

# **M1 Upgrade Kariong to Somersby ancillary facility**

Addendum review of environmental  
factors

October 2016



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# M1 Upgrade Kariong to Somersby ancillary facility

## Addendum review of environmental factors

**October 2016**

Prepared by Bowditch Group and Roads and Maritime Services

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## Document controls

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### Approval and authorisation

<b>Title</b>	M1 Upgrade Kariong to Somersby ancillary facility Addendum review of environmental factors
<b>Accepted on behalf of NSW Roads and Maritime Services by:</b>	Ben Phillipson Project Manager – M1 Upgrade Kariong to Somersby Freight & Regional
<b>Signed:</b>	
<b>Dated:</b>	26/10/2016.

### Document Control

Title	Prepared by	Reviewed by	Issue Date
<b>1.0</b>	Andrew Grainger (Bowditch Group)	Stuart Pigott, Ben Phillipson	31/10/16
<b>1.1 (Post Determination)</b>	James Walker (RMS) <ul style="list-style-type: none"><li>Revised Section 5 – Consultation. Including new table 5.2.</li></ul>	Stuart Pigott	28/02/17

# Summary

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## The proposed modification

Roads and Maritime Services (Roads and Maritime) proposes to modify the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project by making land at 85 Pile Road, Somersby, available for use as an ancillary facility by the successful construction contractor. Key features of the proposed modification would include:

- Perimeter security fencing, access and environmental controls
- Concrete batch plant and associated material storage, loading and dispatching facilities
- Site offices and amenities eg meal rooms, toilets/showers
- Light and heavy vehicle parking areas
- Plant and material storage.

## Background

A review of environmental factors (REF) was prepared for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening project in December 2014 (referred to in this addendum REF as the approved project REF). The approved project REF was placed on public display between 19 January 2015 and 27 February 2015 for community and stakeholder comment. A submissions report, dated May 2015 was prepared to respond to issues raised.

In addition, the following addendum REFs for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening have been prepared:

- M1 Upgrade Kariong to Somersby concrete road surface repairs Addendum REF (May 2016)
- M1 Pacific Motorway Upgrade Kariong to Somersby Addendum REF (draft seeking approval in October 2016)

## Need for the proposed modification

Chapter 2 of the approved project REF addresses the strategic need for the approved project. The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the approved project.

The proposed modification is needed to support delivery of the approved project.

## Proposal objectives and development criteria

Section 2.4 and 2.5 of the approved project REF identifies the approved project objectives and development criteria for the approved project. These also apply to the proposed modification.

Section 3.4 of the approved project REF identified a number of sites suitable for use as ancillary facilities (and preferred over other options) with reference to the following location based criteria:

- Accessible for construction traffic and deliveries
- Located in areas previously disturbed within the proposal area and that do not require the clearing of native vegetation
- Located away from residential buildings or heritage items
- Located in plain view of the public to deter theft and illegal dumping
- Located close to key construction activities (eg bridge construction) to minimise transport of materials and equipment

- Located in areas not prone to flooding and more than 40 metres from a watercourse.

The criteria from section 3.4 of the approved project REF have also been considered when determining the suitability of the proposed modification.

## Options considered

Roads and Maritime investigated the 'do nothing' option and one other option in the context of the proposed modification. However, this has not precluded Roads and Maritime from pursuing other alternative ancillary facility options at a later date for the broader project. Options investigated include:

1. Option 1 - 'Do nothing' option. This option involves making available only those ancillary facilities approved for use in the approved project REF
2. Option 2 – The 'Preferred option' - This involves making available land at 85 Pile Road, Somersby for use as an ancillary facility by the successful construction contractor.

## Statutory and planning framework

The proposed modification is categorised as development for the purpose of a road and road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposed modification is permissible without consent. The proposed modification is not State significant infrastructure or State significant development. The proposed modification can be assessed under Part 5 of the EP&A Act. Consent from Council is not required.

The matters prescribed by clause 228 of the *Environmental Planning and Assessment Regulation 2000*, for consideration by assessments under Part 5, have been reviewed. No requirement for a referral under the EPBC Act has been identified.

## Community and stakeholder consultation

A Communications and Community Involvement Plan (CCIP) was prepared in February 2014. The CCIP seeks to identify key stakeholders, key potential community and stakeholder issues raised in response to the approved project, and potential mitigation measures/responses to be implemented by Roads and Maritime.

Roads and Maritime undertook consultation under Clause 13(1)(d) of the ISEPP in relation to a connection to a water supply system owned by council and requiring the use of a substantial amount of water. Central Coast Council responded on 11 August 2016.

Community consultation regarding the general scope of the motorway project and ancillary facilities and activities has been undertaken. Details of this consultation are included in the approved project REF and submissions report (May 2015).

Specific consultation has been undertaken regarding potential establishment of a concrete batch plant and ancillary facility at 85 Pile Road during the construction period for the M1 Upgrade Kariang to Somersby project. Correspondence to three landholders in Howes Road described the proposed modification and requested permission to place noise logging equipment to assist with assessing potential noise impacts.

Subject to approval of this Addendum REF for 85 Pile Road, any use of the site as a concrete batch plant and ancillary facility during the construction period would be accompanied by close consultation with adjacent properties and potential noise sensitive receivers. This consultation would be undertaken in accordance with:

- Safeguards described in this Addendum REF
- Safeguards described in the approved project REF and submissions report (May 2015)
- Environmental Protection Licence for the project

- Stakeholder and Community Engagement Plan for the M1 Upgrade Kariong to Somersby project
- Communications Strategy for the M1 Productivity Package.

## Environmental impacts

The approved project inclusive of the proposed modification is substantially the same as that considered in the approved project REF, November 2015 addendum REF, January 2016 addendum REF and May 2016 addendum REF. The proposed modification has been reviewed in the context of the receiving environment to identify any new issues for assessment.

Issues identified for further assessment included:

### Traffic and access

The proposed modification would contribute up to 70 heavy vehicles and about 50 light vehicles per day to the regional and local road network during operation of the site. Traffic would access the site of the proposed modification through local roads within the Somersby Central Industrial Park. Capacity constraints are not anticipated.

### Noise and vibration

During standard daytime hours, noise levels are predicted to exceed the NML by up to 5dB at the nearest affected residences on Howes Road. This is due to a combination of all listed plant and equipment operating simultaneously.

During the early morning and early evening extended hours (i.e. periods from 6am to 7am and 6pm to 8pm) noise levels are predicted to exceed the NML by up to 10dB(A) at the nearest affected residences on Howes Road.

Exceedance of the  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  sleep disturbance criteria during the early morning period is likely with the use of most plant and equipment on site. The predicted exceedance is up to 5dB above the NML. Heavy vehicle compression brakes, batch plant operations and use of front end loaders and excavators are all predicted to exceed the initial criteria. While the initial sleep disturbance criteria of  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  is exceeded, it is noted that internal maximum noise levels would be below 50dB(A) (assuming a 10dB loss for outside to inside noise levels), therefore sleep disturbance would be unlikely to cause awakening reactions.

The proposed modification would operate only during construction of the project, as the activity described in this Addendum REF for 85 Pile shall only be undertaken during the construction period for the M1 Upgrade Kariong to Somersby project.

Due to the type and location of plant that would be used at the site of the proposed modification, vibration impacts are also not anticipated.

### Biodiversity

The proposed modification would result in the direct disturbance of up 0.3 hectares of regenerating native vegetation (parent vegetation is Exposed Hawkesbury Woodland). A further 1.5 hectares of cleared non-native vegetation would also likely be disturbed.

Direct or indirect impact on established Hawkesbury Banksia Scrub - Woodland and Exposed Hawkesbury Woodland would not be expected.

### Landscape and visual amenity

The proposed modification would introduce plant, equipment and temporary buildings to an area of largely cleared land within an industrial estate. Views available to the site of the proposed modification are only available to those in the adjacent waste recycling facility.

The magnitude of the proposed modification has been assessed as 'low'. The resulting level of visual impact is assessed as 'low'.

### **Aboriginal heritage**

Considering disturbance from historical land use practices at the site of the proposed modification (ie extensive clearing and earthworks), Aboriginal cultural heritage impacts are not expected.

### **Safeguards and mitigation measures**

The safeguards and mitigation measures listed in the approved project REF, submissions report and subsequent addendum REFs would apply to the proposed modification. Additional measures have been proposed where necessary.

### **Justification and conclusion**

Justification for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project has been analysed in detail in Section 8.1 of the approved project REF. The analysis remains applicable to the proposed modification.

The benefits of the proposed modification are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposed modification.

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# 1 Introduction

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## 1.1 Proposed modification overview

Roads and Maritime Services (Roads and Maritime) proposes to modify the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project by making land at 85 Pile Road, Somersby, available for use as an ancillary facility by the successful construction contractor. Key features of the proposed modification would include:

- Perimeter security fencing, access and environmental controls
- Concrete batch plant and associated material storage, loading and dispatching facilities
- Site offices and amenities (eg meal rooms, toilets/showers)
- Light and heavy vehicle parking areas
- Plant and material storage

The proposed modification would incorporate all land associated with 85 Pile Road, Somersby. The location of the proposed modification in the context of the approved project is shown in Figure 1-1. Figure 1-2 shows the location of the proposed ancillary facility and access to the M1 Pacific Motorway. Chapter 3 describes the proposed modification in more detail.

A review of environmental factors (REF) was prepared for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening project in December 2014 (referred to in this addendum REF as the approved project REF). The approved project REF was placed on public display between 19 January 2015 and 27 February 2015 for community and stakeholder comment. A submissions report, dated May 2015 was prepared to respond to issues raised.

In addition, the following addendum REFs for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening have been prepared:

- M1 Upgrade Kariong to Somersby concrete road surface repairs Addendum REF (May 2016)
- M1 Pacific Motorway Upgrade Kariong to Somersby Addendum REF ((draft seeking approval in October 2016).

## 1.2 Purpose of the report

For the purposes of these works, Roads and Maritime is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This addendum REF is to be read in conjunction with the approved project REF (December 2014), submissions report (May 2015) and previous addendum REFs (November 2015, January 2016, May 2016, October 2016) for the approved project. The purpose of this addendum REF is to describe the proposed modification, to document and assess the likely impacts of the proposed modification on the environment, and to detail protective measures to be implemented.

The description of the proposed work and associated environmental impacts have been undertaken in context of clause 228 of the Environmental Planning and Assessment Regulation 2000, the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

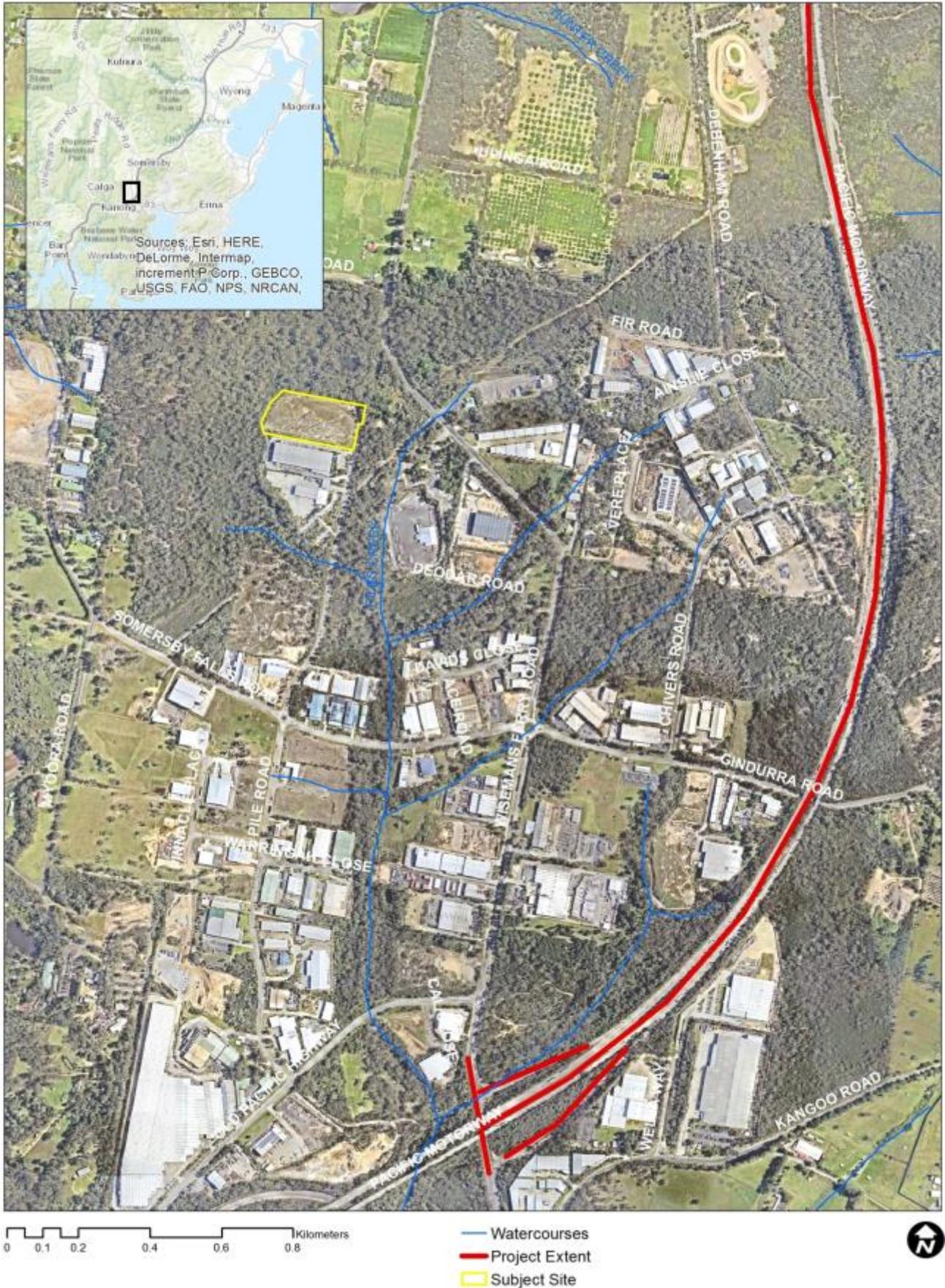


Figure 1-1: Location of the proposed modification in relation to the approved project

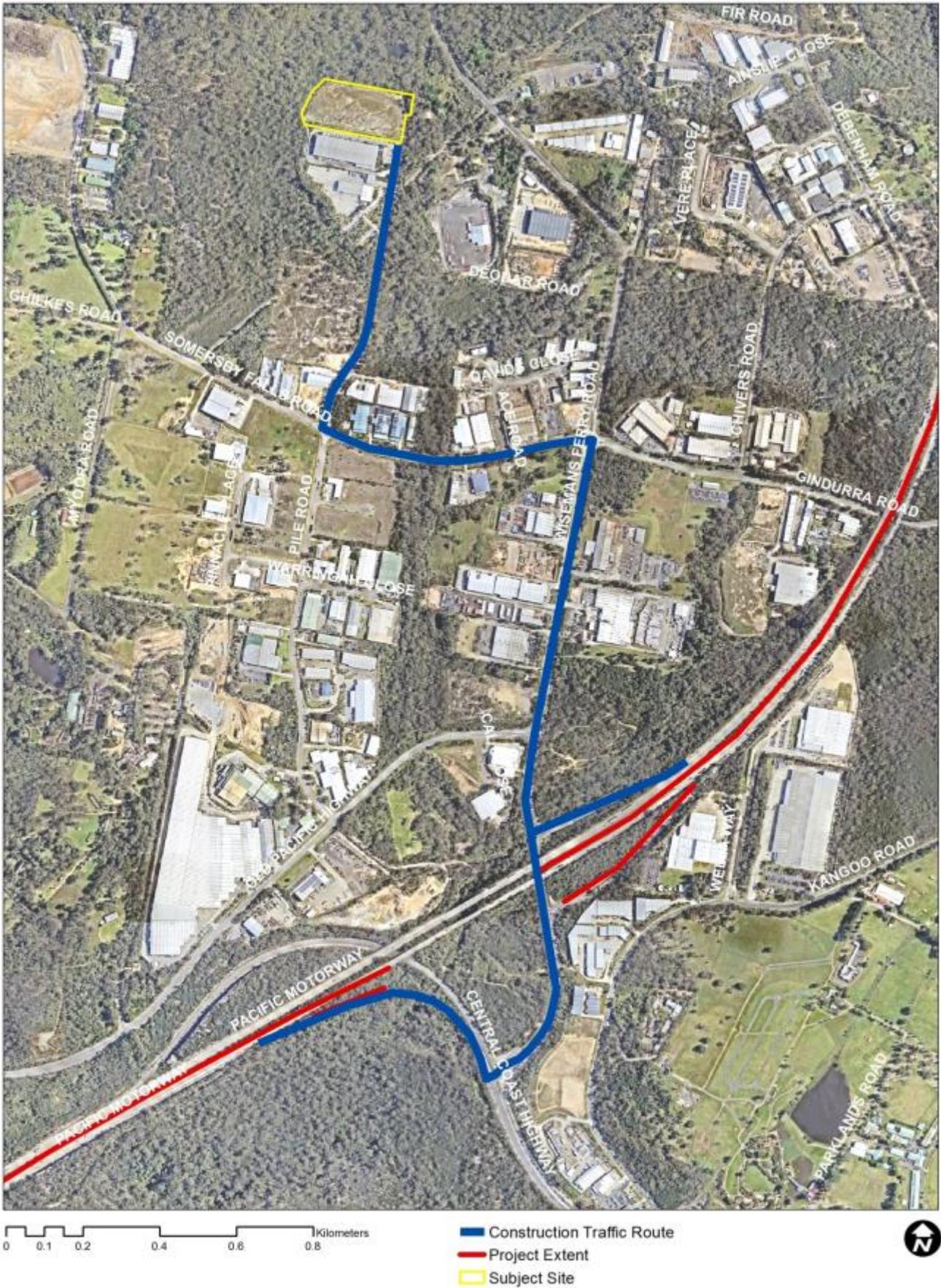


Figure 1-2: Location of the ancillary facility and access to the M1 Motorway

In doing so, the addendum REF helps to fulfil the requirements of Section 111 of the EP&A Act that Roads and Maritime examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the addendum REF would be considered when assessing:

- Whether the proposed modification is likely to result in a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposed modification to significantly impact any other matters of national environmental significance or Commonwealth land and therefore the need to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

## 2 Need and options considered

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### 2.1 Strategic need for the proposed modification

Chapter 2 of the approved project REF addresses the strategic need for the approved project. The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the approved project.

The proposed modification is needed to support delivery of the approved project. Chapter 3 of the approved project REF acknowledges the need to establish a concrete batching plant at one of the project ancillary sites.

### 2.2 Proposal objectives and development criteria

Section 2.4 and 2.5 of the approved project REF identifies the approved project objectives and development criteria for the approved project. These also apply to the proposed modification.

Section 3.4 of the approved project REF identified some potential locations for ancillary sites. The following location based criteria were developed for use in identifying final ancillary site locations:

- Accessible for construction traffic and deliveries
- Located in areas previously disturbed within the proposal area and that do not require the clearing of native vegetation
- Located away from residential buildings or heritage items
- Located in plain view of the public to deter theft and illegal dumping
- Located close to key construction activities (eg bridge construction) to minimise transport of materials and equipment
- Located in areas not prone to flooding and more than 40 metres from a watercourse.

The criteria from section 3.4 of the approved project REF were considered when determining the suitability of the proposed modification.

### 2.3 Alternatives and options considered

#### 2.3.1 Methodology for selection of preferred option

The proposed modification involves making land at 85 Pile Road, Somersby, available for use as an ancillary facility to support construction requirements and provide ready access to the project corridor.

In this context, the process of option selection had two broad stages:

1. A consideration of whether the proposed modification in any configuration could be justified. This is an evaluation of the 'do nothing' option
2. An evaluation of the proposed modification and the associated impacts and benefits.

#### 2.3.2 Identified options

Roads and Maritime investigated the 'do nothing' option and one other option in the context of the proposed modification. However, this has not precluded Roads and Maritime from pursuing other alternative ancillary facility options at a later date for the broader project. Options investigated include:

1. Option 1 - 'Do nothing' option. This option involves making available only those ancillary facilities identified for use in the approved project REF

2. Option 2 – The ‘Preferred option’ - This involves making land at 85 Pile Road, Somersby, available for use as an ancillary facility by the successful construction contractor.

### 2.3.3 Analysis of options

#### Option 1 – ‘Do nothing’

The ‘do nothing’ option does not address the need to provide a number of suitable options for ancillary facility sites for use by the successful construction contractor and would therefore only be preferred in circumstances where the costs and environmental impacts of proceeding were assessed as outweighing identified benefits. That was not the case and therefore the ‘do nothing’ option was not pursued further.

#### Option 2 – Making land available at 85 Pile Road, Somersby for use as an ancillary facility

This option would involve making land at 85 Pile Road, Somersby, available for use by the successful construction contractor as an ancillary facility. The site is located in an established industrial estate, is located more than 200 metres from the nearest noise sensitive receiver and has ready heavy vehicle access to the M1 Pacific Motorway (approved project corridor).

When land at 85 Pile Road, Somersby, is considered against location based criteria identified in section 3.4 of the approved project REF, it is noted that all criteria can be satisfied.

Potential impacts of the proposed modification are considered in chapter 6 of this addendum REF.

## 2.4 Preferred option

The preferred option is to make land at 85 Pile Road, Somersby, available for use as an ancillary facility by the successful construction contractor. This would include:

- Perimeter security fencing, access and environmental controls
- Concrete batch plant and associated material storage, loading and dispatching facilities
- Site offices and amenities (eg meal rooms, toilets/showers)
- Light and heavy vehicle parking areas
- Plant and material storage.

The preferred option would address the identified need and can be justified against adopted location based criteria for ancillary facilities.

## 3 Description of the proposed modification

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### 3.1 The proposed modification

Roads and Maritime proposes to modify the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project by making land at 85 Pile Road, Somersby, available for use by the successful construction contractor as an ancillary facility. The location of the proposed modification is shown in Figure 1-1.

Key features of the proposed modification would include:

- Perimeter security fencing, access and environmental controls
- Concrete batch plant and associated material storage, loading and dispatching facilities
- Site offices and amenities (eg meal rooms, toilets/showers)
- Light and heavy vehicle parking areas
- Plant and material storage.

### 3.2 Construction activities

#### 3.2.1 Work methodology

If selected for use by the successful construction contractor, 85 Pile Road at Somersby would be prepared to make it suitable for use as an ancillary facility. Preparation of the site would include:

- Minor earthworks to level parts of the site
- Importation of all-weather road-base for access roads, tracks and hardstand
- Spray-sealing trafficable areas for durability
- Construction of erosion and sediment controls, and stormwater detentions structures as required.

Figure 1-2 shows the extent of land associated with 85 Pile Road, Somersby.

#### 3.2.2 Construction hours and duration

Construction work associated with establishment of land at 85 Pile Road, Somersby, as an ancillary facility would be carried out during standard construction hours, which are:

- Monday to Friday between 7am and 6pm
- Saturday between 8am to 1pm
- No works on Sunday or public holidays.

It is anticipated that set up and establishment of 85 Pile Road, Somersby as an ancillary facility would be up to eight weeks.

Operation of the land as an ancillary facility would be between approved extended working hours documented in the approved project REF (and any limitations that might be imposed by an Environmental Protection Licence), which are:

- Monday to Friday between 6am and 8pm
- Saturday between 7am and 5pm
- No works on Sunday or public holidays.

The ancillary facility would commence operation toward the middle of 2017 for a period of about two years.

### 3.2.3 Plant and equipment

Plant and equipment required for the proposed modification would include:

#### Establishment of the ancillary facility

- Excavators
- Dump trucks (truck and dog)
- Concrete agitator
- Delivery vehicles
- Site vehicles
- Various hand tools
- Bobcats
- Franna / mobile crane
- Grader
- Rollers
- Water cart
- Asphalt spray seal equipment

#### Operation of the ancillary facility

- Concrete agitators
- Delivery vehicles
- Excavators
- Site vehicles
- Concrete crusher
- Water cart
- Batch plant
- Front end loader
- Dump trucks (truck and dog)

### 3.2.4 Earthworks

Limited earthworks would be needed for construction of the proposed modification.

The site has previously been cleared and levelled in preparation for a commercial development that did not proceed. In preparation for use as an ancillary facility, the site would be further levelled in places to accommodate the placement of site offices and amenities, material storage, the erection of a batch plant and the formation of internal service roads.

### 3.2.5 Source and quantity of materials

Various materials in small to moderate quantities, sourced from local suppliers where possible, would be required for the proposed modification, including:

- Hardstand material
- Hardstand and access road spray seal
- Concrete
- Geotextile fabric and other erosion and sediment control products.

### 3.2.6 Traffic management and access

Traffic would be managed in accordance with *Traffic Control at Worksites* (Roads and Traffic Authority, 2010) and an approved traffic control plan where necessary. Establishment and operation of the site would be during approved construction hours detailed in section 3.3.2.

Access to the site (from the M1 Pacific Motorway) would be via the regional and local road network. Travelling either north or southbound on the M1 Pacific Motorway construction traffic would exit the motorway via the Kariong Interchange, travel north along Wisemans Ferry Road, turn left into Somersby Falls Road and then right into Pile Road before accessing the site (refer Figure 1-2). The route is about 2.2 kilometres from the M1 Pacific Motorway.

For the majority of the work, it is anticipated that up to 70 additional heavy vehicle movements per day would be required for the delivery of various materials to site. About 50 light vehicles would arrive and depart the site of the proposed modification at the start and end of each working day.

### **3.3 Ancillary facilities**

Ancillary and/or stockpiling facilities in addition to those subject to this addendum REF or those documented in the approved project REF are not currently proposed.

The 85 Pile Road, Somersby, ancillary facility would remain in operation (if selected for use by the successful contractor) until the conclusion of the project, which is anticipated to be toward the middle of 2019.

### **3.4 Public utility adjustment**

Public utility adjustment would not be required for the proposed modification. However, a number of connections to existing utilities would be required and include:

- Power
- Communications
- Sewer
- Water.

### **3.5 Property acquisition**

Additional property acquisitions would not be required for the proposed modification. 85 Pile Road, Somersby, would be occupied under a lease agreement with the existing owner.

## 4 Statutory and planning framework

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### 4.1 Environmental Planning and Assessment Act 1979

#### 4.1.1 State Environmental Planning Policies

##### **State Environmental Planning Policy (Infrastructure) 2007**

*State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposed modification is for road and road infrastructure facilities and is to be carried out by Roads and Maritime, it can be assessed under Part 5 of the EP&A Act. Development consent from council is not required.

The proposed modification is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not affect land or development regulated by *State Environmental Planning Policy No. 14 - Coastal Wetlands*, *State Environmental Planning Policy No. 26 - Littoral Rainforests*, *State Environmental Planning Policy (State and Regional Development) 2011* or *State Environmental Planning Policy (Major Development) 2005*.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP (where applicable), is discussed in chapter 5 of this addendum REF.

##### **State Environmental Planning Policy (State and Regional Development) 2011**

*State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) identifies development that is State Significant Infrastructure (SSI) under Part 5.1 of the EP&A Act. As discussed in Section 4.5 the proposal does not meet the definition of SSI and therefore this SEPP does not apply.

#### 4.1.2 Local Environmental Plans

##### **Gosford Local Environmental Plan 2014**

The proposed modification is located on land zoned IN1 General Industrial under the *Gosford Local Environmental Plan 2014*. Development for the purposes of roads is permitted with development consent in the IN1 General Industrial zone.

As noted in Section 4.1.1, the ISEPP confirms that any development for purpose of roads or road infrastructure facilities may be undertaken without development consent.

### 4.2 Other relevant NSW legislation

#### 4.2.1 Protection of the Environment Operations Act, 1997

The *Protection of the Environment Operations Act 1997* (PoEO Act) consolidates key pollution statutes, including noise, air, water pollution, and waste management, under a single Act. The PoEO Act establishes the NSW environmental regulatory framework and determines the need for an environmental protection licence (EPL).

Part 3.2 of the POEO Act requires an Environmental Protection Licence for scheduled development work and the carrying out of scheduled activities. An EPL for operation of the project "Pinnacle Place" ancillary facility was issued on 30 November 2015. An amendment to the licence would be required for the proposed modification.

## 4.2.2 Threatened Species Conservation Act 1995

The TSC Act is directed at conserving threatened species, populations and ecological communities of animals and plants.

Certain species of animals or plants are identified as endangered species, populations or communities or vulnerable species under the Act. Areas of land comprising the habitats of listed endangered species may also be declared critical habitat under the Act.

By operation of associated EP&A Act provisions, activities likely to have a significant impact on listed threatened species, populations, endangered ecological communities or their habitats must be the subject of a species impact statement and require the concurrence of the Director-General of the OEH. This is unless the activity is a project to which Part 5.1 of the EP&A Act applies. Likely impacts on threatened species were considered in Section 6.3 of the approved project REF and concluded significant impacts were not expected. The proposed modification would have no additional impact on endangered species, populations or communities or vulnerable species identified under the Act.

## 4.2.3 National Parks and Wildlife Act 1974

The harming or desecrating of Aboriginal objects or places is an offence under section 86 of the *National Parks and Wildlife Act 1979*. Under section 90, an Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

The Office of Environment and Heritage has published the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (Department of Environment, Climate Change and Water, 2010). The due diligence process outlined at section 8 of that publication has been followed for the approved project and it has been determined that an application for an Aboriginal Heritage Impact Permit is not required in this case.

Impact on Aboriginal objects or places were discussed in detail in Section 6.8 of the approved project REF. In addition, Roads and Maritime's Aboriginal Cultural Heritage Officer for Hunter Region has inspected the site and concluded in a Stage 1 cultural heritage assessment that the proposed modification would have no additional impact on Aboriginal heritage (refer Section 6.7).

## 4.2.4 Water Management Act 2000

The Unregulated Water Sources Sharing Plan for Central Coast has commenced and, as such, the *Water Management Act 2000* (WM Act) applies to surface water in the proposal area.

Under the Water Management (General) Regulation 2011 (WM Regulation) Roads and Maritime, as a Roads Authority, is exempt from the need for a water access licence and/or water use approval. A water supply work would not be required for the proposed modification and therefore a water supply work approval would not be required.

Section 91E of the WM Act prohibits the carrying out of a controlled activity on waterfront land (land within 40 metres of a watercourse) other than in accordance with a controlled activity approval. However, under clause 38 of the WM Regulation, public authorities (other than Landcom and the Superannuation Administration Corporation) are exempt from controlled activity approvals. Therefore, Roads and Maritime would be exempt from the need to obtain a controlled activity approval for the proposed modification.

It is noted that the provisions relating to aquifer interference approvals under Part 3 of the WM Act have not yet commenced.

## 4.3 Commonwealth legislation

### 4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed 'actions that have the potential to significantly

impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix B and chapter 6 of the addendum REF.

A referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of chapter 6 of the addendum REF and Appendix B.

#### **Findings – matters of national environmental significance (other than biodiversity matters)**

The assessment of the proposed modification's impact on matters of national environmental significance and the environment of Commonwealth land found that there would be no change to the findings of the determined activity and would be unlikely to cause a significant impact on matters of national environmental significance or the environment of Commonwealth land. A referral to the Australian Government Department of the Environment is not required.

## **4.4 Confirmation of statutory position**

The proposed modification is categorised as development for the purpose of a road and road infrastructure facilities and is being carried out by or on behalf of a public authority. Under clause 94 of the ISEPP the proposed modification is permissible without consent. The proposed modification is not State significant infrastructure or State significant development. The proposed modification can be assessed under Part 5 of the EP&A Act. Consent from Council is not required.

The matters prescribed by clause 228 of the *Environmental Planning and Assessment Regulation 2000*, for consideration by assessments under Part 5, are reviewed at Appendix B. No requirement for a referral under the EPBC Act has been identified.

## 5 Consultation

### 5.1 Consultation strategy

A Communications and Community Involvement Plan (CCIP) was prepared for the project in February 2014. The CCIP seeks to identify key stakeholders, key potential community and stakeholder issues raised in response to the approved project, and potential mitigation measures/responses to be implemented by Roads and Maritime.

The CCIP (Roads and Maritime Services 2014b) details communications objectives, key messages, community involvement activities and a communications program for the approved project.

### 5.2 ISEPP consultation

Consultation requirements contained within Part 2 of the ISEPP were reviewed for the proposed modification (refer Appendix C). Clause 13(1)(d) relates to a connection to a water supply system owned by council and requiring the use of a substantial amount of water and was identified as applicable. Roads and Maritime wrote to Central Coast Council on 8 August 2016 outlining the volume of water that would be required for use as part of the proposed modification. Central Coast Council responded on 11 August 2016. Table 5-1 lists issues raised by council and provides Roads and Maritime's response.

Table 5-1: Summary of issues raised by Central Coast Council

Issue raised	Roads and Maritime response	where addressed in addendum REF
Roads and Maritime is advised that the water reticulation main servicing Lot 2 DP1117622 (85 Pile Road, Somersby) has sufficient capacity to accommodate the estimated three litres per second nominated.	Noted	N/A
Roads and Maritime is advised that any development proposed on Lot 2 (including a concrete batching plant) shall be conditioned to obtain a Section 307 Certificate under Section 306 / 307 of the <i>Water Management Act 2000</i> .	Roads and Maritime note an application may be made under the relevant section of the WM Act 2000. The successful construction contractor will consult with Central Coast Council regarding connections to Council's water supply and sewerage infrastructure and any associated costs.	N/A

Specific consultation with other public authorities has not been undertaken.

### 5.3 Consultation outcomes

Community consultation regarding the general scope of the motorway project and ancillary sites and activities has been undertaken. Details of this consultation are included in the main Project REF and Submissions Report (May 2015).

Specific consultation was undertaken regarding the potential establishment of a concrete batch plant and ancillary facility at 85 Pile Road for use during the construction period for the M1 Upgrade Kariong to Somersby project, including:

- Correspondence to three nearby landholders in Howes Road described the proposed modification and also sort permission to place noise logging equipment to assist with assessing noise impacts
- Subsequent liaison with a resident on Howes Road who opposes the proposed facility due to noise concerns.

Table 5-2: Summary of issues raised by nearby landholders on Howes Road

Issue raised	Roads and Maritime response	where addressed in addendum REF
<p>A resident on Howes Road opposes the proposed facility at 85 Pile Road due to noise concerns. The resident says an existing recycling facility operating at 75 Pile Road creates considerable noise – the resident believes the proposed facility is likely to also have noise impacts.</p>	<p>Roads and Maritime Services will carry out a noise assessment to identify and adopt appropriate safeguards to manage any noise impacts.</p> <p>Further consultation with the resident will take place if the proposed facility is deemed necessary by the successful contractor.</p>	<p>N/A</p>

## 5.4 Ongoing or future consultation

Consultation will continue with the community and stakeholders throughout the detailed design and construction phases of the approved project and proposed modification. Future consultation will include:

- Targeted consultation with community stakeholders including letters to the householder and/or face-to-face meetings to help in managing impact during construction eg timing and duration of specific construction activities, special resident needs
- Updates throughout the planning and construction period to the immediately affected community as well as travelling public. Updates would be provided through a range of media including, but not limited to, letters to stakeholders and the local community, advertisements in local newspapers, static and mobile variable message signage, and media alerts to advise motorists of major traffic changes
- One-on-one meetings with government agencies, utility providers and community stakeholders as required
- Consultation with Central Coast Council about construction activities and supplies such as potable water
- Updates as required on the approved project website including the times and location of information sessions, and approved project documentation.

Subject to approval of this Addendum REF for 85 Pile Road, any use of the site as a concrete batch plant and ancillary facility during the construction period would be accompanied by close consultation with adjacent properties and potential noise sensitive receivers. This consultation would be undertaken in accordance with:

- Safeguards described in this Addendum REF
- Safeguards described in the approved project REF and submissions report (May 2015)
- Environmental Protection Licence for the project
- Stakeholder and Community Engagement Plan for the M1 Upgrade Kariong to Somersby project
- Communications Strategy for the M1 Productivity Package.

## 6 Environmental assessment

This section of the addendum REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modification of the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening. All aspects of the environment potentially impacted upon by the proposed modification are considered. This includes consideration of the factors specified in the guidelines *Roads and Related Facilities* (DUAP 1996) and *Is an EIS required?* (DUAP 1999) as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000. The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix B.

All existing safeguards and management measures outlined in Chapter 7 of the approved project REF would be implemented as part of the works that are subject of this addendum REF.

Additional site-specific safeguards and management measures are provided to ameliorate identified potential impacts associated with the modification proposal.

### 6.1 Issue identification

The approved project inclusive of the proposed modification is substantially the same as that considered in the approved project REF, November 2015 Addendum REF, January 2016 Addendum REF and May 2016 Addendum REF. The proposed modification has been reviewed in the context of the receiving environment to identify any new issues for assessment. The review is documented below in Table 6-1. The aspects reviewed generally correspond with those presented in Chapter 6 of the approved project REF and Chapter 3 of prior addendum REFs.

Table 6-1 Environmental issues review

Aspect/Impact	Further assessment?		Comment
Traffic and access	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Local roads not previously proposed for use by construction traffic to experience construction traffic. Further assessment is therefore required. Refer section 6.2.
Noise and vibration	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	A new work location with the potential for noise impacts on sensitive receivers not previously affected. Further assessment is therefore required. Refer to Section 6.3.
Biodiversity	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	A new work location that would require additional clearing of native vegetation. Further assessment is therefore required. Refer to Section 6.4.
Water quality and hydrology	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Minor impact only. Refer to section 6.8.1.
Topography, geology and soils	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	A new work location that would require disturbance of land not anticipated. Further assessment is therefore required. Refer to Section 6.5.
Landscape and visual amenity	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	A new work location that would require the introduction of construction plant and equipment. Further assessment is therefore required. Refer to Section 6.6.
Air quality	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Minor impact only. Refer to section 6.8.1.
Aboriginal heritage	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	A new work location that would require ground disturbance and additional clearing of native vegetation.

Aspect/Impact	Further assessment?		Comment
			Further assessment is therefore required. Refer to Section 6.8.
Non-Aboriginal heritage	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	No impact only. Refer to section 6.8.1.
Socio-economic	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Minor impact only. Refer to section 6.8.1.
Climate change and greenhouse gases	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	No impact only. Refer to section 6.8.1.
Land use and property	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Minor impact only. Refer to section 6.8.1.
Resource use and waste management	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	No impact only. Refer to section 6.8.1.
Cumulative impacts	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Minor impact only. Refer to section 6.8.1.

## 6.2 Traffic and access

### 6.2.1 Existing environment

The broader existing traffic and transport environment is described in section 6.1 and Appendix D of the approved project REF.

The proposed modification is located in a developing industrial estate about 2.2 kilometres by road from the M1 Pacific Motorway Kariong Interchange. Pile Road is a local road within the industrial estate and ends in a cul-de-sac adjacent to the site of the proposed modification. It is one lane in each direction, but is relatively wide at about 14 metres to accommodate articulated heavy vehicles. Pile Road is generally orientated north-south and intersects with Somersby Falls Road and the Old Pacific Highway with a roundabout and T-intersection, respectively. The posted speed limit is 60 kilometres per hour.

Other local and regional roads in the area include Wisemans Ferry Road, the Old Pacific Highway and Somersby Falls Road. Posted speed limits on these roads are either 60 or 70 kilometres per hour.

### 6.2.2 Potential impacts

The approved project REF identified the potential for construction traffic related impacts including minor delays from construction traffic travelling at slower speeds and safety for cyclists due to an increase in the number of heavy vehicles on the road network. These potential impacts remain unchanged as a result of the proposed modification.

The use of the northern extent of Pile Road (about 700 metres), was not originally envisaged in the approved project REF. The proposed modification, under a worst case scenario, would involve 50 additional light vehicles arriving and departing at the start and conclusion of each working day. It is also expected to result in up to 12 heavy vehicle movements per hour during the most intense periods of construction (ie concrete paving). Given the limited development within the industrial estate and the capacity for substantial expansion, both in terms of land and local road use, the addition of these light and heavy vehicle is expected to have a negligible to minor impact to road users.

### 6.2.3 Safeguards and management measures

Safeguards TR-1 to TR-4 as detailed in Table 3.1 of the Submissions Report are sufficient to manage potential environmental impacts from the proposed modification. Additional safeguards are not proposed.

## 6.3 Noise and vibration

A construction noise and vibration assessment has been prepared for the proposed modification. The following sections provide a summary of this assessment. The full report is provided at Appendix D.

### 6.3.1 Existing environment

The proposed modification is located within the northern extent of the Somersby Industrial Park. Industrial and other commercial operations are located to the east and west, and extend south to the M1 Pacific Motorway. A large scale recycling facility is located on the adjacent block immediately south. A number of rural to semi-rural residential properties are located to the north with the closest about 250 metres northwest of the proposed modification. Natural sounds (eg birds, insects, wind noise) and distant road traffic noise from the M1 Pacific Motorway are generally recognised as the predominant noise source for the majority of sensitive receivers.

In response to the location of the proposed modification beyond noise catchment areas (NCAs) assessed for the approved project REF, unattended background noise monitoring was conducted at one location in September 2016. The logger was placed at 25 Howes Road, Somersby (nearest noise sensitive receiver) to allow for the setting of specific noise management levels (NMLs). Table 6-2 shows the results of noise monitoring carried out for the proposed modification.

Table 6-2 Noise monitoring results 2016

NCA	Address	Rating Background Level (RBL)				
		Day	Evening	Night	Early morning ECH 1	Early evening ECH 2
		7am - 6pm	6pm - 10pm	10pm - 7am	6am - 7am	6pm - 8pm
NCA 5 <sup>3</sup>	25 Howes Road	38	41 (38) <sup>2</sup>	36	41 (38) <sup>2</sup>	42 (38) <sup>2</sup>

Notes:

<sup>1</sup> Application notes to the 'NSW Industrial Noise Policy' (EPA 2000) indicate that the community generally expects a greater control of noise during the evening and night as compared to the daytime. Therefore the RBL for the evening is set to no more than that for the daytime, and the night-time to no more than the evening.

<sup>2</sup> Consistent with the above, out of hours work (OOHW) time periods have been reduced to the relative daytime RBL noise level

<sup>3</sup> The specialist construction noise assessment attached at Appendix D for the proposed modification refers to this as NCA 1. To avoid confusion with the approved project REF, it is from here forward referred to as "NCA 5".

### 6.3.2 Criteria

#### Construction noise

Appropriate construction noise targets are given in the *Interim Construction Noise Guideline* (ICNG, Department of Environment and Climate Change, 2009).

In general these criteria provide that, for residential receivers, the construction noise should not exceed the background by more than 10 dB(A) during standard hours, and by more than 5 dB(A) out of hours (ie for night work). If these levels are exceeded then receivers are considered noise affected and all reasonable and feasible noise measures should be used to minimise noise.

75dB(A) is the level at which receivers are considered highly noise affected. Exceedance of these levels means respite periods should be considered in consultation with affected people.

Table 6-3 identifies the adopted construction NMLs for the proposed modification. The NMLs for residences are derived from the background level results presented in Table 6-2.

Table 6-3 Proposed modification construction noise objectives at residential receivers

NCA	Standard hours	Extended construction hours		Sleep disturbance
	Day	Early Morning ECH 1	Early evening ECH 2	
	7am - 6pm	6am - 7am	6pm - 8pm	
<b>Rating background level (RBL)</b>				
NCA 5	38	38	38	38
<b>Noise management level (NML) <math>L_{Aeq,15min}</math></b>				<b>Noise management level (NML) <math>L_{A1,1min}</math></b>
NCA 5	48	43	43	53

### Sleep disturbance

The ICNG recommends where construction work is planned to extend into the night time period (ie in this case, 6am to 7am), the assessment should consider maximum noise levels and the extent and frequency of maximum noise level events exceeding the RBL. The ICNG takes guidance from the *NSW Environmental Criteria for Road Traffic Noise* (ECRTN, Environment Protection Authority 1999) for recommended night time noise goals to minimise potential impact and preserve acoustic amenity within receivers:

- Maximum internal noise levels below 50-55dB(A) are unlikely to cause awakening reactions
- One or two events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing.

The NSW EPA confirm a sleep disturbance criterion of  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  should be used for the initial assessment. It should only be used as a first step guide and where the criterion is not met and more detailed analysis needs to be incorporated into the detailed design and Construction Noise and Vibration Management Plan. The Application Notes of the *NSW Industrial Noise Policy* (2010) note the detailed analysis should include:

- The extent to which the maximum noise level exceeds the background level
- The number of times this happens during the night-time period
- The time of day (normally between 10pm and 7am).

### Construction vibration

*Assessing Vibration: a technical guideline* (NSW Department of Environment and Conservation, 2006) sets out human comfort criteria for disturbance to human occupants of buildings as a result of continuous, impulsive and intermittent vibration. Table 6-4 provides limits for continuous exposure to vibration sources and impulsive vibration. Criteria are based on the British Standard BS 6472-1992, 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

Table 6-4 Preferred / maximum vibration levels (continuous / impulsive) for human comfort

Location	Assessment period <sup>(1)</sup>	Preferred values		Maximum values	
		z-axis	x & y axis	z-axis	x & y axis
Continuous vibration (Weighted RMS Acceleration, m/s <sup>2</sup> , 1-80Hz)					
Critical areas <sup>(2)</sup>	Day or night	0.005	0.0036	0.010	0.0072
Residences	Day	0.010	0.0071	0.020	0.014
	Night	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night	0.020	0.014	0.040	0.028
Workshops	Day or night	0.04	0.029	0.080	0.058
Impulsive vibration (Weighted RMS Acceleration, m/s <sup>2</sup> , 1-80Hz)					
Critical areas <sup>(2)</sup>	Day or night	0.005	0.0036	0.010	0.0072
Residences	Day	0.30	0.21	0.60	0.42
	Night	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night	0.64	0.46	1.28	0.92
Workshops	Day or night	0.64	0.46	1.28	0.92
<p>(1) Daytime is 7.00 am to 10.00 pm and night-time is 10.00pm to 7.00 am</p> <p>(2) Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992</p>					

Where vibration is intermittent, the dose values presented in Table 6-5 are applicable.

Table 6-5 Intermittent construction vibration criteria for human comfort

Location	Daytime <sup>(1)</sup>		Night time	
	Preferred <sup>(3)</sup>	Maximum <sup>(3)</sup>	Preferred <sup>(3)</sup>	Maximum <sup>(3)</sup>
Critical areas <sup>(2)</sup>	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60
<p>(1) Daytime is 7.00 am to 10.00 pm and night-time is 10.00pm to 7.00 am</p> <p>(2) Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992</p> <p>(3) Vibration Dose Values, VDV, m/s<sup>1.75</sup>, 1-80Hz</p>				

For structural damage, safe limits for construction-generated vibration have been determined using the vibration limits set out in the German Standard DIN 4150 Part 3-1999 *Structural Vibration in Buildings Effects on Structures*. The minimum 'safe limit' of vibration at low frequencies for commercial and industrial buildings is 20 mm/s. For dwellings it is 5 mm/s and for particularly sensitive structures (e.g. historical with preservation orders etc), it is 3 mm/s. These limits increase as the frequency content of the vibration increases. The criteria are presented in Table 6-6.

Table 6-6 DIN 4150-3 structural damage criteria

Group	Type of structure	Vibration velocity, mm/s			
		At foundation at frequency of			Plane of floor uppermost storey
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (eg buildings under a preservation order)	3	3 to 8	8 to 10	8

### 6.3.3 Potential impacts

#### Construction

Noise emissions were determined by modelling the noise sources, receiver locations and proposed construction scenarios / activities. Construction activities, and associated plant and equipment, with the potential to generate noise during the proposed modification are presented in Table 6-7.

Table 6-7 Construction activities and associated noise levels

Activity/ Work Area	Plant/ Equipment type	Day/ECH1/ECH2 plant number	Sound Power Level, dB(A) L <sub>Aeq,15min</sub>	Sound Power Level, dB(A) L <sub>AMax</sub>
Batching - Batch plant, concrete crushing, stockpiling and storage	Dump truck	1	108	118
	Excavator	1	107	122
	Batch plant	1	108	117
	Concrete Crusher	1	103	114
	Front end loader	1	113	122
	Heavy vehicles	12 per hour	1081	118

Activity/ Work Area	Plant/ Equipment type	Day/ECH1/ECH2 plant number	Sound Power Level, dB(A) L <sub>Aeq,15min</sub>	Sound Power Level, dB(A) L <sub>AMax</sub>
Stockpile - Stockpiling and storage	Dump truck	1	108	118
	Excavator	1	107	122
	Front end loader	1	113	122
	Heavy vehicles	12 per hour	1081	118

Notes:

1. Source modelled as moving point source. Sound power level presented is prior to time correction.

Table 6-8 to Table 6-11 summarise predicted L<sub>Aeq(15min)</sub> and L<sub>AMax</sub> construction noise levels at receivers, and the number of receivers predicted to exceed the applicable NML, within the defined NCA. The maximum of the predicted noise level range is based on the worst affected receivers for the NCA and is depicted as 'max'. The minimum of the predicted noise level range is based on the least affected receiver and is depicted as 'min'. Noise predictions to other sensitive receivers (OSR), in this case nearby industrial sites, is also provided.

Table 6-8 Predicted construction noise levels, L<sub>Aeq,15min</sub>

NCA/ ID	Day (7am - 6pm)					ECH1 (6am - 7am) and ECH 2 (6pm - 8pm)				
	NML L <sub>Aeq,15min</sub>	Batching		Stockpile		NML L <sub>Aeq,15min</sub>	Batching		Stockpile	
		min	max	min	max		min	max	min	max
NCA 5	48	26	<b>53</b>	21	<b>52</b>	43	26	<b>53</b>	21	<b>52</b>
OSR	75*	33	66	32	65	75*	33	66	32	65

Notes:

\* OSR NML of 75dB(A) provided for the highest impacted nearby industrial receiver. The full list of other sensitive receivers is provided in Appendix E of the construction noise and vibration assessment attached at Appendix D.

Table 6-9 Number of residences predicted to exceed the NML

NCA/ ID	Day (7am - 6pm)		ECH1 (6am - 7am) & ECH 2 (6pm - 8pm)	
	Batching	Stockpile	Batching	Stockpile
NCA 5	2	1	4	3
OSR	0	0	0	0

Table 6-10 Predicted construction noise levels, L<sub>AMax</sub>

NCA/ ID	ECH 1 (6am - 7am)										
	NML L <sub>A1,1min</sub>	Dump truck		Excavator		Batch plant		concrete crusher		Front end loader	
		min	max	min	max	min	max	min	max	min	max
NCA 5	53	23	<b>56</b>	24	<b>58</b>	22	<b>54</b>	15	51	26	<b>58</b>

Notes:

\* Bold font indicates exceedance of LA1,1min sleep disturbance criteria D.

Table 6-11 Number of residences predicted to exceed the sleep disturbance NML

NCA	Sleep disturbance NML L <sub>A1,1min</sub>	Number of residences predicted to exceed the NML				
		Dump truck	Excavator	Batch plant	concrete crusher	Front end loader
NCA 5	53	2	3	2	-	3

During standard daytime hours, noise levels are predicted to exceed the NML by up to 5dB at the nearest affected residences on Howes Road. This is due to a combination of all listed plant and equipment operating simultaneously.

During the early morning and early evening extended hours (ie periods from 6am to 7am and 6pm to 8pm) noise levels are predicted to exceed the NML by up to 10dB(A) at the nearest affected residences on Howes Road.

Exceedance of the  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  sleep disturbance criteria during the early morning period is likely with the use of most plant and equipment on site. The predicted exceedance is up to 5dB above the NML. Heavy vehicle compression breaks, batch plant operations and use of front end loaders and excavators are all predicted to exceed the initial criteria. Whilst the initial sleep disturbance criteria of  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  is exceeded, it is noted that internal maximum noise levels would be below 50dB(A) (assuming a 10dB loss for outside to inside noise levels), therefore sleep disturbance would be unlikely to cause awakening reactions.

### Operation

The proposed modification would operate only during construction of the project. There would be no operational impacts.

### Vibration

The major sources of vibration would be truck and trailer and general excavator movements. Table 6-12 identifies the dominant vibration generating plant and their typical vibration levels based on other similar projects.

Table 6-12 Typical ranges of construction plant vibration levels

Plant Noise Source	Typical PPV Vibration (mm/s) at distance from plant			
	5 metres	10 metres	15 metres	20 metres
Excavator ≤30T (travelling)	8	3.4	1.6	-
Excavator ≤30T (digging)	5.8	4	0	-
Truck & Trailer (45T net)	14.5	10.3	3.4	-

Note

Source – Renzo Tonin & Associates database

Based on available data, Table 6-13 below presents the recommended minimum working distances for high vibration generating plant.

Table 6-13 Recommended minimum working distances for vibration intensive plant

Plant item	Rating / description	Minimum working distance	
		Cosmetic damage	Human response
Excavators <sup>1</sup>	< 30 Tonne (travelling/ digging)	10 metres	15 metres
Loaders <sup>1</sup>	-	-	5 metres
Truck Movements <sup>1</sup>	-	-	10 metres

Notes

<sup>1</sup> Renzo Tonin & Associates project files, databases & library

The nearest residence is approximately 250 metres from the site of the proposed modification and the nearest other sensitive receiver is an industrial building which is about 30 metres from boundary of the site. Vibration impact on residences is therefore not anticipated.

### 6.3.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Construction noise	<ul style="list-style-type: none"> <li>Regular training of workers and contractors (such as at toolbox talks) would be undertaken in the use of equipment in ways to minimise noise. The training would also include details of relevant approval requirements including, but not limited to, approved working hours.</li> </ul>	Contractor	Pre-construction Construction
Construction noise	<ul style="list-style-type: none"> <li>The use of equipment that generates impulsive noise would be minimised as far as practicable</li> <li>The need for reversing movements would be minimised as far as practicable and non-tonal reversing alarms would be fitted to plant and site vehicles.</li> </ul>	Contractor	Pre-construction Construction
Construction noise	<ul style="list-style-type: none"> <li>Consultation with the affected community (ie those where noise levels have been predicted to exceed NML) would be undertaken in the lead up to and throughout the project in accordance with the project Communications and Community Involvement Plan. Key aspects of this communication would include: <ul style="list-style-type: none"> <li>Information relating to the type of works planned, associated noise impacts, location, timing (eg working hours) and duration. Notifications would include letters to the householder, phone calls and/or individual briefings</li> <li>Opportunities for respite during out of hours work (ie between 6am to 7am and 6pm and 8pm) where noise levels are predicted to exceed the NML by more than 5dB and up to 10 dB in accordance with Roads and Maritime's Construction Noise and Vibration Guideline</li> </ul> </li> <li>After-hours emergency contact details (eg senior personnel name and phone number) would be provided to potentially affected receivers in consultation information and provided on the Roads and Maritime website.</li> </ul>	Roads and Maritime / Contractor	Pre-construction Construction
Construction noise	<ul style="list-style-type: none"> <li>A readily accessible 24 hour toll-free information and complaints line would be implemented prior to commencement of the works</li> <li>A documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow, would be implemented for the works</li> </ul>	Roads and Maritime / Contractor	Pre-construction Construction

Impact	Environmental safeguards	Responsibility	Timing
	<ul style="list-style-type: none"> <li>Feasible and reasonable measures would be implemented to address the source of complaints</li> <li>A register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, work area, time of verbal response and timeframe for written response where appropriate, would be maintained.</li> </ul>		
Construction noise	<ul style="list-style-type: none"> <li>Reduce throttle setting and turn off equipment when not being used.</li> </ul>	Contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>Regularly inspect and maintain equipment to ensure it is in good working order. Also check the condition of mufflers</li> <li>Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified</li> <li>Ensure air lines on pneumatic equipment do not leak.</li> </ul>	Contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>Place as much distance as possible between the plant or equipment and residences.</li> </ul>	Contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>Non-tonal reversing alarms would be fitted to plant and site vehicles operating outside of standard construction hours.</li> </ul>	Contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>Where possible, place temporary site buildings, material stockpiles and other fixed structures to minimise the propagation of noise toward residential noise sensitive receivers (eg toward the northern side of the site to provide maximum shielding to nearby residences on Howes Road).</li> </ul>	Contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>Organise work to be undertaken during the recommended standard hours where possible.</li> </ul>	Contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>Optimise the number of vehicle trips to and from the site – movements can be organised to amalgamate loads rather than using a number of vehicles with smaller loads</li> <li>Schedule deliveries during standard working hours where possible.</li> </ul>	Contractor	Construction
Construction noise	<ul style="list-style-type: none"> <li>Undertake noise monitoring at the nearest affected noise sensitive receiver (where possible) within 14 days of the commencement of construction activities</li> </ul>	Contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	<p>at the proposed ancillary facility to verify predicted noise impacts. Continue monitoring on a three-monthly basis until use of the site is no longer required to support construction. Monitoring would be undertaken in accordance with procedures documented in AS1055.1-1997 Acoustics - Description and Measurement of Environmental Noise - General Procedures</p> <ul style="list-style-type: none"> <li>Where monitoring indicates noise levels attributable to operation of the proposed ancillary facility are greater than those predicted, investigate and implement additional feasible and reasonable mitigation measures.</li> </ul>		

## 6.4 Biodiversity

An ecological assessment has been prepared for the proposed modification. A summary of the assessment is provided below. The full report is included in Appendix A.

### 6.4.1 Methodology

The approach to the biodiversity assessment involved the following:

- Background literature review of biodiversity assessments
- Searches of the Atlas of NSW Wildlife and Department of the Environment Protected Matters Search Tool databases to identify any listed threatened species recorded in the vicinity of the sites since the previous assessments
- Site assessment (22 July 2016) to searches for threatened species, compiling a flora and fauna list, noting vegetation characteristic across the site and carry out a habitat assessment
- Likelihood of occurrence assessment to determine threatened species likely to occur on the site (based on the field inspection and suitability of habitat at the site)
- Assessment of the potential impacts of the proposed modification on threatened biodiversity recorded or considered likely to occur.

### 6.4.2 Existing environment

#### Native vegetation and threatened ecological communities

Two native vegetation communities were mapped and observed on and in the vicinity of the proposed modification and include:

- Hawkesbury Banksia Scrub - Woodland
- Exposed Hawkesbury Woodland.

The Exposed Hawkesbury Woodland comprises area considered to be either in regenerating condition or of moderate condition. A substantial portion of land affected by the proposed modification has also been classified as cleared land (refer Figure 6-1 and Appendix A). The area classified as cleared land makes up the majority of the site and is dominated by introduced grasses.

Vegetation within the study area does not align to any Threatened Ecological Communities (TECs) listed under the TSC Act or EPBC Act.

### **Threatened flora**

A total of 33 threatened flora species have previously been recorded or have been considered having potential habitat within a 10 kilometre radius of the proposed modification. Of these, only *Acacia bynoeana*, *Epacris purpurascens* var. *purpurascens*, *Prostanthera junonis* and *Hibbertia procumbens* have a low/moderate likelihood of potential to occur within habitat of the study area. However, none of these species were recorded during field surveys.

### **Threatened fauna**

A total of 79 threatened fauna species have previously been recorded or have been considered having potential habitat within a 10 kilometre radius of the proposed modification. Only *Hirundapus caudacutus* (White-throated Needletail) is considered to have moderate likelihood of occurrence within habitat of the study area. No threatened fauna species were recorded during field surveys.

### **Fauna habitat**

The site of the proposed modification is considered to generally lack a range of habitat features important to fauna due to previous clearing.

Field surveys identified the following habitat features:

- A drainage channel that runs along the southern boundary of the property
- A drainage pit to the north of the property
- Thickets of native shrubs toward the west of the property boundary.

No logs, tree hollows, large amount of leaf litter, rocks, or hollow-bearing trees were recorded. Such habitat features are likely to be within the bushland immediately surrounding the proposed modification.

### **Fauna habitat corridors / connectivity**

The proposed modification is located adjacent to native bushland to the north, west and partially to the east. The bushland provides a fauna habitat corridor between Somersby Recreation Reserve near the Pacific Highway to the east, and bushland amongst mixed residential/industrial land to the west. It also provides a distant connection to Popran National Park. However, the site of the proposed modification is predominantly cleared and lacks fauna habitat.



Figure 6-1: Vegetation communities

### 6.4.3 Potential impacts

#### Impacts on native vegetation and threatened ecological communities

The proposed modification would result in the direct disturbance of up to 0.3 hectares of regenerating native vegetation (parent vegetation is Exposed Hawkesbury Woodland). A further 1.5 hectares of cleared non-native vegetation would also likely be disturbed.

Direct or indirect impact on established Hawkesbury Banksia Scrub - Woodland and Exposed Hawkesbury Woodland would not be expected with the implementation of appropriate safeguards and management measures (refer Figure 6-2 and section 6.3.4).

#### Impacts on threatened flora

Four threatened flora species were identified as having a low to moderate potential of occurring on the site of the proposed modification. These included *Acacia bynoeana*, *Epacris purpurascens* var. *purpurascens*, *Prostanthera junonis* and *Hibbertia procumbens*. However, none of these species were recorded during field surveys.

Impacts on threatened faunas is therefore considered unlikely.

#### Impacts on threatened fauna

*Hirundapus caudacutus* (White-throated Needletail) was the only threatened fauna species considered to have moderate likelihood of occurrence at or in the vicinity of the proposed modification. It is also considered possible that some other threatened birds or microbats may fly over or into the study area on occasion. However, the removal of 0.3 hectares of sporadic regenerating native shrubs is considered highly unlikely to impact upon any limiting foraging resources for such species. The adjacent bushland is considered likely to provide a much more important foraging resource, and is likely to contain roosting and breeding resources.

In addition, no core or potential habitat defined under the State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44) will be impacted by the proposed activity.

Impacts on threatened fauna listed under the TSC Act, EPBC Act, FM Act are not anticipated.

#### Impacts on fauna habitat corridors / connectivity

Fauna habitat corridors have been noted in native bushland to the north, west and partially to the east of the proposed modification. However, the cleared nature of the proposed modification site is considered not to provide an expansion of the wildlife corridor, only offering some opportunistic foraging habitat with grassy areas for fauna. The proposed modification is considered unlikely to restrict fauna mobility through the corridor.



Figure 6-2: Vegetation to be retained

## Conclusion on significance of impacts

The proposed modification is unlikely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the TSC Act or FM Act and therefore a Species Impact Statement is not required.

The proposed modification is also unlikely to significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act.

### 6.4.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Impacts on flora and fauna including habitat loss	<ul style="list-style-type: none"> <li>Establish clearing limits on site in accordance with the <i>Biodiversity Guidelines</i> (Roads and Traffic Authority, 2011) and avoid impact on retained vegetation mapped in Figure 6-2.</li> </ul>	Contractor	Construction

## 6.5 Topography, geology and soils

### 6.5.1 Existing environment

#### Topography

The site of the proposed modification has an elevation of about 200 metres Australian Height Datum (AHD) at the entrance from Pile Road. The site rises a further 10 metres away from the road to the northwest over a distance of about 200 metres.

The landform is gentle sloping from northwest to southeast and continues on that gradient toward the upper reaches of Piles Creek, about 120 metres to the southeast. The site of the proposed modification has previously been cleared of native vegetation and contoured with swales and drainage channels.

#### Geology and soils

Section 6.5.1 of the approved project REF describes the geology and soils of the broader area including the site of the proposed modification. The following is summary of relevant information.

The underlying geology of the area is documented by the Gosford-Lake Macquarie 1:100 0000 Geological Map (DPI 2003) and comprises consolidated sediments of the Triassic Hawkesbury Sandstone series.

Soils of the area are from the Sydney Town soil landscape that consists of Hawkesbury Sandstone medium to coarse grained quartz sandstone, with minor shale and laminate lenses and Narrabeen Group (Gosford Subgroup) lithic quartz sandstone, siltstone and claystone.

The Sydney Town soil landscape formed by erosional processes and is characterised by undulating to rolling low hills moderately inclined slopes. Soils are shallow to deep yellow earths and sands on crests and slopes, shallow to moderately deep sands and grey earths in poorly drained areas. Moderately deep yellow podsollic soils, gleyed podsollic soils and yellow podsollic soils are associated with shale lenses. Occasionally, rock benches are present.

The Sydney Town soil landscape generally has a high erosion hazard.

#### Acid sulfate soils

Acid sulfate soil occurs predominantly on coastal lowlands, with elevations generally below five metres and is therefore not expected at the site of the proposed modification. The site of the proposed modification is not identified as having acid sulfate soil potential by NSW acid sulfate soils risk mapping (Naylor, 1995).

## Contaminated land

A review of the list of NSW Contaminated Sites notified to the Environment Protection Authority as of 30 August 2016 did not identify any sites within the suburb of Somersby.

A search of the Environment Protection Authority contaminated land record of notices (26 September 2016) returned no records for the suburb of Somersby.

### 6.5.2 Safeguards and management measures

Safeguards TS-1 to TS-8 as detailed in Table 3.1 of the Submissions Report are sufficient to manage potential environmental impacts from the proposed modification. Additional safeguards are not proposed.

## 6.6 Landscape and visual amenity

### 6.6.1 Methodology

The landscape character and visual impact assessment undertaken for the proposed modification has used the methodology outlined in *Guidelines for landscape character and visual impact assessment* (Roads and Maritime Services, 2013).

The guidelines establish an assessment process by reference to the sensitivity of the area and magnitude of the proposed modification in that area. Figure 6-3 illustrates the process.

		MAGNITUDE			
		HIGH	MODERATE	LOW	NEGLIGIBLE
SENSITIVITY	HIGH	HIGH	HIGH - MODERATE	MODERATE	NEGLIGIBLE
	MODERATE	HIGH - MODERATE	MODERATE	MODERATE - LOW	NEGLIGIBLE
	LOW	MODERATE	MODERATE - LOW	LOW	NEGLIGIBLE
	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

Figure 6-3 Landscape character and visual impact grading matrix

### Landscape character

Landscape character assessment sums up an area's sense of place including all built, natural and cultural aspects, covering towns, countryside and all shades between (Roads and Maritime Services, 2013). The assessment involves identifying landscape character zones and considers the impact of the proposed modification on those character zones.

### Visual impact

Assessing the visual impact of a proposed modification involves the assessment of the visibility of the proposed modification, the identification of key existing view points and their sensitivity followed by the assessment of their visual impact.

### 6.6.2 Existing environment

Existing landscape character and views were described in section 6.6.1 of the approved project REF. The site of the proposed modification was identified as being within landscape character zone 4 (LCZ 4) Commercial / Industrial Development which is described as follows:

*The landscape character of LCZ 4 consists of light industrial and commercial development which is found in close proximity to the road corridor, concentrated within the Somersby Industrial Park at the southern end of the study area. Development consists primarily of larger buildings including warehouses and storage facilities up to 15 metres in height. Sparse and fragmented vegetation is scattered through this character zone.*

The site of the proposed modification represents a transition between the developing Industrial Park and the buffer of retained native bushland that separates the residential lifestyle and small rural blocks to the north.

The main local views relevant to the proposed modification are those available from the adjacent commercial operation. Views from nearby residential lifestyle and small rural blocks to the north are not available due to the extensive bushland that separates the two land use practices. Local views and vistas are illustrated by Figure 6-4.



View east across 85 Pile Road, Somersby



View west of 85 Pile Road, Somersby



View west of 85 Piles Road, Somersby and adjacent recycling facility at 75 Pile Road, Somersby

Figure 6-4 Local views and vistas

### 6.6.3 Potential impacts

The proposed modification would introduce plant, equipment and temporary buildings to an area of largely cleared land within an industrial estate. Views available to the site of the proposed modification are only available to those in the adjacent waste recycling facility located at 75 Pile Road, Somersby.

In accordance with the matrix provided in Figure 6-3, the overall landscape character impact for the proposed modification is assessed as 'low'. In addition, it is also noted that the impact would be temporary and following restoration of the site on completion of the project, the landscape character impact would be negligible.

The sensitivity of local views and vistas is considered to be 'low' with a substantial area of bushland separating views from nearby residential lifestyle and small rural blocks to the north. Consistent with the landscape character assessment and for the same reasons identified above, the magnitude of the proposed modification has been assessed as 'low'. The resulting level of visual impact is 'low'. Again, this would be a largely temporary impact, with the visual impact of the proposed modification reducing to negligible following site restoration.

### 6.6.4 Safeguards and management measures

Safeguards LV-1 to LV-2 as detailed in Table 3.1 of the Submissions Report are sufficient to manage potential environmental impacts from the proposed modification. Additional safeguards are not proposed.

## 6.7 Aboriginal heritage

### 6.7.1 Existing environment

The broader existing environment as it relates to Aboriginal heritage was described in section 6.8.1 of the approved project REF. An updated Aboriginal Heritage Information Management System (AHIMS) search was undertaken on 17 May 2016 for the broader area around the site of the proposed modification. The search returned a number of records within one kilometre of the site. The nearest site is ID 45-3-2114 located about 150 metres to the south the proposed modification.

### 6.7.2 Potential impacts

Aboriginal cultural heritage impacts are not expected as a result of the proposed modification. The Roads and Maritime Aboriginal Cultural Heritage Advisor for Hunter Region has noted the following in relation to the proposal (refer to Appendix E):

- The proposed modification is unlikely to harm known Aboriginal objects or places
- The AHIMS search did not indicate Aboriginal objects or places in the study area
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* (Department of Environment, Climate Change and Water, 2010) and the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime Services, 2011)
- The cultural heritage potential of the study area appears to be severely reduced due to past disturbance
- The proposed modification would not require the removal of mature native trees.

### 6.7.3 Safeguards and management measures

Safeguard AH-1 as detailed in Table 3.1 of the Submissions Report is sufficient to address any unexpected Aboriginal cultural heritage impacts associated with the proposed modification.

## 6.8 Other impacts

This section considers all environmental factors not address in Section 6.2 to Section 6.7 that were the subject of the approved project REF and are assessed as having negligible to minor additional environmental impact.

### 6.8.1 Existing environment and potential impact

Environmental factor	Existing environment	Potential impact
Water quality and hydrology	<p>The site of the proposed modification is within the catchment of Piles Creek. The general characteristics of the catchment are described in section 6.4.1 of the approved project REF.</p> <p>Existing overland flows from 85 Pile Road, Somersby enter a stormwater pit located at the low-point of the property (southeast corner) adjacent to Pile Road. Water subsequently passes beneath Pile Road and discharges to the east before entering Piles Creek about 120 metres to the east.</p>	<p>Flows in and around the site of the proposed modification would be managed in accordance with a progressive erosion and sedimentation control plan.</p> <p>While there would be some increase in runoff associated with the establishment of hardstand areas, management measures including on-site detention would minimise impacts to receiving drainage lines / waterways.</p> <p>Works associated with the proposed modifications are not expected to intercept groundwater.</p> <p>Safeguards SW-1 to SW3 as detailed in Table 7.1 of the approved project REF are adequate to manage potential impact. No additional measures are proposed.</p>
Air quality	<p>Local air quality is consistent with that described in section 6.7.1 of the approved project REF.</p>	<p>The proposed modification would have potential air quality impacts consistent with those described in section 6.7.3 of the approved project REF. The main potential air quality impact associated with the proposed modification would be the mobilisation of dust during site establishment and localised cement emissions during concrete batching operations.</p> <p>Safeguards AQ-1 to AQ-2 as detailed in Table 7.1 of the approved project REF are adequate to manage potential impact. No additional measures are proposed.</p>

Environmental factor	Existing environment	Potential impact
Non-Aboriginal heritage	Updated searches of the State Heritage Inventory and Commonwealth Heritage Database were undertaken on 26 September 2016. There are no heritage items near the site of the proposed modification. The nearest item is the Mount Penang Parklands located about three kilometres to the south southeast.	Safeguard NH-1 as detailed in Table 7.1 of the approved project REF is adequate to manage potential impact. No additional measures are proposed.
Socio-economic	The existing socio-economic environment relevant to the proposed modification is discussed in section 6.10.1 of the approved project REF.	<p>The main socio-economic impact from the proposed modification is related to amenity including noise. Potential impact in this area is considered in sections 6.3 of this addendum REF.</p> <p>The proposed modification would have no impact on key social infrastructure including schools, child care centres, community centres and medical facilities.</p> <p>Safeguards relating to community consultation, traffic, dust, and noise as detailed in Table 7. 1 of the approved project REF are adequate to manage potential impacts. No additional measures are proposed.</p>
Greenhouse gases and climate change	Relevant climate change policy settings are described in section 6.11.1 of the approved project REF.	<p>Potential impacts of the project on greenhouse gas emissions are considered in section 6.11.2 of the approved project REF. The proposed modification would have minimal incremental impact on project related greenhouse gas emissions.</p> <p>No climate change related impacts specific to the proposed modification have been identified.</p> <p>Safeguards GG-1 to GG-2 as detailed in Table 7.1 of the approved project REF are adequate to manage potential impact. No additional measures are proposed.</p>

Environmental factor	Existing environment	Potential impact
Land use and property	The site of the proposed modification is located within an industrial / commercial estate and appropriately zoned for such purposes (ie IN1 General Industrial zone) under the Gosford Local Environmental Plan 2014.	Use of the site for the proposed modification would be consistent with the intent of the land zoning and would not compromise any future use of the site for industrial / commercial purposes.
Resource use and waste management	Relevant waste and resource management policy settings are described in section 6.12.1 of the approved project REF.	Potential impacts associated with the generation of waste are considered in section 6.12.2 of the approved project REF. No additional waste generating activities or waste materials have been identified for the proposed modification.  Safeguards WR-1 to WR-9 as detailed in Table 7.1 of the approved project REF are adequate to manage potential impact. No additional measures are proposed.

## 6.8.2 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
General	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs.</li> </ul>	NA	NA	NA
Surface water quality (water quality and hydrology)	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs.</li> </ul>	NA	NA	NA
Air quality	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs.</li> </ul>	NA	NA	NA
Non-Aboriginal heritage	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs.</li> </ul>	NA	NA	NA

Impact	Environmental safeguards	Responsibility	Timing	Standard / additional safeguard
Socio economic	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs.</li> </ul>	NA	NA	NA
Greenhouse gases and climate change	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs.</li> </ul>	NA	NA	NA
Land use and property	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs</li> </ul>	NA	NA	NA
Resources and waste management	<ul style="list-style-type: none"> <li>No additional safeguards to those included in the approved project or subsequent addendum REFs.</li> </ul>	NA	NA	NA

## **6.9 Cumulative impacts**

### **6.9.1 Potential impacts**

Given the location and scale of the proposed modification, cumulative impacts would be considered minor.

There would be the potential for some localised noise and traffic impacts. However, these would be of a minor nature and confined to the construction stage of the project.

While there would also be some vegetation clearing, significant impacts on threatened species populations and/or ecological communities are not expected.

Minimising impacts attributable to the proposed modification is the best way to address any potential cumulative effects and various measures have been proposed to address impacts in Table 7-1 of the approved project REF, May 2016 addendum REF and in this addendum REF.

### **6.9.2 Safeguards and management measures**

Safeguards were proposed in Table 7-1 of the approved project REF and May 2016 addendum REF and would be adopted for the proposed modification. Additional safeguards are not proposed.

## **7 Environmental management**

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### **7.1 Environmental management plans (or system)**

A number of safeguards and management measures have been identified to minimise adverse environmental impacts, including noise impacts, which could potentially arise as a result of the proposed modification. Should the proposed modification proceed, these management measures would be addressed during detailed design and incorporated into the Contractor's Environmental Management Plan (CEMP) and applied during the construction and operation of the proposed modification.

## 7.2 Summary of safeguards and management measures

Environmental safeguards and management measures for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project are summarised in Table 7-1. Additional safeguards and management measures identified in this addendum REF are included in bold, red and italicised font. The safeguards and management measures will be incorporated into the detailed design phase of the proposed modification and the CEMP, and implemented during construction and operation of the proposed modification, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 7-1: Summary of safeguards and management measures

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
General				
GEN1	General	<ul style="list-style-type: none"> <li>All environmental safeguards must be incorporated within the following documents:                             <ul style="list-style-type: none"> <li>– PEMP</li> <li>– Detail design stage</li> <li>– Contract specifications for the proposal</li> <li>– Contractor's Environmental Management Plan.</li> </ul> </li> </ul>	Roads and Maritime project manager	Pre-construction
GEN2	General	<ul style="list-style-type: none"> <li>Any works resulting from the proposal and as covered by the REF may be subject to environmental audit(s) and/or inspection(s) at any time during their duration.</li> </ul>	Roads and Maritime project manager	Pre-construction
GEN3	General	<ul style="list-style-type: none"> <li>The environmental contract specification Q36 Environmental Protection (Management Plan) must be forwarded to the Roads and Maritime Senior Environmental Officer for review at least 10 working days prior to the tender stage.</li> </ul>	Roads and Maritime project manager	Pre-construction
GEN4	General	<ul style="list-style-type: none"> <li>The Roads and Maritime construction contractor must notify the Roads and Maritime Environmental Officer, Central Coast or Hunter Region, at least five days prior to work commencing.</li> </ul>	Roads and Maritime project manager	Pre-construction
GEN5	General	<ul style="list-style-type: none"> <li>All businesses and residences likely to be affected by the proposed works must be notified at least five working days prior to the</li> </ul>	Roads and Maritime project manager	Pre-construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		commencement of the proposed activities.		
GEN6	General	<ul style="list-style-type: none"> <li>Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.</li> </ul>	Construction contractor	Pre-construction construction
GEN7	General	<ul style="list-style-type: none"> <li>Prior to commencing the geotechnical investigations, the geotechnical contractor would review this REF and any other relevant documents in consultation with Roads and Maritime and prepare a Geotechnical Investigations Management Plan to ensure any potential impacts that may occur during the investigations are managed using appropriate environmental safeguards. The Geotechnical Investigations Management Plan would be subject to review and approval by Roads and Maritime.</li> </ul>	Geotechnical contractor and Roads and Maritime	Pre-geotechnical investigations
GEN8	General	<ul style="list-style-type: none"> <li>Roads and Maritime will provide direct correspondence relating to the proposal to any potentially affected residences who do not receive letter box drop information or local newspapers, upon request.</li> </ul>	Roads and Maritime	Prior to and during construction
Traffic and access				
TR-1	General	<ul style="list-style-type: none"> <li>A Traffic Management Plan (TMP) would be prepared to the satisfaction of Roads and Maritime, as part of the pre-construction planning. The plan would detail how the traffic associated with the construction would be managed in accordance with the Roads and Maritime Services Traffic Control at Work Sites (RTA 2010b), as well as relevant Australian Standards including AS1742 and the work site manual Roads and Maritime Services Specification G10 (RTA 2003a). The TMP would be submitted in stages to reflect the progress of work and would outline: <ul style="list-style-type: none"> <li>Traffic control provided to manage and regulate traffic movements during construction, including minimising traffic switching</li> <li>Procedures for undertaking lane possession, erecting signage</li> </ul> </li> </ul>	Construction contractor	Prior to construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<p>and consulting with the TMC, Traffic Commanders and TEPs during construction</p> <ul style="list-style-type: none"> <li>– Measures to maintain the continuous, safe and efficient movement of traffic for both the public and construction workers</li> <li>– Traffic controls plans for the installation of signs and devices for safe passage of vehicles past the work site</li> <li>– Identification of haulage routes and ensuring impacts to local routes and peak periods on the motorway are minimised</li> <li>– Temporary speed restrictions to ensure a safe driving environment around work zones</li> <li>– Appropriate warning and advisory signposting (including variable message signs)</li> <li>– A local and regional communications strategy</li> <li>– Parking measures for workers using ancillary sites</li> <li>– Considerations for other developments that may also be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic.</li> </ul> <ul style="list-style-type: none"> <li>• A vehicle movement plan (VMP) would be prepared as part of the overall TMP. The VMP would assess construction-related heavy and light vehicle movements per shift in to and out of the construction site/s. The VMP would identify elements of the construction such as: <ul style="list-style-type: none"> <li>– Limiting the number and location of entry and exit points to work sites on the motorway</li> <li>– Limiting the need to occupy areas of the roads adjacent to ancillary sites</li> <li>– Identifying haulage routes for construction traffic, including routes between ancillary sites and work sites on the motorway</li> <li>– Undertaking road condition surveys of local roads prior to construction.</li> </ul> </li> </ul>		
TR-2	Changes to access arrangements for	<ul style="list-style-type: none"> <li>• Consultation with emergency service authorities would be undertaken during development of the detailed design.</li> </ul>	Roads and Maritime	Detailed design and pre-

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
	emergency vehicles			construction
TR-3	Cyclist detours	<ul style="list-style-type: none"> <li>Cycling groups would be consulted prior to the commencement of construction and advised to use alternate sections of the motorway, or alternative routes during the construction period.</li> <li>Measures to increase the safety for cyclists using Wisemans Ferry Road or alternate cyclist diversion paths would be investigated during the detailed design period.</li> </ul>	Roads and Maritime	Detailed design and pre-construction
TR-4	Incident management	<ul style="list-style-type: none"> <li>The selected construction contractor would consult with Roads and Maritime's Traffic Commanders, TEP and TMC to plan construction to allow for appropriate incident management response plans to be implemented.</li> </ul>	Construction contractor	Prior to construction
Noise and vibration				
NV-1	Construction noise	<ul style="list-style-type: none"> <li>Prior to construction commencing, a CNVMP would be prepared. This document would provide a framework for addressing noise levels associated with construction works. Specifically any out of hours works undertaken near sensitive receivers.</li> </ul>	Construction contractor	Prior to construction
NV-2	Construction noise	<ul style="list-style-type: none"> <li>Construction works would adopt appropriate practices as recommended in the ICNG and ENMM to reduce noise emissions.</li> </ul>	Construction contractor	Prior to construction
NV-3	Construction noise	<ul style="list-style-type: none"> <li>Construction plant source noise levels should be confirmed prior to the commencement of works to verify construction noise impacts and confirm the requirement for noise management and mitigation measures.</li> </ul>	Construction contractor	Prior to construction
NV-4	Construction noise	<ul style="list-style-type: none"> <li>The construction program would be scheduled where feasible to: <ul style="list-style-type: none"> <li>maximise the offset distance between construction plant and adjacent receivers</li> <li>orientate construction and auxiliary equipment away from sensitive receivers</li> </ul> </li> </ul>	Construction contractor	Prior to construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>– minimise reversing alarm noise emissions from mobile plant and vehicles and where practicable, manage site entry and exit points to limit the need for reversing</li> <li>– minimise concurrent operation of dominant noise generating equipment such as: bulldozer, rock breaker, mobile crane and asphalt paver construction plant. Where dominant noise generating plant are not in concurrent operation, reductions to received noise impacts of up to 6 dB(A) are anticipated.</li> </ul>		
NV-4	Construction noise	<ul style="list-style-type: none"> <li>• Adjacent residents should be notified of potential night-time construction works at least two weeks prior to the commencement of construction works.</li> </ul>	Construction contractor	Prior to construction
NV-4	Construction noise	<ul style="list-style-type: none"> <li>• A one page summary of required construction noise and vibration management practices would be provided to construction staff and contractors and be discussed during site inductions. The summary should include, as a minimum, the permitted hours of construction work, work site locations, locations of sensitive receivers and site ingress/egress.</li> </ul>	Construction contractor	Prior to construction
NV-4	Construction noise	<ul style="list-style-type: none"> <li>• A complaints management procedure would be established and implemented in the CEMP for the proposal. This would include the implementation of a phone hotline and a procedure for recording and responding to any issues relating to noise that may arise during fieldwork associated with the proposal.</li> </ul>	Construction contractor	Prior to construction
NV-4	Construction noise	<ul style="list-style-type: none"> <li>• Noise impacts would be minimised in accordance with Practice Note 7 in Roads and Maritime's ENMM (RTA 2001a) and Environmental fact sheet No. 2 – Noise management and Night Works.</li> </ul>	Construction contractor	Prior to construction
NV-4	Construction noise	<ul style="list-style-type: none"> <li>• Noise monitoring would be considered if complaints are received regarding excessive noise and this would be assessed against relevant guidelines.</li> </ul>	Construction contractor	Prior to construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
NV-4	Construction noise	<ul style="list-style-type: none"> <li>Machinery and equipment would be well maintained to assist with minimising noise levels.</li> </ul>	Construction contractor	Prior to construction
NV-4	Construction noise	<ul style="list-style-type: none"> <li>Idling equipment would be turned off where appropriate.</li> </ul>	Construction contractor	Prior to construction
NV-5	Operational noise	<ul style="list-style-type: none"> <li>Supplementary noise investigations would be undertaken at residences potentially affected by road noise, following construction. This would include supplementary background noise monitoring. If this monitoring indicates noise levels in excess of those previously modelled and above relevant noise goals, Roads and Maritime would consider additional noise mitigation measures specific to any potentially affected residence.</li> </ul>	Roads and Maritime	After construction
NV-6	Construction noise	<ul style="list-style-type: none"> <li>Program the work so noise and vibration at night would not affect any single dwelling or group of dwellings, flats, units and other places of residence on more than two consecutive nights, or on more than a total of six nights over a period of one calendar month. When night work is programmed in stages to comply with this requirement, the periods of work would be separated by not less than one week.</li> <li>If programmed night work is postponed for any reason, the work would be re-programmed and the programming requirements described above apply again.</li> </ul>	Roads and Maritime	Pre-construction Construction
NV-7	Construction noise	<ul style="list-style-type: none"> <li>Where possible, particularly noisy activities eg saw cutting, concrete hammering, to be completed before 11:00pm.</li> </ul>	Roads and Maritime	Pre-construction / Construction
NV-8	Construction noise	<ul style="list-style-type: none"> <li>Regular training of workers and contractors (such as at toolbox talks) would be carried out in the use of equipment in ways to minimise noise. The training would also include details of relevant approval requirements including, but not limited to, approved working hours.</li> </ul>	Contractor	Pre-construction / Construction
NV-9	Construction noise	<ul style="list-style-type: none"> <li>The use of equipment that generates impulsive noise would be minimised as far as practicable</li> <li>The need for reversing movements would be minimised as far as</li> </ul>	Contractor	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<p>practicable and non-tonal reversing alarms <b>would be</b> fitted to plant and site vehicles.</p> <ul style="list-style-type: none"> <li>• Truck movements would avoid residential streets where possible.</li> <li>• Periods of respite would be provided in the case of unavoidable maximum noise level events.</li> </ul>		
NV-10	Construction noise	<ul style="list-style-type: none"> <li>• Consultation with the affected community (ie those where noise levels have been predicted to exceed NML) would be undertaken in the lead up to and throughout the <b>project in accordance with the project Communications and Community Involvement Plan. Key aspects of this communication would include:</b> <ul style="list-style-type: none"> <li>– Information relating to the type of works planned, associated noise impacts, location, timing (eg working hours) and duration. <b>Notifications would include letters to the householder, phone calls and/or individual briefings</b></li> <li>– <b>Opportunities for respite during out of hours work (ie between 6am to 7am and 6pm and 8pm) where noise levels are predicted to exceed the NML by more than 5dB and up to 10 dB in accordance with Roads and Maritime’s Construction Noise and Vibration guide</b></li> </ul> </li> <li>• Targeted community consultation would be carried out in the lead up to the work to, among other things, identify and where possible accommodate any special affected community needs (eg health issues, student examinations) where noise levels exceeding the calculated NMLs from justifiable programming changes would be anticipated for more than two consecutive nights.</li> <li>• After-hours emergency contact details (eg senior personnel name and phone number) would be provided to potentially affected receivers in consultation information and provided on the Roads and Maritime website.</li> </ul>	Roads and Maritime	Pre-construction / Construction
NV-11	Construction noise	<ul style="list-style-type: none"> <li>• A readily accessible 24 hour toll-free information and complaints line would be implemented before the start of work.</li> <li>• A documented complaints process, including an escalation procedure so if a complainant is not satisfied there is a clear path to follow, would be implemented for the work.</li> <li>• Feasible and reasonable measures would be implemented to address the</li> </ul>	Roads and Maritime / Contractor	Pre-construction / Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<p>basis of complaints.</p> <ul style="list-style-type: none"> <li>A register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, work area, time of verbal response and timeframe for written response where appropriate, would be maintained.</li> </ul>		
NV-13	Construction noise	<ul style="list-style-type: none"> <li>Non-tonal reversing alarms would be fitted to plant and site vehicles operating outside of standard construction hours.</li> </ul>	Contractor	Construction
NV-14	Construction noise	<ul style="list-style-type: none"> <li>Where possible, properties identified for architectural acoustic treatment as part of the approved project would be treated prior to commencement of the proposed modification.</li> </ul>	Roads and Maritime	Pre-construction / Construction
<b>NV-15</b>	<b>Construction noise</b>	<ul style="list-style-type: none"> <li><b>Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.</b></li> <li><b>Ensure air lines on pneumatic equipment do not leak.</b></li> </ul>	<b>Contractor</b>	<b>Construction</b>
<b>NV-17</b>	<b>Construction noise</b>	<ul style="list-style-type: none"> <li><b>Place as much distance as possible between the plant or equipment and residences.</b></li> </ul>	<b>Contractor</b>	<b>Construction</b>
<b>NV-18</b>	<b>Construction noise</b>	<ul style="list-style-type: none"> <li><b>Where possible, place temporary site buildings, material stockpiles and other fixed structures to minimise the propagation of noise toward residential noise sensitive receivers (eg toward the northern side of the site to provide maximum shielding to nearby residences on Howes Road).</b></li> </ul>	<b>Contractor</b>	<b>Construction</b>
<b>NV-19</b>	<b>Construction noise</b>	<ul style="list-style-type: none"> <li><b>Organise work to be undertaken during the recommended standard hours where possible.</b></li> </ul>	<b>Contractor</b>	<b>Construction</b>
<b>NV-20</b>	<b>Construction noise</b>	<ul style="list-style-type: none"> <li><b>Optimise the number of vehicle trips to and from the site – movements can be organised to amalgamate loads rather than using a number of vehicles with smaller loads.</b></li> <li><b>Schedule deliveries during standard working hours where possible.</b></li> </ul>	<b>Contractor</b>	<b>Construction</b>

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
<b>NV-21</b>	<b>Construction noise</b>	<ul style="list-style-type: none"> <li>• Undertake noise monitoring at the nearest affected noise sensitive receiver (where possible) within 14 days of the commencement of construction activities at the proposed ancillary facility to verify predicted noise impacts. Continue monitoring on a three-monthly basis until use of the site is no longer required to support construction. Monitoring would be undertaken in accordance with procedures documented in AS1055.1-1997 Acoustics - Description and Measurement of Environmental Noise - General Procedures</li> <li>• Where monitoring indicates noise levels attributable to operation of the ancillary facility are greater than those predicted, investigate and implement additional feasible and reasonable mitigation measures.</li> </ul>	<b>Contractor</b>	<b>Construction</b>
<b>Biodiversity</b>				
BIO-1	General	<ul style="list-style-type: none"> <li>• Prepare a Flora and Fauna Management Plan, including weed management, and ensure that it is integrated with the landscape plan for the project</li> <li>• Prepare a Vegetation Management Plan (VMP) detailing restoration, regeneration and rehabilitation of areas of native vegetation in the vicinity of the project. Preparation of the VMP should involve consultation with local Landcare groups and the CMA.</li> </ul>	Construction contractor	Prior to construction
BIO-2	Site specific environmental induction	<ul style="list-style-type: none"> <li>• All staff working on site are to undertake a site-specific environmental induction. The induction is to include items such as: <ul style="list-style-type: none"> <li>– Sensitivity of surrounding vegetation (particularly threatened flora species)</li> <li>– Site environmental procedures (vegetation management, sediment and erosion control protective fencing and noxious weeds)</li> <li>– What to do in case of emergency (chemical spills, fire or fauna encountered)</li> <li>– Key contact in case of environmental incident</li> <li>– Details of threatened flora species.</li> </ul> </li> </ul>	Construction contractor	Construction
BIO-3	Risk to fauna	<ul style="list-style-type: none"> <li>• Limit of work temporary fencing is to be established.</li> </ul>	Construction	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>Pre-clearing processes are to be undertaken in accordance with Roads and Maritime Biodiversity Guidelines (2011) and Roads and Maritime Biodiversity Guidelines: Guide 4 - Clearing of vegetation and removal of bushrock (RTA, 2011)</li> <li>A fauna relocation site would be identified prior to construction to release any uninjured fauna encountered on site.</li> </ul>	contractor	
BIO-4	Flora and fauna encountered	<ul style="list-style-type: none"> <li>If unexpected threatened fauna or flora species are discovered, stop works immediately and follow the Unexpected Threatened Species Finds Procedure in the Roads and Maritime Biodiversity Guidelines – Guide 1 (Pre-clearing process)</li> <li>WIRES is to be consulted if any injured fauna are encountered as outlined in site specific environmental inductions</li> <li>Fauna handling must be carried out in accordance with the requirements the Roads and Maritime Biodiversity Guidelines - Guide 9 (Fauna Handling).</li> </ul>	Construction contractor	Construction
BIO-5	Vegetation clearing	<ul style="list-style-type: none"> <li>Where possible, habitat trees and hollow bearing trees are to be retained throughout the proposal area</li> <li>If hollow bearing trees are unable to be retained, a qualified ecologist is to be present on-site for staged habitat removal and hollow clearing and must follow the Roads and Maritime Staged Habitat Removal Process.</li> </ul>	Construction contractor	Construction
BIO-6	Threatened fauna	<ul style="list-style-type: none"> <li>Site hygiene management to prevent the spread of Chytrid Fungus</li> <li>Undertake pre-clearing surveys for threatened species, particularly amphibians on the morning (24 hours) before clearing works commence</li> <li>Threatened amphibian tadpole surveys to be undertaken prior to de-watering of any water bodies to relocate any threatened tadpoles to adjoining habitats</li> <li>If threatened amphibians are recorded during preclearing surveys, a specific frog management plan (FMP) developed by a frog expert</li> </ul>	Construction contractor	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		with at least 5 years' experience in behavioural ecology of frogs will be required.		
BIO-7	Threatened flora	<ul style="list-style-type: none"> <li>Exclusion zones should be set up around retained threatened flora species of <i>Darwinia glaucophylla</i>, <i>Hibbertia procumbens</i> and <i>Prostanthera junonis</i></li> <li>These areas should be signed as environmentally sensitive</li> <li>All construction staff working in the vicinity of these threatened species should be informed of the location of these threatened flora species.</li> </ul>	Construction contractor	Construction
BIO-8	Revegetation	<ul style="list-style-type: none"> <li>Revegetate or replant disturbed areas with native vegetation following construction</li> <li>Revegetation and replanting is to be carried out following Roads and Maritime Biodiversity Guidelines.</li> </ul>	Construction contractor	Construction
BIO-9	Interrupted fish passage	<ul style="list-style-type: none"> <li>Although the proposal will make every endeavour to avoid the interruption of fish passage if this is unavoidable a permit from the DPI would be required.</li> </ul>	Construction contractor	Construction
<b>BIO-10</b>	<b>Impacts on flora and fauna including habitat loss</b>	<ul style="list-style-type: none"> <li><b>Establish clearing limits on site in accordance with the Biodiversity Guidelines (Roads and Traffic Authority, 2011) and avoid impact on retained vegetation mapped in Figure 6 2.</b></li> </ul>	<b>Contractor</b>	<b>Construction</b>
Surface water				
SW-1	Impacts to downstream environments from operational drainage	<ul style="list-style-type: none"> <li>Where required, drainage designs would incorporate features such as energy dissipation measures, scour protection and other features to control flow intensity and direction of flow at any new drainage outlets.</li> </ul>	Roads and Maritime	Detailed design
SW-2	General impact mitigation measures	<ul style="list-style-type: none"> <li>An SWMP would be developed prior to construction and implemented throughout the construction period of the proposal</li> <li>An ESCP would be developed prior to construction and</li> </ul>	Construction contractor	Prior to construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<p>implemented throughout the construction period of the proposal</p> <ul style="list-style-type: none"> <li>• The extent and time of exposed soil would be minimised through construction staging.</li> </ul>		
SW-3	Management of stockpiles and ancillary sites	<ul style="list-style-type: none"> <li>• Chemicals and other pollutants would be stored in a bunded or sealed area <ul style="list-style-type: none"> <li>– Establish erosion control and sediment capture measures, and maintain them regularly, to divert offsite stormwater, manage onsite stormwater runoff and stabilise stockpiles in accordance with RMS Technical Guideline EMS-TG-010: Stockpile Site Management and the BLUE BOOK guidelines</li> <li>– All stockpile and chemical storage locations would be located above the 100 year ARI flood level and at least give metres from areas of concentrated flows</li> <li>– Stockpile sites would be identified in the ESCP with the number and size of stockpiles kept to a minimum where possible through the proposal area</li> <li>– Stockpile heights would be no greater than two meters, unless otherwise approved by Roads and Maritime, with slopes no steeper than 2:1</li> <li>– Measures would be implemented to prevent the growth of weeds in topsoil stockpiles</li> <li>– Stockpiles that are in-place for more than 20 days would be covered, or, if susceptible to wind or water erosion, within 10 days</li> <li>– Uncovered stockpile sites would have discrete downslope controls for treatment of stormwater.</li> </ul> </li> </ul>	Construction contractor	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
Topography, geology and soils				
TS-1	Erosion and sediment control during construction	<ul style="list-style-type: none"> <li>A soil conservationist from the Roads and Maritime Erosion, Sedimentation and Soil Conservation Consultancy Services Register would be engaged during detailed design to develop an ESMP which would inform the development of soil and water management protocols for construction of the proposal.</li> </ul>	Roads and maritime	Detailed design
TS-2	General impact mitigation measures	<ul style="list-style-type: none"> <li>An SWMP would be developed prior to construction and implemented throughout the construction period of the proposal. This plan would be prepared to implement the findings of the ESMP. The SWMP would address the management measures detailed in Roads and Maritime's QA Specifications G36 and G38, including an ESCP. The SWMP would include: <ul style="list-style-type: none"> <li>Approval, licencing and other statutory requirements</li> <li>Site details, including: soil properties, rainfall records, groundwater etc.</li> <li>Details of environmental control measures to be implemented, including: <ul style="list-style-type: none"> <li>Responsibility for implementation</li> <li>Resources required for construction, monitoring, maintenance and removal</li> <li>Implementation and monitoring schedules</li> <li>Monitoring and maintenance activities required</li> </ul> </li> </ul> </li> <li>Training details, including: site induction, environmental training and toolbox.</li> </ul>	Construction contractor	Prior to construction
TS-3	Disturbance of asbestos	<ul style="list-style-type: none"> <li>An Asbestos Handling Management Plan would be developed for the construction period. The plan would comply with the Roads and Maritime Asbestos Management Plan (2013b).</li> </ul>	Construction contractor	Prior to construction
TS-4	Stockpile management	<ul style="list-style-type: none"> <li>All stockpiles would be designed, established, operated and decommissioned in accordance with Roads and Maritime Stockpile Management Procedures (RTA 2011b). Stockpile sites would be located: <ul style="list-style-type: none"> <li>At least 10 m from the nearest waterway</li> </ul> </li> </ul>	Construction contractor	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> <li>In an area of low ecological significance</li> <li>On relatively level ground.</li> </ul>		
TS-5	Topsoil management	<ul style="list-style-type: none"> <li>Topsoil would be stockpiled separately for possible reuse for the landscaping and rehabilitation works within the identified compound and stockpile sites.</li> </ul>	Construction contractor	Construction
TS-6	Disturbance of contaminated material	<ul style="list-style-type: none"> <li>Roads and Maritime would be promptly notified of any suspected or potential contamination exposed during construction activities, and cease all work activities within the vicinity of actual or suspected contaminated land</li> <li>If contamination is known or expected to be encountered, a Remediation Action Plan would be prepared in accordance with Roads and Maritime's G36 Specification (Clause 4.2.4). The Remediation Action Plan must be prepared in accordance with EPA guidelines on contaminated land management, and must include the following: <ul style="list-style-type: none"> <li>Testing requirements for any contaminated material prior to its disposal off site</li> <li>Validation plan, which must include the area in the immediate vicinity of (both below and adjacent to) the known contamination</li> </ul> </li> <li>Implications of the validation results on the waste classification for material that may be excavated in the vicinity of the known contamination. Carry out remediation of the contaminated material, or its removal and disposal, in accordance with the Remediation Action Plan.</li> </ul>	Construction contractor	Construction
TS-7	Accidental spills during construction	<ul style="list-style-type: none"> <li>Appropriate temporary bunding would be erected for any refuelling or maintenance of plant and equipment, mixing cutting oil with bitumen, or carrying out any other activity which may result in spillage of a chemical, fuel or lubricant at any location which drains directly to waters or environmentally sensitive areas, Refuelling operations would not be left unattended. All fuels, chemicals and hazardous materials would be stored within an impervious bunded</li> </ul>	Construction contractor	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		area in accordance with relevant Australian Standards and EPA guidelines.		
TS-8	Liaison with National Parks and Wildlife Services	<ul style="list-style-type: none"> <li>Roads and Maritime will consult with National Parks and Wildlife Services if any drainage works or off-site impacts are expected, outside the proposal disturbance boundary identified in the REF. Any such works would be subject to further environmental assessment and approval, and an EPL licence variation if required.</li> </ul>	Roads and Maritime	Prior to and during construction
Landscape and visual amenity				
LV-1	Design considerations	<p>The following landscape and visual impact mitigation strategies would be considered during the detailed design process:</p> <ul style="list-style-type: none"> <li>Opportunities to minimise vegetation clearing</li> <li>Ensure road treatment (surfacing, safety barrier and abutments) are visually consistent with existing adjacent sections of the motorway</li> <li>Trimming of rock cuttings to alleviate visual impact. Shotcrete to be used sparingly and only where necessary. Shotcrete colour to be matched to natural rock at location to be used. Alternatively, stonework infill (preferably recovered on site) would provide a higher aesthetic finish</li> <li>Procedures for rehabilitating construction areas would be incorporated in the CEMP.</li> </ul>	Roads and Maritime	Detailed design
LV-2	Visual impacts – construction	<ul style="list-style-type: none"> <li>Restrict vegetation clearing to those areas where it is necessary</li> <li>Trimming rather than removal of trees is to be undertaken where possible and would be conducted by a qualified arborist</li> <li>All disturbed areas would be revegetated as soon as possible following completion of works</li> <li>The ancillary sites would be screened with temporary mesh fencing</li> <li>The size of stockpile sites would be minimised wherever possible to reduce the visual impact of these sites.</li> </ul>	Construction contractor	Construction
Air quality				

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
AQ-1	Construction dust impacts	<p>Control measures would be included in the CEMP to ensure that dust emissions are suitably managed such that air quality impacts at nearby sensitive receptors are minimised including:</p> <ul style="list-style-type: none"> <li>• Monitoring would be carried out during the construction phase of the proposal to assess compliance with EPA air quality criteria</li> <li>• All materials transported to and from the construction site would be covered</li> <li>• Stockpiles of soil or other materials would be managed by the construction contractor to minimise dust emissions, particularly during dry or windy conditions</li> <li>• Speed limits would be imposed for equipment on unsealed surfaces</li> <li>• Stockpiles would be located as far away from residences as practically possible</li> <li>• The extent of disturbed areas would be minimised as far as practicable</li> <li>• Disturbed areas would be rehabilitated as quickly as possible</li> <li>• Dust on unsealed surfaces, temporary roadways, stockpiles and other exposed areas would be suppressed using water trucks, hand held hoses and temporary stabilisation Activities resulting in excessive dust generation would be stopped or modified during very windy conditions.</li> <li>• Air quality, both visually and/or using instrumentation would be monitored near sensitive receptors to verify the effectiveness of controls.</li> <li>• Where required controls would be installed at compound and stockpile sites to ensure there is no tracking of mud and soils off-site.</li> </ul>	Construction contractor	Pre-construction Construction
AQ-2	Construction vehicle emission impacts	<ul style="list-style-type: none"> <li>• Operating and maintaining vehicles and equipment would occur in accordance with manufacturer's specifications.</li> </ul>	Construction contractor	Construction
Aboriginal heritage				

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
AH-1	Unexpected artefacts	<ul style="list-style-type: none"> <li>In the event that previously undiscovered Aboriginal objects, sites or places (or potential Aboriginal objects, sites or places) are discovered during construction, all works in the vicinity of the find should cease and NSW Roads and Maritime should implement their Standard Management Procedure: Unexpected Archaeological Finds (November, 2011) for addressing un-identified Aboriginal objects</li> <li>Should suspected human skeletal material be identified, all works should cease and NSW Roads and Maritime should implement their Standard Management Procedure: Unexpected Archaeological Finds (November, 2011) for managing human skeletal remains</li> <li>Use of the Kangoo Road ancillary site would be managed so that no activities occur within 15 m of the western boundary of the property. This would include the installation of temporary fencing around that area to prevent impacts to the exposed sandstone bedrock in this area.</li> </ul>	Construction contractor	Construction
Non Aboriginal heritage				
NH-1	Unexpected heritage found	<ul style="list-style-type: none"> <li>If an item (or suspected item) of non-Aboriginal heritage is discovered, Roads and Maritime Services Unexpected Finds Procedure (Roads and Maritime Services 2011) would be implemented including that all work in the area of the find would cease immediately and would not recommence until the heritage value and associated protection and any approval requirements have been determined. Roads and Maritime would notify OEH if any item (or suspected item) of non-Aboriginal heritage is found during construction to determine the appropriate course of action.</li> </ul>	Roads and Maritime and construction contractor	Construction
Social and economic				
SE-1	Community consultation and communications	<ul style="list-style-type: none"> <li>Ongoing consultation with potentially affected residents, schools, adjacent property owners and businesses regarding the proposal and potential impacts that may affect them during both construction</li> </ul>	Roads and Maritime	Prior to construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<p>and operation through development of a Stakeholder Engagement Plan</p> <ul style="list-style-type: none"> <li>• Develop a communication plan and work with Transport for NSW's TMC for informing regional communities and users of the motorway (including cyclists) of potential delays and construction related impacts during the construction period</li> <li>• Once the detailed design is developed, undertake consultation with stakeholders to identify any specific access requirements to inform the construction schedule and ensure adequate mitigation measures can be implemented.</li> </ul>		
SE-2	Cumulative impacts with other M1 Widening projects	<ul style="list-style-type: none"> <li>• The construction periods for both Kariong to Somersby and Tuggerah to Doyalson would overlap in order to be completed on schedule. Where practical the construction works would minimise interaction or cumulative impacts with the Tuggerah to Doyalson Project to minimise potential construction and traffic disruption fatigue for users of the motorway.</li> </ul>	Roads and Maritime	Prior to construction
GHG and climate change				
GG-1	Climate change and GHG	<ul style="list-style-type: none"> <li>• Detailed designs for the proposal would take into consideration the potential effect of climate change on the proposal, including increased average temperatures, increased frequency of bushfires, drainage requirements and the potential for increased flood frequency.</li> </ul>	Detailed design contractor	Detailed design
GG-2	GHG emissions from fuel consumption	<ul style="list-style-type: none"> <li>• Fuel-efficient equipment would be selected wherever possible</li> <li>• Biofuels (biodiesel, ethanol, or blends such as E10 or B80) would be considered wherever possible and available</li> <li>• Plant and equipment would be regularly maintained to ensure maximum fuel efficiencies</li> <li>• Energy-efficient work practices would be promoted on site, such as turning machinery off when not in use</li> <li>• Energy-efficient lighting would be utilised (where available) during</li> </ul>	Construction contractor	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		night works (if required) <ul style="list-style-type: none"> <li>Monitoring, recording and reporting energy consumption would be undertaken to identify and address energy wastage.</li> </ul>		
Resources and waste management				
WR-1	Waste management	<ul style="list-style-type: none"> <li>A Waste Management Sub-Plan would be developed as a component of the CEMP, following the Waste Classification Guidelines (DECCW 2009), NSW Governments 'Waste Reduction and Purchasing Policy and relevant Roads and Maritime fact sheets. This plan would include:               <ul style="list-style-type: none"> <li>Identify waste streams that will be generated by the proposal, including:                   <ul style="list-style-type: none"> <li>How and where waste generated by the proposal is to be reused and disposed of</li> <li>The receptacles that would be used for storing identified waste materials prior to reuse, recycling, stockpiling and disposal</li> <li>How, and by whom, would waste be transported between generation, storage and point of reuse, recycling, stockpiling or disposal</li> <li>Sampling and testing requirements, as specified in Roads and Maritime's Waste Fact Sheet 'Waste Sampling'</li> <li>Procedures for verifying licences or permits for handling, transportation and disposal of waste</li> </ul> </li> <li>Controls for minimizing consumption of fuel, oil and other consumables and on- site electricity consumption</li> </ul> </li> <li>Methods for monitoring the implementing the plan, notification and ensuring compliance with statutory requirements.</li> </ul>	Construction contractor	Pre-construction and construction
WR-2	Waste tracking	<ul style="list-style-type: none"> <li>Types of waste collected, amounts, date/time and details of disposal shall be recorded in a waste register.</li> </ul>	Construction contractor	Construction
WR-3	Personnel inductions	All personnel are to be informed of the resources management	Construction	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		<p>hierarchy principles during site induction.</p> <p>Resource management hierarchy principles are to be followed:</p> <ul style="list-style-type: none"> <li>• Avoid unnecessary resource consumption as a priority</li> <li>• Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery)</li> <li>• Disposal is undertaken as a last resort (in accordance with the Waste Avoidance &amp; Resource Recovery Act 2001).</li> </ul>	contractor	
WR-4	Site maintenance	<ul style="list-style-type: none"> <li>• Workspaces would be maintained, kept free of rubbish and cleaned up at the end of each working day.</li> </ul>	Construction contractor	Construction
WR-5	Waste disposal and storage	<ul style="list-style-type: none"> <li>• Solid and liquid wastes, as well as fuels, lubricants and chemical containers would be disposed of in accordance with EPA requirements</li> <li>• Material identified for recycling shall be stockpiled in an adequately bunded area (in accordance with the Roads and Maritime Stockpile Site Management Guidelines, (RTA 2011b)).</li> </ul>	Construction contractor	Construction
WR-6	Procurement	<ul style="list-style-type: none"> <li>• Procurement would endeavour to use materials and products with a recycled content and low carbon footprint where it is cost and performance effective to do so.</li> </ul>	Construction contractor	Pre-construction and construction
WR-7	Waste management	<ul style="list-style-type: none"> <li>• All wastes would be managed in accordance with the Protection of the Environment Operations Act 1997.</li> </ul>	Construction contractor	Construction
WR-8	Contamination	<ul style="list-style-type: none"> <li>• Waste identified as being contaminated would be managed in accordance with the Contaminated Land Management Act 1997 and any other relevant legislation. Hazardous waste arising from construction of the proposal would also be removed and disposed of in accordance with relevant guidelines, including the Waste Classification Guidelines (DECCW 2009).</li> </ul>	Construction contractor	Construction
WR-9	Waste management	<ul style="list-style-type: none"> <li>• A dedicated concrete washout facility would be provided during construction so that runoff from the washing of concrete machinery</li> </ul>	Construction contractor	Construction

No.	Impact / aspect	Environmental safeguards	Responsibility	Timing
		and equipment could be collected and disposed of at an appropriate waste facility.		
Cumulative impacts				
CI-1	Cumulative impacts	<ul style="list-style-type: none"> <li>Roads and Maritime would consult with GCC and DP&amp;E on a routine basis to identify potential developments that may affect the proposal or contribute to cumulative impacts.</li> </ul>	Roads and Maritime	Ongoing

### 7.3 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project proposed modification and when they need to be obtained are listed in Table 7-2.

Table 7-2: Summary of licensing and approval required

Instrument	Requirement	Timing
<i>Protection of the Environment Operations Act 1997</i>	Roads and Maritime sought and received an EPL for the operation of Pinnacle Place ancillary site under section 48 of the Act on 30 November 2015. An amendment of the licence would be required for the main project	Prior to the commencement of construction on the main project and/or operation of the ancillary facility at 85 Pile Road, Somersby

## 8 Conclusion

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### 8.1 Justification

The M1 Pacific Motorway links the regions of Sydney, the Central Coast and the Hunter. It forms part of the Sydney-Brisbane corridor of the National Land Transport Network (NLTN), which is the key road transport network in Australia. It currently carries about 75,000 light and 7,000 freight vehicles per day.

Justification for the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project has been analysed in detail in Section 8.1 of the approved project REF. The analysis remains applicable to the proposed modification.

The benefits of the proposed modification are considered to outweigh the mostly temporary adverse impacts and risks associated with the proposed modification.

### 8.2 Objects of the EP&A Act

The consideration of the EP&A Act objects provided in Section 8.2 of the approved project REF applies to the proposed modification.

### 8.3 Ecologically sustainable development

The consideration of ecological sustainable development provided in Section 8.3 of the approved project REF applies to the proposed modification.

### 8.4 Conclusion

This addendum REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration, where relevant, of conservation agreements and plans of management under the NPW Act, joint management and biobanking agreements under the TSC Act, wilderness areas, critical habitat, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification as described in the addendum REF best meets the approved project objectives, but would still result in some impact from construction noise. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts. The proposed modification would also support the construction of the project. On balance the proposed modification is considered justified and the following conclusions are made.

#### **Significance of impact under NSW legislation**

The proposed modification would not result in a change to the findings of the approved project REF or submissions report and would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act. A Species Impact Statement is not required. The proposed modification is subject to assessment under Part 5 of the EP&A Act. Consent from Council is not required.

#### **Significance of impact under Australian Commonwealth legislation**

The proposed modification would not likely cause a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Department of the Environment is not required.

## 9 Certification

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This addendum review of environmental factors provides a true and fair review of the proposed modification in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed modification.



Andrew Grainger  
Environmental scientist  
Bowditch Group  
Date: 26 October 2016

I have examined this addendum review of environmental factors and accept it on behalf of Roads and Maritime Services.



Benjamin Phillipson  
Project Manager  
M1 Upgrade Kariong to Somersby | Freight & Regional  
Date: 24/10/2016

## 10 References

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## 11 Terms and acronyms used in this addendum REF

Term/ Acronym	Description
CEMP	Construction / Contractor's environmental management plan
EIA	Environmental impact assessment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
NES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
Noxious Weeds Act	<i>Noxious Weeds Act 1993</i> (NSW)
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
Roads and Maritime	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.

Term/ Acronym	Description
SEPP 14	<i>State Environmental Planning Policy No.14 – Coastal Wetlands</i>
TSC Act	<i>Threatened Species Conservation Act 1995 (NSW)</i>
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Roads and Maritime Services.

# Appendix A

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Ecological impact assessment

11 October 2016

Andrew Grainger  
Mobile: 0424 565 662  
Email: agrainge@gmail.com

Dear Andrew,

**Re: Ecological impact assessment for proposed ancillary facility at 85 Pile Road Somersby NSW.**

Niche Environment and Heritage (Niche) was commissioned by Bowditch Group Pty Ltd on behalf of the NSW Roads and Maritime Services (Roads and Maritime) to assess potential impacts to biodiversity associated with the proposed ancillary facility located at 85 Pile Road Somersby NSW (Figure 1). The ancillary facility would be used for the modification of the M1 Pacific Motorway Kariong Ramps and Kariong to Somersby Widening Project.

The purpose of this ecological impact assessment is to satisfy approval requirements under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), which requires a terrestrial flora and fauna impact assessment to be completed for any disturbance to biodiversity. This assessment has therefore, addressed those matters listed for consideration under the following key biodiversity legislation and policy instruments:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44)
- *Threatened Species Conservation Act 1995* (TSC Act)
- *Fisheries Management Act 1994* (FM Act)
- *National Parks & Wildlife Act 1974* (NP&W Act).

***Study area description***

The proposed ancillary facility would be contained within the 85 Pile Road property boundary (Lot 2 DP1117622) (Figure 2) (referred to as the study area – area of direct and indirect impacts). The site adjoins bushland that occurs immediately to the north, west and east of the property; and industrial complex is to the immediate south.

The property has been largely subject to historical clearing and slashing, which has left an open introduced grass area throughout much of the site (Plate 1). Advanced native regeneration occurs along the property boundaries, with sporadic regenerating younger shrubs and ground cover occurring throughout the slashed field. The advanced regeneration coincides with drainage channels that occur on the property boundaries. The drainage flows into feeder drainage near Pile Road.

The proposed ancillary facility would be located predominantly within the cleared areas of the site, with areas of advanced native regeneration on the property boundaries being retained. The existing drainage channels on the north, west and south would also be left intact.

### ***Description of works***

The ancillary facility (subject site) would include the following key features:

- Perimeter security fencing, access and environmental controls.
- A concrete batch plant and associated material storage, loading and dispatching facilities.
- Site offices and amenities (e.g. meal rooms, toilets/showers).
- Light and heavy vehicle parking areas.
- Plant and material storage.

The precise location of the infrastructure are not yet known, however the positioning of the ancillary facility would be located away from areas of relatively intact native vegetation, as well as the drainage channels which occur on along the boundaries of the property as shown in Figure 2.

Further detail on the operation of ancillary facilities is provided in the approved project REF (December 2014).

### ***Field Assessments***

Luke Baker (Senior Ecologist) from Niche completed a field survey on the 22<sup>nd</sup> July 2016. The field survey involved traversing the entire study area, searches for threatened species, compiling a flora and fauna list, and noting vegetation characteristic across the site.

A habitat assessment was also conducted within the study area. Habitat characteristics and parameters that were assessed included:

- Physical aspects of the site such as climate (desktop), geology, soils, slope, elevation, drainage and aspect
- Floristic composition, structure and age
- Vegetation condition
- Composition of ground layer (bare earth, litter etc.)
- Presence and relative abundance of key habitat features (e.g. tree hollows, large logs, exfoliating rock, flowering resources, aquatic features).

Targeted fauna survey methods, including trapping, targeted amphibians survey and bat detector/harp trapping surveys were not considered necessary given the site's condition, thus these were not undertaken.

## Native vegetation

Vegetation of the study area has been previously mapped as part of the Natural Vegetation of the Gosford Local Government Area, Central Coast, New South Wales (Bell 2009). The mapping has identified the site contains a 'cleared' vegetation unit to the east of the property, and 'Hawkesbury Sandstone Vegetation' throughout the majority of the site and the surrounding lands (Figure 3).

Based on the result of the field survey, inconsistencies with the existing vegetation mapping were observed. Niche has mapped four vegetation units, comprising of two native vegetation communities: Hawkesbury Banksia Scrub - Woodland, and Exposed Hawkesbury Woodland. A detailed vegetation map has been provided in Figure 4 showing the location of the vegetation communities and condition classes. A description of the vegetation units, condition classes and associated area has been provided in Table 1, and photographs of each vegetation unit are provided in Attachment 2.

In total, the proposal may result in the direct disturbance of 0.3 hectares of regenerating native vegetation that is of the parent vegetation type Exposed Hawkesbury Woodland. A further 1.5 hectares of cleared-non-native vegetation may be disturbed.

This assessment assumes that indirect impacts, such as the spread of weeds in the adjacent bushland, would not occur as a result of the proposal due to proposed control measures.

**Table 1: Vegetation mapping description and area**

Niche vegetation community	Description	Area within 85 Pile Road	Area to be disturbed
Hawkesbury Banksia Scrub - Woodland, (good condition) (Plate 2)	The vegetation community occurs to the far west of the study area. The community consists of a thicket of <i>Banksia ericifolia</i> , <i>B. spinulosa</i> , and <i>Leptospermum trinervium</i> . The shrubs are approximately 3 m in height. A sedge and forb layer occupies the ground layer comprising of <i>Entolasia stricta</i> , <i>Boronia ledifolia</i> , <i>Pomax umbellata</i> , <i>Goodenia hederacea</i> , <i>Lepidosperma laterale</i> , <i>Epacris pulchella</i> , <i>Lomandra obliqua</i> , <i>Juncus spp.</i> and <i>Cyperus spp.</i> . Soil seed bank would be of high resilience.	0.1	0.0
Exposed Hawkesbury Woodland, (regenerating condition) (Plate 3)	Sporadic regenerating shrubs and ground cover occurring throughout the site. Most of the shrubs are pioneer species which occur following soil disturbance, such as <i>Acacia parramattensis</i> , <i>Hakea sericea</i> , and <i>Dodonaea triquetra</i> . Other native species include: <i>Lomandra obliqua</i> , <i>Imperata cylindrica</i> , <i>Pomax umbellata</i> , <i>Mirbelia rubifolia</i> , <i>Monotoca scoparia</i> . A high percentage of introduced species occur throughout this community including: <i>Chloris gayana</i> , <i>Plantago lanceolata</i> , <i>Pennisetum clandestina</i> , and <i>Andropogon virginicus</i> .	0.4	0.3
Exposed Hawkesbury Woodland, (moderate condition) (Plate 4)	This community occurs along the boundaries of the property. The community would not be impacted by the proposal. This area is of moderate to high resilience. The vegetation community consists of an advanced regeneration of the native species: <i>Eucalyptus haemastoma</i> , <i>E. sieberi</i> , <i>Corymbia gummifera</i> , <i>Acacia parramattensis</i> , <i>Allocasuarina littoralis</i> , <i>Hakea sericea</i> , <i>Dodonaea triquetra</i> , <i>Lomandra obliqua</i> , <i>Imperata cylindrica</i> , <i>Pomax umbellata</i> , <i>Mirbelia rubifolia</i> , and <i>Monotoca scoparia</i> . A moderate percentage of introduced species occur throughout this community including: <i>Chloris gayana</i> , <i>Plantago lanceolata</i> , <i>Pennisetum clandestina</i> , and <i>Andropogon virginicus</i> .	0.4	0.0
Cleared land, (Plate 5)	Areas dominated by introduced grasses and of low resilience. It occurs throughout the majority of the study area. Introduced species include: <i>Chloris gayana</i> , <i>Plantago lanceolata</i> , <i>Pennisetum clandestina</i> , <i>Andropogon virginicus</i> , <i>Senecio madagascariensis</i> , <i>Hypochaeris radicata</i> , <i>Verbena bonariensis</i> , <i>Conyza bonariensis</i> and <i>Paspalum dilatatum</i> .	1.2	1.2
<b>Total area of native vegetation</b>		<b>0.9</b>	<b>0.3</b>
<b>Total area</b>		<b>2.1</b>	<b>1.8</b>

### ***Threatened Ecological Communities***

The vegetation within the study area does not align to any Threatened Ecological Communities (TECs) listed under the TSC Act or EPBC Act. No further impact assessment is required for this aspect.

### ***Threatened flora***

A total of 33 threatened flora have previously been recorded or have been considered having potential habitat within a 10 km radius of the study area (subject flora). Records have been derived from both the Atlas of NSW Wildlife and the EPBC Act Protected Matters Search tool. Tables identifying the habitat requirements for each of the threatened flora have been provided in Appendix 1.

After an analysis of the habitat requirements for each of the threatened subject flora, only *Acacia bynoeana*, *Epacris purpurascens* var. *purpurascens*, *Prostanthera junonis* and *Hibbertia procumbens* have a low/moderate likelihood of potential to occur within habitat of the study area. However, the field survey involved a traverse of the entire property, and no threatened flora were recorded. Given these species are relatively conspicuous, particularly amongst the introduced grasses that occupies the majority of the study area, they are unlikely to remain undetected during the survey, and thus are unlikely to be present within the study area. Furthermore, the area to be disturbed has been previously cleared and is of a lower resilience to that of the vegetation to be retained.

This assessment therefore concludes that no threatened flora listed under the TSC Act or EPBC Act are likely to be impacted by the proposal.

### ***Fauna habitat***

The site generally lacked a range of habitat features important to fauna due to previous clearing.

The survey identified the following habitat features across the site:

- Drainage channel which runs along the southern boundary of the property (Plate 6).
- Drainage pit to the north of the property (Plate 7).
- Thickets of native shrubs toward the west of the property boundary.

No logs, tree hollows, large amount of leaf litter, rocks, or hollow-bearing trees were recorded.

Such habitat features are likely to be within the bushland immediately surrounding the site.

### ***Fauna habitat corridors/connectivity***

The site occurs adjacent to native bushland to the north, west and partially to the east. The bushland provides a fauna habitat corridor between Somersby Recreation Reserve near the Pacific Highway to the east, and bushland amongst mixed residential/industrial land to the west which eventually connecting to Popran National Park. Given the site is predominantly cleared and lacks fauna habitat (as described above), it does not provide an expansion of the wildlife corridor, only offering some opportunistic foraging habitat with grassy areas for fauna. Given the cleared condition of the site, the proposal is unlikely to restrict fauna mobility through the corridor.

### ***Threatened fauna***

A total of 79 threatened flora have previously been recorded or have been considered having potential habitat within a 10 km radius of the study area (subject fauna). Records have been derived from both the Atlas of NSW Wildlife and the EPBC Act Protected Matters Search tool. Tables identifying the habitat requirements for each of the threatened fauna have been provided in Appendix 1.

Developments can impact upon fauna in a number of ways. The significance of an impact would be large if any of the following situations occur:

- Death or injury of individuals.
- Loss or disturbance of limiting foraging resources.
- Loss or disturbance of limiting breeding resources.

Limiting resources are those that are of particular importance for the survival of a species.

After an analysis of the habitat requirements for each of the threatened subject fauna, no threatened fauna species are likely to have limiting resources present within the study area.

Whilst it is possible that some threatened birds or microbats may fly over or into the study area on occasion, the removal of 0.3 hectares of sporadic regenerating native shrubs is highly unlikely to impact upon any limiting foraging resources for such species. The adjacent bushland is likely to provide a significantly greater and much more important foraging resource, and is likely to contain roosting and breeding resources.

It should be further added that the area of drainage/seepage flows to the west and south of the property would be retained and adequate sedimentation controls set in place to ensure no indirect impacts such as runoff and erosion affect these features.

No core or potential habitat defined under the *State Environmental Planning Policy 44 – Koala Habitat Protection* (SEPP 44) will be impacted by the proposed activity.

Given the site would be used as a concrete batching plant, and to transport materials to and from the site, the generation of noise as an indirect impact has also been considered in this assessment toward threatened fauna. It is our opinion that the noise during the construction and operational phases of the proposal may cause temporary disturbance to fauna. The impacts from noise emissions are likely to be localised close to the proposal (up to 100 m) and are not likely to have a significant long-term impact on wildlife populations, given that populations are already exposed to noise associated with industrial activities to the immediate south. There is also evidence that most animal species will habituate and adjust to periodic noise disturbance from regular maintenance activities (Forman et al. 2000; Larkin 2005). As such, Niche conclude that any indirect noise impacts are unlikely to result in significant disruption to any threatened fauna that may occupy the study area.

This assessment therefore concludes that no threatened fauna listed under the TSC Act, EPBC Act, FM Act are likely to be impacted by the proposal.

### ***Ecological constraints, safeguards and recommendations***

It is recommended that the following measures are undertaken to ensure no long term negative impacts occur to any threatened biodiversity:

- All disturbances are located within cleared and previously disturbed areas as identified in Figure 2.
- Vegetation to be retained should be appropriately demarcated.
- Sufficient sedimentation works and barriers to be placed around the disturbance areas to ensure no indirect water flow, erosion or sedimentation leaves the site into the adjacent drainage channels.
- Suitable weed control in place to prevent the establishment of noxious weeds within the study area and the potential spread of such noxious weeds in the surrounding bushland.
- Any soil disturbance or vegetation clearing, other than that described in this assessment, will require further assessment.

### ***Conclusions***

This report assesses the terrestrial ecology impacts associated with the proposal, in accordance with the requirements of the EP&A, TSC and EPBC Acts.

The proposal would result in the removal of 0.3 hectares of regenerating native shrubs of the parent vegetation type – Exposed Hawkesbury Woodland. This vegetation type is not listed as a TEC under the TSC Act or EPBC Act.

No threatened flora were recorded within the study area. The proposal was determined unlikely to impact any threatened flora or their habitats.

No threatened fauna were recorded during the current survey. This assessment concludes that the proposal is unlikely to impact on any limiting habitat for the subject threatened fauna species.

A number of recommendations have been made to minimise the potential impact of the proposal on native flora and fauna occurring in the study area.

A Species Impact Statement or Referral is not considered to be required.

I trust that this advice is sufficient for your purposes. Should you require any further information please do not hesitate to contact me.

Yours sincerely,



Luke Baker  
Senior Ecologist  
Niche Environment and Heritage

## **References**

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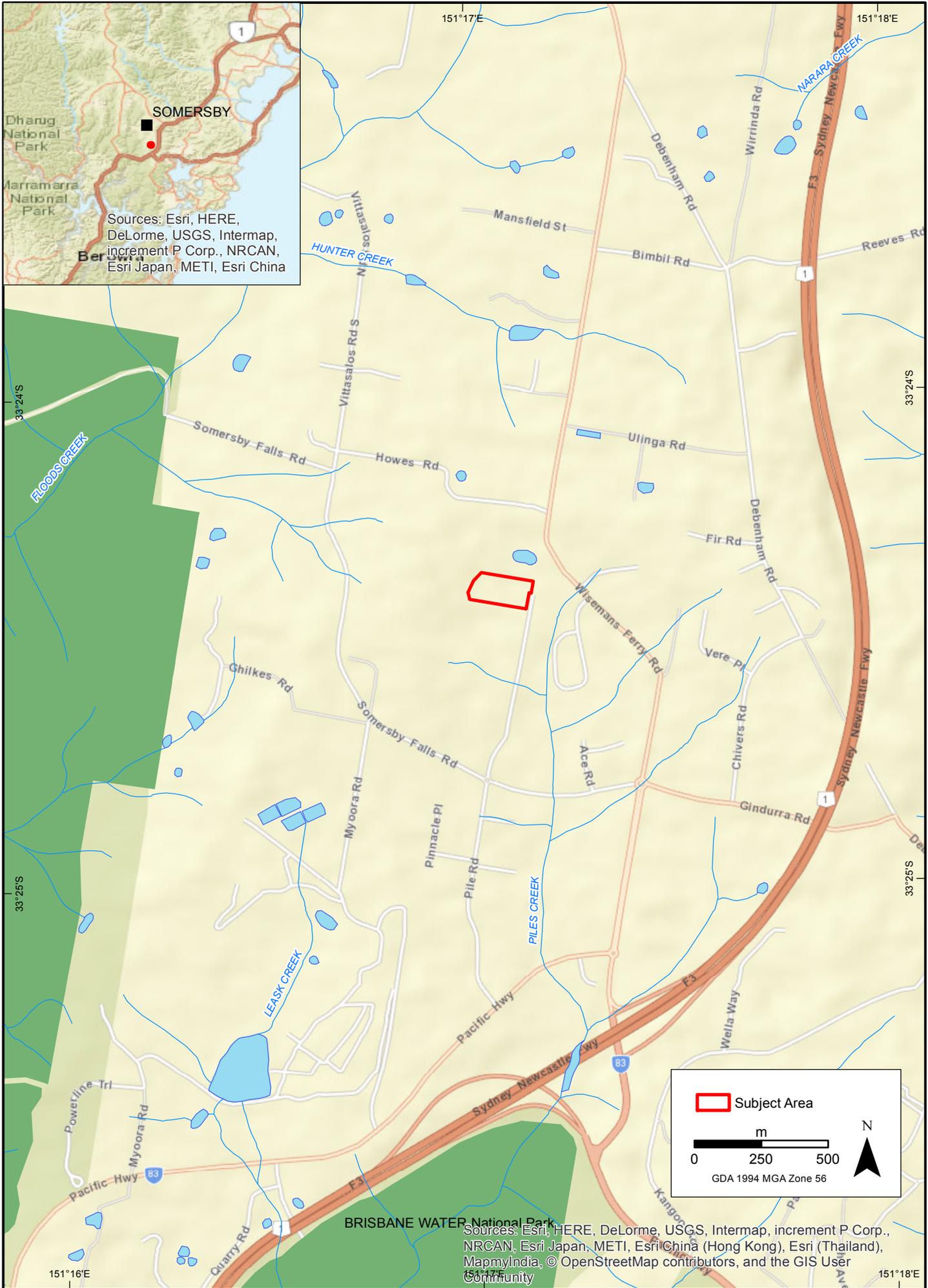
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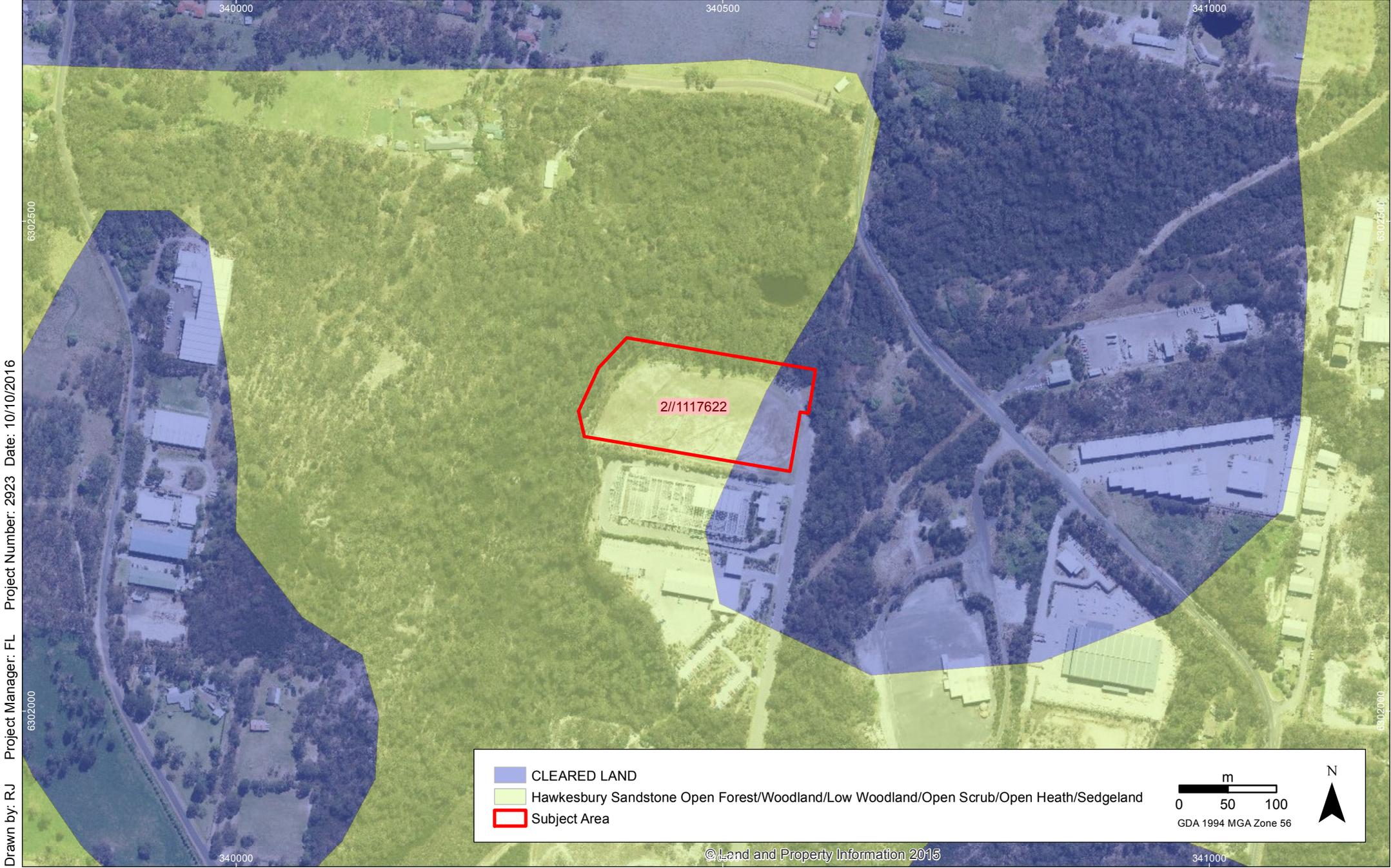
Drawn by: RJ Project Manager: FL Project Number: 2923 Date: 10/10/2016





Subject Area - 88 Pile Road Somersby NSW  
 M1 Pacific Motorway Upgrade - Kariong to Somersby (K2S)

**FIGURE 2**  
 Imagery: (c) LPI 2014-10-01



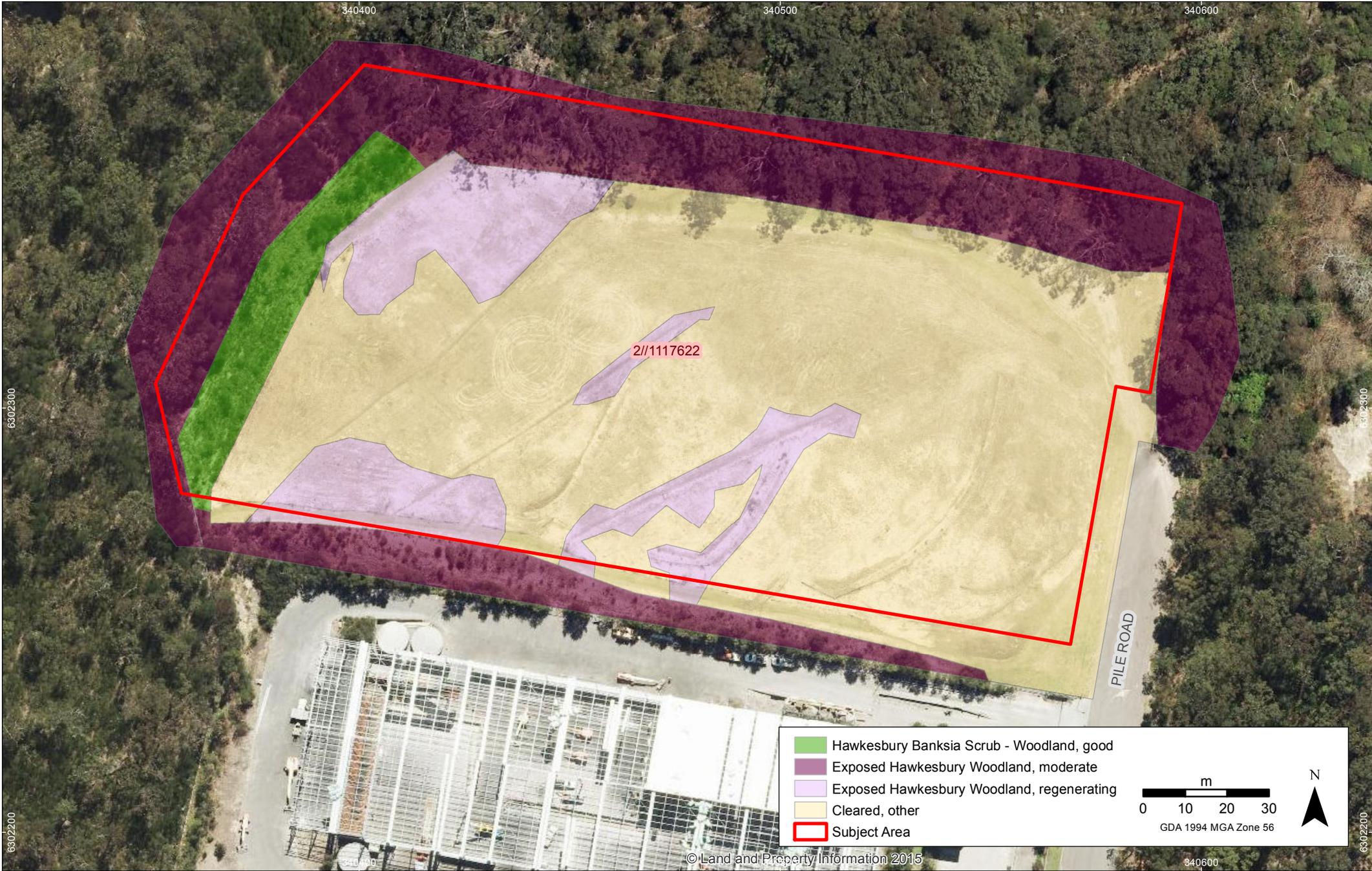
Mapped Vegetation (Gosford VIS 2345)  
M1 Pacific Motorway Upgrade - Karingong to Somersby (K2S)

**FIGURE 3**  
Imagery: (c) LPI 2014-10-01

Drawn by: RJ Project Manager: FL Project Number: 2923 Date: 10/10/2016

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## Appendix 1: Likelihood of occurrence of threatened flora and fauna within the study area

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<b>Amphibians</b>					
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but at least semi-permanent water must be present to allow its large tadpoles time to reach metamorphosis.	Low – no deep pool or permanent water present.
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	Low – no area of bullrushes or spike rushes, or permanent water bodies present.
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	-	This species is distributed from south-east Queensland to the NSW Central Coast. It occurs in a range of habitat types including rainforest, moist eucalypt forest, dry eucalypt forest and heath, but is most closely associated with wetter forest types in the southern part of its range. Calling and breeding is highly correlated with heavy rainfalls that lead to the formation of large ephemeral pools in a range of sites, but always in association with some native vegetation. Calling occurring only for one or two nights at a time anywhere between September and May.	Low – habitat not suitable. Wet forest not present.
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration.	Low – not recorded nearby. Habitat present not suitable.
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water.	Low – none recorded in locality. No permanent streams.

<sup>1</sup> Descriptions obtained from the NSW Wildlife Atlas unless otherwise stated.

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Mixophyes iteratus</i>	Giant Barred Frog	E	E	This species is found along larger streams of the coast and adjacent ranges of NSW and SE QLD. It inhabits rainforest and wet sclerophyll forest, but is also found within cleared farmland where fringing vegetation is retained, including lantana beds. Many sites where the Giant Barred Frog is known to occur are the lower reaches of streams which have been affected by major disturbances such as clearing, timber harvesting and urban development in their headwaters.	Low – no large streams present.
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After rain these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	Low – no rocky sandstone structures present. Study area only likely to contain water during time of rainfall events. Shallow pools unlikely to be present in the site except for during rain. The site lacks leaf litter.
<b>Birds</b>					
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE, M	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.	Low – no feed trees present.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	The Australasian Bittern is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes.	Low – no permanent water bodies.
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	Low – lack of fallen timber habitat.
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> spp. Tends to prefer drier forest types with a middle stratum of <i>Allocasuarina</i> below <i>Eucalyptus</i> or <i>Angophora</i> . Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	Low – few <i>Allocasuarina</i> trees regenerating.
<i>Charadrius bicinctus</i>	Double-banded Plover	-	M	Found on littoral, estuarine and fresh or saline terrestrial wetlands, rocky beaches, bays and inlets. Sometimes found on exposed reefs and rock platforms. Migrates to breed in New Zealand.	None
<i>Cuculus optatus</i>	Oriental Cuckoo	-	M	Mainly inhabits coniferous, deciduous and mixed forests. Breeds in northern hemisphere. Brood parasite, laying eggs in nests of other birds.	Low

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature eucalypts with hollows.	Low – lack of tree hollows. May use the adjacent bushland.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.	Low – lack of dense scrub.
<i>Diomedea antipodensis</i>	Antipodean Albatross	V	V	The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia. The Antipodean Albatross breeds biennially in colonies on ridges, slopes and plateaus of isolated subantarctic islands, usually in vegetation such as grass tussocks. This species regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter where they feed on cuttlefish.	None
<i>Diomedea exulans</i>	Wandering Albatross	E	-	The Wandering Albatross is marine, pelagic and aerial. The Wandering Albatross visits Australian waters from Fremantle, Western Australia to northern New South Wales between June and September each year.	None
<i>Gallinago hardwickii</i>	Latham's Snipe	-	M	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration.	Low – lack of habitat features.
<i>Gallinago megala</i>	Swinhoe's Snipe	-	M	Occurs at edges of wetlands, swamps and freshwater streams. Also known to occur in grasslands, sewage ponds and drying claypans. Northern hemisphere breeding.	Low – lack of habitat features.
<i>Gallinago stenura</i>	Pin-tailed Snipe	-	M	Occurs at edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. Also found on more open wetlands, claypans and sewage ponds. Breeds in the northern hemisphere.	Low – lack of habitat features.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	Low – no trees hollows.
<i>Grantiella picta</i>	Painted Honeyeater	V	-	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits boree, brigalow and box-gum woodlands and box-ironbark forests.	None
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	-	In NSW the Sooty Oystercatcher occupies rocky headlands, reefs and offshore islands along the entire coast, apparently as a single continuous population.	None
<i>Haematopus longirostris</i>	Pied Oystercatcher	E	-	The Pied Oystercatcher inhabits marine littoral habitats, including islands. It occupies muddy, sandy, stony or rocky estuaries, inlets and beaches, particularly intertidal mudflats and sandbanks in large marine bays.	None

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	V	-	The Black-breasted Buzzard is found sparsely in areas of less than 500 mm rainfall, from north-western NSW and north-eastern South Australia to the east coast at about Rockhampton, then across northern Australia south almost to Perth, avoiding only the Western Australian deserts.	None
<i>Hieraetus morphnoides</i>	Little Eagle	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	Low – may fly over site. Unlikely to exclusively use the site for foraging.
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	Moderate
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	Usually found on coastal plains below 200 m. Often found along timbered watercourses, in wetlands with fringing trees and shrub vegetation. The sites where they occur are characterized by dense waterside vegetation.	Low – dense waterside vegetation not present.
<i>Lathamus discolor</i>	Swift Parrot	E	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Low – availability of food resources is limited.
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	-	M, V	Bar-tailed Godwit (spp. <i>baueri</i> ) is the eastern Australian / New Zealand sub species. Mainly found in coastal habitats such as intertidal sand flats, mudflats, estuaries, inlets, coastal lagoons and bays. Often found around beds of seagrass and saltmarsh. Northern hemisphere breeding.	None
<i>Limosa lapponica menzbieri</i>	Bar-tailed godwit	-	M, CE	Bar-tailed Godwit (spp. <i>menzbieri</i> ) is the western Australian sub species. Mainly found in coastal habitats such as intertidal sand flats, mudflats, estuaries, inlets, coastal lagoons and bays. Often found around beds of seagrass and saltmarsh. Northern hemisphere breeding.	None
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100 km <sup>2</sup> . They require large living trees for breeding, particularly near water with surrounding woodland -forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	Low – no large living trees for breeding, no permanent water present.
<i>Macronectes giganteus</i>	Southern Giant Petrel	E	E	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20 S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	None
<i>Macronectes halli</i>	Northern Giant-petrel	V	V	Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer.	None
<i>Monarcha melanopsis</i>	Black-faced Monarch	-	M	Found along the coast of eastern Australia, becoming less common further south. Inhabits rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Low

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Monarcha trivirgatus</i>	Spectacled Monarch	-	M	Coastal north-eastern and eastern Australia, including coastal islands, from Cape York, Queensland to Port Stephens, New South Wales. Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	None
<i>Motacilla flava</i>	Yellow Wagtail	-	M	Breeds in temperate Europe and Asia. The Yellow Wagtail is a regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. The species is considered a vagrant to Victoria, South Australia and southern Western Australia. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.	Low – lack of records.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	M	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Low
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	M	Inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands.	Low – no heavily gullied vegetation.
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	Low – no trees hollows present.
<i>Ninox connivens</i>	Barking Owl	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	Low – no roosting habitat. Very limited foraging habitat in open introduced grass area.
<i>Ninox strenua</i>	Powerful Owl	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within turpentine tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	Low – no roosting habitat. Very limited foraging habitat in open introduced grass area.
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE, M	A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover.	Low
<i>Numenius minutus</i>	Little Curlew	-	M	Feeds in short, dry grassland and sedgeland, including dry floodplains and black soil plains, which have scattered, shallow freshwater pools. Northern hemisphere breeding.	None
<i>Numenius phaeopus</i>	Whimbrel	-	M	Usually found on intertidal mudflats of sheltered coasts. Also found in harbours, lagoons, estuaries and river deltas, often those with mangroves. Northern hemisphere breeding.	None

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Pandion cristatus</i>	Eastern Osprey	V	M	Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	Low
<i>Petroica boodang</i>	Scarlet Robin	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Low
<i>Pluvialis fulva</i>	Pacific Golden Plover	-	M	Coastal habitats such as beaches, mudflats, sand flats, estuaries, lagoons and evaporation ponds in salt works. Northern hemisphere breeding.	None
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-	In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open box-gum woodlands on the slopes, and box-cypress-pine and open box woodlands on alluvial plains.	Low
<i>Pterodroma nigripennis</i>	Black-winged Petrel	V	-	Ranges throughout the Tasman Sea and Central Pacific Ocean, breeding at various island groups including Lord Howe Island. Marine Nests at numerous sites on Lord Howe Island.	None
<i>Rhipidura rufifrons</i>	Rufous Fantail	-	M	Found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. Inhabits tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Low
<i>Rostratula australis</i>	Australian Painted Snipe	E	E, M	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	Low
<i>Tringa nebularia</i>	Common Greenshank	-	M	Variety of inland wetlands and sheltered coastal habitats of varying salinity. Found on mudflats, saltmarsh, mangroves in embayments, harbours, deltas and lagoons. Breeds in northern hemisphere.	Low
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	Low
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts, often located in gullies. Nests have been located in trees 125 to 161 cm in diameter.	Low
<b>Reptiles</b>					

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-	The Pale-Headed Snake has a patchy distribution from north-east Queensland to north-east NSW. In NSW it occurs from the coast to the western side of the Great Divide as far south as Tuggerah and out to the western plains. It is found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest where it favours streamside areas, particularly in drier habitats. They shelter during under loose bark or in hollows and have a preference for frogs as prey, although lizards and small mammals are also taken. This species breeds and shelters in hollows in live and dead trees and in and under fallen timber. It is best detected from mid spring to mid-autumn and is mostly nocturnal.	Low – lack of bark, trees, logs, and hollows.
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	None
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	Low
<b>Mammals</b>					
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to nine nest sites within a 0.5 ha area over a 5 month period.	Low
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	Low – may fly over site however study area lack foraging resources.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Low
<i>Dasyurus viverrinus</i>	Eastern Quoll	E	-	No recent sightings of this species in NSW. Occurs in dry sclerophyll forest, scrub, heathland and cultivated land. Opportunistic carnivore with insects as its most important prey.	Low
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary, but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	Low – may fly over site however study area lack foraging resources.
<i>Macropus parma</i>	Parma Wallaby	V	-	Once occurred from north-eastern NSW to the Bega area in the southeast. Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to the Queensland border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	None

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bentwing-bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel hundreds of kilometres from feeding home ranges to breeding sites. Little Bentwing-bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	Low – may fly over site however study area lack foraging resources.
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Low – may fly over site however study area lack foraging resources.
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits.	Low – may fly over site however study area lack foraging resources.
<i>Myotis macropus</i>	Southern Myotis	V	-	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.	Low – may fly over site however study area lack foraging resources.
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Low
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	Low
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	None
<i>Phascolarctos cinereus</i>	Koala	V	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	Low – lack of Myrtaceae species within study area.
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy.	Low

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	V	-	In NSW the Eastern Chestnut Mouse mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. There are however isolated records in the Jervis bay area. In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again.	Low
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	Low
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	Low – may fly over site however study area lack foraging resources.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Low – may fly over site however study area lack foraging resources.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	Low – may fly over site however study area lack foraging resources.
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	Low
<b>Flora</b>					
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	Low – moderate
<i>Acacia pubescens</i>		V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Grows in open woodland and forest, in a variety of plant communities, including Cooks River-Castlereagh Ironbark forest, Shale-Gravel Transition forest and Cumberland Plain woodland.	Low

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Ancistrachne maidenii</i>		V	-	Restricted to northern Sydney, around St Albans - Mt White - Maroota - Berowra areas and to the Shannon Creek area south-west of Grafton. Habitat requirements appear to be specific, with populations occurring in distinct bands in areas associated with a transitional geology between Hawkesbury and Watagan soil landscapes. Grows in dry sclerophyll forest on sandstone-derived soils.	Low
<i>Asterolasia elegans</i>		E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys (e.g. in or adjacent to gullies) which support sheltered forest.	Low
<i>Astrotricha crassifolia</i>	Thick-leaf Star-hair	V	V	Occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). Also in Victoria. Occurs in dry sclerophyll woodland on sandstone.	Low
<i>Baloskion longipes</i>	Dense Cord-rush	V	V	Drier rainforest, usually near streams	Low
<i>Caladenia tessellata</i>	Thick-lip Spider Orchid	E	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	Low
<i>Callistemon linearifolius</i>		V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Low
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly gum, Silvertop Ash, Red Bloodwood and Black Sheoak and appears to prefer open areas in the understorey of this community.	Low
<i>Darwinia glaucophylla</i>		V	-	Known from approximately 15 sites, several within or near to Brisbane Waters NP and one within Popran NP. Grows in sandy heath, scrub and woodlands often associated with sandstone rock platforms or near hanging swamps and friable sandstone shallow soils.	Low
<i>Dendrobium melaleucaphilum</i>		E	-	Occurs in coastal districts and nearby ranges, extending from Queensland to its southern distributional limit in the lower Blue Mountains. In NSW, it is currently known from seven recent collections. There has been no subsequent confirmation from the locations of three earlier (pre-1922) collections and it is possible that these are now extinct. Grows frequently on <i>Melaleuca styphelioides</i> , less commonly on rainforest trees or on rocks in coastal districts. Flowers July–October.	Low
<i>Diuris bracteata</i>		E	Extinct	Dry sclerophyll woodland and forest with a predominantly grassy understorey.	Low
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	Low – moderate

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Eucalyptus camfieldii</i>	Heart-leaved Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	Low
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils.	Low
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March. Has been recorded between Ulladulla and Port Stephens. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded in Berowra Valley Regional Park, Royal National Park and Lane Cove National Park and may also occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	Low
<i>Grevillea shiressii</i>	Grevillea shiressii	V	V	Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	Low
<i>Haloragis exalata subsp. exalata</i>	Square Raspwort	V	V	Occurs in 4 widely scattered localities in eastern NSW. It is disjunct distributed in the central coast, south coast and north-western slopes botanical subdivisions of NSW. The species appears to require protected and shaded damp situations in riparian habitats.	Low
<i>Hibbertia procumbens</i>	Spreading Guinea Flower	E	-	Within NSW, known from several locations only on the Central Coast in the Gosford and Wyong LGAs. These populations are at Bumble Hill near Yarramalong in Wyong LGA; Kulnura, Strickland State Forest, Mangrove Mountain, Somersby, Calga/Mt White and Peats Ridge in the Gosford LGA; and near Mogo Creek to the west of Mangrove Creek Dam. Majority of known populations occur within heath banksia scrub on skeletal sandy soils. May also be found associated with upland swamps on sandy deposits.	Low – moderate
<i>Lindsaea fraseri</i>		E	-	Poorly drained, infertile soils in swamp forest or open eucalypt forest, usually as part of a ferny understorey.	Low
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	Low
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	Low
<i>Micromyrtus blakelyi</i>	Micromyrtus blakelyi	V	V	Typically occurs within heathlands in shallow sandy soil in cracks and depressions of sandstone rock platforms.	Low
<i>Pelargonium sp. striatellum</i>	Omeo's Stork's-bill	E	E	Flowering occurs from October to March. Occurs in habitat usually located just above the high water level of irregularly inundated or ephemeral lakes. During dry periods, the species is known to colonise exposed lake beds. The species is known to form clonal colonies by rhizomatous propagation.	Low

Species name	Common name	NSW TSC Act	EPBC Act	Preferred habitat <sup>1</sup>	Likelihood of occurrence
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of occurrence, but occurs in small populations, increasing the species' fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other <i>Persoonia</i> spp. are) but will regenerate from seed.	Low
<i>Pimelea curviflora</i> <i>var. curviflora</i>		V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shale-lateritic soils over sandstone and shale-sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Low
<i>Prostanthera askania</i>		E	E	Occurs adjacent to drainage lines on flat to moderately steep slopes formed on Narrabeen sandstone, and in moist sclerophyll forest and warm temperate rainforest communities. These communities are generally tall forests with a mesic understorey. Appears in some locations to propagate vegetatively by stem-layering where prostrate branches take root where they remain in contact with the soil.	Low
<i>Prostanthera junonis</i>		E	E	The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest-low woodland-open scrub. It occurs in both disturbed and undisturbed sites.	Moderate
<i>Rhizanthella slateri</i>		V, EP (Great Lakes)	E	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	Low
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities	Low
<i>Tetradlea glandulosa</i>	Tetradlea glandulosa	V	V	Associated with shale-sandstone transition habitat where shale cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey-sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands-open woodlands, and open forest.	Low
<i>Tetradlea juncea</i>		V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest-woodland with a mixed shrub understorey and grassy groundcover. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October.	Low
<i>Thesium australe</i>	Austral Toadflax	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic Coolatai grass.	Low

## Appendix 2: Photographs



**Plate 1: General photo showing disturbance area within cleared land. Regenerating shrubs in the distance.**



**Plate 2: Hawkesbury Banksia Scrub - Woodland (good condition). This vegetation to be retained.**



**Plate 3: Exposed Hawkesbury Woodland (regenerating condition). Approximately 0.3 ha of regenerating shrubs mixed with introduced grasses may be disturbed.**



**Plate 4: Exposed Hawkesbury Woodland (moderate condition). This vegetation to be retained.**



**Plate 5: Area dominated by introduced grasses.**



**Plate 6: Steep drainage embankment along southern portion of the site. This would not be impacted by proposal.**



**Plate 7: Drainage pit along northern portion of the site. This would not be impacted by proposal.**

# **Appendix B**

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Consideration of clause 228(2) factors and matters of national environmental significance

## Clause 228(2) Checklist

In addition to the requirements of the *Roads and Related Facilities EIS Guideline* (DUAP 1996) and *Is an EIS required?* (DUAP 1995/1996) guideline as detailed in the addendum REF, the following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposed modification on the natural and built environment.

Factor	Impact
<p>a. Any environmental impact on a community?</p> <p>The proposed modification would have the potential for short-term noise and traffic impacts during construction. Mitigation measures have been proposed to minimise the extent and duration of these potential impacts.</p>	Short-term negative
<p>b. Any transformation of a locality?</p> <p>The proposed modification would not transform the locality</p>	Nil
<p>c. Any environmental impact on the ecosystems of the locality?</p> <p>The proposed modification would not impact on ecosystems of the locality</p>	Nil
<p>d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?</p> <p>The proposed modification would have a minimal impact on environmental quality. Impacts would be confined to the construction phase.</p>	Minor negative
<p>e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?</p> <p>Impacts on heritage and other items with special values were assessed and it was determined that the proposed modification was unlikely to result in impacts.</p>	Nil
<p>f. Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>The proposed modification would be confined wholly to land contained within 85 Pile Road, Somersby. The site has previously been cleared for industrial development. Impacts on habitat on which protected fauna would be reliant would not be expected.</p>	Nil
<p>g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The proposed modification would not endanger any species of animal, plant or other form of life.</p>	Nil
<p>h. Any long-term effects on the environment?</p> <p>The nature and scale of the proposed modification are such that long-term negative effects on the environment are not expected.</p>	Nil

Factor	Impact
<p>i. Any degradation of the quality of the environment?</p> <p>The impacts of the proposed modification have been discussed and safeguards have been proposed. While short-term amenity (eg noise, visual, traffic) impact during the construction phase would be anticipated, the long-term degradation of the quality of the environment is considered unlikely.</p>	Short-term negative
<p>j. Any risk to the safety of the environment?</p> <p>The proposed modification would involve minimal risk to the safety of the environment through the implementation various work health and safety, and environmental management safeguards.</p>	Nil
<p>k. Any reduction in the range of beneficial uses of the environment?</p> <p>The proposed modification would not reduce the range of beneficial uses of the environment.</p>	Nil
<p>l. Any pollution of the environment?</p> <p>The proposed modification would not result in any pollution of the environment. Minor short-term risks to local water and/or air quality would be present during operation of the facility. Safeguards to avoid local water or air quality impacts have been proposed to address the risk of pollution during construction.</p>	Nil
<p>m. Any environmental problems associated with the disposal of waste?</p> <p>Any waste generated as a result of the proposed modification would be removed from site and disposed of legally. No environmental problems are anticipated for the disposal of waste.</p>	Nil
<p>n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?</p> <p>There would be no increased demand on resources, natural or otherwise, which are, or are likely to become in short supply as a result of the proposed modification.</p>	Nil
<p>o. Any cumulative environmental effect with other existing or likely future activities?</p> <p>The proposed modification would contribute to short-term amenity and traffic impacts from operation of the ancillary facility during construction of the project. The potential for adverse cumulative impacts has been assessed as minor.</p> <p>In the long-term, the proposed modification would assist in providing road user safety improvements on the nationally important M1 Pacific Motorway.</p>	Short-term negative Long-term positive
<p>p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?</p> <p>The proposed modification is not located within the coastal zone and would have no impact on coastal processes and coastal hazards.</p>	Nil

## Matters of National Environmental Significance

Under the environmental assessment provisions of the *Environment Protection and Biodiversity Conservation Act 1999*, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposed modification should be referred to the Australian Government Department of the Environment.

A referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are assessed in detail as part of this addendum REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
<p>a. Any impact on a World Heritage property?</p> <p>Given the nature of the proposed modification and the lack of direct proximity, impacts are not expected.</p>	Nil
<p>b. Any impact on a National Heritage place?</p> <p>Given the nature of the proposed modification and the lack of direct proximity, impacts are not expected.</p>	Nil
<p>c. Any impact on a wetland of international importance?</p> <p>The proposed modification is not near any wetland of international importance. Indirect impacts are not expected.</p>	Nil
<p>d. Any impact on a listed threatened species or communities?</p> <p>A number of Commonwealth listed threatened species have potential occur in the broader area. The nature, scale and location of the proposed modification is such that impacts on these species or their habitats are not expected. Indirect impacts are also not expected.</p>	Nil
<p>e. Any impacts on listed migratory species?</p> <p>A number of Commonwealth listed migratory species have potential occur in the broader area. The nature, scale and location of the proposed modification is such that impacts on these species or their habitats are not expected. Indirect impacts are also not expected.</p>	Nil
<p>f. Any impact on a Commonwealth marine area?</p> <p>The nature, scale and location of the proposed modification is such that there would be no environmental impact on a Commonwealth Marine area.</p>	Nil
<p>g. Does the proposed modification involve a nuclear action (including uranium mining)?</p> <p>The proposal does not involve a nuclear action.</p>	Nil
<p>Additionally, any impact (direct or indirect) on Commonwealth land?</p> <p>Direct or indirect impacts on Commonwealth land due to the nature and scale of the proposed modification are not expected.</p>	Nil

# Appendix C

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Statutory consultation checklists

# Infrastructure SEPP

## Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	ISEPP clause
Stormwater	Are the works likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	No		ISEPP cl.13(1)(a)
Traffic	Are the works likely to generate traffic to an extent that will <i>strain</i> the existing road system in a local government area?	No		ISEPP cl.13(1)(b)
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system?	No		ISEPP cl.13(1)(c)
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a <i>substantial</i> volume of water?	Yes	Central Coast Council (refer section 5.2).	ISEPP cl.13(1)(d)
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	No		ISEPP cl.13(1)(e)
Road & footpath excavation	Will the works involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No		ISEPP cl.13(1)(f)

## Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s)	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than <i>minor</i> or <i>inconsequential</i> ?	No		ISEPP cl.14

## Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with local Council(s)	ISEPP clause
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a <i>minor</i> extent?	No		ISEPP cl.15

## Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	ISEPP clause
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> ?	No		ISEPP cl.16(2)(a)
Marine parks	Are the works adjacent to a declared marine park under the <i>Marine Parks Act 1997</i> ?	No		ISEPP cl.16(2)(b)
Aquatic reserves	Are the works adjacent to a declared aquatic reserve under the <i>Fisheries Management Act 1994</i> ?	No		ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the <i>Sydney Harbour Foreshore Authority Act 1998</i> ?	No		ISEPP cl.16(2)(d)
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No		ISEPP cl.16(2)(f)

# Appendix D

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Construction noise and vibration assessment

# KARIONG TO SOMERSBY – M1 PACIFIC MOTORWAY UPGRADE

## Construction noise assessment for ancillary site at 85 Pile Rd, Somersby

6 October 2016

Roads and Maritime Services

TH981-04F02 (r2) Construction noise assessment

## Document details

Detail	Reference
Doc reference:	TH981-04F02 (r2) Construction noise assessment
Prepared for:	Roads and Maritime Services
Attention:	Andrew Grainger

## Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
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6.10.2016	Final		2	RP	MG	MG

### Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

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Supplementary professional advice should be sought in respect of these issues.

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# 1 Introduction

Roads and Maritime Services (Roads and Maritime) is upgrading the M1 Pacific Motorway between the Kariong and Somersby interchanges to improve traffic flow and safety. The upgrade involves widening the motorway to provide three lanes in each direction and upgrading entry and exist ramps at the Kariong interchange.

A construction noise and vibration assessment was conducted as part of the approved project REF which assessed the project impacts, including a number of ancillary facilities to support the construction works. Subsequently, Roads and Maritime plan to modify the project to include an additional ancillary facility located at 85 Pile Road, Somersby, which is the subject of this construction noise and vibration assessment.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

## 2 Project description

### 2.1 Ancillary site location

The proposed ancillary facility is located at 85 Pile Road, Somersby and is at the northern end of the Somersby Industrial Park. The site is currently unoccupied. There is an industrial recycling facility located directly adjacent to the site, with the nearest residential receiver being approximately 250m to the north on Howes Road. The location of proposed ancillary facility is shown in Figure 1.

### 2.2 Ancillary site operations

The proposed ancillary facility would be used as a concrete batch plant, and for the stockpiling of materials, storage of equipment and as a site office.

### 2.3 Construction hours and duration

The ancillary facility would operate during the daytime period between 7am - 6pm Monday to Friday and 8am to 1pm, with extended construction hours (ECH) in the early morning and evening periods implemented to reduce the duration of the overall construction period. The proposed working hours for the ancillary facility are:

- Monday to Friday: 6am to 8pm
- Saturday: 7am to 5pm
- Sunday and public holidays: no work.

The project is anticipated to commence towards the middle of 2017 for a period of up to 24 months.

Figure 1: Location of 85 Pile Road ancillary site



## 3 Existing noise environment

### 3.1 Noise monitoring location

Noise monitoring was conducted at the nearest residential receiver to the proposed ancillary facility. The noise monitor was installed at 25 Howes Road, approximately 250m north of the proposed ancillary facility. During the site inspection it was noted that ambient background noise was controlled by general nature (birds, insects, wind noise etc.) and distant road traffic noise from the M1 Motorway.

Appendix B of this report details the noise monitoring methodology. The graphical recorded output from the long term noise monitoring is included in Appendix C. The graphs in Appendix C were analysed to determine an assessment background level (ABL) for each day, evening and night period in each 24 hour period of noise monitoring, and based on the median of individual ABLs an overall single Rating Background Level (RBL) for the day, evening and night period is determined over the entire monitoring period in accordance with the NSW 'Industrial Noise Policy' (INP). The noise monitoring location is shown in the figure in Appendix D.

The results of the noise monitoring are detailed in Table 1 below. RBL's for the proposed extended construction hours are also shown.

**Table 1: Noise monitoring results**

NCA	Address	Rating Background Level (RBL)				
		Day	Evening	Night	Early morning ECH 1	Early evening ECH 2
		7am - 6pm	6pm - 10pm	10pm - 7am	6am - 7am	6pm - 8pm
NCA 1	25 Howes Road	38	41 (38) <sup>2</sup>	36	41 (38) <sup>2</sup>	42 (38) <sup>2</sup>

Notes:

<sup>1</sup> Application notes to the 'NSW Industrial Noise Policy' (EPA 2000) indicate that the community generally expects a greater control of noise during the evening and night as compared to the daytime. Therefore the RBL for the evening is set to no more than that for the daytime, and the night-time to no more than the evening.

<sup>2</sup> Consistent with the above, out of hours work (OOHW) time periods have been reduced to the relative daytime RBL noise level

### 3.2 Noise catchment area

Noise catchment areas (NCA's) were determined in the approved project REF along the route of the main alignment works. As the proposed ancillary facility is not located within any of the approved project REF NCAs, an additional NCA has been created to assist in identifying impacts at nearby receivers. The additional NCA is shown in the figure in Appendix D.

## 4 Construction noise assessment

Roads and Maritime has recently released the Construction Noise and Vibration Guideline (April 2016). This guideline refers to the NSW 'Interim Construction Noise Guideline' (ICNG, DECC 2009) for the setting of Noise Management Levels (NMLs). For this construction noise assessment, the quantitative assessment method has been applied.

### 4.1 Construction noise objectives

Construction noise assessment goals presented in the ICNG are referenced to noise management levels for residential, sensitive land uses and commercial/ industrial premises.

#### 4.1.1 Residential receivers

Table 2 sets out management levels for construction noise at residences and how they are to be applied.

**Table 2: Noise management levels for residences**

Time of day	Management Level L <sub>Aeq</sub> (15 min) *	How to apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> <li>Where the predicted or measured L<sub>Aeq</sub> (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. <ul style="list-style-type: none"> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:               <ol style="list-style-type: none"> <li>times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences).</li> <li>if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ol> </li> </ul>

Time of day	Management Level L <sub>Aeq</sub> (15 min) *	How to apply
Outside recommended standard hours	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.</li> </ul>

\* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

## 4.1.2 Other land uses

Table 3 presents management levels for noise at sensitive land uses other than residences.

**Table 3: Noise management levels at other sensitive land uses (non-residences)**

Land use	Noise assessment location	Noise management level (L <sub>Aeq,15min</sub> )
Classrooms at schools and other educational institutions	Internal	45
Hospitals and operating theatres		
Places of worship		
Active recreation areas <sup>1</sup>	External	65
Passive recreation areas <sup>2</sup>	External	60
Community centres	Dependent on intended use	Maximum internal levels recommended in AS2107 for specific use
Industrial premises	External	75
Office, retail outlets	External	70
Other noise sensitive businesses	Investigation to determine suitable noise levels on project-by-project basis	

Notes:

- Active recreation areas are characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.
- Passive recreation areas are characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion (eg. reading, meditation).

## 4.1.3 Sleep disturbance

Given that the site will operate during the early morning period of 6am - 7am (ECH1), an assessment of potential sleep disturbance is required. The ICNG recommends that the assessment should consider maximum noise levels and the extent and frequency of maximum noise level events exceeding the RBL. The ICNG takes guidance from the NSW Environmental Criteria for Road Traffic Noise (ECRTN, Environment Protection Authority 1999) for recommended night time noise goals to minimise potential impacts and preserve acoustic amenity within receivers:

- Maximum internal noise levels below 50-55dB(A) are unlikely to cause awakening reactions.
- One or two events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing.

The NSW EPA confirm that a sleep disturbance criterion of  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  is used for the initial assessment for the purpose of this review of environmental factors. It should only be used as a first step guide and where the criteria is not met, more detailed analysis is required to be incorporated into the detailed design and Construction Noise and Vibration Management Plan. The Application Notes of the NSW Industrial Noise Policy (2010) note the detailed analysis should include:

- the extent to which the maximum noise level exceeds the background level
- the number of times this happens during the night-time period, and
- the time of day (normally between 10pm and 7am).
- For the purpose of this assessment,  $L_{Amax}$  noise levels are been presented in place of  $L_{A1(1min)}$  for the maximum noise levels assessment. This is a conservative approach and is consistent with EPA policy.

## 4.2 Adopted project noise management levels

Based on measured noise levels, the proposed modification construction noise objectives for the Noise Catchment Area (NCA) has been determined and presented in Table 4. Considering that the proposed ancillary facility will operate for extended hours the early morning period of 6am - 7am (ECH1), management levels for potential sleep disturbance have also been set.

**Table 4: Project construction noise objectives at residential receivers**

NCA	Standard hours	Extended construction hours		Sleep disturbance
	Day	Early Morning ECH 1	Early evening ECH 2	
	7am - 6pm	6am - 7am	6pm - 8pm	
<b>Rating background level (RBL)</b>				
NCA 1	38	38	38	38
<b>Noise management level (NML) <math>L_{Aeq,15min}</math></b>				<b>Noise management level (NML) <math>L_{A1,1min}</math></b>
NCA 1	48	43	43	53

## 4.3 Construction activities

Table 5 lists the main construction activities and the associated major plant and equipment for the construction and operations of the proposed ancillary facility. The equipment list and associated sound power levels for have been obtained from the approved project REF for ancillary facilities.

**Table 5: Construction noise activities**

Activity/ Work Area	Plant/ Equipment	Day/ECH1/ECH2	Sound Power Level, dB(A) $L_{Aeq,15min}$	Sound Power Level, dB(A) $L_{Amax}$
<b>BATCHING</b>	Dump truck	1	108	118
Batch plant, concrete crushing, stockpiling and storage	Excavator	1	107	122
	Batch plant	1	108	117
	Concrete Crusher	1	103	114
	Front end loader	1	113	122
	Heavy vehicles	12 p.h	108 <sup>1</sup>	118
<b>STOCKPILE</b>	Dump truck	1	108	118
Stockpiling and storage	Excavator	1	107	122
	Front end loader	1	113	122
	Heavy vehicles	12 p.h	108 <sup>1</sup>	118

Notes:

1. Source modelled as moving point source. Sound power level presented is prior to time correction.

#### 4.4 Predicted noise levels

Noise modelling was conducted using the 'Cadna-A' software package with ISO 9613 calculation algorithm. Emissions were determined by modelling the noise sources, receiver locations, and operating activities, based on the information presented in Section 4.3 Construction activities. Ground topography in the area was supplied by Roads and Maritime, and ground absorption for rural areas of 0.75 was adopted.

Table 6 summarises the predicted  $L_{Aeq(15min)}$  construction noise levels at receivers within the defined NCA. The maximum of the predicted noise level range presented in the summary tables is based on the worst affected receiver and is depicted as 'max' in the tables. The minimum of the predicted noise level range is based on the least affected receiver and is depicted as 'min' in the tables. Noise predictions to other sensitive receivers (OSR), in this case nearby industrial sites, is also provided. Table 7 summarises the number of receivers predicted to exceed the NML.

**Table 6: Predicted construction noise levels,  $L_{Aeq,15min}$** 

NCA / ID	Day (7am - 6pm)				ECH1 (6am - 7am) & ECH 2 (6pm - 8pm)					
	NML $L_{Aeq,15min}$	BATCHING		STOCKPILE		NML $L_{Aeq,15min}$	BATCHING		STOCKPILE	
		min	max	min	max		min	max	min	max
NCA1	48	26	53	21	52	43	26	53	21	52
OSR	75*	33	66	32	65	75*	33	66	32	65

Notes:

\* OSR NML of 75dB(A) provided for the highest impacted nearby industrial receiver. The full list of other sensitive receivers is provided in Appendix E

**Table 7: Number of receivers predicted to exceed the NML**

NCA / ID	Day (7am - 6pm)		ECH1 (6am - 7am) & ECH 2 (6pm - 8pm)	
	BATCHING	STOCKPILE	BATCHING	STOCKPILE
NCA1	2	1	4	3
OSR	0	0	0	0

Table 8 shows the predicted  $L_{Amax}$  construction noise levels at the nearest residential receiver during the early morning period (ECH1) to allow assessment of sleep disturbance. For the purpose of this assessment, each item of plant and equipment has been assessed individually to provide a greater understanding of its likely impact. Table 9 shows the number of receivers predicted to exceed the sleep disturbance NML.

**Table 8: Predicted construction noise levels,  $L_{Amax}$** 

NCA / ID	ECH 1 (6am - 7am)										
	NML	Dump truck		Excavator		Batch plant		concrete crusher		Front end loader	
	$L_{A1,min}$	min	max	min	max	min	max	min	max	min	max
NCA1	53	23	<b>56</b>	24	<b>58</b>	22	<b>54</b>	15	51	26	<b>58</b>

Notes:

\* Bold font indicates exceedance of  $L_{A1,min}$  sleep disturbance criteria

**Table 9: Number of receivers predicted to exceed the sleep disturbance NML**

NCA	Sleep disturbance NML $L_{A1,min}$	Number of residences predicted to exceed the NML				
		Dump truck	Excavator	Batch plant	concrete crusher	Front end loader
NCA1	53	2	3	2	-	3

## 4.5 Summary of noise impacts

### 4.5.1.1 Standard daytime hours

During standard daytime hours, noise levels are predicted to exceed the NML by up to 5dB at the nearest affected residences on Howes Road. This is due to a combination of all listed plant and equipment operating simultaneously.

Detailed results of the construction noise predictions at each residence are presented in Appendix E.

### 4.5.1.2 Extended construction hours (ECH1 & ECH2)

During the early morning and early evening extended hours periods between 6am - 7am and 6pm - 8pm, noise levels are predicted to exceed the NML by up to 10dB(A) at the nearest affected residences on Howes Road.

Detailed results of the construction noise predictions at each residence are presented in Appendix E.

#### 4.5.2 Sleep disturbance

Exceedance of the  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  sleep disturbance criteria during the early morning period is likely with the use of most plant and equipment onsite. The predicted exceedance is up to 5dB above the NML. Heavy vehicle compression breaks, batch plant operations and use of front end loaders and excavators are all predicted to exceed the initial criteria. Whilst the initial sleep disturbance criteria of  $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$  is exceeded, it is noted that internal maximum noise levels would be below 50dB(A) (assuming a 10dB loss for outside to inside noise levels), therefore sleep disturbance would be unlikely to cause awakening reactions.

Detailed results of the sleep disturbance impacts at each residence are presented in Appendix F.

Construction mitigation and management measures are provided in Section 7 Construction mitigation and management measures to assist in reducing construction noise impacts to receivers.

## 5 Construction related road traffic

All construction related traffic will access and depart the site through the Somersby industrial precinct onto the M1 Motorway. As there are no residences within the industrial precinct, noise impact from site generated traffic would not be anticipated.

## 6 Construction vibration assessment

### 6.1 Vibration objectives and limits

#### 6.1.1 Disturbance to buildings occupants

Assessment of potential disturbance from vibration on human occupants of buildings is made in accordance with the DECC 'Assessing Vibration; a technical guideline' (DECC, 2006). The guideline provides criteria which are based on the British Standard BS 6472-1992 'Evaluation of human exposure to vibration in buildings (1-80Hz)'. Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent'. Table 10 provides definitions and examples of each type of vibration.

**Table 10: Types of vibration**

Type of vibration	Definition	Examples
Continuous vibration	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive vibration	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers.  Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

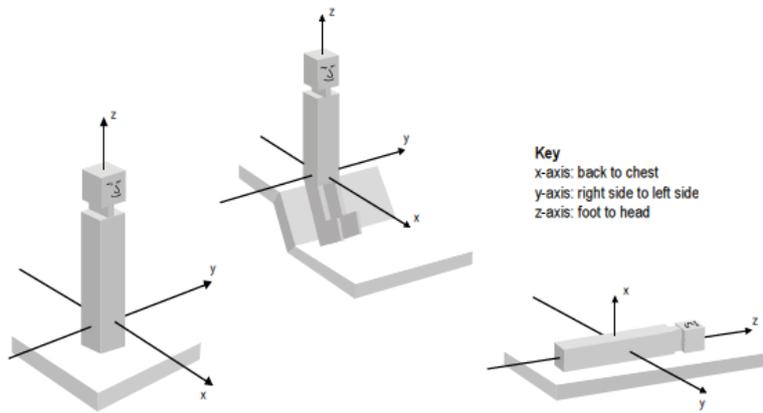
Source: Assessing Vibration; a technical guideline, Department of Environment & Climate Change, 2006

The vibration criteria are defined as a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

*'Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).'*

When applying the criteria, it is important to note that the three directional axes are referenced to the human body, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). Vibration may enter the body along different orthogonal axes and affect it in different ways. Therefore, application of the criteria requires consideration of the position of the people being assessed, as illustrated in Figure 2. For example, vibration measured in the horizontal plane is compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y- and z- axis criteria if the concern is for people in the lateral position.

**Figure 2: Orthogonal axes for human exposure to vibration**



The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 11.

**Table 11: Preferred and maximum levels for human comfort**

Location	Assessment period <sup>[1]</sup>	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
<b>Continuous vibration (weighted RMS acceleration, m/s<sup>2</sup>, 1-80Hz)</b>					
Critical areas <sup>2</sup>	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
<b>Impulsive vibration (weighted RMS acceleration, m/s<sup>2</sup>, 1-80Hz)</b>					
Critical areas <sup>2</sup>	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

- Notes:
1. Daytime is 7am to 10pm and night-time is 10pm to 7am
  2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 12.

**Table 12: Acceptable vibration dose values for intermittent vibration ( $m/s^{1.75}$ )**

Location	Daytime <sup>1</sup>		Night-time <sup>1</sup>	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas <sup>2</sup>	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes: 1. Daytime is 7am to 10pm and night-time is 10pm to 7am  
 2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.  
 Source: BS 6472-1992

## 6.1.2 Structural damage

Potential structural damage of buildings as a result of vibration is typically managed by ensuring vibration induced into the structure does not exceed certain limits and standards, such as British Standard 7385 Part 2 and German Standard DIN4150-3. Currently there is no existing Australian Standard for assessment of structural building damage caused by vibration energy.

Within British Standard 7385 Part 1: 1990, different levels of structural damage are defined:

- *Cosmetic - The formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition the formation of hairline cracks in mortar joints of brick/concrete block construction.*
- *Minor - The formation of large cracks or loosening of plaster or drywall surfaces, or cracks through bricks/concrete blocks.*
- *Major - Damage to structural elements of the building, cracks in supporting columns, loosening of joints, splaying of masonry cracks, etc.*

The vibration limits in Table 1 of British Standard 7385 Part 2 (1993) are for the protection against cosmetic damage, however guidance on limits for minor and major damage is provided in Section 7.4.2 of the Standard:

### 7.4.2 Guide values for transient vibration relating to cosmetic damage

*Limits for transient vibration, above which cosmetic damage could occur are given numerically in Table 1 and graphically in Figure 1. In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the guide values for the building types corresponding to line 2 are reduced. Below a frequency of 4 Hz, where a high displacement is associated with a relatively low peak component particle velocity value a maximum displacement of 0.6 mm (zero to peak) should be used.*

*Minor damage is possible at vibration magnitudes which are greater than twice those given in Table 1, and major damage to a building structure may occur at values greater than four times the tabulated values.*

Within DIN4150-3, damage is defined as "any permanent effect of vibration that reduces the serviceability of a structure or one of its components" (p.2). The Standard also outlines:

*"that for structures as in lines 2 and 3 of Table 1, the serviceability is considered to have been reduced if*

- cracks form in plastered surfaces of walls;*
- existing cracks in the building are enlarged;*
- partitions become detached from loadbearing walls or floors.*

*These effects are deemed 'minor damage.' (DIN4150.3, 1990, p.3)*

While the DIN Standard defines the above damage as 'minor', based on the definitions provided in BS7385, the DIN standard is considered to deal with cosmetic issues rather than major structural failures.

#### **6.1.2.1 British Standard**

British Standard 7385: Part 2 'Evaluation and measurement of vibration in buildings', can be used as a guide to assess the likelihood of building damage from ground vibration. BS7385 suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur.

The cosmetic damage levels set by BS 7385 are considered 'safe limits' up to which no damage due to vibration effects has been observed for certain particular building types. Damage comprises minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls. 'Minor' damage is considered possible at vibration magnitudes which are twice those given and 'major' damage to a building structure may occur at levels greater than four times those values.

BS7385 is based on peak particle velocity and specifies damage criteria for frequencies within the range 4Hz to 250Hz, being the range usually encountered in buildings. At frequencies below 4Hz, a maximum displacement value is recommended. The values set in the Standard relate to transient vibrations and to low-rise buildings. Continuous vibration can give rise to dynamic magnifications due to resonances and may need to be reduced by up to 50%. Table 13 sets out the BS7385 criteria for cosmetic, minor and major damage.

**Table 13: BS 7385 structural damage criteria**

Group	Type of structure	Damage level	Peak component particle velocity, mm/s		
			4Hz to 15Hz	15Hz to 40Hz	40Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	Cosmetic	50		
		Minor*	100		
		Major*	200		
2	Un-reinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 to 20	20 to 50	50
		Minor*	30 to 40	40 to 100	100
		Major*	60 to 80	80 to 200	200

Notes: Peak Component Particle Velocity is the maximum Peak particle velocity in any one direction (x, y, z) as measured by a tri-axial vibration transducer.

\* Minor and major damage criteria established based on British Standard 7385 Part 2 (1993) Section 7.4.2

### 6.1.2.2 German Standard

German Standard DIN 4150 - Part 3 '*Structural vibration in buildings - Effects on Structure*' (DIN 4150-3), also provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are generally recognised to be conservative.

DIN 4150-3 presents the recommended maximum limits over a range of frequencies (Hz), measured in any direction, and at the foundation or in the plane of the uppermost floor of a building or structure. The vibration limits increase as the frequency content of the vibration increases. The criteria are presented in Table 14.

**Table 14: DIN 4150-3 structural damage criteria**

Group	Type of structure	Vibration velocity, mm/s			
		At foundation at frequency of			Plane of floor uppermost storey
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (eg buildings under a preservation order)	3	3 to 8	8 to 10	8

## 6.2 Construction vibration

### 6.2.1 Vibration sources

The major sources of vibration would be truck and trailer and general excavator movements. Table 15 below identifies the dominant vibration generating plant and their typical vibration levels based on library data and measurements from past projects. Potential vibration generated to receivers for the proposed modification would be dependent on separation distances, the intervening soil and rock strata, dominant frequencies of vibration and the receiver structure.

**Table 15: Typical ranges of construction plant vibration levels**

Plant Noise Source	Typical PPV Vibration (mm/s) at distance from plant			
	5m	10m	15m	20m
Excavator ≤30T (travelling)	8	3.4	1.6	-
Excavator ≤30T (digging)	5.8	4	0	-
Truck & Trailer (45T net)	14.5	10.3	3.4	-

Notes:

Source – Renzo Tonin & Associates database

### 6.2.2 Recommended minimum buffer distances

Based on available data from a database containing vibration measurements from past projects and from library information, Table 16 below presents the recommended minimum working distances for vibration generating plant.

**Table 16: Recommended minimum working distances for vibration intensive plant**

Plant item	Rating / description	Minimum working distance	
		Cosmetic damage	Human response
Excavators <sup>1</sup>	< 30 Tonne (travelling/ digging)	10 m	15 m
Loaders <sup>1</sup>	-	-	5 m
Truck Movements <sup>1</sup>	-	-	10 m

Notes: 1. Renzo Tonin & Associates project files, databases & library

The nearest residence is approximately 250m from the site and the nearest other sensitive receiver is an industrial building which is approximately 30m from boundary of the site. Vibration impact is therefore anticipated.

## 7 Construction mitigation and management measures

### 7.1 Site hoardings

Constructing site hoardings around the site was considered as a noise mitigation strategy, however were found to be not a viable solution as the residences on Howes Road are approximately 25m higher in elevation to the proposed ancillary facility. Where the receiver is much higher than the noise source, noise barriers and hoardings are ineffective.

### 7.2 Mitigation measures

The ICNG contains in-principle recommendations for noise control solutions to reduce noise impacts to nearby sensitive receivers. The Construction Noise and Vibration Guideline also includes additional mitigation measures to be applied where feasible and reasonable when the predicted noise level exceeds the NMLs by a specific trigger value (in this case, 5dB and up to 10 dB for work between 6am to 7am and 6pm to 8pm Monday to Friday). Relevant management measures from the ICNG and additional measures from Roads and Maritime's Construction Noise and Vibration Guideline have been adapted and presented in Table 17 below and should be implemented where feasible and reasonable.

**Table 17: Construction noise and vibration management recommendations**

Construction noise and vibration management options	
<b>Universal work practices</b>	
Work practices at any time of day	<ul style="list-style-type: none"> <li>Regular training of workers and contractors (such as at toolbox talks) would be undertaken in the use of equipment in ways to minimise noise. The training would also include details of relevant approval requirements including, but not limited to, approved working hours.</li> </ul>
Additional work practices during early morning shoulder period	<ul style="list-style-type: none"> <li>The use of equipment that generates impulsive noise would be minimised as far as practicable</li> <li>The need for reversing movements would be minimised as far as practicable and non-tonal reversing alarms fitted to plant and site vehicle.</li> </ul>

<b>Construction noise and vibration management options</b>	
<b>Consultation and notification</b>	
Notification before and during construction	<ul style="list-style-type: none"> <li>• Consultation with the affected community (ie those where noise levels have been predicted to exceed NML) would be undertaken in the lead up to and throughout the project in accordance with the project Communications and Community Involvement Plan. Key aspects of this communication would include: <ul style="list-style-type: none"> <li>- Information relating to the type of works planned, associated noise impacts, location, timing (eg working hours) and duration. Notifications would include letters to the householder, phone calls and/or individual briefings</li> <li>- Opportunities for respite during out of hours work (ie between 6am to 7am and 6pm and 8pm) where noise levels are predicted to exceed the NML by more than 5dB and up to 10 dB in accordance with Roads and Maritime's Construction Noise and Vibration Guideline</li> </ul> </li> <li>• After-hours emergency contact details (eg senior personnel name and phone number) would be provided to potentially affected receivers in consultation information and provided on the Roads and Maritime website.</li> </ul>
Complaints handling	<ul style="list-style-type: none"> <li>• A readily accessible 24 hour toll-free information and complaints line would be implemented prior to commencement of the works</li> <li>• A documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow, would be implemented for the works</li> <li>• Feasible and reasonable measures would be implemented to address the source of complaints</li> <li>• A register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, work area, time of verbal response and timeframe for written response where appropriate, would be maintained.</li> </ul>
<b>Plant and equipment</b>	
Operate plant in a quiet and efficient manner	<ul style="list-style-type: none"> <li>• Reduce throttle setting and turn off equipment when not being used.</li> </ul>
Maintain equipment	<ul style="list-style-type: none"> <li>• Regularly inspect and maintain equipment to ensure it is in good working order. Also check the condition of mufflers</li> <li>• Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified</li> <li>• Ensure air lines on pneumatic equipment do not leak.</li> </ul>
Use quieter equipment	<ul style="list-style-type: none"> <li>• Different types of machines would be examined that perform the same function and compare the noise level data to select the least noisy machine. For example, rubber wheeled excavators can be less noisy than steel tracked excavators.</li> </ul>
<b>On site</b>	
Location of plant	<ul style="list-style-type: none"> <li>• Place as much distance as possible between the plant or equipment and residences.</li> </ul>
Alternatives to reversing alarms	<ul style="list-style-type: none"> <li>• Non-tonal reversing alarms would be fitted to plant and site vehicles operating outside of standard construction hours.</li> </ul>
Maximise shielding	<ul style="list-style-type: none"> <li>• Place temporary site buildings, material stockpiles and other fixed structures where possible to minimise the propagation of noise toward residential noise sensitive receivers e.g. toward the northern side of the site to provide maximum shielding to nearby residences on Howes Road.</li> </ul>

<b>Construction noise and vibration management options</b>	
<b>Work scheduling</b>	
Schedule activities to minimise noise impacts	<ul style="list-style-type: none"> <li>Organise work to be undertaken during the recommended standard hours where possible.</li> </ul>
Organise deliveries and access	<ul style="list-style-type: none"> <li>Optimise the number of vehicle trips to and from the site – movements can be organised to amalgamate loads rather than using a number of vehicles with smaller loads.</li> <li>Schedule deliveries during standard working hours where possible.</li> </ul>
<b>Verification noise monitoring in the community</b>	
	<ul style="list-style-type: none"> <li>Undertake noise monitoring at the nearest affected noise sensitive receiver (where possible) within 14 days of the commencement of construction activities at the proposed ancillary facility to verify predicted noise impacts. Continue monitoring on a three-monthly basis until use of the site is no longer required to support construction. Monitoring would be undertaken in accordance with procedures documented in AS1055.1-1997 Acoustics - Description and Measurement of Environmental Noise - General Procedures</li> <li>Where monitoring indicates noise levels attributable to operation of the proposed ancillary facility are greater than those predicted, investigate and implement additional feasible and reasonable mitigation measures.</li> </ul>

## APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L <sub>Max</sub>	The maximum sound pressure level measured over a given period.
L <sub>Min</sub>	The minimum sound pressure level measured over a given period.

L <sub>1</sub>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L <sub>10</sub>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L <sub>90</sub>	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L <sub>eq</sub>	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

## APPENDIX B Noise monitoring methodology

### B.1 Noise monitoring equipment

A noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave Band Data
RTA06 (NTi Audio XL2)	Type 1	1/1 octaves

Notes: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table, and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Type 4230 or 4231 calibrator. No significant drift in calibration was observed.

### B.2 Meteorology during monitoring

Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the INP. The Bureau of Meteorology (BOM) provided meteorological data, which is considered representative of the site, for the duration of the noise monitoring period. The data was modified to allow for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data was taken from Australian Standard AS1170.2 1989 Section 4.2.5.1.

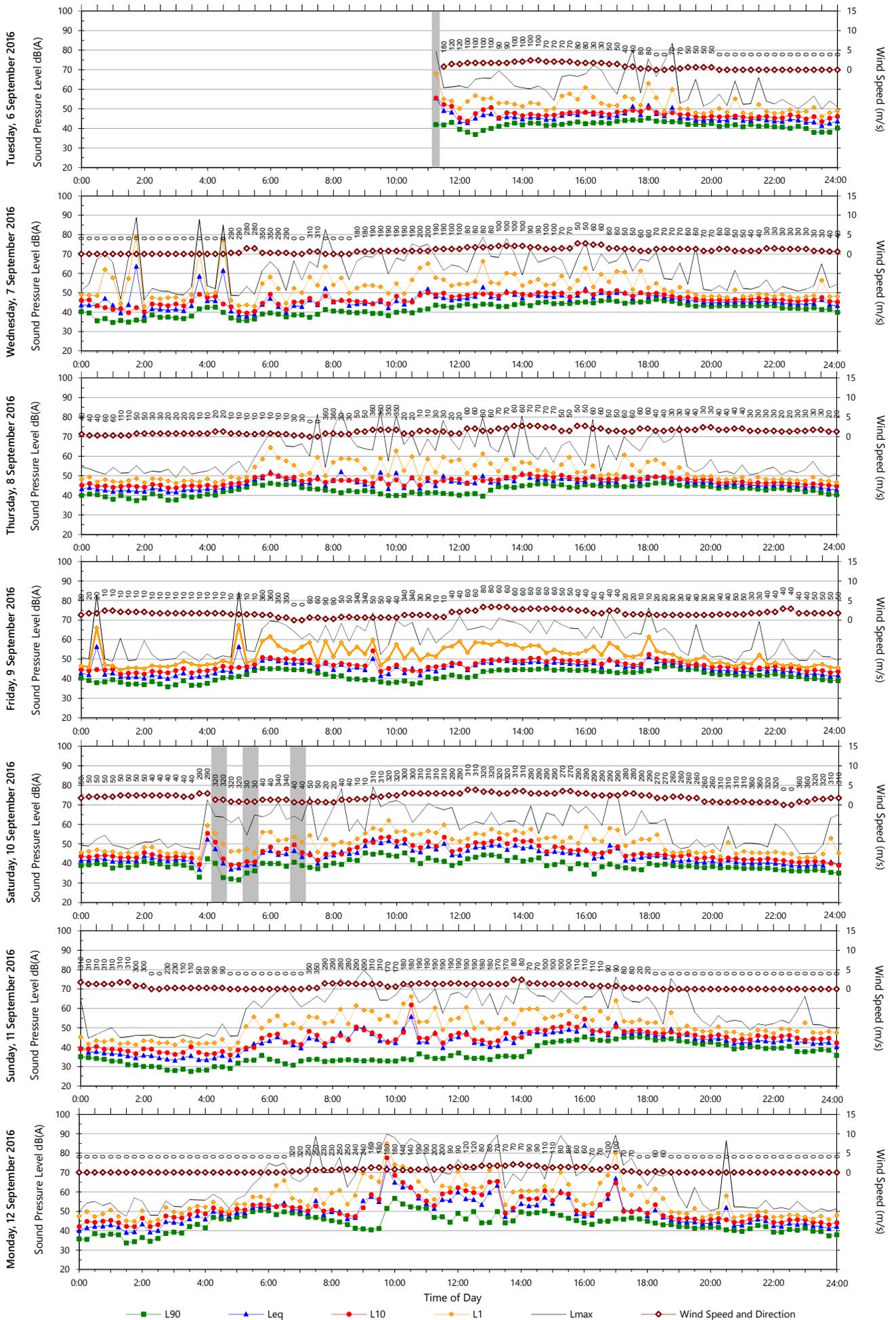
### B.3 Noise vs time graphs

Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the L10, L90, and Leq levels. The statistical descriptors L10 and L90 measure the noise level exceeded for 10% and 90% of the sample measurement time. The Leq level is the equivalent continuous noise level or the level averaged on an equal energy basis. The measurement sample periods were fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband results.

## APPENDIX C    Noise monitoring graphs

Unattended Monitoring Results

Location: 25 Howes Rd

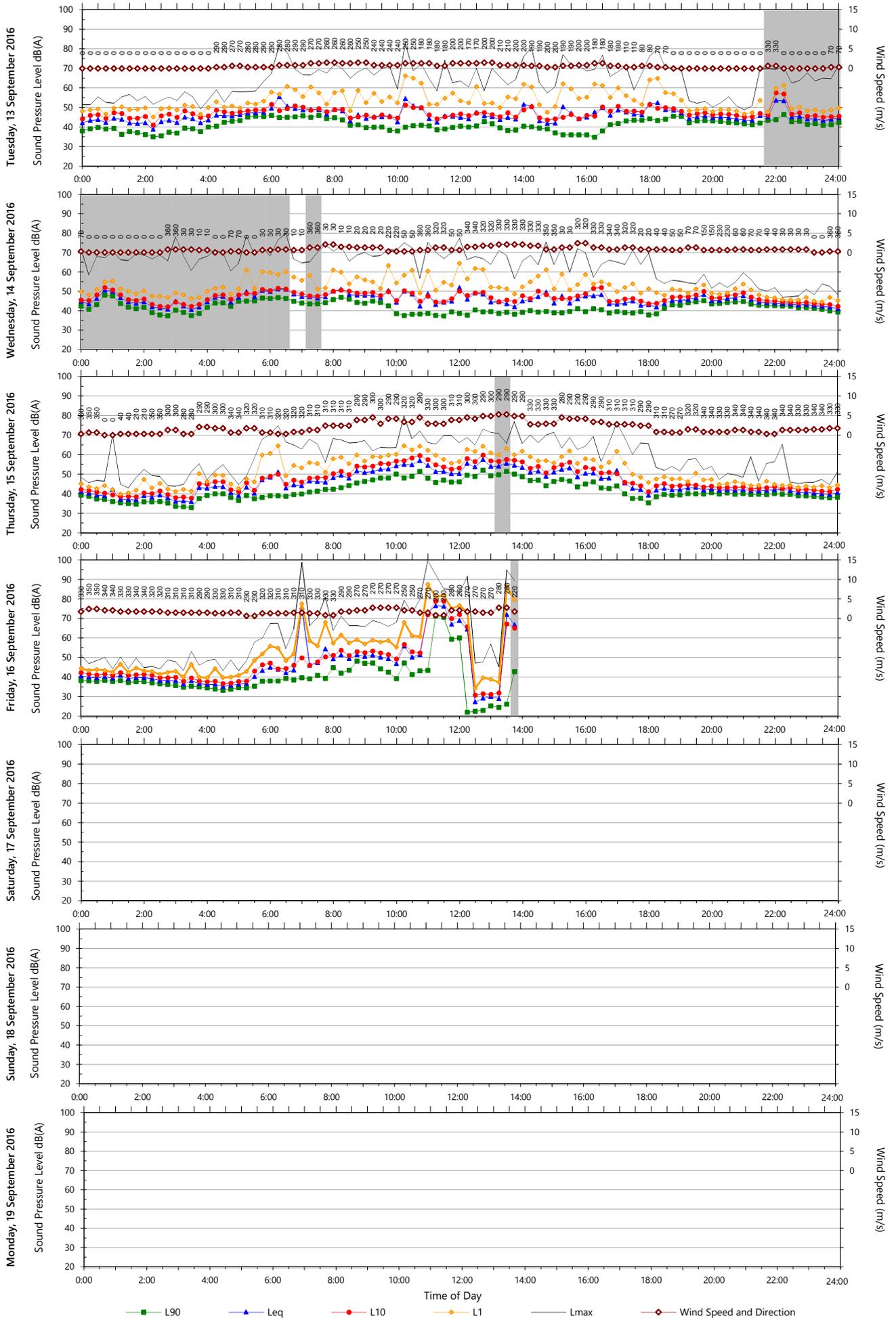


Data File: 2016-09-06\_SLM\_000\_123\_Rpt\_Report.txt

Template: QTE-26 (rev 12) Logger Graphs Program

Unattended Monitoring Results

Location: 25 Howes Rd



Data File: 2016-09-06\_SLM\_000\_123\_Rpt\_Report.txt

Template: QTE-26 (rev 12) Logger Graphs Program

## **APPENDIX D**    **NCA's, noise monitoring locations & identified receivers**



- Legend:
- + Noise monitoring location
  - Residential receiver
  - Other sensitive receiver
  - Ancillary facility
  - NCA



Consultant:



Acoustics, Vibration & Structural Dynamics  
 Sydney Melbourne Brisbane Gold Coast Kuwait  
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Client:



Roads & Maritime

Project:

KARIONG TO SOMERSBY  
 M1 PACIFIC MOTORWAY UPGRADE  
 CONSTRUCTION NOISE ASSESSMENT  
 FOR 85 PILE RD ANCILLARY FACILITY

Noise levels are approximate due to interpolation of contours and should be used for reference only.  
 For information only and not for construction.  
 This information is protected by copyright.

Description:

NOISE CATCHMENT AREAS  
 NOISE MONITORING LOCATIONS &  
 ASSESSED RECEIVERS

Project No.: TH981-04

Created by: rp

Fig Ref: TH981-04.5.1.01 (R0)

Grid: -

Date: 2016.09.19

Scale: 1: 8000 A3

## APPENDIX E Predicted construction noise levels $L_{Aeq,15min}$

## Predicted Construction Noise Levels - LAeq,15min

## Kariong to Somersby - M1 Pacific Motorway upgrade

Receiver			Predicted Noise Levels, dB(A)					
			DAY (STANDARD)			ECH1 & ECH 2		
NCA	NCA ID	Address	NML	BATCHING	STOCKPILE	NML	BATCHING	STOCKPILE
NCA1	NCA1_01	25 HOWES ROAD SOMERSBY	48	53	52	43	53	52
NCA1	NCA1_02	39 HOWES ROAD SOMERSBY	48	46	45	43	46	45
NCA1	NCA1_03	36 HOWES ROAD SOMERSBY	48	42	40	43	42	40
NCA1	NCA1_04	37 HOWES ROAD SOMERSBY	48	49	48	43	49	48
NCA1	NCA1_05	45 HOWES ROAD SOMERSBY	48	38	37	43	38	37
NCA1	NCA1_06	50 HOWES ROAD SOMERSBY	48	38	36	43	38	36
NCA1	NCA1_07	60 HOWES ROAD SOMERSBY	48	35	33	43	35	33
NCA1	NCA1_08	70 HOWES ROAD SOMERSBY	48	34	33	43	34	33
NCA1	NCA1_09	79 HOWES ROAD SOMERSBY	48	33	31	43	33	31
NCA1	NCA1_10	90 HOWES ROAD SOMERSBY	48	33	32	43	33	32
NCA1	NCA1_11	191 WISEMANS FERRY ROAD SOMERSBY	48	37	35	43	37	35
NCA1	NCA1_12	281 WISEMANS FERRY ROAD SOMERSBY	48	44	43	43	44	43
NCA1	NCA1_13	282 WISEMANS FERRY ROAD SOMERSBY	48	43	42	43	43	42
NCA1	NCA1_14	30 ULINGA ROAD SOMERSBY	48	41	40	43	41	40
NCA1	NCA1_15	110 SOMERSBY FALLS ROAD SOMERSBY	48	42	41	43	42	41
NCA1	NCA1_16	126 SOMERSBY FALLS ROAD SOMERSBY	48	40	39	43	40	39
NCA1	NCA1_17	30 VIITASALO ROAD SOUTH SOMERSBY	48	31	29	43	31	29
NCA1	NCA1_18	311 WISEMANS FERRY ROAD SOMERSBY	48	34	33	43	34	33
NCA1	NCA1_19	21 ULINGA ROAD SOMERSBY	48	37	35	43	37	35
OSR	OSR_01	75 PILE ROAD SOMERSBY	75	66	65	75	66	65
OSR	OSR_02	79 HOWES ROAD SOMERSBY	75	33	32	75	33	32
OSR	OSR_03	142 SOMERSBY FALLS ROAD SOMERSBY	75	41	40	75	41	40
OSR	OSR_04	152 SOMERSBY FALLS ROAD SOMERSBY	75	40	39	75	40	39
OSR	OSR_05	160 SOMERSBY FALLS ROAD SOMERSBY	75	37	35	75	37	35
OSR	OSR_06	170 SOMERSBY FALLS ROAD SOMERSBY	75	35	34	75	35	34
OSR	OSR_07	211 WISEMANS FERRY ROAD SOMERSBY	75	49	48	75	49	48
OSR	OSR_08	218 WISEMANS FERRY ROAD SOMERSBY	75	50	49	75	50	49
OSR	OSR_09	231 WISEMANS FERRY ROAD SOMERSBY	75	50	49	75	50	49
OSR	OSR_10	234 WISEMANS FERRY ROAD SOMERSBY	75	51	50	75	51	50

## APPENDIX F Predicted construction noise levels $L_{Amax}$

Predicted Construction Noise Levels - L<sub>Amax</sub>

## Kariong to Somersby - M1 Pacific Motorway upgrade

Receiver			Predicted Noise Levels, dB(A)					
			ECH 1					
NCA	NCA ID	Address	NML	Dump truck	Excavator	Batch plant	Concrete crusher	Front end loader
NCA1	NCA1_01	25 HOWES ROAD SOMERSBY	53	56	58	54	51	58
NCA1	NCA1_02	39 HOWES ROAD SOMERSBY	53	49	52	48	44	52
NCA1	NCA1_03	36 HOWES ROAD SOMERSBY	53	44	47	44	39	47
NCA1	NCA1_04	37 HOWES ROAD SOMERSBY	53	51	54	51	46	55
NCA1	NCA1_05	45 HOWES ROAD SOMERSBY	53	40	43	40	34	44
NCA1	NCA1_06	50 HOWES ROAD SOMERSBY	53	40	43	40	34	43
NCA1	NCA1_07	60 HOWES ROAD SOMERSBY	53	36	39	37	30	40
NCA1	NCA1_08	70 HOWES ROAD SOMERSBY	53	36	38	37	30	40
NCA1	NCA1_09	79 HOWES ROAD SOMERSBY	53	34	37	35	28	38
NCA1	NCA1_10	90 HOWES ROAD SOMERSBY	53	35	38	36	29	38
NCA1	NCA1_11	191 WISEMANS FERRY ROAD SOMERSBY	53	39	40	40	32	42
NCA1	NCA1_12	281 WISEMANS FERRY ROAD SOMERSBY	53	47	50	46	42	50
NCA1	NCA1_13	282 WISEMANS FERRY ROAD SOMERSBY	53	45	49	44	41	49
NCA1	NCA1_14	30 ULINGA ROAD SOMERSBY	53	44	47	42	39	47
NCA1	NCA1_15	110 SOMERSBY FALLS ROAD SOMERSBY	53	44	48	43	40	47
NCA1	NCA1_16	126 SOMERSBY FALLS ROAD SOMERSBY	53	42	46	42	38	45
NCA1	NCA1_17	30 VIITASALO ROAD SOUTH SOMERSBY	53	32	36	33	26	36
NCA1	NCA1_18	311 WISEMANS FERRY ROAD SOMERSBY	53	37	40	37	32	40
NCA1	NCA1_19	21 ULINGA ROAD SOMERSBY	53	39	42	38	35	42

# Appendix E

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Aboriginal cultural heritage advice



25.08.2016

**Christopher Meehan**  
Graduate Engineer  
**Freight and Regional Program Office**  
Infrastructure Development Division  
**M** 0491 214 467  
**Roads and Maritime Services**  
Level 1 47 Darby Street Newcastle NSW 2300

Dear Christopher

**Preliminary assessment results for the proposed ancillary facility at 85 Pile Rd Somerby, based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation*.**

The project, as described in the Stage 1 assessment checklist was assessed as being unlikely to have an impact on Aboriginal cultural heritage. The assessment is based on the following due diligence consideration:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search on 25 May 2016 **did not** indicate Aboriginal objects or places within the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection Aboriginal objects in NSW* and Roads and Maritime Services procedure.
- The cultural heritage potential of the study area appears to be severely reduced due to past in disturbance.
- No removal of mature native trees

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Roads and Maritime Services' *Unexpected Heritage Items Procedure*.

For further assistance in this matter, do not hesitate to contact me on 0408 965 730.

Yours sincerely

Stephen Knight  
Aboriginal Cultural Heritage Officer – Hunter Region



[rms.nsw.gov.au](https://rms.nsw.gov.au)



[contactus@rms.nsw.gov.au](mailto:contactus@rms.nsw.gov.au)



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