Duplication of Tourle Street Bridge and Cormorant Road, Kooragang

Urban Design, Landscape Character and Visual Impact Assessment

Written: JG / AG

Checked: JG

James Mather Delaney Design Pty Ltd
Landscape Architects
ABN 30 128 554 638

190 James Street
Redfern NSW 2016
Australia

T +61 2 9310 5644
F +61 2 9319 4858
info@jmddesign.com.au
www.jmddesign.com.au
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Tourle Street Bridge and Cormorant Road - Urban Design, Landscape Character and Visual Assessment
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1 Background

1.1 Introduction

JMD Design has been commissioned by the Road and Maritime Services to prepare an Urban Design, Landscape Character and Visual Impact Assessment Report. The purpose of the assessment is to identify and summarise the likely potential visual impacts and outline mitigation measures to assist in the development of an integrated engineering and urban design proposal for the Tourle Street and Cormorant Road duplication (the proposal). The proposal consists of a duplication of Tourle Street and Cormorant Road Kooragang. The total length of the proposal is approximately 3.8 kilometres including duplication of the existing Tourle Street bridge. (see Figure 1.2)

Tourle Street and Cormorant Road form the main corridor connecting Kooragang Island to Newcastle and the southern section of the Port of Newcastle. Demand for the widening of Tourle Street and Cormorant Road has arisen due to growth in traffic volume in the last 5-10 years and the expected increase in commercial, industrial, and domestic traffic using the route. As a result there is the need for improved transport links to the Port of Newcastle, The RAAF Base, Williamtown-Newcastle Airport and other important surrounding land uses.

1.2 Purpose of the Report

The purpose of this report is to ensure that the proposal is considered from a holistic design viewpoint. This is achieved by mapping the existing landscape character, visual and scenic qualities of the site and surrounding areas and analysing this information which then informs the overall design. Although the additional bridge and road upgrade are relatively straightforward it is still necessary to establish landscape and design strategies to assist with ongoing design development.

1.3 Site Context

Tourle Street Bridge and Cormorant Road are located north of the Newcastle CBD on the lower Hunter River floodplain. Cormorant Road runs along the south of Kooragang Island which is located in the Hunter River of New South Wales (see Figure 1.1). Tourle Street Bridge extends across the south arm of the Hunter River and provides an important connection between Newcastle and Kooragang Island and further north to Williamtown Airport and the popular tourist areas of Nelson Bay and Port Stephens. Tourle Street and Cormorant Road are currently two-lane undivided arterial roads providing for local and regional car and truck movements.

The Tourle Street Bridge that now stands was built to replace the old Bridge in May 2009. The demolition of the previous bridge was completed as part of this previous project in September 2010.
Figure 1.2: Site map
Source: Nearmaps, 2013
1.4 Project Description

The key features of the proposal are as follows:

- Duplicating Tourle Street Bridge adjacent to the western side of the existing bridge.
- To widen Tourle Street on the southern approach to the bridge from Tourle Street Bridge from approximately 350m north of the Industrial Drive intersection.
- To widen Cormorant Road on the northern approach to the bridge through to approximately 200m West of Egret Street on Kooragang Island. This would replace a two lane road with a four lane road, for a length of approximately 3.8km.
- As the proposal lies within the lowlands of the south channel of the Hunter River filling and extending the earthworks would be required.

1.5 Methodology

The methodology employed to undertake this landscape and visual assessment involved the following tasks:

**Stage A: Existing Context Analysis**

- Site visit and detail site survey and photography from various view points along the road
- Review of available studies or previous works
- Review of topographic maps and aerial photography
- Prepare site analysis diagrams for context, topography and hydrology, soils and contamination, ecological characteristics, heritage, infrastructure environment, vehicle, cyclist and pedestrian movement and major industrial features.

**Stage B: Urban design Objectives and Principles**

- Describe the urban design objectives and principles
Stage C: Landscape Character and Visual Impact Assessment

LANDSCAPE CHARACTER
- Describe the existing Landscape character zones.
- Assess the overall impacts of the proposal on the areas built, natural and cultural character.
- Review the proposal to determine the visual impact on landscape elements:
  VISUAL IMPACT
- Describe the visibility of the proposal area as it exists currently
- Visual assessment: describe the impact the proposal will have on views from surrounding areas.

Stage D: Concept Design

- Describe the current proposed concept design.
- Suggest ways to refine the concept to address the impacts on landscape character and views of the site.

Stage E: Mitigation Strategies

- Provide recommendations for the proposal to reduce impacts and maximise design outcomes.

Figure 1.4: Methodology Diagram
Source: RMS 2013
2 Existing Context Analysis (Stage A)

The existing environment needs to be understood to determine the level of impact the proposal will have on both the landscape character and the visibility of the proposal from surrounding areas. All relevant aspects of the site including context, topography, hydrology, soils and contamination, flora and fauna, heritage, infrastructure, cyclist and pedestrian movements, and major industrial features have been reviewed to determine the possible implications of the design of the proposal.

2.1 Context

The proposal stretches along Cormorant Road and Tourle Street for a distance of 3.8km (see Figure 2.1). The land directly adjacent to the proposal varies from highly disturbed industrial lands to more sensitive remnant vegetation communities. Adjacent to Tourle Street on both sides of the southern approach to the bridge are grass verges and a buffer of dense weedy planting to screen the industrial uses beyond. The Tourle Street Bridge then connects Tourle Street to Cormorant Road. Adjacent to Cormorant Road at the western end is Long Pond (a constructed wetland) to the north and Mangroves to the south. At the eastern end of the proposal there are planted mounds to the north and a grassed verge to the south.

The areas surrounding the proposal have a mainly industrial use (see Figure 2.2). Numerous industrial activities occur in this district but the most dominant is the coal exporting which utilises the Hunter River and its deep water port. The Port of Newcastle covers approximately 265 hectares of land on Kooragang Island and a similar portion of land on the opposite bank south of the Hunter River (see Figure 2.1). Cormorant Road runs adjacent to the port activities on Kooragang Island.

IMPLICATIONS FOR DESIGN

The surrounding land uses, directly adjacent and further afield, impact the landscape character of the proposal.
Figure 2.2: Site Context: Surrounding land use
Source: Nearmaps, 2013
Parsons Brinckerhoff Australia Pty Limited, 2012
2.2 Topography and Hydrology

2.2.1 Topography

Heading north from Industrial Drive, Tourle Street rises up to a crest before dipping down to a low point, it then rises slightly again on the approach to the bridge. The Tourle Street Bridge is raised with a minimum 3.3m navigation clearance of the river. On the northern side of the Tourle Street Bridge Cormorant Road lies within the lowlands associated with the south channel of the Hunter River and is approximately 2m to 3m above sea level (AHD) along the northern approach onto the Tourle Street Bridge (Parsons Brinckerhoff Australia Pty Ltd, 2012).

Implications for Design

The undulating nature of Tourle Street means that at its low point the proposal is hidden from view, especially where embankments are located. The flat topography of the lowlands, on which Cormorant Road is located, means views of the proposal are limited. These flat areas contribute to the landscape character and provide space on which to widen the road.

2.2.2 Hydrology

The proposal spans across the Southern arm of the Hunter River and then continues adjacent to its northern bank (see figure 2.3). At Tourle Street Bridge, the Hunter River is approximately 230m wide and is typically 3m deep. The south arm of the Hunter River is shallow in places but artificially deep in others due to dredging for large ship navigation. Water quality in the river is typically influenced by stormwater inflows, frequency of ship movement and contaminated sediment within the estuary (Parsons Brinckerhoff Australia Pty Ltd, 2012).

Road runoff on Tourle Street drains to existing low points where it ponds on both sides of Tourle Street. Road runoff along Cormorant Road flows either north into the Long Pond at the western end or into existing table drain at the eastern end. To the south Cormorant Road flows into low lying areas and then into the Hunter River.

Implications for Design

Views of the river make a strong contribution to the landscape character of the area and should be maintained as part of the proposal. The proposal could possibly have a visual impact on the constructed ponds. The road drainage should consider increased runoff from the wider road pavement and assess potential impact on the wetlands, with appropriate mitigation measures as required. This may include treatments such as additional vegetation on the edge of the Long Pond to filter road runoff.

Figure 2.3: Southern arm of the Hunter River.
Figure 2.4: Soils

Source: Nearmaps, 2013
Parsons Brinckerhoff Australia Pty Limited, 2012
2.3 Soils and Contamination

Reference to the Newcastle Soil Landscape Series Sheet 9232 in Parsons Brinckerhoff Preliminary Environmental Investigation report indicates that the majority of the site is located on ‘Disturbed Terrain’ Landscapes (see Figure 2.4). This is a result of the agricultural land use, long-term land reclamation and waste disposal activities that have taken place on Kooragang Island in the past (see section 2.5 Heritage). The soil may include man made fill, silt and clay from unknown sources.

IMPLICATIONS FOR DESIGN
There is potential for the proposal to be designed using retaining walls through the cutting south of Tourle Street Bridge to limit potential disturbance to contaminated soils. Where fill is required it should match original soil profiles and be free of contaminated soils and acid sulphate soils in order to allow the establishment of endemic vegetation communities as part of the visual mitigation measures.

2.4 Ecological Characteristics

The edges of the existing Tourle Street and Cormorant Road are thought to be generally disturbed from previous land uses and are mostly constructed and dominated by weedy regrowth. However, some surrounding areas have naturalised and now provide important habitat for a few endangered species.

2.4.1 Flora

The majority of vegetation along Tourle Street is full of weedy regrowth while the vegetation along Cormorant road varies. The vegetation on the northern side of Cormorant Road is in a disturbed condition at the eastern end but is of better condition at the western end where the Long Pond wetland is located (see Figure 2.5). This wetland exists as a result of previous industrial site works but is now classified as a ‘Freshwater Wetlands’ which is listed as an endangered ecological community. An endangered plant species, Zannichellia palustris, also occurs in the pond (see figure 2.13). The vegetation south of Cormorant Road is, again, in a disturbed condition at the eastern end but at the western end has some remnant mangroves (Mangrove-Estuarine Complex community) (see Figure 2.6), wetland and rushland environments (see Figure 2.7).

IMPLICATIONS FOR DESIGN
The widening of both Tourle Street and Cormorant Road are likely to disturb vegetation communities adjacent to the road thus impacting the landscape character and the visibility of the proposal. The Mangrove Estuarine Complex is most at risk as Cormorant Road is widening predominately to the south into the mangroves in order to minimise potential impacts on the Long Pond to the north. Regeneration of affected mangrove communities should form part of the landscape mitigation measures.

2.4.2 Fauna

Long Pond has been identified as a potential breeding habitat for the Green and Golden Bell Frog and is used by many threatened species of water birds (White-fronted chat, Lesser Sand-plover, Curlew Sandpiper and Little Eagle).

Occurrence of threatened species of bat and a few migratory species of bird have been noted in the remnant mangrove habitats down the western end of Cormorant Road. These include Eastern Bent-wing Bat, Little Bent-wing Bat, Eastern Freetail-bat, Eastern False Pipistrelle, Southern Myotis and Grey-headed Flying Fox, White-bellied Sea Eagle and Sharp-tailed Sandpiper.

IMPLICATIONS FOR DESIGN
The widening of Cormorant road has been proposed predominantly on the southern side of the Long Pond to minimise potential impacts to fauna.
Figure 2.5: Long Pond Wetland

Figure 2.6: Northern Riverbank - Mangroves-Estuarine Complex Community

Figure 2.7: Rushland
2.5 **Heritage**

### 2.5.1 Aboriginal Heritage

It is believed that Aboriginal people occupied the Hunter River estuary approximately 4000 years ago when the area was rich in natural resources. The islands were used by the Worimi Aboriginal people for hunting and gathering purposes. A search of the AHIMS database was undertaken on 11 October 2012 by Parsons Brinckerhoff. This identified one Aboriginal open camp site in the vicinity of the proposal. A survey conducted around 1970 identified this site as being potentially located near the Tourle Street Bridge, however, the site has not been recorded or discovered since and there is no evidence that this site exists at the coordinates provided.

**IMPLICATIONS FOR DESIGN**

There are no specific implications for the design process at this stage.

### 2.5.2 European Heritage

European settlement of the Newcastle region began in the 1820s and from then Kooragang Island has changed drastically. Our modern day Kooragang Island is a creation of industry. Prior to the 1950s a series of deltaic islands existed between the two arms of the Hunter River. These included Ash Island, Upper Moscheto, Moscheto Island, Dempsey Island and Spit Island. The original islands were lowlying and were susceptible to flooding and subject to tidal influence.

Kooragang Islands were used for agriculture (grazing and dairy farming), timber harvesting and salt production until the early 1930s. In 1859 the islands were sporadically used for spoil disposal (mainly from dredging operations) up until the early 1950s.

In the 1950s Kooragang Island underwent land reclamation and all of the islands were “glued” together with slag and other industrial pollutants and refuse to create our modern day Kooragang Island. This has resulted in a highly disturbed and modified landform (see Figure 2.8).

**IMPLICATIONS FOR DESIGN**

When assessing the landscape character and visual impact of sites the knowledge that an area is highly modified or disturbed could affect the sites sensitivity rating. However the flora and fauna on Kooragang Island has naturalised and the wetlands are now considered ‘Freshwater Wetlands’ which is listed as an endangered ecological community. Thus the disturbed history of the site will not affect its sensitivity rating.
Figure 2.8: Form of Kooragang Island
Source: Newcastle Coal Infrastructure Group, 2006

LEGEND
- - APPROXIMATE FUTURE POSITION OF THE PROPOSAL
EXTENT OF THE PROPOSAL
KOORAGANG ISLAND
MAINLAND
2.6 Infrastructure Environment

The proposal is located in close proximity to numerous services that may affect the future development of this site. These services include a water main, overhead high voltage power line, the Kooragang Wind Turbine and railway level crossing (see Figure 2.13).

- **The water main** runs along the eastern side of Tourle Street. It is mostly located underground but rises out of the ground along Tourle Street as you approach the bridge from the south before it dives back into the ground just before Tourle Street Bridge.

- **Overhead high voltage power lines** are located on the south side of Cormorant Road. Large stanchions occur approximately every 60m. (see Figure 2.9).

- **Many railway lines** are located around the proposal associated with the various industrial activities. One of these rail lines crosses over Cormorant Road just west of Egret Street in the existing four lane section. This is located outside the extent of the proposal.

- **Kooragang Wind Turbine** is located approximately half way along Cormorant Road on the northern bank of the Hunter River. It was installed in late 1997 as part of a push to promote the emerging green energy market.

**IMPLICATIONS FOR DESIGN**

The proposal will have a very minor impact on the landscape character and visibility of the infrastructure environment. The following minor changes will occur:

- the water main along Tourle Street will become more visible as Tourle street is widened;
- the power lines will be relocated further south to allow for the road widening of Cormorant Road; and
- the removal of mangroves may open up views along Cormorant Road of the power lines, wind turbine and industrial sites as a result of the widened road corridor.

However, these minor changes are almost negligible when the character of the site is predominantly industrial.
2.7 Cyclist and Pedestrian Movements

2.7.1 Cyclists

Based on observations, surrounding land use and discussions with RMS personnel familiar with the project area, recreational cyclists are low on Tourle Street and Cormorant Road with Stockton Bridge a constraint due to steep grade and no shoulders. It is mainly sporting and commuter cyclists that would use these roads on the weekends as 3 cycling clubs race on Kooragang Island (east of the proposal) and several NSW Opens events have been hosted there in the past. Cyclists currently use the narrow road shoulder along Tourle Street and Cormorant Road (see Figure 2.10). Along Cormorant Road this shoulder is approximately 1m wide. Tourle Street has a similar situation at its south end however on approach to the Bridge from both directions the shoulder widens and a bike symbol is marked in the shoulder. Across the bridge cyclists can use the shared path (see Figure 2.11), however it is understood most cyclists continue along in the shoulder over the bridge (see Figure 2.13).

IMPLICATIONS FOR DESIGN

Cyclist provisions to be a key consideration in the development of the preferred design cross section and at intersections.

2.7.2 Pedestrians

Pedestrian movement along Tourle Street and Cormorant Road is very low, based on observations, surrounding land use and discussions with RMS personnel familiar with the project area. Pedestrian access is provided over the Tourle Street Bridge on the shared path on the eastern side of the bridge. However this path terminates 10-20m past the bridge at both ends with no pedestrian connections present.

IMPLICATIONS FOR DESIGN

The existing road environment is of an industrial nature on the urban fringe of Newcastle. With no residential areas within close proximity of the study area the need for pedestrian facilities and connectivity is considered low.
2.8 Major Industrial Features

Currently the landscape character of the site is predominantly industrial. Elements of this industrial landscape act as markers that are visible from surrounding areas (see Figure 2.12 & 2.13). The most obvious of these markers include:

- **Coal holding piles.** These black mountains rise above the tree line and are visible from Tourle St Bridge and along the majority of the Cormorant Road;
- **Massive coal loading structures** associated with coal loading, located on both sides of the eastern end of Cormorant Road;
- **Energy Australia Wind Turbine** (see section 2.6 Infrastructure Environment);
- **The Hunter River.** The river is of high visual interest all along the roads especially when crossing Tourle Street Bridge and is an important feature of the industrial landscape as it provides access for ships into the Port of Newcastle; and
- **Tourle Street Bridge** provides an important visual element in the landscape. It is known to many people as it provides a connection not only to Kooragang Island and its coal port but also to Newcastle airport and the popular tourist areas of Nelsons Bay and Port Stephens. It also has a visual impact for water users on the Hunter River.

**IMPLICATIONS FOR DESIGN**

These unique elements combine to deliver an interesting industrial landscape along Tourle Street and Cormorant Road. It should be considered during the detailed design phase that these major industrial elements (in particular the coal holding piles and coal loading structures) be left exposed rather than screened to further enhance this industrial landscape.

Figure 2.12: Landscape Markers Photo
Figure 2.13: Existing Analysis
Source: Nearmaps, 2013

Parsons Brinckerhoff Australia Pty Limited, 2012
3 Urban Design Objectives & Principles and Concept (Stage B)

The following urban design principals have been considered when developing the urban design objectives for the proposal:

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<th>PRINCIPLE</th>
<th>OBJECTIVES FOR THE PROPOSAL</th>
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<tr>
<td>SENSITIVITY</td>
<td>Minimise the project footprint where appropriate to reduce adverse impacts on the landscape character and views of The Proposal.</td>
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<td>- Minimise disturbance to the landscape through careful design and rehabilitation to reduce impact on vegetation and to avoid contaminated soils entering the Hunter River.</td>
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<td>Design streets to suit their purpose. They should be well connected and easily navigable.</td>
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<td>- Ensure Tourle Street and Cormorant Road have been designed to accommodate the volume of traffic that is expected to travel on them.</td>
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<td>- Consider all modes of travel in the urban design solution including vehicular, pedestrian and cycle.</td>
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<td>- Give clear directions to road users through road marking and signage such as right of way, speed limits, stopping and crossing points.</td>
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<td>FUNCTIONALITY &amp; CONNECTIVITY</td>
<td>Design a continuous and safe cycle network.</td>
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<td>- Provide a continuous cycle network located in the sealed road shoulder that will ensure ease and safety of travel for cyclists and reduce road traffic.</td>
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<td>- Consider providing a shared path in the area occupied by the overhead power lines when/if they are placed underground in the future.</td>
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<td>CYCLE NETWORK</td>
<td>Maintain and enhance the character of surrounding area.</td>
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<td>- Fit well with the natural and built surroundings and social dimensions of the site and community. It should also contribute to the overall public domain quality in the area.</td>
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<td>- Reinforce local landscape character through planting of local native species.</td>
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<td>- Reinforce the industrial landscape character.</td>
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<td>CHARACTER</td>
<td>Retain and protect natural systems.</td>
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<td>- Make effort to conserve and enhance the health of natural systems and areas of environmental significance, and manage the impacts of climate change.</td>
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<td>- Select local plant species which have minimal water and maintenance requirements.</td>
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<tr>
<td>MAINTAINING NATURAL SYSTEMS</td>
<td>Maintain and enhance the character of the street.</td>
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<td>- Careful consideration of the landscaping and other elements that contribute to the character of the roads and selected based on sustainability.</td>
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<td>LANDSCAPE</td>
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Table 3.1: Urban Design Principles and objectives
4 Landscape Character and Visual Impact Assessment (Stage C)

4.1 Description of the Existing Landscape Character

The existing environment needs to be understood to determine the potential level of impact the proposed road widening would have. For purposes of this analysis the proposal has been broken into four distinct landscape character zones that each have differing qualities (see figure 4.1).

- Zone 1: Tourle Street;
- Zone 2: Tourle Street Bridge;
- Zone 3: Cormorant Road, West; and
- Zone 4: Cormorant Road, East.

ZONE 1: TOURLE STREET
Tourle Street starts at a signalised T-intersection off Industrial Drive. From here it heads north as a 4 lane arterial road that is buffered with vegetation from adjacent industrial uses. It heads up over a rise and down to a low point, where it merges down to a two-lane undivided arterial road which leads onto Tourle Street Bridge. Through this low point retaining walls and dense vegetation make the road feel quite enclosed limiting any views into or out of the road environment. A water main running along the eastern side of the road becomes highly visible, emerging from the ground, as you get closer to the bridge.

ZONE 2: TOURLE STREET BRIDGE
Tourle Street Bridge provides an important visual element in the landscape. It is known to many people as it provides a connection not only to Kooragang Island and its coal port but also to Newcastle airport and the popular tourist areas of Nelson Bay and Port Stephens. When crossing the bridge, views of the Hunter River are exposed. To the west on the southern bank of the Hunter industrial lands can be seen and to the northern on Kooragang Island mangrove estuarine complex vegetation is visible. To the east, Port of Newcastle industrial lands can be seen on the north and south riverbanks. Mangroves are also highly visible in the foreground of the northern riverbank.

ZONE 3: CORMORANT ROAD (WESTERN END)
After the bridge crossing the road turns to the east and becomes Cormorant Road which is currently a two-lane undivided arterial road. At this point the area is quite open, but as Cormorant Road heads east the character becomes more enclosed by mangroves to the south and screen planting adjacent to long pond north of the road.

ZONE 4: CORMORANT ROAD (EASTERN END)
The proposal is surrounded by large scale industrial activity in this zone. The Port of Newcastle is located on both sides of Cormorant road. To the north large coal holding piles are visible behind a vegetated mound buffer. To the south large multistorey structures can be seen loading coal onto large ships. The character of the road is more open along this section allowing the industrial landscape to dominate.
Figure 4.1: Landscape character zones

Source: Nearmaps, 2013
4.2 Assessment of Landscape Character Impact

The assessment of Landscape character impact has been undertaken in accordance with the ‘Landscape character and visual impact grading Matrix’ in the EIA Guidelines for Landscape Character and Visual Impact Assessment.

The analysis of landscape character has been broken up into the four distinct zones (Zone 1-4) as the different qualities of each zone are affected in different ways by the proposal and may be given a different rating on the ‘Landscape character and visual impact grading Matrix’.

ZONE 1: TOURLE STREET
There is minimal impact on the landscape character in this zone as an existing large grass verge accommodates the road duplication. The verge is located to the east side of Tourle Street for the majority of the road and switches to the west side closer to the bridge. Although the proposal will be substantially wider than the existing road the work will not change the character of this zone. This zone is not sensitive as it has been greatly modified by the past industrial activities and road activities. Some earthworks, batter widening and extension of retaining walls are proposed but have been reduced as much as possible by locating the new bridge close to the existing and keeping the proposal within the existing road reserve.

<table>
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<tr>
<th>Sensitivity</th>
<th>Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High Impact</td>
</tr>
<tr>
<td>Moderate</td>
<td>High-Moderate</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

Figure 4.2: Zone 1: Images
ZONE 2: TOURLE STREET BRIDGE
The proposal impacts on the landscape character are minimised in this zone by the location and design of the duplication of the Tourle Street Bridge. The new bridge would be constructed to match the existing bridge in the previous location of the old Tourle Street Bridge, which would effectively utilise previously disturbed environments. Thus, due to the lands reduced sensitivity from previous disturbance, the location and design of the bridge the impact on the landscape character is moderate-low.

Figure 4.3: Zone 2: Images

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
<th>Negligible</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High Impact</td>
<td>High-Moderate</td>
<td>Moderate</td>
<td>Negligible</td>
</tr>
<tr>
<td>Moderate</td>
<td>High-Moderate</td>
<td>Moderate</td>
<td>Moderate-low</td>
<td>Negligible</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate</td>
<td>Moderate-Low</td>
<td>Low</td>
<td>Negligible</td>
</tr>
<tr>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

ZONE 3: CORMORANT ROAD (WESTERN END)
Impact on the landscape character in this zone is considered to be the greatest of the entire proposal due to the sensitive vegetation communities in this zone. Potential impacts on the Long pond have been minimised by the proposed widened to the south of the existing road. This will result in the removal of a portion of the mangrove vegetation which will widen and open up the road environment in this zone. Overhead power lines will also need to be relocated further south, closer to the river. The impact in this location is considered to be moderate due to the widening of the corridors and removal of mangrove vegetation.

Figure 4.4 Zone 3: Images

<table>
<thead>
<tr>
<th>Sensitivity</th>
<th>High</th>
<th>Moderate</th>
<th>Low</th>
<th>Negligible</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>High Impact</td>
<td>High-Moderate</td>
<td>Moderate</td>
<td>Negligible</td>
</tr>
<tr>
<td>Moderate</td>
<td>High-Moderate</td>
<td>Moderate</td>
<td>Moderate-low</td>
<td>Negligible</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate</td>
<td>Moderate-Low</td>
<td>Low</td>
<td>Negligible</td>
</tr>
<tr>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
</tr>
</tbody>
</table>
ZONE 4: CORMORANT ROAD (EASTERN END)
There is minimal landscape character impact in this zone as the road is widened to the south where there is an existing turf verge. Although the proposal will be substantially wider than the existing road, this will not change the character of this zone. Street trees will possibly be removed; however the majority of these Melaleucas are in poor condition and do not significantly contribute to the landscape character in this zone. The character of this zone is strongly industrial and any changes are considered to be low in comparison to the scale of the industrial activity on either side of the road.

Figure 4.5: Zone 4: Images

4.2.1 Overall impact on Landscape Character
Taking into account the rating of each zone, the overall the impact on the landscape character of the proposal is moderately low.
4.3 Visibility of the proposal

The proposal is located within the industrial precinct of Kooragang Island and is surrounded by mostly industrial and port related activities. The only close views of the proposal are from nearby industrial sites, Tourle Street, Cormorant Road and the Hunter River. Views from all other locations are blocked by vegetation, topographical features or industrial structures.

Figure 4.8: Visibility of The Proposal
Source: Nearmaps, 2013
4.4 Visual Impact Assessment

The visual impact of the proposal has been assessed in two ways to fully understand the impact it will have from surrounding locations.
1. Through analysing the key viewpoints
2. Through an analysis of the visibility of each character zone

4.4.1 Analysis of Key Viewpoints

KEY VIEWPOINTS
Seven key viewpoints were chosen to characterise the views obtained by observer groups. These key viewpoints are as follows:

<table>
<thead>
<tr>
<th>VIEWPOINT</th>
<th>DESCRIPTION OF SETTING</th>
<th>SENSITIVITY OF VIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>View for road users as they travel north through Zone 1, along Tourle Street</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity of this view is from small remnants of 'Coastal Foothills Spotted Gum – Ironbark Forest'. Sensitivity is reduced due to the highly disturbed nature of this vegetation community. (See section 2.4 Ecological Characteristics)</td>
</tr>
<tr>
<td>2</td>
<td>View for road users as they travel north through Zone 2, over Tourle Street Bridge</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity of this view is derived from views of the river, remnant mangroves, wetland and rushland that can be seen as road users drive over the bridge. View Changes for road users traveling north as the alignment of the bridge is located west of the existing bridge. Sensitivity of view is reduced due to its temporary nature.</td>
</tr>
<tr>
<td>3</td>
<td>View for road users as they travel east through Zone 3, along Cormorant Road</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity of this view is derived from remnant mangroves, wetland and rushland environments viewed as road users pass through the west end of Cormorant Road. Sensitivity of view is reduced due to its temporary nature.</td>
</tr>
<tr>
<td>4</td>
<td>View for road users as they travel east through Zone 4, along Cormorant Road</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity of this view is low as views on either side of the road are dominated by industrial activities. Sensitivity of view is further reduced due to its temporary nature.</td>
</tr>
<tr>
<td>5</td>
<td>Looking north-west towards The Proposal from industrial lands on the south side of the Hunter River east of the Tourle Street Bridge</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity of this view is derived from remnant mangroves, wetland and rushland environments on the north side of the Hunter River. Sensitivity of view is reduced due to the industrial nature of viewpoint location.</td>
</tr>
<tr>
<td>6</td>
<td>Looking north-east towards The Proposal from industrial lands on the south side of the Hunter River west of the Tourle Street Bridge.</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity of this view is derived from remnant mangroves, wetland and rushland environments on the north side of the Hunter River. Sensitivity of view is reduced due to the industrial nature of viewpoint location.</td>
</tr>
<tr>
<td>7</td>
<td>View for river users as they travel along the Hunter River</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensitivity of this view is derived from remnant mangroves viewed from the Hunter River. Sensitivity of view is reduced due to its temporary nature.</td>
</tr>
</tbody>
</table>
Figure 4.9: Key Viewpoint locations
Source: Nearmaps, 2013

Figure 4.10: Key Viewpoint 1
Source: Google Maps, 2013
Figure 4.11: Key Viewpoint 2
Source: Google Maps, 2013

Figure 4.12: Key Viewpoint 3
Source: Google Maps, 2013

Figure 4.13: Key Viewpoint 4
Figure 4.14: Key Viewpoint 5
Source: Roads and Maritime Services, 2013b

Figure 4.15: Key Viewpoint 6
Source: Kirkwood, I, 2013

Figure 4.16: Key Viewpoint 7
Source: RMS
These key viewpoints were assessed in terms of sensitivity and magnitude and were then given an overall rating.

<table>
<thead>
<tr>
<th>VIEWPOINT</th>
<th>VISUAL SENSITIVITY</th>
<th>ELEMENT OF THE PROPOSAL VISIBLE</th>
<th>MAGNITUDE OF THE PROPOSAL VISIBLE</th>
<th>SUMMARY</th>
<th>RATING OF VISUAL IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Low</td>
<td>Widened carriageway of Tourle Street and removal of ‘Coastal Foothills Spotted Gum – Ironbark Forest’</td>
<td>Low</td>
<td>The widened carriageway has little impact on surrounding areas. Rating of visual impact is reduced due to the temporary nature of this view.</td>
<td>Low</td>
</tr>
<tr>
<td>2</td>
<td>Moderate</td>
<td>New Tourle Street Bridge</td>
<td>Moderate</td>
<td>Rating of visual impact is reduced due to the temporary nature of this view.</td>
<td>Moderate</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Widened carriageway of Cormorant Road and removal of remnant mangroves</td>
<td>Low</td>
<td>Rating of visual impact is reduced due to the temporary nature of this view.</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>4</td>
<td>Low</td>
<td>Widened carriageway of Cormorant Road</td>
<td>Low</td>
<td>The widened carriageway has little impact on surrounding areas. Rating of visual impact is reduced due to the temporary nature of this view.</td>
<td>Low</td>
</tr>
<tr>
<td>5</td>
<td>Moderate</td>
<td>View of the new Tourle Street bridge should be blocked by the existing Tourle Street Bridge. May be possible to view removal of some mangroves</td>
<td>Low</td>
<td>Rating of visual impact is reduced due to the industrial nature of viewpoint location. However removal of mangroves is most evident from this location.</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>6</td>
<td>Moderate</td>
<td>New Tourle Street Bridge is fully visible from this location.</td>
<td>Moderate</td>
<td>Rating of visual impact is reduced due to the industrial nature of viewpoint location. From here the new bridge is completely visible, however it is to reflect the design of the existing bridge, lowering its visual impact.</td>
<td>Moderate</td>
</tr>
<tr>
<td>7</td>
<td>Low</td>
<td>New Tourle Street Bridge.</td>
<td>Moderate</td>
<td>Existing view is only slightly altered as New Bridge is to reflect the design of the existing bridge. Rating of visual impact is reduced due to the temporary nature of this view.</td>
<td>Moderate-Low</td>
</tr>
</tbody>
</table>

Table 4.2: Analysis of Key Viewpoints
4.4.2 Analysis of each character zone

ZONE 1: TOURLE STREET
Visual impact is low as the northern end of Tourle Street as it is low lying and is mostly blocked from view by surrounding vegetation and embankments.
The main visual impact will be to road users as they drive along new section of road. However the high speed limit of 80km per hour along Tourle Street will reduce the sensitivity of the views (See viewpoint 1 in section 4.1.4 Analysis of Key Viewpoints).

ZONE 2: TOURLE STREET BRIDGE
Visual impact is moderate in this zone (See Viewpoint 2 in section 4.1.4 Analysis of Key Viewpoints). There are no nearby residents who have close views of the bridge and its surroundings. The only permanent close views are from adjacent and nearby industrial sites located on the southern bank of the Hunter River which are not considered sensitive due to their industrial nature. The view from the south side of the Hunter River west of the Tourle Street Bridge will be the most sensitive view as the new bridge will be fully visible from here. However, views of the bridge from surrounding locations will vary only slightly as the new bridge is to be aligned parallel to the existing bridge with a similar design, height and navigational clearance for water craft (3.3m x 30m). The location of the bridge piers will also match the location of the existing bridge piers where possible, so the existing bridge will hide the new bridge when it is viewed from the east.

ZONE 3: CORMORANT ROAD (WESTERN END)
Visual impact of the wider road is minimal when viewing from surrounding areas as the road corridor is visually contained. However the removal of adjacent vegetation communities will have a greater visual impact resulting in a moderate-low visual impact. (See Viewpoint 3 in section 4.1.4 Analysis of Key Viewpoints)
ZONE 4: CORMORANT ROAD (EASTERN END)
The visual impact in this location is considered to be low as views from surrounding areas are limited due to the industrial nature of the surrounding activities. (See Viewpoint 4 in section 4.1.4 Analysis of Key Viewpoints)

| Sensitivity | Magnitude     
|-------------|---------------
| High        | High Impact   |
| Moderate    | High-Moderate |
| Low         | Moderate-Low  |
| Negligible  | Negligible    |

4.4.3 Overall Visual Impact

Overall the visual impact of the proposal is low. Views of the proposal are not considered sensitive due to their industrial and non-residential nature. Also many of the view of the proposal are temporary which further reduces their sensitivity.
5 Concept Design and Review (Stage D)

5.1 Current Concept Design

The key features of the design are described below and illustrated in figure 5.1 and figure 5.2: Concept design.

5.1.1 Tourle Street Widening

The proposal would involve widening Tourle Street on the approach to the bridge from a two lane undivided arterial road to a four lane divided arterial road. The median along Tourle Street is 2.4m wide at its narrowest and widens out to 7m on the approach to the bridge. Embankments will be required on both the east and west side of the road in various sections.

5.1.2 Tourle Street Bridge Duplication

The proposal involves duplication of Tourle Street Bridge on the western side adjacent to the existing bridge. The new bridge would have two lanes and a 3m wide shoulder on the west side and a 1m shoulder on the east side. It will be located in the previous location of the old Tourle Street Bridge and will be aligned parallel to the existing bridge with a similar design, height and navigational clearance of 30m.

5.1.3 Cormorant Road Widening

The proposal would involve widening Cormorant Road from Tourle Street Bridge to 200m west of Egret Street on Kooragang Island for approximately 3km. Cormorant Road will widen from a two lane undivided arterial road to a four lane divided arterial road with a 2.5m wide shoulder for cyclists on both sides.

5.1.4 Cycle Network

The proposal would provide improved on-road cyclist facilities with wider shoulders for the extent of the proposal. This shoulder is 3m wide on the left side of the bridge, 1m wide on the right side of the bridge and 2.5m wide along both sides of Cormorant Road.
5.2 Review of Concept Design after Landscape Character and Visual Impact Assessment

The key features of the design have been reviewed after the landscape character and visual assessment process to determine potential areas to refine during the detailed design phase.

5.2.1 Tourle Street Widening Review

Widening of Tourle Street has a low impact on landscape character and low visual impact, however elements of the design would be refined during the detailed design phase to ensure impacts remain low. These elements include:

- Embankments would be required on both the east and west side of the road in certain areas. It is important this battering is carefully integrated into adjoining landforms.
- Verges should be planted with a low maintenance turf, low native grasses or groundcovers in order to maintain clear zones. Barrier rails should be considered if infrangible objects lie within the clearance zone.
- Median treatment to be further developed. Currently there are a few sections of median along Tourle Street. Some portions of this are turfed and others are concrete. New sections of median should be constructed in accordance with the RMS Landscape Guidelines.

5.2.2 Tourle Street Bridge Duplication Review

The duplication of the Tourle Street Bridge has a low impact on landscape character and moderate visual impact. The landscape character and visual analysis confirmed the importance of the position and design of the new bridge in reducing its impact on the character of the landscape. This new bridge is the most visible element of the proposal from surrounding areas, so it is appropriate that it reflects the existing bridge.

5.2.3 Cormorant Road Widening (western end) Review

The widening of Cormorant Road has a moderate impact on landscape character and moderate-low visual impact at the western end. Elements of the design that would be refined during the detailed concept design phase include:

- Embankments would be required on both sides of Cormorant Road in this zone. Again it is important this battering is carefully integrated into adjoining landforms.
- Verge treatment see above section 5.2.1
- Median treatment to be further developed. The new median along this end of Cormorant Road is 7m wide at the Tourle Street Bridge approach and narrows down to 1.6m as Cormorant Road turns to the east. A concrete barrier is proposed where the median is 1.6m wide. New sections of median should be constructed in accordance with the RMS Landscape Guidelines.
- The volume of runoff from the wider road carriageway is to be considered to ensure it does not disrupt sensitive wetland areas.

5.2.4 Cormorant Road Widening (eastern end) Review

Widening of Cormorant Road has a low impact on landscape character and low visual impact at the eastern end. Elements of the design that would be refined during the detailed concept design phase include:

- Minor embankments will be required mainly on both sides of Cormorant Road at this end. Again it is important this battering is carefully integrated into adjoining landforms.
- Verge treatment see above section 5.2.1
- Median treatment to be further developed. The new median is to be 1.6m wide with a concrete barrier.
- Landscape Character. Down this end where the industrial nature of the site is most prominent views of the industrial landscape could be celebrated not screened.

5.2.5 Cycle Network Review

Currently the proposal cycle network consists of an on road cycle lane in the shoulder of the road. It is proposed to be 2m wide along both sides of Tourle Street, 3m wide over the Tourle Street Bridge and 2.5m wide on both sides of Cormorant Road. Consideration could be given to providing a shared off road path on the southern side of Cormorant Road in the area occupied by the overhead power lines when/if they are placed underground in the future.
5.2.6 Landscape Design Review

It is important to consider during the detailed design that:

- Any new planting works would be designed to satisfy the relevant road safety guidelines. This would include maintaining the required clear zone to non-frangible vegetation except where a safety barrier is present.
- A comprehensive planting and revegetation plan would be developed during the detailed design phase.
- Advanced plants would be used in the areas closest to the road and near the bridge due to higher visibility and exposure of the vegetation in this location.
- Planting is not necessarily to be used to screen and buffer industrial environments but rather to replace what has been removed during the construction of the proposal.

5.2.7 Ancillary Item Review

As discussed previously the high voltage power lines on the south side of cormorant road will need to be relocated to accommodate the widening of Cormorant road. These stanchions and power lines are a strong element of the infrastructure environment when moving along Cormorant Road.

Future stages of the project will incorporate refinements and development of the urban design and landscape concept.
6 Mitigation Strategies (Stage E)

Mitigation strategies have been and will continue to be implemented to reduce the visual impact of the proposal and retain the character of the area.

6.1 Impacts Already Minimised

Measures have already been taken to minimise the impact of the proposal. These mitigation strategies include:

- **The location and design of the duplication of the Tourle Street Bridge:**
  The bridge will be aligned parallel to the existing bridge with a similar design, height and navigational clearance to reduce the visual impact. It will also be constructed in the previous location of the old Tourle Street Bridge to utilise previously disturbed environments.

- **Cormorant Road Widening:**
  Cormorant Road will be widened to the south to minimise potential impacts to threatened species of flora and fauna located in the Long Pond.

6.2 Mitigation Strategies

Impacts of the proposal can be further mitigated during the design process as the landscape and urban design is resolved.

6.2.1 Landscape Impact Mitigation

The following mitigation measures would be implemented during the detailed design and construction phases to minimise the impact of the proposal on the landscape and the landscape character of the existing site:

- Efforts to be made to reduce extent of clearing of vegetation and minimise the construction area to conserve remnant vegetation. Particular attention to be given to protect the Long Pond wetlands and remanent mangroves to assist the conservation of the landscape character. However, if these areas are effected during construction, regeneration should form part of the landscape mitigation.

- Planting within the road corridor to be consistent with the locally native species (including *Acacia decora*, *Casuarina glauca*, *Eucalyptus punctata*, *Eucalyptus robusta*, *Hardenbergia violacea*, *Leptospermum laevigatum*, *Lomandra longifolia*, *Melaleuca armillaris*, *Melaleuca quinquenervia*, *Melaleuca styphelioides*) used. The purpose of this planting is reinstatement of previous ecological communities rather than screening. Where fill is required it should match original soil profiles and be free of contaminated soils and acid sulphate soils in order to allow the establishment of these locally native species.

- The road drainage should consider increased runoff from the wider road pavement and assess potential impact on wetland vegetation.

- Batters along the proposal should be carefully integrated into adjoining landforms.

6.2.2 Visual Impact Mitigation

The following mitigation measures would be considered during the detailed design phase:

- In certain zones the landscape character of the proposal is predominantly industrial. Thus celebrating industrial views by leaving them open rather than attempting to screen them with earth mounds and planting would be considered.

- Efforts to be made to reduce clearing of vegetation in order to maintain the experience of the remnant mangrove vegetation from the southern banks of the Hunter River.

6.2.3 Structures and Furniture Mitigation

The following urban design elements to be further considered during the detailed design phase:

- Further refine the details of the Tourle Street Bridge to match the existing bridge including: substructure, traffic barriers, and superstructure.

- The installation of barrier treatment types along Tourle Street and Cormorant Road should be consistent along the corridor to maintain the landscape character of the area.

- Determination of the most appropriate place to relocate the high voltage power lines.
7 References:


- E.D.K. Green, Principal engineer Harbours and rivers, Department of Public Works, 1951 NSW Newcastle Harbour improvements proposed reclamation of islands, viewed 24 July 2013: http://www.flickr.com/photos/uon/6000055835/


- Nearmaps, 2013, Newcastle, Nearmaps, viewed 26 June 2013: http://www.nearmap.com/photomaps


- Parsons Brinckerhoff Australia Pty Ltd, 2012, MRs08 duplication of Tourle Street and Cormorant Road, Kooragang Island - Preliminary environmental investigation, Parsons Brinckerhoff Australia, Sydney


8 Appendix

Typical Section Design