7.4 Visual amenity, urban design and landscape

This section assesses the visual amenity, urban design and landscape impacts of the project. The assessment is supported by an Urban Design and Landscape Concept Report Working Paper, which has been included as Working Paper 5 in Volume 3 of this EIS. The Director General's requirements for the EIS identify visual amenity, urban design and landscape as a key issue. The Director General's requirements have been addressed in this chapter and the Urban design and landscape working paper (Volume 3 - Working paper 5) as detailed in **Table 7-22** below. The relevant requirements of Schedule 2, Part 3 of the *Environmental Planning and Assessment Regulation 2000* have also been addressed.

Table 7-22 Director General's requirements – visual impact, urban design and landscape

Director General's requirements	Where addressed
The EIS must address the following specific matters: **Visual Amenity, Urban Design and Landscaping** – including but not limited to:	
• a description of the visual significance of the bridge surrounds, Thompson Square, river foreshore and landscape setting, and an assessment of the visual impact of the project on the landscape and urban design character of the area, including built form (materials and finishes), urban design (height, bulk and scale), views to and from Thompson Square, the town centre and river foreshore areas, and design details such as lighting, balustrades and street furniture;	Section 7.4.2 (significance), Section 7.4.5 (visual impact) and Section 7.4.4 (design details)
• the overshadowing impact of the bridge on the public domain, including open space, parks and parklands, river foreshore areas and Thompson Square, and adjoining residential/ commercial uses; and	Section 7.4.5
• the landscape and urban design objectives for the reinstatement and rehabilitation of Thompson Square, taking into account Council's desired future landscape and urban design character of this locality. The EIS must include:	Sections 7.4.3 and Section 7.4.4
– details of landscaping treatment and integration with the public domain and historic values of Thompson Square and surrounds, in particular the integration of the existing road corridor with Thompson Square and the new bridge alignment and approach roads, and	Sections 7.4.4 and 7.4.6
– details of integration of the bridge and Thompson Square with existing and future pedestrian and cycle networks, including design and safety measures for pedestrian and cycle access on the bridge.	Sections 7.4.4 and 7.4.6

7.4.1 Guidelines and methodology

Guidelines applied

The impact assessment and urban design concept development were undertaken in accordance with the DGRs and relevant RMS guidelines, and involved consultation with Hawkesbury City Council and the local community. Guidelines applied as part of this process were as follows:

- Beyond the Pavement (RTA, 2009).
- Landscape Guideline (RTA, 2008a).
- Bridge Aesthetics (RTA, 2004).
- Environmental Impact Assessment Guidance Note: Guidelines for Landscape Character and Visual Impact Assessment (RTA, 2008b).

The study area

The study area for the visual amenity, urban design and landscape assessment is located to the north east of the Windsor town centre, incorporating the existing Windsor bridge crossing and the approach roads on both sides of the river. The study area can be divided into three distinct precincts:

- The area of Thompson Square and the built environment immediately surrounding it, including George Street, Bridge Street, Old Bridge Street and The Terrace.
- The Hawkesbury River including the Windsor bridge and the foreshores on the northern and southern embankments.
- The northern foreshore, including the intersection of Wilberforce Road and Freemans Reach Road and the entry road to Macquarie Park.

Overview of scope and key tasks

Development of the urban design concept has been an iterative process, informed by the impact assessment, with the aim of avoiding, reducing or mitigating adverse impacts wherever possible. Key steps in the process have included:

- Analysing the visual environment and landscape setting of the study area.
- Analysing how the project would interact with the visual environment and landscape setting of the study area.
- Landscape character impact assessment.
- Visual impact assessment.
- Identifying urban design and landscape strategies to avoid or mitigate adverse impacts.
- Informing the development of the engineering concept design through consultation with the engineering specialists, with the aim of minimising impacts via the design process.

The visual amenity, urban design and landscape assessment undertaken as part of this EIS involved:

- Assessment of the impacts of the project on visual amenity, urban design and landscape in the existing environment of Windsor.
- Framing a positive urban and landscape strategy for the project.
- Development of the urban design and landscape concept for the project to avoid, reduce and mitigate adverse impacts to the greatest extent practicable.

Landscape character impact assessment

Landscape character is the aggregate of built, natural and cultural factors that make up an area and provide its unique sense of place. To assist with the assessment of impacts on landscape character, the study area was divided into Landscape Character Zones based on land use, urban form, topography, vegetation and cultural heritage significance. The potential impacts of the project on landscape character were then assessed in consideration of the 'sensitivity' of the landscape and the 'magnitude' of the project. For each Landscape Character Zone, both 'sensitivity' and 'magnitude' were assessed on a qualitative basis and given a 'rating' on a scale ranging from 'negligible' to 'high'. The impact assessment grading matrix presented in **Figure 7-19** was then used to define the landscape character impact.

For the purposes of the landscape character impact assessment, the terms 'sensitivity' and 'magnitude' were defined as follows:

- Sensitivity – A measure of how sensitive the landscape is to change or the capacity of the landscape to absorb change. For the landscape character impact assessment in this EIS, the assessment of 'sensitivity' took into consideration the perceived value of the existing landscape, with judgments made about its scenic quality, cultural and historical importance, and importance to the local community.
- Magnitude – A measure of the physical size and scale of the project within the relevant Landscape Character Zone and hence the magnitude of change that would be imposed by the project within that zone. The assessment of 'magnitude' took into consideration the compatibility of the project with the existing landscape character. All elements of the project were considered, in addition to the scale of each element and its location within the existing environment.

		MAGNITUDE					
		High	**High to Moderate**	**Moderate**	**Moderate to Low**	**Low**	**Negligible**
SENSITIVITY	**High**	High impact	High impact	High to Moderate impact	High to Moderate impact	Moderate impact	Negligible impact
	High to Moderate	High impact	High to Moderate impact	High to Moderate impact	Moderate impact	Moderate impact	Negligible impact
	Moderate	High to Moderate impact	High to Moderate impact	Moderate impact	Moderate impact	Moderate to Low impact	Negligible impact
	Moderate to Low	High to Moderate impact	Moderate impact	Moderate impact	Moderate to Low impact	Moderate to Low impact	Negligible impact
	Low	Moderate impact	Moderate impact	Moderate to Low impact	Moderate to Low impact	Low impact	Negligible impact
	Negligible	Negligible impact	Negligible impact	Negligible impact	Negligible impact	Negligible impact	Negligible impact

Figure 7-19 Impact grading matrix

Visual impact assessment

A detailed field and desktop assessment was undertaken to determine the area from where the proposed works would be visible, defined as the visual envelope map (VEM). To assist with the visual impact assessment, four visual catchment zones were defined based on increasing distance from the centre of the study area (centred on the location of the replacement bridge). The four visual catchment zones are as follows (refer to **Figure 7-20**):

- Areas within a 0.25 kilometre radius.
- Areas within a 0.5 kilometre radius.
- Areas within a 0.75 kilometre radius.
- Areas within a one kilometre radius.

Within each visual catchment zone, a number of key representative viewpoints were identified based on consideration of land use. The identified viewpoints were located along streets and in other public domain areas such as Thompson Square. Views from these selected viewpoints were then analysed to identify the extent to which houses and other buildings were visible. This provided an indication of the likely level of visibility from houses, as it was not feasible to inspect private residences to check potential views directly. A total of 18 viewpoints were selected for the analysis. The locations and directions of the selected representative viewpoints are shown on **Figure 7-20** and are described in more detail in **Section 7.4.5**.

Similar to the landscape character impact assessment, the visual impact of the project on each viewpoint was assessed by considering both the 'sensitivity' of the viewpoint and the 'magnitude' of the project elements within that view. For the purposes of the visual impact assessment, the terms 'sensitivity' and 'magnitude' were defined as follows:

- **Sensitivity** – A measure of the quality and importance of the view from the viewpoint and its capacity to absorb change. This is dependent on the sensitivity of viewers to visual change. Viewers with a high sensitivity to visual impacts are those that place a high value on the existing views. These are likely to include residents who have attractive existing views, users of public open space or other areas where viewer attention is likely to be focused on the visual quality of the landscape and communities that place high cultural and historical significance on the visual landscape. People with a relatively lower sensitivity to visual impacts could include people focused on their work or other non-recreational activities and motorists whose attention is focused on driving.
- **Magnitude** - A measure of the physical size and scale of the change imposed on the viewpoint by the project. Magnitude is dependent on the nature and scale of the project elements that are visible to the viewer, the context in which the project elements are placed relative to the existing landscape and the proximity of the viewer to the visible project elements. A 'high' magnitude would result if the project elements are of a major scale and are different in scale or uncharacteristic of the existing visual character, or if there is considerable modification to the existing landscape. A 'low' magnitude would result if there is minimal alteration to the existing view and the project elements are of a scale and nature that is consistent with the existing visual character.

The assessment of visual impacts took into consideration the direction and composition of views, the manner in which the views are experienced (for example, from the road by drivers or from Thompson Square by recreational users of the parkland), the proximity of project elements to viewers, and the number of viewers likely to be affected by visual impacts. It also took into consideration the presence of intervening landforms between the viewpoint and the project. Vegetation was not considered to provide a permanent visual obstruction as it can be removed by clearing or other factors such as bush fire.

As for the landscape character impact assessment, the visual impact assessment was a qualitative analysis based on the application of 'sensitivity' and 'magnitude' ratings and the impact assessment grading matrix presented in **Figure 7-19**. The impact gradings have been measured based on their impact relative to each other within the scope of the project rather than on an absolute scale covering all potential forms of impact.

Overshadowing

The potential overshadowing impacts have been analysed using shadow diagrams prepared by Urban Circus, based on a computer model of the study area and the replacement bridge. Two sets of diagrams have been prepared and depict the shadows cast by the replacement bridge at 9:00am, midday and 3:00pm during the winter solstice (21 June) and summer solstice (21 December). The diagrams are presented later in this document (refer to **Section 7.4.5** and **Figure 7-29**).

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

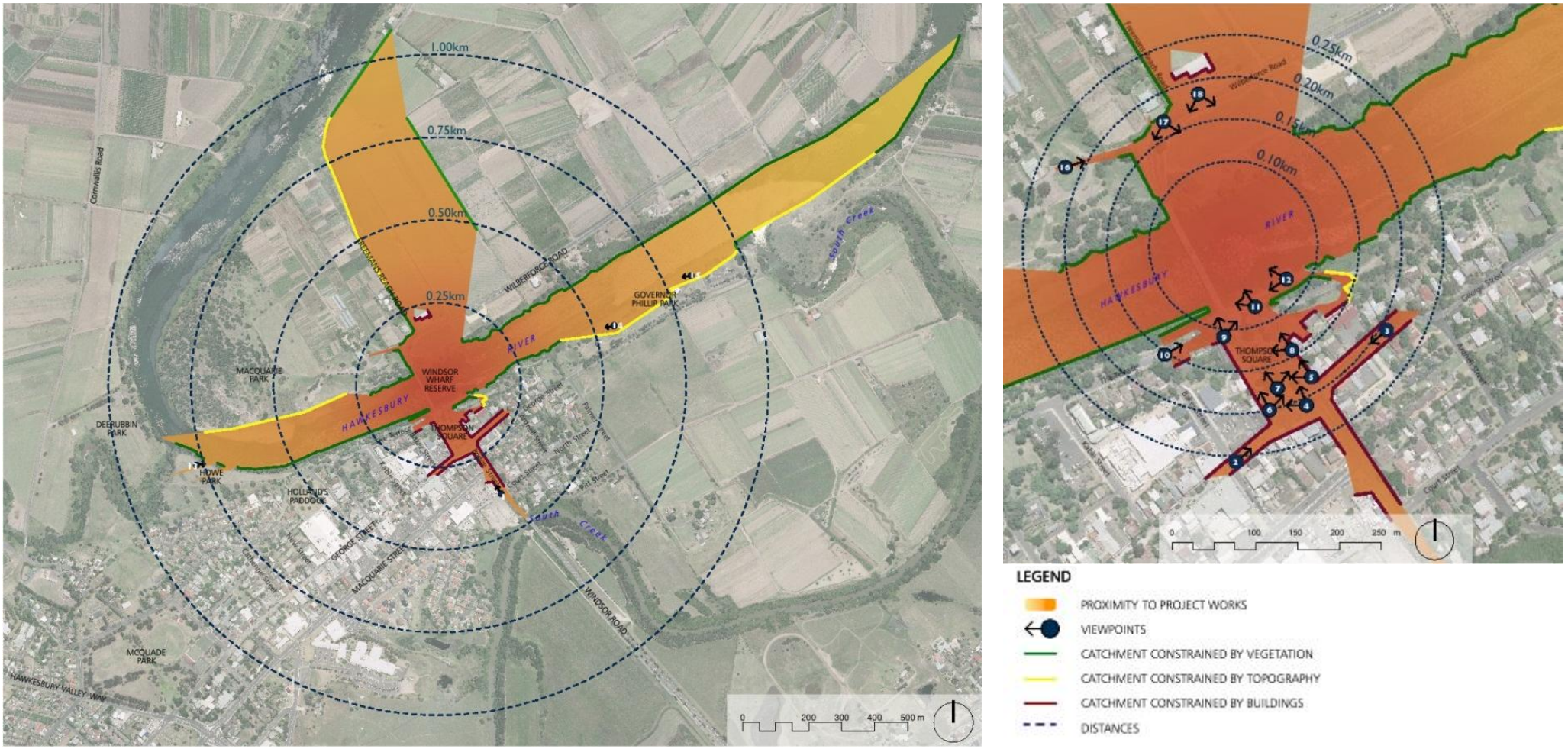


Figure 7-20 Visual catchment zones and landscape view points

7.4.2 Existing environment

This section describes the existing visual and landscape character of the study area, including the areas surrounding the existing and replacement bridges. These areas include the township of Windsor (incorporating Thompson Square) and the foreshore areas on the southern and northern banks of the Hawkesbury River.

Landscape setting

The visual character of the study area is strongly dependent on its European heritage elements, including the historic precinct of Thompson Square, as well as its location within the Hawkesbury River landscape.

Windsor is a historic, rural town located on a ridge above the southern bank of the Hawkesbury River. The southern approach to the existing bridge runs through the township and Thompson Square and descends steeply from the ridge to the river. The northern approach is less visually distinct, with the approach road being almost level with the bridge.

The town of Windsor comprises a commercial/retail core with adjoining low density residential developments. The land surrounding the township is made up of pastureland and dominated by agricultural and rural activities. Almost all of the original native vegetation has been cleared for development and agriculture.

There are considerable areas of open space and recreational land located around the built up areas and along the river foreshore. Important parks include Deerubbin Park, Howe Park, Windsor Wharf Reserve and Governor Phillip Park on the southern bank of the river, and Macquarie Park on the northern bank. Further back from the river edge are the reserves of Thompson Square and Hollands Paddock. These parks provide for a range of recreational activities and are of great importance to the local community.

Many of the parks on the southern side of the river are linked to various degrees by The Terrace, a local road that runs along the southern foreshore. The continuity of The Terrace along the foreshore is currently severed by the southern approach road to the existing bridge.

While the southern side of the river at the existing bridge crossing is dominated by the town of Windsor, the northern side is more rural in character. The northern side includes a number of turf farms with associated buildings and infrastructure, as well as the large, popular recreation area of Macquarie Park.

There are two key arrival points into Windsor, both of which are located within the study area: the George Street and Bridge Street intersection on the south side of the river and the Wilberforce Road and Freemans Reach Road intersection on the north side of the river. Both of these locations have key visual elements that signify to motorists, cyclists and pedestrians that they are arriving at Windsor.

The intersection of Bridge and George streets is approached up a relatively steep slope, rising out of South Creek. The sense of arrival at Windsor at this point is heightened by reaching the top of the ridge at George Street and the opening up of the view created by the open space of Thompson Square. A similar experience occurs when approaching the intersection of Bridge and George streets from the north after crossing the existing bridge.

The arrival point at the intersection of Wilberforce and Freemans Reach roads is situated on the Hawkesbury River floodplain and is influenced by the opening up of the view across the river to Thompson Square and the town rather than a change in topography. The view to the town is made possible by the lack of riverside and roadside vegetation and the presence of a turf farm in the foreground.

Thompson Square

Thompson Square has been a focal point for community activity since the early days of European settlement in the late 1700s. Today, Thompson Square comprises a series of single and two storey colonial buildings set around three sides of a rectangular open space area (referred to in this section as the Thompson Square parkland). The historic buildings have been recently restored and provide not only a physical edge and a sense of containment of the open space area but also a powerful and unified heritage quality that defines the character of the space. The historic buildings that provide Thompson Square with much of its visual character are the Macquarie Arms Hotel, the Doctor's House and the building at 10 Thompson Square. The heritage buildings and parkland together comprise the Thompson Square Conservation Area. These heritage elements are discussed further in **Section 7.1**.

The Thompson Square precinct incorporates a series of landscaped areas, ranging from the open space area of attractive parkland to small grassed islands adjacent to roadways and property boundaries. A range of mature trees occupy these landscaped areas creating a strong verdant character to the area. Some of these trees may form part of the historical plantings within Thompson Square (dating back to the early 1900s), although many are more recent plantings and some are seedlings that have regenerated naturally in the available spaces. Thompson Square open space area also contains a range of park elements, including picnic facilities, fencing and a memorial. Other than the placement of the memorial and its flanking trees to the George Street frontage, the landscaped space is unstructured in its form and layout. This form reflects a history of unplanned use and the primary need to accommodate road access between the town and the river.

Roadways bound the Thompson Square open space on all four sides, while Bridge Street crosses the centre of the Thompson Square open space area in a deep cutting running diagonally from east to west. This road provides the southern approach to the existing bridge and links to Wilberforce and Freemans Reach roads on the northern side of the crossing. The diagonal cutting of Bridge Street through Thompson Square results in a strong physical split of the open space into two disconnected triangular shaped reserves. The division creates a distinct upper open space area adjacent to George Street (the upper parkland) and a lower open space area adjacent to The Terrace and river foreshore (the lower parkland). The road cutting and connection to the southern bridge abutment also severs The Terrace at the point where The Terrace meets Bridge Street. This prevents pedestrian, cycle and vehicle access along The Terrace between the main area of Windsor and the wharf.

As a result of these physical constraints, current activities within Thompson Square are mostly restricted to the upper parkland. This area is strongly connected to George Street and the commercial precinct of the town. This area of Thompson Square is an important open space area for residents and visitors and is used for a range of activities, from major community events and festivals to family gatherings and picnics. A series of benches and tables are scattered around this area of the park, providing picnic facilities for casual use. Views from this area of the square are focused towards the surrounding buildings and urban scene, with views to the river restricted by trees.

The lower parkland of Thompson Square is more isolated from the commercial centre, with the Bridge Street cutting making pedestrian access from the town centre difficult. The exposure of this relatively small area of green space to the Bridge Street cutting also decreases its amenity for recreational activities. The topography within the parkland area has been artificially mounded, forming a small promontory that provides views out towards the river and northern river bank. It is separated from the river foreshore, however, by a small car park and The Terrace, with steep sloping ground at the base of the parkland increasing its physical separation. Recreational facilities in this area are limited to two picnic table settings.

River foreshore

The river bank area in the vicinity of the existing bridge is heavily vegetated and has been degraded by weed invasion and erosion, which limits direct access to the river. Macquarie Park on the northern foreshore to the west of the existing bridge is one of the few locations in the area where people can access the river directly at a large sandy beach.

Use of the remaining foreshore areas for recreational purposes is currently largely limited to the western side of the southern foreshore (west of the existing bridge). The eastern side of the southern foreshore, which includes Windsor wharf, is used mainly for car parking and servicing, rather than being a popular public space. On the northern foreshore, there is a footpath on the northern side of Wilberforce Road connecting to the footpath on the bridge. Access to Macquarie Park, a key destination for pedestrians and cyclists in this area, is constrained, however, by poor sightlines on the curved road alignment, the speed of vehicles approaching and leaving the bridge, and the cut embankment between the footpath and the entry road to Macquarie Park.

Access along the southern foreshore area is currently available via The Terrace, although this road is severed by the existing road cutting of Bridge Street and does not provide continuous vehicular or pedestrian access between the town and Windsor wharf. Hawkesbury City Council has carried out works along the western side of the southern foreshore to provide a continuous linear park with pathways and lookout points. Like The Terrace, these works are also currently interrupted by Bridge Street and the southern bridge abutment, which prevent continuous at-grade pedestrian access along the foreshore. The lack of a controlled pedestrian crossing, poor sightlines and the speed of vehicles approaching the bridge make it dangerous for pedestrians to cross Bridge Street from one side of the southern foreshore to the other at this point. The existing alternative is to use a set of stairs that lead to a dark underpass below the bridge.

Thompson Square provides the only potential open space access route for pedestrians and cyclists between the commercial area of Windsor and the river foreshore. Other access routes to the river, such as those provided by streets that intersect George Street, are not located within a parkland setting and do not provide the same level of amenity. Thompson Square therefore provides the preferred access route to the wharf and river foreshore for pedestrians and cyclists.

Pedestrian access to the river from Thompson Square is currently restricted to the existing road reserves. Access from George Street down to the river can be made via either the footpath of Old Bridge Street or the footpath or roadway on the unnamed road on the south eastern edge of the square.

Access via Old Bridge Street requires people to cross at the George Street and Bridge Street intersection, which is difficult due to the absence of a controlled pedestrian crossing, poor sightlines, the speed of vehicles and the multiple directions from which vehicles are entering into the roundabout. The steepness of the grade down Old Bridge Street also makes this route unsuitable for wheelchairs and people with restricted mobility or disabilities.

Access via the Thompson Square road, past the Doctor's House, is safer and reasonably accessible for people with restricted mobility or disabilities until they arrive at the intersection of Bridge Street and The Terrace next to the Windsor bridge abutment. At this point, a set of timber stairs provides grade separated access under the bridge to the northern side of The Terrace and ultimately to the wharf. It is possible to avoid the stairs by crossing Bridge Street at its intersection with The Terrace, although the absence of a controlled pedestrian crossing, poor sightlines and the speed of vehicles on Bridge Street, makes this a dangerous crossing.

The existing bridge

The existing bridge, originally constructed in 1874, is another listed heritage item in Windsor and contributes to the town's historic character. The existing bridge provides both vehicular and pedestrian crossing facilities, although both are narrow by current standards and restrict the safe and efficient movement of vehicles, bicycles and pedestrians. The deck of the existing bridge is relatively low, matching the height of the river bank on the southern foreshore and landing in a deep cutting on the northern foreshore. This visually integrates the bridge into the river setting.

The predominant experience of the existing bridge from the town of Windsor is of its presence as a low, horizontal line across the river. Approaching Windsor from the northern side of the river, the bridge crossing offers a strong upwards vista towards the Doctor's House, which is elevated above the current road alignment and provides a prominent urban landmark. The visual relationship between the bridge and other parts of Thompson Square is currently restricted, however, as a result of the road cutting and associated ground level differences within the square and the screening effect of trees.

The predominant experience from the bridge itself is one of being set low in the river landscape. The low rail of the existing bridge allows broad vistas up and down the river. The amenity of the pedestrian experience on the bridge is compromised, however, by the narrowness of the bridge and the limited separation between traffic lanes and the narrow pedestrian footpath. The narrowness of the bridge and footpath makes it feel unsafe and uncomfortable for pedestrians, particularly during peak traffic periods.The experience of 'crossing' the Hawkesbury is another important element of landscape character and is influenced by the topographic pattern of bridge 'approach' and 'exit', the form of the bridge itself, and the views experienced both on the approach/exit and on the crossing. The existing Windsor bridge provides a distinct experience of 'crossing', with an articulated descent to the crossing from the south and views of the river experienced both on the approaches and the crossing. Preserving the experience of 'crossing' has therefore been a key consideration in the design of the project[10].

[10] Works carried out on the Fitzroy Bridge crossing of South Creek in the 1970s resulted in a reversal of the original crossing pattern. The Fitzroy Bridge over South Creek is now approached on an incline to the crossing point and marked by a descent on the landing side. This profile creates adverse interfaces with adjoining roadside properties. The project has been designed to avoid such impacts to the greatest extent practicable.

Patterns of traffic movement

Traffic movement, including volumes, speed and changing diurnal patterns, directly affects the amenity of the project study area, as well as accessibility around and through it.

There are two main thoroughfares in Windsor, the primary route being the arterial road that follows Bridge Street through Thompson Square and onto the Windsor bridge, and the other being the Macquarie Street bypass of the commercial centre of Windsor. The patterns of traffic movement on Bridge Street are dominated by the narrow cross section of the existing bridge, the relatively steep and narrow approach road through Thompson Square, the roundabout at George Street and the signalised intersection at Macquarie Street. The volumes of traffic are at their highest level in the morning and evening peak periods.

Typically Bridge Street between Macquarie Street and George Street carries high volumes and during peak periods at relatively slow speeds. During non peak periods, however, vehicle speeds typically increase in response to reduced traffic volumes and congestion. As vehicles approach the roundabout on George Street, the speeds drop substantially as it acts as a natural traffic calming device.

Beyond the roundabout, traffic in both directions on Bridge Street generally travels at a slow speed, constrained by the narrow and steep road alignment and poor sightlines. Vehicle speeds do not substantially vary during peak and non peak periods due to these road conditions and the narrow bridge configuration. The steep grade on Bridge Street increases the noise levels generated by heavy vehicles due to the need to use low range gearing and engine breaking.

Beyond the bridge on the northern foreshore, vehicle speeds increase on both Wilberforce Road and Freemans Reach Road. Speeds are restricted, however, by the considerable congestion that occurs during the morning peak as higher volumes of vehicles negotiate the intersection of these two roads and approach the narrow bridge.

The local roads within Windsor, including George Street, Old Bridge Street, The Terrace and Thompson Square road, all carry lower volumes of traffic travelling at much slower speeds in comparison to the main traffic routes described above. The lower traffic volumes and speeds on these roads are compatible with the outdoor and street activities that are associated with the local shops, hotels and the upper parkland of Thompson Square.

Parkland and street trees

Trees contribute to the visual quality of the study area and are located within Thompson Square, along the edge of the river on both the northern and southern foreshores, and adjacent to Wilberforce Road, Freemans Reach Road and the entry to Macquarie Park. The trees comprise a combination of exotic and native species. Some of the native species are endemic to the area, such as the Swamp Oak (*Casuarina glauca*), although many, such as the Silky Oak (*Grevillea robusta*) originate from other parts of Australia. Large parts of the southern and northern foreshore are heavily weed infested, which restricts tree growth and also contributes to an unattractive character in what is otherwise a very attractive setting.

Some of the trees in the study area have been planted, although many have self seeded, particularly those close to the foreshore. Thompson Square contains a mix of mature trees, some of which appear to have been planted many decades ago, and less mature trees that have self seeded. Some of the mature trees growing in the upper parklands area near George Street are 'landmark trees' that create a considerable presence in the park and adjoining streets.

Along the boundaries of Macquarie Park and the heritage property Bridgeview, there are hedgerow plantings of native and exotic species, including Lilypillys, Photinia and Cypress Pine. These delineate the property boundaries and present an orderly and suburban character to an otherwise rural setting. A number of isolated mature Eucalypt trees also occur along the roadside and at the entrance to Macquarie Park.

Existing views

Both the southern and northern approach roads to Windsor provide glimpses of the historic town. The river foreshore area provides views upstream and downstream, as well as views of the township, the existing Windsor bridge and the foreshore parklands.

The existing bridge provides views upstream and downstream along the river, as well as views of Thompson Square. The view east from the bridge is open, extending downstream along the river, while the view to the west is more intimately focused towards the beach at Macquarie Park and the elevated bank of Howe Park.

Within Thompson Square, views from the upper parkland are focused on the surrounding buildings, with views of the river restricted by trees. The lower parkland of Thompson Square has views through trees to the river and foreshore, but only limited views of the upper area of Thompson Square.

Landscape Character Zones

To assist with the identification of landscape character impacts, the study area was divided into Landscape Character Zones (refer to **Section 7.4.2** for details of assessment methodology). Three Landscape Character Zones were identified as follows:

- Landscape Character Zone 1 - Thompson Square. This landscape character zone is dominated by the open space parkland of Thompson Square. The open space area is framed by one and two storey buildings that are part of the Thompson Square Conservation Area. The open space is diagonally dissected by Bridge Street and its cutting. It is bounded by George Street to the south and the southern foreshore of the Hawkesbury River to the north.
- Landscape Character Zone 2 - Hawkesbury River and banks. This landscape character zone comprises the Hawkesbury River and its banks, which are set into an extensive floodplain. The river banks are generally vegetated, framing upstream and downstream views. The town of Windsor sits on the ridgeline above the southern bank while the north side of the river is largely rural in character. The existing bridge across the river sits below the adjacent landform and is of a scale that complements the semi rural setting.
- Landscape Character Zone 3 - Wilberforce Road and Freemans Reach Road intersection. This landscape character zone is dominated by the large and relatively flat floodplain to the north of the Hawkesbury River. The land is predominately agricultural, consisting mainly of turf farms with large hedgerows separating plots of land. The two lane configuration of Wilberforce Road and Freemans Reach Road reinforce the rural character of the area. Macquarie Park is located to the west and contains scattered native and exotic trees.

The landscape character attributes of each identified Landscape Character Zone are summarised in **Table 7-23** to **Table 7-25**. The view from the Doctors House of the existing bridge and location of the replacement bridge is shown in **Figure 7-21**.

Table 7-23 Landscape Character Zone 1 - Thompson Square

Landscape character attribute	Description
Built form and heritage	Thompson Square is located on the north western edge of the ridge on which the Windsor township is located. It is bounded by roadways on all four sides. It is also diagonally bisected from east to west by Bridge Street and its deep cutting, which physically and visually separates the space into two distinct open space areas. Buildings surrounding Thompson Square comprise of one and two storey colonial buildings on three sides of the parkland. These recently restored buildings provide a strong physical edge and sense of containment to the square, as well as a unified heritage quality. Together, the buildings and Thompson Square comprise the Thompson Square Conservation Area.
Connectivity and access	Pedestrian access to the river, wharf and existing bridge is currently limited to the footpath along Old Bridge Street and the Thompson Square road. Access via Old Bridge Street requires pedestrians to cross at the Bridge Street intersection. This crossing is made difficult by poor sight lines, vehicle speed and multiple traffic directions entering the roundabout intersection, as well as the steep grade at this intersection. Access along the Thompson Square road is safer and more suitable than the Old Bridge Street access, until the Bridge Street intersection. At this point, access to the riverfront or across the bridge is only available via a flight of timber steps under Bridge Street, or directly across Bridge Street which is inherently dangerous due to vehicle speeds and poor sightlines to vehicles approaching the bridge.
Public domain	The upper area of Thompson Square offers the best amenity with easy access to adjoining retail premises on George Street. This area is generally a level, open grassed area with a number of scattered mature trees. Park furniture and picnic facilities are available in this area. The cutting provides visual and acoustic separation from traffic on Bridge Street. The lower area of Thompson Square has lower landscape amenity. Pedestrian access is poor due to steeper grades and the presence of road infrastructure (including a small carpark). It is physically separated from George Street. The topography has been artificially mounded, offering views towards the river, opposing riverbank and provides the only usable green space. The physical relationship of this area is poor due to the utilitarian character of the space.
Key activity areas	Thompson Square is the dominant green recreational space within Windsor and is complemented by its relationship with the variety of food and beverage outlets and the architecture of buildings along George Street. This area performs a number of functions, including functioning as a civic square or a quiet picnic location.

Figure 7-21 View of the existing bridge and location of the replacement bridge from the Doctors House

Table 7-24 Landscape Character Zone 2 – Hawkesbury River and banks

Landscape character attribute	Description
The existing bridge	The original bridge was constructed in 1874 and was raised to its current level in 1896. It provides crossing facilities for vehicles and pedestrians. The bridge deck has been aligned to match the height of the northern foreshore river bank and lands in a deep cutting on the southern foreshore, visually integrating the bridge into the river setting.
The river	This section of the Hawkesbury River is characterised by a long and generally straight reach of open water. Long and attractive views may be had in both directions from the bridge and open foreshore areas. Both northern and southern foreshore areas, the river bank adjacent to the Terrace and the Macquarie Park foreshore are well vegetated with a combination of native and exotic trees. The steep banks are heavily weed infested, detracting from the otherwise attractive river setting. The recently reconstructed Windsor wharf is located on the southern bank and is adjacent to some minor scour protection works using sandstone rocks. Flood events are regular in this area. Two small markers on the existing bridge alert visitors to the potential of flooding.
Connectivity and access	The bridge provides one lane in each direction. The pedestrian path is narrow and has limited separation from the southbound traffic lane, but provides attractive upstream and downstream views. On the southern side, the footpath terminates at the junction with the Terrace, continuing on the northern side of the Terrace to Windsor wharf in the east and linking with the timber steps under Bridge Street and along the foreshore path to the west. On the northern foreshore, the footpath continues along the southern side of Wilberforce Road.

Table 7-25 Landscape Character Zone 3 – Wilberforce Road and Freemans Reach Road intersection

Landscape character attribute	Description
Built form and heritage	Land on the northern foreshore is predominantly agricultural, consisting of turf farms, associated buildings and infrastructure and large hedgerows separating plots of land. The heritage listed single storey residence, 'Bridgeview,' is located adjacent to the intersection of Wilberforce Road and Freemans Reach Road and is prominently visible from the southern foreshore.
Connectivity and access	Pedestrian access in this zone is poor, the formal pathway in the zone limited to the bridge to the southern side of Wilberforce Road. Pedestrian access from the bridge to Macquarie Park is dangerous and constrained by poor sightlines on the curved road, the speed of vehicles approaching and leaving the bridge, as well as the cut embankment between the footpath and the entry road. The two-lane configuration of Wilberforce Road and Freemans Reach Road reinforce the rural character of the area. Vehicular access to Macquarie Park is via a narrow road on the curved approach to the bridge.
Public domain	The majority of land in this zone is rural. The large and popular Macquarie Park is located to the west of the intersection. It is grassed with scattered native and exotic trees and small carparks. Vegetation in this area mirrors the vegetation across the river in Thompson Square. A small children's playground, picnic shelter and restaurant are located near the entrance of Macquarie Park. The river can be accessed from Macquarie Park, at a large shady beach.
Key activity areas	Macquarie Park is the major public destination on the northern foreshore.

7.4.3 Urban design and landscape objectives and principles

Overarching objectives and principles

Urban design and landscape objectives and principles have been prepared for this project to guide the concept design so that the replacement bridge and approach roads are physically, visually and operationally integrated with the surrounding environment. They also guide the rehabilitation of Thompson Square.

The 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 (*Hawkesbury City Council, 2009). They also reference RMS' Beyond the Pavement urban design policy (RTA, 2009b) and the DGRs for this project. Furthermore, the objectives and principles are based on an understanding of the existing landscape and urban values of the study area and the issues that affect or are affected by the project. The urban design and landscape objectives and principles for the project are presented in **Table 7-26**.

Table 7-26 Urban design and landscape objectives and principles

Objective	Design principles
Develop an integrated concept design that fits sensitively with the existing qualities and characteristics of Windsor and its Hawkesbury River setting	• Maintain the landmark qualities of a bridge crossing at Windsor. • Minimise the physical footprint and scale of the bridge, approach roads and associated intersections. • Ensure the design and character of the bridge and associated road works 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 detail are to be robust, low maintenance and suitable for their 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.
Maintain the integrity of cultural and historic buildings, structures, elements and spaces of Windsor	• 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.

Objective	Design principles
Enhance the existing amenity, visual character and cultural landscapes of Thompson Square and Windsor	• 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 at 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. • 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 redundant road areas back to consolidated parkland. • 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.
Improve connectivity for vehicles, pedestrians and cyclists	• 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.

Bridge design principles

Specific architectural principles have been applied to the proposed design of the replacement bridge. These principles supplement the design guidelines set out within RMS' Bridge Aesthetics (RTA, 2004) and are summarised in **Table 7-27** (principles for siting and character) and **Table 7-28** (principles for bridge elements).

Table 7-27 Bridge design principles - Principles for siting and character

Category	Principles
Character	• In alignment, gradient and in its constituent elements, the bridge should have a dignified, calm and confident presence. • The bridge should have a robust structural character. • The bridge and its approaches should equally have a considered landscape and urban presence. • Like the existing bridge, the new bridge's character should be understated rather than overly expressive.

Category	Principles
Placement and siting	• The new bridge and its approaches should be well sited and considered in relationship to the Hawkesbury River's landscape setting, the township of Windsor, the banks, parks and approach roads. • The new bridge should have a simple linear geometry so that it continues to be expressed as a calm, succinct form in the landscape. • The experience of crossing the bridge should be clearly articulated and distinct from the experience of approaching the bridge. • The eastern bridge approach should accord as close as possible to the historic Bridge Street alignment. • The vertical alignment through the historically important Thompson Square should be as close as possible to existing ground levels.

Table 7-28 Bridge design principles – Bridge elements

Category	Principles
Deck	• The deck of the bridge should be expressed as an uncluttered horizontal plane spanning the Hawkesbury River. • The bridge's alignment as it spans between abutments should mirror the horizontal plane of the river as closely as possible. • The width of the deck should be reduced 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. • The pedestrian and cyclist shared path should be raised slightly above road pavement level, to improve safety for pedestrians and cyclists. • Traffic barriers should sit between the traffic lane and the shared path to minimise the bulk of the bridge as viewed from Thompson Square. • The pedestrian balustrade on the outer edge of the bridge should allow for a finer scale/edge to be developed on the Thompson Square side. • The pedestrian balustrade on the outer edge should be collapsible during flood events in accordance with established and tested RMS design solutions.
Deck soffit	• The deck soffit should be designed, treated and finished as an important facade, due to its high visibility from land and water within the public domain. • The deck soffit should be profiled to give it a modelled architectural expression, rather than a generic flat plane. • The bridge's edge detail should be fully integrated with the soffit design. • Services should be concealed wherever possible - if unavoidable, they should be recessed into the deck soffit so that they sit flush with the finished surface, or recessed away from the edge to be in shadow. • The transition of the soffit to the abutment should be resolved in three dimensions. • Consideration should be given to the treatment of the surface in terms of reflection, light and shadow.

Category	Principles
Piers	• The piers should express, through their structure, the forces that are transferred from deck to the foundations. • The piers should be designed for compliance with structural minima, to minimise their bulk. • The piers should have a paired leg expression and be slender. i.e. the proportion of their vertical height to width should be controlled such that the piers appear fine, rather than squat. • Design of the piers should reflect their role as dominant visual elements as would be seen from Thompson Square and the river foreshores. • The pile caps should be recessive and integrated with the columns. • The view through the pier structure from the Terrace and Wilberforce sides should be considered as a particular experience and articulated accordingly. • The placement, material character and any finish of the piers should discourage vandalism and graffiti.
Abutments	• The abutments should seamlessly resolve the transition from elevated deck to the ground plane, and be fully considered as a three dimensional design. • There should be consistency in the architectural language between the piers and the abutments. • The abutment walls should be considered as an integral part of Thompson Square, defining the open space. • The abutment walls should be designed as vertical walls to maximise usable space in Thompson Square and minimise land take. • The abutment walls should be formed of robust masonry elements to complement existing walls in Thompson Square. • The design of the abutment walls should explore opportunities for interpretation of flooding and flood levels.
Materials	• All materials should be selected for their robustness and durability, considering their tendencies to develop a patina as they age. • Materials should be robust and durable. • Materials should express the inherent material of the bridge construction and minimise the use of cladding. • Where special finishes are desired, they should be integral and suit the construction method, rather than be an applied finish.
Lighting	• Lighting should be an integral part of the design, rather than an unrelated attachment. • Lighting levels should comply with statutory requirements for each type of road user, including motorists, pedestrians and cyclists. • Integrated and linear lighting should be used 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. • Lighting sources should comprise low energy use sources wherever possible, and should have appropriate IP ratings that anticipate inundation.

An impression of the replacement bridge from the Doctors House is shown in **Figure 7-22**.

7.4.4 Urban design and landscape concept

The concept design for the project, as described in Chapter 5, is the result of an integrated design approach in which a team of environmental, heritage and urban design specialists have worked collaboratively to achieve a better integration of the project within Windsor. The integrated design approach has included the development of an urban design and landscape concept, based on the urban design and landscape principles identified in the previous section. The overriding aim of the urban design and landscape concept is to minimise the adverse impacts of the project on the heritage values of Thompson Square and the overall visual and landscape character of Windsor. The urban design and landscape concept has informed the development of the concept design for the project and will continue to inform the development and refinement of the design should the project proceed to detailed design and construction.

The urban design and landscape concept for the project is presented in the Urban Design and landscape working paper (Volume 3 - Working paper 5). The key elements of the urban design and landscape concept are summarised below.

The existing bridge

The existing Windsor bridge would be demolished as part of the project. Measures to manage the associated impacts on the heritage values of Windsor are identified in **Section 7.1.5**. These measures may include interpretive treatments and/or signage providing information about the bridge, the location of which would be determined during detailed design in consultation with Hawkesbury City Council and the community.

Figure 7-22 Impression of the replacement bridge from Doctors House

Thompson Square

The southern approach road of the new bridge is on the eastern edge of Thompson Square and would create a strong and more legible rectangular structure to the square with roadways defining the four edges of the central open space area. The existing buildings around the perimeter of Thompson Square would further strengthen this balanced spatial structure. The existing retaining wall beneath the Doctor's House would form a visual relationship with the new bridge abutment, creating a clearly defined and enclosed amphitheatre in the intervening space.

The project would involve removal of the existing diagonal road and alignment of Bridge Street through Thompson Square (see **Figure 7-23**). This would allow for connection of the upper and lower parklands, which would result in a greater area of continuous open space within Thompson Square (see **Figure 7-24**). Measures to manage the associated impacts on heritage values of the area have been detailed in **Section 7.1.5**. These measures may include interpretive treatments and/or signage providing information on the history of previous road alignments within the square. The location of interpretative treatments and/or signage would be determined during detailed design in consultation with Hawkesbury City Council and the community.

In addition to increasing the amount of continuous open space available for public use, the connection of the upper and lower parklands of Thompson Square would:

- Improve the amenity of the open space area for public use (as it would no longer be dissected by a busy roadway).
- Improve the connection of Thompson Square to the river (by providing a continuous green space connection), with potential to connect to future foreshore walkways.
- Reinforce the existing successful connection between the open space area and the street life of George Street.

Consultation with Hawkesbury City Council, relevant heritage agencies and the community on the urban design and landscape concept for Thompson Square would be undertaken during the detailed design phase of the project. A preliminary concept design for Thompson Square has been developed (see **Figure 5-8**). This preliminary concept design would be used as the basis for the further development of the concept design for the square should the project proceed to detailed design and construction.

Access and movement

Recognising the landmark location and historic importance of Windsor has been an important aspect of the engineering design process and development of the urban design concept. The design of the new bridge and approach roads, combined with appropriate urban design treatments, would make road users aware of their arrival at Windsor so that they can then respond and make decisions about breaking their journey.

In comparison to the existing bridge, the replacement bridge would provide a river crossing that is more direct and safer for vehicles, pedestrians and cyclists. Key improvements would be as follows:

- The ease, safety and amenity of pedestrian and cyclist access to The Terrace via Thompson Square road would be improved as there would no longer be a need to cross the bridge approach road.
- The provision of a wide shared pedestrian and cycle path across the replacement bridge would improve the amenity of the bridge crossing for pedestrians and cyclists travelling between the town centre and the northern foreshore area, including the Macquarie Park recreation area.
- The provision of a signalised intersection at the George Street and Bridge Street intersection would also improve pedestrian and cyclist safety at this location.

A range of alternative access routes would be available for people moving between the main street and the river foreshore through Thompson Square. In addition to the route provided by Thompson Square road, two new sets of stairs would be constructed to provide direct pedestrian access to The Terrace - one set adjacent to the new bridge abutment and another adjacent to the existing retaining wall under the Doctors House. There would also be a footpath on the eastern boundary of Thompson Square adjacent to the southern bridge approach road that would connect to The Terrace near the wharf.

The Terrace, which is currently bisected by the Bridge Street road cutting, would be reconnected as a result of the project, allowing continuous access along the river foreshore from Thompson Square Road to the wharf. This would create a valuable link between Thompson Square and the riverside parkland areas.

The new roundabout at the Wilberforce Road and Freemans Reach Road intersection would improve vehicular circulation but would constrain pedestrian and cyclist access around this area, particularly due to the double lane configuration. This impact would be mitigated by the shared pedestrian and cyclist paths which would provide two access points to Macquarie Park as well as a grade separated shared access route under the bridge.

Views and vistas

Retaining visual connections to the views and vistas of the town has been a key design consideration. The existing key arrival points to Windsor, namely the George Street and Bridge Street intersection on the south side of the river and Wilberforce Road on the north side of the river, would be retained. The roads at these arrival points would remain at similar levels and vegetation planting would be restricted to preserve sightlines to key viewpoints.

The concept design allows for retention and possible improvement of some of the visual connections and sightlines between buildings across the upper areas of Thompson Square. Existing sightlines through the open space area towards the river would also be retained and the extent of the visibility of the river may be improved in some locations.

Bridge design

The replacement bridge has a close to horizontal alignment that mirrors the horizontal plane of the water below. On the deck of the bridge, the pedestrian/cycle shared path would be raised slightly about the road pavement level, which would elevate cyclists and pedestrians and provide them with increased visibility. The required traffic barriers would be located between the traffic lane and the shared path, which would allow the balustrade on the edge of the bridge to be finer and thus reduce the potential for adverse visual impacts on Thompson Square.

On the southern approach to the bridge from Thompson Square, the approach road would largely follow the natural grade of topography down to the new bridge. This would clearly distinguish the approach road from the near horizontal bridge crossing, making the crossing a distinct experience. The southern approach to the new bridge closely follows the historic alignment of Bridge Street, which reinforces that important historical element. The design speed and resultant level of the approaches to the bridge have been selected to allow the existing ground levels of properties fronting Old Bridge Street to be retained without adjustment.

The design of the deck soffit would give the underside of the bridge a modelled, rather than a flat profile, which would improve the appearance of the bridge when viewed from below. To reduce the heavy appearance of the bridge piers and prevent the formation of strong linear shadows, the piers have been designed with a curved shape at all four corners. This also allows the piers to be narrower in profile on the outside edges of the bridge, which would make them less imposing from distant viewpoints. Light coloured concrete would be used as it is the best surface for light and reflections, and would be consistent with the finish of the bridge deck. The spacing of the piers is wide, which would give the bridge an open quality when viewed from Thompson Square, the river foreshore, the Hawkesbury River and distant viewpoints. The bridge piers would also be set well away from the riverbank, making them less susceptible to vandalism and graffiti.

The abutment walls would be constructed of light coloured concrete with a curved profile to match the bridge piers. They would also be textured with relief features (such as ridges) to disrupt the planar surface and make them less susceptible to graffiti. Opportunities for incorporating additional surface design features, such as visual markers that provide information on past flood events, would be explored during the detailed design phase.

Ancillary items

The project would require the construction of ancillary items necessary for the effective operation of the roadway. These would include retaining walls, scour protection, traffic safety barriers and balustrades, street lighting, street furniture, and water quality structures including a water quality basin. Recommendations for the design of key auxiliary elements are presented in **Table 7-29**.

Retaining walls would be made from precast concrete panels with matching capping units and would have a finish that would be practical for construction while reducing long term maintenance requirements. They would be dark coloured so to allow for the visual character of foreshore planting to dominate.

Scour protection would be designed to encourage and facilitate access to the river, and would incorporate the use of natural materials wherever possible. The visual impacts of the scour protection works would be minimised by plantings of riparian species.

The water quality basin, designed to treat runoff from the new road surface before it reaches the Hawkesbury River, would be located on the north east side of the crossing, south-east of the proposed new roundabout at the intersection of Freemans Reach and Wilberforce roads. The size of the water quality basin would be minimised as far as practicable and its perimeter would be planted with native species to provide visual screening and integrate it with the surrounding landscape.

Lighting would be provided on poles positioned at intervals along the bridge and approach roads. The placement and height of the poles would provide adequate lighting levels to the bridge and the approaches in accordance with current standards and codes. The final design, height and spacing of poles would be selected to minimise visual impacts and impacts on rural character.

Additional roadside elements necessary for the effective operation of the roadway (such as safety barriers and balustrades, kerbs and street furniture) would be designed so as to make a positive contribution to the character of both the roadway and the local landscape. The design of all ancillary elements would be finalised during detailed design in consultation with Hawkesbury City Council, the community and other stakeholders.

Table 7-29 Recommendations for the design of auxiliary features

Project elements	Recommendation	Rationale
Retaining Walls - Windsor Wharf Reserve	Retaining walls with precast concrete panels with grey concrete and dark grey exposed aggregate. A matching precast concrete capping unit should be used at the top of the wall.	• The recessive colour would allow for the visual character of the adjoining foreshore planting to dominate. This would also help to make the wall visually recede when viewed from a distance. • The integral finish to the concrete panels would be practical for construction and reduce long term maintenance requirements.
Scour protection - Northern foreshore	Construction of the rock faced scour protection with roughly dimensioned sandstone blocks, loosely coursed, would create a more ordered and more attractive appearance. The spaces between the scour protection rocks would be planted, wherever possible, with sedges to minimise the hard visual appearance of the works.	• Reduce visual impact of structure. • Facilitate informal access to the river.
Bridge - safety barriers	Concrete 'Half Type F' barrier with twin steel rail.	• Minimise barrier depth. • Maximise views along the river reach. • Twin rail expresses a greater attention to detail than a single barrier.
Street lighting Required for the length of the new works.	Lighting to be minimised to meet requirements set out in AS1158. Ensure uniformity in size, height and spacing of lights. Use galvanised steel lightposts. Lighting for The Terrace and under the bridge to be confirmed with Council.	• Reduce visual dominance of the works, to retain semi-rural character.

Planting

The project would involve removal of a number of trees from the Thompson Square parkland area and the northern river foreshore. Most of the trees to be removed from Thompson Square are located in the lower part of the parkland. Most of these trees are exotic species and are of a mature to semi mature age. The majority of the mature trees located in the upper part of the parkland would be retained and protected.

New tree plantings would be provided in the lower part of the parkland after the cutting of Bridge Street has been filled in and re-graded. These new plantings would comprise similar species to those currently existing in the square and would complement the new parkland design by improving visual character and allowing views to the river.

The landscape design of the northern foreshore has been developed to create an open parkland setting that would assist in reducing the visual impacts of the new roundabout. These new plantings and the associated regrading of ground levels have been designed to extend the Macquarie Park character beyond its current boundary.

Replanting of the river embankments would be undertaken once the scour protection works have been completed. The river embankment plantings would comprise endemic species suitable for riverine environments that experience frequent flooding.

The plantings would be designed to integrate the new works into the existing landscape setting and to further define and reinforce the unique landscape character zones. The plantings would be designed to enhance the unique sense of arrival at Windsor (from both the north and the south) and strengthen the landscape character of Thompson Square. This requires striking a balance between screening the works from sensitive visual receivers and maintaining and enhancing key views and vistas.

Design measures for environmental impact management

As discussed above, an integrated design approach was adopted for project development, resulting an urban design and landscape strategy that aims to minimise adverse impacts on the heritage values of Thompson Square and the overall landscape and visual character of Windsor. The key design measures that have been incorporated into the concept design are identified in **Table 7-30**. .

Table 7-30 Concept design measures for environmental impact management

Project element	Concept design measures
The bridge: The replacement bridge would be a prominent feature in the landscape. During the design process, a number of decisions were undertaken to minimise the impact of the new structure.	• A design speed of 50km/h will allow the bridge level to be kept as low as possible relative to existing ground levels on the northern and southern approaches. • Selection of an incrementally launched bridge type will minimise the number of piers required, keeping views through and across the bridge as open as possible. • The selected bridge type will allow the structural members to be placed below the bridge deck level, which will minimise the 'bulk' and visual impact of the structure from surrounding elevated areas. • Selection of curved form will give the bridge piers a 'finer' less bulky appearance. • The placement and design of the bridge abutments will improve access along the river foreshore, which will provide better surveillance opportunities to deter vandalism and anti social behaviour. • The placement of vehicle barriers between the travel lanes and the shared pedestrian/cycle path will allow for the placement of a pedestrian railing on the outside of the bridge. This will create a visually 'finer' and more 'transparent' edge to the bridge.
Thompson Square: Reducing the impact of the project on the existing character of Thompson Square has been a high priority for this project.	• Direct access through and around Thompson Square will be provided by the infilling of the existing Bridge Street cutting, consolidating the parkland and providing a more direct connection down to the river. • Views across the upper area of Thompson Square have been maximised through the siting of the bridge approach road as close as possible to existing ground levels. • Improved pedestrian access will be achieved with the placement of traffic signals at the Bridge Street and George Street intersection
The Terrace and river foreshore: Enhancement of The Terrace as a shared zone along the river's edge providing access to the river.	• The removal of Bridge Street will allow The Terrace to be reconnected, facilitating pedestrian and cycle movements between the foreshore parklands. • Revegetation of the foreshores will assist in integrating the scour protection works on the foreshores. • The foreshore area will be rehabilitated with suitable riparian vegetation once the scour protection works would be constructed. • Construction of the rock faced scour protection with roughly dimensioned sandstone blocks, loosely coursed, will create a more ordered and more attractive appearance. • The spaces between the scour protection rocks will be planted, wherever possible, with sedges to minimise the hard visual appearance of the works.
Northern intersection: Integration of the northern intersection works into the existing character and adjoining land uses has been thoroughly considered as part of this project.	• Pedestrian and cyclist access will be provided around the intersection and under the abutment. • New tree planting will be undertaken in the area surrounding the roundabout works, reducing the scale of the works over time as the tree planting matures. • The design of the water quality basin will be refined to create a more natural form and its size reduced to the minimum operational size. It would be planted with native riparian species.

7.4.5 Construction, demolition and operational impacts

This section details the potential impacts of the project, including its construction and operational phases. The potential visual amenity, urban design and landscape impacts of the project would be largely associated with the overall changes to the landscape that would occur as a result of the project proceeding. As such, the impact assessment focuses on the potential impacts of the completed project.

Landscape character impacts

The results of the landscape character impact assessment are presented below for each of the three identified Landscape Character Zones. A summary of the results for all three zones is provided in **Table 7-31**.

Landscape Character Zone 1 – Thompson Square

The key impacts of the proposed works in Landscape Character Zone 1 are detailed below for each of the key attributes that make up the zone.

- Built form and heritage:
  - The existing Bridge Street road pavement would be removed, the cutting wholly or partially filled, regraded and landscaped.
  - Old Bridge Street would become the alignment for the new approach road to the replacement bridge and would experience a change in elevation.
  - The footprint and scale of the new road and infrastructure will be more physically and visually apparent than the existing road, despite the removal of other road infrastructure such as the small carpark.
  - The increased width of the new approach road would further separate the buildings on Old Bridge Road from the parkland.
- Connectivity and access:
  - Removal of the existing roundabout and replacement with a four way signalised intersection at the intersection of Bridge Street and George Street.
  - Removal of existing Bridge Street and Old Bridge Street north of George Street.
  - Construction of a new shared path along the western side of the new Bridge Street, linking to the replacement bridge and Macquarie Park on the northern foreshore.
  - Construction of a new pedestrian path along the eastern side of the new Bridge Street, linking to Windsor wharf carpark.
  - Connection of The Terrace to Windsor wharf.
  - Construction of new stairs adjacent to the bridge abutment and the Thompson Square road.
- Public domain:
  - Reunification of the Thompson Square parkland areas from George Street to The Terrace, which would provide a unified green open space.
  - Removal of some existing trees from within Thompson Square.
  - Elevated southern approach road abutment and the bridge over the Terrace would present a large physical and visual barrier between Thompson Square and the parkland adjacent to the wharf. Traffic would be a dominant physical presence.

- Construction and compound sites located at the two Council carparks would be surrounded by temporary fencing during construction. These sites would consist of temporary storage facilities, site buildings, stockpile areas and other facilities and would be dismantled progressively during works where possible and restored to their pre-construction state after construction.

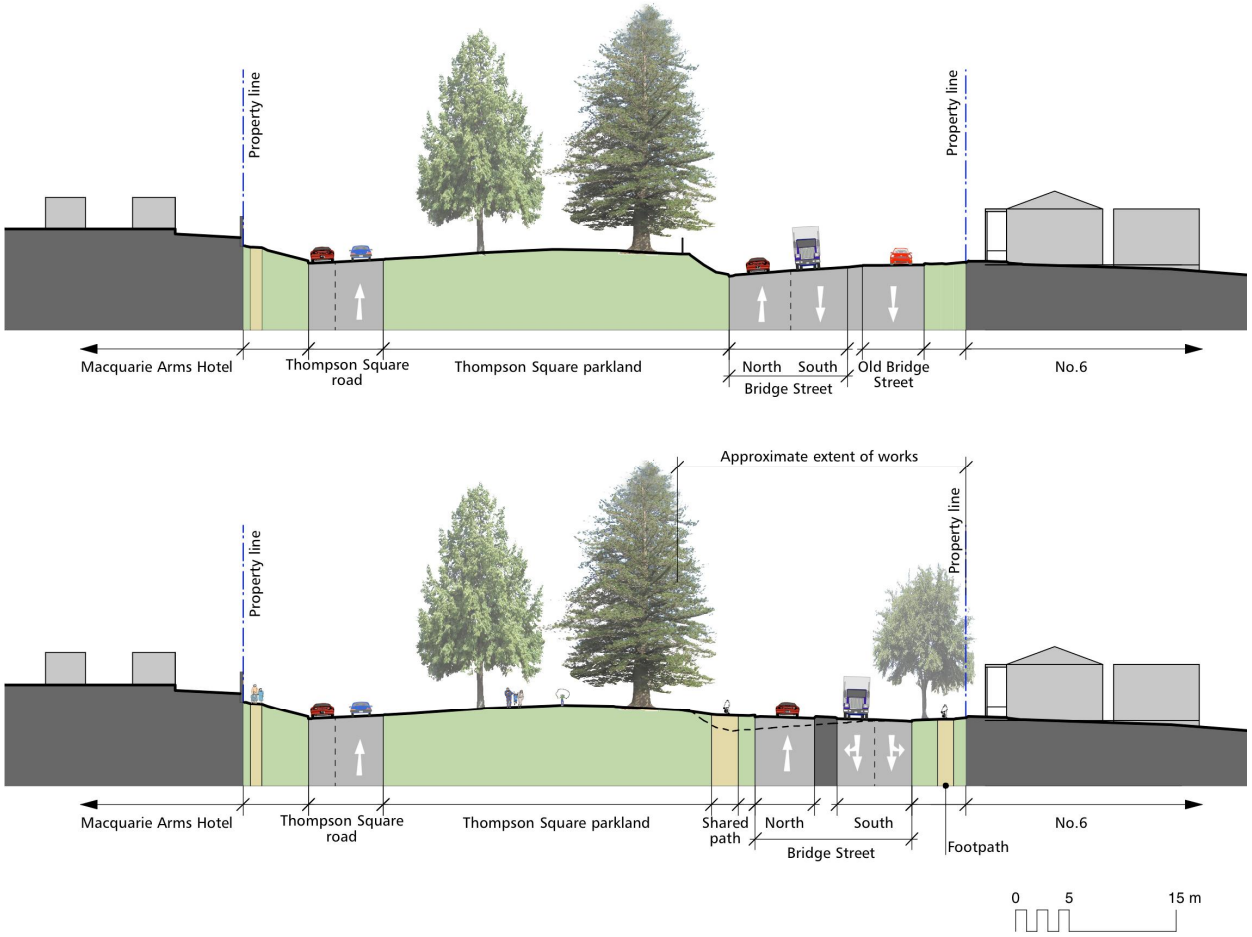
The cross sections in **Figure 7-25**, **Figure 7-26** and **Figure 7-27** show the relationship of the southern approach road and bridge abutment to lower Thompson Square and properties along Old Bridge Street. The long section along the centreline of The Terrace provides an indication of what the project would look like from the northern foreshore (see **Figure 7-28**).

The results of the landscape character impact assessment for Landscape Character Zone 1 are as follows:

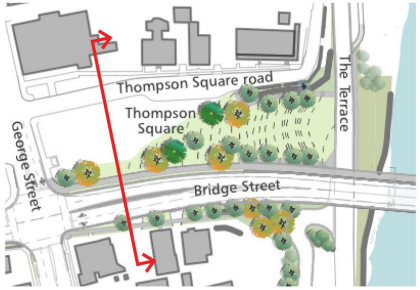
- **Sensitivity** – The sensitivity of Landscape Character Zone 1 is considered to be High due to its heritage values and the social, cultural and recreational values placed on it by the local community.
- **Magnitude** – The magnitude of change that would be imposed by the project on Landscape Character Zone 1 is considered to be High to Moderate given that the works would raise the height of the southern road approach to the bridge and visually separate the lower section of Thompson Square from Windsor Wharf. While the layout of the Thompson Square parkland would be consolidated by removal of the existing bridge approach road (Bridge Street), the footprint of the new approach road and its height at the abutment would be out of scale with the adjoining roads.
- **Landscape character impact** – Using the impact grading matrix (**Figure 7-19**), the landscape character impact of the project on Landscape Character Zone 1 is likely to be High.

Figure 7-23 Road area in Thompson Square – existing conditions

Figure 7-24 Road area in Thompson Square – future conditions



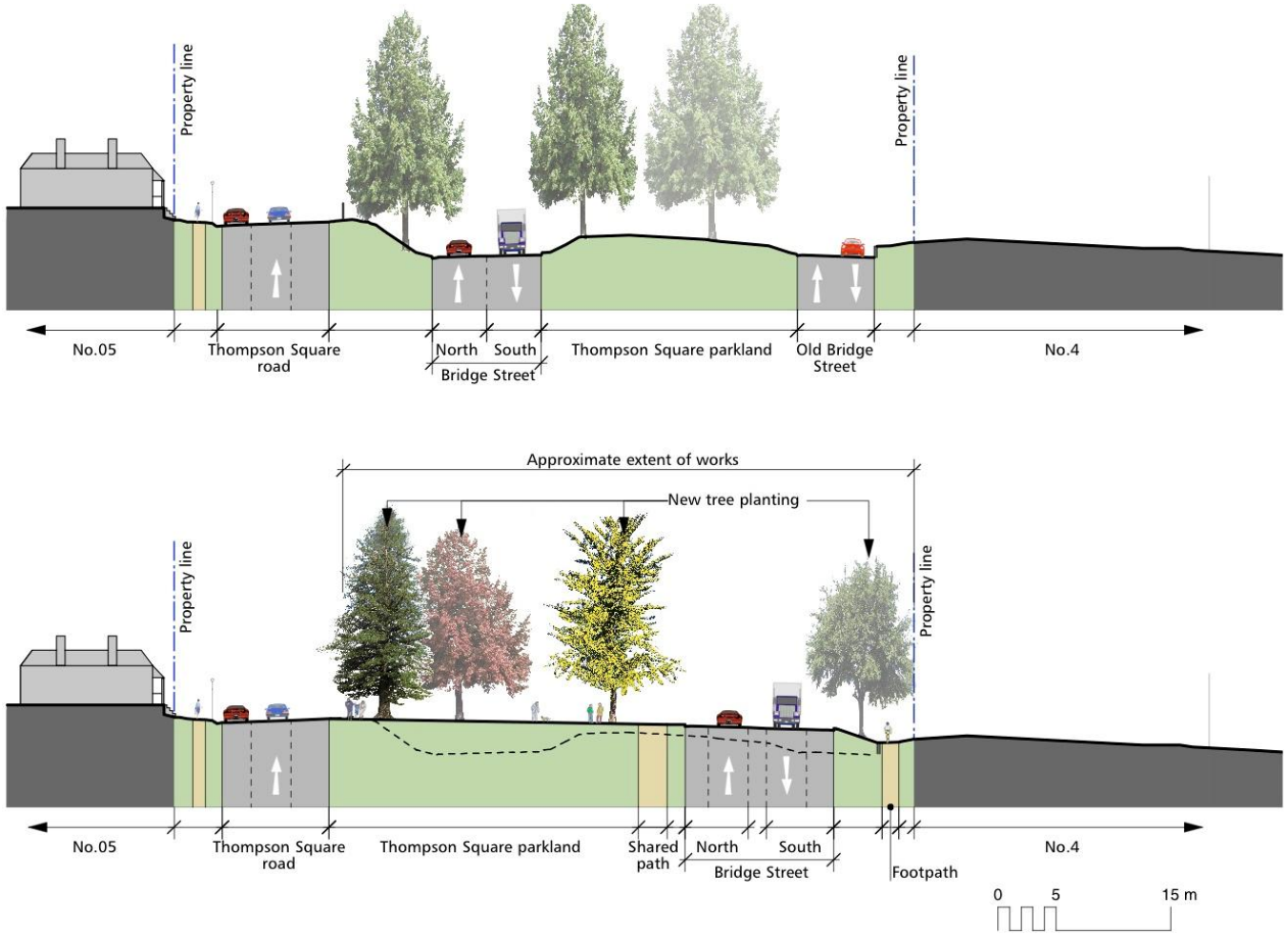
Existing conditions



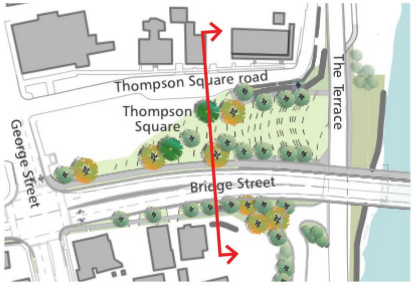
Cross Section B Location

After proposed works

Figure 7-25 Cross section of the project near the George Street intersection



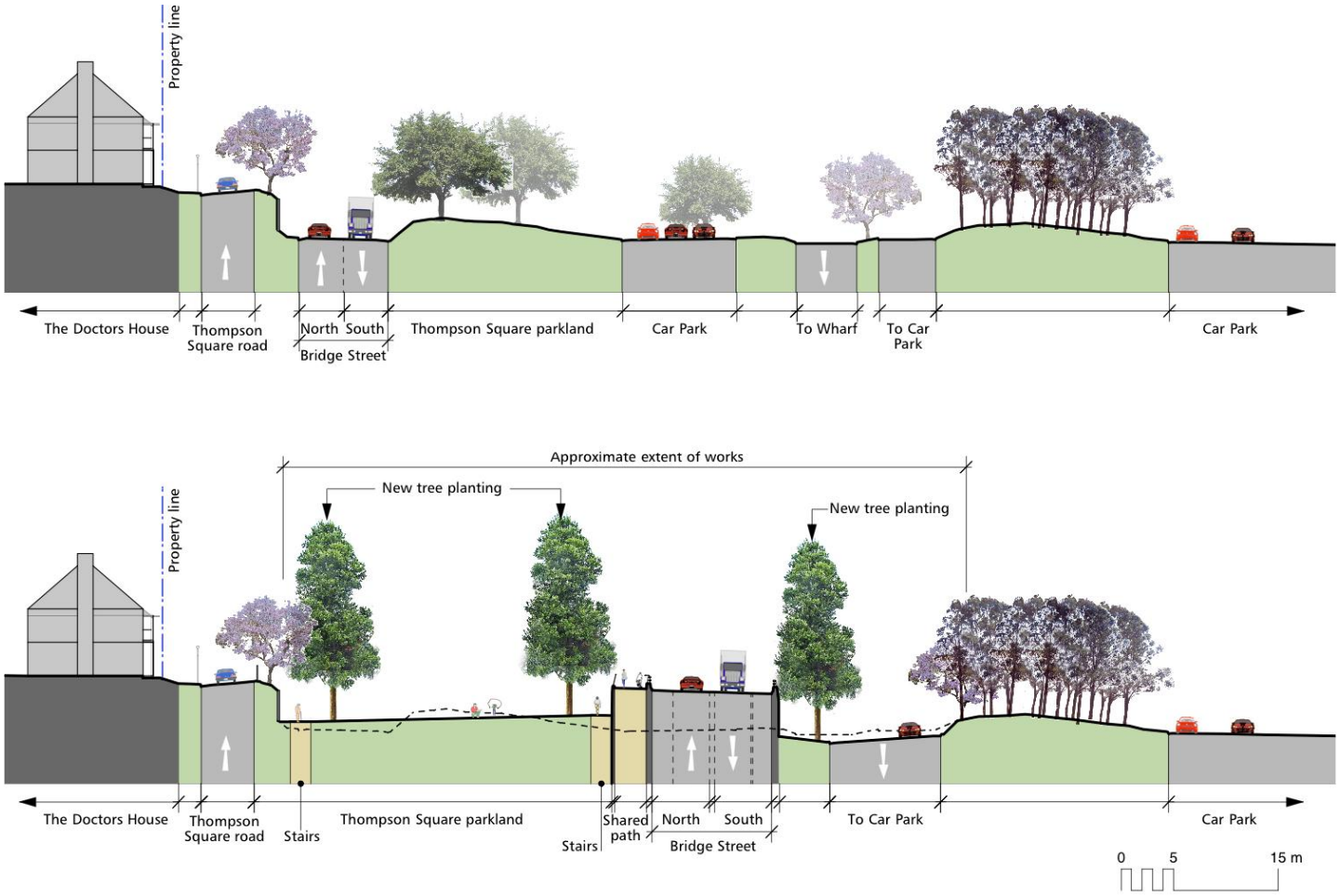
Existing conditions



Cross Section D Location

After proposed works

Figure 7-26 Cross section of the project at the southern approach road - midway



Cross Section F Location

Figure 7-27 Cross section of the project at the southern approach road – Doctors House

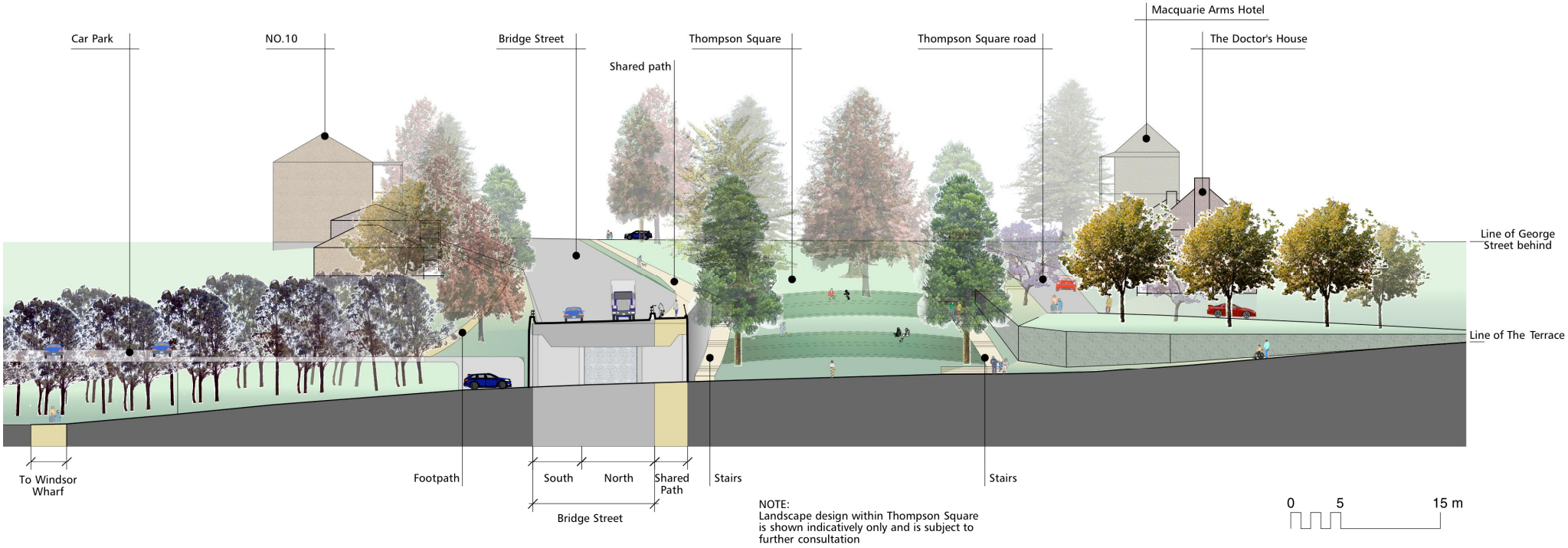


Figure 7-28 Long section of the project along The Terrace

Landscape Character Zone 2 – Hawkesbury River and banks

The key impacts of the proposed works in Landscape Character Zone 2 are detailed below for each of the key attributes that make up the zone.

- The bridge:
  - Removal of existing bridge deck, piers and abutments.
  - Construction of a new bridge about 35 metres downstream of the existing bridge. The new bridge would be about three metres higher and about nine metres wider than the existing bridge.
- The river:
  - Scour protection measures would be installed along the southern foreshore and around the bridge piers.
  - Removal of large areas of vegetation, particularly on the southern side of the river.
- Access and connectivity:
  - Construction of a shared pathway across the western side of the replacement bridge, linking Macquarie Park on the north to the Windsor town centre.
  - Redevelopment of the Terrace to improve connectivity.

During construction, temporary piers and pontoons would be constructed and land reclamation works for the construction of bridge piers may be necessary. Works would be removed following construction.

The results of the landscape character impact assessment for Landscape Character Zone 2 are as follows:

- **Sensitivity** – Due to the historic nature of the natural river setting and the generally flat topography of the surrounding area, particularly to the north, the zone is considered to have a High sensitivity.
- **Magnitude** – The project involves the placement of the existing bridge with a new bridge that is higher and wider. The replacement bridge would sit above the existing landform, making it a more dominant structure in the landscape. Scour protection works on the banks of the Hawkesbury River would also affect the river setting. The magnitude of change that would be imposed by the project on Landscape Character Zone 2 is therefore considered to be High to Moderate.
- **Landscape character impact** – Using the impact grading matrix (**Figure 7-19**), the landscape character impact of the project on Landscape Character Zone 2 is likely to be High.

Landscape Character Zone 3 – Wilberforce and Freemans Reach roads intersection

The key elements of the proposed works in Landscape Character Zone 3 are detailed below for each of the key attributes that make up the zone.

- Built form and heritage:
  - Construction of a new dual lane roundabout at the intersection of Wilberforce Road, Freemans Reach Road, the northern bridge approach road and the access road to Macquarie Park. Although the new roundabout and associated approaches would be at or close to existing grades, the footprint and scale would make this intersection a dominant feature in the rural landscape.
  - Removal of the existing northern approach road to the bridge and a section of Wilberforce Road.
  - Construction of a permanent water quality basin to capture and treat stormwater runoff from the bridge and northern intersection.
- Connectivity and access:
  - Construction of footpaths that would link Macquarie Park, the riverside and the northern side of Wilberforce Road.
- Public domain:
  - Exotic and native tree planting would be undertaken in the open space surrounding the roundabout to reduce the visual impact of the upgraded intersection.

During construction, land currently used as a turf farm located between Wilberforce Road and the Hawkesbury River would be used as the main construction and compound site. It would be surrounded by temporary fencing and would consist of storage facilities, stockpile areas, site buildings and other facilities. Following construction, or progressively during the works where possible, the site would be dismantled and restored to its pre-construction state. The results of the landscape character impact assessment for Landscape Character Zone 3 are as follows:

- **Sensitivity** – While comprising modified and open agricultural land, the zone has a scenic character that is enhanced by the vegetated entry to Macquarie Park. The sensitivity of this zone is therefore considered to be High to Moderate.
- **Magnitude** – The works increase the scale of the road infrastructure, alter existing access to properties and require minor earthworks to shape cut and fill embankments and the water quality basin. New tree planting would be undertaken in the area surrounding the road works, reducing the visual impact of the works. The magnitude of change that would be imposed by the project on Landscape Character Zone 3 is therefore considered to be Moderate.
- **Landscape character impact** – Using the impact grading matrix (**Figure 7-19**), the landscape character impact on Landscape Character Zone 2 is likely to be High to Moderate.

Summary of landscape character impact

While project impacts have been minimised to the extent possible during design development, overall the project would have an adverse impact on landscape character. The project is located in an established rural township that has high historical significance to the local community. The existing bridge dates from 1874 and sits comfortably within the scale of the landscape. Replacement of the existing bridge and upgrade of existing road infrastructure and it would have a substantial impact on all Landscape Character Zones in the study area due to the high sensitivity of the landscape and the relative scale of the works in comparison to existing bridge and road infrastructure. The replacement bridge would be of a larger scale than the existing bridge and would sit higher in the landscape. The project would result in the reunification of the two components of Thompson Square, which would change its existing character.

While the project would have a substantial impact on landscape character, some of the landscape character changes are likely to benefit the community and enhance the experience of visitors to the area in the long term. Changes that are considered to be beneficial are:

- Consolidation of open space within Thompson Square through the removal of the existing bridge approach road and connection of the upper and lower parklands.
- Connection of The Terrace along the river foreshore.
- Provision of improved pedestrian and cycle access. This includes access between Thompson Square and the river foreshore and across the bridge from Windsor to the northern foreshore and Macquarie Park. Pedestrian and cycle access would also be provided across Bridge Street at the George Street intersection.

Incorporation of the proposed visual and landscape environmental management measures would also aid in integrating the resulting changes within the existing landscape and minimise their impact on visual amenity and landscape character.

Table 7-31 Summary of landscape character impact assessment results

Landscape Character Zone (LCZ)	Sensitivity	Magnitude	Landscape character impact
LCZ1 – Thompson Square	High	High to Moderate	High
LCZ2 – Hawkesbury River and banks	High	High to Moderate	High
LCZ3 –Wilberforce and Freemans Reach roads intersection	High to Moderate	Moderate	High to Moderate

Visual impacts

The results of the visual impact assessment for the 18 identified viewpoints (refer to **Figure 7-20**) are summarised in **Table 7-32**. Of the 18 viewpoints assessed, five viewpoints have been identified as likely to experience a High visual impact, five viewpoints a High to Moderate visual impact, four viewpoints a Moderate visual impact, two viewpoints a Moderate to Low visual impact, and two viewpoints a Low visual impact. The areas that are considered likely to experience a High visual impact are as follows:

- Viewpoint 7 – Thompson Square looking north.
- Viewpoint 8 – Old Bridge Street, at the entrance to number six, looking north west.
- Viewpoint 9 – Thompson Square, adjacent to the Doctor's House, looking north.
- Viewpoint 11 – Small carpark near the intersection of Old Bridge Street and The Terrace, looking north west.
- Viewpoint 12 – Windsor Wharf, looking south west.

The areas where the potential for a High visual impact has been identified are generally located in open space areas, either close to the Hawkesbury River or within Thompson Square, where the sensitivity to visual change is high and existing views would be impacted by the replacement bridge.

Table 7-32 Key representative viewpoints and the potential visual impacts of the project

ID	Location	Description	Sensitivity	Magnitude	Impact
1	Western side of Bridge Street near shared path, opposite Court Street, looking north west. 	Viewpoint from the perspective of motorists, pedestrians and cyclists travelling north along Bridge Street. It addresses mid distance views to the intersection works at George Street.	Low - A substantial number of motorists would be affected by the changed view, but works would be undertaken within an existing road corridor within a commercial area, where sensitivity is considered low.	Low - The road would be slightly lowered at the George Street intersection. Traffic lights would replace the existing roundabout.	Low
2	George Street, at the intersection of Baker Street, looking north east. 	Viewpoint is from the perspective of a pedestrian walking east along George Street. It addresses mid distance views to the proposed intersection works at George Street.	Moderate - A moderate number of pedestrians would be affected by the changed view. There would be a substantial distance between viewers and the project.	Low - The road would be slightly lowered at the George Street intersection. Traffic lights would replace the existing roundabout.	Moderate to Low
3	George Street, 100 metres east of Bridge Street, looking south west. 	Viewpoint from the perspective of a pedestrian walking south west along George Street. It addresses mid distance views to the proposed intersection works at George Street.	Low - A small number of pedestrians would be affected by the changed view. There would be a substantial distance between viewers and the project.	Low - The road would be slightly lowered at the George Street intersection. Traffic lights would replace the existing roundabout.	Low

ID	Location	Description	Sensitivity	Magnitude	Impact
4	Seating area on south side of George Street, near Bridge Street intersection, looking north. 	Viewpoint from a pedestrian's perspective. It addresses foreground views to the works in Thompson Square and mid distance views to bridge works.	High - Thompson Square is of high scenic, social and heritage value to the community.	Moderate - The changes in Thompson Square, including the removal of a number of trees and the widened approach road to the replacement bridge would be highly visible. The new bridge may be visible following the removal of trees.	High to Moderate
5	Bridge Street, at the entrance to River Music, looking north west. 	Viewpoint from a pedestrian's perspective. It addresses foreground views to the works in Thompson Square and the road approaches to the replacement bridge.	High - A small number of pedestrians would be affected by the changed view. Thompson Square is, however, of high scenic, social and heritage value to the community.	Moderate - The existing two lane road would be replaced by a wider road with a raised concrete median. The eastern verge would be reduced, the northbound lane raised, and the embankment regraded to accommodate a 3m wide path. Some trees would be removed. Filling, regrading and landscaping of Bridge Street would reduce the extent of the road surface in this view.	High to Moderate

ID	Location	Description	Sensitivity	Magnitude	Impact
6	Thompson Square, at the entrance to Macquarie Arms Hotel, looking north. 	Viewpoint from the perspective of a pub patron in the beer garden and passing pedestrians. It addresses foreground views to the works in Thompson Square and the road approaches to the replacement bridge.	High - A small number of pedestrians and pub patrons would be affected by the changed view. Thompson Square is, however, of high scenic, social and heritage value to the community.	Moderate - The existing Bridge Street cutting would be filled and the land slightly regraded. The existing white post, rail fence and a number of small/ medium trees would be removed. The abutments to the road approach to the bridge would be visible through the trees. Views to vehicles on the new approach road would be more prominent as the road matches existing levels for a greater distance.	High to Moderate
7	Thompson Square looking north. 	Viewpoint from a park user's perspective. It addresses foreground views to the works in Thompson Square and the road approaches to the replacement bridge.	High - Park users would be affected by the changed view. Thompson Square is of high scenic, social and heritage value to the community.	High to Moderate – The amount of road pavement would be reduced and the upper and lower parklands connected. The white post, rail fence and a number of small to medium trees would be removed. The widened approach road and abutment would be prominent in this view, partially blocking views to the river.	High

ID	Location	Description	Sensitivity	Magnitude	Impact
8	Old Bridge Street, at the entrance to number six, looking north west. 	Viewpoint from a pedestrian's perspective. It addresses foreground views to the works in Thompson Square and the road approaches to the replacement bridge.	High - A small number of pedestrians would be affected by the changed view. Thompson Square is, however, of high scenic, social and heritage value to the community.	High - Existing two lane road would be replaced by a wider road with a raised concrete median. The eastern verge would be reduced, the northbound lane raised, and the embankment regraded to accommodate a 3m wide path. Some trees would be removed. Views of the river would be obscured by the abutment rising above the existing grade. The site compound in the council carpark would be visible during construction.	High
9	Thompson Square, adjacent to the Doctor's House, looking north. 	Elevated viewpoint from a pedestrian's perspective. Addresses foreground views to the works in lower Thompson Square and removal of the existing bridge, and mid distance views to road works on the northern side of the river, scour protection works on the northern bank and the replacement bridge.	High - A small number of pedestrians would be affected by the changed view. Thompson Square is, however, of high scenic, social and heritage value to the community.	High - Existing two lane bridge and approach road would be removed. The Terrace would be reinstated along the southern bank. The replacement bridge, larger in scale and higher than the existing bridge, would be clearly visible due to the removal of some existing trees along the foreshore. Scour protection works on the northern foreshore would also be visible. During construction, the temporary construction facility on the turf farm and any temporary works on the river would be visible.	High

ID	Location	Description	Sensitivity	Magnitude	Impact
10	Pedestrian path, north side of The Terrace, opposite Baker Street, looking north east. 	Viewpoint from a park user's perspective. It addresses foreground views to the works.	High to Moderate - A moderate number of pedestrians would be affected by the changed view. The riverfront public path has high scenic value.	Low - The removal of the approach road to the existing bridge and the existing bridge would be visible through foreshore vegetation. The existing path would link to the upgrade of The Terrace. Some vegetation would be removed for scour protection works.	Moderate
11	Small carpark near the intersection of Old Bridge Street and The Terrace, looking north west. 	Viewpoint is from the perspective of a motorist and a pedestrian. It addresses foreground views to the works.	High - Only a small number of viewers would be impacted but the viewpoint has high scenic and cultural values.	High - The location of this viewpoint would be covered by the new bridge abutments, resulting in a completely altered view. The existing two lane bridge would be removed. Scour protection works undertaken to both sides of the river would be highly visible. Trees would be removed on foreshore areas during scour protection works.	High
12	Windsor wharf, looking south west. 	Viewpoint from a pedestrian's and wharf user's perspective. It addresses foreground views to the bridge works.	High - Viewpoint has high scenic values.	High - The existing two lane bridge would be removed. The replacement bridge, larger in scale and higher than the existing bridge, would be clearly visible due to the removal of some existing trees along the foreshore. Scour protection works on the southern foreshore would also be visible.	High

ID	Location	Description	Sensitivity	Magnitude	Impact
13	Pedestrian path at Howe Park, looking north east. 	Viewpoint from a pedestrian's perspective. It addresses mid distance views to the bridge works.	Low to Moderate - Low number of pedestrian viewers. Work elements are distant from viewpoint and would be partially screened by existing trees.	Moderate - The removal of the existing bridge and replacement with a new bridge sitting above the existing landform would be visible.	Moderate to Low
14	Picnic shelter near the playground at Governor Phillip Park, looking south west. 	Viewpoint from a pedestrian's perspective. It addresses mid distance views to the bridge works.	High to Moderate - Popular public park. Work elements are distant from viewpoint.	Low - The removal of the existing bridge and replacement with a new bridge sitting above the existing landform would be visible through existing vegetation.	Moderate
15	Governor Phillip Park, north of carpark, looking south west. 	Viewpoint from a pedestrian's perspective. It addresses mid distance views to the bridge works.	High to Moderate - Popular public park. Work elements are distant from viewpoint.	Moderate to Low - The removal of the existing bridge and replacement with a new bridge sitting above the existing landform would be visible.	Moderate

ID	Location	Description	Sensitivity	Magnitude	Impact
16	Macquarie Park, near picnic shelter, looking north east. 	Viewpoint from a park user's perspective. It addresses foreground views to the northern approach road works.	High to Moderate - Park has high scenic values but view corridor is narrow.	Low - The approach road to the existing bridge would be removed and the cut embankment filled and regraded. The entry road would be extended to link with the proposed roundabout. New tree planting in the area surrounding the roundabout would be visible. Existing tree planting in the foreground screens the extent of the view.	Moderate
17	Wilberforce Road, west of Freemans Reach Road intersection, outside residence, looking south. 	Viewpoint from the perspective of the residence and motorists as they approach the existing bridge. It addresses foreground views to the northern approach road, roundabout, and bridge works.	High to Moderate - Close proximity to heritage listed residential dwelling 'Bridgeview'.	High to Moderate - Increased road pavement and infrastructure in the form of the roundabout linking Wilberforce Road, Freemans Reach Road, the proposed bridge and Macquarie Park access road. The existing road would be removed and the area regraded, turfed and planted. Shared paths would be located in this parkland area. The new bridge would be visually prominent from this location.	High to Moderate

ID	Location	Description	Sensitivity	Magnitude	Impact
18	Wilberforce Road, east of Freemans Reach Road intersection, outside agricultural building, looking south. 	Viewpoint from the perspective of turf farm workers. It addresses foreground views to the northern approach road, roundabout, and bridge works.	Moderate - A small number of turf farm workers in a working environment would have the potential to be affected. Motorists travelling on Wilberforce Road would have an attractive view of Windsor, however, they would be travelling at a moderate speed.	High to Moderate - Increased road pavement and infrastructure in the form of the roundabout linking Wilberforce Road, Freemans Reach Road, the new bridge and Macquarie Park access road would be visible. The existing road would be removed and the area regraded, turfed and planted. Shared paths would be located in this parkland area. The new bridge would be prominent from this location. The temporary construction facility on the turf farm site would also be visible during construction,.	High to Moderate

Overshadowing

This section considers the potential overshadowing impacts of the replacement bridge on the public domain areas of Thompson Square, the Hawkesbury River waterway, the northern foreshore and adjoining private properties.

Background

The shadow cast by the existing bridge is restricted to the water directly under the bridge and the pedestrian stairs under the southern abutment due to its relatively low elevation above the river. Early morning and late afternoon shadows extend beyond the footprint of the bridge over the river, although the numerous trees growing along both foreshores and in the adjoining parklands mostly cast their shadows over the river and the bridge.

The replacement bridge would, by contrast, cast a larger and more obvious shadow across the water and the foreshore areas around the abutments due largely to the increased elevation and width of the new structure. The areas affected by overshadowing would include the lower areas of Thompson Square and the adjoining areas along the southern foreshore; areas of the northern foreshore adjacent to the bridge abutment, and the river itself. Overshadowing diagrams for morning, midday and the afternoon in summer and winter are presented in **Figure 7-29**.

Thompson Square and the adjoining foreshore

The overshadowing from the replacement bridge would start where the southern approach road becomes elevated as it approaches the abutment. The lower areas of Thompson Square closer to the river foreshore would be affected by overshadowing in the early morning during winter when the sun's angle is low and in the north eastern sky. Overshadowing of a very small section of the parkland would occur in summer, although the majority of the parkland would not be overshadowed and park users would therefore have access to sun in other areas of the parkland.

The section of The Terrace and adjoining foreshore which would be located directly beneath the replacement bridge, immediately adjacent to the abutment, would be in deep shadow for extensive periods of the day during all seasons.

The existing vegetation, when combined with mature replacement tree planting, proposed as a part of the concept for the project, would substantially increase the amount of shading of the river and both foreshores. Given the climate in Windsor, summer shading is considered to be a positive attribute of the landscape strategy.

Adjoining private properties

The private property closest to the proposed abutment, Number 4 Old Bridge Street, could potentially be affected by some overshadowing from the replacement bridge in the late evenings as the sun is setting (see **Figure 7-29**). The area of the property most likely to be affected would be the garden area below the house and closest to the river foreshore. Trees growing along the foreshore and the adjoining car park, would also cast shadows around this time over the lowest parts of this garden. Overshadowing effects of the replacement bridge on this property are unlikely to substantially affect the use of this garden area.

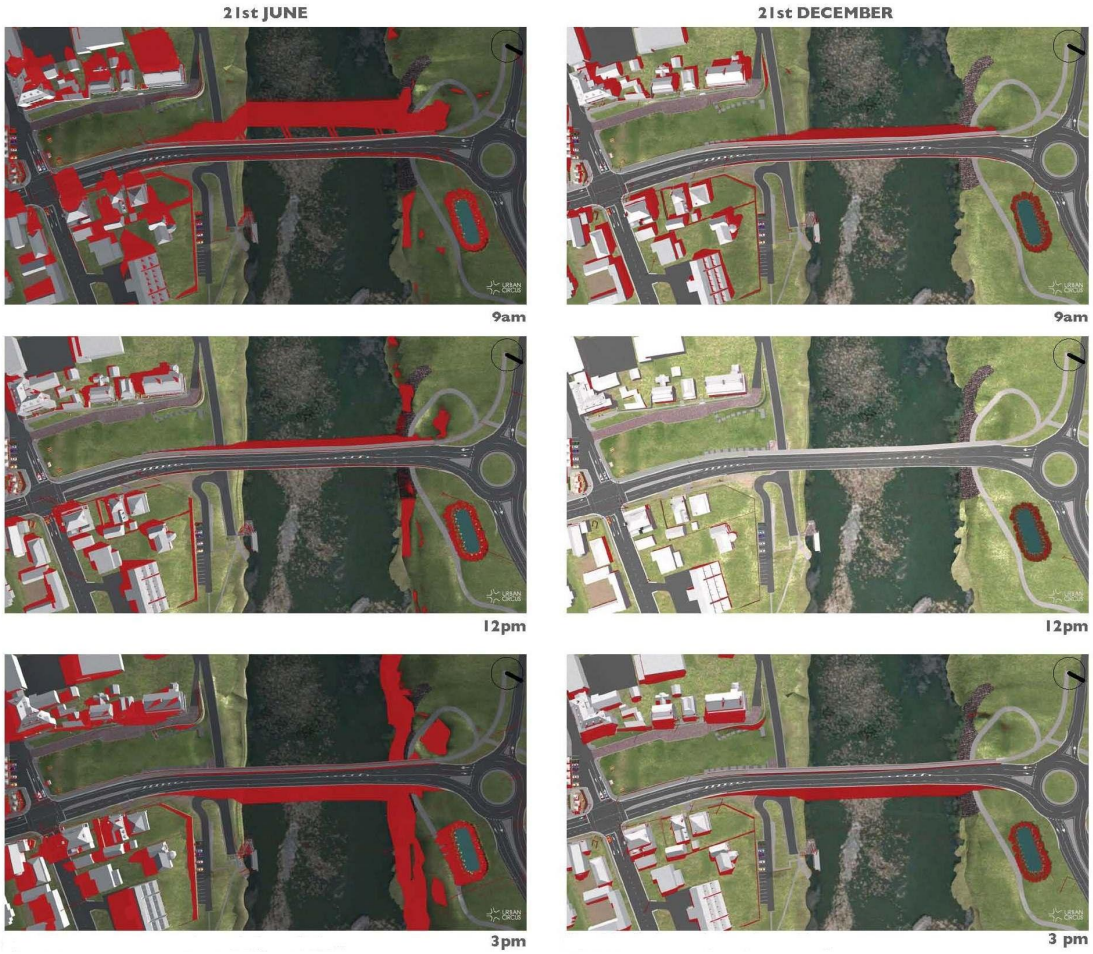


Figure 7-29 Overshadowing diagrams

The northern foreshore

Although the replacement bridge would be slightly wider at the northern end than the southern end, the lower clearance at the northern end, combined with the approach road at grade, would result in less overshadowing. Overshadowing of the northern foreshore and would be mainly restricted to underneath the bridge and an area either side. The longest shadows would occur in winter during the early morning when the area to the west of the abutment would be in shadow. These overshadowed areas would be used by pedestrians and cyclists accessing other recreational areas, rather than being a likely place where pedestrians or cyclists would stop.

The river

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

The public wharf currently provides the only stationary activity over the water in this location and whilst the replacement bridge would be closer to the wharf than the existing bridge, it is not likely to affect the wharf activities due to overshadowing, as this would occur only in the very late afternoon. Boating is unlikely to be affected by the overshadowing from the replacement bridge.

Summary of overshadowing impact

Overshadowing impacts would be mainly confined to areas directly under and adjacent to the replacement bridge. Generally these overshadowed areas are transitional locations with the users likely to be moving between other elements of the landscape – rather than locations of activity or interest.

Overshadowing of a small area of lower Thompson Square parkland immediately west of the replacement bridge and southern approach road would occur, with the highest area of over shadowing occurring on winter mornings. However, overall the overshadowing impact of the replacement bridge on the Thompson Square parkland and other key areas would be minor and transitory.

Summary of project impacts

Overall, the project would have an adverse impact on landscape character due to the introduction of dominant bridge and road elements that have greater footprint and scale in comparison to the existing bridge and road infrastructure. The project would also have a substantial impact on some views, particularly viewpoints within open space areas close to the Hawkesbury River or within Thompson Square. Overshadowing impacts are not expected to be substantial, given that most overshadowing occurs in transitory areas.

The project would, however, also result in long term benefits to the community and the enhancement of experiences within the area. Reunification of Thompson Square parkland areas would provide a larger usable open space for the community and visitors, while reinforcing its existing successful connection with George Street. Improved pedestrian and cycle connectivity through formal pathways would link previously isolated foreshore and parkland areas. The reunification of Thompson Square combined with improved pedestrian and cycle connectivity to and along the river southern foreshore, George Street and Macquarie Park would facilitate opportunities to further develop the area's cultural and recreational functions.

7.4.6 Environmental management measures

Throughout the concept design development process, urban design and landscape objectives and principles (refer to **Section 7.4.3**) have been iteratively considered with the aim of integrating the project within the existing historical and scenic landscape of Windsor. As a result, a number of potential adverse visual and landscape impacts have already been avoided or reduced as part of the concept design development process. The resulting concept design, incorporating the proposed urban design and landscape concept (refer to **Section 7.4.4**), aims to protect and enhance as far as practicable the existing visual character of the Windsor township, the Hawkesbury River and its floodplain. The measures that have already been incorporated into the concept design to reduce and manage environmental impacts are summarised in **Table 7-30** (refer to **Section 7.4.4**).

This section describes the additional environmental management measures that would be implemented during the detailed design and construction phases of the project, should the project be approved. The measures have been developed in accordance with the urban design and landscape objectives and principles identified in **Section 7.4.3**.

Construction measures

The following additional measures would be applied during the construction phase:

- Construction facilities will be contained within the construction works zone boundary and occupy the minimum area practicable.
- During construction, suitable barriers will be provided to screen views from adjacent areas.
- Temporary construction facilities and compound areas will be returned to their pre-construction state or better, either at the completion of the construction phase or progressively throughout the construction period where possible and practicable.
- Pollution and dust will be kept to a minimum through the application of pollution management measures and monitoring (refer to **Section 7-10**).
- Footpaths that will be affected by construction activities would be temporarily diverted to maintain suitable alternative access routes for pedestrians.
- Existing trees within construction area and compounds that do not need to be removed will be identified, protected and maintained throughout the construction period.
- Temporary lighting will be screened or diverted to reduce unnecessary light spill.
- Heritage items will be protected and managed in accordance with the measures identified in **Section 7.1.5**.
- Material used for temporary land reclamation will be removed once the works are complete.

Detailed design measures

It is recognised that further design development and refinement would be undertaken following approval of the project. As part of this detailed design process, the measures summarised in **Table 7-33** would be implemented with the aim of further reducing the adverse impacts of the project as far as practicable. Further consultation with the community, Hawkesbury City Council and other government stakeholders would be undertaken at this time to obtain their input to the detailed design.

Table 7-33 Detailed design management measures

Project element	Detailed design management measure
The bridge The new bridge would be a prominent feature in the landscape. During the detail design process, further measures would be examined to reduce the impact of the new structure on the area.	• Refinement of the bridge, its abutments and constituent parts and details to ensure a high quality outcome in response to its prominence within the Hawkesbury River's landscape setting and the township of Windsor. • Lighting design would be refined to integrate with the design and character of the bridge, approach roads and public domain, with consideration of minimising potential impacts associated with light spill and glare.
Thompson Square Reducing the impact of the project on the existing character of Thompson Square would be considered in greater detail during the detail design phase.	• Further consultation would be undertaken with Hawkesbury City Council and other relevant stakeholders to develop an urban design, landscape and open space use plan for Thompson Square and adjacent areas on the southern foreshore. • The concept design of Thompson Square presented in this proposal would form the basis for ongoing consultation. • 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. • Review the potential benefits of locating the shared path on the eastern side of the proposed bridge to increase the area of green space in Thompson Square. • New tree planting would be consistent and complement the existing species that are to be retained. Planting locations would facilitate direct views to the river and screen the replacement bridge where possible. • Any new lighting would strike a balance between illumination for safety and the context of the parkland and adjoining areas.
The Terrace and river foreshore Further refinement of the re-connection of The Terrace along the river's edge would be considered in the detail design phase.	• Further consultation would be undertaken with Hawkesbury City Council to develop an urban design, landscape plan for the southern foreshore and adjacent areas. • Further design refinement of The Terrace and foreshore area to achieve high quality public access and amenity along the river's edge and to the river, including the appropriate provision of lighting where required. • Detailed design of the form, materials and finishes of the foreshore retaining wall would be undertaken to maximise the integration of the wall into the river setting. • Consideration would be given to the design of The Terrace roadway including materials and form and to integrate it into the surrounding parkland. • New tree, shrub and groundcover planting would be incorporated in the foreshore areas to enhance the parkland setting and views to the river.

Project element	Detailed design management measure
The northern foreshore and intersection Integration of the northern intersection works into the existing character and adjoining land uses would be considered in greater detail during the detail design phase.	• Further consultation would be undertaken with Hawkesbury City Council to develop an urban design, landscape plan for the northern foreshore and adjacent areas. • Further design refinement would be undertaken to improve the integration of the northern intersection responding to its location and role as the northern arrival point to Windsor and Macquarie Park • Safe pedestrian and cycle connections throughout the project and links with existing path network within Macquarie Park would be further examined. • Appropriate provision for lighting would be considered and lighting infrastructure utilised only where required.
Pedestrian and cycle access Further refinement of the pedestrian and cycle access will occur in the detail design phase.	• Further consultation would be undertaken with Hawkesbury City Council to develop a pedestrian and cycle access plan for the project and the surrounding area, in order to integrate the pedestrian and cycle connections into the surrounding network.