Upgrade of the New England Highway, Singleton Railway Underpass (Gowrie Gates)

Urban Design, Landscape Character and Visual Assessment Report

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0215 0018 LD - R01_00
Executive Summary

The study area is located in the lower Hunter Valley near Singleton some 200 km north of Sydney and 80 km north-west of Newcastle by road. The proposal is located in the Singleton Local Government Area (LGA) between Simpson Terrace and Maison Dieu Road at Singleton.

The proposal involves the replacement of both a rail bridge and the widening of a section of the New England Highway at "Gowrie Gates". The main purpose of the proposal is to address the current situation on the New England Highway which restricts the access of oversized vehicles, requiring a 30 km diversion and potentially risks the closure of both rail line and road should an accident occur as a result of the restricted opening.

The report provides an urban and landscape design framework to support and assist in the design development of the bridge so that the proposal is sympathetic with its context and responsive to it. The report has been structured to identify existing conditions and character, define urban design objectives and principles to inform the development, identify its landscape character and visual impacts, and then identify mitigation strategies which may be used to enhance the final outcome.

The concept design of the bridge and highway alignment are restricted by the operational requirements of the facility and what can be built to meet the ARTC and Roads and Maritimes design standards. The constructability within operational constraints has played a significant role in the determination of options. The refinement of the design has adopted the following principles:

- The expression of purpose (role and function of the bridge); and
- Provide a strong and substantial appearance reflecting its role as a rail bridge.

As part of this process three landscape character zones have been identified within the study area. The character zones include:

1. A residential housing zone - composed of two suburbs located to the east of the railway and either side of the highway.
2. A parklands and highway zone, essentially the immediate corridor through which the highway passes; and
3. A rural precinct located to the west of the alignment.

These have been assessed in terms of the proposal and the changes it will have on these zones. Generally the change was determined to have a low- moderate impact. The changes to the environment were not seen as impacting the overall character as they replaced existing facilities. The reconfiguration of the bridge and road was seen as offering the potential to enhance the character of the area through the simplification of the bridge.

Visual impacts were generally assessed to be low, with two locations assessed as moderate. The proposal’s scale, the nature of the works (ie the replacement of an existing structure), and the limited visibility from sensitive receivers such as residential dwellings all play a role in this assessment.

Mitigation strategies are considered to ensure the structure is well integrated with the existing conditions and its context. Strategies proposed address the following issues, architectural form of the bridge - including the shape and nature of the abutments- termination of ends, resolution of maintenance issues, landscape issues and the provision of appropriate pedestrian and cycling facilities to the address the needs of other users.

The report concludes that the proposal in adopting the design and mitigation measures recommended would be well integrated within its landscape and visual setting.
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1 INTRODUCTION

1.1 Background

Roads and Maritime Services (Roads and Maritime) and the Australian Rail and Track Corporation (ARTC) propose to replace the existing twin steel truss rail bridges carrying the Main North Railway Line over the New England Highway at “Gowrie Gates” near Singleton and widen the New England Highway Singleton Railway Underpass to include three metre wide shoulders on both lanes (the proposal). This section of the New England Highway currently carries around 22,000 vehicles per day from regional and local areas and the Main North Railway carries around 80 freight and 9 passenger trains per day.

The site is located in the lower Hunter Valley near Singleton some 200 kilometres north of Sydney and 80 kilometres north-west of Newcastle by road; refer to Figure 1. The proposal is located in the Singleton Local Government Area (LGA).

Figure 1 – Regional Context Plan (Source: Googlemaps, 2014)
Currently the twin steel truss bridges carrying both the up and down tracks of the railway line and is managed by ARTC. The bridges have a horizontal clearance of 7.9 metres and a vertical clearance of 5.5 metres. These dimensions currently restrict vehicles greater than 7.3 metres wide from using the Singleton Railway Underpass. This is affecting freight access and efficiency on the New England Highway, as over-dimension vehicles require a 30 kilometre detour via local roads. Further, the narrow width and age of the rail bridges poses a risk to the road and rail transport network in the region as there is potential for a heavy vehicle collision with the bridge that could cause major structural damage leading to the closure of both the highway and the railway line.

Roads and Maritime are developing a strategic concept design to replace the bridge in-situ, designed for a 350LA loading and to provide the New England Highway with a minimum horizontal clearance of 13 metres and vertical clearance of 5.3 metres.

1.2 Purpose of Report

Tract Consultants Pty Ltd has been commissioned to provide urban design, landscape character and visual impact assessment services to assist in the design development of the proposed bridge for Gowrie Gates Rail Bridge and road underpass.

The method of this assessment is described in the Roads and Maritime Services - Environmental Impact Assessment Practice Note: Landscape Character and Visual Impact Assessment (EIA No.4). This defines the purpose of the landscape character and visual impact assessment as follows:

“1. To inform the development of the preferred route and concept design so that the proposal can avoid and minimise impacts up front. It must be commenced early in the environmental impact assessment (EIA) process to achieve this goal and integrate with the design process.

2. To inform the RMS, other agencies and the community about the landscape character and visual impact of the proposal and what avoidance, management and mitigation strategies would be implemented.”

In addressing the landscape character and visual assessment of the proposal, the guide differentiates between the two categories of assessment with them defined as follows:

“landscape character assessment - the impact on the aggregate of an area’s built, natural and cultural character or sense of place and visual assessment – the assessment of impact on views.

Landscape character and visual assessment are equally important. Landscape character assessment helps determine the overall impact of a project on an area’s character and sense of place. Visual impact assessment helps define the day to day visual effects of a project on people’s views.”

The report has been structured in such a way that it defines the context, character and visual impacts of the proposal to assist the resolution of the design.

1.3 Proposal Description

The proposal involves the replacement of the twin steel rail bridges carrying the Main North Railway Line over the New England Highway and upgrade of the Singleton Railway Underpass to improve horizontal road clearance. The proposal is located between Simpson Terrace and Maison Dieu Road at Singleton, refer to Figure 2.
Figure 2 – Local Context Map (Source: Googlemap, 2014)
The main features of the proposal include rail, road and ancillary activities which are described further below:

- The rail work components of the proposal includes replacing the existing twin steel rail bridges with a new single concrete rail bridge that would increase the horizontal clearance for the New England Highway Singleton Railway Underpass to a minimum of around 13 metres. Specific activities include:
  - Relocation of utilities
  - Installation of 15 precast half-through girders including post-tension works on a temporary support structure
  - Rail cutting, removal of ballast and stripping and replacement of track for around 160 metres to the north and around 130 metres to the south of the rail bridge
  - Removal of existing bridge structure, bridge support and retaining structures
  - Securing new headstocks and jacking the new bridge into place
  - Replacement of ballast and reconnection of track
  - Reinstating the posted rail line speed limits

- The road work components of the proposal includes:
  - Excavation and reconstruction of around 260 metres of new road surface on the New England Highway
  - Provision of three metre wide shoulders along the New England Highway for the length of the proposal
  - Maintaining a 60 kilometres per hour design and posted speed limit
  - New road surface markings along the length of the proposal
  - Kerb and guttering the length of the proposal
  - Relocating about 240 metres of the shared pedestrian cycleway to a level and location that provides better visibility to the New England Highway traffic. The pathway will be part of the New England Highway Singleton Railway Underpass work and will cross underneath the new rail bridge. A pedestrian fence installed on the north side of the path will provide separation from the traffic for the pedestrians and cyclists
  - Drainage works including the construction of new road inlets and grass lined swales

- Use of ancillary construction facilities, including construction compound site, stockpile sites and hardstands for cranes and piling rigs. Ancillary activities include but are not restricted to the following:
  - Site establishment, clearing and grubbing activities including: demolition of existing kerbing under bridge; installation of roadside barriers, precast concrete and anti-gawking screens; construction of temporary staff overpass; and installation of side track safety fencing
  - Construction of a temporary side track about 270 metres long to the south of the New England Highway for traffic flow during the bridge replacement works. The side track would cross the existing rail track around 20 metres south of the existing rail bridge via a temporary bridge structure that would be constructed during rail possessions
  - Temporary shoring of piling platform for piling works
  - Installation of six permanent, ten temporary piles and support structure
  - Removal of temporary side track and rehabilitation of impacted construction areas
  - Demobilisation of ancillary facilities and rehabilitation of vegetated areas impacted by the proposal.

The railway bridge asset is managed by ARTC and as a result needs to be built to their construction standards. The highway is a Roads and Maritime Services asset and needs to be constructed to meet their performance requirements for the road alignment. The present alignment is a single lane in each direction.
The following parameters must be met by the proposal:

The bridge is required to span over 3.5 m wide travel lanes in each direction with 3.0 m shoulders on each side of the road. The pavement width kerb to kerb is 13 m. The bridge span is also required to accommodate a 2.4 m wide shared path to the southern side. This is to be set on the embankment above the road to minimise earthworks and enhance connectivity. The proposed design provides a spill through design and has abutment walls set clear of all constraints, providing a total clear span of 30 m.

1.4 Proposal Objective

The proposal objectives include:

- Improve access and travel times for over-dimension freight movements on the New England Highway
- Minimise disruptions to freight movements on the New England Highway and the movement of bulk coal on the Main North Railway line
- Improve road safety for traffic on the New England Highway
- Provide network reliability for the rail service
- Reinstate the posted rail line speed
- Allow for safe maintenance for both road and rail after the project is complete.

The objectives will be achieved by:

- Widening the road underpass from 7.9 m to a minimum of 13 m (two through lanes and shoulders)
- Providing a minimum vertical road clearance of 5.3 m
- Replacing the existing rail bridge with a new structure with a 100 year design life and no restrictions
- Constructing the overpass within scheduled ARTC full track closures and minimise closures of the New England Highway.
2 PROJECT CONTEXT

2.1 Location

The proposal is located at the junction of the New England Highway and the Main North Railway Line around 1.8 kilometres to the north-west of the outskirts of the Singleton Township (refer to Figure 2). Singleton is about 80 kilometres north of Newcastle and 200 kilometres north of Sydney by road. The New England Highway passes through Singleton and is the main inland highway from Newcastle to Brisbane via Tamworth. The proposal is situated between the intersection of the New England Highway and Maison Dieu Road located around 120 metres to the west of the proposal and the intersection of the New England Highway and Simpson Terrace Avenue located around 245 metres to the east. It forms part of the western gateway into/out of Singleton.

This section of highway carries approximately 22,000 vehicles per day (VPD) and has a posted speed limit of 60km/h in each direction.

The Main North Railway Line also passes through Singleton and is the main railway line between Sydney and Brisbane. The majority of rail traffic on the line in this location is heavy haul serving a large number of coal mines located west of Singleton in the Hunter Valley. A small number of passenger trains also use the railway line for regional commuters and interstate travellers.

2.2 Land Use and Built Form

The proposal is located in the Singleton LGA at the intersection of four suburbs including Singleton Heights to the north-east, Darlington to the south-west, McDougall’s Hill to the north-west and Gowrie to the south-west. Singleton forms a major rural centre within the Hunter Valley. Its land use patterns reflect this combination of rural and urban zonings refer to Figure 4.

The approaches to the proposal site are dominated by rural development along the Hunter River floodplain. The landscape consists of open fields, vineyards and scattered vegetation beyond the developed areas of the town. Approaching the proposal from the south-east after exiting Singleton and crossing the Hunter River the New England Highway crosses a one kilometre section of floodplain zoned RU1 primary production which is dominated by open farmlands, a mix of vineyards, pasture etc refer to Figure 4.

Figure 3 – View of floodplain north east of the proposal
From here the New England Highway transitions into urban development having moved off the floodplain and onto higher ground. The suburbs of Darlington and Singleton Heights located east of the railway line are zoned R1 General Residential, and straddle the New England Highway, (Darlington to the south and Singleton Heights to the North). The subdivision of Darlington, (Figure 5), reflects the expansion of Singleton as part of the growth in mining and dates from the 1970’s and 1980’s, whereas Singleton Heights predates this. The development within both these subdivisions is a combination of free standing dwellings and townhouses.
Gowrie located to the west of the railway and south of the highway, is zoned residential and E4 Environmental Living. The residential area of the suburb is yet to be developed but was formerly a golf course. The zoning reflects the future development direction of the Singleton Township. Whereas the environmental living zonings has seen rural residential established on the hill side and with this the establishment of an open woodland canopy, refer to Figure 6.

**Figure 6 – Environmental Living, Gowrie**

McDougalls Hill is a combination of Rural lands, zoned RU1 Primary Production, and B5 Business Development. The rural lands are a rolling grassland with scattered remnant trees and a couple of isolated farm dwellings and sheds. Business Development presents an altogether different character of large wharehouse type developments including Bunnings, car yards and service stations.

A small strip of parkland, including Gowrie Park, provides a buffer to the adjoining suburbs of Darlington and Singleton Heights refer to Figure 7. This land is zoned RE1 Public Recreation and consists of grassland with scattered trees, bike paths and stormwater corridor. The primary role of this land is the provision of a buffer from the highway and the provision of pedestrian/cyclist connectivity along the highway corridor, with minimal improvement made to the space for recreation or amenity.

Both the New England Highway and Main North Railway Line are zoned SP2 Infrastructure, reflecting their role as significant state infrastructure works.

**Figure 7 – View of recreational lands along the corridor**
2.3 Vegetation

The vegetation of the site is heavily modified with no significant remnant stands evident. This reflects the agricultural history of the area which has cleared the floodplain for grazing. Gowrie Park is located to the north-west of the proposal and largely consists of a grassland area with a BMX track formed within the body of the park. Plantings within the park consist of a range of native species including the following: Eucalyptus amplifolia, E. punctata, E. sideroxylon, Corymbia citriodira and the Melaleuca quinquenervia and are depicted in Figure 8.

![Figure 8 – Mixed Eucalypts within Gowrie Park](image)

West of the bridge a small stand of planted vegetation adjoins the corridor and provides screening to a stockpile. This is composed of Casuarina glauca, Melaleuca armillaris and Melaleuca linariifolia.

A number of noxious weed species were identified to be occurring within the corridor. These plants require specific controls to limit the further spread and distribution. Species are listed in the Table 1.

<table>
<thead>
<tr>
<th>Species</th>
<th>Class</th>
<th>Noxious class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crofton weed</td>
<td>4</td>
<td>Locally Controlled Weed</td>
</tr>
<tr>
<td>Ageratina adenophora</td>
<td></td>
<td>The growth of the plant must be managed in a manner that continuously inhibits</td>
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<tr>
<td></td>
<td></td>
<td>the ability of the plant to spread and the plant must not be sold, propagated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or knowingly distributed</td>
</tr>
<tr>
<td>Willows</td>
<td>4</td>
<td>Locally Controlled Weed</td>
</tr>
<tr>
<td>Salix babylonica</td>
<td></td>
<td>The plant must not be sold, propagated or knowingly distributed</td>
</tr>
</tbody>
</table>

The environmental weed of Castor Oil – *Recinus communis* was also present within the corridor.
2.4 Landform and Hydrology

The drainage and hydrology of the area have played an important part in shaping the development. (Refer Figure 9). The proposal occurs just to the north of the floodplain of the Hunter River and the township of Singleton. The elevation of the New England Highway is approximately 55 m Above Sea Level (ASL) at the bridge with the railway nominally located at 62 m ASL.

The New England Highway is set within a small valley with housing rising to both the north and south sides, above the alignment within the suburbs of Darlington and Singleton Heights respectively. McDougalls Hill to the north west of the alignment is the high point at 130 m ASL.

A number of unnamed creeklines drain from the hills to the Hunter River. North of the New England Highway these drain downslope in an easterly direction from McDougalls Hill before flowing onto the floodplain near the intersection of Blaxland Avenue and Bridgeman Road. At this point the flow splits and either continues east or heads south crossing the highway at the edge of the suburban development of Singleton Heights and Darlington. The flood level on the floodplain, based on Councils’ flood planning mapping, is nominally 45m. This sees the bridge located above the flood zone but potentially cut off from Singleton as the Hunter River floods.

South of the highway, drainage is located to the west of the railway alignment draining off McDougalls Hill and to the Hunter River.

Figure 9 – Landform and Hydrology base on Singleton LEP 2013
3 URBAN DESIGN OBJECTIVES AND PRINCIPLES

3.1 Urban and Landscape Design Objectives and Principles

In order to address the impacts of the proposed works, a number of key objectives have been developed to define the nature and parameters of the landscape character and visual impact mitigation recommendations which need to be developed to ensure that the proposal design responds appropriately to its context.

The objectives and guiding principles are applicable for all design disciplines and have been developed to assist the development of the concept design and are to be carried through to detailed design and construction to ensure a unified and consistent approach to the development of the proposed works.

Roads and Maritime have developed a number of documents which inform the design development of the concept and how this process should be run. These include:

- Beyond the Pavement which focuses on the overall fit of the proposed works and the delivery mechanism to ensure that an integrated outcome is achieved.
- Bridge Aesthetics which reviews the nature of bridges and how consideration of the overall context and its visual impacts will inform the design of the bridge.

The design of the proposed rail bridge and associated highway upgrade will need to respect the visual context of the surrounding area. In doing so it should adopt an approach of simplicity and refinement. In order to address the impacts of the proposed works, a number of key objectives have been developed to define the nature and parameters of the landscape character and visual impact mitigation recommendations. These need to be developed to ensure that the proposal design responds appropriately to its context.

The urban design objectives are:

- Provide a positive contribution to the local landscape environment of Singleton.
- Provide a structure which provides a sense of arrival/departure befitting the western gateway to or from Singleton.
- Provide an open feel to the bridge which enables connection with the broader landscape. This can be achieved by minimising the need for intermediate supports and reducing the scale of abutment walls, through the use of a spill through design.
- Develop a concept that respects the overall landscape character of the site.
- Ensure accessibility for all users including pedestrians and cyclists is provided.
- Minimise the need for the acquisition of adjoining lands.
- Ensure a safe pedestrian environment through the adoption of Crime Prevention Through Environmental Design (CPTED) principals.
- Provide a cost effective solution.

In addition to the broader urban design objectives outlined above, the bridge design should adopt a simple design language that reflects simplicity and refinement. The specific design principles applying to the bridge are outlined below:

- Bridge must be constructible within the constraints of track work to minimise disruption to rail traffic.
- Use a consistent approach to engineering and architectural components to provide a unified design solution to enhance visual unity and clarity.
- The design, form, materials and arrangement of all elements must be simple, refined and responsive to the function of the bridge.
- Form should integrate with the landform, providing a smooth connection with the ground plane.
- The bridge must provide safe and manageable solutions for maintenance workers and bridge users.
- The design should avoid unnecessary elements.
4 CONCEPT DESIGN

4.1 Introduction

The concept design has been developed to reflect the constraints of both ARTC and Roads and Maritime in terms of operational performance. A number of options were developed before a final preferred option was selected. The options were driven by the specific performance parameters required by both parties including functional, life cycle costs and constructability.

Constructability has formed a key consideration of the proposal as the works need to occur under track possessions, which are limited each year to a small number of three to four day rail closures. This impacts how the bridge can be built as it needs to minimise the period of impact on the rail line itself.

The proposed structure of the bridge is to be a precast segmental bridge, post tensioned together. The depth of the structure through girders is 3.2 m, with a depth of 1.27 m from rail level to soffit including rails, sleepers, ballast and concrete precast deck. The construction of the bridge structure forms a concrete trough.

The bridge is designed to provide a minimum of 5.3 metres clearance above the road to enable high loads to pass.

4.2 Design Principles

The design of the rail bridge should reflect the following attributes. It should:

- Express its purpose and being easily recognised as such.
- Generally appear strong and substantial.

(Roads and Maritime, Bridge Aesthetics, 2012).

The emphasis on strength necessarily leads to a heavier appearance in the design with deeper girders, bulkier columns and shorter spans. An emphasis on proportion and refinement of the form is consequently important in order to minimise impact and create an attractive structure.

4.3 Existing Structure

The existing structure is a steel truss composed of a large central section accommodating the main span and two smaller approach trusses, (Figure 10). The southern approach span has been modified to incorporate the cycle and pedestrian underpass.

Figure 10 – Existing Rail Bridge over New England Highway
Other rail bridges within the vicinity generally see the railway pass under the road and so the road bridge is the element which dominates the view. In terms of the experience of the viewer/roads users there are potentially two bridges which would be experienced in close proximity to the underpass, these are the Singleton Crossing Bridge over the Hunter River on the New England Highway and the Dunolly Ford Bridge also over the Hunter. Their form and structure varies considerably reflecting their variation in age. The Singleton Crossing Bridge is a modern concrete box girder, while the Dunolly Ford Bridge is a steel truss.

4.4 Proposal

The general structure of the bridge has been determined by its load requirements and the constraints on constructability.

4.4.1 Structure

The form of the proposed bridge is of a concrete trough bridge and is similar in concept to that illustrated below:
This presents a heavy, robust form consistent with its role as a rail bridge. Care needs to be taken with the detailing of the thickenings top and bottom of the girder and the way in which the segments are joined. The transition or termination of the bridge also needs to be reviewed to provide a smoother termination and integrate with the adjoining landform, refer **Figure 14**.

![Figure 14](image)

**Figure 14** – Illustration of bridge that provides a smooth and integrated termination of form which assists in grounding the structure. (RMS, 2015)

### 4.4.2 Abutments

The form of the abutment consists of a combination of wall and spill through, a product of the need to incorporate the shared path under the bridge, refer to **Figure 15**.

The abutment consists of a piled wall with concrete headstock which extends to the edge of the underpass. The face of the wall between piles is to be soil nailed and shotcrete applied. A finishing treatment should be applied to the wall face in the form of a precast concrete face panel. This will provide protection to the underlying substrate as well as provide a finish appropriate for that of a pedestrian/shared path route.

The facing panel should extend beyond the bridge itself to provide the wing walls required to assist with the transition of grades from near vertical under the bridge to an edge which fades out into the landscape.

### 4.4.3 Spill thru treatments

Spill thru abutments have been adopted to assist with meeting the required changes in geometry and provide a sense of openness as the New England Highway passes under the Main North Railway Line.

The adoption of a spill through abutment as part the bridge construction has enabled the shared path alignment to be revised, removing the need for retaining structures along the edge of the highway alignment and enhancing the overall feel and safety of the path.

The batter slopes within the shadow of the bridge and one metre beyond are to be paved. Paving is to be a concrete unit laid on the slope to provide a stable and robust ground plane treatment beneath the bridge and within its drip zone. The colour of the paver should be dark to reduce the visual impact of the embankment itself but also to emphasise the width of the opening.

### 4.4.4 Handrails

Handrails are required to provide protection and separation for those using the shared path (southern abutment) and maintenance access (northern abutment). The profile of the handrail should be smooth.
and even avoiding sharp changes in direction. The handrail is to consist of simple double rail galvanised steel fence similar to a Monowills balustrade.

4.4.5 Shared pedestrian/cyclepath

The shared pedestrian/cyclepath is a continuation of the existing network. The construction of the new bridge has required the realignment of the path. This has enabled the shared pedestrian/cyclepath to be lowered and greater clearance to be provided under the bridge enhancing the experience of the user and reducing the grades on the path. The current path is a concrete path and this is to be replaced like for like.
Figure 15 – Concept Plan
Figure 16 – Elevation of proposed bridge looking west

Figure 17 – Cross section of bridge looking north
This section of the report aims to review the proposed works assessing the visual impact and effect on the landscape character of the area.

The Roads and Maritime Visual Impact and Environmental Impact Assessment Guidance Note: Guidelines for landscape character and visual impact assessment, (2013) sets out two main purposes of landscape character and visual impact assessment:

“To inform the development of the preferred route and concept design so that the proposal can avoid and minimise impacts up front.

To inform the Roads and Maritime managers, other agencies and the community about the landscape character and visual impact of the proposal and what mitigation strategies would be implemented.”

And defines visual impact assessment and landscape character assessment as follows:

Landscape character assessment - the assessment of what makes up an area and provide its unique sense of place are equally important and visual assessment - the impact on views.

Landscape Character and Visual assessment are equally important. Landscape character assessment helps determine the overall impact of a project on an area’s character and sense of place. Visual impact assessment helps define the day to day visual effects of a project on people’s view.

This dual assessment will help differentiate options, improve route alignment decisions and improve design outcomes.”

5.1 Landscape Character and Impact Assessment

In order to assess the landscape character a number of steps are undertaken to understand the context and implications of the works. These include the defining of character zones (zones of similar spatial or character properties), and the analysis of changes to these zones as a result of the proposed widening.

Landscape character is defined as:

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

(EIA No.4 Guidelines, 2013).

The proposal is assessed in terms of its impacts on these character zones and the impact ranked in terms of sensitivity to change. This assessment differs from a visual assessment in that it assesses the overall impact of the proposal on the area’s character and sense of place.

5.2 Visual Impact Assessment

Visibility

The view fields of a road corridor or object (in this instance a bridge) are composed of static receptors i.e. those that adjoin the corridor/bridge and mobile receptors those that travel along the corridor. The impacts of the two groups are unique in that the time and frequency of the exposure differ. The extent from which views can be obtained is referred to as the view catchment.
### Static Receptors

Static receptors occur within the visual catchment of the corridor i.e. they are points, which have a view of or can be viewed from the corridor and bridge. The corridor of the proposal is visually defined by both the topography and vegetation, which adjoins the corridor.

### Mobile Receptors

Mobile receptors are the users of the corridor who pass through the alignment and beneath the bridge, in this instance the vehicles and cyclists that travel along part or all of the alignment. Their experience of the space is short term.

### 5.3 Landscape Character and Visual Assessment Matrix

Landscape character and visual assessment are equally important. Landscape character assessment helps determine the overall impact of a project on an area’s character and sense of place including all built, natural and cultural aspects, covering towns, countryside and all shades between. Visual impact assessment helps define the day to day visual effects of a project on people’s views.

To quantify these impacts it is important to assess two qualities in relation to landscape character or view point these are: Sensitivity and Magnitude

- **Sensitivity** refers to the qualities of an area, the type number and type of receivers and how sensitive the existing character of the setting is to the proposed change. For example a pristine natural environment will be more sensitive to change than a built up industrial area.

- **Magnitude** refers to the nature of the project. For example a large interchange would have a very different impact on landscape character than a localised road widening in the same area."

(EIA No.4 Guidelines, 2013).

As part of the process of assessment the Roads and Maritime Services has adopted a matrix which combines rankings of sensitivity with magnitude of change in order to determine the overall impact of the proposal. This has been used to inform the undertaking of the Landscape Character and Visual Impact Assessment, refer **Table 2**

**Table 2 – Landscape Character and Visual Impact Assessment Matrix**

<table>
<thead>
<tr>
<th>Sensitivity</th>
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<tr>
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6

LANDSCAPE CHARACTER AND VISUAL ASSESSMENT

6.1 Landscape Character Assessment

This section of the report reviews the physical attributes of the character zones and the potential impacts of the proposal on these. As part of the character assessment three distinct zones have been identified, refer Figure 18. These are:

- Residential housing.
- Parkland.
- Rural lands.

Figure 18 – Landscape Character Map
6.1.1 Character Zone 1 – Residential Housing

Character Zone 1 is comprised of two parts, the residential suburb of Singleton Heights (Zone 1a) and Darlington (Zone 1b). Both are characterised by suburban housing of one to two storeys in height. Each subdivision is setback from the highway and has a landscape buffer. Both rise up from the highway and are located on a relatively small rise above the floodplain of the Hunter River, refer to Figure 19.

![Figure 19 – Darlington overlooking the floodplain of the Hunter River](image)

Singleton Heights is the older of the subdivisions with construction of the housing stock characterised by a mix of fibro and weatherboard dwellings dating from the 1950’s and 1960’s, refer to Figure 20. Its street layout is relatively grid like with few cul-de-sacs.

![Figure 20 – Typical housing of Singleton Heights – White Ave](image)
Darlington reflects a more recent subdivision dating from the 1970’s and 1980’s. Housing is predominantly brick veneer. A range of housing stock is available with town house and individual free standing dwellings present within this subdivision, refer to Figure 21. The road network consists primarily of a ring road with a number of small cul-de-sacs off this main spine.

Figure 21 – Typical housing of Darlington - Millard Close

Sensitivity – All housing is set back from the highway alignment and the rail bridge. The closest properties are nominally within 80-100 metres of the proposal. Both suburbs have a landscape offset, which consists of grassland and trees, which separates them from the immediate impact of the bridge. The view is consequently a mid-ground view. The sensitivity is therefore assessed as moderate.

Magnitude – The proposed bridge and highway exist in their present location with an expansion in footprint proposed to meet present safety and traffic requirements. The distance of the main observers combined with the fact that it is a replacement of an existing structure sees the magnitude of change assessed as low.

6.1.2 Character Zone 2 – Parklands and Highway

A landscape reserve separates the residential development of Singleton Heights and Darlington to either side of the highway alignment, east of the bridge; refer to Figures 22 and 23.

The parklands form part of the arrival sequence into Singleton. They provide a green transition as the intensity of housing and commerce increases on entry into Singleton Township. The parklands have had limited improvements in terms of provision of recreational facilities. The parkland however is serviced by a path system providing a link both along and across the highway between Darlington and Singleton Heights.

Gowrie Park adjoins the highway corridor to the north of the alignment. It is an informal parkland which is comprised predominantly of a grassland setting with scattered trees. A BMX track is the main improvement made to the park.
Sensitivity – Gowrie Park and the adjoining reserves serve as a transitional space and buffer between the highway and the adjoining communities. Its sensitivity is consequently considered moderate.

Magnitude – The proposed bridge and highway exist in their present location with the proposal constituting an expansion in footprint primarily around the bridge structure itself. The changes proposed represent a change in the form and material of the bridge. Within this broad open context the impacts are considered to be low.

6.1.3 Character Zone 3 – Rural Precinct

Located on the western side of the railway line the landscape presents a rural grassland setting with a woodland canopy evident on the ridge beyond (refer to Figure 24). A variety of structures exist within this setting including sheds, houses, and scattered trees.

Gowrie Golf Course is located to the south of the highway. This is screened from the bridge and the highway by a stand of Casuarinas located within the road reserve.

To the north are a number of rural holdings. These are located above the highway, as the highway is set within a cut as it climbs McDougall Hill. The descent down McDougall Hill forms a key element of the arrival sequence from the west. The landscape transitions from the broader rural landscape and residential and commercial uses become more common.

West of the highway alignment is zoned environmental living and composed of rural residential small acreage holdings. This is set within a canopy of native trees.
Sensitivity – A clear view of the proposed works is not evident from the majority of the adjoining lands with vegetation or elevation limiting potential views of the proposal. The sensitivity of this site is consequently considered to be low.

Magnitude – The proposed bridge and highway exist in their present location with the proposal constituting an expansion in footprint primarily around the bridge structure itself. The changes proposed represent a change in the form and material of the bridge. Within this broad open context the impacts are considered to be low.

6.2 Landscape Character Impact Assessment Summary

The overall character of the environment in which the bridge is located is not going to change. The present alignment and bridge have been part of the landscape for some time and the community is accustomed to these elements within the landscape. The present bridge is a significant restriction along the route and this restriction is experienced by those who pass beneath it either while using the highway or its shared path.

The proposal represents a freeing of this restriction which has the potential to enhance both physical and visual connection between the two sides of the bridge.

The impact of the proposal on the landscape character has been assessed to be low – moderate. The proposed changes have the potential to enhance the character of the crossing through the simplification of the rail bridge.

The following table summarises this change.

Table 3 – Summary of Landscape Character Assessment

<table>
<thead>
<tr>
<th>Character Zone</th>
<th>Sensitivity</th>
<th>Magnitude</th>
<th>Impact</th>
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<tbody>
<tr>
<td>Zone 1</td>
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<td>Low</td>
<td>Low - Moderate</td>
</tr>
<tr>
<td>Zone 2</td>
<td>Moderate</td>
<td>Low</td>
<td>Low - Moderate</td>
</tr>
<tr>
<td>Zone 3</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
6.3 Visual Impact Assessment

The potential visual impact of the proposed rail bridge and highway upgrade has been assessed in relation to a number of key viewpoints and/or group of viewpoints. It is based on the existing landuse pattern and development adjoining the proposals location.

The assessment method has involved:

- Defining the scale of the proposed works.
- Identification of key visual envelops, viewpoints and groups of viewpoints from which the proposal is visible.
- Assessment of the level of impact on the proposed viewpoints from the proposal.

6.3.1 Visual Envelope Mapping

A detailed field and desktop assessment of the alignment was undertaken to determine the areas/viewpoints from where the proposal is visible as defined in the Visual Envelop Map, refer to Figure 25. The visibility of the rail bridge is primarily from the New England Highway corridor and the landscape reserves adjacent to it.

![Visual Envelop Map](image)

Legend

- **Vpt 1**: View Points
- **Visual Envelope**

Figure 25 – Visual Envelop Map
6.3.2 Key Viewpoints (Vpt)

Vpt 1 – Eastern Approach to Simpson Terrace

Views: The view is from just east of Simpsons Terrace looking west along the park lined corridor of New England Highway, refer to Figure 26. The Gowrie Gate Bridge is located a distance of 275 metres from the observer. The bridge is set below the ridgeline behind and has a backdrop of trees. These combine to limit the visual prominence of the existing/future bridge.

Figure 26 – Vpt1 - View from just east of Simpsons Terrace looking west along the New England Highway.

Sensitivity: The view along the highway corridor is dominated by the road and traffic on it. The bridge being a distant mid ground element within the view reduces the sensitivity of any viewer from this point. The impact of changes to the bridge and its approaches is consequently considered to be low.

Magnitude: The works involve the replacement of an existing structure. While the magnitude of the proposed works sees an increase in the span and subsequent widening of the opening. This is relatively minor in the scale of the view and its impact is considered to be low.

Conclusion: The impact of the proposal from the east of the intersection of the New England Highway with Simpsons Terrace is considered to be low.

Vpt 2 – Approach to Gowrie Gates Bridge

Views: The view is taken west of Simpsons Terrace intersection with the New England Highway, approximately 125 m from the bridge refer to Figure 27. The bridge is now a more dominant element within the view and sits just below the ridgeline beyond. To the south of the highway (left of photo) the presence of a cream noise wall along the railway line dominates the view to the south west. Trees lining the corridor to the north west filter views to housing and focus the eye westward. The steel bridge structures impact is reduced by its dark colour which sees it blend into the background.

Figure 27 – Vpt2 - Approach to Gowrie Gates west of Simpsons Terrace
Sensitivity: The view along the highway corridor is dominated by the road pavement and traffic on it. The bridge is a mid-ground element within the view and in part is dominated by the light coloured noise wall to the south of the bridge. The impact of changes to the bridge and its approaches are considered to be low.

Magnitude: The works involve the replacement of an existing structure. While the magnitude of the proposed works sees an increase in the clear span and change of form. This is relatively minor in the scale of the view its impact are considered to be low.

Conclusion: The impact of the proposal from the New England Highway alignment on approach is considered to be low.

Vpt 3 – View from White Avenue at its intersection with Blaxland Avenue looking south

Views: The view from White Avenue at its intersection with Blaxland Avenue captures the closest view of the Gowrie Gates Bridge from the streets of Singleton Heights, refer to Figure 28. Located 140 metres from the bridge the view of the bridge is partially obscured by its abutment and the acute angle at which it is being viewed. A cluster of trees adjoining the New England Highway filter views of the raised rail alignment and the bridge.

Figure 28 – Vpt3 - View from White Avenue towards Gowrie Gates

Looking back from the highway, northwards, confirms the restricted visibility from houses along White Avenue, refer Figure 29.

Figure 29 – View from New England Highway back to White Avenue

Sensitivity: The White Avenue view point is from both residential addresses set some 140 m from the bridge and the public domain of White Avenue. These factors combine to produce a moderate sensitivity.
**Magnitude:** The magnitude of the impact on the White Avenue addresses are moderated by:

1. The presence of vegetation both in the foreground and mid-ground of the view in front of the proposed bridge.
2. The acute angle at which the structure is viewed limiting the exposure of the structure.

The magnitude of change from White Avenue is consequently considered to be low.

**Conclusion:** The presence of both residential viewers and transitory road users lifts the sensitivity of the site but this is offset in magnitude in part by the distance, in part by the angle, and in part by the obstructions. The overall impact is assessed to be low to moderate.

**Vpt4 – View from rear of 46 White Avenue across Gowrie Park**

**Views:** The view depicted in this image, Figure 30, is from the rear corner of the property, 46 White Avenue, and reveals an oblique angle of view to the existing bridge. Properties to the north of this residence experience a view of the bridge largely obstructed by planting between house and bridge.

![Figure 30 – View from rear of 46 White Avenue](image)

**Sensitivity:** The rear of 46 White Avenue is some 100 metres from the existing structure across a parkland setting. As a residential user with a parkland outlook the site is considered to be moderately sensitive to change.

**Magnitude:** The proposal will see an expansion of the bridge structure, and changes in material and form. The oblique angle of view limits the visibility of the structure. The bridge however is clearly visible and the changes are considered to result in an increase in the scale of the built elements of the bridge. The magnitude of change is considered to be moderate.

**Conclusion:** The impacts of the proposed changes are of moderate impact due to proximity of viewer and scale of changes proposed.
Vpt5 – View from rear of 30 White Avenue and park access road.

Views: The view from this location is across the relatively open landscape of Gowrie Park, refer Figure 31. The view is across the BMX track, which appears largely grassed from this angle, with the bridge in the background. The bridge is seen against the tree line ridge beyond; its dark colour sees it blend against the dark green canopies.

Figure 31 – View from the side boundary of 30 White Avenue

Sensitivity: The view from this location is considered to have a low sensitivity. It is not a focus of any common areas of the house and is largely a background view.

Magnitude: The distance from the bridge is 220 metres. The views of the bridge are partially filtered by vegetation. The scale of change is considered to be low.

Conclusion: The view represents a low visual impact due to the distance of the viewer from the proposed works and the scale and nature of these works.

Vpt6 – Grainger Crescent near its intersection with Millard Close

Views: This view is from the road reserve of Grainger Crescent looking west towards the existing bridge, some 375 m away, refer to Figure 32. The bridge is barely visible in the background and is backed by a canopy of trees. The open space reserves dominate the foreground of the view.

Figure 32 – Vpt6 – Viewer from Grainger Crescent looking west
Sensitivity: The viewer within this street is not focused towards the bridge. They are physically separated by distance from the works and the backdrop mitigates the visual impacts of the existing bridge. This will not change. The sensitivity is considered to be low.

Magnitude: The distance of separation combined with the proposal replacing an existing structure mean that the impact has been considered low.

Conclusion: The impact of the proposal is considered minimal due to the distance of all receptors and the fact it is a replacement of an existing structure.

Vpt 7 – View from the boundary fence of 9 and 9a Allen Court

Views: The view is across road reserve and parkland and is composed of scattered trees in mown grassland. The views are from the side of the properties and so are not a focus of the viewer and are at an acute angle. In part views are obstructed from the properties by boundary planting and the fence line. The houses are set at a similar level as the rail line and so the opening under the bridge is not evident.

Sensitivity: This view field is from residential properties which presently have indirect views over the existing rail infrastructure. They are considered to be moderately sensitive to changes within this view field.

Magnitude: The bridge is located a distance of 160 metres from the properties. The bridge structure presently sits near the top of the skyline beyond. There is an increase in the scale of the structure proposed which will potential reduced the extent of skyline visible beyond. The scale of change is considered moderate.

Conclusion: The impact of this view has been assessed to be of moderate significance due to the residential nature of the landuse and the scale of the proposed bridge.
Vpt 8 – View from turning head of Allen Court

**Views:** Views of both the rail corridor and highway corridor are restricted from Allen Court, refer to **Figure 34**. The battle axe configuration of the blocks means that two rows of houses occur between this street and the proposal limiting views from the public domain.

![Figure 34 – Vpt4 - View looking North West from Allen Court](image)

**Sensitivity:** As a residential property in close proximity of the bridge, the sensitivity of change is elevated and so has been assessed as moderate.

**Magnitude:** The magnitude of the proposal is negligible as a result of the limited ability to observe the changes from this view point.

**Conclusion:** The impact has been assessed as negligible as a result of the restricted view opportunity

Vpt 9 – Intersection of Maison Dieu Road

**Views:** The intersection of Maison Dieu Road forms the critical view point to the west of the railway alignment. This reflects the fact that the New England Highway and Maison Dieu Road both view the proposal from this point. Refer to **Figure 35** and **Figure 36**.

![Figure 35 – Vpt5 - View from Maison Dieu Road east towards Gowrie Gates Bridge](image)

Maison Dieu Road up to this point is in part screened from the view of the highway by a cluster of planting set back from the road. This planting screens a stockpile area and contains views from the east up towards Gowrie and views from Gowrie down Maison Dieu Road. The approach to the intersection sees the bridge begin to be revealed.
Similarly the view from the New England Highway too is restricted up to this point as the land rises to the north as the highway is benched into the side of the ridge and blocks the view to the east. This is illustrated in the view looking west from under the existing bridge, refer Figure 37.

Figure 37 – View looking west from Gowrie Gates to the Maison Dieu Road/ New England Highway intersection

**Sensitivity:** The viewers from this point are all transitory in nature as either road users or users of the pedestrian path. The view is in the mid-ground some 150 m from the view point. The sensitivity has been assessed as low.

**Magnitude:** The magnitude of change is limited to the expansion of the bridge opening and a minor widening of the highway pavement. Within the scale of the space this has been assessed as low.

**Conclusion:** The combined sensitivity of the viewer and magnitude of the impact have been assessed as of low impact.
6.4 Visual Impact Assessment Summary

The scale of the proposal, the fact it is a replacement of an existing structure and the vegetated context mean that the visual impacts are relatively contained or absorbed within the context. Table 4 summarises these findings.

Table 4 – Visual Impact Assessment Summary

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Generally the proposal represents a low visual impact. Two locations have been identified as moderate, which reflects the presence of relatively unobstructed views of residential receivers. In both instances the viewer’s fall within 150m of the site, and view it at an acute angle. The impact of these views is restricted to the individual properties rather than indicative of adjoining properties. Any impact would be easily managed by the addition of vegetation within the public domain to screen and filter the view.
The concept design has identified a number of parameters and elements which define the visual character of the resultant bridge. Constructability has been one of the critical defining factors in terms of the ability to deliver the proposal without significant disruption to the operation of the Main North Railway Line or the New England Highway. Despite these constraints it is important that the bridge is developed with appropriate consideration of its context and the opportunities to mitigate these.

The concept report identified the management of the abutment and its slopes as two key areas where appropriate treatments are required to mitigate the visual and enhance the aesthetic qualities of the bridge. A focus on this was getting properly formed abutment walls and slopes. This provides both a more inviting path of travel for the shared pedestrian/cyclepath users and a high level of vandal resistance and management by enabling the use of sacrificial coatings to protect the surface of the abutment.

Precast concrete was proposed to face the walls of the abutment and a paver unit for the slope of the abutment. The design development of the walls should consider the appropriateness of a rebated wall finish to provide texture, shadow and minimise its attraction for the application of graffiti. An anti-graffiti coating should also be applied to all accessible panels.

The design of the structure was also considered to require some further review to integrate the termination of the structure with the surrounding landscape. In particular, the abrupt vertical ends should be transitioned down to the ground to ground the bridge.

Landscape treatments will also play an important role in the management of the visual impacts. Within the concept plan, areas of garden bed and planting have been indicated to both reinstate the areas disturbed by the works but also to lift the usability of the space. Screen planting either side of the alignment is recommended to filter views to the new structure and limit impacts on the adjoining properties.

The shared pedestrian/cyclepath approach from the east is presently in full sun. It is suggested that additional clusters of trees would both enhance the usability of the path and also assist in the integration of the bridge within the landscape and in part screen the abutments from residents and road users alike.
CONCLUSION

The proposal encompasses modification to the New England Highway and Rail Overbridge at Gowrie Gates. The design of both, road and bridge, have specific performance parameters which have determined the basic form and method of construction.

An assessment of both the landscape character and visual impact of the proposal has been made in order to identify potential impacts associated with the works and the mitigation required to address this.

The landscape character assessment determined the bridge would generally have a low to moderate impact, with visible change evident. The community is accustomed to the presence of both the highway and the bridge and this is not going to change. The upgrading of the bridge and its associated changes were identified as potentially enhancing the visual quality of the rail crossing by opening up the space under the bridge and simplifying its profile.

Visual impacts were generally assessed to be low with two residential receivers identified as moderate. The relatively low impact of the proposal reflects the scale of the proposed works, the fact the works are a replacement of an existing structure and the vegetated context mean that the visual impacts are relatively contained or absorbed within the context of the surrounding environment.

In addressing the findings of the landscape character and visual assessment, a key aspect of the design has been its response to the landscape and visual setting of the area and the expression of the functionality of the bridge. The language of the bridge reflects the strength of the structure and the substantial loads it has to carry. The management of the space beneath the bridge has been addressed to reflect the presence of both vehicular as well as pedestrian movement beneath the structure. The resultant bridge form is open and lighter than the previous bridge with recommendations provided for the treatment of: the substructure - to reflect the pedestrian access; and end terminations.

By adopting these initiatives, the proposal has been designed to integrate with its landscape and visual setting.
REFERENCES


Rocks and Maritime Services (2012) Bridge Aesthetics - Design Guidelines to improve the appearance of bridges in NSW.


Web Sites:

Local Environmental plans and mapping:
