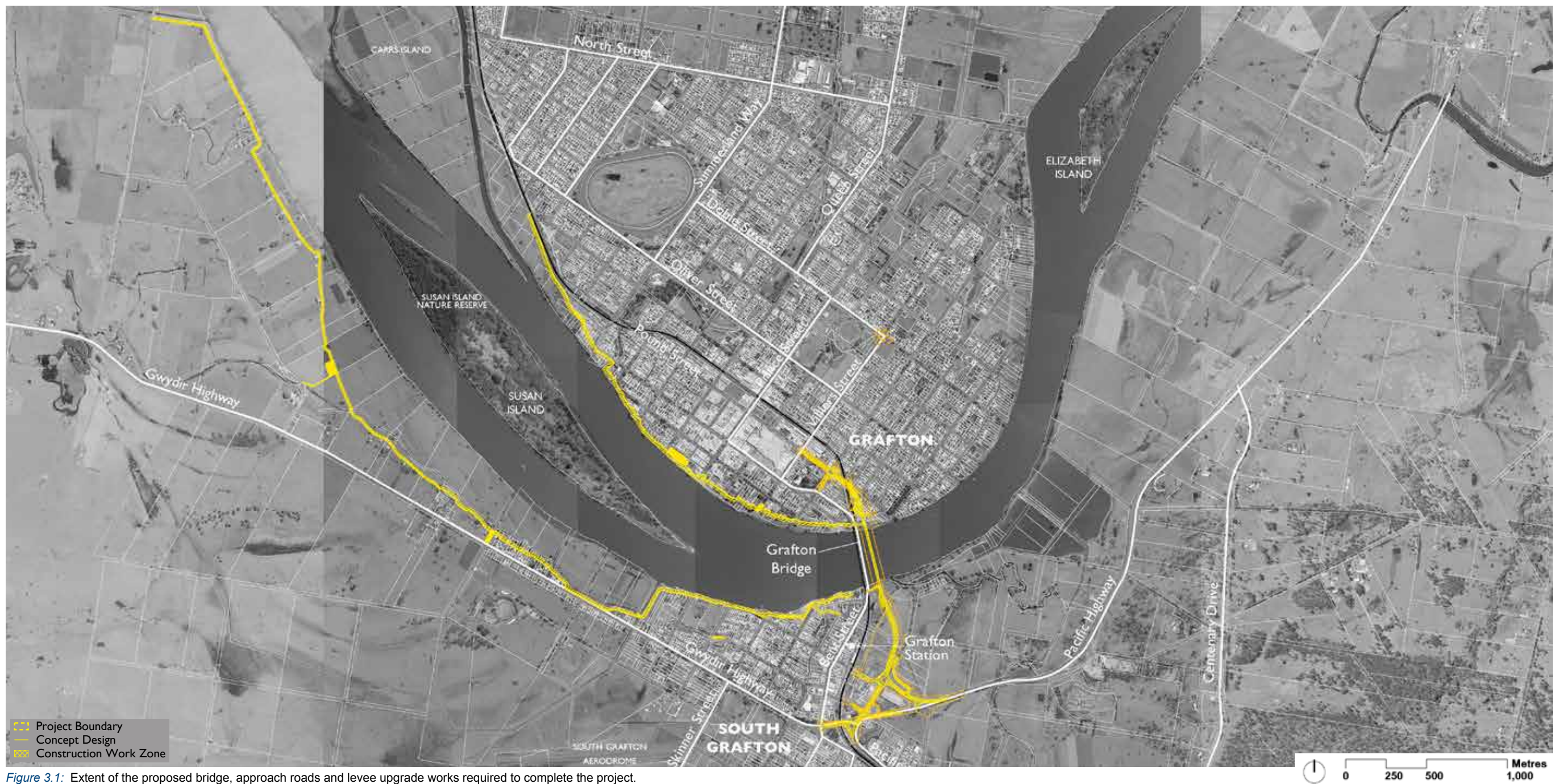


Figure 3.1: Extent of the proposed bridge, approach roads and levee upgrade works required to complete the project.



Figure 3.2: Proposed bridge and road design plan, sheet 1 of 5.



Figure 3.3: Proposed bridge and road design plan, sheet 2 of 5.





Figure 3.5: Proposed bridge and road design plan, sheet 4 of 5.



Figure 3.6: Proposed bridge and road design plan, sheet 5 of 5.

4 PROJECT CONTEXT

The location of the proposed bridge over the river influences the route for the approach roads and their relationship to the existing urban fabric, physical structure and experience of the Grafton area by residents and tourists. This chapter provides an identification and discussion of the key landscape and urban design factors that are likely to be affected by the location of the proposed bridge and approach roads in Grafton and South Grafton. This discussion will be the basis for understanding how the Objectives and Principles were developed for the project that are described in Chapter 5.

The key aspects of the project area that are likely to influence the urban and landscape design of the project and help define the landscape character include:

- River setting
- Aboriginal heritage and cultural values
- Non-Aboriginal heritage and cultural values
- Vegetation and habitat
- Urban character and landscape
- Recreational values of the Clarence River
- Arrival points
- Activity generators
- Pedestrian and cyclist connectivity
- Property and built form.

These are discussed in the following sections.

4.1 PROPOSED BRIDGE AND APPROACH ROAD CONTEXT

RIVER SETTING

The strong connection between the main streets and the riverfront is a distinguishing characteristic of both Grafton and South Grafton's town centres. Both Prince Street and Skinner Street lead directly to the primary riverfront public spaces on either side of the Clarence River. Skinner Street also leads directly to the section of the river between Susan Island and Grafton Bridge, which is the primary recreational and special event space for Grafton.

The visual relationship between Grafton and the Clarence River is fundamental to the urban experience of the town and is illustrated in Figure 4.1. This vital relationship is clearly identified and supported by the Clarence River Way Masterplan (2009), which refers to Grafton as the "River City" and aims to further develop the public recreational values of the riverfront between the existing bridge and Susan Island.

East (downstream) of Grafton Bridge, the relationship between the city and the river has a much less public focus. Residential properties occupy much of the river's northern frontage and public access is limited to the ends of the streets that lead down to the river. On the southern side of the river, the area east of the bridge is occupied by private agricultural land.

As the dominant visual feature on the Clarence River, Grafton Bridge is a key urban landmark that contributes significantly to the identity of the town. There are two primary types of views to the bridge: proximate views from the riverfront public spaces at Grafton and South Grafton, and long range views from elevated vantage points throughout the district, primarily south of the Clarence River.

The views of the town from the bridge are also an important component of the urban experience of Grafton, providing a strong visual sense of the relationship between the town and the Clarence River. The best views from the bridge of the river and the adjoining foreshores are from the two pedestrian and cyclist paths, located at the rail deck level on either side of the bridge. The views from the train are partially screened by the bridge's steel trusses, and the motorists' views from the road deck level are partially obscured by the bridge parapet.

← Direct view point
 - - - Distant view point

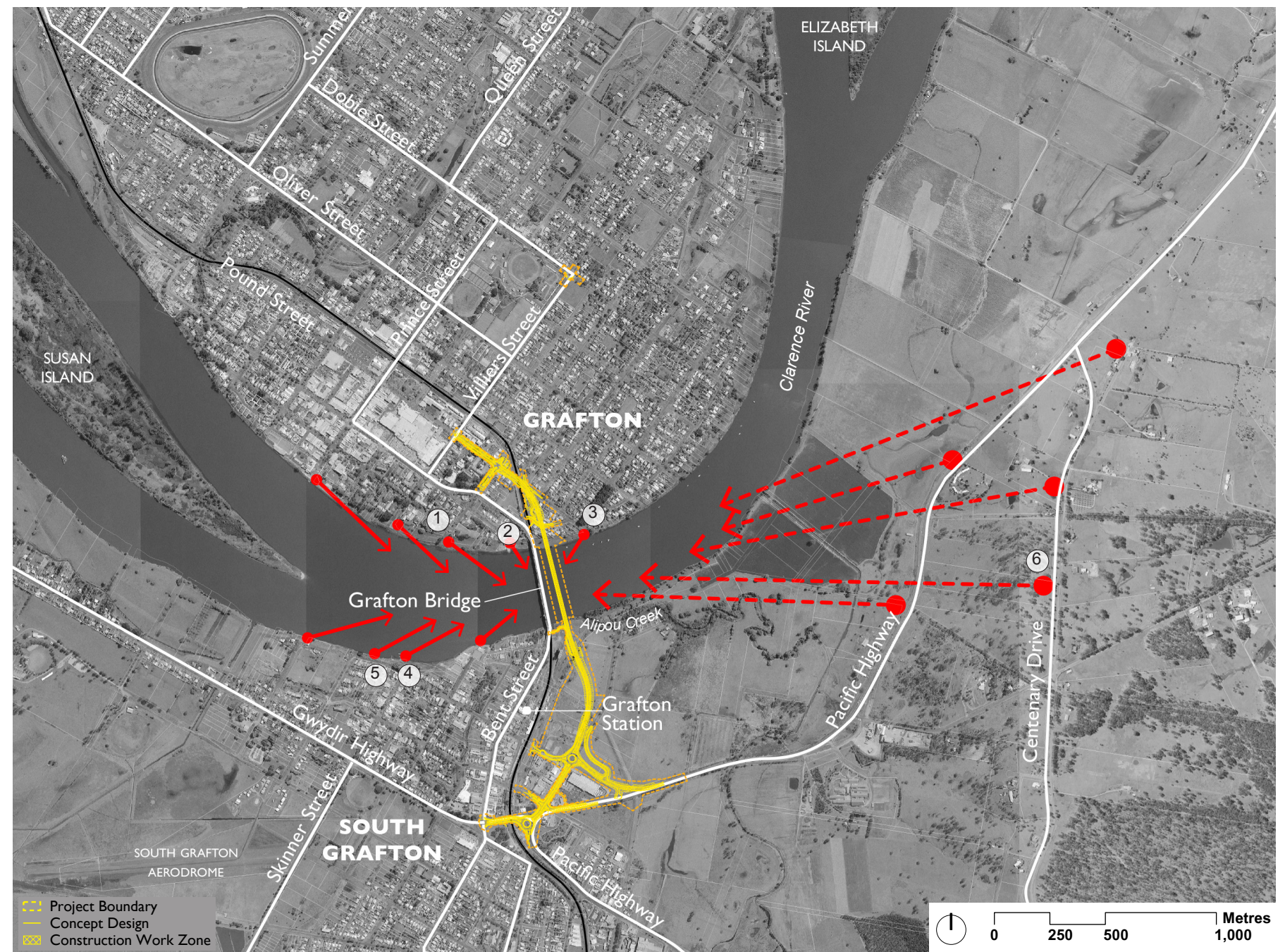


Figure 4.1: Key view points from Grafton and South Grafton of the existing bridge in the context of the proposed project



ABORIGINAL HERITAGE AND CULTURAL VALUES

The Clarence River and the mouth of the Alipou Creek have been identified by the local Aboriginal community as having strong Aboriginal cultural values which need to be recognised and protected. Specifically, Alipou Creek and the Golden Eel site hold great significance to the Aboriginal community. Site investigations have identified that the project is located in areas of low archaeological potential in Grafton and South Grafton; these are shown on Figure 4.2.

Ensuring that the South Grafton side of the proposed bridge and approach roads are sensitively integrated into this highly valued cultural landscape will be an important consideration in the urban design of the project.



Figure 4.2: Aboriginal heritage in the context of the proposed project

NON ABORIGINAL HERITAGE AND CULTURAL VALUES

There are a range of non-Aboriginal heritage and associated cultural values to be considered as part of the proposed bridge and approach roads. The majority of the developed urban area in Grafton and South Grafton is located within a heritage conservation area, as is illustrated on Figure 4.3. Grafton is also the 'Jacaranda City' and hosts the annual Jacaranda Festival which is a major tourism attraction to the Grafton area.

Most of the potential impacts of the project on non-Aboriginal heritage items are located in Grafton. These items are of local heritage significance and include:

- The TAFE and two residential properties on Pound Street would be indirectly and directly impacted by the project
- The rail viaduct where it crosses Pound Street would be directly impacted by the project
- Several residential properties in the Kent/Greaves Street area would be directly impacted by the project
- A number of heritage listed tree species, specifically jacarandas and figs would be directly impacted by the project.

In contrast, there are no areas of listed heritage value in South Grafton that will be directly affected as part of the proposed bridge and approach roads. Site investigations for the project identified the train car turntable, near the Sugar Loading Facility, as having heritage value and it could be partially impacted by the project. Otherwise, the nearest listed heritage item is Grafton Station and the existing Grafton Bridge, which are both State heritage listed items.

Careful consideration of the heritage values in both Grafton and South Grafton will need to be carefully integrated into the project, in particular the visual relationship between the proposed bridge and the existing State heritage listed bridge.

- State Register Heritage Listed Items
- CVLEP 2011 Heritage Conservation Area
- CVLEP 2011 Heritage Listed Items
- CVLEP 2011 Heritage Listed Significant Tree
- National Trust Listed Items
- Heritage Item Identified During Project Investigations



Figure 4.3: Non Aboriginal heritage in the context of the proposed project

VEGETATION AND HABITAT

The developed parts of the Grafton area are relatively urbanised. A variety of different tree species and vegetation communities provide habitat for a broad variety of species, including a number of threatened species that have been recorded in the area.

The foreshore of the Clarence River and Alipou Creek provide a range of different vegetation communities. Whilst most of this foreshore area contains weeds and exotic species, there are locations where recognised culturally important trees, such as jacaranda and flame trees, have established themselves. These contribute to the overall character of the area.

Minimising impacts on the local biodiversity and recognised culturally important trees will need to be carefully considered as part of the project. Opportunities to incorporate culturally important trees into the landscape design should also be considered.

- Recorded threatened fauna species
- Hollow-bearing tree
- Degraded riparian forest (EEC)
- Potential drainage soak (EEC)
- Reedland (EEC)
- Remnant eucalypt (EEC)
- Melaleuca plantation
- Native and exotic planting
- Native revegetation
- Planted fig
- Weeds and exotic

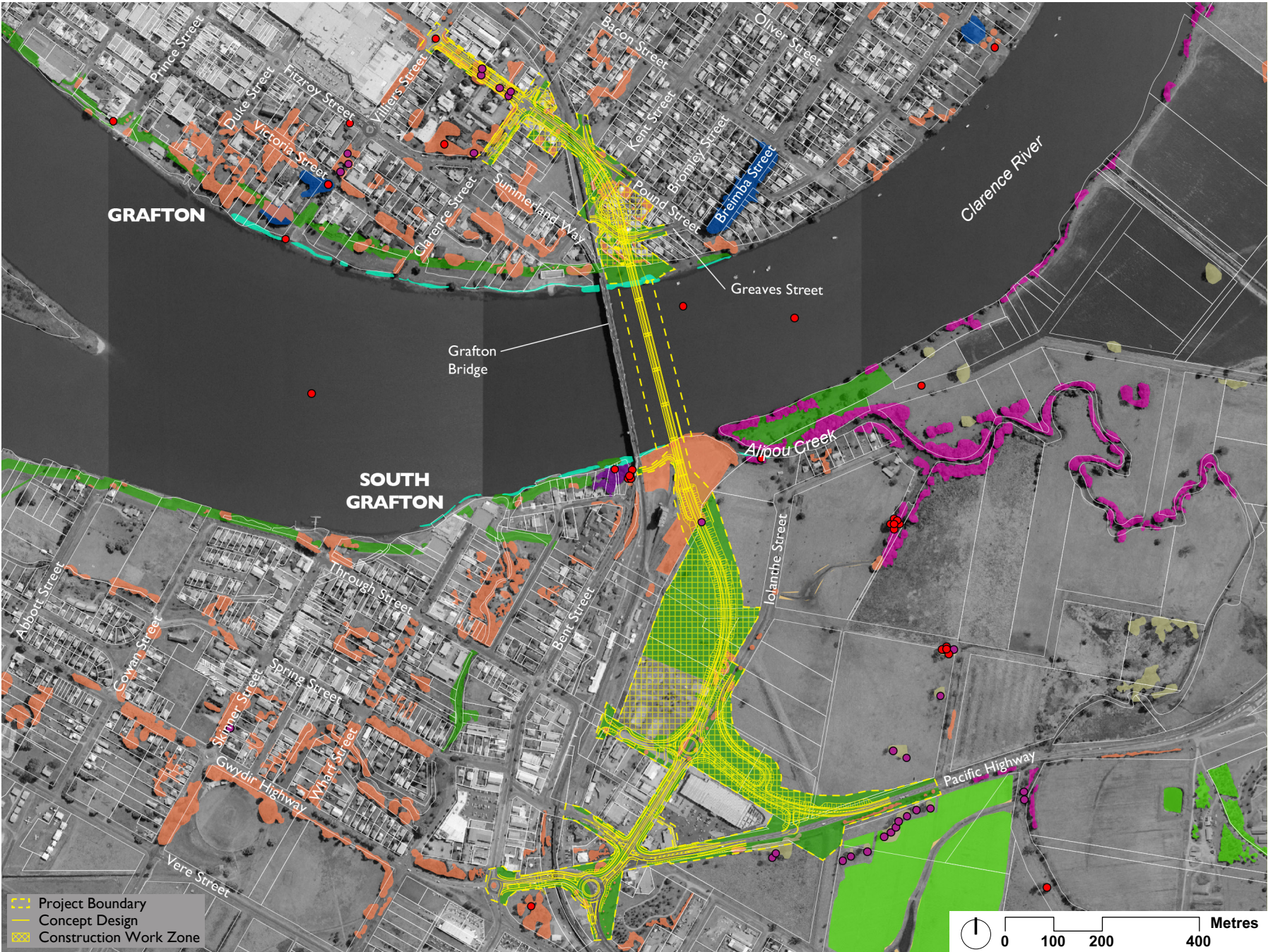


Figure 4.4: Vegetation and habitat in the context of the proposed project

URBAN CHARACTER AND LANDSCAPE

There are a number of distinct landscape character types in Grafton, each distinguished by its particular combination of land use, topography and built form. The relationship between these landscape character types is an important aspect of the urban experience of the town. Based on site assessment and desktop review, the primary landscape character types in Grafton that are likely to be affected by the project are:

- The Clarence River
- The two town centres of Grafton and South Grafton, which form the civic and commercial urban cores on either side of the river
- The established residential areas immediately connected to the town centres, with housing stock of varying ages
- Industrial areas generally situated along primary regional transport routes and on the outskirts of town
- The rural hinterland, consisting of low-lying river floodplain and rolling hills, with intermittent buildings in the landscape.

- Town Centre
- Established Residential
- Industrial
- Rural Hinterland

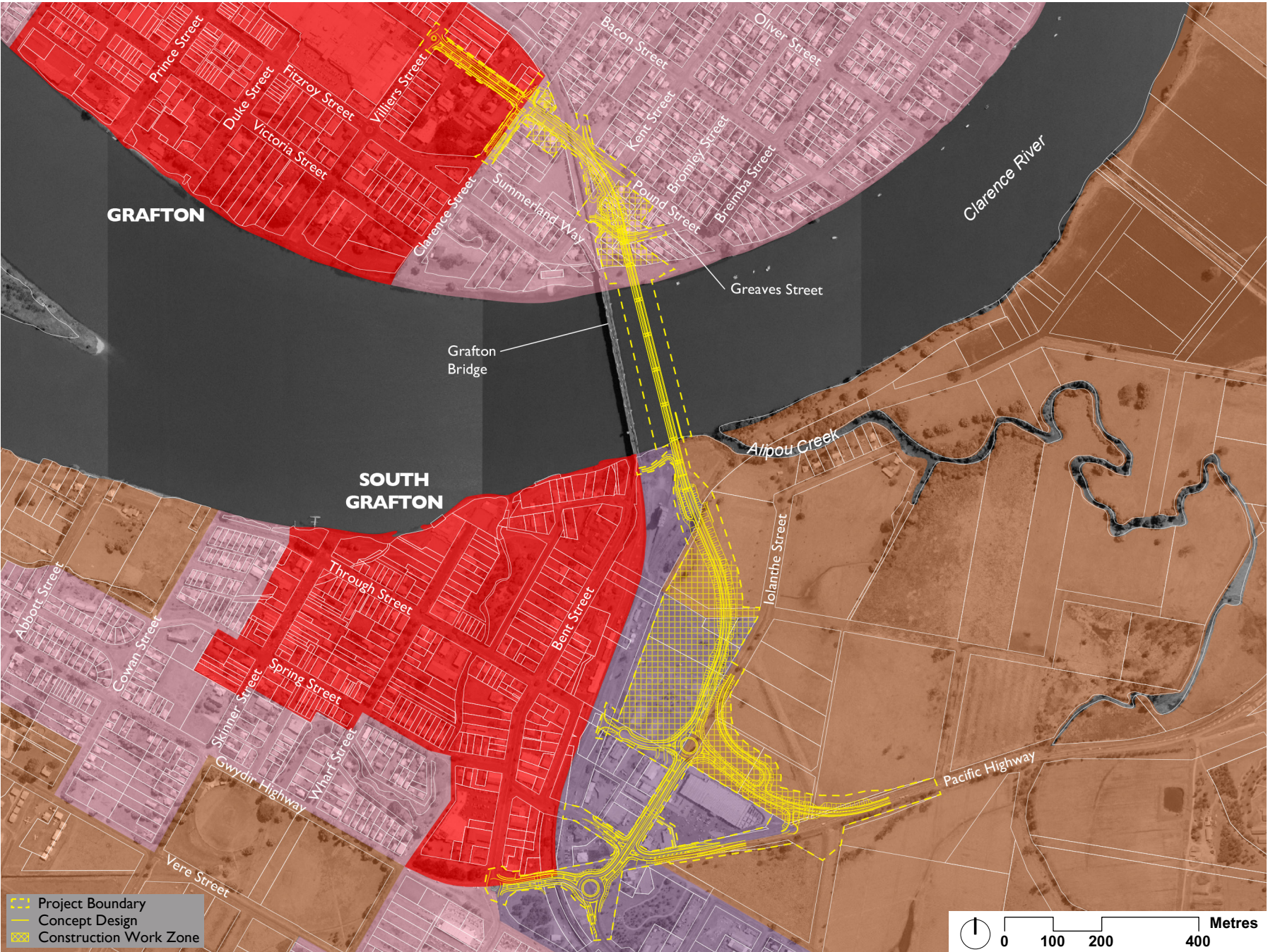


Figure 4.5: Urban character areas in the context of the proposed project

RECREATIONAL VALUES OF THE CLARENCE RIVER

West of the existing bridge, the stretch of river up to Susan Island is the primary location for river-related town festivals and sporting events. Activities include: water skiing, including the famous Bridge to Bridge Ski Race held annually in October; rowing, including the Clarence Schools Head of the River Regatta; wakeboarding; dragon boat racing; sailing; and fishing.

In addition, Council’s Grafton Waterfront Precinct Masterplan (Mar 2011) aims to further develop the public recreational values of the riverfront between the existing bridge and Susan Island. The concept plan for the Masterplan is included in Appendix A.

The recreational values of the river to the east of the existing bridge has a more private focus, with the residential properties fronting the river having moorings along the northern banks. Due to current navigational clearances, boats with a total height greater than 8.5m, are limited to the stretch of river east (downstream) of the existing bridge. If the current recreational amenity of this stretch of the river is to be maintained, the height of any proposed bridge in this area would need to allow for the passage of boats, which NSW Maritime indicate is 9.1m above Mean High Water Springs upstream of Pound Street.

Foreshore areas with potential for future public open space improvement in Grafton may be affected by the proposed bridge passing overhead and would require specific design consideration to retain suitable recreational amenity for future foreshore users.

- Main Street
- River Connection
- Public park
- Riverfront Parkland
- Street Tree
- Grafton Waterfront Precinct
- Primary River Recreation Area
- NSW Maritime Navigable Channel

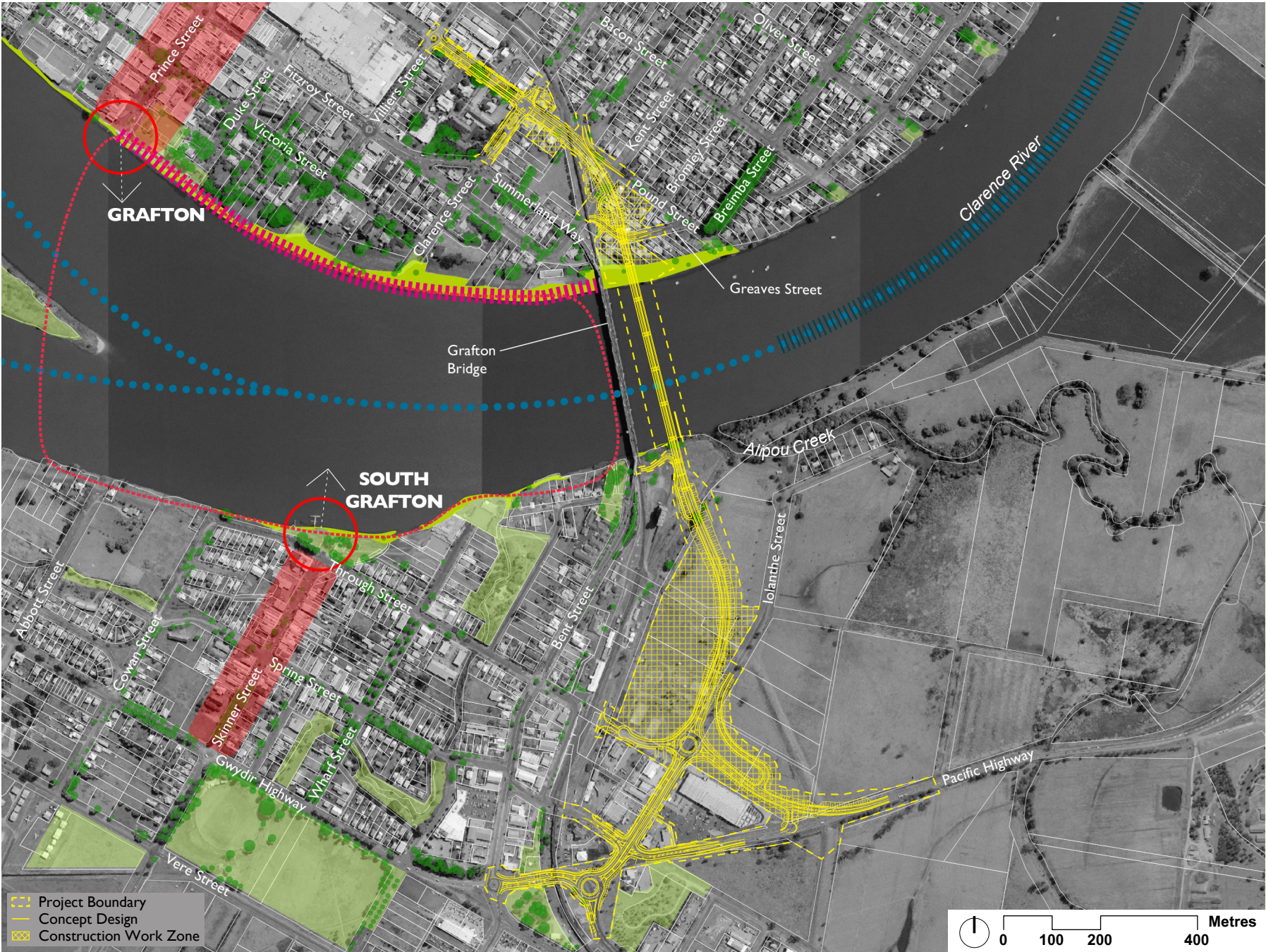


Figure 4.6: Recreational areas in the context of the proposed project

ARRIVAL POINTS

The proposed bridge and approach roads will create new arrival points in both Grafton and South Grafton. Like the existing Grafton arrival point the new entry in Grafton will see the TAFE as a key built element in the setting. Developing a notable entry character to this arrival point will need to be incorporated into the approach road design.

The arrival points in South Grafton will now be split between the two new roundabouts. The northern roundabout will announce the arrival for travellers heading south from Clarenza and the Pacific Highway. Whilst the roundabout at the intersection of the Gwydir Highway and Pacific Highway will be the main arrival point for travellers from the west and south. Ensuring these intersections appropriately identify these arrival points will need to be a key element of the proposed approach road design.

✱ Arrival Point



Figure 4.7: New arrival point based on the proposed project

ACTIVITY GENERATORS

The location of major commercial activity attractors on both sides of the river, particularly Grafton Shopping World to the north of the river and bulky goods retailers such as Bunnings Warehouse to the south of the river, has resulted in dispersed urban activity. Additionally, the Grafton TAFE along with other school campuses in both Grafton and South Grafton generates substantial vehicular traffic across the bridge on school days.

RMS’s 2011 Heavy Vehicle Study found that 97% of the traffic currently using Grafton Bridge is local traffic, with an origin and/or destination in Grafton or South Grafton. The other 3% of vehicles comprises regional traffic passing through to other destinations.

Developing an appropriate urban design response to meet the needs of these activity generators while accommodating a range of local and regional vehicular traffic, as well as pedestrian and cyclists, will require careful consideration.

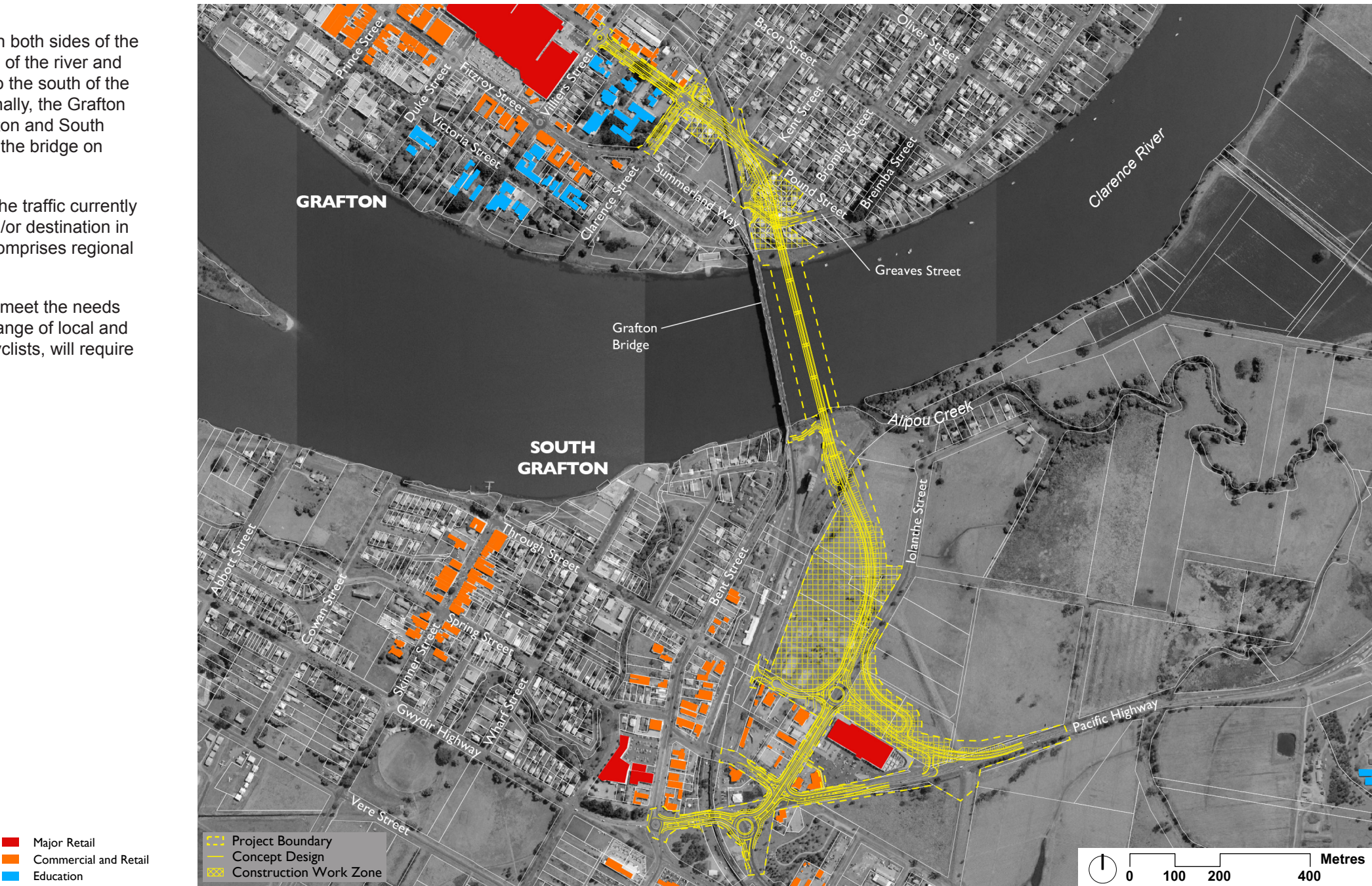


Figure 4.8: Main activity generator locations in the context of the proposed project

PEDESTRIAN AND CYCLIST CONNECTIVITY

The existing Grafton Bridge currently provides the only pedestrian and cyclist connection between Grafton and South Grafton. Pedestrian and cyclist access is currently provided by the shared paths on either side of the existing Grafton Bridge along the regional Coastline Cycleway. In South Grafton the cycleway continues along the western side of the railway corridor to the railway station and then continues south.

The project will provide additional pedestrian and cyclist access between Grafton and South Grafton, improving connectivity to primary destinations in Grafton and South Grafton. The proposed pedestrian and cycle path would be an off road path. Signalised pedestrian and cyclist crossings would be provided at the intersection of Pound and Clarence streets in Grafton, and mid-block signalised crossings on Iolanthe Street and on the Gwydir Highway in South Grafton.

In Grafton, the existing regional Coastline Cycleway route will be impacted along Kent Street. This route could be realigned through the project area along Pound Street and Greaves Street to access both the proposed bridge and the existing bridge.

Improved access which is more efficient and minimises conflicts with vehicles is a key design consideration for the project. Improving the amenity for pedestrians and cyclists travelling between Grafton and South Grafton, and improving safety through improved passive observation are also a key design consideration.



- Existing RMS Regional Coastline Cycleway Route
- Proposed RMS Regional Coastline Cycleway Route
- Proposed CVC Recreational/Off-road Route



Figure 4.9: Pedestrian and cyclist connections in the context of the proposed project

PROPERTY AND BUILT FORM

The proposed bridge and approach roads would have a substantial impact on properties in Grafton, and some impacts on properties in South Grafton. Around 30 properties may require full acquisition and another 20 may require partial acquisition. Of the properties that would be fully acquired, it is anticipated that around 20 dwellings in Grafton would be demolished. Few structures would be impacted in South Grafton; however the proposed changes to the road network would alter access to existing buildings and businesses. The transformation and redefinition of uses for these effected areas will need to carefully consider and reflect the surrounding urban character and form.



Figure 4.10: Property and built form in the context of the proposed project

5 OBJECTIVES AND PRINCIPLES

Urban design and landscape objectives and principles have been prepared for this project to guide the concept design to ensure that the project is physically, visually and operationally integrated with the surrounding environment.

These objectives and principles take into account the desired future landscape and urban design character for the area as set out in the Director-General's environmental assessment requirements and Clarence Valley Council documents, including the Clarence River Way Masterplan, Urban Tree Management Strategy, Grafton City Open Space Plan and the Grafton Waterfront Precinct Masterplan. They also reference the key urban design aspects of Roads and Maritime Beyond the Pavement urban design policy and associated guidelines.

A key consideration in the development of these objectives and principles is to respect the heritage and cultural values of the existing bridge. Furthermore, the objectives and principles are also based on an understanding of the existing landscape and urban values of the area and the landscape and urban design issues that affect, or are affected by the project.

These wider values include the understanding that the project should integrate with the immediate and surrounding context, enhancing Grafton as a attractive town with wide, tree lined streets. The neighbourhood areas should be kept liveable, walkable, cycle-able, well scaled, visually attractive and safe. The natural systems and ecological biodiversity should be protected, as far as possible, and used to contribute to unique character of the place, recreational uses, outdoor lifestyle values of the area and the overall sustainability of the project. Additionally, the extent and quality of all public open space should be reinforced, particularly along the Clarence River foreshore areas.

As a broad approach to the design and construction of the bridge, its approach roads and the ancillary works, the principles of Ecologically Sustainable Development should underpin all decisions. Amongst other factors, this would ensure that the most economical use of resources

is achieved during both the construction and operation of the project. For example, project elements would be designed using robust, low maintenance materials that would also minimise the potential for vandalism.

The following eight urban design objectives are based on the contextual analysis of the site and the proposed project, and are accompanied by a series of principles which provide a high level urban design response to each of the objectives.

The urban design objectives related to the following:

- Landscape and Scenic Quality,
- Urban Form,
- Heritage and Cultural Values
- Relationship of the Proposed Bridge to the Existing Historic Bridge
- Design of the Approach Roads
- User Connectivity
- Urban Development
- Public Domain.

LANDSCAPE AND SCENIC QUALITY

Objective: To achieve a project that fits sensitively with the existing qualities and characteristics of Grafton, South Grafton and its Clarence River setting.

Design principles:

- Protect and integrate the river environment including foreshore areas, into the overall project design.
- Maintain important recognisable views of the river, foreshore areas and townscape, in particularly those views to and from the existing bridge
- Design the project to fit in naturally with the local topography and river setting.
- Design major project elements like earthworks, embankments, and mounding to fit into its setting and reduce its visual and physical obtrusiveness.
- Integrate natural patterns and ecology into the design of the project, protect creeks, retain physical continuity of natural systems, and use natural characteristics in the project's landscape design.
- Minimise the intrusion of project related elements on the local landscape, such as lighting, barriers, fencing and flood control elements.

URBAN FORM

Objective: To maintain the integrity of the existing urban character, particularly the physical and visual experience of the streetscape and street grid.

Design principles:

- Protect the built fabric and streetscape quality of the existing neighbourhoods by integrating the project into the existing character of Grafton and South Grafton.
- Retain the existing urban character of the neighbourhood areas, for example by minimising the removal of street trees that provide a sense of place.
- Minimise the effects of fragmentation on neighbourhoods and precinct areas.
- Minimise the effects on the general form of the existing grid and urban settlement patterns.

HERITAGE AND CULTURAL VALUES

Objective: To protect the integrity of the heritage and cultural values of the Grafton area.

Design principles:

- Minimise the impact of the project on State and locally listed Aboriginal and non-Aboriginal sites, buildings and precincts and their contribution to the setting and character of the area.
- Respect and incorporate places and sites of Aboriginal value in the overall project design.
- Minimise impacts to heritage listed tree species and cultural plantings.
- Retain the cultural qualities and identity of Grafton through sensitive design.

RELATIONSHIP OF THE PROPOSED BRIDGE TO THE EXISTING HISTORIC BRIDGE

Objective: To protect the integrity of the existing State Heritage-listed Bridge as the pre-eminent structure in its setting.

Design principles:

- Design the proposed bridge to minimise the loss of views towards to the existing bridge.
- Create a new landmark crossing over the river at Grafton through a complementary relationship of the proposed bridge with the old bridge having regard to form, scale and function.
- Design the proposed bridge to have a contemporary form and scale that complements the existing bridge and allows it to take visual precedence:
- Design all of the proposed bridge elements as part of unified bridge architecture, minimising the bulk and massing of the bridge elements.
- Design the soffit of the proposed bridge to create a visually attractive form, particularly in areas that will be highly visible to the public.
- Design the shared path on the bridge to maximise the visual experience for pedestrians and cyclists, and consider a sequence of events such as stopping points to improve users experience.
- Design all lighting and signage on the proposed bridge to be unobtrusive against the existing bridge and in the landscape.
- Minimise over-shadowing and over-looking from the proposed bridge structure and viaducts on adjoining residential areas.

DESIGN OF THE APPROACH ROADS

Objective: To achieve an integrated road design form and character that blends with the adjoining areas.

Design principles:

- Design the approach roads to not visually dominate the landscape.
- Minimise the potential visual and physical barrier effect of the approach roads by maintaining cross connections for local traffic, public transport, cyclists and pedestrians.
- Minimising the footprint and scale of the approach roads and intersections.
- Minimise the size of intersections between the approach roads and the existing local roads.
- Integrate and coordinate the approach road elements with adjoining road elements and structures.
- Minimise the height and extent of noise walls, retaining walls and embankments along the approach roads.
- Maximise the opportunities to rehabilitate the streetscapes impacted by the proposed approach roads.

USER CONNECTIVITY

Objective: To contribute to the accessibility and connectivity into and through Grafton and surrounding areas.

Design principles:

- Retain permeability of movement through areas by maintaining the continuity of the street grid and laneway systems.
- Improve connectivity around and through the project area for all modes of transport and user groups.
- Maximise safe pedestrian and bicycle crossings on streets and at intersections that are attractive, easy to use and minimise crossing distances.
- Integrate the pedestrian and cycle path of the proposed bridge as a continuous system with the Clarence Valley Council's existing and future planned network in Grafton and South Grafton.
- Improve connectivity to existing and potential future riverfront public recreation spaces.
- Provide attractive, safe and accessible undercroft areas adjacent to the abutments for potential future foreshore and local pedestrian and cycle access.

URBAN DEVELOPMENT

Objective: To create a project that facilitates future urban development and revitalisation along and surrounding the project area.

Design principles:

- Design the proposed bridge and associated infrastructure so that it can support future development and revitalisation of surrounding retail, commercial, industrial, recreational and educational areas.
- Work with Council to facilitate the consolidation of residual land parcels into sufficiently useable areas that can be redeveloped appropriately, consistent with surrounding land uses.
- Consider the potential for new uses of residual and underutilised areas impacted by the project.
- Provide suitable streetscape design that will facilitate new public and private related land uses.

PUBLIC DOMAIN

Objective: To enhance the quality and value of the public domain along and surrounding the project area.

Design principles:

- Minimise negative physical impacts on public, open space, the river and other foreshore areas adjacent to the bridge and on the existing activities.
- Design the project to accommodate potential new uses and improvements in existing and new public domain spaces along the river foreshore.
- Design the project to ensure that the spaces under and around the bridge and viaducts are appropriately integrated into the public domain.
- Design the project to create town entry treatments that are attractive and inviting.
- Design the project to ensure good surveillance for pedestrians and cyclists on and around the bridge and its approach roads.

6 URBAN DESIGN, BRIDGE AND LANDSCAPE CONCEPT

6.1 OVERVIEW

The urban design, bridge and landscape concept has been developed based on the objectives and principles described in Chapter 5, to achieve an integrated concept design for the project. This chapter describes the interrelationship between the proposed bridge and road works and the adjoining areas in the form of an indicative urban design and landscape concept plan. The concept design presented here includes the bridges, retaining walls, noise barriers, cuttings and fill embankments. The structures shown on the drawings in this chapter reflect the current engineering concept design for the structural elements; for a detailed discussion and drawings of the structures, refer to the corresponding sections of the EIS. The landscape concept includes planting to integrate the proposed works with the existing character of the local area, as well as feature planting to define the township entries and other cultural areas.

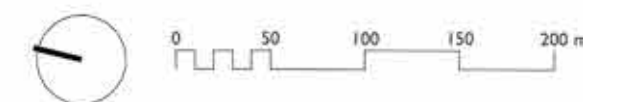
The urban design, bridge and landscape concept identifies a series of recommended works that should occur in conjunction with the construction of the bridge and its associated roadworks, within the defined project area. This concept provides the basis for determination of the environmental assessment process, as well as future detailed design and construction documentation.

Further mitigation measures are identified in Chapter 8 of this report, which describes opportunities to better integrate the project into the Grafton area. The detailed design and documentation of these works, both inside and outside the project area would be the subject of comprehensive consultation with a range of stakeholders including State government agencies, Clarence Valley Council and the Grafton community.



Figure 6.1: LANDSCAPE AND URBAN DESIGN CONCEPT – OVERVIEW

Refer to Landscape and Urban Design Concept plans for more detail.



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6.2 GRAFTON

The following describes the key urban design and landscape components of the Concept Design as observed travelling towards the river. The Urban Design and Landscape Concept plan and sections for Grafton are presented on the following pages.

ROADWORKS

Pound Street

From the north, the proposed works would commence at the intersection with Villiers Street. Pound Street would be widened to accommodate two lanes of traffic in both directions, with wide shoulders replaced with kerb and gutter. Sealed angle parking on the northern side and parallel parking on the southern side would be introduced.

Formal garden beds are proposed at the intersections of Pound Street with Villiers Street and Clarence Street. These would be planted with attractive shrubs and groundcovers to provide a visual entry to this section of Pound Street. Smaller street trees would be planted along the northern side of the street, within the angle parking zone and where space permits, to provide shade and to reduce the visual scale of the street due to the removal of a number of existing mature trees. On the southern side, Fig trees would be planted within the Grafton TAFE where it has been affected by the works (subject to agreement with the TAFE). Street trees (Jacaranda) would also be planted on Pound Street, east of Clarence Street, signifying the entry to Grafton town centre.

It is proposed to use a visually contrasting pavement material such as permeable pavers, in the designated parking areas to visually break up the large expanse of asphalt with a different texture and tone, and to potentially assist in reducing stormwater runoff. This would be subject to acceptance from Clarence Valley Council.

A 2.5 metre wide pedestrian and cycle path would be provided on the southern side of Pound Street, improving local connectivity by linking Grafton and South Grafton via the new bridge. A 1.5 metre wide pedestrian path would be provided between Villiers Street and Clarence Street on the northern side to replace the existing path.

East of Clarence Street, seven existing houses would be demolished. On the northern side, these would be replaced by an off street car park with about 26 car park spaces. Trees would be planted to the carpark boundary to provide shade and to screen the carpark. On the southern side, the land would be turfed and scattered native trees planted to create a park-like character.

Clarence Street

Clarence Street, south of Pound Street, would be widened to accommodate two northbound lanes and one southbound lane. The open grassed swales to the existing verges would be replaced with kerb and gutter and paved shoulders for angle and parallel parking, with 90° parking in the centre of the road.

Small street trees would be planted on the western side of the street only, due to space constraints. A 1.2 metre wide pedestrian path would be located on the western side, linking Pound Street with the TAFE driveway entrance. The verge on the eastern side would be turfed to be consistent with the existing character. The traffic islands at either end of the 90° parking would be planted with exotic shrub and groundcover planting.

Northern bridge approach road

As Pound Street approaches the bridge, it becomes a two lane road with a narrow raised median, on an elevated fill embankment. A retaining wall about 1.3 metre high and 51 metre long would be constructed on the eastern side of the approach road. On top of the wall, and extending 310 metres to the river, would be a transparent noise barrier, enabling views of the surrounding landscape and river for motorists.

On the eastern side, the fill embankment would be planted with native shrubs and groundcovers, softening the base of the road infrastructure. Trees would be planted in small stands, providing some screening of the road works while still allowing views of the landscape for motorists. Up to 15 houses would be demolished in the area bounded by Pound Street, Greaves Street and the proposed approach road. This area would be grassed, with appropriate existing trees retained where possible, and supplemented with new native tree planting to provide a parkland character.

On the western side, a fenced water detention basin would be constructed. It would be planted with native grasses to better integrate it into the landscape. The embankment south of this would be planted with native grasses.

A new 2.5 metre wide pedestrian and cycle path would be provided on the western side, next to the approach road. It is proposed to edge the path with a 1.4 metre high galvanised fence for user safety where it occurs on the raised embankment. The new path would link with the existing pedestrian path that crosses the existing bridge.



Plate 6.1: View along existing Pound Street, looking north west



Plate 6.2: View along existing Clarence Street, looking south west



Plate 6.3: View along existing Pound Street, looking south east



Plate 6.4: Existing railway viaduct over Pound Street, Grafton



Plate 6.5: Existing railway bridge over the Gwydir Highway, South Grafton



Plate 6.6: Example of blockwork retaining wall Plate 6.7: Example of transparent noise wall

Greaves Street

Greaves Street would be slightly lowered at bridge Abutment B to provide the necessary height clearance to the bridge above. It is proposed to turf the required small cutting and area under the bridge to provide stabilisation and easy access to the underside of the bridge for maintenance.

The area between Greaves Street and the river foreshore, where construction activities are proposed, would be grassed and planted with native trees to retain the existing character of the river foreshore.

Dobie Street and Villiers Street intersection

Minor kerb modifications are proposed to the intersection of Dobie Street and Villiers Street. Any planting removed during construction would be replaced by similar species.

RAILWAY BRIDGE

The low clearance on the existing railway bridge over Pound Street (refer Plate 6.4) would prevent trucks travelling across the proposed Grafton Bridge from entering Grafton or continuing along the Summerland Way. The creation of adequate clearance under the existing bridge would require the lowering of Pound Street, which in turn would increase flooding risks in an already flood prone area. In order to provide adequate clearance over and avoid additional flood impacts, it is proposed that a new railway bridge replace the existing Pound Street bridge.

The proposed new bridge would be a single span steel truss bridge connecting the existing railway viaduct to the existing railway embankment on the northern side of Pound Street. The use of a steel truss provides the required clearance over Pound Street without needing to lower the street level. It also references the steel truss railway bridge over the Gwydir Highway in South Grafton (refer Plate 6.5), as well as the iconic steel truss of the existing Grafton Bridge.

Additionally, the widening of Pound Street would affect the adjacent piers and abutment of the existing railway viaduct. The existing abutment would require strengthening, and the final viaduct pier (on the southern side of Pound Street) would require either strengthening or replacement (subject to further structural design investigations).

Urban design recommendations

- The steel truss should be painted using a micaceous iron oxide paint in a dark grey colour, in keeping with the steelwork on the railway bridge over the Gwydir Highway.
- If a new pier is required on the southern side of Pound Street, it should be a simple concrete blade pier with detailing to match the piers of the existing railway viaduct.
- The abutment modifications on the northern side of Pound Street should be off form concrete with simple clean detailing, in keeping with the character of the existing abutment and the abutments of the other railway bridges in Grafton.

Rationale

- To tie in the new railway bridge works with the character of the existing viaduct at Pound Street
- To create a recognisable 'family' of steel truss bridges in the Grafton area. The new Pound Street railway bridge and the existing railway bridge over the Gwydir Highway would form distinctive landmarks at the arrival to Grafton and South Grafton along the Summerland Way.

STORMWATER MANAGEMENT SYSTEM

A stormwater management system is required at Pound Street to provide flood-free access to the proposed bridge in a 20 year average recurrence interval flood event. The stormwater management system would include:

- A detention basin north of Greaves Street, between the approach road and the railway line.
- Culverts beneath the approach road in the vicinity of Bridge Street to connect the catchment north of Pound Street to the detention basin.
- A flood pumping station south of Greaves Street to extract water from the detention basin and convey it to the Clarence River. The pumping station would be predominantly below ground, except for the switchboard and backup generator, which would be mounted on a concrete slab near the crest of the existing levee. The slab would be at RL 8.25m to avoid the 1:100 year flood event, while the switchboard and generator would be located within enclosures up to 2.4 metres high.
- Culverts between the flood pumping station and the Clarence River

Urban design recommendations

- Minimise the size of the proposed permanent basin.
- Plant with native grasses.
- Investigate opportunities to reduce batter steepness to avoid the need for fencing around the detention basin.

Rationale

- To provide a natural aesthetic.

RETAINING WALL

A retaining wall would be required on the eastern side of the approach road, opposite the reconfigured intersection of Pound Street and Bridge Street. The retaining wall would be about 51 metres long and up to 1.3 metres high. A 820mm high concrete vehicle barrier would be required at the top of the retaining wall, making the overall height of the wall a maximum of 2.12 metres.

Urban design recommendations

- Utilise materials appropriate to the residential context of Grafton, for example, a combination of split-faced and smooth-faced blockwork in a light colour (refer to Plate 6.6).
- Applied finishes (such as painting) are to be avoided.

Rationale

- A site specific design response allows the wall to individually respond to the local landscape character.
- Light coloured blockwork contrasts with the character of the industrial grey concrete of the nearby road and rail viaducts.
- Applied finishes require additional long term ongoing maintenance.

NOISE BARRIER

Acoustic assessment of the concept design indicates that a noise barrier would be required to mitigate noise impacts from the elevated bridge and approach road on the surrounding neighbourhood. The noise barrier would be:

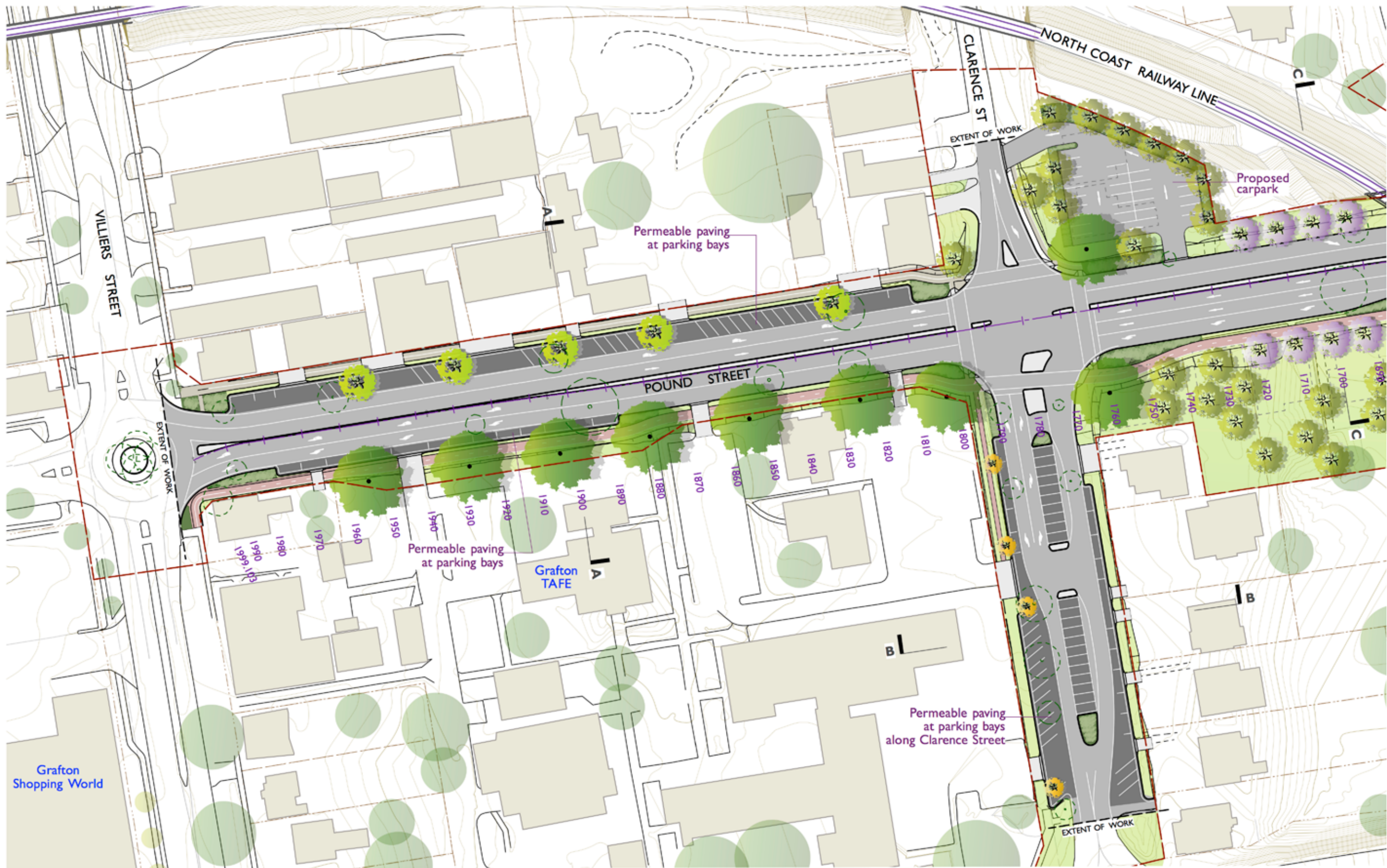
- 3.0 metres high, measured from the road surface.
- Approximately 310 metres long, located between the Grafton waterfront and Bridge Street.

Urban design recommendations

- Transparent panels. Angle panels away from the carriageway to enhance natural cleaning (refer to Plate 6.7).
- Align the noise barrier posts with the posts for the twin rail barrier.

Rationale

- Transparent panels allow views of the existing landscape and river.
- Transparent panels aid in the visual reduction of the road infrastructure and bridge.
- Aligning barriers posts creates a unified and coordinated appearance to the roadside elements.



LEGEND

- Construction boundary
- Property boundary
- Buildings to be removed
- Navigation channel

- Proposed pedestrian and cycle path
- Proposed footpath
- Proposed roadworks
- Proposed parking

- Proposed type F barrier
- Proposed three beam barrier
- Proposed bridge barrier
- Proposed pedestrian safety fence
- Proposed noise barrier
- Proposed retaining wall

- Proposed grass
- Proposed pasture grass
- Proposed planting
- Proposed native planting
- Proposed riparian planting

- Trees to be removed
- Existing native trees
- Existing exotic trees

- Proposed native tree planting
- Proposed feature tree planting
- Proposed exotic tree planting

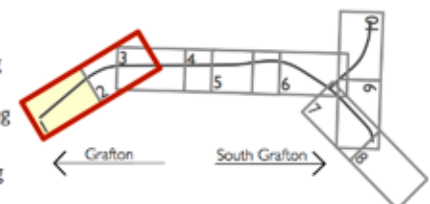
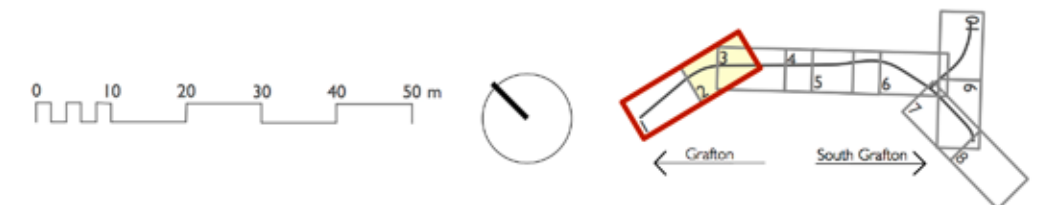




Figure 6.2: URBAN DESIGN AND LANDSCAPE CONCEPT PLAN – SHEETS 1 & 2
Scale 1:1000



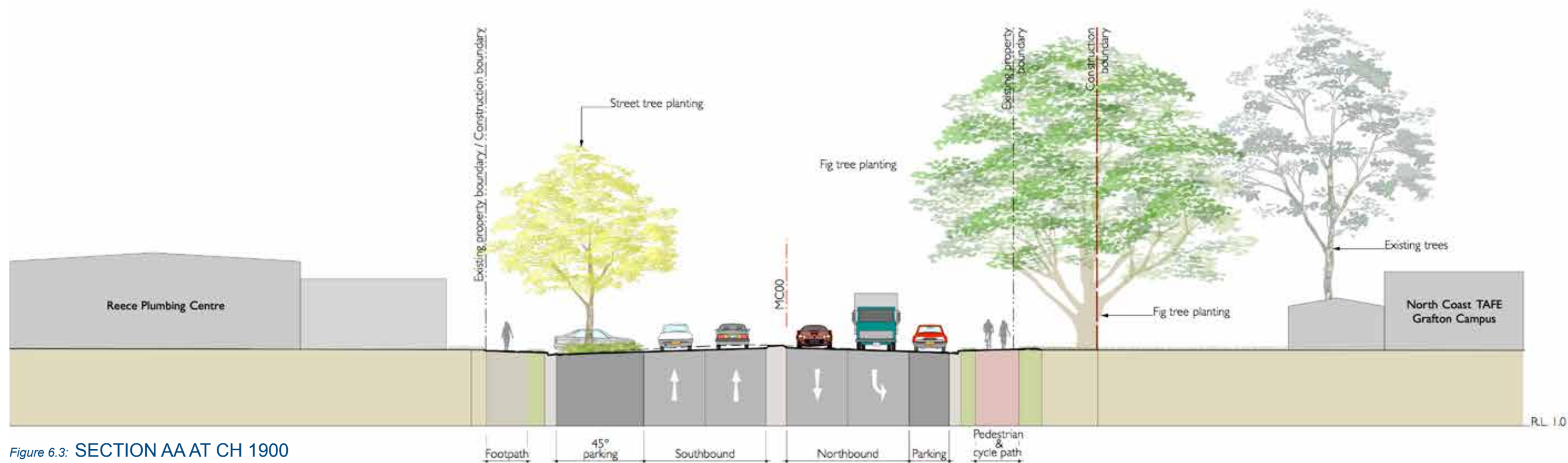


Figure 6.3: SECTION AA AT CH 1900
Scale 1:250

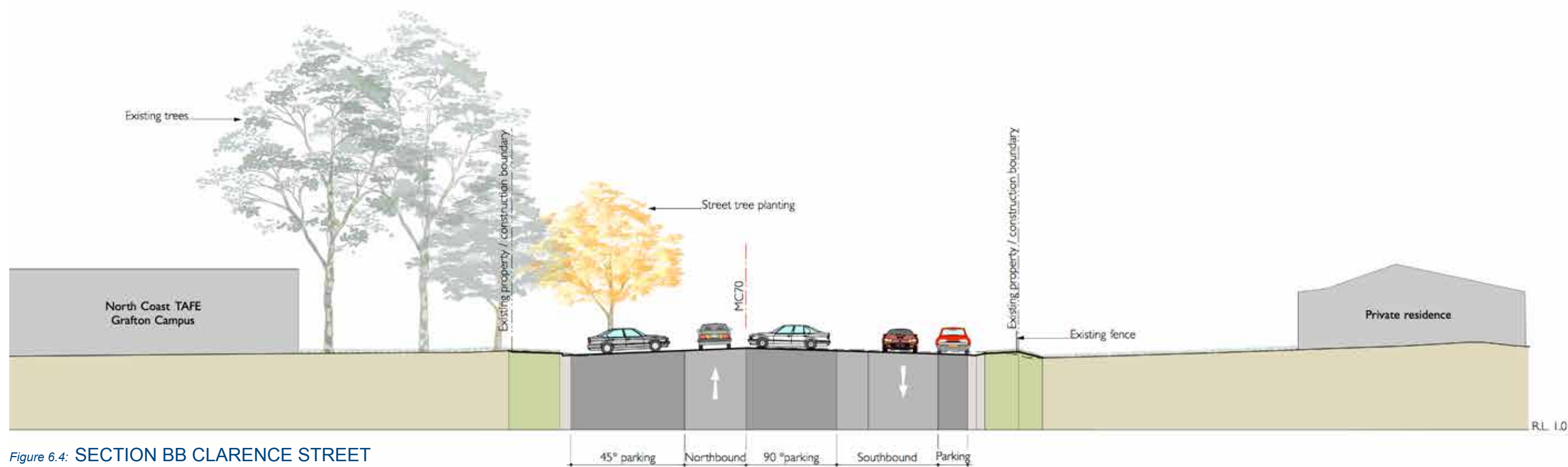


Figure 6.4: SECTION BB CLARENCE STREET
Scale 1:250

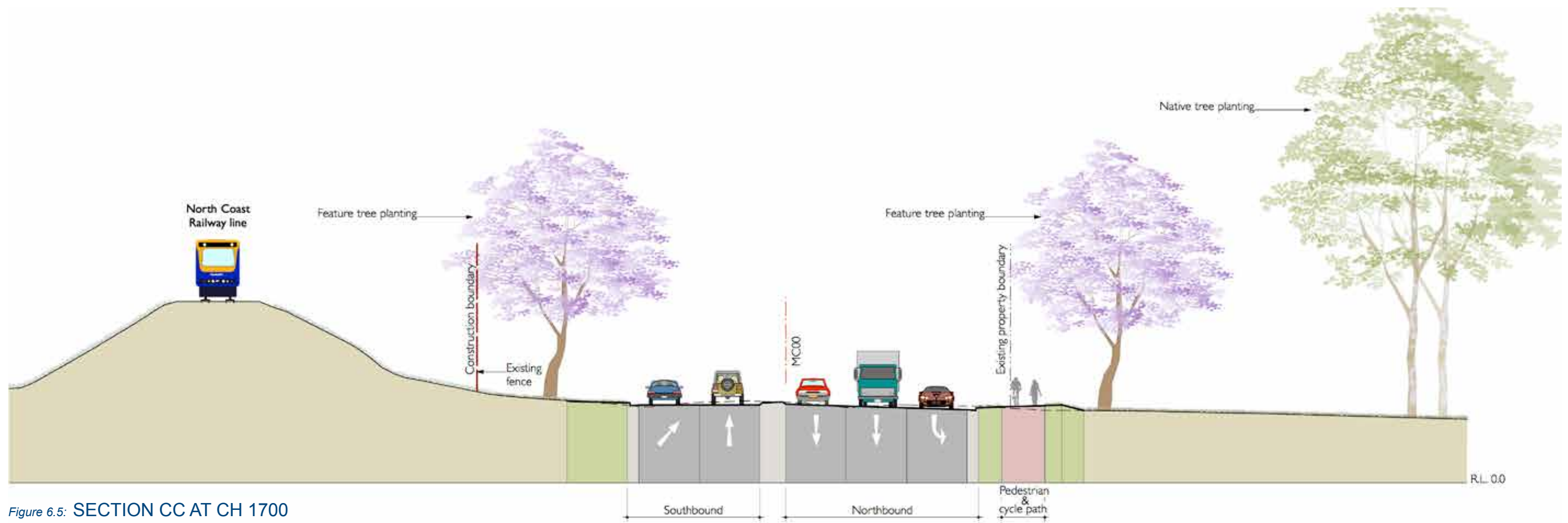


Figure 6.5: SECTION CC AT CH 1700
Scale 1:250

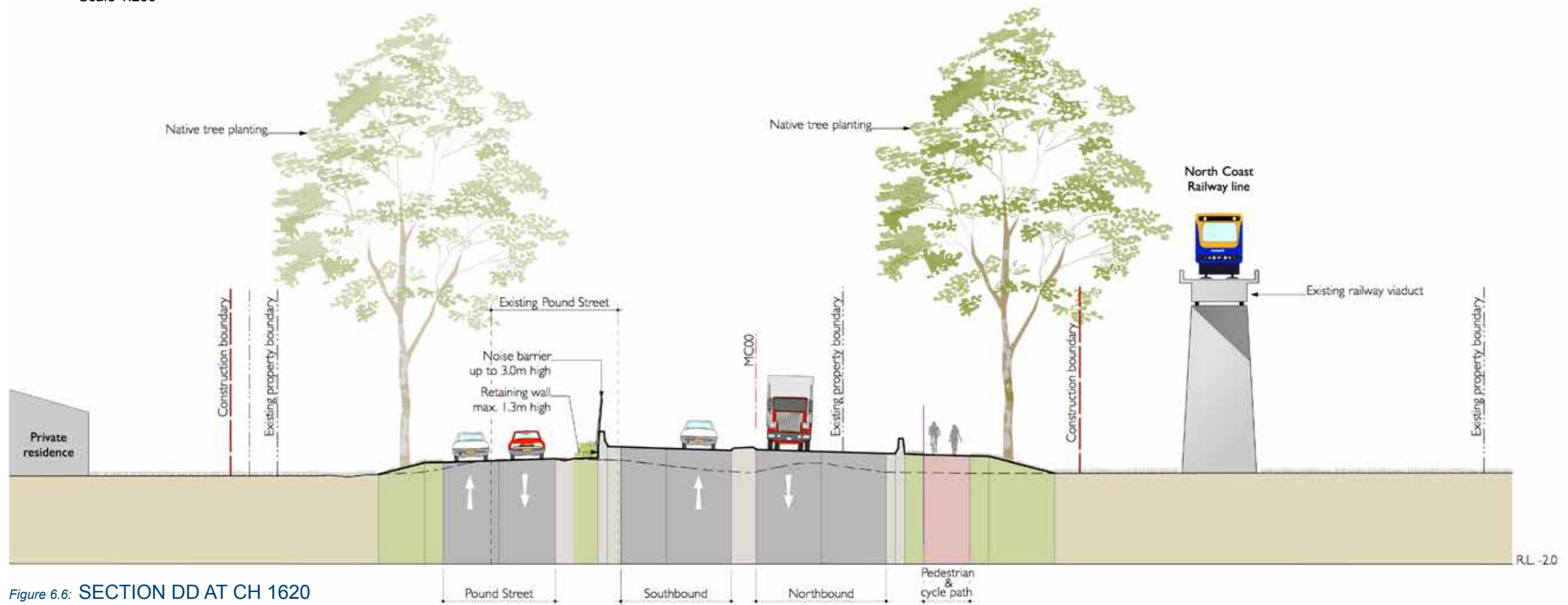


Figure 6.6: SECTION DD AT CH 1620
Scale 1:250

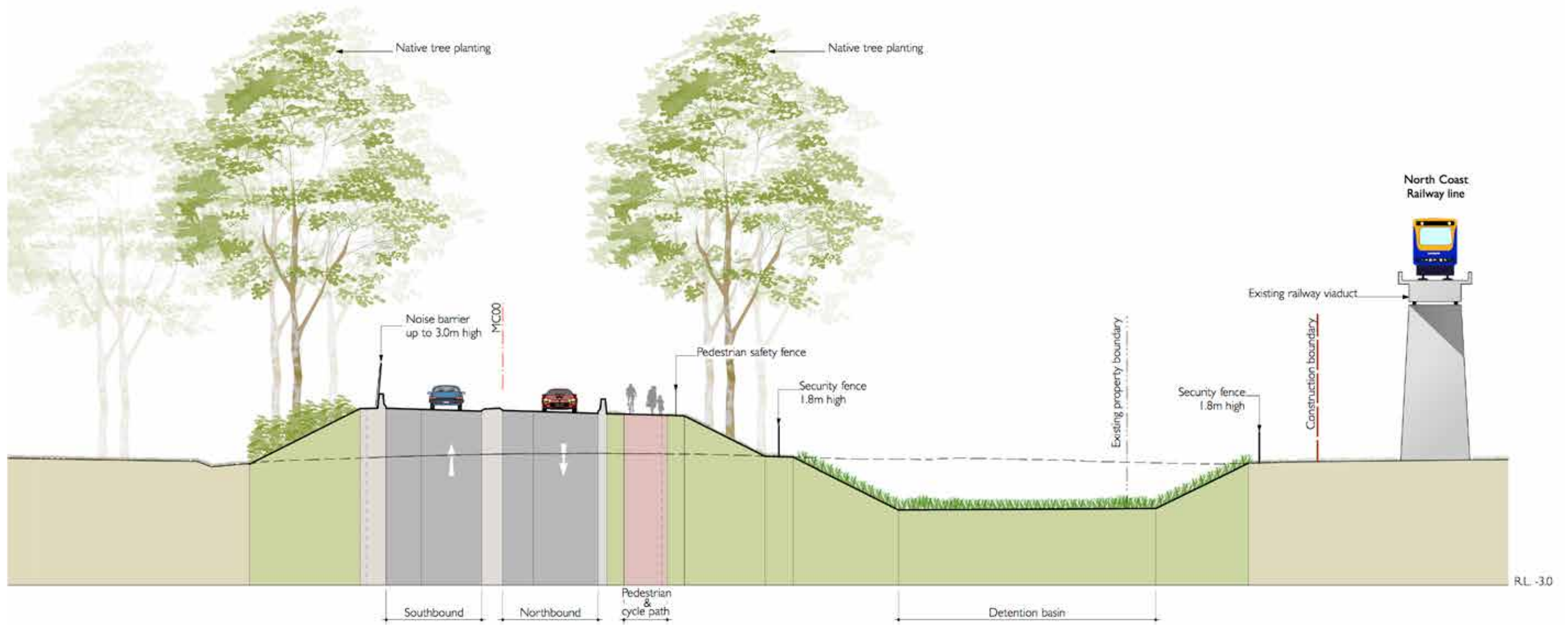


Figure 6.7: SECTION EE AT CH 1540
Scale 1:250

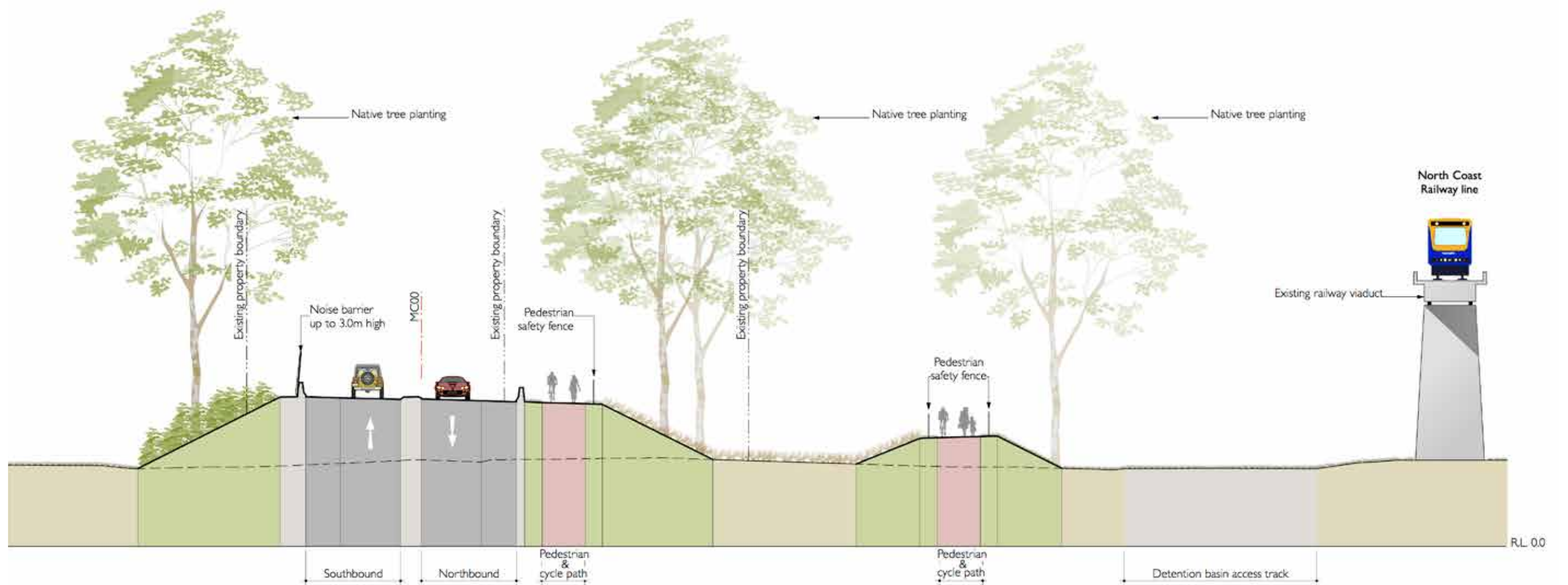


Figure 6.8: SECTION FF AT CH 1500
Scale 1:250

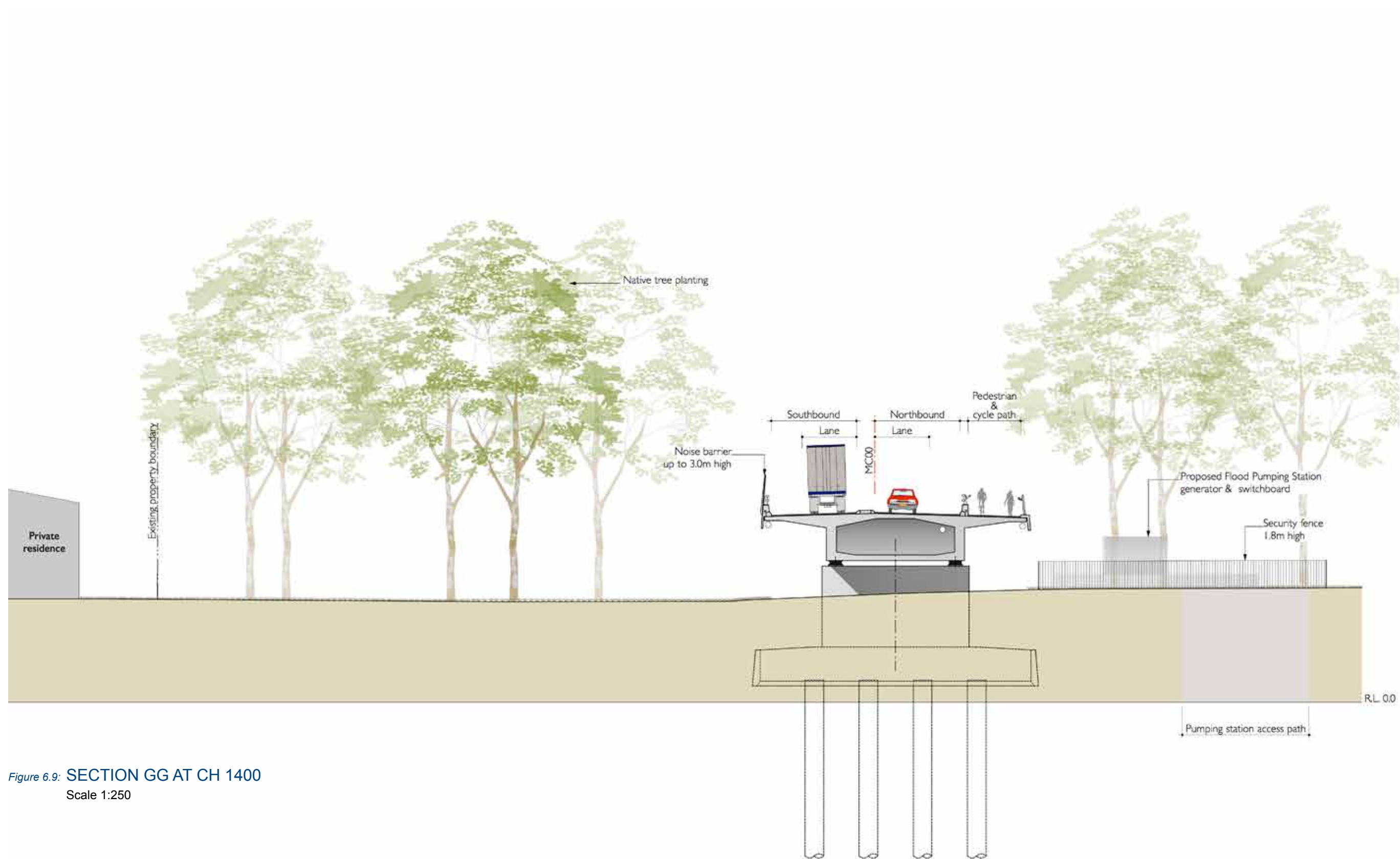


Figure 6.9: SECTION GG AT CH 1400
Scale 1:250

6.3 THE PROPOSED GRAFTON BRIDGE

OVERVIEW

The concept design for the proposed Grafton Bridge has developed through an iterative process where the project team members from all relevant disciplines have worked collaboratively to achieve an integrated outcome for the bridge. The urban design concept for the bridge has been developed in accordance with the Roads and Maritime Bridge Aesthetics guide (2012), and in response to the requirements for bridge and structure design, road design, drainage design and lighting design. The following section describes the design outcomes of this process.

The proposed bridge would be a 553 metre long concrete bridge located approximately 70 metres downstream of the existing Grafton Bridge. The bridge would accommodate one lane of traffic in each direction. A pedestrian and cycle path would be located on the upstream side of the bridge, facing the existing bridge, to connect with the existing local network.

SITING RELATIONSHIP TO THE EXISTING BRIDGE

The horizontal position of the proposed bridge over the Clarence River is governed by the need to tie in with the alignment of Pound Street in Grafton and to minimise impacts on Alipou Creek and the existing sugar loading facility in South Grafton. Within these constraints, the proposed bridge has been designed to be as parallel as possible to the existing bridge.

The proposed bridge has 10 spans, with five piers in the Clarence River and two piers on land at each foreshore. The piers have been positioned

to align as closely as possible with the piers of the existing bridge, especially those in the river itself.

The proposed bridge structure has been kept as low as possible over the Clarence River in order to allow the existing bridge to take visual precedence and to minimise the loss of views to the existing bridge. However, the height of the bridge also responds to other key factors, namely:

- The bridge must allow for two 9.1 metre high navigation channels at Mean High Water Spring (MHWS).
- The depth of the superstructure is governed by the span lengths between the piers, the positions of which have been determined by the positions of the piers on the existing bridge.

Within these parameters, the road level at the centre of the proposed bridge would be approximately 15.4 metres above the river at MHWS – roughly halfway between the levels of the road deck and the railway deck on the existing Grafton Bridge.

OVERALL FORM

The proposed bridge has a straight horizontal alignment that simplifies construction while also referencing the straight alignment of the existing bridge. The vertical alignment would be a continuous curve with a crest in the centre of the bridge to facilitate bridge drainage. The longitudinal grades have been kept as 'flat' as possible to complement the flat alignment of the existing bridge while also meeting the necessary drainage requirements.

BRIDGE GIRDERS

The proposed bridge superstructure would be concrete, which allows for a simple, clean, contemporary character that allows the steel truss of the existing bridge to take visual precedence. The superstructure would have two types of girders:

- Spans 3 to 9 have a single haunched box girder that responds to the long spans over the Clarence River. The girder would be about five metres deep at the piers and about three metres deep at mid-spans.
- Spans 1, 2 and 10 have Super T girders that are about 1.2 metres deep to minimise the structural depth of the bridge over the existing ground behind the levees in Grafton and South Grafton.

The bridge spans over the Clarence River are about 74 metres long to match the spans on the existing bridge. The length of the spans necessitate an approximately five metre deep girder over the piers, which, combined with the required 1.3 metre high bridge barrier, would result in an overall bridge depth of about 6.3 metres at the piers over the river. In order to reduce the visual 'bulk' of the proposed bridge and provide structural efficiency, the girder depth has been minimised at mid-spans to about 3 metres, resulting in a haunched superstructure. The long spans allow for long, smoothly tapering haunches that create a slender and graceful appearance to the proposed bridge when viewed in elevation.

BRIDGE DECK

The concrete bridge deck is approximately 16.9 metres wide and accommodates two vehicle lanes, shoulders, a median, a pedestrian



Figure 6.10: View of proposed Grafton Bridge from the Clarence River

and cycle path and barriers. Over the box girder, both sides of the deck would be cantilevered. The cantilevers would cast a shadow on the vertical face of the girder, helping it to visually recede and minimise its visual bulk.

PARAPETS

Simple, unarticulated, precast concrete parapets are proposed for both sides of the bridge. The parapets are designed to appear as crisp, uninterrupted, linear elements that extend the full length of the bridge to beyond the abutments, helping to emphasise the horizontal and to anchor both sides of the bridge beyond the shores of the river.

The outer face of the parapets angle slightly out at the bottom to better catch the sunlight, helping to visually define them against the girder. The parapets extend below the deck soffit to conceal underslung drainage pipes and also to increase the depth of shadow cast on the girder, helping to make the girder visually recede.

PIERS

Three different types of piers are required in response to the two different types of girder:

- Piers 3 to 8 are simple concrete blade columns
- Pier 1 consists of twin concrete blade columns with a concrete headstock to carry the Super T girders.
- Piers 2 and 9 are at the transition between the box girder and the Super T girders. These piers have a single blade column consistent with Piers 3 to 8, with a headstock over one half of the column to carry the Super T girders.

A simple, straight sided rectangular blade column shape has been adopted for all piers to unify the visual expression of the different pier types.

- Further recommendations for detailed design
- Detailed design for the bridge should explore alternative shapes for the piers that respond to the expression of the piers on the existing bridge

– in particular, the slightly tapering shape in side elevation.

- Rationale*
- To further visually reinforce the complementary relationship between the proposed bridge piers and the piers on the existing bridge.

PILE CAPS

The pile caps for Piers 3 to 7, which are situated in the Clarence River, finish above MHWS in order to be visible to boats as a safety precaution. These pile caps would have a precast concrete skirt with rounded ends that reference the shape of the pile caps on the existing Grafton Bridge. The remaining piers are situated on land; as such, their pile caps would be buried below the finished ground surface.

ABUTMENTS

Both bridge abutments would be simple, robust and unadorned concrete structures in keeping with the character of the abutments of the existing bridges in Grafton.

At Abutment B (Grafton), a retaining wall would be required on the western side of the abutment to facilitate the lowering of Greaves Street. The retaining wall would be either a reinforced soil wall with precast concrete facing panels, or a cast in situ concrete gravity wall.

- Recommendations
- If the Abutment B retaining wall is to be a cast in situ concrete wall, the finish should match the abutment.
 - If the Abutment B retaining wall is to be a reinforced soil wall, the facing panels should have an off-form concrete finish.

- Rationale*
- To integrate the retaining wall with the adjacent concrete bridge abutment.

VEHICLE BARRIERS

Vehicle barriers are required at the shoulders of both carriageways on the bridge. The barriers would be

1.3 metres high and would be concrete under twin rail steel barriers, which enable views out to the river from the roadway. On the southbound (downstream) side of the bridge, the barrier would be integrated with the parapet and consistent with the traffic barrier on the opposing side.

PEDESTRIAN AND CYCLE PATH

The proposed bridge includes a 3.1 metre wide pedestrian and cycle path to improve pedestrian and cyclist connectivity between Grafton and South Grafton. The pedestrian and cycle path is located on the western (upstream) side of the bridge to facilitate connections to existing path systems in Grafton and South Grafton.

At the edge of the pedestrian and cycle path, a 1.4 metre high balustrade would be integrated with the bridge parapet to provide safety for pedestrians and cyclists.

- Further recommendations for detailed design
- The detailed design of the balustrade should be simple, streamlined and contemporary in its expression.

- Rationale*
- To ensure that the balustrade is in keeping with the overall aesthetic of the bridge.

BRIDGE LIGHTING

Lighting will be provided on the bridge to meet the relevant standards. Lighting has the potential to change the character of the area at night and impact on adjoining areas, such as residential areas as a result of light spill as well as potentially reducing the prominence of the existing historic bridge. The proposed use of aeroscreen light diffusers will assist in the reduction of light spill from these light.

Lighting for navigational purposes may also be required on the piers to meet the relevant standards.

- Further recommendations for detailed design
- The detailed design of the lighting should minimise the number of lights and align their placement

- with existing elements such as the piers, wherever possible.
- Ensure uniformity in size, height and spacing of lights.
 - Use galvanised steel light posts in black or dark grey finish.
 - Feature lighting may also be considered in detailed design and would need to take into account proximity to the existing bridge and neighbouring residential areas.

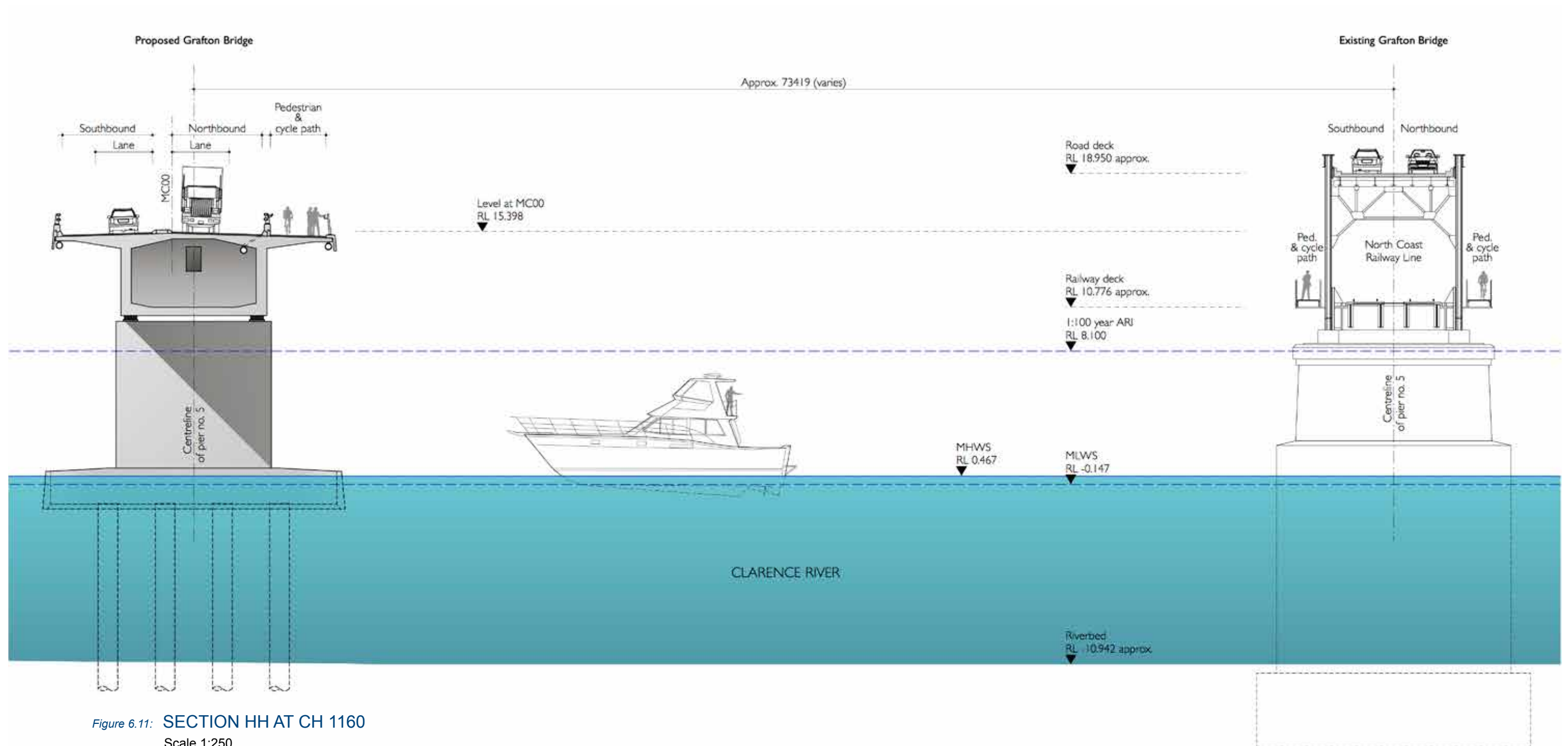
- Rationale*
- To ensure that all bridge lighting is in keeping with the overall aesthetic of the bridge, the existing bridge and minimises any impacts on adjoining foreshore areas.

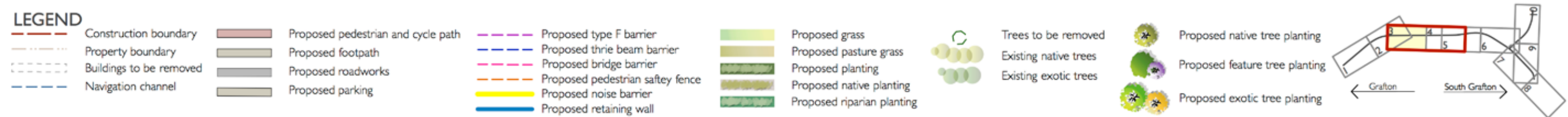
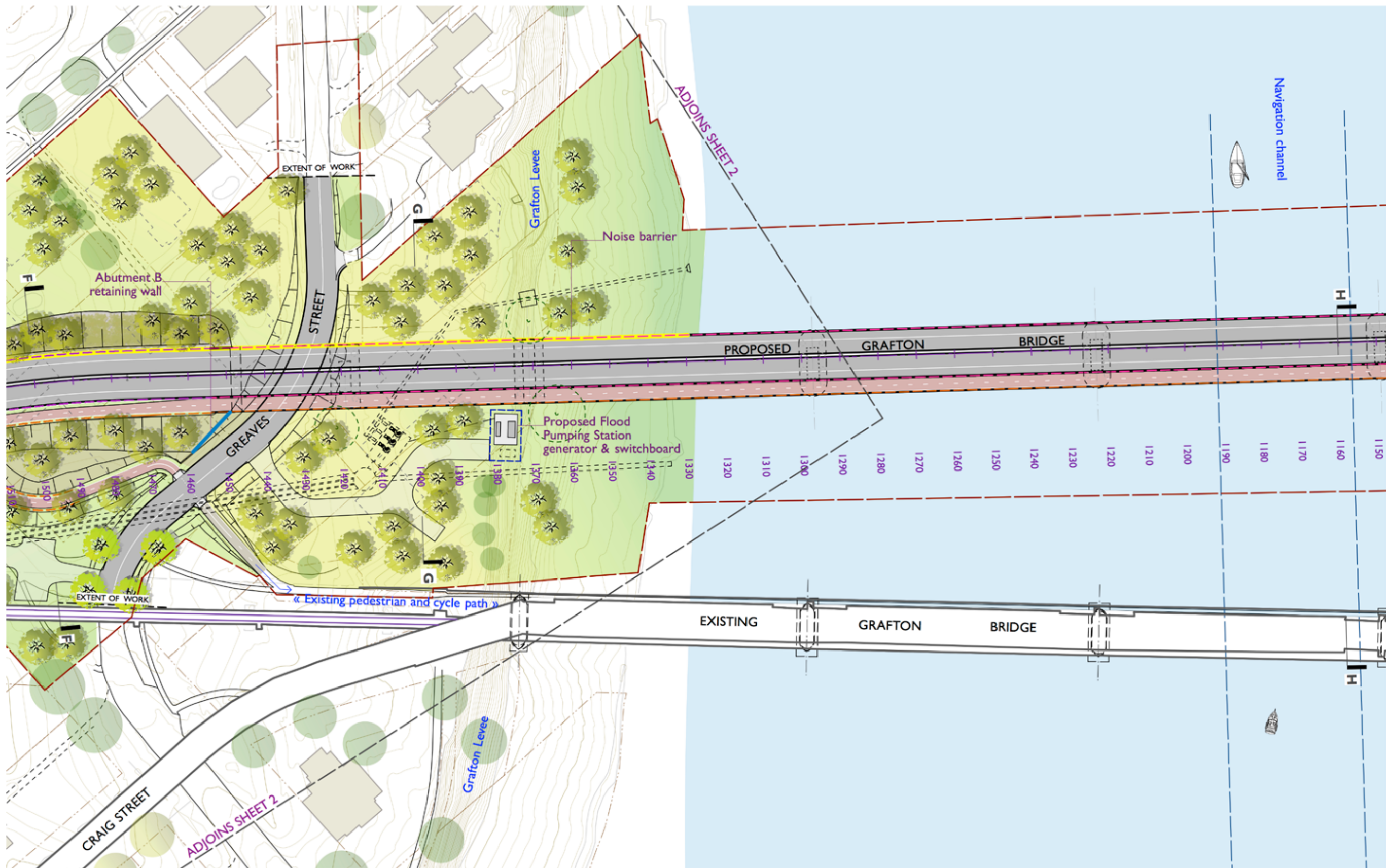


Plate 6.8: Transition pier between box girder and Super T girders at the new Iron Cove Bridge.



Plate 6.9: Slightly tapering pier shape with rounded pier ends on the existing Grafton Bridge





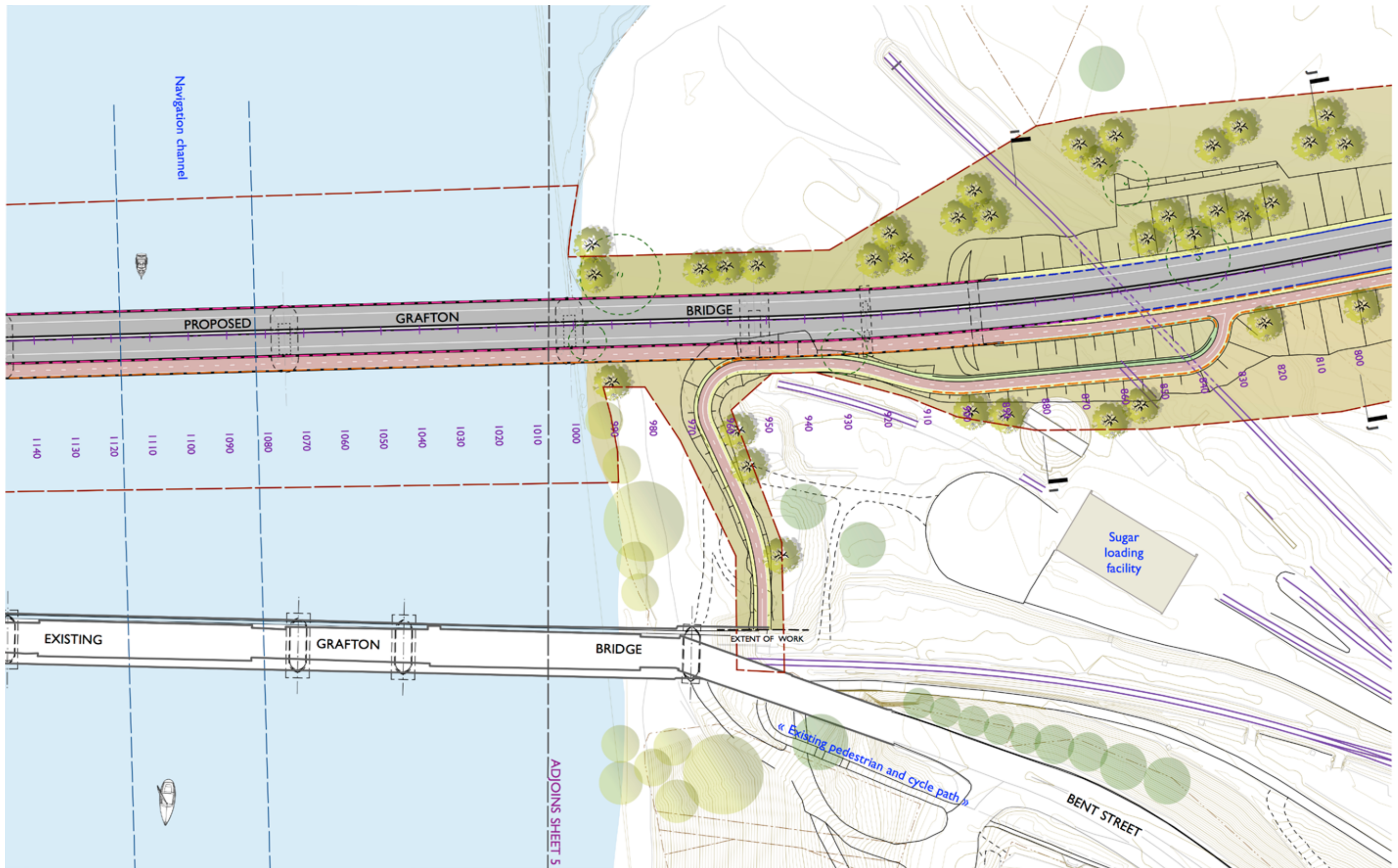
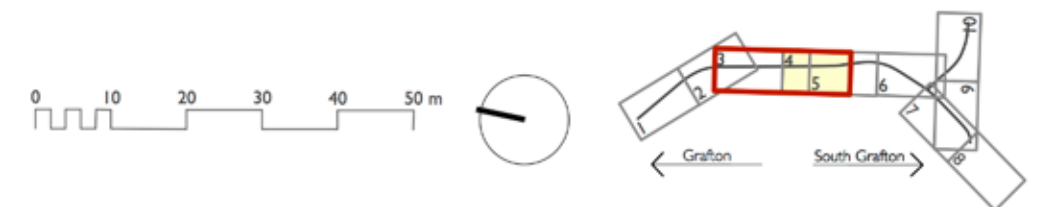


Figure 6.12: URBAN DESIGN AND LANDSCAPE CONCEPT PLAN – SHEETS 3 & 4
Scale 1:1000



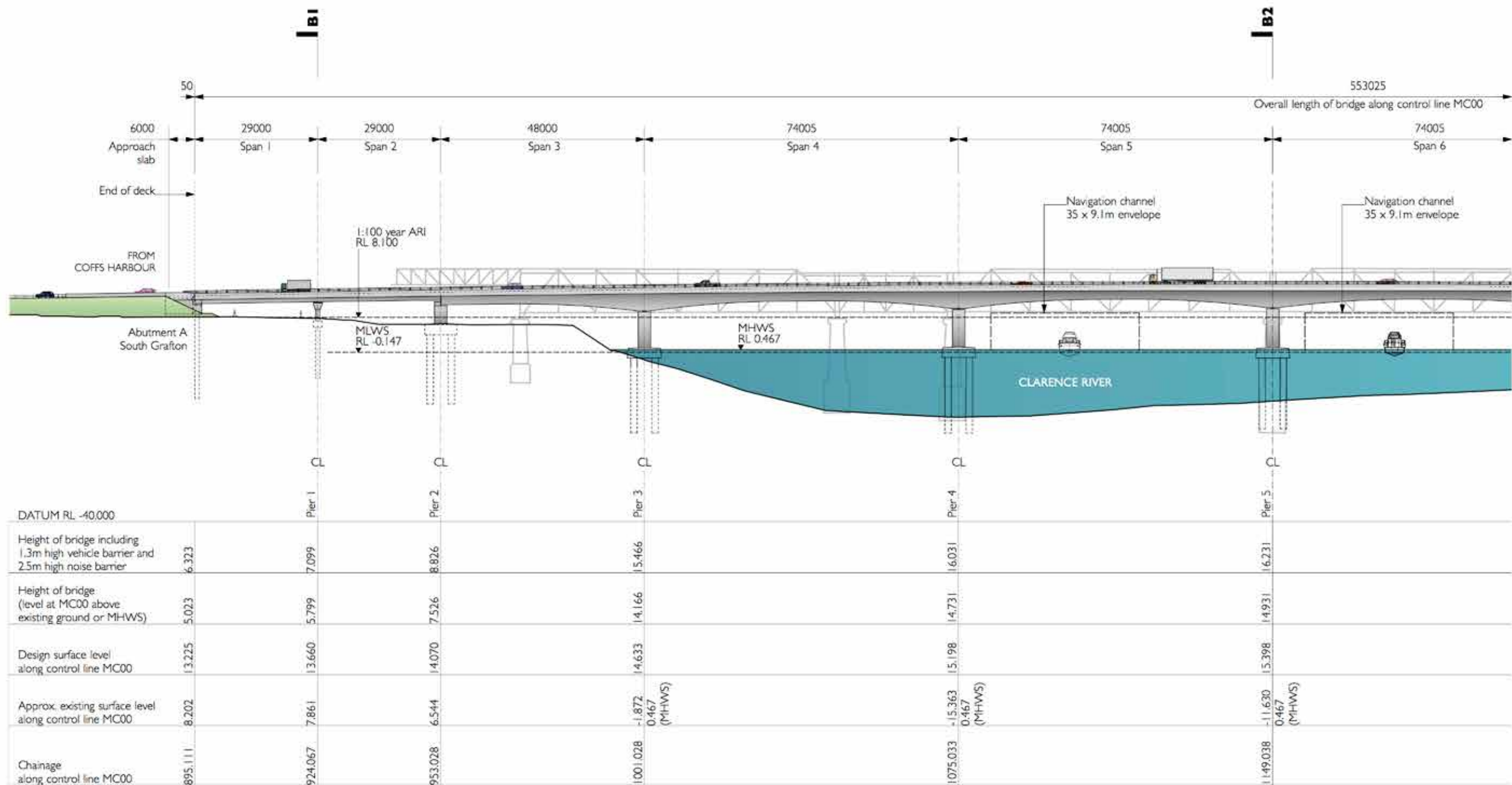
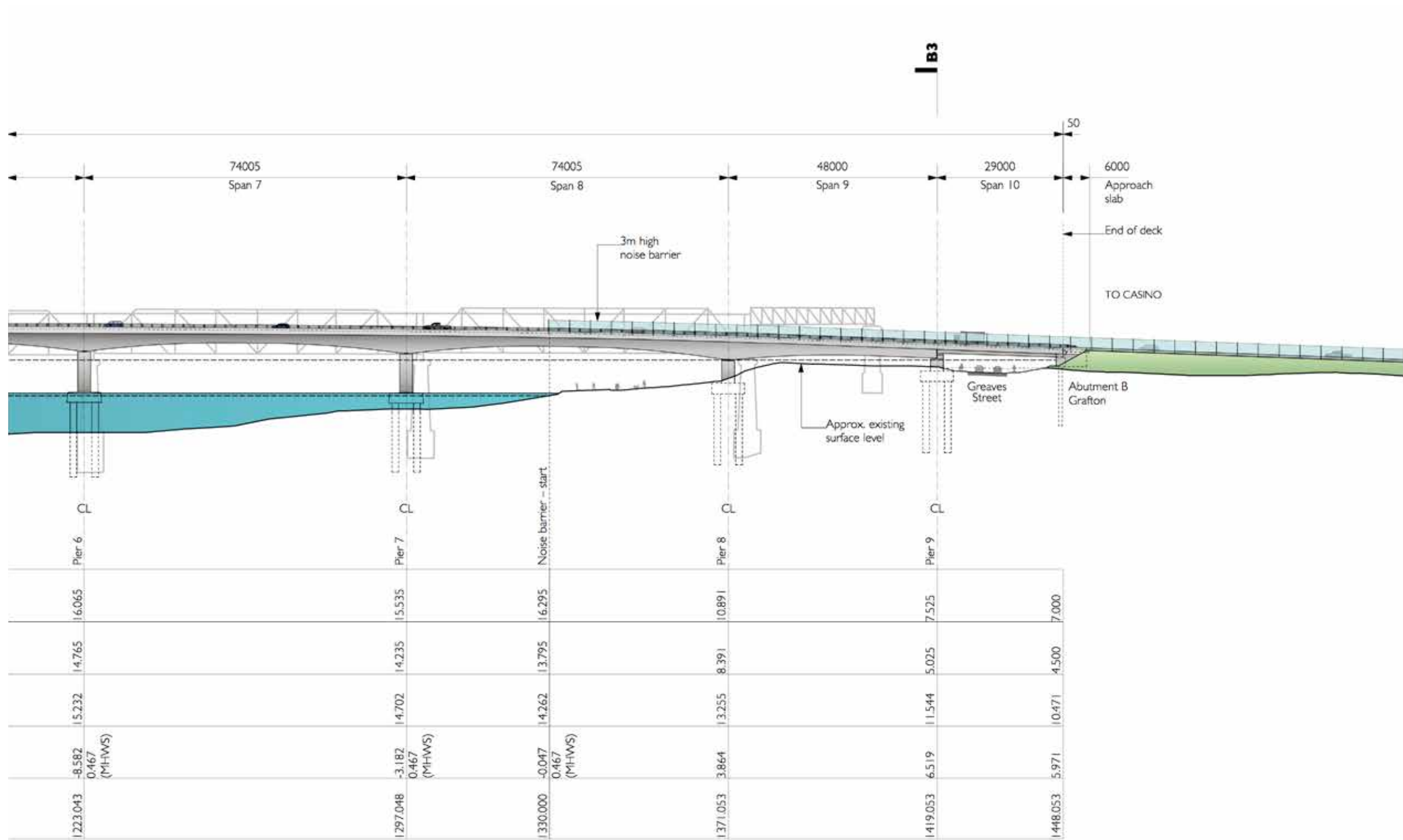


Figure 6.13: **BRIDGE ELEVATION**
Scale 1:1000



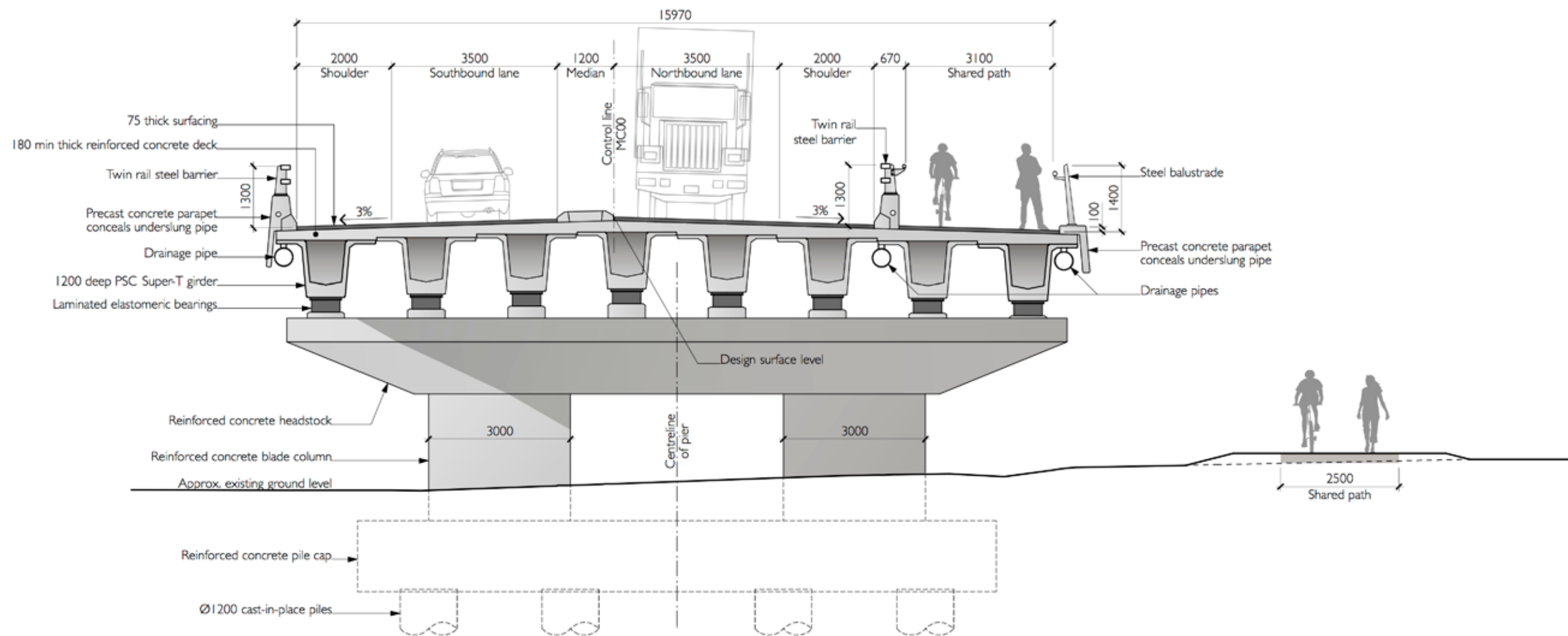


Figure 6.14: **BRIDGE CROSS SECTION B1**
Scale 1:100

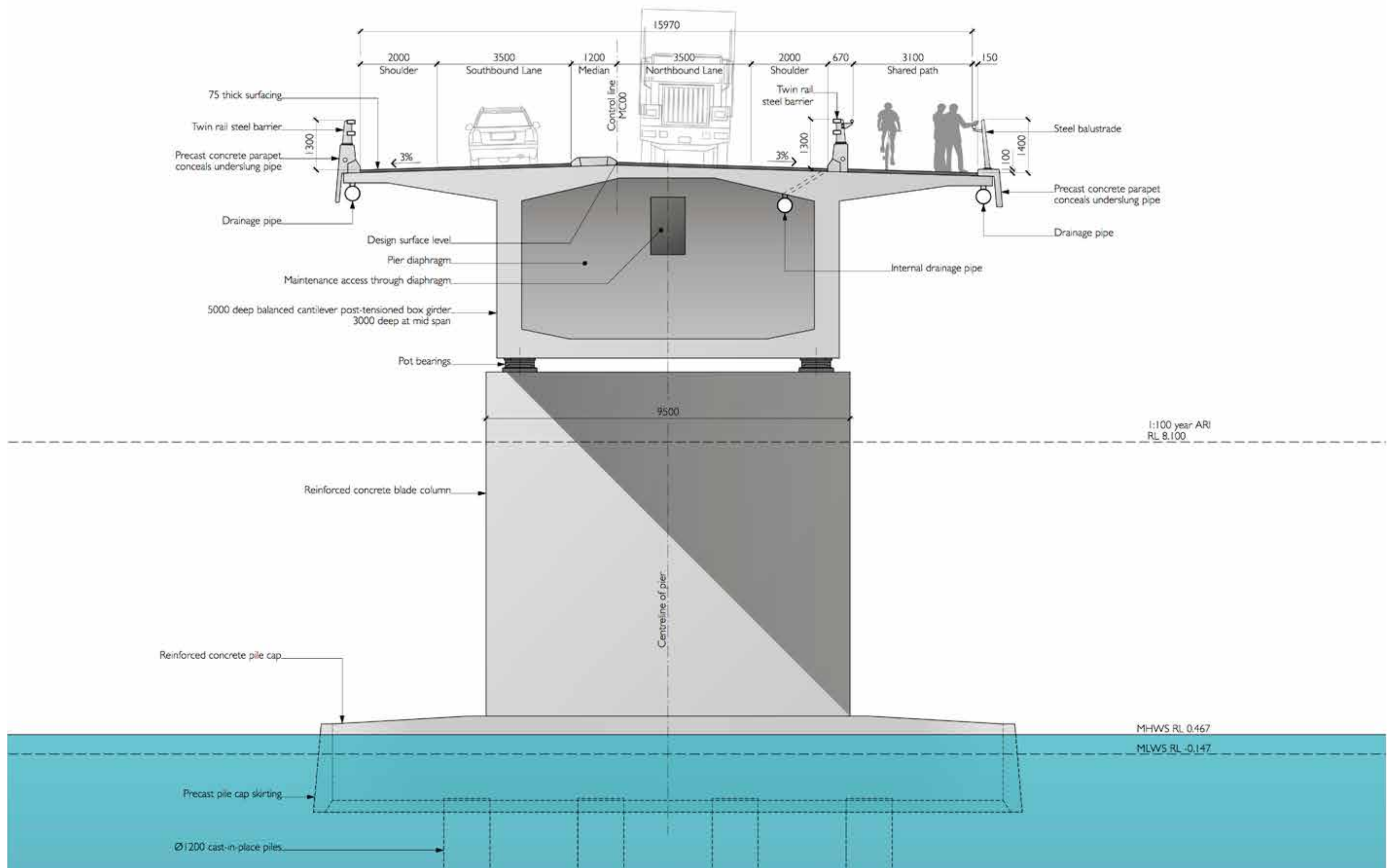


Figure 6.15:

BRIDGE CROSS SECTION B2
Scale 1:100

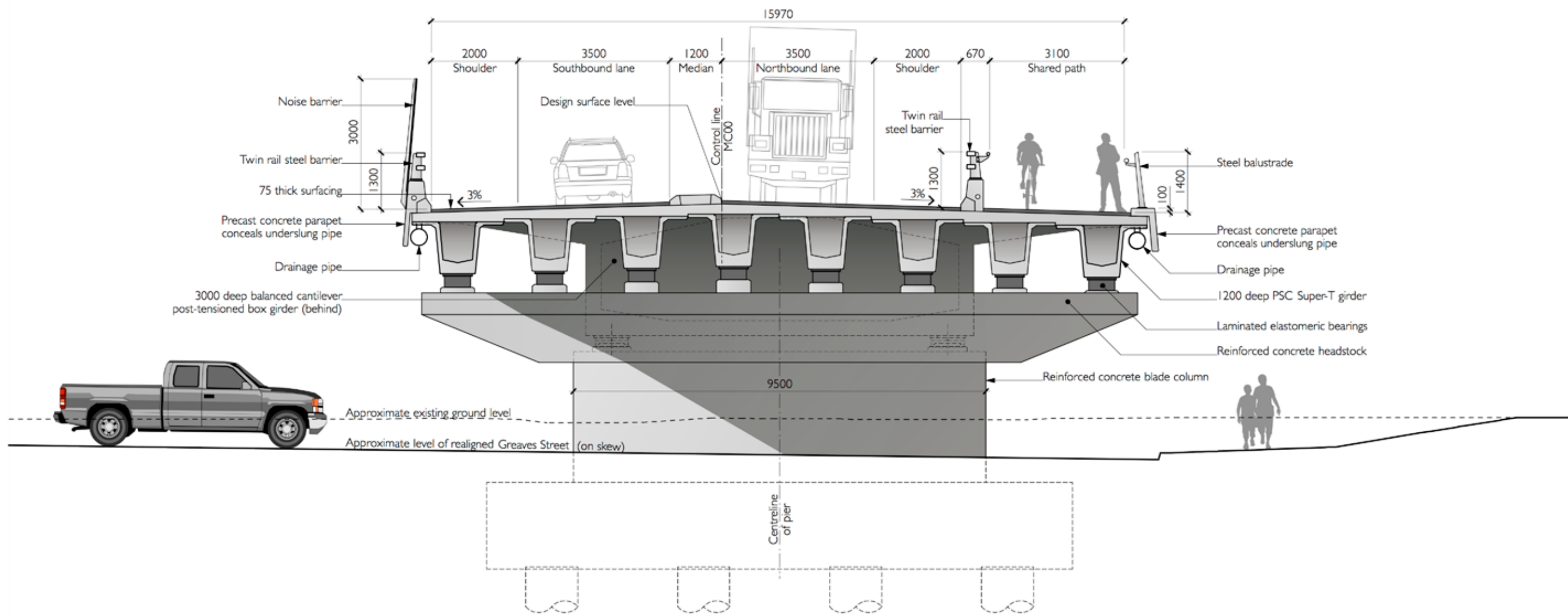


Figure 6.16: **BRIDGE CROSS SECTION B3**
Scale 1:100

6.4 SOUTH GRAFTON

The following describes the key urban design and landscape components of the Concept Design as observed travelling away from the river. The Urban Design and Landscape Concept plan and sections for South Grafton are presented on the following pages.

ROADWORKS

Southern bridge approach road

Travelling south from the new bridge, the two lane approach road and 2.5 metre wide pedestrian and cycle path would be elevated on a 1 in 2 fill embankment of up to about 7.25 metres high. It is proposed to provide pasture grasses on the embankments to maintain the surrounding rural character. Scattered stands of native trees would be planted on the eastern embankment to allow expansive views over the existing grazing land.

On the western embankment, a native tree avenue treatment is proposed, to provide shade for pedestrians and cyclists and a visual identity for the bridge approach road. The flat area between the embankment and the railway line would consist of pasture grasses with occasional stands of native trees to maintain the existing rural character.

The pedestrian and cycle path, on the western side of the road, would be edged by a 1.4 metre high galvanised steel fence. The path would link with the existing Coastline Cycleway near the foreshore (refer to the Urban Design and Landscape Concept plan on page 78).

Pacific Highway connection and former Pacific Highway

The Pacific Highway (Charles Street) would be realigned north of Bunnings Warehouse along Iolanthe Street, connecting to the new bridge approach road and Through Street. It would consist of one lane in each direction, with a right turn lane into the realigned Butters Lane extension. It is proposed to maintain the existing character of the highway with pasture grasses to the verges and fill embankments. New native trees would supplement existing plantings on the southern side of the highway, with small stands on the northern side allowing views over the grazing land.

The Butters Lane connection would consist of a two lane road with avenue tree planting (Casuarinas and Melaleucas) to tie in with existing trees. The area between the connection road and the highway connection would be heavily planted with native trees.

The former Pacific Highway, south of Bunnings Warehouse, would consist of two lanes, with a turning area and a left turn only onto the Pacific Highway connection at the eastern end. On the southern side, new native tree planting would supplement existing planting. A 2.5 metre wide pedestrian and cycle path is proposed to link Iolanthe Street (south), running between the Bunnings Warehouse carpark and Supercheap Auto, crossing the former highway and continuing east on the southern side of the highway (refer to the Urban Design and Landscape Concept plan on page 84).

Through Street

The existing Through Street would be sealed and consist of a two laned cul-de-sac with single lane access to the gravel track that travels parallel to the railway line. New concrete driveway would be provided from Through Street to the existing commercial businesses. The verges would be grassed and avenue planted with hardy exotic species. The area between the businesses and Through Street would be grassed and planted with small stands of native trees.

Iolanthe Street

Iolanthe Street, between Through Street and Gwydir Highway, would be formalised to contain two lanes in each direction. Traffic signals would be located mid block between Through Street and Spring Street. A pedestrian and cycle path would be located on the western side of Iolanthe Street and would link with the Coastline Cycleway at Derek Palmer Place. Native street trees would be planted on the eastern side of the street where space permits.

Spring Street

Spring Street would be upgraded between Iolanthe Street and the McDonald's entry, consisting of three lanes, with left and right turn lanes into McDonald's and the Clarence River Tourist Information Centre, and a left turn only onto Iolanthe Street. A 1.5 metre wide footpath would be provided on the northern side of the street, with hardy exotic street tree planting provided.

Gwydir Highway

Gwydir Highway would be realigned and widened and would consist of two lanes in each direction. Traffic signals would be provided at the intersection of the highway and the Coastline Cycleway. The verges would be grassed and planted with Jacarandas, denoting the major entry

point into South Grafton from the Pacific Highway. New planting would supplement existing plants around the 'Grafton - A Tidy Town' sign.

Roundabouts

Two new roundabouts would be constructed, one at the intersection of Through Street and Iolanthe Street/ southern approach road, and one at the intersection of Gwydir Highway, Iolanthe Street (south) and Pacific Highway. They signify the major entries into Grafton via the new bridge, and South Grafton from the Pacific Highway. It is proposed to plant the verges outside the roundabout with feature tree planting (Jacaranda, Flame Tree, Fire Wheel Tree), and three figs and low shrub and groundcover planting to the centre of the roundabout, to highlight their importance and to reduce the scale of the road infrastructure. All tree planting would be located in accordance with sightline guidelines and views to the Clarence River Tourist Information Centre would be maintained.



Plate 6.10: View along existing Iolanthe Street, looking south



Plate 6.11: View along existing Gwydir Highway, looking east

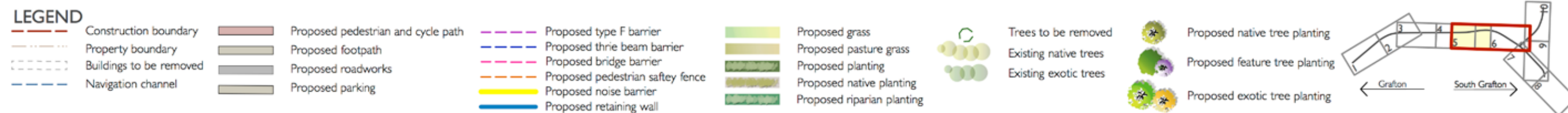
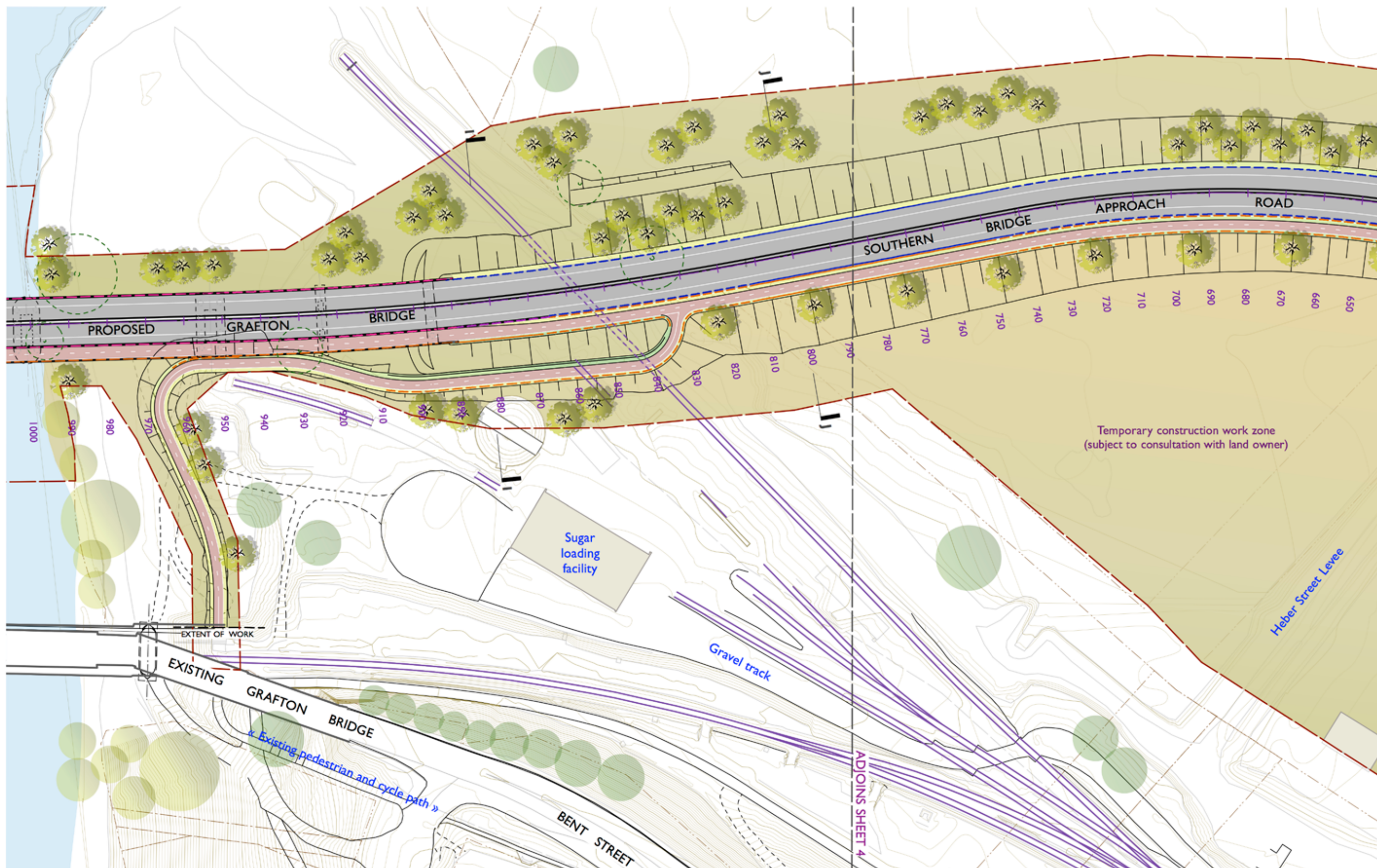
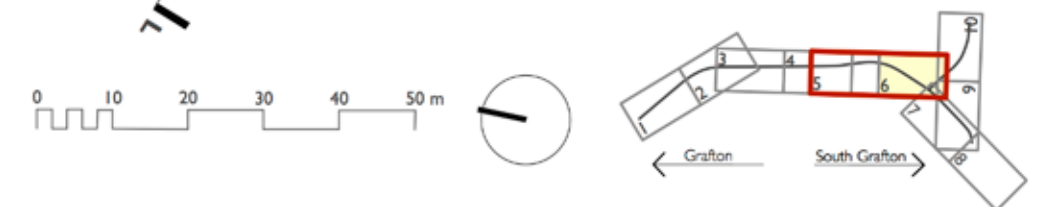




Figure 6.17:

URBAN DESIGN AND LANDSCAPE CONCEPT PLAN – SHEETS 5 & 6 Scale 1:1000



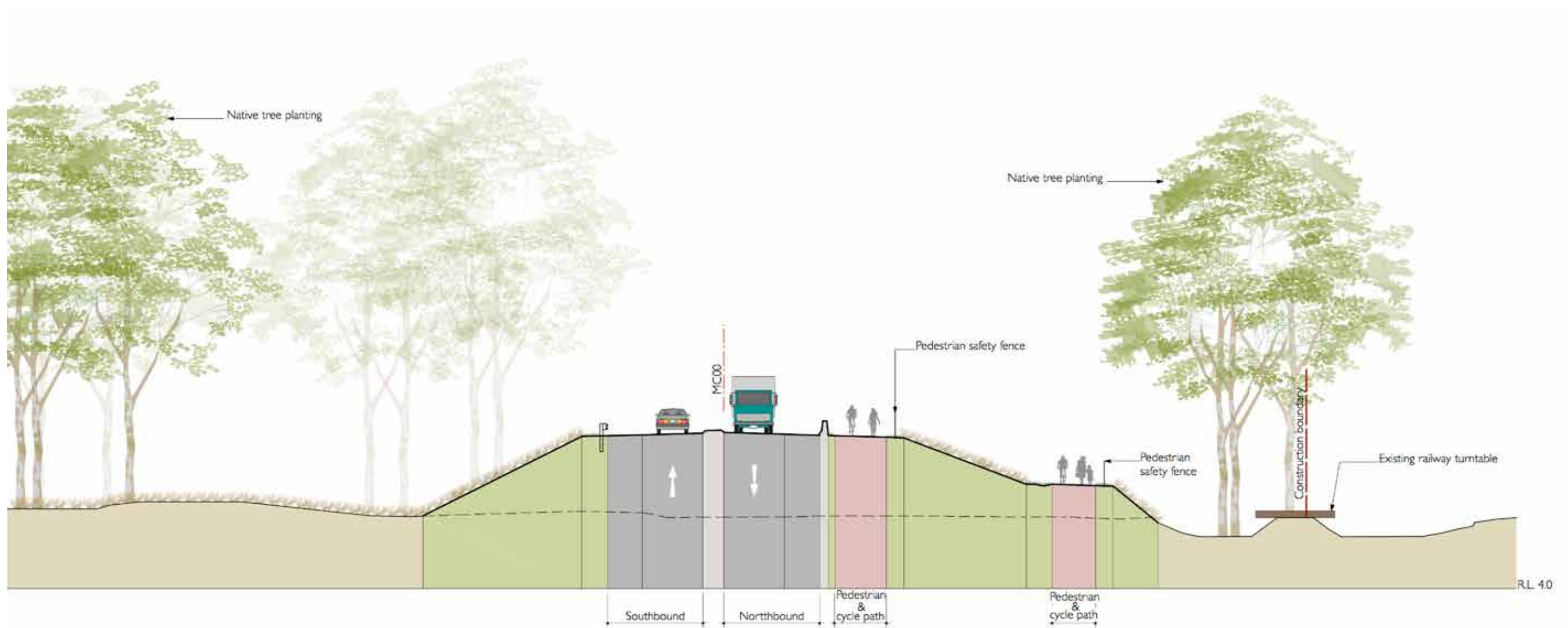


Figure 6.18: SECTION II AT CH 880
Scale 1:250

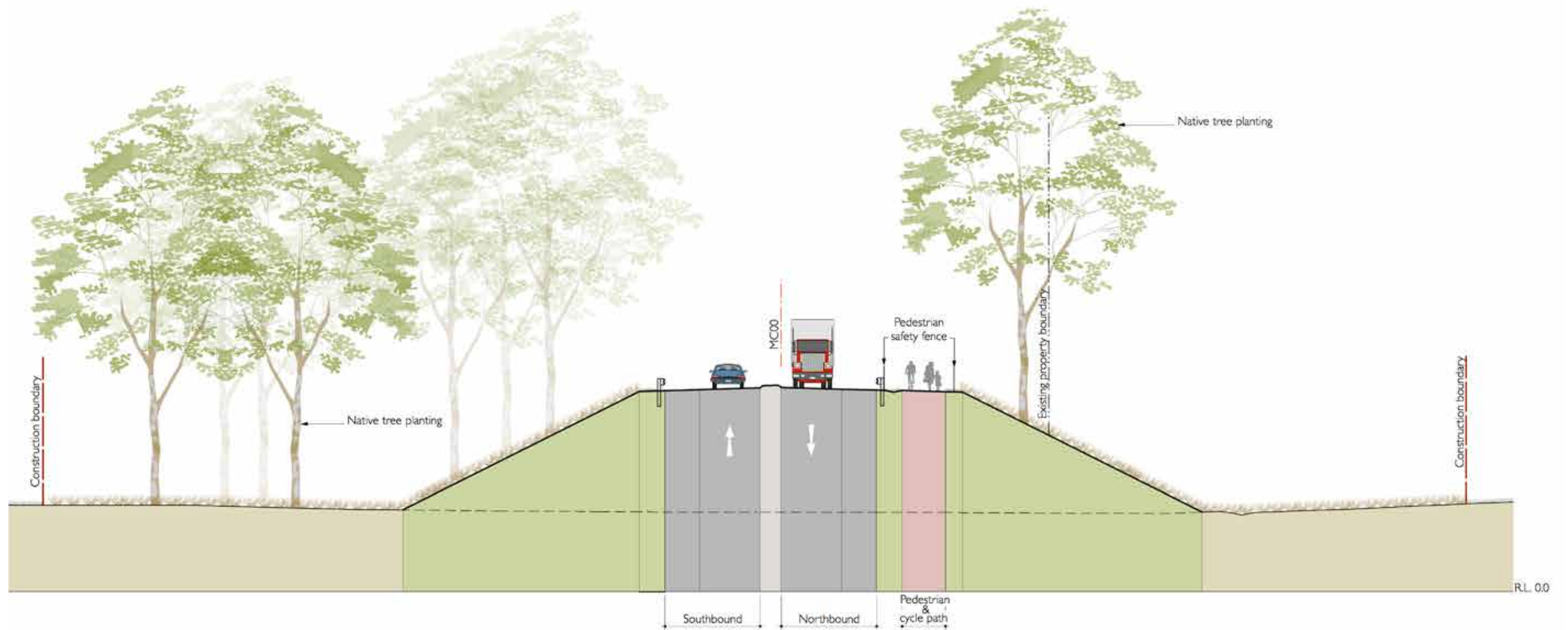


Figure 6.19: SECTION JJ AT CH 800
Scale 1:250

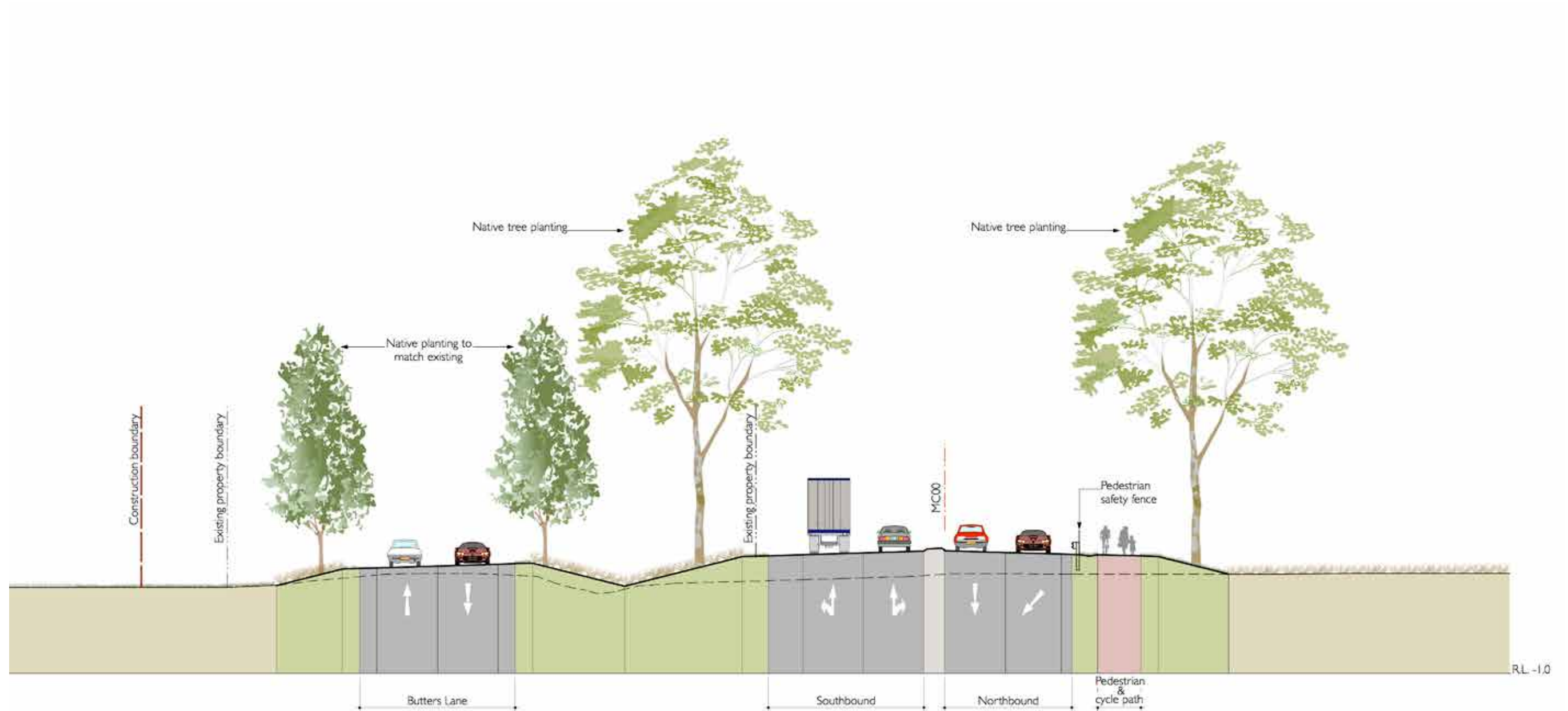


Figure 6.20: SECTION KK AT CH 460
Scale 1:250

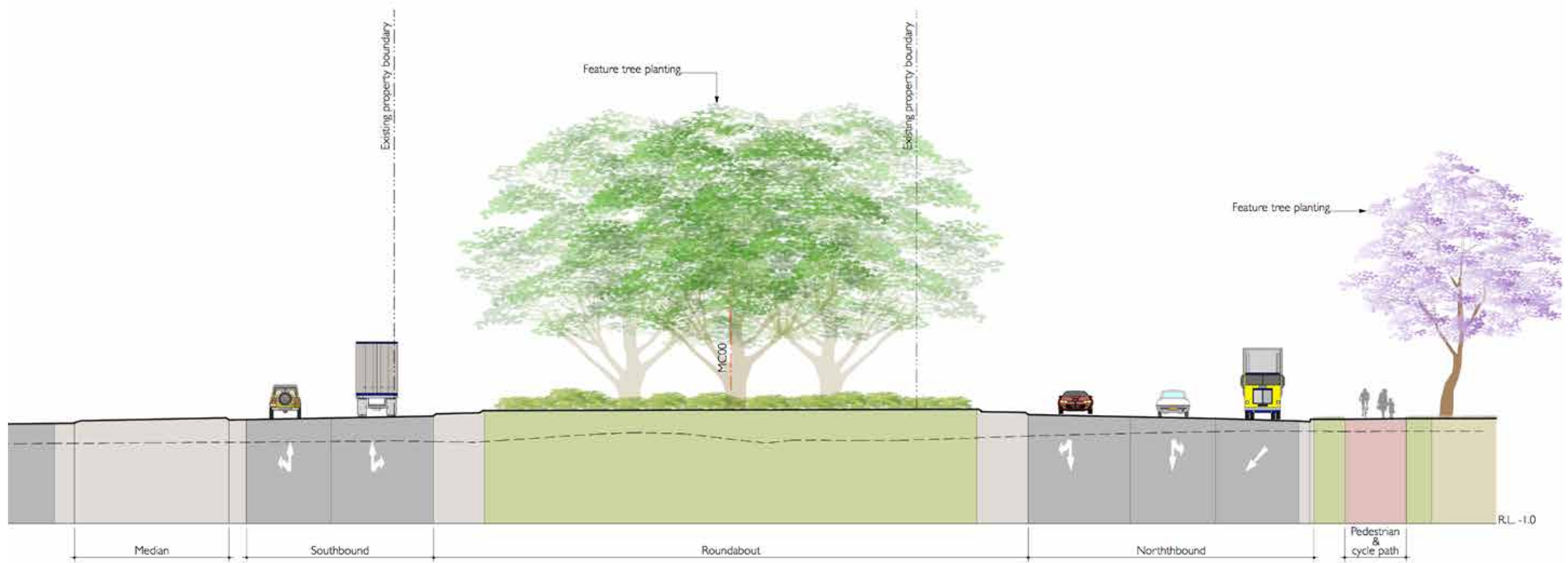


Figure 6.21: SECTION LL AT CH 340
Scale 1:250

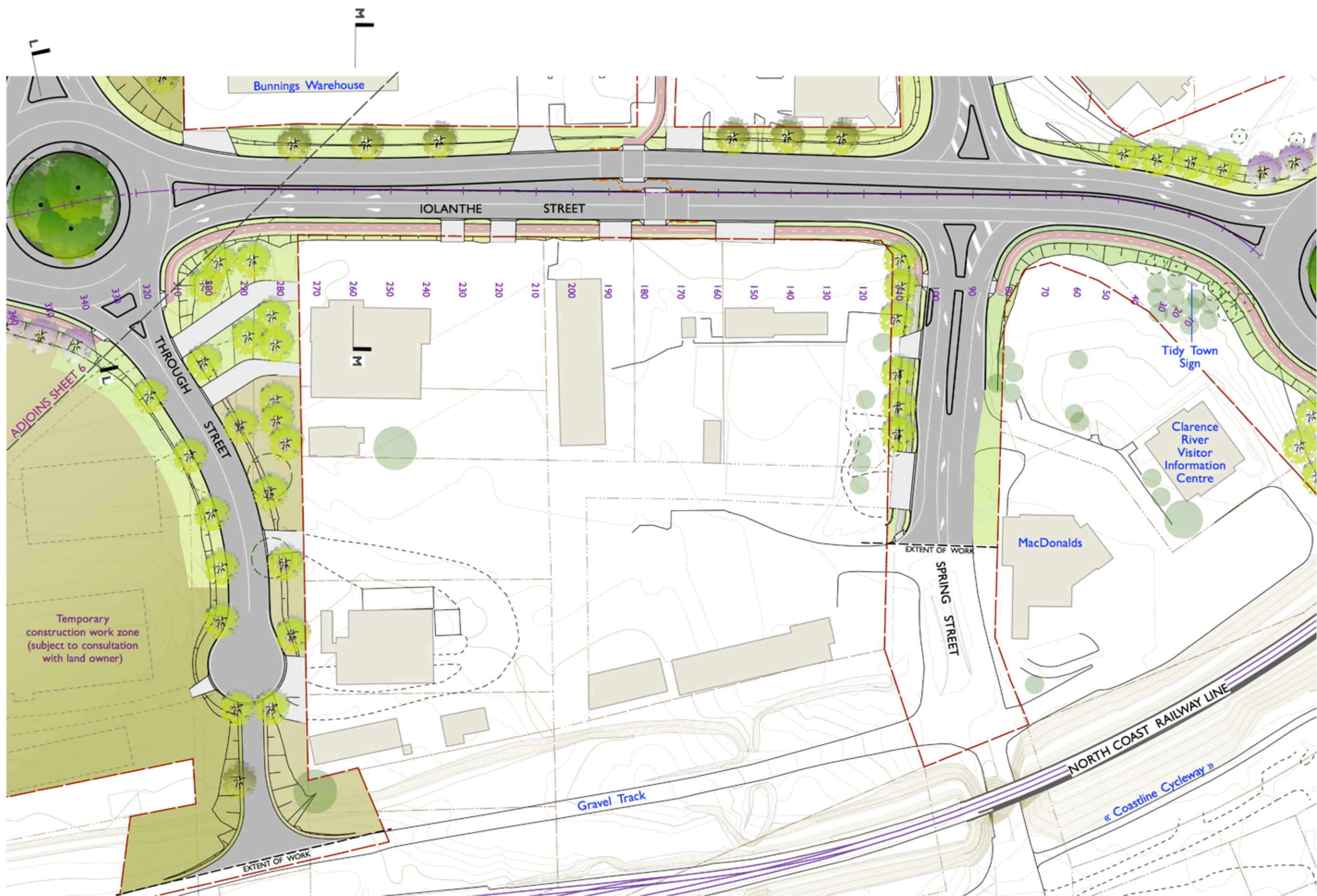




Figure 6.22: URBAN DESIGN AND LANDSCAPE CONCEPT PLAN – SHEETS 7 & 8
Scale 1:1000



LEGEND

	Construction boundary		Proposed pedestrian and cycle path		Proposed type F barrier		Proposed grass		Trees to be removed		Proposed native tree planting
	Property boundary		Proposed footpath		Proposed thrie beam barrier		Proposed pasture grass		Existing native trees		Proposed feature tree planting
	Buildings to be removed		Proposed roadworks		Proposed bridge barrier		Proposed planting		Existing exotic trees		Proposed exotic tree planting
	Navigation channel		Proposed parking		Proposed pedestrian safety fence		Proposed native planting				
					Proposed noise barrier		Proposed riparian planting				
					Proposed retaining wall						

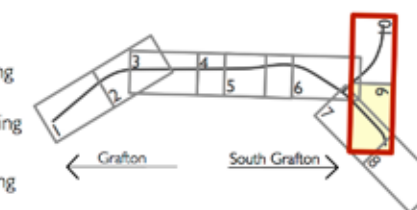




Figure 6.23: URBAN DESIGN AND LANDSCAPE CONCEPT PLAN – SHEETS 9 & 10
Scale 1:1000



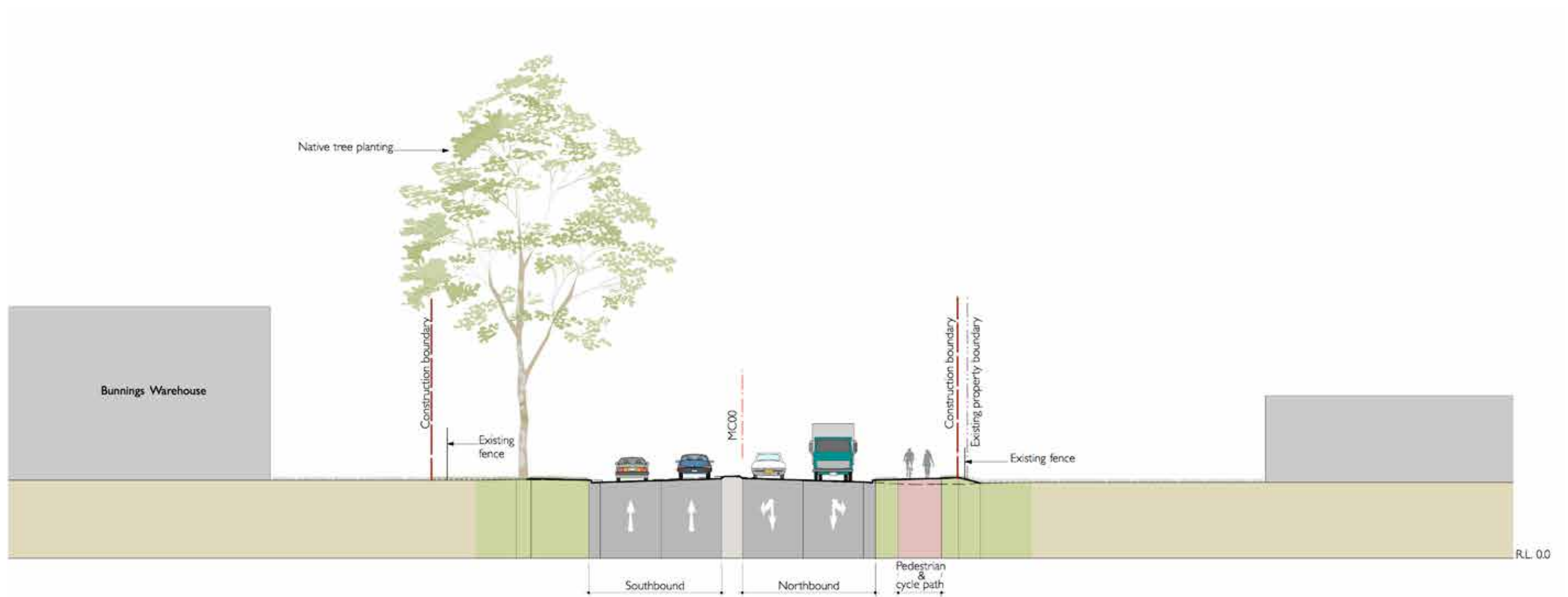


Figure 6.24: SECTION MM AT CH 260
Scale 1:250

6.5 PROJECT-WIDE RECOMMENDATIONS

The following urban design recommendations are provided for the project-wide structures and roadside elements as they can contribute positively to the character of both the roadway and the local landscape. These recommendations would be refined further during detailed design and inform the urban design and landscape plan for the project.

CUTTINGS AND FILL EMBANKMENTS

Cuttings and fill embankments are required to reconcile the upgraded bridge approach road levels with existing ground levels. They are required due to the necessary elevated level of the bridge that addresses flooding and navigational requirements and the minimum geometric requirements for the horizontal and vertical road alignment to meet the relevant design standards.

The types of earthworks formations required for this proposal are:

- Cuttings - where Greaves Street, which would be been lowered to achieve clearance heights, would be situated below the existing ground, requiring excavation.
- Fill embankments - where the approach roads on both sides of the river would be situated above the existing ground, requiring the road to be elevated.

Urban design recommendations

- Turf the cutting at Greaves Street.
- The use of shotcrete is to be avoided unless absolutely necessary. Where shotcrete is required, its application is to be designed to minimise its visibility. Techniques include matching the colour of the concrete to the surrounding rock, and recessing the shotcrete from the cutting face. Refer the Roads and Maritime Shotcrete Design Guidelines.

Rationale

- Turfing stabilises the cutting and integrates with adjoining treatments.

Fill embankments do not generally impact on the road user as they are located below the road level. They do however provide, through the elevation of the road, an opportunity to promote views of the broader landscape. Views of the fill embankment from the broader landscape also need to be considered.

- Embankments should be vegetated using species that corresponds to the adjoining landscape.
- Two general responses to landform are recommended:
- Where the existing landform is relatively flat and space permits, provide a flatter embankment profile (4H:1V) or flatter) to better fit with the surrounding landform.

- ↳ Where the existing landform is steep or where space is limited, provide steeper embankments to minimise extent. In all cases a minimum angle of 2H:1V is preferred to facilitate planting.
- In open areas, limit tree planting to clusters to ensure vistas through to the broader landscape.

Rationale

- Views from the road improve the driving experience, sense of place and orientation.
- Views of the road can be improved where the embankments are integrated with the existing landscape through shaping and revegetation.
- Flattening of batters creates a larger surface area of revegetation to occur. Do not flatten batters where additional tree loss would result as existing trees provide better initial screening than new revegetation.
- Revegetation of embankments allows for better integration of the embankments with the character of the surrounding landscape. This is further improved where vegetation is matched to the surrounding vegetation.

PEDESTRIAN AND CYCLE PATHS

A 2.5 metre wide pedestrian and cycle path is proposed to link Grafton and South Grafton (and the existing Coastline Cycleway) via the new bridge. It would be separated from the carriageway, and in some situations, fenced.

Urban design recommendations

- Investigate alternative concrete finish options to reduce glare.
- Provide exposed aggregate thresholds, with adequate tonal variation, to alert cyclists to upcoming intersections.
- Provide fencing to the top of embankments only. In higher speed environments, provide W Beam barriers only next to the road.
- Provide turf next to the path. If planting is to be provided, allow a 300-500 millimetre setback.

Rationale

- A separated pedestrian and cycle path provides maximum safety and amenity to path users.

SAFETY BARRIERS

Road safety barriers are required at the top of fill embankments and in other roadside situations. The preferred type of barrier depends on the location.

Urban design recommendations

- In general, full height concrete barriers are to be avoided as they restrict views to the surrounding landscape.

- Either W Beam guard rail or wire rope barrier, as appropriate for the situation. Either barrier type should preferably be used in conjunction with planting behind.
- Where space is limited or where maximum visual transparency is required, the modified concrete barrier (type F) with twin rail bridge barrier should be used.

Rationale

- Facilitate views from the road to the surrounding landscape, and to provide a sense of connection to the local area.

FENCING

Fencing is required next to the pedestrian and cycle path, at the top of fill embankments, for safety requirements.

Urban design recommendations

- Investigate alternative fencing types and colour to minimise the visual impact of fencing.

Rationale

- Reduce the visual dominance of balustrades.
- Provides transparency to allow for adjoining vegetation to add to the character of pathways and roadways.

STREET LIGHTING

Urban design recommendations

- Lighting to be minimised to meet requirements set out in AS1158.
- Ensure uniformity in size, height and spacing of lights.
- Use galvanised steel light posts in black or dark grey finish.

Rationale

- Reduce visual dominance of the works, and to retain the existing town character.

SIGNAGE

Urban design recommendations

- There needs to be a balance of regulatory signage and local information signage as part of the works, which would be coordinated on a Signage Plan and subject to urban design review.
- Signage would be installed in accordance with relevant Roads and Maritime and Government guidelines.

Rationale

- The need for signage within the road corridor should be appropriate and suitable within the context of Grafton.

6.6 PLANTING

PLANTING DESIGN

The general approach to the planting design for this project is to integrate the new works into the existing landscape setting and to further define and reinforce the unique landscape character zones. This approach aims to maintain the generously scaled streets and extensive tree plantings in Grafton, and enhancing the southern arrival to town. In order to do this, the planting must strike a balance between screening the works from sensitive visual receptors and maintaining and enhancing key views and vistas to the surrounding landscape.

PLANTING DESIGN PRINCIPLES

The planting concept has been guided by the following design principles:

- Revegetation of all areas affected by the new works.
- Revegetation of residual land affected by the works that is not viable for amalgamation.
- Provision of planting at outside verges wherever possible to minimise the visual scale of the roadway.
- Provision of planting on fill embankments to stabilise the earthworks, minimise their visual impact and integrate them with the character of the surrounding landscape.
- Provision of planting to screen the works from sensitive adjacent land uses where applicable.
- Provision of ‘gateway’ planting at key intersections to provide visual landmarks and enhance local identity.
- Provision of street tree planting to provide a visual identity to the street and to minimise the scale of the street due to the road widening works.
- Provision to mitigate impacts on individual heritage items and heritage values associated with the Grafton Conservation Area.
- Use of provenance plant material (plants grown from locally collected seeds) wherever reasonable and feasible for all native plantings, in particular native revegetation.
- Species selection to consider potential roosting and foraging resources for bird and bat species.

At the detailed planting design stage, which would include further refinement of the plant species selection, particular consideration should be made for ongoing maintenance requirements.

Principles include:

- Selection of plant species that are robust, non-invasive and not fire-promoting.
- Use of local provenance plant material wherever reasonable and feasible for native revegetation plantings.

- Use of species climatically suited to the local area for cultural plantings.
- Exclusion of all species on weed lists applicable to the local area.
- Placement and species selection for planting within the road corridor (e.g verges) to be in accordance with clear zone and sight stopping distance requirements.

INDICATIVE PLANTING PALETTE

An indicative planting palette has been developed for the planting concept, which provides the framework for detailed species selection and planting design during the detailed design phase. The species have been selected based on site observation, Street Trees of Grafton (Clarence River Tourism) publication, and species previously used at road infrastructure projects in the area. The final selection of plant species would be undertaken in consultation with Clarence Valley Council, the local community and key stakeholders.

Following in tables are indicative species for native and cultural plantings. A selection of images for the key tree species proposed is also presented on the following page.

Table 6.1: INDICATIVE STREET TREE PLANT SPECIES LIST

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT	MATURE SPREAD	STREETSCAPE	FEATURE TREE
TREES					
Brachychiton acerifolius	Illawarra Flame Tree	20m	10m	●	
Casuarina glauca	Swamp Oak	20m	8m	●	
Delonix regia	Royal Poinciana	5m	5m	●	●
Eleocarpus reticulatis	Blueberry Ash	6m	3m	●	
Ficus macrophylla	Moreton Bay Fig	40m	20m		●
Harpullia pendula	Tulipwood	12m	6m	●	
Hymenosporum flavum	Native Frangipani	8m	5m	●	
Jacaranda mimosifolia	Jacaranda	15m	8m	●	●
Koelreutaria paniculata	Golden Rain Tree	6m	4m	●	
Melaleuca quinquenervia	Broad-leaved Paperbark	12m	6m	●	
Stenocarpus sinuatis	Fire Wheel Tree	30m	10m		●
Syzigium luehmannii	Small-leaved Lilly Pilly	7m	3m	●	

Table 6.2: INDICATIVE REVEGETATION PLANT SPECIES LIST

BOTANICAL NAME	COMMON NAME	MATURE HEIGHT	MATURE SPREAD	PARKLAND	OTHER
TREES					
Casuarina cunninghamiana	River She-oak	15m	7m		●
Casuarina glauca	Swamp Oak	20m	8m	●	●
Eucalyptus fibrosa	Red Ironbark	30m	8m		●
Eucalyptus moluccana	Grey Box	20m	8m	●	●
Eucalyptus robusta	Swamp Mahogany	20m	9m		●
Eucalyptus teretecornis	Forest Red Gum	35m	12m	●	●
Melaleuca quinquenervia	Broad-leaved Paperbark	12m	6m	●	●
SHRUBS					
Acacia elongata	Swamp Wattle	3m	2m		●
Banksia spinulosa	Hairpin Banksia	2m	2m		●
Callistemon salignus	Willow Bottlebrush	5m	3m		●
Callistemon viminalis	Weeping Bottlebrush	7m	4m		●
Dodonaea triquetra	Common Hop Bush	3m	2m		●
Indigofera australis	Australian Indigo	2m	2m		●
Melaleuca linariifolia	Snow in Summer	8m	4m		●
GROUNDCOVERS					
Aristida vagans	Threeawn Speargrass				●
Dianella caerulea	Blue Flax-lily				●
Hardenbergia violacea	Native sarsaparilla				●
Lomandra longifolia	Spiny-head Mat-rush				●
Lomandra multiflora	Many-flowered Mat-rush				●
Themeda australis	Kangaroo Grass				●
RIVERSIDE PLANTING					
Bolboschoenus fluviatilis	Tall Club-sedge				●
Carex appressa	Tall Sedge				
Cyperus eragrostis	Tall Flat-sedge				●
Juncus usitatus	Common Rush				●
Phragmites australis	Common Reed				●
Schoenoplectus mucronulatis	Bog Bullrush				●



Jacaranda mimosifolia (Jacaranda)



Brachychiton acerifolius (Illawarra Flame Tree)



Ficus macrophylla (Moreton Bay Fig)



Koelreutaria paniculata (Golden Rain Tree)



Delonix regia (Royal Poinciana)



Hymenosporum flavum (Native Frangipani)



Stenocarpus sinuatis (Fire Wheel Tree)



Melaleuca quinquenervia (Broad-leaved Paperbark)



Casuarina glauca (Swamp Oak)



Eucalyptus tereticornis (Forest Red Gum)

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7 IMPACT ASSESSMENT

This chapter provides an assessment of the landscape character, visual and overshadowing impacts of the proposed project on the character of a place and the views within that place. The landscape character assessment relates to the built, natural and cultural aspects that makes a place unique, while the visual impact assessment is intended to identify design improvements that can address adverse impacts either through design integration or as mitigation measures.

This landscape character and visual impact assessment is related to the Roads and Maritime urban design process that addresses visual and character issues, both of which are key aspects for delivering good urban design outcomes.

The landscape character and visual impact assessment for the proposed levee upgrades is provided separately in the Environmental Impact Statement.

7.1 IMPACT ASSESSMENT METHOD

BRIDGE AND APPROACH ROAD METHOD

A landscape character and visual impact assessment of the projects concept design has been undertaken. Based on the results of the assessment, appropriate mitigation measures have been developed to assist in reducing the identified visual impacts, which are included in Chapter 8.

The method used to undertake this study follows the ‘Guideline for Landscape Character and Visual Impact Assessment’ (Roads and Maritime, 2013) and is summarised as follows:

- Site visits and field investigations, reviewing relevant literature, analysing aerial photographs and topographic maps to understand the study area.
- Reviewing the engineering, urban design and landscape concept designs, and other supporting material to gain an appreciation of the project.
- Defining landscape character through a study area analysis.
- Identifying and describing landscape character zones.
- Evaluating the impact of the project on these landscape character zones by combining the sensitivity of the zone and the magnitude of the works to provide an overall impact rating as indicated by the Impact Assessment Grading Matrix (Table 7.1).
- Identifying the visual catchment of the proposed works for the visual impact assessment.
- Selecting viewpoints within the visual catchment representing a range of different land uses.
- Evaluating the visual impact of the project by comparing the sensitivity of viewpoints and the magnitude of the impact of the

project upon them to provide an overall impact rating as indicated by the Impact Assessment Grading Matrix (Table 7.1).

The issue of overshadowing is addressed separately in this section after the visual impact assessment. It looks at two main times of year, specifically 21 June (winter solstice) and 21 December (summer solstice), when shadowing from the proposed bridge would potentially have the most dramatic impact on the surrounding landscape.

Specifics of how the method is applied to the landscape character zone and visual impact assessment are described on the following pages.

The impact assessment grading matrix, adopted from Guideline for Landscape Character and Visual Impact Assessment (Roads and Maritime 2013), shown in Table 7.1, is used in both the landscape character and visual impact assessments. The matrix is applied based on specific criteria relevant to each type of assessment. These criteria are described at the beginning of each assessment section.

Table 7.1: IMPACT ASSESSMENT GRADING MATRIX

		MAGNITUDE			
		High	Moderate	Low	Negligible
SENSITIVITY	High	High Impact	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

7.2 PROPOSED BRIDGE AND APPROACH ROADS LANDSCAPE CHARACTER IMPACT

Roads and Maritime's 'Guidelines for Landscape Character and Visual Impact Assessment' (Roads and Maritime, 2013) provides the following definition of landscape character:

'The combined quality of built, natural and cultural aspects that make up an area and provide its unique sense of place'.

Applying this definition to the specific conditions within the study area, and the features of the proposal, the landscape character assessment also considers how the area is used and how it functions in the Grafton area.

LANDSCAPE CHARACTER ZONES

The study area has been divided into five Landscape Character Zones (LCZ) as illustrated in Figure 7.1. The zones are based on the general landscape character types in the area. This allows for a more detailed discussion of each character zone within the proposal; and a more specific understanding of the likely impact on the landscape character to be experienced as a result of the proposal. Each zone has been defined through the development of an understanding of urban form, topography, and vegetation in combination with other factors, such as land use activities as previously described in Chapter 4.

The five Landscape Character Zones from north to south are listed below and shown on Figure 7.1:

- LCZ1 - Grafton town centre and established residential.
- LCZ2 - Grafton established residential.
- LCZ3 - Clarence River and foreshore
- LCZ4 - South Grafton industrial and rural hinterland.
- LCZ5 - South Grafton industrial and commercial

The existing landscape character of the area is topographically dominated by the Clarence River and its flat river plain. Either side of the river sit the town centres of Grafton and South Grafton which consist of wide gracious streets laid out on a square grid. Outside of the town centres, there are established and newly developing residential areas, and industrial areas, generally concentrated around the regional road and rail corridors. These urban areas are surrounded by the agricultural areas that comprise the city's rural hinterland. Each LCZ is described in more detail in the following sections.

LANDSCAPE CHARACTER ASSESSMENT CRITERIA

The landscape character zones facilitate detailed assessment of the character of the study area, of the proposal within it, and of the magnitude, sensitivity and impact likely on the landscape character of each zone to be experienced as a result of the project.

Magnitude

In landscape character assessment, magnitude refers to the type of proposal and its compatibility with the existing landscape character. All anticipated elements of the project, including the bridge, alignment, road infrastructure, pedestrian and cycle paths, planting, lighting, etc, are considered. The scale of the elements (height, length), as well as its location or setting (on floodplain, near the town), all have a bearing on the magnitude of the physical presence of the works.

- A *high magnitude* results if the proposal is a major development or piece of road infrastructure and contrasts highly with the surrounding landscape, or entails heavy modification of the existing landscape, for example, the large scale removal of existing vegetation.
- A *moderate magnitude* rating would result if the proposal is moderately integrated into the landscape.
- A *low magnitude* rating would occur if the project is of a small scale and integrates well into the landscape.

The magnitude impact rating also considers whether the proposal has a positive or negative impact on the landscape character of the zone. For example, a proposal may be of a large scale but may provide beneficial outcomes such as increased open space, enhancement of the areas 'sense of place', and better connectivity and a safer road environment.

Sensitivity

Sensitivity refers to how sensitive the character of the setting is to the proposed change. A judgement has been made as to the quality of the landscape, its cultural and historical importance to the community, scenic quality, and overall composition of the place and its inhabitants. The following sensitivity judgements have been used as the basis for this assessment:

- Places with high social, recreational, and historical significance to local residents have higher sensitivity.
- Generally, water and natural environments are more highly valued than modified areas, though views over rolling farmland are still highly valued.
- Areas of unique scenic quality have higher sensitivity.
- A pristine environment would have greater sensitivity with less ability to absorb new elements in the landscape than modified landscapes or those areas with contrast and variety of landscape types.
- The number and frequency of viewers effects sensitivity, with retail, residential and open space viewers generally more sensitive than workers and motorists.

Impact

Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer to Table 7.1).

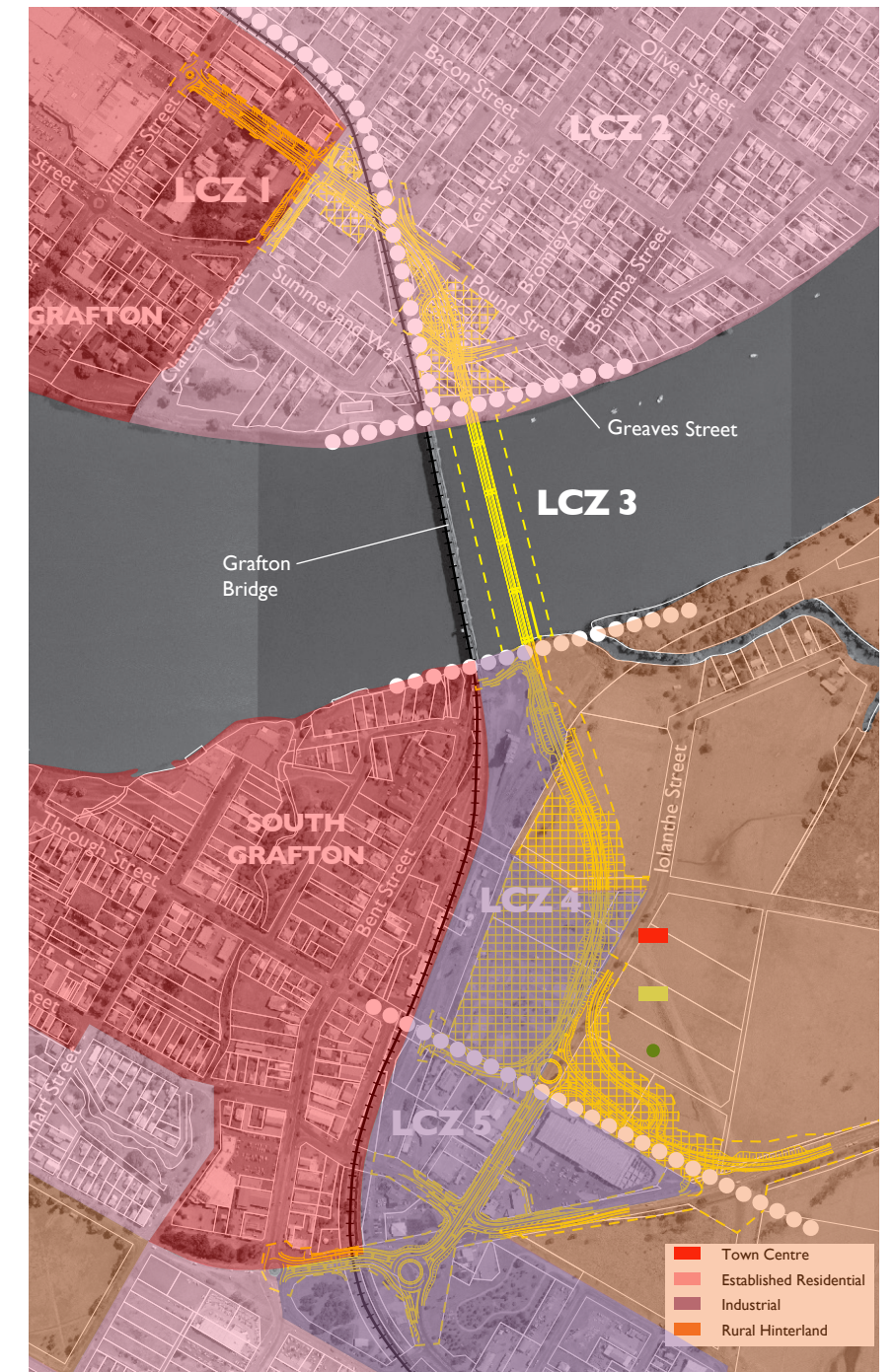


Figure 7.1: Landscape Character Zones - LCZs.

LCZ 1: GRAFTON TOWN CENTRE AND ESTABLISHED RESIDENTIAL

EXISTING LANDSCAPE CHARACTER

The landscape character in this part of the town centre is generally classified as a transitional area from the residential areas to the urban core. The Grafton TAFE campus is a visually prominent property, characterised by large trees in a park-like setting, at the entrance to the CBD which forms part of the educational precinct. The character attributes of this zone are described below.

Built Form and Heritage

Grafton TAFE is the dominant property owner in the area, and is located over the majority of the block to the west. Local residential homes are scattered throughout the area but mostly located to the south and east. The northeast side of one block of Pound Street contains a number of light industrial and commercial businesses. There are a number of locally and National Trust listed heritage buildings and trees within this zone. The entire property of the Grafton TAFE is listed amongst these heritage listed items.

Public Domain

Public open space within the zone consists of the tree lined streets with their wide grassed verges and footways. The grounds of Grafton TAFE are also accessible to the public.

Connectivity and Access

Pound Street is an important vehicular access route into the Grafton town centre particularly the Grafton Shopping World and Prince Street, the traditional main street of Grafton, from the residential areas to the south and east. There are minimal formal pedestrian or cycle paths, with pedestrians having to utilise the grass verges of the street and cyclists the road pavement.

Vegetation

A broad variety of street trees are located throughout this zone. Pound Street includes a number of trees including three Small Leaf Figs, Illawarra Flame Trees, Poincianas, Jacarandas and two very large Hill's Fig trees (30m high), of good health and ecological value, which have great cultural importance to the area. The five Fig trees have a crown spread ranging from 16-32m and are the dominant element in the section of Pound Street between Villiers Street and Clarence Street,

providing valuable shade as well as screening the light industrial and commercial buildings.

Key Activity Areas

Grafton TAFE is the main activity generator in this zone and is accessed from both Pound Street and Clarence Street. The light industrial and commercial businesses located along northern section of Pound Street are also activity generators in this zone.

Spatial Quality

The wide streets and low rise buildings contribute to the open character of the zone. Both Pound Street and Clarence Street are characterised by a relatively narrow road pavement carriageway with large, open grassed swales and do not have formal kerb and gutter. Street trees, particularly those on Pound Street, dominate the landscape in this area.



Plate 7.2: View along existing Pound Street looking south east



Plate 7.1: View along existing Pound Street looking south east



Plate 7.3: View along existing Clarence Street looking south west

THE PROPOSAL

The proposal in LCZ 1 is summarised as:

- Two lanes of traffic in both directions along Pound Street.
- Signalised intersection at Pound Street and Clarence Street.
- Provision of angle parking to the northern side and parallel parking to the southern side of Pound Street.
- One lane of traffic in both directions along the southern section of Clarence Street, angle and parallel parking on both sides of the street, and 90° parking to the centre of the street.
- New pedestrian and cycle path on the southern side of Pound Street.
- New footpath on the north side of Pound Street.
- Removal of a majority existing trees in Pound Street, between Clarence Street and Villiers Street, and Clarence Street between Pound Street and Fitzroy Street.
- Demolition of two houses and the construction of a small carpark on the north eastern corner of the Pound and Clarence Street intersection.

PROPOSED LANDSCAPE CHARACTER

Landscape character changes and effects to LCZ 1 that would result from the project are described below.

Built Form and Heritage

The proposal would result in the demolition of seven (7) houses, including one (1) locally heritage listed buildings. The land on the corner of Pound and Clarence Streets would be converted into a carpark, altering the built form structure of Pound Street. The dominance of vehicular parking and road pavement would change the appearance of the area, which would become an additional arrival point to Grafton. There would be slight encroachment of the proposed works on the Grafton TAFE property and another heritage listed dwelling on Pound Street.

Public Domain

The proposal would result in the formalisation of the grass and tree lined street verges, which would improve pedestrian and cycle access along Pound Street. However, the removal of the trees would reduce shade and visual amenity until the new plantings mature. The property

encroachment on Grafton TAFE would also be an impact to the public domain. The residual land on Pound Street, east of Clarence Street has the potential to increase and improve public open space amenity in the area.

Connectivity and Access

The proposal would provide an additional vehicular access route into Grafton town centre. It would also provide another access to Grafton Shopping World and would provide an alternative route to Prince Street from South Grafton.

Pedestrian and cycle access would be improved by the construction of a pedestrian and cycle path next to Grafton TAFE, linking the town centre with the proposed bridge.

Vegetation

The majority of trees along Pound Street and Clarence Street, including five large Fig trees, would be removed. Feature trees would be planted at the ends of the angled car parking bays on the northern side of Pound Street, and on the southern side, some partially with Grafton TAFE land. Medium sized trees are proposed closer to the intersections, in conformance with sight line requirements.

Key Activity Areas

Traffic activity may slightly increase within this zone, particularly on Pound Street, due to the increased number of lanes and formalised parking. Additional parking in Clarence Street and the proposed carpark at the corner of Pound and Clarence Streets would increase pedestrian activity, particularly students attending Grafton TAFE, key activity area in this zone.

Spatial Quality

The spatial quality of Pound Street would be greatly impacted due to the removal of the trees, particularly the large Figs. The planting of replacement trees would leave the street open until the trees mature over time.

There would also be impacts to the spatial quality of Clarence Street, with the removal of existing trees, wide traffic islands in centre of the road and doubling the extent of hard surface in the area. Angle, parallel and 90° parking bays would be the dominant feature in this area as there is limited space for street tree planting.

Construction Activities

During construction, land on the eastern corner of Pound Street and Clarence Street, and the land occupied by five houses on the southern side of Pound Street, east of Clarence Street would be used for ancillary facilities, temporarily impacting on the character of the zone. The sites would be surrounded by temporary fencing and include site compounds, stockpile areas for materials and temporary storage of spoil and mulch.

Following construction, the corner site would be converted into a carpark, and the Pound Street frontage would be grassed and planted with an avenue of feature trees with scattered native trees, to form a park like character

LANDSCAPE CHARACTER ASSESSMENT

Magnitude

The proposal increases the scale of road infrastructure to Pound and Clarence Streets, changing them from narrow, two lane streets with wide, tree lined verges, to predominately road pavement thoroughfares, making the road environment the dominant feature. It also requires the demolition of seven houses. The addition of new tree plantings would reduce the magnitude of the project as they mature over time.

Overall, the qualitative assessment indicates that the magnitude of the project would be High due to the proposed changes taking place.

Sensitivity

Grafton town centre and established residential area has a High sensitivity due primarily to the social, cultural, heritage and recreational values placed on it by the local community. It includes a number of retail outlets, education institutions heritage buildings, and open space, and the high number and frequency of users within the zone, due to its proximity to Grafton Shoppingworld, reinforce this rating.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the proposal in this zone is likely to be **High**.

Magnitude	High
Sensitivity	High
Landscape Character Impact	High

LCZ 2: GRAFTON ESTABLISHED RESIDENTIAL

EXISTING LANDSCAPE CHARACTER

The established Grafton residential area is strongly defined by the street grid pattern, wide streets and single storey dwellings. The character attributes of this zone are described below.

Built Form and Heritage

The housing stock in Grafton generally consists of single storey dwellings of varying ages and styles. Many houses are elevated, with garages and storage located on the lower level, as a response to the frequent flooding of the Clarence River. The rail line viaduct also runs through this zone and is a unique architectural element in the urban character of this residential neighbourhood zone.

There is also a large number of locally significant heritage buildings in this zone.

Public Domain

Public open space within the zone consists of attractive, wide tree lined streets with wide grassed verges and footways, with connections to the existing bridge footpaths, Girl Guide Park and the river foreshore area.

Connectivity and Access

Pound Street is an important vehicular access route into the Grafton town centre and for connections to the existing bridge. North from the existing bridge, Kent Street, Oliver Street and Queen Street form part of the Coastline Cycleway route. There is no formal pedestrian access, with pedestrians generally having to utilise the grass verges of the street.

Vegetation

A broad variety of street trees are located throughout this zone, but the area is dominated by Jacaranda's. This zone is one of the key areas for tourists to visit during Grafton's Jacaranda Festival. This zone also has a grand avenue of Fig trees which begins near Girl Guide Park at the intersection of Pound Street and Breimba Street. This is also an attraction for visitors to the area.

Key Activity Areas

Whilst the area is mostly a residential neighbourhood, it is used by cyclists and tourists passing through the area during the Jacaranda Festival.

Spatial Quality

The LCZ has a generally open character due to the flat topography, low level dwellings and wide street reservations. The houses are set well back on streets with wide grass verges and prominent street trees.

The existing road and rail viaducts add another vertical element to the landscape.



Plate 7.5: View along existing Pound Street, at Kent Street intersection, looking north west



Plate 7.4: View along existing Pound Street, near Girl Guide Park, looking north west



Plate 7.6: View along existing Greaves Street looking east

THE PROPOSAL

The proposal in LCZ 2 is summarised as:

- A steel truss bridge to connect the North Coast Railway Line over Pound Street west of Kent Street.
- Realignment of Pound Street as the approach road to the proposed bridge.
- Proposed bridge from Greaves Street to the Clarence River, with the bridge abutment immediately north of Greaves Street.
- Lowering of Greaves Street at the bridge abutment to provide the necessary height clearance to the bridge above for vehicles.
- A retaining wall on the southbound side of the approach road, opposite the intersection of Pound Street and Kent Street.
- A noise barrier on the southbound side of the approach road from the river’s edge at Grafton running north to steel truss bridge at Pound Street. .
- A pedestrian and cycle path on the northbound side of the approach road, including a connection via Greaves Street adjacent to the drainage detention basin.
- A drainage detention basin north of Greaves Street, between the bridge approach road and the railway viaduct.
- Drainage culverts under the bridge approach in the vicinity of Kent Street.
- A flood pumping station south of Greaves Street that would extract water from the detention basin and convey it to the Clarence River.

PROPOSED LANDSCAPE CHARACTER

Landscape character changes and affects to LCZ 2 that would result from the project are described below.

Built Form and Heritage

The proposal would result in the removal of most of the Greaves/Kent Street neighbourhood precinct. It is proposed to demolish 15 houses, including six (6) locally heritage listed buildings, as part of the works in this zone.

The houses would be replaced by a new elevated four lane road, with a pedestrian and cycle path and a section of noise wall on a large embankment as it approaches the bridge. Additionally, a drainage detention basin would be constructed with a 1800 mm high chain wire

fence around its perimeter which would be planted with native species around its base. Overall, the proposal would have a considerable impact on the built form and heritage in this zone.

Public Domain

The large areas of land acquired for the proposal would alter the existing public domain by providing additioanl areas of open space. These areas may potentially improve pedestrian connections to the river foreshore.

Connectivity and Access

The new approach road, whilst providing additional access between Grafton and South Grafton, restricts access to Grafton town centre from the area north and east of Pound Street.

The new pedestrian and cycle path would improve pedestrian and cycle access and would also link with the existing bridges path system just west of Greaves Street, however it would affect the route of the existing regional Coastline Cycleway, which would require minor realignment to link with the existing path on Kent Street.

Vegetation

A large number of trees would be removed from Greaves Street, Pound Street, Kent Street, and acquired individual properties. New native tree plantings would be provided on the approach road embankments, to screen the road and noise wall. Native tree planting, as well as the planting of species culturally important to Grafton, such as Jacaranda, Figs and Flame Trees, would also be provided to the potential areas of open space. Overall there would be an increase in the number of trees in the area.

Key Activity Areas

The proposal would have little impact on the key activity areas in the zone, however, it would alter access to some of these areas. There is the potential to add activity areas, in the form of parkland, to the areas of land acquired for the proposal.

Spatial Quality

The proposal would add another vertical element, along with the existing road and rail viaducts, into the landscape. Additionally, the removal of the houses would result in a more open views which would be dominated

by new road and existing rail infrastructure, until the proposed tree plantings reach maturity.

Construction Activities

During construction, an area bound by Kent Street, Pound Street and the railway viaduct would be used for ancillary facilities, temporarily impacting on the character of the zone. The sites would be surrounded by temporary fencing and include site compounds, stockpile areas for materials, temporary storage of spoil and mulch and other construction activities.

Following construction, the land would be grassed and planted with scattered native trees, to form a park like aesthetic.

LANDSCAPE CHARACTER ASSESSMENT

Magnitude

The proposal increases the scale of road and related infrastructure into this residential landscape. It requires the demolition of 15 houses and the removal of a number of trees in an area bounded by Pound Street, Greaves Street and the railway line, which would be replaced by areas of open space.

Although impacts are localised, the qualitative assessment indicates that the magnitude of the project would be High due to the scale of the proposed changes taking place.

Sensitivity

The local residents along with cyclists, visitors and tourists have a High sensitivity as there is a strong social and cultural significance to this part of Grafton. The area contains a number of houses and trees of historical value, reinforcing this rating.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the project in this zone is likely to be **High**.

Sensitivity	High
Landscape Character Impact	High

LCZ 3: CLARENCE RIVER AND FORESHORE

EXISTING LANDSCAPE CHARACTER

The Clarence River winds across a wide floodplain. The bridge is the dominant visual feature on the river in the Grafton area and strongly defines the landscape character of LCZ 3. The character attributes of this zone are described below.

The Bridge

The State, local and National Trust heritage listed bridge was opened to road and rail traffic in 1932. The upper deck contains a two way road, whilst the lower level supports a rail line, two footpaths, and water mains. The bridge, despite sitting comfortably within the river setting, remains, the dominant piece of infrastructure within the river and its surrounds.

The River and Foreshore

The Clarence River is the dominant visual element in the local landscape, and the existing steel truss bridge contributes to this by allowing views to continue though the superstructure of the bridge. This section of the river is characterised by its wide oxbow form that provides for sweeping views across the river plain. The two pedestrian paths, on either side of the railway line on the lower level of the bridge, provide the best views of the foreshore and floodplain both upstream and downstream along the river.

The river edge is defined by levee banks on both sides, protecting Grafton and South Grafton from periodic flooding of the river. The foreshore is a predominately public open space, the exception to this being the northern foreshore, in areas both east and west of the bridge, where some parcels of foreshore land are privately owned.

Susan Island and Elizabeth Island are located either side of the bridge and are important elements in the character of the river. Susan Island is visible from the bridge, and due to its size, visually blends in with the surrounding landscape.

Key Activity Areas

There are a number of public facilities along the foreshore, including the Grafton Mens Bowling Club, Grafton Rowing Club and Clarence River Sailing Club on the northern foreshore, and the South Grafton Ex-Servicemens Club and Skinner Street Wharf on the southern foreshore. Public open space includes Grafton Memorial Park, and Girl Guide Park on the northern foreshore.

The river itself is also a key activity area for boating, sailing, fishing and other recreational activities.

Vegetation

Vegetation is mixed along the foreshore area. Reeds are dominant at the waters edge, while generally exotic planting and weeds are found amongst the grassed foreshore areas. There are several trees, including Jacaranda’s and Flame Tree’s on the both foreshores. Further to the east, riparian planting is located on the banks of Alipou Creek which is of great cultural significance to the Aboriginal community.

Connectivity and Access

The existing bridge provides one lane of vehicular traffic in each direction. There are also two pedestrian paths, on either side of the railway line on the lower level of the bridge. Access to the pedestrian paths is via relatively steep ramps, which both have poor sight lines and limited surveillance. The paths are relatively narrow, particularly as it is used as a pedestrian and cycle path for both pedestrians and cyclists, yet these paths do offer very attractive panoramic views both of the upstream and downstream reaches of the river.



Plate 7.8: Pedestrian path on the downstream side of the existing bridge, looking south



Plate 7.7: The existing bridge viewed downstream from South Grafton CBD



Plate 7.9: Pedestrian path on the downstream side of the existing bridge, looking east

THE PROPOSAL

The proposal in LCZ 3 is summarised as:

- 553 metres long concrete bridge, approximately 70 metres east of the existing Grafton Bridge with a crest in the centre and a longitudinal grade falling back toward Grafton and South Grafton.
- The road level on the proposed bridge would be approximately halfway between the levels of the road deck and the railway deck on the existing Grafton Bridge with one lane of traffic in each direction on the new bridge.
- The bridge would have 10 spans, with five piers in the Clarence River and four piers on land – two piers at each foreshore.
- The bridge spans would be a concrete box girder. The girder would be five metres deep at the piers and three metres deep at mid spans.
- The viaduct spans would be 1.2 metres deep Super T girders.
- At the crest of the bridge (at Pier 5), the road level would be approximately 15.4 metres above the river at Mean High Water Spring (MHWS). The top of the vehicle barrier would be about 16.7 metres above the river at this point.
- Precast concrete parapets on both sides of the bridge.
- Twin rail steel barriers at the edge of both carriageways.
- A pedestrian and cycle path on the northbound (upstream) side of the bridge, facing the existing Grafton Bridge.



Plate 7.10: View from northern foreshore to existing bridge

PROPOSED LANDSCAPE CHARACTER

Landscape character changes and affects to LCZ 3 that would result from the project are described below. It is noted that the impacts on landscape character would be different on the upstream and downstream sides due to the existing bridge partly obscuring the proposed bridge on the upsteam side. For this reason, landscape character assessment has been provided for both sides of the river setting

The Bridge

The proposed bridge would be constructed about 70 metres downstream of the existing bridge. The scale of the proposed bridge would be slightly less than the existing bridge, however, the accumulative effect of both bridges substantially increases the scale of infrastructure on the river setting. Additionally, the road level on the proposed bridge would be approximately halfway between the levels of the road deck and the railway deck on the existing Grafton Bridge.

The River and Foreshore

Whilst the Clarence River would remain the dominant visual element in the local landscape, the proposed bridge would have an adverse impact on the spatial quality of the existing bridge in its setting.

Downstream views of the Clarence River and Alipou Creek would no longer be visible to pedestrians, cyclists and train passengers on the lower deck of the existing bridge as the views would be blocked by the concrete box girder of the proposed bridge. These views would also not be accessible from the proposed bridge as the pedestrian and cycle path would be on the upstream side. However, this path would provide a continuous and relatively close view of the existing bridge.

Upstream views from the existing bridge would not be affected. Downstream views of the existing bridge would also be maintained, however the proposed bridge would be visible through the existing bridge structure, increasing the overall visual bulk of the more light weight truss bridge.

Key Activity Areas

The proposal would have limited impact on boating and river foreshore use, mostly during the construction phase of the bridge. There would be some slight overshadowing of the foreshore areas and an impact on views from the existing bridge and river foreshore (including Girl Guide Park), which would be obscured by the new bridge. Other foreshore areas would not be affected.

Vegetation

The proposed bridge works would require the removal of vegetation, including a number of Jacarandas and Flame Trees. New tree plantings would replace those removed. Scour protection works directly under the new bridge would provide a harder edge to the river bank.

Connectivity and Access

The project would incorporate a pedestrian and cycle pedestrian/cycle path across the western side of the new bridge, an alternative route between Grafton and South Grafton, and a path linking with the existing path network over the existing bridge on the southern foreshore. Access along the northern foreshore would not be affected.

LANDSCAPE CHARACTER ASSESSMENT

Magnitude

The proposed works include the construction of a new bridge which together with the existing bridge, increase the scale of infrastructure on the river setting which would be particularly visible from the downstream side.

Overall, the qualitative assessment indicates that the magnitude of the project would be Moderate on the upstream side and High on the downstream side due to the proposed changes taking place.

Sensitivity

Due to the highly scenic character of the river setting, the heritage listed bridge, Alipou Creek Aboriginal site and the generally flat topography of the surrounding area, the zone would have a High sensitivity to the proposed works on both sides.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the project in this zone is likely to be **High to Moderate** on the upstream side and **High** on the downstream side.

	upstream	downstream
Magnitude	Moderate	High
Sensitivity	High	High
Landscape Character Impact	High to Moderate	High

LCZ 4: SOUTH GRAFTON INDUSTRIAL AND RURAL HINTERLAND

EXISTING LANDSCAPE CHARACTER

The landscape character of LCZ 4 is that of rail lines, vacant industrial land and flat, open agricultural fields in the floodplain. The character attributes of this zone are described below.

Built Form and Heritage

Buildings within this LCZ are limited to a small number of residential homes along Butters Lane, the sugar loading facility and the buildings and structures at Grafton Railway Station. The Grafton Railway Station is a State, local and National Trust listed heritage site. Alipou Creek is also an important Aboriginal heritage location and has significant cultural value to the local Aboriginal community.

Public Domain

The Grafton Railway Station and Coastline Cycleway are the main areas of public domain in this zone. The railway and cycleway corridors have slightly elevated views over this zone.

Connectivity and Access

Access is limited to the local and service roads. Iolanthe Street is the main road in the area which connects Butters Lane with the rest of South Grafton at Iolanthe Street. The Coastline Cycleway, a separated pedestrian and cycle path that connects the existing bridge crossing, is the only formal pedestrian or separated cyclist access in the zone. The regional Coastline Cycleway is a pedestrian and cycle pedestrian and cycle path that runs parallel to the railway line, linking the existing bridge to the Grafton Railway Station and Through Street, Spring Street and the South Grafton Bus Interchange in this zone.

Vegetation

Tree planting is sparse in this zone and is limited to plantings along the roadside, to property boundaries, along Alipou Creek, and scattered plantings within the paddocks. This zone contains a range of trees including Jacarandas, Figs and Brush Boxes, which are readily visible throughout the area and particularly from the Coastline Cycleway and Grafton Railway Station.

Key Activity Areas

The main activities in this LCZ focus around the sugar loading facility and farming activities. The rail line and the Coastline Cycleway form key transport corridors on the western edge of the zone.

Spatial Quality

The LCZ is generally flat and open providing relatively unobstructed views throughout the area. The narrow industrial land area quickly transitions to rural hinterland, which consists of flat, open country on the floodplain. To the southeast, the land rises with the rolling hills.



Plate 7.11: View south east from the Bent Street layby south of the existing bridge



Plate 7.12: View along existing Butters Lane looking east



Plate 7.13: View north east from the Bent Street layby south of the existing bridge

THE PROPOSAL

The proposed construction and operational changes in LCZ 4 include:

- A two lane approach road connecting the proposed bridge to Iolanthe Street at Through Street. The approach road would be elevated on a fill embankment up to approximately 7.25 metres high and would intersect with the Heber Street Levee.
- A large roundabout at the intersection of the bridge approach road, Through Street, Iolanthe Street and the realigned Pacific Highway.
- Realignment of northern section Butters Lane to connect along the new alignment of the Pacific Highway east of the new roundabout.
- A pedestrian and cycle path on the western side of the bridge approach road.
- A pedestrian and cycle path connection between the bridge approach road at Abutment A and the existing regional Coastline Cycleway at the existing Grafton Bridge.

PROPOSED LANDSCAPE CHARACTER

Landscape character changes and affects to LCZ 4 that would result from the project are described below.

Built Form and Heritage

The proposal would not directly impact buildings within the zone.



Plate 7.14: View along existing Iolanthe Street looking north

However, it would be partially visible from the small group of houses on Butters Lane as well as the Grafton Railway Station, railway line and the regional Coastline Cycleway along the boundary of this zone.

Public Domain

The proposal would have no direct impact on the public domain areas in this zone. However, the new approach road would be visible from the Grafton Railway Station and Coastline Cycleway.

Connectivity and Access

The new road works would provide an alternative access between Grafton and South Grafton. It would also divert the existing Iolanthe Street and the Pacific Highway between Bunnings Warehouse and the Heber street levee.

The new pedestrian and cycle path would be located on the western side of the approach road and would connect the bridge with South Grafton and the Coastline Cycleway in Derek Palmer Place, providing additional access.

Vegetation

A moderate amount of exotic and native vegetation would be removed throughout the zone for both the construction compounds and the proposed approach roads. The proposed planting strategy would allow views east over the zone from the approach road, and the native avenue treatment on the western side would provide shade for pedestrians and a visual identity for the road as it nears the bridge.

New feature trees would be planted around and within the Through Street roundabout to help to reduce its visual scale and to provide a visual identity to this point of entry to the approach road to the new bridge.

Key Activity Areas

The proposal would have limited impact on the key activity areas, mostly to changes to the grazing areas, parts of the old rail line as well as areas around Alipou Creek

Spatial Quality

Despite its proximity to the existing road and rail embankment, and levee bank, the proposal introduces a new vertical element, in the form of a 7.25 metre high embankment, into the relatively flat topography of the zone. This would result in the large embankment being highly visible

from local residents, the Grafton Railway Station, railway line and the Coastline Cycleway.

Construction Activities

During construction, a large area of land between Iolanthe Street and the railway line would be used for ancillary facilities, impacting on the character of the zone for up to three years. The site would be surrounded by temporary fencing and include site compounds, stockpile areas for materials, temporary storage of spoil and mulch, a concrete batching plant and pre-cast facilities.

Following construction, the site would revert to its pre-construction state.

LANDSCAPE CHARACTER ASSESSMENT

Magnitude

The works increase the scale of road infrastructure and require the construction of a 7.25 metre high fill embankment. However, its proximity to the existing road and rail embankment, the poor quality of the nearby post industrial land and proposed tree plantings would reduce its rating.

Overall, the qualitative assessment indicates that the magnitude of the project would be Moderate due to the proposed changes taking place.

Sensitivity

Despite being a modified and flat, open landscape, the zone has an attractive rural character and has a direct visual relationship with the river and surrounding hills. The proposal is located in the transition between the rural landscape and the urban landscape of South Grafton. However, the poor quality of the land between Iolanthe Street and the railway line result in this zone having a Low sensitivity to the proposed works.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the project in this zone is likely to be **Moderate to Low**.

Magnitude	Moderate
Sensitivity	Low
Landscape Character Impact	Moderate to Low

LCZ 5: SOUTH GRAFTON INDUSTRIAL AND COMMERCIAL

EXISTING LANDSCAPE CHARACTER

The landscape character of LCZ 5 is distinguished by a range of medium and large industrial and commercial buildings. The character attributes of this zone are described below.

Built Form and Heritage

The buildings within this zone are predominately large industrial and commercial buildings. The newer buildings are typically ‘big box’ warehouse developments, for example, Bunnings Warehouse on the Pacific Highway. There are a number of fast food outlets in this zone in addition to the Clarence River Tourist Information Centre. Older buildings tend to be user specific and cater to either industrial and commercial uses. There are no identified heritage items in this zone.

Public Domain

Recreation and public open space areas are located adjacent to both the Pacific Highway and Gwydir Highway. These open space areas include Derek Palmer Place, Truck Drivers Memorial Park, and the Clarence River Visitors Information Centre. User amenity in these locations is generally poor and the spaces are divided by the highways and railway line.

Connectivity and Access

The Pacific Highway provides the main vehicular thoroughfare in the zone and connects to the Gwydir Highway and Iolanthe Street. The regional Coastline Cycleway is a pedestrian and cycle pedestrian and cycle path that runs parallel to the railway line, linking the Grafton Railway Station, Through Street, Spring Street and the South Grafton Bus Interchange in this zone. Pedestrian access is limited to the grassed roadside verges as there are no formalised footpaths in the area.

Vegetation

Tree planting is sparse in this zone and is limited to plantings along the roadside and to property boundaries. There is a cluster of planted palms, pines and groundcovers that serve as an arrival feature at the Pacific and Gwydir Highway intersection.

Key Activity Areas

The key commercial activities in the area are Bunnings Warehouse and a variety of major fast food retail outlets and a highway service station. Derek Palmer Place, the Truck Drivers Memorial Park, and the Clarence River Visitors Information Centre are also used by travellers stopping along the Pacific Highway and Gwydir Highway.

Spatial Quality

The spatial arrangement of the LCZ is generally open and relatively flat. Due to the flat landform and limited tree plantings, the road, railway and buildings visually dominate this zone. The northern part of the LCZ consists of large building footprints with large yards or carpark. The open space areas in the southern portion of the LCZ focused around the Pacific Highway and Gwydir Highway intersection.



Plate 7.16: View along existing Pacific Highway looking west



Plate 7.15: View along existing Pacific Highway, near Iolanthe Street intersection, looking north east



Plate 7.17: View along existing Pacific Highway, near Gwydir Highway intersection, looking east

THE PROPOSAL

The proposed construction and operational changes in LCZ 5 include:

- A two lane approach road connecting the proposed bridge to Iolanthe Street at Through Street. The approach road would be elevated on a fill embankment up to approximately 7.25 metres high and would intersect with the Heber Street Levee.
- Realignment of the Pacific Highway (Charles Street) to connect with Iolanthe Street at Through Street.
- Extension of the northern section of Iolanthe Street to connect with the realigned Pacific Highway to the east of the bridge approach road.
- A large roundabout at the intersection of the bridge approach road, Through Street, Iolanthe Street and the realigned Pacific Highway.
- Reconfiguration of the former Pacific Highway (Charles Street) to intersect with Iolanthe Street at Spring Street.
- An intersection between the former Pacific Highway and the realigned Pacific Highway to the east of Iolanthe Street (north).
- A large roundabout at the intersection of Iolanthe Street, the Pacific Highway (Schwinghammer Street) and the Gwydir Highway.
- A pedestrian and cycle path on the western side of the bridge approach road, Iolanthe Street and the Gwydir Highway that connects with the existing regional cycleway west of the railway line.
- A pedestrian and cycle path connection between Iolanthe Street and the southern side of the former Pacific Highway, with mid block pedestrian refuge crossings on Iolanthe Street and the former Pacific Highway. In the future, the pedestrian and cycle path on the former Pacific Highway would be extended (by others) to Clarenza.



Plate 7.18: View to Derek Palmer Place looking north

PROPOSED LANDSCAPE CHARACTER

Landscape character changes and affects to LCZ 5 that would result from the project are described below.

Built Form and Heritage

The proposal would not impact on existing buildings or heritage items.

Public Domain

There would be some impact on the public domain due to encroachment of the Clarence River Visitors Information Centre and Derek Palmer Place, resulting in a loss of green space. New tree planting to these areas would reduce some of the impacts on visual amenity.

Connectivity and Access

Vehicular access to Through Street would be improved by the construction of a new road pavement. The construction of the Spring Street roundabout would improve traffic flow for motorists on the Pacific Highway and Gwydir Highway.

A new pedestrian and cycle path would be provided on the western side of Iolanthe Street linking the new bridge with the existing Coastline Cycleway running through Derek Palmer Place.

Vegetation

The proposal would have an adverse impact on vegetation in this zone, with a number of existing trees removed in the vicinity of the large roundabout at the intersection of the Pacific Highway and Charles Street. New feature trees would be planted around and within the roundabout to help to reduce its visual scale and to provide a visual identity to this point of entry into South Grafton.

Key Activity Areas

The proposal would have a slight impact on the existing key activity areas.

Spatial Quality

The upgraded road infrastructure occurs within an established road corridor which is generally open. The proposal would increase the area of hard surface, however proposed tree planting within and around the large roundabouts would assist in reducing its impact.

LANDSCAPE CHARACTER ASSESSMENT

Magnitude

The proposed works increase the scale of road infrastructure in the zone, however, these take place in an established road corridor within an industrial/ commercial area. The proposed feature tree plantings in and around the roundabouts would help to reduce the visual scale of the works and provide the opportunity improve the landscape character of the area as the southern entry to Grafton, reducing the magnitude rating.

Overall, the qualitative assessment indicates that the magnitude of the project would be Moderate due to the scale of the proposed changes taking place.

Sensitivity

The character setting of the zone is industrial and commercial which suggests it has a low sensitivity to the proposed changes. However, the addition of the Clarence River Visitors Information Centre, retail establishments, and parks, as well as a high frequency of viewers due the area being at the intersection of the two highways making this an important entry point to Grafton, increases the rating to Moderate.

Landscape Character Impact

The qualitative assessment indicates that the landscape character impact of the project in this zone is likely to be **Moderate**.

Magnitude	Moderate
Sensitivity	Moderate
Landscape Character Impact	Moderate

SUMMARY OF LANDSCAPE CHARACTER IMPACT

The landscape character impact assessment of the proposal described above, represents a qualitative assessment based on the five LCZ's. The results of these assessments range from High to Moderate and are summarised below.

Landscape Character Zone	Magnitude	Sensitivity	Landscape Character Impact
LCZ 1: Grafton town centre	High	High	High
LCZ 2: Grafton established residential	High	High	High
LCZ 3: Clarence River and foreshore (upstream)	Moderate	High	High to Moderate
LCZ 3: Clarence River and foreshore (downstream)	High	High	High
LCZ 4: South Grafton industrial and rural hinterland	Moderate	Low	Moderate to Low
LCZ 5: South Grafton industrial and commercial	Moderate	Moderate	Moderate

Overall, the proposal would have an adverse impact on landscape character. The works would cause adverse impact on all Landscape Character Zones due to the scale of the works and to the high sensitivity of the historic river setting, its value to the community and its generally low ability to absorb change. The existing bridge is a State listed heritage item and sits comfortably within the scale of the landscape. The new bridge, with its proximity to the existing bridge, substantially increases the scale of infrastructure on the river. The works would impact on a number of the wide tree lined streets in LCZ 1 and LCZ 2 by increasing pavement widths and by the removal of existing mature trees and a number of houses.

The moderate to low impacts occur on the southern side of the river where the rural and industrial and commercial land uses are better able to absorb the impacts of the proposed works.



Plate 7.19: Existing landscape character of the Grafton area without the proposed bridge and approach roads



Plate 7.20: Artist impression of the landscape character of Grafton with the proposed bridge and approach roads. Artist impression represents anticipated view during opening year.



Plate 7.21: Existing landscape character of the South Grafton area without the proposed bridge and approach roads



Plate 7.22: Artist impressions of the landscape character of South Grafton with the proposed bridge and approach roads. Artist impression represents anticipated view during opening year.

7.3 PROPOSED BRIDGE AND APPROACH ROADS VISUAL IMPACT

The potential visual impact of the project has been assessed in relation to a number of key viewpoints. It is based on the existing pattern of land uses adjoining the proposal bridge and approach road design. The method of assessment involved:

- Defining the scale or size, form and type of project within the context of the study area.
- Establishing an estimated visual catchment, through desktop analysis and ground truthing on site.
- Identifying key viewpoints from where the proposed works would be visible.
- Assessing the level of potential visual impact on viewers at these viewpoints from the proposed works.

VISUAL CATCHMENT

The extent from which the proposal would be visible from adjoining areas varies throughout the study area. It is influenced by topography, vegetation, buildings, heritage and land use patterns. A detailed desktop and field assessment was undertaken to determine the area from where the proposal would be visible, defined as the Visual Envelope Map (VEM), as illustrated in Figures 7.2 and 7.3.

Views to the proposal within Grafton are generally contained to the road corridors by the commercial and residential buildings. Views become more widespread closer to the river.

From the existing bridge, extensive views are available along the river and foreshore. These are constrained by the curvature of the river both upstream and downstream. The topography and openness of the landscape to the east allows far reaching views into the floodplain, reaching to the undulating hill range in the Clarenza area.

Views to the proposal from South Grafton are also generally contained to road corridors by the density of buildings in the area.

The visual receivers of the proposed bridge and approach road sections of project include residents, commercial tenants, shoppers and tourists, recreational water users, pedestrians, cyclists and motorists.

VIEWPOINT LOCATIONS

Within the VEM, key viewpoints have been identified along adjacent streets and at other public domain areas, for example, Girl Guide Park.

This involved the analysis of views from the road and bridge to identify the extent to which houses and other buildings were visible. Locations and directions of chosen viewpoints are representative of the range of viewpoints both within and beyond the proposal, and are indicated on Figures 7.2 and 7.3.

VISUAL IMPACT ASSESSMENT CRITERIA

The magnitude of change to existing views and the sensitivity of the viewer has been assessed for each of the chosen viewpoints.

Magnitude

Magnitude of change to existing views refers to the nature and scale of the proposal, and the extent and proximity of the view to it. Magnitude represents the contrast in scale, form and type of proposal to the location and context to which it is to be placed. It also takes into consideration landscape and urban design treatments and improvement that are included in the Concept Design.

- A *high magnitude* results if the proposal is of a major scale and is considered out of scale or uncharacteristic of the existing visual character, or if there is considerable modification to the existing landscape.
- A *moderate magnitude* would result if the proposal is prominent but not considered to be substantially uncharacteristic with the existing visual character.
- A *low magnitude* results if there is minimal alteration to the existing view and the proposal is of a scale and nature that is consistent with the existing visual character.

Sensitivity

Sensitivity is the measure of the visual importance of the nominated view and is dependent on:

- Distance between viewer and the proposal.
- The category of viewer, for example, residence, workplace, shops, open space.
- The elements of the proposal that are visible.
- Importance of the view, for example identified in tourist guides, do people deliberately seek the view.

Visual sensitivity includes the consideration of the perceived cultural and historical values of the visual environment and the elements within it.

Generally, viewers with a higher sensitivity include:

- Residents who have existing attractive views that would be affected by the proposal.
- Users of public open space where their attention is focused on the visual landscape, for example, lookouts or other scenic natural areas.
- Communities that place high cultural and historical significance on the visual landscape.

Viewers with a lower sensitivity are most likely to be:

- Employees focused on their work.
- Motorists whose attention is focused on driving. Although low speed vehicles and those with passengers would have a slightly higher sensitivity.

Impact

Impact is the combination of the magnitude and sensitivity rating in accordance with the Impact Assessment Grading Matrix (refer to Table 7.1).

On the following pages is a quantified assessment of the visual impact at each viewpoint. The grading are measured on their impact relative to each other within the scope of the proposal rather than to an absolute scale covering all potential forms of impact.

KEY VIEWPOINTS

A total of 12 viewpoints have been identified on the basis of the criteria outlined above, as indicated in Figures 7.2 and 7.3 and are listed from north to south. . Each viewpoint is comprised of the following summary information:

- Location.
- Existing site description.
- Viewpoint selection rationale.
- Visual impact based on assessment of magnitude of change and sensitivity.

The list of mitigation measures that could be incorporated into the engineering design to potentially reduce the visual impact level are included in Chapter 8.



Figure 7.2: Visual Envelope Map (VEM) and location of viewpoints at local scale

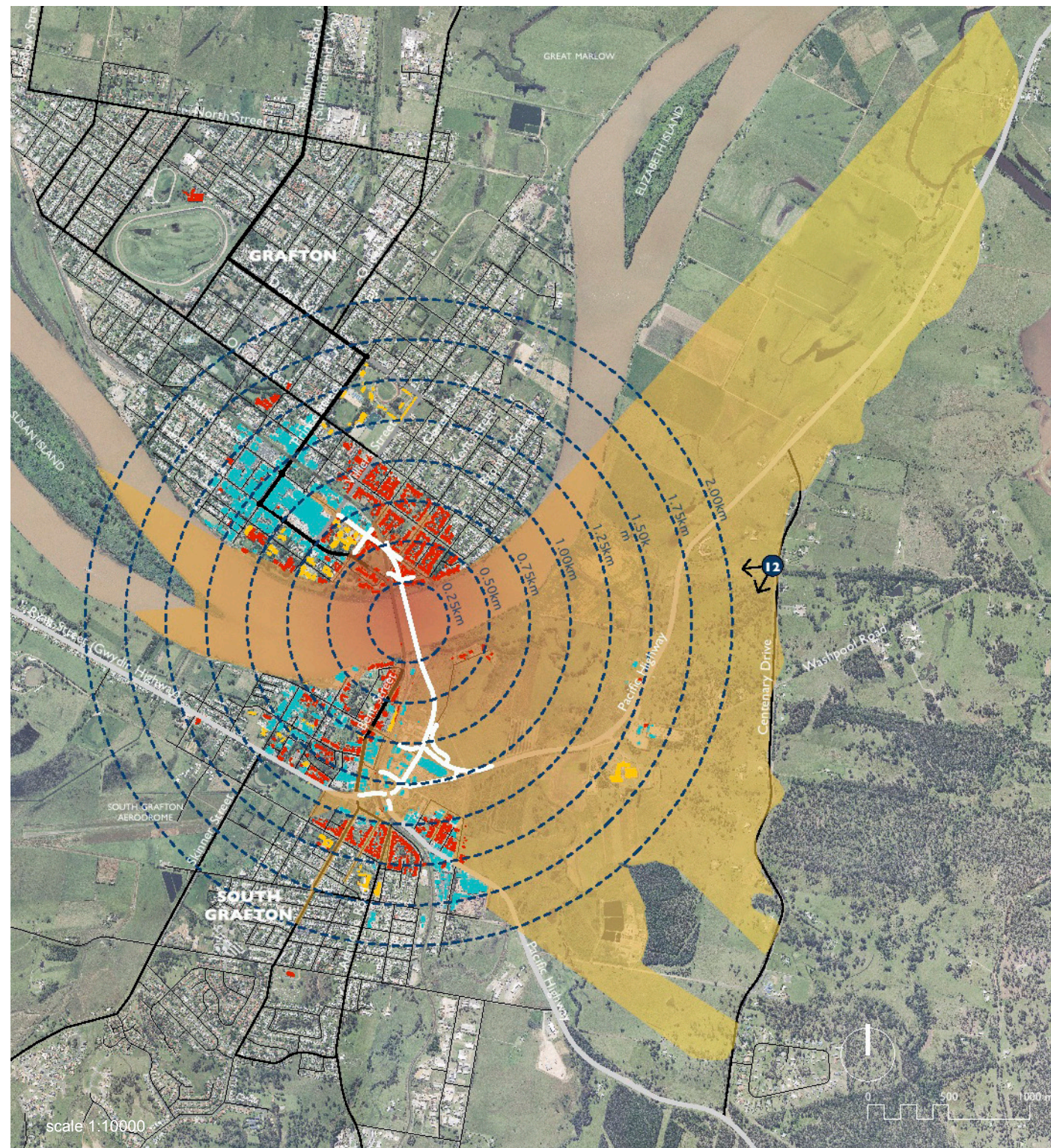


Figure 7.3: Visual Envelope Map (VEM) and location of viewpoints at sub-regional scale





VIEWPOINT 1

The roundabout at the intersection of Pound Street and Villiers Street, looking east.

Site description

This location is in the eastern portion of Grafton town centre and focuses on the heavily vegetated roundabout. Grafton TAFE and a locally listed heritage house are located through and to the right of the viewpoint and a number of commercial and service businesses are located to the left. Grafton Shopping World and other small business are behind this viewpoint.

Viewpoint selection

This viewpoint is from the perspective of motorists travelling east on Pound Street and pedestrians crossing Pound Street. This viewpoint addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
1 Foreground view	High Vegetation in the roundabout would be cleared to provide for the new four lane road on Pound Street. Formalised angle parking to the left of the viewpoint, and parallel parking on the right, increases the extent of road pavement by about eight metres. A pedestrian and cycle path next to the TAFE boundary would encroach slightly into the TAFE. The majority of trees in the middle-ground and background of this view, including the five large Fig trees, would be removed. New tree planting would mitigate the magnitude of the works as they mature over time. However, the works would greatly alter the existing view, causing a high rating.	High Pedestrians, TAFE staff and students, residents and vehicle passengers would be affected by the changes and have been assessed to have high sensitivity. This is due to the majority of viewers being local residents who would see the view often and because of the perceived cultural and heritage importance of the TAFE campus and the Fig and Jacaranda trees that would be removed..	High



VIEWPOINT 2

Pound Street, at the corner of Clarence Street, looking west.

Site description

Pound Street is a well vegetated street, providing a direct connection to Grafton town centre. Grafton TAFE is situated to the left of the viewpoint with a number of commercial and service businesses on the right. Local residents and the Pound Street viaduct are directly behind this viewpoint

Viewpoint selection

This viewpoint is from the perspective of motorists and pedestrians travelling west along Pound Street. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
2 Foreground view	High The existing intersection would be replaced by a signalised intersection, including pedestrian refuges to accommodate the long crossing lengths. Two lanes would be provided in each direction, with formalised angle parking to the right of the viewpoint, increasing the extent of road pavement by about eight metres. A pedestrian and cycle path would be provided next to the TAFE boundary. The majority of trees in this view, including some located on the TAFE property, would be removed. New tree planting would mitigate the magnitude of the works as they mature over time, although they would open the view to Grafton Shopping World in the short to medium term, causing a high rating.	High Pedestrians, TAFE staff and students, residents and vehicle passengers would be affected by the changes and have been assessed to have high sensitivity. This is due to the majority of viewers being local residents who would see the view often and because of the perceived cultural and heritage importance of the TAFE campus and the Fig and Jacaranda trees that would be removed.	High





VIEWPOINT 3

Clarence Street at the corner of Pound Street, looking south.

Site description

Grafton TAFE is located to the right of the viewpoint. Clarence Street has a wide reservation with generous grassed verges. These verges provide informal on street parking for students.

Viewpoint selection

This viewpoint is from the perspective of motorists travelling south on Clarence Street and pedestrians walking along Pound Street. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
3 Foreground view	High The existing intersection would be replaced by a signalised intersection. This would include a four metre wide traffic island to be constructed in the centre of the Clarence Street to provide 90° parking, which would dominate the centre of the street. The grass swales would be replaced with parallel and angled parking with formalised kerb and gutter. All existing street trees would be removed, and the house to the left of the viewpoint would be demolished, opening the view down the street. Mitigation would include new tree planting on the western side of Clarence Street and feature planting at the intersection.	High TAFE staff and students, residents, pedestrians, cyclists and passengers in cars would be affected by the changes and have been assessed to have high sensitivity. There is likely to be an increase in local vehicle traffic turning right at this intersection. These local passengers and drivers waiting for a signal change would also be affected and sensitive to the change.	High



VIEWPOINT 4

Kent Street, 40 metres from the intersection with Pound Street, looking south west.

Site description

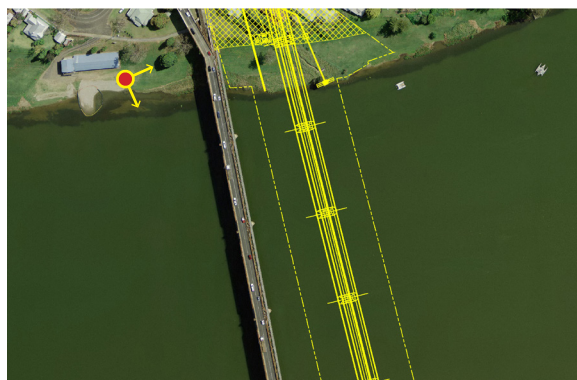
Kent Street is a two lane residential street and designed regional cycleway with wide, tree lined grass verges, typical of the older residential areas of Grafton. The view south west is of a Jacaranda lined street and the existing railway viaduct with the road viaduct in the background.

Viewpoint selection

This viewpoint is from the perspective of residents, cyclists, tourists (Jacaranda Festival) and motorist along Kent Street in the half block north east of Pound Street. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
4 Foreground view	Moderate The embankment, traffic barriers and noise wall for the new approach road would be the major visible elements of the proposal, about 2.5 metres above the existing ground level. The embankment would be planted with native shrubs and trees. The works would require the removal of all houses south-east of Pound Street and six (6) locally heritage listed Jacaranda trees south-west of Pound Street. This would result in the long view along Kent Street being obstructed by the planted embankment, traffic barriers and noise wall for the new approach road. However, Existing vegetation on Kent Street, to the left, obscures much of the works.	High The local residents, cyclists, tourists (particularly visiting during the Jacaranda Festival) would have high sensitivity due to the works altering the attractive view along the Jacaranda tree lined street with grassed shoulders and verges, by revealing the new approach road embankment and infrastructure.	High to Moderate





VIEWPOINT 5

Clarence River Sailing Club grounds, looking south east (downstream)

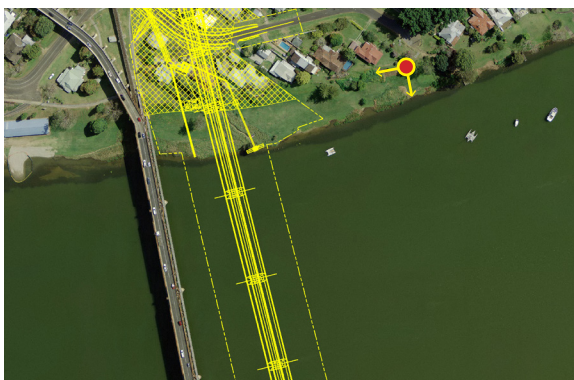
Site description

Clarence River Sailing Club is located on the northern foreshore, just upstream of the existing bridge. A wide, open and generally flat grassed area flows to the river in front of the one storey brick building that sits below Kent and Fitzroy Streets.

Viewpoint selection

This viewpoint is from the perspective of sailing club members and pedestrians using the river foreshore. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
5 Foreground view	Moderate The new bridge would be constructed on the downstream side of the existing bridge. The proposed bridge superstructure and barriers would be partially obscured by the existing bridge from this location. The elements of the bridge that would be visible include the piers and pile caps, and part of the abutment on the southern foreshore. However, vehicles, in particular trucks, would be visible through the existing bridge as they cross over the proposed bridge.	High Sailing club members and pedestrians have been assessed to have high sensitivity as their attention is generally focussed on the river and its surrounds for reasonably long periods of time in the direction of the proposed and existing bridges. They are also engaged in recreational activities of boating and walking along the river foreshore.	High to Moderate



VIEWPOINT 6

Girl Guide Park and the rear of private residences on Greaves Street, looking south west (upstream).

Site description

Girl Guide Park is a public park, located at the eastern end of Pound Street. It consists of a sloping grassed area and a number of trees and sits about five metres above the river. The park, and the rear yards of the properties are located on top of the levee and offer attractive and panoramic views of the river and the existing bridge.

Viewpoint selection

This viewpoint is from the perspective of people using the public open space at Girl Guide Park and the residents whose houses overlook the river. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
6 Foreground view	High The new bridge would be constructed in front of the existing bridge and would be highly visible from this location. All components of the bridge would be visible and would block the view to a large portion of the existing historic bridge. This would also result in the loss of a number of trees including the Jacarandas and She-Oak, to the left of the photo, on the southern bank of the Clarence River, however, these would be replaced with similar species adjacent to the proposed bridge.	High Local pedestrians and tourists visit this public park to observe the panoramic views over the river and in particular the iconic view of the Grafton Bridge. They can also gain access to the river foreshore from this park. These viewers and the local residents have been assessed as having a high sensitivity since this view has a high cultural and historical significance. Their view of the existing bridge would almost be entirely obstructed by the new bridge.	High





VIEWPOINT 7

Pedestrian path on the downstream side of the existing bridge, looking north and south.

Site description

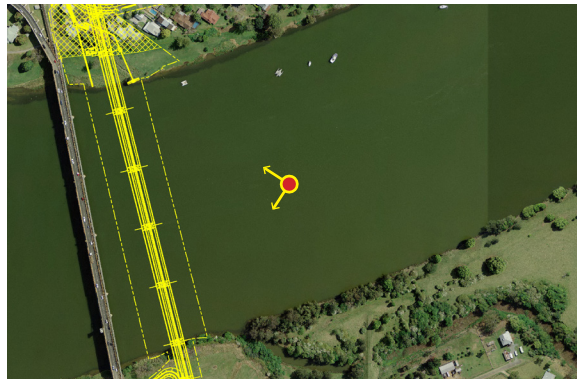
The existing pedestrian path on the bridge structure is located on the downstream side of the railway track on the lower level. It consists of a 1.2 metre concrete path with a 1.5 metre high chainmesh fence on both sides of the path. The path location offers panoramic views over the Clarence River, the foreshore areas and the rural hinterland as far as Clarenza.

Viewpoint selection

This viewpoint is from the perspective of pedestrians walking north on the bridge path and train passengers. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
7 Foreground view	High The new bridge would be located downstream of the existing bridge. All elements of the new bridge would be highly visible from this location. Three houses and a number of native trees would be removed for the construction of the bridge and pump station on the northern side. A number of mature trees including the Jacarandas and She-Oak on the foreshore and the large Fig trees beyond, would be removed on the southern side. The proposed bridge would also obscure the downstream views of the river and rural hinterland beyond. Mitigation measures would include new native tree planting behind the existing levee and adjacent to the approach roads.	High Pedestrians walking crossing the bridge and train passengers would have high sensitivity to change due to the existing attractive views along the river and foreshore and the relatively long time they have to focus on these views. Although the sugar loading facility is a prominent element in the view to the south, the river and its landscape still dominate the view	High





VIEWPOINT 8

Clarence River, about 250 metres east of the existing bridge, looking west (upstream).

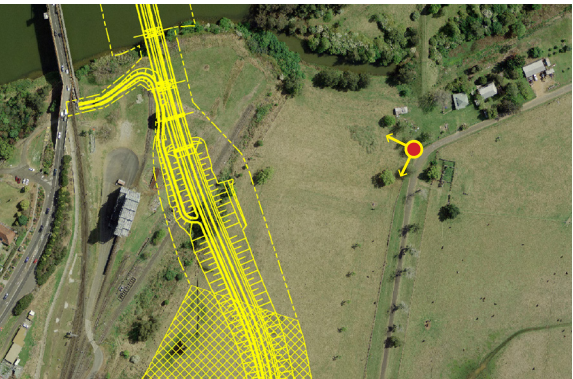
Site description

The centre of the Clarence River affords expansive views along the river, the existing bridge, the foreshore areas and floodplain, and longer distance views to the surrounding mountains, particularly in the west. The river is an important recreational resource for the residents of Grafton and surrounding areas.

Viewpoint selection

This viewpoint is from the perspective of people recreating on the Clarence River, be they rowing, sailing, power boating or fishing. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
8 Foreground view	High The new bridge would be constructed in front of the existing bridge and would be highly visible from this location. All components of the bridge would be visible and would block the view to a large portion of the existing bridge. The foreshore areas would also be visually impacted where the bridge approaches the abutments, requiring the removal of houses and trees.	High People recreating on the river would have high sensitivity to change due to the current attractive views the setting affords of the existing bridge, which has high cultural and historical significance. Also, the relatively long time they have to focus on these altered views contributes to the overall sensitivity.	High



VIEWPOINT 9

Corner of Butters Lane and Iolanthe Street, looking south west.

Site description

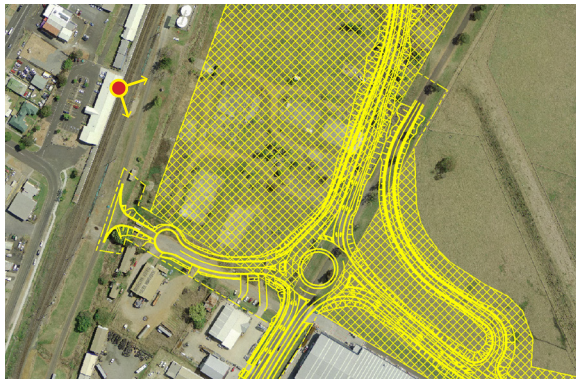
There are a small group of residences along Butters Lane that back onto Alipou Creek, only serviced by Iolanthe Street. The houses are located on the wide and flat Clarence River floodplain which consists of open grazing paddocks with a scattering of individual and clumps of trees. The sugar loading facility and communications tower can be seen to the west.

Viewpoint selection

This viewpoint addresses foreground views from the perspective of the small group of residents on Butters Lane.

Viewpoint	Magnitude	Sensitivity	Impact
9 Foreground view	Moderate The embankment for the new bridge approach road would be highly visible from this location. It would require the removal of the vegetation, including the large Fig tree in the middle-ground of the view. The embankment would be about six metres above the existing ground level and would be seeded with native grasses with pockets of native tree planting. Vehicles travelling on the approach road would be clearly visible and trucks would potentially break through the skyline in some locations.	Moderate Local residents in Butters Lane would primarily be affected by the proposal when travelling to and from their properties. They have been assessed to have moderate sensitivity due to their distance from the works and the existing view comprising a combination of rural landscape in the foreground, with industrial infrastructure including the sugar loading facility and communications tower in the background. Residents would see this view often as travel to and from their properties.	Moderate





VIEWPOINT 10

Platform of Grafton Railway Station, looking east.

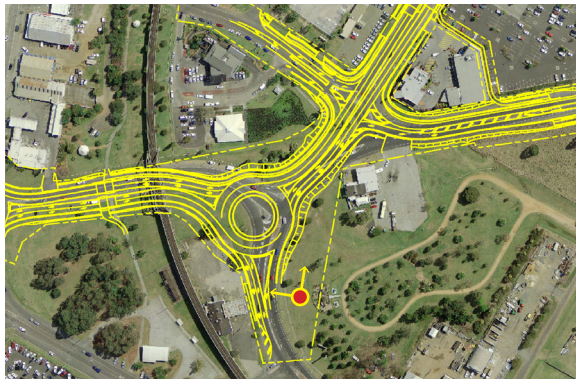
Site description

Grafton Railway Station consists of a single platform next to a single storey brick building, on the western side of three railway tracks. The station services about six passenger trains daily, including two during daylight hours. There are reasonably attractive mid distance views, beyond the post industrial paddocks in the foreground, to the Clarenza hills.

Viewpoint selection

This viewpoint is from the perspective of passengers waiting on the platform, as well as those passengers travelling on the train. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
10 Foreground and mid distance view	Low Although the foreground trees partially obscure the view, the approach road would be visible across the full width of this view. The large Through Street roundabout would be visible in the right of the view in front of Bunnings. The embankment of the approach road would steadily increase in height from right to left across the view. Vehicles travelling on the proposed approach road would also be visible from the platform. The embankment would be seeded with native grasses and planted with native trees evenly spaced along the road. During construction, land in the foreground would be used for activities such as concrete casting for the new bridge.	Moderate The Grafton Railway Station is a State Listed Heritage site and the location is a key arrival point for locals and tourists. The length of time viewers are waiting on the platform increases their sensitivity.	Moderate to Low



VIEWPOINT 11

Next to the Truck Driver's Memorial, Pacific Highway, looking south.

Site description

Truck Driver's Memorial Park is located at the intersection of the Pacific Highway and Gwydir Highway. It is a flat, generally open park, bordered by street trees. A service station and the Clarence River Visitor Information Centre are the main buildings around the intersection. The railway viaduct and the associated embankment form a visually strong western edge to the viewpoint.

Viewpoint selection

This viewpoint is from the perspective of people viewing the Truck Driver's Memorial and the park. It addresses foreground views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
11 Foreground view	Moderate The new large two lane roundabout and approach roads would be the dominant element of the proposal visible from this location and would almost double the extent of visible road pavement. The ability to include feature tree planting around the outside of the intersection as well as a Fig tree and ground cover planting in the centre of the roundabout results in moderate rating.	Moderate People viewing the memorial would generally have moderate sensitivity as their attention would be more focussed on the memorial and a smaller intersection already exists in this location.	Moderate





VIEWPOINT 12
Centenary Drive, Clarenza, looking west.

Site description
Centenary Drive traverses the undulating ridgeline that rises up from the Clarence River floodplain, east of Grafton. The land has been generally cleared and consists of rolling grazing land dotted with stands of native vegetation. A number of rural properties sit on either side of Centenary Drive. The roadside vegetation, which includes groups of native trees, provides occasional glimpses west over the Clarence River and floodplain to the mountains beyond.

Viewpoint selection
This viewpoint is from the perspective of motorists travelling along Centenary Drive and the small group of residences. It addresses long distance views to the proposal.

Viewpoint	Magnitude	Sensitivity	Impact
14 Long distance view	Low The new bridge would be the main element of the proposal visible from this location. It would obscure the lower section of the existing bridge, and the removal of vegetation on both foreshores would potentially be noticeable. However, this vegetation would be replaced by similar species.	Low Due to their distance from the proposal, the sensitivity of the residents and motorists has been assessed as low. While the number of residents would be viewing the proposed bridge from stationary positions, motorists would be moving in a north east direction, parallel to the view.	Low



VISUAL IMPACT SUMMARY

A total of 12 viewpoints form the basis of the visual impact assessment. The viewpoints are generally focused on locations that will be commonly viewed by the Grafton community. It also included views in destination areas that will be sought out by local residents, students and tourists. It is generally anticipated that the viewpoints selected will provide for an even range of magnitude and sensitivity impact ratings.

Out of the 12 selected viewpoints, the range of visual impact ratings were determined to be the following:

- Six viewpoints would have High visual impact
- Two viewpoints would have High to Moderate visual impact
- Two viewpoints would have Moderate visual impact
- One viewpoint would have Moderate to Low visual impact
- One viewpoint would have Low visual impact.

Ratings of high and high to moderate impacts occur in the town centre, residential areas, heritage areas, educational precincts, open space areas and the picturesque river setting, where the sensitivity to change is the highest and the magnitude of the works are greatest. The moderate and low ratings occur in areas where distance from the works is greater and in areas of lower sensitivity, for example the South Grafton industrial area.

To better illustrate these findings, four photomontage impressions of the changes that will result from the bridge and approach road proposal. These four photomontage impressions are shown the following page. The locations for these impressions were selected to show how the proposed bridge would fit in the existing setting. This also provides a better understanding of how the description of the magnitude and sensitivity are determined in the viewpoint assessment.

Based on this assessment a series of landscape and urban design mitigation measures and strategies have been developed, in order to assist in the mitigation of the proposed bridge and approach road impacts. These are discussed in the Chapter 8.

Viewpoint and View Type	Magnitude	Sensitivity	Visual Impact
VP 1 - Foreground view	High	High	High
VP 2 - Foreground view	High	High	High
VP 3 - Foreground view	High	High	High
VP 4 - Foreground view	Moderate	High	High to Moderate
VP 5 - Foreground view	Moderate	High	High to Moderate
VP 6 - Foreground view	High	High	High
VP 7 - Foreground view	High	High	High
VP 8 - Foreground view	High	High	High
VP 9 - Foreground view	Moderate	Moderate	Moderate
VP 10 - Foreground and mid distance view	Low	Moderate	Moderate to Low
VP 11 - Foreground view	Moderate	Moderate	Moderate
VP 12 - Long distance view	Low	Low	Low



Plate 7.23: Before and after artist impressions of Viewpoint 2. Artist impression represents anticipated view during opening year.



Plate 7.24: Before and after artist impressions of Viewpoint 5. Artist impression represents anticipated view during opening year.



Plate 7.25: Before and after artist impressions of Viewpoint 7. Artist impression represents anticipated view during opening year.



Plate 7.26: Before and after artist impressions of Viewpoint 8. Artist impression represents anticipated view during opening year.

7.4 PROPOSED BRIDGE AND APPROACH ROADS OVERSHADOWING

This section considers the potential overshadowing impacts of the proposed bridge on the Clarence River waterway, and the public domain and private areas on the northern and southern foreshores.

BACKGROUND

The shadow cast by the existing bridge and the approach viaducts is located on the water directly under the bridge and the areas next to the road and rail viaducts on the northern side of the river. Early morning and late afternoon shadows extend beyond the footprint of the bridge over the river and adjoining foreshore lands. In winter, the road and rail decks of the existing bridge cast two distinct shadows, with the diffused shadow of the bridge truss in between, particularly in the early morning and late afternoon. The proposed bridge would cast a similar sized, although, single, distinct shadow across the water and the foreshore areas around the abutments due largely to the increased width of the new structure.

The potential overshadowing impacts have been analysed using the accompanying shadow diagrams which were prepared by Arup using a computer model of the study area and the proposed bridge. The two sets of following diagrams depict the shadows cast by the proposed bridge during the winter solstice (21 June) and the summer solstice (21 December) at three times of day; 9am, 12pm and 3pm.

For the purposes of the analysis the existing vegetation and the proposed replacement tree planting have been excluded from the model. The absence of vegetation portrays a clearer depiction of the extent of overshadowing caused by the proposed bridge.

■ Area of overshadowing
■ Fill embankments



Figure 7.4: Shadow at 9am in December (source: Arup)



Figure 7.5: Shadow at 9am in June (source: Arup)



Figure 7.6: Shadow at 12pm in December (source: Arup)



Figure 7.7: Shadow at 12pm in June (source: Arup)



Figure 7.8: Shadow at 3pm in December (source: Arup)



Figure 7.9: Shadow at 3pm in June (source: Arup)

The northern foreshore

The current northern foreshore area, in the vicinity of the approach road to the proposed bridge, is predominately cleared of trees. The proposed construction works for the bridge would require the removal of a small number of trees and a number of residential dwellings around the abutment and in the adjoining areas where earthworks and construction zones are required.

The overshadowing caused by these small number of trees and houses would be replaced by larger and more solid overshadowing caused by the proposed bridge and adjoining earthworks associated with the abutment as well as replacement plantings of trees proposed in this area which would gradually increase the levels of overshadowing throughout the day, as these trees mature.

Overshadowing of the northern foreshore would be mainly restricted to the undercroft of the bridge and an area either side. The longest shadows would occur in Winter during the early morning when the area to the west of the abutment would be in shadow, and the late afternoon when the area to the east of the abutment would be in shadow.

The river

The bridge deck would cast a distinct shadow over the river moving from west to east throughout the whole day. The shadow would appear over the water on the western side of the proposed bridge in the morning and whilst being of a substantial width it would be diffuse in appearance. As the sun rose into the sky, the shadow would migrate closer to the proposed bridge in an easterly direction, and increase in intensity until it was aligned directly under the bridge deck. As the sun tracked to the west, the shadow would continue moving to the east and become increasingly diffuse until the sun set.

In conjunction with the shadow cast by the existing bridge, overshadowing on the river would double in size. However, boating is unlikely to be affected by the overshadowing.

The southern foreshore

The overshadowing effects of the proposed bridge occur on a small portion of land on the southern foreshore, extending to the bridge abutment where the road then travels on an elevated fill embankment. The proposed pedestrian and cycle path deviates off the approach road, veers slightly under the bridge deck, then heads west to link with the

existing path system exiting the existing bridge, about 30 metres south of the shoreline.

Trees currently growing along the foreshore, between the existing bridge and Alipou Creek, create a dappled overshadowing effect in this area, however a number of these trees within the project area would be removed during the construction of the proposed bridge. Therefore current patterns of overshadowing in this area would change when the bridge is constructed, however replacement plantings of trees proposed in this area would gradually increase the levels of overshadowing throughout the day, as these trees mature.

Overshadowing of the southern foreshore and would be mainly restricted to the undercroft of the bridge and an area on either side of the bridge. The longest shadows would occur in winter during the early morning when the area to the west of the abutment would be in shadow, and the late afternoon when the area to the east of the abutment would be in shadow. This would occur over the eastern section of the proposed pedestrian and cycle path, impacting on path users, however, this would be for a relatively short time as they would generally be in transit.

CONCLUSION

The greatest overshadowing impacts would be most likely experienced on the Clarence River due to the height, width and length of the proposed bridge deck over the river. The overshadowing of the river is unlikely to impact any activities occurring on the water.

The size of the overshadowing decreases on the northern and southern foreshores due to the reduced height of the bridge above the land in these locations. These effects are likely to be relatively temporary as people would be mostly moving through the area. There is potential for the southern foreshore to have increased pedestrian and cycle activity which would be subjected to the increased overshadowing during the morning in winter.

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8 MITIGATION MEASURES AND CONCLUSION

This chapter discusses the range of mitigation measures which have been incorporated into the concept design, as well as other measures that could be considered for further investigation and design, subject to consultation with Clarence Valley Council, relevant State government agencies and the community. This section also presents a brief conclusion.

8.1 PROJECT MITIGATION STRATEGIES

INTRODUCTION

This section describes the mitigation measures that have been included as part of the proposal, described in Chapter 6 of this report and a summary of further mitigation measures to be considered during the detailed design and construction phases of the project. They have been developed in accordance with the urban design and landscape objectives and principles, outlined in Chapter 5.

MITIGATION INCORPORATED IN THE CONCEPT DESIGN

The integration of the engineering and performance objectives with urban and landscape design objectives for the additional crossing of the Clarence River at Grafton project aims to produce a design outcome that fits sensitively with the existing qualities and characteristics of the area. In order to achieve this, a range of mitigation measures have been incorporated into the project as the concept has developed. These measures combine to develop a solution that seeks to protect and enhance the existing visual character of the Grafton area, the Clarence River and floodplain, where possible.

The mitigation measures that have been undertaken during the development of the urban and landscape design concept are summarised below.

Grafton

- New ‘gateway’ planting at the intersections of Pound Street and Clarence Street, and Pound Street and Villiers Street would be provided as visual landmarks and to enhance visual identity.
- New tree planting would be provided along the Grafton TAFE grounds next to Pound Street to compensate for tree loss due to the road widening works.
- Small exotic tree planting would be provided along Pound Street, between Clarence Street and Villiers Street to help reduce the visual scale of the street. The planting would consider vehicle sightlines, parking requirements and utilities.
- Native tree planting would be provided to the edge of the proposed carpark at the corner of Pound Street and Clarence Street to reduce the visual dominance of the large expanse of asphalt at the eastern gateway into Grafton town centre.
- Native tree and shrub planting would be provided to the eastern embankment of Summerland Way to reduce the visual dominance

of the road infrastructure and noise wall to the residents of Pound Street, Kent Street and Bromley Street.

- The proposed retaining wall would have a site specific finish to relate to the character of the surrounding landscape.
- Areas where houses are to be removed would be grassed and stands of native trees planted to provide a park like character to these areas.

River foreshore

- Revegetation of the foreshores would assist in integrating the scour protection works on the foreshore.
- The foreshore area would be rehabilitated with suitable riparian vegetation once the scour protection works have been completed.

The proposed bridge

- The following design measures have been undertaken to ensure that the existing Grafton Bridge retains its visual precedence:
 - The proposed bridge has been kept as low as possible over the Clarence River while still allowing for the required navigation clearances.
 - The road level of the proposed bridge sits below the road level on the existing bridge, approximately halfway between the road deck and railway deck on the existing bridge. This allows the existing bridge truss structure to be visible both above and below the proposed bridge.
 - The concrete box girder design for the proposed bridge allows for a simple, streamlined and contemporary appearance that respects and retains the visual integrity of the existing bridge.
 - The visual bulk of the proposed bridge has been minimised by adopting a haunched superstructure.
- The following design measures have been undertaken to create a visually complementary relationship between the proposed bridge and the existing bridge:
 - The piers on the proposed bridge are aligned with the piers on the existing bridge as much as possible, particularly those piers that are located in the river.
 - The exposed pile caps on the piers in the river have rounded ends in keeping the pile cap detailing on the existing bridge.

South Grafton

- New tree planting would be undertaken in the area surrounding the roundabout works, and within the roundabouts, reducing the scale of the works over time as the tree planting matures. The planting would consider motorists sightlines, and, in the case of Spring Street, would allow views to the Clarence River Tourist Information Centre.
- Exotic avenue tree planting would be provided along the new section of Butters Lane to maintain the existing country lane character of the street.
- Native avenue planting would be provided along the western side of Summerland Way to provide visual identity to the upcoming bridge or entry to South Grafton, and to provide shade for pedestrians and cyclists using the shared path. Occasional stands of native trees have been planted on the eastern embankment to provide some reduction to the visual scale of the works, whilst maintaining pleasant rural views over the Clarence River floodplain.

General

- Improvements to pedestrian access has been achieved with the provision of new and upgraded footpaths and shared paths.
- Investigate alternative types and colours of paved surfaces to minimise visual impact.

MITIGATION TO BE INCORPORATED INTO DETAILED DESIGN

Subject to the environmental approval of the project being granted, it is recognised that further work will be required to develop the final urban design and landscape plan for the project.

Whilst development of the concept design has attempted to mitigate the overall impact of the proposal, focussing on the major project components, their design and integration within the Clarence River and Grafton setting, opportunities will arise during detail design to further refine the design of the project to produce enhanced urban design outcomes.

The urban design and bridge design objectives and principles outlined in Chapter 5, together with the urban design, landscape and bridge design concept included in Chapter 6, would be used to further guide the detailed design of key project elements of the new bridge, approach roads and public domain areas.

Below is a summary of the key mitigation and management strategies that would be considered during the detail design phase of the project.

Grafton

- Refine car parking arrangements on the southern side of Pound Street.
- Adjust the kerbline along Pound Street between Clarence Street and Villiers Street. This would enable extra tree planting on both sides of the street and the removal of proposed parallel parking on the southern side. This would improve the visual and pedestrian amenity, reduce the scale of the street and reduce the encroachment of works in TAFE land.
- Consider reducing the batter steepness around the water detention basin to avoid the need for fencing.
- Consider reducing the construction boundary to reduce impacts on Pound Street and Greaves Street.
- Consider refining the Grafton drainage detention basin design to minimise its visual impact.
- Further investigate opportunities to reduce the project footprint throughout detailed design.

The proposed bridge

- Develop the pier designs to further reinforce the complementary relationship between the proposed bridge piers and the piers on the existing bridge. In particular, consider tapering the piers at their long elevation.
- Consider opportunities to further streamline the appearance of the bridge, including:
 - Aligning the edges of the piers with the outside faces of the girder.
 - Investigate monolithic construction as an alternative to the current pier design.
- The detailed design should ensure that the bridge soffit appears as a series of continuous curves. A segmented appearance is to be avoided.

South Grafton

- Consider flattening the fill embankments to the bridge approach road to better integrate with the surrounding flat rural landscape.
- Further investigate opportunities to enhance the locations' role as the southern arrival point to South Grafton and Grafton.
- Consider further design work to better integrate cycle access on the Iolanthe Street / Pacific Highway / Through Street roundabout and the Gwydir Highway / Pacific Highway roundabout in order to maintain

safe and efficient connections to the regional Coastline Cycleway route on the Pacific Highway.

MITIGATION DURING CONSTRUCTION

The following mitigation measures would be implemented during construction:

- Detail design and documentation drawings would define the extent of all construction activity including temporary works in order to protect the area during construction.
- Construction facilities should be contained within the construction works zone boundary and occupy the minimum area practicable for their intended use.
- Provide suitable barriers to screen views from adjacent areas during construction.
- Once construction is complete, or progressively throughout the works where possible, return these sites to at least their pre-construction state.
- Keep pollution and dust emissions to a minimum and monitor throughout the project construction period.
- Divert or re-route footpaths that would be affected by construction activities.
- Existing trees to be retained within construction facilities areas would be identified, protected and maintained.
- Temporary lighting should be screened or diverted to reduce unnecessary light spill.
- Heritage items should be protected, as identified in the non-Aboriginal heritage working paper prepared for the EIS.
- Material used for temporary land reclamation would be removed once the works are complete.

8.2 CONCLUSION

The study area for the Additional Crossing of the Clarence River at Grafton is topographically dominated by the Clarence River and its flat river plain. Either side of the river sit the town centres of Grafton and South Grafton which consist of wide gracious streets laid out on a square grid. The town centres are connected across the river by an historic bridge which is part of the identity of Grafton. Outside of the town centres are established and newly developing residential areas, and industrial areas, generally concentrated around the regional road and rail corridors and surrounded by the agricultural areas that comprise the city's rural hinterland.

Understanding the built, natural and community character of Grafton and characteristics of the existing historic Grafton Bridge, analysing the impacts that a new crossing of the Clarence River in this location and associated road upgrades can make, identifying opportunities for mitigation and public space improvements, and articulating urban design objectives and principles has been an integral part of designing the project. An iterative, inter-disciplinary, process has been adopted to produce:

- An integrated design that best fits in with its context, complements the existing historic Grafton Bridge, minimises the impacts and mitigates the impacts that are unavoidable.
- A proposed bridge design that is elegant and well considered in the whole, parts and detailed elements.
- A new pedestrian and cycle path crossing of the river well connected into the pedestrian and bicycle network of the town.

The project aims to supplement the existing bridge and, in doing this, would introduce a number of elements into the environment, as described in Section 3 of this Report, including:

- Construction of a new bridge over the Clarence River about 70 metres downstream (east) of the existing road and rail bridge, comprising two traffic lanes
- Construction of a new road to link the new bridge with Iolanthe Street in South Grafton
- Construction of a new road to link the new bridge with Pound Street in Grafton
- An approach viaduct, about 58 metres long, on the South Grafton side of the Clarence River and 29 metres long on the Grafton side
- Upgrades to the road network in South Grafton to connect the new bridge to the existing road network

- Upgrades to the road network in Grafton to connect the new bridge to the existing road network
- Replacement of the existing three span concrete arch rail viaduct which crosses Pound Street in Grafton with a single span steel truss bridge
- Construction of a pedestrian and cycle path to provide connectivity between Grafton, South Grafton and the new bridge
- Provision of two pedestrian crossings with lights in South Grafton to improve safety for pedestrians crossing Iolanthe Street and Gwydir Highway
- Construction of new pedestrian links to connect the new bridge with the existing bridge
- Provision of designated car park spaces in Pound Street and Clarence Street, including some off street parking, to maintain a similar number of existing car park spaces currently available in those two streets
- Flood mitigation works, which include raising the height of sections of the existing levee upstream from the new bridge in Grafton and South Grafton
- Construction of a stormwater detention basin and pump station in Grafton to manage local flooding
- Public utilities adjustment
- Ancillary facilities required for the construction of the project, including some or all of the following: site compounds, concrete batching plant, pre-cast facilities, and stockpile areas for materials and temporary storage of spoil and mulch.

The overall fabric of the historic town centres and streetscapes of Grafton and South Grafton are kept largely intact, however, there are unavoidable high visual and landscape character impacts concentrated at Pound Street, Clarence Street and the residential area associated with proposed northern bridge approach road, to a zone of the Clarence River and foreshore where the proposal is inserted, and affecting the ambience around Alipou Creek - which require mitigation. The urban design and landscape objectives and principles developed take into account urban design and visual character not only for the study area itself, but also reflect its relationship with the surrounding river floodplain and urban areas. The urban design, bridge and landscape concept has been developed to achieve an integrated outcome that helps fit the project as sensitively as possible into its context and to minimise the impacts of the

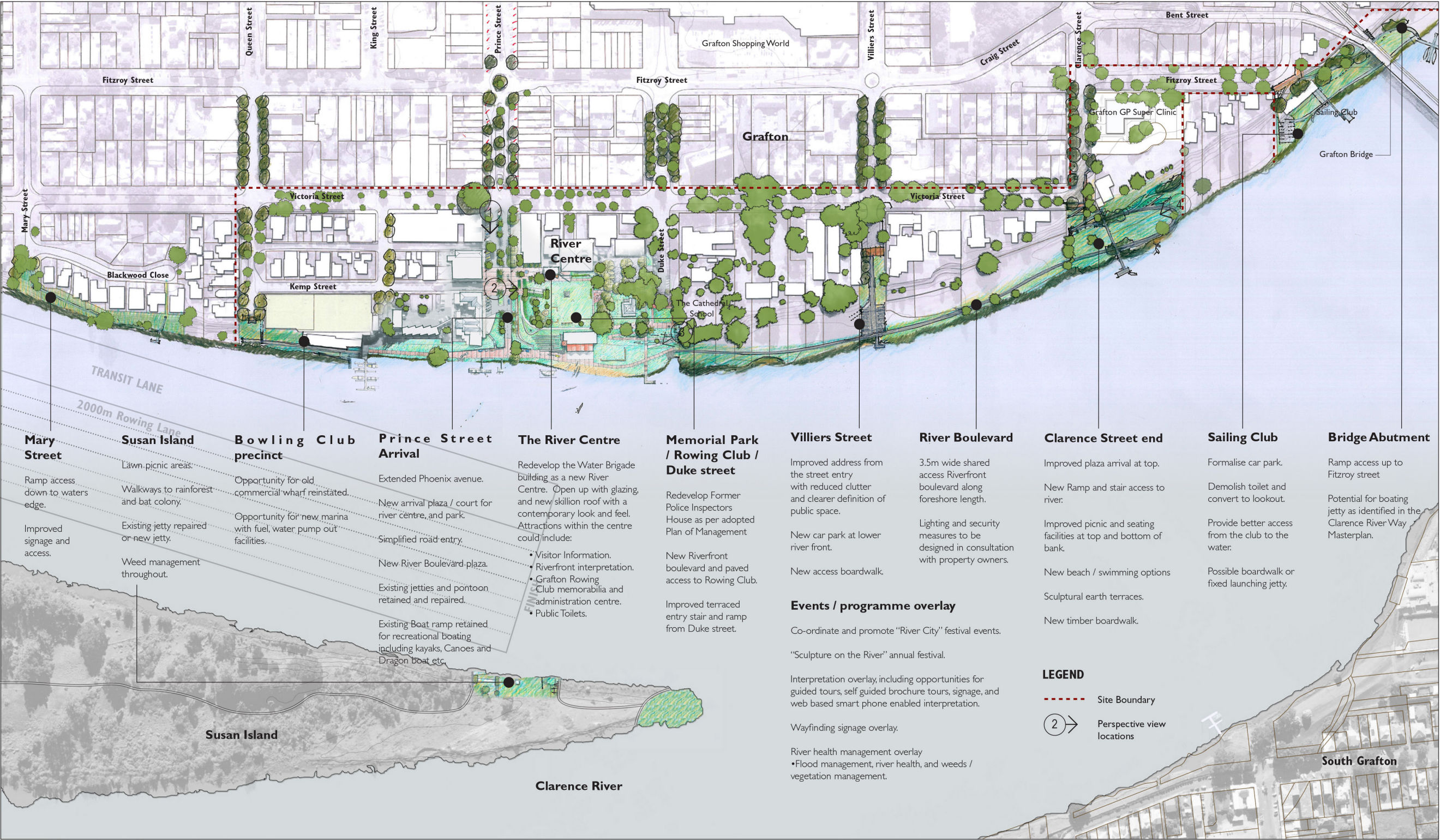
project on the future character of the area, through the incorporation of a number of mitigation measures. The urban design will:

- Ensure attractive views into the broader landscape are maintained by planting in appropriate locations.
- Incorporate materials and finishes for new road elements that are site appropriate
- Ensure that the existing Grafton Bridge retains its visual precedence
- Ensure there is a visually complementary relationship between the proposed bridge and the existing bridge
- Include a planting design intended to reduce the scale of the proposed road infrastructure by the provision of appropriate tree species in the streetscapes of the urban areas of Grafton and South Grafton
- Provide new landscaped open spaces at impacted urban development sites
- Provide distinctive town entry points
- Provide screening, through the use of native plant species, of the road infrastructure to residential areas
- Provide new pedestrian and bicycle connections for the community.

Development of the project during a future detail design phase should consider the further key mitigation strategies outlined in this report to further integrate this project into the townships of Grafton and South Grafton.

9 APPENDICES

9.1 GRAFTON WATERFRONT PRECINCT CONCEPT MASTER PLAN



Clarence Valley Council

Scale 1:2000 @A1 1:4000 @A3



Grafton Waterfront Precinct • Masterplan

CONCEPT MASTERPLAN

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