MR182 - BRIDGE STREET, WINDSOR
WINDSOR BRIDGE REPLACEMENT PROJECT

Urban Design & Landscape
Detailed Design Report

DOC. NO IA098200-GUD-RP-185

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Prepared for

Transport
Roads & Maritime Services

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THE PROJECT

The NSW Government is replacing Windsor Bridge to provide a safe and reliable crossing of the Hawkesbury River at Windsor. The existing Windsor Bridge is over 140 years old, is deteriorating and no longer meets current engineering and road safety standards. Roads and Maritime Services is planning to replace the existing Windsor Bridge with a new bridge 35 metres downstream. New approach roads and intersections will be built and existing approach roads will be filled in and landscaped.

Community consultation on the 10 different options started in 2009. The preferred option was displayed in 2011 and further community feedback was invited to inform the concept design. An Environmental Impact Statement (EIS) for the project was prepared in November 2012 and placed on public display for community and stakeholder comment from November-December 2012. A submissions and preferred infrastructure report was prepared in April 2013 to respond to the issues raised. Approval for the project was granted by the Minister of Planning and Infrastructure in December 2013 and Conditions of Approval were issued.

Roads and Maritime Services (Roads and Maritime) is now undertaking the detailed design for the replacement bridge, including refinement and development of the concept design produced as part of the EIS process.

This report documents the integration of urban design and landscape into the overall engineering components of the project. The report will be placed on public display to allow for input from the community and then submitted to the Department of Planning and Environment for final approval.

THE AIM OF THE PROJECT

The primary aim of this project is to replace the bridge which has reached the end of its useful life. Roads and Maritime are delivering the project to:

- To improve safety for motorists, pedestrians and cyclists.
- To improve traffic and transport efficiency.
- To improve the level of flood immunity.
- To meet community needs for the long term.
- To maximise the impact on the heritage and character of the local area.
- To be cost effective and an affordable outcome.

THE SIGNIFICANCE OF WINDSOR AND WINDSOR BRIDGE

Windsor is the third principal settlement of the early colony officially founded soon after Sydney and Parramatta in 1795. As the earliest settlement in the area and one of the ‘Macquarie towns’, which were laid out by Governor Macquarie in 1810, Windsor has a high level of heritage significance.

Windsor has been the site of river access and crossings for the district since the establishment of the town, when it was then known as Green Hills. The Windsor Bridge was constructed in 1874 to replace the punt which had provided access from the town to the northern foreshore. Windsor Bridge is the oldest existing structure still in use for crossing the Hawkesbury River and is considered to be a rare item listed on the Section 170 NSW State Agency register, relating to its initial construction, its subsequent modifications and survival.

The current approach road from Windsor to the bridge cuts through Thompson Square, an historic place dedicated as public space by Governor Macquarie in 1810. Thompson Square has recognised heritage significance at a state level as one of the oldest surviving public squares in Australia. It was formalised in 1810 by Governor Macquarie, it was being used as a public space for access between the town and the wharf as early as 1794, just 6 years after the founding of the colony of Sydney.

THIS DOCUMENT

This Urban Design and Landscape Detailed Design Report ensures that the project is designed with careful consideration of the built, natural and community environment and in particular is responsive to the heritage values of the site. It brings together the existing site context with a series of urban design and bridge design principles and objectives that have been developed in response to the contextual analysis and Roads and Maritime’s strategic directions.

These objectives and principles take into account the desired future landscape and urban design character for the area as set out in Hawkesbury City Council’s Plan of Management for the Windsor Foreshore Parks Incorporating the Great River Walk. They also reference the key urban design aspects of Roads and Maritime’s Beyond the Pavement urban design policy and associated guidelines. This document also links to the Strategic Conservation Management Plan (SCMP) being developed as part of the project and the Interpretation Strategy. Furthermore, the objectives and principles are 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 bridge and approach roads.

The detailed design of all engineering components have been developed in an iterative process between the project’s engineers, urban designers and heritage consultants. An overall urban design approach is developed, responding to the specific characteristics of the southern bank, including Thompson Square, the Bridge and the northern bank.

The Detailed Design recognises Windsor’s unique and sensitive historical context and that the location and scale of the new bridge and the approach roads will result in a substantial change for the area. However, the project does seek to enhance the urban environment in supporting physical, social and cultural connectivity and accessibility for the community.

This is achieved through a number of key project attributes:

- The realignment of the Bridge approach road onto Old Bridge Street creates a unified Thompson Square between George Street and the river.
- Increased open space and recreation areas with safe and easy access to them and greater amenity.
- Improved connection with safer access between Windsor and the Hawkesbury River.
- Enhanced views to and from the river and throughout Thompson Square.
- Opportunities to interpret the heritage values of the area at a number of key locations.
- Improved connections along and across the river.
- Improved connection between Windsor and the areas north of the river for vehicles with a new intersection that is safer and free-flowing.
- Improved connection between Windsor and Macquarie Park for pedestrians and cyclists.

These project attributes have been achieved through an integrated approach to the urban design and landscaping across three distinct areas of the project including Thompson Square, Southern Foreshore and Northern Foreshore and their relationship with the new bridge.

THE BRIDGE

The new Windsor Bridge will be a new landmark structure in this section of the Hawkesbury River. A number of key urban design considerations have been taken into account during the development of its design.

The key urban design aspects of the new Windsor Bridge include:

- Improved access and safety for all users including improved flood immunity.
- A contemporary form with minimal detailing to differentiate heritage structures in the surrounding area.
- Simple linear geometry to present a more understated character that is not overly expressive in order to reduce its visual dominance of the area.
- Being lowered as much as possible to minimise the visual impacts on views from Thompson Square, the river and the northern foreshore.
- A pedestrian and cyclist shared path has been located on the western (upstream) side of the bridge to provide better physical and visual connections.

This project is designed with careful consideration of the built, natural and community environment in supporting physical, social and cultural connectivity and accessibility for the community.
THOMPSON SQUARE

The heritage value of Thompson Square has been a key factor in the preparation of the Urban Design and Landscape Plan, which has been prepared in parallel with the Strategic Conservation Management Plan and Interpretation Strategy. While Thompson Square has undergone change over the last 200 years, the heritage value of the site has been a key consideration in the urban design. The removal of the Bridge Street alignment across Thompson Square, re-establishment of the visual and physical connection between the town and the river, the partial restoration of the earlier landform and sympathetic choices of material and finishes reinforce the heritage value of the site while creating a number of benefits, including:

- An increase in usable land by 500 square metres with the unified, central green space
- A continuous green space from the top of Thompson Square to the river, suitable for passive recreation activities
- Increased opportunities for interpretation of heritage values
- Improved pedestrian access down to The Terrace with two sets of stairs on either edge of the Square, with access onto the grass area provided from the stair landings
- Enhanced views from Thompson Square to the river with the realignment of Bridge Street
- Views from Thompson Square to the surrounding heritage buildings will be maintained
- Mature and significant trees in the upper area of the Square are retained and protected during construction.

SOUTHERN FORESHORE

Key features of the urban design and landscaping of the southern foreshore include:

- Bridge abutments:
  - A high quality brick finish has been selected to reflect the materials used in local historic buildings, while the pattern in the cladding provides an interpretation of the flood cycles of the river
  - Rounded corners will create a more open and generous space below the bridge at The Terrace
  - Flood interpretation information will be installed on the abutment and stairs
- Improved access:
  - A proposed network of paths will connect the town, the proposed shared path of the new bridge, Thompson Square and the river
  - Two sets of stairs in Thompson Square will provide access to The Terrace and continuous foreshore pathways

- A separate footpath and stairs on the eastern side of Bridge Street will provide direct access from George Street to Windsor Wharf
- Two dedicated accessible parking spaces will provide access for people with a disability to lower Thompson Square and The Terrace
- A signalised intersection at George and Bridge Street will improve pedestrian safety
- The provision of a southern viewing platform using the southern span, pier and abutment of the current bridge will acknowledge the heritage significance and importance of the existing Windsor Bridge
- New planting on the southern foreshore is a mix of local and exotic species to complement existing species and the heritage of Thompson Square while also enhancing the local identity and native riparian plant communities.

NORTHERN FORESHORE

Key features of the urban design and landscaping of the northern foreshore include:

- Bridge abutments:
  - The northern abutment will match the brick finish and rounded corners of the southern abutment
  - Scour protection on the northern riverbank will be random sandstone blocks interspersed with planting to soften its appearance
- New dual lane roundabout replaces the existing T-intersection
  - Provides a safer, more free-flowing intersection at Freeman’s Reach Road and Wilberforce Road
  - Provides a safer connection to Macquarie Park
  - Planting of trees and groundcovers in the roundabout create an entry and visual landmark
- A permanent and planted water quality basin between Wilberforce Road and the riverbank will capture and treat stormwater runoff from the bridge and roundabout prior to being discharged into the Hawkesbury River
- Improved access:
  - A new network of pedestrian and cycle paths link Macquarie Park with the major riverside recreation area, the northern side of Wilberforce Road and to the pedestrian and cycle shared path that crosses the new bridge and provides direct access to Windsor
  - A northern interpretation node, will acknowledge the heritage significance and importance of the existing Windsor Bridge and the earlier punt operation.

MATERIALS

Materials, furniture and lighting across the project have been selected to unify the area’s sense of place and character, for their ability to integrate with existing finishes, have a historic sensitivity, provide interpretation opportunities and for their durability in terms of flood events and routine maintenance.

LANDSCAPE

This document concludes with a Landscape Implementation and Management strategy which provides a framework for the preparation and construction of landscaping works and planting, including clearing, soil preparation, seeding, revegetation, maintenance and weed management.

CONCLUSION

The Windsor Bridge replacement project will deliver improvements in safety, traffic efficiency and increased flood immunity. Being of a substantial scale and set within a uniquely characteristic context, the new bridge also brings with it opportunities for an enhanced public domain, improved pedestrian and cycle connections and a renewed sense of local identity and history.
1. INTRODUCTION

1.1 OVERVIEW

This Urban Design and Landscape Detailed Design Report (UD Report) has been prepared for the Roads and Maritime Services of NSW, by Spackman Mossop Michaels (SMM) for the Windsor Bridge Replacement Project from Macquarie Street to Wilberforce Road in the Hawkesbury City Council Local Government Area. This document is a Technical Paper that supports the detailed design being prepared by Jacobs. SMM has worked on this proposal in conjunction with Jacobs, the Roads and Maritime Services Centre for Urban Design, specialist archaeological advisors and other Roads and Maritime Services specialist advisors.

The report documents the integrated urban design and engineering design for the proposed replacement of Windsor Bridge and is sympathetic to the heritage values and significance of Thompson Square Conservation Area.

This UD Report has been prepared concurrently with a number of heritage management documents including a SCP and the Thompson Square Interpretation Strategy. The urban design and landscape approach is sympathetic to the heritage values of the local area which have been identified in these documents.

The methodology for this report involved an iterative process following Roads and Maritime Services guidelines, consultation with stakeholders and the community to deliver a project in consultation with Office of Environment and Heritage (OEH) which addresses the Ministers Conditions of Approval (MCOA).

Considerable consultation has taken place with Hawkesbury City Council and will continue after the public display period. Consultation with other stakeholders including the Heritage Council will continue until project documentation is complete.

BACKGROUND

Windsor Bridge is the oldest existing structure still in use on the Hawkesbury River section of the Hawkesbury Nepean River. The bridge was opened in 1874, consisting of a timber deck and cast iron piers. Parts of the bridge are now 142 years old. The bridge is 143 metres long and 6.1 metres wide. It carries an average of 19,000 vehicles per day.

In 2009, Roads and Maritime Services prepared a community update describing 10 potential options to rehabilitate or replace the existing bridge, and this was followed up with the preparation of an Options Report which summarised the potential of each option. Option one which involved a new downstream high-level bridge via Old Bridge Street, was identified as the preferred option based on value for money, and because it satisfied the project objectives. An Environmental Impact Statement (EIS) for the preferred option was prepared in November 2012 and placed on public display for community and stakeholder comment from November - December 2012. A submissions and preferred infrastructure report was prepared in April 2013 to respond to the issues raised. Approval for the project was granted by the Minister of Planning and Infrastructure in December 2013 and Conditions of Approval were issued.

Roads and Maritime Services is now undertaking detailed design for the replacement bridge, including refinement and development of the concept design produced as part of the EIS process.

1.2 DESCRIPTION OF THE PROJECT

The project would comprise the following works:

- Construction of a three lane replacement bridge over the Hawkesbury River at Windsor, around 35 metres downstream of the existing Windsor Bridge
- Reconstruction and upgrading of existing intersections and bridge approaches to accommodate the replacement bridge, including:
  - Removal of the existing roundabout and installation of traffic signals at the intersection of George and Bridge Streets
  - Construction of a new roundabout at the intersection of Freemans Reach Road, Wilberforce Road, and the access road to Macquarie Park. All roads serviced by the new roundabout would require minor realignments
  - Realignment of the southern and northern bridge approach roads. The new southern bridge approach road would follow generally align along the intersection of the new dual lane roundabout
- Construction of a new bridge with a design life of 100 years
- Construction of a shared pedestrian/cycle pathway for access to and across the replacement bridge
- Removal of the existing bridge approaches and then backfilling, rehabilitating and landscaping these areas
- Potential retention of southern bridge abutment, first span (girders) and pier for reuse as viewing platform in consultation with Hawkesbury City Council
- Removal of the existing Windsor Bridge including the bridge deck and piers not required for the viewing platform
- Landscaping works within Thompson Square parkland and adjacent to the northern intersection of Bridge Street, Wilberforce Road, Freemans Reach Road and the access road to Macquarie Park
- Redevelopment of part of The Terrace to provide continuous access along the southern bank of the river and under the replacement bridge to Windsor Wharf
- Construction of scour protection works on the northern and southern river banks
- Construction of a permanent water quality retention basin to capture and treat stormwater runoff from the bridge and northern intersection prior to stormwater being discharged to the Hawkesbury River
- Architectural treatments for noise mitigation, as required, where feasible and reasonable and in agreement with affected property owners.
- Ancillary works including:
  - Adjustment, relocation and/or protection of utilities and services, as required
  - Construction and operation of temporary construction, stockpiling and compound sites.

In addition to the above-listed work elements, early works for further identification, salvage, recording and protection of Aboriginal and historical heritage, would be carried out in consultation with key stakeholders as part of impact mitigation for the project and would meet conditions of approval.

1.3 PROJECT OBJECTIVES

This report presents the urban design and landscape concept for the project.

The primary aim of the project is to provide a safe and reliable crossing of the Hawkesbury River at Windsor.

The specific objectives for the project are as follows:

- Replace the existing bridge which has reached the end of its economic life with a new bridge with a design life of 100 years
- Increase flood immunity of the bridge equivalent to the approach roads
- Support economic growth and productivity by providing a road with capacity to transport delays or better for 2026 forecast traffic volumes
- Encourage active transport by providing appropriate facilities for cycling and walking
- Provide safe two-way traffic access for freight vehicles
- Reduce crash rates to be no greater than the stereotypes rates for a primary arterial road (A2 road classification)

Secondary objectives common to all Roads and Maritime projects:

- Design and construction works are to be sympathetic with local heritage and the environment
- To be cost effective and an affordable outcome.
STUDY TEAM
The study team for this project comprised an integrated team of consultants in association with the Roads and Maritime Services including:
• Client: Roads and Maritime Services (Roads and Maritime Services) including the disciplines of engineering, environmental assessment, heritage and urban design.
• Engineering, biodiversity and noise: Jacobs including road design, bridge design and environmental assessment.
• Urban design and landscape including bridge architecture: Spackman Mossop Michaels (SMM).
• Heritage: the Austral AHMS Joint Venture (AAJV)

1.4 REPORT STRUCTURE
This report is structured as follows:
• Chapter 1: Introduction - introduces the project and outlines the scope and study team
• Chapter 2: The Existing Context - a description and illustration of the environmental and cultural factors of the local area.
• Chapter 3: The Urban Design and Landscape Strategy - an overview of the urban design and landscape principles and objectives developed to guide the design development
• Chapter 4: The Urban Design and Landscape Detailed Design - an overview of the key features of the design
• Chapter 5: Landscape Implementation - an overview of the key methods and processes for successful implementation of the soft landscape works
• Chapter 6: Landscape Management - an outline of the maintenance and establishment phase of the project.

1.5 ROADS AND MARITIME SERVICES
GUIDE DOCUMENTS
Roads and Maritime Services 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 2012
• Bridge Aesthetics 2012
• Landscape Guideline 2008
• Heritage Interpretation Guideline 2016

1.6 STRATEGIC POLICY DOCUMENTS
The desired future character of the study area is drawn from an analysis of the existing character of the foreshore areas of Windsor that comprise the study area, and consideration of the strategic planning documents relevant to the project. These include:
• Draft North West Sub-regional Strategy 2007
• Hawkesbury Community Strategic Plan 2010-2030
• Hawkesbury Residential Lands Strategy
• Hawkesbury Local Environmental Plan 1989
• Hawkesbury City Council Generic Plans of Management for Community Lands
• Plan of Management for the Windsor Foreshore Parks - Incorporating the Great River Walk
• Hawkesbury City Council Sustainable Events Management Guide.

1.7 PROJECT APPROVAL - CONSENT CONDITIONS
The Minister for Planning and Infrastructure has prepared and issued consent conditions (Application No. SSI-4951) on 20/12/2013 for the following land:
Parts of Old Bridge Street, Bridge Street, George Street, Wilberforce Road, Freemans Reach Road, The Terrace, Thompson Square Conservation Area, Hawkesbury River and Other Adjacent Areas of Windsor.
The Approved Development is:
• Windsor Bridge Replacement Project, including
  - Construction and operation of the replacement bridge, northern and southern approach roads, intersections and associated infrastructure crossing the Hawkesbury River
  - Removal of the existing bridge and approach roads
  - Ancillary work including rehabilitation and landscaping
• Consent conditions include the following Pre Construction Conditions:
  - Cultural Heritage (B1, B2)
  - Archaeology (B3, B4, B5) Urban Design and Landscaping (B6, B7)
  - Urban Design and Landscaping (B6, B7)
  - Revised Design (B8)
• Consent Conditions include the following Environmental Performance conditions:
  - Heritage Impacts (C1 - C5)
  - Air Quality (C6-C7)
  - Ancillary Facilities (C8 - C11)
  - Hazard and Risk ((C12)
  - Noise and Vibration (C13 - C22)
  - Soil and Water quality (C23-25)
  - Hydrology and Flooding (C26-C33)
  - Biodiversity (C34-37)
  - Waste Management (C38-C40)
  - Utilities and Services (C41-C43)
  - Transport and Access (C44-46)
  - Urban Design and Landscape (C47-48)
Consent conditions relating to urban design and landscape including the location of where they are addressed in this report are listed in the following Table. 1.1.
<table>
<thead>
<tr>
<th>CONDITIONS OF APPROVAL NO.</th>
<th>REFERENCE TO SECTION OF THIS REPORT WHERE THE CONDITION IS ADDRESSED.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Design and Landscape Plan</td>
<td>4.0 Urban Design and Landscape Detailed Design</td>
</tr>
<tr>
<td>B6. Terracing is not approved as part of landscaping for the SS.</td>
<td>4.3 Key features of the urban Design and landscaping detailed design</td>
</tr>
<tr>
<td>B7. The Applicant shall prepare an Urban Design and Landscape Plan prior to the commencement of pre-construction and construction activities in the southern side of the Hawkesbury River to guide the landscaping for the project. The Plan shall be in consultation with the OEH, and Hawkesbury Council and shall present an integrated urban design for the project that is sympathetic to the heritage values and significance of the Thompson Square Conservation Area and shall be prepared in accordance with the requirements of condition C4.7.</td>
<td>1.0 Introduction, 1.1 Overview</td>
</tr>
</tbody>
</table>

**Table 4.1: Summary of Proposed Urban Design Elements, Materials and Finishes**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) the proposed landscaping of Thompson Square Conservation Area, as shown on the map in Appendix 2 Strategic Conservation Management Plan study area;</td>
<td>4.0 Urban Design and Landscape Strategy</td>
</tr>
<tr>
<td>(b) use of the heritage design principles developed under the CMP and take into account appropriate landscaping in the vicinity of heritage items to minimise heritage impacts;</td>
<td>4.6 Project elements / Materials and finishes</td>
</tr>
<tr>
<td>(c) a description of locations along the project corridor directly or indirectly impacted by the construction of the project (e.g. temporary ancillary facilities, access tracks, etc.) and details of the strategies to progressively rehabilitate regenerate and/or revegetate the locations with the objective of promoting biodiversity outcomes and visual integration. Details of species to be replanted/ revegetated shall be provided, including their appropriateness to the area and considering existing vegetation and habitat for threatened species;</td>
<td>4.7 Planting</td>
</tr>
<tr>
<td>(d) location of existing vegetation and proposed landscaping (including use of indigenous and endemic species where possible) and design features;</td>
<td>4.7 Planting</td>
</tr>
<tr>
<td>(e) graphics such as sections, perspective views and sketches for key elements of the project (including, but not limited to built elements such as retaining walls, cuttings, abutments and street furniture);</td>
<td>4.0 Urban Design ad Landscape Detailed Design</td>
</tr>
<tr>
<td>(f) final design details of the proposed external materials and finishes, including schedules and a sample board of materials and colours; including justification for sustainability of materials including design and installation techniques as well as long term maintenance and their suitability in terms of:</td>
<td>4.6 Project elements / Materials and finishes</td>
</tr>
<tr>
<td>(i) function (ability to withstand heavy vehicle usage and public setting);</td>
<td>Table 4.1 Summary of Proposed Urban Design Elements, Materials and Finishes</td>
</tr>
<tr>
<td>(ii) architectural period/style (respecting the simple Colonial Georgian style);</td>
<td></td>
</tr>
<tr>
<td>(iii) landscape suitability (i.e. suited to both usage and context); and</td>
<td></td>
</tr>
<tr>
<td>(iv) heritage context.</td>
<td></td>
</tr>
<tr>
<td>(g) location and design treatments for any associated footpaths and cyclist elements, and other features such as seating lighting (in accordance with AS 4282-1997 Control of the Obtrusive Effect of Outdoor Lighting), fencing, and signage;</td>
<td>4.7 Planting</td>
</tr>
<tr>
<td>(h) take into account appropriate roadside plantings and landscaping in the vicinity of heritage items and ensure no additional heritage impacts;</td>
<td>4.7 Planting</td>
</tr>
<tr>
<td>(i) detailed design drawings of the proposed works including, but not limited to, road pavements, pedestrian pavements, kerb treatments, abutments, garden beds;</td>
<td>5.0 Landscape Implementation</td>
</tr>
<tr>
<td>(j) strategies for progressive landscaping of other environmental controls such as erosion and sedimentation controls, drainage and noise mitigation;</td>
<td>5.0 Landscape Implementation</td>
</tr>
<tr>
<td>(k) the lighting, street furniture and other fixtures shall be consistent with Crime Prevention Through Environmental Design Principles (CPTED) where possible;</td>
<td>4.6 Project elements / Materials and finishes</td>
</tr>
<tr>
<td>(l) the installation of services to support events such as lighting, electricity, water, sewer, vehicle access and communications technology should be considered and be inherent in the design. Refer to Council's Sustainable Events Policy on Council's website: &lt;<a href="http://council.hawkesburv.nsw.gov.au/masterviewui/modules/documentmaster/getdocument.aspx?docsetid=370">http://council.hawkesburv.nsw.gov.au/masterviewui/modules/documentmaster/getdocument.aspx?docsetid=370</a> 1636&gt;;</td>
<td>4.6 Project elements / Materials and finishes</td>
</tr>
<tr>
<td>(m) monitoring and maintenance procedures for the vegetated built elements, rehabilitated vegetation and landscaping (including weed control) including performance indicators, responsibilities, timing and duration and contingencies where rehabilitation of vegetation and landscaping measures fail and</td>
<td>6.0 Landscape Management</td>
</tr>
<tr>
<td>(n) evidence of consultation with the NSW Heritage Council, Hawkesbury City Council and community on the proposed strategy prior to its finalisation.</td>
<td>1.0 Introduction</td>
</tr>
</tbody>
</table>
2. EXISTING CONTEXT OF WINDSOR

2.1 LOCATION

REGIONAL CONTEXT

Windsor lies within the Sydney Basin about 57 kilometres northwest of the Sydney Metropolitan area and 20 kilometres northeast of Penrith within the Hawkesbury City Council Local Government Area (LGA). The area is bounded by the Blue Mountains and Nepean valley floodplain to the west and is defined by the Hawkesbury River (refer to Figure 2.1).

The historic rural town of Windsor is located on a ridge above the southern bank of the Hawkesbury River. The bridge crossing at Windsor is the oldest existing structure in use, crossing the Hawkesbury River. It also provides an important through route to the north and north west, including to the Hunter Valley via Putty Road, for the greater Sydney region, in particular for the North West Growth Centres.

LOCAL CONTEXT

The northwest area includes the town centres of Richmond and Windsor, villages of North Richmond, Vineyard, South Windsor, and small villages including Mulgrave/McGraths Hills, Glossodia, Wilberforce and Pitt Town.

Three major access roads run north-south through the region. These are Windsor Road, which provides connections to Parramatta, Sydney and the Blue Mountains; Richmond Road, connecting Richmond and areas between to Blacktown and to the Westlink M7 Motorway and Londonderry Road/ The Northern Road, connecting Richmond to Penrith. These connections are illustrated in Figure 2.2.

Three major access roads run north-south through the region. These are Windsor Road, which provides connections to Parramatta, Sydney and the Blue Mountains; Richmond Road, connecting Richmond and areas between to Blacktown and to the Westlink M7 Motorway and Londonderry Road/ The Northern Road, connecting Richmond to Penrith. These connections are illustrated in Figure 2.2.

The bridge crossing at Windsor provides one of only two permanent river crossings for the local population and visitors to the local area, the other being the Richmond Bridge at North Richmond.
2.2 HAWKESBURY-NEPEAN RIVER CROSSINGS

The Hawkesbury River has its origin at the confluence of the Nepean River and the Grose River, to the north of Penrith. Once formed, the Hawkesbury River generally flows with a significant number of meanders northwards. Initially, the river passes the towns of Richmond and Windsor, which are the largest settlements on the river and as it flows north, it enters a more rural area, with only small settlements on the river as it makes its way to the coast at Brooklyn.

There are a limited number of bridge crossings along the length of the Hawkesbury-Nepean River. The bridge crossing at Windsor is one of the oldest of the river crossings.

The existing bridge crossings between Brooklyn and Penrith are identified in Figure 2.3 and Plates 2.1 to 2.7 and noted as follows:

1. Hawkesbury River Railway Bridge, Brooklyn (1889 and 1946)
2. Peats Ferry Bridge, Brooklyn (1945)
3. Hawkesbury River Freeway Bridge, Brooklyn (1977)
4. Windsor Bridge, Windsor (1874)
5. Richmond Bridge, Richmond (1905)
6. Victoria Bridge, Penrith (1867 & 1907)

In addition to these railway and road bridges a number of ferry crossing points also exist on the Hawkesbury River (refer to Figure 2.3). These ferry crossings are:

- Wisemans ferry
- Webbs Creek ferry
- Colo River ferry
- Sackville ferry

Figure 2.3: Hawkesbury-Nepean River crossings. (Source: NSW Transport Maritime Hawkesbury River/Broken Bay Boating maps).
Plate 2.1: Hawkesbury River Railway bridge.

Plate 2.2: Peats Ferry bridge, Old Pacific Highway and F3 Freeway bridge (behind).

Plate 2.3: F3 Freeway bridge and Peats Ferry bridge, Old Pacific Highway (behind), Brooklyn.

Plate 2.4: Windsor Bridge, Bridge Street, Windsor.

Plate 2.5: Richmond bridge, Kurrajong Road, Richmond.

Plate 2.6: Victoria bridge, Great Western Highway, Penrith.

Plate 2.7: M4 bridge, Penrith.
2.3 HYDROLOGY & DRAINAGE

The Hawkesbury-Nepean Valley includes the floodplain area downstream of Warragamba Dam including the Windsor area. Over time the pattern of surrounding development has contributed to the unique flood behaviour of this valley, which can have an adverse impact on its surroundings during flood periods. Flood levels in the local area are generally controlled by water releases upstream from the Warragamba Dam and inflow from the Colo River – and downstream by a series of gorges at Wilberforce. Generally flooding is initially contained within the river banks however for flood events greater than the 1 in 2 year event, floodwaters spill into the floodplain inundating large areas and also into the lower reaches of Thompson Square.

As shown in Figure 2.4 the majority of the urban area south of the Hawkesbury River is prone to at least 1 in 100 year flood event. Flooding is particularly prevalent in the south eastern area around North Richmond, Richmond, Windsor, South Windsor, Blight Park, Wilberforce and Pitt Town areas. Much of the township of Windsor is built on a ridge above the 100 year ARI flood level, however low lying areas have suffered from a number of major floods over the past two hundred years. The surrounding landscape is generally inundated in a one in five year flood event. It is noteworthy that all of Wilberforce Road and sections of Freemans Reach Road are subject to flooding during a 1 in 5 year flood event.

Land uses have impacted upon the quality of the water both within the Hawkesbury River and its tributary South Creek. Within the Windsor area, land uses such as rural activities, grazing, market gardens, intensive farming and both urban and industrial land uses have impacted on the water quality of the Hawkesbury River and its tributary South Creek. Also a number of major wastewater treatment plants discharge treated effluent into South Creek. The results of water quality assessments generally demonstrate that pollutant levels at Windsor are close to or above levels recommended by the Healthy Rivers Commission Guidelines.

DESIGN CONSIDERATIONS

As the area around Windsor is prone to flooding, the robustness of any new infrastructure and safety will be important considerations to take into account. The design of the proposed infrastructure and public domain has considered the relatively high flow velocities associated with the Hawkesbury River and flood events. Proposed materials and finishes have been selected to be hard wearing, durable and suitable for this flood prone environment.

LEGEND

MAJOR CONTOURS
MAJOR RIVERS
CREEK/STREAMS
100 YEAR ARI FLOOD EVENT
FLOOD EVACUATION ROUTES

Figure 2.4: Hydrology, drainage and flood zones
2.4 LANDFORM AND TOPOGRAPHY

The Hawkesbury River valley generally comprises a flat undulating floodplain that is subject to regular flooding. However, at Windsor a ridge exists on the southern bank of the river on which much of the township sits. The existing southern bridge approach through the township descends steeply to the north and down to the river. The northern approach is less distinct being almost level with the existing bridge crossing.

The topography of the area surrounding the township, as illustrated in Figure 2.5, is generally characterised by a gently sloping alluvial plain with occasional terraces or levees providing low relief. River beds and banks are common in the area, which in many parts is active floodplain. Local relief is mainly level and less than 10 metres with slopes generally less than 5 per cent.

DESIGN CONSIDERATIONS

Much of the township of Windsor itself is located on a ridge above the river. These steep grades down to the river at this crossing point provide a physical challenge within the existing built fabric of the area.

The difference in level between the ridge line and the river demands a substantial scale of infrastructure, particularly in terms of bridge abutments.
2.5 BIODIVERSITY

Since European settlement almost all of native flora and the natural habitat for fauna species within the local area has been cleared for development and agricultural purposes. As illustrated in the adjacent map on Figure 2.6, minimal remnant native vegetation exists along the Hawkesbury River, its tributaries and creek / drainage lines. The riparian vegetation is generally restricted to exotic grasslands, disturbed woodlands and Casuarina woodland, and is generally degraded by flooding, weed invasion and monocultures of species planted to protect the river bank from erosion.

The aquatic habitats in the area have long been degraded through water pollution, the introduction of aquatic weed species and introduced fauna species, bank erosion, riparian zone modification and flooding. Native flora and fauna species however continue to inhabit the Hawkesbury River. One endangered species, the Trout Cod (Maccullochella maquariensis) has been identified as potentially existing in this section of the Hawkesbury River.

Many species of declared noxious weeds have been identified in the area, many of which are aquatic species and therefore occur within the river or on adjacent banks within the study area. Refer to the Biodiversity Working Paper of the Windsor Bridge Replacement Project Environmental Impact Statement, 2012 for further details relating to existing habitats of the standalone statement area.

Thompson Square is an informal parkland characterised by its open nature and a limited range of tree species. The majority of trees in the square are exotic species and are mature or semi mature. Some of the trees appear likely to be self sown like Melia azedarach, Jacaranda mimosifolia, Ulmus parvifolia, Olea europaea and Schinus orens whilst other trees are consistent with species used in the earliest colonial plantings like Brachychiton populneus, Araucaria cunninghamii and Grevillea robusta as identified in the SCMP.

DESIGN CONSIDERATIONS

Although the study area does not have any significant vegetation communities, present retention of existing vegetation and weed management will be particularly important along the river foreshore in order to maintain river bank stability and reduce any adverse impacts to planting in parklands and open spaces.
2.6 HERITAGE

ABORIGINAL HERITAGE
Aboriginal people have been associated with the land in the Windsor area for tens of thousands of years. These people who spoke the Darug language were believed to have lived in bands or communities of around 50 members each, and were highly mobile across the Cumberland Plain. Foods were gathered from the land and the rivers provided a rich variety of resources to the local community. Food was cooked lightly on open fires or in underground ovens.

HISTORICAL HERITAGE
Windsor is a “Macquarie town” that was established at an existing village settlement known as Green Hills on the Hawkesbury River. The area was first visited by Europeans in 1789 as part of an expedition led by Governor Phillip to find land suitable for growing food for the colony at Sydney Cove. Goods from the farmlands in the Windsor area were transported down the Hawkesbury River to the colony well into the nineteenth century. The village of Green Hills developed on higher ground near one of the landing places along the Hawkesbury River in 1795. In 1810 Governor Macquarie named five towns in the Hawkesbury area, namely Windsor, Castlereagh, Wilberforce, Pitt Town and Richmond. Macquarie designed the town centre of each town including the street layout, a public square, church, school and burial ground.

Over the decade following the town being laid out, Macquarie oversaw the establishment of many buildings near the river in Windsor and Thompson Square, which had been the commercial centre of Green Hills. A punt was used to cross the river from the earliest days of the Green Hills settlement which was accessed through Thompson Square. Thompson Square continued to have an important function for the town of Windsor, as it remained the town’s primary connection to the river.

This importance of Windsor as a crossing point on the river was reinforced by the construction of Windsor Bridge in 1874 and subsequent raising of the bridge deck level in 1896.

The map in Figure 2.7 shows the location of the different heritage items in the vicinity of the project. Refer to SCMP for further details relating to existing historical and Aboriginal heritage.
2.7 THE HAWKESBURY RIVER CROSSING AT WINDSOR

The first western crossing of the Hawkesbury River at Windsor was by a punt operated by John Howe in 1814. Due to lack of reliability in the service, it was taken over by the Government in 1832 and subsequently replaced by a permanent structure completed in 1874 (refer Figure 2.9), the first Windsor Bridge. Work had commenced on the bridge construction in January 1872, however problems with the proposed screw piles and several heavy floods delayed completion of the bridge piers until December 1873.

Due to frequent inundation, the bridge was raised in 1896 (refer Figure 2.10), by adding 8 foot high cylinders onto the existing piers. New capsills, corbells and girders were fitted and damaged elements replaced. A new 4 inch thick tallow wood deck was layed with an ironbark log kerb. New iron handrails enabled the balustrade to be dismantled into four pieces, so that one man could raise and lower them at flood time.

MAINTENANCE AND ADDITIONS

Roads and Maritime Services documents suggest that the timber deck, corbels and beams were replaced by a concrete structure in the 1920’s. In 1967 a water supply pipe to Wilberforce and steel pedestrian walkway were added to the structure.

Refer to SCMP for detailed history of the Hawkesbury River crossing.
2.8 PARKS AND RECREATION

PARKS AND OPEN SPACES

Parks and open spaces are very important features of Windsor. These include Deerubbin Park, Howe Park, Windsor Wharf Reserve and Governor Phillip Park which are located along the southern bank of the river and Macquarie Park on the northern bank. Thompson Square and Hollands Paddock are both separated from the river by The Terrace as shown in Figure 2.12. Each of these open spaces provide for a range of recreational activities and are of great importance to the local community.

HAWKESBURY RIVER ACTIVITIES

Water based activities are a key feature of the open space network at Windsor and include:
- Power Boat Race - Brooklyn to Governor Phillip Park (May)
- Bridge to Bridge Water Ski Classic - Danger Island, Broken Bay to Windsor Stadium, Governor Phillip Park. (November)
- Hawkesbury Canoe Classic - Macquarie Park to Brooklyn (October).

Other river based activities include wake boarding, river cruises, house boats, fishing, kayaking and canoeing.

DESIGN CONSIDERATIONS

The parks and open spaces of Windsor provide a valuable asset for a variety of recreation and community based activities to take place. Water based activities are a key feature of the area. Safe and easy access to these areas needs to be a key consideration for this project.
2.9 CYCLE AND PEDESTRIAN NETWORK

A number of key pedestrian and cycle routes currently exist within Windsor, as illustrated in Figure 2.13. The primary routes to and from the town centre extend out to the various parks and open spaces to the south and north of the river. The secondary route connects the spaces along the foreshore. Thompson Square forms a natural convergence point for the network at the crossing point of the river and near to the town centre.

The Great River Walk Windsor foreshore walking path is a part of the overall proposed route future connections to Governor Philip Park and possibly the northern bank from Macquarie Park.

A number of both off road and on road cycleways provide for connections throughout Windsor and the surrounding areas. Hawkesbury Council has also planned a number of additions and extensions to this network (as set out in the Hawkesbury District Bicycle Network on Council’s website).

DESIGN CONSIDERATIONS

Consultation has been undertaken with Hawkesbury City Council to ensure pedestrian and cycle access for the project is integrated into the surrounding network.
2.10 THOMPSON SQUARE

THE EXPERIENCE OF THOMPSON SQUARE

Thompson Square is currently broken into distinct parts, rather than acting as a cohesive civic space as shown in Figure 2.14.

The Upper Square
The upper square occupies the topographic high point and has good connectivity and access to the George Street and Thompson Square properties. The levels of the park slope gently and culminate in a slightly domed profile at the top of the square adjacent George Street. These gentle grades see this part of the park become strongly connected to the life of George Street, and the focus of recreational activities. Views are focused towards the surrounding buildings and urban scene, as views to the river are restricted by mature trees.

The Lower Square
The lower square is bounded by streets on three sides. As such, it is highly disconnected from the life of George Street and due to the steeper levels at its base feels physically separated from The Terrace and Wharf. The topography has been artificially mounded, forming a small promontory that offers views out towards the river and opposing riverbank, that become a focus of this part of the park. A small area adjacent the car park provides picnic facilities.

DESIGN CONSIDERATIONS

Works on the square resulting from the bridge should seek to reunify Thompson Square into a cohesive place, but allow the upper and lower parts of the square to develop subtly distinctive characters.

The upper square should continue to support the lively character of George Street.

The lower square should develop a positive and open relationship to the river foreshore.

Both parts should be well connected, rather than separate entities.
3. URBAN DESIGN AND LANDSCAPE STRATEGY

3.1 OVERVIEW

Urban design and landscape objectives and principles developed during the concept design phase and presented in the EIS, continue to guide the detailed design development to ensure:

- The project meets conditions of approval
- The bridge and approach roads are physically, visually and operationally integrated with the surrounding environment
- Urban Design and Landscaping is sympathetic to the heritage values and significance of Thompson Square Conservation Area.

These objectives and principles take into account the desired future landscape and urban design character for the area as set out in Hawkesbury City Council’s Plan of Management for the Windsor Foreshore Parks Incorporating the Great River Walk. They also reference the key urban design aspects of Roads and Maritime’s Beyond the Pavement urban design policy and associated guidelines. The objectives and principles are 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 bridge and approach roads. Furthermore, the principles respond to the heritage design principles developed in the draft SCMP which are listed below and are addressed in Chapter 4.

- The most appropriate and sensitive options for the site include:
  - Future works should aim to respect and, where possible, reinstate Thompson Square and the study area as a formal town square
  - Future development should respect the form, scale and character of the area
  - New works should be of a high quality of design and use appropriate materials, colours and textures to enhance the historic fabric of the study area
  - The presentation and interpretation of all facets of the area’s history should be integrated into the future design and development work in the area

- General conservation principles for the study area are to:
  - Protect significant fabric and historic associations
  - Allow for interpretation and public access
  - Inform and engage the community.

The project wide landscape and urban design principles as presented on the following pages.

3.2 URBAN DESIGN OBJECTIVES AND PRINCIPLES

OBJECTIVE 1: DEVELOP AN INTEGRATED CONCEPT DESIGN THAT FITS SENSITIVELY WITH THE EXISTING QUALITIES AND CHARACTERISTICS OF WINDSOR AND ITS HAWKESBURY RIVER SETTING.

Design principles:
- Maintain the landmark qualities of a bridge crossing at Windsor
- Minimise the physical footprint and scale of the bridge, approach roads and associate intersections
- Ensure the design and character of the bridge and associated roadworks are well integrated with the adjoining built areas, open space, historic and natural settings, rather than being a dominant feature
- Minimise negative physical impacts on parklands, open space, the river and other foreshore areas adjacent to the bridge
- Design all road and bridge elements carefully to integrate and coordinate with adjoining elements and structures. Materials and details to be robust, low maintenance and suitable for its purpose and place
- Minimise the intrusion of road-related elements (fencing and water quality control measures) on the local landscape
- Consolidate residual land parcels to retain sufficient public open space for future river front activities
- Safeguard infrastructure from flood impacts
- Any new lighting would strike a balance between illumination for safety and the context of the parkland and its adjoining areas

OBJECTIVE 2: ENHANCE THE EXISTING AMENITY, VISUAL CHARACTER AND CULTURAL LANDSCAPES OF THOMPSON SQUARE AND WINDSOR.

Design principles:
- Not precluding Council’s future plans, which are yet to be determined
- Redevelop any residual road space as parkland to be integrated within Thompson Square
- Maximise opportunities to enhance the connection between Thompson Square and the commercial area around the intersection of George Street and Bridge Street
- Enhance views of Thompson Square and its buildings to and from the bridge and approach roads on both sides of the river
- Retain and, where possible improve, views to important landmarks in particular the Hawkesbury River, Thompson Square and the historic buildings around Thompson Square
- Enhance the unique sense of arrival to Windsor both from the north and south while also strengthening the landscape character of historic Thompson Square through appropriate tree planting
- Protect and interpret the heritage values of Thompson Square and Windsor in general
- Maximise the available open space in Thompson Square by minimising the road corridor footprint and returning unused road areas back to open space land
- Identify the most appropriate uses for Thompson Square in order to define its form and character
- Enhance the access opportunities for all users around and through Thompson Square
- Promote a safe environment through the considered placement of lighting, furniture and fixtures by adhering to Crime Prevention Through Environmental Design principles where possible
- Maintain and rehabilitate native riparian vegetation to enhance the native foreshore landscape character and aid in erosion control
- Retention and protection of as many trees as possible will be undertaken but in particular the most significant existing trees would be incorporated into the design wherever possible.

OBJECTIVE 3: MAINTAIN THE INTEGRITY OF CULTURAL AND HISTORIC BUILDINGS, STRUCTURES, ELEMENTS AND SPACES OF WINDSOR.

Design principles:
- Maintain the physical and visual integrity of State-significant items including historical buildings, public spaces and their curtilage, particularly in Thompson Square
- Preserve the integrity of heritage items and areas of cultural importance to the local community
- Minimise the impact on historical archaeological sites, particularly those associated with Thompson Square
- Enhance the setting of Thompson Square and its buildings
- Minimise the impact on Aboriginal heritage sites and their associated heritage values
- Minimise or avoid alterations to heritage items, except where the removal of intrusive elements would have a positive impact on their heritage significance
- Be sympathetic to the heritage values and significance of the Thompson Square Conservation Area
- Consider the archaeological significance of the site
OBJECTIVE 4: IMPROVE CONNECTIVITY FOR VEHICLES, PEDESTRIANS AND CYCLISTS.

Design principles:
• Provide safe, direct and obvious connections between the bridge and approach roads with the local road network in Windsor
• Enhance opportunities to define the northern intersection as an entry to Windsor
• Provide generous and direct cycle and pedestrian connections across the bridge and enhance the existing pedestrian and cycle networks along the approach roads
• Consider opportunities for public transport throughout the project.
• Maintain and enhance connections to the existing river edge and adjoining open space network
• Provide safe pedestrian, cycle and vehicle access to Macquarie Park
• Examine safe pedestrian and cycle connections throughout the project and links with existing path network within Macquarie Park
• Maintain access to existing wharf.

3.3 BRIDGE DESIGN OBJECTIVES AND PRINCIPLES

Specific architectural principles, to supplement the Roads and Maritime Services Bridge Aesthetics Design Guidelines are set out on the following pages. The first part looks at urban siting and character. The second part looks in detail at individual bridge elements.

OBJECTIVES AND PRINCIPLES FOR SITING AND CHARACTER

A PLACEMENT AND SITING

OBJECTIVE 1: DESIGN A BRIDGE AND APPROACHES THAT ARE WELL SITED AND CONSIDERED IN RELATIONSHIP TO THE HAWKESBURY RIVER’S LANDSCAPE SETTING, THE TOWNSHIP OF WINDSOR, THE BANKS, PARKS AND APPROACH ROADS.

Design principles:
• Give the new bridge a simple linear geometry so that it continues to be expressed as a calm, succinct form in the landscape
• Clearly articulate the experience of crossing the bridge from the experience of approaching the bridge
• Ensure that the eastern bridge approach accords as closely as possible to the Old Bridge Street alignment
• Ensure that the vertical alignment through the historically important Thompson Square is as close as possible to existing ground levels.

B CHARACTER

OBJECTIVE 2: DESIGN THE NEW BRIDGE IN ALIGNMENT, GRADIENT AND ITS CONSTITUENT ELEMENTS SO THAT IT HAS A DIGNIFIED AND CONFIDENT PRESENCE.

Design principles:
• Ensure the new bridge has a robust structural character
• Give strong consideration to the landscape treatment and urban presence of both the bridge and its approaches
• In keeping with the existing bridge character, design the new bridge to have an understated, rather than overly expressive character
• Refinement of the bridge, its abutments and constituent parts and details to ensure a high quality outcome response to its prominence within the Hawkesbury River’s landscape setting and the township of Windsor.

OBJECTIVES AND PRINCIPLES FOR BRIDGE ELEMENTS

A BRIDGE ELEMENTS - DECK

OBJECTIVE 1: THE DECK OF THE BRIDGE SHOULD BE EXPRESSED AS AN UNCLUTTERED HORIZONTAL PLANE SPANNING THE HAWKESBURY RIVER.

Design principles:
• Design the longitudinal grades of the new deck to mirror as closely as possible, the horizontal plane of the Hawkesbury River for the component of the bridge that spans between the abutments
• Reduce the width of the deck as much as possible, to minimise its bulk as viewed and experienced from Thompson Square, the Terrace and from more distant viewpoints along the river
• Raise the pedestrian/cycle path slightly above road pavement level, to improve safety for pedestrians/cyclists
• Minimise the bulk of the bridge as viewed from Thompson Square by locating required traffic barriers between the traffic lane and the shared path
• Use the design of the pedestrian handrail on the outer edge of the bridge to allow a finer scale/edge treatment to be developed on the Thompson Square side of the bridge
• Ensure that the pedestrian rail on the outer edge is collapsible during flood events in accordance with established and tested Roads and Maritime Services design solutions.

B BRIDGE ELEMENTS - DECK SOFFIT

OBJECTIVE 4: THE DECK SOFFIT SHOULD BE DESIGNED, TREATED AND FINISHED AS AN IMPORTANT FACADE, DUE TO ITS HIGH VISIBILITY FROM THE PUBLIC DOMAIN.

Design principles:
• Give the deck soffit a modelled architectural expression, rather than expressing it as a generic flat plane
• Fully integrate the bridge’s edge detail with the soffit design
• Conceal services wherever possible - if unavoidable, recess services into the deck soffit so that they sit flush with the finished surface, or set away from the edge of the soffit so that they are always in shadow
• Ensure that the transition of the soffit to the abutment is fully resolved in three dimensions
• Give consideration to the treatment of the soffit surface in terms of reflection, light and shadow.
C  BRIDGE ELEMENTS - PIERS

**OBJECTIVE 5: THE PIERS SHOULD EXPRESS, THROUGH THEIR STRUCTURE, THE FORCES THAT ARE TRANSFERRED FROM DECK TO THE FOUNDATIONS.**

*Design principles:*
- Design piers for compliance with structural minima, to minimise their bulk
- Design piers with a paired leg expression that is slender; i.e. the proportion of their vertical height to width should be controlled such that the piers appear fine, rather than squat
- Consider the design of the piers in relation to their dominant visual presence from Thompson Square and the river foreshores
- Ensure that the pile caps are recessive and integrated with the pier design
- Consider the view through the pier structure from the Terrace and Wilberforce as a particular experience and articulate it accordingly
- Use the placement, material character and any finish of the piers to discourage vandalism and graffiti.

D  BRIDGE ELEMENTS - ABUTMENTS

**OBJECTIVE 6: THE ABUTMENTS SHOULD SEAMLESSLY RESOLVE THE TRANSITION FROM ELEVATED DECK TO THE GROUND PLANE, AND BE FULLY CONSIDERED AS A THREE DIMENSIONAL DESIGN.**

*Design principles:*
- Provide consistency in the architectural language between the piers and the abutments
- Consider the abutment walls as an integral part of Thompson Square, defining the open space
- Design the abutment walls as vertical walls to maximise usable space in Thompson Square and minimise land take
- Form the abutment walls of robust masonry elements to complement existing walls in Thompson Square
- Consider opportunities to interpret flooding and flood levels in the design of the abutment walls.

E  BRIDGE ELEMENTS - MATERIALS

**OBJECTIVE 7: ALL MATERIALS SHOULD BE SELECTED FOR THEIR ROBUSTNESS AND DURABILITY, CONSIDERING THEIR TENDENCIES TO DEVELOP A PATINA AS THEY AGE.**

*Design principles:*
- Select materials that are robust and durable.
- Express the inherent material of the bridge construction, and minimise the use of cladding
- Where special finishes are desired, consider them as an integral component of the construction method, rather than an applied finish.

F  BRIDGE ELEMENTS - LIGHTING

**OBJECTIVE 8: LIGHTING SHOULD BE AN INTEGRAL PART OF THE DESIGN, RATHER THAN AN UNRELATED ATTACHMENT.**

*Design principles:*
- Ensure that lighting levels comply with statutory requirements for each use - vehicular, pedestrian and cycle
- Use integrated, linear, low level strip lighting wherever possible
- Minimise the use of vertical pole elements that are susceptible to damage in flood and compete with the horizontal plane of the deck
- Select low energy use sources wherever possible, with appropriate IP ratings that anticipate inundation
- The provision of lighting should be sympathetic to the heritage values and significance of Thompson Square.
4. URBAN DESIGN AND LANDSCAPE DETAILED DESIGN

4.1 OVERVIEW

The design of all engineering components has been developed in an iterative process between the project's engineers, urban designers and heritage consultants. In this section of the report an overall urban design approach is addressed. Due to the specific characteristics of this bridge project, it has been divided in three areas, each one with a different character. These areas are the Southern Bank, the Bridge and the Northern Bank (refer Figure 4.1).

LAND TENURE

The existing parks and reserves affected by, or adjacent to the proposed works are classified as Crown land, with one small parcel of land classified as community land at the entrance to Macquarie Park. The existing land tenures as set out in Council’s Plan of Management for Windsor Foreshore Parks Incorporating the Great River Walk, are illustrated by the red dashed line in Figure 4.1 and are noted as follows:

- Thompson Square Lot 345 DP 752061 6(a) Open Space (existing recreation)
- Howe Park Lot 7011 DP 1030959 6(a) Open Space (existing recreation)
- Windsor Wharf Reserve Lot 7008 DP 1029964 6(a) Open Space (existing recreation)
- Macquarie Park Lot 1 DP 226141 Public Road.

PROJECT PRECINCTS INCLUDING PARKS AND RESERVES

This project will result in the re-organisation of the land tenure classification noted above and this will be developed by Hawkesbury City Council. However, in progressing the detail design for integrating this project into the existing conditions, the spatial organisation of these areas has been defined to help guide the urban design and landscape character and elements of the project. The precincts which have been defined are as follows:

- Town centre entry
- Thompson Square
- Howe Park
- Windsor Wharf Reserve
- Macquarie Park
- Northern intersection
- Wilberforce Road
- Open space (existing)

Figure 4.1: Project precincts and existing land tenure.
4.2 KEY FEATURES OF THE DESIGN

HERITAGE VALUES
The heritage values of Thompson Square have been a critical consideration in the concept design for this project as follows and illustrated in Figure 4.2:

- The rationalisation of the extent of roadways in Thompson Square by removing the Bridge Street approach road in order to reduce the amount of paved surfaces, and increase the amount of consolidated green space.
- Infilling the existing road cutting in order to partially restore the earlier landform of Thompson Square.
- The historic connection and relationship of the town to the river would be retained and enhanced.
- The project stops short of the present house called ‘Bridgeview’ on Wilberforce Road.
- Opportunities for heritage interpretation including the retention of the southern abutment and first span of the existing bridge as a viewing platform for heritage interpretation (subject to council acceptance).

STRUCTURE AND FORMS
The project would enhance the structure and urban form of Thompson Square as identified in Figure 4.3 and noted as follows:

- The proposed approach road alignment on the eastern edge of Thompson Square would create a strong and more legible rectangular structure to the square where the roadways define the four edges of the central parkland area.
- The redefined rectangular structure of the square would reinforce the urban form provided by the buildings on its perimeter.
- The lower half of Thompson Square with the road cutting infilled, would be regraded to create more even grades across the parkland.
- The existing retaining wall beneath the Doctor’s House would form a visual relationship with the proposed bridge abutment, creating a clearly defined and enclosed amphitheatre effect in the intervening space.
- The northern foreshore retains an open park-like landscape setting with a network of pathways.
PARKLAND SPACE
The project would provide for enhancement, expansion and consolidation of open space which would provide:

- A continuous green space connection to the river from Thompson Square as well as along both river banks
- Reinforcement of the successful synergy between the retail businesses on George Street and the parklands
- Provision of improved amenity for users of the area and potentially increase the range and frequency of uses
- Provision for two key recreational activity areas within the parklands area of Thompson Square. The upper area adjacent to George Street would provide a large space that is close to the main street retail activities whilst the lower area adjacent to The Terrace would be set below the level of the proposed bridge and approach road and has the potential for activities associated with the river foreshore and the foreshore walking path network upstream of the square
- Expansion of open space adjacent to Macquarie Park would increase the amount of usable open space and improve the character and entrance to the parkland
- Retention of existing bridge elements. On the southern foreshore, the southern abutment and first span is retained as a viewing platform, (subject to acceptance by council) and on the northern foreshore the northern abutment only is retained as an interpretation node.

ACCESS AND CIRCULATION
The project would provide access between the township and the northern foreshore which would be more direct and safer for vehicles, pedestrian and cyclists. The key features as illustrated in Figure 4.5 would include:

- Access for people with disabilities to The Terrace via Thompson Square road through the provision of two disabled parking spaces on the western side of the southern abutment, located close to he Terrace
- The provision of a wide shared path would improve the amenity for pedestrians and cyclists travelling from the town centre across the river to Macquarie Park
- The provision of a signalised intersection at George Street and Bridge Street would improve pedestrian and cyclist safety at this central location
- Two sets of stairs, one adjacent to the bridge abutment and the other adjacent to the existing retaining wall under the Doctor’s House, would provide access down to The Terrace and river
- A footpath connection adjacent to Number 10, 6 and 4 which would provide access down to The Terrace and the wharf area
- The proposed Wilberforce Road and Freemans Reach Road roundabout which would minimise traffic delays and improve safety
- The shared pedestrian and cyclist paths would be separated from the roads in the area surrounding the proposed Wilberforce Road and Freemans Reach Road roundabout, improving safety and amenity for users
- Two access points to Macquarie Park as well as a grade separated path under the bridge for people travelling north which could potentially connect into a future foreshore path
VIEWS AND VISTAS

The key arrival locations at the intersection of George Street and Bridge Street, and on Wilberforce Road would be retained as part of the project. The key features are identified in Figure 4.6 and are noted as:

- Existing key sightlines and viewpoints would be preserved on both sides of the river.
- Some of the visual connections and sightlines throughout Thompson Square, and between the various buildings across the upper areas of the square would be retained or improved.
- Sightlines directly down the Thompson Square parkland towards the river and out over the land north of the project area, would be retained and potentially enhanced with the possibility of increasing the extent of the visibility of the river from some locations.
- Views towards Windsor and Thompson Square from the expanded parkland area and proposed pathways on the northern foreshore, would be enhanced, particularly from the pathways near the foreshore.

**Figure 4.6:** Views and vistas.
TREE PLANTING

A number of existing trees in Thompson Square and on the southern foreshore would be removed as a part of the project. Most of the trees to be removed in Thompson Square are located in the lower section of the parkland as identified in Figure 4.7. Most of these trees are exotic species and are of a mature to semi-mature age. Some of these trees may have been planted whilst others are likely to be self-sown with seed from neighbouring mature specimens. Tree planting as part of the project, as illustrated in Figure 4.8, would include:

Southern foreshore

- Retention and protection of the more mature and significant specimens which are located in the upper area of the parkland
- Removal of tree species that are in poor health, reaching senescence or inappropriate for their setting
- New tree plantings would be installed in the lower section of the parkland after the cutting of Bridge Street would be regraded
- New plantings would be similar species to those existing in the parklands and would enhance the parkland character, and the visual character and functionality while maximising views to the river.

Northern foreshore

- The plantings on the northern foreshore are designed to:
  (a) create an open parkland setting which would assist in reducing the scale of the proposed roundabout.
  (b) extend the Macquarie Park character beyond its current boundary to encompass the whole roundabout area as a new piece of public open space
- Rehabilitation and replanting of the river embankments would be undertaken once the retaining wall and rock have been installed for the river bank scour protection works on both sides of the river. Endemic species suitable for riverine environments, where inundation by flood waters will occur on a relatively frequent basis, would be selected.

NOTE: A tree survey carried out during the detailed design phase of the project was prepared by Moore Trees, Arboricultural Services, Arboricultural Development Assessment Report 2013. Retention of existing trees and other significant vegetation would be maximised wherever possible. All further detailed design of the landscape would be carried out in consultation with the community and Hawkesbury City Council. An Arborist is required to be onsite to reconfirm the condition of vegetation prior to work commencement.
The design process has culminated in the preparation of a proposal for the Windsor Bridge Replacement Project. Key features of the project that have been developed are listed below and in the following pages and shown in Figure 4.9. For the purposes of this report, the key features of the project have been described in three key areas: southern bank, northern bank and the bridge. Key features include:

**Southern bank**
- Thompson Square East
  - Two disabled parking bays
  - New access stairs from Bridge Street to The Terrace
  - New sandstone clad retaining wall
- Thompson Square West
  - New grading to Thompson Square of a continuously grassed slope of maximum 1:4 grade meets the MCOA requirement for no terracing.
  - New low sandstone clad retaining wall
  - Two access stairs along the east and western sides of Thompson Square
- Viewing Platform
  - Seating and site interpretation.

**Northern bank**
- Planting of the dual lane roundabout and surrounding the intersection
- Water quality retention basin
- Retention of existing bridge abutment as an interpretation node.

**The bridge**
- Substructure
- Abutments
- Historical site interpretation incorporated into brick abutment and new stairs adjacent to Thompson Square
- Superstructure.
Figure 4.9: Overview and key features of proposed detailed urban design and landscape plan

- New sandstone retaining wall
- New water quality basin
- New rock scour protection with planting 'pockets'
- New shared path connection to Macquarie Park
- Existing bridge abutment retained as site interpretation

Portion of existing bridge retained as viewing platform with seating and site interpretation (subject to acceptance by council)

New pavement to The Terrace
New low sandstone retaining wall
New access stairs
2 new disabled parking bays

Bridge abutment to be brick clad with integrated site interpretation.
New sandstone retaining wall

Existing bridge abutment retained as site interpretation
New tree planting to northern intersection and roundabout
New water quality basin
New rock scour protection with planting 'pockets'
SOUTHERN BANK

Thompson Square West

New grading is required in the lower portion of Thompson Square in order to integrate the new Bridge Street levels with the existing Thompson Square levels. The new grading also provides an opportunity to improve the amenity of the lower portion of Thompson Square, which is currently an underutilised park space. This is due to poor accessibility as a result of:

• The park space being surrounded by Bridge Street and Old Bridge Street
• The difficult pedestrian crossing at the intersection of Bridge Street, Old Bridge Street and George Street
• The lack of pedestrian access down the steep bank to The Terrace.
• The existing car park occupying part of this area.

The key principles for the reconstruction of the lower portion of Thompson Square as part of the Windsor Bridge replacement project are shown in Figure 4.10 and identified as:

• The portion of Thompson Square park above the existing Bridge Street cutting is to remain unmodified
• To unify the parkland areas of Thompson Square, which are currently bisected by Bridge Street
• To maximise connections into the lower portion of Thompson Square park from the new shared path on Bridge Street, and the two new stairs on either side of Thompson Square
• To provide a grassed slope down to The Terrace with a maximum grade of 1:4 – which is suitable for mowing, can be traversed by pedestrians and is suitable for passive recreation
• To meet the MCOA requirement of no terracing
• To create a relatively flat space adjacent to The Terrace adjacent to the existing bridge abutment
• To create a space for informal community gatherings that is suitable for public performances
• To provide adequate access to Windsor Wharf via The Terrace (under the bridge) for coaches and Council maintenance vehicles.

The key challenge for the reconstruction of the lower section of Thompson Square will be negotiating the approximately 7 metre level change between the centre of the park and The Terrace, while at the same time providing a park space that is suitable for passive recreation and is well connected to its surroundings.

Figure 4.10: Principles for reconstructing Thompson Square
Figure 4.11: Thompson Square sections
Figure 4.12: Thompson Square - 3D sketch.
Figure 4.13: Thompson Square West - Cut & fill section.
SOUTHERN BANK

Thompson Square East

New road grading is required to integrate the bridge and also general vehicle and pedestrian access to the wharf. Regrading also maintains vehicle access to the existing carpark, turning facility for long vehicles and provide access to the new disabled parking spaces.

Two dedicated parking spaces for people with disabilities will be located at the southern end of the access road to the existing Windsor Wharf Carpark, and will replace the existing two parking spaces which will be removed as part of the upgrade works of this project. A new retaining wall with a varying height up to 3.5 meters is also required to the south east of the parking spaces to facilitate the construction.

The key principles for the reconfiguration of Thompson Square East including the relocation of the two parking spaces for people with disabilities are shown in Figure 4.14 and include:

• Provide accessible parking spaces complying to relevant Australian Standards (AS/NZS 2890.6)
• Provide a parking space for people with disabilities which is in relatively close proximity to Windsor Wharf and the foreshore
• Mitigate the visual impact of the retaining wall through planting of native shrubs and grasses to provide a vegetation 'screen' when viewed from the foreshore and areas to the north
• Placement of the parking spaces and retaining wall in a location which does not impact the sensitive foreshore area
• Maintaining access to existing wharf
• Providing a turning facility for long vehicles (coaches and maintenance).

Figure 4.14: Thompson Square East

New stairs with handrail
New disabled parking
New sandstone retaining wall
New concrete kerb
Figure 4.15: Elevations for Thompson Square East

SECTION 1

SECTION 2

SECTION 3

Barrier Rail to top of wall
Sandstone clad retaining wall
Informal planting with native species
Existing ground line
New access path / stairs
New disabled parking
Barrier Rail to top of wall
Sandstone clad retaining wall
Informal planting with native species
Existing ground line
New disabled parking
Property boundary
Property boundary
Property boundary
Property boundary
SOUTHERN BANK

Viewing platform
A viewing platform is proposed to be build in the location of the existing bridge abutment to create safe and easily accessible vantage point to enjoy views across the Hawkesbury River. Refer to Figure 4.16 cross sectional elevation of the viewing platform.

Interpretation for the existing bridge and Thompson Square will be incorporated into this platform, which will be one of the interpretation nodes within the heritage interpretation strategy. The viewing platform responds to the conservation principles identified in the draft SCMP by providing interpretation and public access. Refer to the EIS and SCMP for further details relating to historical heritage.

The bridge abutment, the first set of piers and the first bridge span will be retained from the existing bridge to form the viewing platform. A new balustrade and custom bench seating will also be incorporated.

The viewing platform will be subject to council acceptance.

Plate 4.1: Existing viewing platform over Hawkesbury River in the vicinity of the existing bridge.

Figure 4.16: Heritage interpretation viewing platform at the existing bridge abutment.
NORTHERN BANK

The project includes the construction of a new dual lane roundabout at the intersection of Freemans Reach Road, Wilberforce Road, northern bridge approach road and the access road to Macquarie Park. Whilst the roundabout and approach roads are at, or close to existing grades, the scale and footprint of the road infrastructure would be a dominant feature within this predominately rural landscape.

A permanent water quality retention basin would be constructed to capture and treat stormwater runoff from the bridge and northern intersection prior to stormwater being discharged to the Hawkesbury River. The basin would normally be dry, have a natural form and be planted with native riparian species to reduce its visual impact.

Pedestrian access would be improved by the construction of a number of footpaths linking Macquarie Park, the riverside and the northern side of Wilberforce Road, although crossing Wilberforce Road and Freemans Reach Road adjacent to the roundabout would be challenging, particularly during peak periods.

Macquarie Park would remain the major recreation area on the northern side of the river. The relocation of the bridge to the east would provide additional vegetation between Macquarie Park and the new works.

The northern abutment of the existing bridge will be retained as a heritage interpretation node, custom bench seating will be provided. Refer to SCMP for further details relating to historical heritage.
Figure 4.18: Northern bank sections

SECTION 1

SECTION 2

New scour protection with native grasses

Informal planting with native species

Heritage interpretation node on existing bridge abutment area

Heritage interpretation node integrated with balustrades

New path

Water Quality Basin

Wilberforce Road

New path
BRIDGE

The design for the new Windsor Bridge comprises five spans across the Hawkesbury River. The spans are equally spaced at 31.32 metres, with the four piers evenly spaced across the river. The southern abutment (abutment A) is located on the eastern side of The Terrace (which has been extended as part of the project) while the northern abutment (abutment B) is located just behind the northern bank of the river.

Cross section

The bridge accommodates a roadway as well as a shared path. The shared path is located on the western (upstream) side of the bridge and is a consistent 3 metres in width. The shared path is separated from the roadway by a vehicle barrier, and a balustrade would be located at the outside (parapet) edge of the shared path. The roadway is located on the eastern (downstream) side of the shared path and is contained by roadside barriers. The width of the roadway from abutment A to Pier 3 is 11 metres to accommodate two southbound lanes 3.45 metres wide, one northbound lane 3.5 metres wide and 0.3m shoulder. From Pier 3, the roadway width increases to 15.6 metres to accommodate the merge and diverge from the new roundabout just north of the bridge.

The overall width of the bridge, including barriers and parapets, is 15.2 metres from abutment A to Pier 3, from where it widens to 19.8 metres at abutment B.

Urban design considerations

The following urban design and heritage considerations have informed the bridge’s general arrangement:

- The realignment of Bridge Street adjacent to Thompson Square has been lowered as much as possible to minimise the visual impact on views across Thompson Square, retain existing ground levels wherever possible and to maintain access for coaches to the public wharf
- The southern approach road follows the Old Bridge Street alignment as much as possible
- A straight, rather than curved, bridge profile has been adopted to give the new bridge a simple linear geometry and an understated, rather than overly expressive, character
- The southern abutment is positioned adjacent to The Terrace to avoid the creation of a space under the bridge that would have limited amenity and create undue maintenance and public safety problems
- The shared path is located at the western (upstream) side of the bridge to provide better physical and visual connections to Thompson Square and Macquarie Park
- The vehicle barrier is located between the shared path and the roadway, rather than at the outside (parapet) edge of the shared path to provide a sense of separation between the two spaces.
4.4 BRIDGE DESIGN

The bridge design has been developed from the concept design stage in an iterative process in collaboration with the project’s structural engineering team and project managers. The provision of lighting should be sympathetic to the heritage values and significance of Thompson Square.

The concept bridge design adopted a number of design criteria, including heritage design principles, in response to the bridge design objectives and principles described in section 3.3. While most of the design criteria have been carried through to the detailed design stage, some have been modified in response to additional factors arising from the detailed design process. These changes are described as part of the following discussion on the various bridge elements.

SUBSTRUCTURE

Piles and pile caps

The piles are proposed to be single rows of four Ø1500mm concrete piles with concrete pile caps. A precast concrete shell would be used as permanent formwork for the pile caps, which allows for a minimum quality of Class 2 for the concrete finish (high quality finish intended for external and internal walls that can be viewed in detail). The pile caps extend below the mean low water spring level to avoid the piles being exposed to view, and above the mean high water spring level for navigational safety. The ends of the pile caps are rounded to create a more soft and streamlined appearance that is also in keeping with the rounded geometry that has been adopted for other parts of the bridge substructure. Refer to Figure 4.20.

Piers

The piers consist of paired columns, each supporting one of the paired girders. The piers support equal spans of 31.32 metres along the length of the bridge, and are also spaced evenly across the river.

A range of column shapes were considered during the development of the 20% detailed design, with key functional parameters being size to fit the bearings for the temporary jacks required for bearing replacement; provision of corbels to restrain the superstructure; and strength.

At the concept design stage, the proposal was for straight columns with an ovoid cross section. This has been modified during detailed design development to straight columns with an elliptical cross section that is 2500mm long by 1850mm wide. This shape was considered most efficient to accommodate the bearings, temporary jacks and restraint corbels required, while also retaining a pleasing streamlined shape. The columns will be cast in situ concrete with a minimum Class 2 concrete finish.
Figure 4.21: View from Thompson Square of pier option with elliptical columns.

Figure 4.22: View from the southern abutment of pier option with elliptical columns.
Abutments
Due to the size and mass of the bridge abutments and their location, prominently positioned with the public open space, the abutments will be a significant visual element within the landscape. Special consideration for the development of a high quality outcome is therefore proposed for the surface finish of the bridge abutments.

The two abutments would be structural concrete walls clad with masonry. The corners of the abutments will be rounded, which reflects the rounded geometry of the piers and pile caps. The rounded corners also assist in creating a more generous space below the bridge at the abutments, both for The Terrace and the proposed shared path at the northern riverbank. This is particularly important at the steps that are proposed to run down the western side of Bridge Street to connect Thompson Square with The Terrace.

The proposal at the concept stage was for the abutments to have a textured concrete finish that was integral to the structural element. This concept has been refined during detailed design to improve the ease of construction and also to better integrate the abutments with the local architectural character, particularly that of Thompson Square.

Four options were considered for the abutment cladding:

- Precast concrete tilt-up panels
- Sandstone masonry
- Brick masonry
- Steel panels

Brick masonry was chosen because this is the predominant material used in local historical buildings, including those facing Thompson Square such as the Doctor’s House (Plate 4.3) and elsewhere in Windsor including St Matthews Church (Plate 4.2), Bridgeview house, the Observatory, the war memorial, etc.

Brick as a material imparts a ‘warm’ character and the small unit size imparts a relatable ‘human’ scale that helps to mitigate the ‘infrastructural’ nature of the abutments. The brick abutments can be read as ‘buildings’ of a similar scale and quality outcome is therefore proposed for the surface finish of the bridge abutments.

The urban design preference is for the finish on these retaining walls to match the abutment finish (the preference being brick), in order for the structures to be viewed as a seamless, integrated whole.

Stairs at western (Thompson Square) side of abutment
A new set of stairs is located immediately adjacent to the western (Thompson Square) side of the southern abutment to provide pedestrian connection between Bridge Street, Thompson Square and The Terrace. When viewed from Thompson Square and the surrounding landscape, these stairs would be seen as an integral part of the abutment. The stairs consist of six flights and traverse a level difference of 8.45 metres – a height of more than two storeys, as shown in Figure 4.23. The proportion of the stairs is 1:4 (150mm riser with 600mm tread), which creates a more gentle incline than the abutment stairs which are at 1:2.

The gentle incline of the stairs allows the adjacent levels in Thompson Square to match the stair gradient, creating a grassed slope that can be traversed by pedestrians.

SUPERSTRUCTURE
Girders
The bridge superstructure is formed by two concrete box girders spaced 8.25 metres apart and with a structural depth of 1.85 metres. In cross section, the girders are 2.35 metres wide at the top, tapering to 2 metres wide at the bottom. This tapering produces angled sides that increase the amount of shadow cast on the girders by the cantilevered deck and parapet, visually minimising the bulk of the girders in elevation.
Figure 4.24: Long section through stairs adjacent to existing retaining wall below the Doctor’s House
Figure 4.25: Long section through stairs at western (Thompson Square) side of the southern abutment.
Figure 4.26: Detail of stairs at western (Thompson Square) side of southern abutment.

- Brick abutment wall
- Galvanised steel handrail
- Thin blue bricks on wall represent level of water at historic flood events
- Metal inlays on stairs interpret the level of water at historic flood events
- Grass embankment
Deck and soffit
The concrete deck would be cast over the girders and cantilevers approximately 2.1 metres from the girders between abutment A and Pier 3, increasing to 4.4 metres at abutment B. The deck between the parallel girders remains a constant width.

The bridge soffit consists of a series of angled planes created by the tapered girders and the varying structural depth of the deck both at the cantilevers and between the girders. At abutment B, the depth of the deck decreases from 500mm at the outside edge of the girders to 250mm at the end of the cantilevers. The angle of the soffit at the cantilevers remains constant along the entire length of the bridge. As such, the deck thickness at the ends of the 2.1 metre cantilevers will be 380mm. The deck between girders is also faceted, being 350mm for the central 2 metres, increasing to 500mm at the girders.

While the varied depth of the deck has structural benefits, it also creates an articulated soffit with a modelled architectural expression rather than a generic flat plane – a key urban design principle for the bridge (refer Section 3.3).

Utilities
The new bridge must accommodate a number of utilities conduits and pipes to maintain current services connections across the river and to provide for future services. A key design principle for the bridge is to conceal the services wherever possible (refer Section 3.3).

Most of the required utilities can accommodated in the shared path slab that would be cast over the bridge deck. Unfortunately, some utilities cannot be concealed in the shared path and instead will need be attached to the bridge soffit. These are:
- 2 x Ø375mm water mains
- 1 x Ø335mm conduit for future recycled water main
- 1 x Ø300mm longitudinal drainage pipe.

The Ø300mm longitudinal drainage pipe would be located at the downstream (eastern) edge of the soffit, as the cross fall on the deck is toward the downstream side. The longitudinal drainage pipe would be located behind the parapet, which would be extended below the base of the pipe to ensure that it is concealed in shadow.

Consideration was given to locating the water and recycled water mains behind the eastern parapet, adjacent to the longitudinal drainage pipe, as this was a design strategy adopted at the concept design stage. However, the size of these pipes is such that the depth of the parapet would need to be further extended, which would create a visually undesirable ‘heavy’ edge to the bridge, adversely affecting its proportions in elevation. Furthermore, as the bridge would be viewed primarily from below, either from the river or the public spaces along its banks, the extended parapet could not effectively conceal these larger pipes without being extended even further. In addition, the tight space between these pipes would present difficult to maintain.

The two water mains and the recycled water main will instead be located between the girders, in the two corners where the deck meets the girders, as shown in figure 4.20. Locating the mains between the girders will effectively conceal them from both upstream and downstream views on the river and along the riverbanks. The pipes would only be visible from directly under the bridge when positioned between the girders.

All pipes attached to the bridge soffit should be painted a grey colour to match the concrete soffit, in order to minimise their visual effect.

Parapets
The parapets will be precast concrete units connected to the bridge deck. The parapets will include a ‘skirt’ extension below the soffit level to cast a shadow on the girders to visually minimise their apparent bulk. The parapet skirt on the downstream side of the bridge would be extended to conceal the longitudinal drainage pipe. The overall depth of the parapet on the upstream (Thompson Square) side of the bridge will be shorter in order to create a more ‘slimline’ elevation. This is possible as there are no utilities to conceal behind the upstream parapet.
Figure 4.28: Section showing location of utilities – option with the two water mains and recycled water main located between the girders.

Figure 4.29: View from The Terrace with the longitudinal drainage pipe behind the downstream parapet and the two water mains and recycled water main located between the girders.
The shared path is a 3 metre wide strip provided on the western (upstream) side of the bridge, which provides direct physical and visual connections to Thompson Square. The shared path is separated from the roadway by the roadside vehicle barrier. The shared path would be constructed as a concrete slab cast over the bridge deck.

From an Urban design perspective it is important that the surface finish on the shared path has an appropriate relationship with the adjoining footpath materials. Concrete is the preferred material and would be consistent with the surface finish on the shared path proposed on the northern (Macquarie Park) side of the river. At the landing to the stairs at Thompson Square, the shared path material would change to brick, to integrate with the brick paving of the existing footpaths surrounding Thompson Square.

The roadway will be contained by vehicle barriers on both sides. The vehicle barriers will be precast concrete to a height of 650mm above road level. The balustrade at the outside (parapet) edge of the shared path. A balustrade will be provided at the outside (parapet) edge of the shared path with twin steel rail barriers to 1300mm above road level.

**Balustrade at shared path**
A balustrade will be provided at the outside (parapet) edge of the shared path. The balustrade would be a lightweight steel element to maximise views for pedestrians and cyclists toward the river and Thompson Square, and to minimise the apparent bulk of the bridge when viewed from upstream and Thompson Square.

The balustrade will have simple, uncomplicated detailing, so as to not distract from the views to the wider landscape. The balustrade is to be removable and collapsible in the event of a flood. In order to avoid the need for a separate 'rub rail' to prevent cyclists striking their pedals on the balusters, the top of the balustrade will be angled 150mm in toward the shared path.

**Lighting**
Lighting will be provided on the bridge to meet lighting category V5 - the minimum required for street lighting on main roads. Lighting will also be provided along the Bridge Street approach road to tie in with existing lighting and at the new roundabout at the intersection of Wilberforce Road and Freemans Reach Road.

Lighting has the potential to significantly change the character of the area at night, as the current situation has very low levels of lighting, with none on the bridge itself. Following discussions on this issue with the project lighting designers, it is recommended that aeroscreen light diffusers be used for the street lighting, which limit the amount of sideways light spillage while providing the required levels of illumination on the roadway. The use of aeroscreen diffusers would reduce the amount of ‘light pollution’ and assist in maintaining perception of minimal lighting in the area.

It is proposed that there be four lighting columns on the bridge, aligned with the piers and two position on the bridge abutments. While options for fewer lights were considered with the lighting designers, the required spacing for the columns did not align with the bridge piers, creating an undesirably discordant rhythm to the bridge elevation.

Three options were considered for the location of the lights on the bridge:
1. On the outside of the parapet at the upstream (Thompson Square) side of the bridge.
2. On the outside of the parapet at the downstream (Windsor Wharf) side of the bridge.
3. Behind the vehicle barrier between the roadway and the shared path.

The preferred location is Option 2 as it positions the lights furthest away from Thompson Square and does not affect the amenity of the shared path. By contrast, Option 1 positions the lights on the side of the bridge that is viewed from Thompson Square, a highly visually sensitive space. Option 3 requires the lights to be mounted within the shared path, reducing the amount of usable space for pedestrians and cyclists. Option 2 has the advantage of being located on the less visually sensitive side of the bridge, and being downstream, would also reduce the risk of damage to the bridge structure in the event that the lights collapse during a flood event.

The light columns would be mounted on precast concrete corbels that are integrated with the precast parapet. The detailing of the corbels will be simple and streamlined, in keeping with the intended overall character of the bridge. The light columns proposed to be used on the bridge will be different yet complement the light columns used throughout the rest of the project.

The lighting columns are proposed to be a tapered steel column with one outreach arm. This type of column has a simple streamlined form that suits the understated character of the new bridge and avoids the lights becoming an unnecessarily expressive ‘feature’ in the landscape and in this way being sympathetic to the heritage values and significance of Thompson Square and Thompson Square conservation area. A galvanised finish is recommended for the lighting columns as the grey colour tends to recede when viewed against the sky, especially when the galvanising weathers to a matte finish.

Reach Road.

Lighting will be provided on the bridge to meet lighting category V5 - the minimum required for street lighting on main roads. Lighting will also be provided along the Bridge Street approach road to tie in with existing lighting and at the new roundabout at the intersection of Wilberforce Road and Freemans Reach Road.

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Plate 4.4: Shared path with asphalt surface on the new Iron Cove Bridge
4.5 INTERPRETATION ZONES AND NODES

As part of the SCMP for the project an Interpretation Strategy has been prepared and Interpretation Plan is currently being prepared by the Heritage consultant. The Purpose of the Interpretation Strategy is to make the archaeological, historical and cultural significance of Thompson Square, Windsor Bridge, and surrounds accessible and relevant to the wider community.

Thompson Square Conservation Area provides a great richness of historical stories and locations of interest which has been identified in the SCMP for interpretation.

An overall site approach for the interpretation will provide good overall context to the site and include stories, periods of evolution and change as well as the extant build fabric. Interpretation zones and nodes (refer Figure 4.36) have been identified in the Interpretation Strategy as isolated key areas for interpreting the site. Refer to the Interpretation Strategy for further information.

Where possible interpretation zones and nodes will be made accessible in accordance with Australian Standard AS 1428 Design for Accessibility and Mobility.
4.6 PROJECT ELEMENTS / MATERIALS AND FINISHES

The following criteria has been considered for the selection of material and finishes for The Windsor Bridge replacement Project. These criteria are as follows and have been addressed in more detail in Table 4.1.

- Integration with existing surface finishes
- Responding to historically appropriate materials
- Design life of the material i.e: durability and hard wearing
- Appropriate to context and environmental constraints i.e: flood inundation.
- In accordance with the heritage principles identified in the draft SCMP, materials selected are to be high quality and enhance the historical fabric of Thompson Square conservation area. Refer to Table 4.1 for more information on material selection.

Sustainability

All materials and finishes have been selected for their longevity and long design life and where possible selected for their best practice approach to sustainability. Timber elements including those for benches and bins are to be sourced from either recycled or plantation timbers of ecologically sustainable source. Timbers to be as recommended in the friends of the Earth “Good Wood Guide” 9th edition, and be independently certified by the Forest Stewardship Council (FSC).

Design and installation

The design of the materials, fixtures and finishes are suitable to the site both in terms of historical and local landscape context. Fixtures and finishes are durable and appropriate for the riverfront location and flood inundation. The installation of materials, fixtures and finishes are to the best engineering practices and also in accordance with Roads and Maritime Services and HCC design standards.

Long Term maintenance

The materials and finishes have been selected for their long design life and low maintenance requirements. Review and maintenance of all materials, fixtures and finishes are to be in accordance with Roads and Maritime Services and HCC requirements.

Services to support events

The request by HCC to provide services to support events will include facilitating future connection to 3 phase power supply. Finalisation of details to be in consultation with council following the consultation period.

EXISTING PAVEMENTS & KERBS ADJOINING THE NEW WORKS

Roads

The existing road pavements within the area are generally asphalt. A section of concrete exists on George Street while the intersection of Baker Street and George Street (including The Mall) comprises a raised brick threshold with two pedestrian crossings. Thompson Square Road is a one-way street and its brick road surface finish differentiates it from the surrounding streets.

Kerbs & gutters

Kerbs and gutter in and around Thompson Square generally consists of sandstone with a 150mm integral concrete kerb and gutter in all other areas.

Selection of sandstone was in keeping with the historical material selection adjacent to Thompson Square.

Paths

Footpath surfaces in the vicinity of the proposed works are either concrete or brick, with a few limited areas of sandstone flagging adjacent to buildings in Thompson Square.

PROPOSED PAVEMENTS & KERBS ADJOINING THE NEW WORKS

THE SOUTHERN FORESHORE & THOMPSON SQUARE

Road pavement

All new road pavement will be asphalt with the exception of a section of The Terrace which is to be insitu concrete. The 40m length of the Terrace adjacent to Thompson Square is proposed to be insitu concrete with an exposed aggregate finish.

Kerbs & gutters

A 150mm concrete kerb and gutter is to be used in all areas except for the 40m section of The Terrace adjacent to Thompson Square. In this location a flush concrete kerb is proposed to provide pedestrian movement throughout the shared zone.

_paths

Brick unit paving is the recommended finish for paths surrounding Thompson Square to match the existing brick path along George street.

The three sets of stairs along the southern foreshore and within Thompson Square are to be concrete stairs with sandstone landings. The locations of these three sets of stairs are:

- Stairs along the western side of Thompson Square and below the Doctor’s house
- Stairs to the east of the abutment
- Stairs to the west of the abutment.

Pavement laying pattern is to be laid in a stretcher bond pattern and parallel to the stairs.

The selection of sandstone will complement and integrate the proposal with the other existing sandstone elements surrounding the site including existing sandstone kerbs.

PROPOSED PAVEMENTS & KERBS ADJOINING THE NEW WORKS

THE NORTHERN FORESHORE AND INTERSECTION

Road pavement

All new road pavements are to be asphalt.

Kerbs & gutters

Concrete kerb and gutter is to be used for all areas where applicable.

Paths

Concrete is to be used for all paths on the northern foreshore including the shared path over the bridge and the shared path leading off the bridge and the connection to Macquarie Park.
Figure 4.37: Overview of existing and proposed pavements & kerbs in Thompson Square and surrounding areas.
WALLS, FENCES & BALUSTRADES

Existing walls, fences & balustrades

Existing fences within the area include a hardwood post and rail fence painted white in Thompson Square, low post and wire fence adjacent to roads where no kerb line exists and a Monowills style safety fence associated with the wharf. The existing wall types include concrete below the Doctor’s House.

Proposed fences & balustrades

Southern Bank

No additional fence is currently proposed surrounding Thompson Square.

Tubular galvanised steel handrails are proposed for the stairs passing though Thompson square and along the stair access east on the southern abutment. Handrails are to be compliant with AS 1428 Design for access and mobility.

A balustrade is proposed for the proposed viewing platform in the location of the existing bridge abutment. The balustrade is to match the materials and finishes of the balustrade currently installed at the viewing platform along The Terrace, approximately 200 metres upstream of the existing bridge.

A complying Monowills style barrier rail will be painted black to help the element recede and not be a dominant visual element in the river foreshore setting. The barrier rail is proposed to be fixed to the top of the retaining wall behind the two relocated disabled parking spaces, east of the southern bridge abutment.

The pedestrian path barrier rail will be tubular galvanised steel and will be a durable element suitable for the river foreshore setting.

Bridge

Windsor Bridge will have galvanised steel palisade balustrade.

Northern Bank

A pedestrian path barrier rail will be tubular galvanised steel and will be located between the shared path and the proposed scour protection along the foreshore.

Refer Table 4.1 for Summary of proposed urban design elements, materials and finishes.

Proposed walls

Southern Foreshore

There are two retaining walls proposed along the southern foreshore, one at the base of the western access stairs in Thompson Square and one behind the relocated parking spaces for people with disabilities east of the southern bridge abutment.

The retaining wall in Thompson Square is to be a core filled concrete block structure with a sandstone cladding and capping piece.

The retaining wall east of the southern bridge abutment is to be a concrete pile structure with a sandstone cladding and capping piece.

The sandstone finish to both walls will be the same. The sandstone on the wall face is proposed to have a split face finish and laid in a stretcher bond pattern. Sandstone capping is to be smooth sawn.

Refer to Figure 4.15 for proposed walls along the Southern Bank.

Bridge

Refer section 4.4 Bridge Design for wall associated with the bridge abutments.

Northern Foreshore

No walls are currently proposed along the northern foreshore.

Refer Table 4.1 for Summary of proposed urban design elements, materials and finishes.
Figure 4.38: Overview of the existing and proposed retaining walls and fence types in Thompson Square & adjoining areas.
LIGHTING AND STREET & PARK FURNITURE

Existing lighting and street & park furniture

The existing lighting in the vicinity of the new works is comprised generally of street lighting combined with power poles. However, parkland areas, a section of George Street and The Terrace have pole top lighting only.

Bench seats are located along The Terrace adjacent to the existing brick path. There are two different types of picnic sets in the area. The top half of Thompson Square has a heritage suite, while the ones closer to the river are more utilitarian.

Fixed open top steel bins exist in the area of the new works. Moveable plastic wheel bins are also used in Thompson Square.

Street and park furniture consist of timber picnic sets, timber benches and fixed galvanised litter bins.

A variety of styles and types of signage exists within the area.

Proposed lighting and street & park furniture

Street Lighting

Street Lighting Type 1 to be steel circular hollow column. 10.5m high and 3m outreach. Column to be hot dipped galvanised steel.

Street lighting type 2 to be steel circular hollow column 6.5m high and 1.5m outreach. Column to be hot dipped galvanised steel.

Bridge Lighting

Street Lighting Type 3 to be ‘Western’ columns steel circular hollow column. 10.5m high and 3m outreach. Column to be hot dipped galvanised steel.

Park Lighting

Existing lighting to Thompson Square is proposed to be replaced with new park lighting. New park lighting is to be installed in the following locations:

- Eastern side of Thompson Square
- Adjacent to the three sets of stairs along the southern foreshore
- Along The Terrace, opposite Thompson Square.

New park lighting to be 6.5m high hot dipped galvanised steel tubular pole with die cast aluminium LED Luminaire.

NOTE: Park lighting is subject to council and stakeholder consultation.

Refer Table 4.1 for Summary of proposed urban design elements, materials and finishes.

Park Furniture

Existing furniture in Thompson square is proposed to be retained. New furniture is proposed along The Terrace and at the viewing platform.

New street furniture will be contemporary and simple in form and made from materials that are sympathetic to the character and heritage values of the area. Furniture includes bench seating and bin enclosures that will both have a painted steel frame and hardwood battens that are robust and can be readily repaired or replaced if necessary. The custom designed hardwood seating benches on the viewing platforms and along The Terrace will create a distinct identity to the interpretation nodes and foreshore area.

Bins enclosure to support 120litre bins to council standards.

Final furniture selection and locations to be coordinated with HCC.

Crime Prevention Through Environmental Design (CPTED)

The proposed lighting, furniture and fixtures have been designed in consideration for the principles of CPTED whereby ensuring suitable natural surveillance and lighting space throughout the project.

The placement of these new elements will ensure natural surveillance into communal and public areas and ensuring clear sightlines throughout the project area.

The placement of furniture and fixtures has been considered in conjunction with landscaping to ensure natural surveillance is not obstructed and landscaping does not provide a place to hide. Proposed planting in garden beds located near furniture and fixtures will be low in height to allow clear views to and from these elements.

Efficient lighting throughout the project will be designed to comply with Australian standard AS4282: 1997 Control of the Obtrusive Effects of Outdoor Lighting. Proposed lighting will be effective in not producing glare or dark shadows, and provide appropriate lighting for public spaces.
Figure 4.39: Overview of the existing and proposed street and park lighting in Thompson Square & adjoining areas.
Table 4.1: SUMMARY OF PROPOSED URBAN DESIGN ELEMENTS, MATERIALS AND FINISHES

<table>
<thead>
<tr>
<th>REF.</th>
<th>ELEMENT &amp; TYPE</th>
<th>LOCATION</th>
<th>DESCRIPTION</th>
<th>FINISH &amp; COLOUR</th>
<th>IMAGE</th>
<th>MATERIAL SUITABILITY (COMPLIANCE WITH MCOA C47)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PAVEMENTS, KERBS AND WALLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road surface type 1</td>
<td>Bridge Street, George Street, Wilberforce Road, Freemans Reach Road, Macquarie Park access road</td>
<td>Asphalt</td>
<td>Black</td>
<td></td>
<td>Function: Asphalt surfacing is suitable for heavy vehicle use on public roads. Architectural style (respecting the simple colonial georgian style): Asphalt will match the existing pavement and establish a simple, informal and utilitarian finished pavement surface. Landscape suitability: This is a hard wearing pavement finish suitable for this public setting. Heritage context: Asphalt will be simple and informal and be replacing existing asphalt surfaced roads within the Thompson Square Conservation Area.</td>
</tr>
<tr>
<td></td>
<td>Road surface type 2</td>
<td>The Terrace</td>
<td>Exposed aggregate concrete</td>
<td>Washed concrete to expose light coloured rounded aggregate similar to marangaroo granite.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Driveway connections</td>
<td>No.6 &amp; No.4 Bridge Street, No.27 Wilberforce Road, Lot 68 Wilberforce Road</td>
<td>Concrete (Concrete only to the edge of brick path on Bridge Street)</td>
<td>Natural with broom finish parallel to kerbs and trowelled edges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REF.</td>
<td>ELEMENT &amp; TYPE</td>
<td>LOCATION</td>
<td>DESCRIPTION</td>
<td>FINISH &amp; COLOUR</td>
<td>IMAGE</td>
<td>MATERIAL SUITABILITY (COMPLIANCE WITH MCOA C47)</td>
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<tr>
<td></td>
<td>PAVEMENTS, KERBS AND WALLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stair 1 - west of southern abutment</td>
<td>Thompson Square</td>
<td>Instu concrete stairs with sandstone landings</td>
<td><strong>INSITU CONCRETE STAIRS</strong>&lt;br&gt;Finish: Light Broom finish</td>
<td><img src="image1.jpg" alt="Image" /></td>
<td>Function: Sandstone is a durable material suitable for pedestrian use in a public setting. Architectural style (respecting the simple colonial georgian style): Sandstone will complement the existing sandstone elements used throughout the Thompson Square Conservation Area and respect the colonial georgian style. Landscape suitability: This is a hard wearing pavement material suitable for a public setting, and an appropriate material for use in Thompson Square where flood inundation is anticipated. Heritage context: The sandstone pavement will be simple and complement the existing sandstone in the heritage listed Doctors House and also the street kerbs.</td>
</tr>
<tr>
<td></td>
<td>Stair 2 - adjacent to existing retaining wall below The Doctor's House</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stair 3 - east of southern abutment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Path type 1</td>
<td>Bridge Street (Windsor Bridge), northern foreshore and intersection.</td>
<td>Light Broom finish concrete</td>
<td>Natural with broom finish parallel to kerb and trowelled edges</td>
<td><img src="image2.jpg" alt="Image" /></td>
<td>Function: Concrete pavement is suitable for vehicle use on driveway connections. Architectural style (respecting the simple colonial georgian style): Concrete will match the existing pavement used in existing driveways and footpaths, establish a simple, informal and utilitarian finished pavement surface. Landscape suitability: This is a hard wearing pavement finish suitable for this public setting. Heritage context: Located within the Thompson Square Conservation Area the concrete pavement will be simple and informal and complement the existing context.</td>
</tr>
<tr>
<td></td>
<td>Path type 2</td>
<td>Bridge Street including George Street intersection,</td>
<td>Clay pressed brick</td>
<td>To match existing brick and paving pattern.</td>
<td><img src="image3.jpg" alt="Image" /></td>
<td>Function: Clay pressed bricks are suitable for pedestrian use and facilitating service vehicles. Landscape suitability: This is a hard wearing pavement finish suitable for this public setting. Clay pressed bricks will match the existing brick pavement used along Thompson Square and George Street, and in the raised medians and provide consistency of materiality to three sides of Thompson Square.</td>
</tr>
<tr>
<td></td>
<td>Raised median Type 1</td>
<td>George Street and Bridge Street south</td>
<td>Brick</td>
<td>To match existing</td>
<td><img src="image4.jpg" alt="Image" /></td>
<td>Function: Concrete pavement is suitable material for splitter medians. Landscape suitability: This is a hard wearing pavement finish suitable for a public setting.</td>
</tr>
<tr>
<td></td>
<td>Raised median Type 2</td>
<td>Adjacent to northern roundabout</td>
<td>Light Broom finish concrete</td>
<td>Natural with broom finish parallel to kerb and trowelled edges</td>
<td><img src="image5.jpg" alt="Image" /></td>
<td>Function: Sandstone is a durable material suitable for pedestrian use in a public setting. Architectural style (respecting the simple colonial georgian style): Sandstone will complement the existing sandstone elements used throughout the Thompson Square Conservation Area and respect the colonial georgian style. Landscape suitability: This is a hard wearing pavement material suitable for a public setting, and an appropriate material for use in Thompson Square where flood inundation is anticipated. Heritage context: The sandstone walls will be simple and complement the existing sandstone in the heritage listed Doctors House and also the street kerbs.</td>
</tr>
<tr>
<td></td>
<td>Retaining wall</td>
<td>Wall 1 - East of southern abutment, behind disabled parking. Wall 2 - Western edge of Thompson square at base of new stair access</td>
<td>Sandstone clad wall with sandstone capping</td>
<td>Supplier: Gosford Quarries&lt;br&gt;Product: Mangrove Buff&lt;br&gt;Sandstone blocks: Finish: 590x290x150mm. Split face&lt;br&gt;Sandstone capping blocks: Finish: 590x50mm Gang sawn with 8mm pencil rounds to all external edges</td>
<td><img src="image6.jpg" alt="Image" /></td>
<td>Function: Sandstone is a durable material suitable for pedestrian use in a public setting. Architectural style (respecting the simple colonial georgian style): Sandstone will complement the existing sandstone elements used throughout the Thompson Square Conservation Area and respect the colonial georgian style. Landscape suitability: This is a hard wearing pavement material suitable for a public setting, and an appropriate material for use in Thompson Square where flood inundation is anticipated. Heritage context: The sandstone walls will be simple and complement the existing sandstone in the heritage listed Doctors House and also the street kerbs.</td>
</tr>
</tbody>
</table>
### Material Suitability (Compliance with MCOA C47)

<table>
<thead>
<tr>
<th>REF.</th>
<th>ELEMENT &amp; TYPE</th>
<th>LOCATION</th>
<th>DESCRIPTION</th>
<th>FINISH &amp; COLOUR</th>
<th>IMAGE</th>
<th>MATERIAL SUITABILITY (COMPLIANCE WITH MCOA C47)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fence to private property No.33 Wilberforce Road</td>
<td>No.33 Wilberforce Road</td>
<td>Hardwood post and rail</td>
<td>To match existing</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Located on Wilberforce Road, the proposed fence is outside of the Thompson Square Conservation Area and is to match existing fence.</td>
</tr>
<tr>
<td></td>
<td>Handrail to stairs 1, 2 &amp; 3</td>
<td>Southern foreshore</td>
<td>Galvanised steel</td>
<td>Galvanised steel</td>
<td><img src="image2.png" alt="Image" /></td>
<td>Function: Proposed materials and finishes of balustrades and handrails are durable and suitable for public use. Architectural style (respecting the simple colonial georgian style): Galvanised and dark painted finishes to metalwork, timber rail to the balustrade at the viewing platform will establish a simple, informal and utilitarian suite of fixtures and thereby respect the colonial georgian style. Finishes will ensure the fixtures recede into the surrounds and not be and not become dominant elements in the landscape.</td>
</tr>
<tr>
<td></td>
<td>Balustrade type 1</td>
<td>Windsor Bridge</td>
<td>Palisade</td>
<td>Galvanised steel</td>
<td><img src="image3.png" alt="Image" /></td>
<td>Landscape suitability: The design of the fixtures will be simple, appropriate for this riverside context and suitable for inundation during flood events. Heritage context: Located within the Thompson Square Conservation Area the fixtures will be simple and informal and complement the existing context.</td>
</tr>
<tr>
<td></td>
<td>Balustrade type 2</td>
<td>Viewing platform Southern foreshore Northern Interpretation node</td>
<td>Palisade</td>
<td>Galvanised steel and hardwood timber rail</td>
<td><img src="image4.png" alt="Image" /></td>
<td>The balustrade is to match the materials and finishes of the balustrade currently installed at the viewing platform along The Terrace, approximately 200 metres upstream of the existing bridge.</td>
</tr>
</tbody>
</table>
|      | Barrier Rail | Adjacent to The Terrace Above retaining wall - east of bridge abutment | Monowills style barrier rail | Adjacent to The Terrace - Galvanised steel Above retaining wall, east of bridge abutment - Powder coated black | ![Image](image5.png) | }
<table>
<thead>
<tr>
<th>REF.</th>
<th>ELEMENT &amp; TYPE</th>
<th>DESCRIPTION</th>
<th>FINISH &amp; COLOUR</th>
<th>IMAGE</th>
<th>MATERIAL SUITABILITY (COMPLIANCE WITH MCOA C47)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>LIGHTING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Street lighting type 1</td>
<td>Steel circular hollow column.</td>
<td>Hot dipped galvanised steel</td>
<td></td>
<td>Function: Proposed materials and finishes of the lighting pole and luminaire are durable and suitable for public use. Architectural style (respecting the simple colonial georgian style): Galvanised finishes to metalwork, will establish a simple, informal and utilitarian suite of lighting and thereby respect the colonial georgian style. Finishes will ensure the fixtures recede into the surrounds and not be and not become dominant elements in the landscape. Landscape suitability: The design of the fixtures will be simple, appropriate for this riverside context and suitable for inundation during flood events. Heritage context: Located within the Thompson Square Conservation Area the lighting will be simple and informal and complement the existing context.</td>
</tr>
<tr>
<td>L2</td>
<td>Street lighting type 2</td>
<td>Steel circular hollow column</td>
<td>Hot dipped galvanised steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>Street lighting type 3 - Bridge</td>
<td>Steel circular hollow column.</td>
<td>Hot dipped galvanised steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L4</td>
<td>Park Lighting type 1 - within Thompson square, adjacent to three sets of stairs and along the Terrace (adjacent to Thompson Square) (subject to further consultation with stakeholders)</td>
<td>Pole top luminaire</td>
<td>6.5m high galvanised steel pole with die cast aluminium LED Luminaire, Gerard LED P3 Gerard 42W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L5</td>
<td>Park Lighting Type 2 (subject to further consultation with stakeholders)</td>
<td>Pole top luminaire (blue flood level interpretation light)</td>
<td>Galvanised steel pole with die cast aluminium LED Luminaire, Fiamma Light (guzzini), LED to be blue in colour</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**STREET AND PARK FURNITURE**

<table>
<thead>
<tr>
<th>REF.</th>
<th>ELEMENT &amp; TYPE</th>
<th>LOCATION</th>
<th>DESCRIPTION</th>
<th>IMAGE</th>
<th>MATERIAL SUITABILITY (COMPLIANCE WITH MCOA C47)</th>
</tr>
</thead>
</table>
| SFI  | Custom bench   | Viewing platform and along the Terrace opposite Thompson Square. | Custom steel and hardwood benches. Timber to be Tallowood and steel to be powdercoated black. | ![Custom bench](image) | Function: Proposed materials and street and park furniture are durable and suitable for public use.  
Architectural style (respecting the simple colonial georgian style): Park painted finishes to metalwork, timber components to the benches and bins will establish a simple, informal and utilitarian suite of furniture and thereby respect the colonial georgian style. Finishes will ensure the fixtures recede into the surrounds and not be and not become dominant elements in the landscape.  
Landscape suitability: The design of the fixtures will be simple, appropriate for this riverside context and suitable for inundation during flood events.  
Heritage context: Located within the Thompson Square Conservation Area the fixtures will be simple and informal and complement the existing context. |
| B1   | Rubbish bin type 1 | Thompson Square near The Terrace. | Street Furniture Australia  
Code: WBE-F120  
Finish: Hardwood timber + galvanized steel  
Dimensions (mm): 640W x 640D x 1190H | ![Rubbish bin](image) | |

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*Note: Images and actual dimensions not provided in the text.*

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*Text continues with further details...*
SCOUR PROTECTION

Principles and objectives for river bank scour protection

- The northern embankment will be highly visible from Thompson Square, the wharf area, the bridge and the shared path on the northern foreshore. Therefore visually appropriate treatments for the northern river bank are extremely important.
- "Pockets" of appropriate riparian planting species are proposed to be planted within the rock scour protection to provide initial vegetation presence.
- It is recognised that vegetation will progressively colonise the rock scour protection over time.
- It is also recognised that the rock scour protection (Refer Figure 4.40) will be inundated from time to time during flooding and therefore change in the appearance and condition of any vegetation growing over the rock is likely to occur. However over time vegetation will regrow and mostly cover the rock from view.
- It is therefore the initial phase of establishment, just after construction and when the scour protection is fully exposed, that the rock work will be most obvious visually.
- Rock shape, type and colour should replicate that used adjacent to recent upgrade at Windsor Wharf (Refer to plate 4.10)
- It will important to maximise the area of planting on the river bank, in order to minimise the visibility of the rock scour protection, over time.
- The provision of a 1m minimum wide planting strip between the shared path and the rock scour protection would also reduce the visual exposure of the rock, particularly from the shared path which passes under the bridge.

Plate 4.10: Illustration of scour protection used adjacent to Windsor Wharf

Figure 4.40: Extent of Scour Protection
4.7 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 of the area. This approach aims to enhance the unique sense of arrival to Windsor both from the north and south while also strengthening the landscape character of historic Thompson Square and takes into account appropriate roadside plantings and landscaping in the vicinity of heritage items and ensure no additional heritage impacts. Consideration to respect the heritage items within the Thompson Square Conservation Area are proposed through historically appropriate tree planting and informal garden beds.

TREE PLANTING STRATEGY

An outline of the proposed planting strategy is illustrated in Figure 4.41.

Parkland Type 1 - Thompson Square (Southern bank)

Planting within Thompson Square conservation area and associated areas comprises trees, open lawn and areas of informal shrub planting. Planting in this area is responsive to the heritage context and supportive of the heritage principles identified in the draft SCMP in providing planting which is appropriate to this area and protects existing historic associations.

Parkland Type 2 - Northern Intersection (Northern bank)

On the Northern side of the Hawkesbury River the planting is of trees in open lawns providing a parkland setting associated with Macquarie Park. Tree plantings will be a combination of exotic species to provide seasonal variation in colour and to strengthen this entry point to Windsor. Native river-flat Eucalypt Forest species will also be planted.

Roundabout Entry Planting (Northern bank)

Gateway planting of Araucaria cunninghamii (Hoop Pine) in the roundabout and low shrub and ground cover species will provide a suitable hardy and ornamental plant selection for the northern entry to Windsor.

Riparian

Planting along the foreshore on both sides of the river will be river-flat Eucalypt Forest. Plant selection will be typically be native grasses and sedges to allow open views across and along the river.

Figure 4.41: Overview of the planting strategy in the context of existing conditions.
PLANT PROCUREMENT

It is recommended that a plant procurement contract be set up well in advance of the stock being required for planting on site. Tree species in particular should be secured and grown on to a specimen size so that they are of appropriate size at time of installation.

Seed sources used for the rehabilitation of the riparian corridor are to be from local native botanical provenance where possible. Final plant selection for riparian species to be confirmed by the Vegetation Management Plan (VMP) currently being prepared.

TURFING

Generally all areas adjoining the new works, other than riparian areas, garden beds and areas of grass seeding are to be turfed where grades do not exceed 1 in 4. This includes road margins, parkland areas and open spaces as identified on the landscape plans. The sods shall be of couch grass unless otherwise specified.

PROPOSED PLANTING - SOUTHERN BANK

Proposed tree species within Thompson Square and adjoining areas will be made up of a variety of exotic deciduous species with some evergreen specimen trees, and will be consistent with existing species in the areas adjoining the new works. The proposed plant palette will be comprised of robust species suitable for the public domain and appropriate within a heritage landscape context. The use of historically appropriate plantings responds to the Heritage principles as identified in the draft SCMP, by protecting the historical associations of the area. The selection of appropriate plant species has also considered establishment and ongoing maintenance requirements.

Garden beds are proposed to be an informal arrangement of native species and respectful of the heritage constraints within the Thompson Square Conservation Area. Planting along the western side of Thompson Square is proposed to be a mix of grasses with low growing native shrubs and groundcovers. Planting east of the abutment is to be native shrubs, grasses and groundcovers suitable for screening the new retaining wall.

Tree species selection for planting along the eastern edge of Thompson Square in front to the Doctor’s House has considered the SCMP. The selected species of Jacaranda mimosifolia (Jacaranda) will reinforce the existing Jacaranda along Thompson Square. The open character of the Jacaranda, the fine leaf structure and the deciduous nature of the tree will enable open views to the river and also views towards Thompson Square from the new bridge and the northern foreshore areas. Retaining this strong visual connection between Thompson Square and the Hawkesbury river is important in respecting and reinforcing this important historical visual link.

Proposed species for the Southern Bank include:

**Tree:**
- *Anacardium occidentale* – Hoop Pine
- *Bassiana myrtifolia* – Grey Myrtle
- *Bucida chiton* – Kurrajong
- *Bulnesia osmussa* – Ivory Curl Tree
- *Glerstroemia indica* – Crepe Myrtle
- *Melia azedarach* – White Cedar
- *Tristania lanceolata* – Water Gum
- *Quercus rubra* – Red Oak

**Shrubs:**
- *Baeckea imbricata* – Heath Myrtle
- *Banksia spinulosa* – Harpin Banksia
- *Corea reflexa ‘Dusky Bel’s’* – Dusky Bel’s Coral
- *Doryanthes excelsa* – Gymea Lily
- *Gardenia augusta ‘Flambo’* – Flamma Gardenia
- *Lavandula dentata* – Lavender
- *Melaleuca thymifolia* – Thyme Honey-myrtle
- *Syzygium leuh. ‘Royal Flame’* – Royal Flame Lily Pilly
- *Westejnga ‘Aussie Box’* – AB Rosemary

The foreshore areas between The Terrace and the river will be planted out with riparian species and species consistent with River-flat Eucalypt Forest vegetation community. It is recommended that the area between the existing bridge abutment and the new bridge alignment be kept clear of any trees to allow open views to the river and also views towards Thompson Square from the new bridge and the northern foreshore areas. Retaining this strong visual connection between Thompson Square and the Hawkesbury river is important in respecting and reinforcing this important historical visual link.

Proposed species for the Southern Bank include:

**Groundcovers, grasses:**
- *Banksia ‘Birthday Candles’* – Birthday Candles Banksia
- *Brachyscome multifida* – Cut-leaf Banksia
- *Dianella ‘Little Jess’* – Flax Lily
- *Dianella caerulata* – Blue Flax Lily
- *Dietes inermis* – Iris
- *Grevillea × gaudichaudii* – Groundcover Grevillea
- *Liriope muscari* – Lilyturf
- *Lamahoma langifolia* – Mat Rush
- *Lomandra ‘Tanika’* – Tanika Mat Rush
- *Myoporum parryi* – Creeping Boxbilla

PROPOSED PLANTING - NORTHERN BANK

Proposed tree species for the northern intersection area will generally comprise of species from the River-flat Eucalypt Forest vegetation community. Some exotic deciduous planting will also be included adjacent to the road alignment and roundabout to signal the arrival into Windsor from the north and provide the transition from rural to cultural landscape. This plant palette aims to reinforce the existing planting within Macquarie Park and extend it out to include the roundabout.

The foreshore areas and bio-filtration basin will be planted out with riparian species and species consistent with River-flat Eucalypt Forest vegetation community.

Proposed species typical of the River-flat Eucalypt Forest include:

**Trees:**
- *Casuarina cunninghamiana* (River She-Oak)
- *Casuarina glauca* (She Oak)
- *Eucalyptus amygdalina* (Cabbage Gum)
- *Eucalyptus tereticornis* (Forest Red Gum)
- *Melaleuca decora* (White Feather Honeymyrtle)
- *Melaleuca stypheloides* (Prickly-leaved paperbark)

**Groundcovers, grasses:**
- *Acacia floribunda* (White Sally Wattle)
- *Bassiana myrtifolia* (Grey Myrtle)
- *Bursaria spinosa sub spinosa* (Blackthorn)

**Shrubs:**
- *Lomandra longifolia* (Mat Rush)
- *Microcarya stipoides* (Weeping Grass)
Figure 4.42: Overview of the proposed landscape works
## PROPOSED PLANT SCHEDULES

### PLANT SCHEDULE 1 - PARKLAND, OPEN SPACE & STREETSCAPE

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Height m</th>
<th>Spread m</th>
<th>Pot Size</th>
<th>Density / Spacing</th>
<th>Quantity</th>
<th>Area (ha)</th>
<th>North of River</th>
<th>South of River</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td><strong>TREES</strong></td>
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<tr>
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<td>7.5</td>
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<tr>
<td>P. gigantea</td>
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<td>7.5</td>
<td>As Shown</td>
<td>1</td>
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<td><strong>SHRUBS</strong></td>
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<tr>
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<tr>
<td><strong>GRASSES &amp; GROUNDCOVERS</strong></td>
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### PLANT SCHEDULE 2 - RIPARIAN PANTING

<table>
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<tr>
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<th>Common Name</th>
<th>Height m</th>
<th>Spread m</th>
<th>Pot Size</th>
<th>Density / Spacing</th>
<th>Quantity</th>
<th>Area (ha)</th>
<th>North of River</th>
<th>South of River</th>
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<tr>
<td>Eucalyptus macrocarpa</td>
<td>River She-Oak</td>
<td>1.3</td>
<td>7.5</td>
<td>As Shown</td>
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<td>1</td>
<td>1.3</td>
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<tr>
<td>P. gigantea</td>
<td>River She-Oak</td>
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<td>7.5</td>
<td>As Shown</td>
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<tr>
<td><strong>GRASSES, SEDGES &amp; GROUNDCOVERS</strong></td>
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<tr>
<td>Lomandra longifolia</td>
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### PLANT SCHEDULE 3 - BIO-FILTRATION BASIN

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<th>Common Name</th>
<th>Height m</th>
<th>Spread m</th>
<th>Pot Size</th>
<th>Density / Spacing</th>
<th>Quantity</th>
<th>Area (ha)</th>
<th>North of River</th>
<th>South of River</th>
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<tr>
<td>Eucalyptus macrocarpa</td>
<td>River She-Oak</td>
<td>1.3</td>
<td>7.5</td>
<td>As Shown</td>
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<tr>
<td>P. gigantea</td>
<td>River She-Oak</td>
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<td>7.5</td>
<td>As Shown</td>
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<td><strong>SHRUBS</strong></td>
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<tr>
<td>Acacia decurrens</td>
<td>White Feather</td>
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<td><strong>GRASSES &amp; GROUNDCOVERS</strong></td>
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<td>Lomandra longifolia</td>
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### PLANT SCHEDULE 4 - SEEDING

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Pot Size</th>
<th>Spread m</th>
<th>Density / Spacing</th>
<th>Quantity</th>
<th>Area (ha)</th>
<th>North of River</th>
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<tbody>
<tr>
<td><strong>Weeping grass</strong></td>
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<td><strong>TREES</strong></td>
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<tr>
<td>Eucalyptus macrocarpa</td>
<td>River She-Oak</td>
<td>1.3</td>
<td>7.5</td>
<td>As Shown</td>
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<td>1.3</td>
<td>7.5</td>
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<tr>
<td>P. gigantea</td>
<td>River She-Oak</td>
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<td>1.3</td>
<td>7.5</td>
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</table>

### PLANT SCHEDULES

- **Area (ha)**: Total of 12
- **Volume**: 80%
- **Density / Spacing**: 1/2m2 (4m)
- **Height m**: 5-9
- **Spread m**: 4/m2 (500mm)
PROPOSED PLANTING PALETTE

PARKLAND FEATURE / KEY SIGNATURE TREE SPECIES

- Acacia camphorata (Camphor Tree)
- Quercus rubra (Red Oak)
- Leptospermum scoparium (Honey Myrtle)
- Grevillea robusta (Silky Oak)

MEDIUM & SMALL SIZED TREE SPECIES

- Melaleuca quinquenervia (Paperbark)
- Acacia melanoxylon (Blackbutt)
- Eucalyptus amplifolia (Cabbage Gum)
- Grevillea x gaudechaudii

SHRUB AND GROUNDCOVER SPECIES

- Banksia 'Birthday Candles'
- Lomandra 'Tanika'
- Lomandra 'Yareena'
- Myoporum 'Little Jess'

RIVER-FLAT EUCALYPT FOREST SPECIES & RIPARIAN SPECIES

- Melaleuca styphelioides (Paperbark)
- Eucalyptus tereticornis (Forest Red Gum)
- Backhousia myrtifolia

- Casuarina species
- Melaleuca 'Candyfloss'
- Liriope muscari
- Carex apressa

- Tristaniopsis laurina (Water Gum)
- Melaleuca decora
- Melaleuca cajuputi
- Melaleuca 'Candyfloss'

- Dietes iridioides
- Banksia 'Birthday Candles'
- Dancola 'Little Joe'
- Muhlenbergia species
5. LANDSCAPE IMPLEMENTATION

5.1 CLEARING AND CONSTRUCTION PROTOCOL
Clearing of existing vegetation is to be kept to a minimum and should generally only occur where required for construction of new structures including the bridge, retaining walls and road infrastructure. However, some additional trees may be considered for removal (and potentially for relocation) subject to further detailed design, consideration of an arborist assessment report and consultation with Council.

A VMP will be compiled which will clearly identify which trees are to be removed, which ones are to be relocated and which ones are to be retained and protected. All tree protection measures shall be undertaken in accordance with Council’s Tree Preservation Order and protection of existing trees and stands of vegetation is to be reviewed throughout the construction period. Tree protection measures are to be stringently adhered to in order to ensure plant and equipment are kept clear of the primary and critical root zones so as to ensure the long term health of these trees is maximised.

Areas outside of the road boundary which are disturbed by any construction activities (such as areas for compounds, material storage, access and haul roads) are also to be restored by planting and seeding revegetation works as appropriate.

5.2 RIPARIAN VEGETATION MANAGEMENT
Vegetation management along the river banks should adhere to the following protocols:

- Riparian species consistent with River-flat Eucalypt Forest vegetation community is proposed along the Hawkesbury River bank areas disturbed by the project. The riparian corridor will be consistent with the Controlled Activities on Waterfront Land: Guidelines for Vegetation Management Plan on Waterfront Land (NSW Office of Water, July 2012).
- A VMP is to be prepared that demonstrates the protection of remnant native riparian vegetation and the rehabilitation of the riparian corridor
- Seed sources used for the rehabilitation of the riparian corridor are to be from local native botanical provenance where possible.
- A minimum two year monitoring and maintenance period is required for the riparian zone commencing after final plantings or, until such time as a minimum 80 per cent survival rate of each species planted and a maximum 5 per cent weed cover for the treated riparian corridor is achieved. The monitoring program is to include weed control monitoring.
- Existing trees, grasses and other groundcovers are to be retained wherever possible in order to maintain stability of the river banks.

5.3 CULTIVATION OF SUBGRADE
Subgrades will generally be ripped or chisel tyed to a depth of 200-300mm deep, and ripped to a depth of 500mm where practicable or necessary for tree planting. All areas of old road formation, which will no longer be required as part of the works, will be removed.

All temporary roads, stockpile and compound areas that are to be revegetated will likewise be deep ripped, and made suitable for revegetation.

5.4 TOPSOILING
Topsoil will comprise ameliorated site soils and imported topsoil, generally spread at the following minimum depths:
- Garden Bed planting = 200-300mm
- Turfing = 100-150mm
- River bank edges = 50-150mm
- Seeding - to road side areas or slopes flatter than 1:4 = 100mm

SITE SOILS
Where appropriate, topsoil for use in revegetation works will be stockpiled on site from material identified for stripping and re-use as topsoil by soil testing reports. All soils to be reused for revegetation works will be tested, and organic matter, soil conditioners, and nutrients added as required to suit the intended planting matrix.

All soils to be used for landscape works will be tested for acid sulphate and pH before use and may require additional treatments such as the incorporation of lime and gypsum to stabilise the soil particles.

5.5 SOIL STABILISATION / EROSION CONTROL AND SEDIMENT CONTROL

5.6 DRAINAGE
Drainage is currently proposed to be managed through a kerb and gutter and pit / pipe system.

5.7 NOISE MITIGATION
There are no requirement for landscape or urban design treatment for noise mitigation.
5.8 REVEGETATION

Three main revegetation techniques are to be used for this project which are:

- **Planting**
- **Turfing**
- **Seeding**

**PLANTING**

Planting of trees, shrubs and groundcovers will be undertaken in all areas. Installation of trees will be in accordance with the specific clear zone standard and sight distance requirements as set out by Roads and Maritime guidelines.

Bio-filtration basins will be planted out with moist sedge woodland grass and low shrub and groundcover species. Proposed pot sizes and planting rates are as follows:

- **Trees for all areas**: 400, 200 & 75 Litre pots
- **Trees in riparian areas**: 75 & 45 Litre pots
- **Shrubs**: 200mm & 150mm (typically 4 per m²)
- **Grasses & groundcovers**: 150mm and Viro Tube (typically 4 to 6 per m²).

**TURFING**

Turf underlay is to be applied to all areas that are to be turfed. Turf for use in this project is to be supplied by a local turf farm where possible.

All turfing works are to be carried out in accordance with Roads and Maritime specification R179 Landscape Planting and R178 Vegetation and as customised for this project where applicable.

**SEEDING**

Seeding will be undertaken as direct drill seeding which will include a cover crop and native seed. Hydroseeding is to be used for roadside areas where slopes are gentle along roadside areas, residual land and areas of private property affected by the works. Seeding rates for seeding will be in accordance with Roads and Maritime specifications as customised for this project, and will also depend on seed availability.

5.9 STAKES, TIES AND TREE GUARDS

Staking of plants will only be required where individual tree guards are not used and for trees and shrubs are not self supporting, as follows:

- **Trees 45 litre to 200 litre**: 3 hardwood stakes 50x50x2400mm
- **Tree guards - plastic type with a galvanised wire frame for riparian areas only where required.**

5.10 MULCHING

Site mulch is to be used as both a sediment control and for habitat creation through the use of site timbers as woody debris and for landscaped areas as nominated.

All planted garden bed areas and tree planting in turf are to be mulched with imported hardwood mulch to a depth of 75 to 100mm.

5.11 ORGANIC FERTILISER

The fertiliser to be used shall be an approved Nitrogen, Phosphoric Acid, Potash compound starter fertiliser. Organic fertiliser will be a slow release tablet form which will be applied to all landscaped areas.

<table>
<thead>
<tr>
<th>SEED MIX TYPE 1 - GRASSLAND</th>
<th>SPECIES</th>
<th>RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese Millet (Sept-Mar)</td>
<td>35 kg/ha</td>
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</tr>
<tr>
<td>Rye Corn (Apr-Aug)</td>
<td>15 kg/ha</td>
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</tr>
<tr>
<td>Eclipse/Crusader Rye</td>
<td>7 kg/ha</td>
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<tr>
<td>Red Clover</td>
<td>5 kg/ha</td>
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<tr>
<td>Austrodanthonia richardsoni var Hume</td>
<td>2 kg/ha</td>
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<tr>
<td>Micraena stipoides ‘Griffin’ pelleted seed</td>
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<td>Themeda ‘Tangara’ pelleted seed</td>
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<td>Organic Fertiliser</td>
<td>250 kg/ha</td>
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<th>SEED MIX TYPE 2 - PASTURE / PRIVATE PROPERTY</th>
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<td>Japanese Millet (Sept-Mar)</td>
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<tr>
<td>Organic Fertiliser</td>
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<td>Total</td>
<td>295 kg/ha</td>
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6. LANDSCAPE MANAGEMENT

6.1 MAINTENANCE
Ground preparation treatments and revegetation works have been designed in order to establish good vegetation cover which will minimise maintenance in the long term. The maintenance period from the date the replacement bridge is open to traffic will be 24 months. All areas of new landscape implemented as part of the works outside of the road reserve are to be maintained for a period of 24 months prior to handover to Council.

The roundabout will be operated and maintained by Roads and Maritime including any pruning and weed removal. Maintenance will be carried out in accordance with standard Roads and Maritime maintenance procedures and safety requirements. All other landscaped areas are to be maintained by Hawkesbury City Council.

WEED MANAGEMENT
Weed infestation as a result of construction activities can have a major impact on native flora and threatened species habitats, particularly along roadways and watercourses.

A Vegetation Management Plan (VMP) will be produced to cover the issue of pastoral, environmental and noxious weeds.

Application of pesticides within landscape areas to control noxious or environmental weeds will be carried out strictly in accordance with the Pesticides Act 1999.

ESTABLISHMENT
The establishment period for this project will be 12 weeks at which time poor growth is determined if there is less than 90% vegetation cover. Areas showing poor growth or damage must be cleared of dead vegetation and all lost topsoil replaced. The area is then re-cultivated and revegetated where applicable.

Fertilising post-planting may be required where specific nutrient deficiencies are identified. The need for additional fertiliser is to be reviewed as part of the maintenance plan for the project.

6.2 MONITORING AND ECOLOGICAL ESTABLISHMENT
Roads and Maritime requirements for landscape maintenance are outlined in specifications R179 - Landscape Planting and R179D - Landscape Management Plan. These specifications cover all the tasks necessary to promote the cost effective and consistent management of roadside landscape vegetation established for the project. Landscape monitoring and maintenance will be undertaken during the works and post-completion and take the form of a holistic performance review and rectification process that includes the quality control, establishment, maintenance, monitoring and ongoing assessment of:

- Weed control
- Topsoiling, mulching and erosion control
- Planting
- Fertilising
- Pest control.

Monitoring and ecological establishment including maintenance areas, regimes and responsibilities will be detailed in the VMP following discussions and agreement with Council and other stakeholders.

6.3 WORK HEALTH AND SAFETY (WHS)
All proposed landscape treatments will be further developed during the detailed design phase with future maintenance requirements in mind.

A WHS Report and WHS Development Plan will be produced and maintained on an ongoing basis throughout the project. Performance indicators to include responsibilities, timing, duration and contingency.
7. **NEXT STEPS**

7.1 **NEXT STEPS**

Following the close of the consultation period, comments received from stakeholders will be considered and addressed. The Urban Design and Landscaping Plan will be finalised and issued with the Submissions Report. The Submissions report will be available online at: rms.nsw.gov.au/windsorbridge.
REFERENCES

Roads and Maritime Services (formerly RTA) references and guidelines
Roads and Traffic Authority of NSW, Beyond the Pavement 2009.

Windsor Bridge project reports

Hawkesbury City Council
Hawkesbury City Council, Hawkesbury Local Environmental Plan 2009.
Hawkesbury City Council, Community Strategic Plan, Shaping Our Future 2010-2030.
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